BROCKMAN PARK
Structure Plan

Shire of
CARNARVON
catch a taste of the great life

veris

FAR lane

wave international

sph

June 2017

ENDORSEMENT PAGE

This structure plan is prepared under the provisions of the Shire of Carnarvon Town Planning Scheme No.10

IT IS CERTIFIED THAT THIS STRUCTURE PLAN WAS APPROVED BY RESOLUTION OF THE WESTERN AUSTRALIAN PLANNING COMMISSION ON:

19 October 2017

Signed for and on behalf of the Western Australian Planning Commission

An officer of the Commission duly authorised by the Commission pursuant to Section 16 of the Planning and Development Act 2005 for that purpose, in the presence of:

Witness

19 October 2017

Date

Date of Expiry: 19 October 2027

TABLE OF AMENDMENTS

Amendment No.	Summary of the Amendment	Amendment Type	Date Approved by WAPC

EXECUTIVE SUMMARY

The Brockman Park Structure Plan (the Structure Plan) relates to the land described below and is herein referred to as the Structure Plan Area.

Lot No.	Street Address	Certificate of Title	Plan/Diagram	Registered Landowner
1193	10 David Brand Drive	2176/885	P181640	Shire of Carnarvon
1147	No Street Address	1347/528	P173472	Shire of Carnarvon
1179	No Street Address	1757/95	P213005	Shire of Carnarvon

The Structure Plan has been prepared by Whelans Town Planning, on behalf of the Shire of Carnarvon, and has been formulated using the Structure Plan Framework in response to the Planning and Development (Local Planning Schemes) Regulations 2015. The Structure Plan is to be read in conjunction with the Shire of Carnarvon Town Planning Scheme No.10.

The Structure Plan provides for the comprehensive development of the Structure Plan Area primarily for Aged and Dependant Person's Dwellings and Public Open Space (POS) whilst also allowing some commercial and community uses, which are incidental to the primary use, in order to support the amenity and commercial viability of future development.

The preparation of this Structure Plan has been informed by consultation with the Shire of Carnarvon, Key Stakeholders, including various State Government agencies and the general public.

Item	Data	Structure Plan Ref (section no.)
Total area covered by the structure plan	2.1 hectares	1.2.2
Area of each land use proposed: Special Use: Aged Care: Parks & Recreation:	 16,813m² 4,248m²	4.2
Estimated area and percentage of public open space given over to: Local Parks	 4,248m² 100%	4.2

Note: All information and areas are approximate only and are subject to survey and detailed design.

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LIST OF ABBREVIATIONS

ACAR	Aged Care Approval Rounds
ACFA	The Aged Care Financing Authority
DAP	Daily Accommodation Payments
EBITDA	Earnings Before Interest Tax Depreciation Amortisation
EOI	Expression of Interest
GMF	Gascoyne Memorial Fund
HACC	Home and Community Care
ILF	Independent Living Facility
ILUs	Independent Living Units
MOU	Memorandum of Understanding
MP	Minister of Parliament
NACDC	National Aged Care Data Clearinghouse
NPBT	Net Profit Before Tax
RAC	Residential Aged Care
RAD	Refundable Accommodation Deposit
RSL	Returned Services League
SA2	Statistical Area Level 2
TPS10	Town Planning Scheme No. 10
WACHS	The Western Australian Country Health Service

BROCKMAN PARK
Structure Plan

PART ONE

IMPLEMENTATION

1 Structure Plan Area

The Brockman Park Structure Plan (the Structure Plan), once endorsed, will become the guiding document in the consideration of future subdivision and development for the land contained within the inner edge of the line denoting the Structure Plan boundary on the Structure Plan Map as shown in Figure 1.

2 Structure Plan Content

This Structure Plan comprises:

Part 1: Implementation Section.
Part 2: Explanatory Section.
Part 3: Technical Appendices.

The Structure Plan should be read in conjunction with the Shire of Carnarvon Local Planning Strategy (once endorsed) and the Town Planning Scheme No.10 (TPS10).

Part 1 of this Structure Plan is the implementation component of the Structure Plan which contains the Structure Plan Map and outlines the purpose and intent of the Structure Plan.

Part 2 of this Structure Plan is the explanatory section which contains the background information and explanation of the Structure Plan including design methodology, relevance and compliance with the planning framework. Part 2 also contains all supporting plans and figures.

Part 3 of this Structure Plan includes all of the relevant technical reporting which has been undertaken in support of the Structure Plan.

3 Operation

The Structure Plan comes into effect on the date the Structure Plan is approved by the Western Australian Planning Commission (WAPC). An approved structure plan is a document to which planning decision-makers are to give due regard to when making decisions on the subdivision and development of land within the Structure Plan Area.

4 Subdivision and Development Requirements

4.1 Objectives

4.1.1 Land Use and Built Form

- To provide for aged person's accommodation and a limited range of complementary commercial and community land uses and public open space.
- To establish housing forms that are appropriate for aged residents.
- To create opportunities for the integration of new development with the adjacent GMF development.
- To provide flexibility for a range of housing types at different densities.
- To optimise views to the adjacent open space and water body.
- To integrate architectural and landscape design.

4.1.2 Streetscape

- To address the surrounding street and open space network with an attractive and active interface.
- To reduce the visual impact of car parks and parking structures on the streetscape.
- To address the corner of David Brand Drive and Olivia Terrace with a distinct built-form, active land use, or landscape feature.
- To establish a built form that contributes to Carnarvon's sense of place.

4.1.3 Movement Network

- To optimise passive surveillance of the pedestrian movement network within and adjacent to the structure plan area.
- To establish a comfortable and appealing level of pedestrian amenity to enable and encourage walking.
- To provide a convenient alternative route(s) to the existing pedestrian path through the structure plan area.

4.1.4 Open Space

- To create places that encourages social interaction between residents and between residents and the broader community.
- To maintain sufficient open space for the management of stormwater.
- To integrate stormwater management with passive and/or active recreational space.

4.1.5 Resource Conservation

To make use of the opportunity for passive cooling through the orientation of buildings and the enabling of cross ventilation.

4.2 Zones & Reserves

The Structure Plan Area is divided into a 'Parks and Recreation' reservation (4,248m2) and a 'Special Use - Aged and dependent Persons Dwelling' zone (16,813m2) as shown on the Structure Plan Map. As the 'Special Use' zone does not apply an r-code to the subject land, the provisions of State Planning Policy 3.1 - Residential Design Codes do not apply.

4.3 Land Use

As SPP3.1 is not applicable to development within the structure plan and 'Aged or Dependent Person's Dwelling' is not defined in TPS10 the definition of Aged or Dependent Person's Dwelling, for the purpose of this Structure Plan, is a follows:

> *A dwelling which is built specifically for a person who is either over 55 years of age or has a recognised form of disability requiring special accommodation for independent living or special care.*

Land Use permissibility shall be consistent with the Objectives for the Structure Plan and in accordance with the provisions for the 'Special Use: Aged Care' zone with the following variations:

Use Classes	Permissibility
Serviced Apartment	IP
Restaurant/Café/Eating House	IP

Table 1 – Zoning Table

4.4 Subdivision

Subdivision to create the POS reserve will be required as a condition of Planning Approval. Further subdivision of the land is not anticipated, however if required, would need to be preceded by an amendment to the Structure Plan.

STRUCTURE PLAN MAP

4.5 Development Controls

In addition to complying with the Objectives stipulated above, development within the Structure Plan Area shall conform to the following standards:

4.5.1 Height

Maximum building heights in the Structure Plan Area shall be in accordance with Clause 5.12 of TPS10 ie being limited to 3 storeys or a height of 12 metres above natural ground level.

4.5.2 Setbacks

Street setbacks in the Structure Plan Area to the lot boundaries can be Nil, but a minimum setback of 3m to will apply to POS. Major openings and unenclosed outdoor active habitable spaces, which have a floor level of more than 0.5m above natural ground level and overlook any part of any other residential property behind its street setback line are set back, in direct line of sight within the cone of vision, from the lot boundary, a minimum distance as prescribed in the table below:

View cone from	Distance
Major openings to bedrooms and studies	3m
Major openings to habitable rooms other than bedrooms and studies	4.5m
Unenclosed outdoor active habitable spaces	6m

Table 2 – Setbacks

4.5.3 Site Layout

4.5.3.1 The layout of the built form within the Structure Plan Area shall be designed so it does not inhibit the cooling breezes from the south reaching dwellings adjacent and within the Structure Plan Area.

4.5.3.2 Single or grouped dwellings shall include an outdoor living area of at least 16sqm with a minimum dimension of 3m.

4.5.3.3 Multiple dwellings shall include a balcony with an area of at least 12sqm with a minimum dimension of 3m.

4.5.3.4 The layout of the built form within the Structure Plan Area shall enable sufficient tree planting and other vegetation to provide shade and amenity.

4.5.3.5 The site layout shall include a pathway to the primary entrance of all single and grouped dwellings, and the primary common entrance of all multiple dwellings.

4.5.3.6 Fencing to adjacent streets or POS shall be no more than 1.8m above ground level, and at least 50% visually permeable above 0.9m.

4.5.4 Built Form

4.5.4.1 All buildings, landscaping, car parking and access shall be designed for universal access in accordance with Australian Standards AS1428.1, AS1428.2 and AS4299.

4.5.4.1 All building facades in the Structure Plan Area shall provide visual interest along the street.

4.5.4.1 All buildings in the Structure Plan Area shall be designed to provide passive surveillance of adjacent roads and Public Open Space.

4.5.4.1 All single and grouped dwellings shall enable cross-ventilation from opposing or perpendicular external walls.

4.5.4.1 Cross ventilation from opposing or perpendicular external walls shall be provided to a minimum of 60% of multiple dwellings.

4.5.4.1 All non-residential uses at ground floor with a frontage to a street or POS shall include a minimum of 60% glazing to that frontage.

4.5.4.1 The primary entrance to all single and grouped dwellings, and the primary common entrance to multiple dwellings shall be visible from an adjacent street, POS or common walkway.

4.5.5 Car Parking

4.5.5.1 Car parking spaces within the Structure Plan Area shall generally be in accordance with the following standards. Variations to these standards can be considered in accordance with Clause 5.14 of TPS10. Note: CPS = Car Parking Space and Gross Floor Space has the same meaning as per the definition in TPS10:

Use	Requirement
Aged & Dependent Person's Dwelling	One CPS per five beds plus one CPS per employee
Caretaker's Dwelling	One CPS per dwelling
Medical Clinic	One CPS per employee & one CPS per practitioner
Health Studio	One CPS per 50m² of Gross Floor Space
Arts & Crafts Studio	One CPS per 50m² of Gross Floor Space
Serviced Apartment	One CPS per apartment
Restaurant/Café/Eating House	One CPS per 6m² of dining area

Table 3 – Car Parking

4.5.5.2 At least 50% of the car-parking spaces for Aged & Dependent Person's Dwellings shall be provided within a garage, carport or other shade structure.

4.5.5.3 All disabled car-parking spaces shall be provided with weather protection.

5 Other Requirements

5.1 Transport Assessment

A Transport Assessment justifying the parking provision and vehicle access locations will be required to be submitted with all Applications for Planning Approval proposing development within the Structure Plan Area. The Transport Assessment shall be prepared in accordance with the Western Australian Planning Commission's *Transport Impact Assessment Guidelines 2016*.

5.2 Urban Water Management Plan

An Urban Water Management Plan, prepared in accordance with the Western Australian Planning Commission's *Better Urban Water Management* requirements, shall be submitted with all Applications for Planning Approval proposing development within the Structure Plan Area.

5.3 Designing Out Crime

The development will be designed in accordance with the Designing Out Crime Planning Guidelines produced by the Western Australian Planning Commission.

5.4 Land Capability

Further geotechnical assessment may be required at the development stage in order to determine appropriate site preparation measures and development standards.

BROCKMAN PARK
Structure Plan

PART TWO

EXPLANATORY SECTION

1 PLANNING BACKGROUND

1.1 INTRODUCTION AND PURPOSE

The objective of the Brockman Park Structure Plan (the Structure Plan) is to facilitate the development of the Structure Plan Area for aged person's accommodation and a limited range of complementary commercial and community land uses and public open space.

1.2 LAND DESCRIPTION

1.2.1 Location

The Structure Plan Area is located within the municipal district of the Shire of Carnarvon. The Structure Plan Area falls within the locality of Brockman and is bound by David Brand Drive to the south, Bibra Way to the west, Brockman Park to the north and an existing Independent Living Unit (ILU) development to the east. Refer to Figure 1 for a location plan.

1.2.2 Area and land use

The Structure Plan Area measures approximately 2.1 hectares and is currently used as Public Open Space (POS).

1.2.3 Legal description and ownership

The Structure Plan Area comprises three (3) separate land parcels. Details of each land parcel are provided in the table below.

Lot No.	Street Address	Certificate of Title	Plan/Diagram	Registered Landowner
1193	10 David Brand Drive	2176/885	P181640	Shire of Carnarvon
1147	No Street Address	1347/528	P173472	Shire of Carnarvon
1179	No Street Address	1757/95	P213005	Shire of Carnarvon

Refer to Figure 2 for an ownership plan.

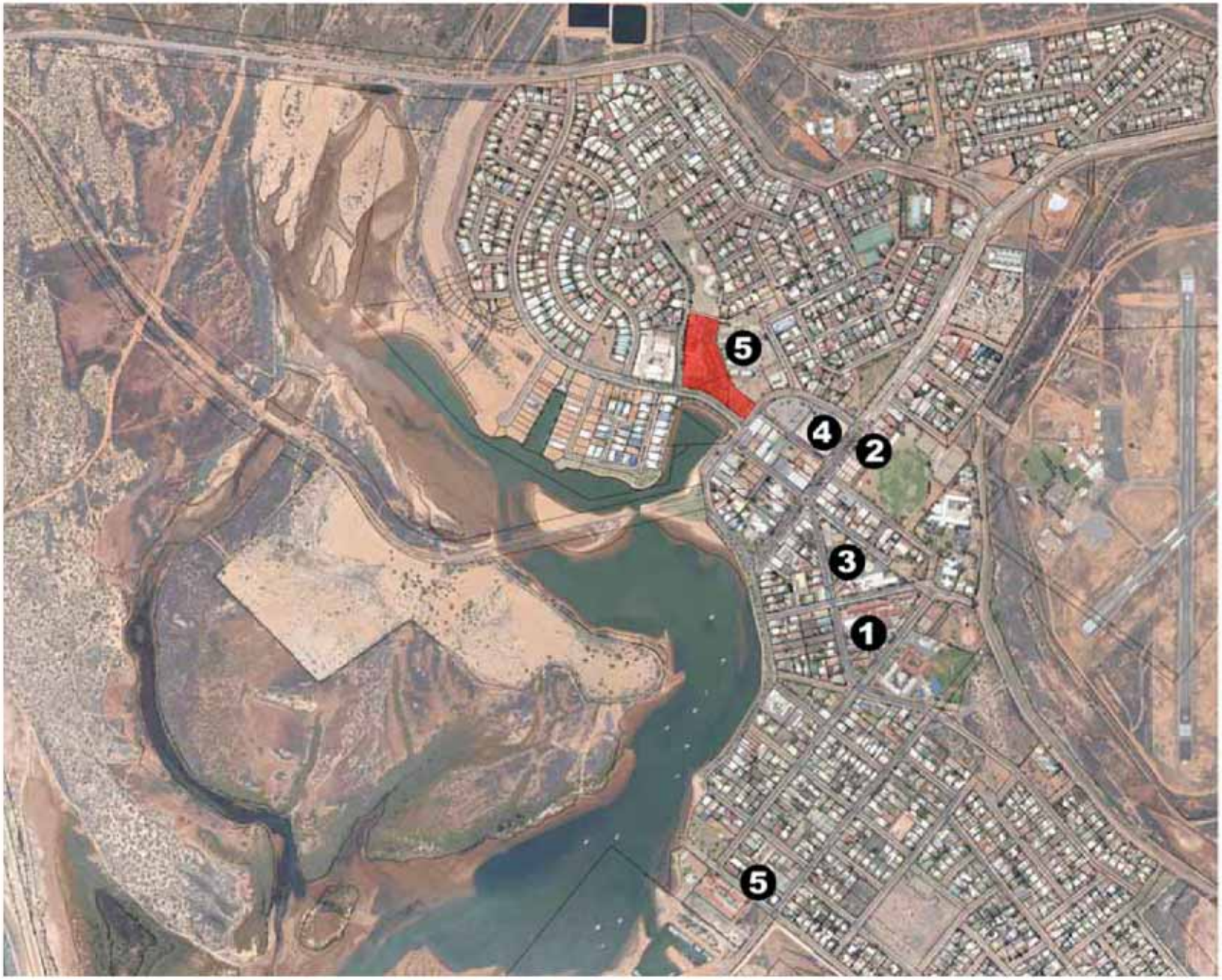
1.3 PLANNING FRAMEWORK

1.3.1 Zoning and reservations

The land is zoned 'Special Use: Aged Care' under the Shire of Carnarvon Town Planning Scheme No. 10 (TPS10); refer Figure 3 – Shire of Carnarvon Town Planning Scheme No. 10 Zoning.

BROCKMAN PARK STRUCTURE PLAN FIGURE 1

LOCATION PLAN



1. Carnarvon Hospital
2. Carnarvon Medical Centre
3. Carnarvon Library & Art Gallery
4. Carnarvon Central
5. Existing Independant Living Units

Structure Plan Area

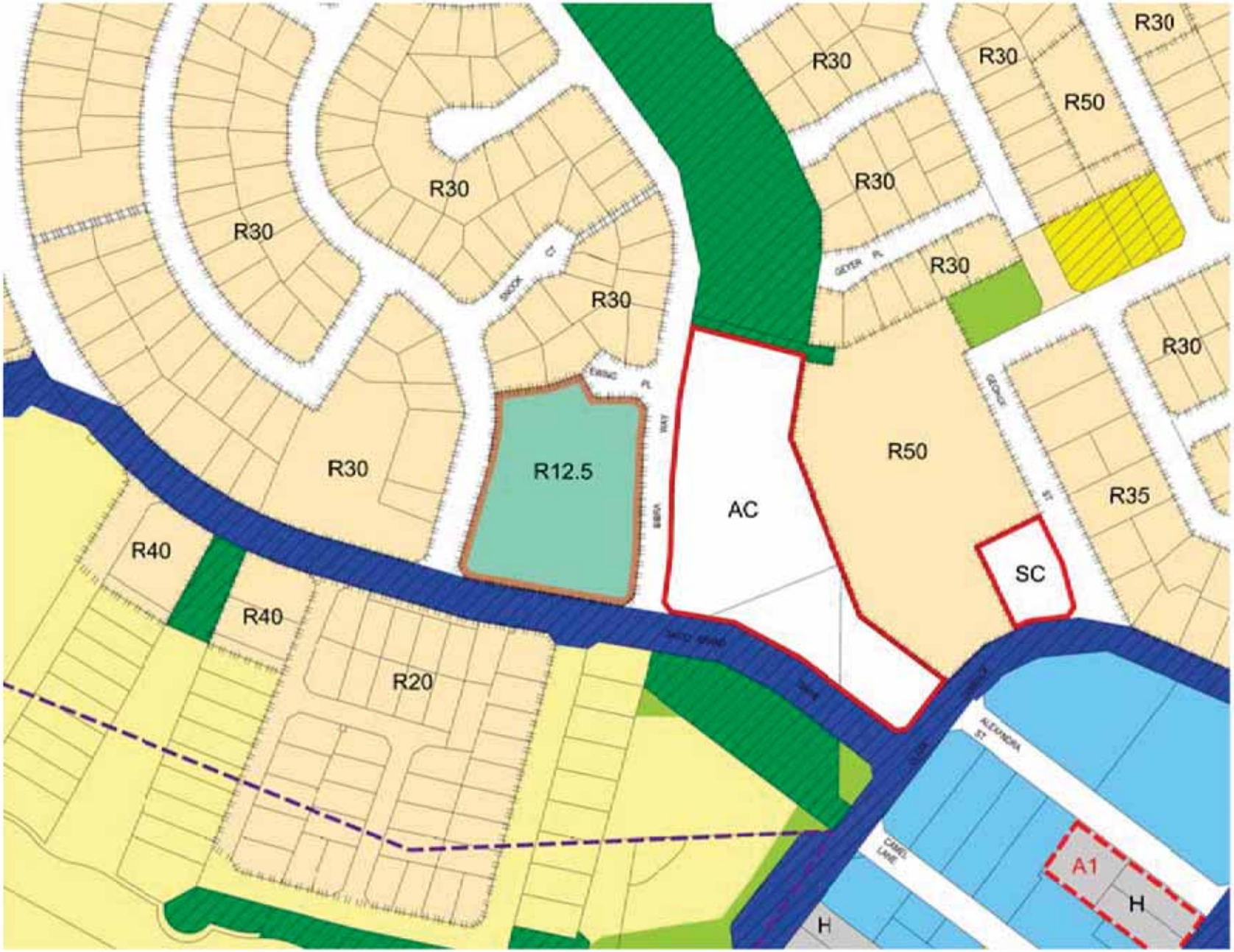
Scale 1:10 000 @A3

BROCKMAN PARK STRUCTURE PLAN FIGURE 2

LAND OWNERSHIP PLAN

BROCKMAN PARK STRUCTURE PLAN FIGURE 3

ZONING PLAN



The provisions for the 'Special Use: Aged Care' zone are set out Clause 6.8 and in Appendix 9 of TPS10 and are as follows:

6.8 SPECIAL USE ZONES

6.8.1 The list of sites included within this Zone is set out in Appendix No. 9 which details the respective primary uses for which the land may be used subject to the grant by the Local Government of Planning Approval pursuant to Part 2.

6.8.2 In addition to the uses nominated for each site in Appendix No. 9 the Local Government may, by absolute majority approve the establishment of any other uses on those sites but only where the additional use or uses are completely incidental and ancillary to the approved primary use and are consistent with the objectives of this Scheme.

Land & Property Description	*Primary Uses*	*Development Requirements*
Part Lots 1193 on Plan 181640, 1179 on Plan 213005 and 1147 on Plan 173472 David Brand Drive, Carnarvon.	*Aged or Dependent Persons Dwelling.* *Other uses to be listed is incidental (IP use):* • *Caretaker's dwelling* • *Medical Clinic* • *Health Studio* • *Arts & Craft Studio* • *Car Park*	1. *No development will be permitted until such time as a structure plan has been prepared and approved by the Local Government and the Western Australian Planning Commission, in accordance with the relevant provisions at Part 4 - Structure Plans in Schedule 2 - Deemed provisions for local planning schemes of the Planning and Development (Local Planning Schemes) Regulations 2015.* 2. *In addition to the structure planning requirements provided at Part 4 of Schedule 2 - Deemed provisions for local planning schemes, a structure plan shall include but not be limited to the following:* • *road networks and access requirements;* • *urban water management plan outlining drainage requirements and landscaping;* • *geotechnical assessment confirming capability of the land for development;* • *consideration of potential impacts of storm surge from the Gascoyne River;* *Areas of open space to be identified to contribute to the 10% requirement for public open space in the Brockman locality which is to be reclassified accordingly.*

1.3.2 Regional and sub-regional structure plans

1.3.2.1 Carnarvon Structure Plan 2004

The Carnarvon Structure Plan was prepared as part of the Ningaloo Coast Regional Strategy Carnarvon to Exmouth. The structure plan identifies key land use planning objectives, actions and guidelines for the orderly development of the Carnarvon town site.

The relevant provisions of this structure plan are as follows:

2.1.5 Residential

To encourage medium density development in close proximity to the town centre to accommodate aged and dependent person's accommodation;

To encourage subdivision and development within the town site that incorporates the philosophy of Liveable Neighbourhoods;

1.3.2.2 Carnarvon Fascine Waterway and Environs Master Plan 2010

The Carnarvon Fascine Waterway and Environs Master Plan was prepared to guide the enhancement of the Fascine waterway and environs and had the following aims:

- An enhanced user environment;
- An enhanced visual landscape;
- Mitigation of adverse flood and storm – surge impacts;
- Integrated terrestrial, aquatic and maritime uses and activities, and;
- An improved image and identify for the Town.

Figure 4: Brockman Park Upgrade. Source: Carnarvon Fascine Waterway and Environs Master Plan Report

For Brockman Park, this Master Plan recommends partial utilisation for residential infill specifically the development of new edge housing designed to overlook the park and improve passive surveillance within the area, and the southern section, the expansion of the Gascoyne Memorial Foundation housing. This Master Plan also recommends improvements to the park infrastructure including the provision of new shade shelters, pedestrian bridges and recreational features such as exercise equipment, basketball rings and barbeques. It also recommends, by utilising water sensitive urban design principles, that existing landforms within the park be reshaped and planted to enhance natural drainage, increase stormwater storage and detention and improve water quality within a parkland setting including the provision of a range of size and scale recreational turf areas to provide both intimate social hubs and larger 'kick about' spaces. These recommendations will be considered as part of the structure plan design and will be incorporated if deemed appropriate.

1.3.3 Planning strategies

1.3.3.1 Ningaloo Coast Regional Strategy Carnarvon to Exmouth 2004

This strategy is a 30 year strategic land use plan that sets the framework of planning for sustainable tourism and land use on the Ningaloo coast. It is accompanied by Statement of Planning Policy 6.3, which provides a legal framework for the key elements of the strategy. This strategy reinforces Carnarvon as one of the key administrative and service centres for the region and contains a structure plan that identifies key land use planning objectives, actions and guidelines for the orderly development of the Carnarvon town site.

1.3.3.2 Gascoyne Regional Planning & Infrastructure Framework

The Gascoyne Regional Planning & Infrastructure Framework was prepared by the WAPC to guide the region's strategic planning and to integrate planning and infrastructure decisions. Opportunities identified in the framework that are relevant to the structure plan are as follows:

- Investigation of regional affordable housing requirements.
- Attracting residents and workforce through the provision of quality social infrastructure, services, affordable housing and well-designed communities, taking into account the region's remoteness and distance between settlements.
- Provide the requisite hard and social infrastructure to facilitate and support future growth of Carnarvon's population and local economy.

Importantly the Framework identifies new aged care facilities for the Gascoyne, including Carnarvon, Exmouth and Denham as a potential project to facilitate economic and population growth in the Region, which supports the purpose of the structure plan.

1.3.3.3 Shire of Carnarvon Draft Local Planning Strategy 2016

At their 28 June 2016 Ordinary Meeting, Council resolved to endorse the draft Local Planning Strategy (LPS) and to forward to the WAPC for final approval by the Minister.

In support of the purpose of the Structure Plan, the draft LPS identified the increased provision of public housing and varied dwelling sizes as an important consideration in addressing future local needs, particularly with respect to an ageing population and household composition trends.

Furthermore Brockman Park is identified on the LPS Plan as follows:

> *Brockman Park Long Term Investigation Area – Parks and Recreation Areas, Surplus Land, and Aged Care facilities analysis is required to assist in long-range planning for the Shire.*

Other than the investigation being undertaking in the short term, the structure plan proposal is considered to comply with this LPS action.

1.3.3.4 Shire of Carnarvon Strategic Community Plan 2011

The Strategic Community Plan outlines the Shire's long term vision, values, aspirations and objectives, based on the input provided by the community. Some of the strategies identified in the Strategic Community Plan that are relevant to the proposed structure plan are as follows:

Outcome 1.2 Increased availability of serviced residential, commercial and industrial land.

1.2.3 Facilitate and / or participate in the development of Shire, State Government and private sector land holdings

1.2.4 Investigate joint ventures to develop commercial, residential and industrial properties

Outcome 2.2 Efficient use and integrated management of water resources

2.2.2 Promote efficient procedures and practices to reduce water consumption by the Shire.

2.2.3 Monitor compliance and encourage water-sensitive design principles in all industrial, commercial and residential development.

2.2.4 Provide for effective management and maintenance of Council's flood control and stormwater infrastructure.

Outcome 2.4 Efficient use and conservation of energy to reduce the production of greenhouse gases.

2.4.3 Monitor compliance and encourage environmentally sustainable design principles in all industrial, commercial and residential development

Outcome 2.5 Improved physical quality of the built environment

2.5.1 Develop and maintain township streetscapes, parks, gardens and open spaces in accordance with aspirations of the community

2.5.6 Investigate and consider preparation of local planning policies and/or design guidelines to influence and manage key development areas and to integrate flood mitigation principles where appropriate

2.5.7 Develop and enhance the fascine waterway and adjacent environments in accordance with the Council endorsed plans.

Outcome 3.1 Carnarvon is a proud community and is a desirable place to live, invest and visit.

3.1.5 Provide opportunities for community participation to promote a sense of belonging.

Outcome 3.4 Improved passive and active leisure and recreation facilities.

3.4.5 Develop and maintain a well utilised passive parkland network.

Outcome 3.7 Housing and transport options that respond to our community's needs.

3.7.4 Facilitate and possibly participate in the development of a lifestyle village for seniors.

3.7.5 Advocate for residential aged care facilities to be available locally.

Outcome 3.8 Improved community health, safety and well being.

3.8.3 Apply urban and environmental design principles to reduce crime and maximise personal safety.

Outcome 5.1 A well engaged and informed community.

5.1.2 Develop appropriate community consultation and communication strategies to enhance the decision-making process.

Outcome 5.2 A high standard of governance and accountability

5.2.2 Ensure compliance with all relevant legislation and regulations.

1.3.4 Planning policies

1.3.4.1 Liveable neighbourhoods

Liveable Neighbourhoods is the WAPC's primary policy for the design and assessment of structure plans (regional, district and local) and subdivision for new urban (predominantly residential) areas in Perth metropolitan and Peel regions and major regional centres, on greenfield and large infill sites.

Liveable Neighbourhoods is a performance-based policy that sets high-level objectives, design principles and requirements to address both strategic and operational aspects of structure planning and subdivision. Where applicable, the provisions of Liveable Neighbourhoods will be addressed as part of the structure planning process and design of the structure planning area.

1.3.4.2 State Planning Policy – Urban Growth and Settlement Policy 3 (SPP 3)

This policy sets out the principles and considerations which apply to planning for urban growth and settlements throughout Western Australia. 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 while 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.

The Structure Plan and development concepts will be prepared in accordance with the objectives of this policy.

1.3.4.3 State Planning Policy – Residential Planning Codes Policy 3.1 (SPP 3.1)

The purpose of State Planning Policy 3.1 – Residential Design Codes (R-Codes) is to provide a comprehensive basis for the control of residential development throughout Western Australia. As such the provisions of this policy will be used to guide the design of the residential components of the Structure Plan and Development Concept.

1.3.4.4 State Planning Policy – Ningaloo Coast Policy 6.3 (SPP 6.3)

Statement of Planning Policy 6.3 was prepared to provide a legal framework for the key elements of the Ningaloo Coast Regional Strategy - Carnarvon to Exmouth. The relevance of SPP6.3 to the Structure Plan is its requirement that planning proposals are consistent with the Carnarvon Structure Plan 2004.

1.3.4.5 State Planning Policy – Water Resources (SPP 2.9)

The objectives of State Planning Policy 2.9 (Water Resources) 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.

The WAPC's Better Urban Water Management (BUWM) framework has been developed to guide the implementation of SPP 2.9, and outlines the requirements for water management strategies at each stage of the planning process. BUWM requires a Local Water Management Strategy (LWMS) be prepared to support a Local Structure Plan, and an LWMS for the site is included as a technical appendix to this Structure Plan.

1.3.4.6 Development Control Policy 1.1 Subdivision of Land

This policy sets out the general principles, which will be used by the Western Australian Planning Commission (WAPC) in determining applications for the subdivision of land. It indicates the WAPC's basic requirements for the creation of new lots as well as the procedures it will follow in processing subdivision applications. The objectives and measures of this policy will be taken into consideration during the preparation of the structure plan.

1.3.4.7 Development Control Policy 2.3 Public Open Space in Residential Areas

The basic component of this policy is the requirement that 10 percent of the gross subdivisible area of a conditional subdivision shall be given up free of cost by the subdivider for public open space (POS). Provisions of this policy that are relevant to the structure plan include the use of the POS for drainage purposes, the payment of cash in lieu of provision of the 10 percent and transferring any areas of POS to the ownership of the Crown.

1.3.5 Pre lodgement consultation

Consultation was undertaken with key stakeholders and the public in order to gain knowledge of the opportunities and constraints associated with developing the site for aged person's accommodation. Details of the consultation are provided in the Outcomes Report located at Appendix A.

2 Site Conditions and Constraints

2.1 Biodiversity and Natural Area Assets

2.1.1 Climate

Carnarvon's climate is semiarid to arid, with predominantly winter rainfall. Mean rainfall is 226mm per year (based on Bureau of Meteorology records from 1945 to 2016). The majority of rainfall in Carnarvon falls between May and August.

2.1.2 Vegetation

The Structure Plan Area contains limited vegetation and is predominately grassed with some trees located primarily along the existing pathway and around the perimeter of the site, including ficus along Bibra Way and Lagunaria Patersonia along David Brand Drive.

2.1.3 Fauna

Given the site's limited vegetation there are no fauna species known to be inhabiting the Structure Plan Area.

2.2 Landform and Soils

A geotechnical site investigation was completed over the Structure Plan Area on 13 July 2016, which comprised the excavation of 10 test pits (to depths of between 2.1m and 3.0m below ground level), testing with a dynamic cone penetrometer adjacent to the test pits (to depths of between 0.9m and 2.0m), and infiltration testing at 3 locations (at a depth of about 0.5m below ground level). Laboratory testing was also undertaken, which comprised of Particle Size Distribution tests on two samples, and Atterberg Limits and Linear Shrinkage tests on two samples.

The Quobba sheet of the 1:50,000 scale Environmental Geology maps indicates that the area is underlain by the following two soil formations:

- North-east part of the site: Alluvium, deposits of Gascoyne River – clay, silt, sand and gravel
- South-west part of the site: Supratidal flats – calcareous clay, silt and sand and authigenic gypsum and superficial algal mats and salt crusts.

The site investigation found that the general soil profile across the site comprised a layer of sand fill overlying clay (typically high plasticity) overlying clayey sand / sandy clay. The sand fill was present from the ground surface to depths of between 1.0m and 2.1m, which was overlying typically medium to high plasticity clay, which was present to the maximum test pit depth of 3.0m in nine of the ten test pits. In the tenth test pit, the clay profile was present to a depth of 2.1m below ground surface, and was overlying clayey sand.

2.3 Groundwater and Surface Water

Groundwater was encountered in four test pits during the geotechnical investigation. These test pits were located in the lower lying areas of the site at depths between 1.8m and 2.6m below ground surface, which is likely close to sea-level. A perched groundwater table over the in-situ clayey soils could be expected at wetter times of the year. The infiltration tests carried out on the site measured permeabilities of >7m/day for the in-situ sandy soils, at a depth of 0.5m below ground level.

The Structure Plan Area has historically been used as a drainage reserve, and is a natural low point which conveys stormwater runoff from the roads surrounding the Structure Plan Area to the adjacent Fascine waterway. This existing surface water flow path needs to be accommodated through the design of the future development.

Given the Structure Plan Area's low-lying nature, it has historically been prone to cyclonic inundation, storm

surge and riverine flooding in extreme weather events. The closure of the northern end of the Fascine by construction of a levee in the 1980s and the more recent construction of sea walls along the Fascine foreshore opposite the development site have gone some way to reducing the risk and potential extent of flooding in major storm events. However, to further mitigate the risk of cyclonic inundation and storm surge, imported fill will be required to ensure finished floor levels of the proposed dwellings are above expected maximum storm surge levels.

2.4 BUSHFIRE HAZARD

The Structure Plan Area is not located in a bushfire prone area according to a search of the Department of Fire and Emergency Services (DFES) Map of Bush Fire Prone Areas.

2.5 HERITAGE

2.5.1 Aboriginal Heritage

A review of the Department of Aboriginal Affairs (DAA) Heritage Inquiry System reveals that the Kuwinwardu Soak Registered Site (Site ID 7234) covers a portion of the Structure Plan Area in the north. The Registered Site encompasses a broad area measuring approximately four square kilometres.

Figure 5: Registered Aboriginal Heritage Site 7234. Source: DAA Aboriginal Heritage Inquiry System

Given the Structure Plan Area is a reclaimed site and is located on the periphery of the Registered Site boundary a targeted Aboriginal heritage investigation has not been undertaken. Investigations may be required prior to construction commencing to ensure compliance with the *Aboriginal Heritage Act 1972*.

2.5.2 European Heritage

A search of the Heritage Council of WA State Register and the Shire of Carnarvon's Municipal Inventory confirmed that there are no recorded sites of European heritage significance with the Structure Plan Area.

2.6 COAST AND FORESHORES

The Structure Plan Area is located opposite the Carnarvon Fascine waterway foreshore, which is largely an enclosed lagoon that previously formed the south arm of the Gascoyne River. The inlet of the Fascine that fronts the Structure Plan Area is a small inlet surrounded by the Northwater Estate to the west, the edge of the Carnarvon Town Centre to the east, and Brockman Park to the north.

2.7 CONTEXT AND OTHER LAND USE CONSTRAINTS AND OPPORTUNITIES

2.7.1 Aged Person's Accommodation

2.7.1.1 Aged Person's Accommodation Demand and Funding

There is a clear demand for aged person's accommodation in Carnarvon. Comprehensive research has been undertaken over recent years to confirm the anecdotal evidence of an unmet need for both Residential Aged Care (RAC) and Independent Living Unit (ILU) accommodation. However, despite the obvious demand, both the Government and aged care providers have been unwilling or unable to respond to these unmet needs due to current funding levels, capital costs and/or the contemporary perspective that small scale residential care is unsustainable. These issues are exacerbated by Carnarvon's remoteness and challenges related to securing an appropriately qualified workforce.

In order to try and address the pressing need, the Shire has taken it upon themselves to identify a site and to undertake the tasks that are required to de-risk the site in order to make it attractive for development by an aged care provider. The preparation of the Brockman Park Structure Plan is one of these tasks.

To inform the preparation of the Structure Plan market analysis and business model assessment has been undertaken. Full details of this analysis is provided in the attached Feasibility Study. The analysis undertaken suggests that there is sufficient demand to support the construction of 100 ILUs in the Structure Plan Area by 2025. This represents an opportunity if development of ILUs can facilitate ageing in place, through the provision of in-home low-care serviceability, at a price point that allows 1st and 2nd quintile income residents to access housing. Further to this, the Structure Plan Area represents an opportunity to;

- Integrate infrastructure associated with low-care home and community care (HACC) into the development to ensure support for future residents, and for the broader Carnarvon and Gascoyne community. Providing low care facilities in the Structure Plan Area will support Carnarvon Health Campus to become the focused location for high care residential aged care beds. This will potentially avoid any duplication of services, ultimately allowing more efficient utilisation of infrastructure.
- Incorporate infrastructure for respite care services (predominately day-respite) to provide support for those that are caring for ageing parents/partners in their own homes
- Support the amenity/development/upgrade of adjacent ILUs at the GMF site by ensuring integration and co-sharing of infrastructure and services

2.7.1.2 Supply – Provider Insight

This mix of housing and services will play a critical role in providing for a resilient and vibrant Carnarvon that can retain and support the local community at all life stages.

Theoretical estimates of market demand must be balanced with the realities of development and service delivery. To inform this understanding, FAR Lane conducted desktop research into industry practices and case studies. This research was supplemented by consultation and input from Aged Care expert Adam Roebuck.

Consultation confirmed that a residential aged care facility in the Structure Plan Area would be unlikely to be feasible for any provider at the scale that the demand assessment suggested. As such it is proposed for the focus for the Structure Plan will be exclusively low-care facilities. This supports Carnarvon Health Campus focus on the provision of high-care residential aged care beds, avoiding duplication of services and ultimately ensuring a more efficient utilisation of infrastructure within the Shire.

Research and consultation also emphasised the importance of providing co-located infrastructure for respite care services (predominately day-respite) to provide support for those that are caring for ageing parents/partners in their own homes.

In addition, beyond ensuring the development complies with the necessary standards and legislation with regards to universal access, consultation and research highlighted a desire for providers to seek flexibility in zoning and design that ensures respite suites and serviced apartments can be adapted to provide appropriate levels of care required by other users in the Gascoyne community - such as those with disabilities or special needs. This response not only ensures that the market potential for these elements of the project is maximised (in turn maximising revenue to the operator), but also ensures an adaptable high-quality outcome for the Gascoyne community with regards to access to services and accommodation.

A key principle in the new design philosophy for aged care is enabling residents to maintain connection with their local community. It is proposed for the Structure Plan to respond to this need through the inclusion of:

- Retail uses (notionally a café);
- Residential universal access apartments; and
- Strong connectivity to the Carnarvon Town Centre.

These elements not only provide for a more diverse and connected community in the Structure Plan Area, but also provide a developer and operator with a diversity of options for revenue generation, making the site more attractive to investment.

2.7.1.3 Aged Person's Accommodation Precinct

While this Structure Plan is only applicable to the land described in Section 1.2.3 above, orderly and proper planning requires the consideration of the context of the site including the adjoining land uses. Initial investigations identified that the existing ILU development and the Senior Citizen Centre, which are located adjacent to the Structure Plan Area, will likely be redeveloped in the future due to their ageing infrastructure and opportunity that current vacant land provides. On this basis an obvious 'Aged Person's Accommodation Precinct' is apparent and the Structure Plan layout will be prepared in the wider context of this precinct.

Refer to Figure 6 for details of the land uses surrounding the Structure Plan Area.

2.7.2 Transport

2.7.2.1 Road Network

The Structure Plan Area maintains frontage to David Brand Drive to the south and Bibra Way to the west, which are both local roads constructed to an urban standard under the care and control of the Shire. David Brand Drive has an approximately 9.7-9.8m pavement width and is classified as a Local Distributer, which has a maximum desirable volume of 6,000 vehicles per day (VPD) whilst Bibra Way has a 7.4m pavement width and is classified as an Access Road, which has a maximum desirable volume of 3,000 VPD.

CONTEXT PLAN

2.7.2.2 Public Transport

The Public Transport Authority (PTA) provides a Regional Town Bus public transport service in Carnarvon; along with school bus services in the morning and afternoon. The Regional Town Bus runs along Olivia Terrace, and the school buses run along Olivia Terrace and David Brand Drive.

2.7.2.3 Pedestrians and Cyclists

Pedestrians, cyclists and gopher users regularly use Brockman Park as a thoroughfare to the Carnarvon Town Centre from the surrounding areas. It will be important for the Structure Plan to maintain this public access way through the development site.

2.7.3 Open Space

The Structure Plan Area is considered to be well serviced by Public Open Space (POS) with Brockman Park immediately adjacent to the north and the Fascine POS to the south.

The Opportunities and Constraints relevant to the preparation of the Structure Plan are represented in Figure 7.

3 Structure Plan

3.1 Design Objectives

The design objectives for the Structure Plan Area are:

3.1.1 Land Use and Built Form

- To provide for aged person's accommodation and a limited range of complementary commercial and community land uses and public open space.
- To establish housing forms that are appropriate for aged residents.
- To provide built environment that is delivered in line with universal access principles.
- To create opportunities for the integration of new development with the adjacent GMF development.
- To provide flexibility for a range of housing types at different densities.
- To optimise views to the adjacent open space and water body.
- To integrate architectural and landscape design.

3.1.2 Streetscape

- To address the surrounding street and open space network with an attractive and active interface.
- To reduce the visual impact of car parks and parking structures on the streetscape.
- To address the corner of David Brand Drive and Olivia Terrace with a distinct built-form or landscape feature.

3.1.3 Movement Network

- To optimise passive surveillance of the pedestrian and cycling/gopher movement network within and adjacent to the structure plan area.
- To establish a comfortable and appealing level of pedestrian amenity to enable and encourage walking.
- To provide a convenient alternative route(s) to the existing pedestrian path through the structure plan area.

3.1.4 Open Space

- To create places that encourage social interaction between residents and between residents and the broader community.
- To maintain sufficient open space for the management of stormwater.
- To integrate stormwater management with passive and/or active recreational space.

BROCKMAN PARK STRUCTURE PLAN FIGURE 7

OPPORTUNITIES & CONSTRAINTS

Legend

- Views
- Structure Plan Area
- Pedestrian Links
- Interface with Existing ILU's
- Proposed Linear Park and Drainage Swale
- Aged Care Precinct
- Potential Collaborative Development Site
- Optimum Location for Community Facilites
- Existing Medical Centre and Pharmacy
- Proposed Location of Silver Chain Facility
- Commercial Precinct
- Future Redevelopment of Ageing Housing Stock
- Potential to Redevelop Existing Seniors Community Centre
- Synergy with Hotel Accommodation for Visiting Relatives
- Cadastral Boundaries

N

Meters

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1:2,500

3.1.5 Resource Conservation

To make use of the opportunity for passive cooling through the orientation of buildings and the enabling of cross ventilation.

3.2 Indicative Development Concept Plan

As part of the local structure planning process an Indicative Development Concept Plan (Concept Plan) has been prepared to demonstrate how the Structure Plan Area may be developed having regard to the provisions of Part One – Implementation, of this report. The Concept Plan is located at Figure 8 overleaf.

The concept plan envisages a development that is focussed on convenient and appealing pedestrian movement, given the anticipated levels of car ownership of the future residents and the close proximity to the Carnarvon town centre. The overall layout of the concept plan is applicable at different scales and densities of development, thus maintaining flexibility in regard to how the development is implemented and the type of aged housing and/or care operator that may be attracted to the site.

Key features of the Concept Plan include:

- A central north-south spine road with access off David Brand Drive that provides a strong sense of arrival associated with the Fascine.
- A potential second access point off Bibra Way utilising the existing vehicle easement across the parkland to the pump station.
- A large area of the existing Brockman Park open space retained to provide for landscape continuity, pedestrian movement and stormwater management.
- Housing that provides direct frontage to the retained Brockman Park open space to provide an appealing outlook and the potential for passive surveillance.
- A network of landscaped east-west pedestrian 'green fingers' that provide for pedestrian connectivity to the adjacent open space but also align with the pedestrian routes through the adjacent GMF site to provide the opportunity for integration between the two developments and the adjacent open space.
- Housing that provides direct frontage to the east-west pedestrian 'green fingers' to provide an appealing outlook and the potential for passive surveillance.
- Housing 'envelopes' that provide for a range of one or two-bedroom ILU dwellings at single storey and sized to enable modular construction.
- The potential for a more urban-scaled building on the corner of David Brand Drive and Olivia Terrace with a possible café on the ground floor to capitalise on exposure to the street network and views of the Fascine.
- The potential for similarly-scaled apartment buildings, subject to market demand and feasibility, with an address to David Brand Drive that offers views of the Fascine,
- Car parking generally provided in shared parking areas to support flexibility of allocation to residents depending on demand.
- Visitor parking provided 'on-street' in the north-south spine road.
- An internal north–south pedestrian connection through the structure plan area via the north-south street and a pedestrian-only link southwards to Olivia Terrace.

The concept plan also indicates:

- A potential pattern of redevelopment for the GMF site that is suited to staging, maintains the concept of the east-west pedestrian links, and integrates with the structure plan area.
- The potential expansion of the GMF accommodation to the vacant southern portion of the GMF site.
- The potential inclusion of a new building for Silver Chain at the southernmost portion of the GMF site and adjacent to both the potential café in the structure plan area and the existing Senior Citizens Centre, thus consolidating non-residential uses at the interface with the town centre.
- Additional vehicle connections between the southern portion of the GMF site and the Senior Citizens Centre to enable reciprocal use of parking.

BROCKMAN PARK STRUCTURE PLAN FIGURE 8

INDICATIVE DEVELOPMENT CONCEPT PLAN

The above suggestions for the GMF site in the concept plan are simply to indicate the opportunity for future integration and facilitate discussion between adjacent landowners, and does not form part of the Structure Plan.

The Concept Plan has been prepared for illustrative purposes only and should not be interpreted as reflecting the final design or layout of buildings within the Structure Plan Area. More detailed planning is required at the Planning Application stage following endorsement of the Structure Plan.

3.3 Land Use

The Structure Plan encourages the provision of housing for aged and dependant living as well as any other uses that provide support or additional amenity for aged residents. In addition, there is allowance for low key development in the form of Café or Kiosk at the intersection of David Brand Drive and Olivia Terrace.

3.4 Built Form

The Structure Plan provides for a range of housing types and built forms, subject to market demand. In principle the built form can be characterised by adherence to the following principles:

- To be designed to respond to the local climate, by providing shade to windows from summer sun and enabling cross ventilation for passive cooling.
- To be constructed from lightweight materials for ease of transportation and to maintain a low thermal mass.
- To be designed to enable a high degree of universal access.
- To be designed to engage with adjacent public or semi-public spaces and provide passive surveillance of footpaths through the placement of major openings to habitable rooms.
- To be designed to the relevant standards to withstand cyclonic conditions.
- To be constructed with ground floors at a minimum level of 3.8m AHD.

3.4.1 Height

The structure plan provides for buildings between one to three storeys. However, in the event a proponent proposes a development greater than three storeys, it may be considered in the context of justification, to the satisfaction of the Shire, that the additional height causes no adverse impact to adjacent residents in regard to overshadowing, overlooking, access to cooling breezes or other clearly discernible aspects of residential amenity.

3.5 Open Space

The Structure Plan Area currently provides a pedestrian thoroughfare and a drainage flow path from the areas north of Brockman Park through to the Fascine foreshore and Carnarvon town centre. The Structure Plan proposes to retain a corridor of POS along the site's western boundary. The POS will provide pedestrian access from the areas north of the site through to the Carnarvon town centre, as well as for the residents of the development itself. The POS corridor will also provide a drainage flow path for stormwater runoff from areas to the north of the site, and will contain drainage swales to retain and treat runoff from hardstand areas within the site.

The proposed POS will also establish a place for passive recreation, provide an outlook for the development enabled by the Structure Plan and creates an opportunity for a landscape approach that evokes the use of the site by previous generations of Carnarvon residents.

3.6 Movement Network

3.6.1 Transport Assessment

It is proposed for a formal transport assessment to be undertaken at the Planning Application stage when the vehicle access points, type of land uses and density of development will be known. To follow is an outline of the Structure Plan's movement network.

3.6.1.1 Pedestrian movement

The Structure Plan identifies a network of pedestrian paths in and around the Structure Plan Area.

The path network within the future development area consist of a north-south path (which, in the case of the concept plan, is shown in the verge of the north-south street), and a series of east-west pedestrian paths that connect to the adjacent open space to the west, and possibly to the GMF development to the east.

The path network within the development area may be either publically accessible, semi-public, or private depending on the ultimate tenure and the management intent of the development's developer and/or operator. All new paths within the development area need to be suitable for residents using mobility aids such as electric scooters.

The path network indicted by the Structure Plan outside the development area provides for continuity of publically-accessible pedestrian movement at all times, particularly between the Carnarvon Town Centre and the residential area to the north of the Structure Plan Area.

3.6.1.2 Bike network

Bicycle use is broadly facilitated on street given the relatively low traffic volumes in the vicinity of the Structure Plan Area.

3.6.1.3 Vehicle Movement

The concept layout for the proposed structure plan includes one two way access driveway along the eastern edge of the site, with access from David Brand Drive. Smaller-scale driveways and parking areas for each cluster of units are located off the main driveway.

The access driveway onto David Brand Drive is located approximately 75m from the intersection of David Brand Drive and Olivia Terrace, and sufficient stopping sight distance is achievable from this intersection to the proposed driveway location.

3.6.2 Parking

3.6.2.1 Location of Parking:

Parking should be located away from the adjacent public domain so as not to diminish the quality and amenity of adjacent streets and public open space. Parking should be located within close proximity of dwellings, and should be able to be viewed from adjacent dwellings to maintain a reasonable degree of security. Wherever possible, resident parking should be provided with shade protection.

3.6.2.2 Management/Allocation of Parking

Consideration should also be given to locating parking in areas where it can either be shared or be utilised by different residents over time, depending on the needs of the residents. In this respect, any development should include a parking management strategy that identifies whether car bays are allocated to particular dwellings and if not, how the parking is allocated to residents and visitors.

3.7 Water Management

3.7.1 Existing stormwater drainage infrastructure

Brockman Park forms an overland flow path for stormwater from the catchment surrounding the park. Piped drainage from the adjacent road reserves outfalls to Brockman Park to the north of the proposed development site, and flows through the park to a stormwater pit in the centre of the development site. This pit then outfalls to the Fascine waterway opposite the site.

3.7.2 Flood management strategy

Given the site's current low-lying nature, it is subject to cyclonic inundation and storm surge in extreme weather events; however it has become less prone to flooding following the construction of levees as part of the Carnarvon Flood Mitigation Strategy works.

The Cyclonic Inundation and Coastal Process Modelling – Carnarvon (GEMS, 2009) study undertook modelling to examine the impact of storm surge inundation and coastal processes in Carnarvon. This modelling showed that Brockman Park is subject to inundation from storm surge in cyclone events, with an estimated maximum storm surge level of 3.3mAHD in a Category 5 cyclone, occurring jointly with the mean high water spring tide.

Based on the GEMS modelling, a minimum finished floor level of 3.8m AHD (0.5m freeboard above the maximum expected storm surge level) is recommended for the housing at the Brockman Park site to protect from flooding in major storm events.

3.7.3 Development water management strategy

The development will need to maintain the pre-development flow path for runoff from the catchments upstream of the development site to ensure that the upstream areas are not affected by the development at Brockman Park. This will be achieved through the use of drainage swales in a corridor of open space along the site's western boundary, which will allow flow from upstream catchments to continue to pass through the site and outfall to the Fascine.

Stormwater runoff from the roads and roof areas within the development area will be managed through soakage where possible, with excess runoff diverted to the POS corridor and ultimately to the Fascine. The geotechnical site investigation indicated that disposal of roof runoff via soakwells was feasible for this site, and the sizes and locations of soakwells for each unit will be further investigation through a future urban water management plan and detailed design of the development.

The WAPC's Better Urban Water Management framework typically requires new developments to retain runoff to pre-development levels for storm events up to 100yr ARI. However, in developments adjacent to the ocean, the Department of Water tends to allow excess runoff to discharge unattenuated, once the 1yr 1hr ARI storm event has been retained and treated onsite.

A Local Water Management Strategy is being prepared to support this Local Structure Plan, which will outline the design objectives and criteria for water management within the development.

3.8 Service Infrastructure

3.8.1 Wastewater

The Water Corporations' Carnarvon Pump Station No. 7 is located at the north-eastern corner of the site, and Water Corporation gravity sewer and sewer pressure main run within the Water Corporation reserve along the site's northern boundary.

The Water Corporation has advised that the pump station has surplus capacity that appears to be able to cater for the proposed development. When the proposed structure plan has been finalised, dwelling yield / flow rates can be more accurately assessed and the Water Corporation will be able to confirm that the pump station has capacity to service the development.

If the site is developed as a strata development, an application would need to be made to the Water

Corporation for a connection to their existing gravity sewer in Bibra Way to discharge wastewater from the site. All internal sewer reticulation within the development would remain as private sewer and would need to be constructed to AS3500 (Australian Standard for Plumbing & Drainage).

3.8.2 Potable water

The Water Corporation has existing potable water reticulation infrastructure in the road reserves surrounding the site, with a DN100 water main in Bibra Way, a DN 375 main in David Brand Drive and a DN525 main in Olivia Terrace.

The Water Corporation has advised that the development would be able to connect to the existing mains. If the site is developed as a strata development, an application would need to be made to the Water Corporation for a new meter from the existing mains. All internal water reticulation would remain as private infrastructure, and new internal water mains would need to be constructed to AS3500 (Australian Standard for Plumbing & Drainage).

3.8.3 Non-potable water

The Shire of Carnarvon owns and operates its own town irrigation system, which irrigates sporting grounds, parks and public open space throughout the Shire. A series of irrigation distribution mains convey water throughout the Shire, with one of the mains crossing through the Brockman Park site to Olivia Terrace, and across to the foreshore of the Fascine on the southern side of David Brand Drive.

Anecdotal evidence from the Shire's engineers indicates that the main is located approximately 5m inside the western boundary of Brockman Park (parallel to Bibra Way), and is expected to be contained within the proposed public open space corridor along the site's western boundary.

The section of the main along David Brand Drive is likely to be impacted by the proposed development. This section of the main will need to be either relocated to the road reserve, or removed and a new connection constructed under David Brand Drive to tie in with the existing section of main on the southern side of the road reserve (on the Fascine foreshore).

3.8.4 Power

There is existing underground HV and LV power along David Brand Drive and Olivia Terrace, with an existing power service to Brockman Park to service the lighting in the park. There is also existing overhead HV and LV power in Bibra Way.

A feasibility study will need to be undertaken by Horizon Power to confirm the capacity of the existing power network surrounding the site, and the extent of upgrade or network reinforcement works that are required to service the proposed development. This feasibility study can only be completed with the development layout and power requirements are confirmed.

3.8.5 Communications

Existing Telstra telecommunications infrastructure is available in the streets surrounding Brockman Park. It is envisaged that the site will be serviced by the National Broadband Network to provide broadband and telecommunications services to the development.

Subsequent to the installation of the NBN pit and pipe system by the developer, the network infrastructure will be installed by NBN appointed contractors.

BROCKMAN PARK
Structure Plan

TECHNICAL APPENDICES

APPENDIX A
OUTCOMES REPORT

BROCKMAN PARK STUCTURE PLAN

Outcomes Report

Shire of CARNARVON
catch a taste of the great life

veris

FAR lane

wave international

sph

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List of Abbreviations

ACAR	Aged Care Approval Rounds
ACFA	The Aged Care Financing Authority
DAP	Daily Accommodation Payments
EBITDA	Earnings Before Interest Tax Depreciation Amortisation
EOI	Expression of Interest
GMF	Gascoyne Memorial Fund
HACC	Home and Community Care
ILF	Independent Living Facility
ILUs	Independent Living Units
MOU	Memorandum of Understanding
MP	Minister of Parliament
NACDC	National Aged Care Data Clearinghouse
NPBT	Net Profit Before Tax
RAC	Residential Aged Care
RAD	Refundable Accommodation Deposit
RSL	Returned Services League
SA2	Statistical Area Level 2
TPS10	Town Planning Scheme No. 10
WACHS	The Western Australian Country Health Service

1 INTRODUCTION

1.1 BACKGROUND

For several years now the Shire of Carnarvon has considered the development of residential aged care housing. Council has previously indicated that the southern part of Brockman Park adjacent to the existing Gascoyne Memorial Foundation (GMF) retirement units is preferable to accommodate such a facility. A scheme amendment (Amendment 69) to Town Planning Scheme No. 10 (TPS10) to reclassify the site from a "Parks and Recreation Reserve" to a "Special Use Zone – Aged Care" was adopted by Council at its ordinary meeting held 24 February 2015, with the Minister subsequently approving the re-zoning and it being gazetted on 16 February 2016.

The Development Requirements of the 'Special Use Zone – Aged Care' state that no development will be permitted until such time as a structure plan has been prepared to the satisfaction of the local government and the Western Australian Planning Commission, in accordance with the relevant provisions of Part 4 – Structure Plans in Schedule 2 – Deemed Provisions for local planning schemes of the Planning and Development (Local Planning Schemes) Regulations 2015. In accordance with this requirement the Shire engaged a consultant team to prepare the Brockman Park Structure Plan and Development Prospectus.

1.2 PURPOSE OF THE REPORT

The purpose of this report is to:

- Provide the context for the project based on a literature review of relevant documents;
- Outline the initial consultation programme and approach, and;
- Summarise the stakeholder and public feedback.

The public consultation outcomes combined with input from the stakeholder workshop will be used by the consultancy team to develop the Draft Brockman Park Structure Plan and Development Prospectus. The Draft Structure Plan will be released for further community and stakeholder feedback at a date to be determined in the near future.

1.3 AIMS AND APPROACH OF THE CONSULTATION PROGRAM

The initial consultation program was devised to provide mechanisms for both key stakeholders and the public to contribute information on the opportunities and constraints associated with development of the site as an 'aging in place' facility.

The primary methods used to collect feedback included a Stakeholder Workshop and a Public Survey.

1.3.1 A Stakeholder Workshop

A workshop was held with key stakeholders as a means to capture input and ownership of the development of the Structure Plan. The workshop was held at the Shire's offices on the 22nd of July 2016 and was attended by representatives of the following key stakeholders:

- Shire of Carnarvon
- WA Country Health Service
- Housing Authority
- Gascoyne Memorial Fund

- Gascoyne Development Commission
- Carnarvon Chamber of Commerce
- Department of Prime Minister and Cabinet
- Silverchain
- Yamatji Marlpa Aboriginal Corporation
- Vincent Catania MP

The notes from the workshop along with comments from the Shire's Environmental Health Technical Officer on the identified opportunities and constraints are located at Appendix 1. The feedback gained from the key stakeholders along with the literature review and site investigations all contributed to the identification of the opportunities and constraints associated with development of the site.

1.3.2 A Public Survey

A public survey was conducted during September 2016 that was designed to obtain local knowledge of the site. Utilising the on-line consultation tool CollabMap, the public was able to provide their comments on the opportunities and constraints of developing the site for aged care accommodation. See screen shots below.

Figure 1 - CollabMap Introductory Page

Figure 2 - CollabMap Guidance Page

Figure 3 – CollabMap Comments Page

A paper version of the survey was also distributed to the caravan parks, the Carnarvon Motel, the Carnarvon Medical Centre, the Senior Citizens' Centre, the Woolworths Shopping Centre (Carnarvon Central), the Carnarvon Library, the Shire's Reception and Visitor's Centres and all the owners of the properties immediately adjacent to Brockman Park. A copy of the paper-based Public Survey is attached as Appendix 2.

The survey was promoted via a variety of methods including an advertisement on the Shire's website and Facebook page and a direct email to key stakeholders.

During the three week consultation period a total of 174 people accessed the CollabMap website and 14 different paper based responses were received. Whilst CollabMap provided the opportunity for responders to include their own comment or to comment on the identified opportunities and constraints, most users chose just to agree or disagree with the identified opportunities and constraints.
A summary of the feedback received is located as Appendix 3 and has been included in the Key Outcomes section of this report.

2 LITERATURE REVIEW

The following documents were reviewed to identify the opportunities and constraints, which contributed to the mapping that was used as a basis for discussion at the stakeholder workshop and for the public survey.

2.1 TOWN PLANNING SCHEME NO.10

The land is zoned 'Special Use: Aged Care' under the Shire of Carnarvon Town Planning Scheme No. 10 (TPS10); refer Figure 2 – Shire of Carnarvon Town Planning Scheme No. 10 Zoning below.

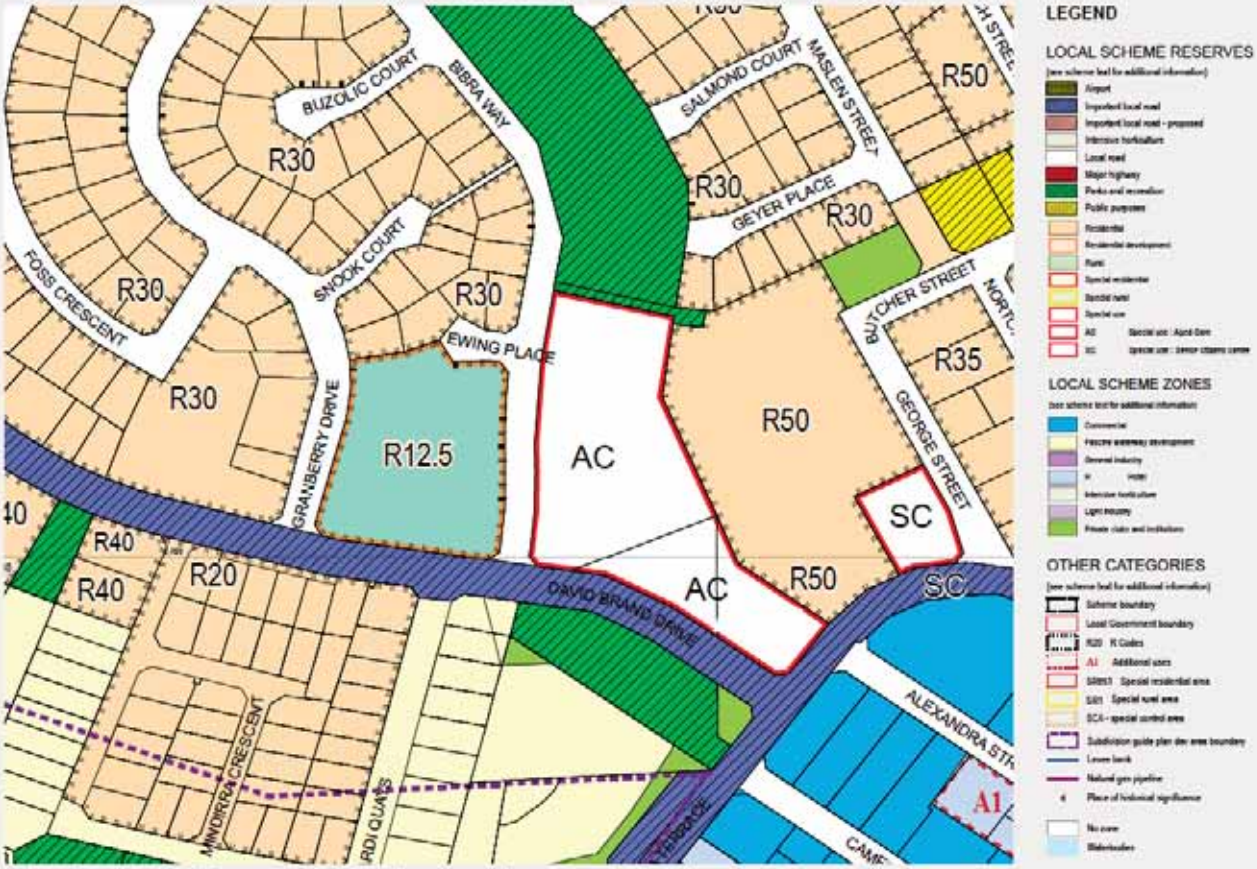

Figure 4 – Shire of Carnarvon Town Planning Scheme No. 10 Zoning

The provisions for the 'Special Use: Aged Care' zone are set out in Appendix 9 of TPS10 and are as follows:

Land & Property Description	Primary Uses	Development Requirements
Part Lots 1193 on Plan 181640, 1179 on Plan 213005 and 1147 on Plan 173472 David Brand Drive, Carnarvon.	Aged or Dependent Persons Dwelling. Other uses to be listed is incidental (IP use): • Caretaker's dwelling • Medical Clinic • Health Studio • Arts & Craft Studio • Car Park	No development will be permitted until such time as a structure plan has been prepared and approved by the Local Government and the Western Australian Planning Commission, in accordance with the relevant provisions at Part 4- Structure Plans in Schedule 2- Deemed provisions for local planning schemes of the Planning and Development (Local Planning Schemes) Regulations 2015. In addition to the structure planning requirements provided at Part 4 of Schedule 2- Deemed provisions for local planning schemes, a structure plan shall include but not be limited to the following: • road networks and access requirements; • urban water management plan outlining drainage requirements and landscaping; • geotechnical assessment confirming capability of the land for development; • consideration of potential impacts of storm surge from the Gascoyne River; Areas of open space to be identified to contribute to the 10% requirement for public open space in the Brockman locality which is to be reclassified accordingly.

Table 1 - Provisions for Special Use Aged Care Zone

The proposed structure plan will be prepared in accordance with these provisions.

2.2 CARNARVON STRUCTURE PLAN 2004

The Carnarvon Structure Plan was prepared as part of the Ningaloo Coast Regional Strategy Carnarvon to Exmouth. The structure plan identifies key land use planning objectives, actions and guidelines for the orderly development of the Carnarvon town site.

The relevant provisions of this structure plan are as follows:

> *'2.1.5 Residential*
>
> *To encourage medium density development in close proximity to the town centre to accommodate aged and dependent person's accommodation;*
>
> *To encourage subdivision and development within the town site that incorporates the philosophy of Liveable Neighbourhoods;'*

2.3 CARNARVON FASCINE WATERWAY AND ENVIRONS MASTER PLAN 2010

The Carnarvon Fascine Waterway and Environs Master Plan was prepared to guide the enhancement of the Fascine waterway and environs and had the following aims:

- An enhanced user environment;
- An enhanced visual landscape;
- Mitigation of adverse flood and storm – surge impacts;
- Integrated terrestrial, aquatic and maritime uses and activities, and;
- An improved image and identify for the Town.

Figure 5: Brockman Park Upgrade. Source: Carnarvon Fascine Waterway and Environs Master Plan Report

For Brockman Park, this Master Plan recommends partial utilisation for residential infill specifically the development of new edge housing designed to overlook the park and improve passive surveillance within the area, and the southern section, the expansion of the Gascoyne Memorial Trust housing. This Master Plan also recommends improvements to the park infrastructure including the provision of new shade shelters, pedestrian bridges and recreational features such as exercise equipment, basketball rings and barbeques. It also recommends, by utilising water sensitive urban design principles, that existing landforms within the park be reshaped and planted to enhance natural drainage, increase stormwater storage and detention and improve water quality within a parkland setting including the provision of a range of size and scale recreational turf areas to provide both intimate social hubs and larger 'kick about' spaces. These recommendations will be considered as part of the structure plan design and will be incorporated if deemed appropriate.

2.4 NINGALOO COAST REGIONAL STRATEGY CARNARVON TO EXMOUTH 2004

This strategy is a 30 year strategic land use plan that sets the framework of planning for sustainable tourism and land use on the Ningaloo coast. It is accompanied by Statement of Planning Policy 6.3, which provides a legal framework for the key elements of the strategy. This strategy reinforces Carnarvon as one of the key administrative and service centres for the region and contains a structure plan that identifies key land use planning objectives, actions and guidelines for the orderly development of the Carnarvon town site.

2.5 GASCOYNE REGIONAL PLANNING & INFRASTRUCTURE FRAMEWORK 2015

The Gascoyne Regional Planning & Infrastructure Framework was prepared by the WAPC to guide the region's strategic planning and to integrate planning and infrastructure decisions. Opportunities identified in the framework that are relevant to the structure plan are as follows:

- Investigation of regional affordable housing requirements.
- Attracting residents and workforce through the provision of quality social infrastructure, services, affordable housing and well-designed communities, taking into account the region's remoteness and distance between settlements.
- Provide the requisite hard and social infrastructure to facilitate and support future growth of Carnarvon's population and local economy.

Importantly the Framework identifies new aged care facilities for the Gascoyne, including Carnarvon, Exmouth and Denham as a potential project to facilitate economic and population growth in the Region. This supports the purpose of the structure plan.

2.6 SHIRE OF CARNARVON DRAFT LOCAL PLANNING STRATEGY 2016

At their 28 June 2016 Ordinary Meeting, Council resolved to endorse the draft Local Planning Strategy (LPS) and to forward to the WAPC for final approval by the Minister.

In support of the purpose of the Structure Plan, the draft LPS identified the increased provision of public housing and varied dwelling sizes as an important consideration in addressing future local needs, particularly with respect to an ageing population and household composition trends.

Furthermore Brockman Park is identified on the LPS Plan as follows:

> *Brockman Park Long Term Investigation Area – Parks and Recreation Areas, Surplus Land, and Aged Care facilities analysis is required to assist in long-range planning for the Shire.*

The structure plan proposal is considered to comply with this LPS action.

2.7 SHIRE OF CARNARVON STRATEGIC COMMUNITY PLAN 2011

The Strategic Community Plan outlines the Shire's long term vision, values, aspirations and objectives, based on the input provided by the community. Some of the strategies identified in the Strategic Community Plan that are relevant to the proposed structure plan are as follows:

> *Outcome 1.2 Increased availability of serviced residential, commercial and industrial land.*
>
> *1.2.3 Facilitate and / or participate in the development of Shire, State Government and private sector land holdings.*
>
> *1.2.4 Investigate joint ventures to develop commercial, residential and industrial properties.*
>
> *Outcome 2.2 Efficient use and integrated management of water resources.*
>
> *2.2.2 Promote efficient procedures and practices to reduce water consumption by the Shire.*
>
> *2.2.3 Monitor compliance and encourage water-sensitive design principles in all industrial, commercial and residential development.*

2.2.4 Provide for effective management and maintenance of Council's flood control and stormwater infrastructure.

Outcome 2.4 Efficient use and conservation of energy to reduce the production of greenhouse gases.

2.4.3 Monitor compliance and encourage environmentally sustainable design principles in all industrial, commercial and residential development.

Outcome 2.5 Improved physical quality of the built environment.

2.5.1 Develop and maintain township streetscapes, parks, gardens and open spaces in accordance with aspirations of the community.

2.5.6 Investigate and consider preparation of local planning policies and/or design guidelines to influence and manage key development areas and to integrate flood mitigation principles where appropriate.

2.5.7 Develop and enhance the fascine waterway and adjacent environments in accordance with the Council endorsed plans.

Outcome 3.1 Carnarvon is a proud community and is a desirable place to live, invest and visit.

3.1.5 Provide opportunities for community participation to promote a sense of belonging.

Outcome 3.4 Improved passive and active leisure and recreation facilities.

3.4.5 Develop and maintain a well utilised passive parkland network.

Outcome 3.7 Housing and transport options that respond to our community's needs.

3.7.4 Facilitate and possibly participate in the development of a lifestyle village for seniors.

3.7.5 Advocate for residential aged care facilities to be available locally.

Outcome 3.8 Improved community health, safety and well-being.

3.8.3 Apply urban and environmental design principles to reduce crime and maximise personal safety.

Outcome 5.1 A well engaged and informed community.

5.1.2 Develop appropriate community consultation and communication strategies to enhance the decision-making process.

Outcome 5.2 A high standard of governance and accountability.

5.2.2 Ensure compliance with all relevant legislation and regulations.

2.8 LIVEABLE NEIGHBOURHOODS

Liveable Neighbourhoods is the WAPC's primary policy for the design and assessment of structure plans (regional, district and local) and subdivision for new urban (predominantly residential) areas in Perth metropolitan and Peel regions and major regional centres, on greenfield and large infill sites.

Liveable Neighbourhoods is a performance-based policy that sets high-level objectives, design principles and requirements to address both strategic and operational aspects of structure planning and subdivision. Where applicable, the provisions of Liveable Neighbourhoods will be addressed as part of the structure planning process and design of the structure planning area.

2.9 STATE PLANNING POLICY – URBAN GROWTH AND SETTLEMENT POLICY 3 (SPP 3)

This policy sets out the principles and considerations which apply to planning for urban growth and settlements throughout Western Australia. The objectives of this policy are listed below.

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

The Structure Plan and development concepts will be prepared in accordance with the objectives of this policy.

2.10 STATE PLANNING POLICY – RESIDENTIAL PLANNING CODES POLICY 3.1 (SPP 3.1)

The purpose of State Planning Policy 3.1 – Residential Design Codes (R-Codes) is to provide a comprehensive basis for the control of residential development throughout Western Australia. As such the provisions of this policy will be used to guide the design of the residential components of the Structure Plan and Development Concept.

2.11 STATE PLANNING POLICY – NINGALOO COAST 6.3 (SPP6.3)

Statement of Planning Policy 6.3 was prepared to provide a legal framework for the key elements of the Ningaloo Coast Regional Strategy- Carnarvon to Exmouth. The relevance of SPP6.3 to the Structure Plan is its requirement that planning proposals are consistent with the Carnarvon Structure Plan 2004.

2.12 DEVELOPMENT CONTROL POLICY 1.1 SUBDIVISION OF LAND

This policy sets out the general principles, which will be used by the Western Australian Planning Commission (WAPC) in determining applications for the subdivision of land. It indicates the WAPC's basic requirements for the creation of new lots as well as the procedures it will follow in processing subdivision applications. The objectives and measures of this policy will be taken into consideration during the preparation of the structure plan.

2.13 DEVELOPMENT CONTROL POLICY 2.3 PUBLIC OPEN SPACE IN RESIDENTIAL AREAS

The basic component of this policy is the requirement that 10 percent of the gross subdivisible area of a conditional subdivision shall be given up free of cost by the subdivider for public open space (POS). Provisions of this policy that are relevant to the structure plan include the use of the POS for drainage purposes, the payment of cash in lieu of provision of the 10 percent and transferring any areas of POS to the ownership of the Crown.

It is noted that the subject land has been made available from surplus POS. As such within this structure planning process contribution of POS to satisfy recreational needs are not anticipated.

2.14 CARNARVON AGED CARE PLANNING AND FACILITATION MODEL OPTIONS REPORT (VERSO CONSULTING - NOVEMBER 2012)

2.14.1 Scope

The report was scoped by the Shire of Carnarvon to support the development of aged care services in the following ways:

- To provide the level of evidence and the compelling case required to achieve the support (operational and to a lesser extent capital funding) from the funders of: Residential Aged Care, Community Aged Care, Home and Community Care (HACC), Respite Services, Transition Care and Post Acute Care Services, Palliative Care Services and pension-level aged persons housing.
- To ensure that the Aged Care services are integrated with complementary/required range of health services.
- To measure current and future demand for services – thus defining the footprint required for an intended aged care precinct.
- To provide evidence for the needs and preferences of residents of Carnarvon Shire, ensuring services and building design are sympathetic to local needs and conditions.
- To facilitate the cooperation, understanding, decision making and participation of all parties (Western Australian Country Health Service (WACHS), Home and Community Care (HACC WA), Department of Health and Ageing (DoHA), the community, Local Health Professionals, the Gascoyne Development Commission, Regional Development Australia (RDA) and the Aged Care Providers).

2.14.2 Report Approach

The report was prepared utilising a range of analytic and consultative techniques to ensure that the outcomes delivered were relevant to the specific needs of the Carnarvon community. The analysis and consultation considered an aged care catchment that included the Shires of Carnarvon, Exmouth, Shark Bay and Upper Gascoyne.

2.14.3 Key Insights

The key insights of the report as they relate to the proposed Brockman Park Structure Plan are summarised below.

Regional Context

Verso analysis suggested that based upon 2011 census figures, that there was a significant aged resident population that were living in caravan parks and other relatively insecure accommodation sources.

88% of respondents to the community survey who were over 55 reported an intention to remain in Carnarvon as they age.

Residential Aged Care

- Estimated at the time of the reports preparation that by 2016 there would potentially be funding available in 2016 for 72 beds (high and low/ageing in place) and 84 beds by 2022 based upon 2011 planning ratios.
- Estimated that by 2017 approximately 52 residents within the catchment will be living with dementia – with no suitable dementia care facilities available within the Region for patients with behavioural management concerns.
- Strong community views were captured during community consultation citing the strong need for a residential aged care facility (with anecdotal experiences being told of families having to place elderly relatives in facilities hundreds of kilometres away).
- Respondents over 70 reported a strong desire to stay in their existing accommodation as they age, moving to a residential aged facility only when their health requires it.

- Overall service needs for Residential Aged Care (RAC) estimated by Verso were:
    - Based on Commonwealth planning ratios alone that there would typically be 58 residential aged care beds servicing the catchment;
    - Conservatively, a minimum of 24 beds is required in Carnarvon (assuming the funded community aged care packages funded in 2012); and
    - Practically Verso estimated short-term demand for 30-36 beds within the ten-year period, rising to 60 or more into the medium term.

Community Aged Care

- The number of community aged care places allocated to Carnarvon in 2012 (49 in total) was above the planning ratios of the time – suggesting evidence of unmet demand resulting from the lack of a suitable residential aged care facility in the Carnarvon.

Retirement Living (Aged Persons Housing)

- Approximately a third of community survey respondents 55-70 reported a strong desire to move into independent living units at some time as their needs change. Extrapolated, this represented a long-term potential for around 950 residents moving to Independent Living Units (ILUs) at some time based upon a 2017 population.
- Using a conservative estimate; a new ILU development of 55 units could be justified.

Development Footprint and Staging

Based on the service analysis the following development footprint and staging for new aged care facilities was proposed:

Service	Stage 1	Stage 2	Stage 3	Total
ILU Development	25 units	15 units	15 units	55 units
Community Centre – Common Area	Shared community resident's facility	N/A	N/A	Community Facility
Residential Aged Care Facility	30-36 beds	12 beds	12 beds	60 beds

Table 2. Estimated Scope for Aged Care Accommodation in Carnarvon. Source: Verso (2012)

Development Models

Three models for sustainable aged care were identified with common actions required including:

- The construction of a new residential aged care facility and the closure of residential aged care beds in the hospital.
- That the residential aged care facility with ageing in place beds be constructed to contemporary standards (9C building standards) and which provides secure dementia care.
- Integration of the care model with primary health.
- The full implementation of the community aged care reforms and approaches as detailed in Living Longer Living Better.
- The construction of new ILUs that incorporate ageing in place and a range of entry options.
- A footprint for the development that supports expansion to meet future demand.
- Consideration being given to the redevelopment of the existing stock of ILUs in Carnarvon.
- The three models developed primarily differed in regards to the governance model
    - Option 1 assumed a single operator;

- Option 2 assumed a consortium of stakeholders or a collaboration supported by Memorandums of Understanding (MOUs) and local MOU steering group;
- Option 3 assumed three separate entities delivering individual elements of the project (residential aged care, community aged care, and older persons housing) with professional cooperation possibly through development of MOUs.

2.14.4 Application for the Project

- Broadly the report will be highly applicable for scoping the structure plan and prospectus.
- Given the time that has passed since the report, any figures drawn from the report will need to be considered in the context of current aged-care policies and strategies (such as consumer directed care and home care packages programming), in particular, recent changes to residential and community aged care provision to better reflect the preference of both the community and government for delivery of care in the home.
- Given the time that has passed any assumptions relating to gaps in aged housing and services will need to be confirmed based upon current offer throughout Carnarvon and the greater catchment area, as well as any updated population projections prepared for the catchment area.

2.15 BRIEFING FOR THE GASCOYNE REGION STATEWIDE AGEING IN THE BUSH PROJECT (VERSO CONSULTING – 2014)

2.15.1 Scope

The Briefing was prepared to solicit feedback from key stakeholders and to ultimately form the basis for the Gascoyne Region component of the Statewide Report for the Ageing in the Bush Project. The purpose of the wider project was to identify aged care models for regional WA that enable residents to age in their community and develop an Action Plan to help realise those Models.

2.15.2 Approach

The Briefing draws upon desktop research covering policy, selected demographics, literature highlighting innovative models of aged support and care, demand/supply research and projections, individual consultations, questionnaire returns from local government, regional development commissions, WACHS managers, and feedback from regional forums. Reference has also been made to the WACHS Midwest Gascoyne Health Service Plan.

2.15.3 Key Insights

The key insights of the report as they relate to the proposed Brockman Park Structure Plan are summarised below.

Regional context

- Seasonal population levels fluctuate significantly.
- Higher cost of living associated with remoteness.
- Logistics and costs of service delivery associated with remoteness.
- Higher capital cost associated with remoteness.
- Relatively disadvantaged (SEIFA) local population.
- Population over 85 years will nearly double between 2016 and 2026. This report relies on new population projections prepared by the ABS for DSS in 2013. The population growth anticipated in this data set is considerably greater than that anticipated in the population projections that underpin the Verso 2012 report. A total of 6,023 residents 55 years and over are anticipated in the region by 2026 compared with 4,428 residents by 2027 which was used in the Verso 2012 report.

Residential Aged Care

- There is an urgent shortage of Residential Aged Care in the Gascoyne Region.
- Complex late-stage aged care requires a specific mix of skills and environment not always present in Home Care settings.
- Much high-care is now advanced dementia care requiring a secure setting.
- Current home-care is good and maintains people at home for a long time, with the net effect that entrants to institutional Residential Care are in need of very high levels of care.
- WACHS believes a private provider will not be interested in the integrated development of Brockman Park after earlier efforts to attract one did not go anywhere.
- The mooted Carnarvon Hospital upgrade will only increase the available number of beds from 16 to 24, which is well short of current and future needs.
- The community strongly prefers a residential development at Brockman Park and opposes the upgrade of residential care at the hospital site.
- The Carnarvon Multi-Purpose Service doesn't believe the capital for the upgrade is totally locked.
- Aboriginal people enter Residential Care at a younger age than the non-Aboriginal population but stay for a shorter period of time.
- Aboriginal people have a strong affinity for country and their desire to remain on country or return to Country after care is not well catered for in the region.
- There are limited trained staff in dementia and limited allied health for Residential Care and associated activities.
- There is a current notional shortfall of around 64 beds in the Gascoyne Region. This shortfall will rise to around 112 beds by 2021 if no new beds are in place by then.
- There is strong local concern about the total absence of "built-for-purpose" Residential Aged Care in the region.
- Verso observed that demand has escalated since the original 2012 report and assert that, in relation to Brockman Park- "it is now quite feasible that the scale of residential demand would now reliably be 40-50 beds and heading towards 60 beds. A reconsideration of that proposal, at least to informally test interest, is suggested."

Retirement Living (Aged Persons Housing)

- There is a shortfall in the supply of older persons housing based on the existence of waiting lists and earlier work in Carnarvon.
- There is a limited range of current providers of aged housing in the region.
- Much housing which exists is not built to a design that facilitates ageing in the community. In particular, GMF housing in Carnarvon is in a prime location but quite old and due for extensive upgrade and development for it to fulfil its potential for ageing in the community.
- Carnarvon Shire has available land adjoining GMF (i.e. Brockman Park) and is interested in developing this to provide older persons housing.
- Insecure tenure in caravan parks and rental housing is relatively high in the region (13.8%). This restricts older people from adapting their accommodation to match their changing needs.
- If the 70+ population projections of an increase from 669 (2011) to 1,655 by 2026 were to materialise, then there would be a dramatic increase in the level of unmet demand.
- All evidence suggests a current shortage of appropriate aged housing in most parts of the Gascoyne Region. In 2012 a conservative estimate was made that there was likely demand for 55 more units in Carnarvon, and that demand is clearly set to grow. Regional assessment of actual/real demand over supply is not an easy task and carefully staged developments are the preferable approach.

- A variety of entry availability is needed, along with evidence that there are potential purchasers who can afford to buy but are ineligible for affordable housing. To reduce the financial risk of having unsold stock when housing is being built for purchase, sale "off the plan" is the preferred approach.
- Future older persons housing must be of the appropriate design, should be located with proximate access to everyday facilities, opportunities for social interaction and have necessary support services available. Housing providers and investors should be made aware of this if not already.
- As with demand for residential aged care, demand for ILUs is likely to have escalated since the original Verso 2012 report was prepared, driven by higher than anticipated population growth in the catchment.

Community Aged Care

- Silver Chain has restructured to employ Care Team Leaders in Carnarvon and Denham.
- Coral Bay, Burringurrah and Gascoyne Junction were identified as lacking aged care services.
- There is a perceived need for more capacity to care for Aboriginal people closer to their country.
- Some stations are directly employing aged carers.
- Carnarvon has Physiotherapy and Chiropractic services, and Exmouth has Chiropractic.
- There is a pharmacy in Denham, Carnarvon and Exmouth.
- There is a resident Nurse Practitioner at Coral Bay (WACHS).
- Nearly half the residents of GMF don't have family in Carnarvon.
- Older residents in Shark Bay "look out for each other".
- Silver Chain delivers services into GMF and may be building a centre on the site.
- Silver Chain cannot provide allied health.
- There are only a handful of Respite beds in the region and they are provided in the general wards of the Carnarvon and Exmouth hospitals (the latter only in off-peak times). During the winter months when the populations of the coastal towns can double, those beds are no longer available for Respite.
- Mobile Respite operates in the region (from Geraldton).
- Carers WA visits Carnarvon several times a year to offer supports.

Support and care at home and support for informal carers will be the increasingly prominent keys to maintaining older people in their communities. This accords with policy direction, funding direction and personal preferences.

There are more than ten times as many people in the region supported under the various community-based programs (mainly HACC & Home Care) than are currently in Residential Care. This is an extreme ratio when a typical one is more like four or five times. However, it does illustrate that non-residential care always predominates in terms of numbers supported.

Older people are often able to be maintained at home throughout their lives, even with high care needs. However, to do so requires the right care and support to be available and currently this isn't so throughout the region.

Limits to Respite Care supply, particularly in peak season for Residential Respite, will likely impinge negatively on the ability of informal carers to maintain their role. In-home respite is available but no feedback was received as to its adequacy, except to note that Silver Chain has now ceased providing overnight respite, which is a cause for regret.

According to Verso, the shortage of Residential Respite in the region is likely attributable to the shortfall in Residential Care beds and is not easily remedied. Providing care at home in outer regional areas is challenging. With orthodox models of care delivery originating from one or two central locations, the hours of care provided at more distant locations can be much reduced due to travel time or care not attempted at all. To address this issue, devolved operational models with small teams of well supported local carers have been shown to be effective. In other places, innovative local recruitment and training approaches can provide the workforce needed for this mode. The net effect is significant new employment and economic activity in the outer localities of the region.

Brockman Park

The ultimate core proposal recommended by Verso (2012) focused on Brockman Park land to be made available by the Shire, and involved an assembly of no/low-cost prime land and head works, operational supports potentially available from the hospital, cooperation from local community care providers and GMF plus proffered capital funding support from the State.

According to Verso, this package was to have been subject to an Expression of Interest process designed to attract approved aged care providers to develop a combined older person's residential development facilitating care in home, a care centre and a smaller scale residential facility with design scope for expansion to 60+ beds as demand manifested. In Verso's estimation the combination of package elements combined with a level of capital assistance would have provided viability and attracted interest. This offering was quite distinct from earlier attempts to gauge interest from providers, and since then unmet demand and likely scale have continued to grow. Ultimately, the proffered capital assistance did not eventuate and the initiative did not proceed.

In 2014, budget funding was announced to construct a 24-bed Residential Aged Care facility to replace the current 16 beds as part of a major upgrade of the Carnarvon MPS. A decision by WACHS to invest in a new residential aged care facility at the hospital will not overcome the unmet demand for Residential Aged Care in the Gascoyne Region; it will only add 8 new beds in several years' time if it proceeds. According to Verso the proposed developed does nothing to address the true scale of likely demand growth. It was reported in consultations that there was already a waiting list of 29 people for a residential place at the Carnarvon facility.

Verso also observed that such a development will make it far more difficult for, or preclude, private providers to enter the market due to issues of scale and viability, and because the establishment of an MPS normally entails the right to exclusive provision of aged care in the catchment area.

Finally, community consultation undertaken by Verso has shown that the community would strongly prefer to see the Brockman Park integrated project proceed.

2.15.4 Application for the project

The report largely reflects the findings and recommendations of the Verso's 2012 report. There are however a number of areas that will likely require clarity including:

- Any history related to releasing an Expression of Interest (EOI) based upon any of Verso's options;
- The current plans/progress of the Carnarvon Hospital aged care expansion (including whether funding commitments may be transferred to the Brockman Park site); and
- The basis for WACHS' belief that 'a private provider will not be interested in the integrated development of Brockman Park'
- Given the escalation in demand identified, it is also highly recommended that the proposed footprint and staging for Brockman Park, outlined in Verso (2012), be re-evaluated to take this increased demand into account.

2.16 FORMATIVE EVALUATION OF THE HOME CARE PACKAGES PROGRAMME – POLICY CONSIDERATIONS PAPER (KPMG – 2015)

2.16.1 Scope

The paper is intended to highlight and explore the policy implications related to an earlier review of the Home Care Packages Programme. This included providing a high-level overview of 'key policy issues and a preliminary view of the associated considerations for government'.

2.16.2 Key Insights

- The Living Longer, Living Better package developed in 2013 seeks to improve and strengthen the aged care system in five key areas:
    - Increasing consumer choice and control, including through consumer directed care (CDC);
    - Reorienting service delivery to consumer-directed with a restorative focus;

- Streamlining access and transition processes;
- Provide more options to support older people in continue to live in their own home; and
- Make funding arrangements more sustainable.

- Major element of the wider aged care reform is expansion of home care packages from current 66,000 (2015) to 100,000 by 2017, with another 40,000 packages by 2022.
- From July 1st 2015 all home care consumers will move to a consumer-directed care model where they will have an individualised budget and control over their aged care plan.
- Key dependency on achieving a consumer-led market in aged care will be the readiness and ability of providers to compete and deliver in such a market.
- KPMG identified a number of relevant key considerations in regards to market development. These included:
  - The need to have a clearly defined definition of success for the any initiative (vision, expectations ad direction) to give the market adequate direction and information to make appropriate decisions
  - A clear understanding of market conditions including current and future demand and supply requirements, including assessment of supply risks to enable the identification of supply gaps and/ or areas of market failure
  - A need to understand how different elements of the aged care market interact, and how this impacts upon the decision-criteria of market participants in a given geography
  - Identification of options/levers for intervening to respond to market gaps/potential market failure and to strengthen and encourage market participation, support and reward performance, manage underperformance, provide incentives to respond to market demand and encourage innovation.

2.16.3 Implications for the Project

Whilst the report focuses specifically on the Home Care Packages Programme, the themes explored by KPMG in regards to development of appropriate conditions for a consumer-led/market-driven approach in regards to all element of the project will be important. In particular, the project, and all of its elements will need to be prepared to address the concerns and decision criteria of markets (hence the need for the development prospectus). In addition, evidence of 'market failure' will need to be collated and expressed in robust, defensible detail if support is sought from public sector agencies to de-risk the project for market investment.

2.17 THIRD REPORT ON THE FUNDING AND FINANCING OF THE AGED CARE SECTOR (AGED CARE FINANCING AUTHORITY – JULY 2015)

2.17.1 Scope

The report sought to provide an up-to-date overview of:

- The structure and operation of the Australian Aged Care Sector and its key characteristics;
- Early observations on the impact of recent reforms;
- Funding and financial performance of the sector based on 2013-14 data; and
- The emerging opportunities and challenges for the Sector as significant reforms continue.

2.17.2 Key Insights

- The Australian Government regulates the supply of home care packages and residential care by specifying a national provision target of subsidised operational aged care places for every 1,000 people aged 70 years or over, known as the aged care provision ratio. As part of the reforms which commenced in 2012-13 the aged care provision ratio is set to grow from 113 places for every 1000 people aged over 70 to 125 places by 2021-22. As the number of places increase, the mix of residential and home care will concurrently change. The target for home care packages will increase from 27 to 45 and the residential target will reduce from 86 to 80.

Figure 6. Aged care planning ration targets, 2013-14 and 2021-22. Source: Aged Care Financing Authority (2015)

- The Government allocates home care packages and residential care places through an annual competitive process, the Aged Care Approval Rounds (ACAR).
- July 2014 reforms to means testing in residential care and income testing in home care packages are expected to see the share of consumer contributions to aged care funding grow over time. In particular, The Aged Care Financing Authority (ACFA) considers the following benefits will flow from the reforms to funding and financing of the residential care sector:
    - Market-based accommodation payment arrangements for non-supported residents will facilitate higher revenue flows (from the removal of caps on daily charges in high care) and an increased pool of lump sum accommodation payments (by allowing lump sums to be paid by high care residents);
    - A higher Government accommodation supplement for supported residents living in new or significantly refurbished facilities will both increase revenue for eligible providers and, in conjunction with the accommodation payment changes, boost investment in the sector; and
    - Stronger means testing arrangements will improve long term sustainability by better balancing Government and consumer contributions.
- Consumer choice of form of accommodation payment in residential care favours lump sum Refundable Accommodation Deposit (RADs) at 41 per cent over rental style Daily Accommodation Payments (DAPs) at 35 per cent and combination payments at 24 per cent.

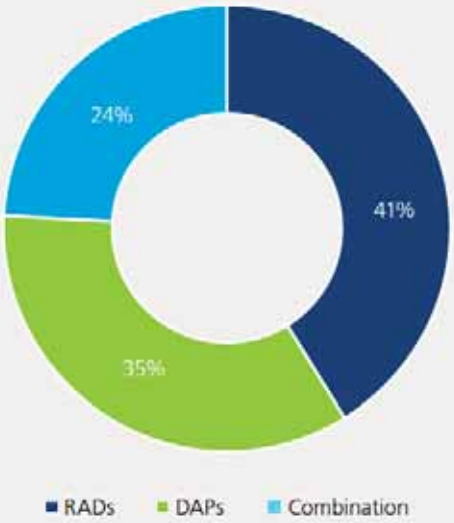

Figure 7. Preferred method of payment by non-supported and partially supported residents, July 2014-March 2015 Source: Aged Care Financing Authority (2015)

- The average actual prices for RAD/DAP was $333,000/$58.02 at 30 June 2015, compared with average new bonds of $296,000 during 2013-14 with prices higher in city areas.
- The majority of residential aged care places are operated by not-for-profit providers (52 per cent of providers and 57 per cent of places). For-profit providers account for 37 per cent of providers and places with state and local government owned providers accounting for 11 per cent of providers and 5 per cent of places.
- Most providers operate predominantly high care facilities (70 per cent of providers and 85 per cent of places). The remaining places are mostly operated by mixed care providers with very few providers operating predominantly low care facilities (4 per cent of providers and 1 per cent of places).
- Earnings Before Interest Tax Depreciation Amortisation (EBITDA) per resident in the residential aged care sector per annum was $9,224, up from $8,660 (an increase of 6.5 per cent).
- Net Profit Before Tax (NPBT) per resident in the residential aged care sector per annum was $4,150, up from $3,492 (an increase of 18.8 per cent).
- The top quartile of residential aged care providers achieved an average EBITDA of $21,889 per resident. Providers in the bottom quartile averaged an EBITDA of negative $8,866 per resident.

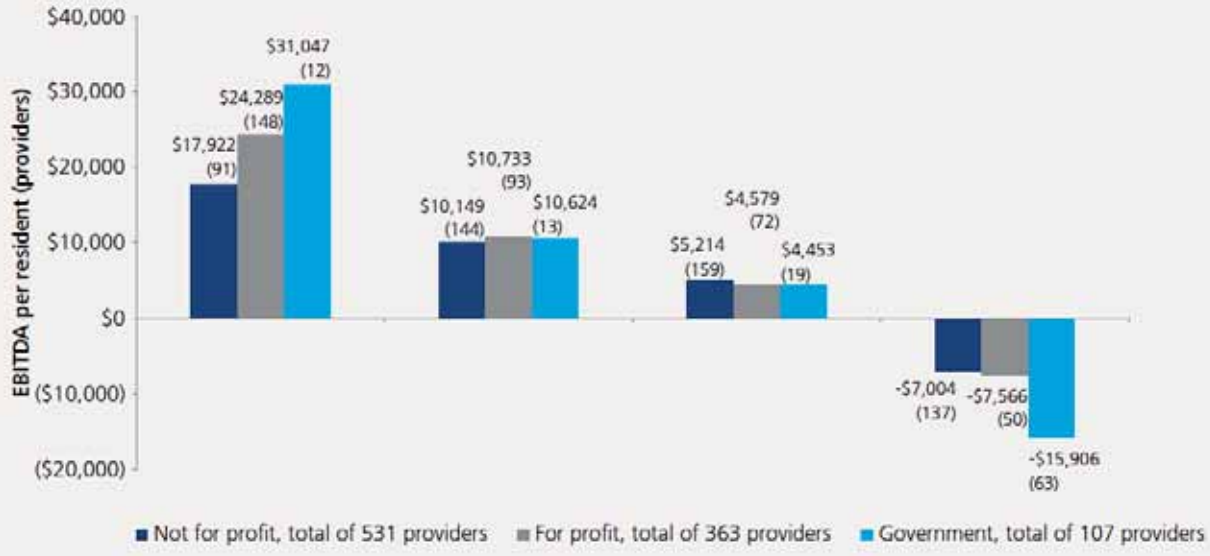

Figure 8. Residential aged care provider average EBITDA. Source: Aged Care Financing Authority (2015)

- In most cases, residential aged care providers with any mix of ownership, location and care type can achieve a sound level of financial performance.
- Providers operating predominantly regional locations were overrepresented in the bottom two quartiles of financial performance for residential aged care providers.
- Multiple factors may impact upon the financial performance of regional providers- particularly those in more sparsely populated, remote areas. Specifically, regional providers are more likely to operate smaller facilities; receive lower resident accommodation revenue due to lower house values; have a higher proportion of low care residents; and, be significantly more dependent upon non-operating revenue for their viability (such as donations). Further, they are more likely to be not-for-profit or government providers which operate services where they may not otherwise exist, reflecting mission objectives and community service obligations.
- The 2.4 per cent increase in the basic care subsidy (on top of indexation) will increase revenue for all providers, and, a 20 per cent increase in the viability supplement will increase revenue for eligible rural and remote and homeless services.

2.17.3 Implications for the Project

The report gives detailed insights into the characteristics of the aged care sector as a whole, and in particular the residential aged care sector. The report gives strong guidance as to industry norms with regards to profitability and performance that will likely need to be met by the project if it is to become an attractive investment for one or more external operators. A particular area that will need to be addressed in the early stage of the project will be the eligibility of the project for the viability supplement that is available for eligible rural and remote services.

2.18 GEOTECHNICAL INVESTIGATION

A geotechnical site investigation was completed at the Brockman Park site on 13 July 2016, which comprised the excavation of 10 test pits (to depths of between 2.1m and 3.0m below ground level), testing with a dynamic cone penetrometer adjacent to the test pits (to depths of between 0.9m and 2.0m), and infiltration testing at 3 locations (at a depth of about 0.5m below ground level). Laboratory testing was also undertaken, which comprised of Particle Size Distribution tests on two samples, and Atterberg Limits and Linear Shrinkage tests on two samples.

The Quobba sheet of the 1:50,000 scale Environmental Geology maps indicates that the area is underlain by the following two soil formations:

- North-east part of the site: Alluvium, deposits of Gascoyne River – clay, silt, sand and gravel
- South-west part of the site: Supratidal flats – calcareous clay, silt and sand and authigenic gypsum and superficial algal mats and salt crusts.

The site investigation found that the general soil profile across the site comprised a layer of sand fill overlying clay (typically high plasticity) overlying clayey sand / sandy clay. The sand fill was present from the ground surface to depths of between 1.0m and 2.1m, which was overlying typically medium to high plasticity clay, which was present to the maximum test pit depth of 3.0m in nine of the ten test pits. In the tenth test pit, the clay profile was present to a depth of 2.1m below ground surface, and was overlying clayey sand. Groundwater was encountered in four test pits in the lower lying areas of the site at depths between 1.8m and 2.6m below ground surface, which is likely close to sea-level. A perched groundwater table over the in-situ clayey soils could be expected at wetter times of the year.

The geotechnical engineers considered that a site classification of "Class S" would be appropriate, in accordance with AS2870-2011 "Residential Slabs and Footings", provided that the appropriate site preparation measures outlined in the geotechnical report are followed. This site classification assumes that no more than 1m of fill is placed on the site as part of the development (i.e. there will not be widespread loading which may cause consolidation of the underlying clayey strata). Should greater levels of fill be required, additional investigation will be required to confirm the thickness and consistency of the underlying clayey strata. A site sub-class of 'Ce' was considered appropriate, in accordance with AS1170.4-2007 "Earthquake Design Actions – Australia".

The infiltration tests carried out on the site measured permeabilities of >7m/day for the in-situ sandy soils, at a depth of 0.5m below ground level. The sands at the site are considered appropriate for on-site disposal of stormwater via soakwells, assuming that the site preparation works outlined in the geotechnical report are followed. A recommended design value of permeability (k) no greater than 5m/day is recommended for the in-situ sands, to allow for natural variation in the sands, densification of the sands during the site preparation works, and clogging of the soakwells over time.

3 MARKET DEPTH ANALYSIS

3.1 SCOPE

The purpose of this analysis is to quantify the current and future market depth for aged care housing in Carnarvon to inform the scope of an aged care precinct at Brockman Park. A detailed description of the methodology for this analysis is included in Appendix I.

3.2 METHODOLOGY

An analytical framework was developed to estimate the plausible demand for aged care services within Carnarvon, the ability of existing supply to meet this demand, and the opportunity that this project represents in meeting this demand. This project will be informed by inputs provided by the Consultant Team and Client, as well as data and projections from sources including:

- ABS Census of Housing and population (2011);
- Social Health Atlas of Australia;
- Productivity Commission inquiry – Caring for Older Australians;
- Department for Social Services;
- Australian Institute of Health and Welfare 2016; and
- National Aged Care Data Clearinghouse (NACDC).

3.2.1 Key Assumptions

Sourced population projections used in this analysis are from the National Aged Care Data Clearinghouse: Population projections, 2012 (base) to 2027 for all states and territories at Statistical Area Level 2 (SA2) by sex and age data set.

High and Low Care Facilities

Demand for residential aged care beds is based on the projected population of residents aged 70 years and over in the Gascoyne Region.

The potential funding available for high and low care facilities in Carnarvon is derived from the projection of residents aged 70 years and over in the Gascoyne, multiplied by the Australian Governments planning ratios for low and high care:

- 40 places per 1000 people for Low residential care;
- 40 places per 1000 people for High residential care.
- The model recognises the trend toward well designed and serviced ILUs becoming a primary location/ solution to the provision of low care services to residents. Consequently, the model assumed that 90% of future demand for low- care beds will be provided for through the provision of ILUs. Additionally, the potential for up to 60 high-care beds being provided by the Carnarvon Health Campus by 2025 has been taken into account for the analysis.

The demand for high and low care facilities is calculated by multiplying the projected population over the age of 70 by the implied planning ratio of 0.04 (40 people per 1000). This is process is repeated for each year. The number of additional beds required is calculated as the difference between the total demand and the existing supply.

Independent Living Units

Modelling of future demand for ILUs is based upon the following assumptions:

- Sourced population projections used in this analysis are from the National Aged Care Data Clearinghouse: Population projections, 2012 (base) to 2027 for all states and territories at Statistical Area Level 2 (SA2) by sex and age data set.
- Average age of residents moving into an ILU in Carnarvon is 74, with an average duration of residence being between 5 to 10 years.
- Proportional market demand for ILUs is based on the 35% of survey respondents aged between 55 and 70 years old having intentions of moving into an ILU when they are 70 years or older with (Verso 2012).
- 88% of ageing residents intending on remaining in Carnarvon (Verso 2012).
- Existing supply of 35 ILUs (with an additional 15 to be constructed) provided by the Gascoyne Memorial Fund adjacent to the Brockman Park site.
- The total number is the sum of "premium" units that consist of 2-3 beds (15% of total) and price sensitive "standard" units that have 1-2 beds (85%). Since this model does not assume all the bedrooms in the 2 and 3 room ILUs are occupied by single residents, the population is divided by a factor of 1.3 for standard and 1.6 for premium ILUs

$$Remaining\ in\ Carnarvon = Population_{74-85} * 0.88$$

$$Demand = Remaining\ in\ Carnarvon * 0.35$$

$$Required\ Units\ to\ meet\ 100\%\ of\ Demand = \frac{Demand * 0.15}{1.6} + \frac{Demand * 0.85}{1.3}$$

To calculate the number of units to fulfil the total demand for ILUs, the projected population of residents aged 74-85 is used and multiplied by 0.88 to account for the 88% of residents intending on remaining in Carnarvon. The product of this is then multiplied by 0.35, as the survey by Verso indicated that 35% of the aged population intended on moving to an ILU. The total number is the sum of "premium" units that consist of 2-3 beds (15% of total) and price sensitive "standard" units that have 1-2 beds (85%). Since this model does not assume all the bedrooms in the 2 and 3 room ILUs are occupied by single residents, the population is divided by a factor of 1.3 for standard and 1.6 for premium ILUs. The number of additional ILUs required is calculated as the difference between the total demand for ILU's and the existing supply of ILU's.

3.3 KEY FINDINGS

Table 3 outlines the forecast demand for additional ILUs and residential aged care beds to 2027. As the Verso report was analysis conducted in 2012, the dissimilarity between the Verso findings and the results of this analysis can be attributed to updated (current) population figures and projections.

Service	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Additional ILUs Required	47	51	55	61	66	74	81	88	95	100	110	118
Additional Residential Aged Care Beds Required	17	20	23	25	27	31	34	37	66	9	14	18

Table 3. Cumulative Estimated Demand Depth - Canarvon Aged Housing Source: FAR Lane (2016), Sourced from Verso (2012, 2014)

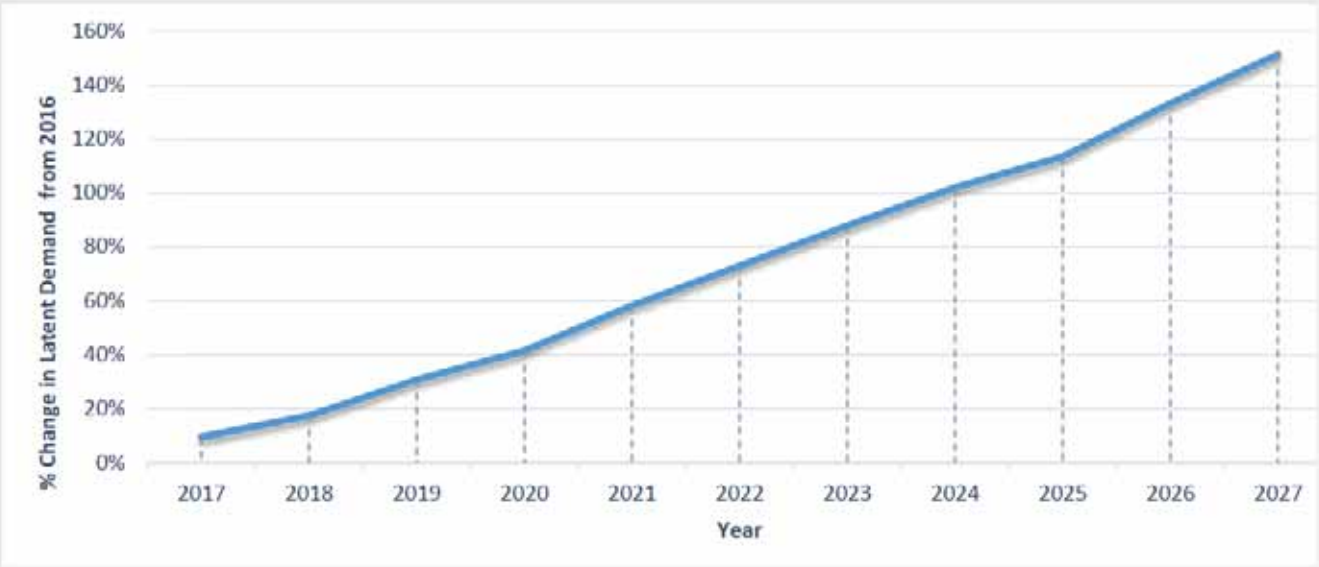

Figure 9. Change in Latent Demand for ILUs from 2016. Source: FAR Lane (2016)

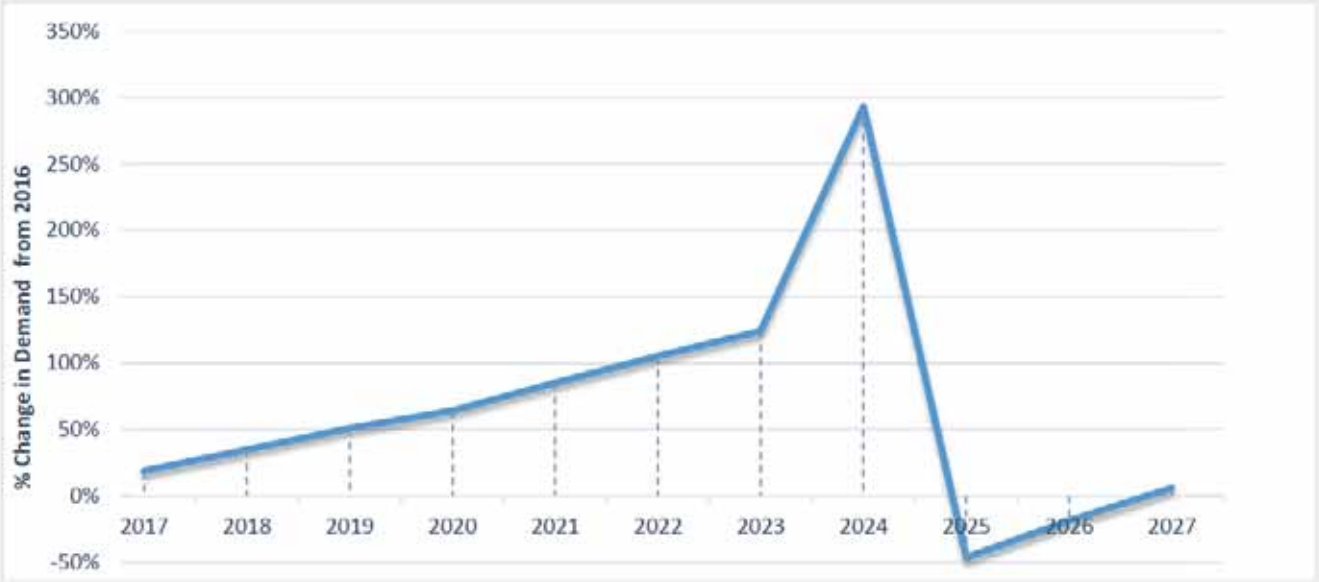

Figure 10. Change in Latent Demand for Residential Aged Care Beds from 2016. Source: FAR Lane (2016)

The market depth analysis found that between 2016 and 2025 the demand for ILUs will increase by 113% whilst the demand for beds decreases by 46%. The demand for residential aged care beds in 2025 is eased as a consequence of the assumed construction of an additional wing of the RAC facilities at Carnarvon Health Campus, providing a total of 60 high-care beds.

Based on the aforementioned assumptions and projected ageing population growth, the analysis suggests that the construction of 100 ILUs and 9 High care beds by 2025 can be justified.

4 OUTCOMES

The outcomes of the background investigations, stakeholder and public consultations are summarised as follows:

4.1 AGED CARE ACCOMMODATION

4.1.1 Opportunities

- Significant existing and future demand in the Gascoyne and Carnarvon population for ILU development, particularly if it can be;
- Achieved to the standard that allows for ageing in place through the provision of in-home low-care services
- Achieved at a price point/business model that allows 1st-2nd quintile household income residents to access housing
- Opportunities for Brockman Park meet a number of ILU market segments, ranging from a premium product that provides for more space (bedrooms, storage and parking) to a price-sensitive market that can be accessed through public support funds (e.g. aged pension). The premium product could take advantage of the high quality views and amenity associated with the site's proximity to the Fascine
- Opportunity for Carnarvon Health Campus to continue to be the focused location for high-care residential aged care beds in the medium term. This is based upon the Campus' existing expansion activities, and the capacity for further expansion. This will allow for more efficient utilisation of infrastructure (less duplication) and allow for Brockman Park to be more focused in its scope.
- Opportunity to integrate infrastructure associated with low-care HACC into the development to ensure support for future residents, and for the broader Carnarvon and Gascoyne community
- Opportunity to incorporate infrastructure for respite care services (predominately day-respite) to provide support for those that are caring for ageing parents/partners in their own homes
- Opportunity to support the amenity/development/upgrade of adjacent ILUs at the GMF site by ensuring integration and co-sharing of infrastructure and services

4.1.2 Constraints

Delivering aged care services in regional and remote areas is a complex challenge, as relative to metropolitan locations, regional area are often characterised by

- High capital and operating costs
- Uncertain or limited local demand which limits economies of scale; and
- Limited capacity of the local market to afford aged care services at the prices required to make investments in aged care service feasible.
- Despite the introduction of viability supplements it will continue to be very challenging to match demand for ILUs and RAC in Carnarvon with developers and operators that are able to meet this demand through appropriate products and price points. Developing a case for private/not-for-profit investment in capital expenditure given the potential returns will require consideration of a number of factors including:
- How the Shire approaches valuation of the Brockman Park site, and the aspirations of the Shire in relation to the realisation of this value
- The role that the Shire and other infrastructure agencies may play in de-risking Brockman Park for any future aged-housing development

- The role that local, state and federal agencies may play in supporting/subsidizing the required capital expenditure to develop Brockman Park and bring it to market at appropriate price points
- Management of site development costs through sensitive design solutions and forward-thinking infrastructure provision
- Careful articulation of the desired housing mix, service mix and amenity that can realistically be achieved to meet the needs of market segments
- Design of a structure plan that allows market participants to develop innovative solutions to meeting the challenges of the site whilst still ensuring that the socioeconomic outcomes of the project are achieved.

4.2 SITE LAYOUT AND LAND USES

4.2.1 Opportunities

- At the key stakeholder workshop there was a desire expressed by the Shire for the subject site along with the adjoining GMF facility and Senior Citizen Centre to be considered as an aged accommodation precinct. On this basis the opportunities and constraints regarding site layout and land uses have included these adjoining properties. This allows for broader consideration of the strategic needs for health care provision within Carnarvon and the region.

Gascoyne Memorial Fund

Senior Citizens Centre

- The overall opportunity to provide aged care accommodation including Residential Aged Care (RAC), Independent Living Units (ILU), community facilities and office space to support community care at the subject site was supported by respondents, however there was a comment made that there was sufficient ILU already available by Returned Services League (RSL). This comment is not validated by the research into demand, which has identified an immediate and pressing need for more aged person's accommodation in the region. There was also a comment that the proposal to develop the site was supported as long as the view is not lost. Similarly the opportunity of the structure plan area being well located, as it is in close proximity to the Town Centre and other facilities such as the Medical Centre, was supported by respondents.

View to the Fascine

Town Centre immediately adjacent to the Structure Plan Area

- The location of an existing hotel (Fascine Lodge) adjacent to the subject site has been identified as an opportunity as it provides conveniently located accommodation for people who may be visiting residents of the proposed aged accommodation. The majority of respondents agreed that this an opportunity however there were a couple of negative comments that associated the hotel with antisocial behaviour at Brockman Park. It is unclear if this premises does generate antisocial behaviour or if it was confused with a different establishment in the area. Notwithstanding this, the proposed development will be designed to provide passive surveillance of the park, which will work towards a reduction in antisocial behaviour.

Facine Lodge

View down Bibra Way

- The linkage of pedestrian paths within the proposed development to existing pedestrian paths within the GMF site was identified as an opportunity as it would increase movement opportunities for residents in both facilities and would also support integration of the two sites. These opportunities were supported by the majority of respondents however there were a couple of submissions that raised concern about any increased access to the GMF site due to previous break ins. It is considered that a design that supports the integration of the two facilities would actually increase the security of the existing facility as the current lack of surveillance of the park combined with a fence that provides concealment opportunities for intruders, contributes to the current security issues. While opportunity for integration of the facilities should be recognised and facilitated through the structure plan this will require consultation between the GMF and the developers of Brockman Park and resolution of safety and design issues at detailed design (after completion of the Structure Plan).

Fence between GMF site and Brockman Park

- The existing senior citizens centre building is ageing and therefore an opportunity for upgrade and improvement was identified. This opportunity was overwhelmingly supported by respondents.
- The vacant area of the GMF adjacent to Olivia Terrace was identified as an opportunity for a collaborative development site due to its proximity to both the existing and proposed facilities and the Town Centre. The majority of respondents supported this opportunity.


Views of vacant land adjacent to Structure Plan Area

- The area of vacant land located on the corner of Olivia Terrace and David Brand Drive was identified as an optimum location for community facilities due to its proximity to the Town Centre. The majority of respondents agreed with this opportunity however a couple of comments suggested their support would be based on the type of facility.


Vacant land on the corner of Olivia Terrace and David Brand Drive

- All respondents agreed that maintenance of pedestrian access to the Town Centre was important and there was a comment that it should be suitable for gophers and prams. The layout will be designed to incorporate this access and it is anticipated that any new footpaths will be constructed to universal access standards.


Existing pedestrian path

- Given that the majority of buildings within the GMF facility are aging, and do not currently meet modern standards for aged persons accommodation, an opportunity was identified for future redevelopment of this old housing stock. In addition to agreements with this opportunity there were comments that this was already being considered and that the dwellings could be upgraded instead of being replaced. There were also comments that could be interpreted as disagreeing with this opportunity stating that the GMF does not belong to the Shire, that it is for poor pensioners and that it is an already functional Independent Living Facility (ILF). Whilst none of these comments are incorrect they also do not discount the opportunity to redevelop the aging housing stock.

Existing building within GMF site

Vacant land within GMF site

4.2.2 Constraints

- The 2.1 hectare size of the site has been identified as a constraint as it limits the number of Independent Living Units (ILU) and/or the size of a Residential Aged Care (RAC) facility that can be developed. The comments in response to this constraint varied. The majority of comments from stakeholders and respondents did not relate to the size of the development site. However there was submission which suggested that the size was sufficient and there was also another that suggested that a larger alternative site should be found. Another suggested that RAC is not a viable option based on the size of the Carnarvon population, however this is not supported by the research into aged persons accommodation demand by both Verso and the Project Team.

View of the Structure Plan Area from the intersection of Bibra Way and David Brand Drive

View of the Structure Plan Area looking north from David Brand Drive

- It is understood that a Silver Chain facility is proposed to be built in the north eastern corner of the GMF site. It is also understood that the facility will include some respite services. Many of the comments provided on this constraint were not related to the proposed facility's location and were instead general comments of support for the facility. Overall the project team concluded that the proposed location of the Silver Chain facility would be more appropriately located closer to the future aged person's accommodation.
- As Brockman Park currently serves a significant drainage function and there is a risk of storm surge due to the proximity to the Fascine, development of the site will need to address these considerations. Preliminary water management investigations has revealed an existing outlet to the Fascine in the south west corner of the site and to maintain the use of this outlet a linear park along the western boundary of the site is proposed to provide Public Open Space and drainage functions. To address the storm surge issue substantial fill will be required. The majority of respondents agreed that this was a constraint to development of the site. Further, Stakeholder consultation noted the need for an appropriate design response to mitigate this risk. Technical investigations by the Project Team will quantify the fill and drainage requirements across the site.

Existing drainage outlet within Structure Plan Area

Existing concrete swales in Brockman Park

4.3 BUILT FORM

- The high cost of construction in regional areas is considered a constraint to the provision of affordable housing and in particular stakeholder engagement noted this constraint. In addition to constructing buildings with low operating costs the opportunity to construct using alternative methods, such as prefabrication and modular, to reduce construction costs was identified. Most respondents agreed with this opportunity however one submission commented that there should be no 'cutting corners'.
- The site visit and consultation with key stakeholders identified a current lack of surveillance of the park and consequent issues with antisocial behaviour at the park and security, in particular at the GMF facility. There was one comment that this was not necessary however an explanation was not provided. Careful consideration of the design of the built form to provide passive surveillance of Bibra Way and David Brand Drive as well as the remainder of Brockman Park was considered an opportunity to address these issues – this can be encouraged through provisions of the Structure Plan.

Existing built form that does not provide passive surveillance of Brockman Park

- The location of the site immediately adjacent to Fascine provides an opportunity for a 2-3 storey built form to take advantage of water views. This opportunity was the most disagreed with by respondents, with many raising concerns that their views will be blocked. While there may be some restriction of views from existing properties, the majority surrounding the subject site, including the GMF facility, has solid fencing that currently blocks any views from their property. The restriction of sea breezes was also raised as a concern with regards to this opportunity. It is considered that the built form can be designed so sea breezes will not be restricted. Flexibility in development form is an important consideration in providing for a viable development site. It is therefore recommended that 2-3 storey built form should be allowed within the Structure Plan.

Views of the Fascine

4.4 ACCESSIBILITY

An analysis of the movement network around and through the site identified one main issue being pedestrian accessibility, as the existing footpath that cuts diagonally through the park is frequently used for access to and from the Town Centre. This pedestrian access will therefore need to be maintained however it is proposed for it to be relocated within the proposed linear park along the eastern boundary. There was minimal disagreement with this proposal however one submitter did comment that the existing trees may be an obstacle. It is considered that there will be sufficient area to construct a new footpath without removing the existing street trees along Bibra Way.

4.5 OPEN SPACE

The provision of a linear park along the western boundary of the site was considered an opportunity to locate Public Open Space (POS) that would provide both a pedestrian access and drainage function. The opportunity to relocate the existing pedestrian path to the proposed linear park was agreed with by the majority of respondents.

Other opportunities identified relating to improvements to the remainder of Brockman Park including the provision of passive surveillance from the proposed buildings to increase safety and the upgrade of the concrete pools located immediately north of the subject site into landscape drainage swales to improve stormwater retention. Both of these opportunities were well received by respondents in particular the conversion of the concrete pools, which were referred to in comments as an eye sore and mosquito breeding ground. Other comments suggested the inclusion of infrastructure that would attract families, such as picnic tables.

With regard to the opportunity to create a continuity of landscaping between the subject site and Brockman Park the majority of submissions and comments were supportive and included a comment that water wise plants should be used a sentiment that echoed key stakeholder feedback.

4.6 SERVICING

Along with addressing the current drainage function of the park the existing Waste Water Pumping Station, which is located adjacent to the north east corner of the subject site, was identified as a consideration in the design of the structure plan and concept plans due to the need to maintain access to the Station. No comments provided by respondents on this issue identified any additional consideration with regards to this infrastructure.

View across Structure Plan Area towards the Pumping Station

Vehicle Access track to Pumping Station.

5 CONCLUSION

The literature review, site investigations, stakeholder workshop and public survey has identified the key opportunities and constraints of the site and provided views on how these issues could be addressed to contribute to the development of an aged person's accommodation facility.

An identified need and strong support for additional aged person's accommodation, the suitability of the site with regards to its proximity to the Town Centre and Fascine and a desire for a safe and sustainable development, were some of the key findings from the consultation process.

As well as the information collected from the stakeholder workshops, there were 20 submissions received from the public. The information obtained within these submissions will be considered in the development of the draft Brockman Park Structure Plan.

The outcomes of the stakeholder workshop and public survey will be combined with the findings from the literature review and technical investigations to increase the consultancy team's understanding of the site development issues and will be used as a basis to develop the draft Brockman Park Master Plan for further community and stakeholder comment.

APPENDIX 1

STAKEHOLDER WORKSHOPS NOTES AND SHIRE COMMENTS

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Workshop Notes

Project Name	**BROCKMAN PARK STRUCTURE PLAN & DEVELOPMENT PROSPECTUS**	Workshop Date	**22 July 2016**
		Recorded By	**Whelans Town Planning**
Meeting/Subject	**Stakeholder Workshop Notes Attendance Register Attached.**	Total Pages	**5**

Hospital Site Visit

- WACHS have actively addressed the high care requirements of Carnarvon with a proposed and funded 38 bed new facility currently in schematic design phase for the hospital.
- The hospital has room to expand this aged care development to 60 beds in the future should funding become available
- Dementia care and respite will be provided as part of the 38 bed
- "Special Rooms" will accommodate bariatric (obese) residents and also couples (2 beds)

Workshop – Introductory Session

- Residential Aged Care – high care, also respite, licensed beds allocated by Commonwealth Govt.
- ILU's or Independent Living Units - a housing product with services added as required by the resident.
- Issue of 'low care' is it a physical facility or a service. In reality it is the latter provided by a care service provider such as Silver Chain SCC, etc.
- An 8 bed hostel on site at Brockman was raised by Shire CEO.
- There is a small potential middle ground in the form of a respite centre/hostel or a serviced apartment model.
- Development Commission 'blue prints' identify the need for funding for age care.
- Different tenure models – what is the consequence
- Potential additional site for ILU's across the Tramway Bridge on Babbage Island
- Tension between local construction costs and delivering affordability.
- Caravan parks are operating as de-facto retirement villages – an impact on tourism capacity.
- Climatic appeal of Carnarvon for long-term tourism and retirees from 'down south'
- Growing appeal of "lock and leave'
- GMF consider there a need for low care bed.
- More demand in the region than the Brockman site can fit.
- Demand numbers have increased considerably since 2012 Verso report.
- Demand is difficult to define. Government policy uses blanket numbers.
- Demand different to viability. Need to de-risk until it becomes viable
- ILU's are a different type of housing product to RAC.
- Economies of scale. An RAC facility does not lend itself to staging.
- Easier to get funding for services than it is for capital.
- Royalties for Regions funding for hospital.
- What defines success?

Workshop – On-site Session

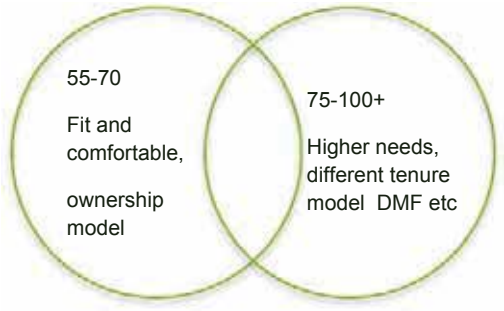
- The site is well located. 5 to 10 minute walk from most facilities ie shopping, medical centre. Senior citizen centre etc
- Close to water. Potential for water views at 2 storeys.
- The previous use of the site by the local people - swimming creek. Potential for a culturally sensitive landscape outcome for the site.
- A need to reaccommodate existing movement patterns across the site.
- Potential for landscape continuity between the site and the park.
- Importance of passive surveillance and walkable streets and paths. A big wall is actually counterintuitive for security.

- GMF turns it back on the site. In this instance it is a good thing as development of the site will not result in loss of views.
- Most of the GMF buildings are past their used by date. There is a proposal to add 15 units to the site.
- Opportunity to integrate/interact with GMF.
- Potential for serviced apartments and more intensive residential product at the southern end of the site closest to the town centre.
- Perhaps Silver Chain could also be at the southern end of the GMF site.
- Potential integrate family-friendly and kids play infrastructure.
- Site currently has a significant stormwater function which will need to continue.
- A number of studies suggest fill to provide a height of 4.2m is required to address storm surge. Storm surge wall could be extended to address fill issue. Fill is not a Shire requirement.
- Wastewater pumping station at north of site needs to be considered.
- Well used path and large lights that may need to be relocated.
- Front door and intense area of development should be located towards the town centre.
- More expensive product located adjacent to the water and less expensive to the rear.
- Re-alignment of David Brand Drive not happening.
- Community safety issues associated with park

Workshop – Open Discussion Session

- Modular more mining orientated. Perception that it is less quality.
- Brick not appropriate for cyclonic zone.
- Framed construction popular - steel frame has freight cost, energy efficiency and corrosion issues – timber is being used in combo with steel.
- Market acceptance of frame construction
  Concrete slab most cost effective.
- Productivity of tradesmen because of lifestyle/climate – results in higher costs (40% productivity for same hourly rate) and longer build time (up to 2-3 months)
- Aesthetics will be important to the Shire – street presentation and relationship to Carnarvon's sense of place. Raised, weatherboard cottage.
- Buy local policy for State Government input.
- Consider operational costs – heating, cooling and maintenance.
- Orientated for solar panels and breezes. Older people don't use air conditioner as they are sensitive to cost therefore cooling breezes are important.
- Horizon Power stopped connection of solar panels as grid is at capacity.
- Design guidance and planning controls – prescriptive or inspirational
- Density vs. functionality and appearance/appeal. Density and yield is not the imperative.
- R-Codes: The design principles are generally fine but shouldn't be tied in to the deemed-to-comply provisions. Design flexibility is important.
- Identify the key principles of good design and allow flexibility for the detail.
- Connectivity with GMF and look at the whole area as a precinct.
- Remove the need for the fence, or a more open fence through good integration.
- Potential for sharing of communal facilities.
- Reduction of utility costs – ESD principles, passive heating, ventilation, PV, water reuse etc. However, consider it in the context of affordability and focus on the cost effective methods.
- Structure plan – more detailed concept plan to be sure it can work and then strip back a structure plan.
- Site layout – potential for scenarios.
- Housing typologies/indicative plans to provide guidance on the intent and to inform the site planning.
- Prospective buyer 1: looking for security, amenity, and access to the surrounding facilities. Worried about central driveway and enabling walk-through access, heating and cooling, and sound attenuation. Price not an issue.
- Prospective buyer 2: two bedrooms min, open plan living. Ideally 2 bed + study. 2 car bays. Price not an issue either.
- Illustrates the importance of a range of products and different price points.
- Gaps in the market: One-bed affordable, good quality for down-sizers. Main market is sub $300k, with some at sub $150k.
- Potentially different tenure models – for sale, for lease, DMF, joint ownership through DoH, etc
- GMF – only pensioner residents pay rent to "Centre Pay". The rent is dictated ie 25% - 30% of an individual's pension.

- Aboriginal people – looking for smaller places, durable, close to town. Ability to express their sense of 'home'. Less need for resident parking, but needs accessibility for visiting family friends. Being out on the edge of town makes life hard.
- Carnarvon is well-integrated physically and socially compared to, say, Geraldton.
- People's needs are different – some may not need a car, others want space for 2 cars and a boat. Important to have flexibility. People's needs change over time too.
- Capacity to downsize within the development too.



- Landscaping - low water use, not lawn. Issue of water costs a dilemma: metered individually so tenants can control their own use, or common metering to maintain quality of landscape.
- GMP desire individually metred (power and water) so bills can be directed to residents – an issue with current GMF model
- GMF residents don't use Senior Citizens – full of old people, or the residents are very insular and don't socialise. 'Ever decreasing circles'. Perhaps other people use Senior Citizens because they are not part of a community?
- Gopher accessibility is not really much of an issue other than at the hospital. Footpaths in the town are largely wide enough.
- Couples – what happens when one partner goes into high care? Rental product to enable sale of home to fund the care bond/costs. Hence, why important to have a mix of product and tenure.

BROCKMAN PARK STRUCTURE PLAN & DEVELOPMENT PROSPECTUS	**SHIRE OF CARNARVON** 3 Francis Street South Carnarvon CARNARVON 6701 *T (08) 99410000* *E shire@carnarvon.wa.gov.au* *Website: www.carnarvon.wa.gov.au*	

ATTENDANCE REGISTER

PROJECT: **BROCKMAN PARK STRUCTURE PLAN & DEVELOPMENT PROSPECTUS**

DATE & TIME: **Friday, 22 July 2016, 10:30 – 14:00**

MEETING: **Key Stakeholder Workshop**

VENUE: **Shire of Carnarvon Council Chambers – Stuart Street**

Name	Designation	Company/Organisation	Telephone No/ Mobile No	Email Address	Signature
Cr. Brett Smith (Chairperson)	Council Representative	Shire of Carnarvon	0419909749	cr.bsmith@carnarvon.wa.gov.au	
Cr. Ed Garrett	Council Representative	Shire of Carnarvon	0428 411271	edgarrett@coralcoastconsulting.com.au	See over
Ian D'Arcy	CEO	Shire of Carnarvon	99410050	ceo@carnarvon.wa.gov.au	PEESENT
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JUDY WILLIAMSON	TEAM LEADER SILVERCHAIN	SILVERCHAIN	0410 222081	judy.williamson@silverchain.org.au	

Brockman Park Structure Plan

A Health Perspective

Prepared by Shire of Carnarvon: Health Department

Brockman Park Structure Plan

Executive Summery

The overall structure plan has many positive attributes for the development of a Residential Aged Care (RAC), Independent Living Units (ILU). The location gives walkable access to basic needs that has been shown to increase physical activity produce positive health outcomes. I found good allocation for pedestrian access, allowing for passive surveillance, however the addition of a barrier between position 4 and 6 may provide some restricted access alleviating safety concerns. Allowing for designated parks and gardens and maybe even a community garden, may create greater social cohesion, lower mental health and anxiety concerns. The design of the development will be dependent on developer specifications, however by engaging community input the project has a greater understanding of developing the needs of the local community. The engineering of drainage and land fill in the development will be constructed by experts in that field, and I see no health concerns from what is proposed. The construction of the houses will need to be in line with local needs and it is suggested that engagement from all stakeholders is appropriate in determining social infrastructure, that fits the community needs as housing is important health determinate. The project has many positive attributes and the location does has scope for future growth into a designated Residential Aged Care (RAC), Independent Living Units (ILU) facility that leans to positive health outcomes.

1. Opportunity to convert concrete pools into landscape drainage swales to improve stormwater retention?

A. Although the effects of smaller scale catchment-scale hydrology are not yet fully understood, restoration or protection of important elements of natural flow is important in this area as tidal movements have a substantial effect to water hydrology. (Burns et al. 2016) If flow-regime management is to be adopted, storm water practitioners require new urban stormwater management objectives to protect oversaturation and avoid a pattern of quality of filtered flows. This should be managed to meet the environmental flow requirements of receiving waters as altering physical form may alter natural conditions (Chin & Gregory, 2005).

2. Continuity of pedestrian access?

A. Neighborhood pedestrian connectivity, aesthetics and interesting scenery is associated with increased physical activity and increased social capital and social cohesion. The idea of a shared space of a mixture of community and development, can incorporate social cohesion, however safety is an issue for many elderly people and a boundary for a safe zone may be more attractable for the elderly and persons with disabilities (Moran et al. 2016) The presence of people in the street is mentioned as both increasing and decreasing the sense of personal safety depending on the type of people. The presence of families with children, friendly, smiling, and familiar people, socially responsible residents, or

people walking, biking or jogging were considered to improve crime-related safety. On the other hand, indiscriminate groups increases criminality, and the presence of intimidating groups of youths, were perceived as decreasing crime-related safety (Moran et al. 2016)

3. Encourage views and passive surveillance of Brockman Park?

A. In new development areas, people have not yet developed a strong bonding and sense of community. The social needs include social participation, and this has implications for residences, as anything that may change their everyday lives are of utmost concern to them. While passive surveillance is certainly a desirable aspect for elderly it also needs support of compliance agencies such as police as safety is of high importance for social vulnerable(Yung, Conejos, Chan, 2016) Parks and increased urban canopy are linked to increased physical and mental health, views of nature are fundamentally important to resident well-being (Reynolds 2016).

4. Continuity of landscaping between the site and Brockman Park?

A. Parks and gardens are associated with improved mental health and reduced anxiety and contribute to the local climate of an area by regulating temperature and providing shade Shanahan et al. (2015). However without a barrier to ensure safety patrons may feel insecure in utilizing facilities and uneasy about their personal security if gardens supply easy access to village, especially after dark (Krekel, Kolbe, Wüstemann, 2016).

5. Proposed Silver Chain facility location. Limited integration with future aged accommodation?

A. Medical facilities are of high importance for elderly, the proposed location of Silver Chain facility is positive for the plan (Zandieh 2012)

6. Existing infrastructure: Waste Water Pumping Station?

A. The existing infrastructure for waste water pumping station is needed as is part of Carnarvon's Irrigation Management Plan. However it is not advised to use the recycled water in the new development as immune compromised elderly may be susceptible to levels of pathogens in the water (Rydin 2012).

7. Pedestrian path relocated to linear park?

A. It is important to maintain accessibility for the elderly and especially those with disability, so access to pathway is essential (Rydin 2012).

8. An additional 15 Independent Living Units (ILU) to be built at the Gascoyne Memorial Fund (GMF) site in the future?

A. Residential housing can improve access to goods and services, the success of neighborhood retail, walkability, success of public transport, and well maintained

walkways suitable for wheelchairs and other personal mobility vehicles, future increases of the development is considered desirable (Moran et al. 2016).

9. Existing hotel: Synergy with hotel accommodation for visiting relatives?

A. Location of current motel is positive for family visits as isolation from family is associated with poor mental health outcomes including depression (Junghyun et al. 2016).

10. Housing style and cost: Cost of construction is a constraint to the provision of affordable housing?
11. Housing style and cost: Opportunity to construct using alternative methods, such as modular to address affordability?

A. The lack of affordable housing has been linked to decreased spending on health and health care, delays in seeking medical prevention, medication non adherence, and general trade off in food and temperature control. There is some evidence that particular types of housing gives rise to mental health disorders and poor design can lead to social isolation and increased crime. The type and style of housing is very important to the elderly whom feel vulnerable and report positive mental wellbeing in attractive well maintained homes that are in an active peaceful environment, without the constraint of financial pressure (Sanders, Harahan, and Stone, 2010).

12. Potential linkage to existing pedestrian paths?

A. It is important to maintain accessibility for the elderly and especially those with disability, so access to pathway is essential (Rydin 2012). Repeat 7

13. The site is 2.1 hectares in area which constrains the number of Independent Living Units (ILU) and/or the size of a Residential Aged Care (RAC) facility that can be developed.

A. Planning and delivery of new housing projects has taken place in the last years, with the focus shifting towards adding value to projects based on a better understanding of housing preferences. The designed model needs to be supported by the population that it is designed for, and must provide the basic and fundamentals needs of the targeted population. The land use that is proposed for usage has many positive aspects in location and access to services that are needed for the target population. The size of the land holding is secondary, to its position and the quality of the development to be constructed (Delgado and De Troyer, 2011).

14. Development of the site is constrained by drainage function and storm surge risk. Substantial fill likely required to address this?

A. Refer to answer 1.

15. Built form to provide passive surveillance of Bibra Way and David Brand Drive?

A. Refer answer 3

16. Existing senior citizens centre - Opportunity of upgrade and improvement?

A. Improving the social infrastructure of the plan with the construction of purpose built facilities gives greater social cohesion, engages residents in decision making and helps develop multi agency partnerships. Age-prepared communities' utilize community planning and advocacy to foster aging in place. 'Elder-friendly communities' are places that actively involve, value, and support older adults, both active and frail, with infrastructure and services that effectively accommodate their changing needs (Alley, Liebig, Pynoos, Banerjee and Choi, 2007).

17. Opportunity for collaborative development site?

A. Collaborative development allows all the stakeholders of a project to negotiate, brainstorm, discuss, share knowledge, and generally labor together to carry out some task, most often to create an executable supporting development. Urban landscapes are characterized by interrelated effects among multiple socioeconomic and ecological systems, a collaborative approach can seriously affect environmental quality and human well-being. Having a collaborative tool and utilizing all stakeholder input can only strengthen the overall concept plan (Hayek 2016).

18. Opportunity to provide aged care accommodation including Residential Aged Care (RAC), Independent Living Units (ILU), community facilities and office space to support community care.

A. Refer answer 13

19. Views to the Fascine. Opportunity for 2 -3 story built form to take advantage of water views?

A. The location of the structure plan is well positioned to access natural ventilation coming from the Fascine Bay lowering the ambient temperature in hot conditions. Also is helpful at reducing concentrations of indoor air pollutants and can provide some financial relief from using temperature control. With the rising environmental problems, such as global warming, air pollution, urban heat island(UHI) and haze events, the incorporation of urban climate factor into planning is supported by incorporating local natural environments (Chao, Yuan, He and Wu, 2014).

20. Optimum location for community facilities?

A. The structure plan makes good usage of sidewalks, potential parks and gardens, shopping assessable by foot that gives residences the opportunity to a nutritional diet. Medical facilities and pharmacies are close by suggesting a greater rate of medication for residences and it was found that rates of depression and anxiety were lower when good access to services is provided (Lee and Jang, 2013). Increase public transport with bus

transport available to hospital, churches and post offices with dedicated disability access would also be constructive and relieve some transport congestion in that sector.

21. Maintain pedestrian access to Town Centre ?

A. Refer answer 20

22. Structure plan area is well located as it is in close proximity to the Town Centre and other facilities such as the Medical Centre?

A. Refer answer 20.

23. Interface with existing aged persons housing?
24. Opportunity for future redevelopment of old housing stock?

A. The development of current infrastructure and redevelopment of the area in future is well placed to suit the needs of the project. Developing the already insisting area utilizes the social infrastructure and the close proximity to town site and medical facilities and provides good health outcomes for residences.

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APPENDIX 2

PUBLIC SURVEY FORM

BROCKMAN PARK STRUCTURE PLAN PUBLIC CONSULTATION

The Shire of Carnarvon has embarked on the preparation of a structure plan over the southern portion of Brockman Park to facilitate the development of an 'ageing in place' facility. The Shire is currently seeking community feedback on the opportunities and constraints associated with the development of the site. Your participation in this survey is important in this process. ***Please write a comment*** *on the opportunities and constraints listed below that correspond to the numbers on the map. Alternatively you can visit www.collaborativemap.com/BrockmanParkStructurePlan and provide your comments online.*

1. Opportunity to convert concrete pools into landscape drainage swales to improve stormwater retention.
2. Continuity of pedestrian access.
3. Encourage views and passive surveillance of Brockman Park.
4. Continuity of landscaping between the site and Brockman Park.
5. Proposed Silver Chain facility location. Limited integration with future aged accommodation.
6. Existing infrastructure: Waste Water Pumping Station.
7. Pedestrian path relocated to linear park.
8. An additional 15 Independant Living Units (ILU) to be built at the Gascoyne Memorial Fund (GMF) site in the future.
9. Existing hotel: Synergy with hotel accommodation for visiting relatives.
10. Housing style and cost: Cost of construction is a constraint to the provision of affordable housing.
11. Housing style and cost: Opportunity to construct using alternative methods, such as modular to address affordability.
12. Potential linkage to existing pedestrian paths.
13. The site is 2.1 hectares in area which constrains the number of Independent Living Units (ILU) and/or the size of a Residential Aged Care (RAC) facility that can be developed.
14. Development of the site is constrained by drainage function and storm surge risk. Substantial fill likely required to address this.
15. Built form to provide passive surveillance of Bibra Way and David Brand Drive.
16. Existing senior citizens centre - Opportunity of upgrade and improvement.
17. Opportunity for collaborative development site.
18. Opportunity to provide aged care accommodation including Residential Aged Care (RAC), Independant Living Units (ILU), community facilities and office space to support community care.
19. Views to the Fascine. Opportunity for 2 -3 story built form to take advantage of water views.
20. Optimum location for community facilities.
21. Maintain pedestrian access to Town Centre
22. Structure plan area is well located as it is in close proximity to the Town Centre and other facilities such as the Medical Centre.
23. Interface with existing aged persons housing
24. Opportunity for future redevelopment of old housing stock

APPENDIX 3

SUMMARY OF SUBMISSION FROM PUBLIC SURVEY

Public Survey Summary

This Appendix contains a summary of comments provided by public submissions obtained through the CollabMap website and through a printed survey.

1. <u>Opportunity to convert concrete pools into landscape drainage swales to improve stormwater retention.</u>
   Agree: 14 Disagree: Comments:

   These concrete pools have been mosquito breeders for too long.
   Pools are an eye sore and waste of space.
   About time.
   Depending on the appearance of the drainage swales.
   Wonderful
   Yes, of importance.
   Great idea.
   An opportunity to breed mosquitos.

2. <u>Continuity of pedestrian access.</u>
   Agree: 9 Disagree: 4 Comments:

   Always need access to walkers
   Great but needs to be a 'good' footpath around George Street and Olivia Terrace.
   No, leave as it, does not go through the GMF complex. GMF has a lot of trouble with kids terrorising aged persons.
   Yes, advisable
   People need to access the park.
   More chance to toss stuff over the fence.

Keep footpath with being shared.
Good idea.
There are safety issues with gophers and pedestrians particularly around the seniors hall car park.

3. Encourage views and passive surveillance of Brockman Park.

Agree: 14 Disagree: Comments:

Definitely need surveillance in this park.
What surveillance? x 2
Plant trees, seating plus tables for picnics etc family orientation.
Security important.
Need views of Parks.

4. Continuity of landscaping between the site and Brockman Park.

Agree: 12 Disagree: Comments:

Never too many parks and recreation areas.
Plan water wise plants/ No lawn.
Great.
More for the inhabitants to destroy.
Again plant shrubs and trees.
Would be lovely.

5. Proposed Silver Chain facility location. Limited integration with future aged accommodation.

Agree: 14 Disagree: Comments:

Good idea – initiated by GMF management.
Great.
What aged care?
If they can secure funding.
Good idea.
What aged care?
Experienced staff on site.
Silver chain in this location should be convenient and helpful.
To have Silver Chain would be of great benefit.

6. Existing infrastructure: Waste Water Pumping Station.

Agree: 9 Disagree: Comments:

Where it is located is ok access only needed now and again.
We don't like but we need.
Not a problem – no smell.

7. Pedestrian path relocated to linear park.

Agree: 11 Disagree: 1 Comments:

Trees may be obstacle.
What does this mean - Please explain?
What does this mean? x 2

Extend to facility.
Is this pathway going to be well lit for the safety of pedestrians walking before and after dark?

8. An additional 15 Independent Living Units (ILU) to be built at the Gascoyne Memorial Fund (GMF) site in the future.
   Agree: 12 Disagree: Comments:

   These 15 ILU's are now underway.
   Very good.
   Great. Already underway.
   In progress now.
   Currently under construction. JV GMF and DoH.
   In process of construction at this moment.
   Very good.
   Thought this was GMF.
   What a great idea. Rented and small fee.
   Excellent – hopefully local builder.
   Some two bedroom units would be good.

9. Existing hotel: Synergy with hotel accommodation for visiting relatives.
   Agree: 10 Disagree: 5 Comments:

   Existing hotel has always been well sited.
   Good point.
   Good idea.
   And people with drinking problems.
   Should not be a factor. Unacceptable behaviour of people using Brockman Park.
   Sounds good.
   What about the boozers.
   Small change for visitors and easy access to facility.

10. Housing style and cost: Cost of construction is a constraint to the provision of affordable housing.
    Agree: 9 Disagree: 3 Comments:

    Costs always matter.
    No cutting corners for our seniors.
    No matter what it costs don't do it. x 2.
    And?
    Should already be addressed by the 'Local Shire'.
    Pre-fabricated homes needed.
    Should be of affordable style and rent has to be affordable.
    Affordable housing.

11. Housing style and cost: Opportunity to construct using alternative methods, such as modular to address affordability.
    Agree: 9 Disagree: 1 Comments:

    Whatever?
    Need decent houses.
    Needed.

Modular must be cheaper.
Yes if built to Shire regs.
This should be a consideration of the Local Council.
Modular must be cheaper.
Use local trades and builder to keep costs down.
Not only affordability but sustainability i.e solar, wind energy; own power sources in emergency situations.

12. Potential linkage to existing pedestrian paths.
Agree: 10 Disagree: 1 Comments:

Necessary.
Important.
Surveillance will be needed.
No. Don't want kids to have additional access to GMF
Go for it.
Surveillance will be needed.
Has to be done, no second thought.
Paths for gopher, bike and pedestrian use.

13. The site is 2.1 hectares in area which constrains the number of Independent Living Units (ILU) and/or the size of a Residential Aged Care (RAC) facility that can be developed.
Agree: 10 Disagree: 1 Comments:

Needed in conjunction with hospital.
Do it.
Residential aged needed in the town.
Why? x 2
Yes that is correct. RAC is not a viable option with our population.
Concerned by this approach.
Find somewhere bigger.
Good size block.
Near senior citizens hall, shops, medical centre, hospital, fascine walkways

14. Development of the site is constrained by drainage function and storm surge risk. Substantial fill likely required to address this.
Agree: 10 Disagree: 1 Comments:

Common sense always prevails.
How high? x 2.
Yes correct.
No development please.
When it rains it doesn't want to flood.
Will consideration be given to the surrounding residence during construction phase? with regards to dust suppression and noise abatement.
Large amounts of fill would ultimately mean large amounts of dust and considerable movements of machinery interacting with local traffic and pedestrians. Appropriate traffic management and dust suppression techniques will need to be put in place as part of the tender process. Is this area still gazetted as a storm surge drain? Were is the water directed once this area is filled in?

15. Built form to provide passive surveillance of Bibra Way and David Brand Drive.
Agree: 10 Disagree: 1 Comments:

Please explain passive surveillance.
Why isn't it now? x 2
Surveillance badly needed.
Not necessary
Very good.
Good surveillance needed.
Any surveillance is a bonus; providing for and protecting our elders.

16. Existing senior citizens centre - Opportunity of upgrade and improvement.
Agree: 14 Disagree: Comments:

Seniors are well aware of future needs and have ideas.
I suppose. x 2.
Appropriate.
Always needed.
Good idea.
Supported.
Possible extension to hall and lock up storage area required.
The site is good. Now would be the time to make changes to the facilities.
If accessed by more aged residents will need to be upgraded.

17. Opportunity for collaborative development site.
Agree: 12 Disagree: Comments:

Positive planning?
With who? What?
Belongs to GMF. x 2.
This belongs to GMF not Shire.
Men's shed.
Ideal location

18. Opportunity to provide aged care accommodation including Residential Aged Care (RAC), Independent Living Units (ILU), community facilities and office space to support community care.
Agree: 12 Disagree: 1 Comments:

Young seniors need to be involved.
About time.
Needed.
Good spot if you've got a unit in that spot. x 2
So long as the view is not lost. This is Carnarvon prime location.
Sufficient (ILU) already viable by RSL.
Go for it.
Good idea. I might need this service.
Excellent.
Supported.
It will be beneficial if dementia enabling design features can be incorporated into the newly built accommodation

Town has limited resources for this age group and can be distressing for family and persons alike if they had to leave town.

19. Views to the Fascine. Opportunity for 2 -3 story built form to take advantage of water views.
    Agree: 10 Disagree: 5 Comments:

    OK by me.
    No, blocks views for seniors.
    These heights would cut out the views from the buildings at the rear.
    No way. x 2.
    No. Obstructs GMF views and sea breezes. Also aged persons/gophers not suitable.
    Not appropriate. Will block the scenic view of Fascine for locals and tourists.
    Take advantage of Carnarvon's beauty.
    Nice for water views. Just because they are old doesn't mean they can't enjoy.

20. Optimum location for community facilities.
    Agree: 10 Disagree: Comments:

    Such as?
    I suppose. x 2.
    Depends what these are.
    Would be of an advantage.
    Men's shed.
    With many shops closing down including Target, so the Town has to get more shops and stay. Rents have to be a lot cheaper and you have to be fair dinkum about improving this Town, not just wait for the tourists, come, stay, spend for 4/5 months and go, it is not just for 'fly by night' scheme and must be supported by everyone and everyone has to be and get involved. Best of luck.
    Good.
    Close to shopping centre.

21. Maintain pedestrian access to Town Centre
    Agree: 14 Disagree: Comments:

    A must.
    In good condition for gophers and prams.
    Needs walk crossing.
    Need to work with closely with relevant authorities to ensure optimum safety.

22. Structure plan area is well located as it is in close proximity to the Town Centre and other facilities such as the Medical Centre.
    Agree: 10 Disagree: 1 Comments:

    Very necessary.
    Great, so close to town.
    Very important.
    Not enough information.
    Shift Tyrepower.
    Good.
    Walking distance good.

APPENDIX B
FEASIBILITY STUDY

FAR lane

Brockman Park Structure Plan and Prospectus

Feasibility Assessment

Shire of Carnarvon

May 2017

1 CONTENTS

2 EXECUTIVE SUMMARY

2.1 Project overview

Brockman Park represents a significant opportunity for delivery of much-needed ageing in place infrastructure in the centre of Carnarvon. The site has the capacity to accommodate a range of interrelated aging in place uses including:

- Independent living units (ILUs) and apartments
- Respite care serviced accommodation
- Short stay accommodation
- Commercial and allied health tenancies

The development will play a critical role in meeting significant and growing demand for age-related housing and accommodation across all demographic groups. It will do this in a high amenity location that will attract ageing residents from throughout the Gascoyne region. It will also support the ongoing development of Carnarvon Town Centre by providing a high-quality mixed use development with strong connections to local businesses and infrastructure.

This analysis has been prepared to assist the Shire of Carnarvon (The Shire) in assessing the development potential of the site, and in identifying likely factors that may support or inhibit the financial viability of the project during development and operations. The analysis does this through assessment of a range of scenarios based around a high-impact site development.

2.2 Market Characteristics

Analysis of Carnarvon's current population revealed that town hosts a population of approximately 5,600 residents, of which 12% are over the age of 65 (Census 2011). Of these ageing residents, 62% and 67% of are aged between 64 and 74 years old respectfully, denoting a strong immediate and future demand for aged care services and infrastructure.

2.1.1 Demand

As the population in the Shire of Carnarvon ages, the number of ILUs and Residential Aged Care beds increases, implying a strong demand for such services. Table 1 shows that by 2027, a total of 118 additional ILUs and 18 additional high care beds would be required to meet the demand of Shire of Carnarvon's ageing population.

Table 1. Cumulative Estimated Demand Depth - Carnarvon Aged Housing

Service	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Additional ILUs Required	47	51	55	61	66	74	81	88	95	100	110	118
Additional Residential Aged Care Beds Required	17	20	23	25	27	31	34	37	66	9	14	18

2.1.2 Supply

The current supply of ILU facilities within the Shire of Carnarvon accommodates 45 residents. This supply does not meet existing or future projected demand for low care facilities. As a consequence, the Brockman Park Structure Plan focused on the provision of low-care residential facilities including 9 respite units. High-care residential aged care was considered

not to be feasible for the site based upon the projected scale of demand, assuming demand being alleviated by the expansion of the western wing of the hospital.

2.3 Development Scenario

2.1.3 Development Yields

A key principle in contemporary design philosophy for aged care is to enable residents to maintain connection with their local community. The Brockman Park Structure Plan therefore allowed for a mix of residential and ancillary commercial services on site, as these elements would not only provide for a more diverse and connected community, but also provide a developer and operator with a diversity of options for revenue generation. This was considered important in making the site more attractive to investment.

The feasibility assessment was based upon a development scenario that consisted of a range of low-case independent living units, independent living apartments, short-stay accommodation, respite care, and commercial allied uses. The configuration and development yields realisable through this scenario are summarised in Figure 1.

Figure 1. Potential Brockman Park Configuration and Development Yield Scenario

2.1.4 Development Costs and Revenues

Construction of the Brockman Park development was assumed to comprise of 3 stages over 5 years with a total capital expenditure of $42,201,500. The breakdown of these costs is outlined in Table 2.

Table 2- Development Cost

Scope	$M
Site, External and Road Works,	$3,271
Building Works	$28,435
Consultancy	$3,490
Construction and Design Contingency	$2,538
Utilities Infrastructure	$0.630
Professional Fees	$3,490
Total	$42,201,500

The structure plan development scenario provided for 5 separate potential income streams once compete (Table 3).

Table 3. Assumed Brockman Park revenue models

ILU - Rent	$108/week - 1 Bed	$220/week - 2 Bed
ILU - Buy	$180,000 - 1 Bed	$225,000 - 2 Bed
Respite	Maximum of 85% of the basic single age pension	
Serviced Apartments	$180 per night	
Commercial/Allied health use space	$200/m2	

2.1.5 Funding Scenarios

Four funding scenarios were considered in feasibility assessment. These scenarios considered the impacts of alternative funding sources, and the subsequent impact on the cost of development to a potential proponent. Scenarios were chosen as there was judged to be limited capacity for price adjustment (revenue) in the project, given the nature of the services and the demographic characteristics of Carnarvon. Scenarios considered were:

- Scenario 1 – Fully funded by a private/community sector proponent
- Scenario 2 – Costs of site external works and services funded by a public-sector funding source
- Scenario 3 – 50% of total project capital expenditure funded by a public-sector funding source
- Scenario 4 - Costs of site external works and services and 50% of total project capital expenditure funded by a public-sector funding source

All scenarios assumed that land cost for the site would be negligible – with land being provided by the Shire through a vehicle such as a long-term peppercorn lease.

2.1.6 Analysis Findings

Net present value (NPV) and internal rate of return (IRR) analysis concluded that under a base scenario (of land being provided by the Shire of Carnarvon and entirely funded by a private entity), the values for NPV and IRR would be -$19.1M and -2.79% respectively. This indicated that, under given assumptions, it would be highly unlikely that the project would be feasible for a private or community-sector proponent. Table 4 outlines the impact of alternative funding scenarios, with the project becoming increasingly viable as public sector support increases.

Table 4. Returns on investment on Brockman Park Concept Plan based on alternative funding scenarios

	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Public Sector Contributions	No contribution to capital expenditure	Site external works and services	50% of CAPEX	Site external works and services and 50% of CAPEX
NPV	**-$19,119,395**	**-$16,805,163**	**-$3,830,778**	**-$1,516,547**
IRR	**-2.79%**	**-2.17%**	**3.68%**	**5.21%**

Finally, the impact of construction costs was examined, with a positive NPV ($835,548) reached for Scenario 4 if construction costs for the development are less than 17% above metropolitan Perth rates. Such an outcome would mean that the development would likely be an attractive investment to commercial or community-sector proponent.

2.4 Recommendation

On the basis of the feasibility assessment, a public private partnership is recommended to ensure that the development outcomes in alignment with the vision set by the Brockman Park Structure Plan are able to be viably delivered. Such an

outcome infers a role for the Shire of Carnarvon in de-risking the site, as well as in working with a potential proponent in attracting 50% of the capital investment required from State or Federal Government sources. Finally development costs would need to be tightly managed to realise project viability.

3 INTRODUCTION

This study provides the Shire of Carnarvon with an overview of economic and financial information required inform decision-making in relation to inviting expressions of interest, and negotiating with, potential project partners for the development of Brockman Park.

It is not intended that this document be published with the Brockman Park Structure Plan but instead is utilised by the Shire in the development and implementation of the Structure Plan.

4 MARKET ANALYSIS

The Draft Structure Plan for Brockman Park has been informed by an economic analysis of the factors that influence demand and supply of aged care in the Gascoyne region, as well as consultation with key local stakeholders and industry experts.

4.1 Demand

The purpose of this analysis is to quantify the current and future market depth for aged care housing in Carnarvon to inform the scope of an aged care precinct at Brockman Park. A detailed description of the methodology for this analysis is included in Appendix I.

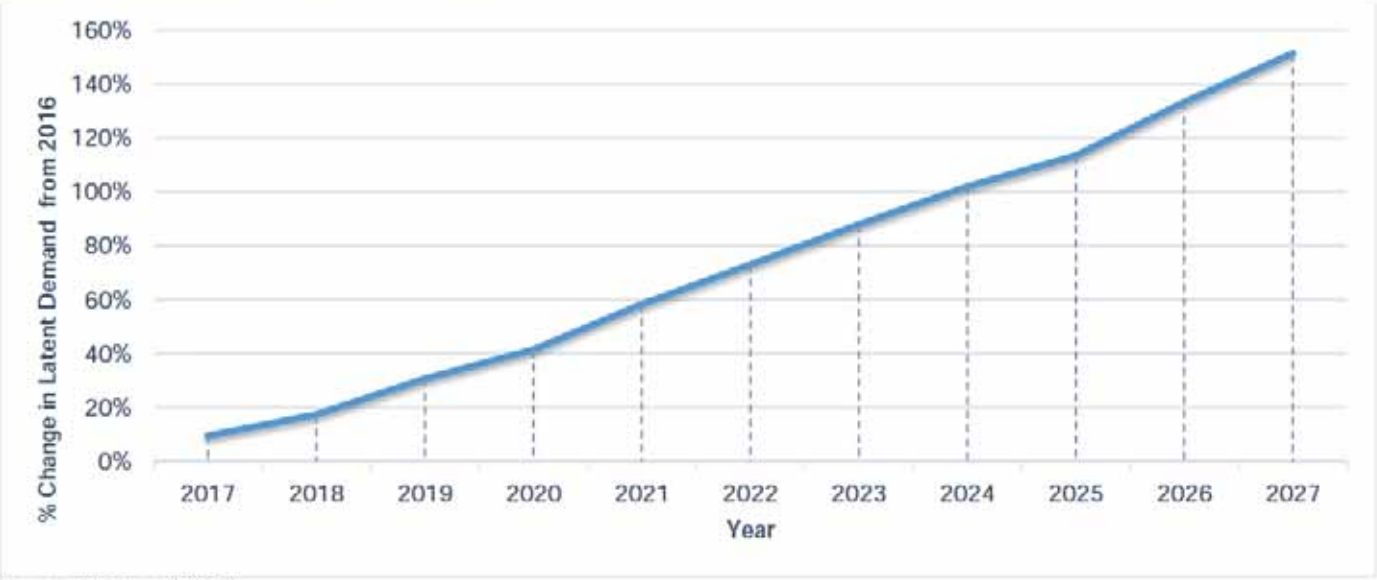
Table 5 outlines the forecast demand for additional ILUs and residential aged care beds to 2027. As the last analysis is likely out of date (Verso 2012), the dissimilarity between these historic findings and the results of this analysis can be attributed to updated (current) population figures and projections.

Table 5. Cumulative Estimated Demand Depth - Carnarvon Aged Housing

Service	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Additional ILUs Required	47	51	55	61	66	74	81	88	95	100	110	118
Additional Residential Aged Care Beds Required	17	20	23	25	27	31	34	37	66	9	14	18

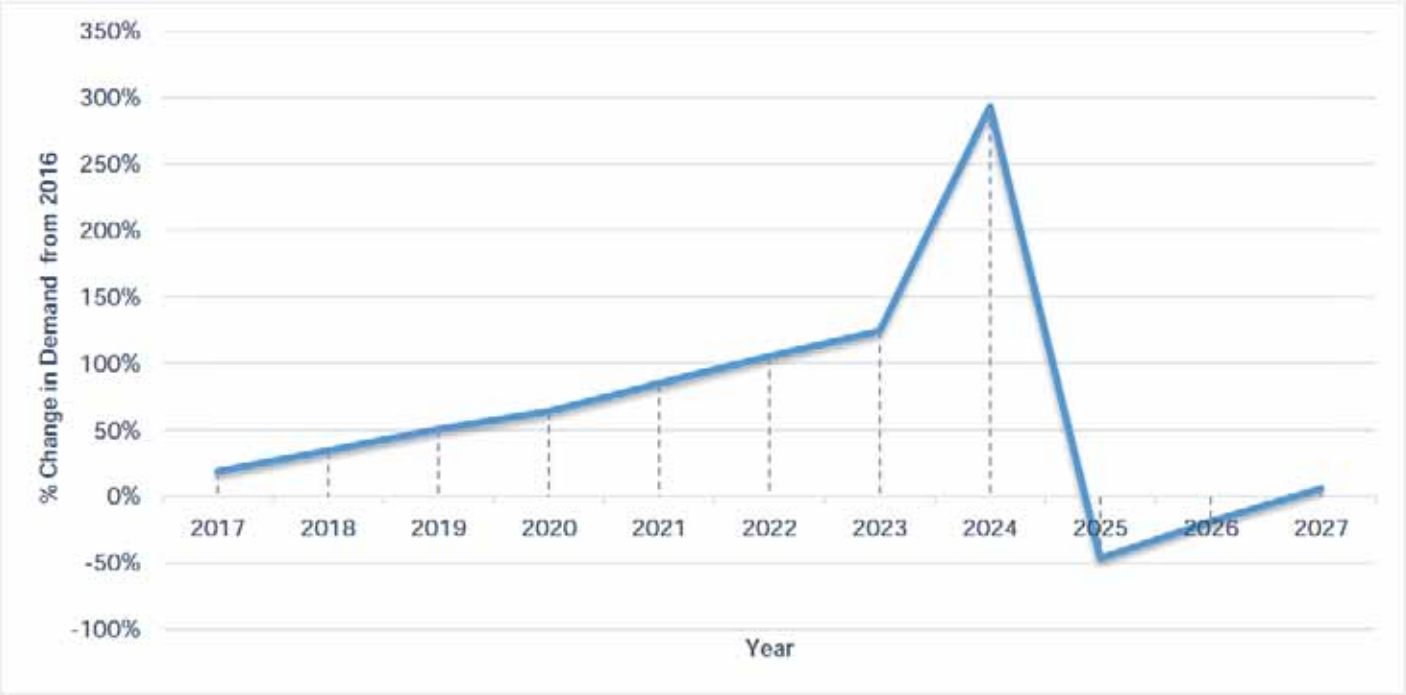
Source: FAR Lane (2016), Sourced from Verso (2012, 2014)

Figure 2. Change in Latent Demand for ILUs from 2016



Source: FAR Lane (2016)

Figure 3. Change in Latent Demand for Residential Aged Care Beds from 2016



Source: FAR Lane (2016)

Market depth analysis suggested that between 2016 and 2025 the demand for ILUs will increase by 113% whilst the demand for beds decreases by 46%. The demand for residential aged care beds in 2025 is eased because of the assumed construction of an additional wing of the RAC facilities at Carnarvon Health Campus, providing a total of 60 high-care beds.

Based on the assumptions, and projected ageing population growth, analysis suggests that the construction of 100 ILUs and 9 High Care beds by 2025 can be justified.

4.2 Supply

Theoretical estimates of market demand must be balanced with the realities of development and service delivery. To inform this understanding, FAR Lane conducted desktop research into industry practices and case studies. This research was supplemented by consultation and input from Aged Care expert Adam Roebuck.

Consultation confirmed that a residential aged care facility at Brockman Park would be unlikely to be feasible for any provider at the scale that the demand assessment suggested. As such, the focus for the Brockman Park Structure Plan was exclusively on low-care facilities. This supports Carnarvon Health Campus focus on the provision of high-care residential aged care beds, avoiding duplication of services and ultimately ensuring a more efficient utilisation of infrastructure within the Shire.

Research and consultation also emphasised the importance of providing collocated infrastructure for respite care services (predominately day-respite) to provide support for those that are caring for ageing parents/partners in their own homes.

In addition, beyond ensuring that development complies with the necessary standards and legislation with regards to universal access, a desire was highlighted for providers to seek flexibility in zoning and design to ensure respite suites and serviced apartments can be adapted to provide care required by other users in the Gascoyne community - such as those with disabilities or special needs. This response not only ensures that the market potential for these elements of

the project is maximised (in turn maximising revenue to the operator), but also ensures an adaptable, high-quality outcome for the Gascoyne community with regards to access to services and accommodation.

A key principle in contemporary design philosophy for aged care is to enable residents to maintain connection with their local community. Planning for Brockman Park should therefore allow for a mix of residential and ancillary commercial services on site, as these elements not only provide for a more diverse and connected community, but also provide a developer and operator with a diversity of options for revenue generation. This is important in making the site more attractive to investment.

Finally, seamless integration of housing and service delivery is central to ensuring residents can successfully age in place. Planning for Brockman Park should seek to provide strong physical connections with other service providers in the immediate locality including Silver Chain and the senior citizens centre. This will not only ensure high quality support is available for future residents, but improve the efficiency of service delivery and reduce costs for service and accommodation providers operating in Carnarvon.

4.3 Conclusion

Brockman Park has the potential to deliver sustained benefits to Carnarvon and Gascoyne communities. Realising this potential requires an integrated development that facilitates aging in place through efficient integration of housing and service delivery at a scale that can viably be developed and serviced.

5 PROJECT CONCEPT

The Brockman Park Structure Plan Area measures approximately 2.1 hectares and is currently utilised by the community as Public Open Space (POS). The Structure Plan Area comprises three (3) separate land parcels all of which are owned freehold by the Shire of Carnarvon.

Whilst a diverse range of land uses will be possible under the Draft Structure Plan, based on the market analysis, the draft concept plan proposes four key uses on the site.

Independent Living Units - An Independent Living Unit (ILU) is an accommodation unit designed for the independent, active retiree who does not require assistance with day-to-day living. The concept plan envisages two types of ILU product, units and apartments, and a mix of 1 and 2 bedroom configurations with options to either purchase or rent.

Serviced Apartments - A serviced apartment is a fully furnished apartment available for short-term as well as long-term stays.

Serviced Apartments (Respite) - Residential respite care is central to the aged care system. Such care is important both for people who need a higher level of care just for the short term, and as a component of the carer support system. These apartments will provide higher levels of care than independent living units. With assisted living, a range of personal services may be available including;

- meals provided each day in a common dining area or delivered to rooms
- assistance with daily living activities such as dressing or going to the bathroom
- cleaning services
- round-the-clock security and support with emergency call systems
- transportation
- medication management
- social and recreational activities.

Allied Use Space - Retirement villages are increasingly providing commercial services on site (e.g. café's, hairdressers and pharmacies). This trend recognises not only the important amenity that these services provide to residents, but the opportunities they create for residents to engage with the wider community who will also be able to access these services. The concept plan envisages a limited amount of retail on site at Brockman Park, notionally a cafe, which will provide local amenity without detracting from the existing retail offer within the wider Carnarvon Town Centre. Such facilities may also provide opportunities for income generation if they can be leased to a third-party operator.

6 FEASIBILITY ASSESSMENT METHODOLOGY

FAR Lane has adopted the following four stage approach to the feasibility assessment of the Brockman Park concept plan.

- Undertake a base case cost benefit analysis to assess the viability of the project to the private sector
- Undertake a sensitivity analysis to understand where the public sector can potentially intervene to influence viability
- Canvass potential models for intervention
- Recommend next steps

Cost benefit analysis is an economic evaluation technique used to inform public and private sector decision-making. The technique involves the estimation and summation of the revenues and costs that will result from a project or policy. The analysis produces two key metrics to guide project decision making:

- Net Present Value - The Net Present Value (NPV) reflects the net benefits of a project in dollar terms. A positive NPV means that benefits outweigh costs and the investment should be considered. A negative NPV means that the costs outweigh the benefits. An NPV of 0 means the benefits are equal to the costs.
- Internal Rate of Return - The Internal Rate of Return (IRR) is the interest rate at which the net present value of all the cash flows (both positive and negative) from a project equals zero. Internal rate of return (IRR) is used to evaluate the attractiveness of a project or investment. If the IRR of a project exceeds an enterprise's required rate of return, that project is desirable. If IRR falls below the required rate of return, the project should not be accepted.

7 FEASIBILITY ASSESSMENT

7.1 Assumptions

This analysis relies on several assumptions about key inputs and variables. The extent to which these assumptions hold true in the market will affect the validity of the results. The following assumptions underpin the analysis:

- The present values of the annual net cash flows are calculated over a 20-year period and discounted at a discount rate of 8.5%.
- Project costs do not escalate above CPI.
- Project revenues do not escalate above CPI.

7.2 Capital Costs

The base case feasibility assessment takes a whole of project approach. As such the distribution of the capital cost between stakeholders is not considered. The base case feasibility assessment assumes that the development of Brockman Park will occur in 3 stages over a period of 6 years from 2019 to 2025.

7.2.1 Acquisition Cost

For all scenarios, no allowance has been made for the cost of land. This effectively implies that the land is sold to the developer at zero cost, or is provided to the developer on a 99-year ground lease.

7.2.2 Development Cost

The total development cost estimate for the development of Brockman Park in line with the concept plan has been prepared by RBB and is estimated to be in the order of $42,201,500. A full breakdown of costs is provided in Appendix 2.

7.2.3 Borrowing Costs

It was assumed that the capital cost of the project is funded without any debt and therefore no allowance has been made for interest costs.

7.3 Residual Value of the Asset

Where the pattern of economic consumption does not materially differ from a straight-line trend, or where the pattern cannot be reasonably determined and demonstrated, straight line depreciation is considered a reasonable assumption. In straight line depreciation, the cost of the asset is apportioned equally over its life. The useful life of the development is conservatively estimated at 40 years. The rate of depreciation based on the capital value of the development (value of the construction cost component) of $42,201,500 is $1,055,037 per annum. At the end of the 20-year horizon of this feasibility analysis, the residual value of the development is $21,100,750.

7.4 Operating Analysis

7.4.1 Operating Revenue

There are effectively five revenue streams associated with the four types of uses for the proposed development.

7.4.1.1 Independent Living Units (ILUs)

Two models of ILU operations have developed over time and are likely to be appropriate for the site. These are:

- ILUs under the Retirement Villages Act 1986 (RVA)
- ILUs under the Residential Tenancies Act 1987 (RTA)

ILUs under the RVA require an ingoing contribution, payment of ongoing fees and often also an exit fee. ILUs under the RTA require ongoing rent to be paid. Eligibility for entry depends on the managing organisation.

For the purposes of this analysis it was assumed that all apartment product in Brockman Park is to operate under the RVA. Residents purchase the unit upfront at current market valuation. Current market valuation is assumed to be 90% of the current average house price in the region. However, due to the quality and age of existing housing stock within the shire of Carnarvon, it would be reasonable to assume that a newly constructed unit would not be 90% of the average respective house price.

Table 6. Market Price for Apartment ILU's

Type	Average House Price	90% of Average Unit Price
1 Bed	$180,000	$162,000
2 Bed	$250,000	$225,000

For the first sale of apartments this purchase price goes to the operator. When a resident's apartment goes on the market, the operator will charge the resident a range of fees (Table 7) proportionate to the length of stay and the current value of the ILU.

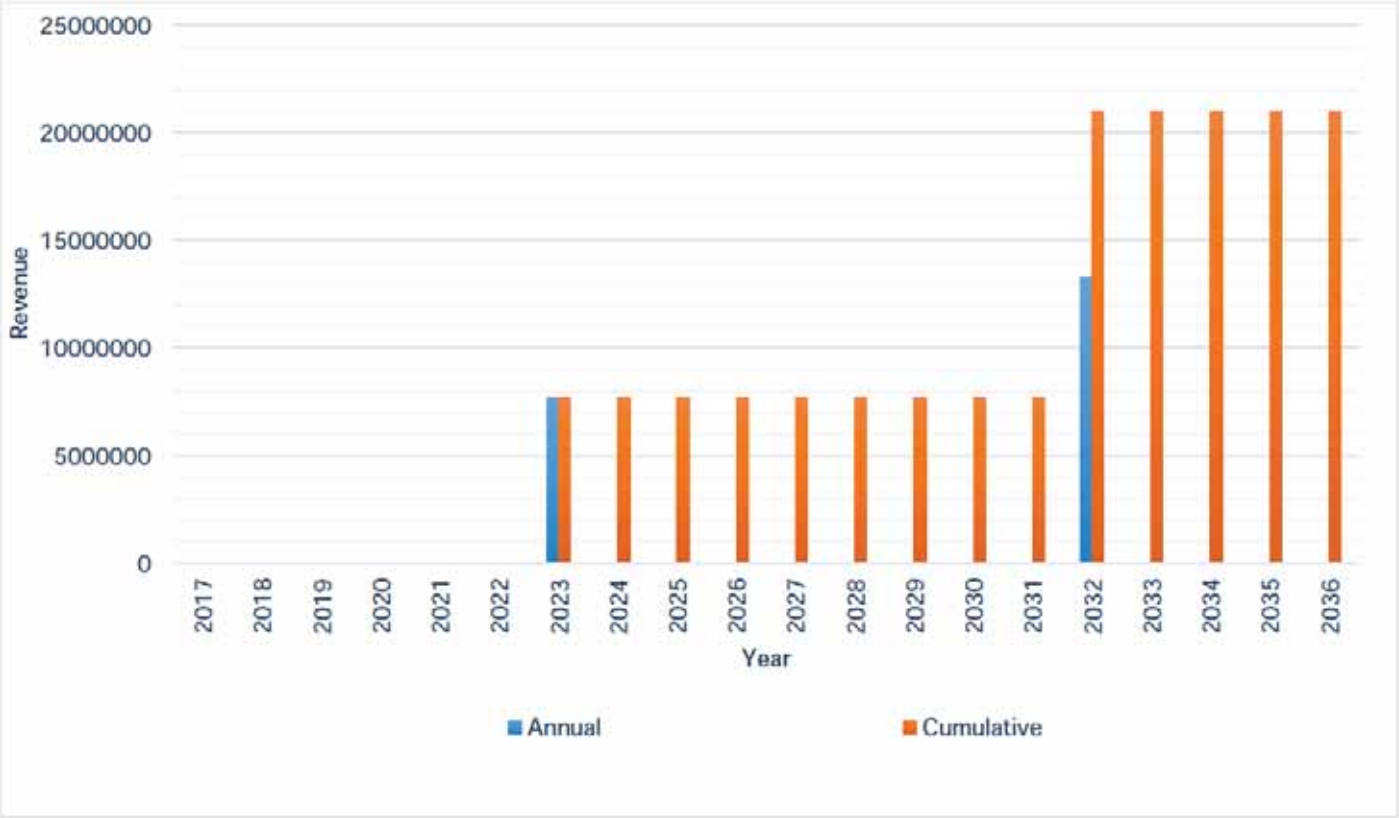
Table 7. Exit Fees for Apartment ILU's

Deferred Facility Fee (DFF)	2.50% pa
Replacement Fund	0.50% pa
Administration Fee	0.15%

For example, if the resident is in the apartment for five years they will be charged a DFF of 12.5% of the current value of the property. The same methodology applies for the other fee proportions although the DFF and Replacement Fund is capped at 25% and 5% respectively, at which point the fees to the resident can only increase if the value of their apartment at the time of sale increases. The length of stay has been pegged to the industry average of 10 years. Occupancy is assumed to be 100% based on significant current and future unmet demand as outlined in previous demand analysis.

Over the forecast time horizon, the cumulative revenue from Apartment ILU's will potentially be in the order of $21M, with a net present value of $10.5M.

Figure 4 – Apartment ILU's - Gross Revenue



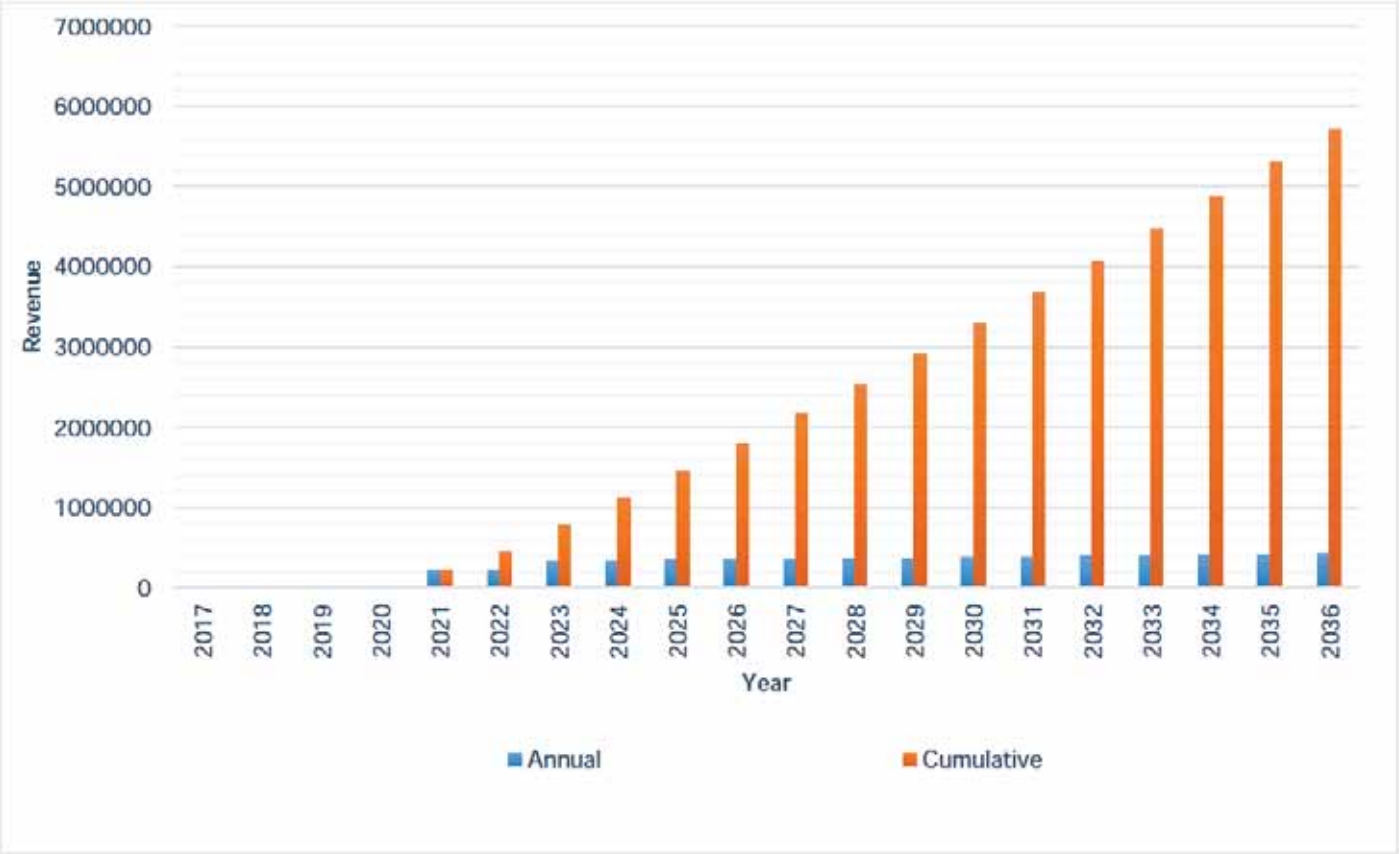
Source: FAR Lane 2016

7.4.1.2 Unit ILU

All unit product on offer in Brockman Park was assumed to operate under the RTA. The rent is assumed to be $108 per week for one-bedroom and $220 per week for two-bedroom units based on 30% of 1st and 2nd quintile income, contributed towards mortgage/rent already being paid. Occupancy is assumed to be 100% based on significant current and future unmet demand as outlined in previous demand analysis.

Over the forecast time horizon, the cumulative revenue from unit ILU's will be in the order of $5.7M, with a net present value of $2.8M.

Figure 5. Unit ILU's – Gross Revenue



Source: FAR Lane 2016

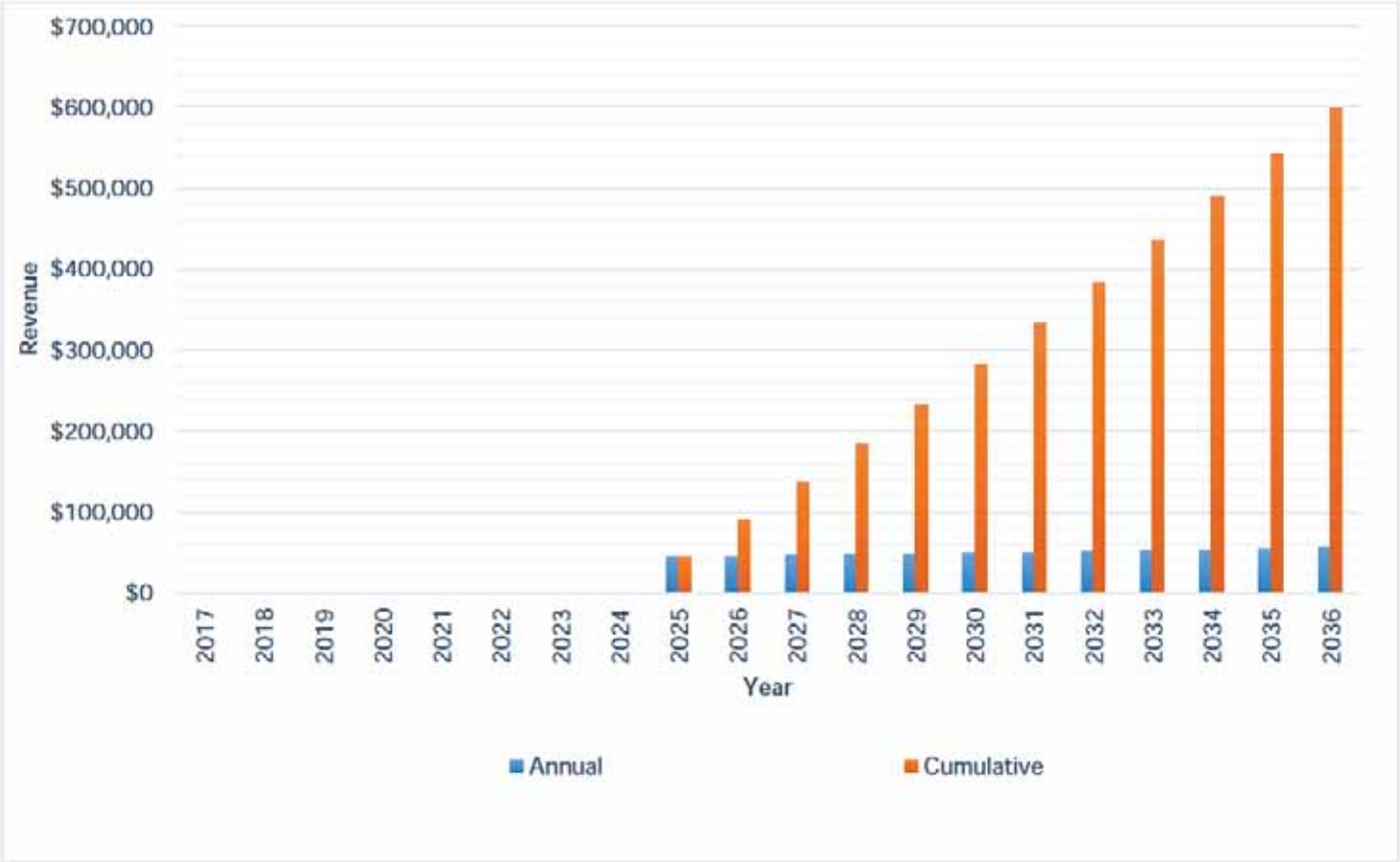
7.4.1.3 Allied Use Space

The following assumptions underpin the analysis of potential revenue from the café.

- The café will occupy a net lettable area of 192sqm
- The café will be leased to a third party under a commercial lease
- The starting net rent will be $200 per sqm p.a. increasing each year by CPI (including fit-out)
- The café will be operational from 2025

Based on these assumptions, the allied use space will generate revenue to the developer of $44,785 in the first year of occupancy. Over the forecast time horizon, the cumulative revenue from this lease will be in the order of $598,672, with a net present value of $260,288.

Figure 6 – Allied Use Space Gross Revenue



Source: FAR Lane 2016

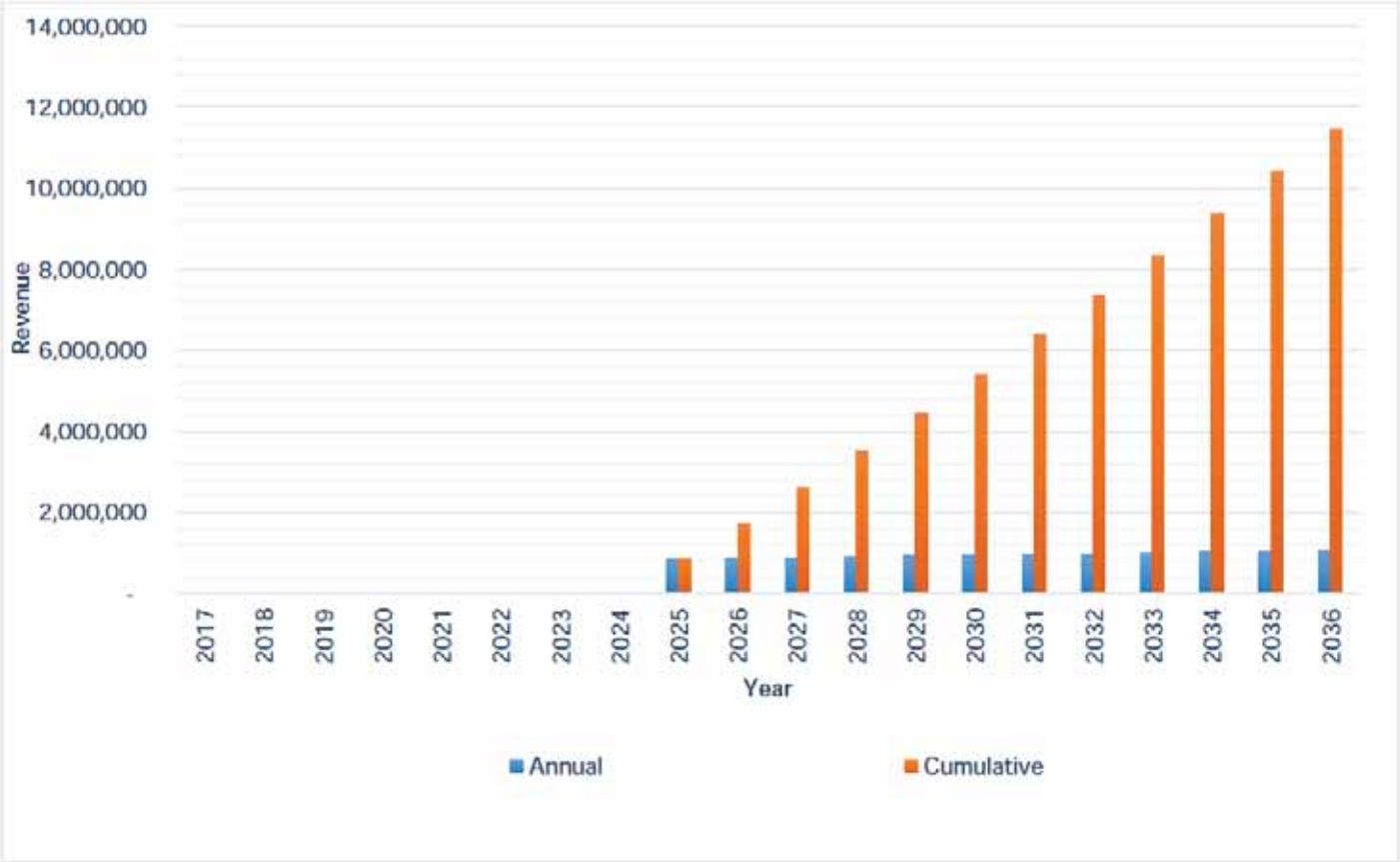
7.4.1.4 Serviced Apartments

The following assumptions underpin the analysis of potential revenue from the Serviced Apartments

- The proposed 18 of the are available commercially
- The average occupancy is assumed to be 62.4% based on the ABS average occupancy for short stay accommodation.
- A rate of $180 per apartment per night based upon similar products available throughout the region, increasing each year by CPI, has been applied.

Over the forecast time horizon, the cumulative revenue from the serviced apartments will be in the order of $11.5M, with a net present value of $4.9M.

Figure 7. Serviced Apartments Gross Revenue



Source: FAR Lane 2016

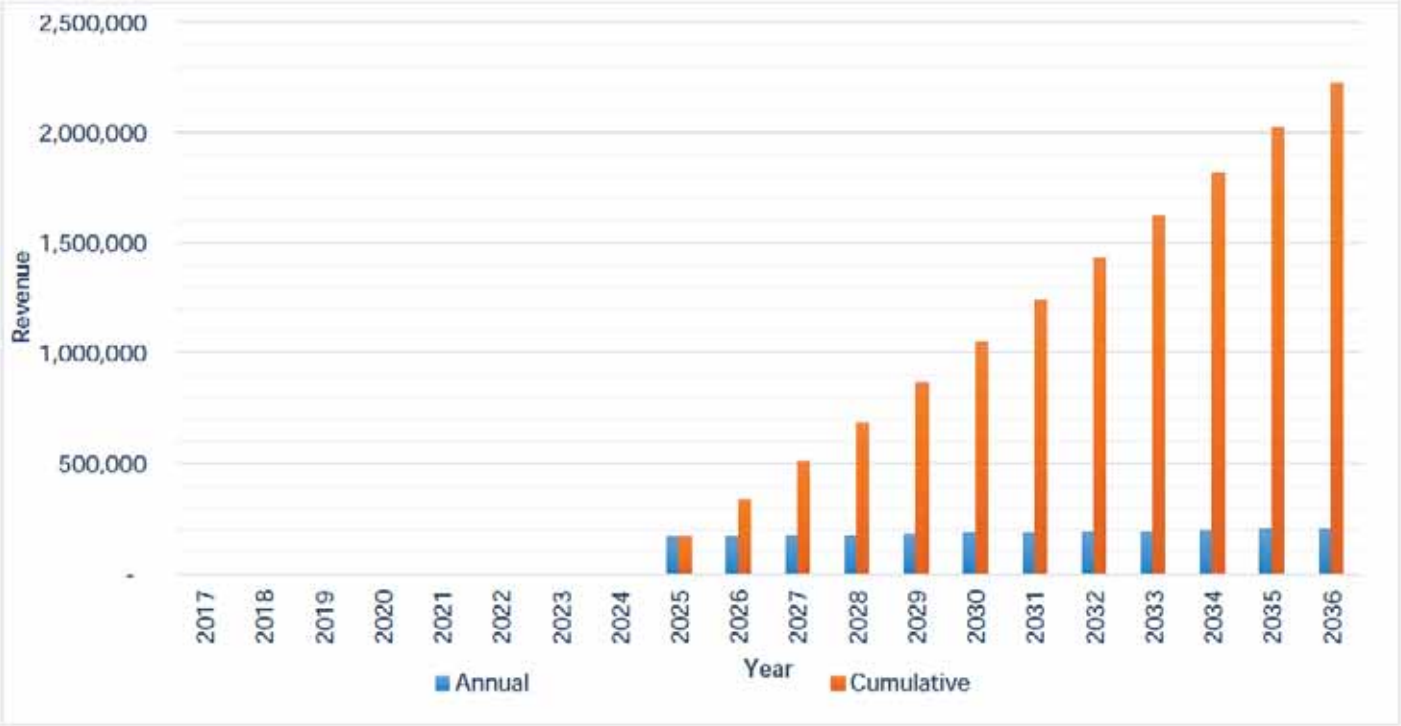
7.4.1.5 Serviced Apartments Respite

The Following assumptions underpin the analysis of potential revenue from the respite units:

- A proposed 9 respite serviced apartments to be built.
- 8 out of 9 respite units will be occupied at any given time, as respite is not permanent by nature.
- It is assumed most services such as personal care, hygiene, program management, food etc. are provided to the community through the HACC program or other body.
- The maximum daily fee an operator can charge for respite services is 85% of the single rate of basic age pension, which is $49.07 as of March 2017. This fee covers the basic utilities and services by the operator.

Over the forecast time horizon, the cumulative revenue from the serviced apartments will be in the order of $2.2M, with a net present value of $968,568.

Figure 8- Serviced Apartments - Respite Gross Revenue



7.4.2 Operating Costs

7.4.2.1 Staffing

For the purposes of this base case assessment it is assumed that a single operator operates the development, with staff working across all three business units. The following assumptions underpin the estimates of staffing costs.

The development requires:

- a full-time village manager with a gross salary of $70,000 per annum
- a full-time administration assistant with a gross salary of $45,000 per annum
- a part time groundskeeper with a gross salary of $20,000 per annum
- Superannuation costs are 10% of gross salaries

7.4.2.2 Building Operations

The costs of building operations for the ILU's are assumed to be borne directly by the occupants or recovered from occupants in the form of a maintenance fee. The costs associated with the serviced apartments will be borne directly by the operator and will be determined by the total floor space of this use.

Table 8: Annual Cost of Building Operations

Item	Cost ($/sqm)	Applicable Sqm	Total Cost per Annum ($2015)
Insurance	7.6	1265.24	$9,616
Air Conditioning	8.3		$10,501
Lifts	6.7		$8,477
Fire Protection	1.4		$1,771
Energy	25.9		$32,770
Cleaning	14.9		$18,852
Building Staff	6.9		$8,730
Security	2.8		$3,543
Repairs and Maintenance	6.2		$7,844
Sundries	4.3		$5,441
Total	85.0		$107,585

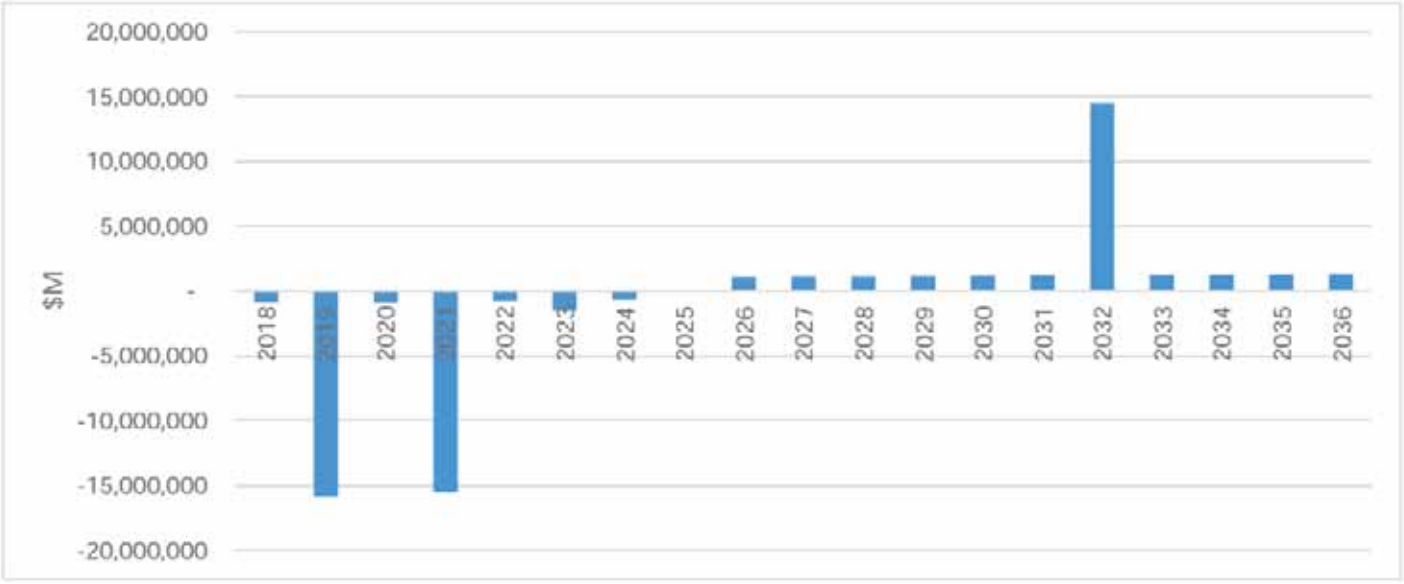
Source: Rawlinson's Construction Handbook (2015)

7.5 Net Position

Under the assumed scenario where the total capital expenditures of $42,201,500 broken down into 3 stages (two year intervals) and the precinct is fully operational for 10 years, the project has a net present value of -$18,083,035 and an IRR of -2.79%. As both values for these metrics are negative, the development of an aged care precinct in the given scenario is unprofitable to a large degree.

As Figure 9 illustrates, the most significant impact on net cash flow is the capital expenditures during stage 1 and 2. This implies that if a developer/operator (both profit and not for profit) was to undergo such a project, variables such as construction staging, capital and operational costs would need to be renegotiated to achieve a NPV and IRR closer to 0.

Figure 9- Net Cash Flow Position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SENSITIVITY ANALYSIS

The parameter values and assumptions of any model are subject to change and error, particularly in the early stages of a project such as Brockman Park. Sensitivity analysis is a technique used to determine how different values of an independent variable will impact dependent variables, in this case net present value, internal rate of return and benefit-cost ratio. The sensitivity analysis will inform an understanding as to where the public sector can intervene to influence the viability of the proposed and the magnitude of intervention required.

7.6 Public Sector Contribution

Under a scenario where 50% of the capital expenditure is publicly funded, the project NPV and IRR significantly improves to -$3,340,801 and 4.42% respectively.

7.7 Site De-Risking

In a scenario where the site and external works are funded publicly, the NPV and IRR improve to -$17,030,701 and -2.05% respectively.

7.8 Public Sector Contribution and Site De-Risking

In the circumstance where the 50% of the capital expenditure and the entire site and external works are publicly funded, the project NPV and IRR significantly improves to -$2,024,661 and 5.31% respectively.

7.9 Development Costs.

Table 9 illustrates the impact of capital expenditure on both the NPV and IRR for the project. The capital expenditure costs by RBB included a 30% loading fee. AS figure x indicates, If the capital expenditure is reduced by 30%, (ie. no remote loading fees) the projects NPV and IRR would improve to -$26.3M and 2.18% respectively.

Table 9. Sensitivity analysis of regional loading of capital costs

+/-% of Capital Cost	Capital Cost	NPV	IRR
-30%	$29,541,050	-$26,348,512	2.18%
-20.0%	$33,761,200	-$30,313,554	0.68%
-10.0%	$37,981,350	-$34,278,596	-0.59%
0.0%	$42,201,500	-$38,243,638	-1.68%
10.0%	$46,421,650	-$42,208,680	-2.64%
20.0%	$50,641,800	-$46,173,722	-3.50%
30.0%	$54,861,950	-$50,138,764	-4.27%

7.10 Summary

The sensitivity analysis indicates a PPP model where the government, local government fund the external site works and 50% of capital expenditure provides more attractive measures of NPV and IRR. This is particularly the case if capital costs can be managed.

LEGISLATIVE AND REGULATORY CONTEXT

The involvement of a third party in the development and operation of an aged care facility at Brockman Park will eventually require the Shire of Carnarvon to dispose of all of part of the structure plan area. The term dispose includes to sell, lease, or otherwise dispose of, whether absolutely or not. As such, any analysis of development model options for the Brockman Park site must be undertaken in the context of the legislative and regulatory frameworks which govern the disposal of property by Local Governments.

7.11 Local Government Act 1995

Local Government Act Section 3.58

Under Section 3.58, Sub Section 2 of the Local Government Act a local government can only dispose of property to

- The highest bidder at a public auction
- The person who at public tender called by the local government makes what is, in the opinion of the local government, the most acceptable tender, whether or not it is the highest tender.

Under subsection 3, a local government can dispose of property other than under subsection (2) if, before agreeing to dispose of the property —

- it gives local public notice of the proposed disposition —
- describing the property concerned; and
- giving details of the proposed disposition; and
- inviting submissions to be made to the local government before a date to be specified in the notice, being a date not less than 2 weeks after the notice is first given; and
- it considers any submissions made to it before the date specified in the notice and, if its decision is made by the council or a committee, the decision and the reasons for it are recorded in the minutes of the meeting at which the decision was made.

The details of a proposed disposition that are required by subsection 3

- the names of all other parties concerned; and
- the consideration to be received by the local government for the disposition; and
- the market value of the disposition —
- as ascertained by a valuation carried out not more than 6 months before the proposed disposition; or
- as declared by a resolution of the local government on the basis of a valuation carried out more than 6 months before the proposed disposition that the local government believes to be a true indication of the value at the time of the proposed disposition.

This section of the Local Government Act does not apply to —

- a disposition of an interest in land under the Land Administration Act 1997 section 189 or 190; or
- a disposition of property in the course of carrying on a trading undertaking as defined in section 3.59; or
- anything that the local government provides to a particular person, for a fee or otherwise, in the performance of a function that it has under any written law; or
- any other disposition that is excluded by regulations from the application of this section.

Local Government Act Section 3.59

Before commencing a major land transaction or undertaking a major trading undertaking, section 3.59 of the Local Government Act 1995 requires a local government to prepare and advertise for public comment a business plan. A "major land transaction" in a regional context, is defined as one in which a local government intends to acquire, dispose of (which includes leasing) or develop land where the total value is worth more than the lesser of $2 million or 10% of the operating expenditure of the local government in the last completed financial year. The budgeted operating expenditure of the Shire of Carnarvon for 2016/17 is $25M. Accordingly the relevant threshold value is $2 million. Based on the total structure plan area of 2.1Ha, if land is valued at more than $95.24 per square metre at the time of disposal, the Shire will be required to prepare and advertise for public comment a business plan.

Table 10. Parameters for defining a Major Land Transaction at Brockman Park

Structure plan area sqm	21,000
Threshold value for Major Land Transaction	2,000,000
Threshold value per sqm Major Land Transaction	95.24

Subsection 3.59(3) states;

"The business plan is to include an overall assessment of the major trading undertaking or major land transaction and is to include details of —

(a) its expected effect on the provision of facilities and services by the local government; and

(b) its expected effect on other persons providing facilities and services in the district; and

(c) its expected financial effect on the local government; and

(d) its expected effect on matters referred to in the local government's current plan prepared under section 5.56; and

(e) the ability of the local government to manage the undertaking or the performance of the transaction; and

(f) any other matter prescribed for the purposes of this subsection."

7.12 Local Government (Functions and General) Regulations 1996

Local Government (Functions and General) Regulations 1996 Section 30 outlines several dispositions which are excluded from the application of section 3.58 of the Local Government Act. The exempt disposition most relevant to the Brockman Park Structure Plan is exemption b

A disposition of land is an exempt disposition if —

(b) the land is disposed of to a body, whether incorporated or not —

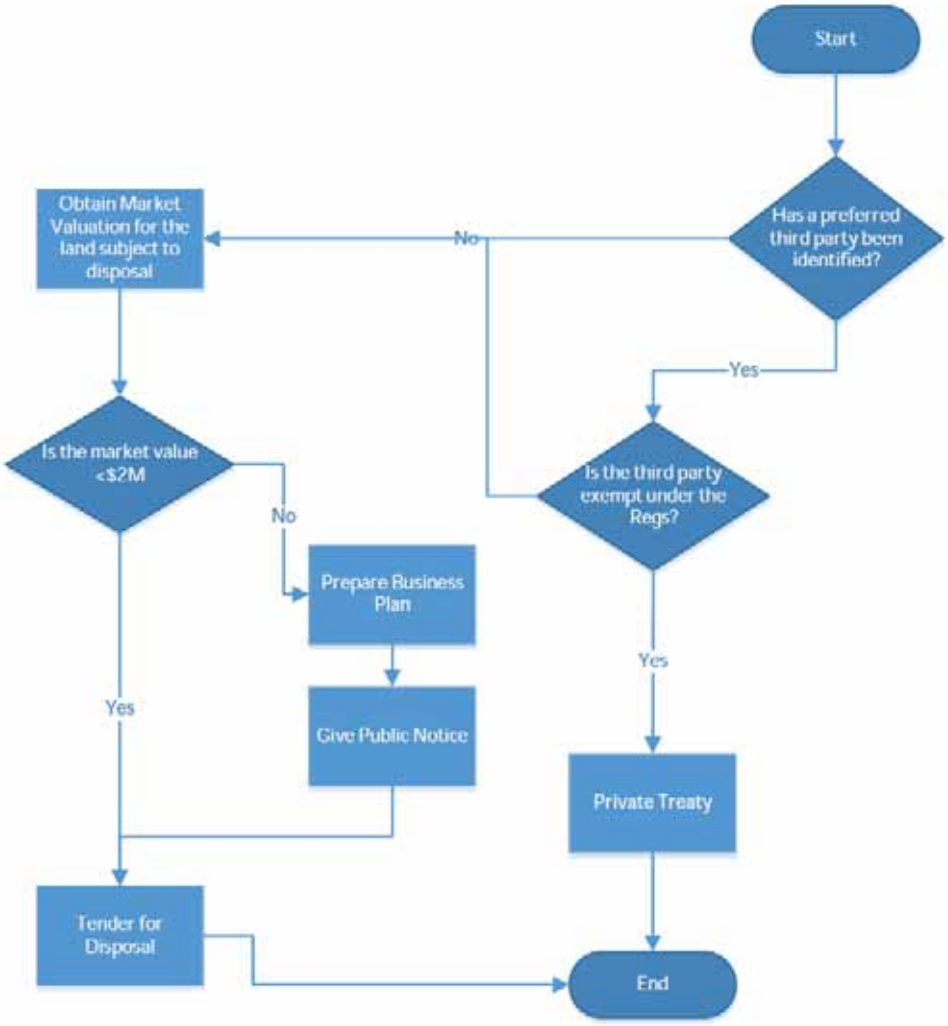
(i) the objects of which are of a charitable, benevolent, religious, cultural, educational, recreational, sporting or other like nature; and

(ii) the members of which are not entitled or permitted to receive any pecuniary profit from the body's transactions;

7.13 Summary

Given the aspirations for the Shire for the site, it is recommended that the site be disposed of by private treaty or by public tender. These disposal methods will ensure greater control over the future of the site. Figure 10 summarises the high-level decision making process that will be required at the point that the Shire disposes of the site. This highlights that the land disposal process will be simpler if the Shire is disposing of the asset to an exempt body such as the State Government or a charitable organisation, however this should not preclude the Shire from seeking for-profit partners.

Figure 10. Indicative Land Disposal Process



8 DEVELOPMENT MODELS

8.1 History

The core proposal recommended by Verso (2012) focused on Brockman Park land being made available by the Shire, and involved an assembly of no/low-cost prime land and head works, operational supports potentially available from the hospital, cooperation from local community care providers and GMF, plus proffered capital funding support from the State.

According to Verso, this package was to have been subject to an Expression of Interest process designed to attract approved aged care providers to develop a combined older person's residential development facilitating care in home, a care centre and a smaller scale residential facility with design scope for expansion to 60+ beds as demand manifested. In Verso's estimation, the combination of package elements combined with a level of capital assistance would have provided viability and attracted interest. This offering was quite distinct from earlier attempts to gauge interest from providers, and since then unmet demand and likely scale have continued to grow. Ultimately, the proffered capital assistance did not eventuate and the initiative did not proceed. In the context of the above it is valuable to re-examine the potential models for the development and operation of Brockman Park.

It would be preliminary to conduct a full feasibility study until the Shire has had the opportunity to review and respond to the draft structure plan. However, the history of the site in not attracting investment, feedback from the project team and consultation with local construction industry suggests that regardless of the structure plan option proposed, the capital cost associated with the project is such that there is likely to be a gap between the investment criteria of aged care provider (not-for-profit or commercial) and the potential return from the development. This assumption has informed the remainder of the draft feasibility assessment and will be tested once data is available to support the completion of the final feasibility assessment.

8.2 Public Investment Led Approach

The most direct way that the Shire of Carnarvon could facilitate the development of Brockman Park, would be to develop the site and outsource the management to an external provider. As discussed, there are likely to be significant capital costs associated with realising the vision for Brockman Park. It is unlikely that Shire of Carnarvon will be able to justify carrying the full capital cost internally, and as such will need to seek joint venture partners. A social investor such as the state government may provide capital without expectation of ongoing returns. They may however have expectations in relation to target residents, terms of the arrangement, management and shared equity.

The Department for Regional Development administers the Royalties for Regions program and facilitates the development and diversification of sustainable regional communities. There are number of successful examples of where local governments have successfully attracted Royalties for Regions investment for residential and respite aged care and older persons' housing. Some examples are outlined in Figure 11.

Figure 11. Examples of projects funded under the Royalties for Regions program

Project	ILU's	Funding Provided ($)
Kojonup independent living units (Stage 2)	3	$646,000
Dwellingup Community Village (Stage 2)	7	$2,500,000

Central East Aged Care Alliance	75	$23,300,000

With the Royalties for Regions funding criteria currently under review, the Shire of Carnarvon will likely need to de-risk the site to the extent of its capability, scope the project and prepare a Businesses Case to the Department of Primary Industries and Regional Development for the project investment. The development would likely need to be retained in the Shire's ownership, and management of the development would then be outsourced to an external provider.

Alternatively, or in parallel, the Shire could approach the Housing Authority as a Joint Venture partner for the development. The Joint Venture Housing Program (JVHP) is targeted towards organisations such as local governments that have resources to contribute to the development of rental accommodation options for people on low incomes. In a typical arrangement, the Shire of Carnarvon would provide the land and some capital, whilst the Department of Housing contributes to the construction of the properties. Other arrangements can be made between parties through negotiation. Because both parties in a joint venture make a substantial capital contribution, each has an equity stake in the asset.

8.3 Market-Led Approach

If government is unable or unwilling to directly invest in the development of the site, a market led approach will need to be considered. Under this approach the Shire will de-risk and promote the site to the best of its capacity and effectively wait until the market conditions make the development feasible.

Beyond the preparation of a structure plan and an investment prospectus, the Shire could consider offering incentives such as a rates exemption for the site which would further de-risk the site for an operator. If the site is operated by a religious or charitable aged care provider, the provider will be rates exempt under Local Government Act 1995, s 6.26. For a for-profit provider, under Local Government Act 1995, s 6.47, subject to the Rates and Charges (Rebates and Deferments) Act 1992, the Shire of Carnarvon could, with an absolute majority, resolve to waive a rate or service charge or resolve to grant other concessions in relation to a rate or service charges.

9 RECOMMENDATIONS

Based on the feasibility assessment, a public private partnership is recommended for the Brockman Park development to ensure that the outcomes in alignment with the vision set by the Brockman Park Structure Plan are able to be viably delivered. Such an outcome would likely require that the Shire of Carnarvon de-risks the site by investing directly in external works and servicing (approximately $800,000), as well as in working with a potential proponent in attracting 50% of the capital investment required from State or Federal Government sources.

Finally, development costs would need to be tightly managed to realise project viability. This may mean that prefabricated and modular construction methods are utilised, as well as ensuring that design specifications are realistic and appropriate to ensure that the development is not overcapitalised for the projected returns on investment.

10 APPENDIX I – MARKET DEPTH ANALYSIS METHODOLOGY

An analytical framework was developed to estimate the plausible demand for aged care services within Carnarvon, the ability of existing supply to meet this demand, and the opportunity that this project represents in meeting this demand. This project will be informed by inputs provided by the Consultant Team and Client, as well as data and projections from sources including:

- ABS Census of Housing and population (2011);
- Social Health Atlas of Australia;
- Productivity Commission inquiry – Caring for Older Australians;
- Department for Social Services;
- Australian Institute of Health and Welfare 2016; and
- National Aged Care Data Clearinghouse (NACDC).

10.1 Key Assumptions

Sourced population projections used in this analysis are from the National Aged Care Data Clearinghouse: Population projections, 2012 (base) to 2027 for all states and territories at Statistical Area Level 2 (SA2) by sex and age data set.

10.1.1 High and Low Care Facilities

Demand for residential aged care beds is based on the projected population of residents aged 70 years and over in the Gascoyne Region. The potential funding available for high and low care facilities in Carnarvon is derived from the projection of residents aged 70 years and over in the Gascoyne, multiplied by the Australian Government's planning ratios for low and high care:

- 40 places per 1000 people for Low residential care
- 40 places per 1000 people for High residential care
- The model recognises the trend toward well designed and serviced ILUs becoming a primary location/solution to the provision of low care services to residents. Consequently, the model assumed that 90% of future demand for low- care beds will have provided for through the provision of ILUs. Additionally, the potential for up to 60 high-care beds being provided by the Carnarvon Health Campus by 2025 has been considered for the analysis.

The demand for high and low care facilities is calculated by multiplying the projected population over the age of 70 by the implied planning ratio of 0.04 (40 people per 1000). This is process is repeated for each year. The number of additional beds required is calculated as the difference between the total demand and the existing supply.

10.1.2 Independent Living Units

Modelling of future demand for ILUs is based upon the following assumptions:

- Sourced population projections used in this analysis are from the National Aged Care Data Clearinghouse: Population projections, 2012 (base) to 2027 for all states and territories at Statistical Area Level 2 (SA2) by sex and age data set.
- Average age of residents moving into an ILU in Carnarvon is 74, with an average duration of residence being between 5 to 10 years.
- Proportional market demand for ILUs is based on the 35% of survey respondents aged between 55 and 70 years old having intentions of moving into an ILU when they are 70 years or older with (Verso 2012).

- 88% of ageing residents intending on remaining in Carnarvon (Verso 2012).
- Existing supply of 35 ILUS (with an additional 15 to be constructed) provided by the Memorial Association adjacent to the Brockman Park site.
- The total number is the sum of "premium" units that consist of 2-3 beds (15% of total) and price sensitive "standard" units that have 1-2 beds (85%). Since this model does not assume all the bedrooms in the 2 and 3 room ILUs are occupied by single residents, the population is divided by a factor of 1.3 for standard and 1.6 for premium ILUs.

  $$Remaining\ in\ Carnarvon = Population_{74-85} * 0.88$$

  $$Demand = Remaining\ in\ Carnarvon * 0.35$$

  $$Required\ Units\ to\ meet\ 100\%\ of\ Demand = \frac{Demand * 0.15}{1.6} + \frac{Demand * 0.85}{1.3}$$

To calculate the number of units to fulfil the total demand for ILUs, the projected population of residents aged 74-85 is used and multiplied by 0.88 to account for the 88% of residents intending on remaining in Carnarvon. The product of this is then multiplied by 0.35, as the survey by Verso indicated that 35% of the aged population intended on moving to an ILU. The total number is the sum of "premium" units that consist of 2-3 beds (15% of total) and price sensitive "standard" units that have 1-2 beds (85%). Since this model does not assume all the bedrooms in the 2 and 3 room ILUs are occupied by single residents, the population is divided by a factor of 1.3 for standard and 1.6 for premium ILUs. The number of additional ILUs required is calculated as the difference between the total demand for ILU's and the existing supply of ILU's.

11 APPENDIX 2

Capital Expenditure Costing

Ref	Scope	Total $
1	Site Works	$721,195
2	Building Works	$21,873,750
3	Main Access Road Works	$223,120
4	External Works	$1,017,960
5	External Services	$554,220
6	Sub-Total - Construction Costs (Perth)	$24,390,245
7	Locality Uplift (130)	$7,316,755
8	Sub-Total - Construction Costs (Carnarvon)	$31,707,000
9	Design Contingency	$952,000
10	Construction Contingency	$1,586,000
11	Headwork's Power	$250,000
12	Water and Sewer	$300,000
13	Gas	$10,000
14	Communications	$50,000
15	Building Act Compliance	$20,000
16	Percentage for Art	Excluded
17	ESD Considerations	Excluded
18	Loose Furniture & Equipment	Excluded
19	IT / AV	Excluded
20	Professional Fees (Consultants)	$3,490,000
21	Southcare Costs	Excluded
22	Total Project Costs (at Current Prices)	$38,365,000
23	Escalation to Tender	Excluded
24	Total Project Cost (excl. GST)	$38,365,000
25	GST	$3,836,500
26	Total	$42,201,500

(Source; RBB)

APPENDIX C
GEOTECHNICAL STUDY

Report on

GEOTECHNICAL STUDY
PROPOSED AGED CARE / LIFESTYLE VILLAGE
LOTS 1147, 1179 & 1193 DAVID BRAND DRIVE
BROCKMAN PARK, CARNARVON

Submitted to:
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PERTH WA 6000

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04 August 2016

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APPENDICES

1. INTRODUCTION

This report presents the outcomes of Galt Geotechnics Pty Ltd's (Galt's) geotechnical study for the proposed aged care/lifestyle facility at Lots 1147, 1179 & 1193 David Brand Drive, Brockman Park, Carnarvon ("the site").

The study was authorised by Kerry White from Wave International in an email dated 8 July 2016.

2. SITE DESCRIPTION AND PROPOSED DEVELOPMENT

Based on the supplied information, the site is irregular in shape and covers a total area of about 2.1 ha. It is bounded by David Brand Drive to the south, Olivia Terrace to the southeast, open land and a residential complex to the east, Bibra Way to the west and open land to the north.

The site is mostly clear with a line of mature trees to the along the southern and western boundaries and a footpath along the eastern boundary. There are tall light poles roughly parallel to the footpath. There are multiple soakwells around the site, particularly toward the western boundary. We also noted stormwater outlet pipes from the adjacent roads direct runoff into the site.

Surface contours provided to us (drawings undated) indicate that the surface is relatively level across most of the site at elevations of between RL 2.3 m AHD and RL 2.6 m AHD, rising to about RL 3.4 m AHD along the southern boundary. **Note:** We do not know if the contour drawing shows the current surface levels.

We understand that an aged care/lifestyle village is proposed. We have not been provided with any details or drawings for the proposed development, but we assume this will comprise single storey units with an associated administration building, roads, parking, services etc.

3. PROJECT OBJECTIVES

The objectives of the study were to:

- confirm the geotechnical suitability of the site for the proposed residential/aged care development;
- assess subsurface soil and groundwater conditions across the site;
- provide recommendations on suitable footing systems for the proposed development;
- provide a site classification(s) in accordance with AS 2870-2011 "Residential Slabs and Footings";
- provide recommendations and geotechnical design parameters for earth retaining structures;
- assess the appropriate site subsoil class for the site in accordance with AS 1170.4-2007;
- recommend appropriate site preparation procedures including compaction criteria;
- assess the permeability of the soils at the site for potential on-site disposal of stormwater by infiltration; and
- advise on any other investigation that may be required for detailed design purposes (depending on ground conditions, types of structures, deep excavations, etc.).

4. FIELDWORK

Fieldwork was carried out on 13 July 2016 and comprised:

- a site walkover to observe existing features;
- excavation of 10 test pits to depths of between 2.1 m and 3 m below ground level;
- testing with a dynamic cone penetrometer (DCP) adjacent to the test pits, to depths of between 0.9 m and 2 m; and

- Infiltration testing using the 'inverse auger hole' technique at 3 locations, at a depth of about 0.5 m below ground level.

General

Test locations were positioned by a geotechnical engineer from Galt. Our engineer selected and positioned the test locations, observed the test pitting, logged the materials encountered, and conducted the penetrometer and infiltration testing.

The approximate test locations are shown on Figure 1, Site and Location Plan and details are summarised in Table 1: Summary of Tests. Photographs of the site are presented in Appendix A, Site Photographs.

Table 1: Summary of Tests

Test Name	Test Depth (m)	Depth to Groundwater (m)	Estimated Fill Thickness (m)	Reason for Termination	Stratigraphy
TP01	3.0	NE[1]	1.8	Target depth	FILL: SAND overlying CLAY
TP02	2.1	1.8	1.8	Collapse	
TP03	2.5	2.3	1.8	Target depth	
TP04	3.0	2.6	1.6	Target depth	
TP05	2.5	2.1	1.0	Target depth	
TP06	3.0	NE	1.1	Target depth	
TP07	2.7	NE	1.2	Target depth	
TP08	2.5	NE	2.1	Target depth	
TP09	2.9	NE	1.5	Collapse	
TP10	3.0	NE	1.5	Target depth	FILL: SAND overlying CLAY overlying Clayey SAND

Notes: 1. NE – Not encountered within investigated depth.

Test Pits

Test pits were excavated using a 5 tonne excavator supplied and operated by Northwest Solutions Pty Ltd. Test pit reports along with a list of notes and abbreviations and the method of soil description used on the reports is presented in Appendix B, Test Pit Reports.

Dynamic Cone Penetrometer Results

Dynamic cone penetrometer (DCP) tests were carried out in accordance with AS1289.6.3.2. Tests were carried out adjacent to each test pit and results are presented in Appendix C, DCP Test Results

Infiltration Tests

Infiltration testing was carried out in hand-augered boreholes using the method described by Cocks[1]. The results of the infiltration testing are presented in Appendix D, Infiltration Test Results and summarised in Table 2.

1 Cocks, G (2007), "Disposal of Stormwater Runoff by Soakage in Perth Western Australia", Journal and News of the Australian Geomechanics Society, Volume 42 No. 3, pp 101-114

Table 2: Summary of Infiltration Test Results

Test Location	Description	Pipe Embedment (m)	Minimum Unsaturated Permeability[1], k (m/day)		
			Test 1	Test 2	Test 3
IT01	FILL: SAND	0.51	11.2	10.6	9.3
IT02	FILL: SAND	0.50	9.9	9.4	7.4
IT03	FILL: SAND	0.55	8.7	9.9	7.8

Note: The minimum unsaturated permeabilities shown are typically recorded towards the end of the test, with pressure head varying between about 0.1 m and 0.2 m.

5. LABORATORY TESTING

Laboratory testing was undertaken by Civil and Mining Geotest in their NATA accredited laboratory. The testing comprised determination of:

- particle size distribution on two samples; and
- Atterberg limits and linear shrinkage on two samples.

Laboratory results along with test methods followed are presented in Appendix E, Laboratory Test Results. The results are summarised in Table 3: Summary of Laboratory Test Results.

Table 3: Summary of Laboratory Test Results

Test Location	Sample Depth (m)	USCS Class	% Gravel	% Sand	% Fines	LL (%)	PI (%)	LS (%)
TP07	1.2	CL	1	24	75	29	9	3.0
TP09	0.7	SP	11	79	10	NO	NP	0.0

LL – Liquid Limit PI – Plasticity Index LS – Linear Shrinkage
NO – Not Obtainable NP – Non-plastic

6. SITE CONDITIONS

6.1 Geology

The Quobba sheet of the 1:50,000 scale Environmental Geology series map indicates that the area is underlain by two soil formations as follows:

Northeast part of site: Alluvium, deposits of Gascoyne River – clay, silt, sand and gravel;

Southwest part of site: Supratidal flats – calcareous clay, silt and sand and authigenic gypsum and superficial algal mats and salt crusts.

We found the general soil profile across the site to be relatively uniform, comprising a layer of sand fill overlying clay (typically high plasticity) overlying clayey sand / sandy clay.

6.2 Subsurface Conditions

The subsurface conditions encountered across the site were largely variable, but can be summarised as comprising:

- FILL: SAND (SP) – fine to coarse grained, sub-angular to sub-rounded, brown, trace fines, trace rootlets and organics in the top 0.5 m, trace shell fragments, with some clay clods/clumps below about 1 m, loose becoming medium dense, moist becoming wet with depth, present from the ground surface to depths of between 1.0 m and 2.1 m; overlying
- CLAY (CI – CH) – typically medium to high plasticity (locally low plasticity), grey, with some fine to coarse grained sand, trace shell fragments, wet, generally stiff, present to the maximum investigated depth of 3 m.

In TP10 (southeast corner of the site), the subsurface conditions were slightly different to the above, comprising:

- FILL: SAND (SP) – *as above*, with some uncontrolled fill including plastic bottles, plastic wrap, batteries and metal cans, present from the ground surface to a depth of 1.5 m; overlying
- CLAY (CI – CH) – *as above*, present from 1.5 m to a depth of 2.1 m; overlying
- Clayey SAND (SC) – fine to coarse grained, sub-angular to sub-rounded, red-brown, 40-50% medium plasticity fines, moist, stiff, present from 2.1 m to the maximum investigated depth of 3 m.

6.3 Groundwater

We encountered groundwater in 4 of the test pits (TP02 – TP05) at depths of between 1.8 m and 2.6 m below the current ground level. These test pits were in the lower lying areas of the site. Given the proximity of the site to the nearby inlet, we expect the groundwater to be close to sea-level.

A perched groundwater table over the in-situ clayey soils could be expected at wetter times of the year.

7. GEOTECHNICAL ASSESSMENT

7.1 Site Classification

We consider that the site is geotechnically capable of supporting the proposed development.

We have assessed the site in accordance with AS2870-2011, "Residential Slabs and Footings", and consider that a site classification of "Class S" is appropriate for the site provided our site recommendation procedures outlined in Section 7.3 are followed.

The above site classification is based on the assumptions that:

1. There will be no excavation across the site (i.e. the thickness of sand fill over the clay will not be reduced);
2. The maximum thickness of inert fill material placed on top of the current surface will be 1 m (i.e. there will not be widespread loading which may cause consolidation of the underlying clayey strata). If more than 1 m of fill is required, further investigation must be carried out to confirm the thickness and consistency of the underlying clayey strata.
3. We have not considered surface hydrology (i.e. flood risk) in the site classification.

7.2 Site Subsoil Class

We have assessed the site subsoil class in accordance with AS1170.4-2007, "Earthquake Design Actions – Australia". We consider that a site subsoil class of 'Ce' is appropriate for the site. This is based on the presence of stiff clayey soil and the expected depth to competent rock being less than 40 m.

7.3 Site Preparation

The site preparation measures outlined below are aimed at improvement of the site in preparation for construction of the structures including on-ground slabs, shallow footings, retaining walls and pavements. Landscaped areas (if any) will not require these measures.

The following site preparation measures should be followed:

- Remove any pavements, services, soakwells and any trees (where required) from the site.
- Perform a topsoil strip (50 mm should be sufficient) across the site, including grubbing out of tree roots and removal of any remaining deleterious materials (including any waste material such as noted in test pit TP10).
- Compact the exposed sandy surface to the level of compaction specified in Section 7.4 to a depth of at least 0.9 m.
- Any areas of loose or unsuitable fill must be removed and replaced with approved fill (refer Section 7.5). This includes remediation of all zones where tree roots have been removed.
- Where fill is required to build up levels, use approved fill (refer Section 7.5), placed and compacted in layers of not greater than 0.3 m loose thickness, compacting to meet the requirements specified in Section 7.4. **Note**: if the total thickness of fill is more than 1 m, additional investigation is required to confirm the thickness and consistency of the underlying clayey strata.
- Excavate for pad and strip footings and compact the exposed bases to achieve the level of compaction specified in Section 7.4 to a depth of at least 0.9 m below the underside of all footings. Remove, replace and compact as required with approved fill any zone not achieving the level of compaction specified in Section 7.4.

7.4 Compaction

7.4.1 Granular Fill

Approved granular fill must be compacted using suitable compaction equipment to achieve a dry density ratio of at least 95% MMDD (maximum modified dry density) as determined in accordance with AS 1289 5.2.1 at a moisture content within 2% of optimum moisture content (OMC). Over-excavation and replacement of loose materials may be required where the minimum density cannot be achieved.

Granular fill must be placed in horizontal layers of not greater than 300 mm loose thickness. Each layer must be compacted by suitable compaction equipment and carefully controlled to ensure even compaction over the full area and depth of each layer.

Where clean sand (<5% gravel, <5% fines) is used as fill, a Perth sand penetrometer (PSP) may be used for compaction control in accordance with AS1289.6.3.3. The following minimum blow counts may be assumed to correspond to a DDR of 95% MMDD:

- 0-150 mm: SET
- 150-450 mm: 8
- 450-750 mm: 10
- 750-1050 mm: 12 (or 750-900 mm: 6)

If difficulty arises in achieving the specified PSP blow counts, then a calibration must be established between PSP blow count and the *in situ* density.

7.4.2 Clay

The earthworking and compaction of clayey soils is not expected to be required on this site, except for the compaction of any deep service trenches that extend into the clay.

The *in situ* clayey soils must be compacted using suitable compaction equipment to a minimum dry density ratio of 95% SMDD (standard maximum dry density) as determined in accordance with AS1289.5.1.1.

The in-situ clay and clay fill will require careful moisture conditioning so that the moisture content of the material is between optimum moisture content (OMC) and 2% wet of OMC at the time of placement and compaction. We note that compaction to specification 95% SMDD can be difficult to achieve for the clayey in situ material when not appropriately moisture conditioned.

For clayey soils, compaction testing must be done using a nuclear density gauge (NDG) in accordance with AS1289.5.8.1.

The clayey soils on the site will drain poorly when inundated during the wetter times of the year and result in saturated conditions that may inhibit compaction of the soil. To reduce the risk associated with this, we recommend that earthworks are not carried out within 1-2 weeks following heavy rainfall, but ideally during middle and late summer. If difficulties are encountered during compaction due to water, further advice should be sought from a geotechnical engineer.

7.4.3 General

Over-excavation and replacement of loose materials must be carried out where the minimum density cannot be achieved.

Fill must be placed in horizontal layers of not greater than 0.3 m loose thickness (except as required for a pioneer layer). Each layer must be compacted by suitable compaction equipment, and carefully controlled to ensure even compaction over the full area and depth of each layer.

After compaction, verify that the required level of compaction has been achieved by testing to a minimum depth of 0.9 m:

- On each lift of fill on a 40 m grid;
- At each spread footing location;
- at 10 m centres along gravity retaining wall footings and strip footings (where present); and
- at 10 m centres below on-ground slabs and pavements.

Care will need to be taken when compacting in the vicinity of existing structures. This is particularly important if vibratory compaction is being carried out. Tynan (1973)[2] provides assistance with the selection of compaction equipment for use adjacent to structures.

Large compaction equipment (self-propelled vibrating rollers, etc.) must not be used within 2 m behind retaining walls. Hand compaction plant must be used.

2 Tynan (1973) Ground Vibration and Damage Effects on Buildings, Australia Road Research Board, Special Report No. 11.

7.5 Approved Fill

Imported granular fill must comply with the material requirements as stated in AS 3798-2007, "Guidelines on Earthworks for Commercial and Residential Developments". Sand fill must comprise clean sand that is free of organic matter and have a fines content of less than 5%.

Generally, the in-situ sand fill present at the site is suitable for re-use as structural fill, provided no deleterious or oversize material is present (>100 mm). All waste materials (plastic bottles, batteries, etc. such as encountered in test pit TP 10) must be removed prior to material being re-used as fill.

Given the plasticity of the in-situ clayey materials (at depth), we do not consider that this is suitable for re-use as structural fill (we do not expect any excavations, other than deep service trenches) will extend to this depth).

The approximately 50 mm -100 mm thick topsoil layer may be re-used as structural fill if it is screened of all organics and blended with clean sand (typically a 1:1 blend would be suitable if there are no permeability requirements).

Where doubt exists, a geotechnical engineer must be engaged to inspect and approve the use of potential fill materials.

7.6 Footings

Provided that the site preparation procedures in Section 7.3 are followed, shallow footings and on-ground slabs may be designed for a Class S site in accordance with AS2870-2011.

All prepared footing excavation must be checked by a competent person prior to blinding.

7.7 Earth Retaining Structures

Retaining structures may be designed in accordance with AS 4678 (2002) "Earth Retaining Structures". We recommend that all retaining walls at the site be backfilled with free-draining fill, e.g. sand (imported free draining sand fill with less than 5% fines). For the design of retaining structures, the following parameters are considered appropriate for compacted sand backfill.

Table 4: Retaining Wall Geotechnical Design Parameters

Soil Type	Bulk Density (kN/m³)	Angle of Internal Friction (deg.)	Wall Friction = 0°		Wall Friction = 0.5Φ	
			Coefficient of Active Earth Pressure, K_a	Coefficient of Passive Earth Pressure, K_p	Coefficient of Active Earth Pressure, K_a	Coefficient of Passive Earth Pressure, K_p
Compacted sand or gravel fill	18	36	0.26	3.85	0.22	7.2

Notes: Earth pressure coefficients are provided in this table for conditions of zero friction between the wall and the soil and with wall friction of 0.5Φ'. The retaining wall designer should make an independent assessment of the parameters appropriate to the construction method to be used, including alternative values of wall friction. A horizontal ground surface behind the wall has been assumed.

Unless a suitable drainage layer is placed behind the wall such that a build-up of pore pressure is prevented, the retaining wall must be designed to accommodate water pressure behind the wall (10 kPa per metre height). In this instance, calculation of lateral earth pressures must include the addition of pore pressure (not required for retaining walls entirely within clean sand and sand fill). A separator geotextile (Bidim A14, or similar, or heavier) must also be used between the interface of any granular backfill and the in-situ soil.

Retaining walls must be backfilled with a 300 mm minimum width layer of free-draining granular fill. A slotted drain (wrapped in a geotextile) should be used at the base of the granular backfill to collect seepage and direct it to a collection point (either discharging by gravity away from the retaining wall, or collecting at a sump fitted with an automatic pump system to ensure that it remains dry).

Compaction plant can augment the lateral earth pressure acting on retaining walls. Hand operated compaction equipment is recommended within 2 m of any retaining walls to minimise compaction pressures.

It is important to note that some ground movement will occur behind any soil retaining system, including gravity retaining walls.

Detailed design of retaining structures should be undertaken using methods appropriate to the proposed retention system.

The prepared foundation for all retaining walls must be checked and approved by a competent person prior to blinding.

7.8 Stormwater Disposal

The results of the infiltration tests carried out at two locations are included in Appendix D, Infiltration Test Results. The minimum measured permeabilities are greater than 7 m/day for the *in situ* sandy soils. We note that the tests were only carried out at a depth of about 0.5 m below the existing surface level.

We consider that sands at the site are suitable for on-site disposal of stormwater by infiltration using soakwells assuming that the site preparation requirements outlined in Section 7.3 have been carried out. Notwithstanding the results of the infiltration testing, we recommend a design value of permeability (k) not greater than 5 m/day for the in-situ sand to allow for the variability in materials and reduced permeability as a consequence of:

- densification of sand during site preparation works;
- natural variation in sands; and
- clogging of the sand around soakwells and soakage basins over time with fines.

If imported sand fill is proposed for use within the site, the permeability of this material will need to be separately assessed.

Soak wells should be placed outside a line of 1V:2H extending below the edge of the nearest footing, subject to local council regulations. Discharge from soak wells has been known to promote densification of loose sandy soils, leading to settlements of footings and slabs. Soak wells should be carefully wrapped with geotextile to prevent migration of sand and fines into the soak well.

8. CLOSURE

We draw your attention to Appendix F of this report, "Understanding your Report". The information provided within is intended to inform you as to what your realistic expectations of this report should be. Guidance is also provided on how to minimize risks associated with groundworks for this project. This information is provided not to reduce the level of responsibility accepted by Galt, but to ensure that all parties who rely on this report are aware of the responsibilities each assumes in so doing.

GALT GEOTECHNICS PTY LTD

Rick Piovesan CPEng

Geotechnical Engineer

Sean Coffey

Geotechnical Engineer

\\GALT-SBS2011\Data\Jobs\2016\J1601132 - Wave St Carnarvon\03 Correspondence\J1601132 001 R Rev0.docx

Figures

Legend

- Site Boundary
- Infiltration Test
- Test Pit

N

0 10 20 30 40 50
Meters

SCALE	1:1,000 (A3)
DRAWN	DAC
DATE DRAWN	2/08/2016
CHECKED	RP
DATE CHECKED	2/08/2016
PROJECTION	GDA 1994 MGA Zone 49

Galt Geotechnics Pty Ltd
ACN : 138 480 865
Tel : +61 (0)8 6272-0200
Fax : +61 (0)8 9285 8444
Address: U2, 38 Flynn Street, Wembley, WA, 6014

CLIENT	WAVE INTERNATIONAL
PROJECT	PROPOSED AGED CARE / LIFESTYLE VILLAGE
LOCATION	LOTS 1193, 1179 & 1147 DAVID BRAND DRIVE BROCKMAN PARK
TITLE	SITE & LOCATION PLAN

Job No	J1601132	Fig No FIGURE 1	Rev A

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Appendix A: Site Photographs

Photograph 1: Looking southwest from near the northern boundary of the site

Photograph 2: Looking east from near TP03

Photograph 3: Looking east from near TP10

Photograph 4: Looking north from near TP10

Photograph 5: Soakwell near the centre-west boundary of the site

Photograph 6: Looking west from near TP10

Appendix B: Test Pit Reports

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4/15 Walters Drive OSBORNE PARK WA 6017

ABN: 64 625 054 729

METHOD OF SOIL DESCRIPTION
BOREHOLE AND TEST PIT REPORTS

Galt GEOTECHNICS

GRAPHIC LOG & UNIFIED SOIL CLASSIFICATION SYSTEM (USCS) SYMBOLS

Graphic	USCS	Soil Name
		FILL (various types)
		COBBLES
		BOULDERS
	GP	GRAVEL (poorly graded)
	GW	GRAVEL (well graded)
	GC	Clayey GRAVEL
	SP	SAND (poorly graded)
	SW	SAND (well graded)
	SC	Clayey SAND

Graphic	USCS	Soil Name
	SM	Silty SAND
	ML	SILT (low liquid limit)
	MH	SILT (high liquid limit)
	CL	CLAY (low plasticity)
	CI	CLAY (medium plasticity)
	CH	CLAY (high plasticity)
	OL	Organic SILT (low liquid limit)
	OH	Organic SILT (high liquid limit)
	Pt	PEAT

RESISTANCE TO EXCAVATION

Symbol	Term	Description
VE	Very easy	All resistances are relative to the selected method of excavation
E	Easy	
F	Firm	
H	Hard	
VH	Very hard	

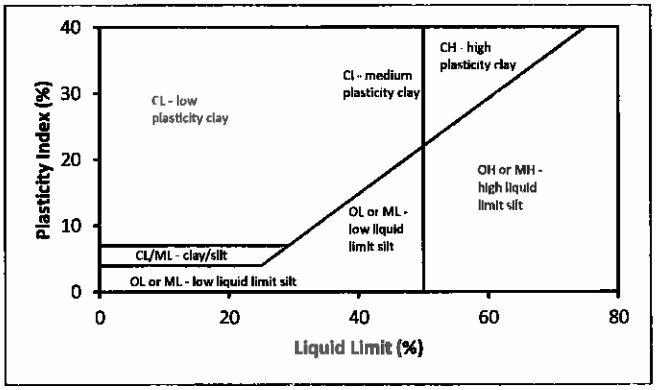
SOIL CLASSIFICATION AND INFERRED STRATIGRAPHY

Soil descriptions are based on AS1726-1993, Appendix A. Material properties are assessed in the field by visual/tactile methods in combination with field testing techniques (where used).

PARTICLE SIZE

Soil Name		Particle Size (mm)
BOULDERS		>200
COBBLES		63 to 200
GRAVEL	Coarse	20 to 63
	Medium	6 to 20
	Fine	2 to 6
SAND	Coarse	0.6 to 2.0
	Medium	0.2 to 0.6
	Fine	0.075 to 0.2
FINES	SILT	0.002 to 0.075
	CLAY	<0.002

PLASTICITY PROPERTIES



MOISTURE CONDITION

AS1726-1993

Symbol	Term	Description
D	Dry	Sands and gravels are free flowing. Clays and silts may be brittle or friable and powdery.
M	Moist	Soils are darker than in the dry condition and may feel cool. Sands and gravels tend to cohere.
W	Wet	Soils exude free water. Sands and gravels tend to cohere.

CONSISTENCY AND DENSITY

AS1726-1993 and HB160-2006

Symbol	Term	Undrained Shear Strength (kPa)	SPT "N"	DCP blows per 100 mm
VS	Very Soft	0 to 12	0 to 2	<1
S	Soft	12 to 25	2 to 4	<1
F	Firm	25 to 50	4 to 8	1 to 2
St	Stiff	50 to 100	8 to 15	3 to 4
VSt	Very Stiff	100 to 200	15 to 30	5 to 10
H	Hard	>200	>30	>10

Symbol	Term	Density Index (%)	SPT "N"	DCP blows per 100 mm	PSP Blows per 300 mm
VL	Very Loose	<15	0 to 4	<1	0 to 2
L	Loose	15 to 35	4 to 10	1 to 2	2 to 6
MD	Medium Dense	35 to 65	10 to 30	2 to 3	6 to 8
D	Dense	65 to 85	30 to 50	4 to 8	8 to 15
VD	Very Dense	>85	>50	>8	>15

Note: PSP correlations only valid to 450 mm depth

Consistency and density may also be inferred from excavation performance and material behaviour.

EXPLANATORY NOTES TO BE READ WITH BOREHOLE AND TEST PIT REPORTS

Galt GEOTECHNICS

METHOD OF DRILLING OR EXCAVATION

AC	Air Core	E	Excavator	PQ3	PQ3 Core Barrel
AD/T	Auger Drilling with TC-Bit	EH	Excavator with Hammer	PT	Push Tube
AD/V	Auger Drilling with V-Bit	HA	Hand Auger	R	Ripper
AT	Air Track	HMLC	HMLC Core Barrel	RR	Rock Roller
B	Bulldozer Blade	HQ3	HQ3 Core Barrel	SON	Sonic Rig
BH	Backhoe Bucket	N	Natural Exposure	SPT	Driven SPT
CT	Cable Tool	NMLC	NMLC Core Barrel	WB	Washbore
DT	Diatube	PP	Push Probe	X	Existing Excavation

SUPPORT

T	Timbering

PENETRATION EFFORT (RELATIVE TO THE EQUIPMENT USED)

VE	Very Easy	E	Easy	F	Firm
H	Hard	VH	Very Hard		

WATER

►	Water Inflow	▼	Water Level
◄	Water Loss (complete)		
◁	Water Loss (partial)		

SAMPLING AND TESTING

B	Bulk Disturbed Sample	P	Piston Sample
BLK	Block Sample	PBT	Plate Bearing Test
C	Core Sample	U	Undisturbed Push-in Sample
CBR	CBR Mould Sample		U50: 50 mm diameter
D	Small Disturbed Sample	SPT	Standard Penetration Test
ES	Environmental Soil Sample		Example: 3, 4, 5 N=9
EW	Environmental Water Sample		3,4,5: Blows per 150 mm
G	Gas Sample		N=9: Blows per 300 mm after
HP	Hand Penetrometer		150 mm seating interval
LB	Large Bulk Disturbed Sample	VS	Vane Shear; P = Peak
M	Mazier Type Sample		R = Remoulded (kPa)
MC	Moisture Content Sample	W	Water Sample

ROCK CORE RECOVERY

TCR = Total Core Recovery (%) $= \frac{CRL}{TCL} \times 100$

SCR = Solid Core Recovery (%) $= \frac{CCR}{TCL} \times 100$

RQD = Rock Quality Designation (%) $= \frac{ALC>100}{TCL} \times 100$

TCL	Length of Core Run
CRL	Recovered Length of Core
CCR	Total Length of Cylindrical Pieces of Core Recovered
ALC>100	Total Length of Axial Lengths of Core Greater than 100 mm Long

TEST PIT: TP01

Sheet 1 OF 1

Job Number:	J1601132	**Contractor:**	Northwest Solutions	**Date:**	13/07/2016
Client:	Wave International	**Machine:**	Takeuchi TB153FR	**Logged:**	SC
Project:	Proposed Aged Care/Lifestyle Village	**Operator:**	Ash	**Checked Date:**	02/08/2016
Location:	David Brand Drive, Brockman Park, Carnarvon	**Bucket:**	600 mm toothed	**Checked By:**	RP

Excavation					Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
E	F		0.0					SP	FILL: SAND, fine to coarse grained, sub-angular to sub-rounded, brown, trace fines, trace rootlets, trace organics	M	L	
			0.5						No rootlets, no organics		D	
			1.0									
			1.5						Trace shell fragments			
	H		2.0					CH	CLAY: high plasticity, grey, with some 20-30% fine to medium grained sand, trace fine shell fragments	W	St	
			2.5									
			3.0						Hole terminated at 3.00 m Target depth Groundwater not encountered			
			3.5									

Sketch & Other Observations

Comments:

See Explanatory Notes and Method of Soil Description sheets for details of abbreviations and basis of descriptions

TEST PIT: TP02

Sheet 1 OF 1

Job Number:	J1601132	**Contractor:**	Northwest Solutions	**Date:**	13/07/2016
Client:	Wave International	**Machine:**	Takeuchi TB153FR	**Logged:**	SC
Project:	Proposed Aged Care/Lifestyle Village	**Operator:**	Ash	**Checked Date:**	02/08/2016
Location:	David Brand Drive, Brockman Park, Carnarvon	**Bucket:**	600 mm toothed	**Checked By:**	RP

Excavation					Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
E	F	▼	0.0					SP	FILL: SAND, fine to coarse grained, sub-angular to sub-rounded, brown, trace fines, trace rootlets, trace organics	M	MD	
			0.5						Becoming dark grey, no rootlets, no organics			
			1.0						Trace shell fragments			
			1.5						With some localised high plasticity clayey pockets			
			2.0					CH	CLAY: high plasticity, dark grey, with some 20-30% fine to medium grained sand	W	VSt	Sidewall collapse below 1.8 m
			2.5						Hole terminated at 2.10 m Collapse due to groundwater Groundwater encountered at 1.8 m			
			3.0									
			3.5									

Sketch & Other Observations

Comments:

See Explanatory Notes and Method of Soil Description sheets for details of abbreviations and basis of descriptions

TEST PIT: TP03

Sheet 1 OF 1

Job Number:	J1601132	**Contractor:**	Northwest Solutions	**Date:**	13/07/2016
Client:	Wave International	**Machine:**	Takeuchi TB153FR	**Logged:**	SC
Project:	Proposed Aged Care/Lifestyle Village	**Operator:**	Ash	**Checked Date:**	02/08/2016
Location:	David Brand Drive, Brockman Park, Carnarvon	**Bucket:**	600 mm toothed	**Checked By:**	RP

Excavation					Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
E	F		0.0					SP	FILL: SAND, fine to coarse grained, sub-angular to sub-rounded, brown, trace fines, trace rootlets, trace organics	M	MD	
			0.5						Becoming pale brown, no rootlets, no organics			
			1.0						Trace cemented clayey sand pockets			
			1.5									Sidewall collapse below 1.5 m
			2.0					CH	CLAY: high plasticity, dark grey, trace fine to coarse grained sand, trace shell fragments	W	St	
									Becoming silty			
			2.5						Hole terminated at 2.50 m Target depth Groundwater encountered at 2.3 m			
			3.0									
			3.5									

Sketch & Other Observations

Comments:

See Explanatory Notes and Method of Soil Description sheets for details of abbreviations and basis of descriptions

TEST PIT: TP04

Sheet 1 OF 1

Job Number:	J1601132	**Contractor:**	Northwest Solutions	**Date:**	13/07/2016
Client:	Wave International	**Machine:**	Takeuchi TB153FR	**Logged:**	SC
Project:	Proposed Aged Care/Lifestyle Village	**Operator:**	Ash	**Checked Date:**	02/08/2016
Location:	David Brand Drive, Brockman Park, Carnarvon	**Bucket:**	600 mm toothed	**Checked By:**	RP

Excavation					Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
E	E		0.0					SP	FILL: SAND, fine to coarse grained, sub-angular to sub-rounded, brown, trace fines, trace rootlets, trace organics	M	D	
E	F		0.5									
E	F		1.0									
E	F		1.5									Sidewall collapse below 1.5 m
E	H	▼	2.0					CH	CLAY: medium to high plasticity, dark grey, with some 20-30% fine to coarse grained sand, trace shell fragments	W	St	
E	H	▼	2.5					CH	Trace sand	W	St	
E	H	▼	3.0						Hole terminated at 3.00 m Target depth Groundwater encountered at 2.6 m			
			3.5									

Sketch & Other Observations

Comments:

See Explanatory Notes and Method of Soil Description sheets for details of abbreviations and basis of descriptions

TEST PIT: TP05

Sheet 1 OF 1

Job Number:	J1601132	**Contractor:**	Northwest Solutions	**Date:**	13/07/2016
Client:	Wave International	**Machine:**	Takeuchi TB153FR	**Logged:**	SC
Project:	Proposed Aged Care/Lifestyle Village	**Operator:**	Ash	**Checked Date:**	02/08/2016
Location:	David Brand Drive, Brockman Park, Carnarvon	**Bucket:**	600 mm toothed	**Checked By:**	RP

Excavation					Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
E	E		0.0					SP	FILL: SAND, fine to coarse grained, sub-angular to sub-rounded, brown, trace fines, trace rootlets, trace clay clods (30 mm in diameter)	M	D	
			0.5									
			1.0					CI-CH	CLAY: medium to high plasticity, dark grey, with some fine to medium grained sand			
	F		1.5							W	VSt	
		▼	2.0						Increasing sand content, becoming Sandy CLAY/Clayey SAND			
			2.5						Hole terminated at 2.50 m Target depth Groundwater encountered at 2.1 m			
			3.0									
			3.5									

Sketch & Other Observations

Comments:

See Explanatory Notes and Method of Soil Description sheets for details of abbreviations and basis of descriptions

TEST PIT: TP06

Sheet 1 OF 1

Job Number:	J1601132	**Contractor:**	Northwest Solutions	**Date:**	13/07/2016
Client:	Wave International	**Machine:**	Takeuchi TB153FR	**Logged:**	SC
Project:	Proposed Aged Care/Lifestyle Village	**Operator:**	Ash	**Checked Date:**	02/08/2016
Location:	David Brand Drive, Brockman Park, Carnarvon	**Bucket:**	600 mm toothed	**Checked By:**	RP

Excavation					Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
E	H		0.0					SP	FILL: SAND, fine to coarse grained, sub-angular to sub-rounded, brown, trace fines, trace rootlets	M	D	
	F		0.5						No rootlets, trace small clay clods			
	H		1.0					CH	CLAY: medium to high plasticity, dark grey, trace fine to medium grained sand, trace shell fragments	W	VSt	
			2.0									
			2.5									
			3.0						Hole terminated at 3.00 m Target depth Groundwater not encountered			
			3.5									

Sketch & Other Observations

Comments:

See Explanatory Notes and Method of Soil Description sheets for details of abbreviations and basis of descriptions

TEST PIT: TP07

Sheet 1 OF 1

Job Number: J1601132	**Contractor:** Northwest Solutions	**Date:**	13/07/2016
Client: Wave International	**Machine:** Takeuchi TB153FR	**Logged:**	SC
Project: Proposed Aged Care/Lifestyle Village	**Operator:** Ash	**Checked Date:**	02/08/2016
Location: David Brand Drive, Brockman Park, Carnarvon	**Bucket:** 600 mm toothed	**Checked By:**	RP

Excavation					Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
E	F		0.0					SP	FILL: SAND, fine to coarse grained, sub-angular to sub-rounded, brown, trace shell fragments, trace fines, trace rootlets	M	MD	Roots (20 mm diameter) through test pit
			0.5						No rootlets			
	H		1.2					CL-CI	CLAY: low becoming medium plasticity, dark grey, with some fine to medium grained sand, trace shell fragments		St	
			2.70						Hole terminated at 2.70 m Target depth Groundwater not encountered			

Sketch & Other Observations

Comments:

See Explanatory Notes and Method of Soil Description sheets for details of abbreviations and basis of descriptions

TEST PIT: TP08

Sheet 1 OF 1

Job Number:	J1601132	**Contractor:**	Northwest Solutions	**Date:**	13/07/2016
Client:	Wave International	**Machine:**	Takeuchi TB153FR	**Logged:**	SC
Project:	Proposed Aged Care/Lifestyle Village	**Operator:**	Ash	**Checked Date:**	02/08/2016
Location:	David Brand Drive, Brockman Park, Carnarvon	**Bucket:**	600 mm toothed	**Checked By:**	RP

Excavation					Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
E	E		0.0						FILL: SAND, fine to coarse grained, sub-angular to sub-rounded, brown, trace shell fragments, trace rootlets	M		Reticulation pipe damaged
	F		0.5						No rootlets			
			1.0					SP	Trace clay clods (80 mm diameter max)	W	MD	
			1.5									
			2.0					CH	CLAY: medium to high plasticity, dark grey, trace fine to medium grained sand, trace shell fragments			
			2.5						Hole terminated at 2.50 m Target depth Groundwater not encountered			
			3.0									
			3.5									

Sketch & Other Observations

Comments:

See Explanatory Notes and Method of Soil Description sheets for details of abbreviations and basis of descriptions

TEST PIT: TP09

Sheet 1 OF 1

Job Number:	J1601132	**Contractor:**	Northwest Solutions	**Date:**	13/07/2016
Client:	Wave International	**Machine:**	Takeuchi TB153FR	**Logged:**	SC
Project:	Proposed Aged Care/Lifestyle Village	**Operator:**	Ash	**Checked Date:**	02/08/2016
Location:	David Brand Drive, Brockman Park, Carnarvon	**Bucket:**	600 mm toothed	**Checked By:**	RP

Excavation					Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
E	F		0.0					SP	FILL: SAND, fine to coarse grained, sub-angular to sub-rounded, brown, trace fines, trace rootlets	M	MD	
			0.5						No rootlets			
			1.0						With some clay pockets			
			1.5					CL-CI	CLAY: low to medium plasticity, dark grey, with some fine to medium grained sand, trace shell fragments		St	
			2.0									
			2.5									
			3.0						Hole terminated at 2.90 m Collapse below about 2 m Groundwater not encountered			
			3.5									

Sketch & Other Observations

Comments:

See Explanatory Notes and Method of Soil Description sheets for details of abbreviations and basis of descriptions

TEST PIT: TP10

Sheet 1 OF 1

Job Number:	J1601132	**Contractor:**	Northwest Solutions	**Date:**	13/07/2016
Client:	Wave International	**Machine:**	Takeuchi TB153FR	**Logged:**	SC
Project:	Proposed Aged Care/Lifestyle Village	**Operator:**	Ash	**Checked Date:**	02/08/2016
Location:	David Brand Drive, Brockman Park, Carnarvon	**Bucket:**	600 mm toothed	**Checked By:**	RP

Excavation					Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
	F		0.0					SP	FILL: SAND, fine to coarse grained, sub-angular to sub-rounded, brown, trace fines, trace rootlets		MD	
			0.5						No rootlets			Inclusions of mixed waste: plastic bottle, batteries, plastic and metal cans
			1.0						Trace clay clods (80 mm diameter max)		D	
E	H		1.5					CI-CH	CLAY: medium to high plasticity, dark grey, trace fine to medium grained sand, trace shell fragments	M		
	F		2.0					SC	Clayey SAND: fine to coarse grained, sub-angular to sub-rounded, red-brown, 40-50% medium plasticity fines		St	
			2.5									
			3.0						Hole terminated at 3.00 m Target depth Groundwater not encountered			
			3.5									

Sketch & Other Observations

Comments:

See Explanatory Notes and Method of Soil Description sheets for details of abbreviations and basis of descriptions

Appendix C: DCP Test Results

www.galtgeo.com.au
4/15 Walters Drive OSBORNE PARK WA 6017

ABN: 64 625 054 729

DYNAMIC CONE PENETROMETER FIELD TEST DATA
(AS 1289.6.3.2)

Client:	Wave International	**Job No:**	J1601132
Project:	Proposed Aged Care / Lifestyle Village	**Date:**	13/07/2016
Location:	David Brand Drive, Brockman Park, Carnarvon	**Engineer:**	SC

Test No:									
Location:	TP01	TP02	TP03	TP04	TP05	TP06	TP07	TP08	TP09
Depth (mm)	**No of Penetrometer Blows per 100 mm Depth Interval**								
0-100	-	-	-	-	-	-	-	-	-
100-200	1	4	2	2	3	2	4	1	4
200-300	1	4	4	5	4	3	4	2	5
300-400	3	8	6	5	7	3	3	2	3
400-500	3	9	4	7	7	4	4	3	3
500-600	4	9	5	7	5	6	5	3	2
600-700	5	5	7	6	7	5	4	5	4
700-800	7	4	6	4	7	4	2	7	5
800-900	9	4	6	4	6	4	4	5	6
900-1000	8	5							
1000-1100	5	7							
1100-1200	6	5							
1200-1300	6	6							
1300-1400	7	6							
1400-1500	5	9							
1500-1600	4	6							
1600-1700	4	5							
1700-1800	3	5							
1800-1900	5	5							

Test No:									
Location:	TP10								
Depth (mm)	**No of Penetrometer Blows per 100 mm Depth Interval**								
0-100	-								
100-200	2								
200-300	4								
300-400	5								
400-500	5								
500-600	6								
600-700	5								
700-800	5								
800-900	7								
900-1000									
1000-1100									
1100-1200									
1200-1300									
1300-1400									
1400-1500									
1500-1600									
1600-1700									
1700-1800									

Dynamic Cone Penetrometer tests done in accordance with AS 1289.6.3.2
HB: Hammer bounce (refusal)
0 = Penetration due to hammer weight only
R: Refusal

Appendix D: Infiltration Test Results

www.galtgeo.com.au
4/15 Walters Drive OSBORNE PARK WA 6017

ABN: 64 625 054 729

Permeability Calculation - Inverse Auger Hole Method

Galt Geotechnics	Spreadsheet author:	ORW	17-Oct-09

Job No:	J1601132
Client:	Wave International
Site:	Brockman Park
Location:	Carnarvon
Calc by:	SC
BH Name:	IT01
Test Depth:	0.51 m

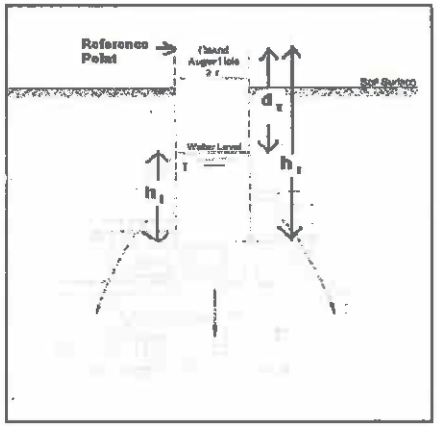
$$K = 1.15r\frac{\log_{10}(h_0 + \frac{1}{2}r) - \log_{10}(h_t + \frac{1}{2}r)}{t - t_0}$$

REFERENCE: Cocks, G. *Disposal of Stormwater Runoff by Soakage in Perth Western Australia*, Journal and News of the Australian Geomechanics Society, Volume 42 No 3 September 2007, pp101-114

Spreadsheet Legend

	Required input
	Calculated field
	Comment field
	Field not used
	Fixed field

Parameter	Description	Value	Units
K	Permeability		m/s
r	radius of test hole	0.03	m
t	time since start of measurement		s
h_r	reference point height above base	0.6	m
d_t	depth from reference point to water at time t		m
h_t	Water column height at time t		m
h_0	h_t at t=0		m



Test 1

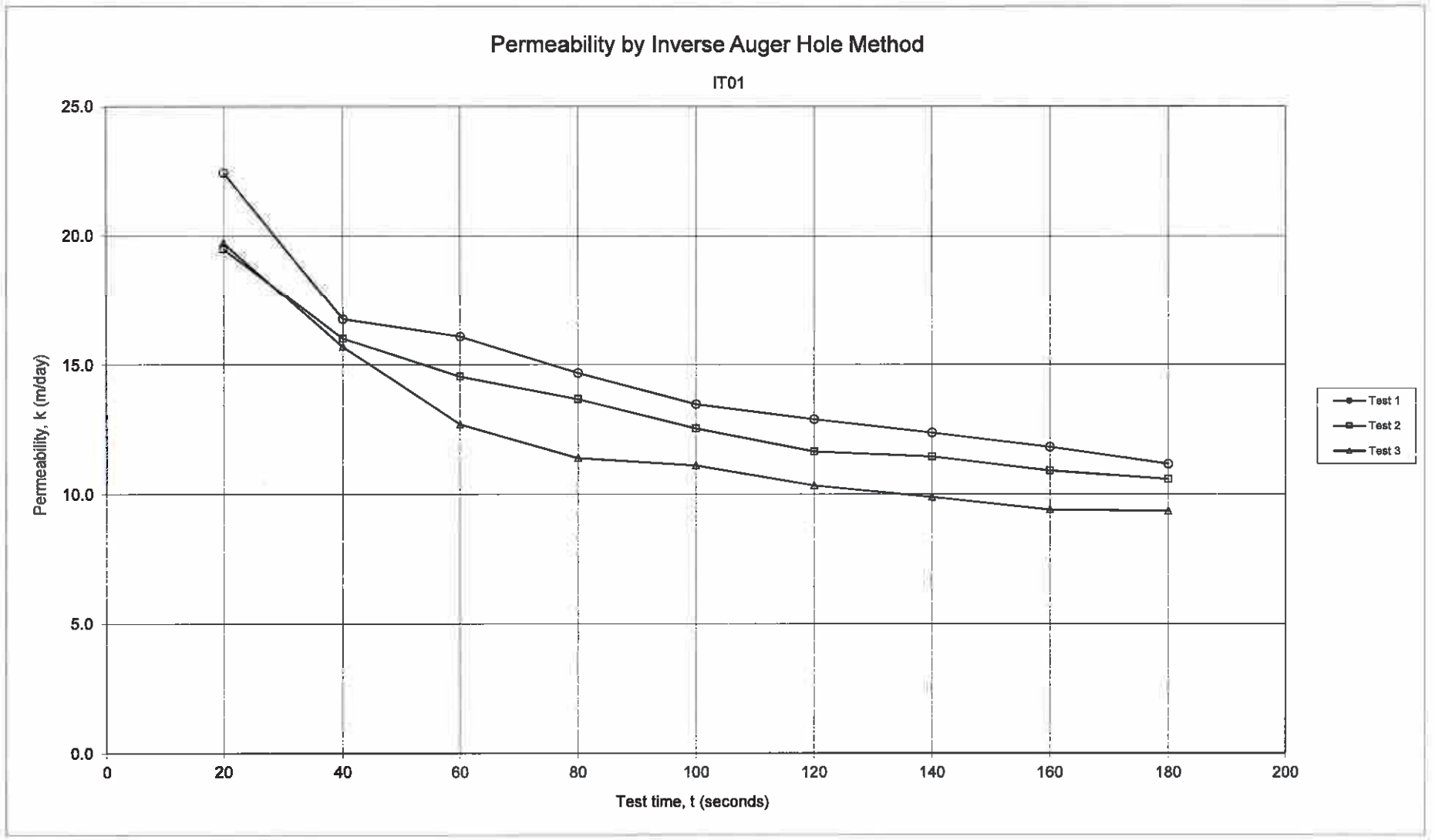
t (s)	d_w (m)	h_t (m)	K (m/s)	K (m/day)
0	0.12	0.48		
20	0.265	0.335	2.6E-04	22.4
40	0.32	0.28	1.9E-04	16.8
60	0.38	0.22	1.9E-04	16.1
80	0.415	0.185	1.7E-04	14.7
100	0.44	0.16	1.6E-04	13.5
120	0.465	0.135	1.5E-04	12.9
140	0.485	0.115	1.4E-04	12.4
160	0.5	0.1	1.4E-04	11.8
180	0.51	0.09	1.3E-04	11.2
		AVERAGE	1.7E-04	14.6

Test 2

t (s)	d_w (m)	h_t (m)	K (m/s)	K (m/day)
0	0.115	0.485		
20	0.245	0.355	2.3E-04	19.5
40	0.31	0.29	1.9E-04	16.0
60	0.36	0.24	1.7E-04	14.5
80	0.4	0.2	1.6E-04	13.7
100	0.425	0.175	1.4E-04	12.5
120	0.445	0.155	1.3E-04	11.6
140	0.47	0.13	1.3E-04	11.4
160	0.485	0.115	1.3E-04	10.9
180	0.5	0.1	1.2E-04	10.6
		AVERAGE	1.6E-04	13.4

Test 3

t (s)	d_w (m)	h_t (m)	K (m/s)	K (m/day)
0	0.12	0.48		
20	0.25	0.35	2.3E-04	19.7
40	0.31	0.29	1.8E-04	15.7
60	0.34	0.26	1.5E-04	12.7
80	0.37	0.23	1.3E-04	11.4
100	0.405	0.195	1.3E-04	11.1
120	0.425	0.175	1.2E-04	10.3
140	0.445	0.155	1.1E-04	9.9
160	0.46	0.14	1.1E-04	9.4
180	0.48	0.12	1.1E-04	9.3
		AVERAGE	1.4E-04	12.2



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Permeability Calculation - Inverse Auger Hole Method

Galt Geotechnics

Spreadsheet author:	ORW	17-Oct-09	

Job No:	J1601132
Client:	Wave International
Site:	Brockman Park
Location:	Carnarvon
Calc by:	SC
BH Name:	IT02
Test Depth:	0.5 m

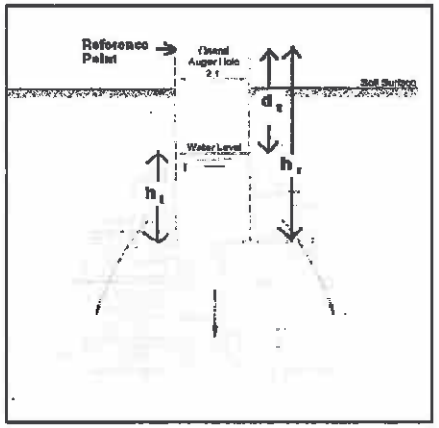
$$K = 1.15r\frac{\log_{10}(h_0 + \frac{1}{2}r) - \log_{10}(h_t + \frac{1}{2}r)}{t - t_0}$$

REFERENCE: Cocks, G. *Disposal of Stormwater Runoff by Soakage in Perth Western Australia*, Journal and News of the Australian Geomechanics Society, Volume 42 No 3 September 2007, pp101-114

Spreadsheet Legend

	Required input
	Calculated field
	Comment field
X	Field not used
	Fixed field

Parameter	Description	Value	Units
K	Permeability	X	m/s
r	radius of test hole	0.03	m
t	time since start of measurement	X	s
h_r	reference point height above base	0.6	m
d_t	depth from reference point to water at time t	X	m
h_t	Water column height at time t	X	m
h_0	h_t at t=0	X	m



Test 1

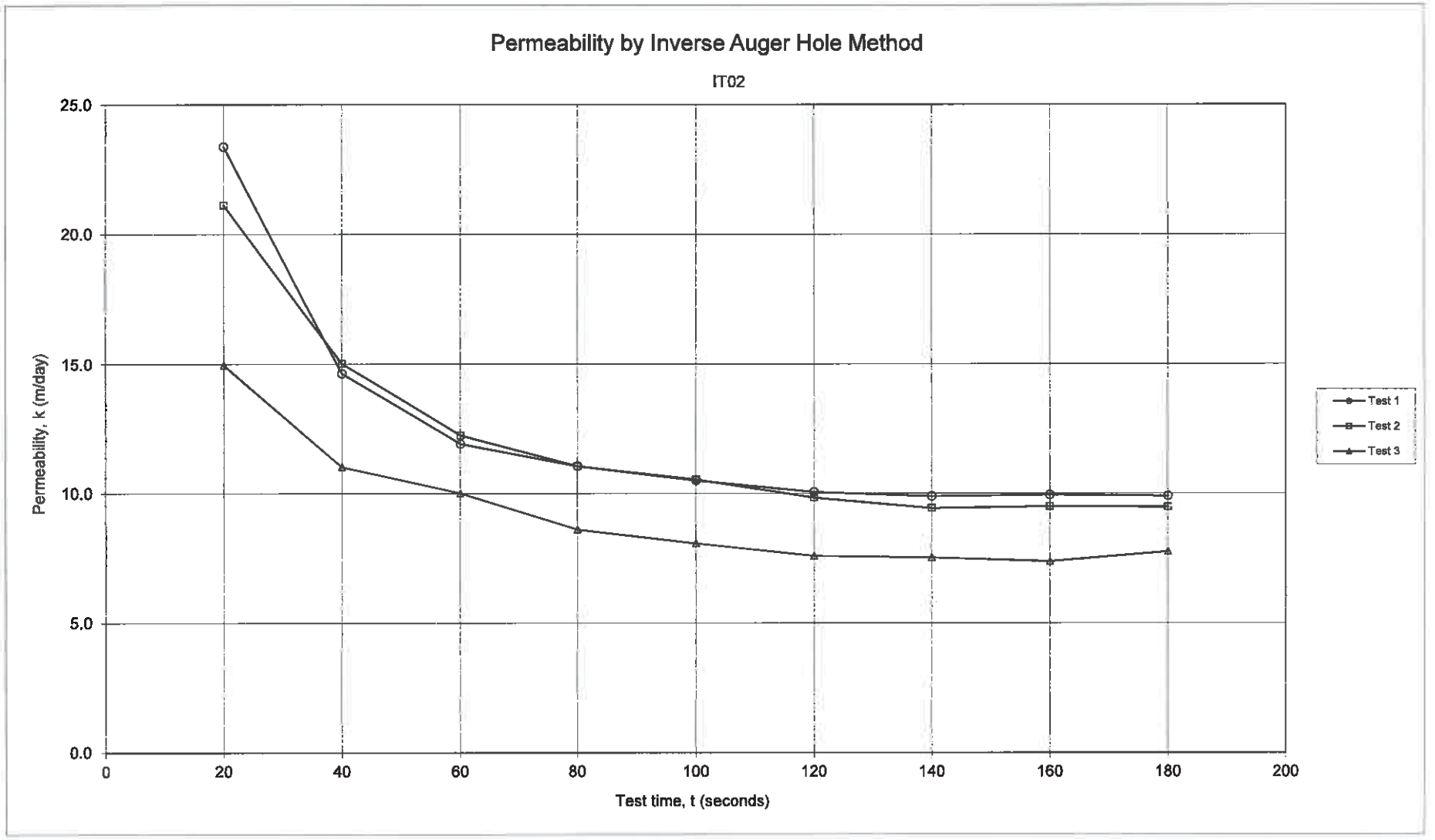
t (s)	d_w (m)	h_t (m)	K (m/s)	K (m/day)
0	0.12	0.48	X	X
20	0.27	0.33	2.7E-04	23.4
40	0.3	0.3	1.7E-04	14.6
60	0.33	0.27	1.4E-04	11.9
80	0.365	0.235	1.3E-04	11.1
100	0.395	0.205	1.2E-04	10.5
120	0.42	0.18	1.2E-04	10.0
140	0.445	0.155	1.1E-04	9.9
160	0.47	0.13	1.1E-04	9.9
180	0.49	0.11	1.1E-04	9.9
		AVERAGE	1.4E-04	12.4

Test 2

t (s)	d_w (m)	h_t (m)	K (m/s)	K (m/day)
0	0.13	0.47	X	X
20	0.265	0.335	2.4E-04	21.1
40	0.31	0.29	1.7E-04	15.0
60	0.34	0.26	1.4E-04	12.2
80	0.37	0.23	1.3E-04	11.1
100	0.4	0.2	1.2E-04	10.5
120	0.42	0.18	1.1E-04	9.8
140	0.44	0.16	1.1E-04	9.4
160	0.465	0.135	1.1E-04	9.5
180	0.485	0.115	1.1E-04	9.5
		AVERAGE	1.4E-04	12.0

Test 3

t (s)	d_w (m)	h_t (m)	K (m/s)	K (m/day)
0	0.13	0.47	X	X
20	0.23	0.37	1.7E-04	14.9
40	0.27	0.33	1.3E-04	11.0
60	0.31	0.29	1.2E-04	10.0
80	0.33	0.27	1.0E-04	8.6
100	0.355	0.245	9.3E-05	8.1
120	0.375	0.225	8.8E-05	7.6
140	0.4	0.2	8.7E-05	7.5
160	0.42	0.18	8.5E-05	7.4
180	0.45	0.15	9.0E-05	7.8
		AVERAGE	1.1E-04	9.2



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Permeability Calculation - Inverse Auger Hole Method

Galt Geotechnics

Job No:	J1601132
Client:	Wave International
Site:	Brockman Park
Location:	Carnarvon
Calc by:	SC
BH Name:	IT03
Test Depth:	0.55 m

Spreadsheet author:	ORW	17-Oct-09

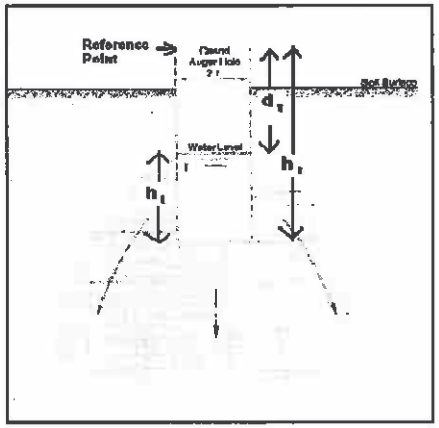
$$K = 1.15r\frac{\log_{10}(h_0 + \frac{1}{2}r) - \log_{10}(h_t + \frac{1}{2}r)}{t - t_0}$$

REFERENCE: Cocks, G. *Disposal of Stormwater Runoff by Soakage in Perth Western Australia*, Journal and News of the Australian Geomechanics Society, Volume 42 No 3 September 2007, pp101-114

Spreadsheet Legend

	Required input
	Calculated field
	Comment field
X	Field not used
	Fixed field

Parameter	Description	Value	Units
K	Permeability	X	m/s
r	radius of test hole	0.03	m
t	time since start of measurement	X	s
h_r	reference point height above base	0.6	m
d_t	depth from reference point to water at time t	X	m
h_t	Water column height at time t	X	m
h_0	h_t at t=0	X	m



Test 1

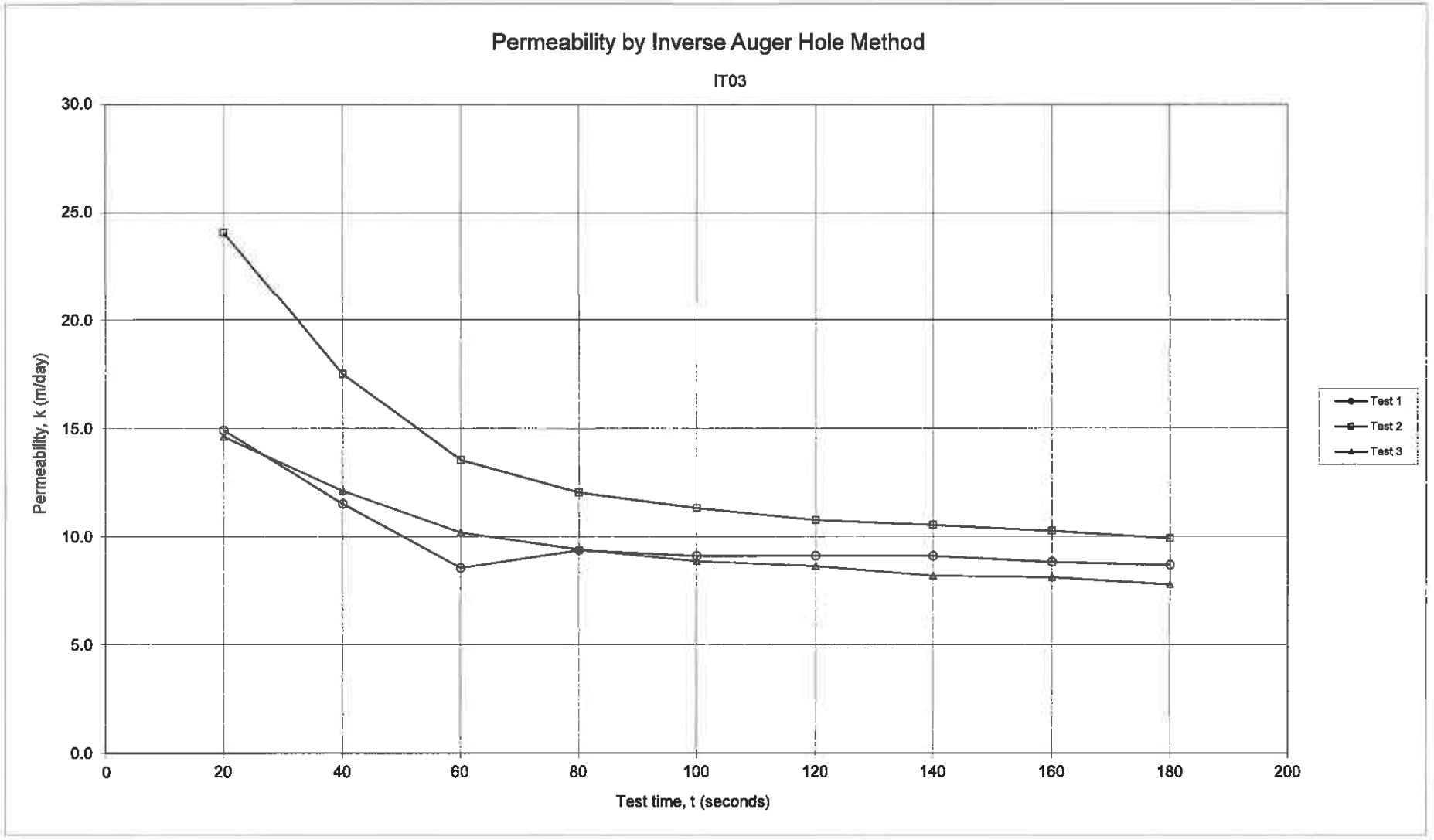
t (s)	d_w (m)	h_t (m)	K (m/s)	K (m/day)
0	0.08	0.52	X	X
20	0.19	0.41	1.7E-04	14.9
40	0.24	0.36	1.3E-04	11.5
60	0.255	0.345	9.9E-05	8.5
80	0.315	0.285	1.1E-04	9.4
100	0.35	0.25	1.1E-04	9.1
120	0.385	0.215	1.1E-04	9.1
140	0.415	0.185	1.1E-04	9.1
160	0.435	0.165	1.0E-04	8.8
180	0.455	0.145	1.0E-04	8.7
		AVERAGE	1.1E-04	9.9

Test 2

t (s)	d_w (m)	h_t (m)	K (m/s)	K (m/day)
0	0.1	0.5	X	X
20	0.26	0.34	2.8E-04	24.1
40	0.315	0.285	2.0E-04	17.5
60	0.34	0.26	1.6E-04	13.5
80	0.37	0.23	1.4E-04	12.0
100	0.4	0.2	1.3E-04	11.3
120	0.425	0.175	1.2E-04	10.8
140	0.45	0.15	1.2E-04	10.5
160	0.47	0.13	1.2E-04	10.3
180	0.485	0.115	1.1E-04	9.9
		AVERAGE	1.5E-04	13.3

Test 3

t (s)	d_w (m)	h_t (m)	K (m/s)	K (m/day)
0	0.07	0.53	X	X
20	0.18	0.42	1.7E-04	14.6
40	0.24	0.36	1.4E-04	12.1
60	0.275	0.325	1.2E-04	10.2
80	0.31	0.29	1.1E-04	9.4
100	0.34	0.26	1.0E-04	8.9
120	0.37	0.23	1.0E-04	8.6
140	0.39	0.21	9.5E-05	8.2
160	0.415	0.185	9.4E-05	8.1
180	0.43	0.17	9.0E-05	7.8
		AVERAGE	1.1E-04	9.8



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Appendix E: Laboratory Test Results

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4/15 Walters Drive OSBORNE PARK WA 6017

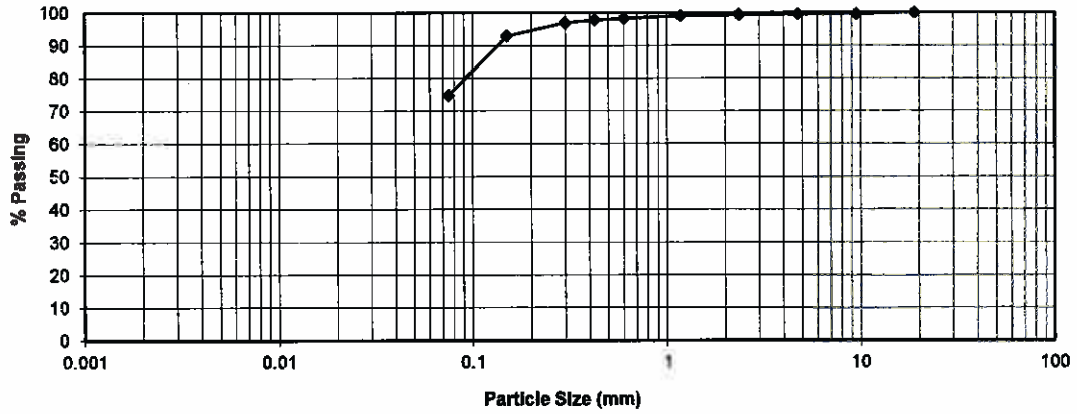
ABN: 64 625 054 729

Particle Size Distribution & Plasticity Index tests

Mining & Civil
Geotest Pty Ltd

9 Lerista Court, Bibra Lake WA 6164
Ph: (08) 9418 1873 Mob: 0412 427 245
Email:craig@mcgeotest.com.au

Job No:	**60083**
Report No:	**60083-P16/2031**
Sample No:	**P16/2031**
Issue Date:	**22-Jul-16**
Client:	Galt Geotechnics J1601132
Project:	Wave International - Proposed Aged Care Facility
Location:	Brockman Park, Carnarvon
Sample Details	TP07-01
Sample Depth (m):	1.2



SIEVE ANALYSIS AS1289.3.6.1

Sieve Size (mm)	% Passing
75.0	
37.5	
19.0	100
9.5	100
4.75	99
2.36	99
1.18	99
0.600	98
0.425	98
0.300	97
0.150	93
0.075	75

Plasticity index tests
AS 1289

Liquid Limit 3.9.2	29	%
Plastic Limit 3.2.1	20	%
Plasticity Index 3.3.1	9	%
Linear Shrinkage 3.4.1	3.0	%

Cracked ☐

Curled ☐

Client Address: U 2 39 FLYNN Street, Perth Western Australia 6014

Sampling Procedure: Tested as received

Notes:

NATA
WORLD RECOGNISED ACCREDITATION

Approved signature

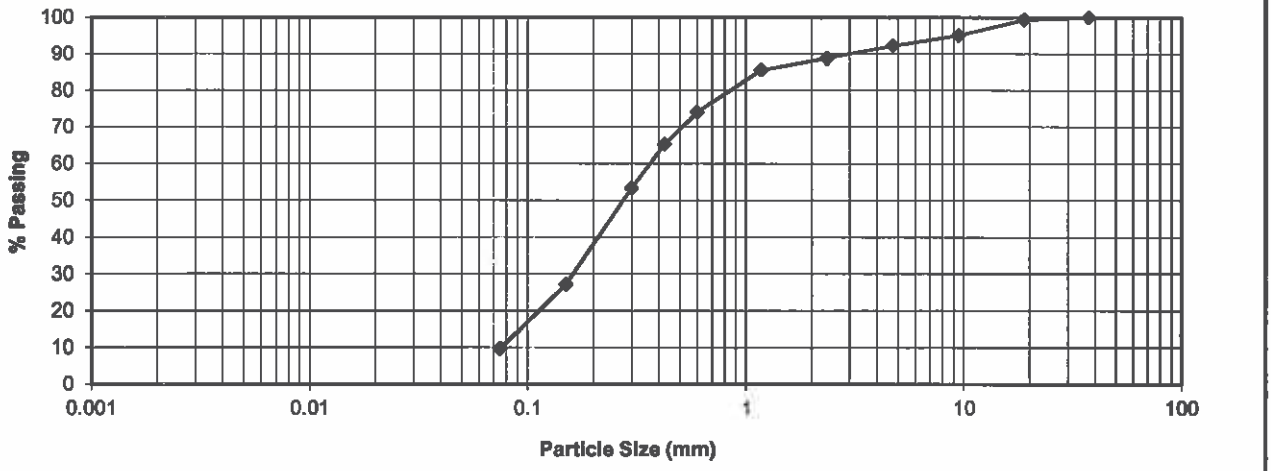
Kevin Jones

Particle Size Distribution & Plasticity Index tests

Mining & Civil
Geotest Pty Ltd

9 Lerista Court, Bibra Lake WA 6164
Ph: (08) 9418 1873 Mob: 0412 427 245
Email:craig@mcgeotest.com.au

Job No:	60083
Report No:	60083-P16/2032
Sample No:	P16/2032
Issue Date:	22-Jul-16
Client:	Galt Geotechnics J1601132
Project:	Wave International - Proposed Aged Care Facility
Location:	Brockman Park, Carnarvon
Sample Details	TP09-01
Sample Depth (m):	0.7



SIEVE ANALYSIS AS1289.3.6.1

Sieve Size (mm)	% Passing
75.0	
37.5	100
19.0	99
9.5	95
4.75	92
2.36	89
1.18	86
0.600	74
0.425	65
0.300	53
0.150	27
0.075	10

Plasticity index tests
AS 1289

Liquid Limit 3.9.2	NO	%
Plastic Limit 3.2.1	NP	%
Plasticity Index 3.3.1	NP	%
Linear Shrinkage 3.4.1 *	0.0*	%

N/O = Not Obtainable

N/P = Non Plastic

***= Non Standard Test as Liquid Limit was not Determined**

Client Address: U 2 39 FLYNN Street, Perth Western Australia 6014
Notes:

Sampling Procedure: Tested as received

Approved signature

Kevin Jones

Appendix F: Understanding Your Report

www.galtgeo.com.au
4/15 Walters Drive OSBORNE PARK WA 6017

ABN: 64 625 054 729

UNDERSTANDING YOUR REPORT

GALT FORM PMP11 Rev2

1. EXPECTATIONS OF THE REPORT

This document has been prepared to clarify what is and is not provided in your report. It is intended to inform you of what your realistic expectations of this report should be and how to manage your risks associated with the conditions on site.

Geotechnical engineering and environmental science are less exact than other engineering and scientific disciplines. We include this information to help you understand where our responsibilities begin and end. You should read and understand this information. Please contact us if you do not understand the report or this explanation. We have extensive experience in a wide variety of projects and we can help you to manage your risk.

2. THIS REPORT RELATES TO PROJECT-SPECIFIC CONDITIONS

This report was developed for a unique set of project-specific conditions to meet the needs of the nominated client. It took into account the following:

- the project objectives as we understood them and as described in this report;
- the specific site mentioned in this report; and
- the current and proposed development at the site.

It should not be used for any purpose other than that indicated in the report. You should not rely on this report if any of the following conditions apply:

- the report was not written for you;
- the report was not written for the site specific to your development;
- the report was not written for your project (including a development at the correct site but other than that listed in the report); or
- the report was written before significant changes occurred at the site (such as a development or a change in ground conditions).

You should always inform us of changes in the proposed project (including minor changes) and request an assessment of their impact.

Where we are not informed of developments relevant to your report, we cannot be held responsible or liable for problems that may arise as a consequence.

Where design is to be carried out by others using information provided by us, we recommend that we be involved in the design process by being engaged for consultation with other members of the project team. Furthermore, we recommend that we be able to review work produced by other members of the project team that relies on information provided in our report.

3. SOIL LOGS

Our reports often include logs of intrusive and non-intrusive investigation techniques. These logs are based on our interpretation of field data and laboratory results. The logs should only be read in conjunction with the report they were issued with and should not be re-drawn for inclusion in other documents not prepared by us.

4. THIRD PARTY RELIANCE

We have prepared this report for use by the client. This report must be regarded as confidential to the client and the client's professional advisors. We do not accept any responsibility for contents of this document from any party other than the nominated client. We take no responsibility for any damages suffered by a third party because of any decisions or actions they may make based on this report. Any reliance or decisions made by a third party based on this report are the responsibility of the third party and not of us.

5. CHANGE IN SUBSURFACE CONDITIONS

The recommendations in this report are based on the ground conditions that existed at the time when the study was undertaken. Changes in ground conditions can occur in numerous ways including anthropogenic events (such as construction or contaminating activities on or adjacent to the site) or natural events (such as floods, groundwater fluctuations or earthquakes). We should be consulted prior to use of this report so that we can comment on its reliability. It is important to note that where ground conditions have changed, additional sampling, testing or analysis may be required to fully assess the changed conditions.

6. SUBSURFACE CONDITIONS DURING CONSTRUCTION

Practical constraints mean that we cannot know every minute detail about the subsurface conditions at a particular site. We use professional judgement to form an opinion about the subsurface conditions at the site. Some variation to our evaluated conditions is likely and significant variation is possible. Accordingly, our report should not be considered as final as it is developed from professional judgement and opinion.

The most effective means of dealing with unanticipated ground conditions is to engage us for construction support. We can only finalise our recommendations by observing actual subsurface conditions encountered during construction. We cannot accept liability for a report's recommendations if we cannot observe construction.

7. ENVIRONMENTAL AND GEOTECHNICAL ISSUES

Unless specifically mentioned otherwise in our report, environmental considerations are not addressed in geotechnical reports. Similarly, geotechnical issues are not addressed in environmental reports. The investigation techniques used for geotechnical investigations can differ from those used for environmental investigations. It is the client's responsibility to satisfy themselves that geotechnical and environmental considerations have been taken into account for the site.

APPENDIX D
LOCAL WATER MANAGEMENT STRATEGY

Local Water Management Strategy to be inserted

wave international

DETERMINE • DESIGN • DELIVER

Brockman Park, Carnarvon

Local Water Management Strategy

Whelans

Rev A – January 2017

engineering asset management project delivery

306 Murray Street, Perth
Western Australia 6000
PO Box 7085, Cloisters Square
Western Australia 6904

t +61 (0)8 9204 0700
f +61 (0)8 9244 7311
e enquiries@waveinternational.com

Project Brief

Job Number	4323
Project	Brockman Park, Carnarvon Local Water Management Strategy
Client	Whelans
Client Contact	Greg Comiskey
Client Address	PO Box 99 Mount Hawthorn WA 6915

Document Status

Rev	Date	Description	By	Signed
A	January 2017	Draft for client review	KW	

DISCLAIMER

TABLE OF CONTENTS

LIST OF TABLES

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1 INTRODUCTION

1.1 Background

Wave International has been commissioned by Whelans to prepare a local water management strategy (LWMS) for Brockman Park in Carnarvon, which is proposed to be developed as an aged care precinct. This LWMS has been prepared to support a local structure plan over the site.

The Brockman Park site is located in the Brockman locality of the Carnarvon townsite, immediately to the west of the Carnarvon town centre. The site is currently used as public open space, and is bounded by Bibra Way to the west, David Brand Drive to the south, Olivia Terrace and an existing development to the east, and the remainder of the Brockman Park public open space to the north.

The Shire of Carnarvon has identified the Brockman Park site for the creation of an Aged Care / Lifestyle Village development, which would assist in accommodating the current shortage of aged care services in the Gascoyne region.

Figure 1.1 shows the site's location.

1.2 Proposed development

The Brockman Park site comprises Lots 1193, 1179 and 1147 David Brand Drive, Carnarvon. The site is approximately 2.1ha in area and is currently used as public open space, although the Shire of Carnarvon recently rezoned the land as Special Use: Aged Care under Town Planning Scheme No. 10.

There is a need for additional aged care in Carnarvon to provide for demand in the town and wider Gascoyne region, and the development of the Brockman Park site will go some way to alleviating the current shortfall. The Gascoyne Memorial Foundation development immediately east of Brockman Park is also currently constructing 15 independent living units (ILUs) in addition to the 35 units currently on the site, and there are plans for a 20-bed residential aged care facility at the nearby Carnarvon Hospital to be constructed in the coming years.

This LWMS has been prepared to support the local structure plan for the proposed development of the Brockman Park site. A concept plan has been prepared by SPH Architects, which comprises 1-bed and 2-bed ILUs, along with respite care suites, short-stay accommodation units and a café on the site.

Figure 1.2 shows the concept layout plan for the development site.

1.3 Design principles and objectives

There is no over-arching district water management strategy that sets out the design principles and objectives for this site, but the Western Australian Planning Commission's Better Urban Water Management framework and the Department of Water's guidelines for Developing a Local Water Management Strategy have informed the strategies and objectives for water sensitive urban design that are proposed for this development. The design principles and objectives are outlined in Table 1.1 below.

Table 1.1 - Design principles and objectives

Category	Design objectives	Design criteria	Section reference
Water conservation – potable and non-potable	Where alternative water sources are available, no potable water should be used outside of homes and building. Achieve efficient use of scheme water.	Consumption target for water of 100 kL/person/day, with an aspirational target of not more than 40-60 kL/person/day of scheme water.	To be achieved via waterwise fittings and appliances and planting water efficient gardens. Refer Section 3.
Water quantity management	Maintain post-development peak flows relative to pre-development conditions, unless otherwise established through determination of ecological water requirements for sensitive environments.	Ecological protection – for the critical 1-year ARI event, the post-development discharge volume and peak flow rates shall be maintained relative to pre-development conditions in all parts of the catchment. Flood management – manage the catchment runoff for up to the 100-year ARI event by directing flows to the POS corridor and into the Fascine waterway opposite the site.	Bioretention areas to be used to retain and infiltrate runoff from 1yr 1hr ARI storm event for ecological protection. When the capacity of bioretention treatment areas are exceeded, the surplus runoff will be conveyed to the southern end of the POS corridor and will discharge to the Fascine waterway. Post-development flows can exceed pre-development levels, due to the site's location immediately opposite the Fascine. Refer Section 5.

Category	Design objectives	Design criteria	Section reference
Water quality management	Maintain surface water and groundwater quality at pre-development levels (winter concentrations) and, if possible, improve the quality or water leaving the development tare to maintain and restore ecological systems in the (sub)catchment in which the development is located.	If the pollutant outputs of the development exceed catchment ambient conditions, the proponent shall achieve water quality improvements within the development area or, alternatively, arrange equivalent water quality improvement offsets within the catchment. Drainage - ensure that all runoff contained within the drainage infrastructure network receives treatment prior to discharge to a receiving environment consistent with the Stormwater Management Manual for Western Australia (2004-07). Swales/vegetation bioretention systems are to be sized at 2% of the constructed impervious area from which they receive runoff.	Post-development stormwater monitoring is to be undertaken at the upstream and downstream ends of the site to ensure that the development site does not result in a degradation in water quality. Bioretention treatment areas are to be sized to have a surface area at least 2% of the connected impervious area (ie road pavement area) Refer Section 5.4.
Disease vector and nuisance insect management	Reduce the health risk from mosquitoes	Retention and detention treatments should be designed to ensure that between the months of November and May, detained immobile stormwater is fully infiltrated within a time period not exceeding 96 hours.	Infiltration areas will be designed to ensure that retained runoff is infiltrated within 4 days - details of individual bioretention areas will be provided in future urban water management plans for the site.

2 PRE-DEVELOPMENT ENVIRONMENT

2.1 Topography

The site has historically been used as a drainage reserve, and forms a low point which conveys stormwater runoff from the roads surrounding Brockman Park to the Fascine waterway.

Natural surface levels around the perimeter of the site vary between 2.3mAHD and 3.8mAHD. The northern half of the site falls towards a low point in the centre of the park at a level of approximately 1.5mAHD; while the southern half of the site slopes gently towards the east, with natural surface levels along the site's eastern boundary ranging between 2.3mAHD and 2.9mAHD.

An aerial photo showing the existing topography is included as Figure 2.1.

2.2 Geotechnical conditions

The Quobba sheet of the 1:50,000 scale Environmental Geology maps indicates that the area is underlain by the following two soil formations:

- North-east part of the site: Alluvium, deposits of Gascoyne River – clay, silt, sand and gravel.
- South-west part of the site: Supratidal flats – calcareous clay, silt and sand and authigenic gypsum and superficial algal mats and salt crusts.

A geotechnical site investigation was completed in July 2016, which found that the general soil profile across the site comprised a layer of sand fill overlying clay (typically high plasticity) overlying clayey sand / sandy clay. The sand fill was present from the ground surface to depths of between 1.0m and 2.1m, which was overlying typically medium to high plasticity clay, which was present to the maximum test pit depth of 3.0m in nine of the ten test pits. In the tenth test pit, the clay profile was present to a depth of 2.1m below ground surface, and was overlying clayey sand. Groundwater was encountered in four test pits in the lower lying areas of the site at depths between 1.8m and 2.6m below ground surface. A perched groundwater table over the in-situ clayey soils could be expected at wetter times of the year.

Imported fill will be required as part of the development, to raise the site above the maximum predicted storm surge level and cyclonic inundation. The depth of imported fill may be up to 2m over the low-lying areas of the site. Additional geotechnical investigation is required prior to development in the areas that will require more than 1m of imported fill, to confirm the thickness of the underlying clayey strata and to recommend measures to mitigate the risk of consolidation and settlement of the underlying clay as a result of the importation of sand fill.

Figure 2.2 shows the geotechnical test pit locations, and groundwater level measured in the test pits where groundwater was encountered during the site investigation.

2.3 Groundwater

The geotechnical site investigation encountered groundwater in four test pits located around the lowest area of the site, at levels between -0.7mAHD and 0.3mAHD. Given the site's proximity to the coast, groundwater flow is expected to be generally towards the Fascine. A perched groundwater table over the in-situ clayey soils could be encountered during wetter times of the year.

A pre-development groundwater monitoring program has not been undertaken, and given that stormwater drainage infrastructure in the development is not expected to intercept groundwater, an extensive pre-development monitoring program is not considered necessary for this site. A limited monitoring program to obtain a snapshot of pre-development groundwater levels and quality is recommended, as outlined in Section 6.1, and should be completed before an urban water management plan is prepared for the proposed development.

2.4 Surface water

Brockman Park forms an overland flow path for stormwater from the existing subdivision surrounding the park. Piped drainage from the adjacent road reserves outfalls to Brockman Park to the north of the proposed development site, and flows through the site to a stormwater pit in the low point in the centre of the development site. The Shire has limited as-constructed stormwater drainage records for the area, and this pit is not shown on the Shire's stormwater drainage plans from the 1980s. We have assumed that this pit connects to the two existing pits near the intersection of David Brand Drive and Olivia Terrace, before outfalling to the Fascine.

Due to the limited as-constructed stormwater records held by the Shire, we have estimated the extent of the external catchment that outfalls to Brockman Park, based on contour data obtained from the Water Corporation. Figure 2.3 shows the assumed catchment boundaries for Brockman Park, and key stormwater infrastructure in the LSP area.

Prior to preparation of the UWMP for the site, we recommend that the extent of the external stormwater drainage catchment be surveyed and verified, and that the invert levels and configuration of all existing infrastructure in Brockman Park and discharging to the Fascine be confirmed, as several pits in the park were filled with silt, debris and/or water and were inaccessible during a recent feature survey of the site.

3 WATER CONSERVATION

The State Water Plan (WA Government, 2007) sets a target for total water use of no more than 100 kL/person/year. This water consumption target is reflected in the Department of Water's interim guidelines for developing an LWMS, which also sets an aspirational target of no more than 40-60 kL/person/year of potable (scheme) water use.

3.1 Potable water supply

Potable water will be supplied from the Water Corporation's reticulated water supply.

The total water consumption target of 100kL/person/year is generally achieved through the use of waterwise fittings and appliances inside the house, along with planting water efficient gardens with minimal lawn areas and native, low-water-use plants. Future UWMPs will include a detailed water consumption estimate to show that the development can achieve the State Water Plan consumption target.

To achieve the potable water consumption target of 40-60kL/person/year, all water use outside the house (i.e. outdoor taps and irrigation) generally needs to be from non-potable sources like groundwater, rainwater or recycled water.

Future urban water management plans (UWMPs) will need to include an estimate of potable water consumption to demonstrate how these water consumption targets will be met within the development.

3.2 Non-potable water supply

An important part of water sustainability is fit-for-purpose water use, or the use of alternative water sources for applications where drinking-quality water is not necessary (e.g. toilet flushing, garden watering).

The Shire of Carnarvon owns and operates its own town irrigation system, which irrigates sporting grounds, parks and public open space throughout the Shire. There are four sources for the irrigation water – the town's potable water supply, recycled water from the wastewater treatment plant, water supplied from an artesian bore, and flood waters from the Gascoyne River.

A series of distribution mains convey irrigation water throughout the Shire, with one of the mains crossing through the Brockman Park site to Olivia Terrace. The POS within the development area will continue to be irrigated from the Shire's town irrigation system, with the infrastructure in the Brockman Park site relocated as necessary to suit the ultimate development.

3.3 Wastewater

A Water Corporation wastewater pumping station is located adjacent to the north-eastern corner of the site, and the Water Corporation has indicated that this pump station is likely to have sufficient capacity to service the development.

4 GROUNDWATER MANAGEMENT

As discussed in Section 2.3 above, groundwater levels across the LSP area are deep (<1.8m below natural surface level), and will not be an influence on the future development of the site.

Groundwater quality will primarily be managed through the landscaping design, with the design of POS areas making use of plants that require low fertiliser use, and soil amendment to minimise the amount of nutrients leaching into the groundwater.

Subsoil drainage may be used within the site to protect against infiltrated surface water perching on the underlying clay material. The need for subsoil drains will depend on the ultimate earthworks design, and will be determined as part of the future urban water management plan for the site.

5 SURFACE WATER MANAGEMENT

The key design objectives for stormwater management for the Brockman Park development are as follows:

- For the critical 1yr ARI event, the post-development discharge volume and peak flow rates shall be maintained relative to pre-development conditions in all parts of the catchment.
- Road runoff from first-flush events (storm events up to 1yr 1hr ARI) is to discharge via bioretention areas for treatment prior to leaving the site. Bioretention systems are to be sized at no less than 2% of the impervious area from which they receive runoff.
- The catchment runoff shall be managed for all ARI events up to and including the 100yr ARI event within the development area by directing flows to the POS corridor and into the Fascine waterway opposite the site.

The post-development surface water strategy for the site is to maintain the pre-development flow paths, and allow flow from upstream catchments to continue to pass through the site and outfall to the Fascine via the existing piped outlet. Swales through the POS corridor will convey runoff from the development to the existing drainage outlet. Post-development stormwater drainage modelling has been undertaking using the XP-Storm software package. Appendix A includes a summary of the parameters used in the stormwater modelling.

5.1 First-flush storm management (up to 1yr ARI)

Runoff from the internal driveways within the site will be conveyed to bioretention swales within the POS corridor along Bibra Way. The bioretention swales will be sized to retain and infiltrate runoff from the 1yr 1hr ARI storm event. Infiltration testing undertaken during the site geotechnical investigation found in-situ infiltration rates of 7-11 m/day, which is suitable for on-site disposal of stormwater via infiltration. The geotechnical report recommends a permeability rate of 5 m/day be used for design purposes.

Where practicable, runoff should be conveyed via verge swales alongside the internal driveways, however piped drainage will be used where space and accessibility constraints exist. Figure 5.1 shows the size of bioretention swales that are required.

5.2 Minor flood management (up to 5yr ARI)

Given the site's close proximity to the Fascine waterway, post-development runoff does not need to be attenuated to pre-development levels within the site. The swales in the POS corridor alongside Bibra Way will convey runoff through the site to the southern end of the POS corridor, near the intersection of David Brand Drive and Bibra Way. A piped connection to the existing drainage pit in the corner of Brockman Park will allow runoff to discharge from the site to the Fascine via the existing stormwater drainage outlet.

Runoff from the catchments to the north of the development site will bypass the bioretention swales and will be diverted to the existing stormwater pit in the southern-western corner of the site. This will avoid washing out the bioretention swales in regular storm events, and will allow the earthworks design for the remainder of the POS area to better tie in with the adjacent road levels and finished floor levels of the proposed development.

The peak post-development flow rate from the development area in the 5yr 30min ARI storm event is 0.3 m^3/s. Figure 5.2 shows the extent of flooding in the POS corridor for the critical 5yr ARI storm event.

5.3 Major flood management (up to 100yr ARI)

5.3.1 Flood protection from cyclone events and storm surge

Habitable floor levels are generally required to be at least 0.3m above the 100 year flood level in subdivision drainage networks, and 0.5m above the 100 year flood level in basins and waterways. Given the structure plan area's low-lying nature it has historically been prone to cyclonic inundation, storm surge and riverine flooding in extreme weather events. For this reason, finished floor levels of buildings across the site will be governed by storm surge levels in the Fascine from cyclone events, rather than by local storm events being conveyed through the site.

A recent study, the Cyclonic Inundation and Coastal Process Modelling – Carnarvon (GEMS, 2009) undertook modelling to examine the impact of storm surge inundation and coastal processes in Carnarvon. This report modelled various cyclone tracks and intensities to determine the storm surge levels affecting the waterfront areas of Carnarvon. This report also made an estimate of indicative recurrence interval for various intensity cyclones, with a Category 3 cyclone having a recurrence interval of approximately 300 years, and a Category 5 cyclone having a recurrence interval of approximately 3000 years. These recurrence intervals reflect a cyclone with the storm surge occurring jointly with mean high water spring tide, directly impacting on Carnarvon.

The modelled water level in the Fascine near the Brockman Park site was 2.6mAHD for the worst-track Category 3 cyclone, and 3.3mAHD for the worst-track Category 5 cyclone. These cyclones were modelled as occurring at current sea level, and at mean high water spring tide. The GEMS report also noted that future sea level rise due to climate change has been estimated at 0.88m.

A very conservative finished floor level for the buildings at Brockman Park is 3.8mAHD, which is 0.5m above the Category 5 storm surge level (based on current sea level), and also maintains 300mm freeboard above the worst-case Category 3 storm surge level superimposed on a 0.9m increase in sea level due to climate change. This recommended finished floor level may be reduced in consultation with the Shire, to more accurately reflect the storm surge level for a cyclone with ~100yr recurrence interval.

5.3.2 Flood management from local storm events

Surface runoff from roads and lots in major storm events will be conveyed via overland flow towards the POS corridor. The earthworks design for the site will ensure that an overland flow path is available through the development area to the POS corridor, to protect buildings from flooding.

The peak post-development flow rate from the development area in the 100yr 24hr ARI storm event is 0.5 m^3/s.

Figure 5.2 shows the extent of flooding in the POS corridor for the critical 100yr ARI storm event.

5.4 Surface water quality

Bioretention swales will be located at drainage outfalls in the POS corridor, which will be planted to promote the uptake of nutrients from the stormwater runoff. In accordance with the Stormwater Management Manual for Western Australia (DoW, 2004-2007), bioretention areas will be sized with a surface area that is at least 2% of the connected impervious (road reserve) area for each catchment, and will have sufficient volume to retain road runoff from the 1yr 1hr ARI storm event. Table 5.1 below shows the sizes of the bioretention areas that will be required.

Table 5.1 - Required size of bioretention areas

Bioretention area	Northern swale	Southern swale
Bioretention area required to retain 1yr 1hr ARI storm event (>2% of connected impervious area)	90 m^2	160 m^2

Due to the high intensity of wet season storms in the Carnarvon area, roofs of the building on site are not expected to have gutters installed to divert roof runoff to soakwells within each lot. Roof runoff will fall to garden areas and surplus runoff that does not infiltrate will flow via overland flow to the internal driveways within the site.

5.5 Wetlands & waterways

The site is located opposite the Fascine waterway, and stormwater runoff from the site and surrounding catchments currently discharges to the Fascine via an outlet pipe located in the south-western corner of Brockman Park, near the intersection of David Brand Drive and Bibra Way. To ensure that runoff from the development area does not adversely affect water quality in the Fascine, stormwater runoff from frequent, first-flush storm events will be treated in bioretention areas in the verge swales and POS corridor before entering the Fascine.

6 MONITORING AND IMPLEMENTATION

6.1 Monitoring program

A pre-development and post-development monitoring program is recommended to establish baseline surface water and groundwater quality entering and leaving the site. This baseline water quality data will then be used to compare with post-development data to ensure that water quality from the development is not causing any degradation in water quality in the Fascine. Table 6.1 below outlines the proposed pre- and post-development monitoring program, and Figure 6.1 shows indicative monitoring locations.

The UWMP for the site should present a summary of the pre-development monitoring data, and confirm the baseline requirements for the post-development monitoring program.

Table 6.1 - Monitoring program

Responsible agency	Monitoring program	Requirements	Duration and frequency
Shire of Carnarvon or Developer	Pre-development groundwater monitoring	GW levels and nutrients (pH, EC, TN, FRP, TKN, ammonia, TP, heavy metals).	12 months (including one full wet season). Monthly water levels, quarterly water quality.
Shire of Carnarvon or Developer	Pre-development surface water monitoring	Water levels and nutrients (pH, EC, TN, FRP, TKN, ammonia, TP, heavy metals)	One wet season. Monthly levels and water quality following storm events, when flow is occurring.
Developer	Post-development groundwater monitoring	GW levels and nutrients (pH, EC, TN, FRP, TKN, ammonia, TP, heavy metals).	Period of 2 years post-development. Monthly water levels, quarterly water quality.
Developer	Post-development surface water monitoring	Water levels and nutrients (pH, EC, TN, FRP, TKN, ammonia, TP, heavy metals).	Period of 2 years post-development. Monthly levels and water quality during wet season, when flow is occurring.

7 SUBDIVISION AND URBAN WATER MANAGEMENT PLANS

The preparation of more detailed water management plans to support subdivision is a requirement of the Better Urban Water Management framework. While strategies have been provided in this LWMS that address planning for water management within the LSP area, it is a logical progression that future subdivision designs and supporting urban water management plans will further develop these water management strategies and will outline details of the designs that are not able to be determined at this stage of the planning process. Future UWMPs for development of Brockman Park will include more detailed information on the design of the following infrastructure:

- Stormwater retention and conveyance swale sizes, depths & configurations.
- Confirmation that the final stormwater drainage design achieves the objectives of this LWMS.
- Verification of the external catchment areas contributing to Brockman Park.
- Details of the specific water-conservation measures that will be applied at the site and an estimate of water consumption based on the final lot mix and layout.
- Proposed earthworks design levels across the site, and results of more detailed geotechnical investigations for the areas of the site that will require more than 1m of imported fill, to confirm the site preparation requirements to avoid excessive consolidation of the underlying clay materials.

8 LWMS CHECKLIST

Local water management strategy item	Deliverable	☑	Section ref
Executive summary			
Summary of the development design strategy, outlining how the design objectives are proposed to be met	Table 1 – design elements and requirements for best management practices and critical control points	☑	Table 1.1
Introduction			
Total water cycle management – principles and objectives Planning background Previous studies		☑	Section 1
Proposed development			
Structure plan, zoning and land use Key landscape features Previous land use	Site context plan Structure plan	☑ ☑	Figure 1.1 Figure 1.2
Landscape – proposed public open space areas, public open space credits, water source, bore(s), lake details, irrigation areas (if applicable)	Landscape plan	☑	Section 3.2
Design criteria			
Agreed design objectives and source of objectives		☑	Section 1.3
Pre-development environment			
Existing information and more detailed assessments (monitoring). How do the site characteristics affect the design?		☑	Section 2

Local water management strategy item	Deliverable	☑	Section ref
Site conditions – existing topography/contours, aerial photo underlay, major physical features	Site condition plan	☑	Section 2.1 Figure 2.1
Geotechnical – topography, soils including acid sulphate soils and infiltration capacity, test pit locations	Geotechnical plan	☑	Section 2.2 Figure 2.2
Environmental – areas of significant flora and fauna, wetlands and buffers, waterways and buffers, contaminated sites	Environmental plan	n/a	No significant environmental constraints present.
Surface water – topography, 100-year floodways and flood fringe areas, water quality of flows entering and leaving (if applicable)	Surface water plan	☑	Section 2.4 Figure 2.3
Groundwater – topography, pre-development groundwater levels and water quality, test bore locations	Groundwater plan plus site investigations	☑	Section 2.3 Figure 2.2
Water sustainability initiatives			
Water efficiency measures – private and public open spaces including method of enforcement		☑	Section 3
Water supply (fit-for-purpose) strategy, agreed actions and implementation		☑	Section 3.2
Wastewater management		☑	Section 3.3
Stormwater management strategy			
Flood protection – peak flow rates, volumes and top water levels and control points, 100-year flow paths and 100-year detention storage areas	100-year event plan Long section of critical control points	☑ ☑	Section 5 Figure 5.2 Figure 5.3 (cross-section of POS corridor)
Manage serviceability – storage and retention required for the critical 5-year ARI storm events. Minor roads should be passable in the 5-year ARI event	5-year event plan	☑	Figure 5.2

Local water management strategy item	Deliverable	☑	Section ref
Protect ecology – detention areas for the 1-year 1-hour ARI event, areas for water quality treatment and types of agreed structural and non-structural best management practices and treatment trains (including indicative locations). Protection of waterways, wetlands (and their buffers), remnant vegetation and ecological linkages	1-year event plan Typical cross-sections	☑	Section 5 Figure 5.1 Figure 5.3
Actions to address acid sulphate soils or contamination		n/a	No ASS or contamination on site
Protection of waterways, wetlands (and their buffers) remnant vegetation and ecological linkages		n/a	No sensitive wetlands on or adjacent to the site
Management of disease vectors and nuisance insects		☑	Table 1.1 - Design principles and objectivesTable 1.1
Groundwater management strategy			
Post-development groundwater levels, existing and likely final surface levels, outlet controls and ubsoil drain areas / exclusion zones	Groundwater / subsoil plan	☑	Section 4
The next stage – subdivision and urban water management plans			
Content and coverage of future urban water management plans to be completed at subdivision. Include areas where further investigations are required before detailed design.		☑	Section 7
Monitoring			
Recommended future monitoring plan including timing, frequency, locations and parameters, together with arrangements for ongoing actions		☑	Section 6
Implementation plan			

Local water management strategy item	Deliverable	☑	Section ref
Developer commitments Roles, responsibilities, funding for implementation Review		☑	Section 6

9 REFERENCES

Department of Water, *Interim: Developing a local water management strategy (December 2008)*

Galt Geotechnics, *Geotechnical Study - Proposed Aged Care / Lifestyle Village, Lots 1147, 1179 & 1193 David Brand Drive, Brockman Park, Carnarvon (August 2016)*

GEMS, *Cyclonic Inundation and Coastal Process Modelling, Carnarvon (June 2009)*

Hassell, *Carnarvon Fascine Waterway and Environs - Masterplan Report (December 2010)*

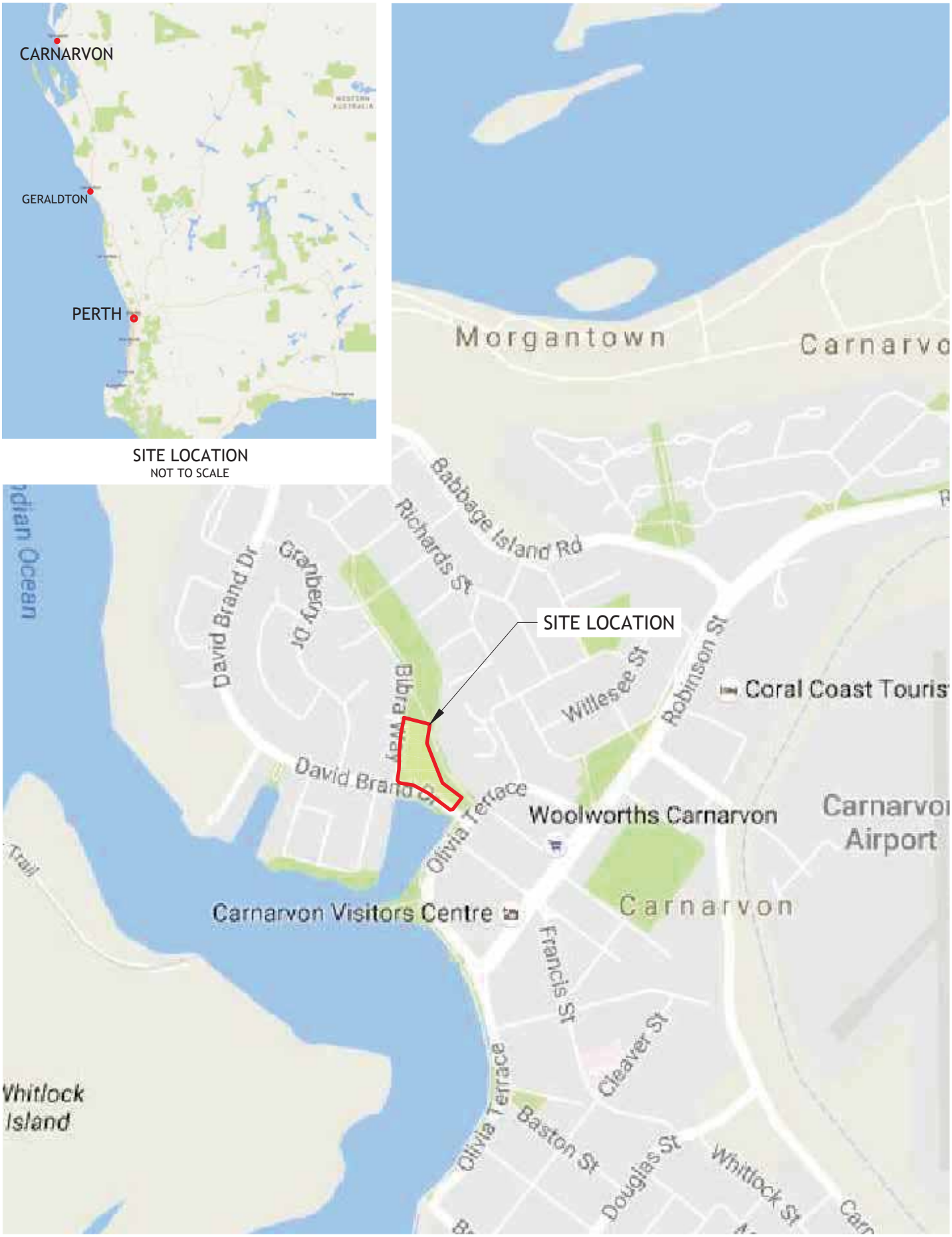
Ministry for Planning, *Gascoyne Coast Regional Strategy (March 1996)*

Sinclair Knight Merz, *Lower Gascoyne River, Carnarvon Floodplain Management Study (October 2002)*

Western Australian Planning Commission, *Better Urban Water Management (October 2008)*

Western Australian Planning Commission, *Ningaloo Coast Regional Strategy (August 2004)*

SITE LOCATION
NOT TO SCALE



SITE LOCATION
NOT TO SCALE

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WHELANS
BROCKMAN PARK CARNARVON
LWMS
SITE LOCALITY PLAN

Job Number	1529/4323
Revision	A
Date	NOVEMBER 2016

FIG 1.1

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LOCAL STRUCTURE PLAN LAYOUT

Job Number	1529/4323
Revision	A
Date	NOVEMBER 2016

FIG 1.2

LEGEND

DEVELOPMENT AREA BOUNDARY

2.00 NATURAL SURFACE CONTOURS (0.25m INTERVALS)

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EXISTING CONTOURS AND AERIAL PHOTO

Job Number	1529/4323
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FIG 2.1

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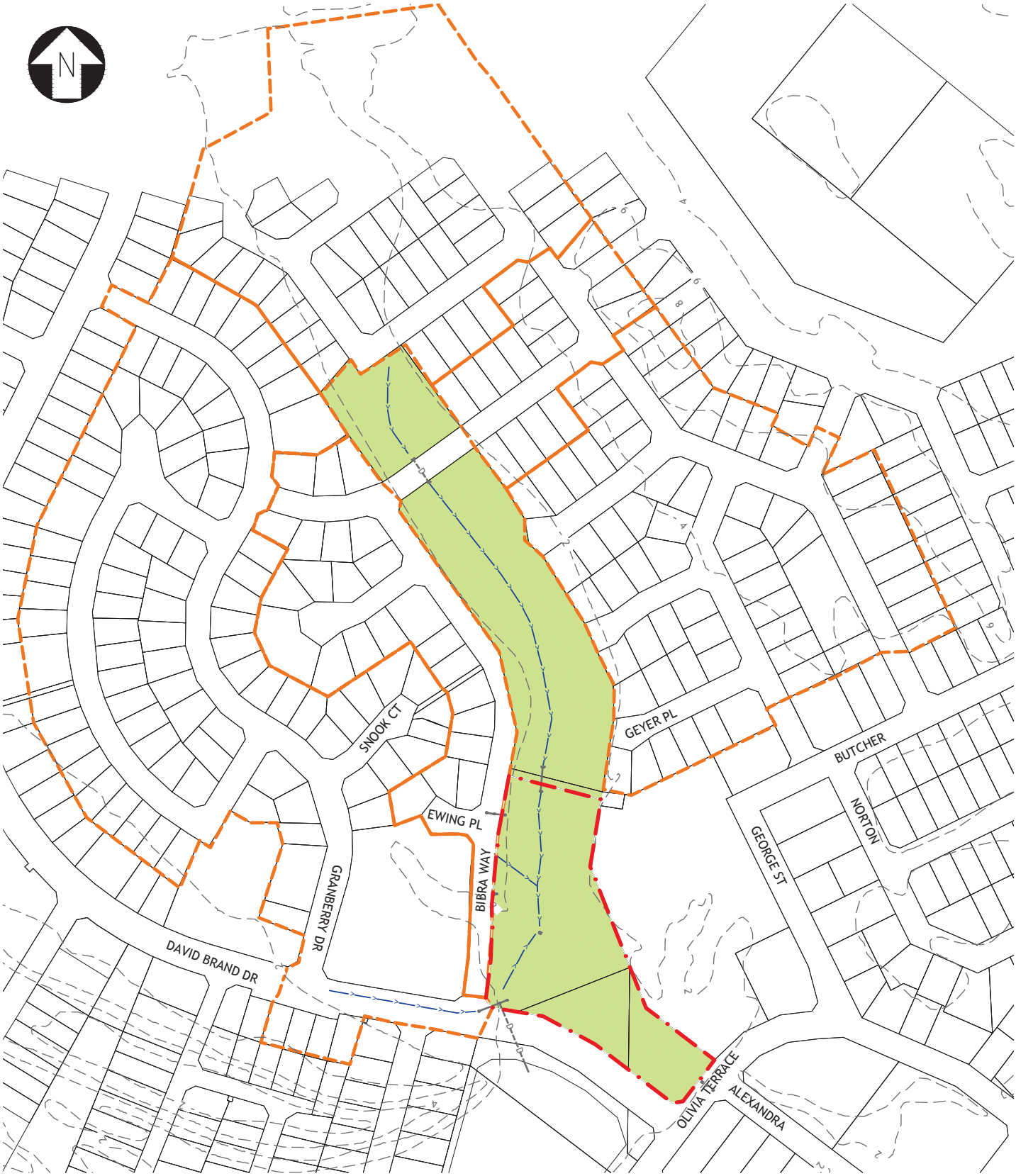
GEOTECHNICAL TEST PIT LOCATIONS

Job Number	1529/4323
Revision	A
Date	NOVEMBER 2016

FIG 2.2



LEGEND

- DEVELOPMENT AREA BOUNDARY
- 2.00 NATURAL SURFACE CONTOURS (2m INTERVALS)
- EXISTING DRAINAGE
- ASSUMED PRE-DEVELOPMENT CATCHMENTS
- PRE-DEVELOPMENT FLOW PATHS
- BROCKMAN PARK

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PRE-DEVELOPMENT FLOW PATHS

Job Number	1529/4323
Revision	A
Date	NOVEMBER 2016

FIG 2.3

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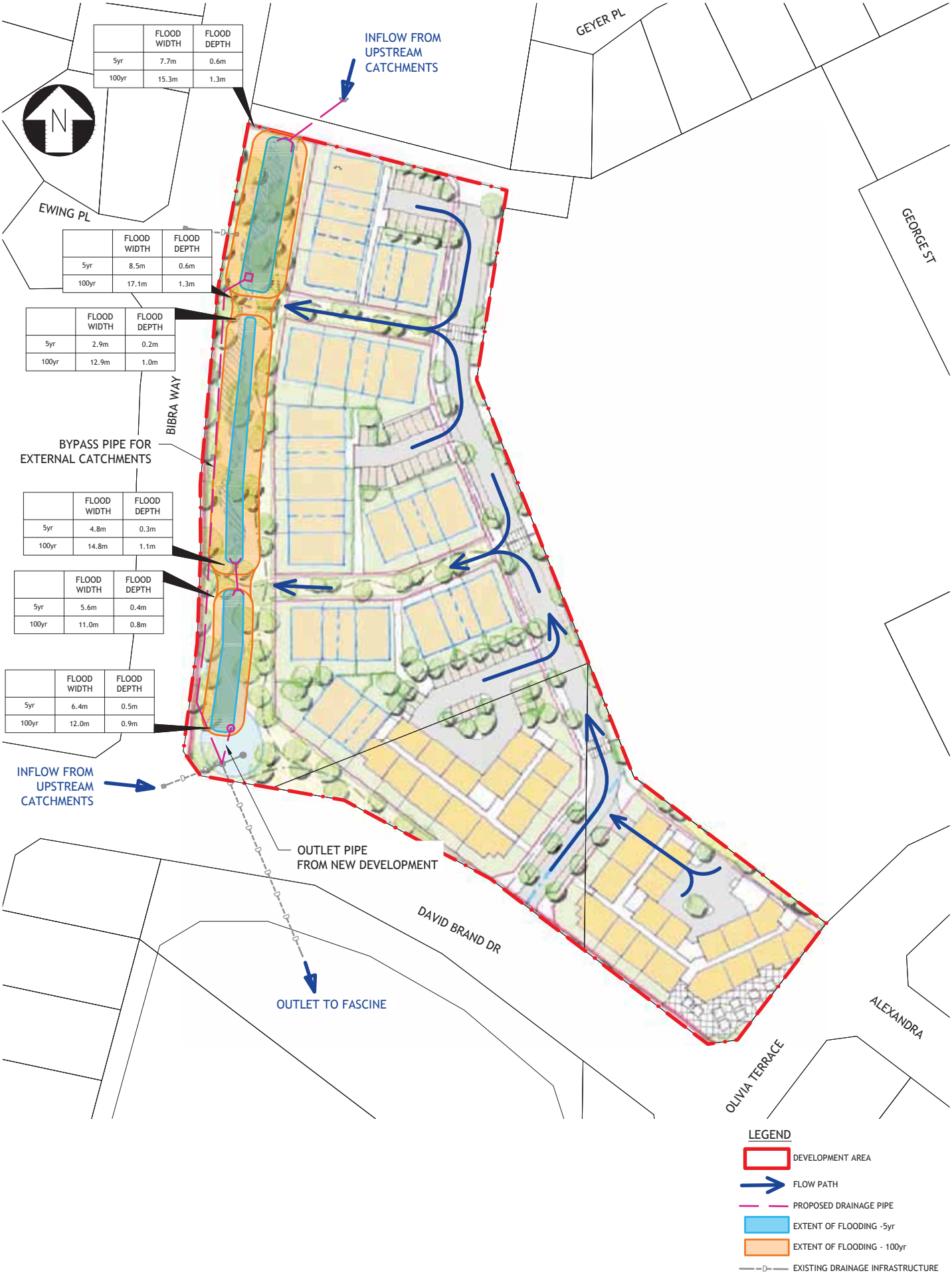
POST DEVELOPMENT DRAINAGE MANAGEMENT - 1yr ARI

Job Number	1529/4323
Revision	A
Date	NOVEMBER 2016

FIG 5.1



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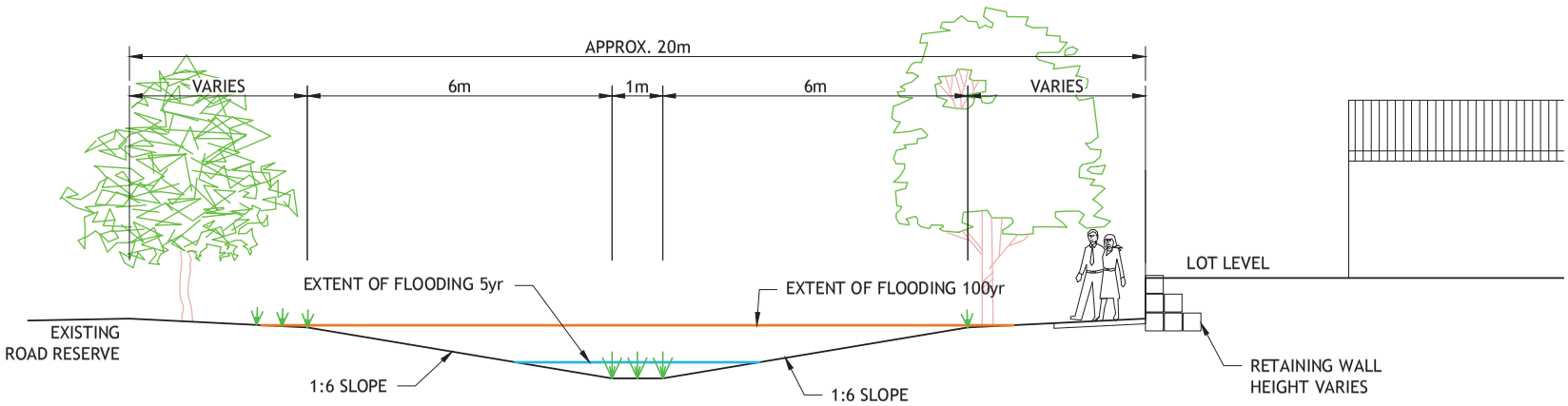
POST DEVELOPMENT DRAINAGE MANAGEMENT - 5yr & 100yr

Job Number	1529/4323
Revision	A
Date	NOVEMBER 2016

FIG 5.2



TYPICAL CROSS SECTION OF POS CORRIDOR

NOT TO SCALE

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BROCKMAND PARK CARNAVON
LWMS

POST DEVELOPMENT
CROSS SECTION OF POS CORRIDOR

Job Number	1529/4324
Revision	A
Date	JANUARY 2017

FIG 5.3

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MONITORING LOCATIONS

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Revision	A
Date	NOVEMBER 2016

FIG 6.1

APPENDIX A – Stormwater modelling parameters

Post-development surface water modelling parameters

Post-development stormwater modelling was undertaken using the XP Storm design package. The program uses a node & link network to model the hydrology of the urban catchment, and the hydraulic elements such as basins and piped or open drains.

The following sections outline the parameters used in modelling the subdivision runoff.

Design rainfall

Design storm durations varied between 10 minutes & 72 hours, for 1yr, 5yr & 100yr ARI design storms. Design rainfall Intensity Frequency Duration (IFD) data was created using the Bureau of Meteorology's online IFD-generator tool. The data used for the Brockman Park site is presented in Table A.1 below.

Table A.1 - IFD design data

ARI	Duration									
	Intensity (mm/hr)									
	10 min	30 min	1 hr	2 hr	3 hr	6 hr	12 hr	24 hr	48 hr	72 hr
1 year			15.9							
5 year	12.95	22.85	30.2	38	42.6	52.02	63.36	77.28	91.2	97.2
100 year	25.17	45.25	60.8	78.6	90.6	114.6	142.8	174.2	203	215.3

Catchment properties

The breakdown of subcatchment areas by land use is shown in Table A.2 below. The catchment parameters for the various land uses included in the modelling are outlined in Table A.3 & Table A.4 below.

Table A.2 - Subcatchment landuse breakdown

Catchment number	Total area	Road	POS	Residential	Commercial
External - Brockman Park North	18 ha	4 ha	3 ha	11 ha	-
External - Bibra Way	3 ha	1 ha	0.1 ha	2 ha	-

Catchment number	Total area	Road	POS	Residential	Commercial
External - David Brand Drive	12 ha	6 ha	-	4 ha	1 ha
Internal - northern swale	0.8 ha	0.2 ha	0.2 ha	0.4 ha	-
Internal - southern swale	1.3 ha	0.4 ha	0.2 ha	0.6 ha	0.1 ha

Table A.3 - Post-development land use

Post-development landuse	% impervious
Road	80 %
POS	20 %
Residential	40 %
Commercial	70%

Table A.4 - Manning's n & infiltration losses

Landuse	Manning's roughness	Initial loss (mm)	Continuing loss
Impervious surfaces	0.014	1 mm	0.1 mm/hr
Pervious surfaces	0.03	20 mm	5 mm/hr

APPENDIX E
INFRASTRUCTURE SERVICING REPORT

wave international

DETERMINE • DESIGN • DELIVER



Brockman Park, Carnarvon

Infrastructure Servicing Report

Whelans

Rev C – May 2017

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Project Brief

Job Number	4323
Project	Brockman Park, Carnarvon Infrastructure Servicing Report
Client	Whelans
Client Contact	Greg Comiskey
Client Address	PO Box 99 Mount Hawthorn WA 6915

Document Status

Rev	Date	Description	By	Signed
A	October 2016	Draft for client review	KW	
B	December 2016	Revised following client review	KW	
C	May 2017	Final	KW	

DISCLAIMER

TABLE OF CONTENTS

LIST OF FIGURES

1 INTRODUCTION

1.1 Background

Wave International has been commissioned by Whelans to prepare an infrastructure servicing report for Brockman Park in Carnarvon, which is proposed to be developed as an aged care precinct. This infrastructure servicing report has been prepared to support a local structure plan over the development site.

The Brockman Park site is located in the Brockman locality of the Carnarvon townsite, immediately to the west of the Carnarvon town centre. The site is currently used as public open space, and is bounded by Bibra Way to the West, David Brand Drive to the south, Olivia Terrace and an existing development to the east, and the remainder of the Brockman Park public open space to the north.

The Shire of Carnarvon has identified the Brockman Park site for the creation of an Aged Care / Lifestyle Village development, which would assist in accommodating the current shortage of aged care services in the Gascoyne region.

Figure 1.1 shows a site locality plan.

1.2 Proposed land use

The Brockman Park site comprises Lots 1193, 1179 and 1147 David Brand Drive, Carnarvon. The site is approximately 2.1ha in area and is currently used as public open space, although the Shire of Carnarvon recently rezoned the land as Special Use: Aged Care under Town Planning Scheme No. 10.

There is a need for additional aged care in Carnarvon to provide for demand in the town and wider Gascoyne region, and the development of the Brockman Park site will go some way to alleviating the current shortfall. The Gascoyne Memorial Foundation development immediately east of Brockman Park is also currently constructing 15 independent living units (ILUs) in addition to the 35 units currently on the site, and there are plans for a 20-bed residential aged care facility at the nearby Carnarvon Hospital to be constructed in the coming years.

A concept plan for the site has been prepared by SPH Architects, which comprises 1-bed and 2-bed ILUs, along with respite care suites, short-stay accommodation units and a café on the site. Figure 1.2 shows the concept layout plan for the development site.

1.3 Existing site conditions

The site has historically been used as a drainage reserve, and forms a low point which conveys stormwater runoff from the roads surrounding Brockman Park to the Fascine waterway. Accurate ground levels for the site and surrounding road reserves are not available, but the Shire's historical plans indicate that ground level across the site is between 2mAHD and 3.5mAHD.

The Quobba sheet of the 1:50,000 scale Environmental Geology maps indicates that the area is underlain by the following two soil formations:

- North-east part of the site: Alluvium, deposits of Gascoyne River – clay, silt, sand and gravel
- South-west part of the site: Supratidal flats – calcareous clay, silt and sand and authigenic gypsum and superficial algal mats and salt crusts.

A geotechnical site investigation was completed in July 2016, which found that the general soil profile across the site comprised a layer of sand fill overlying clay (typically high plasticity) overlying clayey sand / sandy clay. The sand fill was present from the ground surface to depths of between 1.0m and 2.1m, which was overlying typically medium to high plasticity clay, which was present to the maximum test pit depth of 3.0m in nine of the ten test pits. In the tenth test pit, the clay profile was present to a depth of 2.1m below ground surface, and was overlying clayey sand. Groundwater was encountered in four test pits in the lower lying areas of the site at depths between 1.8m and 2.6m below ground surface, which is likely close to sea-level. A perched groundwater table over the in-situ clayey soils could be expected at wetter times of the year.

Imported fill will be required as part of the development, to raise the site above the maximum predicted storm surge level and cyclonic inundation. When the site has been surveyed and existing ground levels are confirmed, the required depth of fill can be determined. Should the depth of fill required be greater than 1m, additional geotechnical investigation will be required to confirm the thickness of the underlying clayey strata, and to recommend measures to mitigate the risk of consolidation and settlement of the underlying clay as a result of the importation of sand fill.

Figure 1.3 shows an aerial photo of the site, with the locations of the geotechnical test pits.

2 ROADS AND TRAFFIC

The site is well located, near the Carnarvon town centre. The site has frontages to Bibra Way, David Brand Drive, and Olivia Terrace, all of which are constructed to an urban standard.

Olivia Terrace is a boulevard road, with two 3.9-4.0m traffic lanes divided by a 1.6m median. David Brand Drive has an approximately 9.7-9.8m wide pavement, while Bibra Way has a 7.4m pavement width.

The development concept plan proposes a single driveway through the site with access from David Brand Drive, and a turnaround area at the northern end of the development. All units within the development serviced from the internal driveway, with no vehicle access proposed from the units directly onto David Brand Drive or Bibra Way. The proposed driveway access to David Brand Drive is located approximately 75m from the intersection of David Brand Drive and Olivia Terrace, and sufficient stopping sight distance is achievable from this intersection to the proposed driveway location.

The design and construction specifications for the internal road pavements within the site will depend on whether the access driveway is ultimately developed as a gazetted road, or as an internal driveway within a strata complex.

3 STORMWATER MANAGEMENT

3.1 Existing infrastructure

Brockman Park forms an overland flow path for stormwater from the catchment surrounding the park. Piped drainage from the adjacent road reserves outfalls to Brockman Park to the north of the proposed development site, and flows through the park to a stormwater pit in the centre of the development site. This pit then outfalls to the Fascine waterway opposite the site.

3.2 Flood management strategy

Given the Structure Plan Area's low-lying nature, it has historically been prone to cyclonic inundation, storm surge and riverine flooding in extreme weather events. The closure of the northern end of the Fascine by construction of a levee in the 1980s and the more recent construction of sea walls along the Fascine foreshore opposite the development site have gone some way to reducing the risk and potential extent of flooding in major storm events. However, to further mitigate the risk of cyclonic inundation and storm surge, imported fill will be required to ensure finished floor levels of the proposed dwellings are above expected maximum storm surge levels.

A recent study, the Cyclonic Inundation and Coastal Process Modelling – Carnarvon (GEMS, 2009) undertook modelling to examine the impact of storm surge inundation and coastal processes in Carnarvon. This modelling showed that Brockman Park is subject to inundation from storm surge in cyclone events, with an estimated maximum storm surge level of 3.3mAHD in a Category 5 cyclone, occurring jointly with the mean high water spring tide. Figure 3.1 shows the area prone to storm surge, from the GEMS report.

Based on the GEMS modelling, a minimum finished floor level of 3.8m AHD (0.5m freeboard above the maximum expected storm surge level) is recommended for the housing at the Brockman Park site to protect from flooding in major storm events.

3.3 Development drainage strategy

The development will need to maintain the pre-development flow path for runoff from the catchments upstream of the development site to ensure that the upstream areas are not affected by the development at Brockman Park. This will be achieved through the use of drainage swales in a corridor of open space along the site's western boundary, which will allow flow from upstream catchments to continue to pass through the site and outfall to the Fascine.

Stormwater runoff from the roads and roof areas within the development area will be managed through soakage where possible, with excess runoff diverted to the POS corridor and ultimately to the Fascine. The geotechnical site investigation indicated that disposal of roof runoff via soakwells was feasible for this site, and the sizes and locations of soakwells for each unit will be further investigation through a future urban water management plan and detailed design of the development.

The WAPC's Better Urban Water Management framework typically requires new developments to retain runoff to pre-development levels for storm events up to 100yr ARI. However, in developments adjacent to the ocean, the

Department of Water tends to allow excess runoff to discharge unattenuated, once the 1yr 1hr ARI storm event has been retained and treated onsite.

A separate Local Water Management Strategy is being prepared to support the Brockman Park Local Structure Plan, which outlines the design objectives and criteria for water management within the development, but Figure 3.2 shows indicative surface water flow paths through the site.

4 SEWER

4.1 Existing infrastructure

There is existing Water Corporation gravity sewer reticulation at the northern end of the development site, and also at the intersection of George St and Olivia Tce to the east of the site.

The existing Water Corporation wastewater pump station (Carnarvon PS 7) is located adjacent to the north-eastern corner of the development site, and a gravity sewer and pressure main are located within a Water Corporation reserve along the northern boundary of the site. The wastewater pump station has a 10m odour buffer around the pump station wet well, but this buffer does not extend into the Brockman Park site.

An abandoned sewer pressure main also crosses the northern end of Brockman Park. When the site is developed, the developer's engineer will need to liaise with the Water Corporation for the removal of this redundant pressure main as part of the construction works.

4.2 Water Corporation sewer planning

The Water Corporation has advised that the current sewer planning for Carnarvon did not consider the potential development of the Brockman Park site, given its previous zoning and land use as public open space.

However, the Water Corporation has advised that the pump station has surplus capacity that appears to be able to cater for the proposed development. When the proposed structure plan has been finalised, dwelling yield / flow rates can be more accurately assessed and the Water Corporation will be able to confirm that the pump station has capacity to service the development.

If the site is developed as a strata development, an application would need to be made to the Water Corporation for a connection to their existing gravity sewer in Bibra Way to discharge wastewater from the site. All internal sewer reticulation within the development would remain as private sewer and would need to be constructed to AS3500 (Australian Standard for Plumbing & Drainage).

Figure 4.1 shows the existing sewer infrastructure surrounding the site, and the location of the pump station adjacent to the site.

5 WATER

5.1 Existing Water Corporation infrastructure

The Water Corporation has existing potable water reticulation infrastructure in the road reserves surrounding the site, with a DN100 water main in Bibra Way, a DN 375 main in David Brand Drive and a DN525 main in Olivia Terrace.

5.2 Water Corporation potable water planning

The Water Corporation has advised that the development would be able to connect to the existing mains. If the site is developed as a strata development, an application would need to be made to the Water Corporation for a new meter from the existing mains. All internal water reticulation would remain as private infrastructure, and new internal water mains would need to be constructed to AS3500 (Australian Standard for Plumbing & Drainage).

Figure 5.1 shows the existing water infrastructure surrounding the site.

5.3 Existing and proposed Shire of Carnarvon irrigation water

The Shire of Carnarvon owns and operates its own town irrigation system, which irrigates sporting grounds, parks and public open space throughout the Shire. There are four sources for the irrigation water – the towns potable water supply, recycled water from the wastewater treatment plant, water supplied from an artesian bore, and flood waters from the Gascoyne River.

A series of irrigation distribution mains convey water throughout the Shire, with one of the mains crossing through the Brockman Park site to Olivia Terrace, and across to the foreshore of the Fascine on the southern side of David Brand Drive.

Figure 5.2 shows an indicative location of the irrigation main, which will need to be surveyed to confirm its location before development commences.

Anectodal evidence from the Shire's engineers indicates that the main is located approximately 5m inside the western boundary of Brockman Park (parallel to Bibra Way), and is expected to be contained within the proposed public open space corridor along the site's western boundary.

The section of the main along David Brand Drive is likely to be impacted by the proposed development. This section of the main will need to be either relocated to the road reserve, or removed and a new connection constructed under David Brand Drive to tie in with the existing section of main on the southern side of the road reserve (on the Fascine foreshore).

6 POWER

6.1 Existing high voltage infrastructure

There is existing underground HV and LV power along David Brand Drive and Olivia Terrace, with an existing power service to Brockman Park to service the lighting in the park. There is also existing overhead HV and LV power in Bibra Way.

Figure 6.1 shows the existing Horizon Power infrastructure surrounding the site.

6.2 Funding

The extension of any HV infrastructure to the subject site will likely be a developer funded project due to the small size of the proposed development.

A feasibility study will need to be undertaken by Horizon Power to confirm the capacity of the existing power network surrounding the site, and the extent of upgrade or network reinforcement works that are required to service the proposed development. This feasibility study can only be completed with the development layout and power requirements are confirmed.

7 COMMUNICATIONS

Existing Telstra telecommunications infrastructure is available in the streets surrounding Brockman Park. It is envisaged that the site will be serviced by the National Broadband Network to provide broadband and telecommunications services to the development.

Figure 7.1 shows the existing Telstra infrastructure surrounding the site.

Subsequent to the installation of the NBN pit and pipe system by the developer, the network infrastructure will be installed by NBN appointed contractors.

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LOCALITY PLAN

Job Number	1529/4323
Revision	A
Date	OCTOBER 2016

FIG 1.1

LEGEND

DEVELOPMENT AREA

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CONCEPT LAYOUT PLAN

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FIG 1.2

LEGEND

DEVELOPMENT AREA

TP10 TEST PIT POSITIONS

IT02 INFILTRATION TEST

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AERIAL PHOTO WITH
GEOTECHNICAL TEST PITS

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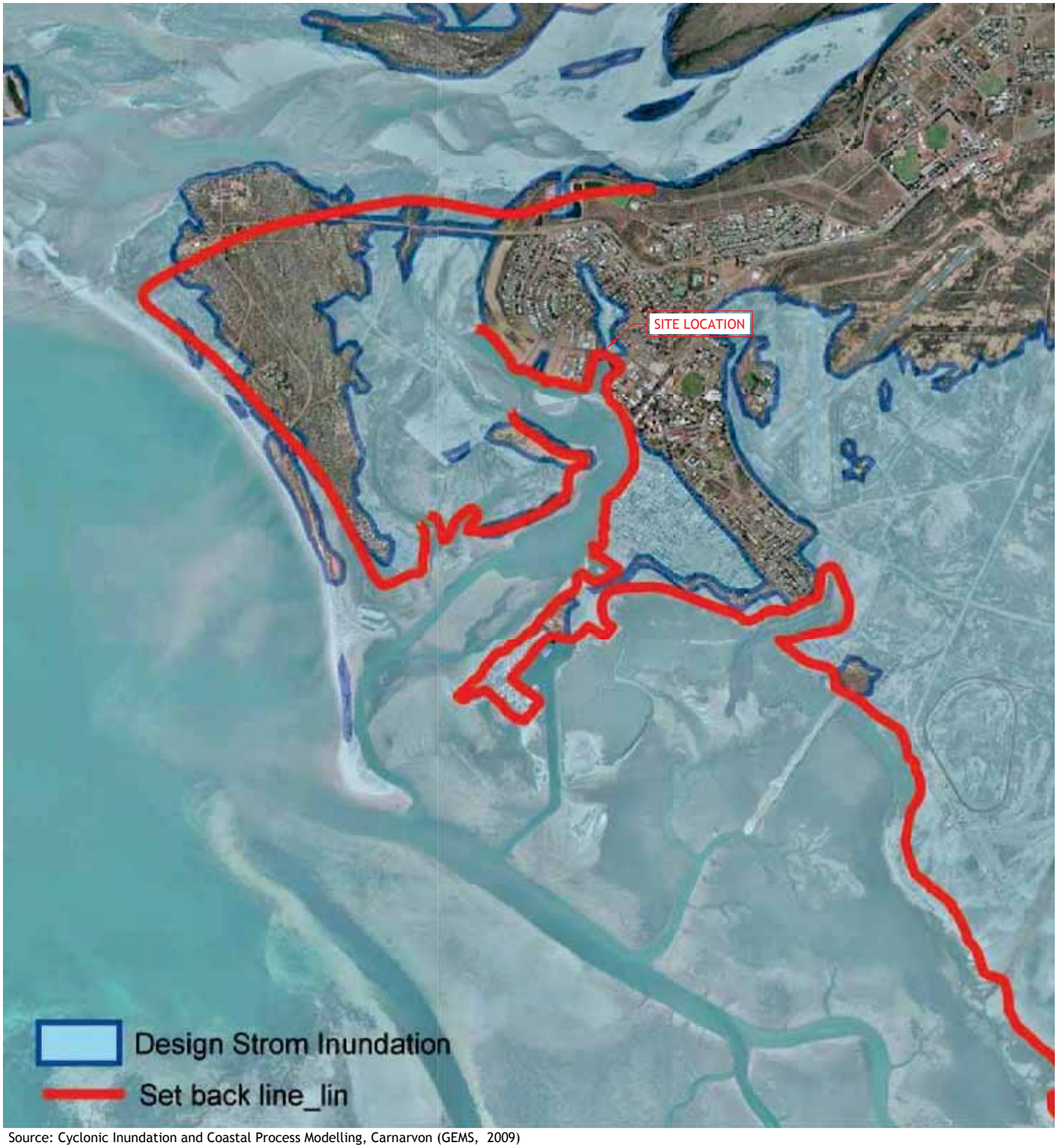
FIG 1.3



Source: Cyclonic Inundation and Coastal Process Modelling, Carnarvon (GEMS, 2009)

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CYCLONIC INUNDATION
& STORM SURGE

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FIG 3.1

LEGEND

DEVELOPMENT AREA

FLOW PATH

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STORMWATER FLOW PATHS

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FIG 3.2

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EXISTING SEWER INFRASTRUCTURE

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FIG 4.1

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EXISTING WATER INFRASTRUCTURE

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FIG 5.1

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EXISTING IRRIGATION DISTRIBUTION MAIN

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FIG 5.2

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EXISTING HORIZON POWER INFRASTRUCTURE

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Revision	B
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FIG 6.1

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EXISTING TELSTRA INFRASTRUCTURE

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FIG 7.1

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