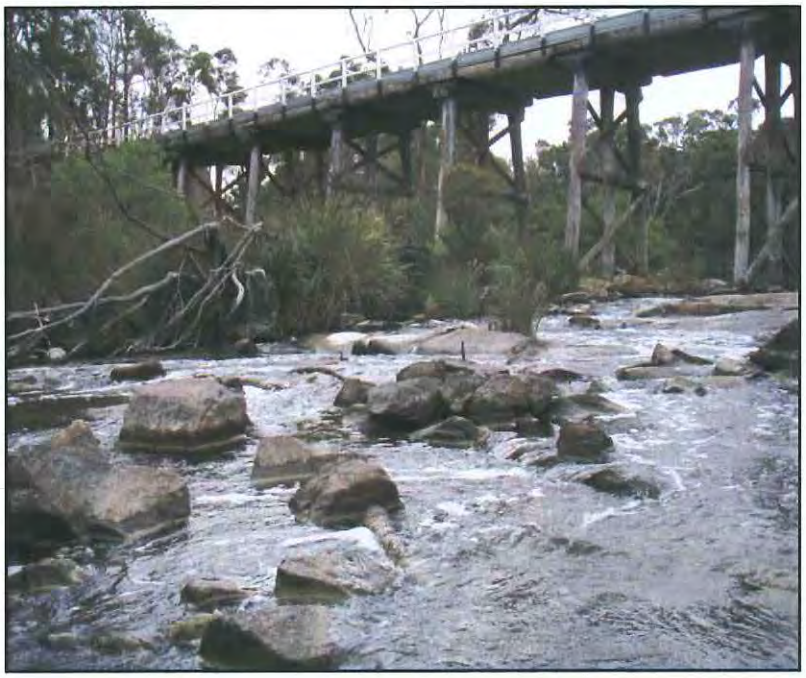
SPN/0256

PLANNING REPORT

KALGAN RURAL VILLAGE STRUCTURE PLAN



March 2012

Endorsed by WAPC 28 February 2012

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ENDORSEMENT PAGE

This structure plan is prepared under the provisions of the City of Albany Local Planning Scheme No. 2

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

28 FEBRUARY 2012

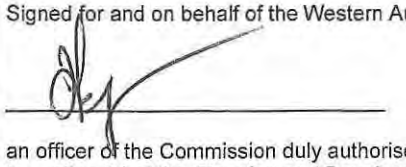
In accordance with Schedule 2, Part 4, Clause 28 (2) and refer to Part 1, 2. (b) of the *Planning and Development (Local Planning Schemes) Regulations 2015.*

Date of Expiry: **19 OCTOBER 2028**

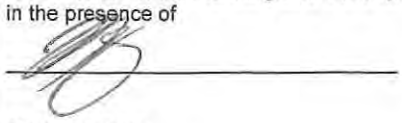
ENDORSEMENT OF OUTLINE DEVELOPMENT PLAN

The Western Australian Planning Commission resolved on 28 February 2012 to endorse the Kalgan Rural Village Structure Plan as a guide for subdivision within the locality.

Signed for and on behalf of the Western Australian Planning Commission



an officer of the Commission duly authorised by the Commission pursuant to section 24 of the *Planning and Development Act 2005* for that purpose in the presence of



Witness

22 March 2012

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A. Land Capability and Geotechnical Assessment – Oct 2008, Revised Aug 2010
B. Fire Management Plan – Original prepared 2008, Revised 2010

Revised June 2010
Revised September 2010
Revised (Structure Plan and Notations only) December 2010
Revised (Structure Plan and Notations & Plans 7, 8 & 9 Added) May 2011
Modified in accordance with Council Item 2.6, 21/06/11 July 1011
Modified through consultation with Department of Planning and City of Albany – Nov – Dec 2011, Jan 2012
Further mofications31st Jan 2012
Modified in accordance with SPC resolution of 28 February 2012

1. EXECUTIVE SUMMARY

This Kalgan Rural Village Structure Plan provides the framework for coordinated development and expansion of the Kalgan Rural Village. The supporting report analyses the local and regional context of Kalgan, the issues, opportunities and constraints relative to the existing settlement and potential future development and then synthesises these considerations into a development strategy.

This Structure Plan was adopted for final approval by the City of Albany on 21 June 2011 following and extended period of public advertising and liaison with agencies. Community consultation was an integral component of the preliminary stages of the process. The various workshop findings and agency responses were used to update and revise the draft plan and the final modifications are reflected in this document. The Structure plan addresses the issues relevant to the Kalgan Rural Settlement, based on detailed environmental capability assessment, through the community workshops and dialogue with relevant service authorities. The local characteristics have been identified, preferred lot sizes established and the boundary of the settlement has been nominated.

The new Rural Village Zone and the associated Structure Plan serve as an appropriate mechanism for providing a flexible planning framework to guide future development in Kalgan. The zoning and Scheme provisions and Standards coupled with the Settlement Zone Objectives and this Structure Plan ensure the area is comprehensively planned and will be developed in accordance with agreed standards and community expectations.

This Structure Plan sets the framework for future growth and consolidation of Kalgan within three identified Precincts, based on capability and community expectations.

The study area contains 54 residential and rural living lots, 40 of which contain dwelling houses.
The estimated population of the study area is 100 persons. Reliable demographic information is not available for the study area which extends across Bureau of Statistics collector district boundaries. Dwelling construction and low vacancy rates, coupled with anecdotal information and observation suggest very moderate population growth.

The Plan accords with Albany Local Planning Strategy and with the Lower Great Southern Strategy. It is consistent with the objectives of the State Sustainability Strategy and SPPs 1, 2 and 3 as well as relevant Development Policies. The notion of identifying Kalgan as a 'Rural village' and issues associated with its development have been extensively canvassed through the preparation and advertising of ALPS, Amendment 290 to TPS3 and thorough community workshops. The Strategic direction for Kalgan is clearly established by these higher order documents and this Structure Plan provides the mechanism to fulfil the relevant Actions contained in ALPS.

A land capability and geotechnical analysis of the Study Area was undertaken by Landform Research in July/Aug 2006 and January 2007. The field work involved extensive land surveys and site testing. The resultant report and mapping includes detailed information on soils, geology, vegetation, hydrology and land capability. Relevant findings are summarised and discussed in Parts 4 and 5 of the Amendment Report. The capability assessment was used to inform both the rezoning proposal and this Structure Plan. The spatial scale of the mapping and the level of detail are appropriate for the preparation of the Structure Plan. In some instances, further site testing and vegetation surveys on individual properties may be warranted.

The Land Capability and Geotechnical Assessment provides a number of specific recommendations which have been incorporated into this document. Importantly, the study concludes that there are no significant environmental issues that cannot be effectively managed during the planning process.

This Structure Plan sets out the Objectives and Performance Standards for Kalgan and shows the overall road layout for the settlement, cost sharing arrangements (where applicable), approximate lot sizes/lot density and key community facilities.

The 'Rural Village' zone and Structure Plan are based on the premise of consolidating the settlement. There will be a range of lot sizes in the Village given the topography, vegetation, heritage sites and varied land capability within the study area. Infill development and growth of the settlement is advocated via the creation of predominantly urban lots staged as per the Draft Country Sewerage Policy.

Because of the particular circumstances and constraints in Kalgan a conventional compact 'Rural Village' layout would necessitate significant loss of remnant and riparian vegetation and may compromise the character of the existing settlement. Many of the lots within the existing townsite are Crown Land, most of which are well vegetated. Of the original 'Residential' zoned lots only half are freehold. The balance, together with various foreshore and recreation reserves is Crown Land. The combination of larger lots, varied topography and associated vegetation are the key elements which create the unique character of the Kalgan rural settlement. It is essentially a rural residential development as opposed to the rural/urban townsite model. It is the dispersed, larger & well vegetated lots which the community values rather than a conventional compact urban form.

The Community Hall, the adjoining bushland and the foreshores at the core of the settlement have immense cultural significance; both Indigenous and European. These sites warrant protection and any future development must be sensitive to the unique heritage and cultural values of Kalgan. Whilst this is a significant asset, it also restricts the options for layout and form.

The existing pattern of settlement is quite dispersed and has a strong linear form due to the River and Highway. The settlement is divided by both the Kalgan River and South Coast Highway. This is a significant constraint to the form of the settlement and a barrier to north south movement. The traditional focal points, being the local shop, the community Hall and Recreation Reserve, are disparate and options for expansion are restricted. Options for concentrating development either to the north or south of the Highway were considered and it was concluded that development to the south is preferable.
Land to the south of the Highway and River can be more effectively integrated with the original core of the village and it is not dissected by major roads or waterways.

A site for new community facilities is nominated on the less constrained land to the south. Allowance has been made for recreation facilities, a possible Country Club, Fire Shed and additional Emergency Water Supply. The Plan also provides for improved movement networks through rationalisation of the road layout, closure of redundant road reserves and extension of the trails network.

The Kalgan Rural Village Structure Plan (KRVSP) aims to achieve a balance between these competing objectives and varied requirements, in particular to support sustainable development and protect the existing character of the area. Alternatives are explored in the report accompanying the Structure Plan report and a preferred option is as presented.

This Structure Plan (or ODP) has been endorsed by Council following advertising for public comment and input. Modifications in response to community feedback, and as required by agencies and the City of Albany have been completed.

Key issues addressed in the Structure Plan include:

- Form and Layout of the Kalgan Settlement;
- Protection of remnant and riparian vegetation areas
- Protection of significant heritage sites;
- Provision/upgrade of community facilities;
- Visual impact of development particularly from South Coast Highway and Hunton Road;
- Traffic Management and controlled access onto South Coast Highway;
- Provision of a potable water;
- Transitional arrangements between the settlement and surrounding rural area.

2. INTRODUCTION

2.1 Purpose

The purpose of this document is to provide a framework for the coordinated and staged growth of the Kalgan Rural Village.

Amendment 290 to Town Planning Scheme No.3 introduces the Rural Village zone into Town Planning Scheme No.3.

The Scheme sets out the Objectives for the zone and stipulates that development shall be undertaken in accordance with the zoning Table and the approved Structure Plan. This document fulfils that requirement.

2.2 Study Area

The study boundary, as established by the planning process and the recent Amendment, is a logical basis within which to prepare the required Structure Plan. It is based on the existing pattern of subdivision and infrastructure as well as the topography and areas of remnant vegetation. The area contains the majority of natural and man-made features which contribute to the identity of the Kalgan Village, while at the same time allowing for further development and designation of appropriate buffers to the surrounding agricultural areas.

As the existing townsite boundary does not reflect the historic development of the locality or relate to the natural topography a study area has been defined which encompasses the existing gazetted townsite together with the intervening and immediate surrounding land holdings. The study area rationale was based on a number of considerations;

- The historic development of the area
- The existing gazetted townsite
- Incorporation of development and small lot subdivision in the immediate locality.
- Significant topography and vegetation which helps to contain and define the townsite.
- Provision for sufficient buffer areas to the surrounding rural areas.
- Discussion with the Local community at two workshops.
- Incorporation of areas currently zoned Residential under the provisions of Town Planning Scheme No. 3.

Ridgelines to the south, east and west, together with significant areas of remnant vegetation provide a sense of containment and buffer to surrounding broad acre farming. The boundary to the north is less defined by the topography and more by the transition to larger landholdings and the significant area of remnant vegetation associated with the recreation reserve. The core of the village is located around the two main bridges over the Kalgan and this is also where the shop and community hall are located. Dwellings and associated smaller land parcels are also concentrated along Church Lane Road, Hunton Road and Riverside Drive. In terms of landuse, the Alpaca farm and craft centre at the northern gateway to the village, the aquaculture farm at the eastern gateway, Montgomery Hill winery and vineyard at the western gateway the smaller vineyard, holiday accommodation and orchard on Riverside Drive and the Hobbs Hoist shed and Chris Andrews rural contracting on Hunton Road are all closely associated with the Kalgan Village.

The Study Area and Characteristics Plan outlines the key components that contribute to an understanding of the physical boundaries and makeup of the Kalgan Rural Settlement.

The Study Area, as defined in the document provides the basis for the Rural Village zone and the Structure Plan. Within this zone, the Structure Plan will determine the extent of development, lot sizes and landuses considered appropriate.

2.3 Background

Following the decision of Council on 21 October 2008 to support the Scheme Amendment Request (SAR) to rezone Kalgan to 'Rural Settlement' the rezoning application (Amendment 290) was prepared. The Amendment was initiated by Council in March 2009 and adopted for final approval, with modifications, in October 2009.

The new Rural Village zone is a similar planning device other Development zones which currently operate under TPS3. Furthermore Kalgan is seen as suitable 'pilot' project for the rural villages throughout the City of Albany.

Following rezoning of the subject land and finalisation of the Structure Plan, implementation will be achieved via subdivision and development applications and through dealings with other agencies and organisations as a product of conventional Local Government activities. Subdivision and/or development will proceed in the form prescribed by the adopted plan.

2.4 Community Consultation and Workshop Outcomes

Community participation was seen as critical to the development of this structure plan, particularly with regard to establishing the character of the area and the social aspirations of residents.

Workshops were held in January and March 2008. Meetings were advertised and well attended and participants were invited to provide input on issues including Kalgan and its future, the character of the area, community use, (and need) for facilities and determining the extent of the study area. Further meetings with key stakeholders have been held over the life of the project.

The SAR was referred out to twelve (12) agencies in July 2008. As reported to Council there was general support for the proposal from government agencies. The City advised it was prepared to entertain the submission of a formal scheme amendment.

Amendment 290 was formally advertised from 23 July to 3 September 2009. This included placement of signage on-site, advertisements in the local newspaper and direct referral to affected and adjoining/nearby landowners and relevant State Government agencies. Twenty Three (23) written submissions were received.

Submissions and responses on both the SAR and the Amendment have been taken into consideration in the preparation of the Structure Plan and have been used to inform the subdivision layout, road plan and nominated landuses.

The results gathered from the two community workshops and subsequent meetings with landholders, City of Albany officers and representatives from Government agencies and service providers were incorporated into the development of the Kalgan Rural Village Structure Plan.

3. LOCATION, AREA & ZONING

3.1 Location

The Kalgan Rural Village is located approximately 27km north east of the Albany City centre at a point where the South Coast Highway crosses the Kalgan River. Refer to Location Plan.

While there is evidence that the locality was inhabited by indigenous people up to 19,000 years ago, the area was first settled by non-indigenous people around 1831 when Governor Stirling granted land to Geake with its northern boundary running up to Riverside Drive. In 1837 the area was gazetted as a townsite and called Wyndham Town. The townsite consisted of 1, 280 acres (518ha) and encompassed land from Riverside Road northwards. The townsite area was subsequently reduced in size to 225ha in 1889 and in 1912 the name was changed to Kalgan Townsite.

3.2 Area, Tenure & Zoning

The existing rural settlement covers an area of approximately 1.3 km by 1.8 km comprising some 234 ha. Currently there are approximately 56 lots generally ranging in size from 3000m^2 to 20ha with a number of larger lots, portions of which fall within the designated townsite area.

The extent of the townsite as shown on Landgate Plan is relatively confined and does not include development which has historically occurred to the south and west of the gazetted townsite boundary. Approximately 40 lots within the Study Area have been developed with a dwelling house (refer Study Area and Site Characteristics Plan).

Kalgan is the subject of Town Planning Scheme Amendment 290 which established the Rural Village zone. Land within the historic core of Kalgan was zoned 'Residential' under the original TPS3; comprising 11 freehold lots and 9 of the Crown lots, most notably the Hall site. Other Crown land is shown on the zoning map as 'Parks and Recreation', 'Public Purpose', 'Major Highways' or 'Important Regional Roads' and generally accords with the use and/or designation.
Amendment 290 served to extend and rationalise the Parks and Recreation reservation to include the various foreshore widenings, closed road reserves and other public land. There are fourteen (14) previously 'Rural' zoned lots within the gazetted Townsite; lot sizes range from 2915m2 to 3.5ha. Six (6) of these are below 1ha. The freehold lots in the balance of the Study area range sizes from just 1.5ha. Twenty five (25) lots are below 10ha and only four (4) are above 20ha. (Refer Lot sizes and Tenure Plan).

The inconsistencies between cadastral, townsite and zoning boundaries have been partially addressed through the introduction of the Rural Village zone. The KRVSP will further resolve the discrepancies in tenure, land uses and lot sizes that currently exist.

The following tables set out the land tenure and lot description for the Freehold land and reserves within the Kalgan Rural Village Study Area.

Lot No.	Street No.	Street Name	Land owner	Lot Area
3465	70	Churchlane Road	A Varden	4.04ha
105	60	Churchlane Road	A Varden	3.74ha
106	36	Churchlane Road	S Salmon	4.06ha
107	34	Churchlane Road	AS Salmon	6570m²
103	22	Churchlane Road	BW Dowsett	1.58ha
104		Churchlane Road	Dowsett/ Eggleston	3.09ha
4791	45720	Churchlane Road	B Attwell	87.32ha
77		South Coast H'way	T & K Bairstow	4.32ha
2	45647	South Coast H'way	AD Hawksworth	4.70ha
28	45594	South Coast H'way	LJ Grinstead	1.52ha
19	45562	South Coast H'way	DE Dalyt	8050m²
14	45560	South Coast H'way	J Pickles	3593m²
15	45556	South Coast H'way	P G Prideaux	2915m²
20	45554	South Coast H'way	ML Anderson.	3115m²
21	45544	South Coast H'way	Hambley Betti (BB)	3476m²
3112	45528	South Coast H'way	AJ Dixon	3.90ha
29	45510	South Coast H'way	IC Bishop	3.87ha
150	31	Andrews Road	D Tomlinson	6.76ha
151	17	Hunton Road	A S Maxton	2.87ha
20	45559	South Coast H'way	BA James	8591m²
24	6	Wheeldon Road	A Romanoff	2.28ha
25	45593	South Coast H'way	JW Jones	1.97ha
100	26	Riverside Road	FR Douglas	12.01ha
102		Riverside Road	Seaside Bay Pty Ltd	5.53ha
2	78	Riverside Road	A & ES Bernick	2.42ha
3	82	Riverside Road	AP & LJ James	3.36ha
1491	110	Riverside Road	J & R Walker	2.23ha
103	60	Riverside Road	JW & SE Bird	6113m²
221	48	Riverside Road	C & S Shilizzi	5714m²
600	156	Hunton Road	L Buktenica	15.68ha
1730	114	Hunton Road	Paterson, Fry, McGregor	20.28ha
37	84	Hunton Road	NG Hewitt	3.55ha
18	70	Hunton Road	ATA Butler	8239m²
17	60	Hunton Road	SKA Butler	6272m²
14	58	Hunton Road	Marmion, Westerberg	3547m²
23	17	Wheeldon Road	NA Gibbons	6573m²
22	22	Hunton Road	MacKenzie, (Smith) (HJ)	5035m²
1	37	Hunton Road	OE Holmes	1.65ha
2	55	Hunton Road	AT Glass	1.01ha
3	63	Hunton Road	P Ramsden & E Fletcher	4835m²
4821	85	Hunton Road	CJ Andrews	8.31ha
4904		Hunton Road	CJ Andrews	23.72ha
200	87	Hunton Road	KH Andrews	3.80ha
201	115	Hunton Road	L Douglas	13.12ha

Reserve No.	Lot No.	Street Name	Owners	Lot Area	Purpose
R 15658	43	South Coast Highway	DPI	13.311ha	Recreation
R 13909	41	Hunton Rd	DPI	0.3831ha	Recreation
R 13909	1	Hunton Road	DPI	1.2627ha	Recreation
R 48746	46	River	DPI	0.5120ha	Public Recreation
R 37318	42	River	DPI	0.1998ha	Public Recreation
R 14910	3	Wheeldon Road	DPI	0.0848ha	Church
R 22325	500	James Street	DPI	0.6628ha	Hall, Recreation
R 22324	19	Wheeldon Road	DPI	0.1559ha	Recreation
R 22323	13	Hunton Road	DPI	0.3093ha	Park, Recreation
R 16146	33	Taylor Street	DPI	0.1679ha	Church
R 45837	44	river	DPI	2.068ha	Conservation, Foreshore Protection, Recreation
R 43409	7814	river	DPI	0.0485ha	Public Recreation
R 46024	7972	river	Water & Rivers	0.2464ha	River Crossing
R 46024	7971	river	Water & Rivers	0.1882ha	River Crossing
R 45837	7996	river	DPI	4.1023ha	Conservation, Foreshore, Recreation
R 22720	8261	Riverside Road	DPI	0.3471ha	Recreation
R 22720	8262	Riverside Road	DPI	0.4399ha	Recreation
R 27720	8263	Riverside Road	DPI	3.7062ha	Recreation
1	UCL			0.1901ha	
2	UCL			22.964ha	
3	UCL			1.5035ha	
4	UCL			0.6247ha	
5	UCL			1.1053ha	
6	UCL 2		State of WA	0.0739ha	
7	UCL 6		State of WA	0.0345ha	
8	UCL			8.5742ha	
1	Closed Road			0.1470ha	
2	Closed Road			0.1521ha	
3	Closed Road			1.244ha	

4. PLANNING FRAMEWORK AND CONSIDERATION

4.1 State Strategies and Policies

This proposal accords with relevant State and Regional Strategic and Policy Documents, in particular:

- SPP 1 State Planning Framework Policy
- SPP 2 Environment and Natural Resources
- SPP 2.5 Agriculture and Rural Land Use Planning
- SPP 3 Urban Growth and Settlement
- DC 1.1 Subdivision of Land – General principles
- DC 3.4 Subdivision of Rural Land
- DC 3.7 Fire Planning
- Lower Great Southern Strategy (2007)

SPP1 provides the strategic framework and guiding principles for landuse planning in Western Australia. The primary aim is to provide for sustainable use and development of land. The Strategy identifies the five key principles of environment, community, economy, infrastructure and regional development which define and influence decision making. In recognition of the concentration of population between Lancelin and Albany and growth pressures in the south-west, the strategy confirms the need for careful management. SPP1 supports the growth of regional communities to achieve their social, environmental and economic goals. Co-ordination, high standards of development, availability of land and services are required to ensure regional communities area sustainable in the long term.

The objectives of SPP3 most relevant to this proposal include:

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

- promote a sustainable and liveable neighbourhood form which reduces energy, water and travel demand;
- ensure safe and convenient access to employment and services;
- provide choice and affordability of housing;
- create an identifiable sense of place for each community, and
- Co-ordinate new development with the efficient, economic and timely provision of infrastructure and services.

The Kalgan Rural Village Structure Plan accords with and will assist in achieving the particular objectives contained in these Strategic Policies.

4.2 Regional Planning Context

The Lower Great Southern Strategy (LGSS) "sets out the strategic direction for planning in the study area for the next 20 to 30 years". It provides "region-wide consistency for local governments when setting priorities for the area through their local planning strategies and schemes". More specifically the LGSS aims to encourage development around existing nodal settlements and provides a presumption in favour of consolidating settlements. This represents an efficient use of resources such as land, infrastructure and energy and also assists in supporting social services. The LGSS identifies Kalgan as a Rural Village and nominates its place in a settlement hierarchy as part of an overall settlement strategy for the LGS region. The LGSS advocates that "for Rural Villages identified for expansion Local Governments need to prepare and have endorsed by the WAPC a townsite strategy and/or conceptual structure plan". This Structure Plan fulfils that requirement. The LGSS states that "Rural Residential development should be consolidated and located close to existing settlements" and suggests that Rural Villages "will be assessed for their growth potential in the context of each Local Government's local Planning Strategy."

Kalgan is one of eighteen Rural Villages identified in Table 4 and Figure 13 of the LGSS. Relevant planning issues facing such rural settlements include:

- Aging infrastructure and cost of upgrades.
- Cost of extending infrastructure to support development.
- Availability of water and wastewater services.

- Issues relating to tenure, in particular Native Title claims.
- Maintenance of community assets.
- Loss of services and facilities.
- Impact of natural hazards such as bushfires.

One of the objectives contained in the LGSS is "ensure that identified settlements develop in a sustainable manner." Specific actions listed within the section on 'Sustainable settlements and community development' include identifying sufficient land for town expansion in local planning strategies, preparation of conceptual structure plans and strengthening of existing towns and centres. In recognition of the lack of infrastructure the LGSS advocates the identification of "innovative approaches to supply country towns with water and sewerage services."

The Objectives, Development Provisions and Performance Standards contained in the 'Rural Village' zone and the KRVSP address the servicing constraints and place a strong emphasis on achieving self-sustaining settlements and advocate self-reliance in regard to drainage management, water supplies, effluent disposal and other infrastructure needs.

The Rural Village zone and the KRVSP respond directly to the aims and recommendations contained in the Regional Strategy giving particular attention to servicing, consolidation and sustainability objectives.

4.3 Local Planning

The City of Albany Rural Planning Issues Review, 2002 noted that;

> "With the increase in transportation cost, the re-emergence of demand for people choosing to live in smaller, more friendly communities and changes in technology allowing home based businesses to operate, the impact of isolation is greatly diminished. The same study concluded that the growth of rural townsites is "inevitable and desirable" and the existing rural townsites such as the Kalgan provide community focus and services for the surrounding rural countryside.

4.3.1 Local Rural Strategy (1996)

Part 10 of the endorsed Local Rural Strategy (1996) deals with Rural Townsite development. The following Policy is relevant to this proposal;

> ***GP50 Improvement of Amenity and Townscape in Rural Townsites***
> *In order to provide for the improvement of rural townsites in terms of their social and visual amenity, sense of community and attractiveness to the travelling public, Council will support the planned establishment of townscape improvements, community facilities, general stores, Arts/crafts outlets etc.*

The KRVSP accords with General Policy 50 and the associated Action 22 of the endorsed Local Rural Strategy.

4.3.2 Albany Local Planning Strategy (2009)

This proposal is consistent with the Albany Local Planning Strategy (ALPS) as endorsed by the City of Albany. Parts 6.2.4 and 8.3.6 of ALPS deal with Rural Townsites/Villages. As set out on page 102,

"Rural townsites will expand as a result of development projects such as mining or tourism ventures. Their populations are also likely to rise through lifestyle settlement such as "sea change" and "tree change", and more labour-intensive agricultural uses. The challenge will be to allow the operation of increased services while maintaining the character of these towns. The City proposes to include the existing towns in Rural Townsite zones in the LPS1 and undertake structure planning for each town. New proposals for remote settlements will be determined on a case-by-case basis according to sustainability principles.

Although tourism, low-cost housing and the "sea change" trend have increased the sustainability of some rural communities, population has been lost through increasing farm sizes and labour costs and new agricultural practices such as large-scale tree farming. In some cases, this population loss has compromised the viability of voluntary organisations such as local bushfire brigades, sporting clubs and community groups."

The ALPS also states that *"The planning and development of rural townsites need to be based on appropriate development options to maintain their function and the availability of infrastructure and community facilities".*

As specified on page 135 of ALPS, *"these townsites are seen as becoming sustainable nodes offering a rural lifestyle based around an existing historical area."* Further, *"The ALPS supports the retention of the existing rural townsites, such as Kalgan, as primary rural community focal point and settlement centres of a sufficient size (30 – 100 lots) to support a local store and community, sport and educational facilities"*. ALPS advocates Rural Village development for selected villages including Kalgan and recognises the opportunity for development.

Table 4 of ALPS lists the function of Kalgan as "Urban Residential / Rural Service Centre". The growth scenario in Table 4 is *"Growth via urban lots staged as per Country Sewerage Policy. Min 1000m2 – max 2000m2. Max townsite lots – 100"*. Although Kalgan is listed in ALPS as having Existing 'urban' lots and 'compact' form, there are only twenty nine (29) freehold lots within the 450m ped shed. Seventeen (17) of these lots are greater than 1ha and only twelve (12) are less than 1ha in area; ranging from approximately 3000sqm to 8200sqm. Notwithstanding the former Residential zoning (R20), the existing 'form' does not achieve a density equivalent to R2.5, and the smallest freehold lot (1 only less than 3000sqm) doesn't achieve R5. It is hardly correct to suggest that this is a compact urban form; realistically the historic core is more akin to Special Residential and the surrounds Special Rural. Whilst some boundary adjustments and rationalisation of former road reserves has occurred in Kalgan, the scale and rate of subdivision is very low. Only limited development had occurred in the village and the growth rate has been slow. The level of servicing is low (no mains water or sewer, and presently no primary school) and no significant new infrastructure has been provided.

In recognition of the limitations in infrastructure provided to rural villages, particularly potable water, one of the specific actions contained in ALPS is

"Investigate and implement the creation of alternative potable water supplies such as rain water tanks, bores and dams, particularly for Rural Residential areas and rural townsites that too distant from uneconomic or unsustainable connection existing Water Corporation infrastructure."

To this end, it is proposed to introduce controls requiring rain water tanks and a specified minimum roof area per development/lot. The roof area and tank size are based on current acceptable standards, estimated daily household water usage and local rainfall figures, with allowance for drying climate.

The KRVSP will assist in achieving various Strategic Objectives set out in ALPS, most notably those in relation to Settlement Direction, Consolidation, Rural Living, Rural Townsites and Structure Plans.

4.3.3 Town Planning Scheme No.3

Amendment 290 introduces the 'Rural Village' zone into Town Planning Scheme No.3 and requires the preparation of a Structure Plan to guide future development and enable subdivision. The discrepancies between cadastral, zoning and townsite boundaries have been addressed through the combination of rezoning and preparation of the KRVSP. The Scheme provides for subdivision and development in accordance with Structure Plan.

Sustainability and self-reliance are fundamental principles of the new 'Rural Village' zone, as reflected in the proposed zone Objectives and Scheme Provisions. Sustainability is a key criterion which will need to be fully evaluated in the subsequent preparation of individual townsite Structure Plans.

5. COMMUNITY

Kalgan Rural Village is a small community served by a number of active community groups including the Kalgan Settlers Association, Kalgan River Conservation Community Group and Bush Fire Brigade.

The townsite and hinterland accommodate a variety of activities and uses including agriculture (livestock grazing, mixed cropping), animal husbandry (stud farms, alpacas, and stables), plantation tree farms, viticulture, orchards, aquaculture, tourist related enterprises and short stay accommodation, cafe and limited retail gravel and sand extraction, rural contracting services and rural living..

Due to the visual amenity of the area and provision of tourist related facilities the area is an important tourist destination in its own right. Previously the area has supported, light manufacturing, a restaurant, bakery, fruit growing and horticulture.

A small local hall constructed in 1912, and Local Bushfire Brigade Fire Station currently services the study area, both are situated on Reserve No 22325. The hall is of timber frame construction with corrugated iron as wall and roof cladding.

Though in only fair condition, recent local interest in the facility, which is listed on the City of Albany Municipal Register Category B, has led to the preparation of a conservation plan for the building. It would appear that there is strong local support for restoration of the facility to a standard where it would be suitable for community use and to fulfil its original role as a focal point to the local community. Reserve 15658 (Lot 43) on the northern side of South Coast Highway is reserved for Parks and Recreation and was previously utilised as playing fields. The reserve has fallen into disuse and the remnant vegetation has regenerated. The former cricket oval is barely recognisable.

5.1 Population

The study area contains 54 residential and rural living lots, 40 of which have dwellings constructed. Based on an average occupancy rate of 2.5 persons per dwelling, the estimated population of the study area is 100 persons.

Reliable demographic information is not available for the study area which extends across Bureau of Statistics collector district boundaries. Dwelling construction and low vacancy rates, coupled with anecdotal information and observation suggest very moderate population growth.
The local community comprises a mix household types; predominantly families and couples, across a range of ages and vocational activities.

5.2 Heritage

The rich heritage of the Kalgan area is of local, state and national importance. The Noongar sites adjacent to the Kalgan Hall, the exploration of the area by French navigator Nicholas Baudin in 1803 and the subsequent settlement of the area by Europeans all contribute to the significance of the area.

The registered Heritage Sites within the Study are listed in the following Table. Information is taken from advice provided by relevant agencies and research of Department of Indigenous Affairs Register of Heritage Sites, WA Heritage Council Register and City of Albany Municipal Heritage Inventory. The location of the Heritage Sites is shown on the Constraints and Opportunities Plan.

HERITAGE PLACE/SITE	LOCATION	DIA site ID/No.	HERITAGE COUNCIL No/ID	COA Ref. No..	MHI CATEGORY
Kalgan Hall	Reserve 22325 Lot 500 Wheeldon Rd/James St		00088	A65836	B
Artefacts Scatter	Hall Site & surrounds (former James St)	S00616 5523	-	A65836	A
Fishtraps	Kalgan River - 500m south of Hall	-	15580	S00400	A
Maitland	Lot 24 Hassell Hwy/6 Wheeldon Rd	-	15591	A3858	B
Douglas House (Myola)	Lot 1 (100) Riverside Rd, Kalgan	-	16628	-	
Kalgan River Bridge – Old	Wheeldon Rd (Old alignment of South Coast Hwy/Cape Riche Rd)	-	16090	-	
Kalgan River Bridge – New	Sth Coast Hwy	-	11721	-	
Ship Building Sites Kalgan & King Rivers	Kalgan River (west of Lot 100 Riverside Rd)	-	-	-	M Maritime Sites List (pg 16)

5.2.1 Indigenous Heritage

Traditionally river and estuarine environments were important food sites in Aboriginal culture. As stated in ALPS "it is estimated that the Albany region was home to indigenous people up to 19,000 years before European settlement". The oldest evidence of habitation in the area comes from an area adjacent to the Kalgan Hall (DIA, Site ID 5523, Site Number S00616) where an archaeological investigation in 1978 revealed material from a campsite over 18,850 years old. This "Artefacts/Scatter is on the permanent register.

The Department of Indigenous Affairs Register of Aboriginal Sites also contains an entry relating to fish traps to the south of the Upper Kalgan Bridge (DIA Site ID 5746). The ford and a number of graves, including one believed to be that of Mokare's brother Nakina, are also of significance. These and other sites of local cultural significance within the vicinity, but outside the study area, are described in greater detail in 'Kinjarling' The Place of Rain, The City of Albany and Department of Indigenous Affairs Aboriginal Heritage Survey. The Heritage Survey recommends that any works in the area should be subject to community consultation and Section 18 consent.

Noongar use of the river and its environs has continued post European settlement, until the present day where the river is used as a fishing location by both Noongar and Wadjella (non-Aboriginal) people.

5.2.2 European Heritage

The known non-indigenous history of the area dates back to 1803, with the arrival of the French explorer Nicholas Baudin, in February of that year, when he named the river flowing into the Northern end of Oyster Harbour 'Riviere des Francaises'. He is considered to be the first European to explore the Kalgan River.

Baudin was followed by French Commander Dumont D'Urvill, who arrived in October 1826 aboard the Astrolabe and explored the Kalgan River. Following the arrival of the Brig Amity later that year, and the establishment of the NSW Garrison at Frederickstown, Lockyer commenced the English exploration of the River. Captain Joseph Wakefield, the successor to Lockyer as commander of the settlement, charted and mapped the Kalgan River in June 1828.

Settlement of the Kalgan area commenced soon after the establishment of Frederickstown on the shores of Princess Royal Harbour. The first leasehold land was granted to George Cheyne in 1831.

By 1837 the townsite, Wyndham, was designated at what is now Kalgan. The surveyed boundary of the original townsite covered more than 1500ha and extended south of Riverside Rd and north of the recreation ground. This is approximately the extent of current Study Area.

At the time, Governor Stirling considered this as a possible alternative to siting the new settlement at Frederickstown on Princess Royal Harbour. That idea was subsequently dropped, Frederickstown was renamed Albany and it was selected ahead of Wyndham (Kalgan) for settlement and development.

The first freehold land of 866 acres on the eastern side of the Kalgan near Elbow Island was purchased by Digory Geake, the first Government Auctioneer in Albany, and the owner of Geake's Albany Hotel (on the site of the Old Gaol'). John Lawrence Morley, the Assistant Government Commissariat Office and Pilot, owned land near the mouth of the Kalgan. This was later exchanged for another property near present day Kendenup.

Following a visit of Governor Stirling to England in 1832-4, a group of Quakers, the 'social emigrants' were negotiating to buy the Wyndham site, though this did not eventuate.
In 1835, Captain Thomas Lyell Symers, trader, formerly of the East India Company, purchased land on the Kalgan near to where the Taylor's Candyup property was to be. He began to build a 50 ton schooner on the Kalgan intending to use Albany as a trading base. His wife, Mary and her brother H E Johnstone developed the property. In 1837 Patrick Taylor purchased a block on the eastern bank of the lower Kalgan where he established his Candyup property.

There are several buildings and sites of Heritage significance within the study area. Those listed on the Heritage Council Register include the Kalgan Hall (Upper), Maitland House, Douglas House, both the Old and New Kalgan River Bridges and the Fish traps. Both the Hall and Maitland are on the City of Albany Interim Municipal Heritage Inventory (MHI); listed under Category B. The Aboriginal Archaeological site at the Hall and the Fish traps are both Management Category A under the City's MHI.
Several other buildings, the remnant orchards and agricultural landscape, though not included on the Heritage Council Register or the Municipal Heritage Inventory, contribute to the areas strong sense of place.

6. ECONOMIC BASE

Agriculture, timber production and boat building were the income source for the first settlers, followed after the turn of the century by Fruit production and tourism. The availability of suitable timber led to several vessels been constructed on the banks of the Kalgan River, including the 70 ton schooner 'Fairy'. Construction of this vessel commenced in the mid 1840's, with the timber cut from Spencers and Cheyne's land. The vessel was constructed above Elbow island on Lot 4 owned by E Spencer. The site of the building of the Fairy was included in an 1852 survey of the Kalgan by P Chauncey, with a number of saw pits used in the provision of timber for shipbuilding reputed to exist nearby (adjacent to the site of the Hill Family Jetty). Upon near completion, in June 1850, the vessel was taken down to Princess Royal Harbour. However, following a dispute with his two partners (James Dunn and John Thomas, the ship was never completed and was left to rot at the eastern end of Harbour.

The schooner Chance was constructed by Solomon Cook, in 1842, an American shipwright who had deserted an American Whaler two years earlier. This boat was later sold to the whaler Thomas Sherratt. Other vessels of note constructed on the River were the Cartaburup, the Margaret and possibly the Vulcan. Several lighters and other small vessels were also constructed.

The development of mixed agriculture grew throughout the 19th and 20th centuries supplying produce to a ready market at Albany and further afield. In the closing years of the 19th century fruit growing commenced. Pioneered by the Douglas family this industry rapidly expanded throughout the early 20th century and continued up until the 1980's. Remnants of the orchards are still visible in the area.

The Kalgan also began to develop as an important tourist destination, and by the 1910-15 period was promoted in the brochure 'Alluring Albany'. Tour boats, including the Silver Star operated cruises on the River to destinations such as Powell's Strawberry Garden.

The Kalgan was once a thriving fruit growing area and has, in more recent times, supported a diverse range of economic activities such as light manufacturing, contracting, tourist associated ventures, bakery and bookstore, and agricultural activity including viticulture, animal husbandry (horse and cattle studs, alpacas, beef cattle and sheep) aquaculture and horticulture. Based on land uses across the study area, observations would indicate that income is currently derived from agriculture, tourism, raw materials extraction and contracting.

The Great Southern region's economy is largely based on the agricultural production of wool, grain and livestock (worth in excess of $810 million in 2003/04). However, primary production enterprises such as vineyards, horticultural crops and timber plantations have been established, and concerted efforts are being made to value add and diversify. The region has a growing reputation for cool climate premium wine production. These trends are evident in the study area.

The LGSS (p41) notes there has been considerable diversification of agricultural production in recent years, with viticulture being the most prominent, and crops such as cut flowers and berries also being produced in greater volumes. The capital required to establish these activities and the cost of acquiring large farms can be prohibitive, particularly if only parts of broadacre farms are suitable for more intensive production.

It is, therefore, important that when preparing local planning strategies and schemes, local governments consider opportunities for diversification and further subdivision in areas where the land is suitable for more intensive agricultural pursuits and adequate water supplies are available.

The existing small scale sand and gravel mining activities within the study area represent an important contribution to the local economy. These Raw Materials are used in the construction industry and the activity provides employment opportunities.

The LGSS recognises that mineral resources and the supply of basic raw materials to the agricultural, construction and mining industries are important contributors to economic development in the region. The Strategy aims to maximise opportunities to enable mineral exploration and extraction in accordance with acceptable environmental standards.

Prime extraction sites and existing mining operations should be identified and protected through land use planning. Notably, the LGSS states "Local planning strategies should identify known deposits on private property or Crown land and retain an agriculture zone in local planning schemes to allow for exploration or extraction, where this is deemed environmentally acceptable."

Within the Study area gravel occurs on the higher hills and remnants of the old erosion surfaces. Sand occurs as thicker sheets on some valley slopes, particularly in the north west in the soil type nominated as Deep Sand. The gravel resource is predominantly used for road construction sub-bases. The associated laterite duricrust is not normally crushed for construction materials but this may change in the future and represents an opportunity to rework some of the old gravel pits and therefore minimise the area required for gravel extraction.

Although agriculture and primary production account for almost 45% of the region's economic wealth this sector employs less than 20% of the workforce within the Region. This sector also experienced the largest decline, dropping from 19% in 1996 to 16.7% in 2001. Limited opportunities exist for employment at a local level. Declining levels of employment within the agricultural sector and a general down-turn in agriculture mean the majority of employment opportunities for Kalgan residents will be in the City. In the absence of major employment generators within the manufacturing sector, and in accordance with current trends, most jobs are likely to be within in the retail and service sectors.

The privately owned Upper Kalgan Tearooms provide milk, bread papers and other consumables to both travellers and the local community.

Although currently in a rundown state, the owner is understood to be considering the redevelopment of the site. It is strategically located on an important tourist and transport route.

The LGSS (p63) recognises that Heritage Places, historical sites and Aboriginal culture are an attraction in the region and there is significant potential for tourism in the future. To realise the potential of cultural tourism and ecotourism, informative, attractive, site-specific interpretive material needs to be developed. Given the cultural significance of Kalgan (both Indigenous and European) and the richness of the Heritage sites, there are considerable opportunities for cultural tourism.

7. PHYSICAL CHARACTERISTICS

A land capability and geotechnical analysis of the Study Area was undertaken by Land Assessment Pty Ltd in July/Aug 2006 and January 2007. The Land Capability and Geotechnical Assessment document prepared in 2008 formed an Appendix to the Report for Amendment 290 to TPS3. Among the modifications required by the Minister were various minor updates to the text and Figure 5 of the LCaGA. For the sake of completeness and consistency, the 2010 revised version of the Land Capability and Geotechnical Assessment (LCaGA) accompanies this Structure Plan. See Appendix A.

The field work involved extensive land surveys and included 22 test holes (soil pits excavated using a backhoe) and supplementary hand auger holes. The soil test hole sites were selected to test the least capable ground for development, to maximise the knowledge gained. Ground upslope or on better soils such as gravels were obviously suitable for development. This better ground was walked and mapped using some hand auger holes sunk as necessary to confirm the soil type or provide additional information as necessary. Refer Landform Research Figure 3 and Appendix 2 in the LCaGA for test hole sites, regolith and hydrological logs.

Access was not available to all lots for testing, but this did not significantly affect the soil study. The results have been extrapolated across the study area; detailed site testing and vegetation surveys on individual properties not previously assessed will be warranted in some instances. The resultant report and mapping includes relevant information on soils, geology, vegetation, hydrology and land capability. The spatial scale of the mapping and the level of detail are appropriate for this Structure Plan. Key elements of the site assessment are summarised below and depicted in Landform Research Figure 7 of the LCaGA.

7.1 Geology and Geomorphology

The locality is based on an undulating land surface centred on the Kalgan Valley which is formed on an undulating weathered Archaean granite basement. A palaeovalley was formed prior to the Eocene. The valley and land surface was then flooded as a result of downwarping and the sea flooded in allowing the deposition of the deep silts of the Plantagenet group. With the retreat of the sea, the Eocene sediments were exposed to the atmosphere and the area experienced the development of a deep weathering profile. This profile developed on the relatively flat Plantagenet Group and resulted in the development of laterite and gravel. Cutting down of the old sediments and weathering profile resulted in the formation of the current Kalgan River channel, which cut down to granite basement by the removal of the overlying silts in the valley.

On the ridges at elevations of 40 to 50 metres AHD, the laterite gravel and duricrust protected the sediments and led to the retention of the old erosion sediments on the upper slopes and higher ground. However in the gently sloping valley of the Kalgan River the river and its tributaries now flow across the degraded soft Plantagenet sediments, which in several localised places has been cut to granite basement.

Colluvial and alluvial movement of the fine sands shed from the eroding sediments were deposited in the valley floor forming deep fine sands.

7.2 Soils & Landform

The soils of the study area are predominantly sand over silts and silty clay duplex in the lower elevations, with the clay subsoils forming loams on the mid slopes and gravel and duricrust and gravel on the ridges around the perimeter of the site. Soils through the centre and lower elevations are silty sands over silty loams and clays with some alluvial silts. The key soil types shown in Landform Research Figure 3 and are listed in Table 1.

Table 1 Soil Types

RL	Brown Rocky Loam	Brown loam over yellow brown loam and granite saprolite. May have minor band of gravel from 100 to 400mm. Associated with granite basement outcrop.
BL	Brown Loam	Dark brown loam over yellow loam clay subsoils developed on sloping granite and colluvium based subsoils
GD	Gravel and Duricrust	Yellow brown gravel over duricrust at 200 - 1 200 mm over silts of the Plantagenet Group. Occupies ridge tops.
G	Gravel	Yellow brown gravel to 500 mm over yellow silty clay. Developed on silts of the Plantagenet Group. Upper valley slopes.
S/ST	Sand over Silty Clay	Grey sand or grey brown sand over yellow silty clay at 500 mm. Developed on silts of the Plantagenet Group on the gentle lower valley slopes. Some slopes are subject to surface seepages and perched water tables in winter
S	Deep Sand	Grey silty sand over deep white silty sand formed by redistribution of the sand by colluvial and alluvial processes. Occupies lower valley slopes of sand shed from upslope.
S/G	Sand over Gravel	Grey silty sand over cream or brown silty sand at 200 - 500 mm over yellow silt or silty sand, mottled in places or brown at depths in excess of 1000 mm. Located on the mid valley slopes where sand has been sheeted across older gravel soils.
A/ST	Alluvial Silts	Low lying, leached white, or brown sand overlying loam and clay subsoils of colluvial to alluvial origin. In some locations the loam subsoils are exposed. Wet in winter with surface water common following heavy rainfall events.

The soil properties and associated management issues for the subject land are examined in detail in the Land Capability and Geotechnical Assessment (LCaGA). The findings and recommendations have been used to inform this Structure Plan. Key issues are summarised in Table 2 and discuss below.

Table 2 Soil Properties

Property	Description	Soil Susceptibility	Soils Potentially Requiring Management
Water Repellence	Water repellence is the uneven or non wetting characteristic of a soil. This commonly occurs in dry situations and more commonly affects soils that contain less clay such as sands. It may lead to greater surface runoff in summer, resulting in lower soil moisture and reduced crop growth in winter.	Minor in surface sands, but with the rainfall patterns the sands are generally not non wetting	No issues for development
Soil Compaction	Soil compaction results from tractor and machinery movements compacting soils and reducing aggregates. It leads to reduced root penetration and reduced water infiltration. Compaction hard pans commonly form. Loamy sands are the most susceptible.	The soils on site have low potential for traffic compaction.	No issues for development
Dispersible Soils	Soils containing sodium in the clay content can disperse when wet, leading to soil erosion and subsoil tunnel formation.	No evidence of soil dispersion.	No issues for development
Wind Erosion	Wind erosion can impact on sands and loose soil when inadequate soil cover is retained. Duplex and sandy soils are at high risk. The worst times are prior to the winter rains.	The sandy soils are more susceptible but on this site, with the rainfall pattern, plant growth rates and vegetation cover there are no issues.	No issues for development
Water Erosion	Water erosion can occur in susceptible soils which have inadequate soil cover, steeper slopes, higher sand content and dispersibility.	Slopes are gentle to moderate. Most soils are relatively resistant because of their loam nature and vegetation cover. However the steeper slopes dropping to the river are more susceptible where vegetation cover has been removed.	Minimal. *See 6.2 Drainage and Flood Risk in LCaGA*

Soil Acidity	Soil acidity depends on a number of factors such as the amount of calcareous material within the soil, the crops grown, fertiliser usage and the proportion of clay. Soils that are too acidic can allow elements such as metals, including aluminium, to dissolve and become toxic.	The soils are acidic There is potential for soils to become more acidic through the use of nitrogenous fertiliser and the growth of legumes. PH measurements show general readings of 5.0 – 6.5 with one reading of pH 4.5.	Sand over Silty Clay and the Alluvial Silts have the most potential for acidic conditions. *See 6.6 Acid Sulfate Risk in LCaGA*
Salinity	Salinity is the proportion of salt in a soil. Often mildly saline soil moisture is concentrated on the surface through evaporation, leading to an inability to support crops and plant growth. Normally worse where ancient soils and laterite profiles are present.	There is little evidence of salinity with all water being fresh to relatively fresh.	No issues for development
Rooting Depth	The depth roots can penetrate depends on texture changes in the soil such as duplex soils, the proximity of bedrock, stone in the soil, hard clay layers and soil compaction.	The soils are sandy with underlying loam clay subsoils, or gravelly and loamy. The only issues are the minor areas of granite basement and laterite duricrust.	Duricrust and rock limit root penetration but do not impact significantly on development capability. The area with granite outcrop is minimal in the central south
Soil Moisture Storage	The ability of a soil to retain water determines the potential for crop growth and the amount of rainfall and irrigation required.	The local rainfall patterns ensure adequate soil moisture under most conditions.	With rainfall and evaporation patterns there are no issues.
Water Logging	Water can lay on the surface, clogging the pores in the soil. This reduces soil oxygen leading to loss of nitrogen and reduced crop growth	Significant areas are subject to winter waterlogging. These are mainly on the lower slopes and are related to the sands over a less permeable subsoil or sands with inadequate drainage.	Sand over Silty Clay, Alluvial Silts *See 6.2 Drainage and Flood Risk in LCaGA by Landform*
Soil Workability	Workability is the ease that the soil can be cultivated. Waterlogging, the presence of stone and slope can all impact on the ease of cultivation.	The soils generally are highly workable, apart from areas of granite basement rock and shallow duricrust.	Shallow duricrust and basement outcrop is limiting.

7.3 Geotechnical Factors, Risk and Management

The geotechnical factors relate to the capability of the site for development. As cited in the LCaGA, with such large lots, and the continued use of the land for rural living with some diversification, the necessity for geotechnical issues to be addressed is minimal. However in the interests of completeness the geotechnical aspects and associated management issues for the subject land are examined in detail in the Land Capability and Geotechnical Assessment (LCaGA). Relevant findings where potential issues may require management are listed in Table 3. The Structure Plan addresses and responds to these issues accordingly.

Table 3 Summary of Geotechnical Properties for Development

Property	Description	Soil Susceptibility	Soils Potentially Requiring Management
Foundation Stability	Foundation stability is related to the ability of a soil to compact and remain stable. Silica sands are best for this. Sloping clay soils, soils loaded with water, or expanding clay, will all lower the stability. Sometimes it is not always obvious what can happen under exceptional conditions.	Generally good foundation conditions occur on the sandy soils. The ridge soils are gravelly with good foundation stability, and the wet soils tend to be more sandy which does not decrease their stability rating substantially.	No special requirements apart from those normally required for footings for dwellings in most areas. The Alluvial Silts and Sand over Silty Clay have the lowest capability but this is still moderate to high *See 6.1 Foundation Stability*
Landslip Risk	Steep soils that are loaded with water and have the slopes changed or vegetation removed are all at greater risk of soil creep and landslip. Assessed to Australian Geomechanics Journal March 2000 (*Landslide Risk Management*).	No particular instability on the gently sloping soils. There are some steeper slopes, but these will normally be excluded from development for other reasons such as the banks of the Kalgan River	No special requirements apart from those normally required for footings for dwellings in most areas. *See 6.5 Landslip Risk*
Ease Of Excavation	The presence of basement rock, shallow groundwater, steep slopes or hard clay can all restrict excavation.	High apart from locations on shallow duricrust which are vegetated and less likely to be used for dwellings. The areas of granite outcrop are small	Generally high across the whole site.
Compaction Ability	Some soils such as quartz sands are easier to compact when using cut and fill. Others such as calcareous sands and hard clays can be difficult to compact.	Sandy soils are easy to compact. Other soils such as the gravels carry no particular requirements.	No special requirements apart from clay based winter wet soils. *See 6.1 Foundation Stability*

Expansive Soils	Some clays such as smectites are expansive and can swell when wet and shrink when dry, therefore impacting on developments.	No expansive soils were noticed.	Only likely to occur in clay based winter wet soils which are not generally present.
Water Logging - Inundation	Soils that become waterlogged can impact on dwellings through capillary action.	The main waterlogging and perched temporary winter wet areas are associated with sand over silty clay or alluvial silts which is level and slowly drained.	Alluvial Silts and Sand over Silty Clay. *See 6.2 Drainage and Flood Risk*
Flood Risk	Soils that are subject to flooding from storm events and watercourses are at risk. Sometimes it is not always obvious what can happen under exceptional conditions.	Flood risk only occurs on drainage lines which are deeply incised.	Restricted to a small area upstream on the Kalgan River. See Figure 5. See Figure 3. *See 6.2 Drainage and Flood Risk*
Depth to Impermeable Clay	A minimum of 1.2 metres of free draining soil under the base of waste water disposal areas	There are no impermeable clays. The winter wet soils result from reduced subsoil permeability rather than impermeable clays.	Not generally present. *See 6.4 Capability for On Site Waste Water Disposal*
Depth to the Water Table	The depth to the water table must be a minimum of > 1.8 metres for conventional septic systems and >0.5 metres for alternative waste water units.	Winter wet and waterlogged areas occur in the Sand over silty Clay and Alluvial Silts due to the permeable and porous upper soil horizons filling with water in winter with reduced subsurface drainage.	Alluvial Silts and Sand over Silty Clay. *See 6.4 Capability for On Site Waste Water Disposal and Plan Constraints Map*
Phosphate Retention	Phosphate is retained on sesqui-oxides, clays and calcareous particles. Soils such as white sands that do not retain water or clays, do not allow water to penetrate and will not adsorb phosphate.	Phosphate retention levels are high in the gravel soils and soils with silty clay subsoils.	Winter wet areas may have reduced retention rates if water flows off site quickly. *See 6.4 Capability for On Site Waste Water Disposal, and 7.7 Nutrient Management*
Removal of Nitrogen	Moist and wet soils with reduced oxygen levels can lead to nitrogen losses through denitrification. Soils such as white sands that do not retain water, or clays that do not allow water to penetrate, may not allow sufficient time for denitrification.	All soils have sufficient capability for denitrification to occur.	Not significant *See 7.6 Nutrient Management*

Microbial Purification	Soil microbes require a minimum of 5 metres of sandy soil or less (down to 1 metre) for soils of lower permeability such as loams. The longer a soil retains waste water the better the microbial purification. Clays may not be permeable enough for waste water to penetrate the soils.	All soils have sufficient area and capability for this away from the wetter areas where rapid runoff may reduce purification ability.	Avoid wet areas. Use nutrient adsorbing waste water systems as appropriate. *See 7.6 Nutrient Management*
Permeability	Soil permeability affects the ability to accept waste water or the ability to retain waste water long enough for adequate treatment. Soils that are too permeable, such as white sands, or clays that are impermeable, are at risk.	The sandy soil horizons and gravel – loams are permeable with reduced permeability in the underlying silty clay soil horizons	Waste water disposal systems can be selected and installed to overcome any short comings. *See 6.4 Capability for On Site Waste Water Disposal*
Acid Sulfate	Acid conditions can be formed when soils containing pyrite are exposed to the air, allowing sulphuric acid to be formed. The soils most at risk are normally saline/estuarine soils, grey soils, peat and some organoferricretes.	Minor evidence of indicators of acid sulfate, based on site and geological mapping in most areas. Only one soils test hole in the Alluvial Silts encountered "suspicious' soil horizons, but this area will be filled rather than drained or dewatered.	Fill rather than dewatering and drainage can manage any potential risk in "suspicious" areas. *See 6.6 Acid Sulfate Risk*

7.4 Hydrology, Drainage and Water Management

In accordance with the principles of better urban water management, the Kalgan Rural Village Structure Plan has been prepared taking account of the following Stormwater Management Objectives:

- Maintaining the on-site and offsite water balance;
- Protect water quality;
- Prevent or minimise nutrient export and pollutant inputs to water bodies;
- Preserve or rehabilitate native vegetation and natural water bodies;
- Prevent flooding and property damage;
- Minimise runoff;
- Maximise local infiltration;
- Protection of public health;
- Promote long term economic viability;

- Use natural drainage features; and
- Integrate stormwater treatment into the landscape.

In general, water management depends on the landforms, types of development, land uses, geology and soils, all of which can affect water bodies and the potential for soils to erode. At the Structure Plan or landscape scale, water management is an assessment of the strategic and on site issues, in particular the potential for these to impact on subdivision or development. This strategic level site assessment and analysis mainly relates to the early identification of any limitations or opportunities that relate to the management of water. The strategic water management considerations set the framework and overall approach to water management for the Kalgan Rural Village. These matters will be incorporated into the subsequent design and addressed in the detailed planning, rather than calculated engineering solutions which will be developed through the process of subdivision approval. The Structure Plan encompasses an area of almost 300ha. Proposed lot sizes range from 1000sqm in the historic village core and community node to 2000 - 5000sqm through to in excess of 2ha, based on site characteristics, capability, vegetation, fire safety and tenure.

Given the extent of the study area and the range of lot sizes proposed for the Kalgan Rural village, there is also an opportunity for the preparation of more detailed urban water management plans at sub-precinct level prior to or at the subdivision stage, to suit scale, intensity and timing of development.

Water management issues are addressed in detail in parts 2.5, 3, 6.2, 6.3 7.5, 7.7, 7.8 7.9 and 8 of the LCaGA. In particular soil properties, geotechnical factors and associated management issues in relation to water erosion, salinity, water logging, inundation, flood risk, depth to water table, phosphate retention, removal of nitrogen and permeability have been assessed, as set out in Tables 2 and 3 (above). Further, the following sections of this report summarise and discuss stormwater, drainage and water management, flooding, groundwater and water availability.

The information and recommendations contained in the LCaGA and other relevant guidelines have been used to inform the Structure Plan. The road layout, trails network, lot density, nomination of preferred land uses, establishment of conservation corridors and identification of development exclusion areas have been developed in response to the opportunities, constraints and site characteristics.

Water Management is addressed in conjunction with these other management issues. The design achieves the relevant objectives; in particular water management to achieve the natural flow of discharge at pre-development levels and protection and enhancement of the water resources.

7.4.1 Surface Water

In general the surface water runs off from the saturated areas of Sand over Silty Clay soils and areas where seepages occur and then runs along creeks to the Kalgan River. Minor drainage has been cut in the central south to drain flat Alluvial Silts.

The Kalgan River is estuarine in the southern portion of the study area to a granite rock bar at the Upper Kalgan townsite. Upstream from there the river is non-tidal. The rock bar prevents estuarine water from moving upstream but also impedes flood flows of water, causing the flood waters to build up upstream of the Upper Kalgan Bridge.

The valley of the Kalgan River is generally deeply incised and as the water builds up in a flood it fills the incised valley upstream of the townsite. The affected areas are very small and are shown in Landform Research Figure 5 and were mapped from geomorphological evidence and discussions with local people including landholders.

The flood elevations and extent were for the large flood in early 2006 when a 1: 100 year event occurred. Downstream of the rock bar the river does not flood because the width of the channel is greater and the river outlets to Oyster Harbour.

Groundwater was tested using a portable conductivity meter and converted to mg/L salt. The salinity was measured in August 2006 and showed the surface water flows to be 935 to 2585 mg/L. Potable water is less than 990 mg/L and stock water up to 9000 mg/L. The water quality of dams is normally fresher as indicated by the dam in the north west corner with a salinity of 385 mg/L which is fresh. The water is therefore suitable for stock and some irrigation, but is not generally suitable as a potable water source. In summer the water can be expected to be similar or slightly higher in salt concentration due to reduced runoff.

7.4.2 Drainage and Water Management

The LCaGA recognises that drainage relates to the water levels in summer and winter, the elevation of perched or regional water tables, the type of soils, underlying geology and hydrology, natural and potential drainage of a site. Poor drainage can result in waterlogged soils and may impact on foundation stability. Soil moisture can also result in capillary action which can impact on structures.

The majority of the site is well drained apart from the central area and lower slopes, where winter wet conditions occur in the Sand over Silty Clay and Alluvial Silt soils.

The Sand over Silty Clay soils have upper sand horizons that are permeable with reduced permeability in the silty clay subsoils. These soils therefore have a tendency for the upper soil horizons to fill with water because of reduced subsoil permeability and slow lateral subsurface water flows resulting from the fine grainsize.

In turn this leads to some winter wet areas, seepages and waterlogging. Cut-off drains normally in the form of road drains can be used to reduce the soils moisture. Some of these areas are covered by remnant vegetation and may not be developed.

The Alluvial Silts are winter wet because they are lower lying and flat, with reduced surface water and lateral subsurface soil flows. In the past these have been partially drained by the construction of small drains. The large scale drainage of these areas is not recommended without additional soils testing on any potential impacts of dewatering. It is preferable, where possible, to use fill to raise the development areas on these soils.

There are areas where further testing is recommended before drainage is implemented, as shown on Landform Research Figure 5 of the LCaGA (Refer Appendix A), and are related to the small potential for increases in soils acidity from reducing conditions in the some upper soil horizons.

Winter wet conditions occur through the centre of Lot 1, See LCaGA Landform Research Figure 7. As recommended these areas are to be excluded from development unless filled. Further, any lots located within the central area are to be large enough to include ridges on which building envelopes can be located.

An effective way to aid and manage drainage is to encourage the use of rainwater collection and use for a potable supply or garden watering, and to encourage the disposal of stormwater on each lot through soak wells located in sand fill areas. The use of rainwater tends to reduce the overall water loading and the soakwells increase the soakage areas and spread infiltration across the Development Area.

This can be further helped by the use of detention and infiltration basins accepting all stormwater from any kerbed roads or roads using defined edge drainage. Swale drains that include infiltration devices and do not result in surface water flows will not require such basins.

On sloping land there may need to be slowing devices, and where possible periodic soakage devices such as a series of soak wells down slope with overflows exiting down slope.

7.4.3 Flooding

Flooding relates to the potential of a watercourse to flood a particular area. An area susceptible to flooding can be subject to the flood flow or may lie in a flood fringe. Construction should not impede a flood flow and normally structures are not to be placed in the floodway.

The flood fringe is not subject to the same erosive forces as the floodway and structures may be located in the flood fringe provided they do not increase the elevation of the flood. Normally a 500 mm separation is required between the 1 : 100 year flood level and any floor elevation.

A 1 : 100 year flood occurred in early 2006, a few months prior to the site inspection. Discussions with local residents and landholders were used to determine the flood paths.

The major creeks and rivers on the site are deeply incised by some 3 to 7 metres with sloping valley sides of steep incisions. The watercourse below natural land surface contains the normal flows and flood flow.

The Kalgan River is estuarine in the southern portion of the study area to a granite rock bar at the Kalgan settlement. Upstream from there the river is fresh.

The rock bar impedes flood flows of water, causing the flood to build up upstream. The valley of the Kalgan River is generally deeply incised and as the water builds up in a flood it fills the base of the incised channel upstream of the townsite. The affected areas are shown in Figure 5 and are restricted to one small area in the central north of the planning precinct.

Downstream of the rock bar the water does not flood because the width of the channel is greater and the outlets to Oyster Harbour.

The only areas at risk of flooding are immediately adjacent to the watercourses as shown in Figure 5. The majority of this is Crown land and is within existing foreshore reserves. The only freehold land at risk of flooding is the eastern portion of Lot 3486, adjacent to the Recreation Reserve (former oval and cricket pitch) north of the townsite.

7.4.4 Groundwater

Groundwater is normally at shallow depth or perched on the lower slopes with the depth increasing upslope. Water is supplied from bores and dams. The quality of the water depends on whether the wet areas are clay based, with no seepages, compared to dams with continuous seepages which are the freshest. Water draining areas containing laterite remnants are normally slightly higher in salt content.

7.4.5 Water Availability

The water on site has traditionally been supplied from bores and dams. With the rainfall, relatively low evaporation and sandy soils overlying more silty and clay rich subsoils, there has not normally been a water shortage because of the reduced need to irrigate. The surface water supply on site has therefore been able to satisfy the demands placed on it. There are only low demands for irrigation today because of the relatively limited extent of horticultural activity.

Water quality is normally suitable for irrigation of trees and orchards but is not always potable, particularly in the surface water. Water from dams and bores can continue to be available.

Domestic supply of water can also be obtained from roof catchments. Normally each dwelling on rural residential properties will also have a garage/large shed which could be used to increase supply.

Based on historic rainfall figures for Kalgan, a minimum storage of 60kl capacity would be required to supply 450lt of water per day with 98% reliability. Typically a 90 - 120 kl tank is recommended for areas such as this without scheme water.

With an average rainfall of 798 mm, a roof area of 150 m^2 is capable of filling the tank. In this case it is recommended that a minimum roof area of 250m^2 be specified for Rural Living developments in Kalgan. The recommendations for greater storage capacity and larger roof areas are intended to allow for the uncertainty of future rainfall and possible drying change.

7.4.6 Impact on Recharge and Water Balance

In order to determine the effects of development, and what should be designed for and considered, an assessment of the likely recharge pre and post development is considered. At present rain which falls on the subject land either soaks into the soils or runs from the site. The predominant landuse is pasture; a significant area contains remnant vegetation and there is a slight concentration of buildings within the historic village core together with an existing network of road and associated drainage.

Rainfall at Albany Airport is 798 mm per year, 932 mm in the town, and 794 per year at Kalgan River. Mean monthly rainfall varies from near 20 mm in summer months to 130 mm in the winter months. Annual evaporation is less than 1000 mm per year, with rainfall exceeding evaporation for almost nine months of the year.

The Development Area will not be connected to reticulated water supply and will not be sewered. Rainwater tanks are required to be installed for all habitable and commercial buildings. 5kl tanks are generally required to attenuate 1 in 1 year storm events, the minimum tank size required in Kalgan is 90kl. On smaller lots (below 4000sqm) it is recommended that soakwells also be installed.

Groundwater recharge was considered by the Environmental Protection Authority in Bulletins 512, 788, 821 and 818; although this was for the Lake Clifton area where rainfall is similar but spread over a lesser number of months with a winter high and soils are highly permeable, an estimate can be made on the water balance using the data within the bulletins.

The recharge figure the EPA used for recharge from native vegetation was 10 – 15% rainfall, whereas cleared land had a recharge of 30 – 40%. For the Development Area a current figure of 35% is taken as an estimate of the water not used by vegetation, lost as surface water or as infiltration. For an annual rainfall of 800 mm this equates to 2800 kl per year of water generated per hectare.

For lots of 1 hectare or greater there will be little change to the recharge. For lots of 0.4 ha the amount of hard surface will increase with dwellings, driveways and roads. However as the runoff from roads will be accommodated within swale drains and rainwater is to be harvested and stored in rain tanks, with any overflow discharged into soakwells, there will be no net increase in recharge. More intensive subdivision may be considered in the historic core, but is subject to detailed design, soil testing flora Assessment and preparation of a water management plan. Any consolidation will utilise the existing road network and associated drainage infrastructure, with upgrading as required to accommodate 1 in 5 year events. Again new developments will incorporate rainwater tanks and soakwells which will attenuate 1 in 1 year events.

The only significant change to water balance will be if kerbing is used on roads and/or surface road drains are used. The recharge will not increase as a result of the road construction/upgrades but the surface water paths will be changed, with some water running off in the drains. The only water to be dealt with through water management will be that from roads concentrated in kerbed or swale drains edging the roads. Should there be a requirement for detention/treatment basins/swales within any of the post-development catchments these will be located within existing or proposed road/drainage reserves. The existing Reserves total more than 50ha in area and constitute in excess of 25% of the Rural Village. Combined with any additional drainage reserve this is more than sufficient area for the effective treatment of 1 in 1 through to 1 in 10 year events.

In a major rainfall event (greater than 1 in 10) the site will drain in a similar pattern to that of pre-development sub-catchments. Runoff will generally shed across the site, unless intercepted by roads. In addition to the foreshore Reserves, the first order streams, drainage lines, seepage areas and areas subject to flooding are excluded from development. These multi-purpose conservation corridors and foreshores will continue to function as natural drainage features, serving as overland flow paths. The Structure Plan shows approximately 7.5ha of freehold land as new conservation/drainage corridors.

These areas will be progressively re-vegetated thereby enhancing their conservation, biodiversity and amenity value as well as their function and performance in regard to water management, minimising runoff and nutrient export, use of natural drainage features, maximising infiltration, water quality, streamline protection, flooding and maintaining water balance.

7.4.7 Water Management Strategy - Conclusions and Recommendations

- Given the relatively large lot sizes and low intensity of development, there will be minimal additional hard surfaces, following subdivision, which will require drainage. Consequently the need for any infiltration areas will be minimal.
- There will be a minimal impact in water loading across the Rural Village zone. In any case drainage lines, seepage and low capability areas and areas subject to flooding are excluded from future development.
- Water tables will have risen as a result of the initial clearing of the land over the last 150 years, making some areas slightly wetter than previously.
- Almost all nutrient export risk which may occur relates to rural and horticultural landuses, not on hard and impervious surfaces such as roads. There will be little risk of nutrient export from the road drainage. Any risk can be managed through the retention of stormwater in detention and infiltration basins.
- Nutrient export risk is anticipated to reduce because of reductions in nutrient loading, reductions in stock and no change to the broad acre application of the nutrients.
- The subdivision guide plan and development exclusion areas have been designed in response to the findings and recommendations contained in the LCaGA, giving due regard to water management and watercourse buffers.
- Infiltration on individual lots should be across as broad an area as possible, rather than a point source. The use of soak wells and basins, or similar, is preferred rather than single infiltration structures or cages.
- Ensure that any road drainage devices are located within easements and/or designed in a manner that will enable servicing and maintenance by the City of Albany.
- Water flows down steeper slopes should be slowed with soakage sumps, rip rap and other such features.
- Use swale drains, shallow detention and infiltration basins that are landscaped into road verges and appropriately vegetated to accommodate stormwater from roads.

- Notwithstanding that the majority of land which may be at risk of flooding is contained within existing foreshore reserves, in the event of subdivision it would be appropriate to place a notification on the Title of the freehold land west of Reserve 15658 to alert owners to the potential for flooding and to prevent construction of developments that may impact on or change the floodways and flood flow paths.
- Foreshores along the Kalgan River, Chelgiup Creek, Baudin Stream and other drainage lines are identified as development exclusion areas. Existing Reserves will be retained and in some instances widenings and re-planting are proposed.

7.5 Biological Environment

7.5.1 Flora

The vegetation assessment and flora study conducted for this project identified 70 species and three main vegetation communities.

The Flora survey is contained as Appendix 1 of the Capability and Geotechnical Assessment. The Vegetation Communities are depicted in Landform Research Figure 4 from the LCaGA and are briefly summarised in the following Table.

Vegetation Communities – Kalgan

Jarrah – Marri Low Forest	This community occurs on the laterite gravel soil of the upper slopes and ridges. The soils are yellow brown gravels with duricrust close to the surface. It is dominated by Eucalyptus calophylla, E. marginata with Banksia grandis overstorey and an understorey typical of gravelly soils in the Albany and local area. Typical understorey species include Bossiaea linophylla, Sphaerolobium medium, Pultenaea reticulata, Allocasuarina humilis, Dryandra lindelyana subsp lindleyana, Melaleuca thymoides, and Leucopogon verticillatus. Vegetation condition is generally Very Good with some previous clearing for gravel extraction in the west. There is generally little weed impact even though some remnants are not fenced.
Taxandria Shrubland	This community occupies on the lower slopes where the soils are likely to be wet in winter. Typically the soils are sands over silty clays at depths of around 300 - 500 mm. The vegetation is mostly a shrubland typified by wet site species such as Taxandria linerifolia, Taxandria parviceps, Taxandria juniperina, Hakea oleifolia, Calistachys lanceolata, Lepidosperma gladiatum and Gahnia trifida. Eucalyptus cornuta occurs occasionally. The vegetation is normally in Good to Very Good condition and rapidly colonises any cleared land.
Riverine Forest	This vegetation occurs along the Kalgan River and tributaries on deep loam and sand over loam soils. The vegetation is dominated by Eucalyptus diversicolor and Eucalyptus calophylla, with an understorey comprised of species from wet areas and from the gravelly soils, such as Taxandria linerifolia, Taxandria parviceps, Hakea oleifolia, Calistachys lanceolata, Lepidosperma effusum Lepidosperma gladiatum and Gahnia trifida. Melaleuca cuticularis is added along the Kalgan River. The vegetation along the Kalgan River is generally in Good condition or better adjacent to the river but deteriorates to Degraded in some locations which have been cleared or grazed. Chelgiup Creek to the east of the Upper Kalgan townsite has significant disturbance by Watsonia and other exotic species.

In general the remnant vegetation lies on soils that are less suitable for agriculture and therefore were never cleared during the long occupation of the area. The main remnants occur on the laterite gravel – duricrust ridges in the west and east, in winter wet areas through the lower elevations and along the banks of the Kalgan River and tributaries.

Some plantations also occur within the Study Area.

No Declared Rare, Priority or Significant Taxa, or Threatened Ecological Communities were observed during the site investigations. In addition no unusual or unidentified species were recorded. No species or communities listed on databases held under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 were encountered.

The remnant vegetation on site is generally classified Good or above including areas of remnant vegetation into which stock have access. The vegetation is weed free and worthy of protection. Vegetation along the Kalgan River is generally in good condition.

There are some areas of Degraded vegetation and some vegetation which is subject to edge effects from exotic pasture and weed species. For example parts of the fringing vegetation of the Kalgan River adjacent to pasture and Chelgiup Creek adjacent to the Townsite.

The LCaGA concluded that all remnant vegetation should be retained where possible and that regrowth can be used to allow or enhance wildlife corridors.

Remnant vegetation through the study area is fragmented and of varying condition and quality, however is of critical importance to the local residents' sense of place.

Coral Pepper, in her discussion paper "Sustainability of Cultural Heritage and Landscapes", states "Cultural landscapes are...considered to be about people gaining and maintaining a 'sense of place' in their community. Our recognition of a site as being pleasant or important is a first step in planning how it can be preserved and managed for the enjoyment of people."

A key characteristic of the Kalgan area is the natural environment. The river, remnant vegetation and topography all contribute to its attractiveness and desirability as a place to live.

The quality and extent of these attributes contribute to the high landscape amenity and biodiversity values of the area. This was confirmed in the results gathered from the two community workshop sessions.

Retaining and enhancing the local character and sense of place has been a key driver in the preparation of the Structure Plan; in particular the need to retain and protect remnant vegetation, visual amenity and cultural heritage values.

7.5.2 Fauna

The amount of fauna is directly related to the proportion of remnant indigenous vegetation. Remnant vegetation is good habitat and thus all potential fauna species for the area could either be present or could utilise the site. Even isolated trees have habitat potential and the clumps of remnant trees are correspondingly important.

The survival of fauna is thus dependant on the land use and controls imposed, and education of landholders. The vegetation along the Kalgan River is generally in Good or above condition, and there are pockets of remnant vegetation scattered across the area that are also in Good condition or above. These all form habitat, but are frequently restricted to areas where the soils were less useful for agriculture, such as the sloping edges of the Kalgan River, laterite duricrust ridges and winter wet and waterlogged areas.

All remnant vegetation should be retained where possible. In addition, regrowth can be used to allow or enhance wildlife corridors. Vegetation could be protected using a range of mechanisms, including public ownership, conservation covenants and Management Plans.

7.6 Land Capability – Key Recommendations and Conclusions

Land Capability is the recognition of the suitability of a site for a proposed land use. An integral part of this process is the identification of issues and the way they can be managed to ensure that the proposed land use is sustainable and does not lead to significant environmental impacts.

The Land Capability and Geotechnical Assessment categorises much of the Study Area is High or Very High capability for Dwellings. Land immediately to the eastern side of Hunton Road adjacent to the historic core is Fair Capability with moderate physical limitations, as is the seepage area north west of Douglas Rd.

One small area of Low Capability land is identified west of the aquaculture operation. No property within the Study area is categorised Very Low Capability. The areas immediately adjacent to Kalgan River, Chelgiup Creek and Baudin Stream are Not Acceptable for Development because of significant environmental or geographical issues. The Capability Assessment confirms that the gravel based soils of the upper slopes are well suited to urban and rural living development and comply with all guidelines for conventional septic systems. Figure 7 depicts the overall capability of the Kalgan Rural Village.

The opportunities of the site, as identified in the LCaGA are;

- The sloping nature of the site.
- The picturesque nature of the local area.
- Widespread views that can be obtained across the site.
- Proximity to Albany townsite.
- The Kalgan River running through the centre of the local area.
- The long history of the local area.
- The amount of remnant vegetation scattered across the site and along the Kalgan River.
- The potential for tourist activities.
- The nearby land is again increasingly being used for perennial and other horticulture.
- The presence of drainage lines, wet areas and dams across the site.
- The interesting mix of wet site and ridge vegetation.
- Presence of large quantities of water suitable for perennial horticulture.
- Presence of suitable soils for perennial horticulture.
- Potential gravel resources.
- Potential sites for aquaculture.

The constraints of the site are;

- Winter wet soils on the lower valley slopes.
- The fire hazard of remnant vegetation.
- The presence of drainage lines that may require catchment management and appropriate setbacks.
- Presence of existing gravel quarries which require adequate buffers.
- The presence of some winter wet soils.

It is recognised that there is a need for additional lots in the Kalgan settlement and surrounding area. With the development and growth of Albany there is increasing demand for urban and rural living land in rural towns and villages which will complement the City of Albany.

The subject land has been settled since the mid 1800's and by Western Australian standards has a long European history. This is subsequent to an equally significant and much longer aboriginal history. The Kalgan settlement area was an important orchard growing locality but in recent decades has been used predominantly for rural living with minor perennial agriculture.

The gravel based soils of the upper slopes are well suited to urban and rural living development and comply with all guidelines for conventional septic systems. The soils of some of the lower slopes are potentially more wet in winter but have fair to moderate capability and are suitable for development using nutrient adsorbing waste water systems.

The Kalgan River and tributary creeks plus the remnant vegetation can be afforded better levels of protection through the use of setbacks, buffers, conservation areas and changes to lot sizes and boundaries. For example cattle currently graze to the edges of some creeks which, when fenced, will be afforded better protection.

Two areas of soils that lie in the central southern part of the site may be at risk of acid sulfate conditions if they are dewatered or drained; these have been identified in Landform Research Figure 5. Given the relatively low risk, the planning process can be used to provide for fill in these areas rather than drainage or dewatering, which will negate the potential exposure of any at risk soils if they occur.

The remnant vegetation is of generally good condition and worthy of retention and protection which can be better achieved through appropriate planning.

The LCaGA concludes that there are no significant environmental issues that cannot be effectively managed during the planning process. Specific recommendations listed in the management sections throughout the text of the LCaGA relating to the most important environmental issues are incorporated into this Structure Plan.

The evaluation and analysis of geological and environmental factors, combined with the planning process and input from referral agencies, have been used to inform the Structure Plan. The Plan addresses any potential geological or geotechnical limitations and at the same time makes the most of the planning and environmental opportunities.

8. SERVICING

8.1 Roads & Access

Initial transport to the area was by boat, though road transport commenced to the area in the 1850s. A ferry service operated just above the site of the present day Lower Kalgan Bridge from the 1870s to 1904, when the first Lower Kalgan Bridge was constructed above the mouth of the river. The bar at the mouth of the Kalgan was also dredged to form a channel at this time.

In 1912 the Lower Kalgan jetty was built, by the Public Works Department to service the needs of the settlers on the lower Kalgan. It was damaged in 1915 and survives as a ruin to the present day. There were a number of private jetties or landings along the Kalgan. Those in the vicinity of the Kalgan Village include the Hill Family Jetty, the Killarney Landing used to load timber from the Douglas family land and the jetty servicing the Powell's Strawberry Gardens (the latter two are to the south, in the vicinity of Elbow Island also known as Honeymoon Island). Fruit continued to be transported, by lighter, to Albany as late as the 1940's. The lighters were also called into service when floodwater carried away bridges.

These days the study area is serviced and accessible by South Coast Hwy (Hassell Hwy) and Hunton Road, which connect the village to the Albany City centre to the south west, to the south coast and interstate to the east.

South Coast Highway is a sealed two lane national highway accommodating open drainage, in an otherwise vegetated road reserve. The Highway is the primary east west access road. It is part of the State Arterial Road Network and is a dedicated Heavy Haulage Route. It performs the function of a primary freight route and carries in the order of 929 vehicles per day (November 2007). It currently operates at 90km / hr within the townsite with the 85 percentile being 91.4km / hr (Oct-Nov 2007). The Highway carries in excess of 150,000 tonnes of grain per annum and is experiencing growth in freight tonnage associated with the blue gum plantation timber industry.

Hunton Road, the primary north south access route from Nanarup Road to the South Coast Highway, is sealed with a gravel verge within a partially vegetated road reserve. Hunton Road is predominantly a two lane bitumen road developed to rural major road standard. It carries in the order of 131 vehicles per day (South of Wheeldon Rd @ 450m, November 2008).

The posted speed limit is 60km/hr. 43.57% of vehicles (across all classes) were exceeding the speed limit. The 85 percentile being 72.4km / hr (Oct-Nov 2007).

Wheeldon Rd, which connects the Highway to Hunton Road, via the 'Old Kalgan Bridge' is sealed and is, in places, single lane. It carries in the order of 96 vehicles per day (South of the Hwy @ 380m, November 2008). The posted traffic speed is 60km/hr. The average speed (of all vehicle classes) is 47.3 km/hr, with the 85 percentile being 57.6km / hr (Oct-Nov 2007).

Churchlane and Riverside Roads are both constructed to an "all weather" gravel standard with open drainage, and partially vegetated road reserves.

There are a number of redundant, unconstructed and closed roads/reserves within the study area. Most noticeably sections of Wheeldon Road/Place and James Street which are the result of the re-alignment of the Highway in the 1960s and the replacement and raising of the old Kalgan Bridge.

The Highway is designated 'Major Highway' on the City of Albany Town Planning Scheme 3 zoning maps. Hunton Road (south of the historic townsite), Churchlane Road and Riverside Road are designated on the Scheme Maps as 'Important Regional Road'. Road reserves within the gazetted townsite generally have 'no zone'. Previous anomalies in the zoning of portions of closed roads and redundant reserves were rectified through Amendment 290.

Through the course of this project there has been ongoing dialogue with engineering consultants and representatives from Main Roads WA in regard to Highway function, road design, traffic safety and intersection treatments. Preliminary advice from the Engineering consultants was obtained in May 2008 in regard to compliance with NAASRA standards, road geometry, sight distances and vertical curves, traffic speed, emergency access and the opportunity to review to road hierarchy within the settlement and consider the introduction of a 40km/h "share zone".

It is understood that the Settlers Association forwarded correspondence direct to Main Roads WA and the City regarding, amongst other things, traffic speed within the Kalgan Settlement. This issue and related matters were discussed at community meeting attended by officers from Main Roads WA. The issue of traffic speed was raised by the Association at each of the workshops held throughout the project, and continues to be of concern. Given the topography and road geometry through the village, a case can be built for reviewing the speed limit.

It should however be noted that the response, to date, from Main Roads WA is that it would not support a reduction in the posted traffic speed on South Coast Highway.

Preliminary discussions occurred with representatives from Main Roads during 2005 and 2006. At a meeting held 7 March 2008 the implications and expectations in relation to Kalgan settlement were considered. Issues raised included the function of the Highway as a State freight route, traffic speed and volumes, intersection treatments, bridge widening, turning lanes, access and egress to individual lots, pedestrian access, sight distances and safety. The agency has provided formal responses to the Scheme Amendment Request (November 2008), the Rezoning July (2009) and the draft Rural Village Structure Plan (January and May 2011). The respective documents and plans have been modified to incorporate relevant agency advice.

Specific data on traffic volumes for the sections of South Coast Highway and the local roads within Kalgan Settlement was provided by Main Roads WA in March 2008. The SAR was referred to Main Roads WA in July 2008. As reported to the Council in October 2008, the Department indicated it had no objections to the proposal; a number of standard procedures and matters to be addressed were identified to aid in understanding the scope of Main Roads requirements. As cited in correspondence received from Main Roads WA in November 2008 South Coast Highway is an inter-regional road transport route between the Great Southern and Goldfields-Esperance. It is a strategic freight route and a major tourist and inter-town route; the future performance as a transport route requires protection. The agency advised that the Highway carries in excess of 150,000 tonnes of grain per annum through the Kalgan Townsite and is experiencing rapid growth in freight tonnage as the blue gum plantation industry progressively matures. Main Roads WA anticipates that likely "total freight tonnage will exceed 1.5millon tonnes per annum, or 60,000 multi-combination vehicle movements per year".

Amendment 290 was forwarded to Main Roads WA for comment during formal advertising stage in 2009. The agency referred to its previous advice and indicated it was opposed to aspects of the rezoning as development at Kalgan "would expose the State to significant future financial liability".

The draft Structure Plan was referred to Main Roads WA in December 2010. In response to comments received in January 2011 meetings were held with representatives from the Department of Planning, City of Albany and Main Roads WA. A draft Traffic Solutions Plan was prepared and consideration was given to options for intersection treatments.

Further comment was received from Main Roads WA in May 2011. Main Roads advised "it opposed to any proposal to increase linear residential development along South Coast Highway as this will inevitably result in increased traffic conflict between local residents and heavy vehicles, increased community road safety concerns and diminished effectiveness of the South Coast Highway as a priority heavy haulage route". At the same time, the agency also re-confirmed that it was "not opposed in principle to the extension of the Townsite south and east subject to all issues relating to road safety and highway efficiency being resolved to Main Roads satisfaction and at no cost to Main Roads".

Based on further liaison between the parties and the agreed preferred solution, the design concepts were modified and a preliminary local traffic Plan was prepared. This has been further refined in accordance with Agency advice and recommendations.

The City of Albany recognises that some of the accesses to South Coast Highway will need to be restricted or upgraded and that the intersections at Wheeldon Road and Hunton Rd are in need of attention. The combination of curves, limited sight lines and road camber result in substandard intersections at Wheeldon and Hunton Roads. This matter was not adequately resolved when South Coast Highway was realigned. South Coast Highway does function as a significant State haulage route however this needs to be balanced against safety and amenity. With intensification of development, some improvements to the road network within the village, upgrading of appropriate intersections and reduction of speed and other traffic calming techniques may be required. It is also acknowledged that this is a shared responsibility; developer contributions towards the upgrading of these intersections may be required at the time of subdivision. Options for intersection treatments, rationalisation of movement networks, closure of redundant reserves and road upgrading have been explored. These are discussed in the implementation Section of this report and reflected on the preliminary Local Traffic Plan. The required safety improvements and intersection upgrades may be achieved, in part, through developer contributions, particularly where the need for the upgrade is directly attributable to an increase in volumes resulting from subdivision and/or development. Any such developer contribution shall be proportionate to the level of demand created by development in the Kalgan Rural Village which is over and above upgrades and improvements to State assets that are the responsibility of Main Roads WA. Credit is required to be given where land is ceded for intersection and road widenings.

This Structure Plan has been prepared in accordance with sound planning and design principles, road and traffic safety requirements and in recognition of the matters raised by Main Roads WA.

Key elements of the Kalgan Rural Village Structure Plan, as reflected in the Objectives, Management Issues and Precincts Document include:

- Subdivision to be concentrated east of the Kalgan River (not fronting the Highway);
- Community facilities/nodes to be developed within and south of the historic core;
- Highway access, safety and intersection treatment to be addressed;
- No new/additional points of access onto South Coast Hwy.

In terms on non-motorised access and movement, historically the area was accessed predominantly by boat utilising the Kalgan River; river access is still available and utilised mainly for recreation and tourism. There are opportunities for this to be enhanced. Pedestrian access to the Kalgan is via the Luke Pen Walk from East Bank Rd. Within the village pedestrian access is available using road pavements and informal trails. Although there are no dedicated cycle paths, the gentle topography and, generally, low traffic flows are well suited to cycling. Options for improving non-motorised access and movements within the Village are addressed in Part 10.6 of this document. As reflected on the Structure Plan the network of multi-use trails can be incrementally broadened and strengthened developed as subdivision and development occurs

8.2 Potable Water

Reticulated scheme water is unavailable within the Kalgan Rural Village area. Residents have relied on individual collection and water use management. Water has traditionally been supplied from bores, dams and rainwater. Although suitable for stock and irrigation of trees and orchards, water from sources other than rainwater collection may not be suitable for use as a potable water source.

Based on current average rainfall of just under 800mm per year for the Kalgan locality, a development with 250sqm of roof catchment and 60kl storage has 98% reliability of providing 450lt of water per day; total 160kl per annum (AS 1747). By requiring a minimum roof catchment area of 250sqm, together with rainwater storage tank/s of not less than 90kl, residential development can be deemed self-sufficient in terms of water supply, both at present and into the future. It follows that given sufficient roof catchment and storage, an adequate water supply can provided to meet the needs of an average household.

In accordance with the sustainability and self-sufficiency objectives and planning provisions water tanks are required as a condition of Development Approval for all habitable buildings in the Village.

8.3 Power & Telecommunication

The study area is currently serviced by Western Power's Southwest Connected Grid. Single-phase electricity is provided to the area via overhead transmission lines. Western Power's Country Regional Planning Section has advised that, based on an initial prediction that the Structure Plan will yield an additional 100 lots with a maximum of 5-15 lots being created annually, there should be no foreseeable network problems with a development with this scope and time frame. It is not possible to reserve power... and developers will generally be expected to pay for connection to the network. (Western Power, Correspondence 6/8/07).

The Study area is serviced by Telstra's fixed line network; there is also mobile coverage across the study area, though reception in some locations is limited by the topography.

8.4 Effluent Disposal

Reticulated sewer is not available within the Rural Village. Existing dwellings rely on on-site effluent disposal, predominantly conventional septic and leach drain systems as approved by Council.

Due to the low density of the proposed development and environs, and remote location from the existing infrastructure, it is not considered economically feasible to install a reticulated sewer. Consideration has been given to a limited package treatment facility. At this stage the option is not considered feasible or practical and is not supported by the local authority or the community. All current and future development will, by necessity, rely on suitable onsite methods of effluent disposal.

The Capability Assessment conducted on selected lots confirms that much of the subject land can be adequately serviced by on-site effluent disposal systems.

As cited in the LCaGA, the capability of any given site for waste-water disposal depends upon a number of geo-technical factors. These include the soil type, depth and permeability of the soil, depth to impermeable layer, depth of perched or other water tables and potential for flooding or waterlogging.

Two basic soil types exist within the proposed development area:

1. Gravel, sand over gravel and loam soils are high in the landscape and have deep winter water tables. These soils are suitable for both conventional and nutrient adsorbing waste water systems.; and
2. For Sand over Silty Loam and Alluvial Silts it is generally recommended to use nutrient adsorbing waste water systems because of the increased risk of variable winter wet soils and upper sand horizons that have low phosphate retention capability. Where lot sizes are reduced cut-off and other drainage may be applicable and desirable to compensate for increased water loading as a result of winter wet soil potential and run-off in some locations. Whether a conventional septic system or nutrient or composting waste water system is used will depend on the site conditions.

The LCaGA has been used to inform this Structure Plan and, for those lots were testing was undertaken, development areas are available which are suitable for on-site effluent disposal (refer Sections 6.6, 7.7 and 8.0). The soils on the tested sites are capable of compliance with the Draft Country Sewerage Policy.

Testing of additional sites within the Study, not the subject of previous testing and assessment, will be will be necessary to confirm capability and suitability. Some Management Recommendations are made for selected area, as detailed in Section 7 of LCaGA report. These recommendations have been used to guide the preparation of this Structure Plan.

Future development can be serviced by approved on-site systems, designed and installed in accordance with the objectives and requirements of the Draft Country Sewer Policy, current Department of Health Guidelines and Local Government practice.

Furthermore serious consideration should be given to the recycling of grey water for irrigation purposes. The Government Sewerage Policy, 1996, Government Draft Country Sewerage Policy, 2002, Department of Health Guidelines for the Reuse of Greywater in Western Australia, Department of Health Specification for Aerobic Treatment Units 1992, Health (Treatment of Sewerage and Disposal of Effluent and Liquid Waste) Regulations 1974, and AS/NZS1547:2000 all provide guidelines and input into the acceptable site characteristics. This will complement other initiatives relating to more efficient water use and water recycling as set out in the Water Corporation's 2010 draft publication 'Water Forever: Lower great Southern'.

8.5 Solid Waste Disposal

The Study area lies outside of the City of Albany gazetted waste collection area and as such, kerbside collection is unavailable. Bakers Junction is the nearest waste disposal site and provides domestic and industrial waste disposal, with collection points for recycling.

8.6 Bush Fire Management

The previously endorsed Fire Management Plan for the Kalgan Rural Village is Appendix B to Amendment 290.

The Kalgan River Village Structure Plan takes into consideration the essential elements of Planning for Bushfire Protection (2010) and the Western Australian Planning Commission Planning Policy DC3.7. It includes the following key principles and Acceptable Solutions:

- Low fuel areas around all habitable buildings.
- Appropriate separation/hazard reduction zones from the areas identified as potential Extreme Hazard.
- On-going management of fuel loads within areas of remnant vegetation and on vegetated Crown land.
- Subdivisional roads being designed facilitate emergency access/egress.
- Provision of a network of Strategic Fire Breaks/multi-function trails
- Provision of water supply for fire fighting purposes (domestic and communal)

As set out in the current Policy and Guidelines, in particular Guidance Statements B9, B11 and B12, appropriate conditions relating to implementation of fire safety may be applied at the time of subdivision and/or development, previously prepared Assessments and Management Plans may be utilised, and if required further detailed assessments can be prepared.

9. STRUCTURE PLAN – OPTIONS AND DESIGN PRINCIPLES

Based on the foregoing discussion, a number of broad aims and guidelines have been complied to assist in the preparation of the structure plan. It should be noted that not all of these aims and guidelines are mutually compatible, and a certain degree of compromise has inevitably been required. For example, the requirement to prepare a consolidated "walkable" plan based on the 'Liveable Neighbourhoods" 400 metre "ped shed" and minimum/maximum lot sizes of $1000m^2/2000m^2$ cannot be achieved given the topography, vegetation, heritage sites and varied land capability within the study area. A highly compact layout would entail significant loss of remnant vegetation which forms a strong element of the existing character of the area. Feedback from the community also indicated a desire for larger lots more in keeping with the current lot sizes which are predominantly over 1 hectare. The emphasis of the structure plan is therefore to achieve a balance between these varied requirements.

As noted above, the preparation of a consolidated plan which is predominantly contained within a 400 metre walkable catchment is impossible to achieve given the existing layout of the Kalgan Village and physical characteristics of the area.

As illustrated below the central core of the village is intersected by the Kalgan River, the Chelgiup Creek, South Coast Highway, other roads & reserves, which together comprise over 50% of the area. Nor do the lots themselves form a compact core, with lot sizes ranging from $2915m^2$ to 3.5ha with an average of over 1ha. Unlike many rural townsites the layout is not based on a grid street pattern which usually facilitates infill development. Further consolidation is constrained by setbacks to the river and creek, land capability, the need to retain significant vegetation, heritage sites and safe access to and from the South Coast Highway.

The development of a village centre is also a challenge given that the existing shop, community hall and recreation ground are located in three separate locations separated by the South Coast Highway & the River.

Outside of the central core, the rest of the existing village is dispersed along Hunton Road & Riverside Drive to the south of the river and Churchlane Road to the north of the river. Lot sizes are predominantly in excess of 2ha, interspersed with lots in excess of 10ha.

As discussed in the character assessment, the combination of larger lots, varied topography and associated vegetation are the key elements which create the unique character of the village. It is essentially a rural residential development as opposed to the rural/urban townsite model. It is the dispersed, larger & well vegetated lots which the community values rather than a compact urban form.

In order to meet the requirement to create a more compact form for the village, while retaining the essential character of the area, the indicative structure plan is based on the following considerations:

9.1 Selection of Village Centre site

In terms of creating a focal point for the village, it would be preferable for the shop, community hall and recreational area to be co-located. As each element is located separately, consideration has been given the whether any of these uses can be relocated. It is concluded that the shop must remain in its current location on the highway as any other location off the highway would render it unviable. Alternative locations on the highway are not considered suitable.

Consolidation/development of the existing community hall site is constrained by its significance as an archaeological site and remnant vegetation. There is insufficient area to accommodate new recreational facilities such as an oval, half courts and recreation centre/facilities.

The option of redeveloping the existing recreation reserve on the northern side of the South Coast Highway has been considered, however this has been discounted for the following reasons;

- Remnant vegetation has now been extensively re-established on the site.
- It is separated from the rest of the village and proposed development areas by the South Coast Highway which forms a significant impediment to safe pedestrian, bicycle and vehicular access.
- It is located on the periphery of the study area further reducing its ability to form an accessible focal point for the community.

The preferred option is to develop a new oval and recreation centre more centrally located within the future development area.

9.2 Future Development Area Options

Given the constraints of consolidating the existing core area, options for expanding the town are essentially constrained to:

- Concentrating development to the north of the River and South Coast Highway.
- Concentrating development to the south of the River.
- Concentrating development both to the north and south of the highway.

With regard to the third option, it is not considered acceptable to consolidate development on either side of the Highway. The Highway should essentially be retained as a bypass to the future consolidation of the village rather than running through the middle.

In assessing the merits and demerits of concentrating development either to the north or south of the Highway, it is considered that development to the south is preferential for the following reasons;

- Consolidation to the north of the River and Highway is difficult to achieve in a compact form as the Highway and River effectively create three separate development areas.
- The areas to the south and north of the Highway which both abut the River are relatively narrow and constrained by setbacks to the river and access arrangements to the Highway.
- The land between Churchlane Road and the River is constrained by the steep topography, remnant vegetation and existing lot pattern.
- Land to the west of Churchlane Road has sufficient cleared land to accommodate development but is relatively removed from the original core of the village centred on the community hall.
- While the shop is located on the northern side of the Highway, access to it from a northern development option would still require access to and from the Highway.
- The recreation reserve is also located on the northern side of the Highway but is not central to the Churchlane Road (west) development site and is separated from it by the River.

To the south of the Highway and River, surrounding landholdings can be more effectively integrated with the original core of the village and there are no major highways or rivers dissecting the area. Hunton Road is designated as an 'Important Regional Road' but does not present a major constraint in the way that South Coast Highway does. Access to the shop on the other side of the highway, the intersection of Hunton Road with the South Coast Highway, lack of pedestrian access over the old bridge, land capability and remnant vegetation present constraints, but on balance it is considered the merits of the southern development option significantly outweigh the northern option.

Relocation of the shop from its existing site is not likely to be viable, but pedestrian and cycle access can be improved. Improvements to the Hunton Road/South Coast Highway intersection are also recommended to facilitate safer vehicular access to and from the Highway and to the shop.

Provision for a pedestrian cycleway path over the old bridge and a one lane access for vehicles are recommended to improve local access to the shop. While the Albany Local Planning Strategy recommends lot sizes between 1000-2000m^2, land capability and the desirability of retaining significant trees suggests larger lots with a minimum of 2000m^2 are preferable. Larger lots with the ability to screen proposed housing and retain the existing character of the area were strongly supported by the local community.

A particular advantage associated with the southern option is the opportunity to develop community and recreational facilities on Lot 1730 which is located between the River and Hunton Road. This lot contains one of the few flat sites in the area and has the additional benefit of good access to water if needed for irrigation. The oval and recreation facilities can be centrally located within the proposed development, creating a focal point for the community which will be within walking distance of most housing.

The Kalgan Rural Village Structure Plan is based on the southern development option.

10. STRUCTURE PLAN – MANAGEMENT ISSUES, RECOMMENDATIONS AND ACTIONS

The focus of the proposed development of the Kalgan Rural Village is to provide an opportunity for residents and visitors to experience and contribute to a socially, economically and environmentally sustainable community in a semi-rural environment.

The character of the area is defined as a small rural village, set on the River surrounded by significant remnant vegetation and farmland. Its attractions have been described in terms of such factors as the tranquil rural location, the historic background, presence of reserves and strong community spirit and cohesion.

In order to conserve this village character the proposed development will provide for the following aims and objectives;

- Promote, preserve and enhance bio-diversity;
- Provide facilities for alternative modes of transport throughout the development area such as walking, cycling and horse riding;
- Provide and place infrastructure so as to encourage community engagement and interaction;
- Encourage the development of home based and local employment opportunities;
- Maintain the existing character of the area;
- Promote appreciation of, and employment opportunities from, the areas unique heritage;
- Encourage the use of appropriate technologies to minimise potential adverse environmental impacts;
- Provide a diverse range of residential opportunities;
- Provide a tourist destination of interest; and
- To allow the Kalgan River and environs to provide the opportunity for engaging in a variety of recreational (and commercial) pursuits.

Protection and enhancement of this village character will influence the location, form, style and extent of village growth.

Sustainability is often described as; "meeting the needs of current and future generations through the integration of environmental protection, social advancement, and economic prosperity". In accordance with these principles, this Structure Plan seeks to provide a framework for the development of a cohesive sustainable rural community at Kalgan. This Plan allows for development that addresses the broad underlying philosophies of sustainability, within the context of a small rural village.

Traditionally, urban areas have been the predominant sustainability focus for government and general policy formulation. Yet the sustainability ideology is equally applicable to rural areas when considered under the environmental, social and economic hierarchy. Application of these broad sustainability principles provides us with an opportunity to establish the points of difference between locations that are critical to developing a strong sense of place and social cohesion, whilst meeting the demonstrated demand for the rural lifestyle experience.

10.1 Community / Social Advancement

The State Sustainability Strategy acknowledges that

> (Social sustainability)...seems frequently to fall off the sustainability agenda or to take second place to environmental and economic concerns, despite the fact that it is so critical to the lives of individuals and communities and to the overall health of our society.

It is widely recognised that auto dependence has the potential to increase social isolation, by reducing opportunities for social interaction for a significant proportion of the population, such as the young and aged who do not have access to this mode of transport. This Structure Plan attempts to minimise this dependency by ensuring the provision of multi use pathways linking lots to the community hubs. By allowing for limited population growth centralised/clustered around or within close proximity of these hubs the opportunity for social interaction is further enhanced. The State Sustainability strategy emphasises sport and recreation as critical to building social capital, to creating the networks and trust between business, government and community which are totally intermixed and integrated when people join sporting groups and voluntary community associations".

Further, there are now established links that recognise the value of physical exercise and the positive impact on mental and physical health. Not surprisingly, the community focus workshops identified the reinstatement of recreation facilities, at a more centrally located site as a priority.

10.1.1 Population/Settlement Plan

This Structure Plan allows for the creation of additional lots with a diverse range of sizes. Compared to the current estimated population of 100, creation of additional lots and associated development in the Rural Village would contribute to the development of a stronger community, increase the economic viability of the existing local store, school bus services and strengthen local community groups including the local fire brigade.

10.1.2 Heritage

This Structure Plan acknowledges that the history of the Kalgan area is of significance within its own right and within the context of the wider history of Albany, the settlement of Western Australia and Internationally. The plan also recognises that significant opportunities exist to increase the social benefit and add economic value to the region by celebrating both the indigenous and non-indigenous heritage of the area.

RECOMMENDED ACTIONS - HERITAGE

Protect and preserve the area's indigenous and non-indigenous heritage and where compatible with preservation, celebrate the richness of this heritage by;

- **Protecting all aboriginal sites on the Department of Aboriginal Affairs Register and those known and unknown. "Any work proposed in the area should be subject to community consultation and Section 18 consent. If proposed activities were likely to impact [on] areas archaeological material is likely to be found, salvage excavation should be considered";**
- **Providing increased interpretation of the significant history of the area;**
- **Developing Douglas House, and the Kalgan Hall as outliers of a heritage precinct, linked by a multi-use path with interpretation of the areas rich heritage; and**
- **Encourage the community to develop an arts and culture event, such as a river festival, with markets, performance arts, sporting activities, and guided walks to celebrate the rich heritage of the area.**

10.2 Community Facilities

The existing community facilities and services, for the Kalgan area, as identified in ALPS are the:

- Hall;
- Fire Shed;
- School Bus service; and
- General Store.

The retention of existing services is critical for the amenity of the area. In addition the community consultation and workshop process identified community interest in an expansion of the facilities available as part of the village development. These included:

- Re-instatement of sporting facilities;
- Public phone;
- Liquor store; and
- Postal agency.

This Structure Plan supports the retention and/or upgrading of existing services and, where viable, the development of new community facilities.

10.2.1 Kalgan Rural Village Community Hall

Though in only fair condition, recent local interest in the facility, which is listed on the City of Albany Register of Heritage Places and the Municipal Heritage Inventory, has led to the preparation of a conservation plan for the building. Through the Settlers Association there is strong local support for restoration of the facility to a standard where it would be suitable for community use and to fulfil its role as a focal point and activity centre for the local community. Notwithstanding the constraints and cultural sensitivity of the area there is strong support and potential for the establishment of complementary facilities within and adjacent to the Hall. Given its rich cultural heritage and central location the Community Hall and surrounds are well suited for an interpretative centre.

RECOMMENDED ACTIONS – KALGAN RURAL VILLAGE COMMUNITY HALL
That the City of Albany to support the local community with its pursuit of funds for the restoration, refurbishment and active use of the Hall in a way that recognises and celebrates its rich, diverse Indigenous and European cultural Heritage significance.

All site works and development shall have due regard for the natural and cultural heritage of the Place and the requirements of the Aboriginal Heritage Act, Heritage of Western Australian Act and other relevant legislation and guidelines.

10.2.2 Fire Safety

The Kalgan Rural Village study area is in the Kalgan Volunteer Bush Fire Brigade (VBFB) district. At the time of preparing this document the Kalgan VBFB had the following appliances:

1. 1.4R, 1988 Mazda, based at Upper Kalgan shed
2. 2.4R, 1997 Hino, based at Lower Kalgan Shed (adjacent to Hall)
3. 3.4R, 2001 Isuzu,
4. Light Tanker, 2003 Toyota Land Cruiser.

Water supply for fire fighting purposes is available from the strategic water tank maintained by the City located close to the 'Upper Kalgan' fire shed. The numerous dams, soaks and water courses also function as supplementary emergency water sources.

The Kalgan VBFB has a total of approximately 80 members, with 40-50 being active members.

RECOMMENDED ACTIONS – FIRE SAFETY
Support the population growth of the area to ensure an adequate volunteer base exists.

Continue to support the Kalgan VBFB and fund the maintenance of fire fighting facilities and appliances.

10.2.3 Local Activity Centre

The Kalgan Tearooms provide a 'corner store' service to locals and visitors, selling, hot and cold drinks, takeaway foods, milk, bread, newspapers, a small range of groceries, and books. Because of the limited residential catchment, viability is partially dependent on passing trade; the highway frontage is crucial. The existing location has high visibility, vehicular access and is walkable, within the scope of the 'skewed catchment' and physical constraints posed by the River and Highway. Importantly the tearooms also function as a hub for interaction between members of the local community. It is widely recognised that providing opportunities for chance interaction is critical in building social wealth within a community.

The local community has shown interest in expansion of the facilities available as part of the village development, such as re-instatement of sporting facilities, public phone, liquor store and postal agency. It is recognised that an increase in resident population and greater visitor numbers will ensure the continued viability of the store.

The Scheme Provisions for the new Rural Village zone provide greater scope for business and tourist enterprises. This will strengthen the activity centre, help build community and provide employment opportunities.

RECOMMENDED ACTIONS – LOCAL ACTIVITY CENTRE
Support retention and enhancement of retail uses and commercial enterprises which complement both the existing local centre and the community focal point (Hall site).

Strengthen safe pedestrian and other links between nodes in the village, in particular the local store.

Encourage the development of local tourist enterprises.

10.2.4 Public Transport

A school bus currently services the area transporting students to Yakamia Primary School which serves as one of the transport hubs. From there services operate to all schools excluding Flinders Park and Little Grove. There is a charge for certain services, dependent on origin/destination and in accordance with Government Policy.

RECOMMENDED ACTIONS – PUBLIC TRANSPORT
Ensure allowance is made for existing and future bus and coach stops and public transport through the planning and design of roads, pavements and bus stops.

10.2.5 Public Open Space – Active & Passive

Through the community workshop process the community has shown an interest in the reinstatement of sporting facilities. Previously a cricket pitch and playing fields were located on Reserve No 15658 on the northern boundary of the townsite. (This reserve is now revegetated and has significant value for the preservation of bio-diversity).

The Western Australian, State Sustainability Strategy identifies sport and recreation as "critical to building social capital, to creating the networks and trust between business, government and community which are totally intermixed and integrated when people join sporting groups and voluntary community associations".

Within the municipality of the City of Albany, the townsite of Elleker demonstrates the community benefit and social value through the provision of sporting facilities, where the existing playing fields serve as an interaction hub for the general community.

Considering the above, it is desirable that a portion of centrally located, private freehold land be set-aside for this purpose. This will complement the existing Hall site, which serves as a community focal point, is centrally located and accessible, but somewhat constrained.

The foreshore of the Kalgan River and Chelgiup Creek (within the historic townsite) is predominantly Crown Reserve. The Luke Pen walk is located along the eastern bank of the Kalgan River, terminating at the Old Bridge. The various Reserves containing and surrounding the Kalgan Rural Village community Hall contain significant areas of remnant and riparian vegetation. These reserves provide for passive recreation. Formalisation of this function is proposed via rezoning and through the ongoing efforts of the River Rangers, in accordance with City of Albany Policy, Guidelines and Reserve Management Plans.

This Structure Plan also recognises the significant community, economic and environmental benefit associated with amenity, conservation and landscape values derived from riparian and remnant vegetation and development exclusion areas which are in effect private open space.

RECOMMENDED ACTIONS – PUBLIC OPEN SPACE – ACTIVE & PASSIVE
Change the tenure of Reserve No 15658 from recreation to conservation in recognition of its conservation values.

Allocate a new recreation and community facility site which is centrally located, accessible and likely to be established in the early stages of the Village development.

10.3 Services / Infrastructure

To encourage chance interaction, minimise social dislocation and disadvantage and provide equity for those within the population who do not have access to transport a diverse range of services are required within a community. Rural communities are often disadvantaged when compared to urban centres in this regard.

The high cost of providing and extending services and infrastructure is recognised in the LGSS and the ALPS as a significant constraint to the growth of rural villages. ALPS supports the retention of the existing rural villages such as Kalgan, as a primary rural community focal point and settlement centre with a proposed growth scenario and with possible additional community services.

Sustaining or growing local population, developing strong community networks and sound planning are key ways in which these issues can be addressed. The broad objective of this plan is to ensure the retention of and provision of services.

10.3.1 Power and Telecommunications

Standard mechanisms and costs will apply for connection of all new lots to the existing SWICG and landline network.

10.3.2 Water

Scheme water is unavailable within the Kalgan Rural Village area. Due to the location and low density of the proposed development area it is not considered economically feasible to install a reticulated, potable water supply. Provision of potable water supplies will be dependent on individual collection and water use management. Non-potable water suitable for irrigation may be sourced from surface or ground water, grey water re-use or a combination of the three. Water from dams and bores can continue to be used, where available, subject to relevant licensing requirements.

RECOMMENDED ACTIONS - WATER

Development Approvals/Building Licences for habitable buildings to be subject to the provision of adequate roof catchment and storage (minimum combined roof area of all the structures on that lot is 250m2 and minimum storage capacity of 90kl).

Encourage grey water reuse, through an appropriately designed and approved system, to reduce or minimise reliance on surface and ground water supplies.

Landscape plantings and design need to be responsive to available water resources and the implementation of water-wise principles.

Subject to planning consent, environmental constraints and licensing restrictions, certain locations will lend themselves to more intensive types of agriculture due to the availability of reliable water sources.

10.4 Fire Management

The main issues with fire management are the reduction in fuel hazard, the maintenance of firebreaks, the availability of emergency equipment and water to fight fires and the provision of emergency egress. The provision and upgrade of existing facilities and better road access will help mitigate any increased fire risk as a result of development.

Planning for Bushfire Protection, 2010 (WAPC and FESA) provides guidance on bush fire protection within new land development. The document deals various issues and provides guidelines, performance criteria and acceptable solutions. Part 3.3 addresses subdivision and development design, particularly in regard to the bushland interface. The Kalgan Rural Village Structure Plan complies with relevant requirements and Guidelines in terms of road design, hazard separation, water supply and access/egress and incorporates several measures to minimise the threat to residents and fire fighters in the event of a bushfire within or near the site.

The fire hazard assessment previously undertaken for the Study Area is contained in the endorsed Fire Management Plan prepared for the rezoning of Kalgan Rural Village. The document is Appendix B to this Structure Plan.

The Kalgan Rural Village Structure Plan takes into consideration the essential elements of Planning for Bushfire Protection and the Western Australian Planning Commission Planning Policy DC3.7.

RECOMMENDED ACTIONS – FIRE MANAGEMENT
Implementation of appropriate strategies and actions, as set out in the endorsed Kalgan Rural Village Fire Management Plan, to mitigate fire risk including:

- **Provision of convenient access to multiple water supplies for fire fighting purposes;**
- **At least one water storage tank per property shall be fitted with an appropriate gate valve fitting to enable brigade appliances to draw water. The installation of these fittings to be positioned so as to leave 25% capacity or a minimum of 10,000 litres, (whichever is the greater) of water in the tank. Access to these domestic water supplies shall be permitted for emergency fire fighting purposes only;**
- **Provision of a 50kl emergency water tank of located within an identified community node (in conjunction with communal facilities) designed to enable convenient, safe public access for drawing water, maintenance and re-filling;**
- **An active brigade that is well located and resourced, with volunteers drawn from the nearby community;**
- **Well maintained access networks incorporating subdivisional roads, trails, perimeter and strategic firebreaks;**
- **Maintenance of Hazard Separation Zones and Building Protection Zones; and**
- **Management of fuel loads within remnant vegetation areas shall have regard to minimising habitat impact.**

10.5 Roads

The Kalgan Village is reasonably well provided for in terms of access to, from and through the area on an east west and north south axis. Connectivity to the City of Albany and the coast for recreation is well provided for. Internally, the road network within the village is extensive. Other than new subdivisional roads, notably within Precincts 2 and 3, sufficient land is available as road reserves. There are several closed or unconstructed roads within the currently designated townsite (precinct 1). With intensification of development, some improvements to the road network, upgrading of appropriate intersections and reduction of speed and other traffic calming techniques may be required.

This Structure Plan recognises the opportunity to rationalise the existing road network and to develop a road hierarchy and legible movement networks. The Preliminary Local Traffic Plan evolved from the Traffic Solutions Plan and is based on the intersection upgrade options endorsed by Main Roads. It sets out various improvements, categorised by location and responsibility, listed in order of likely implementation. Refer Preliminary Local Traffic Plan

The primary access road within the study area is the South Coast Highway which bisects the northern portion of the study area. The speed limit of this road is generally 110kms with a 90kms zone through the Village, either side of the Kalgan Bridge. This is potentially a safety impediment for pedestrians or cyclists to cross from the southern side to the shop. In the interests of connectivity, safety and the economic viability of the store it is recommended that a crossing be provided; probably under the existing road bridge.

Whilst acknowledging the function of South Coast Highway as a significant State haulage route, this needs to be balanced against safety and amenity. The combination of curves, limited sight lines and road camber result in dangerous and sub-standard intersections at Wheeldon and Hunton Roads. Vehicle access arrangements at both intersections do not meet current standards for sight distances and are not considered safe. The absence of turning/slip lanes and insufficient stopping distances for the posted traffic speed contribute to the hazard. These aspects were not adequately resolved when the Highway was realigned through the village in the 1960's.

The existing Wheeldon Road intersection is acknowledged by Mains Roads WA as being unsafe for right hand turning vehicles off South Coast Highway. The short term option put forward by Main Roads WA is "to ban right turn in movements from South Coast Hwy".

Ultimately a "Type C intersection treatment is required, however the cost of this treatment will be substantial as widening of the Kalgan River Bridge will be required".

With Hunton Road, the configuration and geometry of the intersection at South Coast Highway, the speed environment, poor sight distances and anticipated rate of heavy vehicle growth on the Highway are, most notably. The preferred solution involves realignment to the east and provision of suitable turn treatments. Refer Hunton Road Intersection Plan

Main Roads WA has confirmed that it "does not intend to reduce speed limits on South Coast Highway as this would diminish the effectiveness of the highway as a priority heavy haulage route and increase costs to industry". Notwithstanding, the agency's clearly stated position, the current lot configuration and number of existing crossovers onto the Highway set a precedent, and in light of its function as a road train route a review of the speed limit is warranted. Given the topography and road geometry through the village, a case can be built for reducing the speed limit on South Coast Highway to 70kmph. This is the situation through the nearby Many Peaks town site.

Within the core of the village options for rationalising the road system, including closure of redundant road reserves, require more detailed investigation at the sub-precinct scale. It is important to improve safety, particularly at intersections and to provide both legibility and some hierarchy. Possible solutions include closure of the Hunton Road- South Coast Hwy intersection (except perhaps for emergency traffic), rationalisation/partial closure of James Street, partial closure of Wheeldon Rd to enable parking adjacent to the Hall and reinstating Wheeldon Place. Community representatives have also suggested a one-way loop system within the village. Traffic speed within the village should be set at 40 or 50kmph and appropriate traffic calming introduced.

RECOMMENDED ACTIONS - ROADS

The overall aim is to provide legible movement networks and retain the identifiable character of the village, whilst conforming to all appropriate minimum and safety standards.

Implementation of the improvements and treatments set out in the Preliminary Local Traffic Plan through the subdivision and development process.

The road system within the core of the Rural Village to be reviewed and given some hierarchy in the detailed design stage of Precinct 1 planning.

Review the posted speed limit through the Village.

Pedestrian movement networks to be given a high priority through existing reserves.

10.6 Access & Movement Networks

The Luke Pen walk extends for 7.2km along the east bank of the Kalgan River downstream from the Upper Kalgan Bridge. Entry points are from the northern end of Eastbank Rd, Riverside Rd and the Old Kalgan Bridge. Whilst the Luke Pen Walk fulfils a valuable role as a recreational walk trail it does not contribute significantly to connectivity throughout the study area. In the interest of reducing car dependency and improving access it is of paramount importance that the area offers residents and visitors the opportunity to access community facilities by utilising alternative modes of transport. The LGSS identified potential for a circular route returning along the west bank of the Kalgan River, however there is a more pressing need to provide safe, multi use linkages between existing facilities within the village such as the shop, hall and walk trail. Pedestrian and other linkages need to be provided for between existing and new development with an emphasis on permeability and access throughout the Rural Village area.

RECOMMENDED ACTIONS – ACCESS & MOVEMENT NETWORKS

In general the existing trail network needs to be strengthened and broadened to provide a safe convenient and legible movement network that optimises walkable access and provides linkages between properties, community facilities, other nodes and the River Reserve.

Provide a safe linkage between the Luke Pen walk and the existing local store.

Calming the traffic flow to a single lane on the old Kalgan Bridge through the installation of a designated footpath to separate vehicles and pedestrians and/or designation of "Share zones"

Developing a multi-use trail under the South Coast Highway Traffic Bridge to create a safe link between the southern part of the Village and the local store.

Linking new and existing properties to a proposed Multi use trail between Wheeldon Rd and Riverside Rd including a proposed entry point to the Luke Pen Walk.

Strengthen the entry points to the Luke Pen Walk, with the hall, village green and Riverside Road as termini.

10.7 Economic Prosperity and Sustainability

Rural areas are experiencing a decline in agricultural based employment opportunities and incomes. Anecdotal evidence and informal survey results suggest that a significant proportion of residents in the study area work at some distance from where they reside. While more pertinent to urban areas, Liveable Neighbourhoods suggests that employment requirements should be based on the provision of 1.3 jobs per household. Whilst this is ratio is more difficult to achieve in rural areas, the Kalgan is better placed than many rural communities.

Its strategic location in close proximity to Albany, known heritage values and demonstrated desirability as a tourist destination allows for the provision of employment opportunities that would generally be unavailable in similar sized villages.

In an era where remote no longer means disconnected or disadvantaged, and as stated in the City of Albany Rural Planning Issues Review, 2002 "advances in technology present an opportunity for home based businesses to operate remote from population centres". An area with significant environmental and heritage assets, such as the Kalgan, is well placed to gain increased economic returns and employment opportunities by adding value to its existing assets. An underlying objective of this plan is to provide the opportunities for economic sustainability.

This Structure Plan seeks to identify economic and employment opportunities for the study area that are compatible with the existing and historic character of the area and sensitive to the local environment.

The City of Albany Rural Planning Issues Review, 2002 noted that;

> "With the increase in transportation cost, the re-emergence of demand for people choosing to live in smaller, more friendly communities and changes in technology allowing home based businesses to operate, the impact of isolation is greatly diminished and it is anticipated the growth of rural townsites is inevitable and desirable".

Within a climate of rising fossil fuel costs and the negative social implications associated with the creation of dormitory style suburbs there needs to be the flexibility to accommodate a diverse range of employment opportunities to facilitate the formation of home based businesses and value added agricultural and tourism.

This study recognises the role that agriculture and tourism, have played in the economic development of the area. Since the late 19th century these two sectors have been closely linked. Potential exists to reinvigorate these two sectors by again supporting these land uses and providing opportunities for producers to both value add to farm products and offer local employment opportunities.

Notwithstanding the general decline in levels of employment in the agricultural sector, Kalgan does present opportunities for further diversification, particularly in horticulture. Proximity to local markets, a history of fruit and vegetable production, well established export infrastructure, appropriate soils and availability of water are important attributes.

Due to its relative proximity to the City centre and the attractive character of the area there are significant opportunities for eco-tourism and more particularly to create a rural tourist destination of note.

RECOMMENDED ACTIONS – ECONOMIC PROSPERITY AND SUSTAINABILITY
Local economic and employment opportunities should be enhanced by the following:

- **Support existing land uses where compatible and appropriate;**
- **Permit and encourage the development of tourist accommodation and activities compatible with the existing character and amenity of the area;**
- **Maintain a flexible approach to the approval of non-intrusive home based businesses, including those that depend on farm gate sales;**
- **Provide for exploitation of basic raw materials, subject to establishment of buffers and remediation/rehabilitation;**
- **Facilitate diversification of rural land uses, including the creation of Rural Smallholding lots in areas that can support horticulture and intensive rural uses;**
- **Facilitate cultural tourism and ecotourism initiatives and provide for the development of informative, attractive, site-specific interpretive material; and**
- **Provide opportunities for Noongar people to develop enterprises that focus on their long standing association with the area.**

10.8 Land Capability and Sustainability

The soils of the study area are predominantly sand over silts and silty clay duplex in the lower elevations with the clay subsoils forming loams on the mid slopes and gravel and duricrust and gravel on the ridges around the perimeter of the site. Soils through the centre and lower elevations are silty sands over silty loams and clays with some alluvial silts. Gravel, used predominantly for road construction, is currently being extracted from ridges on the western edge of the locality.

The Land Capability and Geotechnical Assessment for Kalgan states;

> *The gravel based soils of the upper slopes are well suited to urban and rural living development and comply with all guidelines for conventional septic systems. The soils of the lower slopes are potentially more wet in winter and can be developed using nutrient absorbing waste water systems to overcome any deficiencies.*

Importantly, the study concludes that;

> *There are no significant environmental issues that cannot be effectively managed during the planning process.*

The findings of the geotechnical Assessment in relation to particular construction and development requirements have been used to inform the Structure Plan. The Land Capability and Geotechnical Assessment provides a number of specific recommendations; these are reflected in the Opportunities and Constraints Plan and are incorporated into the Structure Plan and associated Guidelines. There are no significant constraints or management issues on the previously tested sites. Additional soil testing, flora surveys and hydrological analysis will be necessary on lots not included in the original land capability assessment.

RECOMMENDED ACTIONS – LAND CAPABILITY AND SUSTAINABILITY

Development and subdivision within the Kalgan Rural Village zone to accord with the requirements and Objectives set out in the Structure Plan and shall comply with relevant Town Planning Scheme Provisions.

Development exclusion areas shall include significant vegetation, riparian and watercourse buffers, low capability areas.

Soil testing, flora surveys and hydrological analysis will be necessary on lots not previously the subject of land capability assessment.

10.9 Biodiversity, Conservation and Environmental Protection

A key attribute of the Kalgan area is the natural environment. The landscape values and qualities help to define the character and sense of place. The waterways, remnant vegetation and topography all contribute to area's attractiveness and its desirability as a place to live. Kalgan has high biodiversity values and landscape amenity. This is clearly recognised by visitors and local residents and was confirmed through community workshop sessions.

This Structure Plan considers that conservation and enhancement of this environment must be an overriding objective of any development within the Kalgan area. Indeed opportunities exist to enhance the amenity and biodiversity value of the area through, revegetation, protection and increased interpretation of the value of these assets.

10.9.1 Biodiversity and Remnant Vegetation

Remnant vegetation is principally found on the western and eastern ridges, lower elevations and along the watercourses and is of three main types:

- Low Jarrah-Marri forest on well drained gravel soils of the higher slopes and ridges – generally in Very Good condition
- Taxandria/moist shrubland on lower slopes with winter wet soils – normally Good to Very Good condition
- Riverine forest along the Kalgan River and tributaries – generally Good condition near the river but Degraded in some areas with invasive wood weeds including Watsonia and Sydney Golden Wattle (Acacia *longifolia*) infestation along Chelgiup Creek.

Although the vegetation is well represented it has a high value, particularly the fringing vegetation along water courses.

The remnant vegetation is generally in Good condition or better and worthy of protection. It is expected that as a result of any changes of land uses there will be no significant clearing of remnant vegetation and that existing remnants will be afforded greater protection, by way of fencing and other measures.

Should any remnant vegetation be proposed to be cleared at some stage in the future a more detailed vegetation survey may be required and an application for a clearing permit will be necessary, unless exemptions apply. Surveys for declared rare flora and assessment under the EPA Position Statement No. 2, will be a prerequisite for the development of areas accommodating or contiguous to significant vegetation.

Options for the protection of quality remnant vegetation should be considered as a part of development proposals as well as revegetation to establish wildlife corridors. Such measures may include the provision as public open space within residential areas, the identification of development exclusion area/building envelopes, and the enhancement of existing areas through the introduction of management guidelines, education, capacity building and/or the formation of management/action groups.

RECOMMENDED ACTIONS – BIODIVERSITY AND REMNANT VEGETATION
Maximise retention of vegetation.

Provide adequate setbacks to the watercourses by retaining the remnant vegetation and allocating further setbacks in accordance with relevant policies.

Use local native species in landscaping wherever possible, whilst acknowledging there may be locations where vegetation or landscaping themes are more appropriate.

Strengthen biodiversity through the protection of existing vegetation and through the location of strategic plantings, on a progressive basis to create corridors to enhance fauna flows and maintain bio-diversity.

Ensure effluent disposal systems are of an appropriate type and located is in accordance with the identified soil capabilities regarding nutrient retention.

10.9.2 Catchment Management

The ALPS recognises the major river corridors and selected tributaries of the Kalgan and Pallinup Rivers as of 'high importance'. ALPS proposes that these be protected by retaining and adding to the existing regional reserve system supplemented by local open space acquired as part of the subdivision process.

It is recognised that the river systems provide a valuable resource that needs to be protected and enhanced as they provide for: natural drainage of the land; a water supply; a habitat and wild life corridor; aesthetic values; fishing; recreation and tourism attractions; cultural importance and historical significance. ALPS specifically recommend the following actions:

- Protect existing and future potable water supplies by introducing controls into Community Planning Scheme; and
- Utilise catchment management principles when assessing impacts of developments.

As well as the river itself, the Kalgan area contains a number of tributaries which feed into the Kalgan River. These also require attention to catchment management principles, notably retention and protection of riparian vegetation and application of appropriate setbacks. The Water and Rivers Commission Surveys and Reports (1994 and 1997) of the Kalgan River and Chelgiup Creek foreshores contain assessments and recommendations including fencing to preclude livestock, weeds management and of revegetation with selected species.

RECOMMENDED ACTIONS – CATCHMENT MANAGEMENT
New lot boundaries or fences across creeks and watercourses will generally not be supported.

Buffers to the Kalgan River, Baudin Stream, Chelgiup Creek and other waterways shall be provided in accordance with DoW guidelines, existing remnant vegetation, and site characteristics.

Implement best practice waterways management principles.

10.9.3 Character and Visual Amenity

Due to the topography and the natural beauty of the Kalgan area, minimisation of the visual impact of development from South Coast Highway, the Kalgan River and tourist routes such as Hunton Road is an important priority. This can be achieved through the following

- Restrictions on exposed building on ridge-tops
- Retention of remnant vegetation
- Building envelopes
- Clustered development
- Vegetation screening

Whilst this structure plan specifically avoids prescriptive covenants for the construction of new dwellings, it recognises that the Kalgan has a particular character that is unique and highly valued by current residents, as demonstrated through the community workshop process.

A range of housing styles currently exists from early settler's cottages through to contemporary styles. Predominantly the architecture could be labelled as a broad interpretation of Australian Colonial style with key elements from this era, such as verandahs and steeper pitched iron roofs, incorporated into many of the contemporary homes. Many dwellings are constructed of traditional local materials such as timber, stone and earth, reflecting sensitivity to their location and the area's heritage. The majority of these homes are discrete from the road and often shielded from full view by screening vegetation.

RECOMMENDED ACTIONS – CHARACTER AND VISUAL AMENITY

Proposed dwellings should demonstrate sensitivity to the existing character of the village, particularly where visible from the river or roadside.

In Rural Living areas, dwellings and structures to complement the rural character and should screened from view from public vantage points.

Within the historic core of the village encourage architectural styles and materials that are sympathetic to character.

Preference is given for the use of construction materials and colours that draw inspiration from the local environment.

The use of screening vegetation using indigenous local species is encouraged.

Roadside vegetation should be retained wherever possible.

Tree-lined streets and roads with open swales are supported.

11. IMPLEMENTATION

11.1 Introduction

The Albany Local Planning Strategy and the subsequent Community Planning Scheme (CPS) are the key local planning devices relevant to this proposal. These documents are designed to cover the entire municipal area and will replace existing Scheme 1A (former Town area) and Scheme 3 (former Shire area). Together these planning tools provide the strategic direction and framework for future development, the rationale for the zonings and the mechanism for implementation.

The Scheme provisions applicable to 'Rural Village' zone together with the endorsed Kalgan Rural Village Structure Plan will serve to guide decisions on subdivision, land use and individual development proposals. Allowance has been made for staged, incremental development. The structure plan provides the framework to ensure coordination of major infrastructure, particularly roads, trails and strategic fire break linkages and will facilitates the establishment of flora and fauna corridors. The Plan also allows for individual owners to proceed independently.

The Structure Plan, together with the subsequent subdivision of land, in combination with State and Local Government infrastructure/works programs, will provide the means for achieving the Objectives and the mechanism for implementation. Proposals for subdivision and/or land use changes are to be evaluated against Objectives of the Rural Village zone, the Key Objectives for the Kalgan Rural Village and the provisions and Management Issues relevant to the precinct.

Sustainable and co-ordinated growth and development is supported for the Kalgan Rural Village. Opportunities exist for subdivision and development, in accordance with the endorsed Structure Plan. In assessing proposals, the decision making authorities shall give consideration to the principles of:

- Ecologically Sustainable Development;
- Social Advancement; and
- Economic Prosperity.

11.2 Objectives

11.2.1 General Objectives

As set out in Clause 3.1.21 of TPS3 the general objectives for the Rural Village Zone are to:

(i) To facilitate the orderly and proper subdivision and development of Rural Villages in a socially, economically and environmentally sustainable manner

(ii) Create a strong sense of community by providing for residents to work, live and recreate within the zone;

(iii) Accommodate development of rural villages to support the community, educational and sporting assets within those communities;

(iv) Provide for a range of lot sizes and activities within the zone to achieve self-buffering of uses within the rural settlement to adjoining rural zone;

(v) Provide for subdivision and the development of rural villages in accordance with individual Structure Plans;

(vi) Allow for a mix of residential, commercial, industrial and other uses appropriate to the needs of the community within the rural village zone;

(vii) Achieve self-sustaining settlements by requiring self-reliance of individual lots in drainage management, the provision of water supplies and effluent disposal and other infrastructure needs; and

(viii) Retain the amenity of rural villages in terms of character and landscape values.

11.2.2 Key Objectives

In order to conserve the village character of Kalgan and meet the Scheme objectives for the Rural Village zone, the structure plan has the following aims and objectives:

Key Objectives for the Kalgan Rural Village are to:

(i) Create a strong sense of community by providing for residents to work, live and recreate within Kalgan;

(ii) Recognise, Protect and Enhance the rich and diverse Natural and Cultural Heritage of Kalgan. Proposals to comply with Aboriginal Heritage Act, SPP 3.5, applicable State and Local Policies and referral to relevant agencies;

(iii) Accommodate controlled expansion and growth of the existing rural townsite to support the community, through staged coordinated development;

(iv) Recognise the function of South Coast Hwy as a State Haulage Route;

(v) Address traffic Safety through the preparation and implementation of a Roads and Access Plan.

(vi) Relocation of Hunton Road intersection to be a priority. Land requirements and widening of reserves to be contributed by subdividers on a pro rata basis. Until such time as a requisite framework is in place per SPP 3.6 upgrading of the South Coast Highway intersection to be the responsibility of Main Roads.

(vii) Provide for a range of lot sizes and activities in response to site characteristics and capability;

(viii) Allow for a mix of residential, commercial, industrial and other uses appropriate to the needs of the community;

(ix) Ensure protection of Rural Village amenity and minimise land use conflict;

(x) Achieve self-sustaining settlement, encourage self-reliance of lots in drainage management, water supplies and effluent disposal and infrastructure needs.

11.3 General Provisions

The following provisions apply generally to development proposals in the Kalgan Rural Village Structure Plan area.

Precinct-specific provisions contained in S11.4 of this Structure Plan apply to development proposals in the Kalgan Rural Village in addition to the over-arching provisions below. Where a discrepancy between the provisions of S11.3 and S11.4 exists, the precinct-specific provisions of S11.4 shall take precedence.

11.3.1 Building Design, Materials & Location

- Dwellings and outbuildings shall be designed and constructed of materials in keeping with the amenity of the site. The Council will be supportive of traditional Australian rural style dwellings with wide verandahs, simple forms and passive solar orientation. Walls and roofs with natural, muted tonings will be supported.

- Sheds are to be designed and constructed of materials and colour schemes which are complementary to the main dwelling on the site. Where shed walls are constructed of concrete, it shall be coloured or bagged in appropriate earthy tones.
- Dwelling houses and sheds shall not exceed 7.5 metres in height which is measured vertically from the natural ground level. The maximum height of all outbuildings will be at the discretion of Council in order to minimise the visual impacts of such buildings when viewed from surrounding roads.
- Notwithstanding the provisions contained elsewhere in the Scheme and this Structure Plan, the variations to the setback and siting requirements will be considered on the basis of existing structures, vegetation, visual amenity and/or fire safety, provided such variation is consistent with the objectives of the zone.
- Tree Planting/Landscape screening may be required as condition of development approval.

11.3.2 Service & Drainage Requirements

- No dwelling shall be constructed or approved for construction unless a supply of potable water (from roof catchment area of not less than 250m^2, an underground bore or well or alternative source) and a minimum of 92kl storage capacity/supply have been incorporated into the approved plans
- On-site effluent disposal shall be the responsibility of the individual landowner. The disposal of effluent shall be by way of an approved wastewater system in accordance with the Health (Treatment of Sewerage and Disposal of Effluent and Liquid Waste) Regulations 1974.

11.3.3 Bushfire Management Control

- Individual landowners are responsible for the maintenance of a 20m wide Building Protection Zone around approved Habitable Buildings and any strategic firebreak where it crosses the landowner's lot.
- Where fences are erected on those lots designated with Strategic Fire Breaks, unlocked gates shall be installed where the fence crosses the SFB.

11.3.4 Land Uses

- In determining applications for discretionary uses listed in the zoning Table, the Council shall have regard to the general objectives of the zone, the key objectives and provisions of the Kalgan Rural Village Strategy and the Precincts Document.
- In order to ensure non-residential uses provide for the protection of rural village amenity the Council will not grant planning consent unless it is satisfied that the proposed use would not have an adverse impact on Rural Village amenity;
- In addition to the general development provisions, in granting development approval, the Council may assess and where appropriate apply conditions in relation to any of the following matters:
    - advertising signage,
    - vehicle access and parking,
    - Building location and setbacks,
    - External appearance, colours and finishes,
    - Size and scale of non-residential buildings and land-uses,
    - Storage and disposal of wastes,
    - Emission of noise, dust and odour,
    - Extent and standard of landscape screening,
    - Hours of operation.

11.4 Development Provisions for Specific Precincts

11.4.1 Introduction

Sustainable and co-ordinated growth and development is supported. The Rural Village zone allows a range of land uses with the majority being at the discretion of Council. The Council will ensure protection of Rural Village amenity is paramount, as is avoidance of land use conflict.

Proposals for subdivision and/or land use changes shall be evaluated against the general Objectives of the zone contained in the Town Planning Scheme, the Management Issues and Recommended Actions set out in Chapter 10 and the General and Key Objectives and Provisions set out in Chapter 11 of the Structure Plan Report as well as the requirements specific to the precinct.

Due regard is to be given to the measures to be undertaken on the land to achieve long term sustainable land uses, inclusive of:

- The method of collecting and storing potable water on-site;
- The method of disposing of solid and liquid wastes generated and the level of recycling of solid and liquid wastes to be undertaken on the land;
- The provision of infrastructure to generate, store and export energy;
- The design, location and finishes to be applied to buildings and structures where this reduces energy demands required for use or maintenance.

Foreshore Management, where applicable, may include biophysical assessment, ceding of land, fencing riparian vegetation, tree planting and appropriate measures to mitigate nutrient export.

- In order to achieve the objectives of this Structure Plan, the Kalgan Rural Village is divided into precincts. The specific provisions applicable to individual precincts apply in addition to the general provisions. Where a discrepancy exists the precinct-specific provisions shall take precedence.
- In addition to conditions relating to the matters required to be addressed under this Structure Plan, approval to develop land within Kalgan Rural Village may be subject to other relevant conditions in order to achieve the specific aims and objectives of the individual Precincts.

11.4.2 Precinct 1 – Historic Village Core

Management Issues

The historic community node is to be protected and enhanced as a local activity centre subject to consideration of the following additional Management Issues:

- Review and rationalisation of Crown Reserves tenure and purpose;
- Establishment of a road hierarchy, review of traffic safety, access and intersection treatments;

- Strengthening of trails network within this precinct and the linkages to Precinct 2 through enhancement of the Luke Pen Walk to complement the proposed Kinjarling Trail; and
- Preferred landuses include residential, commercial (tourism and business), industrial, civic and cultural.

Notwithstanding the general consolidation and efficiency objectives, given the extent of remnant vegetation, proximity to the water courses and the position of existing structures any intensification of development in the historic village core will need to be sensitively managed to address fire safety, water management, protection of landscape values and enhancement of village character.

Aims and Objectives

- To recognise, protect and enhance the Indigenous and European cultural heritage assets and values of the Precinct.
- To encourage development and/or land uses that complement the heritage assets and values of the Precinct
- To retain Kalgan Community Hall as a focal point of the Precinct and enhance interpretive information at the Hall site.

Precinct 1 - Development and Land Use

(i) Development standards within Precinct 1 are to be consistent with the R5 standards of the Residential Design Codes.

(ii) In the event of subdivision in accordance with 11.5.3 Precinct 1 (vii), on lots less than 1000m^2 in area, the development standards are to be consistent with the R20 standards of the Residential Design Codes.

(iii) Approval to develop within Historic Village Core may be subject to conditions relating to heritage matters such as ethnographic surveys; preparation and implementation of heritage conservation plans; retention, protection and/or refurbishment of areas, buildings and/or other structures of heritage value; and/or ceding of land for construction of heritage/multi-use trails as shown on Figure 1 and referred to elsewhere in this Section.

(iv) All site works, development and/or refurbishments of the Kalgan Community Hall shall have regard to the aims and objectives of this structure plan, the natural and cultural heritage of the Place, the requirements of the Aboriginal Heritage Act, Heritage of Western Australia Act and other relevant legislation.

11.4.3 Precinct 2 – Rural Village Activity Centre

Management Issues

Consolidated growth of the settlement south and east of the Kalgan River and Highway is supported. Development proposals are to address the following constraints and Management Issues:

- Land not previously assessed is subject to detailed capability assessment and planning prior to development;
- Foreshore/Creekline Setbacks, Care and Control;
- Protection and enhancement of Cultural Heritage;
- Visual Amenity and Identified Local Character;
- Upgrading/extension of Infrastructure;
- Provision of community facilities. Options include relocation of the Fire Brigade Shed and emergency Water supply, development of Country Club, Sports Pavilion, Oval or the like;
- Fire Protection; and
- Preferred landuses include residential, rural living, employment generators/commercial (tourism and business), industrial, civic, cultural and intensive rural (horticulture, viticulture, equestrian).

Rural Village Activity Centre Sub Precincts 2A and 2C

Aims and Objectives

- To facilitate development of a consolidated local activity centre around the historic village core in which village centre land uses predominate.

- To ensure residential development within the Precinct occurs in a complementary manner to village centre land uses and does not undermine or detract from development of the village centre.
- To encourage development and/or land uses that enhance the function of the Precinct as a village activity centre.

Sub Precincts 2A and 2C - Development and Land Use

(i) Development standards in Precinct 2A and 2C are to be generally consistent with the R5 standards of the Residential Design Codes and the R10 standards of the Residential Design Codes for lots created in Precinct 2A in accordance with 11.5.3 Precinct 2 (iv),

Rural Village Activity Centre Sub Precinct 2B

Aims and Objectives

- To preserve the existing character and amenity of residential development and land use within Kalgan Rural Village.
- To facilitate establishment of residential and other complementary land uses within the Precinct.
- To effectively manage land uses that would impact negatively on existing and future residential development within the Precinct.
- To encourage, where appropriate, provision of alternative services and infrastructure for residential and other developments where these can be demonstrated as reliable, sustainable and environmentally acceptable.

Sub Precinct 2B - Development and Land Use

(i) Development standards within Precinct 2B are to be consistent with the R2.5 standards of the Residential Design Codes where lots are larger than 4000sqm, and the R10 standards of the Residential Design Codes for lots created in Precinct 2B in accordance with 11.5.3 Precinct 2 (iv),.

11.4.4 Precinct 3 – Rural Village North

Management Issues

Development proposals are to address the following constraints and Management Issues:

- Controlled access onto South Coast Highway and no additional access without the prior approval of Main Roads WA;
- Commercial node at existing Tea Room/Local Store and immediate surrounds to be enhanced as local activity centre;
- Provision of stock proof fencing of areas of Riparian and Remnant Vegetation; and
- Preferred landuses include food production (horticulture, viticulture, equestrian, aquaculture, keeping of livestock), rural living, commercial (tourism and rural industry), home business and value adding enterprises, tourism

Aims and Objectives

- To encourage development of existing lots for the purposes provided for under the Rural Village zone, particularly those land uses that would generate employment opportunities, whilst minimising and managing potential conflicts between land uses.

Precinct 3 –Development and Land Use

(i) Buildings shall be setback from lot boundaries as follows:
   a. Front: 20m
   b. Side and Rear: 10m

(ii) Where a non-residential land use and/or development has been approved this shall, wherever possible, be designed, sited and/or screened appropriately in order to minimise impacts on existing residences within the Precinct.

(iii) Approval of land use and/or development within Precinct 3 to be subject to the Local Government, in consultation with Main Roads WA, being satisfied that detrimental impacts on South Coast Highway have been minimised. Approval may be subject to conditions that sufficiently address and/or resolve any identified impacts on South Coast Highway.

11.5 Subdivision

11.5.1 Introduction

Proposals for subdivision are to be evaluated against Objectives of the Rural Village zone, the Key Objectives for the Kalgan Rural Village, the Management Issues relevant to the precinct and the indicative layout nominated on the Structure Plan. Master Planning for the Historic Village Core and adjacent areas of Precinct 2 is anticipated to refine the Structure Plan.

Subdivision to create new lots in Kalgan Rural Village is to be in accordance with the draft Country Sewerage Policy. Creation of lots below 2000m2 as per S5.4 of the Policy may be supported to complement the historic village core and encourage establishment of a nodal village activity centre. Once the total number of lots below 2000m2 within Precincts 1 and 2 reaches 100 (excluding any lots created under clause 11.5.3 Precinct 1 (viii) that are connected to reticulated sewer or a limited effluent scheme), further subdivision to create lots below 2000m2 will not be supported.

A comprehensive and detailed capability assessment is required for those Lots not previously the subject of the capability assessment (refer Assessment Areas Plan – Attachment 7 and Fig 3 by Landform Research). This may include soil testing and analysis of hydrology, vegetation, fire safety and visual amenity and is to be undertaken prior to consideration of subdivision. The results of any such assessment may reduce land use, subdivision and/or development potential of the land currently afforded by existing provisions in the Structure Plan.

11.5.2 Subdivision Provisions

The following guidelines apply generally to subdivision proposals in the Kalgan Rural Village Structure Plan area. Precinct-specific provisions contained in S11.5.3 of this Structure Plan, also apply to subdivision Kalgan Rural Village. Where a discrepancy between the provisions of S11.5.2 and S11.5.3 exists, the precinct-specific provisions of S11.5.3 shall take precedence.

Servicing and Access

(i) Subdivision within Kalgan Rural Village is to satisfy the requirements of the Health (Treatment of Sewerage and Disposal of Effluent and Liquid Waste) Regulations 1974 as well as any other relevant provisions of the Town Planning Scheme relating to onsite effluent disposal. Late winter land capability/geotechnical assessments for onsite effluent disposal may be required to support applications for subdivision.

(ii) Approval to subdivide land within Kalgan Rural Village may be subject to ceding of land for construction and/or road widening purposes, including implementation of multi use trails as shown on Figure 10 (Roads and Access Plan); and/or payment of pro-rata contributions toward construction/augmentation of the Kalgan Rural Village road network as shown on Figure 10.

(iii) New subdivisional roads are to be sited and designed having regard to the heritage, environmental, character and amenity values of Kalgan Rural Village, without compromising road safety or stormwater drainage. Such measures may include but not be limited to traffic calming features; reduced pavement widths and/or alternative pavement materials; and alignment of pavement and services to avoid vegetation and/or visual impacts.

(iv) Approval to subdivide land within Kalgan Rural Village may be subject to ceding of land for construction of heritage/multi-use trails as shown on Figure 1 and referred to elsewhere in this Section.

(v) A Water Management Strategy/Plan, in accordance with the relevant water management guidelines/best practice manual may be required to be lodged at the time of application for subdivision.

(vi) The Council may request the Commission impose a condition at the time of subdivision requiring the submission of a Local Water Management Plan, appropriate to the scale and nature of subdivision.

Fire Safety

(i) Preparation of a Fire Management Plan may be required at the time of subdivision.

(ii) The Council may request the Commission impose a condition at the time of subdivision requiring the preparation of a Fire Management Plan (FMP's) as a condition of subdivision approval. Individual FMP's to address particulars relative to individual proposals, but also reflect and incorporate the relevant components of the FMP appended to this Structure Plan. This requirement shall be waived if sufficient justification is provided, and the relevant authority agrees, that the fire hazard is sufficiently minimal for an individual FMP not to be required.

(iii) Subdivision is to be designed so as to minimise, where possible, clearing of remnant or foreshore vegetation for Building Protection zone purposes.

(iv) Approval to subdivide land within Kalgan Rural Village may be subject to conditions relating to fire safety matters including but not limited to:- installation of strategic firebreaks and water storage for emergency purposes; carrying out of relevant developer responsibilities of the FMP appended to this Structure Plan and/or FMPs prepared for individual subdivision proposals; and notifications on lot titles advising of fire safety/management measures that may be required.

(v) In cases where only part of the zone is developed, an interim firebreak network may be required to be installed to the satisfaction of Council and the FESA.

Waterways and Remnant Vegetation

(i) Planting, establishment, maintenance, stock proof fencing and suitable protection of vegetation corridors may be required as a condition of subdivision on those lots containing identified vegetation corridors.

(ii) Ceding of land for establishment and/or increase of areas of foreshore reserve may be required as a condition of subdivision for those lots abutting or containing waterways, wetlands and/or existing foreshore areas.

(iii) In addition and/or as an alternative to 11.5.2 - Waterways and Remnant Vegetation (ii), as appropriate, the establishment, maintenance, rehabilitation and/or suitable protection of creek line protection areas may be required as a condition of subdivision.

Culture and Heritage

(i) In the event that the indicative Community Facilities site shown on Figure 1 is ceded at the time of subdivision, the City of Albany may seek cash contributions from subsequent subdividers within the Kalgan Rural Village towards the development and maintenance of community facilities, as set out in SPP 3.6.

(ii) Subdivision proposals within Kalgan Rural Village may be referred to the Department of Indigenous Affairs and/or the Heritage Council of WA for comment, as appropriate, in accordance with the Aboriginal Heritage Act and the Heritage Act of Western Australia.

11.5.3 Subdivision within Precincts

In order to achieve the objectives of this Structure Plan the Kalgan Rural Village is divided into Precincts, with specific aims and objectives for the individual Precincts. The specific provisions and guidelines applicable to individual precincts, as set out below, apply in addition to the general provisions.

Precinct 1 – Historic Core

Infill and consolidation through the subdivision of freehold lots is supported, subject to capability assessment and detailed design to address the following additional specific constraints and Management Issues:

(i) Review and rationalisation of Crown Reserves, boundaries, tenure and purpose;

(ii) Establishment of a road hierarchy, review of traffic safety, access and intersection treatments;

(iii) Strengthening of trails network within this precinct and the linkages to Precinct 2. Enhance Luke Pen Walk and complement the proposed Kinjarling Trail;

(iv) Detrimental impact on riparian and remnant vegetation to be minimised – Retention of remnant native vegetation is supported. Removal of significant vegetation is not supported and is subject to relevant Clearance of Native Vegetation Regulations.

(v) Subdivision shall generally be in accordance with the R5 standards of the Residential Design Codes, subject to detailed capability assessment, vegetation assessment and may require comprehensive planning and design within the Precinct 1.

(vi) The minimum size of lots created by subdivision in Precinct 1 shall be 2000m^2.

(vii) Notwithstanding clauses (v) and (vi) of this subsection, subdivision within Precinct 1 in accordance with the R20 Residential Design Code may be entertained subject to reticulated sewerage connections being provided; or an existing approved limited effluent scheme being in place to service the proposed lots.

(viii) Approval to subdivide land within Precinct 1 may be subject to conditions relating to heritage matters including but not limited to ethnographic surveys; preparation and implementation of heritage conservation plans; retention, protection and/or refurbishment of areas, buildings and/or other structures of heritage value; and/or ceding of land for construction of heritage/multi-use trails as shown on Figure 1.

Precinct 2 – Rural Village Activity Centre Sub Precincts 2A & 2B

(i) Consolidated growth of the settlement south and east of the Kalgan River and Highway is supported through staged subdivision and development of sub-precincts A B and C, generally in accordance with the road network and indicative lot layout shown on the Structure Plan. The preferable lot size is 2000 – 5000m^2, based on vegetation & site characteristics. Those lots not previously assessed are subject to planning and detailed capability assessment, as set out in parts 11.5.1 and 11.5.2 Servicing and Access (i), prior to subdivision.

(ii) Subdivision shall generally be in accordance with the R5 standards of the Residential Design Codes.

(iii) The minimum size of lots created by subdivision in Precincts 2A and 2B shall be 2000m^2.

(iv) Notwithstanding (iii) of this subsection, in areas contiguous with Precinct 1 boundary and/or other subdivision carried out in accordance with these provisions, the minimum size of lots within Precincts 2A and 2B created by subdivision may be 1000m^2, subject to late winter land capability/geotechnical assessments for onsite effluent disposal being prepared and lodged with all such applications for subdivision; and these demonstrating that onsite effluent disposal is achievable in accordance with the draft Country Sewerage Policy as well as any other relevant provisions of the Town Planning Scheme.

Precinct 2 – Rural Village Activity Centre Sub precinct 2C

(i) Subdivision shall generally be in accordance with the R5 standards of the Residential Design Codes.

(ii) The minimum size of lots created by subdivision in Precinct 2C shall be 2000m^2.

(iii) Subdivision of land may be considered where:

a. It is in accordance with the indicative lot layout shown on the endorsed Structure Plan; or

b. subject to comprehensive planning and design for the balance of the precinct to address road layout upgrading of Riverside Road and provision of parking, together with detailed capability assessment as set out in parts 11.5.1 1 and 11.5.2 Servicing and Access (i).

Precinct 3

Subdivision of land will not be supported in Precinct 3 except where:

a. It is a realignment of existing lot boundaries with no additional lots being created, and meets the relevant objectives and provisions of this Structure Plan: OR

b. The subdivision is necessary to facilitate provision of infrastructure such as road widening or realignments, utility services or other community facilities: OR

c. It is subdivision of a lot that existed at the time of this Structure Plan being endorsed by the WAPC; and

i Only one additional lot will be created, OR if more than one additional lot is proposed, all lots including the balance of the parent lot are a minimum of 2HA in size; and

ii The purpose of the subdivision is to excise an existing approved land use; and

iii The lot containing the existing land use is sufficiently sized to contain the use, as well as contain any required buffer distances within the lot; and

iv The balance lot(s) are sufficiently sized to accommodate land uses that may be approved by the Local Government within Precinct 3; and

v Access arrangements onto South Coast Highway are resolved to the satisfaction of Main Roads WA, the Local Government and the WAPC; and

vi The proposed subdivision meets all other relevant objectives and provisions of this Structure Plan.

ATTACHMENT

Plans

Figure 1: Kalgan Rural Village Structure Plan

Figure 2: Location Plan

Figure 3: Study Area and Characteristics

Figure 4: Lot sizes and Tenure

Figure 5: Constraints and Opportunities

Figure 6: Vegetation Communities
(Land Capability & Geotechnical Assessment Fig 4)

Figure 7: Land Capability
(Land Capability & Geotechnical Assessment Fig 7)

Figure 8: Capability Assessment Areas

Figure 9; Hunton Road Intersection – Preferred Option

Figure 10: Roads and Access Plan

FIGURE 1

KALGAN RURAL VILLAGE
STRUCTURE PLAN
Kalgan, City of Albany
(Refer item 2.6 21 June 2011)

PRECINCT 1
HISTORIC VILLAGE CORE
The historic community node is to be protected and enhanced as a local activity centre. Infill and consolidation through the subdivision of freehold lots is supported subject to further design and assessment to address capability, fire safety, protection of water courses and vegetation, and to ensure enhancement of cultural, heritage and landscape values and the village character.

PRECINCT 3
RURAL VILLAGE NORTH
In recognition of existing lot sizes, land uses and the constraints of the highway, limited subdivision and boundary rationalisation will be considered. The traditional commercial node is to be retained and enhanced. Development proposals shall give consideration to access, trails, vegetation protection, food production and employment generation.

PRECINCT 2 -
RURAL VILLAGE ACTIVITY CENTRE
Controlled expansion of the settlement south and east of the Kalgan River and Highway is supported through subdivision and development.

2A
2B
2C

ROAD
CHURCHLANE
COAST
HIGHWAY
RIVER
SOUTH
KALGAN
RIVERSIDE ROAD
HUNTON
DOUGLAS
ROAD

ORIG A3
SCALE 1:10000
0 50 100 150 200 250

10-01-STRUCT(i)

LEGEND

- Rural Village Zone Boundary
- Crown Land / Reserve
- Historic Village Core - Precinct 1
- Rural Village - Precinct 2
- Rural Village - Precinct 3
- Existing Vegetation
- Vegetation Corridor
- South Coast Highway
- Proposed Subdivision Road
- Indicative Subdivision
- Site of Cultural / Heritage Significance
- Proposed Multi-Use Trail / Strategeic Fire Break
- Walk Trail
- Traditional Commercial Node
- Village Centre - Existing Community Node
- Indicative Community Facilities Site
- Intersection treatment required to address traffic safety

NOTATIONS

- Opportunities exist for subdivision and development, in accordance with the endorsed Structure Plan for the Kalgan Rural Village, subject to Key Objectives, Recommended Actions and Management Issues relevant to the precinct being addressed.
- Lot and road pattern is indicative only and may change subject to more detailed land capability on other investigations at subdivision stage.
- This plan to read in conjunction with the Structure Plan Report and the Village Precincts Document.

As endorsed by the SPC 28 February 2012

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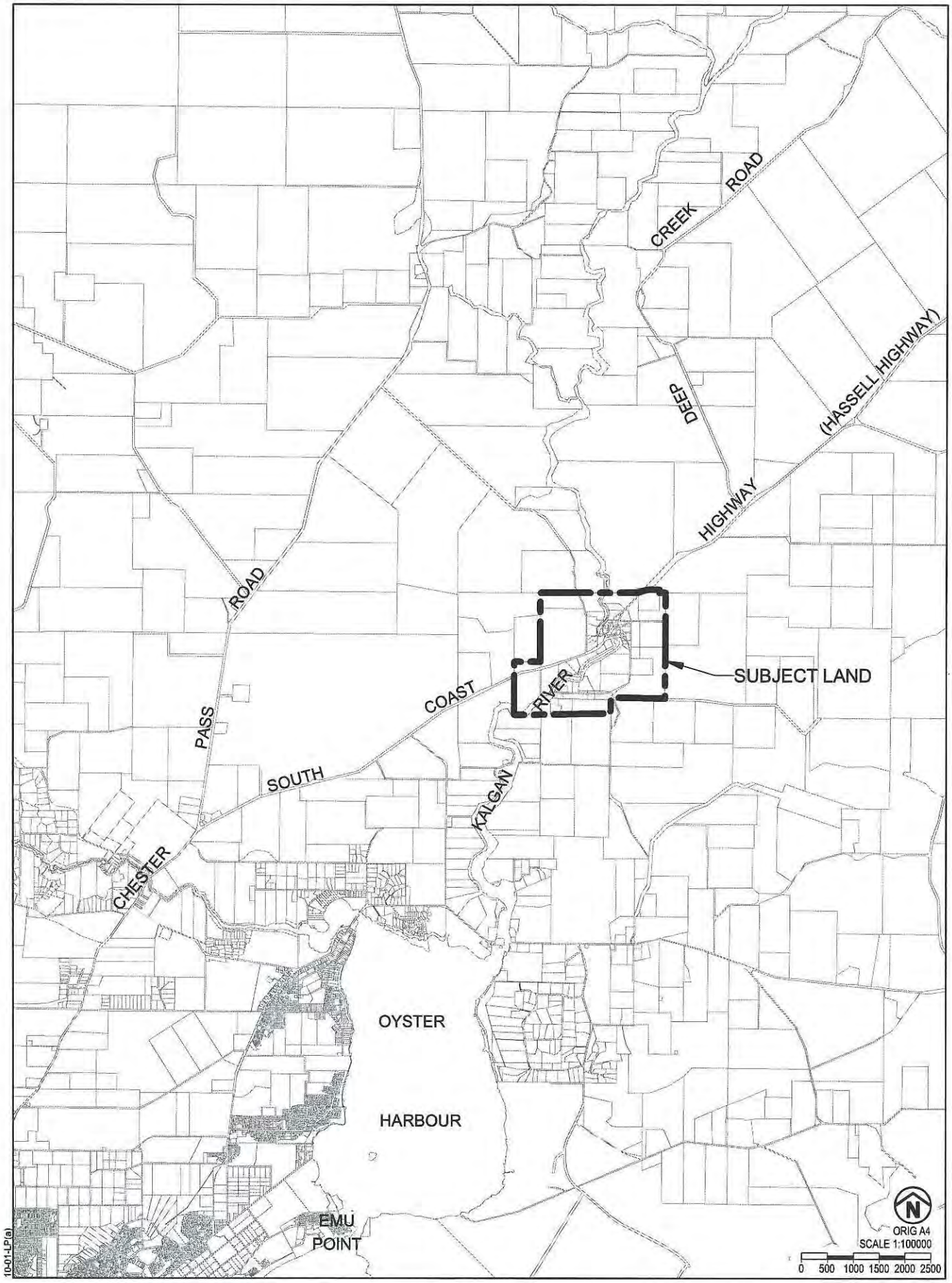

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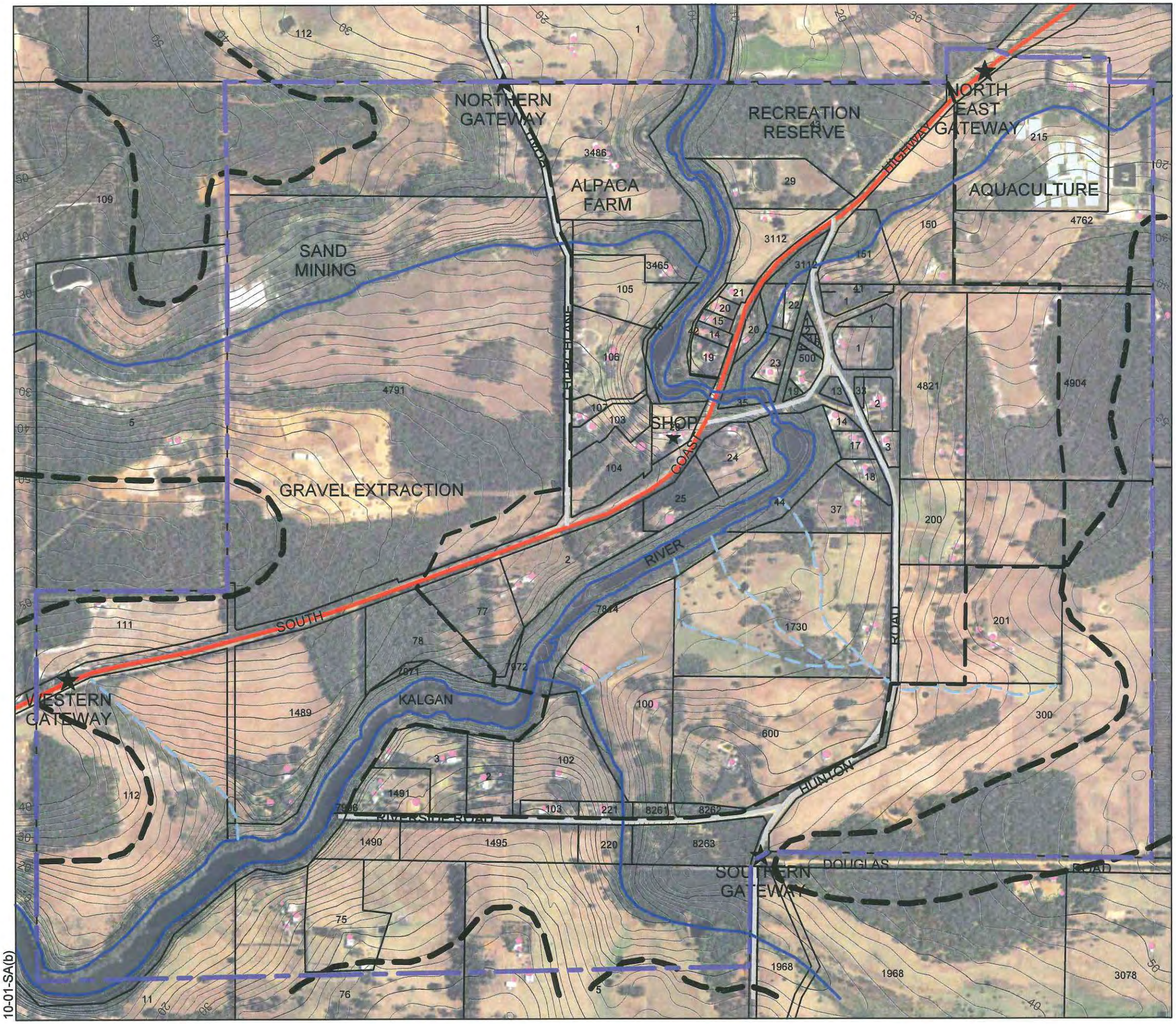
LOCATION PLAN
KALGAN RURAL VILLAGE
Kalgan, City of Albany

Figure 2

FIGURE 3

KALGAN RURAL VILLAGE
STUDY AREA AND CHARACTERISTICS
Kalgan, City of Albany



LEGEND

- Study Area Boundary
- Rural Village Zone Boundary
- River/Creek
- Drainage Line
- Constructed Roads (Bitumen/Gravel)
- Significant Ridgelines
- Main Gateways to Village
- Significant Vegetation
- Existing Structures

ORIG A3
SCALE 1:10000
0 50 100 150 200 250

10-01-SA(b)

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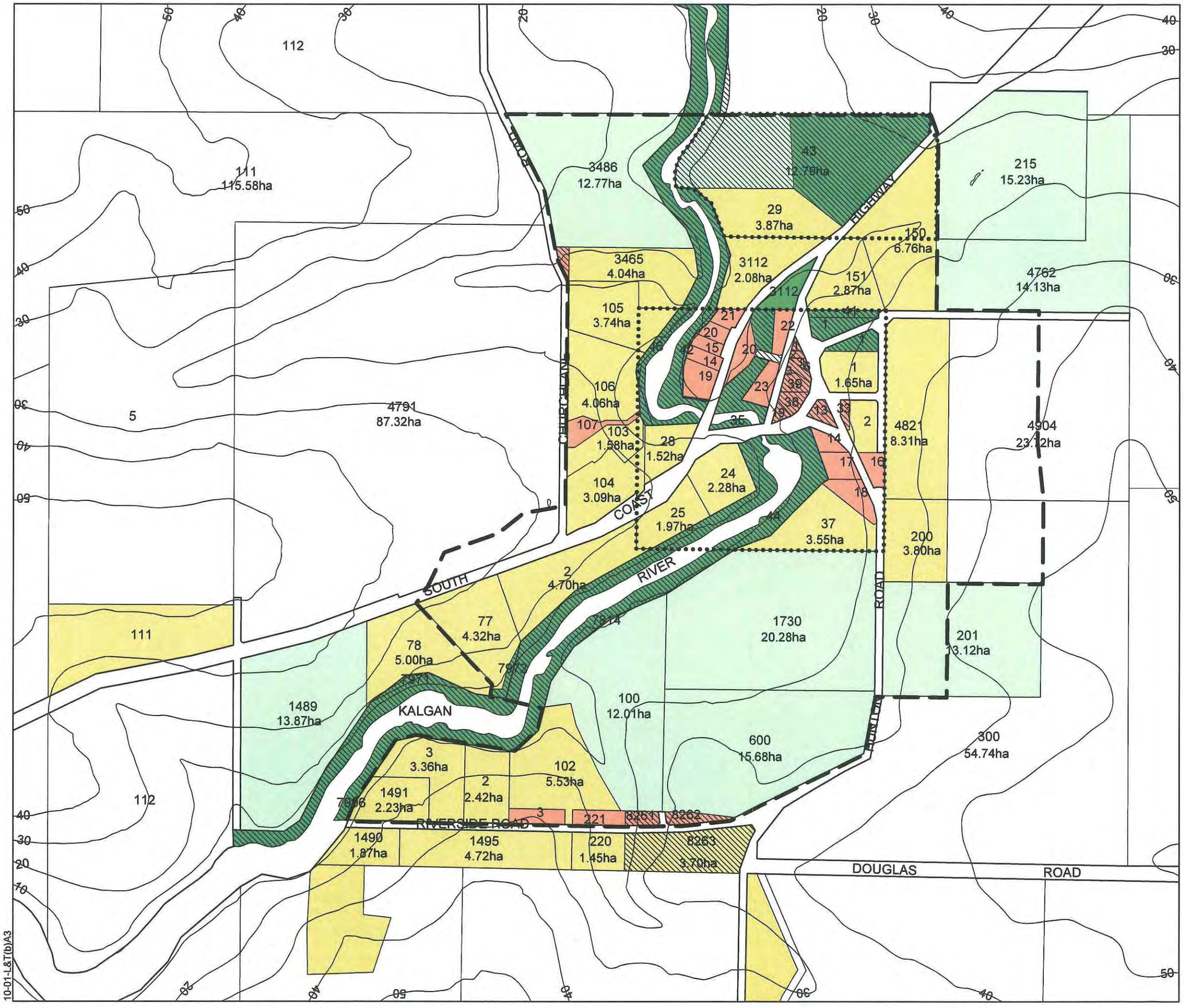
FIGURE 4

KALGAN RURAL VILLAGE

LOT SIZES AND TENURE

Kalgan, City of Albany



LEGEND

- Crown Land / Reserves
- Parks and Recreation
- Reservation TPS No. 3
- Lots Less Than 1ha
- Lots Between 1ha and 10ha
- Lots Between 10ha and 20ha
- Gazetted Townsite Boundary
- Rural Village Zone Boundary

ORIG A3
SCALE 1:10000

0 100 200 300 400 500

10-01-L&T(b)A3

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Albany WA 6330
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Figure 5

KALGAN RURAL VILLAGE
CONSTRAINTS AND OPPORTUNITIES
Kalgan, City of Albany

JANUARY 12

UPGRADE CHURCHLANE ROAD - RETAIN TREE COVER

DESIGNATE FOR CONSERVATION OF FLORA AND FAUNA

FENCE AND REVEGETATE CREEK LINE

NO ADDITIONAL ACCESS ONTO HIGHWAY

REVIEW INTERSECTION

FENCE AND REVEGETATE CREEK LINE

RATIONALISE ROAD NETWORK AND CLOSE REDUNDANT RESERVES

RETAIN REMNANT VEGETATION ON CROWN RESERVES

REDEVELOP SHOP / TEA ROOMS

CONSOLIDATE COMMUNITY HALL SITE

RATIONALIZE / MINIMISE ACCESS TO SOUTH COAST HIGHWAY

PROTECT HERITAGE SITE

FENCE AND PROTECT REMNANT VEGETATION

REVIEW INTERSECTION

REVEGETATE DRAINAGE LINE

REVEGETATE AND CONNECT SIGNIFICANT VEGETATION AREAS

KALGAN

RETAIN REMNANT VEGETATION ON CROWN RESERVES

FENCE AND REVEGETATE CREEK LINE

RIVERSIDE ROAD

UPGRADE RIVERSIDE DRIVE - RETAIN AVENUE OF TREES

DOUGLAS ROAD

HIGHWAY

CHURCHLANE ROAD

SOUTH COAST HIGHWAY

RIVER

HUNTON ROAD

LEGEND

- Study Area Boundary
- Rural Village Zone Boundary
- River / Creek
- Drainage Line
- Indicative 1:100 Flood Extent
- Significant Vegetation
- Revegetation
- South Coast Highway
- Constructed Road (Bitumen / Gravel)
- Redundant Road Reserves
- Site of Cultural / Heritage Significance
- Proposed Multi-Use Trail
- Historic Village Core With Subdivision Potential
- Development Capability Low or Not Acceptable
- Potential Fire Hazard High / Extreme

N

ORIG A3
SCALE 1:10000
0 50 100 150 200 250

10-01-CO(d)

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FIGURE 6

VEGETATION COMMUNITIES		
KEY	**NAME**	**DESCRIPTION**
EcEm	Jarrah - Marri Low Forest	*Eucalyptus marginata, E. calophylla* with *Banksia grandis, Nuytsia floribunda* over *Dryandra formosa, Agonis parviceps, Davieais inflata, Hakea oleifolia, H. ruscifolia, Callistachys lanceolata* and *Acacia pulchella.* Occupies higHer slopes and ridges on well drained gravel soils
R	Riverine Forest	*Eucalyptus diveriscolor, E. calophylla, E. marginata* with *Melaleuca cuticularis* over wet site shrubs such as *Calistachys lanceolata, Agonis linearifolia, Trymalium floribundum, Agonis juniperina, Bossiaea linophylla* and *Hakea oleifolia, with Lepidosperma effusum.* Occurs along the banks of the watercourses and Kalgan River.
MS	Moist Shrubland	Shrubland of *Calistachys lanceolata, Trymalium floribundum, Agonis juniperina, A. parviceps, A. linearifolia, Bossiaea linophylla* and *Hakea oleifolia, with Lepidosperma gladiatum, L. effusum and Gahnia trifida.* Occurs on winter wet soils on lower slopes that are often sandy in the upper horizons.
Pt	Plantation	Plantation of pines or Blue Gums

0 150m

Figure 4

UPPER KALGAN TOWNSITE	
VEGATATION COMMUNITIES	
Landform Research	May 2007
Basemap DOLA Air Photo	Scale 1 : 7 500

FIGURE 7

LAND CAPABILITY FOR DWELLINGS

KEY	CAPABILITY FOR SELECTED LAND USE
I	Very high capability with few physical limitations.
II	High capability with some physical limitations that can be overcome by planning and minor site modifications.
III	Fair capability with moderate physical limitations which may affect development. Careful planning and site modification may be required.
IV	Low capability with many physical limitations.
V	Very low physical capability or with significant limitations.
X	Development not acceptable because of significant environmental or geotechnical issues, or Government Policy. (Includes Conservation Category or EPP Wetlands and significant remnant vegetation, high risk geotechnical issues).

NOTES

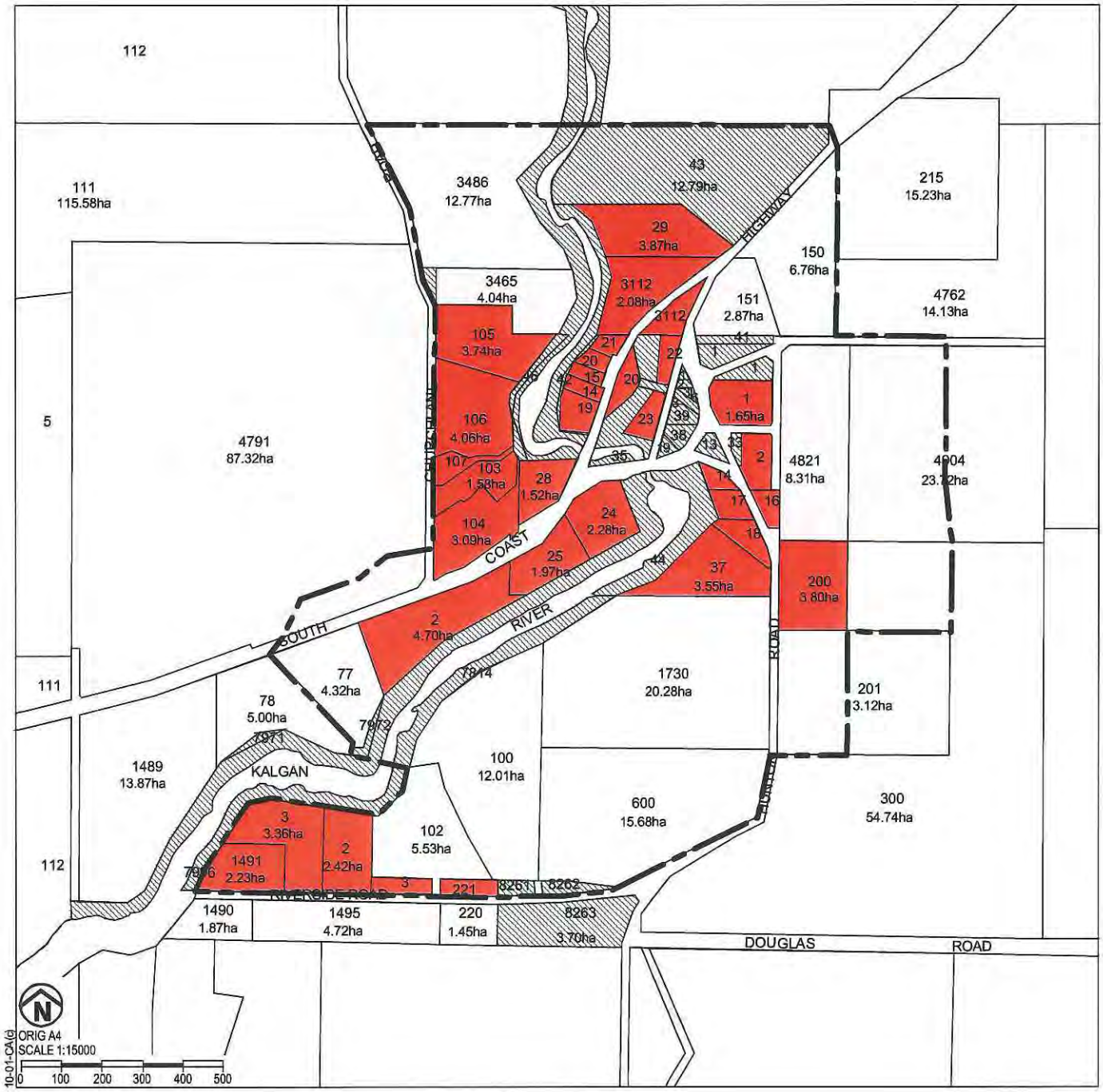
- **See attached sheet for explanations**
- Does not take into account the availability of water
- Possible limitation to be managed is shown in brackets.
- The limitation often applies only to some parts of the soil unit.
- An indication of the severity of the limitation is provided by the Capability Class from Very High (I) to Very Low (V). Class II - III soils may have only a mild limitation or the limitation applies only to some areas. On the other hand Class IV - V soils can be expected to have significant limitations that require management.
- Because of the broad scale of theh mapping, some areas shown as requiring alternative or nutrient adsorbing waste water systsems may be suitable for conventional septic systems with semi inverted leach drains.

See attached sheets for key

0 150m

Figure 7

UPPER KALGAN TOWNSITE	
LAND CAPABILITY	
Landform Research	June 2008
Basemap DOLA Air Photo	Scale 1 : 7 500



LEGEND

Rural Village zone boundary

Crown Land / Reserves

Extrapolated assessment or minimal site testing.

Limited subdivision and boundary rationalisation is supported. Creation of Rural Village lots is subject to further capability assessment and planning.

Area not assessed.

Sites subject to detailed assessment of land capability, soils, hydrology, vegetation, fire safety and visual amenity prior to consideration of subdivision.
The results of any such assessment may reduce land use, subdivision and/or development potential of the land currently afforded by existing provisions in the Structure Plan. These areas require more detailed planning/design.

Area previously assessed and planned (refer Structure Plan)

Soils mapping, regolith and hydrological logs, capability and geotechnical information is to be considered in conjunction with the road and lot layout shown on the Structure Plan. Refer to Figures 3 & 7 and Appendix 2 of Landform Research Land Capability and Geotechnical Assessment Oct 2008, (Revised Aug 2010). The Capability Class ranges from Very High (I) to Very Low (V).
The Class II – IIIcapability soils may have only a mild limitation or the limitation applies only to some parts of the soil unit. Areas notated as 'i - subject to winter wet conditions or water logging risk in wet years' may require further late winter site testing to verify depth to groundwater level.
Class IV and V soils can be expected to have significant limitations. On-site effluent disposal shall be by way of Approved Wastewater Systems, as required by the Health (treatment of Sewerage and Disposal of Effluent and Liquid Waste) Regulations 1974.

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CAPABILITY ASSESSMENT AREAS

KALGAN RURAL VILLAGE

Kalgan, City of Albany

Figure 8

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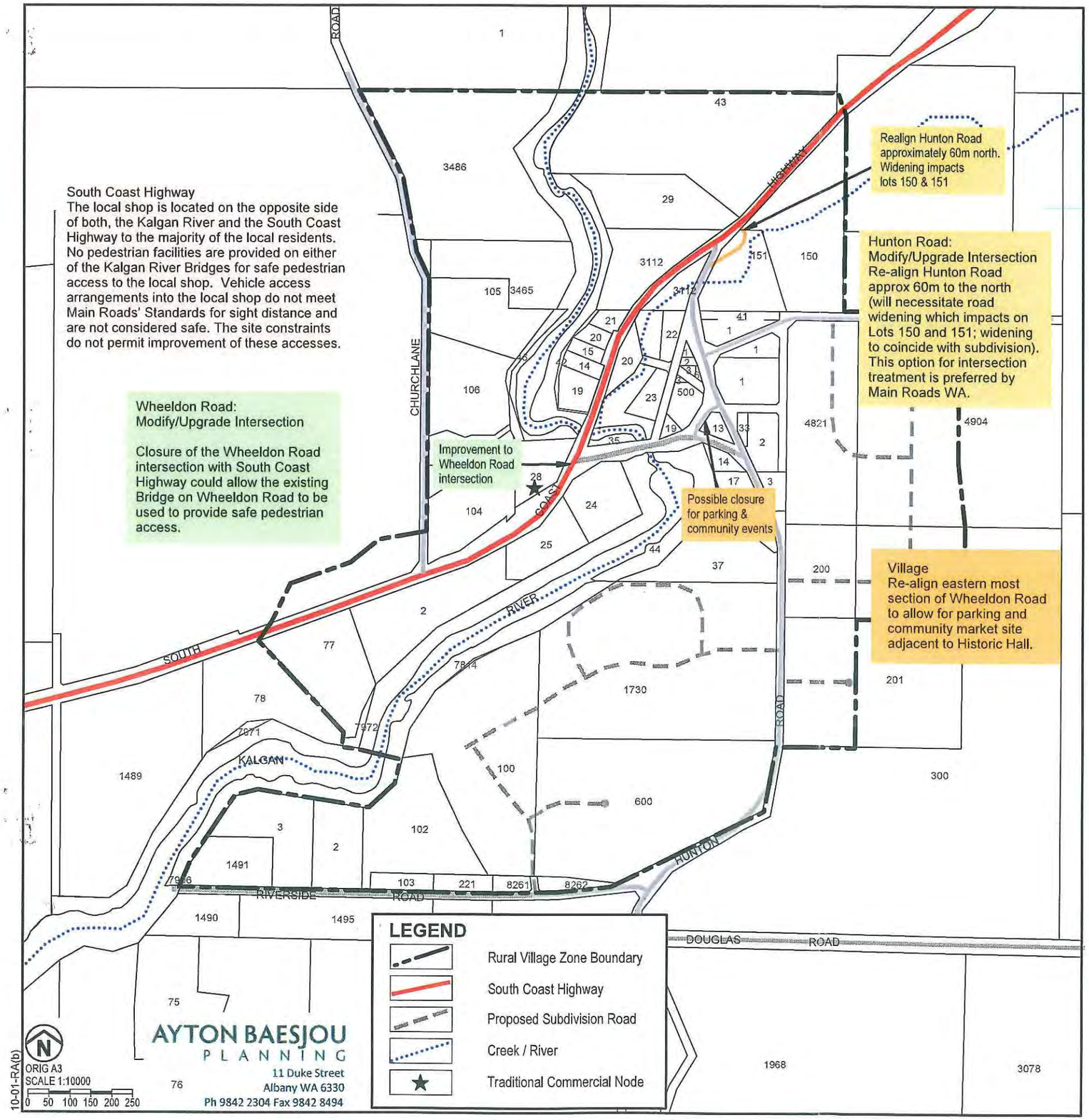
HUNTON ROAD INTERSECTION
Preferred Option
Kalgan Townsite
Kalgan, City of Albany

Figure 9

Figure 10

KALGAN RURAL VILLAGE
ROADS AND ACCESS PLAN
(Refer item 2.6 21 June 2011)



Notations and Advice

The Kalgan Rural Village is serviced by South Coast Hwy (Hassell Hwy) and Hunton Road. The Highway is part of the State Arterial Road Network and functions as a primary freight route. It is under the care and control of Main roads WA. The posted speed limit within the townsite is 90km/hr. Main Roads does not intend to reduce speed limits on South Coast Highway as this would diminish the effectiveness of the highway as a priority heavy haulage route and increase costs to industry.

The Highway currently carries in excess of 150,000 tonnes of grain per annum through the Kalgan Townsite and is experiencing rapid growth in freight tonnage as the blue gum plantation timber industry progressively matures. On the evidence available it is likely that total freight tonnage on the route will exceed 1.5 million tonnes per annum, or 60,000 multi-combination vehicle movements per year within the next few years.

Hunton Road is predominantly a two lane bitumen road developed to rural major road standard. Wheeldon Rd, which connects the Hwy to Hunton Road, via the 'Old Kalgan Bridge' is sealed and is, in places, single lane. The posted speed limit within the townsite is 60km/hr.

Churchlane and Riverside Roads are both constructed to gravel standard. The local roads are under the care and control of the City of Albany

With intensification of development, some improvements to the road network, upgrading of selected intersections, improved signage and review of speed and other traffic calming techniques are to be to considered to accommodate growth and address existing traffic safety issues. (Refer Sections 8.1 and 10.5 of the Structure Plan Report).

Main Roads is opposed to any proposal to increase linear residential development along South Coast Highway because of increased traffic conflict between local residents and heavy vehicles, increased community road safety concerns and diminished effectiveness of the South Coast Highway as a priority heavy haulage route. However, Main Roads is not opposed in principle to the extension of the Kalgan Townsite to the south and east. Accordingly the Structure Plan concentrates village development south of the River and introduces controls to limit direct access onto the Highway.

The existing Hunton Road intersection with South Coast Highway is not considered suitable to handle the increase in traffic which would result from development. Given the current configuration of the intersection, the speed environment, current traffic volumes and the anticipated rate of heavy vehicle growth on South Coast Highway the intersection must be realigned to the east and suitable turn treatments provided. This preferred option is shown as H5 and is reflected on the Structure Plan.

The existing Wheeldon Road intersection with South Coast Highway is unsafe for right turning vehicles off South Coast Highway. As a result, a "Type C" intersection treatment is required by Main Roads, however the cost of this treatment will be substantial as widening of the Kalgan River Bridge will be required. An alternate option is to ban "right turn in" movements from South Coast Highway.

This Roads and Access Plan identified is the culmination of consultation with representatives from Main Roads WA, City of Albany, engineering consultants and the community. The various improvements are categorised by location and management responsibility and listed in order of likely implementation, from immediate through to long term. The Kalgan Rural Village Structure Plan, together with the endorsed Local Traffic Plan and the subsequent subdivision of land, in combination with State and Local Government infrastructure/works programs, will provide the means and mechanism for implementation.

APPENDIX A

LAND CAPABILITY & GEOTECHNICAL ASSESSMENT

Land Capability and Geotechnical Assessment

Kalgan Settlement

October 2008
Revised Aug 2010

Landform Research

25 Heather Road, Roleystone WA 6111
Tel 9397 5145 Fax 9397 5350

BACKGROUND

The Kalgan settlement and surrounding area was settled over a century ago and was primarily used as a fruit growing area and holiday day destination.

The area is typified by a picturesque landscape with views across the Kalgan River, a large navigable waterway up to the Kalgan settlement Bridge and areas of remnant vegetation scattered across the site between pasture.

The Kalgan settlement was an active small country town, but with construction of good roads and the demise of the orchard industry the townsite has stagnated.

In recent times the locality has become the focus of new landholders who are looking for a rural lifestyle at a reasonable distance to the Albany town centre.

The development pressures are just starting to manifest and there is an opportunity to plan for development that complements the history of the local area, and the capability of the land, whilst at the same time enhancing the environment rather than leading to significant environmental impacts.

This study is directed to identify the most capable ground and any limitations on less capable areas.

See Section 8.0 for a summary of the Site Assessment and Land Capability.

CONTENTS

1.0 INTRODUCTION

Background

The Kalgan settlement and surrounding area was settled over a century ago and was primarily used as a fruit growing area and holiday destination.

In recent decades the fruit growing has ceased and the area has been used for rural purposes, mainly grazing of cattle and rural living.

Some perennial horticulture has continued with minor fruit tree orchards and in more recent years small areas of viticulture.

The site was investigated by extensive land surveys on between 31 July and 2 August 2006 and 6 January 2007 to assess the land capability, geotechnical and environmental issues associated with the site and its potential for subdivision.

During the study the area was walked, auger holes were drilled as necessary to confirm soil type or gain information on the soils, and the geology, vegetation, hydrology and salinity mapped. In addition to field observations interpretations were made from aerial photography and research.

A total of 22 soil test holes were excavated using a backhoe See Figure 3). The soil test hole sites were selected to test the least capable ground for development, To maximise the knowledge gained. Ground upslope or on better soils such as gravels were obviously suitable for development. This better ground was walked and mapped using some hand auger holes sunk as necessary to confirm the soil type or provide additional information as necessary.

Access was not available to all lots for testing, but this did not significantly affect the soil study.

Site Description

The Kalgan settlement and surrounding area is typified by a picturesque landscape with views across the Kalgan River, a large navigable waterway up to the Kalgan settlement Bridge and areas of remnant vegetation scattered across the site between pasture.

2.0 PHYSICAL ENVIRONMENT and REGOLITH

2.1 Geology and Geomorphology

The locality is based on an undulating land surface centered on the Kalgan Valley which is formed on an undulating weathered Archaean granite basement.

A palaeovalley was formed prior to the Eocene. The valley and land surface was then flooded as a result of downwarping and the sea flooded in allowing the deposition of deep silts of the Plantagenet group.

With retreat of the sea, the Eocene sediments were exposed to the atmosphere and the area experienced the development of a deep weathering profile. This profile developed on the relatively flat Plantagenet Group and resulted in the development of laterite and gravel.

Cutting down of the old sediments and weathering profile resulted in the formation of the current Kalgan River channel, which cut down to granite basement by the removal of the overlying silts in the valley.

On the ridges, at elevations of 40 to 50 metres AHD, the laterite gravel and duricrust protected the sediments and led to the retention of the old erosion sediments on the upper slopes and higher ground.

However in the gently sloping valley of the Kalgan River the river and its tributaries now flow across the degraded soft Plantagenet sediments, which is several localised places has been cut to granite basement.

Colluvial and alluvial movement of the fine sands shed from the eroding sediments were deposited in the valley floor forming deep fine sands.

2.2 Regolith and Soils

Soils of the site are predominantly sand over silts and silty clay duplex in the lower elevations with the clay subsoils forming loams on the mid slopes and gravel and duricrust and gravel on the ridges around the perimeter of the site.

Soils through the centre and lower elevations are silty sands over slity loams and clays with some alluvial silts.

Where the silty sediments have been reworded by colluvial and alluvial processes the silts and fine sand has moved vertically downwards to deposit in the subsoils, leaving more sandy upper soil horizons. This creates the Sand over Silty Clay. The upper sand horizons being permeable with reduced permeability in the silty clay subsoils. These soils are therefore susceptible to the surface sands filling leading to lateral water floors and waterlogging, in addition to mobile iron movement.

In places the mobile iron deposits as weak ferricrete and bog iron.

Surface water movement has also redistributed some of the sand shed from the erosion of the Plantagenet Group sediments, sheeting fine sand across the gravel on the mid slopes.

In other parts the peaks of the granite basement, with associated loam soils, have been exposed at the Kalgan settlement centre and in the central south. Brown loam in the south west is developed on the older subsoils associated with the granite basement.

The key soil types are listed below. The distribution is shown on Figure 3.

Table 1 Soil Types

SOIL TYPES		
KEY	**NAME**	**DESCRIPTION**
RL	Brown Rocky Loam	Brown loam over yellow brown loam and granite saprolite. May have minor band of gravel from 100 to 400mm. Associated with granite basement outcrop.
BL	Brown Loam	Dark brown loam over yellow loam clay subsoils developed on sloping granite and colluvium based subsoils.
GD	Gravel and Duricrust	Yellow brown gravel over duricrust at 200 - 1 200 mm over silts of the Plantagenet Group. Occupies ridge tops.
G	Gravel	Yellow brown gravel to 500 mm over yellow silty clay.

		Developed on silts of the Plantagenet Group. Upper valley slopes.
S/ST	Sand over Silty Clay	Grey sand or grey brown sand over yellow silty clay at 500 mm. Developed on silts of the Plantagenet Group on the gentle lower valley slopes. Some slopes are subject to surface seepages and perched water tables in winter.
S	Deep Sand	Grey silty sand over deep white silty sand formed by redistribution of the sand by colluvial and alluvial processes. Occupies lower valley slopes of sand shed from upslope.
S/G	Sand over Gravel	Grey silty sand over cream or brown silty sand at 200 - 500 mm over yellow silt or silty sand, mottled in places or brown at depths in excess of 1000 mm. Located on the mid valley slopes where sand has been sheeted across older gravel soils.
A/ST	Alluvial Silts	Low lying, leached white, or brown sand overlying loam and clay subsoils of colluvial to alluvial origin. In some locations the loam subsoils are exposed. Wet in winter with surface water common following heavy rainfall events.

Table 2 Soil Properties

PROPERTY	DESCRIPTION	SOIL SUSCEPTIBILITY	SOILS POTENTIALLY REQUIRING MANAGEMENT
WATER REPELLENCE	Water repellence is the uneven or non wetting characteristic of a soil. This commonly occurs in dry situations and more commonly affects soils that contain less clay such as sands. It may lead to greater surface runoff in summer, resulting in lower soil moisture and reduced crop growth in winter.	Minor in surface sands, but with the rainfall patterns the sands are generally not non wetting	No issues for development
SOIL COMPACTION	Soil compaction results from tractor and machinery movements compacting soils and reducing aggregates. It leads to reduced root penetration and reduced water infiltration. Compaction hard pans commonly form. Loamy sands are the most susceptible.	The soils on site have low potential for traffic compaction.	No issues for development
DISPERSIBLE SOILS	Soils containing sodium in the clay content can disperse when wet, leading to soil erosion and subsoil tunnel formation.	No evidence of soil dispersion.	No issues for development
WIND EROSION	Wind erosion can impact on sands and loose soil when inadequate soil cover is retained. Duplex and sandy soils are at high risk. The worst times are prior to the winter rains.	The sandy soils are more susceptible but on this site, with the rainfall pattern, plant growth rates and vegetation cover there are no issues.	No issues for development

WATER EROSION	Water erosion can occur in susceptible soils which have inadequate soil cover, steeper slopes, higher sand content and dispersibility.	Slopes are gentle to moderate. Most soils are relatively resistant because of their loam nature and vegetation cover. However the steeper slopes dropping to the river are more susceptible where vegetation cover has been removed.	Minimal. *See 6.2 Drainage and Flood Risk*
SOIL ACIDITY	Soil acidity depends on a number of factors such as the amount of calcareous material within the soil, the crops grown, fertiliser usage and the proportion of clay. Soils that are too acidic can allow elements such as metals, including aluminium, to dissolve and become toxic.	The soils are acidic There is potential for soils to become more acidic through the use of nitrogenous fertiliser and the growth of legumes. PH measurements show general readings of 5.0 – 6.5 with one reading of pH 4.5.	Sand over Silty Clay and the Alluvial Silts have the most potential for acidic conditions. *See 6.6 Acid Sulfate Risk*
SALINITY	Salinity is the proportion of salt in a soil. Often mildly saline soil moisture is concentrated on the surface through evaporation, leading to an inability to support crops and plant growth. Normally worse where ancient soils and laterite profiles are present.	There is little evidence of salinity with all water being fresh to relatively fresh.	No issues for development
ROOTING DEPTH	The depth roots can penetrate depends on texture changes in the soil such as duplex soils, the proximity of bedrock, stone in the soil, hard clay layers and soil compaction.	The soils are sandy with underlying loam clay subsoils, or gravelly and loamy. The only issues are the minor areas of granite basement and laterite duricrust.	Duricrust and rock limit root penetration but do not impact significantly on development capability. The area with granite outcrop is minimal in the central south
SOIL MOISTURE STORAGE	The ability of a soil to retain water determines the potential for crop growth and the amount of rainfall and irrigation required.	The local rainfall patterns ensure adequate soil moisture under most conditions.	With rainfall and evaporation patterns there are no issues.
WATER LOGGING	Water can lay on the surface, clogging the pores in the soil. This reduces soil oxygen leading to loss of nitrogen and reduced crop growth	Significant areas are subject to winter waterlogging. These are mainly on the lower slopes and are related to the sands over a less permeable subsoil or sands with inadequate drainage.	Sand over Silty Clay, Alluvial Silts *See 6.2 Drainage and Flood Risk*
SOIL WORKABILITY	Workability is the ease that the soil can be cultivated. Waterlogging, the presence of stone and slope can all impact on the ease of cultivation.	The soils generally are highly workable, apart from areas of granite basement rock and shallow duricrust.	Shallow duricrust and basement outcrop is limiting.

2.3 Basic Raw Materials

Gravel occurs on the higher hills and remnants of the old erosion surfaces.

Sand occurs as thicker sheets on some valley slopes, particularly in the north west in the soil type nominated as Deep Sand.

Statement of Planning Policy No 2.5, Agricultural and Rural Land Use Planning, states that basic raw materials should be taken prior to sterilisation of the area by development. It is inherent in that consideration that sufficient resources are identified and retained for future use by the community.

Gravel is currently being extracted from the ridges on the western edge of the locality.

Locally gravel is predominantly used for road construction sub-bases. The associated laterite duricrust is not normally crushed for construction materials but this may change in the future and represents an opportunity to rework some of the old gravel pits and minimise the area required for gravel extraction. The gravel resource is shown as G, Gravel or GD, Gravel and Duricrust on Figure 3.

Sand is used for fill and concrete manufacture, but is not currently extracted and is a small resource in the west. The sand is shown as S, Deep Sand on Figure 3.

The main issues are the potential generation of dust and noise.

2.4 Climate

Weather data is recorded at Albany and Albany Airport.

The overall climate, however, is warm, dry summers with cool, wet winters.

Rainfall at Albany is 798 mm per year at the airport.

Temperatures show a summer average maxima of 25°C in the hottest months down to just over 15°C in the coldest months, July and August. Minimum temperatures range down to 10 ° C in the coldest months.

Annual evaporation is less than 1000 mm per year, with rainfall exceeding evaporation for almost nine months of the year.

2.5 Hydrology

Surface Water

The site was investigated by extensive land surveys from 31 July to 2 August 2006 and 6 January 2007 to investigate the land capability and geotechnical issues associated with the site and its potential for subdivision.

All water was tested using a portable conductivity meter and converted to mg/L salt. The salinity was measured in August 2006 and showed the surface water flows to be 935 to 2585 mg/L Potable water is less than 990 mg/L and stock water up to 9000 mg/L. See Figure 5.

The water quality of dams is normally fresher as indicated by the dam in the north west corner with a salinity of 385 mg/L which is fresh.

The water is therefore suitable for stock and some irrigation, but is not generally suitable as a potable water source. In summer the water can be expected to be similar or slightly higher in salt concentration due to reduced runoff.

In general the surface water runs off from the saturated areas of Sand over Silty Clay soils and areas where seepages occur and then runs along creeks to the Kalgan River. Minor drainage has been cut in the central south to drain flat Alluvial Silts.

The Kalgan River is estuarine in the southern portion of the study area to a granite rock bar at the Kalgan settlement. Upstream from there the river is fresh.

The rock bar prevents estuarine water from moving upstream but also impedes flood flows of water, causing the flood waters to build up upstream of the Kalgan settlement Bridge. The valley of the Kalgan River is generally deeply incised and as the water builds up in a flood it fills the incised valley upstream of the townsite. The affected areas are very small and are shown in Figure 5 and were mapped from geomorphological evidence and discussions with local people including landholders. The flood elevations and extent were for the large flood in early 2006 when a 1 : 100 year event occurred.

Downstream of the rock bar the river does not flood because the width of the channel is greater and the river outlets to Oyster Harbour.

Groundwater

Groundwater is normally at shallow depth or perched on the lower slopes with the depth increasing upslope. Water is supplied from bores and dams.

The quality of the water depends on whether the wet areas are clay based, with no seepages, compared to dams with continuous seepages which are the freshest. Water draining areas containing laterite remnants are normally slightly higher in salt content.

See 3.0 Water Availability for further details on water.

3.0 WATER AVAILABILITY

The water on site has traditionally been supplied from bores and dams.

With the rainfall, relatively low evaporation and sandy soils overlying more silty and clay rich subsoils, there has not normally been a water shortage because of the reduced need to irrigate.

The surface water supply on site has therefore been able to satisfy the demands placed on it.

There are only low demands for irrigation today because of the small amount of horticulture practised.

Water quality is normally suitable for irrigation of trees and orchards but is not always potable, particularly in the surface water.

Water from dams and bores can continue to be available.

Domestic supply of water can also be obtained from roof catchments. Normally each dwelling on rural residential properties will have a garage/large shed which could be used to increase supply.

A tank of 90 - 120 kL tank is normally recommended for areas such as this without scheme water. With an average rainfall of 798 mm a roof area of 150 m^2 is capable of filling the tank. Normal domestic use potable use is in the order of 120 kL - 180 kL per year. The remainder of water use at a dwelling is on the garden.

4.0 BIOLOGICAL ENVIRONMENT - BIODIVERSITY

4.1 Flora Assessment

Lindsay Stephens of Landform Research conducted an initial vegetation assessment and flora study on 31 August to 2 September 2006,

Searches of the Department of Environment and Conservation and WA Herbarium databases were made and are attached. The databases listed under the *Commonwealth Environment Protection and Biodiverstiy Conservation Act 1999* were also searched.

During the survey the remnant vegetation on site was examined by traverses and edge surveys.

All native species that were noticed were identified from published data, knowledge of the assessor and Florabase. Exotic species were not considered on a species basis but rather were considered on their impact on vegetation condition and their potential impact.

The original and existing plant communities, vegetation condition and plant species were also considered. See Appendix 1.

In general the remnant vegetation lies on soils that are less suitable for agriculture and therefore were never cleared during the long occupation of the area. The main remnants occur on the laterite gravel – duricrust ridges in the west and east, in winter wet areas through the lower elevations and along the banks of the Kalgan River and tributaries.

The three main types of remnant vegetation form the basis for the Community Types used in this survey.

The vegetation communities are shown in the main report as Figure 4.

The vegetation communities are shown in Figure 4.

VEGETATION COMMUNITY	
Jarrah – Marri Low Forest	▪ This community occurs on the laterite gravel soil of the upper slopes and ridges. The soils are yellow brown gravels with duricrust close to the surface. ▪ It is dominated *by Eucalyptus calophylla, E. marginata* with *Banksia grandis* overstorey and an understorey typical of gravelly soils in the Albany and local area. Typical understorey species include *Bossiaea linophylla, Sphaerolobium medium, Pultenaea reticulata, Allocasuarina humilis, Dryandra lindelyana* subsp *lindleyana, Melaleuca thymoides*, and *Leucopogon verticillatus.* ▪ Vegetation condition is generally Very Good with some previous clearing for gravel extraction in the west. There is generally little weed impact even though some remnants are not fenced.
Taxandria Shrubland	▪ This community occupies on the lower slopes where the soils are likely to be wet in winter. Typically the soils are sands over silty clays at depths of around 300 - 500 mm. ▪ The vegetation is mostly a shrubland typified by wet site species such as *Taxandria linerifolia, Taxandria parviceps, Taxandria juniperina, Hakea oleifolia, Calistachys lanceolata, Lepidosperma gladiatum* and *Gahnia trifida. Eucalyptus cornuta* occurs occasionally. ▪ The vegetation is normally in Good to Very Good condition and rapidly colonises any cleared land.

Riverine Forest	▪ This vegetation occurs along the Kalgan River and tributaries on deep loam and sand over loam soils. ▪ The vegetation is dominated by *Eucalyptus diversicolor* and *Eucalyptus calophylla*, with an understorey comprised of species from wet areas and from the gravelly soils, such as ▪ *Taxandria linerifolia, Taxandria parviceps, Hakea oleifolia, Calistachys lanceolata, Lepidosperma effusum Lepidosperma gladiatum* and *Gahnia trifida*. Melaleuca cuticularis is added along the Kalgan River. ▪ The vegetation along the Kalgan River is generally in Good condition or better adjacent to the river but deteriorates to Degraded in some locations which have been cleared or grazed. Chelgiup Creek to the east of the Kalgan settlement has significant disturbance by Watsonia and other exotic species.

Some plantations also occur on site.

No Declared Rare, Priority or Significant Taxa, or Threatened Ecological Communities were observed during the site investigations. In addition no unusual or unidentified species were recorded. Appendix 1.

No species or communities listed on databases held under the *Commonwealth Environment Protection and Biodiverstiy Conservation Act 1999* were encountered.

The remnant vegetation on site is generally Good or above including areas of remnant vegetation into which stock have access. The vegetation is weed free and worthy of protection.

There are some areas of Degraded vegetation and some vegetation which is subject to edge effects from exotic pasture and weed species. For example parts of the fringing vegetation of the Kalgan River adjacent to pasture and Chelgiup Creek adjacent to the Kalgan settlement.

The vegetation condition classification used is Bush Forever 2000.

4.2 Fauna

The amount of fauna is directly related to the proportion of remnant indigenous vegetation. Remnant vegetation is good habitat and thus all potential fauna species for the area could either be present or could utilise the site. Even isolated trees have habitat potential and the clumps of remnant trees are correspondingly important.

The survival of fauna is thus dependant on the land use and controls imposed, and education of landholders.

Fauna is related to the amount of indigenous vegetation remaining and will depend on the final end use of the site.

The vegetation along the Kalgan River is generally in Good or above condition, and there are pockets of remnant vegetation scattered across the area that are also in Good condition or above. These all form habitat, but are frequently restricted to areas where the soils were less useful for agriculture, such as the sloping edges of the Kalgan River, laterite duricrust ridges and winter wet and waterlogged areas.

All remnant vegetation should be retained where possible. In addition, regrowth can be used to allow or enhance wildlife corridors. Vegetation could be protected using conservation covenants or some other mechanism.

5.0 CURRENT and POTENTIAL ALTERNATIVE LANDUSES

Current Land Uses

The Kalgan settlement and surrounding area was settled over a century ago and was primarily used as a fruit growing area and holiday, day destination. In recent decades the fruit growing has ceased and the area has been used for rural purposes, mainly grazing of cattle and rural living.

The history goes back much further, with significant local aboriginal usage typified by nearby remnants of fish traps in the Kalgan River.

Some perennial horticulture has continued with minor fruit tree orchards and in more recent years small areas of viticulture.

Potential land uses

The potential land uses will depend on the planning decisions that are made for the local area.

The Kalgan settlement was an active small country town, but with construction of good roads and the demise of the orchard industry the townsite has stagnated.

In recent times the site has become the focus of new landholders who are looking for a rural lifestyle at a reasonable distance to the Albany town centre.

The development pressures are just starting to manifest and there is an opportunity to plan for development that complements the history of the local area, and the capability of the land, whilst at the same time enhancing the environment rather than leading to significant environmental impacts.

The potential land uses will therefore most likely be directed at smaller lots on the most capable land in locations which complement the townsite with larger lots on the less capable land.

This study is directed to identify the most capable ground and any limitations on less capable areas.

The opportunities of the site are;

- The sloping nature of the site.
- The picturesque nature of the local area.
- Widespread views that can be obtained across the site.
- Proximity to Albany townsite.
- The Kalgan River running through the centre of the local area.
- The long history of the local area.
- The amount of remnant vegetation scattered across the site and along the Kalgan River
- The potential for tourist activities.
- The nearby land is again increasingly being used for perennial and other horticulture.
- The presence of drainage lines, wet areas and dams across the site.
- The interesting mix of wet site and ridge vegetation.
- Presence of large quantities of water suitable for perennial horticulture.

- Presence of suitable soils for perennial horticulture.
- Potential gravel resources.
- Potential sites for aquaculture

The constraints of the site are;

- Winter wet soils on the lower valley slopes.
- The fire hazard of remnant vegetation.
- The presence of drainage lines that may require catchment management and appropriate setbacks.
- Presence of existing gravel quarries which require adequate buffers.
- The presence of some winter wet soils.

6.0 GEOTECHNICAL FACTORS - MANAGEMENT

The geotechnical factors relate to the capability of the site for development. With such large lots, and the continued use of the land for rural living with some diversification, the necessity for geotechnical issues to be addressed is minimal.

A total of 22 soil test holes were excavated using a backhoe See Figure 3). The soil test hole sites were selected to test the least capable ground for development, To maximise the knowledge gained. Ground upslope or on better soils such as gravels were obviously suitable for development. This better ground was walked and mapped using some hand auger holes sunk as necessary to confirm the soil type or provide additional information as necessary. See Figure 3 and Appendix 2.

Access was not available to all lots for testing, but this did not significantly affect the soil study.

However in the interests of completeness the geotechnical aspects are listed where some issue might be significant.

Table 3 Summary of Geotechnical Properties for Development

PROPERTY	DESCRIPTION	SOIL SUSCEPTIBILITY	SOILS POTENTIALLY REQUIRING MANAGEMENT
FOUNDATION STABILITY	Foundation stability is related to the ability of a soil to compact and remain stable. Silica sands are best for this. Sloping clay soils, soils loaded with water, or expanding clay, will all lower the stability. Sometimes it is not always obvious what can happen under exceptional conditions.	Generally good foundation conditions occur on the sandy soils. The ridge soils are gravelly with good foundation stability, and the wet soils tend to be more sandy which does not decrease their stability rating substantially.	No special requirements apart from those normally required for footings for dwellings in most areas. The Alluvial Silts and Sand over Silty Clay have the lowest capability but this is still moderate to high *See 6.1 Foundation Stability*

LANDSLIP RISK	Steep soils that are loaded with water and have the slopes changed or vegetation removed are all at greater risk of soil creep and landslip. Assessed to Australian Geomechanics Journal March 2000 (*Landslide Risk Management*).	No particular instability on the gently sloping soils. There are some steeper slopes, but these will normally be excluded from development for other reasons such as the banks of the Kalgan River	No special requirements apart from those normally required for footings for dwellings in most areas. *See 6.5 Landslip Risk*
EASE OF EXCAVATION	The presence of basement rock, shallow groundwater, steep slopes or hard clay can all restrict excavation.	High apart from locations on shallow duricrust which are vegetated and less likely to be used for dwellings. The areas of granite outcrop are small	Generally high across the whole site.
COMPACTION ABILITY	Some soils such as quartz sands are easier to compact when using cut and fill. Others such as calcareous sands and hard clays can be difficult to compact.	Sandy soils are easy to compact. Other soils such as the gravels carry no particular requirements.	No special requirements apart from clay based winter wet soils. *See 6.1 Foundation Stability*
EXPANSIVE SOILS	Some clays such as smectites are expansive and can swell when wet and shrink when dry, therefore impacting on developments.	No expansive soils were noticed.	Only likely to occur in clay based winter wet soils which are not generally present.
WATER LOGGING - INUNDATION	Soils that become waterlogged can impact on dwellings through capillary action.	The main waterlogging and perched temporary winter wet areas are associated with sand over silty clay or alluvial silts which is level and slowly drained.	Alluvial Silts and Sand over Silty Clay. *See 6.2 Drainage and Flood Risk*
FLOOD RISK	Soils that are subject to flooding from storm events and watercourses are at risk. Sometimes it is not always obvious what can happen under exceptional conditions.	Flood risk only occurs on drainage lines which are deeply incised.	Restricted to a small area upstream on the Kalgan River. See Figure 5. See Figure 3. *See 6.2 Drainage and Flood Risk*
DEPTH TO IMPERMEABLE CLAY	A minimum of 1.2 metres of free draining soil under the base of waste water disposal areas	There are no impermeable clays. The winter wet soils result from reduced subsoil permeability rather than impermeable clays.	Not generally present. *See 6.4 Capability for On Site Waste Water Disposal*
DEPTH TO THE WATER TABLE	The depth to the water table must be a minimum of > 1.8 metres for conventional septic systems and >0.5 metres for alternative waste water units.	Winter wet and waterlogged areas occur in the Sand over silty Clay and Alluvial Silts due to the permeable and porous upper soil horizons filling with water in winter with reduced subsurface drainage.	Alluvial Silts and Sand over Silty Clay. *See 6.4 Capability for On Site Waste Water Disposal and Plan Constraints Map*

PHOSPHATE RETENTION	Phosphate is retained on sesqui-oxides, clays and calcareous particles. Soils such as white sands that do not retain water or clays, do not allow water to penetrate and will not adsorb phosphate.	Phosphate retention levels are high in the gravel soils and soils with silty clay subsoils.	Winter wet areas may have reduced retention rates if water flows off site quickly. *See 6.4 Capability for On Site Waste Water Disposal, and 7.7 Nutrient Management*
REMOVAL OF NITROGEN	Moist and wet soils with reduced oxygen levels can lead to nitrogen losses through denitrification. Soils such as white sands that do not retain water, or clays that do not allow water to penetrate, may not allow sufficient time for denitrification.	All soils have sufficient capability for denitrification to occur.	Not significant *See 7.6 Nutrient Management*
MICROBIAL PURIFICATION	Soil microbes require a minimum of 5 metres of sandy soil or less (down to 1 metre) for soils of lower permeability such as loams. The longer a soil retains waste water the better the microbial purification. Clays may not be permeable enough for waste water to penetrate the soils.	All soils have sufficient area and capability for this away from the wetter areas where rapid runoff may reduce purification ability.	Avoid wet areas. Use nutrient adsorbing waste water systems as appropriate. *See 7.6 Nutrient Management*
PERMEABILITY	Soil permeability affects the ability to accept waste water or the ability to retain waste water long enough for adequate treatment. Soils that are too permeable, such as white sands, or clays that are impermeable, are at risk.	The sandy soil horizons and gravel – loams are permeable with reduced permeability in the underlying silty clay soil horizons	Waste water disposal systems can be selected and installed to overcome any short comings. *See 6.4 Capability for On Site Waste Water Disposal*
ACID SULFATE	Acid conditions can be formed when soils containing pyrite are exposed to the air, allowing sulfuric acid to be formed. The soils most at risk are normally saline/estuarine soils, gley soils, peat and some organoferricretes.	Minor evidence of indicators of acid sulfate, based on site and geological mapping in most areas. Only one soils test hole in the Alluvial Silts encountered "suspicious' soil horizons, but this area will be filled rather than drained or dewatered.	Fill rather than dewatering and drainage can manage any potential risk in "suspicious" areas. *See 6.6 Acid Sulfate Risk*

6.1 Foundation Stability

Foundation Stability relates to the suitability of the soils to accept dwellings or other structures. The assessment of Foundation Stability is conducted using the geotechnical methods outlined in AS 1726, and to the standards outlined in AS 2870, for single storey dwellings.

Field assessment is an important part of this assessment to determine what soils factors may impact on soil stability. The type and composition of the soils, the underlying geology, the presence of expansive clays or compressible materials, slope stability, summer and winter soil moisture and vegetation can all influence soil conditions.

The foundation stability for developments on the site is generally high on the upper slopes of gravelly soils. Loam soils have slightly reduced potential stability, and the Sand over Silty Clay and Alluvial Silts have moderate stability that can easily be overcome through adequate fill and design and installation of suitable footings.

The winter wet areas will require fill to raise footings and floor elevation above capillary actions.

Road construction is rated high, but reduces in the silty soils particularly where the silty soils are winter wet or waterlogged, in which case compaction can be more difficult because the fineness of the grains reduces the movement of water when trying to compact the soils.

The foundation stability listed below is a generalised stability, based on the soil characteristics determined from backhoe test holes and regolith mapping.

GENERALISED FOUNDATION STABILITY		
KEY	**NAME**	**GENERALISED FOUNDATION STABILITY**
RL	Brown Rocky Loam	Moderate to High AS 1726 Site Class S - M
BL	Brown Loam	Moderate to High AS 1726 Site Class S - M
GD	Gravel and Duricrust	High S 1726 Site Class A - S
G	Gravel	High AS 1726 Site Class A - S
S/ST	Sand over Silty Clay	Moderate AS 1726 Site Class S – H @
S	Deep Sand	High AS 1726 Site Class A - S
S/G	Sand over Gravel	High S 1726 Site Class A - S
A/ST	Alluvial Silts	Moderate AS 1726 Site Class M - H

\# Site specific testing will be required at the time of the design and construction of dwellings or other developments.

@ On these soils the AS 1726 rating is likely to vary because of the degree of fill, and any drainage that may be constructed as part of developments and road construction

	GEOTECHNICAL	MANAGEMENT
6.1.1	Road construction	• Road construction is high with few limitations. The main limitations will be the construction of drains and pavements on wet silty ground where more care will be required; That is the Sand over Silty Clay and Alluvial Silts. • Gravel, loam and soils on the upper slopes are generally good for road construction.
6.1.2	Slope stability	• Foundation stability for developments on the site is high to moderate as listed above. • Developments requiring more than 400 mm fill of uncontrolled natural soils or 800 mm uncontrolled sand are AS 2870 Site Class P with engineering input into the design and placement of footings recommended. • Site by site assessment is recommended at the time of design and construction of any dwelling to ensure matching of design and footings to specific features. • Generally development on steeper slopes will be avoided because of the vegetation cover and proximity to the Kalgan River.
6.1.3	Karst	• No limestone is present

6.2 Drainage and Flood Risk

Drainage relates to the water levels in summer and winter, the elevation of perched or regional water tables, the type of soils, underlying geology and hydrology, natural and potential drainage of a site.

Poor drainage can result in waterlogged soils and may impact on foundation stability. Soil moisture can also result in capillary action which can impact on structures.

Flooding relates to the potential of a watercourse to flood a particular area. An area susceptible to flooding can be subject to the flood flow or may lie in a flood fringe. Construction should not impede a flood flow and normally structures are not to be placed in the floodway.

The flood fringe is not subject to the same erosive forces as the floodway and structures may be located in the flood fringe provided they do not increase the elevation of the flood. Normally a 500 mm separation is required between the 1 : 100 year flood level and any floor elevation.

Drainage

The majority of the site is well drained apart from the central area and lower slopes, where winter wet conditions occur in the Sand over Silty Clay and Alluvial Silt soils.

The Sand over Silty Clay soils have upper sand horizons that are permeable with reduced permeability in the silty clay subsoils. These soils therefore have a tendency for the upper soil horizons to fill with water because of reduced subsoil permeability and slow lateral subsurface water flows resulting from the fine grainsize.

In turn this leads to some winter wet areas, seepages and waterlogging. Cutoff drains normally in the form of road drains can be used to reduce the soils moisture. Some of these areas are covered by remnant vegetation and may not be developed.

The Alluvial Silts are winter wet because they are lower lying and flat, with reduced surface water and lateral subsurface soil flows. In the past these have been partially drained by the construction of small drains. The large scale drainage of these areas is not recommended without additional soils testing on any potential impacts of dewatering. It is preferable, where possible, to use fill to raise the development areas on these soils.

There are areas where further testing is recommended before drainage is implemented, as shown on Figure 5, and are related to the small potential for increases in soils acidity from reducing conditions in the some upper soil horizons. See 6.6 Acid Sulfate.

Flooding

A 1 : 100 year flood occurred in early 2006, a few months prior to the site inspection. Discussions with local people and landholders was used to determine the flood paths.

The major creeks and rivers on the site are deeply incised by some 3 to 7 metres with sloping valley sides of steep incisions. The watercourse below natural land surface contains the normal flows and flood flow.

The Kalgan River is estuarine in the southern portion of the study area to a granite rock bar at the Kalgan settlement. Upstream from there the river is fresh.

The rock bar impedes flood flows of water, causing the flood to build up upstream. The valley of the Kalgan River is generally deeply incised and as the water builds up in a flood it fills the base of the incised channel upstream of the townsite. The affected areas are shown in Figure 5 and are restricted to one small area in the central north of the planning precinct.

Downstream of the rock bar the water does not flood because the width of the channel is greater and the outlets to Oyster Harbour.

	GEOTECHNICAL	MANAGEMENT
6.2.1	Flood risk	• The only risk is immediately adjacent to the watercourse as shown in Figure 5.
6.2.2	Waterlogging	• Winter wet conditions occur through the centre of Lot 1 and should be excluded from development unless filled. See Figure 7. • Any lots located within the central area should be large enough to allow for ridges to be included on which building envelopes can be located.

6.3 Stability of Dams

Stability of Dams depends on their location with respect to the underlying geology, the hydrology and the soil types. The proportion of clay, whether the clay is dispersible, slopes and gradients, the water table, rainfall pattern, design and construction of the dam and spillway, and geology, can all impact on the potential stability of a dam.

All dams observed are generally set low in the landscape and are therefore normally considered to be stable.

	GEOTECHNICAL ISSUE	MANAGEMENT
6.3.1	Stability of dams	• There is no evidence of unstable dams. • Developments should not be located downslope of dams.

6.4 Capability for On Site Waste Water Disposal

The Capability of a Site for Waste water Disposal depends on a number of geotechnical factors. These include the soil type, depth and permeability of the soil, depth to impermeable layer, depth of perched or other watertables and potential for flooding or waterlogging. Assessment should be made from field investigations because the whole soil profile and local geology can determine the likely path of the waste water.

The ability of soils to adsorb phosphorus, reduce nitrogen and inactivate microorganisms is important. Phosphate Retention (PRI) can be a useful indicator, but the nature of the analysis can understate or overstate the field behaviour.

Some soils theoretically can have good phosphate retention characteristics, but the behaviour of the waste water in the field may negate these characteristics. For example particles larger than 2 mm are sieved out prior to analysis and a gravelly sand may therefore have a lower PRI than the field reality. On the other hand clay may have a very high PRI but may not be sufficiently permeable for the waste water to penetrate.

The Government Sewerage Policy, 1996, Government Draft Country Sewerage Policy, 2002, Department of Health Guidelines for the Reuse of Greywater in Western Australia, Department of Health Specification for Aeorobic Treatment Units 1992, Health (Treatment of Sewerage and Disposal of Effluent and Liquid Waste) Regulations 1974, AS/NZS1547:2000, all provide input into the acceptable site characteristics.

Nutrient Management encompasses the management from waste water disposal and land uses. Nutrient management may need to change in order to sustain a new land use. There may also be opportunities to improve the management of nutrients from current land uses.

The types of waste water systems all have different installation requirements and potential impacts, and can be selected to alleviate adverse site conditions. Whether a conventional septic system or nutrient or composting waste water system is used will depend on the site conditions.

The management of nutrients is also linked to other environmental and management issues such as revegetation and the treatment of stormwater.

As well as mapping the soils and regolith across the site a total of 22 soil test holes were sunk by backhoe. The test holes were located in generally the areas of lowest capability to provide data on the worst conditions. Upslope the conditions are better.

The soil test holes ended where the yellow silty sands and clay of the Eocene Plantagenet Group were encountered. This subsoil extends to depth and grades into the weathered sedimentary sequence which is similar to the overlying weathered subsoils. The deepest soil horizon encountered can normally be expected to continue below 2 000 mm.

Holes where further information was required were continued deeper.

The Phosphate Retention Indices (PRI) of the loam and gravel soils are high based on the soil composition, proportion of sesqui-oxides and clay, and when compared to the database of type soils held by Landform Research for PRI, and with Chemistry Centre data.

On the other hand some of the sandy soils have reduced phosphate retention and, in addition to more susceptibility to winter wet conditions, are recommended to have nutrient adsorbing waste water disposal systems.

Nutrient behaviour is discussed in 7.7 Nutrient Management. The options available, and the mechanisms to minimise nutrient export, are included.

Proposed Lots

The issue of waste water disposal is independent of lot size. The site is either capable of waste water disposal or can be modified to increase capability. The Government Sewerage Policy permits 2 000 m^2 lot in all soil types. The actual lot size on suitable soils will therefore depend on planning issues.

Lot sizes will depend on planning issues. For example the areas with more capable soils, in areas delineated by planning, will have smaller lots and could be down to 2 000 m^2 in compliance with the Country Sewerage Policy.

Other areas of less capable soils, in areas further away from the town centre will have larger lots of 2 hectares or more. The total water loading requires consideration when small lots are proposed.

Water Table – Water Loading

The water table, susceptibility to winter wet conditions and perched water tables, varies considerably across the site.

The water table was only encountered in two soil test holes, Hole 18 at 900 mm and Hole 22 at 1050 mm. Both these holes comply with the requirement of 500 mm separation to the highest known water table when using nutrient adsorbing waste water systems.

The gravel, sand over gravel and loam soils are high in the landscape and have deep winter water tables. These soils are suitable for both conventional and nutrient adsorbing waste water systems.

On the other hand the Sand over Silty Loam and the Alluvial Silts are generally recommended to use nutrient adsorbing waste water systems because of the increased risk of variable winter wet soils and upper sand horizons that have low phosphate retention capability.

Where lot sizes are reduced cutoff and other drainage may be applicable and desirable to compensate for increased water loading as a result of scheme water and the potential for winter wet soils in some locations.

The total water loading requires consideration in situations that only just comply if lots under 2 000 m^2 are supplied with water. Lot sizes of less than 2 000 m^2 should only be used in areas of high soil capability.

For example the additional loading of scheme water on a lot is likely to vary between 200 kL to 350 kL per year. For 2 000 m^2 lots at 5 per hectare this adds moisture equivalent to 80 to 140 mm of rainfall which would be expected to normally be able to be easily accepted.

On the other hand for 1 000 m2 lots of which there might be 8 per lots hectare, the loading is double and could be equivalent to 160 mm to 280 mm of rainfall.

In the case of the Kalgan, it is advantageous that dwellings will be self sufficient in regard to water supply. The introduction of scheme water could otherwise be expected to increase soil moisture which may create difficulties on lots of 1 000 m^2 and 2 000 m^2.

See Figure 7 Land Capability for the mapped areas and Appendix 1 for the soil test hole logs.

Infiltration results

Australian Standard 1726 for Geotechnical Investigations permits interpreted assessments. Interpreted assessments are an essential part of site evaluation because it is crucial to know how representative the test hole is and what conditions are indicated by the colour, nature, texture and mode of formation of the soil profile.

As the lot sizes are likely to vary from 0.2 hectares to 2.0 hectares or larger, and the outline development plan is not finalised and may change with time, and the location of dwellings or envelopes may change, no infiltration tests were conducted.

The soils mapped were all assessed by normal soil properties as being permeable and capable of meeting the Government Guidelines. No impermeable clay soil profiles were recorded anywhere across the site.

The winter wet soils were generally silty sand based, with the gravel and loam soils with slightly reduced permeability located in the mid to upper slopes where drainage is inherently better because of the elevation.

According to *Schedule 8 of the Health Act, 1911* a loading of 20 litres/m²/day is applicable for leach drains in loam soils with alternating leach drains and 10 litres/m²/day for non alternating systems. It is standard practice to use dual leach drains with waste water disposal being able to be directed alternately to each leach drain. Areas where conventional septic systems are acceptable are shown on the attached plan, as are the areas requiring alternative or nutrient adsorbing waste water systems.

Alternative (aerobic, Envirosafe or Ecomax) effluent disposal systems are also acceptable and require a waste water loading not exceeding 10 litres/m²/day.

The soils will all comply with these infiltration rate guidelines.

The following recommendations are made for waste water disposal systems.

Conventional septic systems are acceptable for higher elevations on soils such as the Gravel, Gravel and Duricrust, Sand over Gravel, Brown Loam and Brown Rocky Loam as shown on Figure 7.

Comply with Government Guidelines and Policy, as below.

1. For conventional septic systems provide two switchable leach drains sized according to the *Health (Treatment of Sewage and Disposal of Effluent and Liquid Waste) Regulations 1974 – Health Act 1911.*

2. Compliance with the *Government Draft Country Sewerage Policy, 2002* (revised September 2003), which provides for the various setbacks from water bodies. A buffer of 100 metres to the drainage lines for conventional septic system and 50 metres for a nutrient adsorbing waste water treatment system.

3. In areas where shown on the attached Land Capability Plan, Figure 7, use alternative waste water systems installed to *Specification for Aerobic Treatment Units (ATU's) Serving Single Households*, Health Department of Western Australia 1992 or superseding document.

4. Greywater disposal is acceptable and should be installed to the *Draft Guidelines for the Reuse of Greywater in Western Australia*, Health Department of Western Australia 2002, or superseding document.

	GEOTECHNICAL ISSUE	MANAGEMENT
6.4.1	Site Capability for Effluent Disposal	• The soils in all areas are capable of compliance with the Draft Country Sewerage Policy. Some recommendations are made for certain areas. See Figure 7. • The recommendations listed above for septic systems, alternative waste water systems and greywater disposal can be applied. • For lot sizes of less than 2 000 m², water loading should be considered where scheme water is used on less capable soils.

6.5 Landslip Risk

Landslip Risk is assessed using the methods developed by the Australian Geomechanics Society (Journal Australian Geomechanics, Volume 35, No 1, March 2000). The risk of landslip or ground movement depends on the geology, soil types, hydrology, landforms and vegetation.

Slopes are gentle in most locations with some minor moderate slopes in the north west and some moderate to steeper slopes along the banks of the Kalgan River.

With the foreshore setbacks and buffers it is unlikely if any of these steeper soils will be developed and therefore landslip risk is considered overall to be minimal. The only proviso to this are the steeper slopes to the small area of flood risk in the central north of the site on the west of the Kalgan River, where there may be a temptation to construct a dwelling for the views. In any case normal construction assessments of soils should result in the design and establishment of suitable footings to minimise any risk.

	GEOTECHNICAL ISSUE	MANAGEMENT
6.5.1	Landslip Risk	• Covered by the considerations in 6.1 Foundation stability and normal site assessment at the time of construction.

6.6 Acid Sulfate Risk

Acid Sulfate Soils can potentially form under reducing conditions when there is a source of carbon and a source of sulfur (normally from sea or saline water). Micro-organisms are thought to play an important role in reducing the sulfates within the sediments to form the iron sulfide. It is a natural phenomenon, that can be exacerbated by disturbance.

Potential acid sulfate conditions most commonly form under current or past estuarine conditions, peaty conditions, and may also result from weathering of some geological formations and situations which contain sulfides.

Overall, at risk areas are geologically a minor occurrence, but in some situations can be important, and lead to acidic polluting conditions developing.

Planning Bulletin Number 64, Department of Environment Guidelines, the Acid Sulfate Soil Management Advisory Committee NSW, 1998, Acid Sulfate Manual provides the most information on recognition and mitigation of potential acid sulfate conditions.

There has been an increased interest in acid sulfate soils since the release of WAPC Planning Bulletin 64 and because some acid sulfate conditions have been identified in the Albany and nearby areas, predominantly on low lying winter wet sedimentary soils.

In Bulletin 64 the majority of the site is shown as buff coloured *"Low to no risk of AASS and PASS occurring generally at depths of >3m."*

There are minor watercourses and an area outside the south east of the study site shown as yellow coloured *"Moderate to low risk of AASS and PASS occurring generally at depths of >3m."*

The only area coloured red is immediately adjacent to the estuarine channel of the Kalgan River; "*High Risk of AAS and PASS at < 3 metres of the surface*".

The mapping for Bulletin 64 was completed on the basis of broad scale soil types and aerial photography with less emphasis on detailed field mapping.

The most definitive survey procedure was produced by the Acid Sulfate Soil Management Advisory Committee NSW, 1998, in their *Acid Sulfate Manual.* This Manual forms the basis for much of the assessment procedures in Australia, including those adopted by the Western Australian Planning Commission and the Department of Environment and Conservation. The *Acid Sulfate Manual* adopts the procedure of reviewing the published data followed up by field assessment, which has been completed for this site. If a geological risk is determined, then a Preliminary Acid Sulfate Assessment is conducted.

Acid sulfate only becomes a potential risk when a number of circumstances are present.

1. There is rock, soil or regolith present that is carrying sulfides.
2. Sulfide carrying materials from below the water table are to be exposed to the atmosphere.
3. Excavation below the water table is to be carried out exposing the sulfide carrying materials to oxygen in the atmosphere.
4. Dewatering of the sulfide carrying materials is proposed, exposing them to oxygen.
5. Regolith conditions are already highly acidic, below pH4, under which oxidation can occur through electron exchange without the need for the presence of oxygen.

The actual areas of potential acid sulfate risk can be delineated by soil and geological mapping and this has been done on this site. The other consideration is the likely chance of any at risk soils being exposed to oxidation. For example there is no risk if acid sulfate conditions occur in the subsoils but these soils are not disturbed by excavation or dewatering.

The areas of highest risk, based on field mapping are some parts of the Sand over Silty Clay and the Alluvial Silts. These are gently sloping or flat and therefore have the potential over time for the accumulation of organic matter that is capable of reducing sulfates to sulfides. Of the Sand over Silty Clay, the well drained sloping area in the north west is of low risk because of the increased slope and summer drying of the soils.

The next issue is to consider whether these at risk areas are likely to be drained.

There is potential for soils to become more acidic through the use of nitrogenous fertiliser and the growth of legumes. PH measurements show general readings of 5.0 – 6.5 across the study area and these levels of pH are not uncommon in the Albany region without indicating acid sulfate conditions.

One reading at pH 4.5 was obtained in the central north east. This reading is still higher than the acid sulfate trigger level for natural soils of pH 4. The reading was obtained from an area of sand over Silty Clay, that, with minor drainage, may have been subject to reduction in soil moisture leading to oxidation of any potential sulfides that might be present.

On the other hand soils and water that looked affected by mobile iron, and which appear to be visually very acidic in the central south, were less acidic at pH 5.5 to 6.5. Figure 5.

The Alluvial Silts have been drained slightly but are still winter wet and it is unlikely that the drainage has resulted in exposure of any at risk materials. These areas are more likely to be filled and in that case there will be little or no risk. If the soils are to be drained, testing for acid sulfate of the soils likely to be exposed to oxidising conditions is recommended.

The Sand over Silty Clay soils which have been highlighted as a "Low Risk" in Bulletin 64, in the central east, appear to have a very thin layer of scattered organo-ferricrete or organic rich material at risk immediately above the underlying yellow silty clay. Whilst these volumes are likely to be small a pH of 4.5 was recorded and highlights the need for more investigations if the soils are to be significantly disturbed.

The most likely scenario, if these areas are to be developed, is for road and cut off drains to be used. These may lead to the exposure of small amounts of material to oxidising conditions and therefore, prior to drainage being undertaken, further soil tests are recommended. in this area as well. Fill of the land without drainage is unlikely to lead to any issues. It should also be noted that most of this land highlighted is vegetated and is therefore unlikely to be significantly developed in the interests of protecting vegetation.

	GEOTECHNICAL ISSUE	MANAGEMENT
6.6.1	Acid Sulfate Risk	• See the above text for recommendations and Figure 5 Hydrology Water Management. • The Alluvial Silts are at risk of acid sulfate conditions if drained or dewatered and further testing is recommended if this is proposed in the areas nominated in Figure 5. • Some small areas of the Sand over Silty Clay soils are also at a lower risk if they are drained or dewatered. Again site specific testing is recommended prior to this being undertaken in areas nominated in Figure 5.

6.7 Earthquake Risk

Earthquake Risk is dependant on the proximity to the active earthquake areas in the Wheatbelt, the soil types and the types of construction.

The risk has been defined by Geoscience Australia and is based on AS 1170.3:1993.

The ridge soils provide good foundations and subsoil stability and are generally no different to other soils in the general locality.

The lower elevation winter and seasonally wet soils have slightly increased earthquake risk because of the potential for moist or deeper less consolidated sediments.

This particularly applies to the Alluvial Silts which appear to be deep, wet and perhaps susceptible to amplification of ground movements. The foundation stability of these soils is less than other areas and heavier footings will therefore be designed into any construction which should assist in reducing any increased risk in these soils.

	GEOTECHNICAL ISSUE	MANAGEMENT
6.7.1	Earthquake Risk	• The Alluvial Silts are the most at risk of amplifying ground movements and are recommended to have heavier footings as a result of their slightly reduced foundation stability • See 6.1 and 6.6 above.

7.0 ENVIRONMENTAL FACTORS - MANAGEMENT

The following items are identified as the most likely to impact on the environment. These items can be managed by the implementation of the management recommendations. Other items are unlikely to impact or the impact is regarded as small.

7.1 Aesthetics

Aesthetics is the visual impact that the proposal may have on the local area.

The site is geomorphologically and environmentally similar to much of the near coastal land in the Great Southern, with the added high visual features of the Kalgan River.

Development will lead to more dwellings on the site.

On paper any dwellings will not be dissimilar to those dwellings already nearby and in the Kalgan settlement.

A site analysis of the existing visual impact was made during the site inspections of the local area.

The main potential visual impacts are from the local roads and the Kalgan River. In general the potential impacts from the Kalgan River will be limited because of the steep banks and riverine vegetation.

On the other hand the views from the local roads are influenced by the location of trees or other vegetation adjoining the roads, and the elevation of the roads.

The visual impacts are identified as High, Medium or Low and are shown in Figure 6 from the roads only because of the low impact from the Kalgan River.

The potential for views of developments can be taken into account during the design of any subdivision guide plan and during the planning for subdivisions or developments.

It is possible to minimise visual impact by planting belts of trees, however this in turn also restricts the views and turns current highly aesthetic views of the countryside into tunnels of trees. In some cases it will be better to sympathetically plan subdivisions to enable continued views across the subdivided land rather than dense perimeter tree planting. In other words it is likely to be more visually appealing to look across some dwellings scattered through a treed landscape or landscaped urban area than to be visually constrained by a tunnel of trees along a road reserve.

An example where this approach is preferable would be in the south east of the site looking towards the north west towards the Kalgan River.

In other areas strategic tree planting is likely to be more appropriate. Dwellings can be located between the remnant vegetation, or in sensitive or visually exposed areas, tree belts can be planted lower in the landscape along contour, which will provide visual protection and yet at the same time enable the owners of the dwellings to maintain unimpeded views.
The main change that could occur is on the more open ground, where it is likely that the planting of many trees by new owners will occur as they move into the area and establish gardens. These trees will provide screening and be no different to other townsites in the Great Southern.

Lot sizes can be varied according to land capability, planning considerations and potential visual impacts.

Dwellings constructed of sympathetic materials will have a less significant impact from local roads and the Kalgan River.

The colour and style of dwellings and other structures should be visually compatible with the area and to this end developments should be coloured, painted or colour bond sheeting used where applicable. The use of grey galvanised or zinc/alum sheeting should be avoided unless as an integral part of a development such as a roof on a "country style" home or shielded from key sight lines.

	ENVIRONMENTAL ISSUE	MANAGEMENT
7.1.1	Remnant vegetation	• Clearing of remnant vegetation is not recommended.
7.1.2	Dwellings, fences and other developments are to be aesthetically compatible with the area.	• Developments and other features will be subject to approval through the City of Albany and can be controlled at the approval stage. • The distances of sightlines and intervening vegetation will minimise visual impact. • Building envelopes on lots covering remnant vegetation could be clustered to reduce disturbance of the vegetation. • Clearing restrictions can be applied to larger lots. • Owners of small rural holdings normally plant significant numbers of trees as part of their development of each block which will assist visual screening. • Restrictions could be placed on the use of visually non compatible materials. • The lot sizes and design of subdivisions and the appropriate visual management can be considered during the structure planning and subdivision design phase.
7.1.3	Potential land uses	• Land uses will depend on the design of any structure planning and subdivision guide plan. • Some lots with significant amounts of remnant vegetation could have conservation covenants or clearing restrictions applied.
7.1.4	Gravel quarry	• These operations are located on the top of the ridge behind the remnant vegetation. As far as can be determined they cannot be seen from any existing road. • The gravel quarries have already operated for a number of years and at some stage the land is to be revegetated.

7.2 Preservation of Agricultural Land

The Preservation of Agricultural land is a comment on the quality of the land for agricultural purposes. The quality of the land depends on a number of things such as the soils, water availability and surrounding land uses. The comments relate to effects the proposal may potentially have on sterilising, fragmenting or removing high quality land from production.

There is a need for residential land in the perimeter of the City of Albany.

This local area has been a townsite for many years and is highly aesthetic. Whilst some soils such as the loam soils are fertile, the majority of the land has a reduced agricultural capability because of leached sands in the surface horizons or winter wet conditions.

In addition the demand for smaller lots must be met and there are good planning reasons to develop the land around an existing townsite.

In agricultural terms the area is relative small and the soils are in general little different to much of the surrounding land. Therefore the loss of agriculture production is unlikely to be significant.

In line with current trends there is also likely to be a pattern of small rural pursuits such as perennial horticulture on the smaller rural lots that may eventuate in some parts of the site. As such the agricultural production from such lots may help compensate of any loss of productive land. For example there are already small vineyards and orchards in several parts of the local area.

	ENVIRONMENTAL ISSUE	MANAGEMENT
7.2.1	Protection of agricultural land	• Considering the existing town site, its location and soil types, the change of this parcel of land to urban and rural living is likely to outweigh the loss of agricultural land. • The loss of agricultural land will also depend on planning decisions based on the need for townsite expansion.
7.2.2	Soil Preservation	• No changes are expected to erosion risks.

7.3 Land Use Buffers

Land Use Buffers relate to the potential for land use conflicts between the proposed and existing land uses and dwellings. The buffers could relate to noise, dust, odour, spray drift or other potential conflicts.

Buffers to significant environmental features such as watercourses, wetlands, and heritage areas are also important and are considered separately.

Gravel Quarry

The issue of appropriate buffers is a matter of the distance and protection measures to prevent impact on adjoining land users. This applies mainly to noise, dust and visual impact.

A gravel quarry exists in the central west, behind existing remnant vegetation.

For the current removal of natural gravel the main plant used on site is a loader only. If the laterite duricrust is to be taken, a bulldozer, rubber tyred loader, and portable crushing and screening plant are normally required. These will all work on the floor of the pit as they currently do. Bunds of overburden can be pushed to the perimeters of the pit to provide visual, dust and noise screening.

A number of Government Policies relate to buffer distances and the protection of Basic Raw Materials. Statement of Planning Policy No 4.1, State Industrial Buffer Policy, *(draft July 2004) discusses the need to consider adjoining land uses when locating buffers but does not prescribe set buffers for operations such as this.*

Statement of Planning Policy No 2.5, Agricultural and Rural Land Use Planning, makes provision for the extraction of basic raw materials. SPP 2.5 in Point 9 states that "The location of rural residential and rural small holdings should avoid unacceptable impacts on, or sterilisation of natural primary resources including prospective areas for mineralisation and basic raw materials .....".

Generic buffer requirements were developed by the Victorian Government and used by the Environmental Protection Authority as the basis for a Draft guideline on recommended buffer distances. These formed the basis of EPA Guidance Statement Number 3, Separation Distances between Industrial and Sensitive Land Uses, June 2005.

EPA guidance "Separation Distances between Industrial and Sensitive Land Uses", June 2005 lists the generic buffers for sand and limestone pits as 300 - 500 metres depending on the extent of processing. A generic buffer relates to the distance at which there are unlikely to be any problems without some further investigations and does not mean that smaller buffers are not acceptable. EPA Guidance for the Assessment of Environmental Factors No 3 June 2005 provides for a case by case separation, based on the potential impacts.

The natural gravel is more similar to a sand quarry in potential impact risks, whereas a duricrust crushing operation is most similar to a limestone quarry.

The excavation and processing methods can be designed to operate predominantly below ground level.

From an examination of the landform and excavation methods, reasonable buffers would be 300 metres from a dwelling to gravel crushing operations conducted behind low perimeter bunds or landform with some intervening vegetation.

For natural gravel and sand extraction a 200 metre buffer is recommended.

A number of recommendations on the management of the quarries are made for consideration during any land use change or subdivision process.

Recommendations

Laterite Duricrust Crushing Excavation

1. The Gravel resource is shown as the Gravel and Gravel and Duricrust soils on Figure 3.

2. Excavation activities should be subject to a management plan with controls through conditions of Planning or an Extractive Industries Licence.

3. A buffer of 300 metres to dwellings is recommended for crushing of laterite duricrust of which some can be contained on the adjoining lots by setting dwellings back from the excavation and behind natural landforms.

4. Excavation should be staged, with rehabilitation following as soon as practicable.

5. A Dust Management Plan is recommended to be available when dwellings are constructed closer than 500 metres to a quarry.

6. It is recommended that the gravel resources be provided with planning protection for the next ten years or the projected life of the pit through the City of Albany Town Planning Scheme as a Special Use Zone or some similar arrangement.

7. For lots closer than 500 metres to the limits of future quarrying it is recommended that building envelopes be used to restrict the location of dwellings, to maximise the buffer distances, and maintain intervening vegetation.

8. For lots closer than 500 metres to the limits of future quarrying it is recommended that a notification be placed on the title of the lots identifying the presence of the existing quarry and future reserves of basic raw materials on site.

Natural Gravel Excavation – Sand Extraction

1. The sand resource is shown as Deep Sand on Figure 3.

2. Excavation activities should be subject to a management plan with controls through conditions of Planning or an Extractive Industries Licence.

3. A buffer of 200 metres to dwellings is recommended, of which some can be contained on the adjoining lots by setting dwellings back from the excavation and behind natural landforms.

4. Excavation should be staged with rehabilitation following as soon as practicable.

5. A Dust Management Plan is recommended to be available when dwellings are constructed closer than 300 metres to a quarry.

6. For lots closer than 300 metres to the limits of future quarrying it is recommended that building envelopes be used to restrict the location of dwellings, to maximise the buffer distances, and maintain intervening vegetation.

7. For lots closer than 300 metres to the limits of future quarrying it is recommended that a notification be placed on the title of the lots identifying the presence of the existing quarry and future reserves of basic raw materials on site.

Lot Sizes

Lot sizes will depend on planning issues. Lot sizes can be varied according to land capability, planning considerations and potential visual impacts. It is likely that lot sizes will vary from 2 000m^2 to 2.0 hectares or greater.

Buffers to Broad Acre Land, Aquaculture and Grazing and Perennial Horticulture

Broad Acre Agriculture

There is a potential use of spray such as herbicide on broad acre farm land. This is regarded as a very low risk because of the nature of land uses within the surrounding area and the intervening belts of remnant vegetation.

Most agricultural land uses are cattle grazing, with aquaculture in the north east and minor perennial horticulture. The remainder is already rural living.

Most boundaries of the structure plan area appear to be well protected with a broad buffer of remnant vegetation at least 50 metres wide. To put this in perspective the research can be looked at to determine if any appropriate buffers are necessary.

The most comprehensive study in recent times has been by Department of Natural Resources, and Department of Local Government and Planning, Queensland, 1997, *Planning Guidelines Separating Agricultural and Residential Land Uses.* Studies in Emerald, and further research, showed that in open ground there is negligible spray drift at 300 metres from broad acre farming techniques. However a single belt of trees captures 80% of the spray drift and, where a satisfactory vegetated buffer element is planted and maintained, the buffer distance can be reduced to 40 metres (pages 9 - 11 of the Queensland Guideline).

Primary Industries Standing Committee 2002, *Spray Drift Management*, SCARM, Report 82, provides guidance on the type of vegetated buffer on page 27. The buffer should consist of trees and shrubs and be up to 20 metres wide. This tall shrub/vegetation barrier already exists to the north west.

In recent years there have been major advances and research into spray technology which have helped to reduce spray drift and increase efficiency. Spraying normally takes place 4 - 6 times per year when growing crops in this area. Using a boom spray a 5 hectare slice of land can normally be sprayed in 30 minutes, which means that the adjoining broad acre land within 300 metres of a new dwelling will be sprayed for about 3 hours (30 minutes x 6) per year if in fact broad acre spraying was locally applied which is unlikely.

"Best Practise", hooded sprays applied close to the ground increase efficiency, reduce waste and improve safety. The use of hooded spraying equipment and "Best Practise" can therefore permit reductions in buffers.

The other major advance has been the switch from high volatile esters to low volatile esters herbicides. Low volatile esters require zero buffer, and are applied directly to the ground under the correct wind conditions. High volatile esters are only able to be used through the issue of a permit from Australian Pesticides and Veterinary Medicines Authority and are now not used. For example no permit has been issued within the six months since October 2006 anywhere in Australia (APVMA website).

Some of the technological factors which have been found to be important in reducing spray drift are listed below. (Farming Ahead No 102, June 2000). All of these would apply to ground spraying. See also Combellack et al 1993.

- Lowering the elevation of the boom from 500 to 350 mm will reduce the potential for drift by 40%.
- Spraying when wind speeds are steady and less than 20 kph.
- Spraying when the wind is blowing away from sensitive areas.
- Spraying when the temperature is between 15 and 25°C which reduces vaporisation.
- Using larger nozzles to increase droplet size.
- Modifying air movement around the sprays with hoods, screens, curtains and the like.
- Reducing spray speeds to 12 to 15 kph.
- The use of polymeric anti-drift products which reduce drift by changing the surface tension of the droplets.
- Use of Low volatile chemical sprays.
- Avoidance of temperature inversions.
- The use of wind breaks or the screening of remnant vegetation.
- Loss of spray through drift is wasteful and avoided wherever possible (spray is expensive).

Perennial Agriculture

With alternative, more intensive land uses the issues of buffers might be similar to orchards and vineyards where these are grown in proximity to dwellings and broad acre rural activities.

The Draft Environmental Code of Practice for Vineyards, jointly prepared by Agriculture WA, Department of Environmental Protection, Water and Rivers Commission, Grape Growers Association and the Wine Industry of WA, recognises that buffers are related to aspects of the site conditions and land uses.

Under spray drift, the earlier Draft Code of Practice quotes (Spillman 1988) who stated that under research and subsequent modeling for aerial spray equipment (non-hooded) there was negligible drift 300 metres downwind. Based on that research a minimum distance was accepted as 300 metres where open ground applies but this can be reduced, with the use of effective tree buffers, to only 40 metres.

The Cessnock Development Control Plan No 28, 1999 recommends a 100 metre separation between a commercial vineyard and a dwelling and this can be accommodated within the large lot sizes proposed. Cessnock Development Control Plan No 28, 1999 (Appendix 2) also notes that research has shown that 30 metre wide tree buffers can provide effective barriers to chemical drift.

There are many areas such as the Barossa in South Australia where vines are grown adjacent to Canola, and the Great Southern, Chittering, and Margaret River areas where vines can be grown alongside broad acre farming practices. Olives for example are for example grown under similar buffer situations in Chittering, Gingin, Great Southern and many other locations. For example see the photographs of the vines in the Barossa attached.

Common law rights would apply to landholders. It is also good practice to notify adjoining land holders when spraying.

	ENVIRONMENTAL ISSUE	MANAGEMENT
7.3.1	Lot sizes	• Lot sizes will depend on planning issues but are likely to be smaller nearer the townsite or in clusters with larger lifestyle lots around the perimeter. This provides for increased buffers to individual dwellings.
7.3.2	Quarries	• A 300 metre buffer for the crushing of duricrust and a 200 metre buffer to natural gravel and sand excavation, are considered appropriate. See Recommendations above and Figure 3.
7.3.3	Perennial agriculture – grazing and aquaculture	• The research indicates that the existing remnant vegetation belts will provide sufficient vegetation screening. The likely lot sizes and pattern of settlement will be compatible with the research findings. • In areas where insufficient screening vegetation is in place, the lots are likely to be slightly larger and appropriate vegetation belts can be planted to provide a greater buffer when established to 30 – 40 metres wide. • Dwellings are recommended to be set back from boundaries on perimeter lots. • Lot sizes adjacent to existing aquacultre, orchards or perennial horticulture should be larger at say 1.0 - 2.0 hectares to allow for sufficient buffer and setback.

7.4 Fire Control

Fire Management is a normal summer practice on all properties. The risk can be reduced through a range of activities such as the provision of fire breaks, providing fuel reduction zones, grazing or slashing and the provision of emergency facilities, procedures and exits.

Fire risk is best described in FESA, 2001, Planning for Fire, Fire and Emergency Services Authority of Western Australia.

Dwellings can be designed to comply with Australian Standard 3959 to assist in protection.

Fire Control falls under the *Bush Fires Control Act 1954* (as amended) and the City of Albany.

The main issues with fire management are the reduction in fuel, the maintenance of firebreaks, the availability of machinery and water to fight fires and the provision of emergency escapes. The location adjacent to the townsite is close to existing facilities.

Planning For Fire, 2001 (WAPC and FESA) provides guidance on the management of the subdivision-rural land and pasture interface.

Much of the land is similar to other townsites in the Great Southern and outskirts of Albany and therefore the fire management issues will be similar and effective.

The amount of cleared land on site allows opportunities to provide and maintain fuel reduction zones.

Fire Management Plans can be required during the subdivision guideplan planning stage.

	ENVIRONMENTAL ISSUE	MANAGEMENT
7.4.1	Fire Risk	• City of Albany Bylaws • The site is similar to other local subdivisions and townsites. • There are standard conditions on the number of fire hydrants and access points for urban developments. • A Fire Management Plan is recommended as part of the subdivision guideline planning process.

7.5 Rivers, Wetlands and Streams

The impact of the proposal on Rivers, Wetlands and Streams relates to whether the proposal will lead to any adverse effects on the waterbodies. The issues involve setbacks, flows of surface and groundwater, and buffers, and their management.

The main watercourse is the Kalgan River into which a number of small creeks feed. These are shown in Figure 5.

All drainage lines are quite deeply incised and in most cases have a fringing vegetation of remnant vegetation which is recommended by Government Policies to be retained.

The condition of the local watercourses were assessed by Water and Rivers Commission 1997. They surveyed Johnston Creek just at the downstream end of the study site and Chelgiup Creek running north east from the Kalgan settlement. The study provided comments on the condition of the vegetation and makes recommendations on the species that should be used in any replanting.

Water and Rivers Commission 1997 advices that waterways should be fenced from stock weeds such as Blackberry, Bridle Creeper and Watsonia controlled. Revegetation from the species list in that report are recommended; including *Taxandria parviceps, Agonis flexuosa, Melaleuca phaphiophylla, Calistachys lanceolata*, and *Acacia myrtifolia.*

Buffer distances are recommended to be 50 metres from permanent watercourses and 30 metres from seasonally flowing watercourses with buffers of 10 metres for smaller waterways. This general recommendation applies more commonly away from the south coast where the creeks run most of the year. The buffers are recommended to be 100 metres to the Kalgan River in existing remnant vegetation or 50 metres in other areas, with 30 metres for Chelgiup Creek, 10 – 30 for the small creek north of River Road and the creek in the north west, and 10 metres for other watercourses. See Figure 5.

The number of fence lines crossing revegetated or vegetated watercourses should be minimised. Ideally there should be no additional lot boundaries or fences required to cross the creeks and watercourses apart from minor watercourses.

	ENVIRONMENTAL ISSUE	MANAGEMENT
7.5.1	Stream side vegetation	• The number of fence lines crossing revegetated or vegetated watercourses should be minimised. • Existing watercourses and associated vegetation is to be retained. • Remnant vegetation should be retained. • Foreshore reserves or setbacks of 10 to 100 metres are recommended. See above and Figure 5.

7.6 Flora and Fauna

This relates to whether the proposal will have significant impacts on the existing ***Flora and Fauna*** *of the area under assessment.*

Remnant Vegetation and Weeds

In most situations the remnant vegetation on site is in good condition with little weed incursion. There are however some areas where weeds are common, particularly along creeks such as Chelgiup Creek. Wood weeds, in particular, Sydney Golden Wattle (Acacia *longifolia*) are evident.

Although the vegetation is generally well represented it has high value, particularly the fringing vegetation along watercourses.

Retention of remnant vegetation is desirable, in as large an area as possible, with large lots to minimise impacts. It is expected that as a result of any changes to land use in the Kalgan area that there will be minimal loss of remnant vegetation and that any existing remnants will be provided with better protection, by way of fencing or other measures.

Some vegetation may be impacted if the gravel resource in the west is accessed.

The main source of weeds in reserved land is normally through the dumping of garden waste over the fence. This can be assisted by planning such as the location of a hard surface, walk trail or firebreak along the edge of the remnant vegetation. However in general the only way to minimise the use of remnant vegetation as a dumping area is through public education, vigilance and the location of building envelopes in a manner which enables neighbours to see if this occurs, and a program of removal and control of any dumped materials.

A hard surfaced path combined with a strategic fire break can assist in providing a buffer to the reserved land and a means of controlling pasture and any potential weed species.

Fire breaks should be strategic and placed on already cleared land. Where possible they can be combined with walk trails or roads.

Recommendations

1. Retain as much remnant vegetation as possible.

2. Further to the initial flora and vegetation assessment (conducted Aug – Sept 2006, Report dated 10 July 2007) a vegetation survey may be required on selected properties prior to development.

3. Land clearing will require an application for a clearing permit, unless excempt.

4. Provide adequate setbacks to the watercourses by retaining the remnant vegetation and allocating further setbacks to comply with the relevant policies.

5. Use local native species in landscaping wherever possible. However there may be locations where vegetation or landscaping themes are more appropriate.

6. The remaining remnant vegetation can be protected by zoning restrictions and Conservation Covenants.

7. The building envelopes could be clustered appropriately to enable maximum retention of the remnant vegetation and to minimise impacts on that vegetation.

8. Any lots located in remnant vegetation should have the building envelopes located outside the remnant vegetation where possible.

9. Where building envelopes are located in remnant vegetation they should be restricted to 2 000 m^2 subject to fire management. These building envelopes should be fenced at the envelope to prevent dogs or other animals from entering the remnant vegetation.

10. Remnant vegetation should be fenced at the time of subdivision development to minimise the incursion by dogs or stock.

11. Lot boundaries through remnant vegetation should be avoided but if they are used they can be marked by poles, fenced with stranded wire in which the bottom wire is left off, or kangaroo gates included.

12. Boundary fire breaks are not recommended through remnant vegetation. Strategic fire breaks, combined with the 2000 m^2 building envelopes and building envelopes located on cleared land, can assist with fire management.

13. Re-linkage of the remnant vegetation remnant should be considered.

Dieback Disease

No Declared Plants (Department of Agriculture and Food) or serious environmental weeds were recorded during the site investigation. (Refer 2007 Flora and Vegetation Assessment)

During the site inspections by Landform Research, no mortalities in native vegetation were observed that suggested that the site has been significantly affected by dieback diseases such as *Phytophthora* or *Armillaria,* but they may occur.

With subdivision it is important to minimise the risk of dieback introduction and spread. A number of recommendations are made to this effect and are listed below.

The steps required to manage dieback are essentially the same as those used to manage weeds.

Recommendations

1. All vehicles and equipment to be used during land clearing or land reinstatement should be clean or cleaned prior to being brought on site from an infected area. They should be washed down prior to leaving the infected site, using the procedures in DEC Guidelines for Dieback Management.

2. Access to vegetated areas should be discouraged and minimised.

3. Runoff from roads is recommended to be to table drains or soakage basins sized to the receiving volumes.

4. Any materials to be used in rehabilitation should be dieback free.

5. Earthworks and construction machinery should push material from remnant vegetation towards previously cleared areas to minimise the spread of weed species and plant diseases.

6. If any diseased areas are identified earthworks and construction machinery should push material from disease free areas towards affected areas.

7. Earthworks should be carried out to comply with DEC Best Practice Guidelines for the Management of Phytophthora cinamomi, draft 2004, and Dieback Working Group 2005, Management of Phytophthora Dieback Guidelines for Local Government. As the site is a working rural property quarantine and a split operation are most relevant.

8. Provide internal trails for horses to exercise rather than having them using the remnant vegetation.

9. Provide public education program or notes to local residents with respect to caring for remnant vegetation and the adjoining reserved land to try and limit dumping of garden rubbish.

10. Arrange building envelopes to enable neighbours to provide vigilance on security and land management issues.

11. A hard surfaced path combined with a strategic fire break along remnant vegetation can assist in providing a buffer and a means of controlling pasture and any potential weed species.

	ENVIRONMENTAL ISSUE	MANAGEMENT
7.6.1	Flora and fauna, corridors	• Protect the existing remnant vegetation as shown in the recommendations above. • The guide plan or subdivision layouts should provide for native vegetation corridors. • See Recommendations above.
7.6.2	Remnant vegetation	• Clearing of remnant vegetation is not recommended. • Dieback and weed management practices are listed above.

7.7 Nutrient Management

A change in land use may alter the Nutrient Input and Management patterns and loadings. Changed agricultural regimes and more intense development may lead to increased nutrient loading. The pattern of this loading and the ability of the soils to accept the loading depend on many factors, such as the type of land use, lot size, type of waste water system, type of crop, nutrient application rates, soils, depth to groundwater, flow paths of surface and groundwater, permeability of the soils and underlying geology.

The various Government policies and regulations are designed to ensure minimisation of the risk of nutrient export so in many cases compliance with these guiding documents is all that is required. The guidelines take into consideration the soil characteristics as well as setbacks from wetlands and water bodies.

The following documents provide input into the acceptable site characteristics and the acceptable Subdivision or development; Government Sewerage Policy, 1996, Government Draft Country Sewerage Policy, 2002, Department of Health Guidelines for the Reuse of Greywater in Western Australia, Department of Health Specification for Aeorobic Treatment Units 1992, Health (Treatment of Sewerage and Disposal of Effluent and Liquid Waste) Regulations 1974, AS/NZS1547:2001.

The type of waste water system and its installation can be used to ameliorate potential problems.

A site specific consideration of the in ground behaviour of phosphorus, nitrogen and microbial inputs is desirable.

Current potential nutrient export comes from the washing of fertiliser, soil particles and manure along drainage lines. The worst time for nutrient export is during summer storms, during the first autumn flush and in winter in central parts when the soils are saturated.

Phosphorus is the main nutrient implicated in algal blooms in waterways. Nitrates are normally taken up by vegetation, denitrified by bacteria under anoxic soil conditions or lost through volatilisation of ammonia. The soils have generally good phosphate retention. Areas of pale sand overly loam or silty clay subsoils which can capture phosphorus if the water is retained on site.

Any waste water disposal sites will need to be selected based on individual site inspection. The location of any leach drains should be assessed on a site by site basis, and may have to be semi-inverted. Any leach drains installed in these soils are recommended to be bunded by natural soil to prevent waste water short-circuiting the soils.

7.7.1 Nutrient Loadings and Stocking Rates

Nutrient Loadings and Stocking Rates

It is expected that with subdivision, broad acre grazing will change to rural living, urban and conservation lots.

Current potential nutrient export comes from the washing of fertiliser, soil particles and nutrients predominantly into the soils. Because of the sandy permeable nature of the upper soil horizons there is potential for runoff from wet and waterlogged ground, but less likely for runoff from gravel soils.

In summer cattle spend most of their time on the green pasture and any nutrients are therefore potentially concentrated and/or lost with autumn flushes of surface and shallow groundwater in potential wet areas. The worst time for this export is during winter when the soils are wet.

The presence of dung beetles can increase the rate of nutrient recycling and thus reduce the potential for nutrient export particularly during the moist months.

- **Current**

Stocking rates for arable soils of the site are estimated to be 10 DSE or 1 adult cow per hectare. (1 breeding cow equates to 8 – 16 sheep depending on whether N or P are compared).

This equates to 10 DSE (dry sheep equivalents) for dry pasture and where limited supplemental feed is supplied. With a current average stocking rate of 10 DSE, the estimated nutrient loading when fully stocked with equivalent numbers of stock could be 57.6 /N/ha/year and 17.6 kg/P/ha/year (Van Gool et al, 2000).

This applies to the cleared and cultivated land only and not to the remnant vegetation which will experience little nutrient loading apart from potentially a small loss of nitrogenous substances from legumes nodulation.

The amount of nutrients used on broad acre crops is not dissimilar to other land uses, but will vary depending on the existing nutrient status of the soils and the type of crop grown; for example if a legume or green manure crop had been used in rotation and if stubble is retained.

Phosphorus rates could be 10 - 30 kg P/ha (20 kg requires 220 kg superphosphate). Nitrogen requirements can be 100 to 200 kg/ha depending on the quality and protein content of the any crop. These fertiliser application rates are discounted for stubble retained (eg 40 kgN), and the existing retained soil levels from past cropping, and thus the actual application rates can be substantially less, particularly in the case of nitrogen.

For example Lantzke and Summers, 2005, *Winegrapes use lower rates of irrigation and fertiliser*, IN Grapegrower and Winemaker, No 494, state that the nutrient inputs for various land uses near Bunbury were as below;

Landuse	Nitrogen kg/ha	Phosphorus kg/ha
Orchard	140	48
Wine grapes	27	23
Broadacrel cropping	30	30

The above land uses which are practised on a small scale can use less fertiliser than cattle grazing. On the other hand rural living and urban land can lead to nutrient input changes.

- **Rural Living**

Firstly it should be noted that the Government Draft Country Sewerage Policy, 2002, permits waste water disposal from lots as small as 0.2 hectares in leached white sand with little phosphate retention capability. This site has much greater inherent waste water treatment capability on the medium and upper slopes.

On the lower slopes and flatter areas, where winter wet conditions are more likely, or on sand over Silty Clay and Alluvial Silts nutrient adsorbing waste water disposal units can be used to minimse nutrient input and export. Therefore the development of the Kalgan settlement can comply with the Government Draft Country Sewerage Policy, 2002.

As an example a variety of lot sizes can be considered, from 0.2 hectares to 2.0 hectares.

Data on nutrient inputs is taken from Van Gool D, K Angell and L Stephens, 2000, *Stocking Rate Guidelines for Rural Small Holdings Swan Coastal Plain and Darling Scarp*, Department of Agriculture, Miscellaneous Publication 02/2000, Legislative Assembly, 1994, *Select Committee on Metropolitan Development and Groundwater Supplies, Western Australia*, Dames and Moore, undated, *Draft nitrate management in Jandakot UWPCA*, Water Authority of Western Australia.

From the above references a typical lot with a conventional septic system, small garden and lawn, dog and cat plus some chickens has a nutrient loading of 31 kg/N/year and 9.6 kg/P/year. This will be added to the soil on the building envelope. A conventional septic system releases 18 kg N and 5.5 kg P per year as a point source. The other nutrients are spread more broadly across the soil surface.

For a nutrient adsorbing waste water system (ATU) a significant proportion of the phosphorus and nitrogen is removed within the waste water disposal area and is not directly added to the soil, reducing the overall soil input to 19 kg/N/year and 4.6 kg/P/year per lot.

A horse has a typical loading of 11 kgP/year and 60 kg/N/year. Horses and other stock will require management of wastes. Best management of manure is outlined in Van Gool D, K Angell and L Stephens, 2000, *Stocking Rate Guidelines for Rural Small Holdings Swan Coastal Plain and Darling Scarp*, Department of Agriculture.

Typical nutrient loadings of some land uses

Possible lot size and activity	Nitrogen loading per hectare	Phosphorus loading per hectare	Likely nutrient scenario
Estimated average current stocking at 10 DSE per hectare	57.6 kg/N/ha/year	17.6 kg/P/ha/year	Unlikely to be nutrient export on gravel based soils. Probable nutrient export from winter wet soils.
Likely nutrient input after subdivision to two hectare lots. Conventional septic system. Small garden, small fertilised lawn, dog, cat, 6 fowl or additional garden. 1 horse.	45.5 kg/N/ha/year	11.8 kg/P/ha/year	Lower nutrient loading, unlikely to be any increased nutrient impacts. Likely to be reduced nutrient export.
Likely nutrient input after subdivision to two hectare lots. Conventional septic system. Small garden, small fertilised lawn, dog, cat, 6 fowl or additional garden. No stock.	15.5 kg/N/ha/year	4.8 kg/P/ha/year	Lower nutrient loading. Reduced nutrient export.

Likely nutrient input after subdivision to two hectare lots. Nutrient adsorbing or alternative waste water system. Small garden, small fertilised lawn, dog, cat, 6 fowl or additional garden. 1 horse.	39.5 kg/N/ha/year	9.8 kg/P/ha/year	Lower nutrient loading. Likely to be reduced nutrient export.
Likely nutrient input after subdivision to two hectare lots. Nutrient adsorbing or alternative waste water system. Small garden, small fertilised lawn, dog, cat, 6 fowl or additional garden. No stock.	9.5 kg/N/ha/year	2.8 kg/P/ha/year	Lower nutrient loading. Significantly reduced nutrient export risk.
Likely nutrient input after subdivision to 0.2 hectare lots (4 lots per ha allowing for roads). Conventional septic waste water system. Small garden, small fertilised lawn, dog, cat, 6 fowl or additional garden. No stock.	62.0 kg/N/ha/year	19.2 kg/P/ha/year	Similar nutrient loading, unlikely to be nutrient export from gravel soils. This scenario is unlikely on sandy or winter wet soils. where nutrient adsorbing waste water systems will be used.
Likely nutrient input after subdivision to 0.2 hectare lots. (4 lots per ha allowing for roads). Nutrient adsorbing or alternative waste water system. Small garden, small fertilised lawn, dog, cat, 6 fowl or additional garden. No stock.	38.0 kg/N/ha/year	11.2 kg/P/ha/year	Reduced nitrogen loading particularly on sandy or potentially winter wet soils.

- A variety of average lot sizes and stocking rates are used to provide an indication of nutrient inputs prior to and following subdivision. Horses are used as a likely example.
- The calculations above are made on the basis of the total area averaged across cleared land and remnant vegetation.
- A variety of average lot sizes and stocking rates are used to provide an indication of nutrient inputs prior to and following subdivision. Horses are used as a likely example.
- One horse is equivalent to six sheep in terms of nutrient output.
- Where nutrient adsorbing waste water systems are used, nutrient inputs will be lower.

Currently the cattle graze all soils at equal density. In fact there is likely to be greater grazing on the potential winter wet soils because they carry pasture better through into summer.

After potential development there will be a better distribution of nutrients with significant reductions on the potentially wetter and sandy soils with lower nutrient retention capability.

7.7.2 Fate of Nutrients

Nutrient Management encompasses the management from waste water disposal and land uses.

The ability of soils to adsorb phosphorus, reduce nitrogen and inactivate microorganisms is important.

The main issue with effluent disposal is nitrogenous and phosphate compounds released by stock, contained in domestic waste water or introduced in fertiliser, together with the microbial purification ability of the soils.

- **Phosphorus**

Phosphorus is the main nutrient implicated in algal blooms in waterways and therefore it is important to limit its loss from the site. Phosphorus is capable of being stored in the basal muddy sediments of water bodies. From there the phosphates are released over time and provide nutrient to fuel algal blooms. In this case phosphorus addition to the soils is the issue.

Phosphorus is readily adsorbed onto clay and sesquioxides of the subsoils, gravels and yellow sands. Calcareous soils and calcretes retain phosphorus as apatite. The soils on site, with their loam nature and increased clay content in the subsoils, have inherently high phosphate retention capability.

Phosphorus adsorbing amended soils would be used for the waste water disposal area of alternative waste water systems on the lower elevations where the sands have low phosphate retention. These systems are nutrient adsorbing, and are designed to adsorb all or almost all the phosphorus released in waste water.

Phosphate Retention (PRI) can be a useful indicator, but the nature of the analysis can understate or overstate the field behaviour. Some soils theoretically can have good phosphate retention characteristics, but the behaviour of the waste water in the field may negate these characteristics. For example particles larger than 2 mm are sieved out prior to analysis and a gravelly sand may therefore have a lower PRI than the field reality. On the other hand clay may have a very high PRI but may not be sufficiently permeable for the waste water to penetrate.

Past history of the site will also influence the PRI analyses. Soils used for crops on which phosphates have been added may have upper soil horizons containing elevated phosphate levels whereas subsoils may be unchanged. PRI testing of soils may need to account for fertiliser history.

The soils are suitable for conventional septic systems provided lot sizes of > 0.2 hectares are used and comply with the Government Draft Country Sewerage Policy, 2002.

The AHMRC, 1996, has not set any limit for phosphorus for drinking water.

Phosphorus is the main nutrient implicated in algal blooms in waterways and therefore it is important to limit its release from the site. Phosphorus is capable of being stored in the basal muddy sediments of water bodies. From there the phosphates are released over time and provide nutrient to fuel algal blooms.

On the ridge there is likely to be adsorption onto the gravel and loam soils. Where waste water is disposed of on the ridge, within a deep ripped dedicated disposal area such as that required by the City of Albany, waste water will infiltrate vertically into the underlying loam clay subsoils.

The Sand over Gravel soils also generally have good phosphate retention because the waste water will be stripped of phosphorus by the underlying gravel when contact is made.

The soils which are suitable for conventional septic systems are set back 120 to over 300 metres from the drainage line. In these areas the soils have ferricrete and gravel at the underlying fine sand/silt interface over yellow earthy silts and sand.

With the setbacks, City of Albany requirements, and nature of the ridge soils, the risk of phosphorus export is considered to be low for correctly installed and maintained waste water systems.

In lower elevations and lower slopes where the Alluvial Silts and Sand over Silty Clay occur the more permeable upper soil horizons can result in more rapid surface water runoff rather than infiltration into the highly nutrient adsorbing subsoils. Nutrients will infiltrate vertically through surface sands in the low elevations to the silty clay interface. From there the nutrients can potentially move laterally through the soil within the sand sheet.

Some of these two soil types and the Sand over Gravel have ferricrete at the silty clay interface. This ferricrete is highly phosphate retaining as shown by Lantzke 1997 for similar soils.

Ferricrete layers that may occur at the sand/underlying yellow silt clay interface typically have very high capability for phosphorus retention as shown by Lantzke 1997, *Phosphorus and nitrate loss from horticulture on the Swan Coastal Plain*, Department of Agriculture Miscellaneous Publication 16/97.

The yellow silts and fine sands, combined with the iron indurated ferricrete, have inherently high phosphorus retention capability. The phosphate retention and thus (PRI) of all soils on site are generally high when considering the whole soil profile. The soils were compared to the database of type soils held by Landform Research for PRI and with Chemistry Centre data.

Gerritse et al, 1995B, found that all phosphate was adsorbed within 2 metres from a 7 year old leach drain in Yarrigal loam soils that have some similarity for phosphate retention with the silty yellow sands. The critical point is retention times within the soils.

To increase infiltration the City of Albany requires that a 3 metre wide area around the leach drain is deep ripped and then the leach drain covered with calcareous sand. The City of Albany has found that this design provides long term satisfactory performance with minimal maintenance.

Phosphorus adsorbing amended soils are used for the waste water disposal area of alternative waste water systems on the lower elevations where the sands have reduced phosphate retention because of the more rapid runoff in winter. These systems are nutrient adsorbing, and designed to adsorb all or almost all the phosphorus released in waste water.

Some indication of the improvements to the quality of the waste water leaving the waste water disposal area of nutrient adsorbing waste water systems can be shown from contacts with Ecomax and Envirosafe. Ecomax reveal that their unit provides for 95% phosphate adsorption with only 10 mg/L nitrogen typically present exiting the system to enter the natural soils. Research by Envirosafe has found that nitrogen is reduced by 75% and phosphate to less than 1mg/L at the edge of the waste water disposal area, (Jo Hopley Envirosafe, 31 July 2002).

There is potential for nutrient adsorbing amended soils to be used for the waste water disposal area of alternative waste water systems which effectively lowers the input of phosphorus to the loading onto the natural soils. These systems are designed to adsorb all or almost all the phosphorus released in waste water.

Some indication of the higher quality of the water leaving the waste water disposal area of nutrient adsorbing systems can be shown from contacts with Ecomax and Envirosafe. Ecomax reveal that their unit provides for 95% phosphate adsorption with only 10 mg/L nitrogen typically present exiting the system to enter the natural soils. Health Department specifications require that 90% of samples have less than 20 mg/L organic matter, with no sample greater than 30 mg/L. Research by Envirosafe has found that nitrogen is reduced by 75% and phosphate to less than 1mg/L at the edge of the waste water disposal area, (Jo Hopley Envirosafe, 31 July 2002).

The risk from phosphorus is therefore not regarded as a significant issue and there should be nil or minimum phosphorus added to the ground water.

- **Nitrogen**

  Nitrogen is a prominent part of living matter and is constantly recycled through the organic matter and the atmosphere.

  Nitrogen as ammonia in waste water is rapidly converts to nitrite and then nitrate under the influence of oxygen.

  The nitrogenous products are taken up by vegetation, denitrified by bacteria under wet and anoxic soil conditions or lost through volatilisation of ammonia or the conversion of ammonia to soluble nitrogenous ions.

  Nitrogen is also held within the soil organic matter and some ions are attached to clay particles. When organic matter breaks down or fertiliser is applied and not taken up by plants, nitrogen is converted to ammonia or rapidly converts to nitrite and then nitrate under the influence of oxygen.

  Soil microbes rapidly colonise the interface where waste water contacts the soil, with small amounts of organic matter at the interface providing the energy to sustain the microflora. Nitrates are normally removed by soil micro flora under anoxic conditions in the soils including leached white sands. The microflora remove the oxygen to leave nitrogen gas which is lost to the atmosphere. Inorganic nitrogen can also attach to clay particles.

  Nitrogen is not generally responsible for algal blooms in freshwater environments, but high levels of nitrogen can affect the health of saline water bodies.

  Nitrogen loss relates to retention times within the soil and microbial activity.

The removal of nitrogen is related to the oxygen conditions of the soils in addition to the microbial material present. The ammonium compounds that exit the two tanks of the waste water system are normally high in ammonia and nitrite and lower in nitrate. With exposure to oxygen the ammonia and nitrite are converted to nitrate. The nitrate is then stripped of oxygen by microflora, in reducing conditions and particles in the soil, in the presence of organic matter. This converts the nitrate to nitrogen gas which is lost to the atmosphere. This occurs in all soil types and is independent of the soil type, and depends on soil oxygen levels and to a lesser extent the nature of the soil particles.

Many studies, for example Dawes and Goonetilleke, 2001, have found that nitrogen is readily stripped from waste water released from a septic system to drainage trenches. For example on a sloping sandy loam site in Brisbane the water entering the trenches had a concentration of 171 - 190 mg/L N but within 1 metre of the last trench the nitrogen concentration had dropped to 1.7 to 3.7 mg/L.

Gerritse et al, 1995, recorded a total of 140 mg/L nitrogen (NH_4 - 100 mg/L and $N0_2$ - 40 mg/L), exiting a leach drain. After a travel distance through shallow soils of 1 metre this had dropped to between 20 and 100 mg/L, and by 3 metres the total nitrogen had dropped to 0.03 to 0.2 mg/L. When loaded with nitrogenous compounds the microflora of soils quickly adjusts to the loading, by increases in the number and type of bacteria. For example, under anaerobic conditions with nitrogen loading, the denitrifying bacteria increase significantly. This can be expected to occur in soil aggregates within the top 2.5 metres of soil, which is regarded as the active bed and root zone for the waste water disposal areas.

The increased effectiveness of nutrient adsorbing waste water systems is shown by research by Envirosafe has found that nitrogen is reduced by 75% at the edge of the waste water disposal area, (Jo Hopley Envirosafe, 31 July 2002) and then further reduced by the soils.

Nitrite is not common in groundwater even under horticultural or urban landuse. For example Poinke et al 1990 found maximum nitrite levels of 0.2 mg/L under intense horticulture on the Swan Coastal Plain with most being significantly lower and ranging from <0.01 mg/L even with nitrate levels of 1.02 mg/L – 56.9 mg/L and added nitrogen of 2700 – 3000 kg/hectare per year.

Lantzke 1997, found high levels of denitrification in moist leached sands on the Swan Coastal Plain indicating that even leached sands can provide good denitrification.

The critical factor is retaining water in the soil or on site for as long as possible. With the proposed lots and loam soils, waste water and nitrogen is likely to be retained on site.

Nitrogen loading is therefore not regarded as a significant issue from either conventional septic systems or nutrient adsorbing waste water systems.

- **Microbial Purification**

  Microbial material from stock or waste water systems can present a health hazard unless the material is deactivated by normal soil microbial organisms. Microbes could consist of thermotolerant bacteria, viruses and other organisms. For deactivation to occur sufficient dilution and retention time in the soils or other media are required.

  Soil microbes require a minimum of 5 metres of sandy soil or less (down to 1 metre) for soils of lower permeability such as loams. (Wells and King, 1989).

Soil microbes require a minimum of 5 metres of sandy soil or less (down to 1 metre) for soils of lower permeability such as loams. (Wells and King 1989). The longer a soil retains waste water the better the microbial purification. Therefore it is important that the leach drains or nutrient adsorbing waste water systems are correctly constructed

On this site the gravelly soils are capable of retaining waste water for adequate microbial purification. The more sandy soils can have reduced microbial purification if the water runs too quickly from the soils.

For conventional septic systems the microbial purification applies to raw waste water with levels of BOD at up to 300 mg/L. The use of nutrient adsorbing waste water systems will result in greatly reduced microbial loading on soils.

In comparison the Health Department, *Specification for Aerobic Treatment Units (ATU'S) Serving Single Households* (Health Department 2002), shows that the average BOD released from a nutrient adsorbing system should be <20 mg/litre, prior to on ground disposal. The systems used on this site may not be aerobic in nature.

Nutrient adsorbing waste water systems have strict guidelines on the waste water quality for suspended solids and faecal coliforms that must be adhered to during the design and testing phase of such units, (Specification for Aerobic Treatment Units Serving Single Households, Health Department of Western Australia, 1992).

Nutrient adsorbing waste water systems are designed to provide for waste water leaving the systems as "of a standard suitable for irrigation" (Health Department 2002), which indicates the low level of microbial and organic matter entering natural soils after leaving the waste water disposal areas. This means that nutrient adsorbing waste water systems can be used to overcome potential deficiencies in the soils, and this is proposed for the Alluvial Silt and Sand over Silty Clay.

The Draft Country Sewerage Policy provides guidelines on the setbacks required from water bodies, with which this proposal complies. 100 metre setbacks are available to the creek even though the policy requires 30 metres.

The health risks will be the same for each waste water system irrespective of lot size and depend on the capability of the soil and the installation of units rather than the lot size. Any potential risk would come from saturation of the soils where the soils could not accept the expected volumes of water. There is no evidence of this particularly if rainwater is used for water supply.

The *Health (Treatment of Sewage and Disposal of Effluent and Liquid Waste) Regulations 1974 – Health Act 1911* require the Local Authority to approve the construction or installation of approved systems in Part 2 of the Regulations, which provides for some control.

The soils are capable of accepting waste water systems and comply with all guidelines, standards and regulations. They are also capable of complying with the Government Country Sewerage Policy.

Nutrient behaviour is discussed in 7.7 Nutrient Management.

	ENVIRONMENTAL ISSUE	MANAGEMENT
7.7.1	Site capability for continued broad acre agriculture or rural living	• Stocking rates should continue to be to Department of Agriculture and Food recommendations. • There is not anticipated to be any increase in the overall nutrient input based on likely lot size and land use. It would be anticipated there will be an overall reduction in the risk of nutrient export because the land use will be better tailored to the capability of the soils, rather than a general land use such as grazing across all soil types • Waste water disposal can comply with all Government Guidelines and Policy. • *Health (Treatment of Sewage and Disposal of Effluent and Liquid Waste) Regulations 1974 – Health Act 1911.* • *Government Draft Country Sewerage Policy, 2002* (revised September 2003 • *Specification for Aerobic Treatment Units (ATU's) Serving Single Households*, Health Department of Western Australia 1992 or superseding document. • *Draft Guidelines for the Reuse of Greywater in Western Australia*, Health Department of Western Australia 2002, or superseding document. • See 6.4 Capability for On Site Waste Water Disposal.

7.8 Salinity

Salinity depends on the landform, underlying geology and hydrology, as well as the regolith profile. Some regolith has more salt stored in it when compared to other areas.

A consideration of the land use changes and water management is normally required to minimise the risk of additional salinity loading and impact. Vegetation plays a part in the assessment and can be used to mitigate salinity issues.

The salinity of the surface water on site is shown in Figure 5. In general the surface water is fresh to slightly brackish and may be potable in some locations, it mostly is not, but is but suitable for stock and irrigation of horticulture over the majority of the site.

The deep laterite gravel soil profiles often contain elevated salt levels in their subsoils which will potentially impact on surface water, and may be the reason of the surface water on site not being as fresh and is probably was pre-clearing. Areas cleared should be replanted to native vegetation or plantation as has been done in the north western corner.

The change to smaller lots, with rural living and urban development are unlikely to have any impact on the salinity of the local surface or goundwater. Runoff and recharge rates are not anticipated to change significantly apart from hard surfaces from which surface water will be directed to stormwater detention basins.

	ENVIRONMENTAL ISSUE	MANAGEMENT
7.8.1	Salinity	• The proposed developments are unlikely to lead to any significant changes as a result of subdivision and development.

7.9 Stormwater, Erosion Potential and Soil Management

Soil Erosion and Management *depends on the landforms, types of development, land uses, geology and soils, all of which can effect the potential for soils to erode.*

Stormwater Management in Western Australia aims to

- *Protect water quality,*
- *Protect infrastructure from flooding and inundation,*
- *Minimise runoff,*
- *Maximise local infiltration,*
- *Use natural drainage features,*
- *Minimise changes to water balance,*
- *Integrate stormwater treatment into the landscape,*
- *Convert drains to "naturalised" streams.*

The potential for wind erosion of the site is low because of the high rainfall and wide distribution through the year which leads to high levels of plant growth.

Potential water erosion is minimal and restricted to sloping non wetting soils which in many cases have porous surface horizons therefore leading to reduced or slow surface water runoff.

Roof stormwater can be disposed of on individual lots. Stormwater from roads can be directed to soakage basins to minimise the risk of dieback. With the high permeability of the soils on the lower slopes, table drains may be all that are likely to be required, rather than constructed detention basins. These can spread infiltration over a broader area which is of benefit to protection of the groundwater.

Overall there is little evidence of significant soil erosion and if it occurs it can be readily solved through normal land management practices, regrowth of native vegetation, maintenance of pasture cover and locating roads sympathetically to the site slopes.

Some management activities that could be used to prevent soil degradation, if it occurred, could include;

Recommendations

Water Erosion

- Constructing, roads, access tracks, fences and firebreaks in locations which are less likely to lead to soil erosion. In some cases this may mean the deletion of fire breaks up and down slope.
- Plant additional trees and shrubs along watercourses.
- Install riprap and linings in gutters on steeper slopes.
- New landholders are to be encouraged to plant additional trees and shrubs.
- Use table drains and infiltration basins to dispose of stormwater.

Wind erosion

- Maintenance of adequate plant and pasture cover through the year.
- Continue planting and sowing perennial pasture on the eastern sand ridge.
- Restrict stock to sustainable levels.
- Incorporation of tree wind breaks and breaks of shrubs or native vegetation.

Subdivision and Development

A number of stormwater management guidelines are applicable to development.

However at this stage it is not possible to be definite with respect to actual actions to be taken to manage developed stormwater. Rather the best solutions for a particular purpose can be obtained from the listed documents.

In general swale drains and vegetated soakage basins can be used to increase the retention of surface water on site.

	ENVIRONMENTAL ISSUE	MANAGEMENT
7.9.1	Water erosion	• See suggestions above. • Normal stormwater management on subdivision. • Stormwater should be directed to table drains adjacent to roads to increase the area of infiltration. • Swales are best described in Water and Rivers Commission, 1998, *A Manual for Managing Urban Stormwater Quality in Western Australia*, Water and Rivers Commission. Guidance • Engineers Australia 2003, *Australian Runoff Quality*, National Committee on Water Engineering. • *Stormwater Management Manual for Western Australia*, Department of Environment WA, 2004. • *Guidelines for Groundwater Protection in Australia*, ARMCANZ, ANZECC, September 1995. • Environmental Protection Authority Victoria/ Melbourne Water, undated, *Urban Stormwater, Best Practice Environmental Management Guidelines* • Water and Rivers Commission, 1998, *Manual for Managing Urban Stormwater Quality in Western Australia.* • *Western Australian Water Quality Guidelines for Fresh and Marine Waters*, EPA Bulletin 711, *1993.* • ANZECC, 1992, *Australian Water Quality Guidelines for Fresh and Marine Waters.*
7.9.2	Wind erosion	• Minimal risk that can be minimised by the suggestions listed above.

7.10 Social and Heritage

Social Issues *includes the support for the existing local planning and social structure, including support for local facilities such as schools, shops and other services, as well as protection of the local amenity.*

Heritage Issues *relates to heritage features such as significant natural features and Aboriginal and European History. These should normally be protected.*

The only aboriginal sites on the Department of Aboriginal Affairs database is an artefact scatter centred on the Kalgan Settlement Hall. Other sites nearby are outside the study area and relate to Oyster harbour and the fish traps along the northern edge of the Harbour near the Kalgan River.

The local area has been settled by Europeans for over a century. A number of buildings and facilities are historic, such as old dwellings and public infrastructure. The dwellings of the early to mid twentieth century although not generally regarded as historic should be recognised at this time because they will form the heritage of the future, particularly the heritage of the fruit growing era.

The planning process will provide the historic input into the structure planning to integrate historic features into the proposed developments and planning.

	ENVIRONMENTAL ISSUE	MANAGEMENT
7.10.1	Social impact	• The heritage will be incorporated into planning considerations for the Kalgan settlement locality.

8.0 SUMMARY, LAND CAPABILITY and CONCLUSIONS

Land Capability is the recognition of the suitability of a site for a proposed land use. An integral part of this process is the identification of issues and the way they can be managed to ensure that the proposed land use is sustainable and does not lead to significant environmental impacts.

The opportunities of the site are;

- The sloping nature of the site.
- The picturesque nature of the local area.
- Widespread views that can be obtained across the site.
- Proximity to Albany townsite.
- The Kalgan River running through the centre of the local area.
- The long history of the local area.
- The amount of remnant vegetation scattered across the site and along the Kalgan River
- The potential for tourist activities.
- The nearby land is again increasingly being used for perennial and other horticulture.
- The presence of drainage lines, wet areas and dams across the site.
- The interesting mix of wet site and ridge vegetation.
- Presence of large quantities of water suitable for perennial horticulture.
- Presence of suitable soils for perennial horticulture.
- Potential gravel resources.
- Potential sites for aquaculture

The constraints of the site are;

- Winter wet soils on the lower valley slopes.
- The fire hazard of remnant vegetation.
- The presence of drainage lines that may require catchment management and appropriate setbacks.
- Presence of existing gravel quarries which require adequate buffers.
- The presence of some winter wet soils.

There is a need for additional lots in the Kalgan settlement and surrounding area. The site has been settled since the mid 1800's and has a long European history planted over a much longer aboriginal history.

With the development of Albany there is increasing pressure for urban and rural living land in small towns supportive of the City of Albany.

The Kalgan settlement area was an important orchard growing locality but in recent decades has been used predominantly for rural living with minor perennial agriculture.

The gravel based soils of the upper slopes are well suited to urban and rural living development and comply with all guidelines for conventional septic systems. The soils of the lower slopes are potentially more wet in winter and can be developed using nutrient adsorbing waste water systems to overcome any deficiencies.

The Kalgan River and tributary creeks plus the remnant vegetation can be afforded better levels of protection from eventual subdivision through the use of setbacks, buffers, conservation areas and changes to lot sizes and boundaries. For example cattle currently graze to the edges of some creeks which, when fenced, will be afforded better protection.

Two areas of soils that may be at risk of acid sulfate conditions lie in the central southern part of the site if they are dewatered or drained, have been identified (Figure 5). The planning process can be used to provide for fill in these areas rather than drainage or dewatering, which will negate the potential exposure of any at risk soils if they occur.

The remnant vegetation is of generally good condition and worthy of retention and protraction which can be better achieved through good planning.

Conclusions

There are no significant environmental issues that cannot be effectively managed during the planning process.

Planning, when combined with geological and environmental input, will determine the best guide plan to make the most of the planning and environmental opportunities whilst at the same time addressing any potential geological or geotechnical limitations.

A number of specific recommendations are made in the text relating to the most important environmental issues.

These are listed in the management sections throughout the report to assist with the planning and development process.

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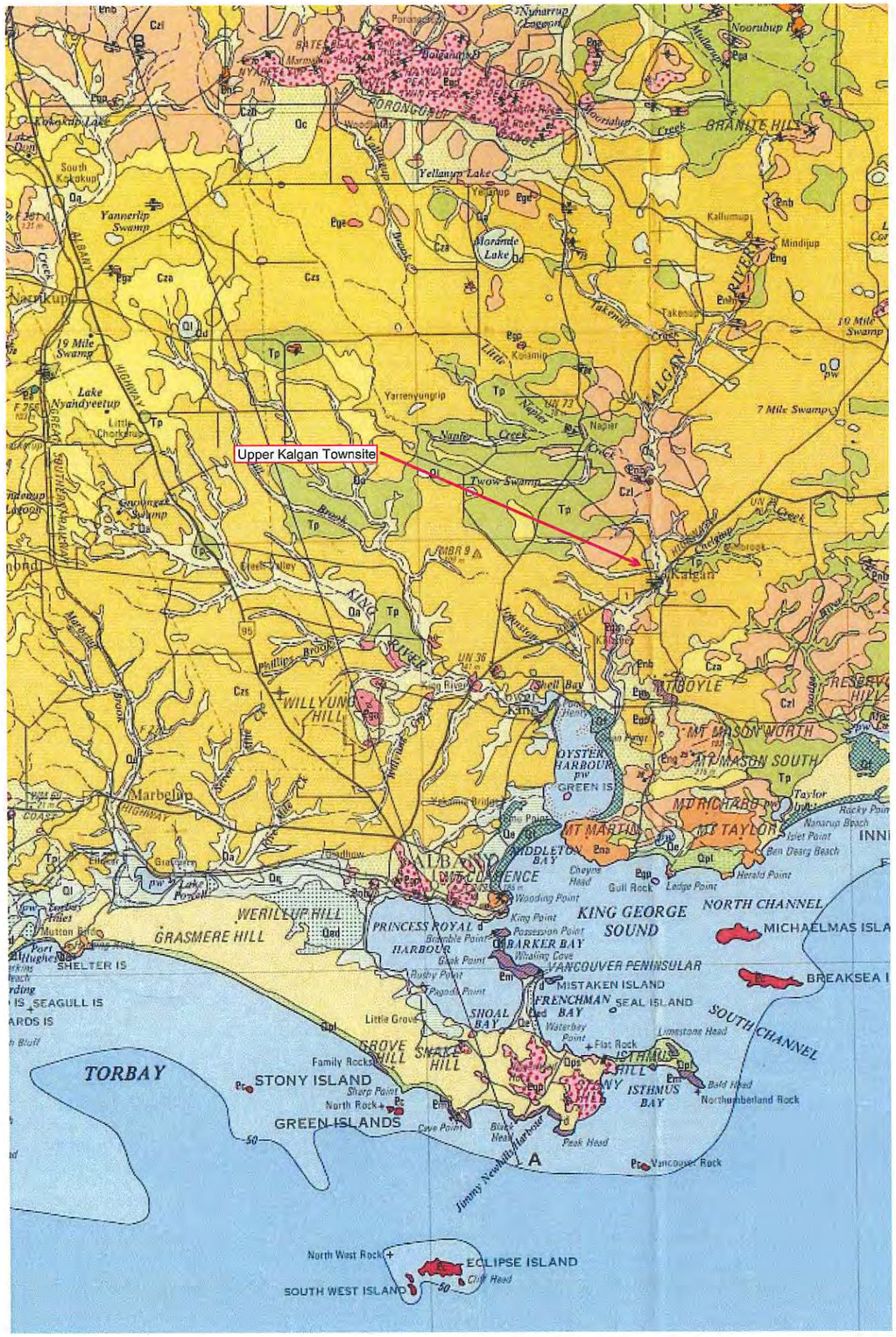


SOURCE Muhling P C and A T Brakel, 1985, Albany Mt Barker 1 : 150 000 Geological Series.

0 5 km

REFERENCE

CAINOZOIC

QUATERNARY

Qf Sand – beach and dune; unlithified mobile sand
Qe Estuarine and lagoonal deposits – clay, silt and sand
Qed Sand dunes on Qe – poorly lithified; vegetated
Qpl Limestone – cross-bedded calcareous sand in calcareous matrix
Qps White quartz sand on, and adjacent to, limestone

Qa Clay, silt, sand and gravel in watercourses
Ql Lake and swamp deposits – sand, silt, clay; may be saline and/or gypsiferous
Qd Mixed alluvium and lake deposits with sand dunes – marginal to lakes; gypsiferous in part
Qc Colluvium – sand, silt, clay

TERTIARY

Cza Alluvium and colluvium – pebbles, sand, silt and clay; includes unlithified as well as lateritized lithified deposits present in old flat-bottomed valleys which contain lakes
Czs Sand – white, grey or brown; commonly contains iron pisoliths and overlies laterite
Czl Laterite – massive and pisolitic deposits; includes both in situ and clastic types interbedded with sandstone
Czb Silcrete – includes friable sandstone

Ts Sandstone, medium-grained; friable

Tp PLANTAGENET GROUP : mostly PALLINUP SILTSTONE; spongolite with minor siltstone and sandstone; includes Nanarup Limestone Member of the WERILLUP FORMATION

PROTEROZOIC

STIRLING RANGE FORMATION
Pzsa Sandstone, quartzite
Pzss Sandstone, shale (slate, phyllite)

Pgh Hornblende-bearing granite to quartz monzonite
Pga Augen gneiss; developed from Pgp
Pgp Porphyritic biotite granite and adamellite
Pge Medium even-grained biotite adamellite
Pgm Mixed granitic rocks; mostly porphyritic and even-grained varieties
Pm Migmatite; granoblastic or gneissic palaeosome (Pnb, Pna) and allotriomorphic granular neosome of Pgp

Pc Unassigned metamorphic and igneous rocks on islands

Pn Gneiss; unassigned
Pns Gneiss; granoblastic granite, adamellite with streaks of mafic minerals (biotite, hornblende or pyroxene) or magnetite, garnet common; includes minor layered and granofelsic rocks
Pna Augen gneiss; coarse-grained with microcline augen
Png Granitic gneiss; fine to medium-grained with subordinate megacrystic varieties; weak foliation; granoblastic texture
Pnb Quartz-feldspar-biotite (-garnet-hypersthene) gneiss; compositionally layered gneiss with subordinate Pns and granofels; includes amphibolite and mafic granulite layers; granoblastic fabric
Pnh Heterogeneous compositionally layered gneiss rich in enclaves; more than one period of migmatization and isoclinal folding

Pa Medium-grained mafic rock; amphibolite and granulite
Pi Banded quartz-magnetite (hematite) (-chlorite-amphibole) rock; metamorphosed banded iron-formation
Pq Quartzite

ARCHAEAN

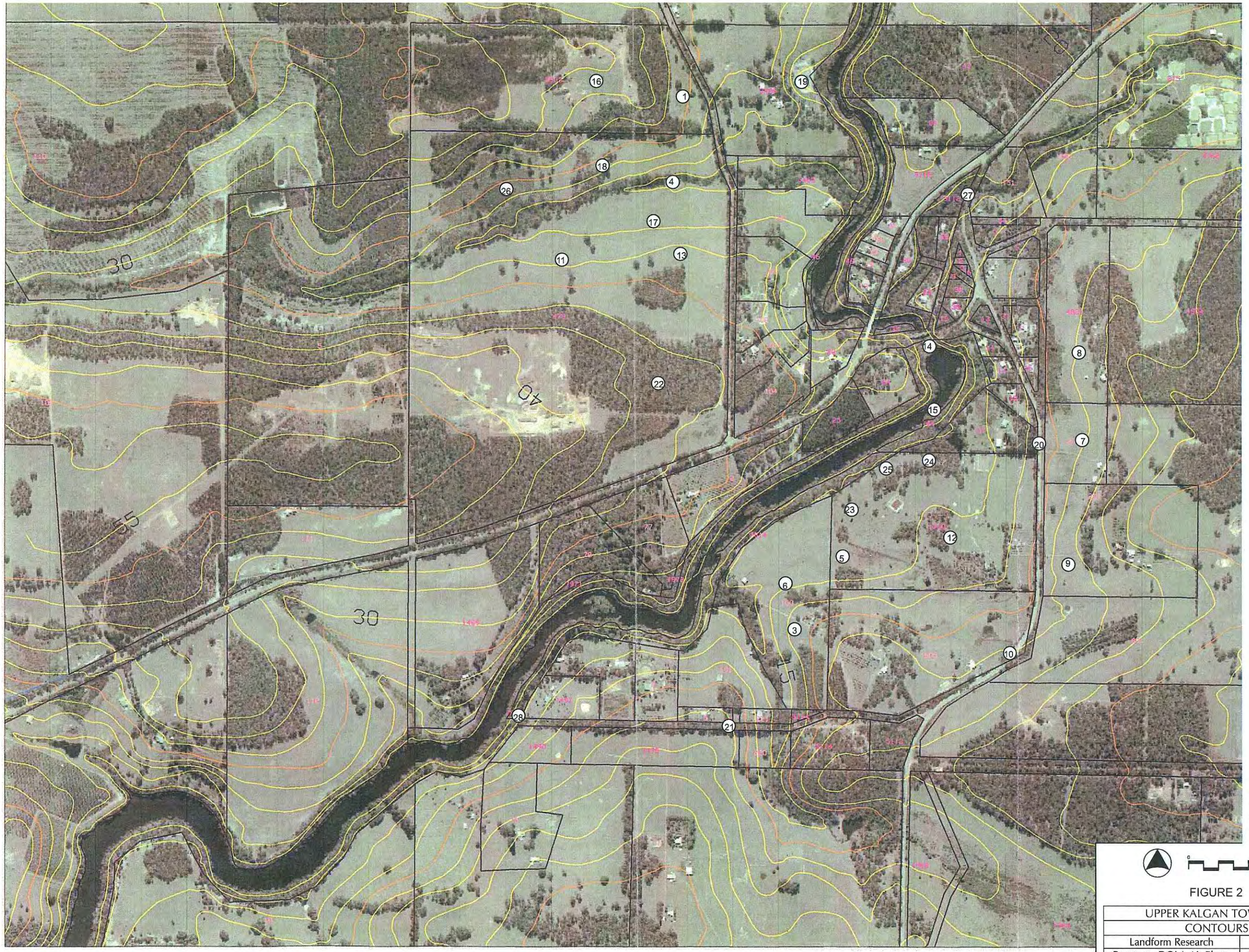
Ag Granitoid; unassigned
Agv Medium-grained adamellite; granite with scattered to locally abundant feldspar megacrysts
Agp Porphyritic adamellite and granite with microcline megacrysts
Age Medium even-grained biotite adamellite and granite
Agm Mixed porphyritic and even-grained biotite adamellite and granite

Ans Gneiss; granoblastic adamellite, granodiorite and tonalite with streaks of biotite or hornblende, garnet common; includes minor banded and granofelsic rocks
Am Migmatite; granoblastic or gneissic palaeosome in allotriomorphic granular neosome of medium, even-grained biotite adamellite

Ai Banded quartz-magnetite (hematite) rock; metamorphosed banded iron-formation
Al Psammo-pelitic schist

Figure 1

UPPER KALGAN TOWNSITE	
GEOLOGY AND LOCATION	
Landform Research	May 2007
Basemap DOIR	Scale 1 : 250 000



(9) Site of photograph See Figures 8A, 8B and 8C

0 200m

FIGURE 2

UPPER KALGAN TOWNSITE	
CONTOURS	
Landform Research	May 2007
Basemap DOLA Air Photo Ayton Taylor Burrell	Scale 1 : 10 000

SOIL TYPES		
KEY	**NAME**	**DESCRIPTION**
RL	Brown Rocky Loam	Brown loam over yellow brown loam and granite saprolite. May have minor band of gravel from 100 to 400mm. Associated with granite basement outcrop.
BL	Brown Loam	Dark brown loam over yellow loam clay subsoils developed on sloping granite and colluvium based subsoils.
GD	Gravel and Duricrust	Yellow brown gravel over duricrust at 200 - 1 200 mm over silts of the Plantagenet Group. Occupies ridge tops.
G	Gravel	Yellow brown gravel to 500 mm over yellow silty clay. Developed on silts of the Plantagenet Group. Upper valley slopes.
S/ST	Sand over Silty Clay	Grey sand or grey brown sand over yellow silty clay at 500 mm. Developed on silts of the Plantagenet Group on the gentle lower valley slopes. Some slopes are subject to surface seepages and perched water tables in winter.
S	Deep Sand	Grey silty sand over deep white silty sand formed by redistribution of the sand by colluvial and alluvial processes. Occupies lower valley slopes of sand shed from upslope.
S/G	Sand over Gravel	Grey silty sand over cream or brown silty sand at 200 - 500 mm over yellow silt or silty sand, mottled in places or brown at depths in excess of 1000 mm. Located on the mid valley slopes where sand has been sheeted across older gravel soils.
A/ST	Alluvial Silts	Low lying, leached white, or brown sand overlying loam and clay subsoils of colluvial to alluvial origin. In some locations the loam subsoils are exposed. Wet in winter with surface water common following heavy rainfall events.

0 150m

21 Soil Test Hole

Figure 3

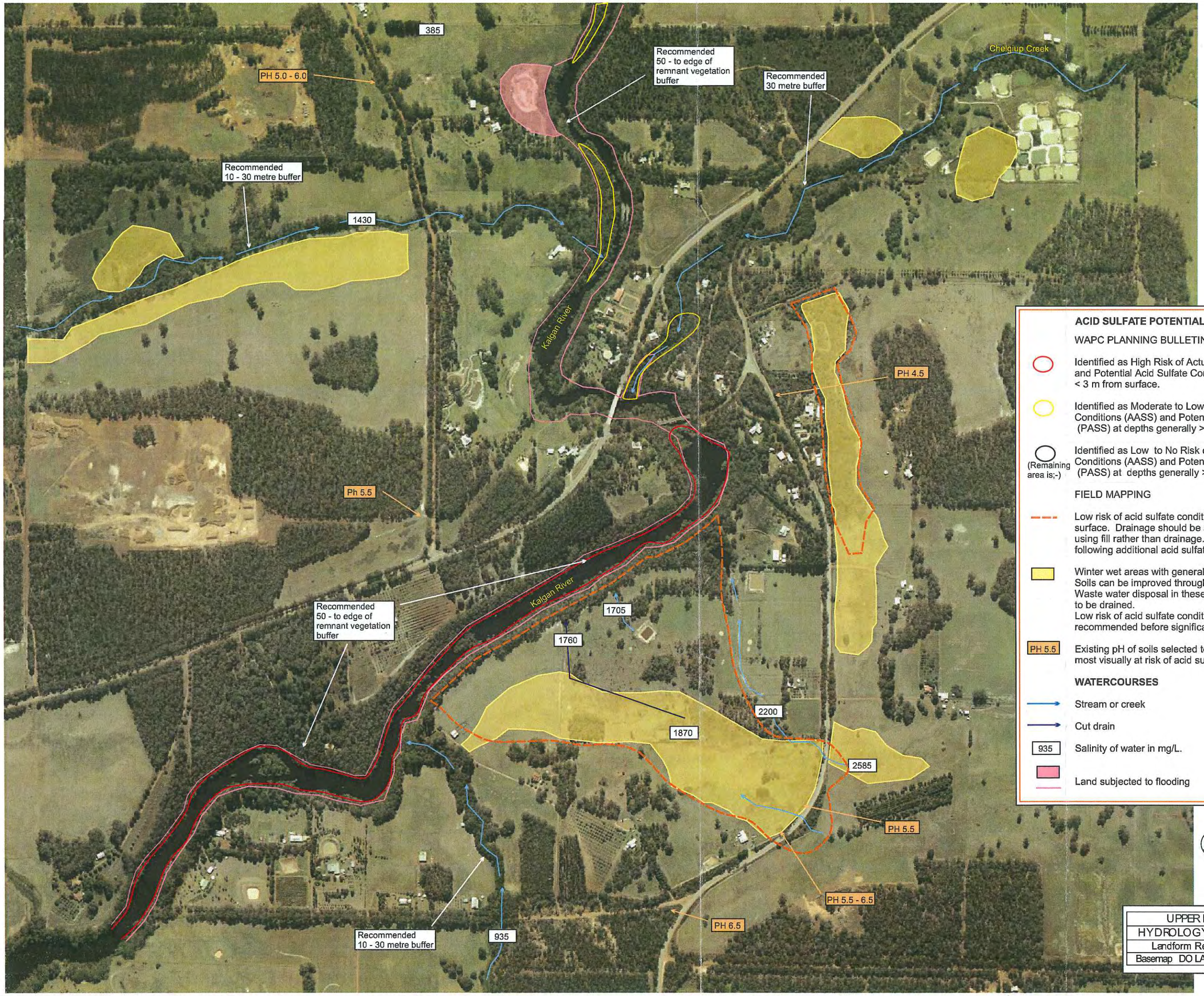
UPPER KALGAN TOWNSITE	
SOIL TYPES	
Landform Research	May 2007
Basemap Landgate	Scale 1 : 7 500

VEGETATION COMMUNITIES		
KEY	NAME	DESCRIPTION
EcEm	Jarrah - Marri Low Forest	*Eucalyptus marginata, E. calophylla* with *Banksia grandis, Nuytsia floribu*nda over *Dryandra formosa, Agonis parviceps, Davieais inflata, Hakea oleifolia, H. ruscifolia, Calistachys lanceolata* and *Acacia pulchella*. Occupies higHer slopes and ridges on well drained gravel soils
R	Riverine Forest	*Eucalyptus diveriscolor, E. calophylla, E. marginata* with *Melaleuca cuticularis* over wet site shrubs such as *Calistachys lanceolata, Agonis linearifolia, Trymalium floribundum, Agonis juniperina, Bossiaea linophylla* and *Hakea oleifolia, with Lepidosperma effusum*. Occurs along the banks of the watercourses and Kalgan River.
MS	Moist Shrubland	Shrubland of *Calistachys lanceolata, Trymalium floribundum, Agonis juniperina, A. parviceps, A. linearifolia, Bossiaea linophylla* and *Hakea oleifolia, with Lepidosperma gladiatum, L. effusum and Gahnia trifida.* Occurs on winter wet soils on lower slopes that are often sandy in the upper horizons.
Pt	Plantation	Plantation of pines or Blue Gums

0 150m

Figure 4

UPPER KALGAN TOWNSITE	
VEGATATION COMMUNITIES	
Landform Research	May 2007
Basemap DOLA Air Photo	Scale 1 : 7 500



ACID SULFATE POTENTIAL

WAPC PLANNING BULLETIN 64

Identified as High Risk of Actual Acid Sulfate Conditions (AASS) and Potential Acid Sulfate Conditions (PASS) within < 3 m from surface.

Identified as Moderate to Low Risk of Actual Acid Sulfate Conditions (AASS) and Potential Acid Sulfate Conditions (PASS) at depths generally > 3 m from surface.

(Remaining area is;-) Identified as Low to No Risk of Actual Acid Sulfate Conditions (AASS) and Potential Acid Sulfate Conditions (PASS) at depths generally > 3 m from surface.

FIELD MAPPING

Low risk of acid sulfate conditions within 2 metres of the surface. Drainage should be avoided, with developments using fill rather than drainage. Drainage is only recommended following additional acid sulfate testing.

Winter wet areas with generally thin sand over silty clay. Soils can be improved through cut off drains. Waste water disposal in these areas will require the soils to be drained. Low risk of acid sulfate conditions, but soil testing is recommended before significant drainage is undertaken.

PH 5.5 — Existing pH of soils selected to be representative and the most visually at risk of acid sulfate conditions.

WATERCOURSES

Stream or creek

Cut drain

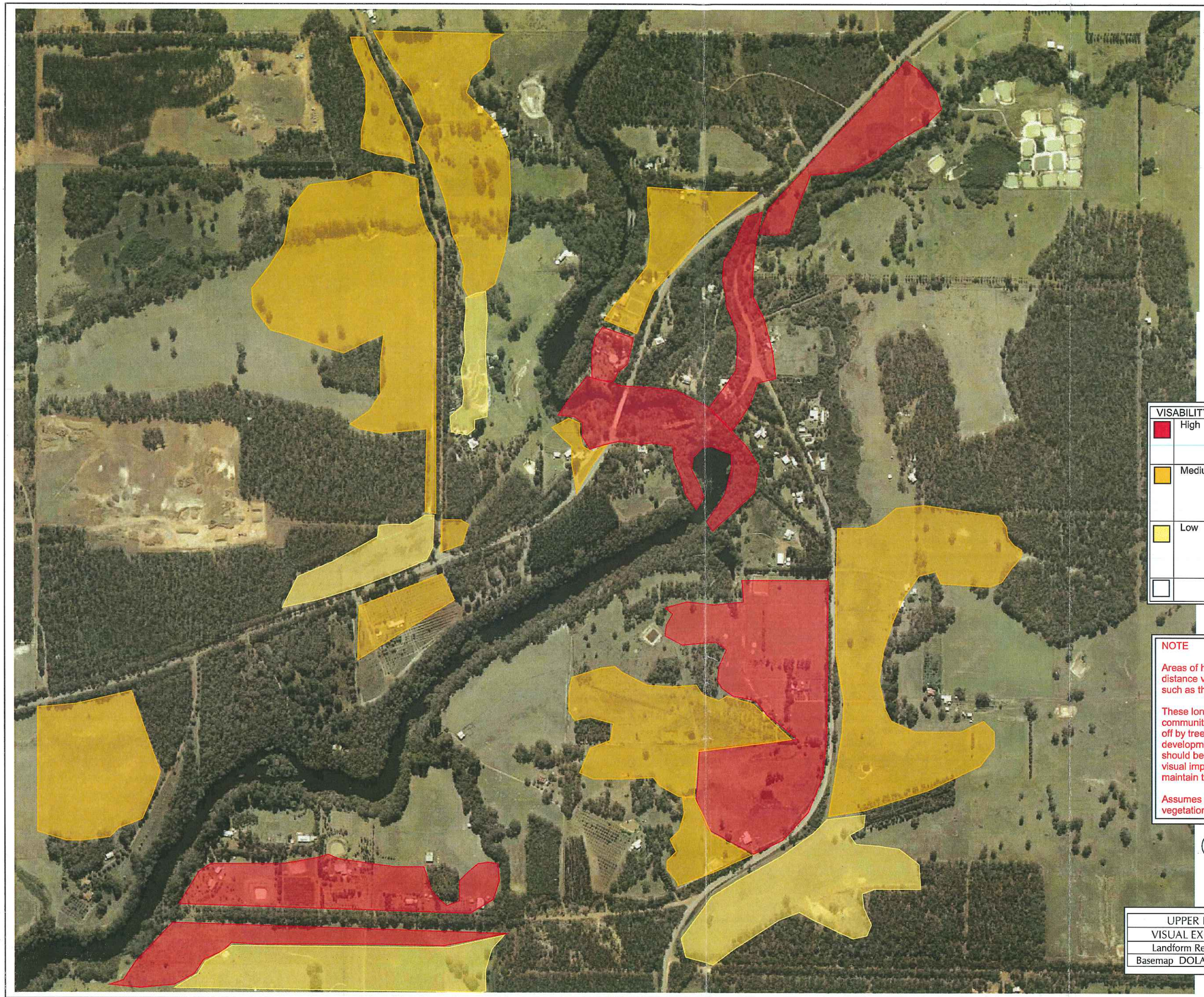
935 — Salinity of water in mg/L.

Land subjected to flooding

0 150m

Figure 5

UPPER KALGAN TOWNSITE	
HYDROLOGY - WATER MANAGEMENT	
Landform Research	May 2007
Basemap DOLA Air Photo	Scale 1 : 7 500



VISABILITY FROM LOCAL ROADS		
	High	Exposed from local roads and areas where developments may have a high visible impact.
	Medium	Views from local roads or views through trees. Developments are likely to have a moderate impact.
	Low	Some views from local roads or views through trees. Developments likely to have a minor impact.
		Generally not visible from local roads

NOTE

Areas of high visability may also be long distance viewscapes to significant areas such as the Kalgan River.

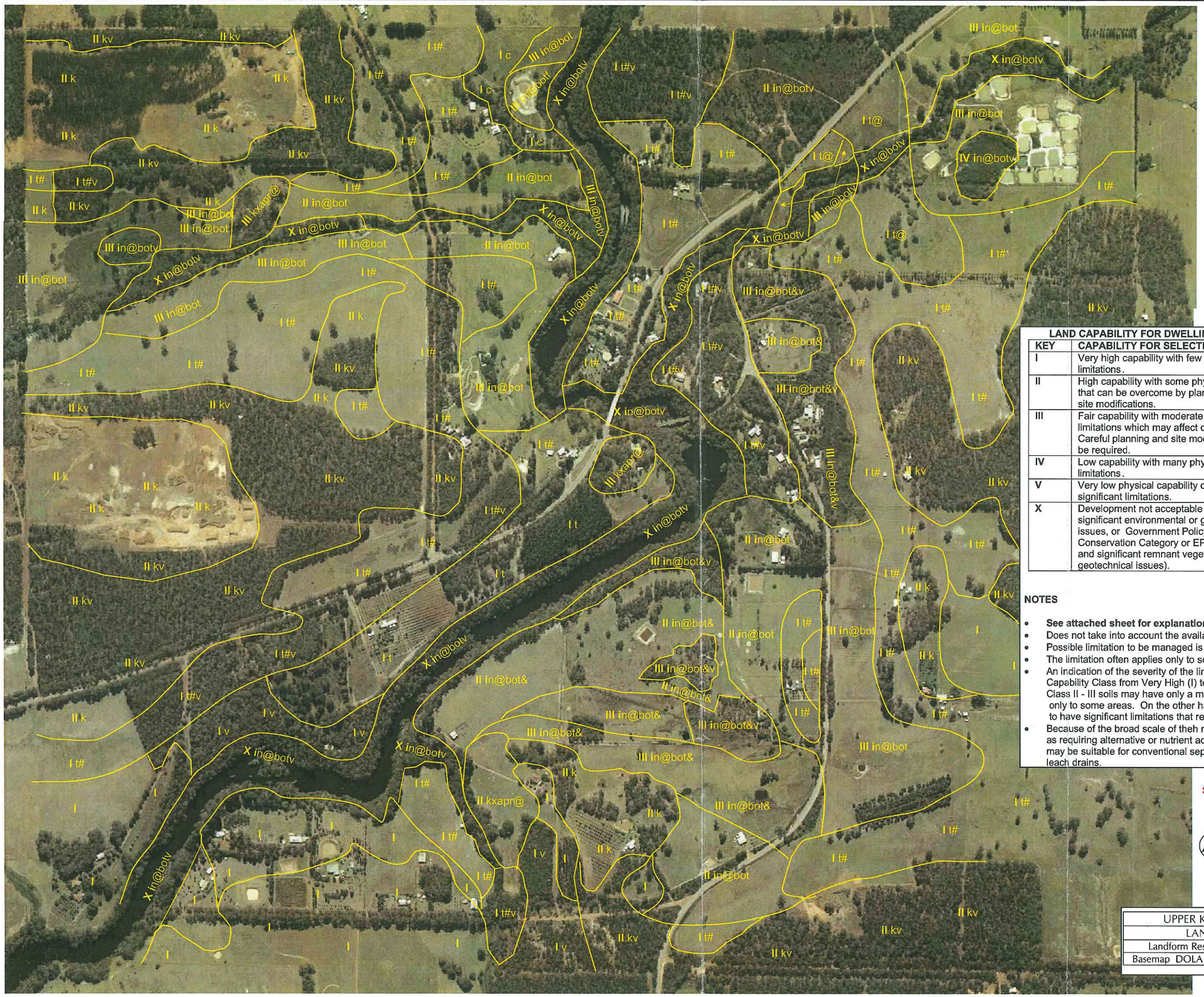
These long distance views have high community value and should not be cut off by tree plantings but rather any developments or land use changes should be managed to minimise visual impacts on the scenery and maintain the long distance viewscapes.

Assumes that the existing remnant vegetation is maintained.

0 150m

Figure 6

UPPER KALGAN TOWNSITE	
VISUAL EXPOSURE FROM ROADS	
Landform Research	May 2007
Basemap DOLA Air Photo	Scale 1 : 7 500



LAND CAPABILITY FOR DWELLINGS

KEY	CAPABILITY FOR SELECTED LAND USE
I	Very high capability with few physical limitations.
II	High capability with some physical limitations that can be overcome by planning and minor site modifications.
III	Fair capability with moderate physical limitations which may affect development. Careful planning and site modification may be required.
IV	Low capability with many physical limitations.
V	Very low physical capability or with significant limitations.
X	Development not acceptable because of significant environmental or geotechnical issues, or Government Policy. (Includes Conservation Category or EPP Wetlands and significant remnant vegetation, high risk geotechnical issues).

NOTES

- **See attached sheet for explanations**
- Does not take into account the availability of water
- Possible limitation to be managed is shown in brackets.
- The limitation often applies only to some parts of the soil unit.
- An indication of the severity of the limitation is provided by the Capability Class from Very High (I) to Very Low (V).
  Class II - III soils may have only a mild limitation or the limitation applies only to some areas. On the other hand Class IV - V soils can be expected to have significant limitations that require management.
- Because of the broad scale of theh mapping, some areas shown as requiring alternative or nutrient adsorbing waste water systsems may be suitable for conventional septic systems with semi inverted leach drains.

See attached sheets for key

0 150m

Figure 7

UPPER KALGAN TOWNSITE	
LAND CAPABILITY	
Landform Research	June 2008
Basemap DOLA Air Photo	Scale 1 : 7 500

CONSTRAINTS ON SOILS FOR LAND USE AND DEVELOPMENT

	CONSTRAINTS IDENTIFIED	POSSIBLE ENVIRONMENTAL MANAGEMENT STRATEGIES
a	Soil permeability limitations	• Provide appropriate waste water disposal systems.
b	Foundation soundness	• Requires house pads of sufficient depth to counteract potential clay or expanding sub-soils. • Organic subsoils may need to be removed if present.
c	Potential slope instability	• AS 2870 Site Class P generally applies to cut and fill. • Provide appropriate foundation design. • Upslope cutoff drains recommended. • Upslope water loading to be avoided. • Trees to be retained/planted. Pasture cover to be maintained
e	Water erosion risk	• Maintain soil cover of crops, pasture, trees or shrubs • Use contour drains and agricultural practices. • Stormwater to be controlled.
f	Potential flooding	• Requires sand pad to be set sufficiently (0.5m) above highest known water level to minimise capillary effects. • Locate developments outside areas of flooding.
i	Subject to winter wet conditions or water logging risk in wet years.	• Alternative waste water treatment systems likely to be required. • Cut off drains and other drainage likely to be required. • Raise waste water disposal areas. • Fill may be required for developments. • Floor elevations to have clearance above water risk levels. • Reduce stock in winter.
k	Soil workability	• Remove or avoid rock, clay subsoils or other restrictions.
m	Low moisture availability of soil	• Manage or reduce stock to ensure pasture cover through summer. • Restrict clearing to building envelopes.
n	Low nutrient retention ability	• Alternative waste water treatment systems may be required. • Leach drains may need to be inverted or semi-inverted, bunded by natural soil or impermeable membrane on downslope side. • Setback developments appropriate distances from water bodies/wetlands. • Feed stormwater through detention basins and swale drains. • Manage nutrient and fertiliser applications and stock • Restrict clearing to building envelopes. • Restrict the density of development.
o	Water pollution risk by overland flow	• Retain surface water in basins, use swale and grass filters. • Manage stock and potentially polluting land uses.
p	Potentially low microbial purification	• Alternative waste water treatment systems may be required. • Correctly install waste water systems. • Bund waste water disposal areas sufficiently.
r	Restricted rooting conditions	• Avoid rock, hardpan or other restrictions.
s	Water pollution risk by subsurface flow	• See (**n**) above.
t	Low topsoil nutrient retention	• See (**n**) above.
v	Remnant vegetation	• Restrict clearing to building envelopes. Maintain linkages.
w	Wind erosion risk	• Manage or reduce stock, irrigate and improve pasture. • Maintain vegetation/stubble cover through summer. • Restrict clearing to building envelopes.
x	Reduced ease of excavation	• Remove rock or avoid constrained areas.
y	Salinity risk	• Provide drainage and reduce ponding. • Plant deep rooted species including deep rooted crops.
z	Wetland conservation	• Exclude building envelopes and developments. • Provide appropriate buffer distances. • Place conservation covenants on wetlands and/or vegetation.
&	Potential for acid sulfate conditions	• Minimise deep excavations or bulk earthworks. • Neutralise removed affected soils. • Minimise or exclude dewatering and lowering of groundwater.
$	Restricted water availability	• Water may be restricted for some horticulture land uses
#	Semi-inverted leach drains	• Leach drains should be semi-inverted, bunded by natural soil or impermeable membrane on the downslope side.
@	Alternative waste water treatment system required	• Unsuitable for conventional septic systems. All lots will be required to use alternative waste water treatment systems to comply with Regulations, Policy and Department Guidelines.

APPENDIX B

FIRE MANAGEMENT PLAN

Kalgan Rural Settlement

Fire Management Plan

AYTON BAESJOU
PLANNING

ABN: 15 061 140 172
11 Duke Street
Albany WA 6330
Ph 9842 2304 Fax 9842 8494

October 2008
Modified August 2010

Contents Page

1. INTRODUCTION

Amendment 290 to the City of Albany Town Planning Scheme No.3 proposes to create a 'Rural Village' zone for Kalgan. This Fire Management Plan complements the rezoning document and has been prepared to guide and inform the Indicative Structure Plan.

2. LOCATION AND AREA

The Kalgan Rural Village is located approximately 27km north east of the Albany City centre at a point where the South Coast (Hassell) Highway crosses the Kalgan River and the Chelgiup Creek tributary feeds into the River.

3. FIRE SAFETY

The Kalgan Rural Village study area is in the Kalgan Volunteer Bush Fire Brigade (VBFB) district. At the time of preparing this Plan, the Kalgan VBFB had the following appliances:

a. 1.4R, 1988 Mazda, based at Upper Kalgan shed
b. 2.4R, 1997 Hino, based at Lower Kalgan Shed (adjacent to Kalgan Hall)
c. 3.4R, 2001 Isuzu,
d. Light Tanker, 2003 Toyota Land Cruiser.

Water supply for fire fighting purposes is provided from the strategic water tank maintained by the City located close to the Upper Kalgan shed. The numerous dams, soaks and water courses also function as supplementary emergency water sources.

The Kalgan VBFB has a total of approximately 80 members, with 40-50 being active members.

4. BUSH FIRE MANAGEMENT

The main issues with fire management are the reduction in fuel hazard, the maintenance of firebreaks, the availability of emergency equipment and water to fight fires and the provision of emergency egress. The provision and upgrade of existing facilities and better road access will help mitigate any increased fire risk as a result of development.

Planning for Bushfire Protection, 2010 (WAPC and FESA) provides guidance on bush fire protection within new land development. The document deals various issues and provides guidelines, performance criteria and acceptable solutions. It addresses subdivision and development design, particularly in regard to the bushland interface. The Kalgan Rural Village Structure Plan complies with relevant requirements and Guidelines in terms of road design, hazard separation, water supply and access/egress.

5. FIRE HAZARD ASSESSMENT

The fire hazard assessment for the subject land is shown on the following Map. The assessment takes into account vegetation types and the slope of the land both within and surrounding the study area.

The majority of the study area is cleared rural land, used for grazing and in some cases horticulture. Most rural properties have been totally cleared or contain isolated paddock trees and some remnant vegetation along ridgelines and drainage lines. Some bush areas on private property have been parkland cleared and are used intermittently for grazing/livestock shelter. Small pockets of pine plantations exist on properties in the west of the study area. The majority of the remnant vegetation within the Study Area is along the foreshore reserves of the Kalgan River and Chelgiup Creek or on the various Crown Reserves within the townsite.

The adjoining land to the north west contains areas of remnant vegetation. Significant vegetation also remains in the road reserves within and adjoining the study area. The extent of surrounding vegetation is shown on the Fire Hazard Assessment Map which was prepared in accordance with the 2001 edition of Planning for Bush Fire Protection, applicable at the time of rezoning.

The study area and consists of predominantly moderately sloping land with gradients ranging between 5 and 15%. Sections of the banks along the Kalgan River and Chelgiup Creek are considered steep, with slopes exceeding 22% (10^{o}). The steep land is generally within Crown Reserves and/or water course buffers and is contained in Development Exclusion Areas.

Given the predominantly gentle to moderate slopes, the cleared areas have a low bush fire hazard rating, while the parkland cleared areas have a moderate rating. The areas of extensive, dense remnant vegetation and plantations have a high or extreme fire rating.

Areas of the remnant vegetation on freehold properties which are subject to regular grazing and periodic burning are classed as medium or high fire hazard rating given its current rural land use. For the purpose of this assessment, consideration has been given to the anticipated land use. Future grazing may not be as intensive and regeneration of some bush areas could be expected, the core remnant vegetation areas are therefore shown on the Hazard Assessment Map as Extreme. In accordance with Table 4 - Identifying Bush Fire Prone Areas of 'Planning for Bush Fire Protection' (pg 17 of 2001 version) the hazard levels within 15 - 40m of the Extreme Hazard are designated High or Medium.

6. FIRE MANAGEMENT

The Kalgan Rural Village Structure Plan incorporates several measures to minimise the threat to residents and fire fighters in the event of a bushfire within or near the site.

6.1 Hazard Separation Zones

The main bushfire threats affecting the Study Area are the areas of remnant vegetation along the Kalgan River and within the various Crown Reserves in the town site, together with the vegetated areas immediately to the north west of the site.

On the Structure Plan, development areas are generally setback 60-100 metres from remnant vegetation and the areas identified and Extreme hazard risk.

Fuel loads within the Hazard Separation Zones will need to be kept below 8 tonnes per hectare, through regular maintenance and appropriate hazard reduction methods including mowing, slashing, removal of understorey/selected lower limbs and prescribed burning. This will be especially important within the remnant vegetation areas if the land use changes from livestock grazing to some form of horticulture of rural retreat. Cool burns on a 5 to 7 year cycle are recommended to achieve the necessary fire safety. Consideration should also be given to minimising habitat impacts.

6.2 Building Protection Zones

Building Protection Zones (BPZ), a minimum of 20m wide, around all dwellings are required based on the general slope of the land within the subdivision. In instances where development occurs on slopes greater than 10° (22%), the width of the BPZ increases by 1m for every degree of incline.

These zones must be maintained in a low fuel state and fulfil the following conditions:

- bush fire fuels must be maintained below 10cm in height;
- trees and branches which may fall onto a house must be removed; and
- lower branches of remaining trees must be trimmed.

6.3 Strategic Fire Breaks and Emergency Access

The road network and lot configuration have been designed to meet the guidelines and criteria contained in "Planning for Bushfire Protection" and Western Australian Planning Commission Policy DC 3.7. The roads will be constructed to a fully trafficable standard which will allow vehicles to pass and overtake. The network of loop roads provides alternative access/egress in an emergency.

In addition, a network of strategic firebreaks will be constructed so as to provide alternative emergency access. There is opportunity to extend and formalise the movement networks by providing multi-function trails which connect the existing and proposed nodes and facilities.

Strategic Fire Break construction standards will be to operational bushfire protection guidelines. Where and if fences are constructed, gates will be required to be installed. In the event of a staged subdivision an interim strategic firebreak is to be installed and maintained.

6.4 Water Supply

A 50,000 litre community tank can be provided at the proposed Country Club to serve as an additional water supply for fire fighting. The tank is to be located and installed to Council/FESA specifications. Access to the tank may need to be secured through notification of the respective title.

At the time of development each landowner will be required to make allowance for emergency water supply. In recognition that the larger lots are likely to be used for horticulture and/or rural living, any associated non-potable water supply may be suitable for fire fighting purposes. The bottom one quarter of at least one water storage tank per lot shall also be set aside for fire fighting purposes. The tank shall be fitted with an outlet to Council's specification and satisfaction, such that a minimum of 10,000 litres per lot is available for fire fighting. The emergency water supply tank shall be identified by signage and readily accessible by emergency services personnel.

6.5 Building Design

In response to slope and the predominantly cleared nature of the majority of the study area, much of the development area is rated as low to medium fire hazard risk. In addition to compliance with the Annual Fire Break Notice, standard development controls will apply, including establishment and maintenance of Strategic Fire Breaks and Building Protection Zones and the provision of emergency water supply. A higher level of design may be required for areas of High and Extreme risk, particularly within the core of the village, to achieve compliance with Australian Standard 3559-1991 "Construction of Buildings in Bushfire Prone Areas".

6.6 Crown Land

Within the public foreshore area and various Crown Reserves within the Study Area, fire management will be the responsibility of the City of Albany and the respective vesting agency. Fuel loads can be managed through a combination of cool burns, slashing or grazing. Cool burns carried out progressively over limited areas in order to minimise the impact on flora and particularly fauna are recommended. Such activity should be undertaken in consultation with the Department of Environment and Conservation and the Department of Water. The burning will need to be handled extremely carefully in order to ensure good understorey is not destroyed. Reduction of the understorey vegetation can dramatically reduce the habitat of some species of fauna and result in their decimation by cats and foxes.

Practical access to and from the foreshore as well as good surveillance from adjoining properties can assist to minimise the threat of bush fires. The multi use trail which will serve as a hard edge to the riparian vegetation and River foreshore; it will function as a strategic firebreak and in some cases emergency access/egress for nearby residents.

7. CONCLUSION

The Kalgan Rural Village Structure Plan takes into consideration the essential elements of Planning for Bushfire Protection (2001 and 2010 versions as applicable) and the Western Australian Planning Commission Planning Policy DC3.7. The Plan includes the following key principles:

- Low fuel areas around all dwellings.
- Appropriate separation/hazard reduction zones from the areas identified as Extreme Hazard.
- Subdivisional roads being designed facilitate emergency access/egress.
- Provision of a network of Strategic Fire Breaks and multi-use trails
- Provision of communal and domestic water supply for fire fighting purposes.

KALGAN RURAL VILLAGE
FIRE HAZARD ASSESSMENT

LEGEND

- L Low
- M Moderate
- H High
- E Extreme
- Existing Vegetation
- > 10 Degrees

CHURCHILANE ROAD
HIGHWAY
COAST
SOUTH
RIVER
ROAD
KALGAN
HUNTON
RIVERSIDE ROAD
DOUGLAS ROAD

3486 12.77ha
29 3.87ha
30 6.76ha
215 15.23ha
3112 2.08ha
4762 14.13ha
105 3.74ha
106 4.06ha
107
103 1.58ha
4821 8.31ha
200 3.80ha
2 4.70ha
37 3.65ha
1730 10.26ha
201 13.12ha
1489 13.87ha
100 12.01ha
600 15.68ha
300 54.74ha
3 3.36ha
1491 2.23ha
2 2.42ha
102 5.53ha
1490 1.87ha
1495 4.72ha
220 1.45ha

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