A

Enviromental Assessment Report

(September, 2011)

ENVIRONMENTAL ASSESSMENT REPORT

Lots 635, 739 and 740 Baldivis Road, Baldivis

ENVIRONMENTAL ASSESSMENT REPORT

Lots 635, 739 and 740 Baldivis Road, Baldivis

Prepared by:

RPS

38 Station Street, SUBIACO WA 6008
PO Box 465, SUBIACO WA 6904

T: 618 9211 1111
F: 618 9211 1122
E: environment@rpsgroup.com.au
W: rpsgroup.com.au

Report No: L09189
Version/Date: Rev 1, September 2011

Prepared for:

NOVALEE NOMINEES PTY LTD AND ESTATES 77 PTY LTD

c/o Carcione Group of Companies

Carcione Nominees Pty Ltd

First Floor, 289 Stock Road

O'CONNOR WA 6163

RPS Environment and Planning Pty Ltd (ABN 45 108 680 977)

Document Status

Version	Purpose of Document	Orig	Review	Review Date	Format Review	RPS Release Approval	Issue Date
Draft A	Draft for Client Review	KarGod	KriBen	31.07.09	DC 07.08.09		
Draft B	Unfinished report for input into LSP Planning Report	KarGod	KriBen	24.08.09	SN 27.08.09		
Rev 0	Finalised report for submission to government authorities	KarGod	BenHol	16.03.10	DC 16.03.10	B. Hollyock	16.03.10
Rev 1	Finalised report for submission to government authorities		BenHol	05.09.11	SN 09.09.11	B. Hollyock	09.09.11

Disclaimer

SUMMARY

Novalee Nominees Pty Ltd and Estates 77 Pty Ltd propose to develop Lots 635, 739 and 740 Baldivis Road, Baldivis ("the site") for residential purposes. Prior to residential development, it is also proposed that sand will be excavated at the site to be used as a resource for other developments.

The 88.5 ha site is zoned "Urban Deferred" in the Metropolitan Region Scheme (MRS), and "Development" in the City of Rockingham's Town Planning Scheme No.2 (2004) (TPS). Therefore, a rezoning application will be submitted to the Western Australian Planning Commission for the lifting of "Urban Deferment" over the site; however, no rezoning is required at the local planning level.

Clause 4.2.4 of the City of Rockingham's TPS requires that a Local Structure Plan be prepared for any development, or part of a development, within a proposed "Development" zone, prior to "recommending subdivision or approving the development of land within the Development Area".

This Environmental Assessment Report (EAR) is intended to support the proposed Structure Plan being prepared for the site, and to assist the City of Rockingham to understand the site's existing environmental conditions. The key objectives of the EAR are to:

- Outline the key environmental characteristics of the site.
- Identify the relevant characteristics of the proposed development and structure plan design.
- Detail any potential environmental impacts associated with the development.
- Outline how these impacts intend to be managed throughout the planning and development process.

The key environmental issues for the site are:

- potential for contamination from past land use activities
- land use setbacks, particularly in relation to the Parmelia High Pressure Gas Pipeline.

Much of the central portion of the property is at topographic elevations greater than 30 mAHD; a height above which potable water will not be easily serviced to future lots. As such, there is a need to reduce the levels across the site to a maximum of approximately 28–30 mAHD. This will result in very little ability to retain native trees across most of the site.

In saying this, wherever possible, existing native trees will be retained in public open space areas, particularly within the gas pipeline easement and the public open space attached to the primary school. Revegetation of these areas, using local native species where available, will also assist in enhancing potential habitat for native fauna species.

Although unlikely to be recorded (due to the parkland cleared nature of the site), a targeted spring flora survey has been undertaken during spring 2009 to confirm the presence or otherwise of any Declared Rare or Endangered Flora Species. No significant species were recorded during the site visit.

There are three past land uses known to have been undertaken on the site that have the potential to result in soil and/or groundwater contamination. The three land uses of interest known at this time include:

- The lessee of Lot 739 had around 500–1000 ostriches; a land use which ceased over five years ago. The animals were bred for their eggs.

- Lot 740 contains poultry sheds, which ceased operation approximately two to three years ago.

- The poultry sheds were previously used as part of a piggery. The dam on Lot 739 was used to contain the run-off water from the piggery.

A Preliminary Site Investigation (PSI) for potential contamination has been completed and submitted to an independent auditor for review. Preliminary planning is now underway for progressing a Sampling and Analysis Plan (or Soil and Groundwater Contamination Investigation and Remediation Plan) as part of the requirements under the *Contaminated Sites Act 2003* and in accordance with Schedule 8 "Environmental Conditions" of the Town Planning Scheme No.2.

The structure plan recognises that development setbacks are required to the Parmelia High Pressure Gas Pipeline, for reasons of safety to future residents of the development.

Development Engineering Consultants (October 2009) states *"the setback of 32 m from the gas main as detailed in the City of Rockingham summary is the current approach we are taking with APT"*. This report states that typically APT reviews the design at subdivision stage to ensure appropriate setbacks are achieved.

RPS understands it is likely that a Condition of Subdivision will be imposed at subdivision stage, requiring the preparation of a "Pipeline Protection Plan" (in accordance with Schedule 8 "Environmental Conditions" of the City of Rockingham's Town Planning Scheme No. 2). The aim of this Plan is to ensure the land uses above the pipeline do not compromise its long-term integrity, and thus the safety of nearby developments and residents is promoted.

In addition to the appropriate setbacks, various mitigation measures will also be implemented to further protect future residents. These include:

- excavation of the pipeline and exposing the pipe – done by contractor appointed by APT.
- backfill to sill level to place concrete cover
- placement of precast pieces of concrete cover and danger tape over the pipeline
- backfill to surface.

Development Engineering Consultants (February 2010) indicates that *"Table 6 of PB87 details the reduction in setback that can be achieved if a 3.0 m wide by 150 mm deep concrete slab is placed below the ground, but above the pipeline together with marker tape. This reduces the setback to the edge of the easement being around 5.5 m from the pipeline."*

Further environmental investigations and reporting will be necessary to further characterise the site, and enable detailed subdivision design to occur.

Urban water management strategies will be implemented and outlined in a Local Water Management Strategy which will be prepared prior to structure plan approval. This document will prescribe water conservation strategies, as well as mechanisms to protect hydrological characteristics on site and off site.

The key for this development will be to carefully develop and implement good environmental practices in the detailed design of the site, such as urban water management, rehabilitation and landscaping using local native species, provision of fauna nesting boxes and/or roosting structures, and other such mechanisms.

This page is intentionally blank.

TABLE OF CONTENTS

Page

TABLES

(contained within report text) **Page**

FIGURES

(compiled at rear of report)

1.0 INTRODUCTION

1.1 Overview and Location

RPS Environment and Planning Pty Ltd ("RPS") has been commissioned by Carcione Group of Companies to undertake the environmental investigatory work necessary to facilitate ultimate development of Lots 635, 739 and 740 Baldivis Road, Baldivis ("the site") for residential purposes.

The 88.5 ha site is located within the City of Rockingham, approximately 11 km south-west of the Rockingham city centre.

The site is under joint ownership, according to:

- Novalee Nominees Pty Ltd – owner and developer of Lot 740 Baldivis Road
- Estates 77 Pty Ltd – owner and developer of Lots 635 and 739 Baldivis Road.

In addition to the proposed development of the site for residential purposes, the developers are exploring the option to excavate sand resources across the centre of the site to provide a resource for other developments requiring imported fill. This activity is also to be considered as part of this report.

1.2 History and Background

To date, desktop investigations and a preliminary site visit have been used to define the key environmental features at the site. An Environmental Opportunities and Constraints Analysis was undertaken to inform the Local Structure Plan design process.

1.3 Current and Proposed Zone

The site is zoned "Urban Deferred" in the Metropolitan Region Scheme (MRS).

The Local Structure Plan and associated documents will form the basis of an application by the City of Rockingham to the Western Australian Planning Commission for the lifting of "Urban Deferment" over the site.

The site is zoned "Development" in the City of Rockingham's Town Planning Scheme No.2 (2004) (TPS). Therefore, no rezoning is required at the local planning level.

1.4 Purpose and Scope

Clause 4.2.4 of the City of Rockingham's TPS requires that a Local Structure Plan be prepared for any development, or part of a development, within a proposed "Development" zone, prior to "recommending subdivision or approving the development of land within the Development Area".

The Environmental Opportunities and Constraints Analysis prepared by RPS Bowman Bishaw Gorham (May 2007) provided key information to inform the Local Structure Plan design, and forms the basis of this Environmental Assessment Report (EAR).

This EAR is intended to support the proposed Structure Plan, and assist the City of Rockingham to understand the existing environmental conditions at the site. The document outlines key characteristics of the proposed development and Structure Plan design, identifies any potential environmental impacts associated with the development, and outlines how these impacts intend to be managed throughout the planning process.

The key objectives of this EAR are to:

- Outline the key environmental characteristics of the site.
- Identify the relevant characteristics of the proposed development and Structure Plan design.
- Detail any potential environmental impacts associated with the development.
- Outline how these impacts intend to be managed throughout the planning and development process.

Specifically, the EAR provides environmental information relating to the following site features:

- topography and landform
- geology and soils
- remnant native vegetation
- potential presence of significant flora
- native fauna habitat values
- hydrology and drainage
- Aboriginal and European heritage values
- acid sulfate soils
- potential for site contamination
- surrounding land uses and requirements for buffers
- environmental considerations relating to sand excavation at the site
- management strategies to minimise any potential environmental impacts from the proposed sand mining or residential development.

2.0 RELEVANT DOCUMENTS

Legislation, policies, planning bulletins, codes of practice and guidelines are in place to protect the environmental values of the site and to reduce the risk of any negative impacts on the natural environment and any future residential development. Key legislative or regulatory guidance documents relevant to the site are outlined below.

2.1 Federal Legislation / Policy / Guidelines

2.1.1 *Environment Protection and Biodiversity Conservation Act 1999*

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the Australian Government's key piece of environmental legislation which enables the Department of Environment, Water, Heritage and the Arts to regulate environmental protection of species or areas which are considered of national significance and/or importance. The EPBC Act came into effect on 16 July 2000.

The objectives of the EPBC Act are to:

- "provide for the protection of the environment, especially matters of national environmental significance.
- conserve Australian biodiversity.
- provide a streamlined national environmental assessment and approvals process.
- enhance the protection and management of important natural and cultural places.
- control the international movement of plants and animals (wildlife), wildlife specimens and products made or derived from wildlife.
- promote ecologically sustainable development through the conservation and ecologically sustainable use of natural resources"

http://www.environment.gov.au/epbc/about/index.html

Under the EPBC Act, a person must not take an action that has, will have, or is likely to have a significant impact on any of the "Matters of National Environmental Significance" without approval from the Federal Environment Minister. A proposed action should be referred to the Federal environmental agency if there is the potential to impact on any "Matter of National Environmental Significance", to determine whether the proposed action will need formal assessment and approval under the EPBC Act.

2.2 State Legislation / Policy / Guidelines

2.2.1 *Environmental Protection Act 1986*

The Environmental Protection Authority is the overarching regulatory body responsible for controlling environmental protection and impact prevention of the natural environment for Western Australia. The purpose of the *Environmental Protection Act 1986* is to:

> "….provide for an Environmental Protection Authority, for the prevention, control and abatement of pollution and environmental harm, for the conservation, preservation, protection, enhancement and management of the environment and for matters incidental to or connected with the foregoing."
>
> http://www.epa.wa.gov.au/template.asp?ID=10andarea=ProfileandCat=Legislation

2.2.2 EPA Guidance Statement No. 3 – Separation Distances Between Industrial and Sensitive Land Uses

The Environmental Protection Authority's Guidance Statement No. *3* (EPA, 2005) is intended to provide advice on generic separation distances between specific industry and sensitive land uses to avoid or minimise the potential for land use conflict.

The objectives of Guidance Statement No. 3 are to:

- Identify the need for specific separation distances or buffer definition studies.
- Provide general guidance on separation distances in the absence of site specific technical studies.

As such, the recommended buffer distances identified in this document represent "generic buffer" distances. The practice of the EPA is to give consideration to alternative buffer distances or management practices based upon site specific analysis that can be demonstrated to meet the required environmental standards specific to various emissions.

2.3 Local Legislation / Policy / Guidelines

2.3.1 City of Rockingham Town Planning Scheme No.2 (2004)

According to the City of Rockingham's website, the City's Town Planning Scheme No.2

"is the primary statutory planning instrument against which development (within the City) is guided and controlled."

The City has stated that the general objectives of the scheme are to:

- "Establish the preferred use of land well in advance of development.
- Optimise the provision of services and facilities for the community.
- Ensure the co-ordinated provision of adequate land for development.
- Conserve and enhance features of cultural, historical, environmental and natural significance.
- Reconcile community needs and aspirations with appropriate land use and development."
  http://www.rockingham.wa.gov.au/Planning_and_Developments/town-planning-scheme-2.php

The Town Planning Scheme No.2 is the overarching document for planning within the City of Rockingham, with a number of policies, planning procedures, information sheets and checklists which guide the day-to-day intent of the scheme. Many of these planning tools relate directly or indirectly to environmental management and protection and/or enhancement of the natural attributes of the City.

Much of Part 5 of the Scheme is related to environmental management, and refers to State draft policies. Schedule 8 details the "Environmental Conditions" for previous Scheme Amendments.

This page is intentionally blank.

3.0 EXISTING ENVIRONMENT

3.1 Topography

The site generally slopes upwards from Baldivis Road (a minimum of 5.5 mAHD), to a ridge that extends north–south almost through the centre of the subject land at a maximum height of 39.5 mAHD (Figure 2). From here, the site falls north-west to a localised low point of 15 mAHD (approximately 80 m from the western boundary along the intersection between Lot 635 and 739) and to the north, to a low of 17 mAHD just outside the northern site boundary.

Two localised low points exist within the site between the high ridgeline and Baldivis Road; one in the central third of Lot 740 (at 19 mAHD) and 23 mAHD at the manmade dam on Lot 739.

The undulating topography provides opportunities for drainage and public open space in regional and localised low points.

3.2 Geology and Soils

The sands at the subject site have good drainage capacity given their sandy nature.

The site comprises sandy soils (S7 and S8 geological classification) (Figure 3). Both soil types are suitable for development as they are stable and highly permeable.

S7 soils (derived from Tamala Limestone) consist of pale yellowish brown sands, medium to course-grained sub-angular quartz, with traces of feldspar, moderately sorted and of residual origin. These soils make up the majority of the site, except the lower-lying south-eastern corner.

S8 soils (Bassendean sands) are located in the south-eastern corner of the site, and consist of very light grey sands at the surface, which change to yellow at depths. It is fine to medium-grained sand, sub-rounded quartz, moderately well sorted and of eolian origin.

The sandy soils will ensure high rates of filtration of stormwater and as such provide a good opportunity for development for residential purposes.

3.3 Vegetation

The vegetation across the property consists of over-storey only. However, many of the trees are in reasonably good condition. More specifically, the vegetation on site consists of three main types of upland vegetation:

- a large stand of *Corymbia calophylla* (Marri) (approximately 260 m wide) extending to approximately 300 m west of Baldivis Road

- an area of *Eucalyuptus gomphocephala* (Tuart) Woodland, with scattered *Eucalyptus marginata* subsp. *marginata* (Jarrah), across the south-western area of the properties (spread over approximately 40% of the site)

- scattered Jarrah predominantly throughout Lot 635.

The area of Tuarts, which are located across almost half of the site, extend most of the way along the western boundary and two thirds of the way towards Baldivis Road. Two subsets of Tuarts can be considered; a rectangular area contained solely on Lot 740 (which extends 400–500 m from the western boundary) containing both Tuarts and Jarrah, and the remaining Tuart complex which consists solely of Tuart species. Figure 4 displays the vegetation types mapped across the site.

A general survey of vegetation health / tree condition was undertaken on Thursday 24 May 2007. The purpose of this survey was to identify which trees are most suitable for retention in the subdivision design. It is recommended that a more detailed tree health assessment be undertaken by a qualified arborculturalist to confirm suitable individual trees for retention.

The outcome of the health survey was that there was consistency in vegetation health across the three complexes. However, the quality of Tuarts was considered comparatively good, as was the quality of Marri. This area is not the usual habitat for Jarrah trees, and as such the Jarrah trees were considered in only moderately good condition compared to its usual habitat and the health / quality / condition of the other two vegetation types.

3.3.1 Bush Forever

There are no Bush Forever Sites located across the three properties, or within the general vicinity of the site.

However, the relatively dense Marri stand along Baldivis Road and the denser area of Tuarts/Jarrah within Lot 740 are identified as "Other Native Vegetation" within the Bush Forever document. This does not accord the vegetation as having any known protection; it merely recognises that native vegetation exists.

3.4 Significant Flora

3.4.1 State-Listed Species

A search of the DEC's Declared Rare and Priority Flora (DRF) databases was conducted in May 2007. The results of the searches indicated (on both occasions) that no DRF are known to exist on the site.

In the initial phases of structure planning, the location of known DRF (i.e. that were recorded from the DEC DRF database search) were plotted in relation to the site. The closest individual was located approximately 4.5 km from the site.

3.4.2 Federally-listed Species

A search of the Department of Environment, Water, Heritage and the Arts' *Environment Protection and Biodiversity Act 1999* (EPBC Act) "Protected Matters" database was undertaken on 21 July 2009. This database provides information on species on or within the vicinity of the site that are considered "Matters of National Environmental Significance (NES)". These NES require protection under the EPBC Act.

The search resulted in the following species of national significance being recorded as having the potential to occur on site (Table 1).

Table 1: Federally-listed Significant Flora that have Potential to Utilise the Site

Latin Name	Common Name	Status	Potential Presence on Site
Drakaea micrantha	Dwarf Hammer-Orchid	Vulnerable	X
Hemigenia ramosissima		Critically Endangered	X
Lasiopetalum sp.	Wing-Fruited Lasiopetalum	Endangered	X
Lepidosperma rostratum	Beaked Lepidosperma	Endangered	X

X = definitely not or unlikely to occur
√ = possible occurrence

None of these species is likely to be found on the site, due to the lack of suitable soil types and/or vegetation communities.

Drakaea micrantha is known to occur in small scattered populations throughout the south-west between Perth and the Porongorups, on white-grey sand in Banksia and Jarrah woodland. The presence of Jarrah and the sandy soils suggest the site could have supported this small orchid. However, the lack of a healthy understorey means the presence of this species is, at present, unlikely (the species is usually found in Banksia and Jarrah woodland under *Kunzea ericifolia* thickets. (Hoffman and Brown 1998; Florabase 2009).

Hemigenia ramosissima is known from only five locations in the vicinity of Arthur River (Florabase 2009). It occurs in winter-wet areas on laterite and clay. The distance from the species' known range, and the sandy nature of the soils means it is extremely unlikely that the site would support populations of this species.

Two *Lasiopetalum* species are listed under the EPBC Act as "Endangered". *L. rotundifolium* is known from the Avon Wheatbelt bioregion of the south-west and is extremely unlikely to occur on the site. *L. pterocarpum* is known from a small area approximately 20 km east of the Baldivis site. It occurs on clayey sand over granite and is associated with riparian vegetation along creek lines (DEWHA 2009). Therefore, it is also unlikely to occur on site due to its specific habitat requirements.

Lepidosperma rostratum is known from nine records near Perth (Florabase 2009), on clay and sandy clay in seasonally-wet, poorly-drained flats. The Baldivis site does not provide suitable habitat to support the species so its presence is extremely unlikely.

3.4.3 Spring Survey

A spring Level 1 flora and vegetation survey was conducted during October 2009, according to the EPA Guidance Statement No.51 Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia. The purpose of this survey was two-fold:

1. To provide detailed vegetation type and condition mapping for the site.
2. Confirm (or otherwise) the results obtained from the DEC database searches.

No flora species of significance were identified as part of the spring survey.

3.5 Potential Native Fauna

The likelihood of the site providing preferential habitat to native fauna is varied. Given the parkland cleared nature of the site, the potential for the site to provide habitat to ground dwelling animals is minimal. However, the large trees on site provide good canopy habitat for certain avian species that prefer Marri/Jarrah/Tuart habitat.

During the site visit in May 2007, Western Grey Kangaroos were observed at the site. These kangaroos appear to be relocating south, away from continuing development currently being constructed north of the site.

3.5.1 State-listed Species

A search of the DEC's Declared Rare and Threatened Fauna database highlighted a number of species of significance that could potentially utilise the subject land (Table 2).

Table 2: State-listed Significant Fauna that have the Potential to Utilise the Site

Latin name	Common name	Potential Presence on Site
Schedule 1 – Fauna that is rare or is likely to become extinct		
Dasyurus geoffroii	Chuditch	X
Calyptorhynchus baudinii	Baudin's Black Cockatoo	√
Schedule 4 – Other specially protected fauna		
Morelia spilota imbricata	Carpet Python	X
Priority 4 – Taxa in need of monitoring		
Macropus irma	Western Brush Wallaby	X
Ixobrychus minutus	Little Bittern	X
Burhinus grallarius	Bush Stonecurlew	X
Charadrius rubricollis	Hooded Plover	X
Numenius madagascariensis	Eastern Curlew	X
Morelia spilota imbricata	Carpet Python	X
Priority 5 – Taxa in need of monitoring (conservation dependant)		
Isoodon obesulus fusciventer	Quenda	X

X = definitely not or unlikely to occur
√ = possible occurrence

Of these species, only the Baudin's Black Cockatoo is considered to have the potential to utilise the site, due to the on-site environmental characteristics not being suitable habitat for the other species. This is mainly concerned with the lack of understorey, and thus protection for ground dwelling species.

Baudin's Black Cockatoo *"occurs in high-rainfall areas, usually at sites that are heavily forested and dominated by Corymbia calophylla (Marri) and Eucalyptus species, especially E. diversicolor (Karri) and E. marginata (Jarrah)"* (DEWHA website, 2009c), of which Marri and Jarrah are both present on site.

Baudin's Black Cockatoo feed on "mainly of the seeds of eucalypts (e.g. Marri, Jarrah), supplemented with insect larvae and the seeds of other plants such as *Banksia*, *Dryandra*, *Erodium, Hakea, Malus sylvestris* (apple) and *Pyrus communis* (pear), and occasionally with nectar from Marri or other plants (Higgins 1999; Robinson 1960; Saunders 1974, 1979; Storr 1991)" (DEWHA website 2009c).

3.5.2 Federally-listed Species

A search of the Department of Environment, Water, Heritage and the Arts' EPBC Act "Protected Matters" database was undertaken on 21 July 2009. The search resulted in the following species of national significance being recorded as having the potential to utilise the site (Table 3).

Table 3: Federally-listed Significant Fauna that have the Potential to Utilise the Site

Latin Name	Common Name	Status	Potential Presence on Site
Birds			
Calyptorhynchus banksii naso	Forest Red-Tailed Black Cockatoo	Vulnerable	√
Calyptorhynchus baudinii	Baudin's Black Cockatoo	Vulnerable	√
Calyptorhynchus latirostri	Carnaby's Black-Cockatoo	Endangered	some possibility
Haliaeetus leucogaster	White-Bellied Sea Eagle	Migratory	X
Merops ornatus	Rainbow Bee-Eater	Migratory	some possibility
Ardea alba	Great Egret, White Egret	Migratory	X
Ardea ibis	Cattle Egret	Migratory	X
Apus pacificus	Fork-Tailed Swift	Migratory	X
Insects			
Synemon gratiosa	Graceful Sun Moth	Endangered	X
Mammals			
Dasyurus geoffroii	Chuditch, Western Quoll	Vulnerable	X
Phascogale calura	Red-Tailed Phascogale	Endangered	X
Setonix brachyurus	Quokka	Vulnerable	X

X = definitely not or unlikely to occur
√ = possible occurrence

Of the species listed in Table 3, the habitat at the site is considered to have the potential to support the following species:

- Forest Red-Tailed Black Cockatoo
- Baudin's Black Cockatoo
- Carnaby's Black-Cockatoo *(although this species prefers the protection offered by stands of dense trees)*
- Rainbow Bee-Eater *(although this species is known to occur in a large range of habitats types)*.

According to an information sheet produced by the Billabong Sanctuary (http://www.billabongsanctuary.com.au/aussie_animals/blackcockatoo.html), the Forest Red-Tailed Black Cockatoo "lives in the crown of eucalypt forests, feeding mainly on the large woody seeds of the marri (*Eucalyptus calophylla*)." The large Marri trees on site therefore provide potential foraging habitat for this species.

As detailed in Section 3.5.1, the presence of Marri and Jarrah on the site creates potential foraging opportunities for the Baudin's Black Cockatoo and Carnaby's Black-Cockatoo.

Although the preference habitat for the Carnaby's Black-Cockatoo is generally considered to be Banksia Woodland, after the breeding season this species migrates to areas of higher rainfall along the coast, where they feed on a variety of introduced and native plant species, including Kwongan Heath species (*Banksia, dryandra, hakea, grevillea* and marri seeds). Therefore, the presence of Marri on site does mean the site has some potential to support foraging opportunities for this species.

According to DEWHA website (2009c), the Rainbow Bee-Eater *"occurs mainly in open forests and woodlands, shrublands, and in various cleared or semi-cleared habitats……It usually occurs in open, cleared or lightly-timbered areas that are often, but not always, located in close proximity to permanent water… in open woodlands and shrublands, including mallee, and in open forests that are usually dominated by eucalypts. It also occurs in grasslands…"* The Rainbow Bee-Eater feeds mainly on insects, with the largest component consisting of bees and wasps. As such, the site does appear to have potential to support this species; however it is unlikely the habitat available would be considered a preferred habitat for this species.

The remaining species are unlikely to be supported by the habitat characteristics at the site.

3.6 Wetlands, Hydrology and Drainage

3.6.1 Wetlands

The site does not contain any mapped wetlands according to the Department of Environment and Conservation's geomorphic wetland mapping database. This was confirmed via site inspection in May 2007.

3.6.2 Groundwater

The site has a large separation distance to groundwater. The Perth Groundwater Atlas (1997) mapping shows the Average Annual Minimum Groundwater Levels (AALGL) at between approximately 1.8 mAHD and 3.5 mAHD (Figure 5). This equates to a depth to groundwater range of between approximately 3.7m in the south-east corner and 36.25 m at the highest point along the ridge.

Due to the depth to groundwater, any drainage channels or basins (constructed at the site are unlikely to retain open water.

Regional groundwater flow is in an east-south-easterly direction across the site, toward the Serpentine River.

3.6.3 Surface Water

No drainage channels exist across the site.

The sandy soils and undulating topography will enable rapid filtration of stormwater and as such, present good opportunities for drainage and public open space in localised low areas and stormwater swales in road reserves. Road drainage swales allow for smaller drainage basins in public open space.

3.7 Acid Sulfate Soils

According to the WAPC Planning Bulletin No. 64 Acid Sulfate Soils, regional Acid Sulfate Soils (ASS) mapping for the area identifies the majority of site as "No Known Risk of ASS occurring within 3 m of natural soil surface (or deeper)", with the south-western corner of the site mapped as "Moderate to Low Risk of ASS occurring within 3 m of natural soil surface" (Figure 6).

3.8 Contamination Potential

During the site visit in May 2007, it was identified that past land uses undertaken across the site may have the potential to have caused soil and/or groundwater contamination.

The following land uses are of particular interest:

- The lessee of Lot 739 farmed approximately 500–1000 ostriches; a land use which ceased over five years ago. The animals were bred for their eggs.
- Also, Lot 740 contains poultry sheds, which ceased operation around two to three years ago.
- The poultry sheds were previously used as part of a piggery. The dam on Lot 739 was used to contain the run-off water from the piggery.

The site is not registered on the Department of Environment and Conservation's Contaminated Sites Register as known or potentially contaminating. The closest site is approximately 10 km to the north-north-west and given groundwater flow if predominantly from east to west-south-west, it is unlikely that any potential contamination from this would have spread to the subject land.

A Preliminary Site Investigation (PSI) was undertaken over the site during 2009. The PSI identified the following potential sources of contamination and potential constraints on development, with further details available in the PSI report:

- pig shed subsurface drainage lines, drainage sumps and the dam system that received wash-water and run-off – metals, phenols, bacteria, nutrients, BOD, solvents, TPHs, oil and grease
- animal plunge dip and surrounding yards – metals and metalloids, OC and OP pesticides
- animal waste areas including the former abattoir – nutrients, pathogens, TSS, oil and grease
- vehicle storage, repair and engineering maintenance workshops – solvents, TPHs, BTEX, PAHs, phenols, trace metals, acids and alkalis
- fuel storage tanks and drums – trace metals, TPHs, BTEX, PAHS, phenols, oil and grease
- old car bodies, spent drums and scrap metal dumped on various properties – metals, TPHs, PAHs, BTEX, phenols
- old batteries – trace metals
- termiticide residues under current and former buildings – arsenic, OC/OPs, synthetic pyrethroids
- buried or underground pipework/infrastructure – asbestos cement materials
- remnant building and demolition materials – asbestos cement materials.

Based on the findings of this PSI, further investigations comprising a soil and groundwater Sampling and Analysis Plan are required to assess the nature, extent and magnitude of contamination (if present) at the identified locations. The need for remedial works will be identified following site specific investigations.

At this time, the results from the PSI have been submitted to an independent auditor for review. The auditor's comments have been incorporated into the final version of the report (Draft C – January 2010). Early planning for the Sampling and Analysis Plan is underway.

3.9 Heritage Values

3.9.1 Aboriginal Heritage Values

A search of the Department of Indigenous Affairs' Heritage Register indicated that there are no known archaeological or ethnographic Aboriginal sites recorded on the project

site. The nearest known site lies immediately south of Sixty Eight Road, just over 500 m south of the subject land.

If any archaeological material is discovered during subdivision development, construction within that area will cease immediately and the findings be reported to the Department of Indigenous Affairs.

3.9.2 European Heritage Values

There are no areas of European Heritage recorded as being on, or within the vicinity of, the site. The closest are the Baldivis Primary School, Group Settler's home and a natural bush reserve at the rear of the school, located along Fifty Road, approximately 5 km north of the site (http://register.heritage.wa.gov.au/).

3.10 Land Use Considerations

There are some existing land uses within the vicinity of the site of which land use separation / buffers have been considered. Land separation distances are recommended by the EPA to reduce negative potential impacts of the activities on sensitive land uses (such as future residential areas).

3.10.1 Parmelia High Pressure Gas Pipeline

The Parmelia High Pressure Gas Pipeline is located within the site, running diagonally from north-west to south-east, in the eastern third of the property. This pipeline was constructed in 1971, and carries gas from Dongara to Pinjarra.

The Western Australian Planning Commission (WAPC) prepared a Draft Planning Bulletin for Planning and Development in the Vicinity of High Pressure Gas Transmission Pipelines (WAPC, 2005). This document was finalised in October 2007, as Planning Bulletin No.87 – High Pressure Gas Transmission Pipelines in the Perth Metropolitan Region.

Buffer distances are provided in WAPC (2007) for the Parmelia Pipeline south of Caversham, thus being:

- 70 m to sensitive land uses (e.g. schools)
- 65 m to residential development
- 45 m to industrial commercial development.

Schedule 8 "Environmental Conditions" of the City of Rockingham's Town Planning Scheme No.2 specifies appropriate setbacks to development, as determined by council, according to the following categories:

1. 96 m to sensitive development (including aged persons accommodation, child care centres, schools and hospitals).

2. 32 m to the boundary of each residential lot.

3. 96 m from the centre of the pipeline to all other uses and developments which facilitate the gathering of people.

These stated distances are "from the centre of the high pressure natural gas pipeline".

3.10.2 Sand Quarry

A sand quarry exists to the immediate south of the site. Operations within Lots 569 and 1263 Baldivis Road have been completed but an extension into Lot 21 (to the west) has been proposed. As such, operations within this area are anticipated to continue for a number of years.

According to EPA Guidance Statement No. 3 – Separation Distances between Industrial and Sensitive Land Uses (2005), a separation distance of 300–500 m depending on size is suggested between sensitive land uses (such as residential development) and "extractive industries – sand and limestone extraction", where no grinding or milling works are undertaken on site. The buffer distance is recommended due to the potential for any of noise and/or dust impacts from these operations.

The recommended buffer distance represents a "generic buffer" distance. The practice of the EPA is to give consideration to alternative buffer distances or management practices based upon site specific analysis that can be demonstrated to meet the required environmental standards specific to various emissions.

3.10.3 Market Gardens

The City of Rockingham's Statutory Planning Section also advised that the market garden existing to the south of the site (at the intersection of Sixty Eight Road and Wandoo Drive) has a current permit for market garden activities.

According to the EPA's Guidance Statement No.3, the EPA identifies the need for a default development setback of 300–500 m, depending on size, to protect future residents from the potential impacts of gaseous, noise, dust and odour. This market garden is approximately 360 m from the closest point of the site.

Three additional market gardens were situated to the south-west of the site quite recently (starting from approximately 250 m away). However, a study of the most recent aerial photography indicates this land use has ceased on all three properties, all of which have since been earth worked.

3.10.4 Disused Orchard

An orchard is located immediately west of the site, adjoining the south-western corner of the site. However, this is no longer used and thus the activity itself poses no impacts to future residents.

3.10.5 Paintball Facility

A paintball recreational facility exists on Lot 739. The main impact likely to be experienced from this facility is noise. However, this land use is not listed in the EPA's Guidance Statement No.3.

In any regard, RPS understands that this facility will cease operation upon the commencement of development.

4.0 PROPOSED STRUCTURE PLAN

The key environmental considerations for the site are shown in Figure 8. These environmental elements were taken into consideration in the proposed structure plan design (Figure 9).

The structure plan designed for the site has been prepared by Roberts Day (Version CGC BAL UDI 102D – 03.03.2010) and comprises the following elements:

- 846 single residential lots (a mixture of R15 to R40 density)
- Four grouped housing sites
- One aged care facility (3.26 ha)
- One primary school (3.5 ha)
- One neighbourhood centre (2.0 ha)
- Gas pipeline easement (4.9 ha)
- Public open space and drainage (8.2 ha).

The total size of the development is 88.5 ha, with 81.84 ha of developable area.

The main internal connection off Baldivis Road bisects the centre of the site east–west. The neighbourhood centre and aged care facility lies adjacent to the north of this road and the primary school lies to the south of it.

There are a total of seven areas of public open space within the proposed structure plan area (including the gas pipeline easement). In addition, three areas are designated for drainage along Baldivis Road; two at the main entry to the development and one in the south-eastern corner of the site.

The public open space in the north-west corner will provide a regional open space function. The gas easement is also provides a long, linear open space corridor. The last large area of public open space is connected to the southern boundary of the proposed primary school.

There is potential to retain some trees within these public open space areas, particularly the gas easement and the public open space attached to the school. The larger public open space areas may also provide the dual function of drainage if required. There are only two locations where road reserves cross the gas pipeline easement.

This page is intentionally blank.

5.0 SAND EXCAVATION AND EARTH-WORKING

5.1 Sand Excavation Proposal

Prior to residential development it is proposed that sand extraction activities will be undertaken across the central portion of the site. The intention of this process is two-fold:

1. To reduce the land to a maximum elevation of 30 mAHD, (which is the highest level that can be serviced by the potable water supply) and then grade down from this level, generally to 28 mAHD, to grade roads for drainage.

2. To maximise the resource utilisation from the site. In order to promote the sustainable use/reuse of resources from the site, the unutilised sand resource will be available to other developments that require imported fill.

Figure 10 displays the areas in the centre of the site that will be excavated to approximately 30 mAHD and graded to around 28 mAHD, essentially showing the areas where sand excavation will occur.

5.1.1 Earth Working Activities

Further to the above, because of the steepness of the land, the intention is that all lots will be terraced to provide an appropriate development surface. This will essentially result in the majority of the site needing to be earth worked.

5.2 Environmental Considerations

As the majority of the site will require earth working; primarily as a result of the engineering constraints, and specifically the ability to service water to future lots, this will limit the amount of vegetation retention that can be achieved. However, wherever possible, native trees will be retained in public open space areas, to provide habitat for avian fauna species as well as provide a landscaping feature and shade to the recreational areas.

This page is intentionally blank.

6.0 LAND PLANNING CONSIDERATIONS AND MANAGEMENT RECOMMENDATIONS

6.1 Native Vegetation

6.1.1 Retention of Remnant Trees

Retention of native vegetation within the subdivision is constrained by the earthworks and servicing requirements. Potable water is only able to service lots to a maximum height of 30 mAHD, which means that the centre third of the site will require elevation modification.

Also, due to the steepness of the remainder of the site, earth-working to create terracing is also likely to be needed.

Wherever possible, the natural environmental values of the site will be retained. This is likely to consist mainly of individual trees within public open space areas. Retention of native vegetation within the final development helps to maintain some of the values and key characteristics of the pre-development land and it provides pleasing aesthetics to public open space, drainage channels and road reserves.

The City of Rockingham's general desire is to retain as much Tuart Woodland as possible within the municipality. This has been taken into consideration in the structure plan design, relative to the constraints of the site.

The structure plan design also aims to retain as many Marri trees as possible from the stand bordering Baldivis Road. Retention of Marri trees along Baldivis Road provide potential habitat for key fauna species, and could act as a buffer / visual entry statement to the development. There may also be potential for the trees bordering the gas pipeline easement to link to trees off site and act as a fauna corridor (or transport route).

6.1.2 Revegetation Works

Revegetation of strategic areas will enhance the retained vegetation stands post-development. Revegetation will also provide an opportunity to create an understorey of shrubs, providing additional potential habitat for native fauna as well as improve the visual landscape character of the development.

Landscaping will utilise local native plant species where possible, and will give due regard to the requirements for landscaping within the gas pipeline easement (as will be detailed in a Pipeline Protection Plan (or Pipeline Risk Management Plan).

6.2 Spring Flora Survey

Although the likelihood of any Declared Rare or Endangered Flora (State or Federal) occurring on the site is minimal, a targeted spring flora survey will be undertaken during spring 2009. This will be based on targeted searches for the species listed on the relevant significant species lists by the State Department of Environment and Conservation and Federal Department of Environment, Water, Heritage and the Arts.

6.3 Native Fauna Considerations

Partial retention of each native tree type will maximise the potential suitable habitat for any native fauna currently using the site to utilise it post-development. Use of the site following development, particularly by key bird species, can provide a natural, peaceful feel to the development, creating a relaxing ambience that would normally be associated with more rural settings.

Key consideration should be given to retaining potential preference habitat for significant species, as identified in Tables 2 and 3 (Section 3.5 of this report). As established in Section 3.5, the habitat on site is considered potential suitable habitat for the following species of significance:

- Forest Red-Tailed Black Cockatoo
- Baudin's Black Cockatoo
- Carnaby's Black-Cockatoo
- Rainbow Bee-Eater.

Retention of as many large trees as possible, particularly Marri, provides opportunities for all three Black Cockatoo species to nest in hollows (should any of these species actually be utilising the site at present).

In addition, appropriate roosting structures and other man-made structures that mimic tree habitat (eg. nesting boxes) will be provided for avian species at strategic locations throughout the development. This will further ensure the site can be utilised by native birds following residential development.

Prior to clearing and earth working activities, a fauna specialist will undertake a site walkover to check tree hollows for any nesting birds. It is also recommended that construction activities be scheduled so as to not coincide with the breeding season for the Black Cockatoo species, in an attempt to avoid unnecessary disturbance to breeding birds.

6.4 Hydrology

The large depth to groundwater means the residential land use is unlikely to impact groundwater resources post-development.

In any regard, urban water management strategies will be implemented and outlined in a Local Water Management Strategy. This document will prescribe water conservation strategies, as well as mechanisms to protect hydrological characteristics on site and off site.

The Local Water Management Strategy is currently being prepared and will be submitted to the City of Rockingham and the Department of Water as part of the structure plan approval process.

6.5 Acid Sulfate Soils

Given the sandy soil types, large depth to groundwater, the outcomes of the WAPC regional ASS mapping, and the fact that dewatering is not required, it is unlikely that ASS will be present on site.

6.6 Potential Contamination

There are three past land uses known to have been undertaken on the site that have the potential to have resulted in soil and/or groundwater contamination. There may also be additional land uses of interest. However, analysis of historical aerial photography will identify the presence or otherwise of such uses. The three land uses of interest known at this time include:

- The lessee of Lot 739 farmed approximately 500–1000 ostriches; a land use which ceased over five years ago. The animals were bred for their eggs.
- Lot 740 contains poultry sheds, which ceased operation approximately two or three years ago.
- The poultry sheds were previously used as part of a piggery. The dam on Lot 739 was used to contain the run-off water from the piggery.

The aim of the contamination investigations will be to ensure the disused poultry sheds, any animal wash down areas, the dam that took the piggery water, on site debris / machinery dumped at several locations across the site, and any other past land activities of interest have not caused soil or groundwater contamination. Under the requirements of the recently enacted *Contaminated Sites Act 2003*, any contamination on site is required to be remediated prior to development of the land for residential purposes.

Following the PSI, there is also the potential for contaminated material associated with storage and building materials.

Based on the findings of this PSI, further investigations comprising a soil and groundwater Sampling and Analysis Plan are required to assess the nature, extent and magnitude of contamination (if present).

It is worth noting that Schedule 8 "Environmental Conditions" of the City of Rockingham's Town Planning Scheme No.2 identifies for areas outside this site, the subject of Scheme Amendments, that a 'soil and Groundwater Contamination Investigation and Remediation Plan" was to be prepared. Although not specified specifically for this site, the standard requirements under the *Contaminated Sites Act 2003* will be followed, and the necessity for a similar Plan will be determined following analysis of the PSI results.

6.7 Land Use Buffer Considerations

6.7.1 Parmelia High Pressure Gas Pipeline

The Parmelia High Pressure Gas Pipeline is located diagonally from north-west to south-east in the eastern third of the property. WAPC (2007) recognises that setbacks to developments within the vicinity of high pressure gas transmission pipelines are required, and those relevant to the site are for the Parmelia Pipeline (south of Caversham).

In addition, Schedule 8 "Environmental Conditions" of the City of Rockingham's Town Planning Scheme No.2 identifies appropriate setbacks to development" (from the centre of the pipeline), as determined by Council, according to the following categories:

1. 96 m to sensitive development (including aged persons accommodation, child care centres, schools and hospitals).

2. 32 m to the boundary of each residential lot.

3. 96 m from the centre of the pipeline to all other uses and developments which facilitate the gathering of people.

Development Engineering Consultants (February 2010) states "the setback of 32 m from the gas main as detailed in the City of Rockingham summary is the current approach we are taking with APT". This report states that typically APT reviews the design at subdivision stage to ensure appropriate setbacks are achieved.

In addition to the appropriate setbacks, various mitigation measures will also be implemented to further protect future residents. These include:

- excavation of the pipeline and exposing the pipe – done by contractor appointed by APT
- backfill to sill level to place concrete cover
- placement of precast pieces of concrete cover and danger tape over the pipeline
- backfill to surface.

Development Engineering Consultants (February 2010) indicates that *"Table 6 of PB87 details the reduction in setback that can be achieved if a 3.0 m wide by 150 mm deep concrete slab is placed below the ground, but above the pipeline together with marker tape. This reduces the setback to the edge of the easement being around 5.5 m from the pipeline."*

In addition, a Condition of Subdivision is normally imposed that requires the preparation of a "Pipeline Protection Plan". This is likely to be requested for this site. The aim of the Plan is to ensure the land uses above the pipeline do not compromise its long-term integrity, and thus the safety of nearby developments and residents is promoted.

6.7.2 Sand Quarry

The proposed extension of sand excavation operations into Lot 21 Sixty Eight Road, Baldivis, would result in the activity continuing for some time into the future. As such, consideration to setbacks to residential development will need to be allowed.

6.7.3 Market Garden

The market garden located on Lot 19 Sixty Eight Road (intersection of Sixty Eight Road and Wandoo Drive) has recently been issued with another licence to continue operations (Fernandes; pers. comm. 2009). This market garden is located approximately 360 m to the immediate south of the site.

According to the EPA's Guidance Statement No.3, a default development setback of 300–500 m, depending on size, is recommended to protect future residents from the potential impacts of gaseous, noise, dust and odour. The current setback of approximately 360 m is considered sufficient due to the small scale of this operation.

This page is intentionally blank.

7.0 SCHEDULE 8 "ENVIRONMENTAL CONDITIONS"

The provisions below were developed as part of Scheme Amendments undertaken for areas outside this site. Although not relating to this site, the developer will have due regard for the relevant Provisions, and the objective of the Provision.

In particular, there is a commitment to prepare various Environmental Management Plans, and the requirements of the City regarding the High Pressure Natural Gas Pipeline are noted and considered.

A. Environmental Management Plans

A-1 The following Environmental Management Plans shall be prepared in accordance with the specifications set out in Attachment 1 of the Minister for the Environment's "statement that a Scheme may be Implemented" No. 000580 published on 19 December 2001, and shall be subsequently implemented in accordance with the provisions of the Plans

- Soil and Groundwater Contamination Investigation and Remediation Plan (if determined through the PSI process that this is necessary)
- Pipeline Protection Plan.

B. High Pressure Natural Gas Pipeline

B-1 The following activities, land uses and developments are prohibited within the high pressure natural gas pipeline easement

- ground disturbing activities, other than for the purposes for which the easement was created and for uses and developments that comply with Condition B-2 of these Environmental Conditions
- temporary residence (including caravans, camping and similar)
- storage of materials and equipment
- fires and barbecues
- explosives, inflammables and corrosives (including storage of liquefied petroleum gas and fuel oil)
- refuse disposal and landfill
- service stations, fuel lines and storage of fuel

- vegetation with an expected growth exceeding one metre in height and plantings within one metre of the centre of the pipeline (with the exception of lawn)

- large obstructions to line of sight along the easement.

B-2 The following uses and developments may be permitted within the high pressure natural gas pipeline easement with the written approval of the local government on advice of the pipeline operator, subject to compliance with the Pipeline Protection Plan referred to in Condition A-1 of this table

- cycleways and footpaths

- road crossings and services (with minimum depth of cover over the pipeline of 1.2 metres)

- public open space

- signage and other facilities that are necessary to comply with the Pipeline Protection Plan referred to in condition A-1 of this table

- car parking during the time that the adjoining land is being developed (with minimum depth of cover over the pipeline of 1.2 metres).

8.0 CONCLUSIONS

A key consideration for the site is the engineering constraints that result in most of the site requiring earth-working. In particular, potable water is only able to service lots to a maximum height of 30 mAHD, which means that the centre third of the site will be reduced to a suitable topographic elevation. This results in limited ability to retain existing trees across the site.

However, where possible existing remnant vegetation will be retained in public open space areas across the development, particularly within the public open space attached to the primary school. Retention of remnant vegetation will provide potential fauna habitat post-development, as well as maintaining a natural feel to the landscape character of the subdivision. Revegetation of certain areas will also assist in enhancing potential habitat for native fauna species.

Retention of any native trees post-development will maximise the potential for native bird species currently using the site to utilise it post-development.

In addition to the vegetation, the following key points and management strategies will be considered with regard to the proposed development.

1. Appropriate roosting structures and nesting boxes will be provided at strategic locations throughout the development to further ensure the site can be utilised by native birds following residential development.

2. There are three past land uses known to have been undertaken on the site that have the potential to have caused soil and/or groundwater contamination.

3. The structure plan recognises that development setbacks are required to the Parmelia High Pressure Gas Pipeline. The Engineering Services Report accompanying this report (DEC, 2010) indicates that a *reduction in (standard) setback…. can be achieved if a 3.0 m wide by 150 mm deep concrete slab is placed below the ground, but above the pipeline together with marker tape. This reduces the setback to the edge of the easement being around 5.5 m from the pipeline."*

   In addition, it is likely that a Condition of Subdivision will be imposed at subdivision stage, requiring the preparation of a "Pipeline Protection Plan". The aim of this Plan is to ensure the land uses above the pipeline do not compromise its long-term integrity, and thus the safety of nearby developments and residents is promoted.

4. The proposed extension of sand excavation operations into Lot 21 Sixty Eight Road, Baldivis, would result in the activity continuing for some time into the future. As such, consideration will need to be allowed for setbacks to residential development within the site.

Further environmental investigations and reporting will be necessary to further characterise the site, and enable detailed subdivision design to occur. The following investigations / surveys / reports will be undertaken /prepared prior to subdivision of the site for residential purposes:

- A targeted spring flora survey will be undertaken during 2009 to confirm or deny the presence of any Declared Rare or Endangered flora species.

- Although Schedule 8 "Environmental Conditions" of the City of Rockingham's Town Planning Scheme No.2 does not relate to this site in particular, the stated provisions have been considered. A Pipeline Protection Plan will be prepared for this site, with the aim of the Plan being to ensure the land uses above the pipeline do not compromise its long-term integrity, and thus the safety of nearby developments and residents.

- A Preliminary Site Investigation (PSI) for potential contamination has been completed and submitted to an independent auditor for review. Preliminary planning is underway for progressing a Sampling and Analysis Plan as part of the requirements under the *Contaminated Sites Act 2003*.

- Urban water management strategies will be implemented and outlined in a Local Water Management Strategy. This document will prescribe water conservation strategies, as well as mechanisms to protect hydrological characteristics on site and off site. The Local Water Management Strategy is currently being prepared and will be submitted as part of the structure plan approvals process. An Urban Water Management Plan will provide greater detail at subdivision stage.

9.0 REFERENCES

Bowman Bishaw Gorham. (2004). Dampier to Bunbury Natural Gas Pipeline Corridor Widening – Kwinana to Bunbury Project – Strategic Environmental Review. Unpublished report prepared for the Gas Pipeline Working Group, Department of Industry and Resources, Perth.

City of Rockingham Planning Procedure 1.6 Preparation and Assessment of Structure Plans , City of Rockingham, Western Australia.

City of Rockingham Town Planning Scheme No.2 – District Zoning Scheme - Scheme Text, Gazetted 19 November 2004, City of Rockingham, Western Australia.

Davidson, W.A. (1995). Hydrogeology and Groundwater Resources of the Perth Region, Western Australia. Western Australia Geological Survey, Bulletin 142.

Department of Environment. (2001–2003). Contaminated Sites Management Series. Department of Environmental, Perth.

Department of Environment. (2004). Perth Groundwater Atlas, Second Edition. Department of Environment, Perth.

Department of Environment and Conservation. (2009). – accessed on 29 July 2009 http:// www.dec.wa.gov.au/news/department-of-environment-and-conservation/ rare-sunmoth-discovered-in-sorrento.html

Department of Environment, Water, Heritage and the Arts website. (2009a). – accessed Federal "Matters of National Environmental Significance" database on 21 July 2009 http://www.environment.gov.au/erin/ert/epbc/index.html.

Department of the Environment, Water, Heritage and the Arts website. (2009b). "Species Profile and Threats" database. Accessed online, 21 July 2009. http://www. environment.gov.au/cgi-bin/sprat/public/publicthreatenedlist.pl? wanted=flora.

Department of Environment, Water, Heritage and the Arts website. (2009c). Accessed 'species Profile and Threats" database on 29 July 2009 http://www.environment.gov. au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=XXX# habitat

Department of Environmental Protection. (1997). *Environmental Protection (Noise) Regulations 1997*, state government, Western Australia.

Department of Environmental Protection. (2001). Contaminated Sties Management Series – Potentially Contaminating Activities, Industries and Landuses. Department of Environmental Protection, Perth.

Development Engineering Consultants (March 2010) Lots 635, 739 and 740 Baldivis Road, Baldivis – Engineering Services Report (Ref PRO519), Development Engineering Consultants Pty Ltd, Perth, Western Australia.

Environmental Protection Authority. (2005). Guidance for the Assessment of Environmental Factors (in accordance with the *Environmental Protection Act 1986*) – Separation Distances between Industrial and Sensitive Land Uses. Guidance Statement No. 3, June 2005. Environmental Protection Authority, Perth.

Environmental Protection Authority. (2008). Environmental Guidance for Planning and Development. Guidance Statement No. 33, May 2008. Environmental Protection Authority, Perth.

Environmental Protection Authority website – accessed 21 July 2009 *(http://www.epa.wa.gov.au/template.asp?ID=10andarea=ProfileandCat=Legislation)*

Fernandes, Tristan (pers. comm.) (2009). City of Rockingham Strategic Planning Officer, personal communication on 30 July 2009.

Florabase®. (2009). Department of Environment, Western Australian Herbarium http://florabase.calm.wa.gov.au/ Accessed Online, July 2009.

Government of Western Australia. (2000). Bush Forever: Keeping the Bush in the City: Volumes 1 and 2. Department of Environmental Protection, Perth.

Hoffman, N and Brown, A. 1998. *Orchids of South-West Australia.* University of Western Australia Press, Perth.

Water and Rivers Commission. (1997). Perth Groundwater Atlas. Water and Rivers Commission, Perth.

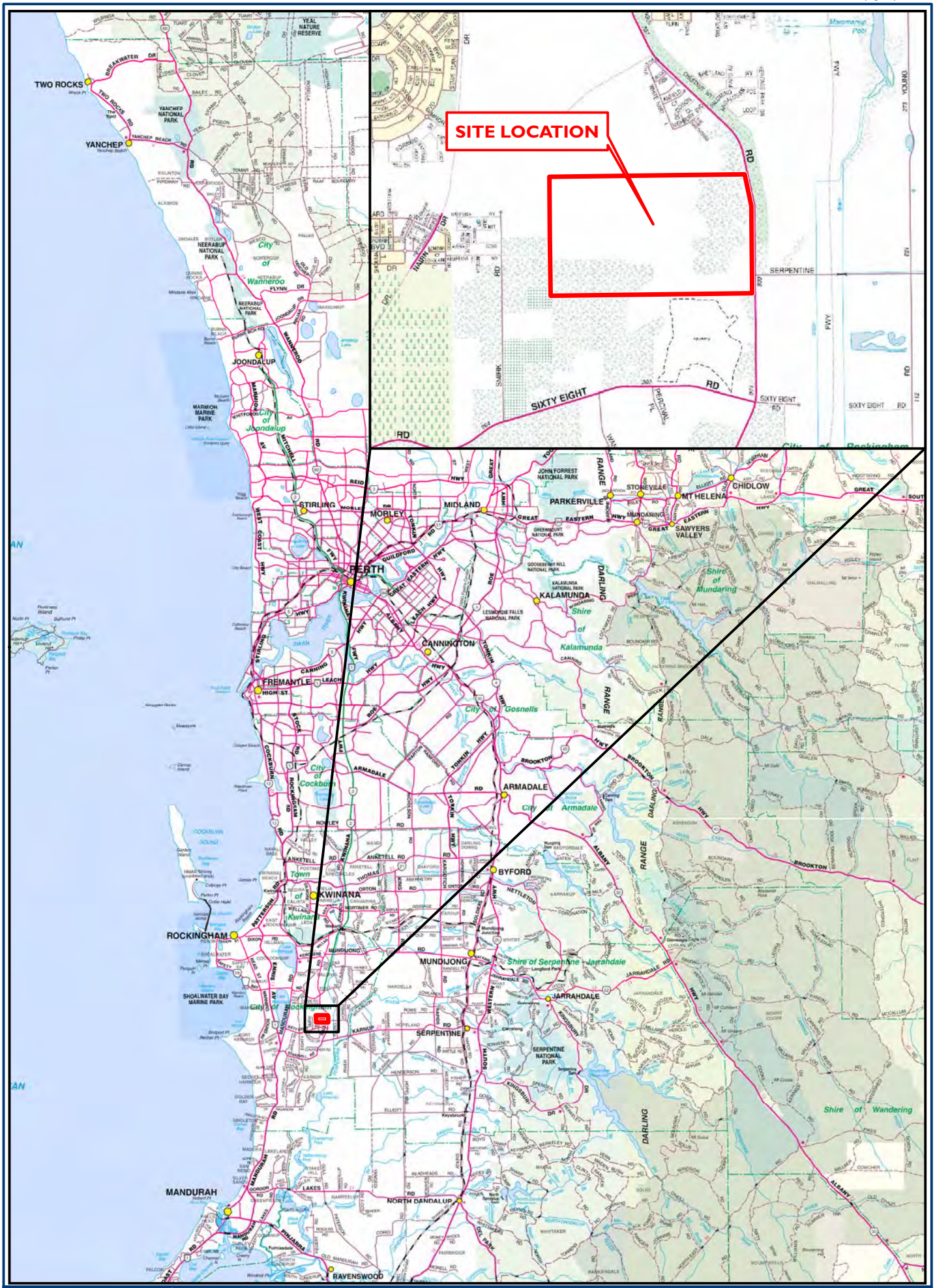
Water and Rivers Commission. (2003). Urban Stormwater Management in WA. Principles and Objectives. Water and Rivers Commission, Perth.

Western Australian Planning Commission. (2003, addendum May 2007). Planning Bulletin Number 64. Acid Sulfate Soils. Western Australian Planning Commission, Perth.

Western Australian Planning Commission. (October 2007). Planning Bulletin Number 87. High Pressure Gas Transmission Pipelines in the Perth Metropolitan Region. Western Australian Planning Commission, Perth.

FIGURES

290 Churchhill Ave Subiaco | T +61 8 93824744 | F +61 8 93821177 | www.rpsgroup.com.au



RPS

Job Number: L09189
Date: 09.06.09
Revision: A
Scale: 1:500000 @ A4
Drafted by: SF
Source: Landgate, 2008

Figure 1

Site Location

290 Churchhill Ave Subiaco | T +61 8 93824744 | F +61 8 93821177 | www.rpsgroup.com.au

LEGEND
- Cadastre
- Index contour (m)
- Intermediate contour (m)
- Site boundary

BALDIVIS RD

SERPENTINE RD

RPS

Job Number: L09189
Date: 23.07.09
Revision: A
Scale: 1:3500 @ A3
Drafted by: SF
Source: Roberts Day, 30.04.2009

0 12.5 25 50 75 100 metres

Figure 2

Topography

290 Churchhill Ave Subiaco | T +61 8 93824744 | F +61 8 93821177 | www.rpsgroup.com.au

LEGEND

Cadastre

Site boundary

Environmental geology mapping

S7 - SAND - pale yellowish brown, medium to coarse-grained, sub-angular to well-rounded quartz, trace of feldspar, shell debris, variably lithified, surface kankar, of eolian origin

S8 - SAND - very light grey at surface, yellow at depth, fine to medium-grained, sub-rounded quartz, moderately well sorted, of eolian origin as relatively thin veneer over C2, M4 and Mc2

S7

S8

BALDIVIS RD

SERPENTINE RD

RPS

Job Number: L09189
Date: 23.07.09
Revision: A
Scale: 1:3500 @ A3
Drafted by: SF
Source: Roberts Day, 30.04.2009. Environmental Geology - DoIR, 1999.

0 12.5 25 50 75 100 metres

Figure 3

Geology and Soils

290 Churchhill Ave Subiaco | T +61 8 93824744 | F +61 8 93821177 | www.rpsgroup.com.au

LEGEND

Cadastre

Site boundary

Vegetation complexes

J Jarrah *Eucalyptus marginata* subsp. *marginata*

M Marri *Corymbia calophylla*

T Tuart *Eucalyptus gomphocephala* and Jarrah *Eucalyptus marginata* subsp. *marginata*

CARROW BEND

THE HAWTHORNS

BALDWIS RD

SERPENTINE RD

RPS

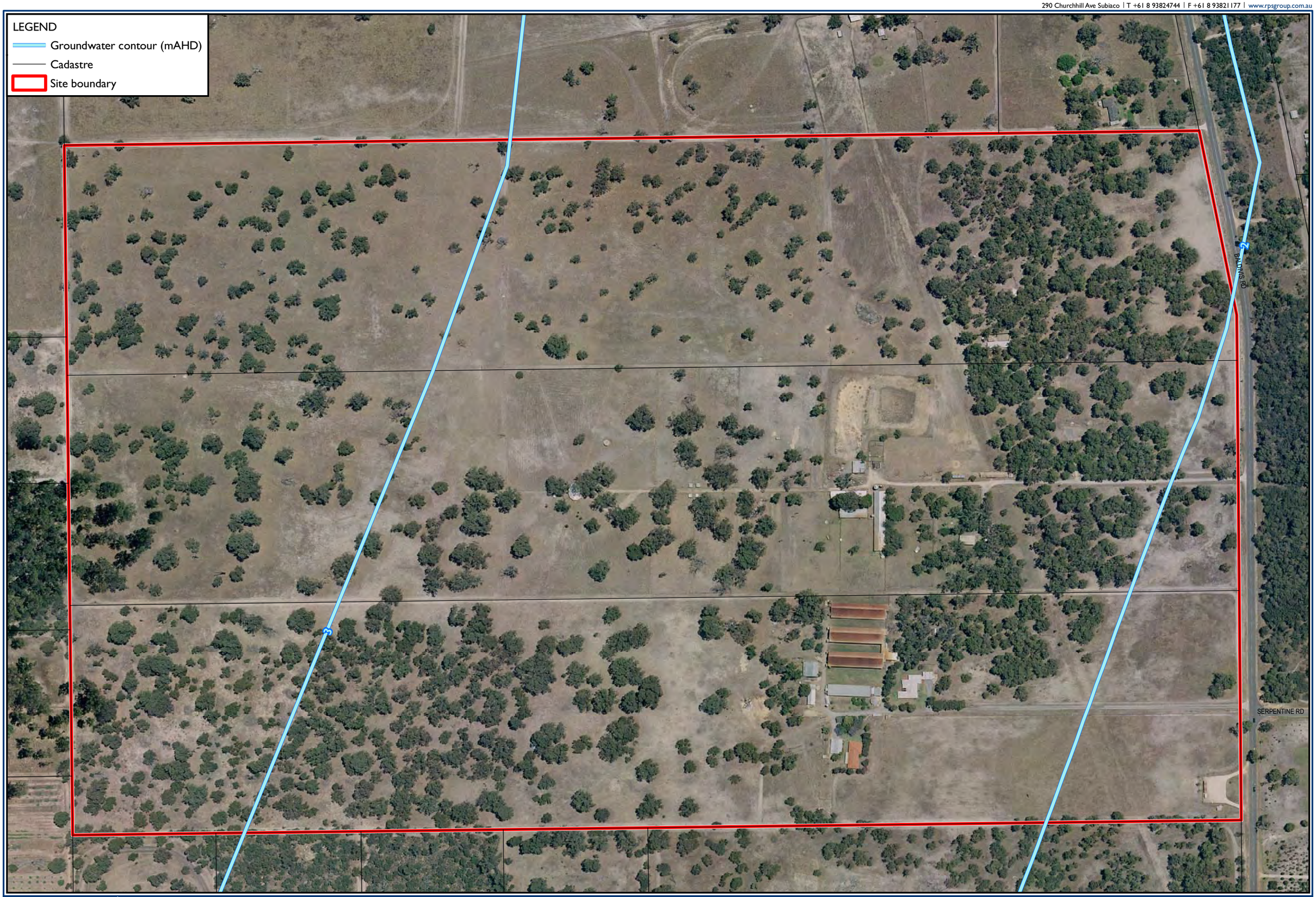
Job Number: L09189
Date: 23.07.09
Revision: A
Scale: 1:3500 @ A3
Drafted by: SF
Source: Roberts Day, 30.04.2009.

0 12.5 25 50 75 100 metres

Figure 4

Vegetation

290 Churchhill Ave Subiaco | T +61 8 93824744 | F +61 8 93821177 | www.rpsgroup.com.au



RPS

Job Number: L09189
Date: 23.07.09
Revision: A
Scale: 1:3500 @ A3
Drafted by: SF
Source: Roberts Day, 30.04.2009. Groundwater contours (historical (May 2003) minimum in mAHD) - DEC,2004

0 12.5 25 50 75 100 metres

Figure 5

Groundwater Contours

290 Churchhill Ave Subiaco | T +61 8 93824744 | F +61 8 93821177 | www.rpsgroup.com.au

LEGEND

Cadastre

Site boundary

Acid sulfate soil risk mapping

High to moderate risk of ASS occuring within 3m of natural soil surface

Moderate to low risk of ASS occuring within 3m of natural soil surface

No known risk of ASS occuring within 3m of natural soil surface (or deeper)

CARROW BEND

THE HAWTHORNS

BALDIVIS RD

SERPENTINE RD

RPS

Job Number: L09189
Date: 23.07.09
Revision: A
Scale: 1:3500 @ A3
Drafted by: SF
Source: Roberts Day, 30.04.2009. Acid sulfate soil risk mapping - DEC, 31.07.2008.

0 12.5 25 50 75 100 metres

Figure 6

Acid Sulfate Soils

290 Churchill Ave Subiaco | T +61 8 93824744 | F +61 8 93821177 | www.rpsgroup.com.au

LEGEND

- 300 m Market Garden buffer
- 500 m Market Garden buffer
- 300 m Sand Quarry buffer
- 500 m Sand Quarry buffer
- Cadastre
- Site boundary

HARPERIA WY
SMIRK RD
SETARIA RTT
AVENA GDNS
KEMPEANA WY
BADDIS RD
SERPENTINE RD

500 m Sand Quarry buffer
DAM (USED FOR EX-PIGGERY)
300 m Sand Quarry buffer
RECREATION (PAINTBALL FACILITY)
DISUSED POULTRY SHEDS
500 m Market Garden buffer
RESIDENCE
DISUSED ORCHARD
300 m Market Garden buffer
SAND QUARRY
MARKET GARDEN

RPS

Job Number: L09189
Date: 03.08.09
Revision: A
Scale: 1:5000 @ A3
Drafted by: SF

0 25 50 100 150 200 metres

Source: Roberts Day, 30.04.2009. Groundwater contours (historical (May 2003) minimum in mAHD) - DEC,2004. ASS mapping - DEC, 10.06.2009. Aerial photograph - Landgate, 2009.

Figure 7

Land Use

290 Churchhill Ave Subiaco | T +61 8 93824744 | F +61 8 93821177 | www.rpsgroup.com.au

HARPERIA WY
SMIRK RD
SETARIA RTT
AVENA GDNS
KEMPEANA WY
SERPENTINE RD

500 m Sand Quarry buffer
300 m Sand Quarry buffer
500 m Market Garden buffer
300 m Market Garden buffer

DAM (USED FOR EX-PIGGERY)
DISUSED POULTRY SHEDS
RESIDENCE
RECREATION (PAINTBALL FACILITY)
DISUSED ORCHARD
SAND QUARRY
MARKET GARDEN

LEGEND

- 300 m Market Garden buffer
- 500 m Market Garden buffer
- 300 m Sand Quarry buffer
- 500 m Sand Quarry buffer
- Parmelia high pressure gas pipeline
- 30 m Parmelia high pressure gas pipeline buffer
- Groundwater contour (mAHD)
- Index contour (m)
- Intermediate contour (m)
- Cadastre
- Site boundary

Acid sulfate soil risk mapping

- High to moderate risk
- Moderate to low risk

Vegetation complexes

- Jarrah *Eucalyptus marginata* subsp. *marginata*
- Marri *Corymbia calophylla*
- Tuart *Eucalyptus gomphocephala* and Jarrah *Eucalyptus marginata* subsp. *marginata*

RPS

Job Number: L09189
Date: 03.08.09
Revision: A
Scale: 1:5000 @ A3
Drafted by: SF
Source: Roberts Day, 30.04.2009. Groundwater contours (historical (May 2003) minimum in mAHD) - DEC,2004. ASS mapping - DEC, 10.06.2009. Aerial photograph - Landgate, 2009.

0 25 50 100 150 200 metres

Figure 8

Key Environmental Planning Considerations

38 Station Street Subiaco | T +61 9 9211 1111 | F +61 8 9211 1122 | www.rpsgroup.com.au

Lot	POS / Drainage / P.S. / Comm. Centre
635 (north)	4.0485 ha
739 (middle)	2.9739 ha
740 (south)	6.3424 ha
	Total 13.3648 ha

279m PIPELINE BUFFER
279m PIPELINE BUFFER
BALDIVIS ROAD
TRAMWAY RESERVE
POS/ DRAINAGE 2.1545ha
PAW
RETIREMENT 3.33ha
NEIGHBOURHOOD CENTRE 2.0ha
POS 2504m²
COMMUNITY CENTRE 5000m²
POS 6200m²
(0.6367ha)
PRIMARY SCHOOL 4.00ha
(3.3636ha)
POS 1789m²
Group Housing
POS/ DRAINAGE 4015m²
Group Housing
EASEMENT
POS 2.9636ha
EASEMENT 8902m2
POS 2900m²
POS/ DRAINAGE 4138m²
GROUP HOUSING
DRAINAGE 7016m²
16m road reserve
18m road reserve
22m road reserve
15m road reserve
14m road reserve
6m laneway

RPS

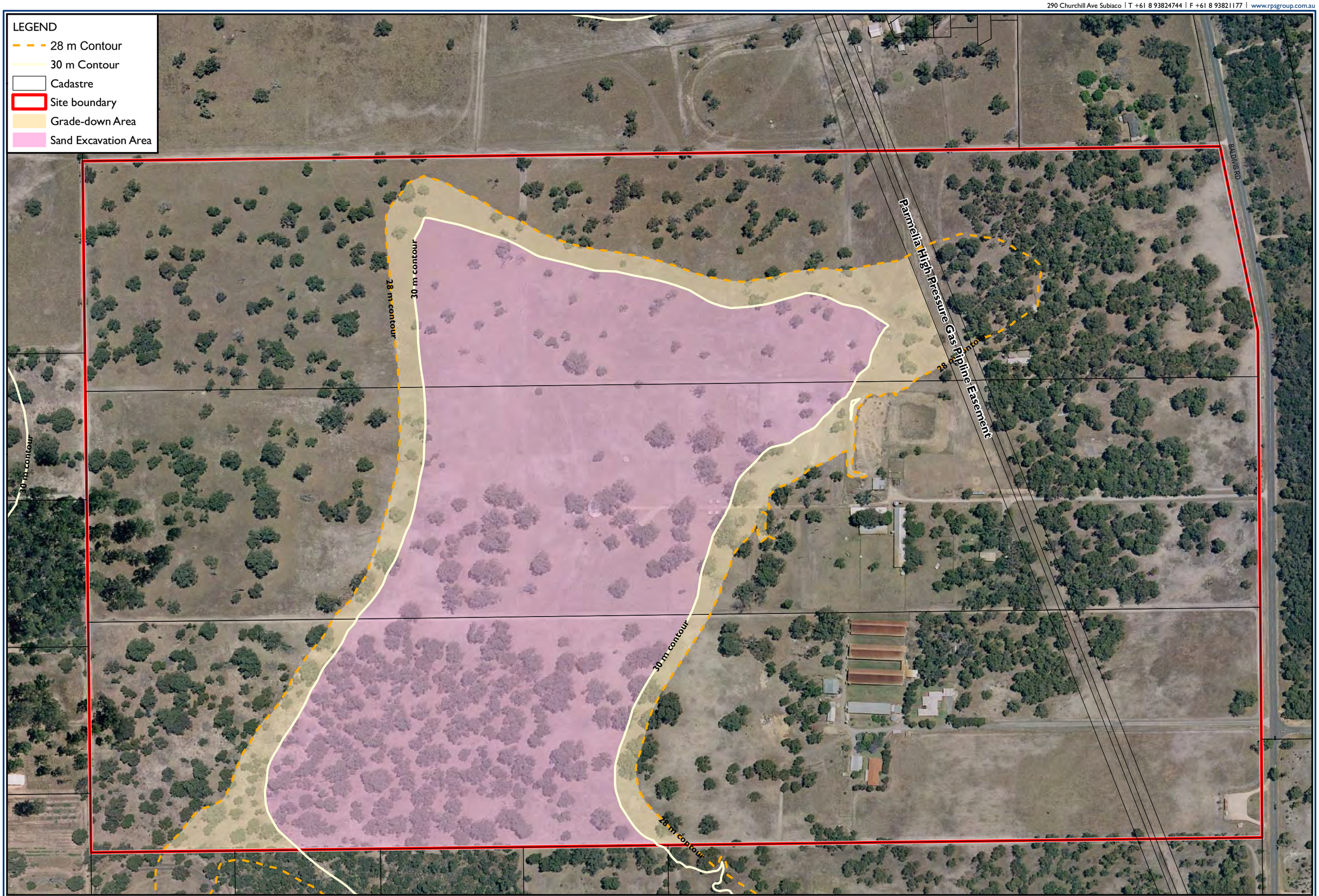
Job Number: L09189
Date: 05.09.11
Revision: A
Scale: 1:4000 @ A3
Drafted by: SC
Source: Roberts Day - CGC BAL UD1 102R - 24.08.11

0 25 50 100 150 200 metres

Figure 9

Proposed Structure Plan

290 Churchill Ave Subiaco | T +61 8 93824744 | F +61 8 93821177 | www.rpsgroup.com.au



RPS

Job Number: L09189
Date: 07.08.09
Revision: A
Scale: 1:3500 @ A3
Drafted by: SF
Source: Roberts Day, 30.04.2009

0 12.5 25 50 75 100 metres

Figure 10

Sand Excavation Area

RobertsDay
planning·design·place

level one
130 royal street east perth
wa australia 6004
t+61 8 9218 8700

level four
17 randle street surry hills
nsw australia 2010
t+61 2 8202 8000

33 chessell street
south melbourne
vic australia 3205
t+61 3 9645 0788

robertsday.com.au