PRECINCTS 1 & 2 THOMAS ROAD, CASUARINA

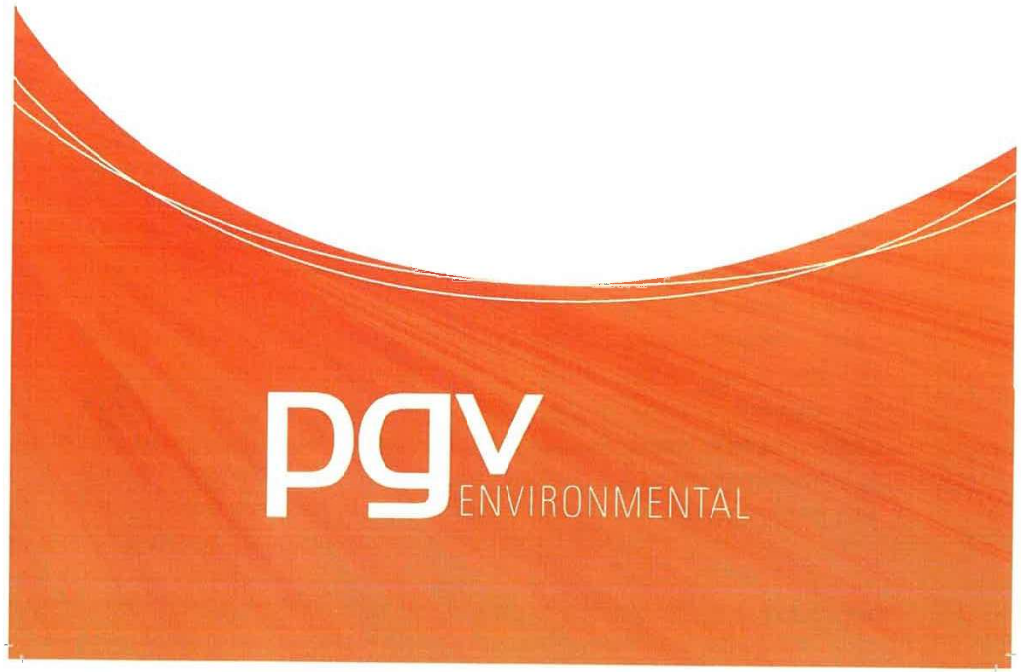
ENVIRONMENTAL ASSESSMENT

Prepared for: Aigle Royal Developments

Report Date: 15 November 2017

Version: 1

Report No. 2017-326



CONTENTS

LIST OF ATTACHMENTS

Plates

Figures

Appendices

1 INTRODUCTION

1.1 Site Location

Aigle Royal Developments is preparing a Local Structure Plan for Precincts 1 and 2 of Lots 3, 1199, 9011, 9012 and 9013 Thomas Road, Casuarina (the site). The site is located 30km to the south of the Perth Central Business District (Figure 1). The site is bounded by Thomas Road to the north, Kwinana Freeway to the west, 'Special Rural' lots to the south and the remainder of Lot 605, which is undeveloped to the east (Figure 2).

1.2 Local Structure Plan

The Local Structure Plan for the site seeks to provide a Mixed Business land use on the site as well as land for drainage (Appendix 1). Two High Voltage Power Easements run north to south through the area.

1.3 Planning Background

1.3.1 Zoning

The site is zoned 'Urban' in the Perth Metropolitan Region Scheme and has been identified for 'Mixed Use' under the City of Kwinana Town Planning Scheme and other strategic planning documents.

1.3.2 Scheme Amendments

The site was part of a suite of five scheme amendments under the Perth Metropolitan Region Scheme to rezone land from the 'Rural' zone to 'Urban Deferred' zone in June 2006. The suite of Scheme Amendments was referred by the Western Australian Planning Commission (WAPC) to the Environmental Protection Authority (EPA) under Part IV of the *Environmental Protection Act, 1986* (EP Act).

Amendment No. 1117/33 Jandakot Structure Plan, Cell 4 – Casuarina included the Local Structure Plan area. The EPA considered (15 March 2006) that Amendment 1117/33 did not need to be assessed under Part IV of the EP Act. The EPA provided advice in relation to regional drainage, Conservation Category wetlands, remnant vegetation, fauna, soil and groundwater contamination, emissions, noise and vibration.

1.3.3 Jandakot Structure Plan

The Jandakot Structure Plan was finalised in August 2007 and provides strategic direction to co-ordinate the development of the region while ensuring environmental, social and economic objectives are met.

The structure plan provides a guide to the future development of the area and management of key environmental issues. It includes potential development areas, road networks, major community facilities, conservation and Bush Forever areas, and a neighbourhood structure. It also provides proposals for the implementation of the plan such as zoning mechanisms, staging, and financial and management arrangements.

The site is shown as Mixed Use and Medium-Term Urban in the Jandakot Structure Plan.

1.3.4 Eastern Residential Intensification Concept

The Eastern Residential Intensification Concept (ERIC) was prepared by the Town of Kwinana in 2005 to provide strategic direction and refinement of the future urban areas identified within the Jandakot Structure Plan. The intensification concept comprises the cells of Mandogalup, Wandi, Anketell, Casuarina, Wellard (east) and Wellard (west) and defines a framework by which urban subdivision and development is able to occur in an orderly and co-ordinated manner.

The intensification concept was advertised for public comment in 2006 and is currently being revised by the City of Kwinana.

The site is largely shown as Mixed Business, with a portion of Residential/Business and a small portion of Residential R25 at the eastern end.

1.4 EPBC Approval

The proposed development of the site including Lot 9014 to the east was referred under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) in 2016. The development concept referred included the proposed clearing of 4.4ha of Banksia woodland and 20 potential breeding trees which provides foraging and potential breeding habitat for Black Cockatoos which are listed under the EPBC Act. The action was assessed to be 'Not a Controlled Action' (Appendix 2) and therefore has approval under the EPBC Act.

1.5 Scope of Works

The Environmental Assessment addresses the following environmental factors:

- Previous land uses and potential contamination;
- Surrounding land uses;
- Soil Types (ASS);
- Hydrology;
- Wetland Assessment;
- Flora and Vegetation Values;
- Fauna values; and
- Heritage.

2 EXISTING ENVIRONMENT

2.1 Land Use

2.1.1 Historical Land Use

In earliest available aerial photography in 1953 half of the site has been completely cleared and the other half contain scattered trees that appear in a range of condition from parkland cleared to an area in the north-west that is likely to have an intact understorey (Plate 1).

Plate 1: Historical aerial photograph from 1953 (Landgate, 2017)

8

Aerial photography from 1965 shows further clearing of the site in the south-west corner (Plate 2). The vegetation in the northwestern area remains as intact remnant vegetation.

Plate 2: Historical aerial photograph from 1965 (Landgate, 2017)

The January 2008 aerial photography shows most of the site was burnt (Plate 3).

Plate 3: Aerial photography from January 2008 (Landgate, 2017).

The site is not on the Contaminated Sites Database (DWER, 2017a). The site does not appear to have had any structures or land use that would cause contamination.

2.1.2 Current Land Use

The site is currently not being utilised for any purposes.

2.1.3 Surrounding Land Use

The balance of the Aigle Royal landholding to the east of Precincts 1 and 2 is generally vacant cleared land with some isolated trees and shrubs and a Resource Enhancement wetland that is vegetated to an extent. The southern boundary in the western part of the site is adjacent to the existing drainage reserve that is part of the Peel Sub-regional drainage corridor and is zoned as Parks and Recreation. Further south there are large lots that form part of a 'Special Rural' development to the south. The eastern part of the southern boundary is Part of Lots 9012 and 9013 that are subject to future planning (Appendix 1).

The Kwinana Freeway is located to the west of the site. The land to the north of Thomas road includes some remnant vegetation (Bush Forever Site 270) as well as a small horticulture industry and factory fertiliser and bird seed supply.

A Mushroom Farm is approximately 30m from the southern boundary. The potential impact of odour and noise on the future mixed use tenants on the site is discussed in section 3.1.

2.2 Topography

The site is predominantly flat and low lying. The elevation of the site varies between approximately 18 and 20m Australian Height Datum (AHD) (Figure 2).

2.3 Geology and Soils

2.3.1 Geology

The site is mapped as part of the Bassendean System and consists of very low relief, leached, grey siliceous Pleistocene sand dunes, intervening sandy and clayey swamps and gently undulating plains (Bolland, 1998). These soils are very leached, infertile and mildly acidic (DAFWA, 2017).

2.3.2 Soils

The soils on the site have been described by the Department of Agriculture and Food Western Australia (DAFWA) (2017) as:

- Bassendean B1 Phase (212Bs_B1) which are described as deep bleached grey sands sometimes with a pale yellow B horizon or a weak iron-organic hardpan at depths generally greater than 2m. These soils occur on extremely low to very low relief dunes, undulating sandplain and discrete sand rises; and
- Bassendean B3 Phase (212Bs_B3) are soils on closed depressions and poorly defined stream channels. These soils are moderately deep, bleached sands with an iron-organic pan, or clay subsoil. Surfaces are dark grey sand or sandy loam.

The B1 phase is located on the western part of the site and the B3 on the eastern. The B3 soils are associated with the lower lying areas on the site (Figure 3).

2.3.3 Acid Sulphate Soils

Acid sulphate soils (ASS) are wetland soils and unconsolidated sediments that contain iron sulphides which, when exposed to atmospheric oxygen in the presence of water, form sulphuric acid. ASS form in protected low energy environments such as barrier estuaries and coastal lakes and commonly occurs in low-lying coastal lands such as Holocene marine muds and sands. When disturbed, these soils are prone to produce sulphuric acid and mobilise iron, aluminium, manganese and other heavy metals. The release of these reaction products can be detrimental to biota, human health and built infrastructure (WAPC, 2009).

The ASS Risk on the site has been mapped by the Department of Environmental Regulation (DER) (Landgate, 2016) as being Moderate to Low (<3m from the surface) (National Map, 2017).

2.3.4 Phytophthora Dieback

Phytophthora Dieback (*Phytophthora cinnamomi*) is a soil-borne pathogen that infects the roots of vulnerable species, limiting the roots ability to take up water, thereby weakening or killing the host plant. The spores of Phytophthora Dieback are transported by water and in soil (DPaW, 2013). The limited number of native species on most of the site renders it 'Uninterpretable' for Phytophthora Dieback. The area of Banksia woodland in the north-west of the site was rated as Very Good to Good by GHD (2012) with no mention of any evidence of Dieback.

2.4 Hydrology

2.4.1 Groundwater

The Perth Groundwater Map shows the top of the groundwater table at 11m to 13mAHD and is approximately 3 to 5m below the ground surface. Groundwater is generally flowing to the west (DWER, 2017b). The groundwater around the wetland has geological formations that have been grouped into three distinct aquifers:

- Superficial Swan Aquifer;
- Leederville Aquifer; and
- Yarragadee North (DWER, 2017b)

2.4.2 Surface Water

Surface water flow will be limited due to the permeable nature of the sandy B1 phase soils. Any overland flow is likely to drain to the eastern lower lying areas and the Drainage Line to the south of the site.

2.4.3 Wetlands

The site contains part of 'Sandy Lake' which is classified as Multiple Use Wetland with the Unique Feature Identifier (UFI) 6669 as mapped in the DPaW's *Geomorphic Wetlands of the Swan Coastal Plain* dataset (National Map, 2017). Wetland UFI 6669 is a Sumpland which is defined as a seasonally inundated basin (Hill *et al.*, 1996).

2.5 Flora

Two vegetation and flora surveys have been undertaken over the whole Aigle Royal landholding including the balance of lots to the east of the structure plan area (GHD, 2012; Bennett Environmental, 2010). The GHD Survey was conducted in May 2012 and a follow-up spring survey of the area was conducted in October 2012 by Bennett Environmental. A total of 133 species have been recorded on the whole site, of which 79 were native species and 54 introduced. None of the species are Threatened or Priority flora. Three weed species listed below recorded on the site are Declared Pests under the *Biosecurity and Agriculture Management Act 2007* (BAM Act):

- Cotton Bush (*Gomphocarpus fruticosus*)
- Cape Tulip (*Moraea flaccida*); and
- Paterson's Curse (*Echium plantagineum*).

2.6 Vegetation

2.6.1 Vegetation Types

A total of seven vegetation types have been mapped on the whole site of which five occur in the structure plan area as well as (Appendix 5) (GHD, 2012 and Bennett Environmental, 2012). These are:

Banksia Woodland
Woodland of *Banksia attenuata*, *Banksia menziesii* and *Allocasuarina fraseriana* over Shrubland of *Hibbertia* spp., *Acacia* spp. and *Leucopogon conostephioides* over Grassland of *Ehrharta calycina* and *Briza maxima* over Sparse Sedgeland of *Schoenus curvifolius* and

Lepidosperma pubisquameum over Herbland of *Dasypogon bromeliifolius*, *Carpobrotus* spp. and *Phlebocarya ciliata.*

Eucalyptus and Melaleuca Open Woodland to Woodland
Open Woodland to Woodland of *Eucalyptus rudis*, *Corymbia calophylla* and *Melaleuca* spp. over weeds.

Mixed Myrtaceous Closed Shrubland
Closed shrubland of *Kunzea glabrescens*, *Melaleuca teretifolia* and *Melaleuca* spp. over Herbland of *Isolepis* spp. and *Carpobrotus* spp.

Sedgeland
Sedgeland of *Juncus kraussii* subsp. *australiensis* over Grassland of *Phalaris ?paradoxa.*

Cleared Paddocks
Scattered trees (*Eucalyptus* spp. and *Melaleuca* spp. and shrub species remain with an understorey dominated by introduced grass and herbs

2.7 Vegetation Condition

The Cleared areas on the site are rated as Completely Degraded and contain pasture weedy species. The Banksia woodland in the north-west part of the site was rated as being in Good to Very Good condition with areas of Degraded vegetation (GHD, 2012; Appendix 6).

2.8 Fauna

GHD (2012) conducted a Level 1 Fauna Survey of the site. The fauna habitat types were divided into five broad categories:

- Banksia Woodland – high habitat value for Black Cockatoos and other fauna species;
- Mixed Myrtaceous Closed Shrubland – recently burnt, small, fragmented with limited habitat value;
- Sedgeland – degraded and extensive weed invasion, would provide breeding habitat for frogs;
- Eucalyptus and Melaleuca Woodland – grazed extensively and there is limited diversity within the habitat type. Provide some roosting and cover for fauna species, particularly birds; and
- Cleared Paddocks – completely degraded very limited fauna habitat.

Conservation Significant species that may occur on the site are:

- *Calyptorhynchus latirostris* (Carnaby's Black Cockatoo);
- *Calyptorhynchus baudinii* (Baudin's Black Cockatoo);
- *Calyptorhynchus banksii naso* (Forest Red-tailed Black-Cockatoo);
- *Ardea ibis* (Cattle Egret);
- *Merops ornatus* (Rainbow Bee-eater);
- *Lerista lineata* (Perth Slider, Lined Skink);
- *Neelaps calonotos* (Black-striped Snake);
- *Isoodon obesulus fusciventer* (Southern Brown Bandicoot, Quenda);

2.9 Heritage

The Department of Aboriginal Affairs Aboriginal Heritage Inquiry System (DAA, 2017) was used to determine if there are any Aboriginal heritage sites recorded on the site. The database did not show any listed sites (Appendix 7).

There are no Heritage Places recorded in the search area (Appendix 7).

A search of the National (DoEE, 2017) and State (Heritage Council of WA, 2017) registers of historical sites indicated that there are no other heritage sites on the site.

3 ENVIRONMENTAL ASSESSMENT

3.1 Land Use

Previous land use indicates that the site is not likely to be contaminated. There has been some dumping of domestic rubbish on parts of the site and therefore raises the potential for localised areas of contaminants such as hydrocarbons and asbestos. Areas containing rubbish should be investigated and, if required, remediated prior to construction.

Mushroom farms and market gardens are listed in the EPA Guidance Statement No. 3: *Separation Distances between Industrial and Sensitive Land Uses* as land uses that require separation distances. The guidance states:

> *...some commercial, institutional and industrial land uses which require high levels of amenity or are sensitive to particular emissions may also be considered "sensitive land uses". Examples include some retail outlets, offices and training centres, and some types of storage and manufacturing facilities.*

A generic separation distance of 500-1000m from mushroom farms and 300-500m from market gardens applies to sensitive land uses which may include some of the mixed business tenants in the future.

In accordance with the guidelines the generic distance is:

> *Not intended to be absolute separation distances, rather they are a default distance for the purposes of:*
>
> - *identifying the need for specific separation distance or buffer definition studies; and*
> - *providing general guidance on separation distances in the absence of site specific technical studies.*

The generic separation distance applies only in the absence of site-specific studies. An odour assessment on the mushroom farm has been undertaken by Environmental Alliances (Appendix 3). The Environmental Protection Authority (EPA) interim criterion for acceptable odour impacts is 2.5 ou, 1-hour. The results of the Environmental Alliances' assessment showed that the 2.5ou, 1 hour, 99.5 percentile contour extends approximately 70m into the southern section of the Structure Plan area. As a result, businesses located in the 2.5 ou, 1-hour contour should be notified prior to purchase that the lot is within the 2.5 ou, 1-hour contour and may experience some intermittent odour impacts. This may affect sensitive retail businesses such as food outlets.

Noise studies undertaken on the mushroom farm by Herring Storer show exceedances at night of 6dB(A) and 4dB(A) during the day as a worst-case scenario (Appendix 4). Noise studies indicate that exceedances of noise are higher at night, at which time sensitive retailers in the proposed Structure Plan are unlikely to be operating. Noise impacts on businesses in the Structure Plan are likely to be low, given the highest noise is from loader activity. Businesses should be informed if they wish to locate within 100m of the Mushroom Farm that intermittent noise impacts may be experienced.

3.2 Topography

Topography is gently undulating and there are no outstanding topographical features and no constraints from this factor.

3.3 Geomorphology and Soils

3.3.1 Geology

The Bassendean Dune geological unit is not constrained for residential development.

3.3.2 Soil Types

The soils in the eastern part of the site are prone to waterlogging. Stormwater controls and appropriate separation to groundwater will need to be considered when designing any development for the site.

3.3.3 Acid Sulphate Soils

The WAPC Acid Sulphate Soils Planning Guidelines (WAPC, 2009) indicate that "acid sulphate soils are technically manageable in the majority of cases". ASS Investigation and Management Plans are likely to be required with a Development Application once the detailed design of the proposed industry is finalised. This will be undertaken in accordance with the Acid Sulphate Soils Guideline Series: *Identification and Investigation of Acid Sulphate Soils and Acidic Landscapes* (DEC, 2009) and *Treatment and Management of Soils and Water in Acid Sulphate Soil Landscapes* (DEC, 2011).

3.3.4 *Phytophthora* Dieback

The site is largely 'Uninterpretable' with small areas of Uninfested for *Phytophthora* Dieback. Standard hygiene protocols should be in place during construction to protect any retained vegetation that may not be infected and vegetation in surrounding areas.

3.4 Hydrology

Groundwater is close to the surface in the low-lying areas. Stormwater management will be required to be addressed in accordance with *Better Urban Water Management* (WAPC, 2008). A Local Water Management Strategy (LWMS) is required at Local Structure Plan stage and an Urban Water Management Plan (UWMP) will be required for each subdivision/development. Stormwater controls should consider water quality and quantity in the drain to the south of the site that is in the Peel Drain Network.

3.5 Wetlands

The draft LSP does not propose to retain the portion of MU wetland UFI 6669 on the site. The wetland has very limited ecological value due to the highly degraded nature of the predominantly cleared vegetation.

3.6 Flora

The site does not contain any native species of conservation significance. Therefore, flora is not an impediment to the proposed development.

3.7 Vegetation

The vegetation on the site is proposed to be largely completely cleared with the potential for some isolated trees and shrubs to be retained in the drainage areas. The vegetation on the site is not regionally significant and is mostly in a Good to Degraded condition that is not suitable for retention for conservation values.

The Banksia woodland in the north-west corner is in Good to Very Good condition and, at 4.4ha, could be suitable for retention for its local environmental significance. However, the location of the vegetation close to the intersection of Thomas Road and the Kwinana Freeway and the zoning of the land for commercial activity makes this part of the site highly visible and valuable for development.

The proposed Mixed Business land use for the site does not require Public Open Space.

Therefore, the retention of the Banksia woodland is highly problematic for planning purposes and is not recommended for the structure plan. The clearing of all vegetation on the site has been approved under the Commonwealth EPBC Act.

3.8 Fauna

Fauna habitats on the site consist of Open Eucalyptus Woodland, Banksia Woodland and Shrubland. The fauna habitat is classified as Highly Degraded or Disturbed Fauna Habitat.

Approval to clear any vegetation that could be habitat for listed Black Cockatoo species was granted under the Commonwealth EPBC Act in 2016.

3.9 Heritage

There are no registered Aboriginal Heritage or Cultural Heritage sites within the proposed development boundary. Therefore, Heritage issues are not impacted by the proposed development in accordance with the Structure Plan.

4 SUMMARY AND CONCLUSIONS

4.1 Summary

This Environmental Assessment Report has been prepared as part of the Local Structure Plan for Precincts 1 and 2 of Lots 3, 1199, 9011, 9012 and 9013 Thomas Road, Casuarina. The report includes an environmental impact assessment of the proposed development of the site as a Mixed Business Precinct.

The site has the following environmental characteristics:

- Historical land use has been for agricultural purposes and the land has been largely cleared since 1953 with a pocket of retained vegetation in the north-west corner;
- The soils are on the Bassendean Dune System and Phase B3 can be prone to waterlogging and Acid Sulphate Soils;
- The site is considered to be 'Uninfested' in small areas and the rest 'Uninterpretable' for Phytophthora Dieback;
- The site contains a Multiple Use wetland;
- The site is adjacent to the northern boundary of part of the Peel Drainage network;
- There are no Conservation Significant flora species on the site and three Declared Pest flora species;
- The vegetation is largely cleared and degraded. A small (4.4ha) area of Banksia woodland in Good to Very Good condition remains in the north-west part of the site;
- The fauna habitat on the site is limited due to the large amount of clearing on the site. The remnant Eucalypts and the Banksia Woodland in the north-west part of the site provide habitat for listed Black Cockatoos;
- There are no Aboriginal Heritage Places mapped on the site; and
- A mushroom farm and market garden are located close to the site.

4.2 Conclusion

The Environmental Assessment concludes:

- Site-specific odour and noise studies undertaken on the mushroom farm indicate that some sensitive businesses within 70-100m of the farm may impact on commercial ventures deemed to be Sensitive Receptors;
- Soils are not an impediment to development. Acid Sulphates Soil Investigation and Management Plans are likely to be required if proposed industries are going to disturb soils. Hygiene protocols are likely to be required to minimise the risk of spreading *Phytophthora* Dieback on and off-site;
- The site is generally low lying so separation to groundwater and management of stormwater will be required through the implementation of a Local Water Management Strategy and Urban Water Management Plans;
- Drainage will also require management of water quality and quantity that is drained into the Peel Drainage Network;

- The development on the site is likely to decrease the Declared Pest species that occur on the site;
- The vegetation on the site is either cleared or has been impacted by previous land use. The vegetation is not regionally significant. Retention of the Banksia woodland in the north-west part of the site is not considered viable due to its location and the intended use of the site as a Mixed Business Precinct;
- Habitat for Black Cockatoos is not required to be retained under Commonwealth legislation as development of the entire site was referred under the EPBC Act and was deemed to be 'Not a Controlled Action'; and
- There are no listed heritage sites, however the developer will need to ensure works are undertaken in accordance with obligations under the *Aboriginal Heritage Act, 1972*.

5 REFERENCES

Bennett Environmental Consulting Pty Ltd (2012) Spring Survey at Lot 650 Thomas Road, Casuarina Perth, Western Australia

Bolland, M. (1998) *Soils of the Swan Coastal Plain.* Department of Agriculture. Bunbury, Western Australia.

Department of Aboriginal Affairs (DAA) (2017) Aboriginal Heritage Inquiry System. Accessed January 2017 http://www.dia.wa.gov.au/AHIS/default.aspx Government of Western Australia, Perth.

Department of Agriculture and Food Western Australia (DAFWA) (2017) Natural Resource Information. Accessed July 2017 http://maps.agric.wa.gov.au/nrm-info/ Government of Western Australia, Perth.

Department of Environment and Conservation (DEC) (2009) *Acid Sulfate Soils Guideline Series: Identification and Investigation of Acid Sulphate Soils and Acidic Landscapes.* Government of Western Australia, Perth.

Department of Environment and Conservation (DEC) (2011) *Acid Sulfate Soils Guideline Series: Treatment and Management of Soils and Water in Acid Sulfate Soil Landscapes.* Government of Western Australia, Perth.

Department of the Environment and Energy (DotEE) (2017) Protected Matters Search Tool. Accessed July 2017 http://www.environment.gov.au/webgis-framework/apps/pmst/pmst.jsf Commonwealth of Australia.

Department of Water and Environmental Regulation (DWER) (2017a) *Contaminated Sites Database.* Accessed July 2017 h https://secure.dec.wa.gov.au/idelve/css/ Government of Western Australia, Perth.

Department of Water and Environmental Regulation (DWER) (2017b) *Perth Groundwater Map.* Accessed July 2017 https://maps.water.wa.gov.au/#/webmap/gwm Government of Western Australia, Perth.

Environmental Protection Authority (EPA) (2005) *Guidance for Assessment of Environmental Factors: Separation Distances Between Industrial and Sensitive Land Uses* - Guidance Statement No. 3. Perth, Western Australia.

GHD (2012) Flora and Fauna Survey at Lots 86, 1199 and Part Lot 650 Thomas Road Casuarina, Perth Western Australia

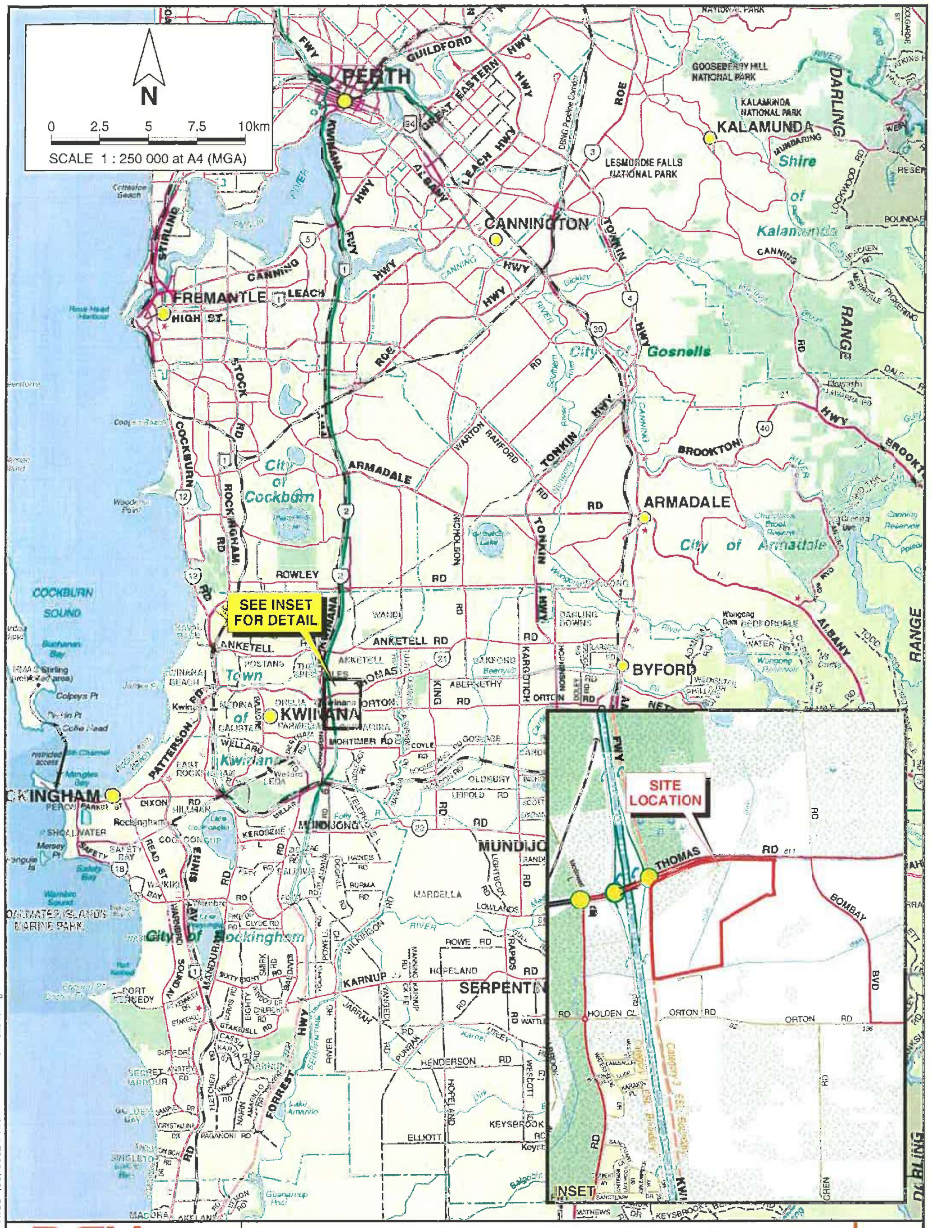
Heritage Council State Heritage Office (2017) State Register of Heritage Places. inHerit Database. Accessed July 2017 http://stateheritage.wa.gov.au/about-inherit Government of Western Australia, Perth.

Hill, A.L., Semeniuk, C.A., Semeniuk, V. and Del Marco, A. (1996) *Wetlands of the Swan Coastal Plain.* Vol. 2A Wetland Mapping, Classification and Evaluation Main Report. Perth, Western Australia.

Landgate (2017) Historical Aerial Photography. Accessed July 2017 https://www.landgate.wa.gov.au/bmvf/app/mapviewer/ Government of Western Australia, Perth.

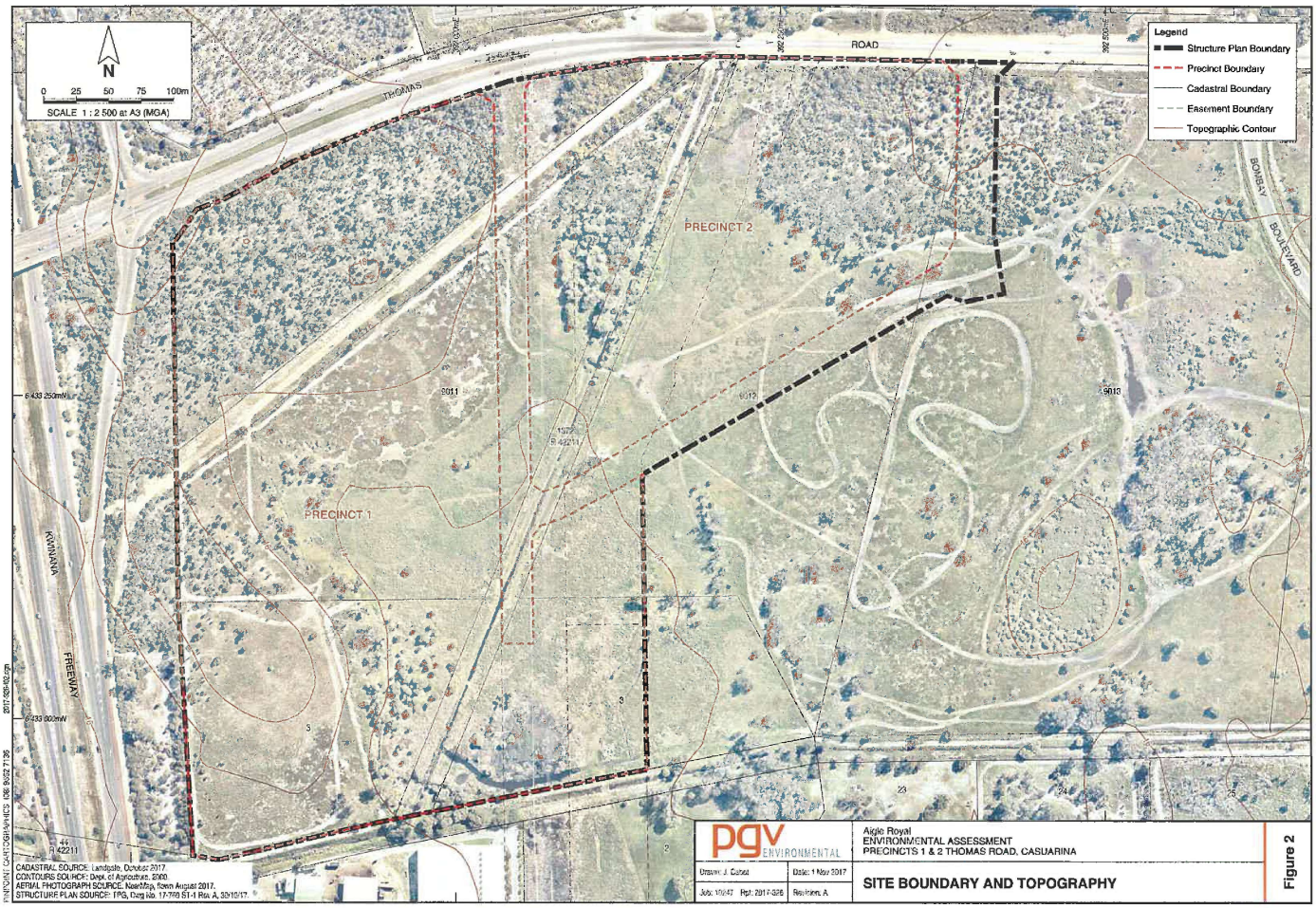
Western Australian Planning Commission (WAPC) (2008) *Better Urban Water Management.* Government of Western Australia, Perth.

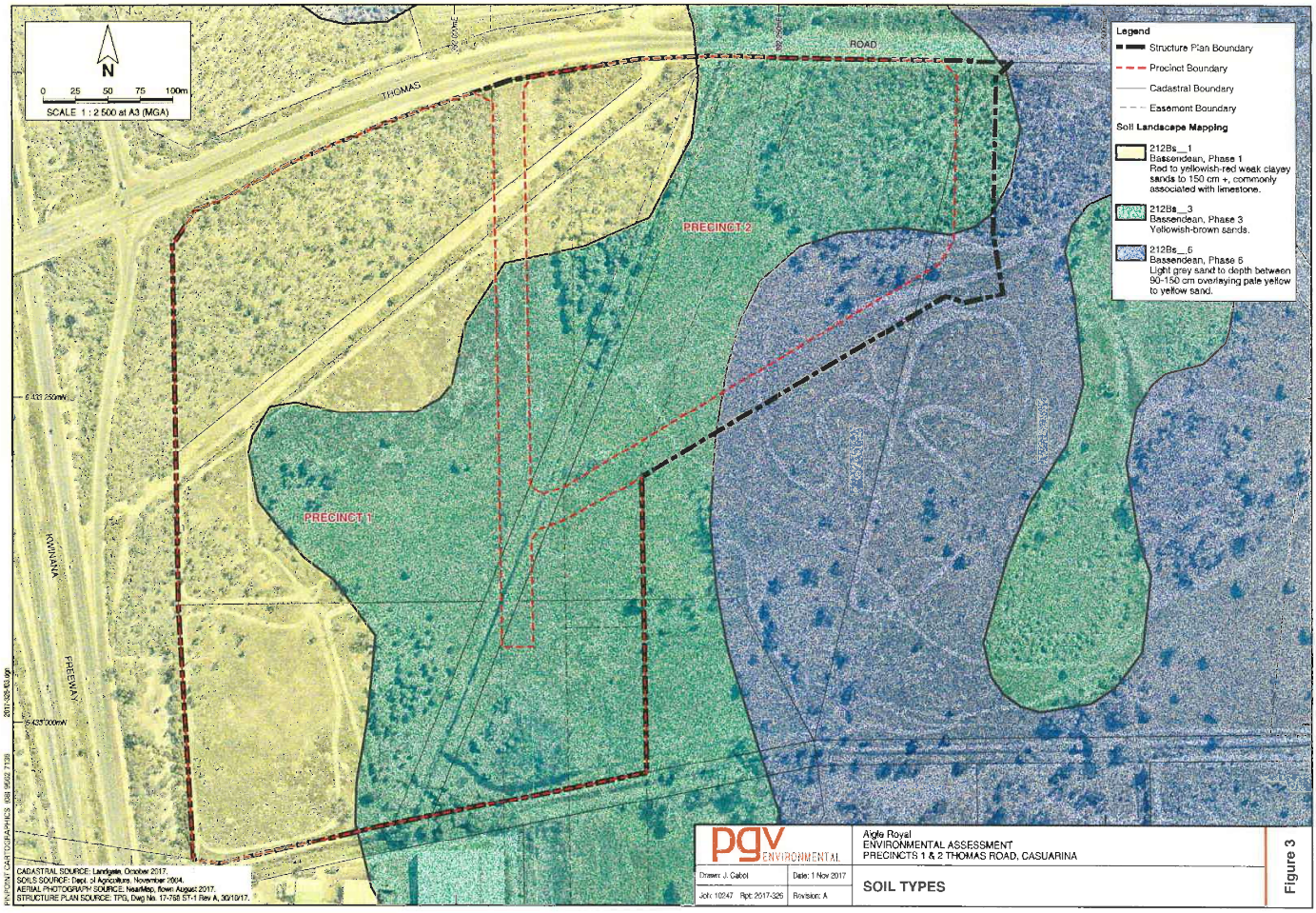
FIGURES

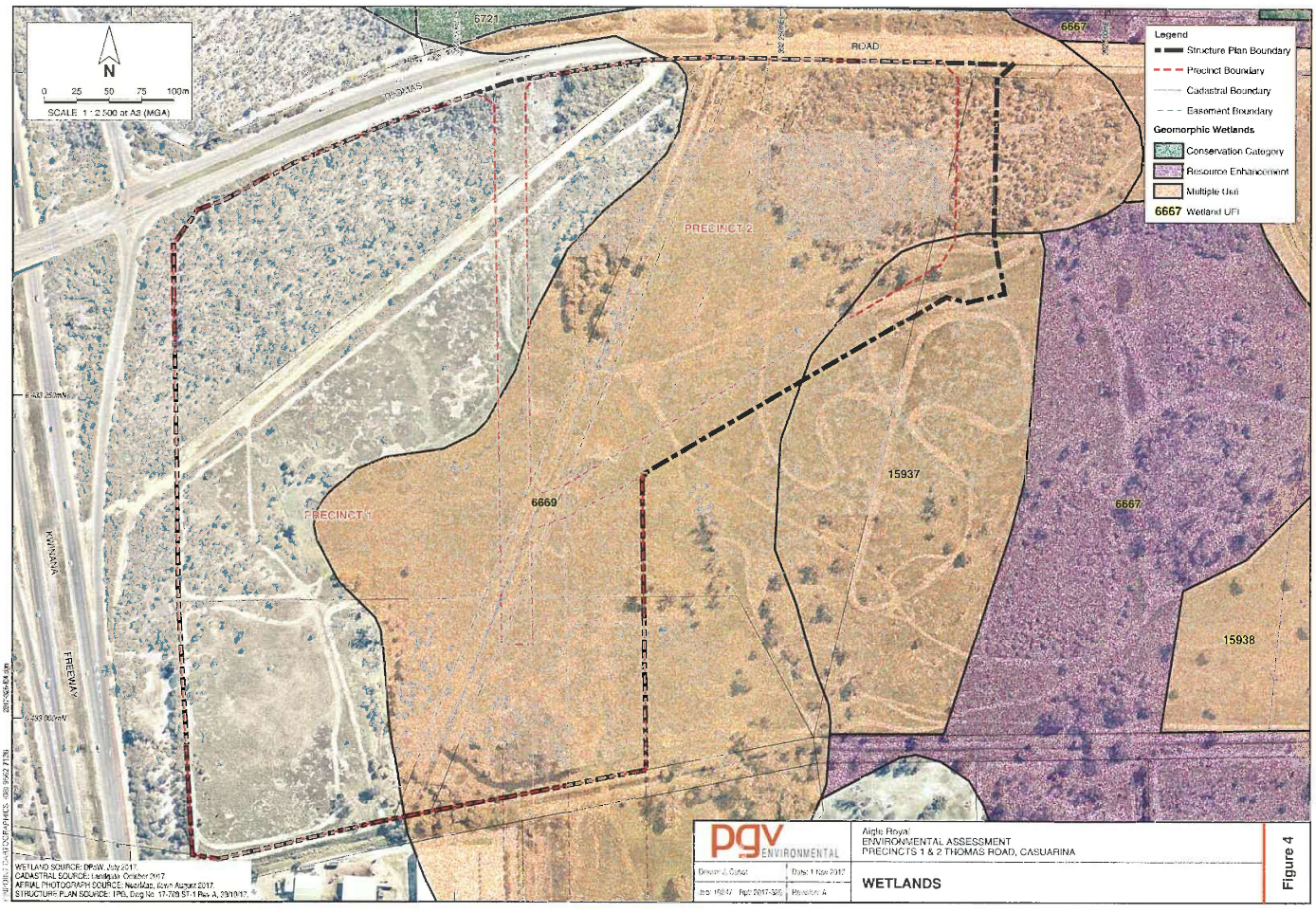


pgv ENVIRONMENTAL	Aigle Royal ENVIRONMENTAL ASSESSMENT PRECINCTS 1 & 2 THOMAS ROAD, CASUARINA
Drawn: J. Cabot	Date: 18 Oct 2017
Job: 10247 Rpt: 2017-326	Revision: A
SITE LOCATION	Figure 1

PINPOINT CARTOGRAPHICS (08) 9562 7136 2017-326-f01.dgn

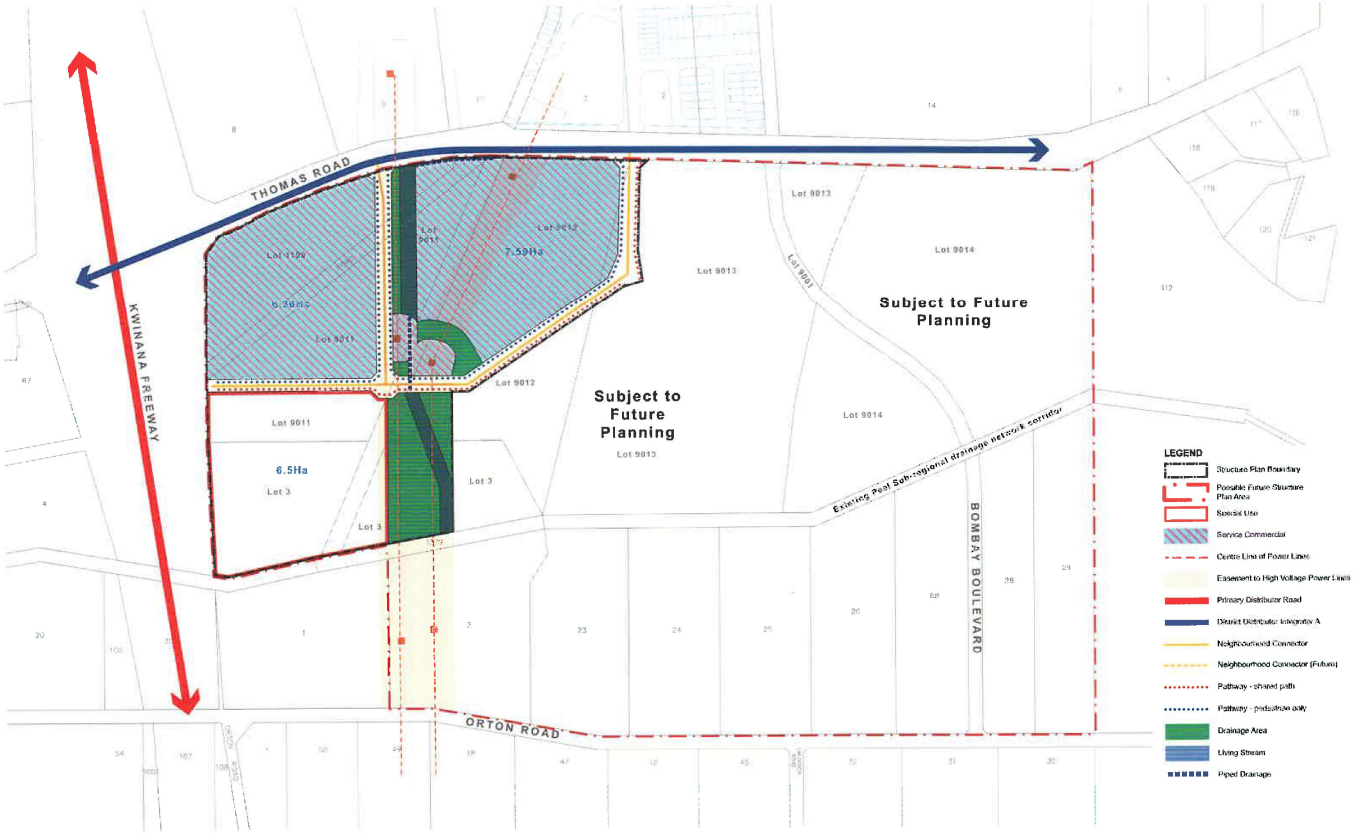

N
0 25 50 75 100m
SCALE 1 : 2 500 at A3 (MGA)
Legend
Structure Plan Boundary
Precinct Boundary
Cadastral Boundary
Easement Boundary
Topographic Contour
ROAD
THOMAS
PRECINCT 2
PRECINCT 1
BOMBAY
BOULEVARD
KWINANA
FREEWAY
6 433 250mN
6 433 000mN
9011
9012
9013
11522
R 42211
44
R 42211
CADASTRAL SOURCE: Landgate, Dated: 2017.
CONTOURS SOURCE: Dept. of Agriculture, 2009.
AERIAL PHOTOGRAPH SOURCE: NearMap, flown August 2017.
STRUCTURE PLAN SOURCE: TPG, Dwg No. 17-769 ST-1 Rev A, 30/10/17.
pgv ENVIRONMENTAL
Drawn: J. Cutsel
Date: 1 Nov 2017
Job: 10147 Ref: 2017-326 Revision: A
Aigle Royal
ENVIRONMENTAL ASSESSMENT
PRECINCTS 1 & 2 THOMAS ROAD, CASUARINA
SITE BOUNDARY AND TOPOGRAPHY
Figure 2


N
0 25 50 75 100m
SCALE 1 : 2 500 at A3 (MGA)
THOMAS
ROAD
PRECINCT 2
PRECINCT 1
KWINANA
FREEWAY
Legend
Structure Plan Boundary
Precinct Boundary
Cadastral Boundary
Easement Boundary
Soil Landscape Mapping
212Bs__1
Bassendean, Phase 1
Red to yellowish-red weak clayey sands to 150 cm +, commonly associated with limestone.
212Bs__3
Bassendean, Phase 3
Yellowish-brown sands.
212Bs__6
Bassendean, Phase 6
Light grey sand to depth between 90-150 cm overlaying pale yellow to yellow sand.
CADASTRAL SOURCE: Landgate, October 2017.
SOILS SOURCE: Dept. of Agriculture, November 2004.
AERIAL PHOTOGRAPH SOURCE: NearMap, flown: August 2017.
STRUCTURE PLAN SOURCE: TPG, Dwg No. 17-768 ST-1 Rev A, 30/10/17.
pgv ENVIRONMENTAL
Drawn: J. Cabot
Date: 1 Nov 2017
Job: 10247
Rpt: 2017-326
Revision: A
Aigle Royal
ENVIRONMENTAL ASSESSMENT
PRECINCTS 1 & 2 THOMAS ROAD, CASUARINA
SOIL TYPES
Figure 3


N
0 25 50 75 100m
SCALE 1:2,500 at A3 (MGA)
THOMAS
ROAD
PRECINCT 1
PRECINCT 2
FREEWAY
6669
15937
6667
15938
5721
Legend
Structure Plan Boundary
Precinct Boundary
Cadastral Boundary
Easement Boundary
Geomorphic Wetlands
Conservation Category
Resource Enhancement
Multiple Use
6667 Wetland UFI
WETLAND SOURCE: DPaW, July 2017
CADASTRAL SOURCE: Landgate, October 2017
AERIAL PHOTOGRAPH SOURCE: NearMap, Flown August 2017
STRUCTURE PLAN SOURCE: TPG, Dwg No. 17-709 ST-1 Rev A, 29/10/17
pgv ENVIRONMENTAL
Aigle Royal
ENVIRONMENTAL ASSESSMENT
PRECINCTS 1 & 2 THOMAS ROAD, CASUARINA
WETLANDS
Figure 4

APPENDIX 1

Proposed Structure Plan



Plan 1: Local Structure Plan

Lots 9011, 9012, 9013, 1199 & 3 Thomas Road, Casuarina

element.
the art and science of place

APPENDIX 2

EPBC Act Decision Notice

Australian Government
Department of the Environment

Notification of

REFERRAL DECISION – not controlled action
Urban development of Lots 3, 1199 and 650 Thomas Road, Casuarina, WA (EPBC 2016/7659)

This decision is made under Section 75 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Proposed action

person named in the referral	Aigle Royal Group Pty Ltd ACN: 601 435 116
proposed action	To clear native vegetation for the purpose of developing Lots 3, 119 and 650 Thomas Road, Casuarina, WA [See EPBC Act referral 2016/7659].
Referral decision:	**Not a controlled action**
status of proposed action	The proposed action is not a controlled action.

Person authorised to make decision

Name and position	Bruce Edwards Assistant Secretary Assessments (WA, SA, NT) and Air Branch
signature	
date of decision	4 April 2016

APPENDIX 3

Odour Study (Environmental Alliances)

(COSTA) MUSHROOM EXCHANGE, CASUARINA

REVISION OF PREDICTED ODOUR LEVELS BASED ON SAMPLING OF STERILISATION BUILDING EMISSIONS

Prepared for

MushroomExchange Pty Ltd Trading as Costa (Mushroom Category)

by

ENVALL

Environmental Alliances Pty Ltd

August 2015

Disclaimer and Limitation

Environmental Alliances Pty Ltd (ENVALL) will act in all professional matters as a faithful adviser to the Client and exercise all reasonable skill and care in the provision of its professional services.

This report has been prepared on behalf of and for the exclusive use of the Client, and is subject to and issued in accordance with the agreement between the Client and ENVALL. ENVALL accepts no liability or responsibility whatsoever for it in respect of any use of or reliance upon this report by any third party.

This report is based on the scope of services defined by the Client, budgetary and time constraints requested by the Client, the information supplied by the Client (and its agents), and methods consistent with the preceding.

Where site inspections, testing or fieldwork have taken place, the report is based on the information made available by the client or their nominees during the visit, visual observations and any subsequent discussions with regulatory authorities. It is assumed that normal activities were undertaken at the site on the day of the site visit(s) unless explicitly stated otherwise.

ENVALL has not attempted to fully verify the accuracy or completeness of the written or oral information supplied for the preparation of this report. While ENVALL has no reason to doubt the information provided, the report is complete and accurate only to the extent that the information provided to ENVALL was itself complete and accurate.

This report does not purport to give legal advice, which can only be given by qualified legal advisors.

Client: MushroomExchange Pty Ltd Trading as Costa (Mushroom Category)

Job No: L2144c	Version	Prepared by	Reviewed by	Submitted to Client	
Status				Copies	Date
Draft Report	V0b	DP	-	*.doc	5/7/2015
Final Report	V1b	DP	KP	*.pdf	19/7/2015
Updated Final Report	V1c	DP	-	*.pdf	17/8/2015

Environmental Alliances Pty Ltd
Tel: (08) 9343 0554
Fax: (08) 9343 0079
ABN: 75 103 600 620

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

1. INTRODUCTION

1.1 2013 ODOUR MODELLING

In 2012, Environmental Alliances was engaged to undertake an assessment of the odour emissions and impacts from the operating facility (ENVALL 2013). This included an investigation of other odour sources in addition to compost receivals/handling.

The three main sources of odour that were considered to be the main contributors to off-site odour impacts were:

- Compost Receivals and handling into the Pasteurisation Building;
- Pasteurisation Building Vents; and
- Sterilisation Building.

1.2 SUMMARY OF ANNUAL EMISSIONS

By way of some perspective, a summary of the odour emissions from the three main sources from the ENVALL (2013) report is shown in Table 1 below:

Table 1 Estimated annual average odour emission rates for quantified Mushroom Exchange odour sources

Source	Annual odour emission rate based on 2011-12 meteorology (ou.m^3/s)
Compost Receivals and handling into the Pasteurisation Building	
Bunker (incl storage and truck dumps)	1,674
Hopper (inclined belt loaded by FE loader incl transfer to conveyor)	3,680
Conveyor	151
Total Compost Receivals	5,505
Sterilisation	18,952
Pasteurisation Vents	8,149

1.3 REDUCTION OF ODOUR EMISSIONS FROM STERILISATION BUILDING

Since the 2013 study, Costa has reduced leakages from the Sterilisation Building. This report describes a re-assessment of odour emissions from this building and re-modelling of odour levels based on the results.

2. STERILISATION BUILDING ODOUR EMISSIONS RE-ASSESSMENT

2.1 FUNCTION OF STERILISATION BUILDING

The Sterilisation Building (also referred to as Cookout Building) contains two similarly sized chambers used to sterilise the mushroom-growing trays using steam produced by an adjacent boiler. Each chamber has its own vehicle door to allow a fork-lift to transport the trays into the chamber and remove them after the sterilisation process. The doors are fitted with rubberised seals. There is also a sub-surface drain within each chamber.

For a sterilisation cycle, steam is pumped into the required chamber for approximately 20 hours to heat the trays to the required temperature (72°C) then eased off to maintain that temperature for a further 8 hours before being shut off completely after which the trays are allowed to cool naturally.

When steam is pumped into a chamber containing the trays, heat transferred from the steam into the trays causes much of the steam to condense, which allows additional steam to be pumped in with little increase to the net pressure inside the building. The drain allows the condensed steam (as water) to escape to prevent flooding the floor.

The lower density of the incoming steam does, however, cause it to initially rise to the top of the chamber. This creates a small pressure difference between the upper part of the Chamber and the outside (cooler) ambient air. If there are gaps in the upper walls and roof, some of the steam, together with any odour from the trays that has been imparted into the steam, will escape.

The Sterilisation Building was considered to be a major source of odour emissions following the sampling in 2012.

2.2 EMISSIONS SAMPLING

The emissions from the Sterilisation Building were sampled on 1 July 2015.

It was observed that the volume of emission is much less than it was in 2012. In 2012, vertical gaps in the corners of the walls were in the order of a centimetre wide in places, and the resulting plume was visible well above the roof of the building.

Now, the emissions can only be observed by close inspection of the door and upper section of the walls. The emissions were through occasional very small gaps:

- between the concrete cladding where the roof section abutted the tilt-up wall panels; and
- around the truck door seal.

The gaps in the concrete were inconsistent in size and there were substantial lengths where no emission (i.e. no gap) was apparent (see Figure 1).

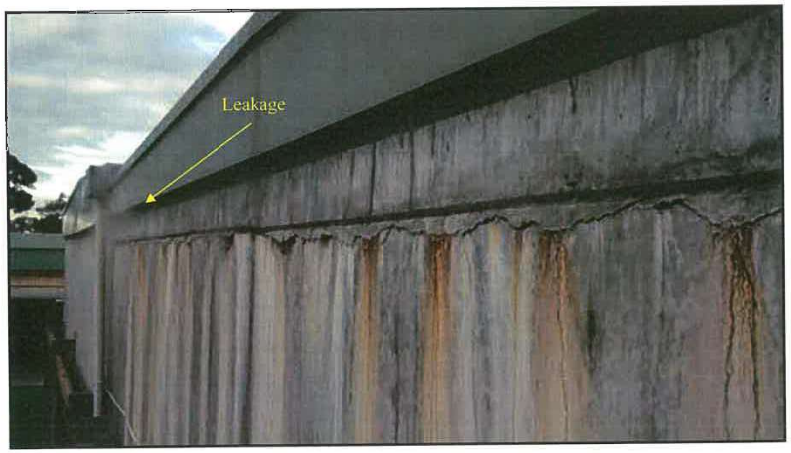


Figure 1 Example of leakage between concrete panels

The emission in the truck door seals was also intermittent and appeared less than the concrete.

2.2.1 Estimation of volume flow rate

It is not possible using conventional sampling methods to make a particularly accurate determination of volume flow rate in these circumstances. The approach used was to measure the velocity of the leakages using a hot-wire anemometer, which has a small probe that can be pressed into the gaps, then multiply this result by the estimated surface area of the gaps.

Using this method, the average of six velocity measurements through the largest of the gaps in the concrete was 1.5 m/s.

Even with the small probe, the velocity through the door seals gaps was too low to measure. There were no obvious gaps as such through the door seal – rather the leaks appeared to be where the rubber seal was only in weak contact with the frame, hence the emission was more of a "seepage". A probable contributing factor to the low emission through the door is that the internal pressure is lower near the base than near the roof due to the vertical temperature gradient. Therefore the anemometer threshold of 0.1 m/s was assumed for the velocity.

It is considered that an average 1 mm gap, if assumed continuous along the front (east), north and rear (west) concrete walls, would be a reasonable estimate. For the door seal, a 1 mm "gap", if assumed continuous around the entire door perimeter, would be a conservative estimate.

This gives the volume flow through the concrete gaps of:

[10.5m x 2 (east and west facing walls) + 21m (north facing wall)] x 0.001 m (gap) x 1.5 m/s = 0.063 m^3/s.

Similarly, the volume flow through the door seal is:

[3.5m (height) x 2 + 4m (width) x 2] x 0.001m (gap) x 0.1 m/s = 0.0015 m^3/s.

This gives a total volume flow of 0.0645 m^3/s.

There is a small hinged hatch in the door (dimensions 0.45 x 0.5 m) which acts as periodic pressure relief. This appears to discharge very infrequently (observed once in approximately 1 hour).

For the purpose of calculating the odour emission rate, the volume flow calculated for the gaps (as above) was therefore rounded up to 0.1 m^3/s, which should be quite conservative.

2.2.2 Temperature

The exit temperature of the leakage should be close to 72°C, which is the air temperature maintained and measured inside the cookhouse. The diffuse nature of the leakages means that the buoyancy is quickly lost, hence the plume rise above the roof is negligible. The remodelling was therefore based on the same "volume source" configuration as previously, except that the emission height was reduced to the roof height.

2.2.3 Odour concentration

The odour concentrations were sampled using the "drum" approach as described in Australian Standard AS4323:3, with a stainless steel probe being inserted into the building through the pressure relief hatch to extract the internal air sample. The samples were analysed for odour concentration in accordance with AS4323:3 by The Odour Unit, which is a NATA Certified laboratory. The detailed results are given in Appendix 1. The average odour concentration reported was 23,250 ou.

2.3 OPERATING REGIME

Since the 2013 assessment, the usage of the Sterilisation Building (also referred to as Cookhouses) has changed.

In 2013, the building was operated four times per week.

The current regime is[1]:

- Tuesday AM – Sterilisation Room opened up and trays removed and emptied.
- Tuesday PM – Next Growing Room that has completed growing cycle - trays put into Sterilisation Room. At approx. 4-5pm, sterilisation process started. Warm up to 72°C using steam from adjacent boiler; process normally reaches temperature (72°C) by approx. 12pm on the Wednesday. Hold at temperature for 12 hours. Steam then shut off and allowed to cool naturally.
- Thursday AM - Sterilisation Room opened up and trays removed and emptied.
- Thursday PM – Next Growing Room that has completed growing cycle - trays put into sterilisation room.
- Saturday AM - At approx. 8-9am sterilisation process started - warm up to 72°C using steam from adjacent boiler; process normally reaches temperature (72°C) by approx. 12am on the Sunday. Hold at temperature for 12 hours then turn steam off and allow to cool naturally.
- Tuesday AM – As per above and the cycle continues.

The key change from 2012 is that empty trays are no longer separately sterilised using steam. Instead, new and repaired trays are dipped prior to use in a fungicide treatment bath. All trays are sprayed on the day of re-use when filling with fresh mushroom substrate (spawned compost) with a germicide product to reduce the potential for wood mould propagation. The use of the Sterilisation Building has therefore been approximately halved. This in itself would lead to an approximate 50% reduction in emissions compared to 2012.

The summary of the odour sources and characteristics through production stages from the 2013 report has been updated incorporating these changes, and is shown in Appendix 2.

2.4 ODOUR EMISSION RATE

The revised, modelled odour emission rate when the Sterilisation Building is operating is 0.1 m^3/s x 23,250 ou = 2,325 ou.m^3/s, with a "pulse" of 9,256 ou.m^3/s, calculated assuming assumed the internal building air volume is released[2], over each hour during which the doors are opened.

---

[1] Costa email 27/5/2015.

[2] This ignores the displacement inside the building due to crates - which would over-state the odour emissions, however it is assumed that crates themselves will also contribute odour emissions. Therefore, the overall estimate is considered reasonable.

Over the 2011-12 year used as the basis for modelling, the revised average odour emission rate from the Sterilisation Building is 442 ou.m^3/s. This compares to 18,952 ou.m^3/s from 2013. The average odour emission is therefore approximately 2.3% of what it was previously.

3. MODELLING ASSUMPTIONS

The modelled re-assessment of odours from the Sterilisation Building has followed the same methodology and assumptions as used in the 2013 report, except for the revised emissions and operating regime.

The nominal time periods of operations, and therefore emissions from leakages, were obtained from temperature plots provided by Costa where the internal temperate was 72°C. These were:

- Wednesdays 0100 hours to 1300 hours (12 hour duration); and
- Saturdays 2000 hours to Sunday 0800 hours (12 hour duration).

For completeness, the odours from the building when the doors are opened at the end of the process were also incorporated. (Note that this was not done in the 2012 modelling).

4. RESULTS

4.1 STERILISATION BUILDING EMISSIONS IN ISOLATION

The predicted 2.5 ou 1-hour average 99.5 percentile odour concentrations from the Sterilisation Building only are shown in Figure 2. The orange contour is from the 2013 assessment. The green contour is from 2015 sampling and revised operating regime. The level of odour against the criterion is insignificant.

Figure 2 Predicted 2.5 ou 1-hour average 99.5 percentile odour concentrations from the Sterilisation Building only

4.2 ALL MODELLED SOURCES (CURRENT SITUATION)

The predicted odour contours from compost deliveries/handling, plus the Pasteurisation Building Vents, plus the Sterilisation emissions from the 2015 sampling, is shown in Figure 3. This, then, represents the best estimate of the current situation i.e. the 2.5 ou criterion level lies between the two contours shown - depending on modelling/assumption uncertainties.

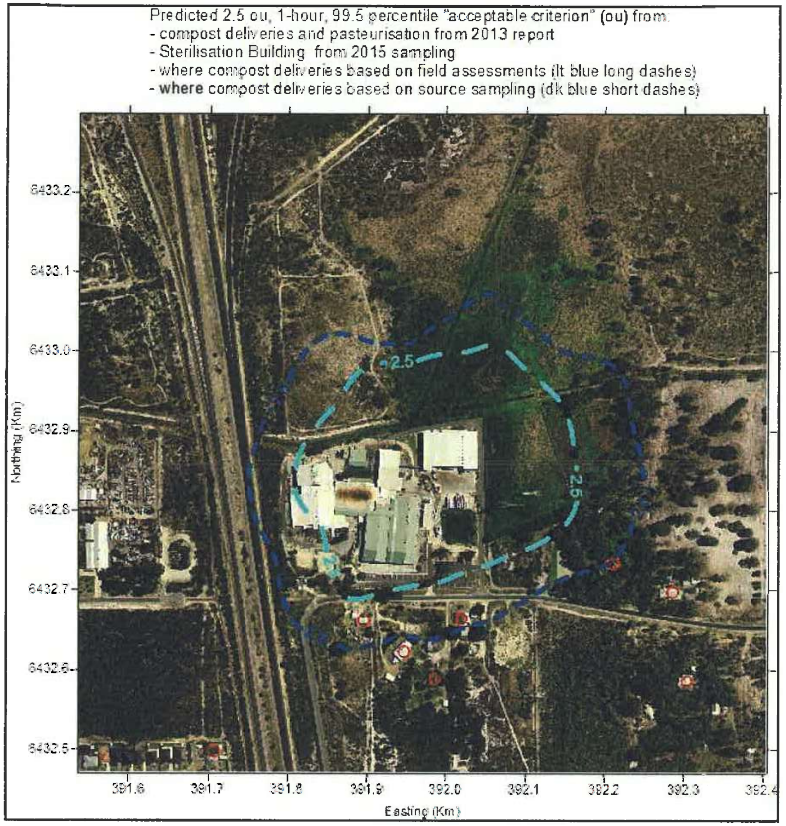


Figure 3 Predicted 2.5 ou 1-hour average 99.5 percentile odour concentrations range for compost deliveries, Pasteurisation Building vents from 2013 modelling and Sterilisation Building from 2015 sampling

Red circles show residences (from "Costa Mushroom Exchange – Environmental Management Plan – Casuarina Production Facility" (2014)).

The 2013 Report (in Figure 11) contained two estimates of odour contours from the compost deliveries/handling 1) based on field assessments and 2) based on source sampling, with the latter, more conservative estimate used in the final presentations (in Figure 12). In other words, the area between these contours lies within the predicted range of the "acceptable" odour levels in view of identified "scientific uncertainty".

4.3 ASSESSMENT OF WALKING FLOOR DELIVERIES OF COMPOST

Currently, trucks deliver compost by dumping it into a bunker. A front-end loader picks up the compost from the bunker and tips it into a hopper, which feeds a conveyor to the Pasteurisation Building.

On 1 July 2015, Costa trialled the use of a truck with a walking floor directly discharging the compost to the hopper.

This would eliminate odour emissions from aspects of the current arrangement whereby trucks dump initially into bunkers. The specific sources/mechanisms of odour generation eliminated would be:

- Truck dumps to the bunkers;
- Front-end loader pick up from the bunkers; and
- Emissions from stationary compost whilst in the bunkers.

From a visual review, the odour emissions from the walking floor discharge to the hopper are similar in magnitude to that from the front-end loader tipping into the hopper. This is because most of the emissions from the hopper appear to arise from the rotating paddle which levels the compost being discharged from the hopper to the conveyor by flinging and re-distributing it within the hopper. (Figure 4 shows a visual comparison, however conclusions shown not be drawn simply from this).

The predicted odour levels for the "current" scenario except assuming walking floor deliveries (i.e. omitting the odour emissions from the truck dumping to the compost bunker and front-end loader pick-up from the bunker) are shown in Figure 5.

The predicted odour levels meet the criteria at all of the residences – albeit only just at the most affected residence for the "conservative" prediction.

These predictions would, however, be further reduced if there were some covering of the hopper (and conveyor to the Pasteurisation). It is considered that if the walking floor deliveries were to be fully implemented together with covering of the hopper and conveyor (even without extraction), the odour criterion will be met at all of the nearby residences.

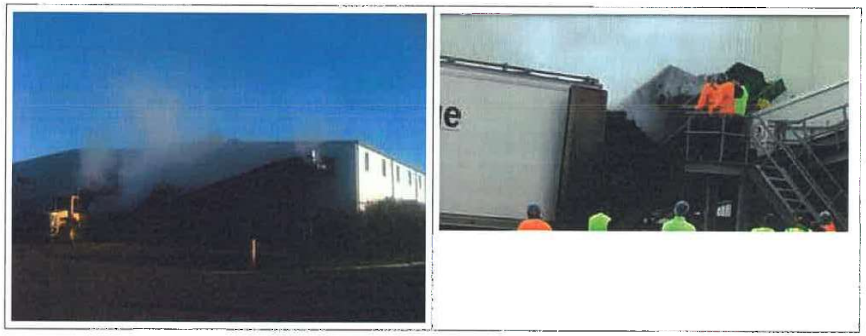


Figure 4 Comparison of hopper loading from front-end loader 25/7/2012 0817 hours and walking floor truck 1/7/2015 0900 hours

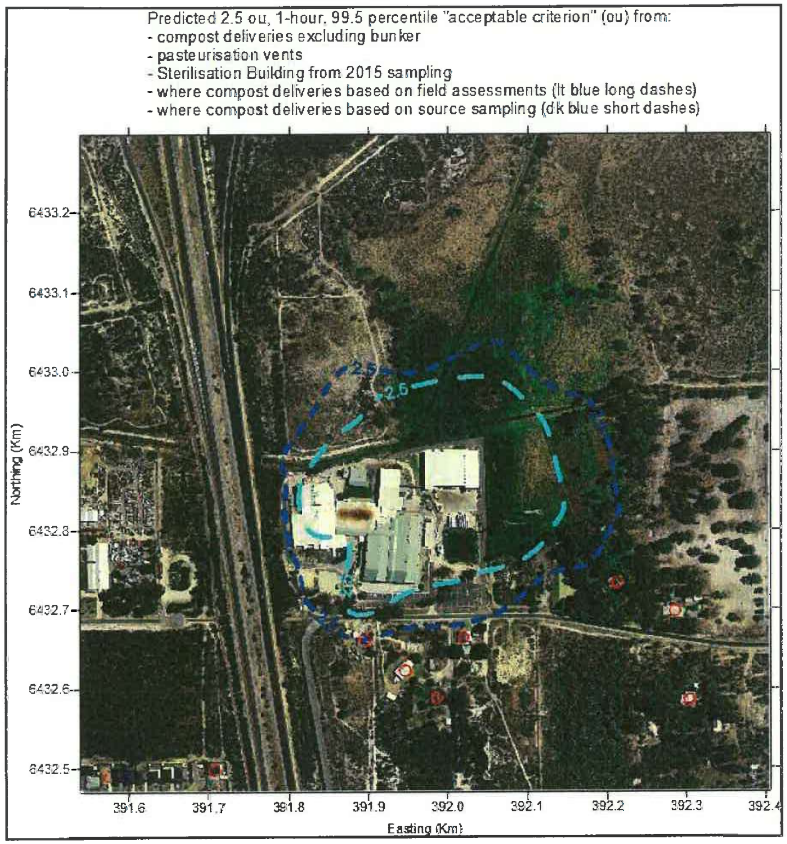


Figure 5 **Predicted 2.5 ou 1-hour average 99.5 percentile odour concentrations range for compost deliveries assuming travelling floor discharge direct to hopper is implemented**

5. REFERENCES

Environmental Alliances, 2005, "Determination of Odour Levels from Chiquita Mushrooms, Casuarina", Prepared for Chiquita Mushrooms by Environmental Alliances Pty Ltd, April 2005.

Environmental Alliances, 2008, "Modelling Of Off-Site Odours For Proposed New Compost Handing System At Costa Exchange Mushroom Farm, Casuarina", Draft Only, Prepared for Costa Exchange by Environmental Alliances Pty Ltd, January 2008.

ENVALL, 2013, "Investigation of Odour Impacts from Mushroom Exchange, Casuarina", Prepared for Mushroom Exchange by ENVALL Environmental Alliances Pty Ltd, December 2013.

Appendix 1 Results from odour concentration analysis of Sterilisation Building emissions

THE ODOUR UNIT (WA) PTY LTD

THE ODOUR UNIT

Showroom 1
16 Hulme Court
Myaree
WA 6154

Phone: +61 8 9330 9476
Facsimile: +61 8 9330 1888
Email: tschulz@odourunit.com.au
Internet: www.odourunit.com.au
ABN: 70 126 439 076

NATA
Accreditation Number: 14974

Form 06 - Perth Laboratory
Odour Concentration Measurement Results

The measurement was commissioned by:

Organisation	Environmental Alliances	Telephone	(DS) 9343 0554
Contact	David Pitt	Facsimile	(DB) 9343 0079
Sampling Site	Costa Mushrooms	Email	david.pitt@ea.iinet.net.au
Sampling Method	Drum & Pump	Sampling Team	David Pitt

Order details:

Order requested by	David Pitt	Order accepted by	John Hurley
Date of order	July 2015	TOU Project #	W2200R.01
Order number	TBA	Project Manager	John Hurley
Signed by	TBA	Testing operator	Clayton Hough

Investigated Item	Odour concentration in odour units 'ou', determined by sensory odour concentration measurements, of an odour sample supplied in a sampling bag. Odour character is also assessed, however, AS4323.3:2001 and NATA accreditation do not cover the performance of this service. Where parties other than The Odour Unit perform the dilution of samples, the result that has been modified by the dilution factor is not covered by The Odour Units NATA accreditation. Sample collection using a hood or IFH (and calculation of the SOER) is not covered by The Odour Units NATA accreditation.
Identification	The odour sample bags were labelled individually. Each label recorded the testing laboratory, sample number, sampling location (or identification), sampling date and time, dilution ratio (if dilution was used) and whether further chemical analysis was required.
Method	The odour concentration measurements were performed using dynamic olfactometry according to the Australian Standard 'Determination of Odour Concentration by Dynamic Olfactometry AS/NZS4323.3:2001. The odour perception characteristics of the panel within the presentation series for the samples were analogous to that for butanol calibration. Any deviation from the Australian standard is recorded in the 'Comments' section of this report.
Measuring Range	The measuring range of the olfactometer is $2^2 \leq y \leq 2^{16}$ ou. If the measuring range was insufficient the odour samples will have been pre-diluted. This is specifically mentioned with the results.
Environment	The measurements were performed in an air- and odour-conditioned room. The room temperature is maintained at 25°C or less, with temperature fluctuations of less than ± 3°C.
Measuring Dates	The date of each measurement is specified with the results.
Instrument Used	The olfactometer used during this testing session was: ODORMAT SERIES V02 The software used during this testing session was: ODORMAT V3.0
Instrumental Precision	The precision of this instrument (expressed as repeatability) for a sensory calibration must be $r \leq 0.477$ in accordance with the Australian Standard AS/NZS4323.3:2001. ODORMAT SERIES V02: $r = 0.168$ (18th & 19th November, 2014) Compliance – Yes
Instrumental Accuracy	The accuracy of this instrument for a sensory calibration must be $A \leq 0.217$ in accordance with the Australian Standard AS/NZS4323.3:2001. ODORMAT SERIES V02: $A = 0.057$ (18th & 19th November, 2014) Compliance – Yes
Lower Detection Limit (LDL)	The LDL for the olfactometer has been determined to be 16 ou (four times the lowest dilution setting)
Traceability	The measurements have been performed using standards for which the traceability to the national standard has been demonstrated. The assessors are individually selected to comply with fixed criteria and are monitored in time to keep within the limits of the standard. The results from the assessors are traceable to primary standards of n-butanol in nitrogen.

NATA

Accredited for compliance with ISO/IEC 17025.
This report shall not be reproduced, except in full.

Date: Wednesday, 1 July 2015

Report Number / Panel Roster Number: PER20150701_1

J. Hurley
State Manager WA

C. Hough
Authorised Signatory

THE ODOUR UNIT (WA) PTY LTD

NATA Accreditation Number: 14974

Odour Sample Measurement Results

Sample Location	TOU Sample ID	Sampling Date & Time	Analysis Date & Time	Panel Size	Valid ITEs	Nominal Sample Dilution	Actual Sample Dilution (adjusted for Temperature)	Sample Odour Concentration (as analysed, in the bag) (ou)	Sample Odour Concentration (Final, allowing for dilution) (ou)	Odour Character
EA 1	PC18247	01/07/2018 @ 07:50hrs	01/07/2018 @ 11:40hrs	4	8	-	-	21,200	21,200	Soil / manure / dry / mineral
EA 2	PC18248	01/07/2018 @ 07:30hrs	01/07/2018 @ 12:04hrs	4	8	-	-	25,300	25,300	Soil / manure / dry / mineral

THE ODOUR UNIT (WA) PTY LTD

NATA Accreditation Number: 14974

Odour Panel Calibration Results

Reference Odorant	Reference Odorant Panel Roster Number	Concentration of Reference gas (ppm)	Panel Target Range for n-butanol (ppb)	Measured Concentration (ou)	Measured Panel Threshold (ppb)	Does this panel calibration measurement comply with AS/NZS4323.3:2001 (Yes / No)
n-butanol	PCR20150701_1	50.2	20 ≤ χ ≤ 80	1,450	35	Yes

Comments None

Disclaimer: Parties, other than TOU, responsible for collecting odour samples hereby certify that they have voluntarily furnished these odour samples, appropriately collected and labelled, to The Odour Unit Pty Limited for the purpose of odour testing. The collection of odour samples by parties other than The Odour Unit Pty Limited relinquishes The Odour Unit Pty Limited from all responsibility for the sample collection and any effects or actions that the results from the test(s) may have.

Accredited for compliance with ISO/IEC 17025. This report shall not be reproduced, except in full

END OF DOCUMENT

Appendix 2 Mushroom Exchange odour sources and characteristics through production stages

Stage	Timing	Source Location	Emission characteristics	Qualitative Assessment[4]	
				Odour character	Potential for off-site impacts
Phase 1 compost receival	0800 to 1500 hours (latest) Wednesdays	Compost receival area	Off-site impacts likely to be wind speed dependent and fluctuate as a function of handling.	Earthy, ammonia	High, particularly for low moderate wind speeds cloudy days; may be detectable off-site.
Phase 2 composting	1 week, Wednesday to Tuesday	Pasteurisation building vent emissions	Elevated release during pasteurisation process – cycle repeated each 7 days therefore maximum emissions most likely from Wed evening to Thursday afternoons. See emissions profile in Figure 6.	Earthy, ammonia to start with (0 - 8 hours during levelling), possible smoulder character (8 – 16 hours), decreasing odour emission rate 16 – 144 hours)	Limited due to small volume flows and elevated release, noticeable but transient levels close to source.
Packing into trays and Casing	Twice per week Monday 0600 to 1630 Friday 0600 to 1630	Tray Line	No substantial emissions.	-	No.
Flushing initiation	Three rooms per week 1 on Tuesday 2 on Friday	Various Growing Rooms in Growing Buildings	Possible pulse of odour.	Mushroom	Possible transient.

Stage	Timing	Source Location	Emission characteristics	Qualitative Assessment[a]	
				Odour character	Potential for off-site impacts
Growing/ Harvesting	In each growing room: • 4 days • Initiate 1st flush lasting 7-10 days • 1 day to harvest (0700 to 1600 hours) • 2nd flush lasting 7-10 days • 1 day to harvest (0700 to 1600 hours) • 3rd flush lasting 7-10 days • 1 day to harvest (0700 to 1600 hours) • leave trays until ready to sterilise Total time = 6 weeks from trays in to trays out	Various Growing Rooms in Growing Buildings. A room (somewhere) is harvested each day.	Ventilation regime in each growing room is variable according to stage of growing. Possible pulses of odour if doors are opening for harvestings and final tray removal.	Mushroom	Possible transient. Limited due to nature of the odour character, may be detectable off-site as transient "slug".
Packing and transport	Packing is daily 0700 to 1600 hours. Transported off site daily (Mon-Sun).	Packing room. Picked up from west yard area.	No odours	-	-
Spent Compost & tray sterilisation[b]	Twice per week Wed approx. 0100-1300 hours & Sat-Sun approx. 2000-0800 hours (12 hours @ 72 °C). Ramp up to temperature takes 8-12 hours beforehand	Sterilisation Building - Cookout 1 & 2 alternating.	Very minor leakage from gaps in concrete panels abutting rook section. Possible "slug" as doors are opened afterwards.	Pinewood/sweetish as observed in ambient air downwind. "Soil/manure/dry/ chemical" as reported by Odour Laboratory from source sample.	Negligible.
Spent compost removals	0700 to 1500 hours, Tuesdays and Thursdays	Spent compost bunker	Wind dependent.	Earthy Spent compost has only low odour when freshly dumped – need to confirm natural level of odour when picking up older stockpile.	Appears unlikely if compost removed soon after stockpiling

Stage	Timing	Source Location	Emission characteristics	Qualitative Assessment[a]	
				Odour character	Potential for off-site impacts
Total compost cycle time	4 weeks in tunnels 6 weeks in growing rooms				
Auxiliary activities					
Tray manufacture	Monday to Friday 0600 to 1430 hours	Growing trays assembly area	Minor odour from storage/assembly areas.	Fresh cut Pine/wood.	Unlikely.
Tray disposals	When skip bin is full	Skip bins on north boundary of premises	Minor odour from Skip Bins.	Decaying wood.	Unlikely.
Waste water disposal	Continuous wash downs from all buildings	4 intermediate below-ground covered sumps Main below-ground collection sump Pond	No odour from covered sumps. Minor odour from Main sump. Pond odour likely to be greater during warmer months due to anaerobic activity. Wind dependent.	Aerobic mild putrescent. Anaerobic/putrescent.	High during light winds – early morning, spring, summer.
Waste mushroom /solid waste disposal	Skip bins removed daily	Small yellow skip bins in mushroom pick up area	Minor odour from Skip Bins.	Mushroom, possibly putrescent/decaying if left for too long.	Unlikely.

[a] Note that Costa has developed a Risk Matrix based on the findings of the ENVALL investigations. The Risk Matrix is included in the EMP.

[b] Updated from the original Table in the ENVALL (2013) report on the basis of the current sampling. Also the "Tray sterilisation" referred to as an odour source/"Stage" in the ENVALL (2013) has been omitted from this revised Table as it is no longer undertaken.

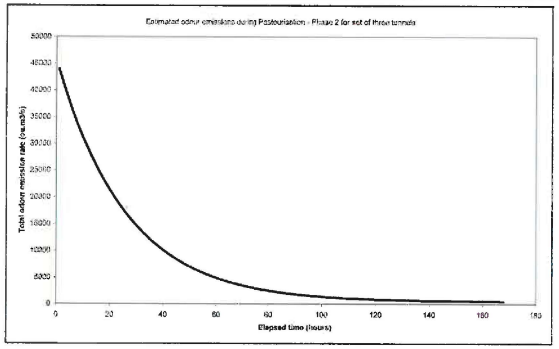


Figure 6 Estimated odour concentration of emissions over pasteurisation (phase 2) process for a set of three tunnels

APPENDIX 4:

Noise Assessment (Herring Storer)

Rochdale Holdings Pty Ltd A.B.N. 85 069 049 067 trading as:
HERRING STORER ACOUSTICS
Suite 34, 11 Preston Street, Como, W.A. 6152
P.O. Box 219, Como, W.A. 6952
Telephone: (08) 9367 6200
Facsimile: (08) 9474 2579
Email: hsa@hsacoustics.com.au

COSTA GROUP PTY LTD

MUSHROOM EXCHANGE

45 ORTON ROAD, CASUARINA

NOISE ASSESSMENT

JULY 2015

OUR REFERENCE: 19347-3-14278-02

DOCUMENT CONTROL PAGE

NOISE ASSESSMENT
MUSHROOM EXCHANGE

Job No: 14278-02

Document Reference: 19347-3-14278-02

FOR

COSTA GROUP PTY LTD

DOCUMENT INFORMATION

Author:	Paul Daly	**Checked By:**	Tim Reynolds
Date of Issue :	8 July 2015		

REVISION HISTORY

Revision	Description	Date	Author	Checked
1	Client Comments	21/7/2015	PLD	
2	Council Comments	17/8/2015	PLD	

DOCUMENT DISTRIBUTION

Copy No.	Version No.	Destination	Hard Copy	Electronic Copy
1	1	Brian Backhouse – Mushroom Exchange		✓
1	2	Brian Backhouse – Mushroom Exchange		✓
1	3	Brian Backhouse – Mushroom Exchange		✓

CONTENTS

APPENDICIES

EXECUTIVE SUMMARY

Herring Storer Acoustics was commissioned by the Mushroom Exchange to undertake an acoustical assessment of noise emissions from the current operations located at 45 Orton Road, Casuarina.

Noise level measurements have been conducted both on a continuous and short term, observed basis. Generally, noise level measurements at the nearest noise sensitive premises (or equivalent distance) were influenced by background noise emanating from the Kwinana Freeway and Thomas Road. As per the regulatory requirement, measurements conducted closer to the noise source were also carried out, with these measured noise levels being used to construct a predictive noise model of the individual noise emissions and various operating scenarios.

Based on analysis of all three (near and far field measurements and the predictive noise model) an assessment of noise levels has been carried out at the neighbouring noise sensitive premises.

Noise levels, under the worst case operating and noise propagation conditions, have been assessed as follows:

Location A. 46 Orton Rd
Assessable noise levels for this location result in an exceedance of 7 dB(A) for the night period. For other regulatory times compliance is achieved. Analysis of the noise levels show the main cooling towers at the Mushroom Exchange are highest contributing noise source.

B. 60 Orton Rd
Assessable noise levels for this location result in an exceedance of 6 dB(A) for the night period and 4 dB(A) for the day period during times of compost delivery / loading. As for Location A, analysis of the noise levels show the main cooling towers at the Mushroom Exchange are highest contributing noise source during the night period.

C. 73 Orton Rd
Assessable noise levels for this location result in an exceedance of 1 dB(A) for the day period during times of compost delivery / loading. For other regulatory times compliance is achieved.

Due to the above potential exceedances, further investigation into noise control for individual noise emissions contributing to the exceedance has been made. These noise control recommendations are provided in this study.

Based on the implementation of the noise control options (as provided in this study), noise levels received at the nearest neighbouring premises have been determined to comply with the *Environmental Protection (Noise) Regulations 1997* for the operating times as outlined in this assessment.

1. INTRODUCTION

Herring Storer Acoustics was commissioned by the Mushroom Exchange to undertake an acoustical assessment of noise emissions from the current operations located at 45 Orton Road, Casuarina.

The Mushroom Exchange is a facility which grows, processes and markets mushrooms to wholesale providers. The facility comprises various operational areas, with the majority of activities being carried out within buildings. The focus of this study is the noise emissions associated with external noise sources, such as product delivery, loading and mechanical services (exhaust fans etc.).

Measurements of the operations in have been undertaken and used as the basis of this assessment. As there is a requirement for the mechanical ventilation to run at all hours, the assessment of the mechanical services has been conducted of the most critical regulatory period of night. For other individual activities such as compost delivery and loading which is carried out once a week during the day, assessment of the relevant time period has been made.

As part of the study, the following was carried out:

- Measure noise levels associated with delivery activities including operations of the front end loader and truck movements in and out of the facility.
- Conduct hand held noise measurements of other noise sources (mechanical plant, exhaust fan, etc.) in near field locations.
- Monitor noise levels continuously in near and far field locations for a period of one week.
- Construct predictive noise model of Mushroom Exchange operations using sound power levels of plant and equipment on site.
- Model a scenario for the worst case noise conditions, as outlined by the DER guidelines.
- Assess noise levels received at neighbouring premises for compliance or otherwise with the requirements of the *Environmental Protection (Noise) Regulations 1997.*
- If exceedances are found, identify noise emissions contributing to the exceedances and provide noise control options for these items.
- Model various scenarios with noise control option included and assess noise levels in accordance with *Environmental Protection (Noise) Regulations 1997.*
- Develop Noise Management Plan based on noise assessment.

For information, a locality plan is attached in Appendix A.

2. CRITERIA

The allowable noise level at the surrounding locales is prescribed by the *Environmental Protection (Noise) Regulations 1997*. Regulations 7 & 8 stipulate maximum allowable external noise levels determined by the calculation of an influencing factor, which is then added to the base levels shown below. The influencing factor is calculated for the usage of land within two circles, having radii of 100m and 450m from the premises of concern.

TABLE 1 - BASELINE ASSIGNED OUTDOOR NOISE LEVEL

Premises Receiving Noise	Time of Day	Assigned Level (dB)		
		$L_{A\ 10}$	$L_{A\ 1}$	$L_{A\ max}$
Noise sensitive premises within 15 metres of a dwelling	0700 - 1900 hours Monday to Saturday (Day)	45 + IF	55 + IF	65 + IF
	0900 - 1900 hours Sunday and Public Holidays (Sunday / Public Holiday Day Period)	40 + IF	50 + IF	65 + IF
	1900 - 2200 hours all days (Evening)	40 + IF	50 + IF	55 + IF
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and Public Holidays (Night)	35 + IF	45 + IF	55 + IF

Note: L_{A10} is the noise level exceeded for 10% of the time.
L_{A1} is the noise level exceeded for 1% of the time.
L_{Amax} is the maximum noise level.
IF is the influencing factor.

It is a requirement that received noise be free of annoying characteristics (tonality, modulation and impulsiveness), defined below as per Regulation 9.

"impulsiveness" means a variation in the emission of a noise where the difference between L_{Apeak} and $L_{Amax\ Slow}$ is more than 15 dB when determined for a single representative event;

"modulation" means a variation in the emission of noise that –

(a) is more than 3dB $L_{A\ Fast}$ or is more than 3 dB $L_{A\ Fast}$ in any one-third octave band;
(b) is present for more at least 10% of the representative assessment period; and
(c) is regular, cyclic and audible;

"tonality" means the presence in the noise emission of tonal characteristics where the difference between –

(a) the A-weighted sound pressure level in any one-third octave band; and
(b) the arithmetic average of the A-weighted sound pressure levels in the 2 adjacent one-third octave bands,

is greater than 3dB when the sound pressure levels are determined as $L_{Aeq,T}$ levels where the time period T is greater than 10% of the representative assessment period, or greater than 8 dB at any time when the sound pressure levels are determined as $L_{A\ Slow}$ levels.

Where the noise emission is not music, if the above characteristics exist and cannot be practicably removed, then any measured level is adjusted according to Table 2 below.

TABLE 2 - ADJUSTMENTS TO MEASURED LEVELS

Where **tonality** is present	Where **modulation** is present	Where **impulsiveness** is present
+5 dB(A)	+5 dB(A)	+10 dB(A)

Note: These adjustments are cumulative to a maximum of 15 dB.

The nearest potential noise sensitive premises to the proposed development have been identified using the area map attached as Figure A2 in Appendix A.

The influencing factor at the closest identified premises has been assessed as 2 to 6 dB:

Major Roads (Kwinana Freeway) within inner circle
A + 6 dB

Major Roads (Freeway) within outer circle
B and C + 2 dB

Hence, Table 3 summarises the Assigned Noise Levels for residences identified in Figure A2.

TABLE 3- ASSIGNED OUTDOOR NOISE LEVEL

Receiver Type	Influencing Factor	Time of Day	Assigned Level (dB)		
			$L_{A\,10}$	$L_{A\,1}$	$L_{A\,max}$
A	+6	Day	51	61	71
		Sunday / Public Holiday Day Period	46	56	71
		Evening	46	56	61
		Night	41	51	61
B and C	+2	Day	47	57	67
		Sunday / Public Holiday Day Period	42	52	67
		Evening	42	52	57
		Night	37	47	57

Note: L_{A10} is the noise level exceeded for 10% of the time.
L_{A1} is the noise level exceeded for 1% of the time.
L_{Amax} is the maximum noise level.

FIGURE 1 – RECEIVER LOCATION MAP

3. NOISE MEASUREMENT

3.1 CONTINUOUS NOISE MONITORING

The acoustic environment was monitored at two locations from 9th to 16th June 2015. Monitoring was performed using automatic noise data loggers (NGARA). These loggers were set to measure statistical data intervals in accordance with EPA Draft Guidance for Assessment of Environmental Factors No. 8 - Environmental Noise. Of the statistical noise level data recorded, the L_{Aeq}, L_{A1}, L_{A10}, and L_{A90} levels are reported. Additionally the monitors recorded wav files for the entire period. The wav files were used for post analysis to confirm "audibly" and characteristics of the noise emissions.

Two locations were used for the continuous noise monitors, firstly the main compost loading / unloading area outside of the Tunnel building within the Mushroom Exchange facility. The second monitor was situated near to the boundary of the residential premise located at 73 Orton Road. Whilst not the closest noise sensitive premise, this site was chosen as from information provided, this was the main premise of concern in regard to noise. Monitor locations are shown in Appendix A.

The Noise Logger was calibrated prior to and after use with a Bruel and Kjaer 4230 Calibrator. All equipment used is currently NATA calibrated. Calibration certificates are available on request. The monitored noise levels are shown graphically in Appendix B with pictures of the monitors and surrounds shown in Figure 2.

FIGURE 2 – LOGGER A – MUSHROOM EXCHANGE LOADING PAD NOISE MONITOR

FIGURE 3 – LOGGER B – FAR FIELD NOISE MONITOR

3.2 SHORT TERM OBSERVED MEASUREMENTS

Hand held observed measurements were conducted on Wednesday 10th June 2015 from 06:30 to 10:30 hours. Noise level measurements were conducted with a Svan 948 Sound and Vibration Analyser which has a current NATA calibration. The calibration certificate is available on request.

Measurements were conducted at various locations within the facility, as well as locations representing the neighbouring noise sensitive premises. Generally, measurements were short term and where possible only of the individual noise emissions from the Mushroom Exchange operations. Figure 4 outlines the measurement locations.

FIGURE 4 – MEASUREMENT LOCATIONS

During the measurements, the Mushroom exchange operations were considered to be at a maximum. Operations measured included:

- Delivery of compost via semi-trailer trucks (one and two trailer units);
- Front end loader, loading the conveyor system;
- Hopper and conveyor system;
- General plant; and
- Cooling Towers.

Note: During the loading of the hopper with the front end loader, there is a requirement to "shake" the bucket to release any compost sticking to the bucket. This is a hydraulic action resulting in transferred noise into the mechanical arm. The above measurements include this operation with the results noted accordingly.

4. MEASURED NOISE LEVEL RESULTS

4.1 HAND HELD OBSERVED MEASUREMENTS

Summarised noise levels for the various locations and the corresponding Mushroom Exchange activity are listed in Table 4. The overall noise descriptor of L_{A1}, L_{A10} and L_{Amax} are noted.

TABLE 4 – SHORT TERM MEASURED NOISE LEVELS dB(A)

Measurement Location	Operating Condition / Noise Source	Comment	L_{A10}	L_{A01}	L_{Amax}
A*	Cooling Tower Fans	Fans Audible/ Traffic influence	60	64	68
B*	General Plant (No Loading)	No Loading / traffic influence	52	55	56
	Loader Loading Hopper	Shaking of Bucket included	52	58	59
C	General Plant (No Loading)	No Loading / traffic influence	52	54	56
	Truck in	-	53	54	58
	Truck Unloading	-	54	55	57
	Loader Loading Hopper	Shaking of Bucket included	56	64	65
D*	Loader Loading Hopper	Shaking of Bucket included	51	55	56
E	Truck In	-	67	72	73
	Loader Loading Hopper	Shaking of Bucket included	56	64	66
F	Truck Unload	Includes Loader	76	78	83
	Loader Loading Hopper	Shaking of Bucket included	73	79	88
G	Truck Out	Includes Loader	75	79	79
	Loader Loading Hopper	Shaking of Bucket included	71	79	85
	General Plant (No Loading)	No Loading / traffic influence	55	56	56
H	Tunnel Building Fans	No Loading / traffic influence	69	-	70
I	Cooling Tower Fans	Fans Audible/ Traffic influence	71	-	72

* Denotes approximate noise sensitive premise measurement location

4.2 CONTINOUS NOISE MONITORING

A Summarised comparison of the 15 minute noise levels for the L_{A10}, L_{A1} and L_{Amax} at both monitoring locations is shown in Figures 5 to 7. For the purpose of the summary, only Wednesday 10th June is detailed, with the entire monitoring period comparison contained in Appendix B.

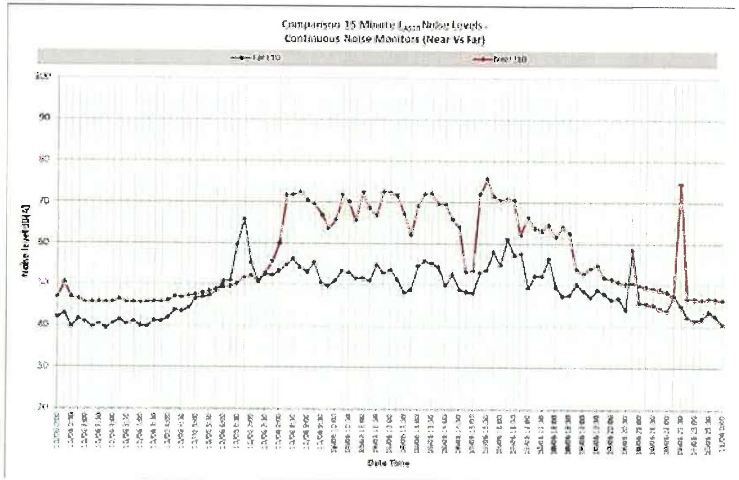


FIGURE 5 – L_{A10} COMPARISON NOISE LEVELS WED 10TH JUNE 2015

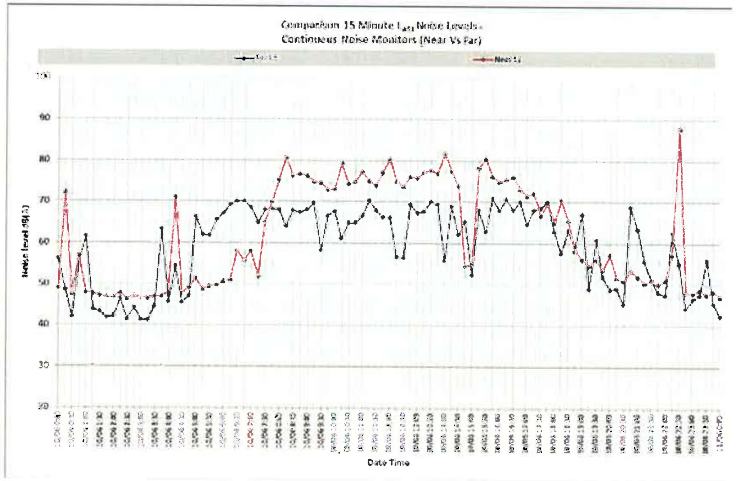


FIGURE 6 – L_{A01} COMPARISON NOISE LEVELS WED 10th JUNE 2015

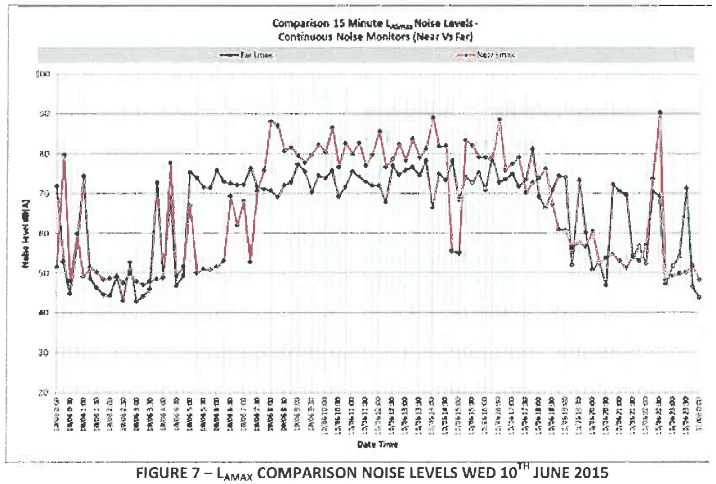


FIGURE 7 – L_{AMAX} COMPARISON NOISE LEVELS WED 10TH JUNE 2015

5. CALCULATED NOISE LEVELS

Noise emissions at the nearest neighbouring residential premises, due to noise associated with the Mushroom Exchange facility, were modelled using the computer programme SoundPlan. Due to the influence of ambient (traffic) noise, as per the regulatory requirements (Regulation7), noise emissions from the Mushroom Exchange were measured at a closer distance with these measured noise levels being used to construct the predictive noise model.

Sound power levels used for the calculations are based on measured sound pressure levels of the various plant and equipment during the site visit.

The modelling of noise levels has been based the sound power levels for the noise sources contained in Table 5.

TABLE 5 – SOURCES SOUND POWER LEVELS

Element Name	Sum dB(A)	
	L_{A10}	L_{Amax}
Truck In	87	93
Loader (At Hopper)	100	112
Hopper and Conveyor (No Loader)	100	-
Tunnel Building Fans	93	-
Tunnel Building Exhaust Fan (Attenuated)	79	-
Sump Pump	96	-
Growing Room Cooling Towers	80	-
Main Cooling Towers (West)	99	-
Loading Dock Chillers	87	-
Refrigeration Truck (Chiller Unit)	90	-
Forklift	90	-

Based on noise emissions from the above equipment, various operating scenarios have been developed. These scenarios represent periods of worst case noise emissions for the operations including:

Scenario 1 Night Operations (L_{A10})

- Fixed Plant:
  Tunnel Building Fans x 3
  Tunnel Building Exhaust Fan (Attenuated) x 1
  Sump Pump x 1
  Growing Room Cooling Tower x 1
  Main Cooling Tower x 1
  Loading Dock Chillers x 1
- Refrigerator Truck x 1

Scenario 2 Day Operations (No Compost Delivery) (L_{A10})

- Fixed Plant:
  Tunnel Building Fans x 3
  Tunnel Building Exhaust Fan (Attenuated) x 1
  Sump Pump x 1
  Growing Room Cooling Tower x 1
  Main Cooling Tower x 1
  Loading Dock Chillers x 1
- Truck Delivery x 1
- Forklifts x 2
- Loader x 1

Scenario 3 Day Operations (Compost Delivery Wednesday Only) (L_{A10})

- Fixed Plant:
  Tunnel Building Fans x 3
  Tunnel Building Exhaust Fan (Attenuated) x 1
  Sump Pump x 1
  Growing Room Cooling Tower x 1
  Main Cooling Tower x 1
  Loading Dock Chillers x 1
- Hopper and Conveyor System
- Loader x 1
- Truck Delivery (Compost) x 1
- Forklifts x 2

Additional to the above scenarios, two more operating parameters were modelled. Analysis of the measured noise levels associated with the truck movement and the shaking of the front end loader bucket during the hopper loading showed that the time noise was present for these operations would not be considered under the L_{A10} criteria. Therefore the two additional scenarios are as follows:

Scenario 4 Day Operations – Truck Movements on Access Road (L_{A1})

- Truck movement on Access Road

Scenario 5 Day Operations – Loader "Banging" of bucket (L_{A1})

- Front End Loader – Bucket movement

It is noted that the Mushroom Exchange has some diversity in operations and it is unlikely that all equipment would be operating at the same time, as some items may not be in use. However, to provide a conservative assessment, the calculated operating scenario includes all items operating at the same time.

Modelling does not allow for the inclusion reversing alarms noise emissions. Whilst it is a recommendation that all equipment on site be fitted with the broadband alarms, information from the Mushroom Exchange is that these broadband alarms are not deemed to be safe, having being previously trialled on site. This is due to the interaction between pedestrians and the mobile equipment, with the broadband alarms not providing sufficient warning for pedestrians.

Based on the site visit and measurements, we believe that there are no other significant noise sources and hence, no other noise sources have been considered for this assessment.

The following input data was used in the calculations:

a) Supplied Drawings and source locations, shown in part in Figure 7.
b) Sound Power Levels listed in Table 5.
c) Ground Absorption of 0.65

FIGURE 7 – SOURCE LOCATION MAP

Weather conditions for modelling were as stipulated in the Environmental Protection Authority's *"Draft Guidance for Assessment of Environmental Factors No. 8 – Environmental Noise"* and for the day and night periods are as listed in Table 6.

TABLE 6 – WEATHER CONDITIONS

Condition	Day	Night
Temperature	20°C	15°C
Relative humidity	50%	50%
Pasquill Stability Class	E	F
Wind speed	4 m/s*	3 m/s*

* From sources, towards receivers.

6. RESULTS

Calculated noise levels associated with noise emissions from the various activities for the Mushroom Exchange, are summarised below in Table 7. The calculated noise contour plots are contained in Appendix C.

TABLE 7 – CALCULATED NOISE LEVELS AT NEAREST NEIGHBOURS

Location	Calculated Noise Level, dB(A)				
	Scenario 1 - Base Fixed Plant (Night) L_{A10}	Scenario 2 - All Noise Sources Normal Day (Non compost loading) L_{A10}	Scenario 3 - All Noise Sources Including Loader L_{A10}	Scenario 4 - Truck In Access Road L_{A1}	Scenario 5 - Loader Only L_{A1}
A. 46 Orton Rd	48	48	48	36	45
B. 60 Orton Rd	43	43	51	47	58
C. 73 Orton Rd	33	35	48	38	56

7. ASSESSMENT

Analysis of the measured noise levels has been conducted. Generally, measured noise for the Mushroom Exchange noise emissions at far field locations were audible, although they are still influenced by background noise levels, such as freeway traffic.

Whist normal practice is to make comment on whether annoying characteristics were present, due to the critical nature of this assessment; an analysis of the annoying characteristics has been undertaken, with the evidence of the analysis included in this report.

For the determination of tonality, the short term L_{Aeq} noise measurements of individual activities were employed.

For the loader bucket movement, there is a possibility that when the bucket shakes, it could be impulsive. Therefore, analysis for this impulsiveness has been based on the detailed time histories. Figures 8 to 10 contain the analysis data for each of the representative noise sensitive premises.

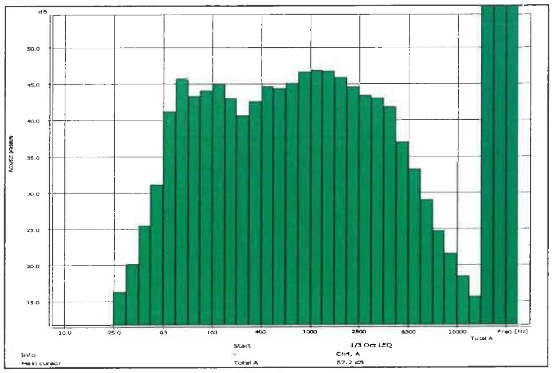
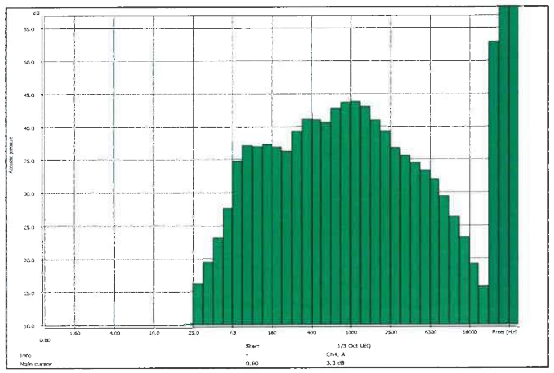


FIGURE 8 – LOCATION A – TONAL ASSESSMENT



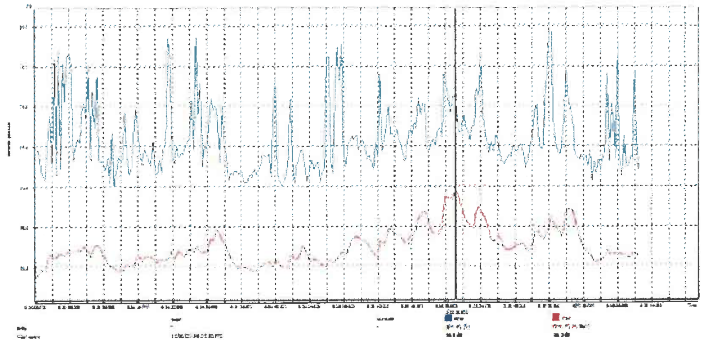


FIGURE 9 – LOCATION B – TONAL AND IMPULSIVE ASSESSMENTS

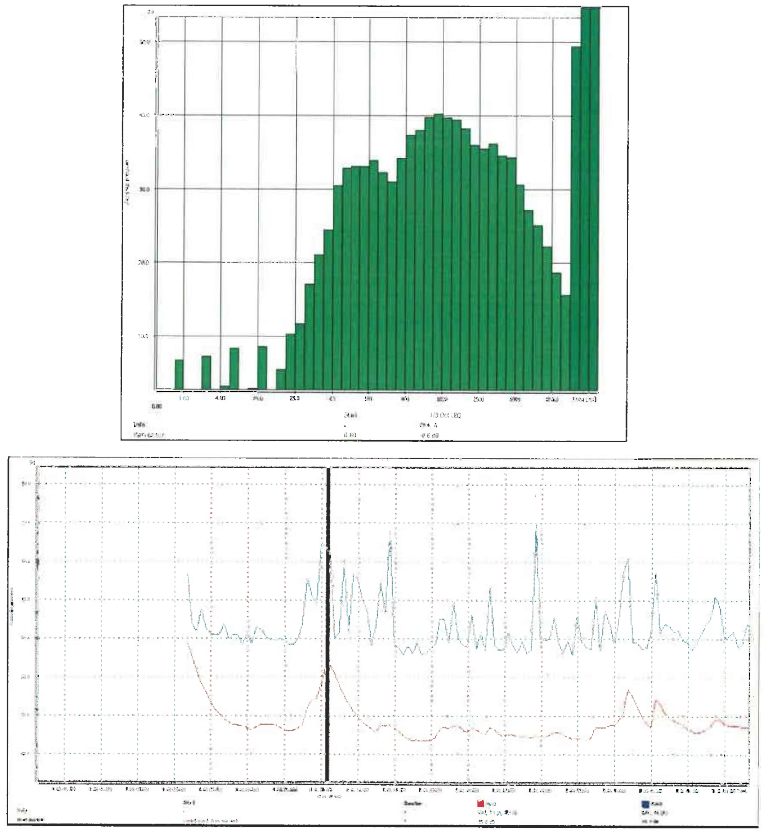


FIGURE 10 – LOCATION D – TONAL AND IMPULSIVE ASSESSMENTS

Analysis of the measured noise levels shows that it is unlikely that noise emissions would contain tonal characteristics due to the presence of traffic noise, masking the tonality. Additional, analysis of the noise associated with the loader bucket showed that noise levels would not be impulsive; hence no penalty has been applied.

Hence, Table 8 summarises the applicable Assigned Noise Levels, and assessable noise level emissions.

TABLE 8 – ASSESSMENT OF NOISE LEVELS

Receiver	Operating Condition / Scenario	Assessable Noise Level, dB(A)	Applicable Times of Day	Applicable Assigned Noise Level (dB)			Exceedance to Assigned Noise Level (dB)
				L_{A10}	L_{A01}	L_{Amax}	
A. 46 Orton Rd	Scenario 1 -Base Fixed Plant (Night) L_{A10}	48	Night	41			+7
	Scenario 2 - All Noise Sources Normal Day (Non compost loading) L_{A10}	48	Day	51	-	-	Complies
	Scenario 3 - All Noise Sources Including Loader L_{A10}	48		51	-	-	Complies
	Scenario 4- Truck In Access Road L_{A1}	36		-	61	-	Complies
	Scenario 5 - Loader Only L_{A1}	45		-	61	-	Complies
B. 60 Orton Rd	Scenario 1 -Base Fixed Plant (Night) L_{A10}	43	Night	37	-	-	+6
	Scenario 2 - All Noise Sources Normal Day (Non compost loading) L_{A10}	43	Day	47	-	-	Complies
	Scenario 3 - All Noise Sources Including Loader L_{A10}	51		47	-	-	+4
	Scenario 4 - Truck In Access Road L_{A1}	47		-	57	-	Complies
	Scenario 5 - Loader Only L_{A1}	58		-	57	-	+1
C. 73 Orton Rd	Scenario 1 -Base Fixed Plant (Night) L_{A10}	33	Night	37	-	-	Complies
	Scenario 2 - All Noise Sources Normal Day (Non compost loading) L_{A10}	35	Day	47	-	-	Complies
	Scenario 3 - All Noise Sources Including Loader L_{A10}	48		47	-	-	+1
	Scenario 4 - Truck In Access Road L_{A1}	38		-	57	-	Complies
	Scenario 5 - Loader Only L_{A1}	56		-	57	-	Complies

8. DISCUSSION

It is noted that, both the measured noise levels and calculated noise levels correlate. There is a variation of around 1 dB lower for the calculated noise levels, which after investigation, is accounted for by the influence of background (i.e. measured noise levels would be 1 dB less when adjusted for traffic influence).

Exceedances in noise levels were assessed for different areas of the facility noise emissions. These noise sources and the respective noise sensitive receiver are explored further, with recommendations on noise control options included.

Location A

Assessable noise levels for this location result in an exceedance of 7 dB(A) for the night period. For other regulatory times compliance is achieved. Analysis of the noise levels show the main cooling towers at the Mushroom Exchange are highest contributing noise source.

Noise control in the form of a barrier is recommended for this area. Information provided is that there are only two of the towers in operations. Hence, the barrier would be required to extend approximately 1m above the top of the two operating cooling towers. Figure 11 details the location of the barrier.

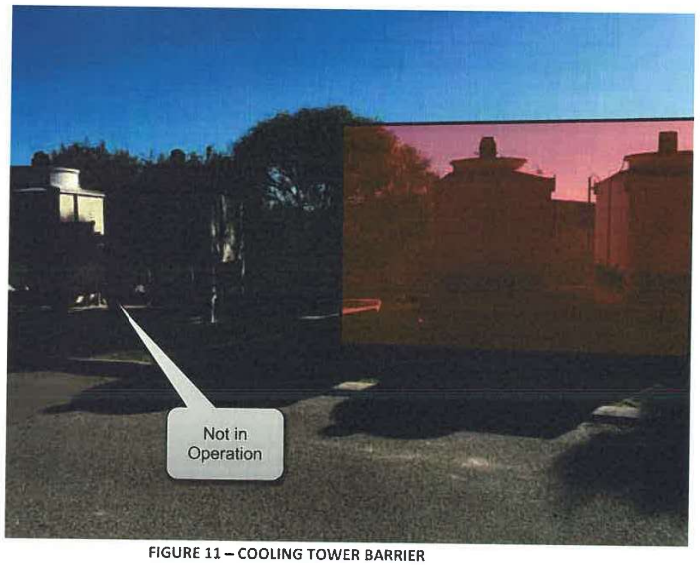


FIGURE 11 – COOLING TOWER BARRIER

Location B

Assessable noise levels for this location result in an exceedance of 6 dB(A) for the night period and 4 dB(A) for the day period during times of compost delivery / loading.

As for Location A, analysis of the noise levels show the main cooling towers at the Mushroom Exchange are highest contributing noise source during the night period. Therefore noise control in the form of a barrier, as recommended, would ensure the same reduction in noise levels for this location.

For noise emissions associated with the Mushroom Exchange compost delivery / loading operations, which normally occur on a Wednesday, noise levels exceed the assigned criteria by 4 dB(A). Investigations show the combination of front end loader operations and the hopper / conveyor are the cause of the exceedance.

Investigations are being conducted into the enclosure of the hopper and conveyor system for the compost loading area. Once enclosed the hopper is loader directly via a "walking deck" truck which eliminates the need for the front end loader. With the reduction of noise emissions from the usage of the front end loader and the attenuation of the hopper and conveyor noise emissions, noise levels would be reduced at this location to a level where compliance would be achieved.

Modelling has also been carried out to include a barrier 4.8 m high along the southern end of the concrete loading area. The height of 4.8 m has been chosen as this is the same as two stacked sea containers. With the inclusion of this barrier, noise levels would be reduced at this location to a level where compliance would be achieved.

Either of the noise control options provided for the composting loading area would result in noise emissions being reduced to a level where compliance is achieved at this location.

Location C

Assessable noise levels for this location result in an exceedance of 1 dB(A) for the day period during times of compost delivery / loading. For other regulatory times and operations, compliance is achieved.

As for location B, investigations show the combination of front end loader operations and the hopper / conveyor are the cause of the exceedance.

The preferable noise control option is the enclosure of the hopper / conveyor and the removal of the front end loader by utilising walking deck trucks to load directly into the hopper as outlined for Location B.

To provide an alternative to the enclosing of the loading equipment, modelling has been carried out to include a barrier 4.8m high along the southern end of the concrete loading area. The height of 4.8 m has been chosen as this is the same a two stacked sea containers. With the inclusion of this barrier, noise levels would be reduced at this location to a level where compliance would be achieved.

FIGURE 12 SHOWS THE LOCATION OF THE BARRIER REQUIRED FOR THE LOADING AREA

As for Location B advice, either of the noise control options provided for the composting loading area would result in noise emissions being reduced to a level where compliance is achieved at this location.

APPENDIX A

FIGURE A1 – SITE LAYOUT
FIGURE A2 – MONITORING LOCATION

FIGURE A1 – SITE LAYOUT

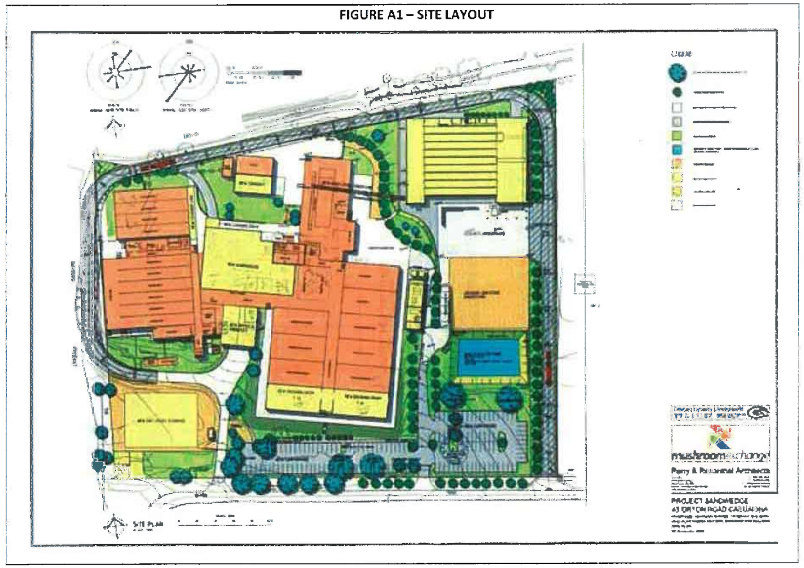
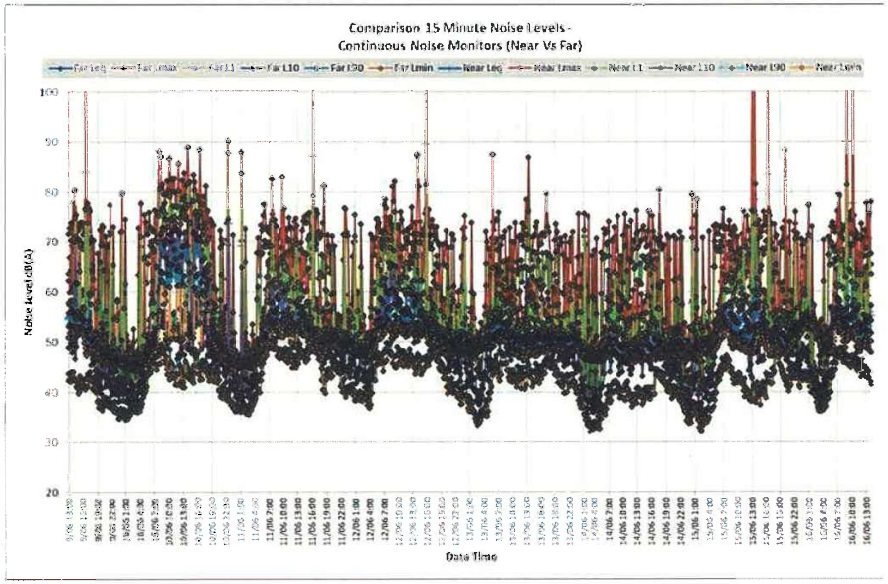
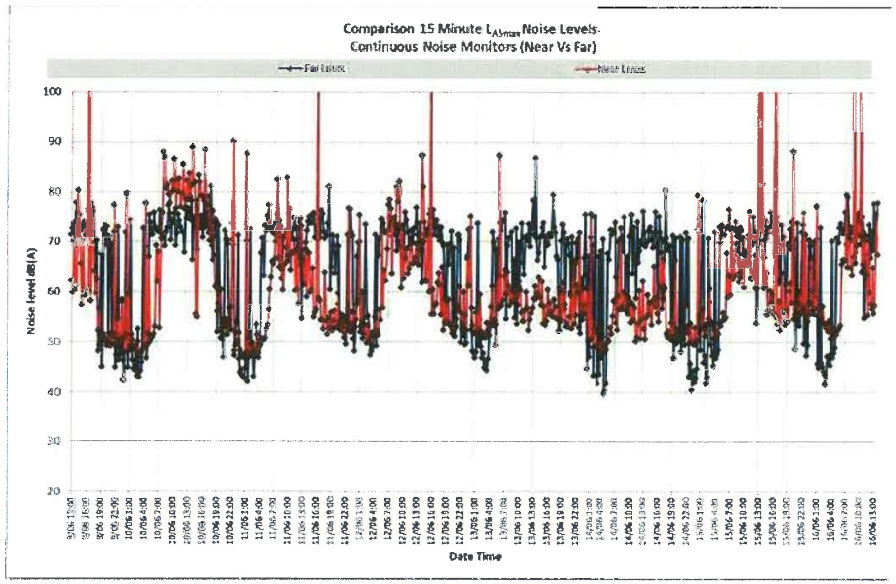


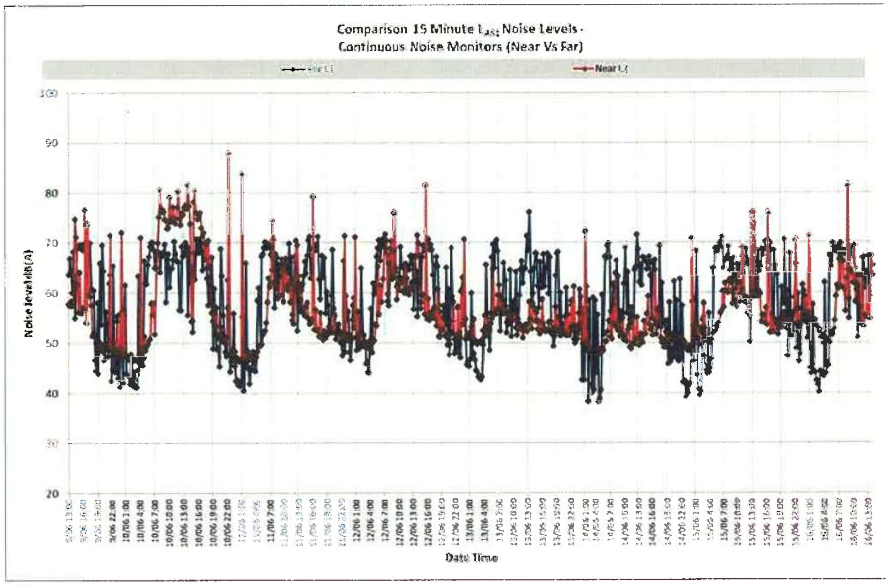
FIGURE A2 – MONITOR LOCATION

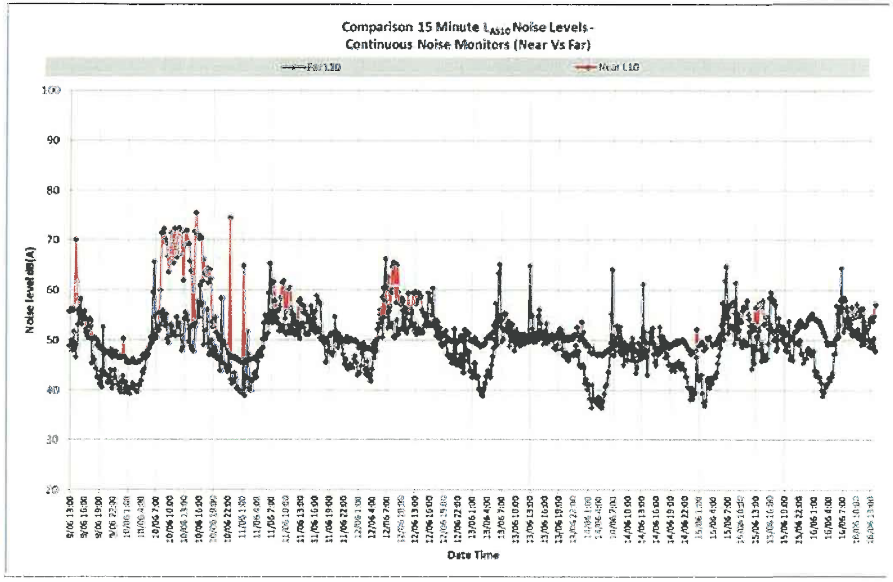
APPENDIX B

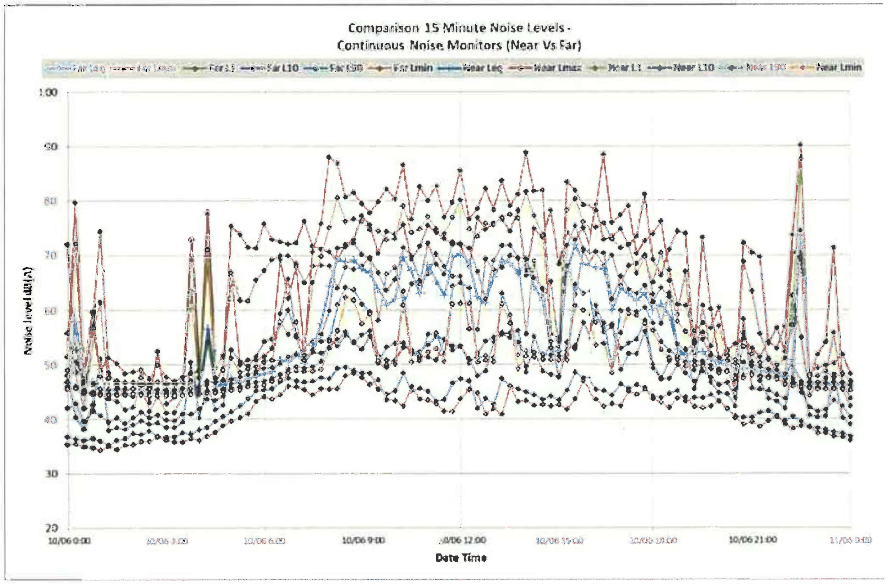
NOISE MONITORING RESULTS

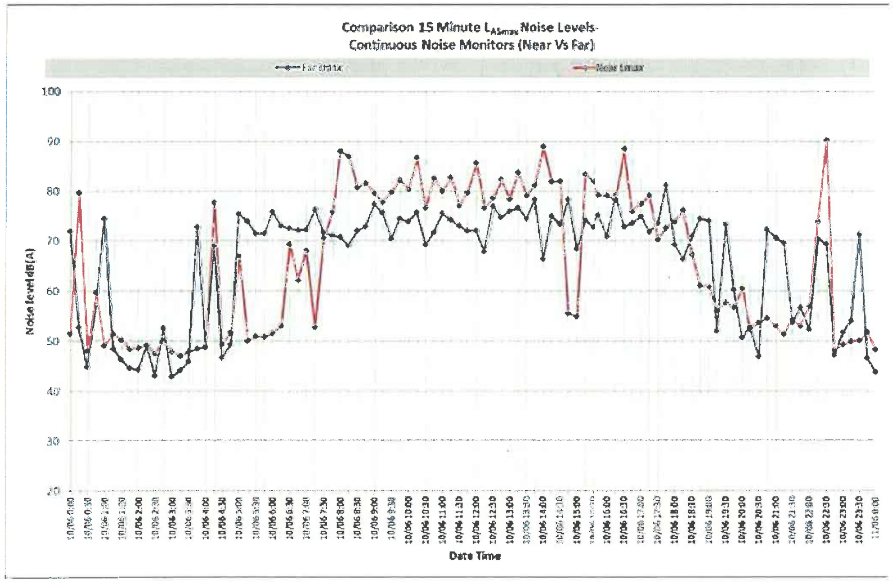

Comparison 15 Minute Noise Levels -
Continuous Noise Monitors (Near Vs Far)
Far L10
Far L90
Far Lmin
Near Leq
Near Lmax
Near L1
Near L10
Near L90
Noise Level dB(A)
100
90
80
70
60
50
40
30
20
Date Time

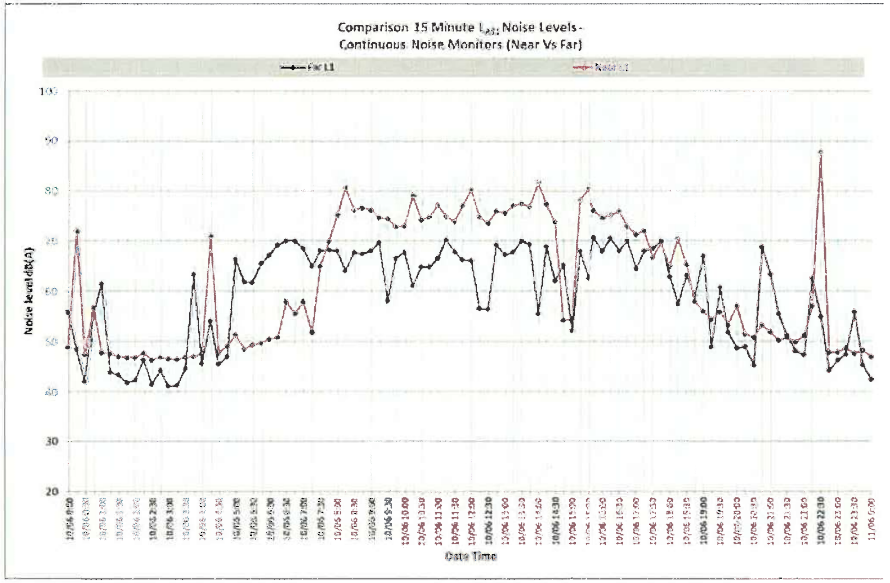

Comparison 15 Minute LASmax Noise Levels
Continuous Noise Monitors (Near Vs Far)
Far Limits
Near Limits
Noise level dB(A)
100
90
80
70
60
50
40
30
20
Date Time

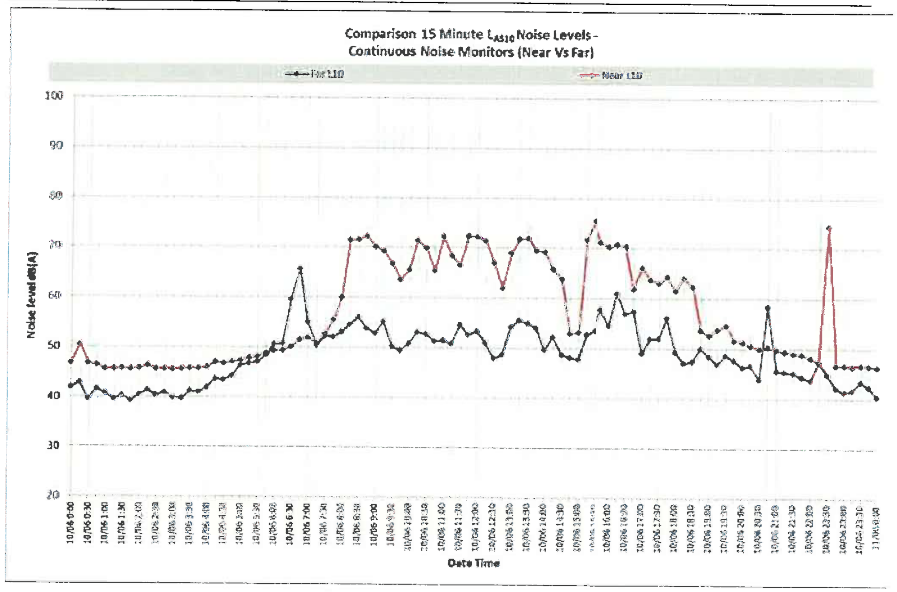

Comparison 15 Minute L_{A90} Noise Levels -
Continuous Noise Monitors (Near Vs Far)
Near L1
Noise Level dB(A)
100
90
80
70
60
50
40
30
20
Date Time


Comparison 15 Minute L_{A510} Noise Levels -
Continuous Noise Monitors (Near Vs Far)
Far L10
Near L10
Noise level dB(A)
100
90
80
70
60
50
40
30
20
Date Time


Comparison 15 Minute Noise Levels -
Continuous Noise Monitors (Near Vs Far)
Far L1
Far L10
Far L90
Far Lmin
Near Leq
Near Lmax
Near L1
Near L10
Near Lmin
100
90
80
70
60
50
40
30
20
Noise level (dB(A))
10/06 0:00
10/06 6:00
10/06 9:00
10/06 12:00
10/06 21:00
Date Time

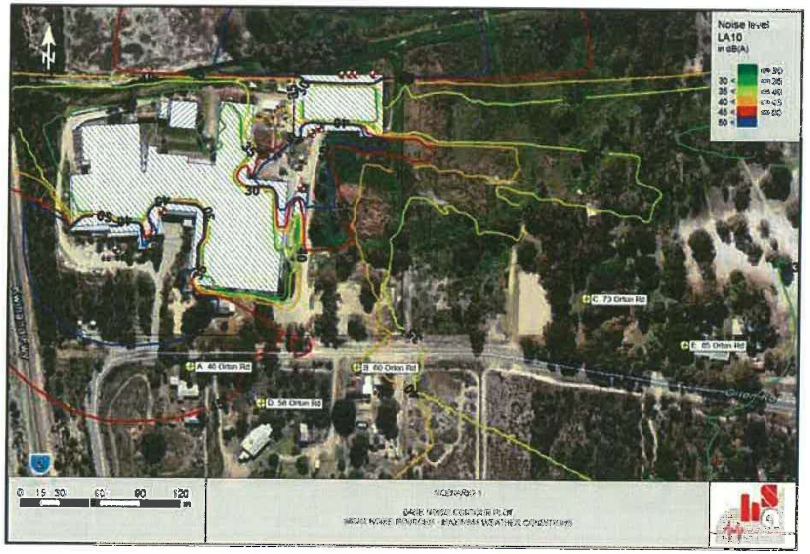

Comparison 15 Minute L_{ASmax} Noise Levels
Continuous Noise Monitors (Near Vs Far)
Far LAmax
Near LAmax
Noise level dB(A)
100
90
80
70
60
50
40
30
20
Date Time


Comparison 15 Minute L_{A90} Noise Levels -
Continuous Noise Monitors (Near Vs Far)
Far L1
Near L1
Noise level dB(A)
100
90
80
70
60
50
40
30
20
Date Time


Comparison 15 Minute L_{A510} Noise Levels -
Coatinuous Noise Monitors (Near Vs Far)
Far L10
Near L10
100
90
80
70
60
50
40
30
20
Noise level dB(A)
Date Time

APPENDIX C

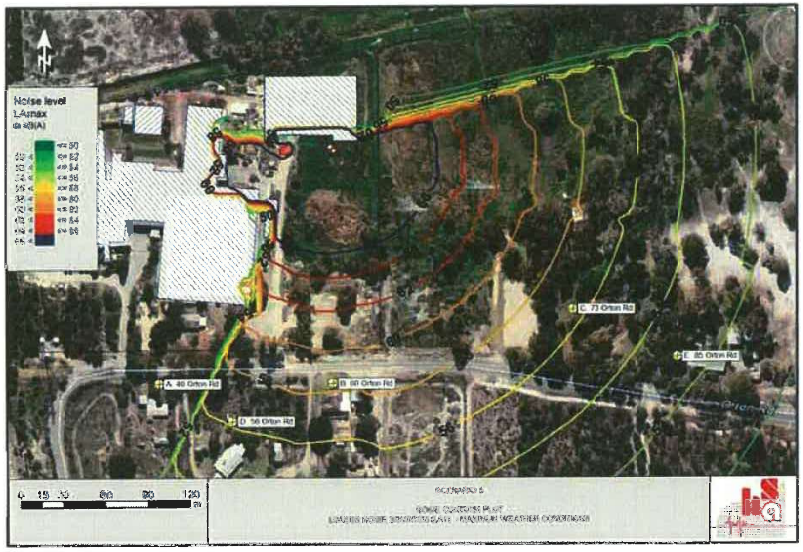
NOISE CONTOUR PLOT


Noise level
LA10
in dB(A)
30 <
35 <
40 <
45 <
50 <
C 73 Orton Rd
E 65 Orton Rd
A 46 Orton Rd
B 60 Orton Rd
D 56 Orton Rd
0 15 30 60 90 120
m


A, 40 Orton Rd
B, 60 Orton Rd
C, 73 Orton Rd
D, 50 Orton Rd
E, 85 Orton Rd
0 15 30 60 90 120
m
SCENARIO 9
NOISE CONTOUR PLOT
DAY LEQ16 SOURCES (NO CONTACT LOADING) + MAXIMUM WEATHER CONDITIONS

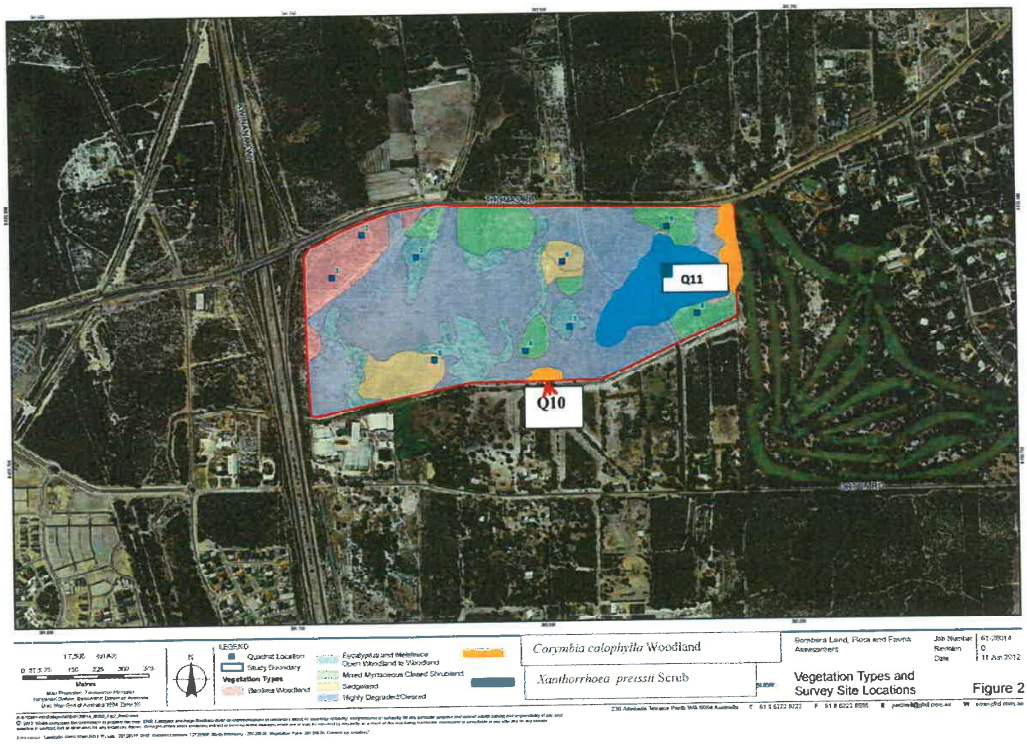

Noise level
LA10
C. 73 Orton Rd
C. 65 Orton Rd
A. 46 Orton Rd
B. 60 Orton Rd
D. 56 Orton Rd
0 15 30 60 90 125
SCENARIO 3


Noise level
LA1
in dB(A)
<= 40
<= 45
<= 50
<= 55
<= 60
<= 65
<= 70
<= 75
<= 80
C 73 Orton Rd
E 85 Orton Rd
A 40 Orbe Rd
B 60 Orton Rd
D 50 Orton Rd
0 15 30 60 90 120
m
SCENARIO 4
NOISE CONTOUR PLOT
TRUCK NOISE SOURCE (LA1) - MAXIMUM WEATHER CONDITIONS


Noise level
LAmax
dB(A)
C, 71 Orton Rd
E, 85 Orton Rd
A, 40 Orton Rd
B, 60 Orton Rd
D, 56 Orton Rd
0 15 30 60 90 120
m

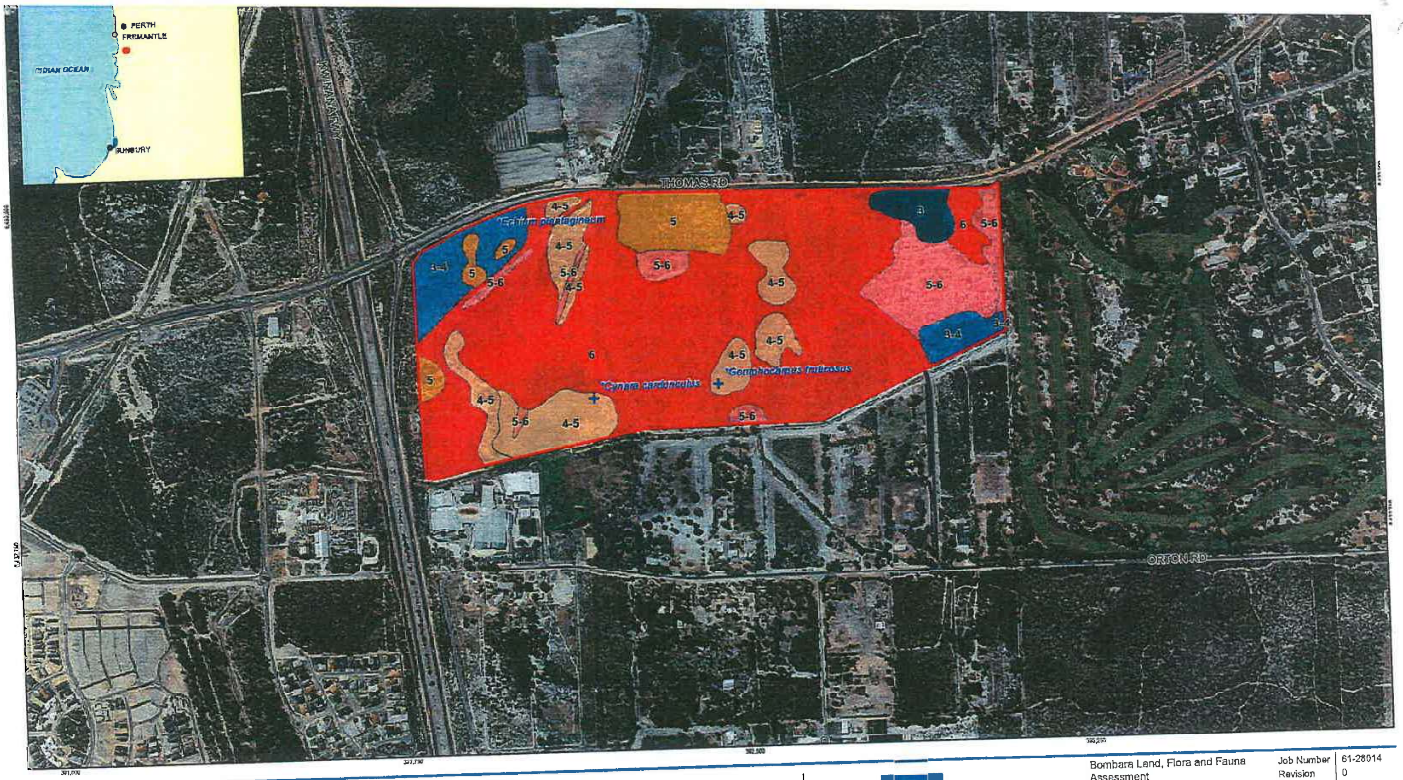
APPENDIX 5

Vegetation Type Mapping


Q11
Q10
LEGEND
Quadrat Location
Study Boundary
Vegetation Types
Banksia Woodland
Eucalyptus and Melaleuca Open Woodland to Woodland
Mixed Myrtaceous Closed Shrubland
Sedgeland
Highly Degraded/Cleared
Corymbia calophylla Woodland
Xanthorrhoea preissii Scrub
Vegetation Types and Survey Site Locations
Figure 2

APPENDIX 6

Vegetation Condition Mapping



1:7,500 (at A3)

0 37.5 75 150 225 300 375

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 50

N

LEGEND

- Declared Weeds
- Study Boundary

Vegetation Condition

- 1. Pristine or Nearly so
- 1-2
- 2. Excellent
- 2-3
- 3. Very Good
- 3-4
- 4. Good
- 4-5
- 5. Degraded
- 5-6
- 6. Completely Degraded

GHD

239 Adelaide Terrace Perth WA 6004 Australia T 61 8 6222 8222 F 61 8 6222 8555 E permail@ghd.com.au W www.ghd.com.au

SLIP ENABLER

Bombara Land, Flora and Fauna Assessment

Job Number 61-28014
Revision 0
Date 11 Jun 2012

Vegetation Condition and Declared Flora Species

Figure 3

APPENDIX 7

Aboriginal Heritage Inquiry System Reports

Search Criteria

No Registered Aboriginal Sites in Custom search area - Polygon - 115.848677902975°E, 32.2356459800142°S (GDA94) : 115.848677902975°E, 32.2297469675972°S (GDA94) : 115.865908413687°E, 32.2297469675972°S (GDA94) : 115.865908413687°E, 32.2356459800142°S (GDA94) : 115.848677902975°E, 32.2356459800142°S (GDA94)

Disclaimer

The *Aboriginal Heritage Act 1972* preserves all Aboriginal sites in Western Australia whether or not they are registered. Aboriginal sites exist that are not recorded on the Register of Aboriginal Sites, and some registered sites may no longer exist.

The information provided is made available in good faith and is predominately based on the information provided to the Department of Aboriginal Affairs by third parties. The information is provided solely on the basis that readers will be responsible for making their own assessment as to the accuracy of the information. If you find any errors or omissions in our records, including our maps, it would be appreciated if you email the details to the Department at heritageenquiries@daa.wa.gov.au and we will make every effort to rectify it as soon as possible.

South West Settlement ILUA Disclaimer

Your heritage enquiry is on land **within or adjacent to** the following Indigenous Land Use Agreement(s): Gnaala Karla Booja People ILUA.

On 8 June 2015, six identical Indigenous Land Use Agreements (ILUAs) were executed across the South West by the Western Australian Government and, respectively, the Yued, Whadjuk People, Gnaala Karla Booja, Ballardong People, South West Boojarah #2 and Wagyl Kaip & Southern Noongar groups, and the South West Aboriginal Land and Sea Council (SWALSC).

The ILUAs bind the parties (including 'the State', which encompasses all State Government Departments and certain State Government agencies) to enter into a Noongar Standard Heritage Agreement (NSHA) when conducting Aboriginal Heritage Surveys in the ILUA areas, unless they have an existing heritage agreement. It is also intended that other State agencies and instrumentalities enter into the NSHA when conducting Aboriginal Heritage Surveys in the ILUA areas. It is recommended a NSHA is entered into, and an 'Activity Notice' issued under the NSHA, if there is a risk that an activity will 'impact' (i.e. by excavating, damaging, destroying or altering in any way) an Aboriginal heritage site. The Aboriginal Heritage Due Diligence Guidelines, which are referenced by the NSHA, provide guidance on how to assess the potential risk to Aboriginal heritage.

Likewise, from 8 June 2015 the Department of Mines and Petroleum (DMP) in granting Mineral, Petroleum and related Access Authority tenures within the South West Settlement ILUA areas, will place a condition on these tenures requiring a heritage agreement or a NSHA before any rights can be exercised.

If you are a State Government Department, Agency or Instrumentality, or have a heritage condition placed on your mineral or petroleum title by DMP, you should seek advice as to the requirement to use the NSHA for your proposed activity. The full ILUA documents, maps of the ILUA areas and the NSHA template can be found at https://www.dpc.wa.gov.au/lantu/Claims/Pages/SouthWestSettlement.aspx.

Further advice can also be sought from the Department of Aboriginal Affairs (DAA) at heritageenquiries@daa.wa.gov.au.

Copyright

Coordinate Accuracy

Coordinates (Easting/Northing metres) are based on the GDA 94 Datum. Accuracy is shown as a code in brackets following the coordinates.

Department of Planning, Lands and Heritage

Aboriginal Heritage Inquiry System

Map of Registered Aboriginal Sites

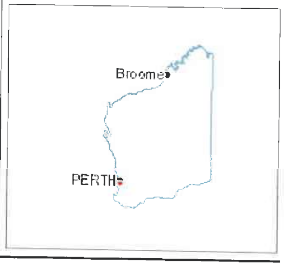
Legend

- Registered Aboriginal Site
- Search Area
- Town
- Road
- River
- Local Government Authority

0.61 kilometres

Map Scale 1 : 18,600

MGA Zone 50 (GDA94)



Map created: 24/07/2017 2:49:44 PM by: GIS_NET_USER

Identifier: 297545

Department of **Planning, Lands and Heritage**

GOVERNMENT OF WESTERN AUSTRALIA

Aboriginal Heritage Inquiry System

List of Other Heritage Places

Search Criteria

No Other Heritage Places in Custom search area - Polygon - 115.849579125204°E, 32.2357185808583°S (GDA94) : 115.849579125204°E, 32.2298377245348°S (GDA94) : 115.865522175589°E, 32.2298377245348°S (GDA94) : 115.865522175589°E, 32.2357185808583°S (GDA94) : 115.849579125204°E, 32.2357185808583°S (GDA94)

Disclaimer

The *Aboriginal Heritage Act 1972* preserves all Aboriginal sites in Western Australia whether or not they are registered. Aboriginal sites exist that are not recorded on the Register of Aboriginal Sites, and some registered sites may no longer exist.

The information provided is made available in good faith and is predominately based on the information provided to the Department of Aboriginal Affairs by third parties. The information is provided solely on the basis that readers will be responsible for making their own assessment as to the accuracy of the information. If you find any errors or omissions in our records, including our maps, it would be appreciated if you email the details to the Department at heritageenquiries@daa.wa.gov.au and we will make every effort to rectify it as soon as possible.

South West Settlement ILUA Disclaimer

Your heritage enquiry is on land **within or adjacent to** the following Indigenous Land Use Agreement(s): Gnaala Karla Booja People ILUA.

On 8 June 2015, six identical Indigenous Land Use Agreements (ILUAs) were executed across the South West by the Western Australian Government and, respectively, the Yued, Whadjuk People, Gnaala Karla Booja, Ballardong People, South West Boojarah #2 and Wagyl Kaip & Southern Noongar groups, and the South West Aboriginal Land and Sea Council (SWALSC).

The ILUAs bind the parties (including 'the State', which encompasses all State Government Departments and certain State Government agencies) to enter into a Noongar Standard Heritage Agreement (NSHA) when conducting Aboriginal Heritage Surveys in the ILUA areas, unless they have an existing heritage agreement. It is also intended that other State agencies and instrumentalities enter into the NSHA when conducting Aboriginal Heritage Surveys in the ILUA areas. It is recommended a NSHA is entered into, and an 'Activity Notice' issued under the NSHA, if there is a risk that an activity will 'impact' (i.e. by excavating, damaging, destroying or altering in any way) an Aboriginal heritage site. The Aboriginal Heritage Due Diligence Guidelines, which are referenced by the NSHA, provide guidance on how to assess the potential risk to Aboriginal heritage.

Likewise, from 8 June 2015 the Department of Mines and Petroleum (DMP) in granting Mineral, Petroleum and related Access Authority tenures within the South West Settlement ILUA areas, will place a condition on these tenures requiring a heritage agreement or a NSHA before any rights can be exercised.

If you are a State Government Department, Agency or Instrumentality, or have a heritage condition placed on your mineral or petroleum title by DMP, you should seek advice as to the requirement to use the NSHA for your proposed activity. The full ILUA documents, maps of the ILUA areas and the NSHA template can be found at https://www.dpc.wa.gov.au/lantu/Claims/Pages/SouthWestSettlement.aspx.

Further advice can also be sought from the Department of Aboriginal Affairs (DAA) at heritageenquiries@daa.wa.gov.au.

Copyright

Coordinate Accuracy

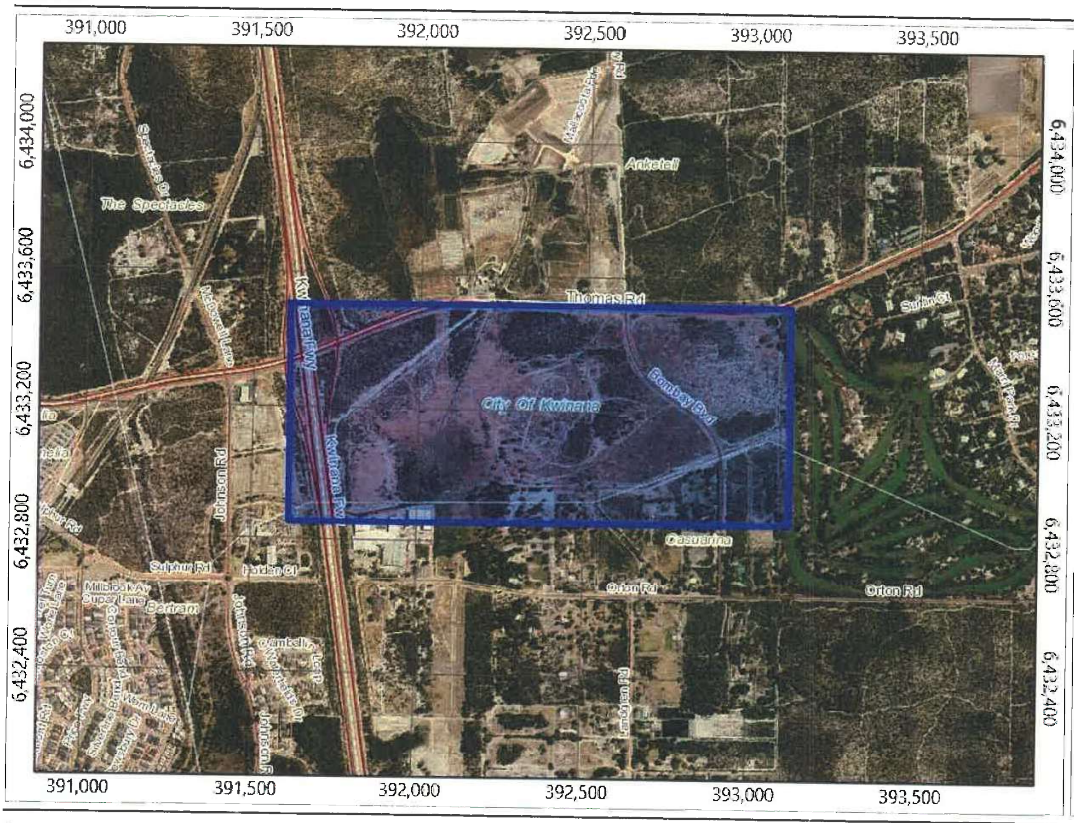
Coordinates (Easting/Northing metres) are based on the GDA 94 Datum. Accuracy is shown as a code in brackets following the coordinates.

Department of Planning, Lands and Heritage

Aboriginal Heritage Inquiry System

Map of Other Heritage Places

For further important information on using this information please see the Department of Aboriginal Affairs' Terms of Use statement at http://www.daa.wa.gov.au/Terms-Of-Use/



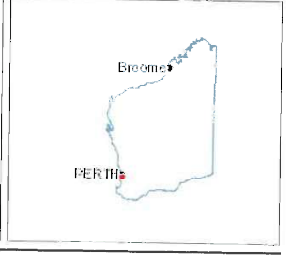
Legend

- Other Heritage Place
- Search Area
- Town
- Road
- River
- Local Government Authority

0.57 kilometres

Map Scale 1 : 17,200

MGA Zone 50 (GDA94)



Map created: 24/07/2017 3:03:46 PM by: GIS_NET_USER

Identifier: 297554