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Lot 1000, 465 Wanneroo Road, Woodvale

Wetland and Buffer Landscaping Management Plan

Prepared for
GMF W.A. Pty Ltd
by Strategen

June 2017

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ENVIRONMENTAL

Lot 1000, 465 Wanneroo Road, Woodvale

Wetland and Buffer Landscaping Management Plan

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June 2017

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Client: GMF W.A. Pty Ltd

Report Version	Revision No.	Purpose	Strategen author/reviewer	Submitted to Client	
				Form	Date
Preliminary Draft Report	A	Client review	C Lehman, M Dunlop / D Newsome	Electronic	3/11/16
Draft Report	B	Client review	C Lehman, M Dunlop / D Newsome	Electronic	15/11/16
Final Draft Report	0	Agency comment	C Lehman, M Dunlop / D Newsome	Electronic	15/11/16
Final Report	1	Agency approval	C Lehman, M Dunlop / D Newsome	Electronic	6/04/17
Revised Final Report	2	Agency approval	C Lehman, M Dunlop / D Newsome	Electronic	6/06/17
Revised final report	3	Agency approval	C Lehman, M Dunlop / D Newsome	Electronic	15/06/17

Filename: GMF16037.01_R003_REV 3 - 15 June 2017

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1. Introduction

This Wetland and Buffer Landscaping Management Plan (WBLMP) has been prepared for GMF W.A. Pty Ltd (GMF), for the development of Lot 1000 (formerly Lot 26, the site), in the suburb of Woodvale within the City of Wanneroo (CoW) (Figure 1). The site is situated approximately 23 km north of the Perth CBD.

The project seeks to develop Lot 1000 for residential purposes and public open space (POS) (Figure 1). The POS is intended to form a buffer between the development and Wallaburnup Swamp, a Conservation Category Wetland (Figure 1) and is required to be landscaped and rehabilitated to form a buffer as described by the *Structure Plan 64: Wetland Management and Rehabilitation Strategy* (WRMS, Cardno 2009). Landscaping of the development will occur in the POS area and a distance 20 m into the wetland from the POS boundary as agreed with CoW.

Condition 10 of the existing Lot 1000 subdivision approval (WAPC No. 152199) requires:

'*Arrangements being made for the proposed Lot 61 public open space to be developed by the landowner/applicant to a minimum standard and maintained for two summers through the implementation of an approved landscape plan providing for the development and maintenance of the proposed public open space in accordance with the requirements of Liveable Neighbourhoods and to the specifications of the local government.* (Local Government)*'.*

Condition 17 of the subdivision approval requires:

'*Prior to the commencement of subdivision works a wetland management plan is to be prepared in consultation with the Department of Parks and Wildlife and approved to ensure the protection and management of the sites environmental assets with satisfaction arrangements being made for the implementation of the approved plan* (Local Government)*'.*

This WBLMP has been prepared to comply with conditions 10 and17 in the context of the *Structure Plan 64: Wetland Management and Rehabilitation Strategy* (WRMS, Cardno 2009).

Rehabilitation and landscaping will be undertaken in a manner consistent with the CoW *Local Planning Policy 4.3: Public Open Space* (CoW 2016)*, Public Open Space Landscape Design Specification* (CoW 2015a) and *Land Development Landscape Submission Process and Requirements* (CoW 2015b).

1.1 Objectives

The purpose of this Wetland and Buffer Landscaping Management Plan is to conserve and enhance the value of the POS and thereby the values of the wetland.

The purpose of this document is to describe the wetland, buffer landscaping and the relevant management measures to be undertaken within the site.

1.2 Land details

The site is currently owned by GMF. The site is primarily cleared of remnant native vegetation, the vegetation on site largely consists of invasive species, mainly grasses. The surrounding land uses are:

- vacant lots 773 & 429 to the north
- Wanneroo Road to the east
- housing estates to the south
- Yellagonga Regional Park (YRP) to the west (Figure 1).

The YRP is jointly managed by the Department of Parks and Wildlife (DPaW), the City of Wanneroo and the City of Joondalup.

1.3 Related documents

This WBLMP should be read in conjunction with the following management plans:

- *Lot 1000, 465 Wanneroo Road, Woodvale, Urban Water Management Plan*
- *Lot 1000, 465 Wanneroo Road, Woodvale, Bushfire Management Plan*
- *Lot 1000, 465 Wanneroo Road, Woodvale, Midge Management Plan*
- *Lot 1000, 465 Wanneroo Road, Woodvale, Dieback Management Plan.*

Figure 1: Site layout

Scale 1:1,500 at A4

0 10 20 30 40 50 Meters

Coordinate System: GDA 1994 MGA Zone 50
Note that positional errors may occur in some areas
Date: 27/10/2016
Author: DWhite
Source: Nearmap: July 2016; Cadastre: SLIP Landgate 2015.

Legend

- Site boundary
- Proposed subdivision layout
- Conservation Category Wetland
- POS
- Yellagona Regional Park
- Existing cadastre

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2. Existing environment

2.1 Climate

The Project area experiences a Mediterranean climate with cool wet winters and hot dry summers. The dry period extends from October – March with the hottest month being February with average minimum and maximum temperatures of 18.0ºC and 31.2ºC respectively in the Perth Metropolitan area. The coolest month is July with average minimum and maximum temperatures of 7.8ºC to 18.4ºC respectively (BOM 2016).

The long-term average annual rainfall is approximately 867 mm with a pan evaporation of approximately 1650 mm (BOM 2016). Perth receives more than 76% of its rain during May to October (BOM 2016), with the remainder from thunderstorms and occasional cyclonic depressions in the warmer months.

Predicted regional implications of climate change include an increase in mean daily temperatures and reduced rainfall (particularly winter rainfall) in south Western Australia over the coming decades (Yates et al 2010). It is possible that the water levels of wetlands will continue to lower as a consequence of these effects, resulting in decreases in inflow (direct and from runoff), lowered groundwater levels and an increase in evaporation. An ongoing reduction in lake water levels threatens the current ecological values of the lake, including the health of fringing vegetation and associated habitat value for water birds.

2.2 Location and topography

Mapping for the Interim Biogeographic Regionalisation for Australia (IBRA) program places the Wallaburnup Swamp within the Swan Coastal Plain Bioregion of the Southwest Botanical Province DEE 2016).

Topographic contours indicate that the surface elevation generally slopes east to west. Surface elevation on the eastern border is approximately 35 mAHD sloping down to 25 mAHD on the eastern edge (Figure 2, 4DG 2015).

2.3 Soils and geology

2.3.1 Soil

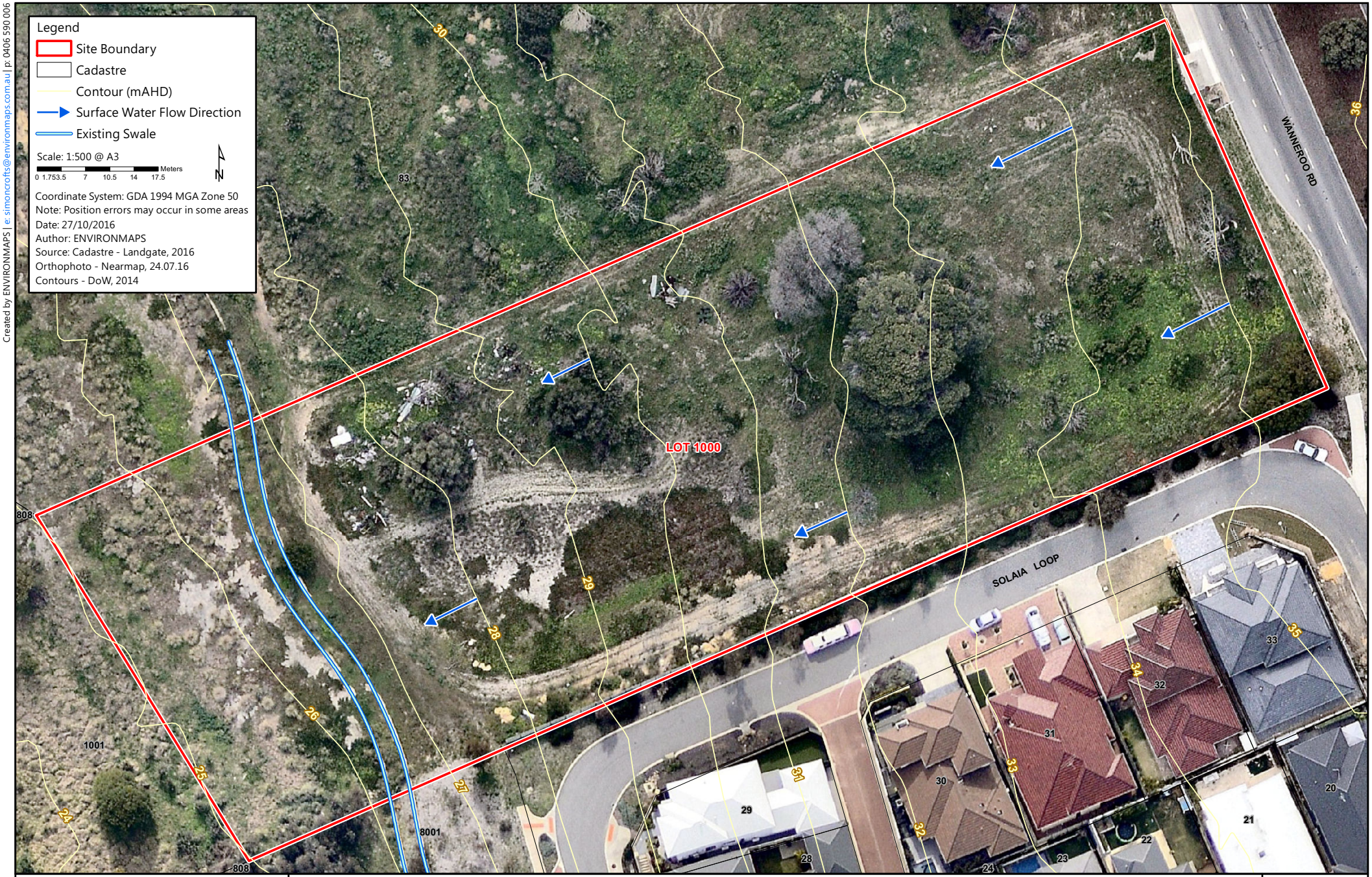
The site is situated within the Spearwood Dune System and contains some low level marsh (Cardno 2009). Soil characteristics are defined as pale and olive yellow Tamala Limestone along the eastern boundary and greyish brown peaty sand with silt and clay along the western boundary (Cardno 2009, Figure 3).

A geotechnical investigation was conducted by 4DG on the 26th November 2015 and determined the site consisted of three soil classifications:

1. SAND – dark grey brown, fine to coarse grained, fill with deleterious materials including wood, and rubbish fragments. This soil type was encountered in the eastern portion of the site, the average depth of this soil unit was 0.7 m and the maximum thickness was 1.2 m.
2. SAND with traces of silt – light grey brown, fine to coarse grained, with traces of organics. interpreted to be *in-situ* material. This soil type was observed intermittently underlying the sand fill across the site. This soil type is darker in colour with traces of organic material occurring between 0.3 metres below ground level (mbgl) to 1.10 mbgl.
3. SAND - pale orange brown to orange brown. This soil type consistently occurred across the eastern residential and the central POS areas of the site underlying the above soil types.

The sands were identified by 4DG as being 'high permeability, free draining material'.

Created by ENVIRONMAPS | e: simoncrofts@environmaps.com.au | p: 0406 590 006



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Wetland Management Plan

Topography and Surface Water Plan

Figure 2

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Figure 3: Soils and geology

Scale 1:1,500 at A4

0 10 20 30 40 50 Meters

N

Coordinate System: GDA 1994 MGA Zone 50
Note that positional errors may occur in some areas
Date: 27/10/2016
Author: DWhite
Source: Nearmap: July 2016; Cadastre: SLIP Landgate 2015; Surface Geology: Geoscience Australia 50K Perth; ASS:DER 2016

Legend

Site boundary

ASS risk category

High to moderate risk

Proposed subdivision layout

Existing cadastre

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2.3.2 Acid sulphate soils

WA Atlas mapping indicates the western portion of the site is within a high risk acid sulphate soils (ASS) area (WAPC 2007) (Figure 3). Dewatering and excavation is not proposed in this area. DER cleared the ASS condition of subdivision on the site on 4 November 2016, indicating that an ASS management plan was not required for the site.

2.4 Hydrology

Wallaburnup Swamp receives surface runoff from the eastern portion of the site. An existing drainage network occurs in the form of a swale running south to north in the central portion of the site intercepting with the planed POS. The swale drains into a vegetated drainage basin.

The Perth groundwater Atlas indicates that the depth to ground water varies from 8.5 m at the eastern edge of the site to 2 m at the western boundary (DoW 2016). A geological survey of the site did not encounter any surface water; however, the presence of the water table was observed at 2 m depth on the western boundary of the site (4DG 2015).

Extensive drainage works are present on the site and in the vicinity. This includes:

1. A piped drainage system in Solaia Loop on the southern boundary of the Site. This drainage system has an outlet which connects to an existing swale.
2. A swale drain in the west of the site. This drain runs in a northerly direction through the POS portion of the site (Figure 2). The drain was dry during inspection on 28 September 2016. The swale drain is not vegetated.
3. A drainage basin connected to the swale drain to the north of the Site. This basin has been planted with native sedge and tree species, with some weed species present.

2.5 Vegetation and flora

Historical land use has resulted in the site being cleared of remnant vegetation; consequently the site is considered to be completely degraded according to the Keighery (1994) rating scale (Cardno 2009). The vegetation across the western boundary of the site consists of the weed one leaf Cape tulip *Moraea flaccid,* invasive grasses and herbs and small shrubs.

2.6 Fauna

Due to the extent of the historical clearing which has been undertaken on site, the range of potential habitats is very low. The wetland to the west of the site does have potential to provide for a variety of wildlife including birds, mammals and reptiles. Additionally, the wetland does provide an important ecological linkage for fauna between Lake Joondalup and Lake Goollelal.

2.7 Cultural heritage and social values

The amenity value to the region is considered significant and the YRP provides strong visual and ecological connections to the surrounding area. Major water features of the YRP include Lake Joondalup to the north and Lake Goollelal to the south. The YRP provides a high recreational value and provides opportunities for both passive and active recreation.

2.7.1 Aboriginal heritage

There are no sites of Aboriginal heritage within or adjacent to the site.

2.7.2 European Heritage

There are no sites of European Heritage within or adjacent to the site. A search of the State Heritage Register shows there are no listed heritage values within the site.

The City of Wanneroo's Municipal Inventory of Heritage Places has no listings within the site boundary or adjacent to the site.

2.8 Bush Forever

The Bush Forever program is to protect native vegetation within the Perth metropolitan area by vesting natural assets in conservation estates for perpetuity (DPI 2000). The YRP forms part of Bush Forever Site 299 which lies directly adjacent to the site (Figure 1).

2.9 Wetlands and ecological linkages

Wallarburnup Swamp is a Conservation Category Wetland. The wetland and POS are presented in Figure 1. Wallaburnup Swamp provides a low level ecological linkage between Beenyup Swamp and Lake Goollelal to the south and Lake Joondalup to the north.

3. Existing and potential threats and impacts

3.1 Geology, soils and hydrology

The Wallaburnup Swamp will be completely retained and protected in accordance with commitments during and post construction. Management commitments during construction are outlined in Section 5.1.2 and post works management commitments are outlined in Section 5.1.3.

A regional acid sulphate soils assessment indicates the western portion of the site is a high risk area within 3 m of the surface (Cardno 2009). The area of high risk ASS falls within the intended POS. As a drainage swale is already constructed in this area, there will be no excavation or dewatering within this area.

Potential sources of impact to hydrology include:

- alteration to wetland hydrology from development activities
- deterioration in surface water and groundwater quality due to pollutants from urban stormwater.

3.2 Flora

Currently the site is cleared of remnant vegetation and is in a completely degraded state according to the Keighery vegetation condition scale (Keighery 1994). Aspects and activities of development that may impact vegetation and flora in the area include:

- introduction and spread of weeds through the increased vehicular traffic.

As the site is completely degraded, clearing is not anticipated to result in impacts to flora. In the longer term, the rehabilitation of the POS will have a net benefit for flora and fauna.

3.3 Fauna

Activities associated with the development may have the following potential impacts:

- vehicle and machinery movement and other construction activities resulting in fauna deaths.

3.4 Ecological linkages

In the longer term, the rehabilitation of the POS will enhance the existing ecological linkage and provide a net benefit for flora and fauna.

3.5 Fire

Wildfire is a significant risk within Yellagonga Regional Park (CALM 2002). In wetland areas, such as Wallaburnup Swamp, heavy infestations of Typha constitute a significant fire hazard. Fires in Typha are extremely difficult to control and can cause severe damage to fringing paperbark vegetation. Frequent wild fires in wetland areas will prevent the establishment of paperbark vegetation and encourages further invasion of Typha because it regenerates far quicker than other local rush species.

Currently there are no firebreaks within the Project area, which has been completely cleared of native perennial vegetation and has not been used for horticultural purposes for a number of years.

Historically, the Department of Parks and Wildlife (DPaW) has managed fire in the area by slashing kikuyu along property boundaries (CALM 2002). There is a potential increase in bushfire risk through increased human habitation, disturbance, the use and storage of hazardous materials and hydrocarbons for the use of construction purposes.

A Fire Management Plan has been prepared for the site to comply with a condition of subdivision and will be implemented during subdivisional works. Vegetation plantings undertaken within the POS is required to be sensitive to the bushfire risk.

3.6 Cultural heritage and social values

The site currently has limited ecological, recreational or visual amenity value due to its completely degraded state and due to the lack of facilities within the Project area or the surrounding area. However, the area provides vistas of the adjacent Wallaburnup Swamp which ideally should be maintained. The Project is expected to improve the visual amenity and ecological value of the area through rehabilitation, landscaping and establishment of access paths.

4. Management

As part of the subdivisional works, the POS area will be rehabilitated with native vegetation to form a buffer to the wetland. Limited earthworks will be undertaken in the POS to ensure the required finished levels are maintained in the POS. This section outlines the management proposed on the site.

This WBLMP will be implemented by GMF until handover. Responsibility of the POS area, up to and including the dual use path (DUP) will be transferred to the CoW. The area to the east of the DUP will be handed over to Department of Parks and Wildlife (DPaW).

All GMF contractors and staff will be required to operate in accordance with this WBLMP. The area will be vested as Crown Reserve designated as POS, with management vested to the CoW under Section 152 of the *Planning and Development Act 2005*.

As there is no native vegetation present within the Project area, the key component of the wetland management approach is with respect to rehabilitation of wetland and associated buffer areas. This section of the Plan describes the general approach to rehabilitation that will be undertaken to restore vegetation to a condition consistent with the original structure and composition of the natural local vegetation. Some actions will be required to be implemented during the construction phase of the project and others will be ongoing post-construction.

4.1 Earthworks and dieback

The inclusion of a POS on the central and western portion of the site requires a re-contouring of the levels of the land as described in Appendix 1 as part of the civil engineering works.

To ensure hydrological regimes are maintained within the wetland, water management will proceed as per the UWMP.

Temporary fencing has been erected around the perimeter of the site prior to construction to prevent unauthorised access to the site.

Flagging will be installed along the western boundary of the site to prevent workers and machinery entering YRP.

Specific management actions to control the spread of dieback are detailed in the Lot 1000 Woodvale Dieback Management Plan but include:

- vehicles entering the site will be inspected to ensure they are free for possible contaminating material such as dirt and mud
- All personnel will undergo induction training to minimise the spread of dieback
- All vegetarian and mulch applied to the site will be free from dieback, with mulch being Biowise.

A dieback management plan has been prepared for the Site, including the management measures outlined in Table 1.

Table 1: Earthworks and dieback management actions

Parameter	Management issue	Mitigation action	Timing	Responsibility
Fencing and flagging	Vehicles and personnel entering YRP.	Flagging to be installed around the property perimeter to prevent vehicle and personnel access.	Prior to clearing	Site manager
Temporary fencing	Unauthorised persons and vehicles entering the site.	Site will be fenced temporarily during works.	Prior to clearing	Site manager
Vegetation removal	The disturbance and redistribution of soil by heavy machinery.	All machinery will be washed down with water and appropriate reagent. The disturbance of soil will not proceed past the POS boundaries.	Prior to vehicles entering site	Site manager
Personnel	Contaminated soil spread and weeds into revegetated areas.	Personnel inducted with procedures for minimising the spread of the risk of dieback and weeds.	Prior to personnel commencing work on site	Site manager
Topsoil and mulch	The spread of topsoil and mulch contaminated with dieback.	Ensure topsoil and mulch is free from dieback.	Prior to entering site	Landscape contractor
Construction materials	The planting of vegetation and landscaping material which contains dieback.	Ensure all imported landscaping and revegetation materials (i.e. seedlings) brought onsite are dieback and pathogen free.	Prior to entering site	Landscape contractor

4.2 Rehabilitation and landscaping

Landscaping plans have been prepared with reference to the WRMS, with from west to east:

- a wetland buffer rehabilitation area - transitional vegetation (Vegetation type D)
- a wetland buffer rehabilitation area - dryland vegetation (Vegetation Type B)
- swale vegetated to meet water quality management criteria (Vegetation Type C)
- a landscaped area (Vegetation Type A) (Figure 4).

Species used have been selected on the basis of the WRMS, input from CoW and species used on surrounding developments. Species densities have been selected on the basis of fire management requirements and the WRMS.

Consistent with the WRMS:

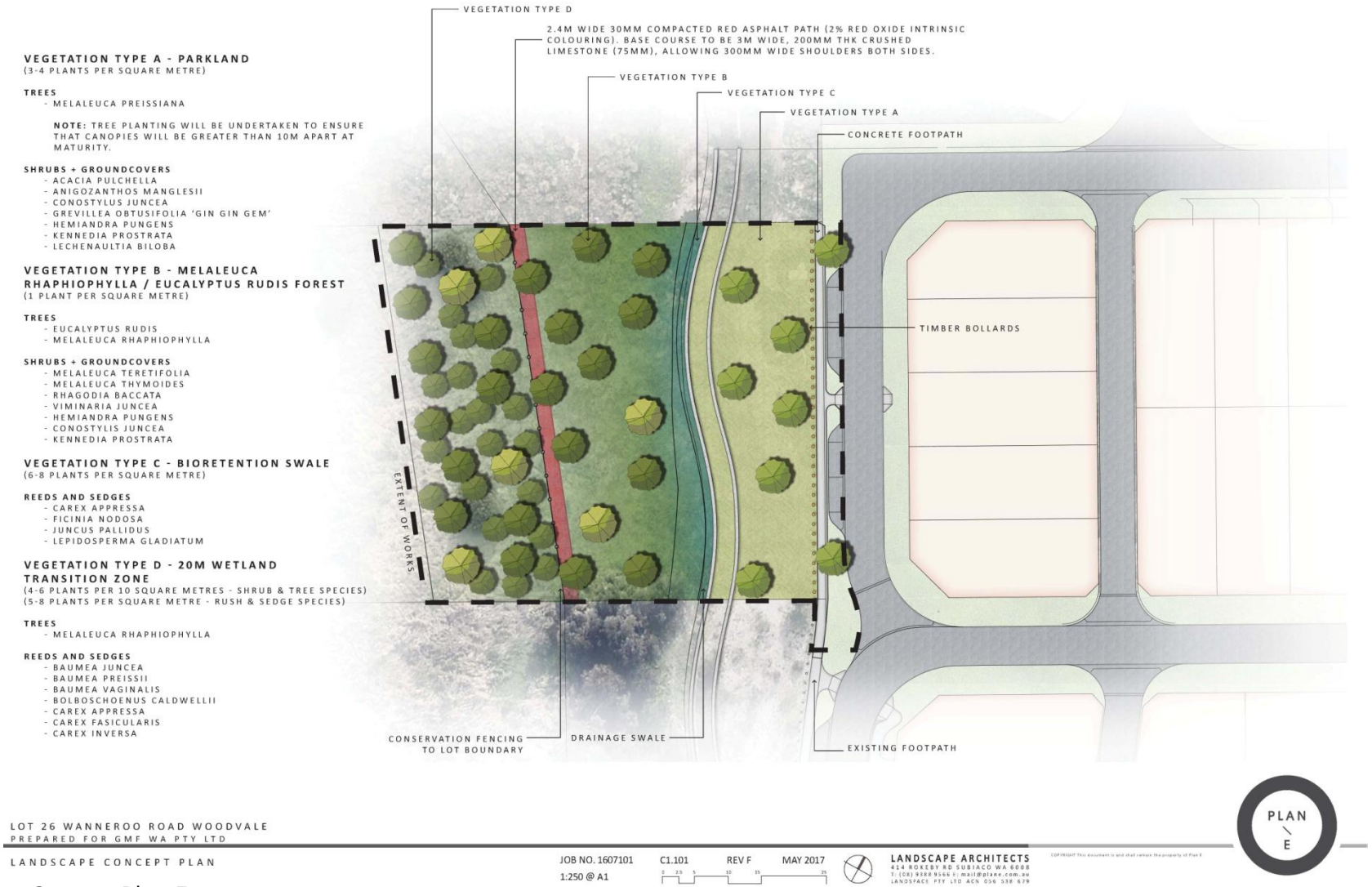
- the first stage of rehabilitation will be a weed control program
- the second stage will be the revegetation program which would involve the installation of seedlings, fertilizer and access control fencing in the revegetation areas (which would take place in winter to spring)
- the third stage of the program would be a three year maintenance and monitoring program which would commence after the initial revegetation program has been completed.

Full landscaping design and specifications are provided in Appendix 3.

4.2.1 Weed control

The site has been historically cleared of native vegetation and is currently heavily infested with weeds. One declared plant was identified on-site, the one leafed cape tulip (*Moraea flaccid*), and this species along with all other non-native vegetation will be removed from within the POS and rehabilitation areas. Round-up Bioactive will be used for weed control.

Targeted weed control shall be undertaken prior to and after planting, as required, where weed species comprise more than 20% ground cover and should continue for the three year maintenance period.



Source: Plan E

Figure 4 Landscape Plan

4.2.2 Planting and completion

Revegetation techniques will be based on the WRMS and shall include:

1. Planting of tubestock as the primary means of revegetation.
2. Tubestock will preferably be sourced from the nursery of Friends of Yellagonga or alternatively any NIASA accredited nurseries.
3. Rehabilitation may also use direct seeding in areas that are relatively free of weeds.
4. Any mulch applied should be 'Biowise' (or approved equivalent), which is certified as being weed and pathogen (dieback) free.

Fencing will be installed to the City of Wanneroo specification for conservation style ringlock fencing along the boundary with the Regional Park as part of the planting stage.

Handover to CoW will occur after three years of maintenance by the developer.

Planting and completion criteria for the works are outlined in Table 2. These have been based on the WRMS (Cardno 2009). The City's recommended revegetation rate for Vegetation Type are 3-4 plants/m^2 but this planting rate, if used within Area B with the plant types proposed there, is considered to pose an unacceptable bushfire risk to the development. As such, a lower planting rate of 1 plant/m^2 is proposed in Area B. Planting rates have been based on the WRMS.

Table 2: Planting densities and completion criteria

Vegetation type	Planting density	Completion criteria
A - parkland	3-4 plants/m^2	Weeds are effectively controlled with weed species comprising less than 20% of the groundcover
B- wetland buffer (dryland vegetation)	1 plant/m^2	0.75 established plants/m^2 Weeds are effectively controlled with weed species comprising less than 20% of the groundcover
C - Bioretention swale	6-8 plants/m^2	Weeds are effectively controlled with weed species comprising less than 20% of the groundcover
D - Wetland buffer (transitional vegetation)	4-6 plants/10m^2 (shrub/tree species) 5-8 plants /m^2 (rush/sedge species)	4 plants / 10m^2 (shrub/tree species) 5-8 plants /m^2 (rush/sedge species) Rush/sedge species are established with an average projective foliage cover of 50% and/or at a rate of 5 plants per m^2 and have a diversity of at least 4 species per 10 m^2 over at least 70% of the area planted Weeds are effectively controlled with weed species comprising less than 20% of the groundcover

Rehabilitation and landscaping maintenance actions are outlined in Table 3.

Table 3: Rehabilitation and landscaping maintenance actions

Parameter	Action	Timing	Responsibility
Planting and landscape maintenance	Species used in revegetation as described in Figure 4.	Prior to rehabilitation	Landscape contractor
	Tubestock sourced from the nursery of Friends of Yellagonga and Nursery Industry Accreditation Scheme (NIASA) accredited nurseries.	Prior to rehabilitation	Landscape contractor
	Plant seedlings when conditions suitable (late autumn to winter) and provide tree guards to prevent against rabbits.	As part of rehabilitation	Landscape contractor
	Mulch will be placed over areas of Vegetation Type A, B and D to prevent weed growth. Mulch will not be placed in the swale area (Vegetation Type C).	As part of rehabilitation planting	Landscape contractor

Parameter	Action	Timing	Responsibility
	Inspect mulch to confirm if topping up is required.	April, May, July, August, October and January until handover to CoW	Landscape contractor
	Inspect site for plant deaths and remove dead and diseased plants.	April, May, July, August, October and January until handover to CoW	Landscape contractor
	Replace dead and diseased plants.	During late autumn to winter following inspections	Landscape contractor
	Inspect and prune trees and shrubs for structural purposes and to maintain sight lines.	April, May, July, August, October and January until handover to CoW	Landscape contractor
	Maintain tree ties to prevent trees being strangled.	April, May, July, August, October and January until handover to CoW	Landscape contractor
	Remove litter.	Ongoing until handover to CoW	Landscape contractor
	Supplementary watering will be applied, if necessary, to ensure revegetation is successful.	During first three years	Landscape contractor
	Keep records of maintenance undertaken.	Ongoing until handover to CoW	Landscape contractor
	Undertake pre-handover meeting and inspection with CoW.	Three months prior to anticipated handover to CoW	Landscape contractor
	Undertake any maintenance required as an outcome of the pre-handover meeting.	Within 30 days of pre-handover meeting	Landscape contractor
	Undertake final handover meeting and inspection with CoW and provide handover documentation.	At handover	Landscape contractor

4.3 Weeds

Maintenance spraying or brush cutting maybe required ensuring effective control of weeds within the POS. To prevent excessive weed growth the time of subsequent applications will need to be assessed twice each during autumn and winter and then once each during spring and summer. Each weed species will be selectively targeted utilising the most appropriate method to control the species. Weed management will be undertaken as described in Table 4.

Table 4: Weed management actions

Parameter	Action	Timing	Responsibility
Site preparation	Remove surface weeds and undertake weed control spraying where required using Roundup Bio-active.	Prior to rehabilitation	Landscape contractor
Weed control	Undertake weed inspections.	April, May, July, August, October and January until handover to CoW	Landscape contractor
	Remove all woody weeds.	As required following inspection	Landscape contractor
	Undertake selective weed control utilising methods appropriate to the species.	As required following inspection	Landscape contractor

4.4 Fauna management

No fauna have been identified to occur on-site, however, as the adjacent Wallaburnup Swamp acts as an ecological corridor for the YRP. For this reason construction activities will be managed to avoid any potential impacts on fauna through the management measures outlined in Table 5.

Table 5: Fauna management actions

Parameter	Action	Timing	Responsibility
Induction	All construction staff shall be made aware of the potential for impacts to fauna and how to avoid potential impacts. The fauna induction program will implement a procedure for dealing with animals injured on-site.	Prior to commencing work on site	Site manager
Earthworks / construction	Regular cleanup of rubbish and general waste will occur regularly on-site during construction.	During construction	Site manager
	Warning signs will be erected on the site where appropriate.	During construction	Site manager
	Staff and contractors will be required to report the death of any fauna, whether they caused the death or have only seen the carcass during staff meetings.	During construction	All personnel
Environmental incident reporting	Any fauna deaths or injuries will be recorded including date of death and reason (if known).	During Construction	Site manager

Development and earthworks will not proceed past the western extent of the POS boundary, and therefore not interfere with the ecological linkage of the chain of wetlands within the YRP.

4.5 Fire

The Lot 1000 Woodvale Fire Management Plan details the activities and measures taken to control the risk of bushfire to the wetlands and POS. The fire management controls for the wetland during construction are:

- prohibit open fires (vegetation or rubbish burning)
- Non-native vegetation within the POS will be cleared prior to rehabilitation
- all flammable materials shall be stored in accordance with their Materials Safety Data Sheet.

Post-construction fire management is discussed in the Bushfire Management Plan (Appendix 2).

Table 6: Fire management actions

Parameter	Action	Timing	Responsibility
Induction	All construction staff shall be made aware of the risks of fire, appropriate chemical storage and what to do in case of fire.	Prior to commencing work on site	Site manager
Earthworks / construction	Vegetation and rubbish shall not be burnt on site.	During construction	Site manager
	Warning signs will be erected on the site where appropriate.	During construction	Site manager
	Staff and contractors will be required to report the death of any fauna, whether they caused the death or have only seen the carcass during staff meetings.	During construction	All personnel
Fuel load	Minimise fuel load by picking up leaves in Vegetation Type A (dry garden bed).	October and January until handover to CoW	Landscape contractor
Environmental incident reporting	Any fauna deaths or injuries will be recorded including date of death and reason (if known).	During Construction	Site manager

4.6 Midge control

The management of nuisance midge populations will be performed as per the Midge Management Plan (Strategen 2016b).

4.7 Monitoring

Completion criteria for landscaping and rehabilitation are outlined in Table 2.

The site will be managed and monitored for three years following the initial revegetation works to assess the achievement of the completion criteria listed above and to identify any maintenance and/or contingency measures required.

Weed and vegetation monitoring will be undertaken in October or November as described in Table 7.

Table 7: Monitoring actions

Parameter	Action	Timing	Responsibility
Weeds	Undertake weed survey.	October/November for first three years	Site manager
Vegetation	Undertake vegetation survey.	October/November for first three years	Site manager

Weed monitoring

Weed invasion will be assessed in terms of:

- dominant species
- area covered by dominant species
- total percentage cover.

Vegetation monitoring

Vegetation monitoring will include monitoring of:

- area cover of native species (% cover)
- native species present
- representation in quadrats of the initial species list.

Where areas of the rehabilitation works do not meet the completion criteria specified above, additional seedlings will be planted or weed control conducted so completion criteria can be met. Inherent risks are associated with any rehabilitation programs which may lead to the required completion criteria being unmet. To manage this level of risk, a framework of contingency measures has been developed to improve the likelihood that the completion criteria for all components of the offset package can be achieved within the maintenance period.

4.8 Contingency actions

Contingency actions will be enacted as outlined in Table 8 if monitoring and reporting indicates that rehabilitation sites are not performing sufficiently well. These actions will be undertaken as soon as practical and the outcome assessed and documented in the following annual report.

Table 8: Contingency actions

Trigger	Action
Inappropriate species growing in rehabilitation areas	1. Identify cause. 2. Remove inappropriate species and replace (if required) with appropriate species. 3. Ensure inappropriate species are not used in future.
Low rate of plant survival	1. Identify cause. 2. Implement approach to remedy cause, which could include: • watering of site • application of fertilisers or wetting agents etc • replanting. 3. Monitor success of remedy.
Seedlings/new germinants show evidence of grazing	1. Consider if protection measures may be required e.g., additional tree guards. 2. Monitor success of remedy.
Increase in weed infestations	1. Identify cause. 2. Identify the weeds, their location and coverage. 3. Undertake weed control as required. 4. Monitor success of control.

Reporting

Every six months during the period of developer management and at handover, GMF will provide to CoW a maintenance report for the vegetation condition and the status of weeds on the site. In addition, all data relating to the maintenance of the site shall be delivered to CoW, including:

- survey data
- species diversity
- weeds present
- weed coverage
- details of any contingency actions undertaken.

4.9 Timeframe

Completion of the site works is expected in the final quarter of 2017.

The proponent will manage the site for a minimum of three years from planting as requested by CoW.

5. References

Bureau of Meteorology (BOM) 2016. Government of Western Australia. Available at: *http://www.bom.gov.au/climate/data/* [29th September 2016].

Cardno 2009, *Structure Plan 64: Wetland Management and Rehabilitation Strategy,* Cardno, Perth, September 2009.

City of Wanneroo (CoW) 2015a, *Public Open Space Landscape Design Specification,* June 2015.

City of Wanneroo (CoW) 2015b, *Land Development Landscape Submission Process and Requirements* (CoW 2015b).

City of Wanneroo (CoW) 2016, *Local Planning Policy 4.3: Public Open Space,* adopted 5 April 2016, (PS01-04/16).

Conservation and Land Management (CALM) (2002). Yellagonga Regional Park Management Plan 2003-2013. Government of Western Australia. Available at: *https://www.dpaw.wa.gov.au/images/documents/parks/management-plans/decarchive/yellagonga_rp_mp.pdf*. [28th September 2016].

Department of Energy and Environment (DEE) 2016. Commonwealth of Australia. Available at: *http://www.environment.gov.au/system/files/pages/bb658d71-c8fd-490b-9e30-a8e596d2c12d/files/ibra61regcolour.pdf* [21st September 2016].

Department of Planning and Infrastructure (DPI) 2000. Bush Forever volume 1: policies, principles and processes. Government of Western Australia. Available at: *http://www.planning.wa.gov.au/dop_pub_pdf/bush_forever_vol1.pdf*. [5th October 2016].

Department of Water (DoW) 2016. Government of Western Australia. Available at: *http://atlases.water.wa.gov.au/idelve/gwa/* [21st September 2016].

Heritage Council State Heritage Office (inHerit) 2016. Government of Western Australia. Available at: *http://inherit.stateheritage.wa.gov.au/Public/Inventory/Details/6e30da1a-2fba-4047-b910-955bf48b4dbf*. [21st September 2016].

Keighery B 1994, Bushland Plant Survey: A Guide to Plant Community Survey for the Community, Wildflower Society of Western Australia (Incorporated), Perth, Western Australia.

Monash University (2014). Water for liveability centre: vegetation guidelines for stormwater biofilters in the south-west of Western Australia. Monash University: Victoria. Available at: *http://www.sercul.org.au/docs/381_Biofilter_vegetation_guidelines_for_southwestWA.pdf*. [5th September 2016].

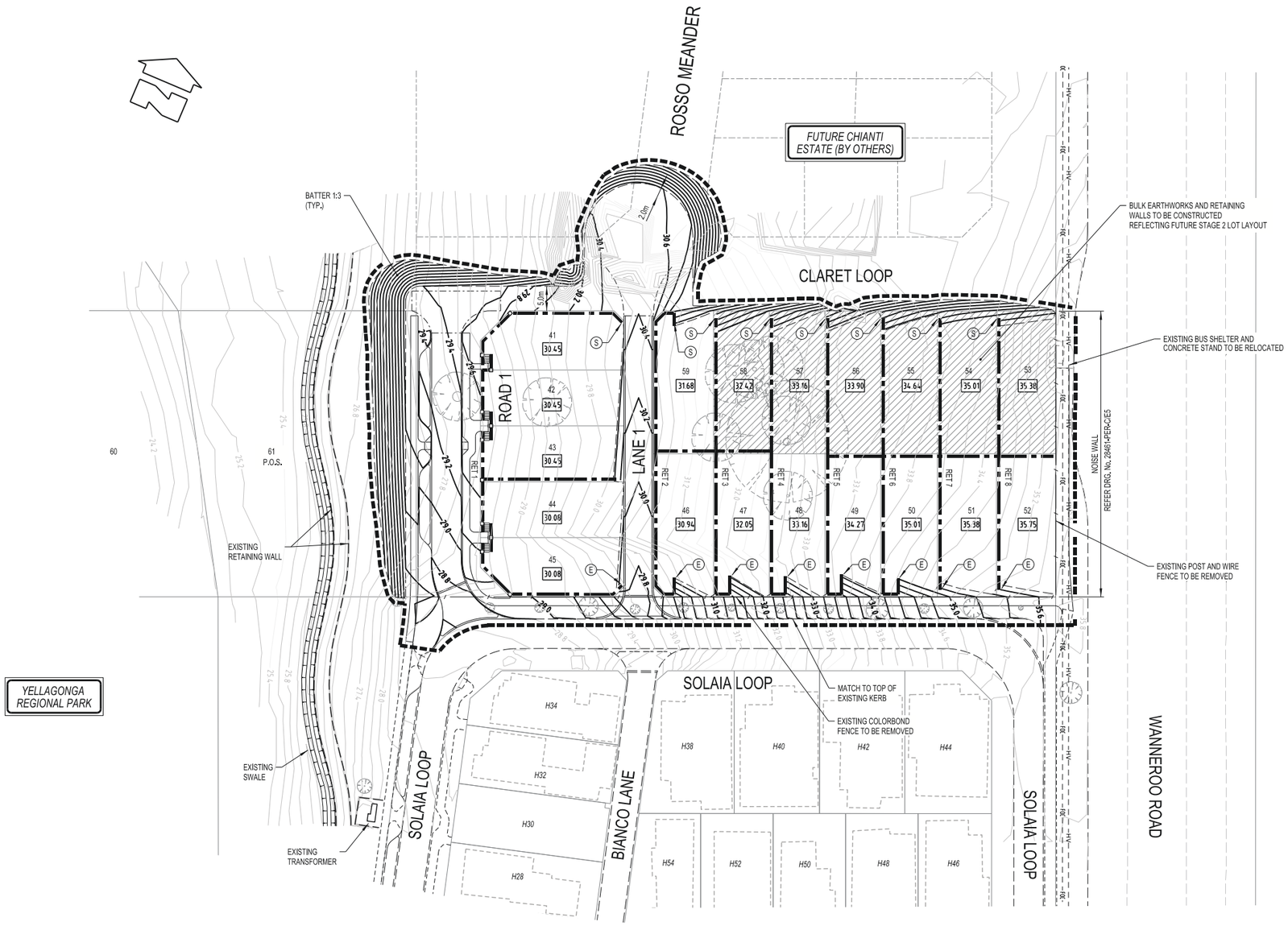
Strategen Environmental (Strategen) (2016). Lot 1000 Wanneroo Road, Woodvale: *preliminary site investigation*.

Water and Rivers Commission 2001 Water Note No. 22 – Herbicide Use in Wetlands. Government of Western Australia, Perth.

Yates, C. J., McNeill, A., Elith, J. & Midgley, G. 2010. Assessing the impacts of climate change and land transformation of Banksia in the South West Australian floristic region. *Journal of conservation biogeography*, 16, 1, 187-201.

4DG Geotechnics Pty Ltd (4DG) (2015). *Lot 1000, 465 Wanneroo Road, Woodvale, WA:* g*eotechnical investigation report*. Perth: Western Australia.

Appendix 1
Engineering drawings



PLAN
SCALE 1:500

NOTES

1. **GENERAL**
1.1. LEVELS ARE REDUCED FROM A.H.D.
1.2. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH DRAWINGS AND THE SPECIFICATION.
1.3. DESIGN LEVELS SHOWN SHALL BE ON THE FINISHED SURFACE INCLUDING TOPSOIL.
1.4. EXISTING LEVELS & CONTOURS INDICATED ARE REFLECTIVE EXISTING SURFACE PICK UP BY SCANLAN SURVEY.

2. **EARTHWORKS**
2.1. THE CONTRACTOR SHALL LIMIT THE MOVEMENT OF EQUIPMENT AND MANPOWER TO THE MINIMUM AREA NECESSARY AND PROTECT ALL VEGETATION ON SITE.
2.2. THE CONTRACTOR SHALL CUT AND FILL THE SITE AS SPECIFIED.
2.3. FOR DESIGN DETAILS OF EARTHWORKS WITHIN THE ROAD RESERVES REFER TO THE LONGITUDINAL DRAWINGS.
2.4. WHERE THE PROPOSED LOTS FACE THE ROAD, CONTRACTOR TO GRADE TO A MAXIMUM OF 1 IN 6 FROM THE VERGE TO DESIGN PAD LEVEL OF THE LOT.

3. **EXCESS MATERIAL**
3.1. THE CONTRACTOR SHALL ALLOW TO REMOVE ALL EXCESS MATERIAL OFF SITE.

4. **DUST CONTROL**
4.1. THE CONTRACTOR SHALL ALLOW FOR DUST CONTROL MEASURES AS SPECIFIED.

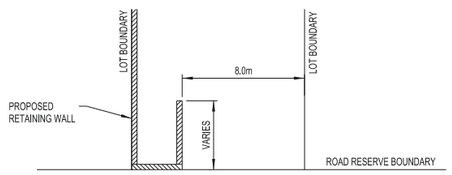
5. **STABILISATION**
5.1. THE COMPLETED SURFACE SHALL BE STABILISED BY HYDROMULCH WITH SEED & GREEN DYE.

6. **TOPSOIL**
6.1. THE CONTRACTOR SHALL CLEAR ALL VEGETATION FROM ENTIRE WORKS AREA TO A STOCKPILE AFTER MULCHING.
6.2. THE CONTRACTOR SHALL REMOVE TOPSOIL FROM WORKS AREA TO BE DISTURBED AND STOCKPILE FOR RE-USE ON BLOCKS.
6.3. FOLLOWING THE COMPLETION OF CIVIL WORKS THE CONTRACTOR SHALL RESPREAD TOPSOIL OVER LOTS AND VERGES AS SPECIFIED. THE CONTRACTOR SHALL USE THE EXISTING TOPSOIL STOCKPILES LOCATED IN THE VILLAGE CENTRE.
6.4. REMAINING TOPSOIL SHALL BE REMOVED FROM SITE.

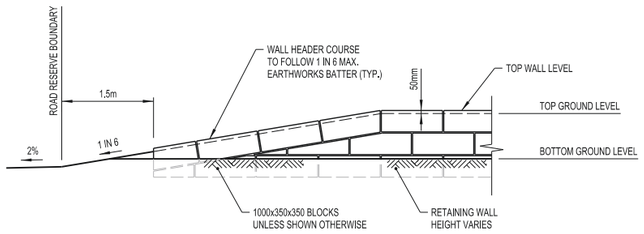
7. **UNCONTROLLED FILL**
7.1 THE CONTRACTOR SHALL TREAT THE UNCONTROLLED FILL ON THE SITE IN ACCORDANCE WITH THE 4DG REPORT DATED 18th DECEMBER 2015, INCLUDED IN THE SPECIFICATION.
7.2 THE CONTRACTOR SHALL ENSURE THAT VALIDATION OF WORKS IS COMPLETED IN CONJUNCTION WITH THE WORKS TO ENSURE TIMELY CLOSEOUT AND REPORTING.

LEGEND

- 14.2 — EXISTING CONTOURS
- 14.2 — DESIGN CONTOURS
- PROPOSED BATTER LINE
- RET 1 — RETAINING WALL LONGSECTION LABEL, SEE DRG. No. 28461-PER-C/E2,E3,E4 FOR DETAILS
- PROPOSED RETAINING WALLS
- END OF RETAINING WALL LONG SECTION
- START OF RETAINING WALL LONG SECTION
- EXISTING RETAINING WALL
- 33.16 — PROPOSED PAD LEVEL
- PROPOSED ROAD KERB
- EXISTING ROAD KERB
- EXTENT OF EARTHWORKS BOUNDARY
- EXISTING FIBRE OPTIC CABLE
- EXISTING HIGH VOLTAGE OVERHEAD POWER CABLE
- EXISTING TREES WITHIN EARTHWORKS BOUNDARY TO BE REMOVED
- EXISTING HOUSE
- BULK EARTHWORKS AND RETAINING WALLS TO BE CONSTRUCTED REFLECTING FUTURE STAGE 2 LOT LAYOUT



TYPICAL RETAINING WALL RETURN DETAIL
SCALE 1:200



TYPICAL RETAINING WALL ELEVATION
SCALE 1:50

WARNING
TELSTRA OPTIC CABLES IN AREA

CONTRACTOR SHALL ENSURE THAT LOCATIONS OF ALL UNDERGROUND SERVICES ARE IDENTIFIED PRIOR TO COMMENCEMENT OF WORKS AND EXCAVATIONS.

DIAL BEFORE YOU DIG
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REV.	DESCRIPTION	DRAWN	VER	APPROVED
B	ROAD 1 AMENDED, LOTS 53 - 59 AMENDED, RET 9 REMOVED	LG		
A	ORIGINAL ISSUE	LG	LG	GM 29/01/16

WOOD & GRIEVE ENGINEERS
Wood & Grieve Engineers Ltd
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PERTH
MELBOURNE
SYDNEY
BRISBANE
GOLD COAST
ALBANY
BUSSELTON
SHENZHEN
DARWIN

CLIENT:
GMF WA PTY LTD
PROJECT:
LOT 26 WANNEROO ROAD, WOODVALE
TITLE:
EARTHWORKS PLAN

PRELIMINARY

SECTION: CIVIL SERVICES	VERIFIED: L. GLOGOVAC 29/01/2016	SCALE: A1 @ 1:500
DESIGNED: L. GLOGOVAC	APPROVED FOR TENDER:	DATUM: A.H.D.
DRAWN: L. GLOGOVAC	APPROVED FOR CONSTRUCTION:	WAPC: 152199

PROJECT No.	DRAWING No.	REVISION
28461-PER-C	E1	B

P:\28461\Civil Drawings\c Plan Earthworks.dgn

A1 @ 1:500
A3 @ 1:1000

Appendix 2
Bushfire Management Plan

FPA AUSTRALIA | Fire Protection Association Australia | Life. Property. Environment.

BPAD Bushfire Planning & Design

Bushfire Management Plan Coversheet

This Coversheet and accompanying Bushfire Management Plan has been prepared and issued by a person accredited by Fire Protection Association Australia under the Bushfire Planning and Design (BPAD) Accreditation Scheme.

Bushfire Management Plan and Site Details

Site Address / Plan Reference: Lot 1000 Wanneroo Road

Suburb: Woodvale **State:** WA **P/code:** 6026

Local government area: City of Wanneroo

Description of the planning proposal: Subdivision application

BMP Plan / Reference Number: GMF16037_01 R007 **Version:** Rev 2 **Date of Issue:** 30/05/2017

Client / Business Name: GMF WA Pty Ltd

Reason for referral to DFES	Yes	No
Has the BAL been calculated by a method other than method 1 as outlined in AS3959 (tick no if AS3959 method 1 has been used to calculate the BAL)?	☐	X
Have any of the bushfire protection criteria elements been addressed through the use of a performance principle (tick no if only acceptable solutions have been used to address all of the BPC elements)?	☐	X
Is the proposal any of the following special development types (see SPP 3.7 for definitions)?		
Unavoidable development (in BAL-40 or BAL-FZ)	☐	X
Strategic planning proposal (including rezoning applications)	☐	X
Minor development (in BAL-40 or BAL-FZ)	☐	X
High risk land-use	☐	X
Vulnerable land-use	☐	X

If the development is a special development type as listed above, explain why the proposal is considered to be one of the above listed classifications (E.g. considered vulnerable land-use as the development is for accommodation of the elderly, etc.)?

Note: The decision maker (e.g. local government or the WAPC) should only refer the proposal to DFES for comment if one (or more) of the above answers are ticked "Yes".

BPAD Accredited Practitioner Details and Declaration

Name	Accreditation Level	Accreditation No.	Accreditation Expiry
Roger Banks	Level 2	36857	30/04/18
Company		**Contact No.**	
Strategen Environmental		9380 3100	

I declare that the information provided within this bushfire management plan is to the best of my knowledge true and correct

Signature of Practitioner **Date** 30/05/2017

intelligent outcomes | respected experience

Bushfire Management Plan

Lot 26 Wanneroo Road, Woodvale

Prepared for
GMF WA Pty Ltd
by Strategen

May 2017

strategen
ENVIRONMENTAL

Bushfire Management Plan

Lot 26 Wanneroo Road, Woodvale

Strategen is a trading name of
Strategen Environmental Consultants Pty Ltd
Level 1, 50 Subiaco Square Road Subiaco WA 6008
ACN: 056 190 419

May 2017

Limitations

Scope of services

This report ("the report") has been prepared by Strategen Environmental Consultants Pty Ltd (Strategen) in accordance with the scope of services set out in the contract, or as otherwise agreed, between the Client and Strategen. In some circumstances, a range of factors such as time, budget, access and/or site disturbance constraints may have limited the scope of services. This report is strictly limited to the matters stated in it and is not to be read as extending, by implication, to any other matter in connection with the matters addressed in it.

Reliance on data

In preparing the report, Strategen has relied upon data and other information provided by the Client and other individuals and organisations, most of which are referred to in the report ("the data"). Except as otherwise expressly stated in the report, Strategen has not verified the accuracy or completeness of the data. To the extent that the statements, opinions, facts, information, conclusions and/or recommendations in the report ("conclusions") are based in whole or part on the data, those conclusions are contingent upon the accuracy and completeness of the data. Strategen has also not attempted to determine whether any material matter has been omitted from the data. Strategen will not be liable in relation to incorrect conclusions should any data, information or condition be incorrect or have been concealed, withheld, misrepresented or otherwise not fully disclosed to Strategen. The making of any assumption does not imply that Strategen has made any enquiry to verify the correctness of that assumption.

The report is based on conditions encountered and information received at the time of preparation of this report or the time that site investigations were carried out. Strategen disclaims responsibility for any changes that may have occurred after this time. This report and any legal issues arising from it are governed by and construed in accordance with the law of Western Australia as at the date of this report.

Environmental conclusions

Within the limitations imposed by the scope of services, the preparation of this report has been undertaken and performed in a professional manner, in accordance with generally accepted environmental consulting practices. No other warranty, whether express or implied, is made.

Client: GMF WA Pty Ltd

Report Version	Revision No.	Purpose	Strategen author/reviewer	Submitted to Client	
				Form	Date
Draft Report	Rev A	For review by client	P Molinari / R Banks (BPAD No. 36857)	Electronic (email)	10/11/2016
Final Draft Report	Rev 0	Agency review	P Molinari / R Banks (BPAD No. 36857)	Electronic (email)	11/11/2016
Final Report	**Rev 1**	**Agency approval**	**P Molinari / R Banks (BPAD No. 36857)**	**Electronic (email)**	**6/04/2017**
Revised Final Report	**Rev 2**	**Agency approval**	**P Molinari / R Banks (BPAD No. 36857)**	**Electronic (email)**	**31/05/2017**

Filename: GMF16037_01 R007 Rev 2 - 31 May 2017

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1. Introduction

1.1 Background

GMF WA Pty Ltd (GMF) proposes to develop a residential estate on Lot 26 Wanneroo Road, Woodvale (the project area, Figure 1). The subdivision plan aims to create 19 residential properties which will range in size from 327 m^2–352 m^2. GMF also owns the land to the west of the project area which will remain as Public Open Space.

The Western Australian Planning Commission (WAPC) has conditionally approved the subdivision of Lot 26 Wanneroo Road (Application No. 152199). In accordance with condition 23 GMF is required to prepare a Bushfire Management Plan (BMP) for the project area:

> *'A fire management plan being prepared, approved and relevant provisions implemented during subdivisional works, in accordance with the WAPC's Guideline Planning for Bushfire Protection Edition 2, May 2010 (in particular Appendix 3) to the specifications of the local government and/or the Department of Fire and Emergency Services. (Local Government).'*

Furthermore, the entire project area is designated as bushfire prone on the WA *Map of Bush Fire Prone Areas* (DFES 2016) due to the extent of on-site and adjacent vegetation.

Consequently, Strategen were commissioned by GMF to prepare a BMP to support the subdivision. The BMP was prepared in accordance with *State Planning Policy 3.7 Planning in Bushfire-Prone Areas* (SPP 3.7; WAPC 2015a) and *Guidelines in Bushfire-Prone Areas* (the Guidelines; WAPC 2015b) which, supersede *WAPC's Guideline Planning for Bushfire Protection Edition 2, May 2010* referred to in the subdivision conditions.

1.2 Purpose and application of the plan

The purpose of this BMP is to provide guidance on how to plan for and manage the potential bushfire risk to future assets of the project through implementation of a range of bushfire risk mitigation measures. The BMP outlines how future on-site assets can be protected during the summer months when the threat from bushfire is at its peak. This is particularly relevant when existing fire appliances in the area may be unable to offer an immediate emergency suppression response; therefore, development planning and design should aim to provide mitigation strategies that protect future life and property from bushfire as a priority.

2. Spatial consideration of bushfire threat

2.1 Existing site characteristics

2.1.1 Location

The project area occupies approximately 1.68 ha and is contained within Lot 26 Wanneroo road, Woodvale, in the City of Wanneroo (CoW). The project area is bound by the following, as depicted in Figure 1:

- vacant land to the north
- Yellagonga Regional Park and Wallubuenup Swamp to the west
- Wanneroo road and car yards to the east
- residential properties to the south.

2.1.2 Zoning and land use

The site is currently zoned as 'Urban Development' under the CoW District Planning Scheme No. 2 (DPS 2). The site is zoned as 'Urban' under the Metropolitan Region Scheme (MRS).

2.1.3 Assets

There are currently no existing life, property or infrastructure assets within the project area. Proposed urban development will significantly intensify these critical assets by increasing the number of residents, visitors and built assets across the project area.

2.1.4 Access

The project area is currently accessed via Solaia loop to the south and Wanneroo road to the east.

2.1.5 Water and power supply

Strategen understands reticulated water and underground power supply provisions will be available to the project area through extension of existing services adjacent to the project area.

Figure 1: Site overview

Scale 1:2,300 at A4

0 10 20 30 40 50 m

Coordinate System: GDA 1994 MGA Zone 50
Note that positional errors may occur in some areas
Date: 3/11/2016
Author: DWhite
Source: Aerial image: Nearmap, flown 07/2016. Subdivision layout: Client 10/2016. Existing cadastre: SLIP, Landgate 2016.

Legend

- Site boundary
- 100m wide assessment area
- POS
- Existing cadastre
- Yellagona Regional Park
- Proposed subdivision layout
- Interim 17m wide area cleared of vegetation around Lot 41
- Proposed Claret Loop

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Path: Q:\Consult\2016\GMF\GMF16037\ArcMap_documents\R007\GMF16037_01_R007_RevA_F001.mxd

2.2 Existing fire environment

2.2.1 Vegetation class

Strategen assessed the pre-development vegetation present within the project area and adjacent 100 m through on-ground site investigation on 19 September 2016. The project area has recently been completely cleared and subsequently, there is no classified vegetation within the project area. Land within the surrounding 100 m currently contains a mixture of woodland, shrubland and grassland vegetation.

GMF are proposing to revegetate land within the POS to the west of the project area as per the landscape concept plan presented in Appendix 1. The plan illustrates that a managed garden bed made up shrubs and groundcovers will be planted at a density of 2–3 plants per square metre to east of the drainage swale (located approximately 30 m west of the proposed lots). The garden bed will be mulched and managed in a low fuel state consistent with Clause 2.2.3.2 (f) of AS 3959–2009. The drainage swale itself will be planted with reeds and sedges at a density of 6-8 plants per square metre. Land to the west of the drainage swale will be planted with a combination of trees, reeds and sedges at a density of one to nine plants per square metre (Appendix 1). Consequently, land within the swale and to its west has been classified as Class B woodland vegetation as this is the predominant vegetation type. Consistent with the Guidelines, the landscape works have been included in the current vegetation class assessment and presented in Figure 2.

Vegetation that currently exists within the project area and surrounding 100 m of land is currently comprised of the following vegetation classes assessed in accordance with methodology contained within *AS 3959–2009 Construction of Buildings in Bushfire-Prone Areas* (AS 3959; SA 2009) and the *Visual Guide for Bushfire Risk in Western Australia* (DoP 2016):

- Class B woodland vegetation (Plate 1–Plate 2)
- Class C shrubland vegetation (Plate 3–Plate 4)
- Class G grassland vegetation (Plate 5–Plate 8)
- exclusions under Clause 2.2.3.2 (e) and (f) of AS 3959–2009) (Plate 9–Plate 12).

Vegetation classes as described above and photograph locations and direction (Plate 1–Plate 12) are depicted in Figure 2.

Land to the north of the project is forecast to be developed in the future as documented in the *Woodvale Local Structure Plan No. 64* (CoW 2016). To service the northern lots of the development (lots 41, 53–59) a road, Claret Loop (approximately 15 m wide including the road reserve), will be constructed connecting Wanneroo road to the northeast of the project area to Solaia loop to southwest. This will remove the grassland abutting the northern boundary of the project area and will provide access for lots 53–59. Lots 53–59 will not be developed or sold until Claret Loop has been constructed and the associated grassland vegetation cleared. In the interim, to allow Lot 41 to be sold and developed, a minimum 17 m of the grassland vegetation surrounding the lot will be cleared as a bushfire mitigation measure. The interim clearing of grassland vegetation surrounding Lot 41 and the introduction of Claret Loop has been included in the BAL assessment in Figure 4.

2.2.2 Effective slope

Strategen has assessed site topography and effective slope under classified vegetation within the project area and adjacent 100 m through on-ground verification in accordance with AS 3959-2009 (Figure 2).

The project area rises from approximately 27 metres Australian Height Datum (mAHD) along its western boundary to 35 mAHD along its eastern boundary (Wanneroo road). The topography of the land within 100 m of the project area is an extension of this, decreasing in height west of the project area and increasing to the east.

The following information summarises the slope characteristics under the classified vegetation to inform the BAL assessment outlined in Section 2.4 and displayed in Figure 2:

- slope under classified vegetation to the west of the project area is down-slope at an angle of 0–5 degrees relative to the proposed lots
- slope under classified vegetation to the southwest of the project area varies from being upslope or on flat land and down-slope at an angle of 0–5 degrees relative to the proposed lots
- slope under classified vegetation to the north of the project area is upslope of on flat land relative to the proposed lots
- slope under classified vegetation to the northwest is down-slope at an angle of 5–10 degrees relative to the proposed lots.

Figure 2: Vegetation class

Scale 1:2,500 at A4

0 10 20 30 40 50 m

Coordinate System: GDA 1994 MGA Zone 50

Note that positional errors may occur in some areas

Date: 4/11/2016

Author: jcrute

Source: Aerial image: Nearmap, flown 07/2016. Subdivision layout: Client 10/2016. Existing cadastre: SLIP, Landgate 2016.

Legend

- Photo points and direction
- Proposed subdivision layout
- Site boundary
- 100m wide assessment area
- POS
- Interim 17m wide area cleared of vegetation around Lot 41
- Proposed Claret Loop
- Existing cadastre

Vegetation class

- Class B Woodland
- Class C Shrubland
- Class G Grassland
- Excluded as per Clauses (e) or (f) of AS 3959-2009

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Path: Q:\Consult\2016\GMF\GMF16037\ArcMap_documents\R007\GMF16037_01_R007_RevA_F002.mxd

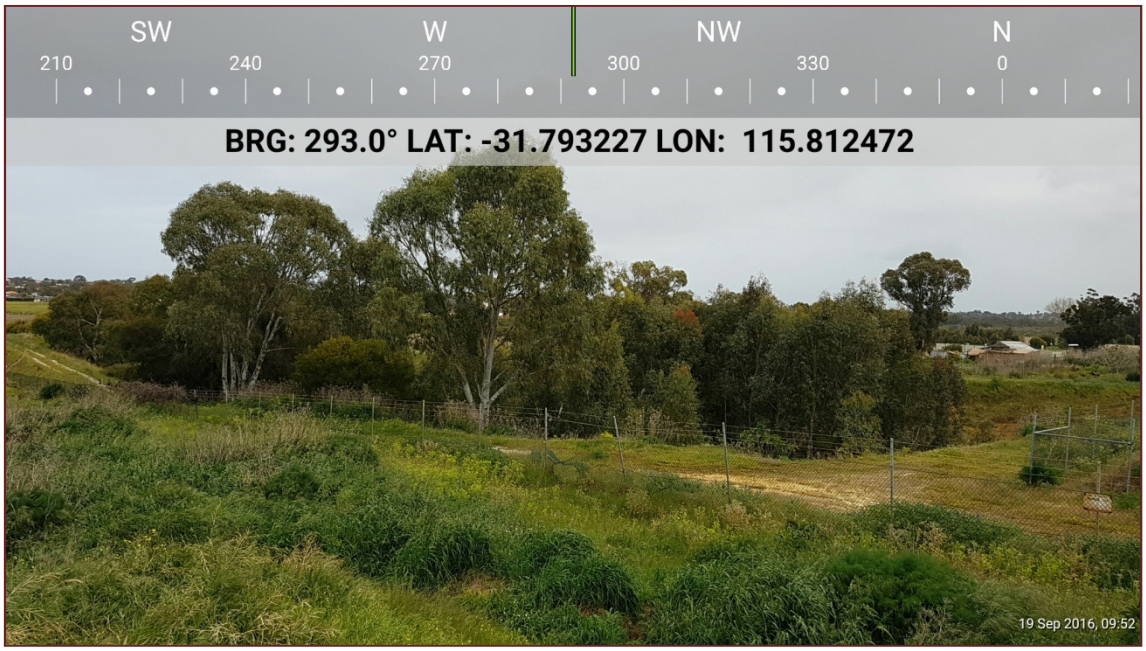

Plate 1: Photo Point 1: Class B woodland vegetation (background) to the northwest of the project area

Plate 2: Photo Point 2: Class B woodland to the southwest of the project area

Plate 3: Photo Point 3: Class C shrubland to the southwest of the project area

Plate 4: Photo Point 4: Class C shrubland (background) to the southwest of the project area

Plate 5: Photo Point 5: Class G grassland vegetation north of the project area

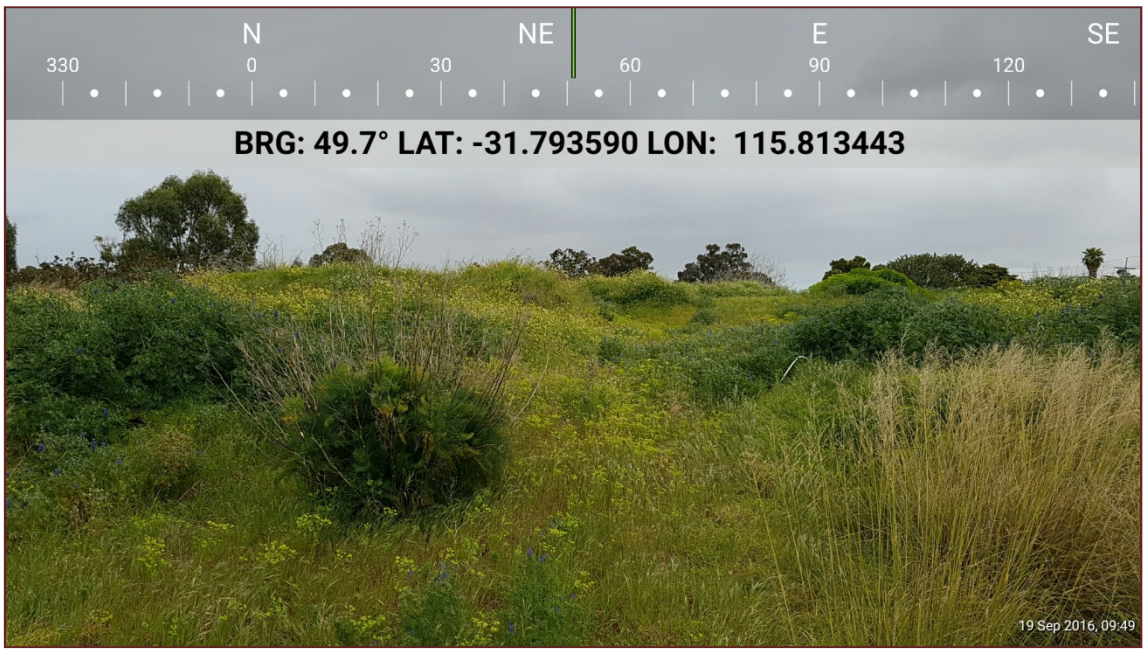

Plate 6: Photo Point 6: Class G grassland vegetation north of the project area

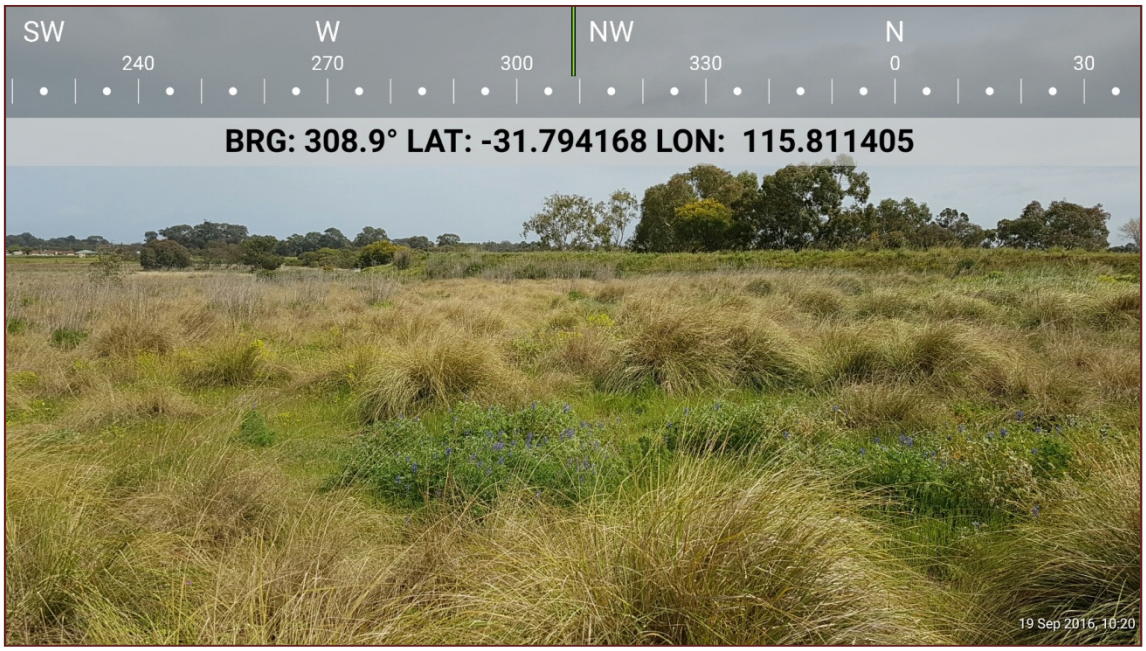

Plate 7: Photo Point 7: Class G grassland vegetation west of the project area

Plate 8: Photo Point 8: Class G grassland vegetation west of the project area

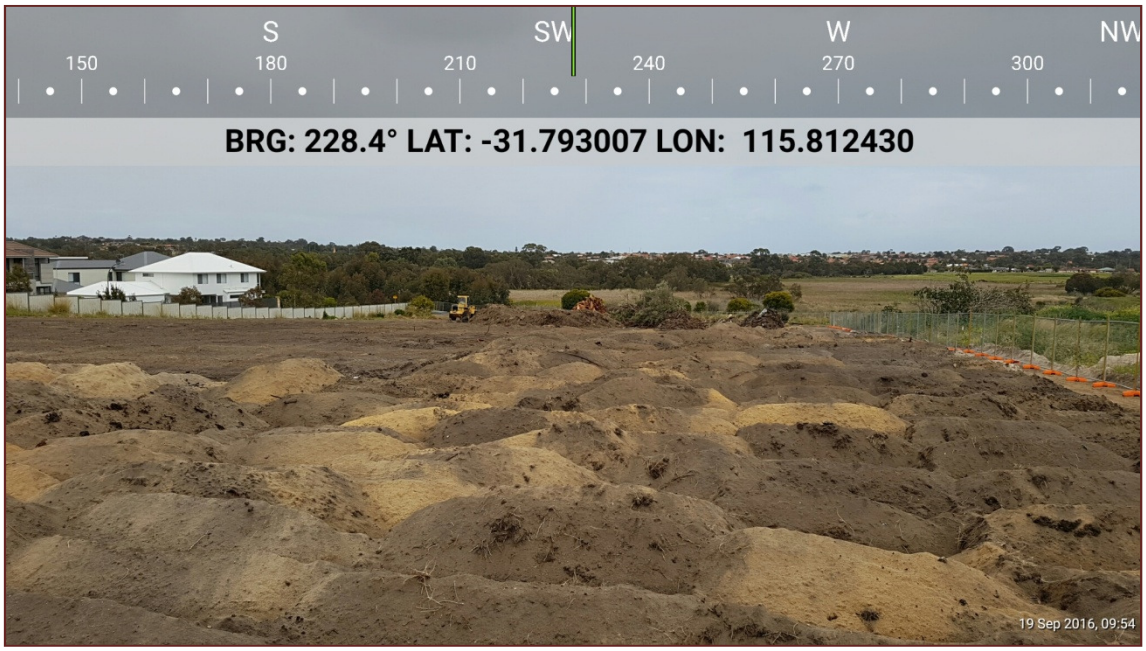

Plate 9: Photo Point 9: Excluded from classification under Clause 2.2.3.2 (e) of AS 3959–2009 within the project area

Plate 10: Photo Point 10: Excluded from classification under Clause 2.2.3.2 (e) of AS 3959–2009 to the east of the project area

Plate 11: Photo Point 11: Excluded from classification under Clause 2.2.3.2 (f) of AS 3959–2009 (foreground) to the south of the project area

Plate 12: Photo Point 12: Excluded from classification under Clauses 2.2.3.2 (e) & (f) of AS 3959–2009 to the south of the project area

2.2.3 Bushfire weather conditions

Worst case bushfire weather conditions

Southwest Western Australia generally experiences a cool to mild growing season in the months of August through to November of each year, followed by four months of summer drought conditions, which is when the potential for bushfire occurrence is at its peak. Worst case (adverse) bushfire weather conditions can occur during this dry period when a low pressure trough forms off the west coast and strong winds develop from the north or northeast. These conditions are sometimes associated with 'Extreme' or 'Catastrophic' fire dangers, which are consistent with very high temperatures, low relative humidity and very strong winds. Based on the predominant summer climatic conditions of the local area, 'Extreme' and 'Catastrophic' fire dangers normally occur less than 5% of the time during the designated bushfire season, which equates to around six days between December and March (McCaw & Hanstrum 2003).

Predominant bushfire weather conditions

Predominant fire weather conditions are considered to occur 95% of the time during the designated bushfire season and these conditions generally align with average summer climatic conditions of the locality.

Average 9:00 am and 3:00 pm January wind profiles for Perth Metro weather station (approximately 18.5 km to the south-southeast) are contained in Appendix 2. These illustrate that the predominant winds during the designated bushfire season are from the east in the morning averaging 13.9 km/h; and from the southwest in the afternoon averaging around 19.0 km/h (BoM 2016).

The mean 9:00 am and 3:00 pm relative humidity for Perth Metro weather station during the designated bushfire season is around 51% and 39% respectively, with average monthly maximum temperatures peaking at around 31.7°C in February.

The predominant bushfire weather conditions discussed above correlate with an average fire danger index of 'High', as determined using the Commonwealth Science and Industrial Research Organisation (CSIRO) Fire Danger and Fire Spread Calculator (CSIRO 1999).

2.2.4 Bushfire history, fuel age, risk of ignition and potential ignition source

Bushfire history in the project area is infrequent and there are no recent records of any fires occurring within the vicinity of the project area within 5 km of the project area within the last ten years as outlined in the recent Landgate Firewatch data (Landgate 2016); however, recent bushfires in the Perth Hills in 2011 and Stoneville/Parkerville in 2013 have highlighted the need to consider bushfire planning in future developments in the metropolitan region.

Available fuel loads within areas of classified vegetation are patchy and inconsistent due to variations in vegetation density, litter depth and trash height.

Since most bushfires in developed to semi-developed areas are ignited by humans; the current ignition risk is low due to the low levels of residency, public access and visitation throughout the site and surrounding rural landholdings. However, Strategen considers that the ignition risk, particularly within the project area, may increase following development intensification and increased levels of public access and resident occupancy at the bushland interface.

The potential sources of ignition in the area are expected to be from:

- deliberately lit fire (i.e. arson)
- lightning strike
- accidental causes, such as vehicle accidents and sparks from vehicle exhausts/machinery
- escapes from fuel hazard reduction burning
- pole-top fires
- incorrect disposal of cigarettes.

2.3 Bushfire hazard level assessment

Bushfire hazard levels have been assessed for this site in accordance with methodology contained within the Guidelines. Strategen has mapped the bushfire hazard levels within the project area and adjacent 100 m as per the pre-development conditions discussed in Sections 2.2.1, 2.2.2, and 2.2.3. A summary of results is provided below and depicted in Figure 3:

- Class B woodland vegetation to the north, west and southwest of the project area, Class C shrubland vegetation to the southwest of the project area and Class G grassland vegetation to the north and west of the project area represents a 'Moderate' bushfire hazard due the fragmented nature of the woodland vegetation and the low fuel load of the shrubland and grassland vegetation
- all areas located within 100 m of moderate or extreme bushfire hazards areas represent a moderate bushfire hazard level by default to reflect the increased level of risk and 100 m wide Hazard Separation Zone (HSZ) requirements (WAPC 2015b).

Figure 3: Bushfire Hazard Levels

Scale 1:2,300 at A4

0 10 20 30 40 50 m

Coordinate System: GDA 1994 MGA Zone 50
Note that positional errors may occur in some areas
Date: 4/11/2016
Author: jcrute
Source: Aerial image: Nearmap, flown 07/2016. Subdivision layout: Client 10/2016. Existing cadastre: SLIP, Landgate 2016.

Legend

- Proposed subdivision layout
- Site boundary
- Existing cadastre
- 100m wide assessment area
- POS
- Interim 17m wide area cleared of vegetation around Lot 41
- Proposed Claret Loop

Bushfire hazard level

- Moderate
- Low

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2.4 BAL assessment

Vegetation with a 'Moderate' or 'Extreme' bushfire hazard level is considered bushfire prone and any proposed development within 100 m of the bushfire prone vegetation extent will require application of Australian Standard *AS 3959–2009 Construction of Buildings in Bushfire-prone Areas* (SA 2009) via implementation of increased building construction standards in response to the assessed Bushfire Attack Level (BAL).

All of the proposed lots within the project area will be located within bushfire prone land, which will require a BAL response in accordance with AS 3959–2009 (Figure 4). This is largely consistent with findings of the *WA State Map of Bush Fire Prone Areas*.

The Method 1 procedure for calculating the BAL (as outlined in AS 3959–2009) incorporates the following factors:

- state-adopted FDI rating
- vegetation class
- slope under classified vegetation
- distance maintained between proposed development areas and the classified vegetation.

Based on the specified BAL, construction/separation requirements for proposed buildings can then be assigned.

2.4.1 Fire Danger Index

A blanket rating of FDI 80 is adopted for Western Australian environments, as outlined in AS 3959–2009 and endorsed by Australasian Fire and Emergency Service Authorities Council.

2.4.2 Vegetation class

Vegetation class is described in Section 2.2.1 and depicted in Figure 2 and consists of woodland (Class B), shrubland (Class C) and grassland (Class G). Where BAL contours differ based on the different BAL application distances associated with the two vegetation classifications, the highest BAL has been applied (e.g. BAL 12.5 in Class B woodland vs. BAL 19 in Class C shrubland – BAL 19 would be the end result).

2.4.3 Slope under classified vegetation

Slope under classified vegetation is assessed in Section 2.4.3, with a summary provided as follows based on the surface elevations depicted in Figure 2:

- slope under classified vegetation to the west of the project area is down-slope at an angle of 0–5 degrees relative to the proposed lots
- slope under classified vegetation to the southwest of the project area varies from being upslope or on flat land and down-slope at an angle of 0–5 degrees relative to the proposed lots
- slope under classified vegetation to the north of the project area is upslope of on flat land relative to the proposed lots
- slope under classified vegetation to the northwest is down-slope at an angle of 5–10 degrees relative to the proposed lots.

2.4.4 Distance between proposed development areas and the classified vegetation

Strategen has assessed and identified the separation distances between future buildings and the classified vegetation extent, as summarised in Table 1.

2.4.5 Method 1 BAL calculation

A Method 1 BAL calculation has been completed for each proposed lot in accordance with AS 3959–2009 (Table 1). The BAL rating gives an indication of the level of bushfire attack (i.e. the radiant heat flux) that may be received by the proposed dwelling and subsequently informs the standard of building construction required for that dwelling to withstand such impacts.

The majority of the project area will be located within 100 m of vegetation assessed as having a 'Moderate' bushfire hazard level (i.e. bushfire prone land), which will require implementation of AS 3959–2009 (refer to Figure 4). The 'Moderate' bushfire hazard applies to Class B woodland vegetation to the north, west and southwest of the project area, Class C shrubland vegetation the southwest of the project area and Class G grassland vegetation to the west and north of the project area. Vegetation under slope is summarised in Section 2.4.3.

BALs for proposed built assets within 100 m of this vegetation are outlined in Table 1. The resulting hazard separation distances around dwellings will be provided in the form of Asset Protection Zones (APZs). Although APZ's are technically to be provided around the building envelope, at this stage of planning they will be provided around the proposed lot boundary as the building envelope is yet to be determined. The purpose of this is to illustrate that it is possible for buildings within the proposed lots to be located outside areas with BAL FZ or BAL 40 ratings. The width of the APZ will be reassessed once the location of the building envelope within the proposed lots is finalised.

Table 1: Determination of Bushfire Attack Level

Vegetation class	Bushfire attack level (BAL)				
	BAL FZ	BAL 40	BAL 29	BAL 19	BAL 12.5
	Distance (m) of the site from the predominant vegetation class				
Vegetation is upslope or on flat land (0 degrees)					
Class B Woodland	0–<10	10-<14	14–<20	20–<29	29–<100 m
Class G Grassland	0–<6 m	6–<8 m	8–<12 m	12–<17 m	17–<50 m
Vegetation is down-slope (>0 to 5 degrees)					
Class B Woodland	0–<13 m	13-<17 m	17–<25 m	25–<35 m	35–<100 m
Class C Shrubland	0–<7 m	7–<10 m	10–<15 m	15–<22 m	22–<100 m
Class G Grassland	0–<7 m	7–<9 m	9–<14 m	14–<20 m	20–<50 m

Section 6.6.2 of SPP 3.7 states that, subdivision and development applications in areas of BAL 40 or BAL FZ will not be supported without extraordinary planning approval. Therefore, all proposed lots must be able to accommodate future buildings outside of areas subject to BAL FZ or BAL 40 to avoid applying for extraordinary planning approval (i.e. proposal for unavoidable or minor development).

3. Bushfire management measures

Strategen has identified a range of bushfire management measures that on implementation will enable all proposed lots to be developed whilst maintaining a manageable level of bushfire risk and compliance with the Guidelines. The bushfire management measures are depicted in Figure 4 (where applicable) and discussed in the following subsections.

3.1 Hazard separation distances and Asset Protection Zones (APZs)

Strategen has designated areas of hazard separation between classified vegetation and proposed lots in the form of APZs. The width of each proposed lot's APZ has been determined on the basis of compliance with a BAL 12.5, BAL 19 and BAL 29 rating under AS 3959–2009. A minimum 15 m wide APZ will be maintained between all proposed lots and classified vegetation in the form of road reserves and managed garden in a low threat state.

The APZs are low fuel areas around each building or lot and are required to be maintained on a regular and ongoing basis at a fuel load less than 2 t/ha to achieve a low threat minimal fuel condition status all year round. Overstorey trees can be retained to some extent within the APZ provided all flammable material including understorey grasses, weeds, shrubs and scrub are removed from the fuel profile, essentially creating a managed parkland cleared landscape, which would result in a diminishing level of radiant heat, ember attack and fire rate of spread at the dwelling interface.

This is also consistent with requirements under City of Wanneroo Fire and Burning Information 2015-2016 (CoW 2015, Appendix 3) for every building and asset of critical infrastructure to be clear of all flammable material, with all grasses to be kept short and scrub pruned so that it is not dense. In addition, all trees, bushes and shrubs are to be trimmed back over driveways and access-ways to all buildings to 2 m wide with tree crowns a minimum of 10 m apart (CoW 2015). Lawns, managed gardens, paving, driveways and swimming pools are also suitable within the APZ. Buildings are not permitted within the APZ.

Hazard Separation Zones (HSZs) are not required around individual lot APZs in this instance, since proposed construction for each proposed dwelling meets the standard appropriate to the BAL for that location and does not exceed BAL 29 (WAPC 2015b).

Strategen reiterates that Section 6.6.2, of SPP 3.7, states that subdivision and development applications in areas of BAL 40 or BAL FZ will not be supported without extraordinary planning approval.

3.2 Increased building construction standards

Strategen has designated BAL requirements for each proposed lot in accordance with AS 3959–2009. This has resulted in a combination of BAL 19 and BAL 12.5 contours being applied to all lots within the project area.

3.3 Vehicular access

The proposed vehicular access network will initially provide two links to the surrounding public road network to the south and one link through the future road network (Claret Loop) to the north. The proposed vehicular access network will also provide buffers and access for emergency service vehicles between proposed buildings and adjacent vegetation.

Public roads, cul-de-sacs and private driveways longer than 50 m proposed as part of the subdivision (none are proposed) will need to comply with technical requirements of the Guidelines, as outlined in Table 2.

Table 2: Vehicular access technical requirements

Technical requirement	Public road	Cul-de-sacs	Private driveway	Emergency Access Way	Fire Service access routes
Minimum trafficable surface (m)	6*	6	4	6*	6*
Horizontal distance (m)	6	6	6	6	6
Vertical clearance (m)	4.5	N/A	4.5	4.5	4.5
Maximum grade <50 m	1 in 10	1 in 10	1 in 10	1 in10	1 in10
Minimum weight capacity (t)	15	15	15	15	15
Maximum crossfall	1 in 33	1 in 33	1 in 33	1 in 33	1 in 33
Curves minimum inner radius	8.5	8.5	8.5	8.5	8.5
* Refer to E3.2 Public roads: Trafficable surface					

Source: WAPC 2015b

3.4 Reticulated water supply

Water supply services will be extended throughout the project area from surrounding areas of residential development, which will result in provision of a reticulated mains water supply for proposed residences.

A network of hydrants will also be provided along the internal road network at locations which meet relevant water supply authority and DFES requirements.

3.5 Additional measures

The following measures are also required to inform ongoing planning stages of the development:

1. Notification on Title: Notification on title be placed on all proposed lots with a BAL of 12.5 or greater as a condition of subdivision to ensure all landowners/proponents and prospective purchasers are aware that their lot is in a designated bushfire prone area and is subject to a Bushfire Management Plan.
2. Compliance with the City of Wanneroo annual fire season guide: the developer/land manager and prospective land purchasers are to comply with the current CoW annual fire season guides and bushfire information (Appendix 3).

Figure 4: Bushfire Management Plan: Lot 1000 Wanneroo Road, Woodvale

Scale 1:2,300 at A4

0 10 20 30 40 50 m

Coordinate System: GDA 1994 MGA Zone 50
Note that positional errors may occur in some areas
Date: 4/11/2016
Author: jcrute
Source: Aerial image: Nearmap, flown 07/2016. Subdivision layout: Client 10/2016. Existing cadastre: SLIP, Landgate 2016.

Legend

- Proposed subdivision layout
- Site boundary
- Existing cadastre
- 100m wide assessment area
- POS
- Interim 17m wide area cleared of vegetation around Lot 41
- Proposed Claret Loop
- Classified vegetation

BAL contours

- BAL FZ
- BAL 40
- BAL 29
- BAL 19
- BAL 12.5

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4. Proposal compliance and justification

The following information has been referenced from SPP 3.7 to demonstrate that the proposed development is compliant with the requirements of SPP 3.7 and associated guidelines.

The proposed development of Lot 1000 Wanneroo Road, Woodvale is required to comply with SPP 3.7 and the Guidelines, as required under the following policy measures:

6.2 Strategic planning proposals, subdivision and development applications

a) Strategic planning proposals, subdivision and development applications within designated bushfire prone areas relating to land that has or will have a Bushfire Hazard Level (BHL) above low and/or where a Bushfire Attack Level (BAL) rating above BAL-LOW apply, are to comply with these policy measures.

b) Any strategic planning proposal, subdivision or development application in an area to which policy measure 6.2 a) applies, that has or will, on completion, have a moderate BHL and/or where BAL-12.5 to BAL-29 applies, may be considered for approval where it can be undertaken in accordance with policy measures 6.3, 6.4 or 6.5.

c) This policy also applies where an area is not yet designated as a bushfire prone area but is proposed to be developed in a way that introduces a bushfire hazard, as outlined in the Guidelines.

6.4 Information to accompany subdivision applications

Any subdivision application to which policy measure 6.2 applies is to be accompanied by the following information in accordance with the Guidelines:

a) a BAL Contour Map to determine the indicative acceptable BAL ratings across the subject site, in accordance with the Guidelines. BAL Contour Maps should be prepared by an accredited Bushfire Planning Practitioner;

b) the identification of any bushfire hazard issues arising from the BAL Contour Map; and

c) an assessment against the bushfire protection criteria requirements contained within the Guidelines demonstrating compliance within the boundary of the subdivision site.

Implementation of this BMP is expected to meet the following objectives of SPP 3.7:

- 5.1: Avoid increasing the threat of bushfire to people, property and infrastructure. The preservation of life and the management of bushfire impact is paramount
- 5.2: Reduce vulnerability to bushfire through the identification and assessment of bushfire hazards in decision-making at all stages of the planning and development process
- 5.3: Ensure that planning proposals and development applications take into account bushfire protection requirements and include specified bushfire protection measures where land has or will have a moderate or extreme bushfire hazard level, and/ or where a rating higher than BAL-Low applies
- 5.4: Achieve a responsible approach between bushfire management measures and landscape amenity and biodiversity conservation values, with consideration of the potential impacts of climate change.

In response to the above requirements of SPP 3.7 and the Guidelines, bushfire management measures, as outlined in Section 3 have been devised for the proposed development accordance with Guideline acceptable solutions where possible to meet compliance with bushfire protection criteria. An 'acceptable solutions' assessment' is provided in Table 3 to assess the proposed bushfire management measures against each bushfire protection criteria in accordance with the Guidelines and demonstrate that the measures proposed meet the intent of each element of the bushfire protection criteria.

Table 3: Acceptable solutions assessment against bushfire protection criteria

Bushfire protection criteria	Intent	Solution	Proposed bushfire management measures	Compliance statement
Element 1: Location	To ensure that strategic planning proposals, subdivision and development applications are located in areas with the least possible risk of bushfire to facilitate the protection of people, property and infrastructure.	Acceptable solution A1.1 Development location The strategic planning proposal, subdivision and development application is located in an area that is or will, on completion, be subject to either a moderate or low bushfire hazard level, or BAL–29 or below.	Refer to Section 2.4, which demonstrates that development will only occur in areas of BAL 19 or lower. No development is to occur in BAL 40 or BAL FZ areas.	The measures proposed are considered to comply and meet the intent of Element 1 Location.
Element 2: Siting and design of development	To ensure that the siting and design of development minimises the level of bushfire impact.	Acceptable solution A2.1 Asset Protection Zone Every building is surrounded by an APZ, depicted on submitted plans, which meets detailed requirements (refer to the Guidelines for detailed APZ requirements).	Refer to Section 3.1, which demonstrates that minimum 15 m APZs will be wholly contained within road reserves and / or managed garden beds.	The measures proposed are considered to comply and meet the intent of Element 2 Siting and design of development.
		Acceptable solution A2.2 Hazard Separation Zone Every building and its contiguous APZ is surrounded by an HSZ, depicted on submitted plans, that meets detailed requirements (refer to the Guidelines for detailed HSZ requirements). An HSZ may not be required if the proposed construction meets the standard appropriate to the BAL for that location, and does not exceed BAL–29.	HSZs are not proposed since the proposed lots will comply with the bushfire construction provisions of the Building Code of Australia (i.e. AS 3959–2009; BALs). No development is to occur in BAL 40 or BAL FZ areas.	
Element 3: Vehicular access	To ensure that the vehicular access serving a subdivision/development is available and safe during a bushfire event.	Acceptable solution A3.1 Two access routes Two different vehicular access routes are provided, both of which connect to the public road network, provide safe access and egress to two different destinations and are available to all residents/the public at all times and under all weather conditions.	Refer to Section 3.3 and Figure 4, which demonstrate that a minimum of two different vehicular access routes will be provided for all proposed lots via the internal road network.	The measures proposed are considered to comply and meet the intent of Element 3 Vehicular access.
		Acceptable solution A3.2 Public road A public road is to meet the requirements in Table 2, Column 1.	Refer to Section 3.3, which demonstrates that all proposed public roads will meet minimum requirements outlined in Table 2 of the Guidelines.	
		A3.3 Cul-de-sac (including a dead-end-road A cul-de-sac and/or a dead end road should be avoided in bushfire prone areas. Where no alternative exists (i.e. the lot layout already exists and/or will need to be demonstrated by the proponent), detailed requirements will need to be achieved (refer to the Guidelines for detailed cul-de-sac requirements).	N/A. Refer to Section 3.3, which demonstrates that no cul-de-sacs are proposed for the subdivision. If this changes during future planning stages then these will meet minimum requirements of the Guidelines outlined in Table 2.	

Bushfire protection criteria	Intent	Solution	Proposed bushfire management measures	Compliance statement
		A3.4 Battle-axe Battle-axe access leg should be avoided in bushfire prone areas. Where no alternative exists, (this will need to be demonstrated by the proponent) detailed requirements will need to be achieved (refer to the Guidelines for detailed battle-axe requirements).	N/A. Refer to Section 3.3, which demonstrates that no battle axes are proposed for the subdivision.	
		A3.5 Private driveway longer than 50 m A private driveway is to meet detailed requirements (refer to the Guidelines for detailed private driveway requirements).	N/A. Refer to Section 3.3, which demonstrates that no private driveways longer than 50 m are proposed for the subdivision. If this changes during future planning stages then these will meet minimum requirements of the Guidelines outlined in Table 2.	
		A3.6 Emergency access way An access way that does not provide through access to a public road is to be avoided in bushfire prone areas. Where no alternative exists (this will need to be demonstrated by the proponent), an emergency access way is to be provided as an alternative link to a public road during emergencies. An emergency access way is to meet detailed requirements (refer to the Guidelines for detailed EAW requirements).	N/A. Refer to Section 3.3, which demonstrates that no emergency access-ways are proposed for the subdivision. If this changes during future planning stages then these will meet minimum requirements of the Guidelines outlined in Table 2.	
		A3.7 Fire service access routes (perimeter roads) Fire service access routes are to be established to provide access within and around the edge of the subdivision and related development to provide direct access to bushfire prone areas for fire fighters and link between public road networks for fire fighting purposes. Fire service access routes are to meet detailed requirements (refer to the Guidelines for detailed fire service access route requirements).	N/A. Refer to Section 3.3, which demonstrates that no fire service access routes are proposed for the subdivision. If this changes during future planning stages then these will meet minimum requirements of the Guidelines outlined in Table 2.	
		A3.8 Firebreak width Lots greater than 0.5 hectares must have an internal perimeter firebreak of a minimum width of three metres or to the level as prescribed in the local firebreak notice issued by the local government.	N/A No firebreaks are proposed as part of the development as the entire project area is cleared prior to development.	

Bushfire protection criteria	Intent	Solution	Proposed bushfire management measures	Compliance statement
Element 4: Water	To ensure that water is available to the subdivision, development or land use to enable people, property and infrastructure to be defended from bushfire.	A4.1 Reticulated areas The subdivision, development or land use is provided with a reticulated water supply in accordance with the specifications of the relevant water supply authority and Department of Fire and Emergency Services.	Refer to Section 3.4, which demonstrates that all proposed lots will be provided a reticulated water supply and network of hydrants in accordance with local water authority, CoW and DFES requirements.	The measures proposed are considered to comply and meet the intent of Element 4 Water.
		A4.2 Non-reticulated areas Water tanks for fire fighting purposes with a hydrant or standpipe are provided and meet detailed requirements (refer to the Guidelines for detailed requirements for non-reticulated areas).	N/A The proposed development will not occur within a non-reticulated area.	
		A4.3 Individual lots within non-reticulated areas (Only for use if creating 1 additional lot and cannot be applied cumulatively). Single lots above 500 square metres need a dedicated static water supply on the lot that has the effective capacity of 10 000 litres.	N/A The proposed development will not occur within a non-reticulated area.	

5. Implementation and enforcement

Implementation of the BMP applies to the developer, local government and prospective landowners to ensure bushfire management measures are adopted and implemented on an ongoing basis. A summary of the bushfire management measures described in Section 3, as well as a works program, is provided in Table 4. These measures will be implemented to ensure the ongoing protection of proposed life and property assets is achieved. Timing and responsibilities are also defined to assist with implementation of each measure.

Table 4: Proposed works program

Bushfire management measure	Timing for application	Responsibility
Ongoing maintenance of APZ (continuation of the current road verge maintenance regime)	As required to keep road verges slashed on a regular and ongoing basis (i.e. grasses and weeds to be maintained under 100 mm in height)	As per the current road verge management arrangement
Construction of public roads as per approved subdivision	Prior to development of lots for each respective stage	Developer
Provision of reticulated water supply and fire hydrant network	Prior to development of lots for each respective stage	Developer
Notification on Title	Following subdivision approval	Developer
Reassessment of the BAL and separation distances	Following any modification to the surrounding vegetation extent or proposed lot layout	Developer, prospective landowners
Compliance with current fire control order	All year round as specified in the current fire control order	Developer/land manager/prospective landowners

5.1 Document review

This BMP will be updated as necessary following the date of approval to ensure:

1. Implementation is assessed and corrective actions are applied in cases of non-compliance.
2. The effectiveness and impact of fire prevention work is evaluated and any significant changes in development design or the surrounding environment are reassessed in a revised BMP.

The lot immediately to the north is anticipated to be cleared prior to titles being issued for the northern lots. A reassessment of the BAL for the northern lots may be sought at the time of clearing.

The developer will be responsible for updating and revising the BMP until such time that the development is complete.

6. References

Bureau of Meteorology (BOM) 2016, Climate statistics for Australian locations: Monthly climate statistics for Perth Metro, [Online], Commonwealth of Australia, available from: http://www.bom.gov.au/climate/averages/tables/cw_009225.shtml, [Accessed: 04 October 2016].

City of Wanneroo (CoW) 2015, *City of Wanneroo Fire and Burning Information 2015–2016*, (Online), City of Wanneroo, Available from: *file:///C:/Users/pmolinari/Downloads/15_486426__Promotional_Material___City_Fire_and_Burning_Information_Flip_Brochure___September_2015___FINAL_PROOF.pdf* [Accessed: 03 October 2016].

City of Wanneroo (CoW) 2016, *Woodvale Local Structure Plan No. 64*, (Online), City of Wanneroo, Available from: *http://www.wanneroo.wa.gov.au/directory_record/178/woodvale_asp_no_64* [Accessed 03 October 2016].

Commonwealth Science and Industrial Research Organisation (CSIRO) 1999, Fire Danger and Fire Spread Calculator, Commonwealth Science and Industrial Research Organisation, Perth.

Department of Fire and Emergency Services (DFES) 2016, *Map of Bush Fire Prone Areas*, [Online], Government of Western Australia, available from: *http://www.dfes.wa.gov.au/regulationandcompliance/bushfireproneareas/Pages/default.aspx*, [5/07/2016].

Department of Planning (DoP) 2016, *Visual Guide for Bushfire Assessment in Western Australia,* Department of Planning, Government of Western Australia, Perth.

Landgate 2016, *Firewatch*, [Online], Landgate, available from: *http://firewatch-pro.landgate.wa.gov.au/* [Accessed: 04 October 2016].

McCaw L and Hanstrum B 2003, 'Fire environment of Mediterranean south-west Western Australia', in Fire in Ecosystems of South-West Western Australia: Impacts and Management, eds I Abbott & ND Burrows, Backhuys Publishers, Leiden, Netherlands, pp. 171–188.

Standards Australia (SA) 2009, *Australian Standard AS 3959–2009 Construction of Buildings in Bushfire-prone Areas*, Standards Australia, Sydney.

Western Australian Planning Commission (WAPC) 2015a, *State Planning Policy 3.7 Planning in Bushfire-Prone Areas*, Western Australian Planning Commission, Perth.

Western Australian Planning Commission (WAPC) 2015b, *Guidelines for Planning in Bushfire-Prone Areas*, Western Australian Planning Commission, Perth.

Appendix 1
Landscape concept plan

VEGETATION TYPE A - PARKLAND
(3-4 PLANTS PER SQUARE METRE)

TREES
- MELALEUCA PREISSIANA

NOTE: TREE PLANTING WILL BE UNDERTAKEN TO ENSURE THAT CANOPIES WILL BE GREATER THAN 10M APART AT MATURITY.

SHRUBS + GROUNDCOVERS
- ACACIA PULCHELLA
- ANIGOZANTHOS MANGLESII
- CONOSTYLUS JUNCEA
- GREVILLEA OBTUSIFOLIA 'GIN GIN GEM'
- HEMIANDRA PUNGENS
- KENNEDIA PROSTRATA
- LECHENAULTIA BILOBA

VEGETATION TYPE B - MELALEUCA RHAPHIOPHYLLA / EUCALYPTUS RUDIS FOREST
(1 PLANT PER SQUARE METRE)

TREES
- EUCALYPTUS RUDIS
- MELALEUCA RHAPHIOPHYLLA

SHRUBS + GROUNDCOVERS
- MELALEUCA TERETIFOLIA
- MELALEUCA THYMOIDES
- RHAGODIA BACCATA
- VIMINARIA JUNCEA
- HEMIANDRA PUNGENS
- CONOSTYLIS JUNCEA
- KENNEDIA PROSTRATA

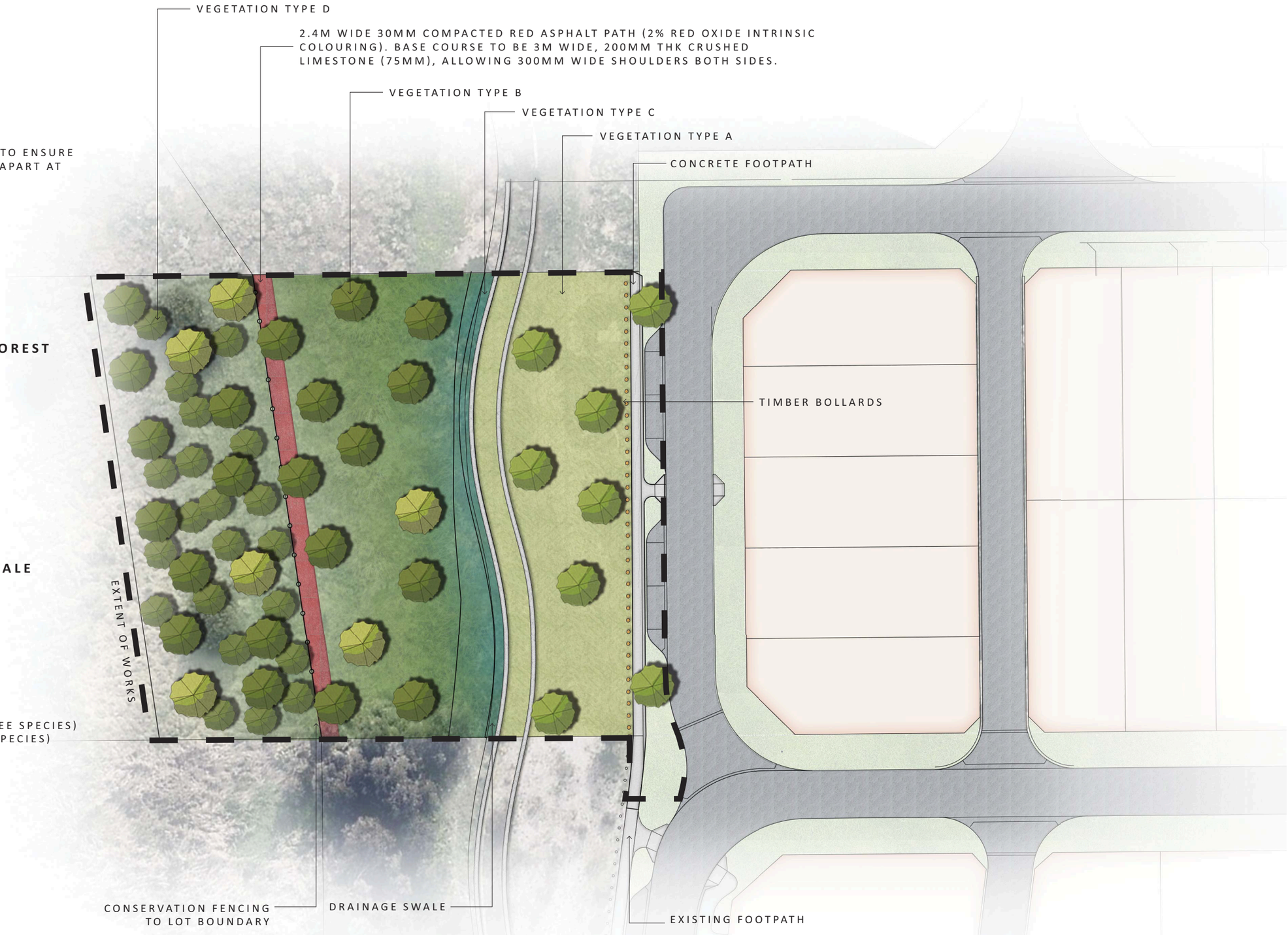
VEGETATION TYPE C - BIORETENTION SWALE
(6-8 PLANTS PER SQUARE METRE)

REEDS AND SEDGES
- CAREX APPRESSA
- FICINIA NODOSA
- JUNCUS PALLIDUS
- LEPIDOSPERMA GLADIATUM

VEGETATION TYPE D - 20M WETLAND TRANSITION ZONE
(4-6 PLANTS PER 10 SQUARE METRES - SHRUB & TREE SPECIES)
(5-8 PLANTS PER SQUARE METRE - RUSH & SEDGE SPECIES)

TREES
- MELALEUCA RHAPHIOPHYLLA

REEDS AND SEDGES
- BAUMEA JUNCEA
- BAUMEA PREISSII
- BAUMEA VAGINALIS
- BOLBOSCHOENUS CALDWELLII
- CAREX APPRESSA
- CAREX FASICULARIS
- CAREX INVERSA



LOT 26 WANNEROO ROAD WOODVALE
PREPARED FOR GMF WA PTY LTD

LANDSCAPE CONCEPT PLAN

JOB NO. 1607101
1:250 @ A1

C1.101 REV F MAY 2017

0 2.5 5 10 15 25

LANDSCAPE ARCHITECTS
414 ROKEBY RD SUBIACO WA 6008
T: (08) 9388 9566 E: mail@plane.com.au
LANDSPACE PTY LTD ACN 056 538 679

PLAN E

Appendix 2
January wind profiles for Perth Metro weather station

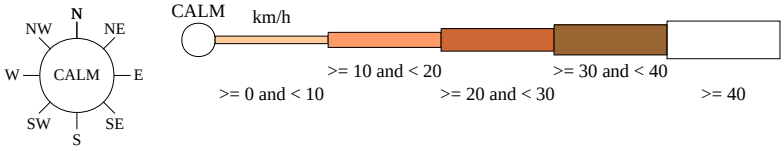
Rose of Wind direction versus Wind speed in km/h (12 Jan 1994 to 08 Mar 2011)

Custom times selected, refer to attached note for details

PERTH METRO

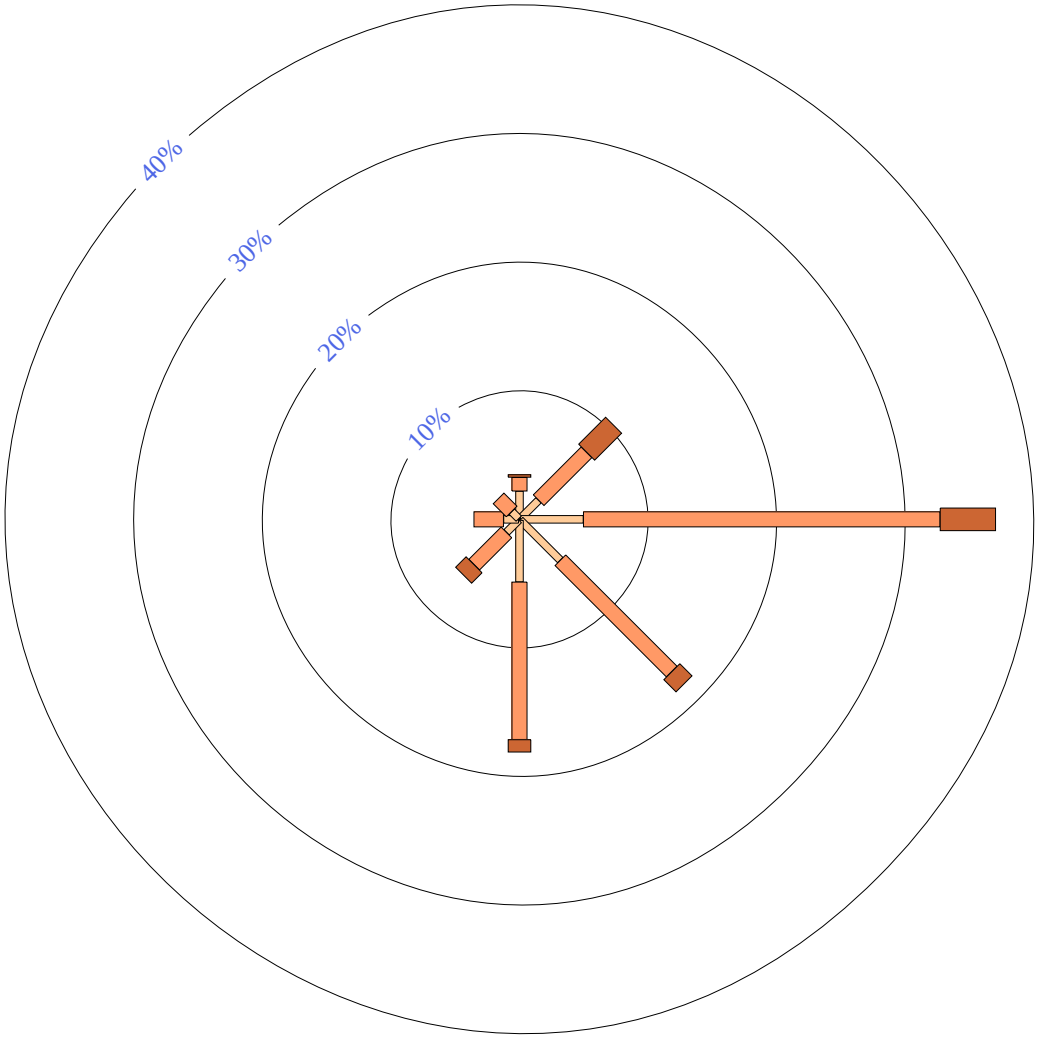
Site No: 009225 • Opened Feb 1993 • Still Open • Latitude: -31.9192° • Longitude: 115.8728° • Elevation 24.m

An asterisk (*) indicates that calm is less than 0.5%.
Other important info about this analysis is available in the accompanying notes.



9 am Jan
514 Total Observations

Calm *



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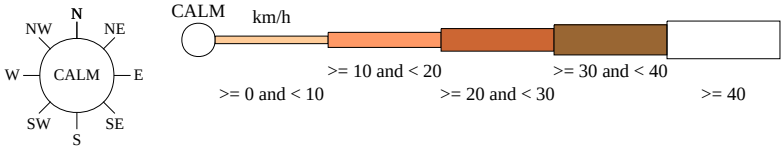
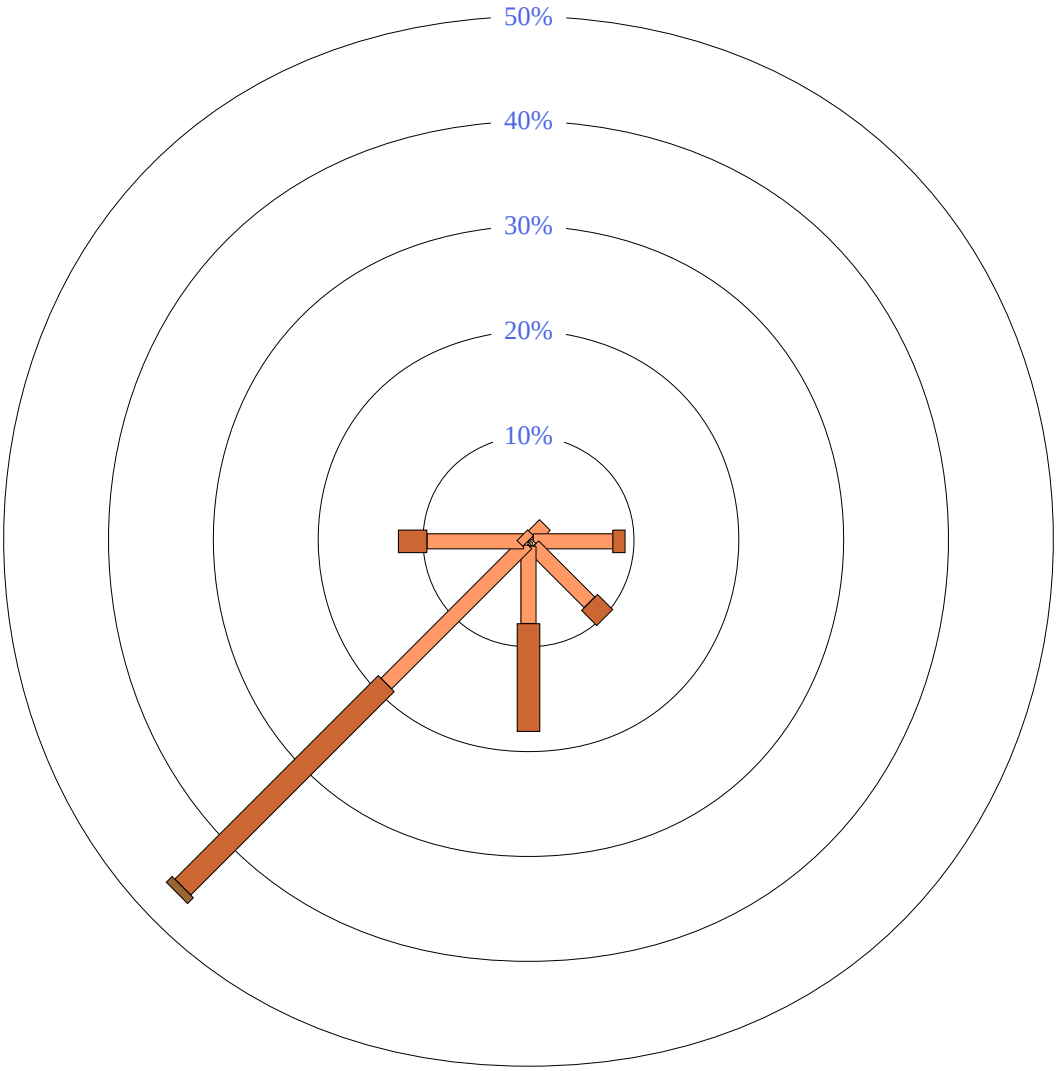


3 pm Jan
516 Total Observations

Calm *



Appendix 3
City of Wanneroo fire and burning information

City of Wanneroo

CITY OF WANNEROO

FIRE AND BURNING INFORMATION

2015-2016

- BURNING PERIODS & FDRS
- BUILDING PROTECTION ZONES
- BURNING GARDEN REFUSE
- ALTERNATIVES TO BURNING
- FIRE BANS / BRIGADE CONTACTS
- BUSHFIRE SURVIVAL PLAN
- FIREBREAKS & EXAMPLES

TO REPORT ALL FIRES RING 000

BURNING PERIOD DATES & FIRE DANGER RATINGS (FDRs)

1 DECEMBER TO 31 MARCH (INCLUSIVE)

ALL burning, including garden refuse is prohibited during this period.

Dates may be varied due to climate or weather conditions. Period variations will be advertised in local papers, the City website and Facebook page.

BURNING PERMITS ARE REQUIRED 1 APRIL - 30 NOVEMBER

Permits to burn may be obtained from the City of Wanneroo at the following locations:

Wanneroo Animal Care Centre
1204 Wanneroo Road, Ashby // 4pm-6pm everyday

City of Wanneroo Civic Centre
23 Dundebar Road, Wanneroo // 9am-4pm weekdays

Two Rocks Volunteer Fire Brigade
Carraway Loop, Two Rocks. Call **0427 026 000** before attending. For Two Rocks residents only (Seatrees Estate and Breakwater estate)

ALL BURNING IS PROHIBITED ON DAYS OF **VERY HIGH** OR ABOVE FIRE DANGER RATINGS AND IF A TOTAL FIRE BAN OR A HARVEST AND VEHICLE MOVEMENT BAN IS DECLARED.

FIRE DANGER RATINGS (FDR)

If you are in a bushfire risk location you need to know what the Fire Danger Rating (FDR) is for your area, monitor local conditions and keep informed.

The FDR is based on the forecast weather conditions and gives you advice about the level of bushfire threat on a particular day. When the rating is high, the threat of a bushfire increases.

FIRE DANGER RATING INFORMATION BOARDS

These boards cleary display the daily fire danger rating and are featured at eight locations across the City of Wanneroo.

- Corner of Joondalup Drive and Wanneroo Road
- Wanneroo Road, south of the Yanchep Beach Road turn off
- Wanneroo Road, Carabooda
- Marmion Avenue, Jindalee
- Neaves Road, Mariginiup
- Old Yanchep Road, Pinjar
- Gnangara Road, Landsdale
- Countryside Drive, Two Rocks

STAY INFORMED

An RSS feed is available to receive email alerts when the City's Harvest and Vehicle Movement Bans are declared. To sign up, visit the City website.

Harvest and Vehicle Movement Bans are also published on the website and broadcast on the ABC local radio station.

The City of Wanneroo's fire weather district is - Lower West Coast.

You can find out the daily FDR online at:

- www.dfes.wa.gov.au
- www.bom.gov.au

or by phoning the Telstra Weather Service on 1196.

BUILDING PROTECTION ZONES

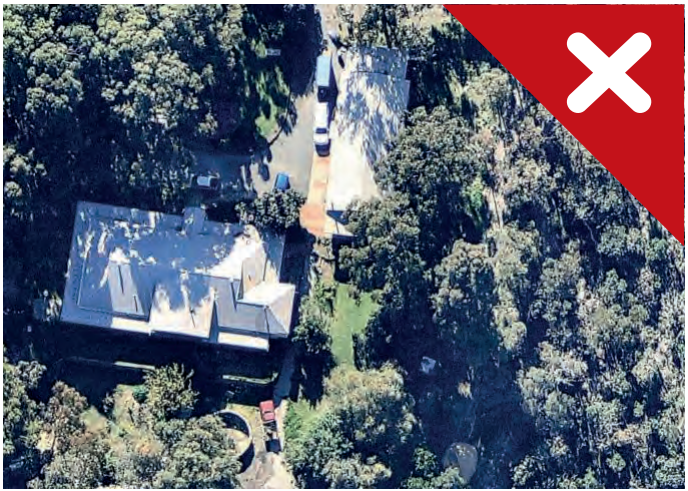
A building protection zone (BPZ) is an area extending for at least 20 metres around a building on all sides where there is little or nothing to burn.

Reducing vegetation, rubbish and anything that can burn from around your home will increase its chances of surviving a bushfire.

If there is little or nothing to burn then the fire's impact will be reduced. This can be achieved by:

- Maintaining a minimum 2m gap between trees and the building. Make sure that no trees overhang the house.
- Ensuring tree crowns are a minimum of 10m apart.
- Ensuring there is a gap between shrubs and buildings of three times their mature height.
- Ensuring shrubs aren't planted in clumps.

- Keeping the grass short and prune the scrub so that it is not dense, nor does it have fine, dead aerated material in the crown of the scrub.
- Raking up leaves, twigs and removing tree trailing bark.
- Pruning lower branches (up to 2m off the ground) to stop a surface fire spreading to the canopy of the trees.
- Creating a mineral earth firebreak.
- Having your paths adjacent to the building and have your driveway placed so that it maximises the protection to the house.
- Keeping your gutters free of leaves and other flammable material



✓ EXAMPLE ABOVE:
extensive fire protection zone created around building.

✗ EXAMPLE LEFT:
no fire protection zone created around building.

BURNING GARDEN REFUSE

There are many methods of hazard reduction available to residents. Reduction of fuel does not have to be as drastic as removing all vegetation. Burning garden refuse is one option available at certain times of the year.

GARDEN REFUSE MAY BE BURNT WITHOUT A PERMIT AFTER 6PM, SUBJECT TO:

- the pile of refuse being burnt not exceeding 1sqm
- a 2 metre wide area clear of flammable material surrounding the pile
- the fire only being lit between 6pm and 11pm
- only one heap being burnt at any one time
- the fire being completely extinguished by midnight
- a person in control of the fire staying with the fire until it is completely extinguished
- there being a means of extinguishing the fire available at all times (eg garden hose, knapsack spray or fire unit)
- neighbours are informed of your intention to burn
- the smoke does not cause a nuisance to neighbours
- the smoke does not create a traffic hazard
- household or commercial waste, or any noxious materials are not burned.

MITIGATION BURNS

For assistance regarding mitigation burns, contact the City of Wanneroo Fire Protection Officers where properties can be assessed. Volunteer Fire Brigades in conjunction with the City's Fire Protection Officers may be able to assist with undertaking the burns. For more information please call 9405 5000.

Mild intensity prescribed burn for fuel reduction.

Eight months post burn at Ashbrook Park.

GARDEN REFUSE CANNOT BE BURNT:

- At any time during the Prohibited Burning Period
- If a Total Fire Ban or Harvest and Vehicle Movement Ban has been declared
- If the Fire Danger Rating is Very High or above.

NOTE: DO NOT BURN DAMP, WET OR GREEN MATERIAL AT ANY TIME AS THIS WILL CAUSE EXCESSIVE SMOKE.

ALTERNATIVES TO BURNING

There are a range of alternatives to burning waste which can also be used as a method of hazard reduction.

In many circumstances, hand and mechanical clearing methods should be considered the best way to protect assets. These methods can be safer than burning, and easier to organise and maintain.

Raking or manual removal of fine fuels

Remove fuels such as fallen leaves, twigs and bark.

Mowing grass

Keep grass short, green and well watered. Mowed / slashed firebreaks need to be kept below 20mm.

Spraying

Grass can be sprayed with herbicide to reduce fuel loads. This may be a practical alternative particularly if erosion is a concern or if areas are difficult to access.

Slashing and mulching

This is an economical method of fuel reduction. To be effective, the cut material must be removed or allowed to rot before summer starts. Slashing and mowing may leave grass in rows, increasing fuel in some places. Mulching, or turbo mowing, also mulches the vegetation leaving the fuel where it is cut.

Ploughing and grading

These methods can produce effective firebreaks, however, the areas need constant maintenance. Loose soil may erode in steep areas, particularly where there is high rainfall and strong winds.

For further information on preventing erosion please contact the Fire Protection Officer.

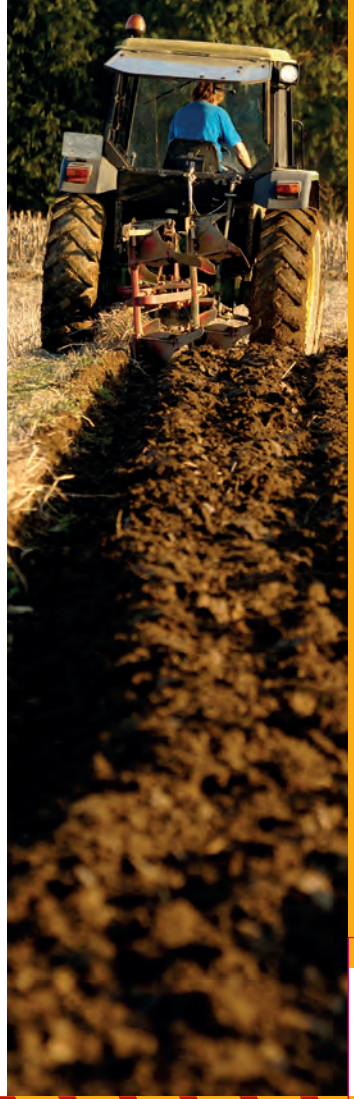
DISPOSAL OF GREEN WASTE

City residents and ratepayers are able to dispose of green waste and garden refuse at the Greens recycling Facility (70 Motivation Drive, Wangara. 8am – 4.45pm weekends and public holidays).

Access to the site is free with a 'Greens voucher'. Four Greens vouchers are included with the annual Rates notice. Each voucher allows the disposal of a standard 6x4 trailer-load of clean greens at no charge. Entry fees apply without a valid voucher

Garden refuse can also be used as a mulch or compost to improve soils and the growth of plants. If you have large quantities of green waste (branches, tree trunks) you can arrange for mobile mulching services to mulch the material onsite.

Mulch piles should be no larger than 5 cubic metres to reduce the risk of spontaneous combustion and should be surrounded by a firebreak.



VERGES - A SHARED RESPONSIBILITY

The City of Wanneroo urges all residents to include their property's verge in their fire preparation activities.

The City cannot do it alone, given its size and number of bush verges requiring maintenance.

FIRE BANS / BRIGADE CONTACTS

TOTAL FIRE BAN

A Total Fire Ban is declared by Department of Fire and Emergency Services (DFES) on days when fires are most likely to threaten lives and property.

WHEN A BAN IS DECLARED IT WILL BE FEATURED ON:

- the DFES website **www.dfes.wa.gov.au**
- DFES Twitter account **@dfes_wa**
- published to subscribers through DFES's automated RSS feeds
- broadcast on **ABC local radio**
- via DFES information line **1800 709 355**

VOLUNTEER BUSH FIRE BRIGADES

Volunteer Bush Fire Brigades are called to fires via a paging and radio communications system. The 000 emergency number will put you in contact with DFES who will dispatch the nearest Brigade.

Brigades should not be contacted directly to report a fire; call 000 to report a fire.

HARVEST AND VEHICLE MOVEMENT BAN

Harvest and Vehicle Movement Bans must be imposed by a local government when the bush fire danger index exceeds 35 during a Total Fire Ban.

They are also imposed when the Chief Bush Fire Control Officer is of the opinion that the use of engines, vehicles, plant or machinery during the prohibited burning times or the restricted burning times or both is likely to cause a fire or contribute to the spread of a bush fire.

If a Harvest and Vehicle Movement and Hot works Ban is declared it is published on the City's website and broadcast on radio 720 AM.

During a Total Fire Ban or Harvest and Vehicle Movement Ban you are not allowed to light, maintain or use a fire in the open air, or to carry out any activity in the open air that causes, or is likely to cause, a fire.

This includes a prohibition on the use of engines, vehicles, plant or machinery likely to cause or be conducive to the spread of a bush fire.

YOU COULD BE FINED UP TO $25,000 AND/OR JAILED FOR 12 MONTHS IF YOU BREACH A BAN.

BRIGADE CONTACT INFORMATION

Quinns Rocks Brigade
T: 0428 498 779
www.quinnsrocksbfb.org.au

Wanneroo Fire Support Brigade
T: 0427 026 006
www.wanneroosupportbfb.org.au

Quinns Rocks Fire Station
14 Hidden Valley Retreat,
Clarkson

Two Rocks Brigade
Caraway Loop, Two Rocks
T: 0427 026 000
www.tworocksbfb.org.au

Wanneroo Brigade
Bldg 1, Ashby Operations Centre
1204 Wanneroo Road, Ashby
T: 0427 026 521
www.wanneroobfb.org.au

PREPARE ACT SURVIVE

ARE YOU BUSHFIRE READY?

areyouready.wa.gov.au

IT COULD SAVE YOUR LIFE!

If you live in or near bush, developing and using a **bushfire survival plan** is critical. Your plan will help you avoid making last minute decisions that could prove deadly during a bushfire.

Your plan MUST include

1. **Your triggers to leave or start defending.**
2. **An informed decision about whether you will leave for a safer place or stay and actively defend.**

Bushfire Survival Plan TIPS

- ☐ Your plan must work for you and your family. Everyone's bush fire survival plan will be different and depend on individual circumstances.
- ☐ If you live alone develop a plan with your neighbours.
- ☐ Write your plan down and don't doubt it when the time comes to put it into action.
- ☐ Prepare and practice your plan with all the members of your family before the start of the bushfire season.
- ☐ Review your plan when your family circumstances change.

3 **A back-up plan.** Conditions can change very quickly in a bushfire, often without warning. Your plan must be flexible and cover a range of situations you may face before, during or after the fire.

4 **Where you will go** and how you will get there if you plan to leave for a safer place?

Research has shown that leaving late can be deadly. Over the last 100 years 60% of people who died in bushfires were found within 100 metres of their own residence.

Act immediately. Never 'wait and see' what might happen. Relocating at the last minute can be deadly. **Never second guess your plan.**

☐ Don't forget to include your pets and livestock in your bushfire survival plan.

Download a bushfire survival plan template today at **www.dfes.wa.gov.au**

For more information visit **www.dfes.wa.gov.au** or contact **DFES Community Engagement** 9395 9861

Government of **Western Australia**
Department of **Fire & Emergency Services**

DFES
Department of Fire & Emergency Services

BUSHFIRE SURVIVAL PLAN

FIREBREAKS / FUEL HAZARD REDUCTION / FIREBREAK EXAMPLES

Under the Bush Fires Act (1954), all owners and occupiers of land in Western Australia must establish and maintain firebreaks.

Fire breaks and protection measures are vital in assisting the prevention of fires spreading and to allow safer access for bush fire fighters and vehicles.

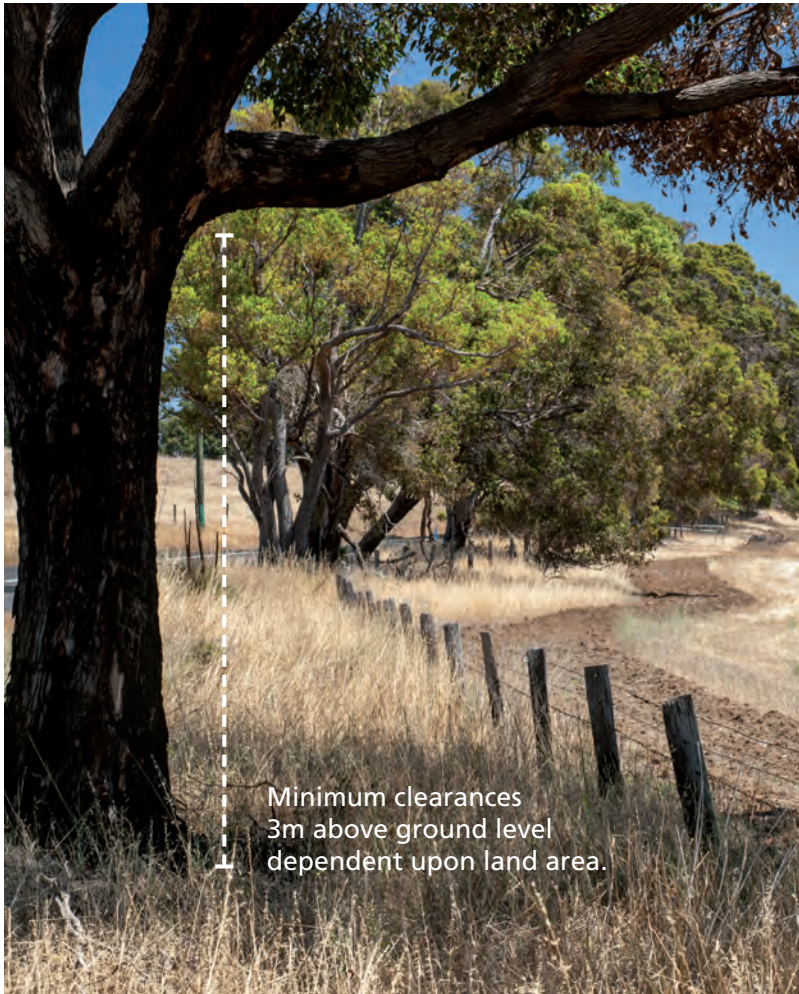
ALL LAND OWNERS WITHIN THE CITY OF WANNEROO BE ADVISED

Fire break installation must be completed by 15 November each year. Property inspections will commence the following day.

Failure to comply with these requirements may incur fines and further action by the City of Wanneroo.

Land with an area of less than 2,000m^2

- A firebreak, not less than two (2) metres wide must be cleared immediately inside (or as close as possible) and around all external boundaries of the land.
- All tree branches that over-hang a firebreak must be trimmed back to a minimum height of three (3) metres above ground level.



Land with an area of 2,000m^2 or more

- A firebreak, not less than three (3) metres wide, must be cleared immediately inside (or as close as possible) around all external boundaries of the land.
- All tree branches that over-hang a firebreak must be trimmed back to a minimum height of three (3) metres above ground level.

Buildings

- A firebreak not less than three (3) metres wide immediately around all external walls of every building must be cleared.

APPLICATION TO VARY THE ABOVE REQUIREMENTS

If it is considered impracticable for any reason to implement any of these requirements, an application may be made not later than the 1st day of November annually to the Council or its authorised officer for permission to provide alternative fire protection measures. If permission is not granted the stated requirements must be complied with.

ADDITIONAL WORKS

In addition to these requirements, you may be required to carry out further works which are considered necessary by an Authorised Officer and specified by way of a separate written notice forwarded to the address of the owner/s as shown on the City of Wanneroo rates record for the relevant land.

Non-compliant: no firebreak installed inside boundary fence

Compliant: grass slashed to ground level

Non-compliant: mineral earth fire break showing grass/weed regrowth

Compliant: mineral earth fire break

Non-compliant: thick scrub creates a fire hazard around power poles

Compliant: cleared buffer zone around power poles

FIREBREAKS & EXAMPLES

23 Dundebar Road, Wanneroo, WA 6065
Locked Bag 1, Wanneroo, WA 6946
T : (08) 9405 5000 F : (08) 9405 5499

wanneroo.wa.gov.au

Appendix 3
Landscaping design and specification

VEGETATION TYPE A - PARKLAND
(3-4 PLANTS PER SQUARE METRE)

TREES
- MELALEUCA PREISSIANA

NOTE: TREE PLANTING WILL BE UNDERTAKEN TO ENSURE THAT CANOPIES WILL BE GREATER THAN 10M APART AT MATURITY.

SHRUBS + GROUNDCOVERS
- ACACIA PULCHELLA
- ANIGOZANTHOS MANGLESII
- CONOSTYLUS JUNCEA
- GREVILLEA OBTUSIFOLIA 'GIN GIN GEM'
- HEMIANDRA PUNGENS
- KENNEDIA PROSTRATA
- LECHENAULTIA BILOBA

VEGETATION TYPE B - MELALEUCA RHAPHIOPHYLLA / EUCALYPTUS RUDIS FOREST
(1 PLANT PER SQUARE METRE)

TREES
- EUCALYPTUS RUDIS
- MELALEUCA RHAPHIOPHYLLA

SHRUBS + GROUNDCOVERS
- MELALEUCA TERETIFOLIA
- MELALEUCA THYMOIDES
- RHAGODIA BACCATA
- VIMINARIA JUNCEA
- HEMIANDRA PUNGENS
- CONOSTYLIS JUNCEA
- KENNEDIA PROSTRATA

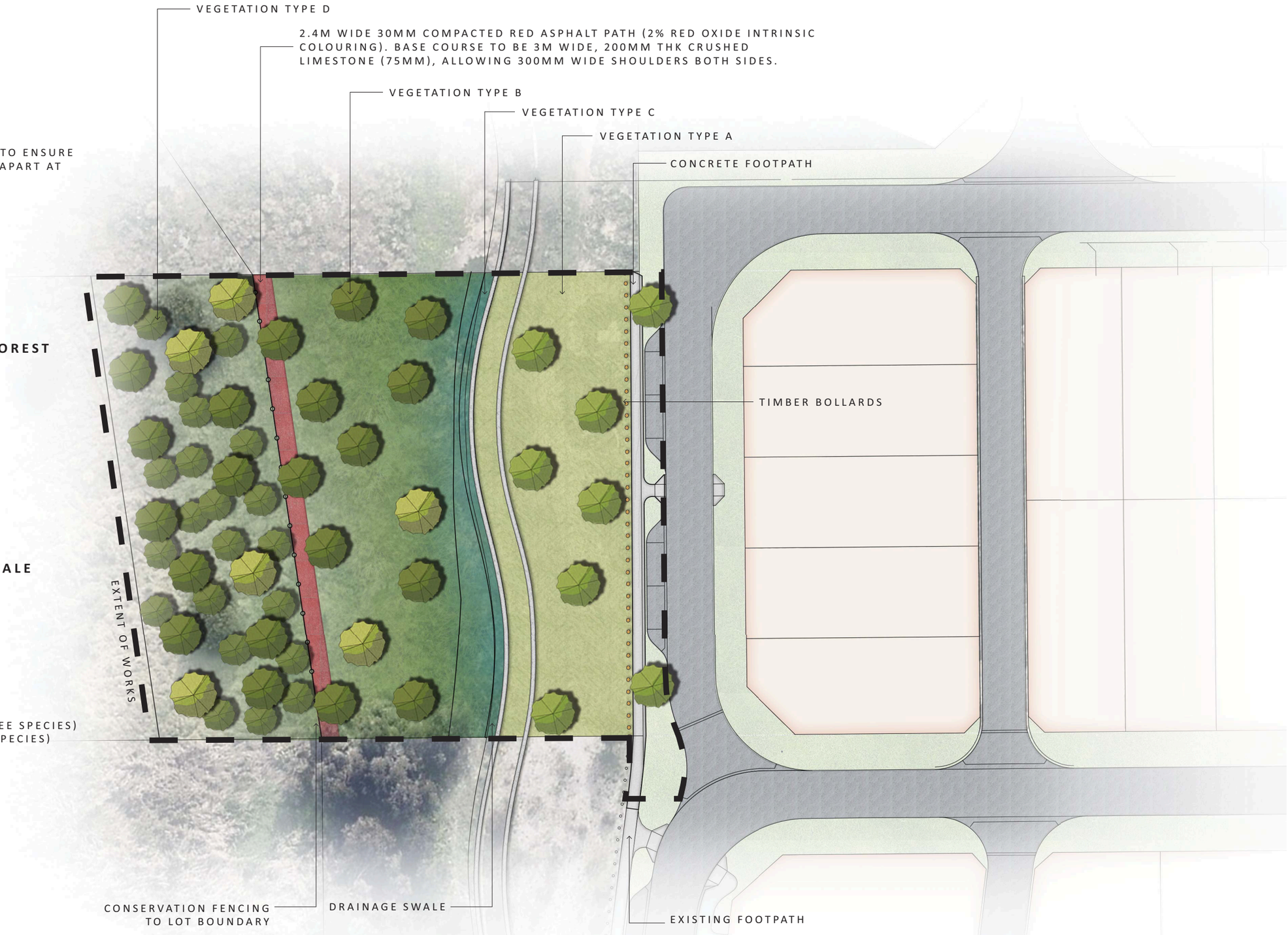
VEGETATION TYPE C - BIORETENTION SWALE
(6-8 PLANTS PER SQUARE METRE)

REEDS AND SEDGES
- CAREX APPRESSA
- FICINIA NODOSA
- JUNCUS PALLIDUS
- LEPIDOSPERMA GLADIATUM

VEGETATION TYPE D - 20M WETLAND TRANSITION ZONE
(4-6 PLANTS PER 10 SQUARE METRES - SHRUB & TREE SPECIES)
(5-8 PLANTS PER SQUARE METRE - RUSH & SEDGE SPECIES)

TREES
- MELALEUCA RHAPHIOPHYLLA

REEDS AND SEDGES
- BAUMEA JUNCEA
- BAUMEA PREISSII
- BAUMEA VAGINALIS
- BOLBOSCHOENUS CALDWELLII
- CAREX APPRESSA
- CAREX FASICULARIS
- CAREX INVERSA



LOT 26 WANNEROO ROAD WOODVALE
PREPARED FOR GMF WA PTY LTD

LANDSCAPE CONCEPT PLAN

JOB NO. 1607101
1:250 @ A1

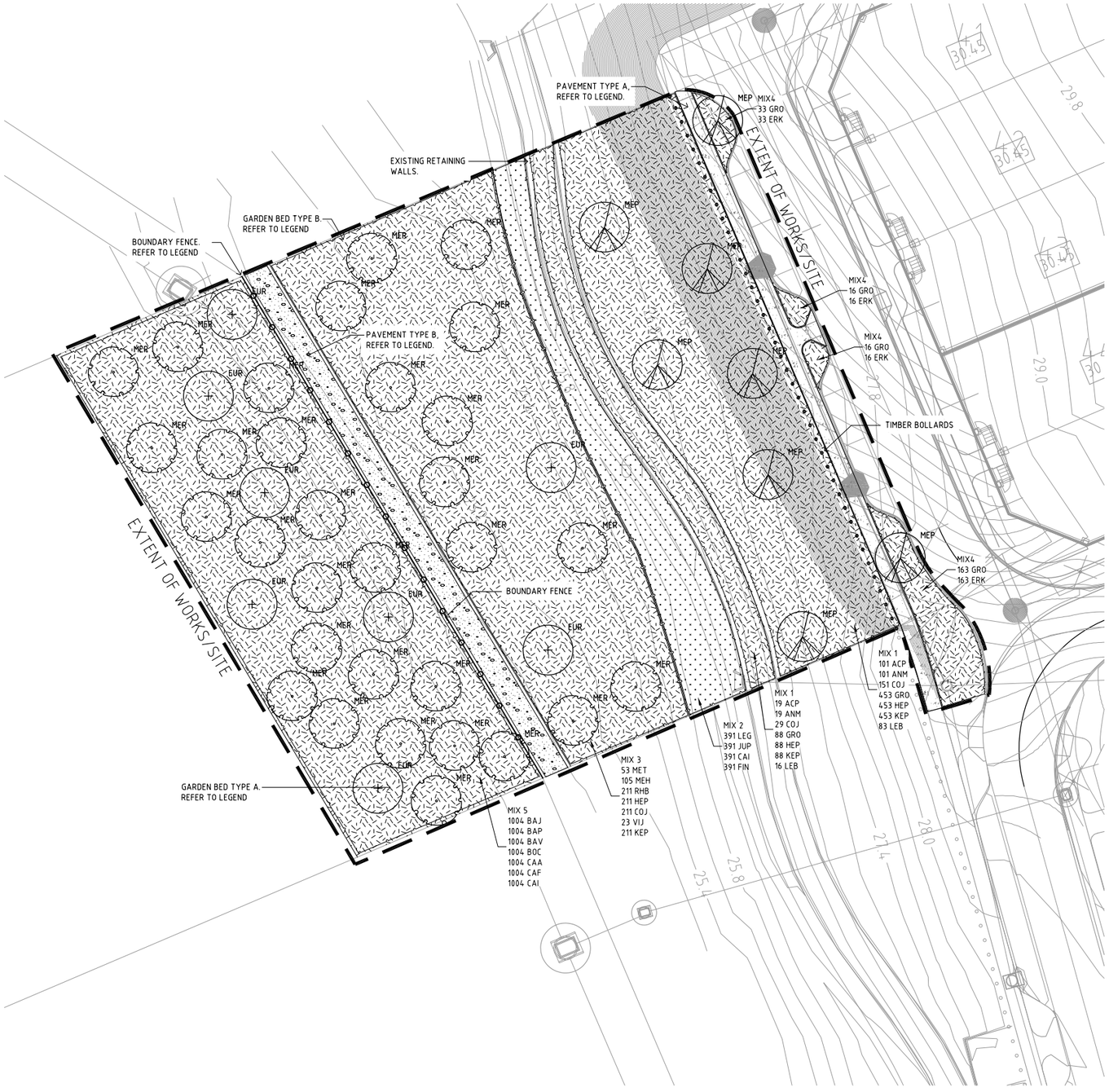
C1.101 REV F MAY 2017

0 2.5 5 10 15 25

LANDSCAPE ARCHITECTS
414 ROKEBY RD SUBIACO WA 6008
T: (08) 9388 9566 E: mail@plane.com.au
LANDSPACE PTY LTD ACN 056 538 679

PLAN E

DATE	REV	DESCRIPTION	BY	AP
10.04.17	A	ISSUED FOR TENDER	AL	AL
30.05.17	B	RE-ISSUED FOR TENDER	AL	AL



MIX 1- PARKLAND

Key	Botanic Name	L.M	Spacing	Pot
ACP	ACACIA PULCHELLA	120	900 mm	TUBES
ANM	ANIGOZANTHOS MANGLESII	120	900 mm	TUBES
COJ	CONOSTYLUS JUNCEA	180	900 mm	TUBES
GRO	GREVILLEA OBTUSIFOLIA	541	600 mm	TUBES
HEP	HEMIANDRA PUNGENS	541	600 mm	TUBES
KEP	KENNEDIA PROSTRATA	541	600 mm	TUBES
LEB	LECHENAULTIA BILOBA	99	700 mm	TUBES

MIX 2- BIORETENTION SWALE

Key	Botanic Name	L.M	Spacing	Pot
LEG	LEPIDOSPERMA GLADIATUM	391	400 mm	400
JUP	JUNCUS PALLIDUS	391	400 mm	400
CAI	CAREX APPRESSA	391	400 mm	400
FIN	FICINIA NODOSA	391	400 mm	400

MIX 3- MELELEUCA RHAPHIOPHYLLA/EUCALYPTUS RUDIS FOREST

Key	Botanic Name	L.M	Spacing	Pot
MET	MELALEUCA TERETIFOLIA	53	1.0 m	TUBES
MEH	MELALEUCA THYMOIDES	105	1.0 m	TUBES
RHB	RHAGODIA BACCATA	211	1.0 m	TUBES
HEP	HEMIANDRA PUNGENS	211	1.0 m	TUBES
COJ	CONOSTYLIS JUNCEA	211	1.0 m	TUBES
VIJ	VIMINARIA JUNCEA	23	1.5 m	TUBES
KEP	KENNEDIA PROTRATA	211	1.0 m	TUBES

MIX 4

Key	Botanic Name	L.M	Spacing	Pot
GRO	GREVILLEA OBTUSIFOLIA 'GIN GIN GEM'	228	700 mm	TUBES
ERK	EREMOPHILA 'KALBARRI CARPET'	228	700 mm	TUBES

MIX 5- WETLAND TRANSITION

Key	Botanic Name	L.M	Spacing	Pot
BAJ	BAUMEA JUNCEA	1004	400 mm	TUBE
BAP	BAUMEA PREISSII	1004	400 mm	TUBE
BAV	BAUMEA VAGINALIS	1004	400 mm	TUBE
BOC	BOLBOSCHOENUS CALDWELLII	1004	400 mm	TUBE
CAA	CAREX APPRESSA	1004	400 mm	TUBE
CAF	CAREX FASICULARIS	1004	400 mm	TUBE
CAI	CAREX INVERSA	1004	400 mm	TUBE

TREES

Key	Botanic Name	L.M	Spacing	Pot
MER	MELALEUCA RHAPHIOHYLLA	31	AS SHOWN	13LT
EUR	EUCALYPTUS RUDIS	8	AS SHOWN	13LT
MEP	MELALEUCA PREISSIANA	8	AS SHOWN	13LT

LEGEND:

SYM. DESCRIPTION

PAVEMENT TYPE A: INSITU CONCRETE PAVING
COLOUR: STANDARD GREY
STRENGTH: 32MPa
JOINTS: EXPANSION JOINTS AT 5M AND CONTRACTION JOINTS AT MAX 2.5M CENTRES
THICKNESS: 100MM
FINISH: TO MATCH EXISITNG ON SITE
BASE COURSE 150MM COMPACTED SUBGRADE
PAVEMENT TO BE INSTALLED AS PER CITY OF WANNEROO SPECIFICATIONS.
REFER DETAIL 01

PAVEMENT TYPE B: RED ASPHALT
30mm COMPACTED RED ASPHALT
COLOUR: 2% RED OXIDE INTRINSIC COLOURING
BASE: 200mm THICK CRUSHED LIMESTONE (75ø NOM)
REFER DETAIL 02

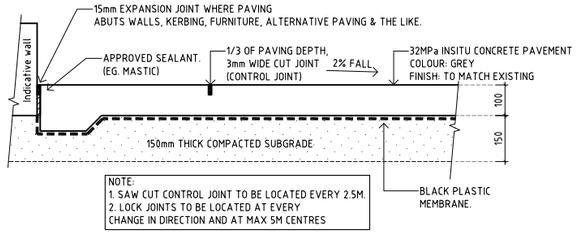
GARDEN BED TYPE A:
IRRIGATED: NO
MULCH: 75MM THK BIO-WISE MULCH

GARDEN BED TYPE B (TO BASIN):
IRRIGATED: NO
MULCH: NO

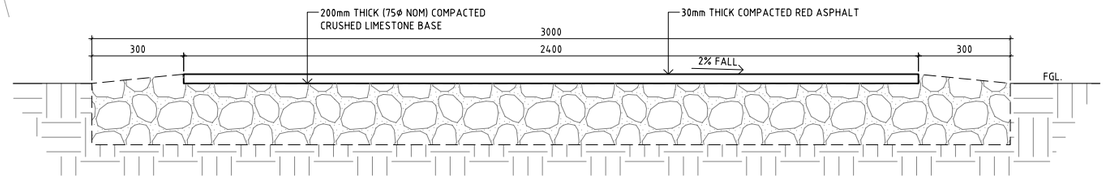
TIMBER BOLLARDS
TREATED PINE IN CONCRETE FOOTING.
REFER TO CITY OF WANNEROO DETAIL TS-01-1-1.

BOUNDARY FENCE
TREATED PINE & PVC COATED CHAIN MESH
REFER TO CITY OF WANNEROO DETAIL TS-01-7-1.

NOTE:
THE CONTRACTOR IS TO OBTAIN CONFIRMATION FROM CITY OF WANNEROO THAT ALL DETAILS ARE CURRENT AT TIME OF CONSTRUCTION.
STREET TREES ARE TO BE LOCATED AT A MIN CLEARANCE OF 8m FROM STREET LIGHTS & 3.5m FROM SIDE ENTRY DRAINAGE PITS & SERVICE PITS AS PER COUNCIL/SHIRE REQUIREMENTS. IMPORTED SOIL TO ALL TREES INSTALLED BY CONTRACTOR.
LANDSCAPE CONTRACTOR IS TO PEG ALL TREE LOCATIONS TO THE SUPERINTENDENT'S APPROVAL PRIOR TO INSTALLATION.
PLANTS USED IN MIXED PLANTING ARE TO BE SPACED AS SHOWN & PLACED WHERE NO MORE THAN THREE (3) PLANTS OF THE SAME SPECIES ARE ADJACENT TO EACH OTHER.
ALL PLANT CENTRES ADJACENT ALL KERBS, PAVEMENTS, WALLS AND SPRINKLERS TO BE OFFSET 500MM OR, HALF THE DIAMETER OF THE MATURE PLANT, WHICHEVER IS THE GREATER.



01 / - INSITU CONCRETE PAVING TYPICAL DETAIL 1:10



02 / - RED ASPHALT TYPICAL DETAIL 1:10

LOT 26 WANNEROO ROAD WOODVALE
PREPARED FOR GMF WA PTY LTD

HARD AND SOFT WORKS DRAWING

JOB NO. 1607102 L4.101 REV B MAY 2017
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PLAN E

Technical Specification
for
Tender No. 1607101

GMF WA PTY LTD

LOT 26 WANNEROO ROAD WOODVALE
LANDSCAPE WORKS

MAY 2017

Project No. 1607101

Suite 4, 414 Rokeby Road
Subiaco WA 6008

1. PRELIMINARY TECHNICAL CLAUSES

1.1 CLERK OF WORKS

The Principal Satterley Property Group may appoint a person nominally as a "Clerk of Works" to oversee the works and to ensure that the Contractor pays heed to the specification with special reference to site access, set out of works, protection of people and property, workmanship and liaison with the public. The "Clerk of Works" may give direction to ensure the Contractor complies with the specification and or drawings. Where a request of the "Clerk of Works" involves changes to the extent of works or material quantities involving cost variations, the Contractor shall immediately liaise with the Superintendent to seek approval for such changes.

1.2 UTILITY CONNECTIONS AND AUTHORITY APPROVALS

Within one week from the award for tender the Contractor shall apply for all services connections including electrical and scheme water connections, Certificate of Building Compliance, all relevant building licences and all other Authority approvals as required to complete the works. The Contractor shall allow for all works to coordinate with service providers and pay all costs and fees as required.

Copies of all written applications are to be furnished to the Superintendent at the time of each application.

1.3 SCHEDULE OF WARRANTIES AND MANUALS

Prior to Date of Practical Completion the Contractor shall supply the Superintendent three (3) complete sets of all Furniture, Irrigation and Electrical works guarantees and operation manuals covering all works as executed and covered by the contract.

Copies of all written warranties duly completed and dated as may be required and made effective from the date of Practical Completion shall be included in the Operation and Maintenance Manual submitted to the Superintendent prior to Practical Completion.

The supply of fully comprehensive and fully complete works as executed guarantees and operation manuals shall be a condition precedent to the Superintendents acceptance of Practical Completion.

1.4 AS CONSTRUCTED WORKS

Prior to Date of Practical Completion, the Contractor shall supply to the Superintendent three (3) A1 paper (or original drawing) size drawing and one (1) digital AutoCAD (CD) drawing of the Irrigation and Electrical works as executed drawings clearly showing all works as executed and covered by the contract.

The supply of fully comprehensive and fully complete works as executed drawings shall be a condition precedent to the Superintendents acceptance of Practical Completion.

1.5 PROTECTION OF EXISTING SERVICES

Prior to commencing works on site, the contractor shall contact all relevant Service Authorities and determine the location of all existing overhead and underground site facilities and services including those to adjacent sites. The Contractor shall engage a suitably qualified cable locator contractor, responsible for locating, marking out and digitally recording all existing facilities and services whether or not such information is shown on any contract drawings. The Contractor shall supply to the Principal, Two (2 no.) electronic copies in CAD format and two (2 no.) hard copies of all Services Survey drawings.

The location and nature of any facilities or services shown on contract drawings is approximate only and shall not be relied upon for construction purposes.

The contractor shall ensure all facility and service locations are defined on site by Chalk Lines and Temporary Bench Marks and are clearly shown on the site drawings and on existing services drawings and prominently displayed in the contractor's site office. The Contractor's workforce shall be made aware of the locations of all facilities and services and the need for their protection.

Particular care must be taken by the Contractor to avoid damage to all such underground and overhead facilities and services and all brackets, posts and fittings in connection therewith. It is the Contractors responsibility to ensure all facilities and services encountered are securely protected, supported, strutted and slung or otherwise protected at the Contractors expense.

The Contractor shall allow for excavating by hand in the close vicinity of all facilities and services. It should be understood that the location of facilities and services shown on the Drawings is only intended as a guide and that liaison must be maintained with the relevant Service Authority so that they can be located more accurately.

Where any facility, structure or service is damaged, displaced or otherwise interfered with, the Contractor is to give notice immediately to the Service Authority and the Superintendents Representative and afford all facilities to assist in early inspection and repair of the service. All costs associated with the necessary repair, and any other cost incurred through the damaged, displacement or otherwise interference with any service will be borne by the Contractor.

The Superintendent's representative reserves the right to have any poles, cables, ducts, etc. re-sited or diverted where he considers it inadvisable to allow them to remain in their present position. The Principal will pay for such re-siting or diversion but the Contractor must give every facility to enable them to carry out the alterations.

Negligence by the Contractor in managing and supervising the protection of services shall be sufficient cause for the Superintendent to direct the Contractor to remove relevant persons from the site or from any activity connected with the works, in accordance with Clause 26 of the General Conditions of Contract.

The Contractor shall have no claim for any extra payment due to interference with, or delay in, the carrying out of the Contract caused by any alteration to a facility, structure or services.

1.6 PROTECTION OF EXISTING TREES

1.6.1 Tree Protection zones

Under the works, trees designated as "Tree to be Protected" will have NO access, plant, equipment, preparation or works whatsoever within their Tree Protection Zone (TPZ), as defined under AS4970-2009 - Protection of Trees on Development Sites, without the approval of the Superintendent.

For any single breach of a TPZ by the Contractor or their representatives for any reason without the approval of the Superintendent, including from wind-blown or water borne materials such as cement, the following penalties will apply:

- Breach of a TPZ $500.00 Per Event.

Should the Contractor or any of their representatives damage (including canopy, trunk and root system) any tree within a TPZ, including from wind-blown or water borne materials such as cement, the following penalties will apply for any single event:

- Damage to a Protected Tree $3,500.00 Per Tree Per Event.

All costs will apply and be borne solely by the Contractor by reduction in monies payable under the Contract.

1.6.2 Works Within Tree Protection Zones

For approved works within Tree Protection Zones the following applies:

- Do not add or remove topsoil;
- Do not backfill around tree trunks to a height greater than 300mm above the original ground surface. Immediately after back-filling, thoroughly water the full extent of the Tree Protection Zone;
- Do not compact. If compaction is required, for example from the operation of heavy constructional plant, loosen the soil by coring;
- Air Spade all excavations such that root systems are preserved intact and undamaged;
- Open up excavations under tree canopies for as short a period as possible;
- Do not cut tree roots exceeding 25mm diameter unless permitted. Where it is necessary to cut tree roots, use means such that the cutting does not unduly disturb the remaining root system. Immediately after cutting, apply a bituminous fungicidal sealant to the cut surface to prevent the incursion of rot or disease.

1.7 PROTECTION OF EXISTING HABITAT

1.7.1 General

The Contractor and their representatives shall limit the movement of plant and equipment, preparation work and stockpiling of materials to within the designated access points and areas within the works as indicated on the drawings.

If the Contractor believes that for construction purposes, additional access points and movement areas are required in the form of work, preparation and storage areas, haul roads and/or access roads, he shall submit details of the proposed location and extent of these areas and roads to the Superintendent for approval prior to their construction.

1.7.2 Habitat Protection Zones

The site contains designated Habitat Protection Zones as indicated on the drawings. The Prior to commencement of works on site the Contractor shall fully fence all Habitat Protection Zone to prevent

pedestrian and vehicular access at all times during the currency of the contract to the approval of the Superintendent

Any breach (either pedestrian or vehicular) for any reason of the Habitat Protection Zone by the Contractor or their representatives, including from wind-blown or water borne materials such as cement, without the authorisation of the Superintendent will incur the following costs:

- First Single Breach $2000 Per Event
- Subsequent Breaches $5,000 Per Event,

Any damage to vegetation within the Habitat Protection Zone by the Contractor or their representatives, including from wind-blown or water borne materials such as cement, without the authorisation of the Superintendent will incur the following costs:

- Any Damage $50 Per Square Metre

All costs will apply and be borne solely by the Contractor by reduction in monies payable under the Contract.

1.8 WORKS WITHIN ROAD RESERVES

1.8.1 General

All works undertaken within road reserves shall comply with AS 1742.3 Part 3 – Traffic Control Devices for Works on Roads. The contractor shall ensure all conditions under this standard are satisfied.

Works within reserves under the control of Main Roads WA (MRWA) shall only be undertaken in accordance with an MRWA approved road management plan, approved in writing by the Superintendent prior to commencement of works on site. Notification of impending works on an MRWA controlled road shall be supplied to the relevant MRWA Road Maintenance Contractor as required prior to the works commencing.

1.9 SETTING OUT OF WORKS

The Contractor shall be responsible for setting out the works in accordance with issued hard copy and electronic set out drawings.

Set out of all works, including but not limited to, all earthworks, all hard works, all soft works, all structures, all above and below ground services, all built elements, and all other works under the contract. Set out works shall be undertaken by a Licensed Surveyor from the dimensions as indicated on the drawings and from electronic drawings issued by the Superintendent for set out purposes. Electronic drawings shall be in ACAD format. Datum to set out for surveyor will be Australian Height Datum and either Perth Coastal Grid or Perth Coastal Grid 94.

The Contractor shall maintain survey pegs undamaged and unaltered until such time as the works have been completed to the satisfaction of the Superintendent. The Contractor shall undertake all re-surveying as necessary to maintain the integrity of the survey set out.

The Contractor will provide:

- White painted timber stakes to define the position of all elements, including services, built elements, trees, paths, paving, garden beds and other construction elements as specified and or on the drawings,
- Relevant levels and bench marks for all set out points, and
- Stakes to define lot boundaries.
- Setting out shall be approved by the Superintendent prior to the commencement of construction. All discrepancies between the design levels and the existing site levels shall be brought to the immediate attention of the Superintendent for written direction prior to commencement of works.

Permanent survey pegs which have been damaged or moved during construction shall be reinstated by a Licensed Surveyor nominated or approved by the Superintendent and the cost of such work shall be paid for in full by the Contractor.

Should survey pegs or marks be in the line of construction operations, the Contractor shall advise the Superintendent prior to commencing work to enable their temporary removal or relocation of the works. Co-ordination shall include necessary approvals from Main Roads Department, Council, Service Authorities, other Contractors and the like, to make the contract run smoothly.

Due to the nature of landscape construction works, minor changes in the layout of the works may be instigated by the Superintendent on site.

The Contractor shall allow in their price for changes in the set out of the works. A variation to the contract shall only be issued where any change results in a change in the scope of works.

1.10 WORKS BY OTHERS

1.10.1 General

The Contractor shall be aware and allow for in their tender price the co-ordination of works that will be built by others during the contract period, within the designated construction site of the works. Works that are being constructed by others are:

- Civil: TBC

The Contractor shall allow for all costs associated with co-ordination of other works as listed included but not limited to programming and co-ordination of site access.

The contractor shall allow contractors undertaking other works sufficient access to the site and site services to ensure the completion of the works to programme.

1.11 SAMPLES AND TESTING

1.11.1 Sample Schedule

1.11.1.1 General

The contractor shall provide samples and sample panels to the Superintendent for approval for all materials and works as detailed in schedules. No works comprising samples or works items as listed in the schedules shall proceed without approval by the Superintendent.

Subject to approval by the Superintendent, samples and panels may be permitted to be incorporated into the works.

Approval of samples and panels by the Superintendent in no way absolves the Contractor of their obligations and responsibilities under the contract.

1.11.1.2 Sample Schedule

ITEM	QUANTITY	REQUIRED BY
All sands, soils and mulch	500gm bag	2 weeks prior to supply.

1.11.2 Sample Panel Schedule

1.11.2.1 General

The contractor shall prepare sample panels for the works as detailed in the sample panel schedule. Approved panels, if suitably located, may be permitted to be incorporated into the works to the approval of the Superintendent. Any panel not incorporated into the works shall be fully removed from site and the area made good at the completion of the works.

1.11.2.2 Sample Panel Schedule

ITEM	QUANTITY	REQUIRED BY
All Pavements	4 Sq. m	2 weeks prior to supply.

1.11.3 Testing

It is the Contractors responsibility to provide all materials, machinery and labour as required for the completion of this project and, to provide verification that all materials and workmanship comply with the requirements of this specification.

In addition it is the Contractors responsibility to undertake, at the Contractors expense, all necessary testing as specified and, as may be requested from time to time by the Superintendent for certification of the works, including materials and workmanship, to confirm conformance with the drawings and this specification.

All costs associated with testing and quantity certification shall be the responsibility of the Contractor and will be included in the appropriate lump sum schedule item.

2. TECHNICAL SPECIFICATION

2.1 BULK EARTHWORKS

2.1.1 Bulk Earthworks by Others

All bulk earth works shall be completed by others including site clearing and cut and fill to within +/- 200mm of final design levels.

2.2 SITE WORKS

2.2.1 General

Provide all machinery and equipment necessary to complete minor excavation, levelling and grading to ensure the works conform to the levels and details in the landscape drawings and specification. All minor earthworks shall be carried out in accordance with finished contours, levels and details indicated on drawings, and to ensure water drains to sumps.

2.2.2 Tree and Stump Removal

Remove all trees and stumps in accordance with the drawings and as specified.

Grub out stumps and roots over 10mm diameter to a minimum depth of 600mm below finished sub-grade level in paved areas or 450mm below finished surface level in unpaved areas. Backfill grub holes with suitable spoil from excavations compacted in layers to the density of the surrounding undisturbed soil.

All debris together with fallen timber shall be loaded, hauled and disposed of in a tip in compliance with statutory requirements or may if instructed be dumped as directed by the superintendent.

2.2.3 Site Clean Up

Clean up all areas to be irrigated and landscaped prior to commencement of construction works. Remove from the site all deleterious material and rubbish including but not limited to building rubbish and vegetative refuse and the like and dispose of in the correct manner off site at an approved rubbish.

2.2.4 Weed and Grass Eradication

After site clean up and prior to cut and fill and fine grading totally eradicate all existing grass and weeds throughout the full extent of soft landscape areas in this Contract.

Broad Spectrum Herbicide for the eradication of both weeds and grasses shall be a non-residual herbicide such as Glyphosate (e.g. “Round-Up) or an Approved equivalent.

Selective Herbicide for the eradication of grasses only shall be a non-residual, monocotyledon specific herbicide such as “Fusilade” or an Approved equivalent. Confirm that this product will be effective against the grasses on site prior to commencement of application.

Weed and grass eradication shall be undertaken prior to the commencement of any earthworks or installation of soil conditioner, either by physical or mechanical means or by the use of an approved non-residual herbicide as detailed below in this Specification.

Where physical or mechanical means are used to eradicate grass and/or weeds, excavate to a depth as required, to remove all roots, rhizomes, stolons and any other propagative material, to ensure that re-growth does not occur in the area.

Remove all resultant spoil, including all vegetative material, from site. Where it is necessary to reinstate levels, backfill with approved clean, weed-free sand.

Where the use of a non-residual herbicide is approved to eradicate grass and/or weeds, it shall be applied strictly in accordance with the manufacturers written directions.

Spraying shall only be carried out on windless days and the Superintendent shall be informed when this operation is to be undertaken.

Do not use Glyphosate near any waterways nor use any other herbicides near waterways unless such use is specifically approved by the Waters and Rivers Commission and the Relevant Local Authority.

The use of a herbicide will only be approved whilst there is active translocation occurring in the grass and/or weeds. This can be generally be judged by the presence of visible new growth, however approval shall be solely at the discretion of the Superintendent.

Where the application of herbicide is proposed between the months of April to October the application rate shall be increased by 30% to allow for the lower rate of plant translocation during these months.

The ratio for application shall be chosen to suit the hardiest weed species present.

Herbicide shall not be applied within six (6) hours of rain, nor shall the treated area be watered within six (6) hours of application. Re-apply herbicide, if the treated area is affected by rain or watering within six (6) hours of the initial application.

Following the application of the herbicide, the treated weeds shall be left undisturbed for a minimum of fourteen (14) days.

Following the fourteen (14) day "ingestion" period, the treated area shall be cultivated to a depth of 150mm, to expose all roots, stolons, rhizomes etc, to the atmosphere. The affected area shall be left in this condition for an additional two (2) days, prior to undertaking any further work.

If, in the opinion of the Superintendent, the use of a herbicide may constitute a threat to any existing habitat or vegetation, eradicate weeds by manual means only.

2.2.5 Cut and Fill

2.2.5.1 General

Undertake all excavation, cut and fill or fill operations as may be required for the construction of the works under the contract, including but not limited to excavation and back filling to all retaining walls and excavation for the importation of prepared soils and the like under the contract. No variation shall be issued for any earthworks, cut or fill operations, removal of excess material off site or importation of clean fill as may be required to complete the works under the contract.

2.2.5.2 Imported Fill

Imported fill material shall be a clean granular material, sand as defined in AS1289.3.6.1-1995 and shall have a maximum particle size of 1mm.

Fill sand shall be free from rocks, clay, roots and other vegetative material and any other deleterious material.

Fill sand shall be certified free from all salt, pests, diseases and pathogens, including those not detrimental to plant growth. Independent testing certifying compliance shall be provided to the Superintendent within three days of request.

Place and compact filling in uniform layers of thickness. Layers shall extend for the full width of fill area. The maximum layer thickness generally shall be 150mm compacted. However, greater thicknesses will be permitted subject to the ability of compaction equipment to achieve specified densities. No layer shall be less than 100mm thick compacted. Each layer shall be compacted to not less than Eight (8) blows per 300mm with a Perth sand penetrometer as determined by AS1289.5.2.1-2003.

2.2.5.3 Excess Material

All excess excavated material shall be loaded, hauled and disposed of off site in an approved tip in compliance with statutory requirements.

2.2.6 Fine Grading

Undertake all minor levelling and grading to achieve final design levels to all areas under the works. Supply all the machinery and equipment necessary to complete the works in an efficient manner.

Fine grading shall including all excavation or fill as required for the provision of hard landscape works and prepared soils and mulch to achieve final design levels.

All final grading shall be carried out in accordance with finished contours and levels indicated on drawings, and to ensure water drains to sumps.

Finish all levels to neatly tie in and match up with existing work in adjoining areas to the satisfaction of the Superintendent. This shall include all works associated with roads and pavements carried out previously, to the areas covered by this contract.

Remove from the site all excess excavated material and deleterious material encountered during final grading and dispose of in the correct manner off site at an approved rubbish tip.

2.3 IN-SITU CONCRETE PAVEMENT

2.3.1 General

Supply and install in-situ concrete pavement where indicated on the drawings.

2.3.2 Earthworks

Carry out earthworks and preparation to allow for levels to be achieved to finished grades as specified.

2.3.3 Sub-Grade

2.3.3.1 Preparation

Prior to compaction, bring the sub-grade to within 2% of the optimum moisture content determined to AS1289.5.1.1-2003 (standard) or AS1289.5.2.1-2003 (modified) as applicable to the material.

2.3.3.2 Compaction

The pavement sub grade shall be fully compacted with a mechanical vibrator to not less than Eight (8) blows per 300mm with a Perth sand penetrometer as determined by AS1289.5.2.1-2003 to a depth of 450mm.

2.3.3.3 Finished Sub-Grade Level Tolerances

Maximum deviation from the design level: + 10mm, - 0mm.

Maximum deviation from a 3 m straightedge laid anywhere on each plane surface: 20mm.

2.3.3.4 Compaction Equipment:

Use approved rollers, appropriate to the materials and compaction requirements. Use approved plate compactors on areas inaccessible to rollers. To maintain moisture content, use water spraying equipment capable of distributing water uniformly in controlled quantities without washing fines from the sub-grade or base material.

2.3.4 Base Course

2.3.4.1 Preparation

The formation shall be to the profiles, dimensions, camber and depths shown on the accompanying plans. The width of formation shall be 300mm greater than the finished width of the pavement to accommodate the laying of adjacent pavements.

The formation shall be approved by the Superintendent or their representative prior to the laying of the foundation material.

2.3.5 Concrete

Concrete mixes shall be as follows:

Pavement Type 1:

Cement:	Grey
Oxide:	Standard Grey
Aggregate:	Grey granite, nominal maximum size 14mm,
Maximum slump:	80mm;
Finish:	Broom finish, no picture frames;
Compressive Strength:	32 M.Pa. Minimum at twenty eight (28) days.

The Contractor shall guarantee that all concrete shall be of like composition, i.e. utilising the same batch of sand and using the same proportional mix of materials.

All colour variations caused by variances in the composition of materials used, the lack of cleanliness of the site or truck, or failure to adequately protect concrete will be replaced by the Contractor, at the Contractor's expense.

2.3.6 Form Work

Form work shall be of steel or suitable dressed seasoned timber planks, free of warps, bends or kinks.

Forms shall be staked with no less than 3 stakes and not more than 1.5m apart to prevent unspecified warps and bends. Forms shall be in one piece for the concrete pavement thickness specified.

2.3.7 Placement

2.3.7.1 Placement – Pedestrian Pavement

Lay concrete 100mm thick minimum with 150mm thick thickened edges between control joints and screened off to falls and finish with a steel hand trowel.

2.3.7.2 Placement – Trafficable Pavement

Lay concrete 100mm thick with 150mm thick thickened edges between control joints and screened off to falls and finish with a steel hand trowel.

2.3.8 Expansion and Control Joints

2.3.8.1 Expansion Joints

Provided 15mm All In One Lock Joint expansion joints in paving as indicated on the drawings and, as a minimum evenly spaced at intervals not exceeding 5000mm apart in any one direction in pavements or in lineal sections of paths.

All In One Lock Joints rubber top to match surrounding pavement materials.

Provided 15mm wide expansion joints with a backing of 15mm dia. closed cell polyethylene strip (colour to match surrounding pavements) in paving at all fixed edges including kerbs, adjoining pavement edges and walls, to the edges of all furniture and fittings, services lids and other pavement inserts and where two linear paths join or deviate in alignment. Set strip back sufficient distance so that sealing compound will finish flush with paving.

2.3.8.2 Contraction Joints

Provided 30mm deep cut contraction joints as indicated on the drawings located as per the drawings, at a minimum evenly spaced at intervals not exceeding 2500mm apart in any one direction.

2.3.9 Finishing

2.3.9.1 General

All pavement surfaces shall comply with AS/NZS 4586 Classifications in Selecting Pedestrian Surface Materials.

2.3.9.2 Broom Finish Concrete

After placing and compaction, concrete shall be finished monolithically to a smooth, even surface by means of steel floats or other suitable equipment.

On completion of steel floating and before initial set, the surfaces of concrete pavements shall be brushed to a "non-skid" texture. This shall be achieved by drawing a moistened nylon broom lightly across the surface in a continuous direction.

2.3.9.3 Exposed Aggregate Concrete

After placing and compaction, concrete shall be finished monolithically to a smooth, even surface by means of steel floats or other suitable equipment.

On completion of steel floating and before initial set, the surfaces of concrete pavements shall be washed to an exposed aggregate texture. This shall be achieved by water wash down to produce an even exposure of aggregate over the full extent of the pavement.

2.3.9.4 Edges and Joints

Pavement finish shall be to full extent. There shall be no picture window treatment; no tooled edges or joints.

2.3.10 Curing

To AS 3600 clause 19.1.5.

Protect fresh concrete from premature drying and excessively hot or cold temperatures. Maintain the concrete at a reasonably constant temperature with minimum moisture loss for the curing period.

Commence curing immediately after finishing, and cure continuously for not less than seven (7) days.

Submit for approval the proposed method of curing, which may include the following:

- Ponding or continuous sprinkling with water (moist curing)
- An impermeable membrane
- An absorptive cover kept continuously wet.

2.3.11 Protection

Protect paving from staining and damage. Use sheeting or other screening as necessary. Do not use hardwood in contact with pavements.

Clean off all droppings as they occur. Stained or damaged pavements shall be replaced, not repaired, unless otherwise permitted by the Superintendent.

Protect adjoining surfaces during paving work. Finished surfaces in the vicinity of work being carried out shall be protected from staining and impact and all necessary precautions are to be taken to ensure that protection is provided and maintained.

Protect all paving as follows:

- exclude all foot traffic for 3 days;
- exclude all vehicles and heavy traffic for 21 days minimum; and
- provide barriers and planking to accommodate traffic.

2.3.12 Tolerances

Works shall be undertaken to the following tolerances:

- Maximum deviation from design level: + 5mm, - 5mm

- Grade across pavement shall be 2% + or -0.5% or as indicated on the drawings.
- Pavement surface shall be true to line and not deviate more than 5mm under a 3m straight edge.
- Surface irregularities, including abutting to service authority manholes, etc. shall not exceed 2mm.
- Thickness: = or –5mm. A random testing programme will be used to check the thickness, and if any point is outside the tolerance, further testing shall be undertaken within that 5m section and the adjoining 5m sections on either side. Three or more additional thickness tests will be taken on each of the sections. If any of these show a reading that is outside the required tolerance, that section of the pavement shall be removed and replaced with new work to this specification.
- The pavement shall be constructed to the nominated width + or - 20mm.

Any sections of the pavement not meeting the requirements of this specification shall be removed from the site and replaced.

2.3.13 Sample Panel

Construct a three (3) square metre sample panel for approval of the Superintendent prior to commencing works. All works shall comply with the finish of the approved sample panel.

The panel may be incorporated into the Works. Panel location is to be determined on site by the Superintendent.

2.4 COLOURED ASPHALT PAVEMENT

2.4.1 General

Supply and install coloured hot asphalt dual use pavements as shown on the drawings, details and in accordance with the specification.

The materials and workmanship used shall comply with the following Australian Standards unless otherwise specified.

AS1152	Test Sieves
AS1160	Bitumen Emulsions for Construction and Maintenance of Pavements
AS1289	Method for Testing Soils for Engineering Purposes
AS1465	Dense Natural Aggregate for Concrete
AS1467	Lightweight Aggregates for structural Concrete
AS2008	Residual Bitumen for Pavements
AS2150	Asphalt (Hot-Mixed)

2.4.2 Alignment

Follow the set out of the drawings to reproduce the intent of the design on the ground. Prior to boxing out peg the alignment and give the Superintendent 48 hours notice to allow for approval prior to proceeding with the construction.

In setting out care should be exercised to avoid irrigation installations and unnecessary clashes with existing tree planting. In particular care should be taken to avoid existing irrigation valves and manholes. There will be some leeway afforded to the contractor to utilize common sense with the set out of the pavement to marginally adjust the alignment such that the pavement avoids existing obstacles.

At all times the horizontal and vertical curves are to be free flowing with smooth radii.

2.4.3 Preparation - Boxing Out

After approval of the preliminary layout by the Superintendent, box out the pavement and ramps to required depth. The ground shall be well compacted with a mechanical vibrator to not less than Eight (8) blows per 300mm with a Perth sand penetrometer as determined by AS1289.5.2.1-2003 to a depth of 450mm.

2.4.4 Limestone Base Course

Limestone base material used throughout the contract shall have a percentage of wear by the Los Angeles Test of not more than 60. It shall also contain not less than 60% calcium carbonate by weight and shall conform to the following requirements:

AS. Sieve Aperture	Percentage Passing (By Mass)
0mm	100
9mm	50 - 70

.36mm	30 - 50

Materials passing the 425 micrometer sieve shall have the following properties:

Liquid Limit	Not to exceed 25%
Plasticity Index	Not to exceed 5%
Linear Shrinkage	Not to exceed 1.5%
Dry Compressive Strength	Not less than 1725 K.Pa.

Lay limestone base course from end tipping trucks (without disturbing the sub-grade) to give a minimum compacted overall thickness of 200mm.

2.4.5 Compaction of Base Course

Carry out compaction when the base material is at an optimum moisture content. If necessary apply water to achieve optimum moisture content. Compact the base course materials to not less than Eight (8) blows per 300mm with a Perth sand penetrometer as determined by AS1289.5.2.1-2003

Make good all irregularities and finish surface smooth with uniform falls as shown.

Do not apply bitumen coatings until the base course has dried out and has been inspected and tested for compaction and approved by the Superintendent.

2.4.6 Bitumen Emulsion

2.4.6.1 Materials

Bitumen emulsion shall have a 60% minimum content of Class 50 residual bitumen. Bitumen emulsion shall be cationic grade CRS. An anionic bitumen emulsion grade ARS may be used subject to the approval of the Superintendent. Do not apply the bitumen emulsion during weather conditions considered unsuitable by the Superintendent.

2.4.6.2 Tack Coat

Prior to laying the hot bituminous concrete, sweep primed and sealed areas clean and spray a tack coat of bitumen emulsion diluted to 60/40 with water, over the base course at a rate of 1.2 Litres/Sq. metre.

2.4.6.3 Red Oxide Hot Bituminous Concrete ('Ready pave' plus oxide)

Lay 30mm minimum compacted finished thickness 2% red oxide [intrinsic colouring] hot bituminous concrete paving on the base course to areas shown on the drawings.

Red Oxide hot bituminous concrete shall be mixed in the following proportions:

- Crushed laterite 93%
- FE_2O_3 (Bayer 130) 1%
- Bitumen 6%

Bitumen shall be class 170 and constitute 6% out of the total mix by weight.

The crushed laterite shall be proportioned so that the combined grading falls within the following limits:

AS Sieve Aperture	Percentage Passing (By mass)
.5mm	100
.7mm	80 - 100
.75mm	63 - 83
.36mm	43 - 60
.18mm	29 - 44
600 micrometers	20 - 36
300 micrometers	15 - 27
150 micrometers	6 - 18
75 micrometers	2 - 15

At least 60% of the materials passing the 75 micrometer sieve shall be in the form of added mineral fillers.

2.4.6.4 Delivery

Deliver the red oxide hot bituminous concrete to the point of spreading in end tipping trucks having lightly oiled clean steel lined bodies. Cover each load with canvas of sufficient size to protect from rain and prevent loss of heat from the mixture.

The temperature of the red oxide hot bituminous concrete as delivered to the point of spreading shall not vary by more than 7 Deg.C. from load to load provided it is always within the limits 120 Deg.C. to 160 Deg.C. Any loads outside the allowable temperature range or wet by rain will be rejected.

2.4.7 Spreading

Do not place or spread red oxide hot bituminous concrete when the air temperature is below 7 Deg.C. or weather conditions are considered unsuitable by the Landscape Architect.

Spread and tamp red oxide hot bituminous concrete on a dry clean base in one layer by a power driven spreading machine in lanes equal to the width of the pavement.

Use a self propelled mechanical spreading machine equipped with hoppers, distributing screw, adjustable screed and equalizing devices, capable of distributing material over the full width of the strip being spread and adjustable for transverse slope and depth as required. The machine shall have a heated tamping bar for compaction of the material during spreading and screeding.

2.4.8 Rolling

As soon after spreading as it will bear the roller without lateral displacement, roll the hot bituminous concrete uniformly and thoroughly by a self propelled 5 tonne smooth steel wheel tandem roller of equivalent making a minimum of 8 passes. Roller speed shall not exceed 6 KM./H. Finish paved areas to a hard smooth surface with even grades.

Hand finish areas inaccessible by machine and to surface matching machined areas.

2.4.9 Dual Use Pavements Camber

Finish Dual Use Pavements with a uniform camber of not less than 1 in 32. Shoulder 300mm.

2.4.10 Finish

2.4.10.1 General

All pavement surfaces shall comply with AS/NZS 4586 Classifications in Selecting Pedestrian Surface Materials.

2.4.10.2 Tolerances

Works shall be undertaken to the following tolerances:

- grade across pavement shall be 2% + or -0.5%;
- pavement surface shall be true to line and not deviate more than 10mm under a 3m straight edge;
- surface irregularities, including abutting to service authority manholes, etc. shall not exceed 2mm;
- thickness: = or –5mm. A random testing programme will be used to check the thickness, and if any point is outside the tolerance, further testing shall be undertaken within that 5m section and the adjoining 5m sections on either side. Three or more additional thickness tests will be taken on each of the sections. If any of these show a reading that is outside the required tolerance, that section of the pavement shall be removed and replaced with new work to this specification; and
- the pavement shall be constructed to the nominated width + or - 20mm.

Any sections of the pavement not meeting the requirements of this specification shall be removed from the site and replaced.

2.4.11 Protection

Barricade, warning signs and lights shall be erected to prevent damage of the works from vehicles and pedestrians for not less than 24 hours after completion.

2.4.12 Clean Up and Back Filling

All bituminous droppings, slurry, etc., and surplus materials including form work and pegs, are to be removed from site.

After removal of form work and acceptance of the construction by the Landscape Architect, the edges shall be back filled with clean sand to finish flush with the edge of pavement.

2.5 CHAIN WIRE FENCE

2.5.1 General

Supply and erect a timber chain wire fence where indicated on the drawings.

Main posts, end posts and corner posts to be 125mm Dia. Dome top treated pine posts. Footings to be concrete, 350mm square x 450mm deep.

All footings to finish 100mm below finished ground level.

Chain wire to be nominal mesh size: 45mm., Selvedge: Knuckled, nominal diameter of wire to be 2.5mm, protective coating, Type B (standard) galvanized to AS2423-2002 with PVC coating, PVC coating colour to be Black, roll width to be 1800mm.

Chain wire support cable to be two strands of 3.15mm diameter wire, type B (standard) galvanized to AS2423-2002, with PVC coating, twisted together.

Lacing and tie wire to be 2mm diameter steel wire finished to match chain wire. Attach chain wire support cables to posts at top, centre and bottom of the fence on the outside of the enclosure. Lace chain wire to end posts and gate posts with lacing wire. Tie chain wire to support cables, corner posts and intermediate posts with tie wires spaced not more than 500mm apart. Fix chain wire to the outside of the enclosure.

Footings to be hand dug where necessary to avoid any clearing of existing vegetation. Final alignment of fence is to be determined on site in consultation with the superintendent and City of Wanneroo.

2.6 PINE TIMBER BOLLARDS

2.6.1 Pine Timber Bollards

Supply and install Pine timber bollards. Bollards shall be made from Pinus radiata logs tanalith treated in accordance with treatment level H4 AS 1604 as detailed on the drawings.

Pine bollards shall be set 600mm in ground. Back filling shall be with 15 M.Pa. concrete, as detailed on the drawings.

Spaces between bollards shall be even at 1500mm apart or as detailed on the drawings.

Finish shall be natural timber or Finish shall be painted using 2 coats 'Dulux' 'Timber colour Low Sheen Acrylic' paint. Preparation is to be as per manufacturer's instruction. Colour to match existing.

2.7 TREE, SHRUB AND PLANT (GREEN STOCK) SUPPLY AND PLANTING

2.7.1 Green Stock Supply

All green stock supplied by the Contractor shall be supplied by suppliers approved by the Superintendent, to the species, sizes and quality as specified in Specification and Plant Schedules.

2.7.2 Supplier Specified Green Stock

The following green stock species shall be purchased from the following specified suppliers:

NIL

The Contractor shall allow in their lump sum tender price for the purchase and delivery of the stock from the supplier to the site and all site storage as necessary to complete the works.

The Contractor shall take delivery of the stock within seven (7) days of possession of site or as directed by the Superintendent.

2.7.3 Green Stock Supply and Report

2.7.3.1 Supply Report

Within two (2) weeks of acceptance of tender, furnish to the Superintendent a PRELIMINARY GREEN STOCK SUPPLY REPORT covering all green stock under the works, including Principal supplied stock and stock from specified suppliers, detailing the following:

- Container and Green Stock Size for each species;
- Number of each species;
- Nursery Supplier for each Species;
- Contact Details for each Nursery Supplier;
- Holding Location and Details for each Species; and
- Green Stock not currently available as specified.

Within four (4) weeks of acceptance of tender, furnish to the Superintendent a FINAL GREEN STOCK SUPPLY REPORT, including all species substitutions for unavailable green stock as determined by the Superintendent. The report shall detail the following:

- All Green Stock and Stock Substitution Species under the Works,
- Container and Green Stock Size for each species,
- Number of each Species,

- Nursery Supplier for each Species,
- Contact Details for each Nursery Supplier,
- Holding Location and Details for each Species,

2.7.3.2 Green Stock Supply Guarantee and Penalties

Failure to provide to the Superintendent, in writing, a Preliminary Green Stock Supply Report and a Final Green Stock Supply report comprising all green stock species and sizes within the contract within the times specified within this contract will incur a penalty on the Contractor of One Thousand Dollars ($1,000) per week per report for every week, or part week for which the reports are not submitted, excluding Principal supplied stock and stock from specified suppliers. The penalty shall be deducted from the value of the Contract.

The Final Plant Supply Report shall constitute a written guarantee by the Contractor that each species listed in the report will be in good condition and available for use in the works, excluding Principal supplied stock and stock from specified suppliers.

A penalty on the Contractor of Two Thousand Dollars ($2,000) shall apply for each species listed in the Final Green Stock Supply Report approved by the Superintendent that is subsequently found by the Superintendent to not be in good condition or not available for use in the works, excluding Principal supplied stock and stock from specified suppliers. The penalty shall be deducted from the value of the Contract.

The full cost of the supply and planting of all replacement species for plants that are subsequently found by the Superintendent to not be in good condition or not available for use in the works shall be borne by the Contractor, excluding Principal supplied stock and stock from specified suppliers. The Superintendent shall determine the species and stock to be used for substitution in the works.

2.7.3.3 Green Stock Quality

All green stock shall:

- be true to species, subspecies and variety;
- be vigorous and healthy;
- be of good form consistent with species and variety;
- be well established in the plant container specified including having a large and healthy root system that occupies the full extent of the container while showing no evidence of restriction or having been restricted or damaged at any time during production;
- not be soft or produced using forced growing techniques;
- be hardened off;
- be fully self supporting without staking or guying;
- be free from disease, insect pests and other pathogens and;
- be free from damage from staking, tying or any other horticultural techniques used throughout production.

The Superintendent will reject any green stock which does not meet the required quality.

2.7.3.4 Green Stock Labelling

Label at least one specimen of each species or variety with a durable, readable tag.

2.7.3.5 Green Stock Storage on Site

Wherever possible, green stock shall be planted immediately after delivery to the site. If this is not possible, keep them in good condition by appropriate storage methods, or as may be directed. Prevent theft, drying out or damage from any cause including frost, wind, sun, rain, animals and the like. Provide an on-site nursery for holding green stock on site for more than 48 hours, of sufficient size, with provision for watering.

2.7.4 Planting Generally

2.7.4.1 Setting Out of Works

Where underground services, manholes, cable pits, fire hydrants, lamp standards, retaining walls, kerbing, roads, paving and other obstructions occur, plant clear of such service and obstructions and protect services and obstructions from damage by machines and equipment.

2.7.4.2 Planting Generally

Remove all plants from their containers, including all biodegradable containers and growing tubes, in such a manner as to do as little disturbance as possible to the roots. Where necessary, tease out root-balls before planting.

Place trees, shrubs and plants in holes in an up-right position and backfill level with top of root-ball. Compact soil by hand watering.

2.7.4.3 Mass Planting Areas

Excavate a hole for each plant large enough to provide not less than 150mm all round the root system of the plant, or as shown on the Drawings.

2.7.4.4 Individual Planting in Grassed Areas

Excavate a hole 100mm deeper and 600mm wider than plant containers of 5 Litre and over, or 450mm diameter x 300mm deep for pots small than 5 Litre, unless otherwise shown on the Drawings. Break up the base of the hole to a further depth of 100mm, and loosen compacted sides of the hole, as necessary to prevent confinement of root growth to the hole.

2.7.4.5 Plant Locations

Do not vary the plant locations from those shown on the Drawings unless otherwise directed. If it appears necessary to vary the location and/or spacing to avoid service lines, or to cover the area uniformly, or for similar reasons, apply for directions.

2.7.4.6 Planting Conditions

Do not plant in unsuitable weather conditions such as extreme heat, cold, wind or rain. Suspend excavation in other than sandy soils when the soil is wet, or during frost periods.

2.7.4.7 Depth of Planting

When the plant is in its final position in its hole or bed the top soil level of the plant root-ball shall be level with the finished surface of the soil surrounding the hole or bed. Test the depth by measuring the sides of containers. If back filling is required to correct the depth, use soil as specified.

2.7.4.8 Plant Placement

When the hole of bed appears to be of correct size and not before, remove the plant from the container with minimum disturbance to the root-ball, and place it in its final position, in the center of the hole and plumb.

2.7.4.9 Fertilizer to Non Australian (Exotic) Plants

At time of back filling Exotic plants, all plants are to receive approved propriety item 'Eight to Nine Month Slow Release All Purpose Fertilizer'.

A sample of the fertilizer is required for approval by the Superintendent prior to commencement of works on site.

Fertilizer to be applied in backfill during planting at the manufacturers recommended rate for the relative plant size, and at a minimum rate as follows:

- 200 to 100 Litre pot size plants to have sixty grams;
- 45 Litre pot size plants to have forty grams;
- 25 to 15 Litre pot size plants to have thirty grams;
- 13 to 5 Litre pot size plants to have twenty grams;
- 200 to 170mm pot size plants to have twenty grams;
- 150 to 130mm pot size plants to have ten grams; and
- Tube pot size plants to have ten grams.

2.7.4.10 Fertilizer to Australian Native Plants

At time of back filling Australian native plants, all plants are to receive Macracote Grey 8 - 9 Month Slow Release Fertilizer strictly in accordance with the manufacturer's instructions.

A sample of the fertilizer is required for approval by the Superintendent prior to commencement of works on site.

Fertilizer to be applied in backfill during planting at the manufacturers recommended rate for the relative plant size.

2.7.4.11 Back Filling to Plants

Backfill with soil as specified. Lightly tamp down the soil and water to eliminate air pockets.

2.7.4.12 Watering Basins with Mulch

Construct a watering basin around the base of each individually planted tree of 13 Litre pot size and above, consisting of a raised ring of soil of minimum diameter of 1000mm capable of holding a minimum of 10 litres

of water. Supply and place 75mm mulch as specified to the extent of each watering basin, minimum diameter 1000mm.

2.7.4.13 Mulching

All plant stems shall be kept free from mulch.

Mulch shall not be placed within 100mm of all plant stems for less than 13 litre pot sized stock, and shall not be placed within 100-200mm of all plant stems for 13 litre pot size and greater.

2.7.4.14 Staking and Tying

Protect each tree of pot size 200 & 100 Litre with four (4) 50 x 50 x 2500mm pointed hardwood stake set 700mm into the ground. Protect each tree of pot size 45 & 15 Litre and above with two (2) 50 x 50 x 2000mm pointed hardwood stake set 500mm into the ground. Locate stakes parallel to prevailing wind direction on site. Do not pierce root ball.

All Stakes shall be painted Black using two coats of Dulux Timber colour Low Sheen Acrylic. Painting of stakes is to be carried out no less than 48 hours prior to installation to ensure that paint on all stakes is dry prior to installation.

All ties shall be approved flat rubber tree ties of minimum width of 10mm. Ties are to be located to provide additional support during adverse prevailing wind conditions only. All ties shall be placed in a loose figure of eight around stake and stem to provide adequate protection from damage without compromising natural plant growth.

2.7.4.15 Watering

At time of planting provide by hand watering a minimum of 10 litres of water to each plant. Repeat watering to each plant with 10 litres of water on each alternate day up to Practical Completion.

Watering of plants by sole reliance on the irrigation system will not be accepted until the irrigation system is practically complete or, unless approved in writing by the Superintendent.

2.7.5 Tree Planting

2.7.5.1 Planting

Remove tree bag or container carefully to prevent root damage. Edges of the root ball to be 'ruffled' to remove any root circling / girdling that may be occurring.

Backfill with improved soil media to occur in 100-150mm 'lifts' with firming of the back-fill occurring around the root ball of the tree after every lift.

Watering shall occur at the same time as the planting and firming.

Construction a 'bund' at the edge of the compost / mulch zone to aid in water retention where landscape surrounds allow.

After planting conditioned site soil shall finish 120mm below adjacent kerbing, paving and turf areas.

2.7.5.2 Compost

Directly after planting apply 40mm compost to the full extent of the root ball and conditioned soil mix and gently cultivate into the top 100mm to provide a homogeneous mix.

Compost shall be:

- Eclipse Soils 'Organic Soil Conditioner'.

Soil conditioner shall comply with AS4454-2003 Composts, Soil Conditioners and Mulches.

2.7.5.3 Humate

At time of compost application apply a Humate to the full extent of the rootball and conditioned soil mix.

Humate shall be:

- Eco-Growth's Humus 400.

Apply at the rate of 50g / square metre.

2.7.6 Clean Up

On completion of planting ensure that all plants are in first class, presentable condition by removing dead, damaged and unhealthy branches and trimming where necessary to result in balanced growth typical of their normal form.

After inspection by the Superintendent and on Practical Completion, remove labels from plants.

2.8 MULCH – BIO WISE

2.8.1 General

Supply and apply Bio-Wise mulch to all areas as designated on the drawings. Mulch shall be applied to a depth, after tamping down, of 75mm.

Mulch shall be applied:

- To the full extent of all areas indicated 'Garden Bed Areas' on the drawings.

Mulch is to be completely free of all noxious weeds, seeds and fungus, insect pests and other deleterious material.

A sample of the mulch will be required for approval by the Superintendent prior to commencement of works on site.

Minor beds preparation including raking and removal of rubbish to produce an even and smooth surface at a constant depth of 75mm below finished surface of mulch will be the responsibility of the Landscape Contractor.

All plant stems shall be kept free from mulch.

Mulch shall not be placed within 100mm of all plant stems for less than 13 litre pot sized stock, and shall not be placed within 100-200mm of all plant stems for 13 litre pot size and greater.

The mulch will be consolidated, to produce smooth and even grades, finishing 10mm below surrounding hard surfaces.

2.8.2 Mulch Standards

Soil conditioner shall comply with AS4454-2003 Composts, Soil Conditioners and Mulches.

2.9 PRACTICAL COMPLETION

2.9.1 General

Reference is made to the General Conditions of Contract, definition of Practical Completion.

Give the Superintendent three (3) working days notice that the works are complete and that the works are ready for issue of the Certificate of Practical Completion and commencement of the 3 month consolidation period

Prior to Date of Practical Completion the Contractor shall supply to the Superintendent one A1 paper (or original drawing) size and one digital (CD) copy of the irrigation work as executed drawings clearly showing all irrigation works as executed and covered by the contract.

The supply of the irrigation works as executed drawings, warranties and manuals shall be a condition precedent to the Superintendents acceptance of Practical Completion.

2.10 MAINTENANCE

2.10.1 Scope of Works

2.10.1.1 Scope of Works

This Contract is for the maintenance for 21 month period of all works as designated on drawings and any other works as listed below:

Works include but are not limited to the following:

- Monthly Reporting;
- Litter and Rubbish Removal;
- Hard Landscape Elements Maintenance including pavements and mulches;
- Tree and Shrub Maintenance; and

2.10.1.2 Extent of Maintenance

The Lump Sum Contract Sum shall include all cost associated with the satisfactory completion of the works including but not limited to staff, machinery, materials and profit and attendance necessary to maintain the landscape as existing at possession of site.

Possession of site shall be from date of practical completion of the construction works.

The landscape shall be maintained in peak condition using approved landscape maintenance and horticultural techniques.

No modifications shall be made to the works without prior approval by the Superintendent.

2.10.1.3 Quality of Maintenance

The landscape shall be maintained in peak condition, in keeping with the natural seasonal cycle throughout the year by horticulturists and other suitably qualified staff using approved horticultural and landscape management techniques.

2.10.1.4 Termination

The Principal reserves the right to, at any time and with two week notice to the Contractor terminate the contract should the Contractor fail to fulfil the obligations of this contract.

2.10.2 Inspection and Reporting

2.10.2.1 Inspection

The Contractor shall inspect the full works at a minimum on a weekly basis and immediately report to the Superintendent any activities and conditions that in any way adversely affect the works including all damage and theft.

2.10.2.2 Monthly Maintenance Reports

Throughout the maintenance period the maintenance Contractor shall prepare and submit to the Superintendent on a monthly basis a maintenance report covering the following:

- Date and time of daily / weekly inspections;
- Condition of pavements and hard landscape elements;
- Condition of garden beds;
- Progress of establishment of green stock;
- Occurrence of vandalism, theft and graffiti throughout the works;
- Damage or disruption by others throughout the works, including sand drift from adjacent sites;
- Activities that have been completed throughout the month;
- Activities planned for the month ahead; and
- Upcoming capital outlays required to maintain the works.

2.10.2.3 Site Work Sheets

Throughout the maintenance period, the maintenance Contractor shall submit to the Superintendent on a monthly basis, and at the same time as the monthly maintenance report, all site work sheets completed by maintenance personnel, including all maintenance sub contractors.

2.10.3 Litter and Rubbish Removal

2.10.3.1 General

The Contractor shall remove all litter from the full extent of the maintained area including but not limited to:

- All garden beds
- All car park areas
- All hard surfaces

Collection shall take place on a weekly basis. All rubbish and refuse shall be dispose of off site. Collection shall take place only on a Friday or Saturday morning of each week.

2.10.4 Hard Landscape Maintenance

2.10.4.1 General

All paved surfaces within the maintained areas including roads and car parks; steps, feature paving and kerbing shall be swept or blown down monthly or as required to maintain a clean and sand free surface.

All paved surfaces including roads affected by mowing shall be swept or blown down after each turf mow and clippings removed from site.

All paved surfaces will be maintained free of weeds or unwanted vegetation by the use of non residual non toxic Glyphosphate sp. herbicide.

Any obstruction or obvious defect in hard landscape works including pavements and steps shall be immediately brought to the notice of the principal for direction. Any obstruction or defect that constitutes a public hazard will immediately be made safe by the Contractor, including barricading and immediately reported to the Principal for direction.

2.10.5 Tree and Shrub Maintenance

2.10.5.1 Planting - General

The Contractor shall maintain all plants in a healthy and vigorous growing condition. Plants that die or fail to thrive shall be replaced immediately by the contractor at the contractor's expense. Plant replacements with be of the same species and size as those removed.

The cost of replacing plants that are wilfully damaged or stolen shall be borne by the Principal. The maintenance Contractor shall submit a report and quote for approval prior to commencing replanting works.

Construction drawings will be provided to ensure replacements match those planted during the landscape contract.

2.10.5.2 Planting - Pruning

The Contractor shall periodically prune shrubs to either maintain or encourage healthy plant growth or to allow clear sight lines and access in both vehicular and pedestrian access ways.

Prune trees to select and develop a permanent single leader and scaffold branches that are smaller in diameter than the trunk or branch to which they are attached. The vertical spacing of branches should be such that with radial orientation they do not to overlay each other. Prune to remove any dead or degenerating parts of trees and make repairs to tree wounds wherever possible. Stripping of lower branches on younger trees will not be performed, instead branches will be maintained in a pinched back condition with as much foliage as possible. Only when the plant begins to sucker from the base will the stem (sucker) be removed.

Primary pruning of advanced deciduous trees shall be completed whilst the tree is dormant with a secondary pruning required to shape the tree after the tree has regenerated foliage.

Any substantial pruning shall be deferred until mid spring to reduce the risk of disease infesting the wound.

2.10.5.3 Planting - Staking and Guying

The Contractor shall regularly inspect and maintain all stakes, guys and ties in sound condition.

When trees attain a trunk calliper of 100mm consideration will be given to removing existing stakes and ties. All stakes and guys will be inspected at least twelve times per year to prevent girdling of trunks and branches and prevent rubbing causing bark wounds.

2.10.6 Watering - Irrigated

Provide sufficient irrigation to maintain all plants in a healthy growing condition in accordance with the Irrigation Operation and Maintenance section of this specification for the duration of the Maintenance period.

All water and watering equipment suitable to the works shall be supplied by the contractor.

2.10.7 Hand Watering Schedule

Apply as a minimum 10 Litres / Square Meter of water per application in accordance the below hand watering application schedule. Monitor and adjust by increasing or decreasing frequency and rate based upon individual plant requirements and requirements for hardening off.

Season	Month	Minimum Applications / Week
Summer	December	2
	January	3
	February	3
Autumn	March	2
	April	1
	May	1
Winter	June	
	July	
	August	
Spring	September	1
	October	1
	November	2

2.10.7.1 Trees - Fertilizing

The Contractor shall fertilize all trees twice per year as a minimum. Fertilizer shall be 4 x 20 gram "Langley" tree tablets place below ground level with access to the plants root system.

The Contractor shall make periodic checks to ensure no nutrient deficiencies are evident. The contractor shall correct immediately any nutrient deficiencies upon detection at the Contractors expense.

2.10.7.2 Shrubs - Fertilizing

The Contractor shall fertilize all garden beds twice per year as a minimum. Fertilizing shall be slow release "Osmocote" or equivalent with even applications of 20 grams/m^2. All weed growth shall be removed directly prior to applications.

The Contractor shall make periodic checks to ensure no nutrient deficiencies are evident. The contractor shall correct immediately any nutrient deficiencies upon detection at the Contractors expense.

2.10.7.3 Trees and Shrubs - Insect and Disease Control

The Contractor shall maintain all plants free from insect pests and disease by approved methods at the Contractors expense. Where chemicals are required preference will be given to biological control and low toxicity systemic products. Mechanical applicators will be precisely calibrated and care taken when applying to minimize over spray.

Chemicals used in plant maintenance shall be applied in accordance with all Health Department Regulations and relevant approved Safety Data Sheets for each chemical.

2.10.7.4 Shrub Beds - Mulching

The Contractor shall maintain all mulch in all garden beds at all times.

The contractor shall, at the Contractors expense, 'top up' mulch as necessary and as a minimum twice a year to maintain mulch at a minimum depth of 75mm after light tamping down, finishing flush with garden bed kerb top.

All plant stems shall be kept free from mulch.

Mulch shall not be placed within 100mm of all plant stems for less than 13 litre pot sized stock, and shall not be placed within 100-200mm of all plant stems for 13 litre pot size and greater.

Mulch shall be equivalent to that used in the works at construction. Should a change in mulch type be beneficial to plant growth the contractor shall submit a proposal to the Superintendent for approval.

2.10.7.5 Shrubs Beds – Weeds and Refuse

The maintenance Contractor shall maintain all garden beds in a neat and tidy condition, free of all weeds, grasses and other deleterious materials.

All weeds and refuse shall be removed and disposed of off site at an approved disposal tip.

Works shall be completed by hand or mechanically. Chemicals used in weed eradication shall be only by approval of the Superintendent and applied in accordance with all Health Department Regulations and relevant approved Product Data Sheets for each chemical.

2.10.8 Vandalism and Theft

2.10.8.1 General

The Contractor shall take all reasonable steps practicable to minimize the threat and occurrence of vandalism, theft and graffiti to the landscape generally. This shall include but not be limited to maintaining vehicular barriers in good condition, ensuring all limited access areas are secure at all times including irrigation cubicles, removal of unused equipment after hours, not leaving tools or piles of pruned or mowed vegetative material on site over weekends and reporting suspicious activities to the Superintendent or the police as deemed necessary at the time.

Any wilful damage to the landscape shall be reinstated as shown on the plans and as outlined in the contract documents. The maintenance Contractor shall submit a report and quote to rectify the works and await approval of the quotation by the Superintendent prior to commencing work.

Any graffiti to the landscape shall be removed. The maintenance Contractor shall submit a report and quote to clean or rectify the works and await approval of the quotation by the Superintendent prior to commencing work.

All costs associated with remedial works due to vandalism, theft or graffiti removal is the responsibility of the Principal.

2.10.8.2 Residential and Commercial Building Works

The maintenance Contractor shall be required to monitor and report to the Superintendent any disruption, damage, theft or vandalism to the areas under maintenance caused by residential or commercial building works, including works by service authorities.

The maintenance Contractor shall take all reasonable steps to prevent or minimize disturbance or damage to the landscape areas including bringing any problems or potential problems to the attention of the building Contractor and the Superintendent.

Residential building Contractors shall be held responsible for any damage caused by them including spreading of rubbish or building materials on landscaped areas.

2.11 MAINTENANCE COMPLETION - PRINCIPAL HAND OVER

2.11.1 General

Fourteen (14) days prior to the date of Completion of Maintenance, give the Superintendent written notice that the Maintenance Period is due to expire. The contractor shall be responsible for the ongoing maintenance of the works until such time that the notice has been served to the Superintendent.

Directly prior to Principal maintenance completion, Contractor is to ensure the following works are carried out:

- ‘top up’ mulching to all garden beds and tree watering basins to conform with specification,
- rectification of defects, vandalism and theft, and
- all sprinklers and valve boxes sitting proud of native soil levels are reset flush.

At time of maintenance completion grass areas shall have a healthy and vigorous grass sward.

At time of hand over trees and shrubs shall show signs of healthy vigorous growth, be free of all pests and diseases and be appropriately pruned. Trees shall be appropriately staked and have a suitably sized watering basins intact.

At time of maintenance completion all hard works including paving, kerbing and street furniture shall be free of damage, clean, neat and tidy.

At time of maintenance completion all irrigation works shall be fully automated, working efficiently and effectively and programmed to suit the current status of the landscape works. Maintenance personnel to whom the work are to be handed to shall be fully briefed on the operation of all systems to ensure they can operate the systems efficiently and effectively.

2.12 FINAL COMPLETION

2.12.1 General

Fourteen (14) days prior to date of Final Completion, give the Superintendent written notice that final completion is due.