DEVCON GROUP P/L

DPO East Schedule 3 - Lyndhurst Industrial Development Plan Stage 1

Pursuant to Clause 43.04 Schedule 3 of the Greater Dandenong Planning Scheme this is a copy of the Development Plan for part of the land defined as DPO3 on the planning scheme map and particularly as the Eastern Stage of the Precinct Plan shown in Clause 43.04 Schedule 3 of the Greater Dandenong Planning Scheme. This Development Plan has been prepared to the satisfaction of the Responsible Authority. Once the Development Plan has been approved by Council, Council retains the sole right to amend the Development Plan.

Signed _____ 31 August 2012
by Manager Planning and Design
City of Greater Dandenong

August 2012

File: 2638

Contents

1.0 CONTEXT

1.1 Statutory Context

The Local Structure Plan 3, Lyndhurst Industrial Development Plan - Stage 1, has been prepared as a Development Plan under Schedule 3 of Clause 43.04 of the Greater Dandenong Planning Scheme.

The Development Plan is designed to be consistent with other key State and Local policies including:

- The State Planning and Local Policy Frameworks of the Greater Dandenong Planning Scheme;
- The Municipal Strategic Statement;
- Metropolitan Strategy - Melbourne 2030
- Urban Design in Commercial and Industrial Areas Policy (Clause 22.03 of the Greater Dandenong Planning Scheme)
- The South Eastern Growth Area Plan (1990), which is no longer applicable to this site as at the date of the review of this Development Plan.

1.1.1 State Planning and Local Policy Frameworks

The State Planning and Local Policy Frameworks were considered by Council as part of placing Amendment C11 on exhibition and adopted by Council in consideration of the Panel Report to Amendment C11. The necessary changes were made in the approval of Amendment C11. The State Planning Policy Framework (SPPF) was updated in September 2010 as part of VC67 and this section of the revised Development Plan outlines the relevant updated sections of the SPPF of the Greater Dandenong Planning Scheme as outlined below:

Clause 12.01 – Biodiversity

The objectives of this clause include protecting and conserving biodiversity, including native vegetation retention, provision of habitats for native plants and animals and control of pest plants and animals. The plan outlines strategies to achieve this objective including the creation of reserves of identified significant vegetation within the plan area.

In addition, culturally significant trees have been nominated to be retained and appropriate protection measures put in place.

Clause 15.03- Heritage

This clause seeks to conserve and enhance places of Aboriginal heritage significance. Two separate investigations have been carried out into the cultural heritage significance of the Development Plan area. Aboriginal cultural heritage has been identified and measures put in place through the original recommendations and the subsequent Cultural Heritage Management Plan (CHMP), which was approved by Aboriginal Affairs Victoria. Section 7 of this plan discusses this matter further.

Clause 17.02 – Industry

This plan addresses this clause, which builds on the Melbourne 2030 objectives and seeks to ensure the supply of well-located industrial land which has good access for employees and freight movements and that land is suitably buffered from sensitive land uses.

Westernport Highway acts as both a key access point for employees and freight as well as a buffer between the industrial land to the west and the residential land, the bulk of which is located on the eastern side of the highway.

Further, the construction of Lynbrook Railway Station will provide greater public transport options for employees and the Inland Port will provide essential services for freight.

1.1.2 Municipal Strategic Statement and Local Planning Policies

Similarly, the Municipal Strategic Statement recognises the issues that need to be addressed to ensure conformity with the Statement.

Clause 21.04-3 Land Use – Industrial

The objective of this clause is to "*provide development, employment and industrial opportunities, which cater for a broad range of industries.*"

This was taken into account in the preparation of Amendment C11. The created industrial estate will be a key employer and is well located to residential land and public transport.

Clause 22.03 Urban Design in Commercial and Industrial Areas

This clause relates to the design of new industrial subdivisions and was taken into consideration in the preparation of Amendment C11.

This policy requires the following matters to be addressed and the table below outlines how they have been addressed by this Development Plan:

ELEMENT	**RESPONSE AND ITEM OF DEVELOPMENT PLAN IF APPLICABLE**
Estate and road layout	Addressed – Item 3.3
Lot size, shape and orientation	Individual lots to be managed through subdivisions
Interface with other uses	Addressed – Item 8
Engineering services	Addressed – Item 5.0
Built form	Addressed – Item 5.9
Minimum setbacks	Addressed – Item 5.9
Storage areas	Matter for individual development applications
Fencing	Addressed around sensitive vegetation – Item 6.0 & 8.10
Landscaping	Addressed – Item 6.0 & EMP
Buildings at gateways and on main roads	Matter for individual development applications
Built form of buildings along main roads	Matter for individual development applications
Landscaping and frontage setbacks along main roads	Addressed in part – Item 5.9
Buildings and works setback and landscaping design standards	Matter for individual development applications – vegetation under item 4.2

1.1.3 Melbourne 2030

Melbourne's current Metropolitan Strategy - Melbourne 2030, has various elements that are applicable and are set out below:

Policy 4.1 *Maintain access to productive natural resources and an adequate supply of well-located land for energy generation, infrastructure and industry*

This Development Plan will assist in providing supply of adequate industrial land, especially those industries that require larger areas of land.

Initiative 4.1.4 *Increase protection for natural resource-based industries, industrial land and energy infrastructure against competing and incompatible uses*

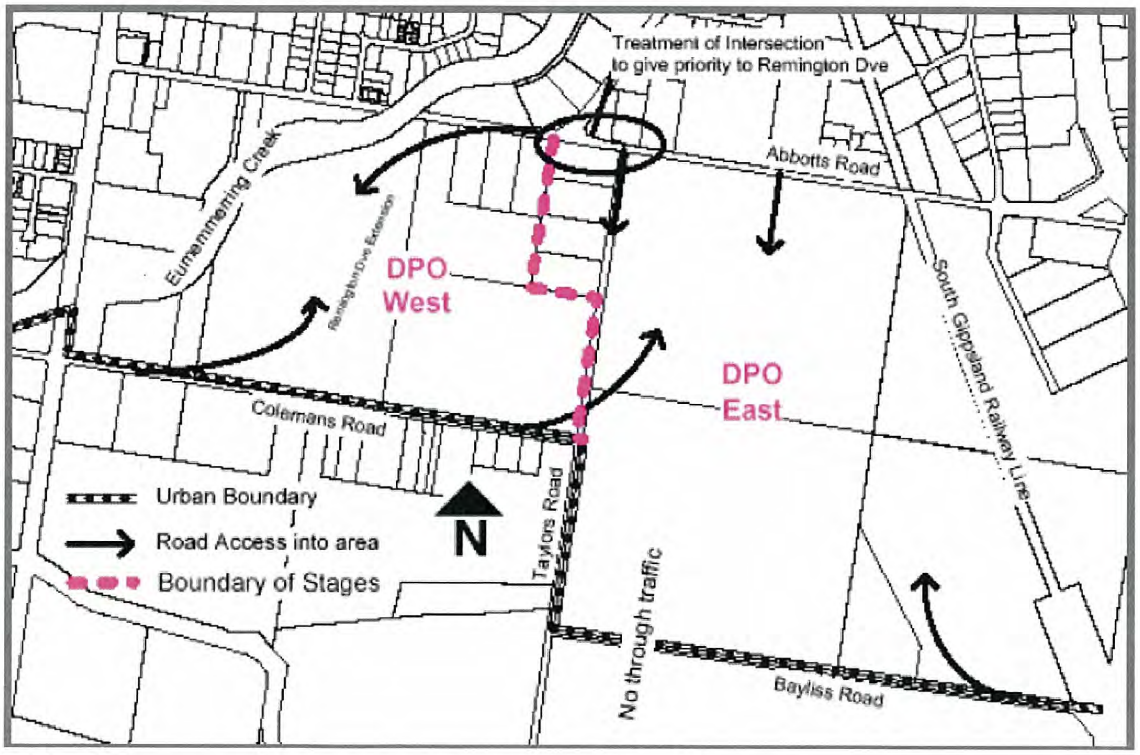
This plan addresses and provides for suitable interfaces between uses and zones.

Initiative 4.1.7 *Ensure an adequate supply for all categories of industrial land and work with the land development sector to address discrepancies in supply and demand*

This plan makes available for immediate development land that is currently in demand.

1.2 Physical Context

Schedule 3 of Clause 43.04 requires that a Development Plan be prepared, and that this plan can be prepared in no more than 2 stages as shown below:



This document is the Development Plan for the area designated as DPO-East in the above figure.

The Lyndhurst Industrial Development Plan - DPO-East, applies to the area shown on the Physical Context Plan, and is generally all of the land bounded by the Dandenong - Cranbourne Railway, Bayliss Road, Taylors Road and Abbotts Road, and also includes the 4 industrially zoned lots on the west side of Taylors Road.

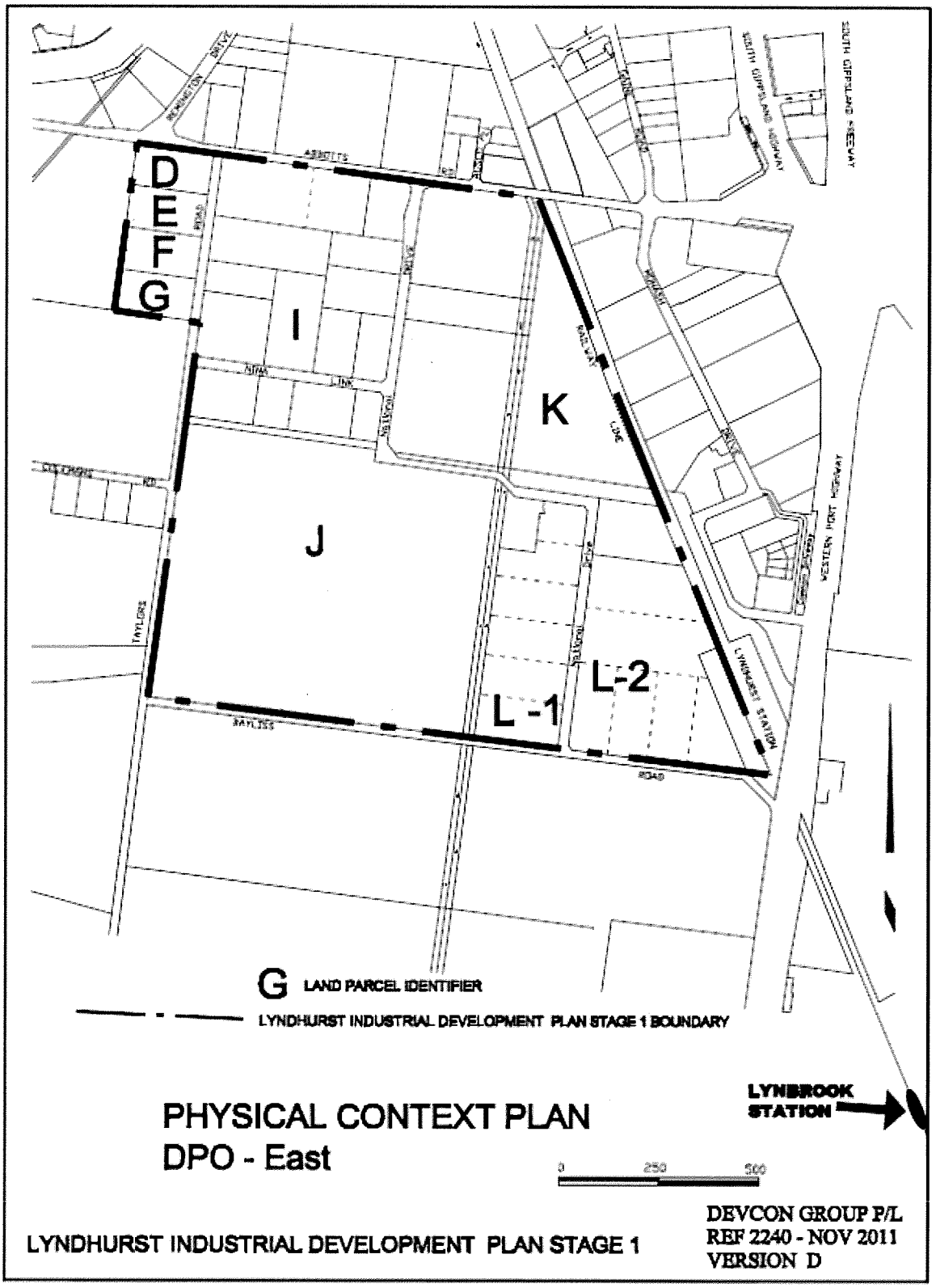
Within the Development Plan, 9 individual Titles comprise the area, and these are designated as parcels D, E, F, G, I, J, K, L-1 & L-2, on the Physical Context Plan. Parcels D, E, F, G, I, L-1 & L-2 are zoned Industrial 1 under the Greater Dandenong Planning Scheme.

Parcels J & K are zoned Farming Zone under the Greater Dandenong Planning Scheme.

Parcel J has Planning Permits and Environment Protection Authority Works

Approvals issued to enable the land to be used for Prescribed Wastes Landfill.

Parcel K encompasses a significant stand of remnant Red gum that has been identified as being worthy of special consideration and retention and already covered by an Environmental Significance Overlay within the Planning Scheme.



2.0 AIM & OBJECTIVES

2.1 Aim

The fundamental aim of this Development Plan is to describe the key elements of a framework plan that must be implemented to enable the orderly and proper development of an industrial area consistent with the objectives and standards of the Greater Dandenong Planning Scheme.

2.2 Objectives

The objectives for the Development Plan are:

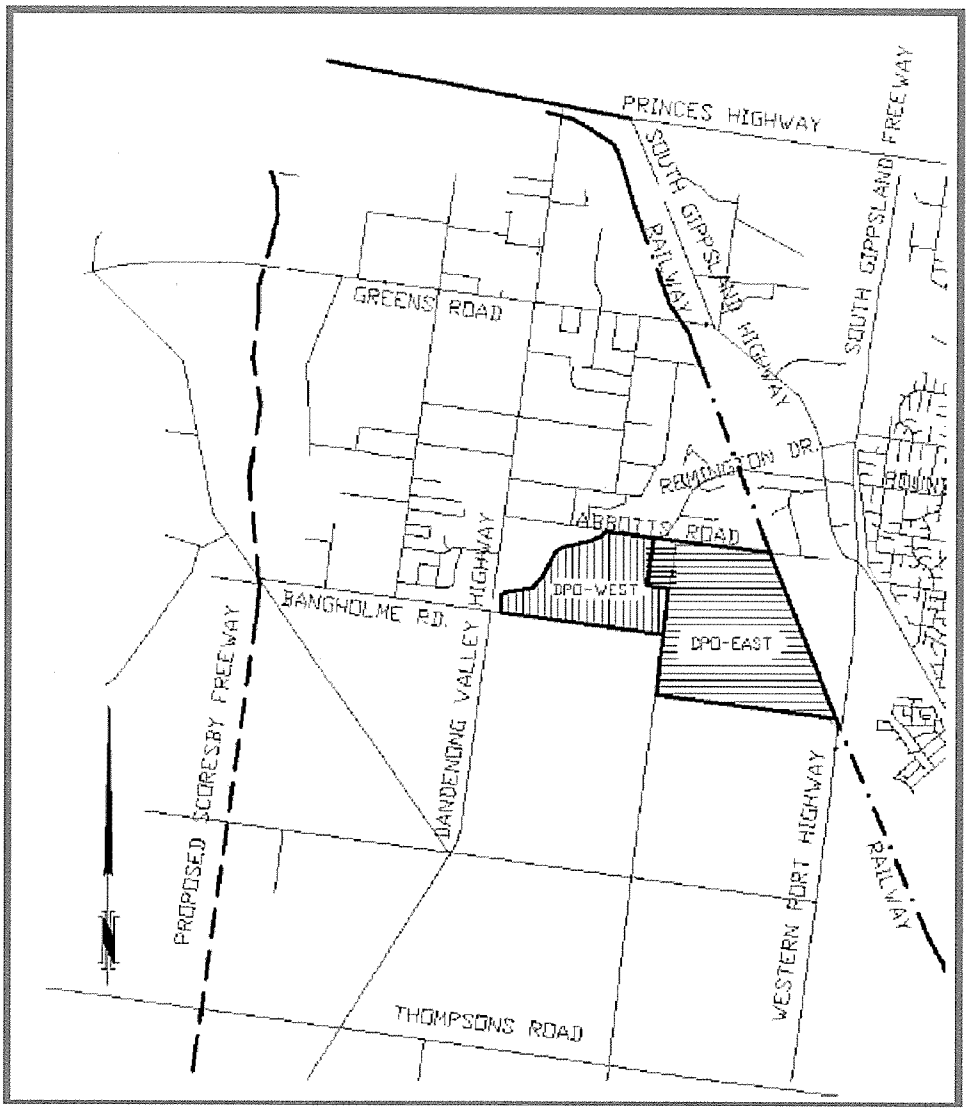
- To provide an integrated plan that takes into account the views of all relevant stakeholders in the community;
- To provide direction to owners / developers on the form of development that can be undertaken that will not compromise the objectives of the development plan;
- To establish the transportation requirements of the area;
- To establish environmental and design parameters applicable for development within the area;
- To establish guidelines that take into account the protection of existing infrastructure and maximises the utilisation of current and future extensions of infrastructure.
- To address the interface needs of uses on adjoining lands, and especially the landfill sites within the area.
- To identify significant environmental features, provide parameters for their removal / retention / protection as appropriate.

3.0 TRANSPORTATION

3.1 Transport Analysis

A key element of the Development Plan is the need for an integrated approach to transport of goods, services, and people by all modes and for all functions.

The whole of the DPO area represents an integral part of the regional road / rail network as indicated on the regional network figure below:



The major arterial road proposed (Pound Road/ Remington Drive/ Bangholme Road link) is wholly contained within DPO West, and thus this Stage 1 DPO- East does not include this as a detailed item.

Various components of transportation are addressed below:

3.2 Rail Network

3.2.1 Rail Freight

Rail Freight transport has traditionally been lacking in the Dandenong area, and whilst not directly within the Development Plan area, immediately adjacent to the southern end of Stage 1 of the plan, is an existing rail freight facility.

This facility is currently utilised by Blue Circle for the distribution of cement based products, which in turn are distributed by road transport to south-east Melbourne and surrounding country areas.

The Development Plan recognises the proposed Inland Port on the south side of Bayliss Rd will utilise the proximity of the site to encourage good rail freight connections.

The Transport Hierarchy section of the Development Plan Section 3.2 deals in more detail with this interface of road / rail transport.

3.2.2 Passenger Rail

Passenger Rail transport for the workforce, at present, is almost non-existent, not only within the Development Plan Area but in the Dandenong South area generally.

The current rail network in the area comprises an electrified single track between Dandenong and Cranbourne, which is on the main metropolitan system.

It appears that the utilisation of this infrastructure is very low, and encouragement of public transport in the area should be further investigated for the wider area as a separate study.

Opportunities for the introduction of new rail passenger interchanges are limited within the Development Plan area due to the location of the freight facility near Bayliss Road, and the environmental significance of Parcel K. However, it should be noted that, subsequent to the initial preparation of this Development Plan, a new railway station, Lynbrook Railway Station, was approved and is under construction at the time of this revision. It is located approximately 1 kilometre from the southern boundary of the Development Plan area.

An opportunity may exist for a transport interchange at the corner of Abbotts Road and the rail line on the northern side, but as this land is outside the Development Plan Area, it is identified as a potential site that Council could consider at a future date. The creation of a new rail passenger interchange should provide for the sufficient land set aside for car parking and bus interchange, which would then allow for the expansion of the public transport network in the whole of the Dandenong South industrial area.

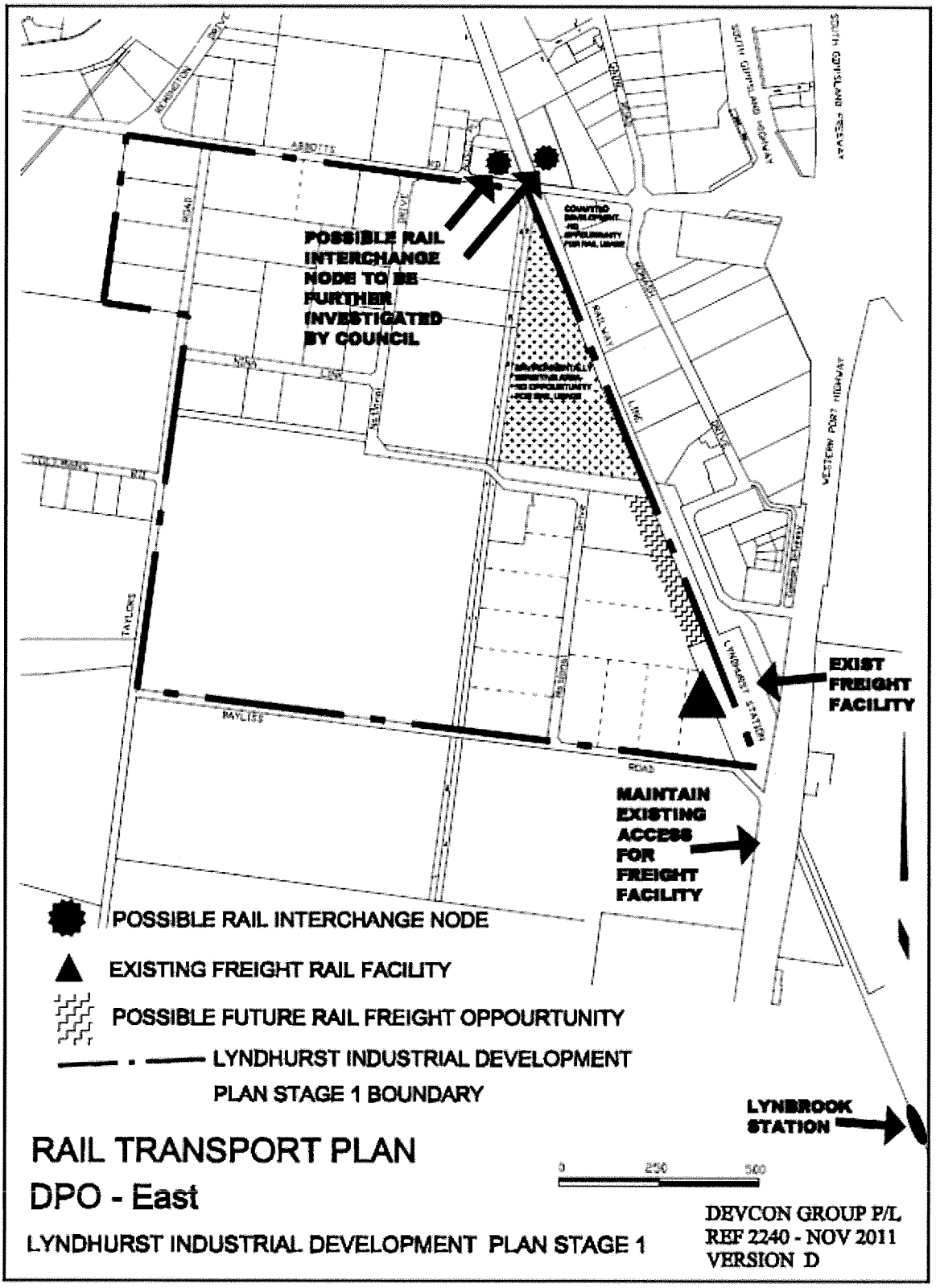
Currently there are 2 vacant allotments that could be suitable for the provision of the interchange, on the north side of Abbotts Road. The allotment on the eastern side has a larger area being nearly 1.5 hectares but a smaller road abuttal, whereas the lot on the western side being 8,500 m^2 in area has the benefit of a longer frontage to Abbotts Road in addition to the Ausco Place abuttal.

As both these sites are privately owned, and outside of the Development Plan area, it is recommended that Council pursue further investigations of these site as potential rail interchange nodes.

Given the significant distance between the new Lynbrook Railway Station and Dandenong Station, approximately 7 kilometres, it is recommended that the above options in relation to a new passenger rail station be explored in order to facilitate greater public transport options for the wider employment and residential areas.

3.2.3 Rail Facilities

The outcomes of rail facilities are set out in the Rail Transport Plan.



3.3 Road Network

3.3.1 Regional Road Network

The Regional Road network within stage 1 of the Development Plan is limited to Abbotts Road, which, whilst not a declared main road, functions in this capacity in the absence of a vital Remington Drive Link between South Gippsland Highway and Frankston Dandenong Road. The majority of this link is within Stage 2 of the Development Plan. Ultimately the Remington Drive link will provide an arterial road function between substantial residential areas within the City of Casey and the proposed Scoresby Freeway, and once completed, will substantially reduce the volume of traffic using Abbotts Road.

Upon completion of the Remington Drive link, Abbotts Road is proposed to be maintained with one lane in each direction as detailed in Traffix Group Pty. Ltd. report attached as Appendix 1.

As part of development on the south side of Abbotts Road, any abutting property shall construct that portion of the road adjacent to the development. Direct access to properties from Abbotts Road shall be kept to a minimum, and where this is permitted shall be subject to a detailed traffic evaluation to ensure appropriate measures are provided to provide minimal impact on the through road function.

3.3.2 Local Road Network

Connection to surrounding roads of Stage 1 of the development plan includes the consideration of Bayliss Road, Taylors Road and Colemans Road, which are a mix of sealed and unsealed roads providing local access and currently a connecting route between Dandenong-Frankston Road (Dandenong Valley Highway) and Dandenong-Hastings Road (Western Port Highway) and vice versa.

Subsequent planning scheme amendments relating to land to the south of the Development Plan area have negated the need for the closure of Bayliss Road adjacent to Parcel J. In addition, the future upgrade of Westernport Highway to a freeway, will result in the closure of the Bayliss Road access point at Westernport Highway. Therefore, it is no longer deemed necessary to propose the closure of Bayliss Road adjacent to Parcel J.

3.3.3 Internal Road Network

The internal road network to service the form of development is not significant in relation to the area of the Stage 1 of the Development Plan as a consequence of the relatively large allotments to be created by the substantial buildings envisaged. Taylors Road, between Abbotts Road and the entry to the landfill operations has been constructed with kerb and channel on the western side and a sealed pavement of approximately 10 m. To enable access to the sites within Stage 1 of the Development Plan, it was required that Taylors Road construction be completed to provide a 12m (back to back of kerb) cross section. A footpath shall be provided on the western side in accordance with the pedestrian network plan and section 3.4.

3.3.4 Internal Road Details

The internal roads only serve a local access function and sufficient width needs to be to be provided to cater for larger vehicles to enter and exit the site. All developments shall be designed in such a manner that all vehicles enter and leave the site in a forward direction, with adequate turning or circulation movements provided within the site.

Parking within roads shall not be permitted except in an emergency, and the outer lanes are provided primarily for turning manoeuvres.

The cross-sectional width of internal roads within Stage 1 of the Development Plan are detailed on the Road Section Plan. The exception to the adopted cross section is where the road abuts the Reserve and the landfill site. As no access is provided to properties, and services can be grouped more closely to the road reserve boundary, a corresponding reduction in the width of the reserve can be utilised.

3.3.5 Bayliss Road

Bayliss Road was originally to have no direct access to properties and accordingly did not require any widening to provide for turning movements, except at any intersection, which was designed to accommodate all forms of truck types including B-Doubles.

To cater for the access traffic a road pavement of two, 3.0m wide traffic lanes with a 1.8m wide bike/ emergency lane has been provided. In keeping with the present rural nature of the land on the south side of Bayliss Road, kerb and channel was originally not to be constructed for the portion of Road that is east/ west. However, since the rezoning of the land on the south side of Bayliss Road, kerb and channel has been constructed along the north side of the road, adjacent to the southern boundary of the Development Plan area. This has been as approved by Council.

Given the rezoning of land to the south of the Development Plan area and its inclusion within the Urban Growth Boundary, together with the approved subdivisional layout of the land either side of National Drive, subdivision and development applications should now consider providing access directly from Bayliss Road.

3.3.6 Additional Roads

Where an application proposes to create an additional road that departs from the Internal Road network plan, the application must be accompanied by a report from a Traffic Engineer confirming that the change does not create unsafe traffic conditions or detrimentally affect the concept of traffic movement or impact on traffic volumes.

3.3.7 Road Safety Audit

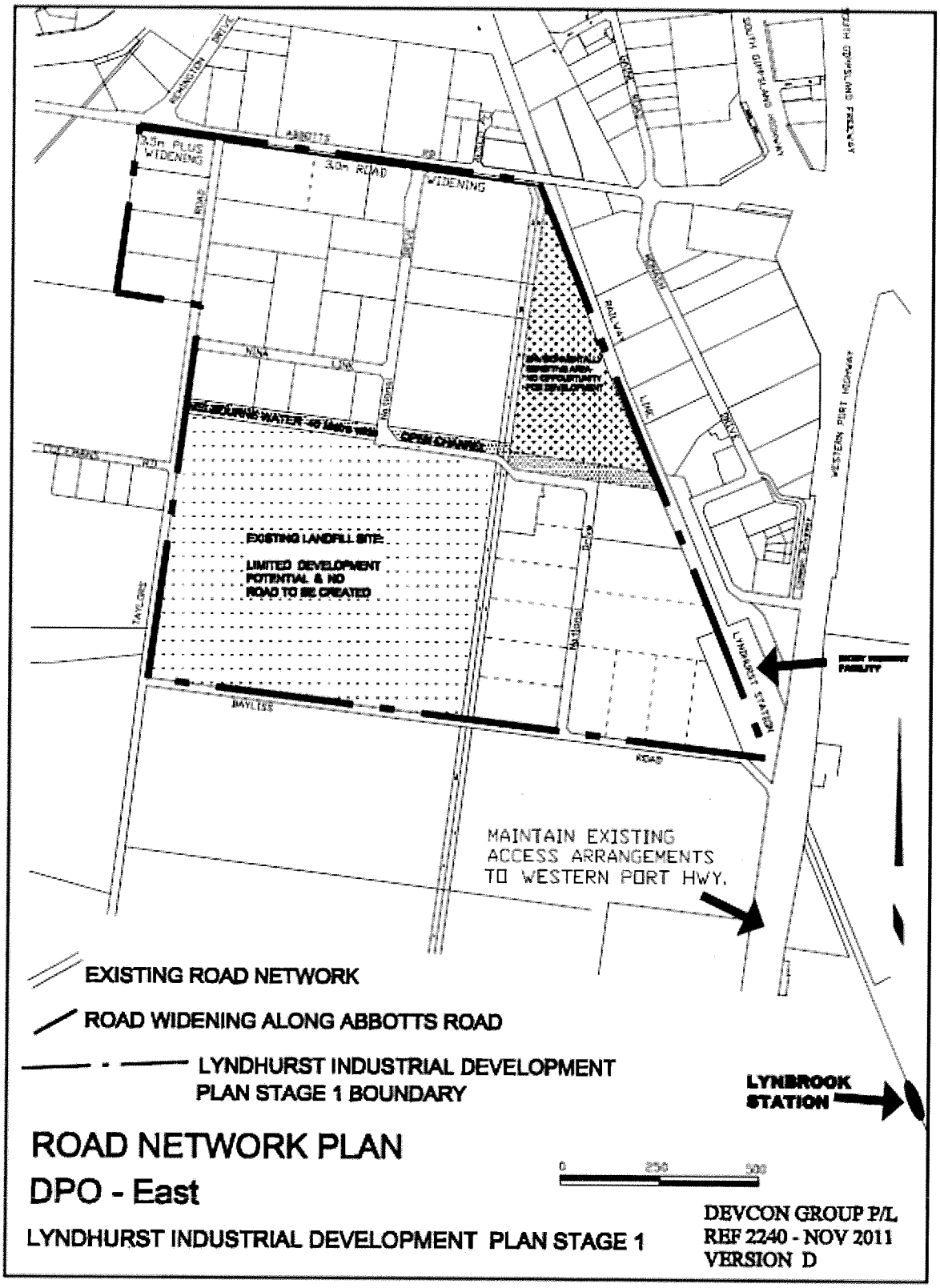
An independent road safety audit shall be undertaken in accordance with the Austroads guidelines, at the appropriate stages:

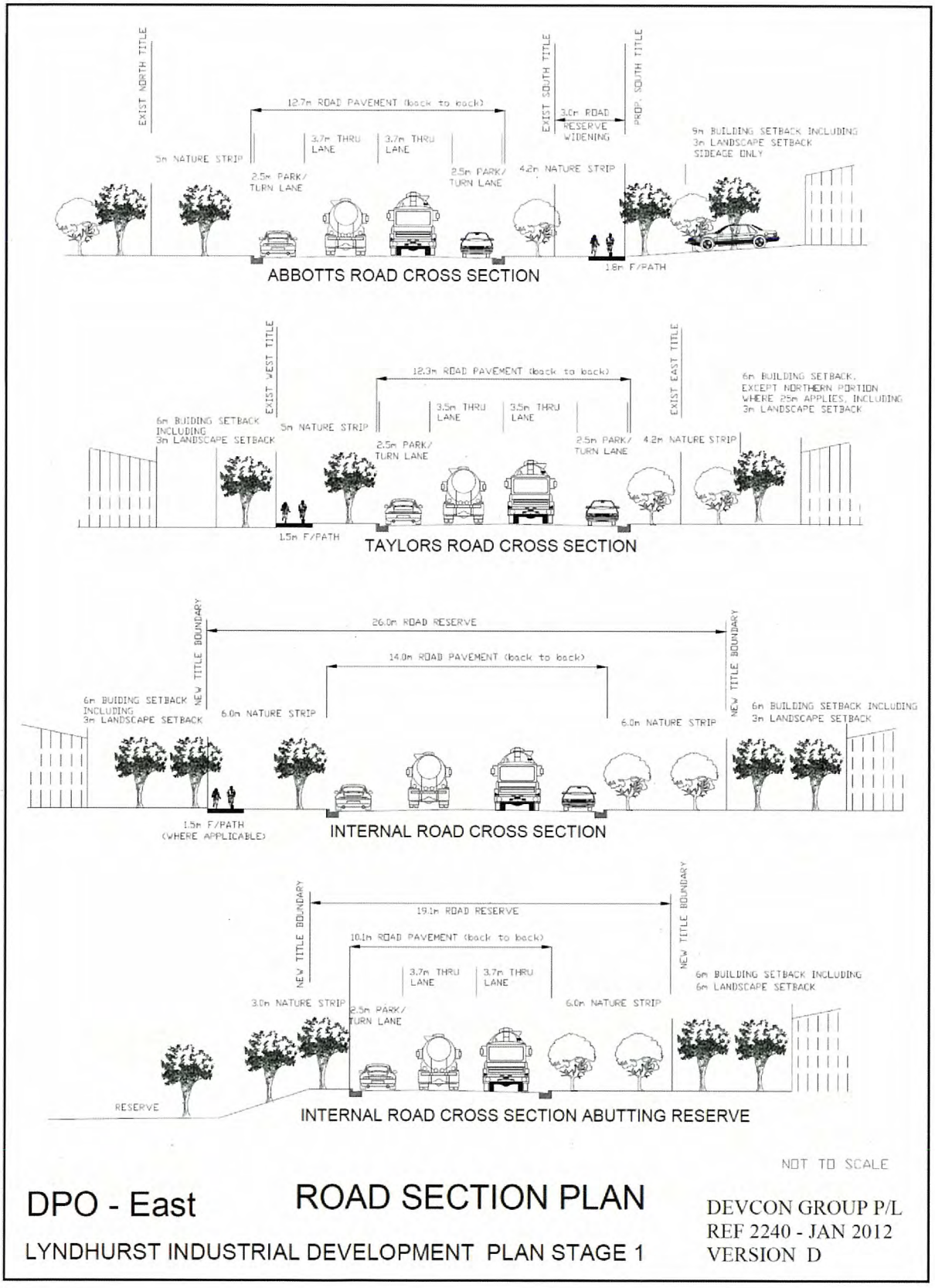
i) concept stage
ii) detailed design stage
iii) post construction stage

and a copy of this audit shall be provided to Council at no cost.

3.3.8 VicRoads Submission

During the exhibition period, a submission was received from VicRoads, and the letter dated 21st November 2002, from Traffix Group responds to the issues raised. A copy of the VicRoads letter and the Traffix Group response is appended to the original Traffix report.





3.4 Pedestrian and Cycle Network

Pedestrian and cycle movements within and around industrial areas have traditionally been given a very low priority. An increasing awareness of these modes of transport is emerging, and due consideration of provision of these facilities should be addressed within the Development Plan. Some of the key points that need to be considered are:

- need to provide in key locations
- likely usage patterns
- cost benefit of providing/ usage/ maintenance
- likely damage and liability issues

3.4.1 Pedestrian and Cycle Movements

In determining the need for pedestrian / cycle paths, the origin and destination of likely users must be considered.

Generally, it is not considered cost effective management of resources to provide every road with a footpath.

For major arterial and distributor roads, consideration should be given to the provision of a shared pathway along one side of the Road. Due to the relatively low usage patterns of pedestrian and cycles, it is considered that shared footway of 2.0 metres in width would be required.

The provision of shared footways on arterial / distributor roads would be likely to be utilised by:

- Employee access to and from work:
  - utilising existing or upgraded public bus transport
  - Cycling from home (or rail connection)
  - walking from home
- Lunch time exercise walking / jogging / cycling
- Access to activity nodes such as "sandwich bar" and passive recreational facilities.

Within the Development Plan Stage 1, only Abbotts Road falls into this Category, and thus it is proposed that a footway, 1.8 metres wide, be constructed between the Railway Line and the projection of Remington Drive.

The Extension of this footway to the west would need to be considered as part of Stage 2 of the Development Plan.

Connection to the east should only be considered by Council if and when a Rail transport interchange node is resolved.

3.4.2 Footways

For internal roads, footways are less likely to be utilised and accordingly, the width of these can be reduced to 1.4 metres in width.

In determining the need for the location of footways, it is considered that connections to the arterial roads be always provided, and continued along that road if the road length exceeds 800m from another arterial / distributor road, and then to only leave a 400m gap between pathways.

If an activity node (eg "lunch bar" / public open space reserve) is provided within the development then footways shall be provided for a 100m radius, and if a remaining gap between any other path is less than 200m, then it shall be extended in that direction to be continuous.

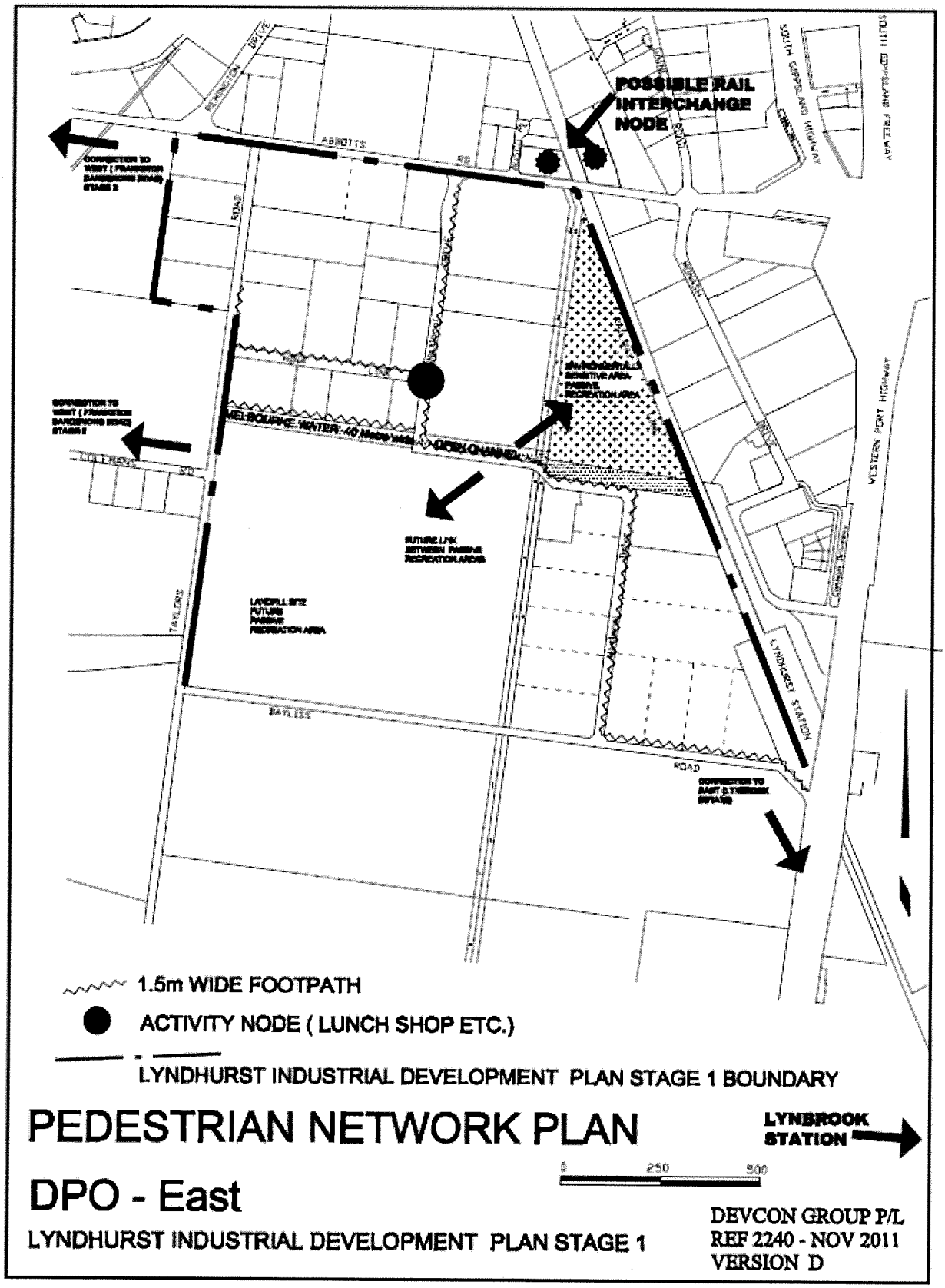
3.4.3 Wider area pedestrian / cycle linkages

Wider area pedestrian / cycle linkages are to be provided where they provide community benefit by way of linking existing / proposed open space networks, activity areas and residential areas.

Within Stage 1 of the Development Plan, Parcel K is identified as being the only item of significance that requires pedestrian connectivity that is not provided with pathways by any other criteria set out above.

3.4.4 Pedestrian Network Plan

The outcomes of the pedestrian network are shown on the Pedestrian Network Plan.



4.0 PHYSICAL CONSIDERATIONS

4.1 Physical Constraints

The extent of Stage 1 of the Development Plan contains a wide and varied number of physical constraints and opportunities, which include:

- Low lying and flat topography which requires filling over the majority of the area.
- Existing vegetation and environmentally sensitive areas.
- Melbourne Water's significant open waterway drainage system.
- The Gas and Oil transmission pipelines.
- The existing landfill.

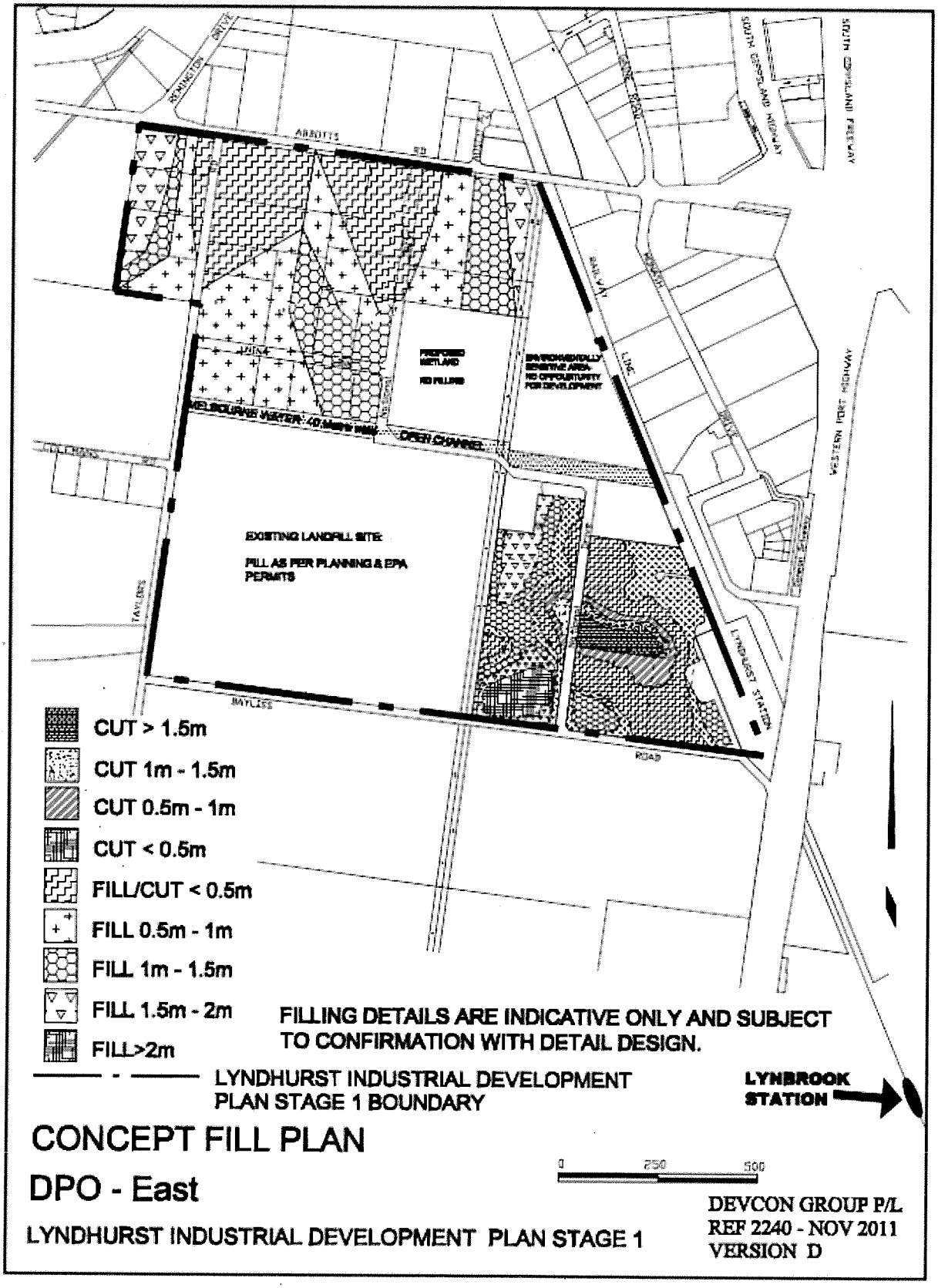
4.1.1 Filling

Typically the area within Stage 1 of the Development Plan is between AHD 12 and 16 m, and, whilst there is no one fixed flood level over the extent of the area, drainage is a major factor in setting final levels of any development. The whole drainage network is controlled by the Melbourne Water open waterway, and, in the drainage design, the hydraulic grade line considerations dictate that filling is required over a substantial portion of the site to provide drainage outlets, as well as flood protection.

Stage 1 of the Development Plan area has largely been filled and/or developed, with only L-1 and L-2 yet to be fully developed. L-1 has only partly been filled, whilst L-2 has now been filled.

It is proposed that the various extents of filling, which are depicted on the filling extent plan, will require further detailed calculations to refine the design and will result in minor variations to this plan. These variations shall be provided as part of any subdivision or development approval, with appropriate referral to Melbourne Water.

The preliminary outcome of these factors is depicted in the Fill Plan below.



4.1.2 Vegetation

The existing vegetation can be basically broken down into five broad categories, as follows:-

- Triangular woodland
- Ephemeral wetlands
- Individual significant trees
- Grouping of significant vegetation
- Lower order vegetation

Further detailed assessments on flora and fauna impacts are contained within Section 6, and also the Biosis report of this document. Individual trees of cultural significance are dealt with separately within Section 7.

The triangular woodland is acknowledged as having no development potential and is worthy of preservation and this site has been included in the Environmental Significance Overlay, Schedule 2 – Abbotts Road Vegetation Protection Area. This site has been created as a reserve and ownership handed over to Council.

In addition to the triangular woodland, the adjacent site to the west has also been created as a reserve and these sites have acted as an offset to any vegetation removal considered elsewhere within Stage 1 of the Development Plan.

The main bodies of the ephemeral wetlands are also to be retained and enhanced.

Individual trees which have been identified as being of significance have been nominated to, where possible, be retained. It is, however, recognised that, where filling is to exceed 0.5 m near the trees, it is not practical to provide free flowing outlets and therefore the likely survival rates of trees with filling in proximity to the trees will cause ground water conditions to be altered.

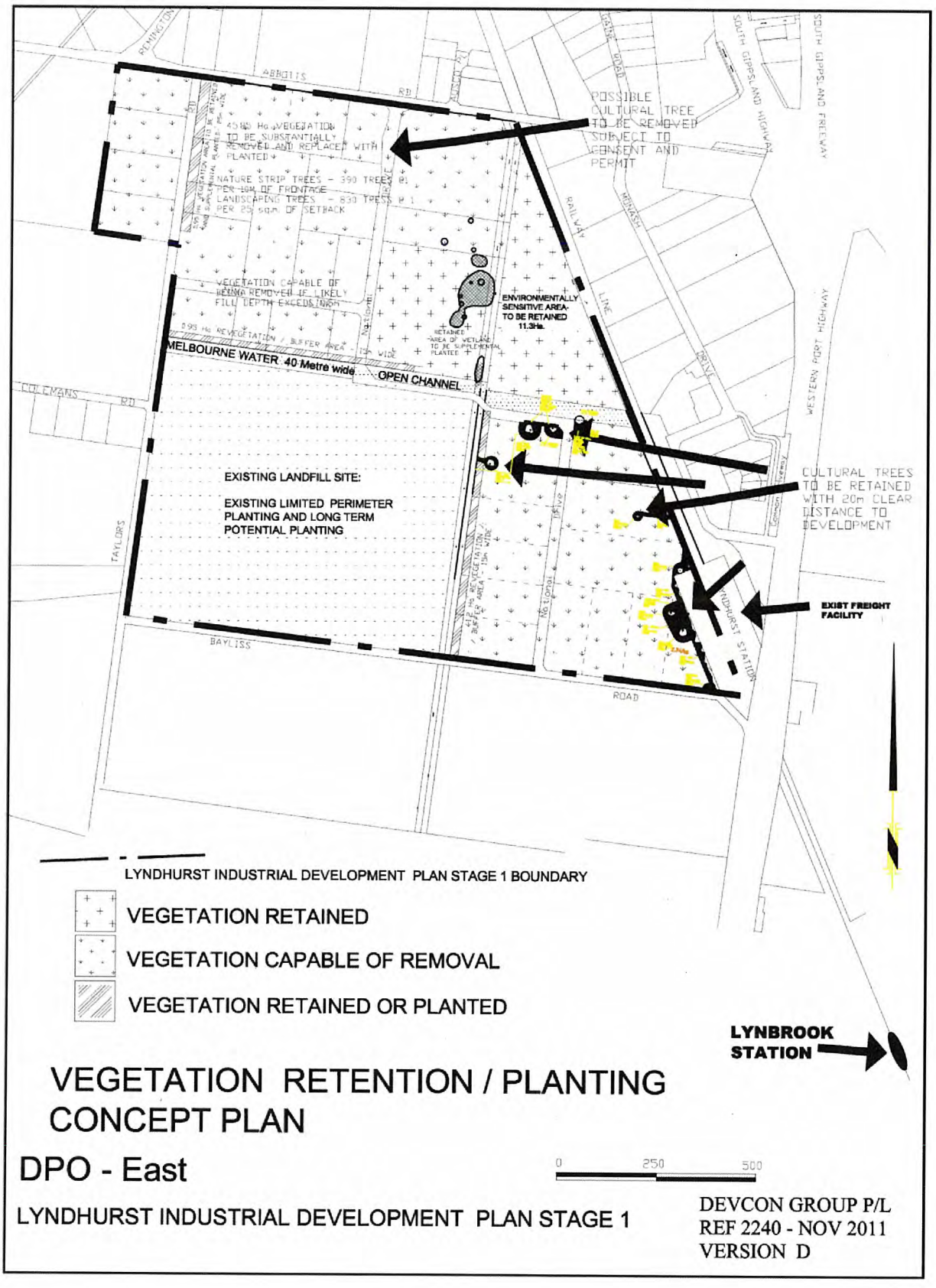
Similarly, groupings of vegetation, where filling or major excavation to provide the appropriate physical services required, is also impractical to maintain certainty of tree survival, and no detailed report is required for these trees to be removed if the services are within 5.0m from the canopy or filling exceeds 0.5m.

The outcomes of specific tree retention are depicted on the Vegetation Retention/Planting Concept Plan.

This Plan also identifies specific areas that must be set aside for tree planting.

These areas are to offset lost vegetation and/or provision of buffering to the landfill site.

The extent of filling shall be shown on all subdivision or development applications, and under no circumstances shall filling within Parcel "K" or the reserve to be created in the South East corner of Parcel "I" be permitted.



4.1.3 Drainage and other Reservations

The area within Stage 1 of the Development Plan is bisected in an east-west direction by an open waterway drainage system contained generally within a 40m (nominal) width Reservation. The cross sectional layout within the Reservation has provision of a maintenance access track and this can also be utilised as a pedestrian/cycle path.

The provision of a 15 m wide buffer strip along the southern boundary of Parcel "I" is to:-

- Create a buffer to the existing landfill.
- Screen the rear of factory development from the walkway/cycle path.
- Provision of planting to partly offset the loss of vegetation elsewhere on the site.
- Allow for the meandering of the footpath/cycle track.

4.2 New Vegetation

All new planting of vegetation within the DPO - East shall be indigenous vegetation and where possible sourced from seeds or cuttings from vegetation either within the area or otherwise sourced locally.

4.2.1 Environmental Management Plan

The areas set aside for retention of vegetation shall be managed in accordance with the approved Environmental Management Plan (Biosis, August 2005) and the Reserve Management Plan (Azbeco 2008).

4.2.2 Landscaping of Road Reserves

Landscaping within Road Reserve nature strips shall be planted with indigenous vegetation at the rate of 1 tree per every 10 metres of nature strip available.

4.2.2 Landscaping of Allotments

Landscaping within allotments is located within substantial areas at the front of buildings and lesser areas of planting along the side and rear boundaries. These areas shall be planted with suitable indigenous plants and trees, taking into account, both the characteristics of the root structure for healthy growth, as well as minimising damage to adjacent paving and building foundations.

The minimum rate of tree planting shall be at a rate of 1 tree per 25m^2 of landscape setback area and supplemented by appropriate indigenous shrubs and grasses.

4.2.3 Approved Landscaping Plans

A landscape plan prepared by a suitably qualified designer, and construction undertaken in accordance with those plans shall be approved by Council prior to completion or occupation of the buildings.

4.2.4 Maintenance

With the substantial planting of indigenous vegetation prior to the buildings occupation, and a suitably worded planning permit condition for the maintenance of these areas in accordance with the approved landscape plans, ongoing maintenance of these areas can be controlled. With the exception of minimal ornamental flowers and shrubs, non-indigenous plants shall not be planted. Parcel J (the landfill site) is exempt from this requirement.

4.2.5 Noxious Weeds

Within the allotment area, it is not considered that noxious and environmental weeds and pest animals will be a consideration that requires major attention, due to the substantially impervious area of the allotments.

The areas not within allotments will be addressed by the EMP required by section 4.2.1.

4.3 Pipeline Easements

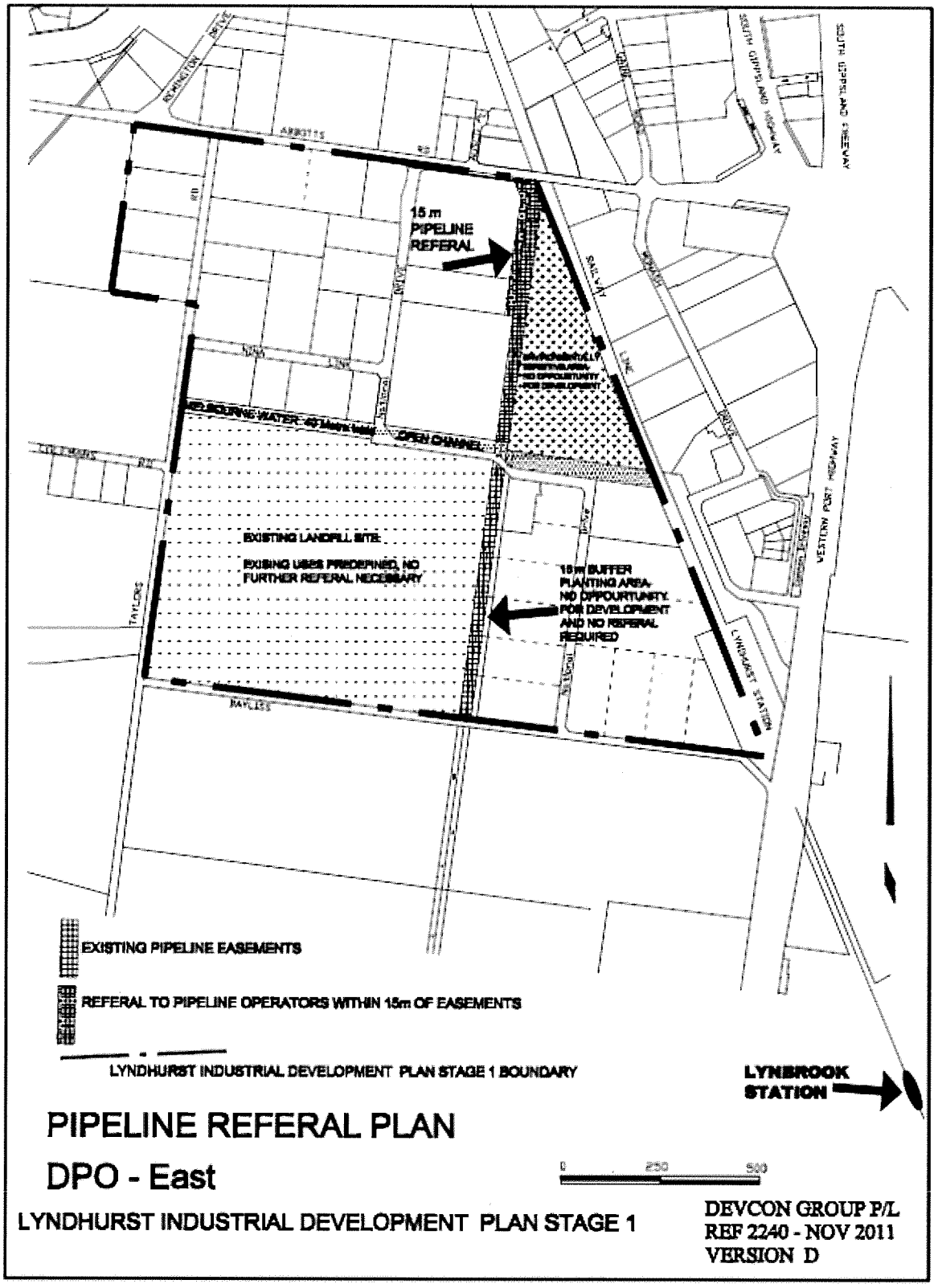
The area within Stage 1 of the Development Plan is bisected in a north-south direction by two 15.24 m wide easements.

These easements contain two gas pipes and an oil pipeline. These pipelines are significant features that need due consideration and any application for development that abuts or is within 15 m of these pipelines needs to be referred to the relevant operators for approval.

The exception to this requirement is the landfill operation, which has already obtained approval for works near the pipelines, and the southern portion, which has a 15m wide plantation reserve.

Where practicable, any buildings within close proximity to the pipelines shall be designed with minimal openings facing the pipelines.

The land capable of development adjacent to the pipeline easements which must be referred to the operators of the various pipelines is shown on the Pipeline Referral Plan.



5.0 SERVICING AND SITE CONSIDERATIONS

5.1 Introduction

With the development of Stage 1 of the Development, usual services are to be provided, typical of those required for industrial uses. These services are different from those required in residential developments, mainly due to the larger capacity required by industry.

Within the industrial uses, varying degrees of service provision is required, and, as uses can change over the life of a building, flexibility needs to be retained to ensure that both current and future uses can be accommodated. The practicalities of being able to provide the highest level of service to all potential uses needs to be evaluated against economic feasibility as compared to probable use.

A detailed report on servicing and engineering requirements is included in the separate report by John Chivers and Associates, dated the 1st August, 2002, and listed below is a summary of the key elements.

5.2 Drainage

Drainage within the area is under the control of Melbourne Water, as a regional drainage authority, with local drainage subject to Council control. Drainage from industrial sites is generally of larger volumes as a consequence of the significantly larger impervious areas. This is reflected in Melbourne Water's area charges, which are typically 50% greater than the equivalent residential contributions.

As part of the Lyndhurst North Drainage Scheme, Melbourne Water are proposing a significant retarding basin/wetland south/west of Taylors and Bayliss Roads. This facility will be the primary treatment of water quality as well as a mechanism for controlling downstream flow. As a consequence of this facility, minimal on-site water quality treatment is required for the development within Stage 1 of the Development Plan.

All internal drainage will comply with the appropriate principles outlined in "Best Practice Environmental Management Guidelines for Urban Stormwater", a joint publication by Melbourne Water, EPA, Department of Natural Resources and Environment, and others. It should be noted that not all of the recommendations are applicable to an industrial development, and furthermore consideration needs to take into account the major Melbourne Water facility downstream. Construction of drainage shall be in accordance with the EPA publication "Construction Techniques for Sediment Pollution Control", and a construction site management plan shall be prepared for each construction activity prior to construction.

Special consideration shall be given in the detailed design to ensure that the drainage regime is sympathetic to the triangular woodland and ephemeral wetland reserve being flooded on a regular but infrequent basis. Drainage from the rear of the developments abutting Parcel K shall be provided with "sheet flow" drainage of the rear paved areas directed towards Parcel K, with particular emphasis to minimise the level of concentration and velocity of the discharge by way of rock spillage walls.

Drainage of the four lots on the west side of Taylors Road should accord with the approved Melbourne Water drainage scheme for the area.

5.3 Sewerage

Sewerage facilities for the area come under the control of South East Water and advice has been received that, subject to the usual financial and other requirements, full facilities can be provided. It is therefore a requirement that any proposed works or subdivision obtain approval from South East Water, and enter into the usual arrangements with South East Water to provide sewerage facilities to each development or lot created.

A more detailed report on sewerage provision is provided within the John Chivers and Associates report.

5.4 Water

Water supply to industrial premises serves the following broad functions:-

- Fire fighting capacity, which can range from hydrants within the road to a full sprinkler system within the building.
- A component of a manufacturing process.
- Potable uses, which, in the industrial case, is very minimal.
- Non-potable uses (eg toilet flushing), which, again, in an industrial case is very minimal.
- Garden/landscape irrigation systems, which again, in an industrial case, relate to a very small amount due to the large paved/roof areas.

The re-use opportunities of water are very limited due to the low volumes utilised, and any economic or environmental benefits are far outweighed by the implications of creating these re-use facilities.

South East Water is the controlling authority for the provision of water supply in this area, and they have indicated, in writing, that suitable facilities can be provided.

It is therefore a requirement of the Development Plan that any proposed works or subdivision be provided with adequate water supply in accordance with the usual requirements of South East Water prior to each development or lot created.

5.5 Electricity

Electricity consumption within industrial areas varies significantly as a result of:-

- The size of the building.
- The use of the building.
- The manufacturing processes (if any) within the building.
- The level of provision of public and security lighting.

Due to the variability of the above factors, and the possibility of changes during the life of the building, the supply by way of a grid system is the only viable option.

Public lighting within industrial areas is generally at a lower level of provision, and the benefits of providing altemative sources of supply are not viable taking into account the environmental costs of providing any alternative.

United Energy is the responsible authority for electricity supply for this area.

Existing high and low voltage grid systems currently exist in Abbotts Road, Taylors Road, and Bayliss Road.

With the exception of parcel "J", provision of electricity to developments that abut these roads can be provided from the existing grid system by means of underground conduiting and cabling.

For provision of electricity within any new road, consideration of likely uses, suggests that likely requirements can be determined relatively close to the existing overhead system. Accordingly, it is possible to quantify the likely cable and conduiting requirements to provide underground supply to any development on the new road network.

Thus it is a requirement of the Development Plan that any developments abutting existing roads that have overhead supply obtain that connection by way of underground means, and that all new roads be provided with underground supply.

It is a further requirement that all new intersections be provided with a safe lighting standard and all new roads be provided with the City of Greater Dandenong's requirements for public lighting.

5.6 Telecommunications

Telecommunications is becoming a more vital component of any industry, and is a service that should be provided with any development.

Telstra is the main provider of telecommunications infrastructure, and have significant assets in the area.

It is a requirement of the Development Plan that telecommunication infrastructure be provided on an underground basis for any development.

5.7 Gas

Gas utilisation by industry is not a common occurrence, unless manufacturing processes dictate that the economics of using this energy source are warranted.

Accordingly, it is only when a particular development justifies the need for gas supply that this should be further investigated.

Currently gas mains exist within Abbotts Road that can be reticulated to any site within Stage 1 of the Development Plan should demand be justified.

5.8 Services Timing

Services are to be provided to suit the demands of the proposed buildings.

5.9 Building Form

Buildings within industrial areas of this nature are generally of the larger proportions and can vary significantly in nature of use from transport/ distribution facilities to manufacturing. Due to the diversity of the buildings, size, proportions, orientation etc., the ultimate form of the building is in most cases dictated by the needs and requirements of the end user of the building.

Energy efficiency of industrial buildings is of lesser significance due to factors other than northerly orientation of building windows. Typically, all office areas are fully air conditioned, and the ratio of "habitable" (or mostly day time usage) is much larger than in the residential context. Office location and internal layout is often controlled by the interaction of the main building.

Openings to the buildings are normally substantial to provide access to large vehicles for loading / unloading of products or materials. The orientation of these openings are to be located to reduce the impacts of prevailing weather.

With the prevailing weather coming generally from the South West, openings, as far as practicable shall be located on the eastern and northern sides of a building. Where this is not practicable, openings on the southern and western faces shall be provided with appropriate canopies.

Building setbacks are to accord with the following table:

	Abbotts Rd and Bayliss Rd	**Taylors Rd**	**National Drive, Nina Link**	**Sideage to Abbotts Rd**	**Sideage to Taylors and Bayliss Rds, National Drive and Nina Link**
Building Setback (minimum)	9m with a minimum of 3m landscape strip between property boundary and any car parking	6m with a minimum of 3m landscape strip between the property boundary and any car parking, except northern portion where 25m applies	6m with a minimum of 3m landscape strip between the property boundary and any car parking	A 5m building setback which is to be landscaped	A 3m building setback which is to be landscaped

5.10 Land Degradation

Land degradation is managed in industrial areas by the use of impervious surfacing such as: large roofs, paved areas etc. These large areas of impervious surfaces, also prevent the evaporation of moisture from the soil, and allows for (after an initial settling down period) a stable water table with little vertical movement.

Similarly, with the large paved areas, the opportunity for erosion, either wind or water generated, is also negligible.

6.0 FLORA AND FAUNA

6.1 Introduction

A detailed assessment has been undertaken by Biosis Research and forms part of this Plan.

The final outcomes of this assessment have identified various significant elements that need to be considered along with the need for the provision of industrial land for the development of the area and the community at large.

The balance between the need for industrial land and recognition of the conservation values needs to be carefully evaluated and a compromise of the competing interests found.

6.2 Site Environmental Management Plan (EMP)

An Environmental Management Plan has been prepared by Biosis Research Pty Ltd (August 2005) for the whole of the subject land and has been included in Appendix A7 of this plan.

The EMP was prepared in accordance with the following format:

i) a statement on the environmental policies and purpose of the EMP
ii) a component to identify the environmental issues and the goals and objectives of the EMP
iii) management and operation action plans and procedures
iv) a regular monitoring and review program

The Reserve Management Plan was prepared by Azbeco Pty Ltd (November 2008) and has been included in Appendix A8 of this plan.

6.3 Comprehensive Net Gain Assessment

Prior to the development and subdivision of the lots west of National Drive, a comprehensive Net Gain assessment was undertaken by Azbeco Pty Ltd to identify how the proposed development could preserve any vegetation, and if, where vegetation could not be preserved, what on- and off-site actions will be undertaken to meet the State Government's Net Gain policy. The assessment took account of:

- The proposed development
- The need for filling and the impact of this filling
- The ability to provide free drainage outlet
- The ability to construct the local drainage network without compromising engineering standards
- The Net Gain policy under the State Biodiversity Strategy.
- The level of habitat restoration and implementation of the Reserve Management Plan

Any development must be in accordance with the approved Net Gain Assessment/Reserve Management Plan included in Appendix A8 of this plan.

Enhancements to planting areas are proposed along the Melbourne Water open waterway and the gas easements south of the Melbourne Water waterway to Bayliss Road. These additional planting reservations will also perform a pedestrian link function and thus will also satisfy any public open space requirements pursuant to the Subdivisions Act for the land on the east side of Taylors Road.

6.4 Reserve Area and Taylors Road Woodland

The triangular woodland area and the area of wetland and grassy woodland south of Lots 1 and 2 and east of National Drive have been recognised worthy of retention and have been transferred to the City of Greater Dandenong. The details of the environmental enhancement are detailed in the approved Reserve Management Plan (RMP), which is attached to this document and is part of the comprehensive net gain assessment prepared for the whole of the site.

A strip of land 25 m wide along the east side of Taylors Road from Abbotts Road to the proposed internal road will be reserved to maintain the area of healthy woodland present within it. Filling along this strip should not be undertaken. The details of the environmental enhancement for this area are also addressed in the RMP.

6.5 Balance of the Land

Lots 1 and 2 were developed shortly after the approval of the Development Plan. The following flora and fauna management actions for these lots were implemented as a matter of urgency:

6.1 Clarification of taxonomic status of the eucalypts

6.2 Assessment of the need to propagate or translocate any plant material, including eucalypts, into the reserve area

6.3 Implementation of any recommended propagation or translocation program.

As identified in Section 4, filling of considerable depth is required to attain the drainage functions and flood protection, and any trees that are in areas with filling exceeding 0.5 metres are unlikely to survive. For the four lots on the western side of Taylors Road, substantial filling is required to fulfill a drainage function and flood protection level control. This filling, depicted on the Concept Fill Plan (Section 4) shows that the rear half of these sites requires filling in excess of 1.0 metre, and thus for these to be utilised for industrial purposes basically precludes any tree retention except at the very front of these allotments.

6.6 Section 173 Agreement

A requirement of the originally approved Development Plan stated that a Section 173 agreement shall be entered into by the owners to implement the outcomes of the management plan within three years and transfer ownership parcel K, the identified environmentally sensitive areas and wetland component Parcel I, to the City of Greater Dandenong prior to any subdivision or development planning approval. This agreement was entered into and the terms of the agreement completed.

7.0 CULTURAL ASSESSMENT AND MANAGEMENT

7.1 Archaeological Assessment

A voluntary archaeological assessment of the DPO - East area was undertaken by TerraCulture Pty. Ltd., and specific cultural heritage management recommendations were included as requirements of this Development Plan. The approved recommendations covered development within the Development Plan area, however, it should be noted that a subsequent Cultural Heritage Management Plan has been approved for development of land at 97-155 Bayliss Road, Dandenong South, in accordance with the requirements of the *Aboriginal Heritage Act, 2006*, which was gazetted subsequent to the original approval of this Development Plan. This CHMP has superceded the requirements of the TerraCulture report for this land.

All future development of land at 97-115 Bayliss Road, Dandenong South should be consistent with the requirements of the approved Cultural Heritage Management Plan (CHMP 10333) and where required, the recommendations of the archaeological assessment as approved under the

Development Plan. As the archaeological assessment prepared by TerraCulture Pty Ltd was not prepared due to a statutory requirement, where conflicting, the approved CHMP (10333) takes precedence.

It should be noted that all development prior to the CHMP being in place, was conducted in accordance with the TerraCulture Pty Ltd recommendations including tree protection zones on subdivision plans for all identified scar trees.

Due to the sensitive nature of details contained within these reports, permission must first be sought from the relevant authorities/communities before releasing the contents of these reports to the general public.

7.2 Cultural Heritage Management Plan

As outlined above, a Cultural Heritage Management Plan (CHMP 10333), was developed as required under the *Aboriginal Heritage Act, 2006*. This legislation was introduced subsequent to the original Development Plan approval.

The CHMP was developed by Tardis Enterprises Pty Ltd and was approved by Aboriginal Affairs Victoria on 9 December 2008. The assessment resulted in a number of recommendations for protection of cultural heritage including contingency plans. These recommendations must be followed when cultural heritage is located on or affected by development on land within the Development Plan area. Due to the sensitive nature of the contents of the CHMP, permission should first be obtained from the relevant authorities / communities before releasing contents of this report to the general public.

8.0 INTERFACES WITH ADJOINING ZONES/USES

8.1 Southern Boundary

On 26 March 2009, land to the south of the Development Plan area was rezoned from Farming Zone to Industrial 1 Zone and included within the Urban Growth Boundary as part of Amendment C87 to the Greater Dandenong Planning Scheme. The purpose of the rezoning was in part to increase the supply of industrially zoned land in this region. Land on the south side of Bayliss Road is proposed to be developed as an inland port utilising the nearby railway and road networks to shuttle goods around Melbourne.

8.2 Eastern Boundary

The eastern boundary to Stage 1 is the Railway line, and further to the east, the existing and developing M1 Industrial Estate. No special interface treatment is necessary as the uses are similar and compatible.

8.3 Northern Boundary

The northern boundary of Stage 1 is Abbotts Road, and again, the properties to the north are industrially zoned and utilised. Again, no special interface treatment is necessary.

8.4 Western Boundary

The western boundary of Stage 1 abuts the Cleland's development or the sand extraction facility on the comer of Taylors Road and Colemans Road.

Both of these facilities do not require any special interface treatments.

8.5 SITA Landfill

Within Stage 1, the existing landfill operates under Council's Planning Permits and EPA licences that require various controls to be adhered to as part of the operation of the site as a landfill.

The purpose of the Development Plan is not to alter these requirements.

8.6 Landfill Interface

Similarly, whilst no special controls are proposed on adjoining industrial land but it is recognised that certain industries are not compatible with a landfill adjoining (eg. Food processing).

Industries that require special consideration are those that cannot tolerate the potential adverse market perceptions of locating close to an active landfill or the potential occasional emission of:-

- Dust
- Noise
- Odour
- Potential pathogen spread and these should not be encouraged adjacent to or near the boundaries of the landfill site.

8.7 Sewer

As part of the operation of the landfill and long-term closure maintenance, a secure discharge to sewer is a requirement that needs to be provided, and this will be provided with the development of Parcels "L" or the rear stage of Parcel "I".

8.8 Interface with Vegetation Reserve

The treatment of the environmentally significant vegetation areas, being Parcel "K" and the South East portion of Parcel "I", required consideration of the interface between the adjoining developments during both the construction phase and long term uses.

For the adjoining developments to these areas, the boundary was fenced with safety mesh or a post and wire fence with a suitable flagging tape attached to the top wire prior to construction or filling works commencing. This fencing has been maintained in a proper manner during the course of any works.

Upon completion of the development the site boundaries were required to be fenced with a black coated chain wire mesh fence at least 2100 mm in height, with no openings permitted.

8.9 Drainage

In order to maintain the hydrology of parcel "K", the rear paved areas of the northern portion of Parcel "I", shall be directed by sheet flow towards the woodland area. No concentration of flows shall be permitted by way of kerbing or piping, but rather the paving area shall be sloped towards the treed area.

No roof water shall be permitted to discharge by this method.

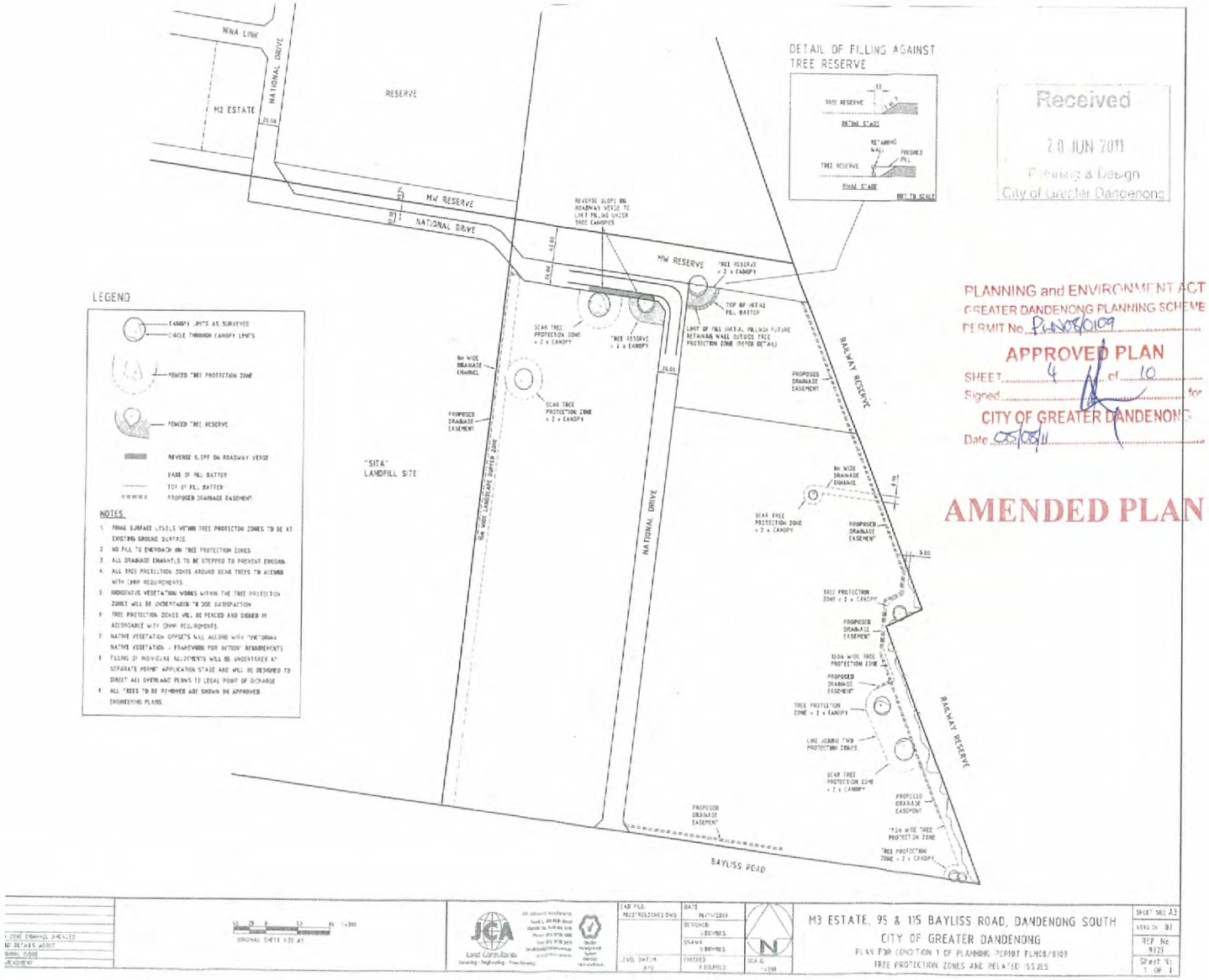
8.10 Tree Protection

Tree protection measures have been outlined in the approved EMP which is included in Appendix A7 of this plan. These measures include the following:

- Fencing and Access Control
- Refuse
- Drainage and Erosion Management
- Appropriate Species for Planting Near Reserves

- Design requirements for Construction Adjacent to the Reserve Areas
- Habitat restoration

It should be noted that the Nature Reserve in Parcels K & I have been transferred into Council ownership. The tree reserve along the east side of Taylors Road and the trees outlined in the endorsed plan to PLN08/0109 (see below) are the remaining trees which may be affected by any future development. Tree protection measures have been put in place for these trees.



9.0 FINANCIAL CONSIDERATIONS AND STAGING

9.1 Provision of Items

Most of the items within Stage 1 of the Development Plan will be provided by the development that creates the need for any specific item.

Listed below are key elements of infrastructure that need to be provided and the responsibility of who is to provide these.

ELEMENT	PROVIDER	TIMING
1. Completion of Construction of Abbotts Rd (over and above those planned by Council).	Abutting developer of Parcel I	Upon development of abutting land in stages
2. Construction of footpath/cycle path along Abbotts Rd	Abutting developer of Parcel I	Upon development of abutting land in stages
3. Construction of footpath along Taylors Rd	Abutting owners on West side	Upon development of abutting land
4. Completion of Taylors Rd construction	Abutting owner on East side	Upon development of abutting land in stages
5. Construction of Bayliss Rd	Abutting owner of Parcel L1 & L2	Upon development of abutting land in stages
6. Closure of Bayliss Road	Abutting owner of Parcel L1 & L2	No longer applicable (see 9.3)
7. New traffic signals on Abbotts Rd midway Parcel "I"	Owner of Parcel "I"	Has been completed
8. Management Plan and implementation on Parcel "K" (triangular woodland) and Wetland Reserve	Parcel "I" and Parcel "K" owner	Has been completed
9. Design and construction of local drainage of four lots on West side of Taylors Rd	Parcels "D", "E", "F", and "G" owners	Has been completed
10. Provision of internal roads	Parcel owners	Development as required in stages
11. Provision of infrastructure services	Parcel owner	Upon development as required

9.2 Timing of Development

Timing of development within the Development Plan East is largely possible independently of any other development. The exception to this is the development of Parcels "L-1" and "L-2", which are dependent on the provision of services from the development of Parcel "I" and cannot be developed until services are provided.

9.3 Bayliss Rd Closure

The timing of the mooted closure of Bayliss Road was dependent on an alternative internal link being provided from Bayliss Road to Abbotts Road. This link has been provided in the form of National Drive, however, since the original development plan was approved, land to the south of Bayliss Road has been rezoned and included within the Urban Growth Boundary. With the rezoning of the land on the southern side of Bayliss Road together with the future plans to close Bayliss Road at Westernport Highway, it is no longer considered necessary to close Bayliss Road at the point originally outlined in this plan. In addition, to respond to these altered circumstances, it is now considered appropriate to allow for the considerations at planning permit phase that the proposed lots that have a direct frontage to Bayliss Road can gain direct access, together with landscape setbacks which are detailed in section 5.9 of this development plan.

APPENDIX A1 – TRAFFIC ENGINEERING ASSESSMENT

Traffic Engineering Assessment

for the

Proposed Industrial Subdivision in Lyndhurst

Planning Scheme Amendment C11 (Stage 1)

Prepared for Devcon Group Pty Ltd

July, 2002
5106R0096

Traffic Engineering Assessment

for the

Proposed Industrial Subdivision in Lyndhurst

Planning Scheme Amendment C11 (Stage 1)

Study Team: Henry H Turnbull
B.E.(Civil), M.I.E. Aust., M.I.T.E., F.V.P.E.L.A., CPEng.
Nathan Woolcock
B.E. (Civil), M.I.E. Aust.

Our Reference: 5106R0096

Prepared By

Released By

1. INTRODUCTION

Traffix Group Pty Ltd has been engaged by Devcon Group Pty Ltd to undertake a traffic engineering assessment for Stage 1 of the Greater Dandenong Planning Scheme Amendment C11.

In particular, this report provides an assessment of the traffic engineering related issues associated with Stage 1 as set out at Schedule 3 to the Development Plan Overlay (copy attached at Appendix A).

2. SUBJECT SITE

The site is bounded by Bayliss Road to the south, Taylors Road to the west, Abbotts Road to the north and the Cranbourne Railway Line to the east, and includes four lots located on the south west corner of the Taylors Road/Abbotts Road intersection.

The site is shown in the locality plan at Figure 1 below.

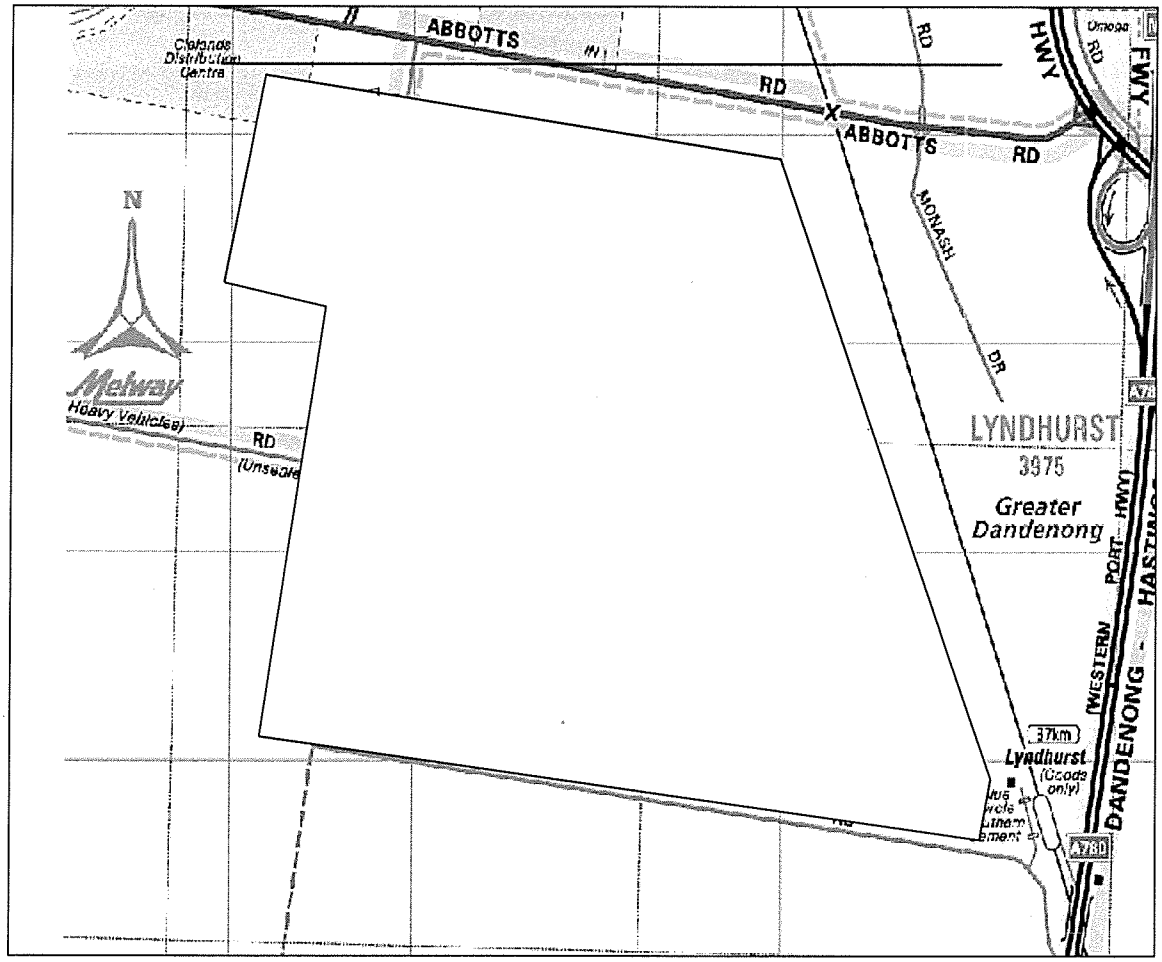


Figure 1: Locality Plan

Abbotts Road runs east-west between Frankston-Dandenong Road and South Gippsland Highway and carries in excess of 10,000 vehicles per day. Not only does it provide a connection between these north-south arterial roads, but it serves as a local access road to the industrial area which surrounds the subject site.

It has one traffic lane in each direction and is now signalised at both South Gippsland Highway and Frankston-Dandenong Road. Signals are also located on Abbotts Road at the entrance to the Clelands Distribution Centre and we understand that signals are to be installed at Monash Drive in the near future.

Bayliss and Taylors Roads generally provide local access to nearby properties.

A plan showing the proposed internal road network for Stage 1 of the Development Plan is attached at Appendix B. Access to the site is proposed via intersections at Bayliss, Taylors and Abbotts Roads. Potential internal access to the north side of the existing landfill site which is located on the south west corner of the subject site will also be provided.

3. TRAFFIC ISSUES

3.1. INTERNAL ROAD NETWORK

The internal roads that are proposed within the subject site are to have 14 metre carriageways within 26 metre road reserves. This exceeds Council's requirements of 12 metre carriageways within 22 metre road reserves and we are satisfied that they will be more than sufficient.

The proposed road layout ensures that satisfactory access is available to all of the tenancies that will ultimately be located within the site (which we understand have roof lines between 1.5 and 4 hectares in size) and good pedestrian access will be provided by the proposed footpaths (both internally and along the site's Abbotts Road frontage).

3.2. EXTERNAL ROAD NETWORK

Remington Drive/Colemans Road Link

The Development Plan requires an arterial link to be provided between Remington Drive and Colemans Road as part of the ultimate link between South Gippsland Highway and Scoresby Freeway.

While this is not required as part of the Stage 1 work, it is important to note that this link will significantly reduce the amount of traffic that would otherwise be required to use the majority of Abbotts Road (including the section along the site's northern boundary).

We are therefore satisfied that existing cross-section of Abbotts Road (ie. one lane in each direction) along the site's boundary (east of Remington Drive) will sufficiently cater for the likely traffic demands once this alternative arterial link is provided.

Dandenong-Frankston Road/Westernport Highway Route

The Development Plan requires an *appropriate road alignment to prevent the use of Colemans, Taylors or Bayliss Roads as through routes from Dandenong Frankston Road to the Westernport Highway or vice versa.*

While the location of the internal road alignment of Stage 1 discourages any traffic from the site using these roads as a through route, we appreciate that this route is currently used as a connection between the two arterials.

It is our opinion that Bayliss Road should be closed in order to eliminate the use of these local roads as a through route. We believe that it would be appropriate to close Bayliss Road immediately to the west of the internal access road which is proposed towards the south east side of the site. While this would prevent access to the existing entrance to the landfill site on Bayliss Road from Westernport Highway, we are satisfied that sufficient alternative access arrangements (including the internal arrangement that will be created to the north of the landfill site) will be available.

However, we appreciate that a further assessment should be undertaken in order to establish the most appropriate location of the intended road closure.

Intersection Treatment

Three T-intersections are proposed on the external road network as a result of the proposed internal layout as shown in Appendix B.

While it is our opinion that unsignalised intersections would adequately cater for the traffic that is likely to be generated by the site, it is recommended that signals be installed at the proposed intersection with Abbotts Road.

This section of Abbotts Road is likely to carry a reasonable amount of traffic even after completion of the South Gippsland Highway/Scoresby Freeway link, and the provision of signals at this intersection would improve access to and from the site (particularly for heavy vehicles).

Westernport Highway/Bayliss Road Intersection

It is our understanding that the existing median opening on Westernport Highway at Bayliss Road is to be closed following installation of signals to the south as part of the subdivision at 250 Dandenong-Hastings Road.

A new connection would then be provided to Bayliss Road via a service road located adjacent to Westernport Highway.

Closure of this median opening and existing access arrangement at Bayliss Road will have a detrimental impact on access to the subject site and we believe that its removal is unnecessary. We are of the opinion that signals could be installed at this location which would "operate in the shadow" of the signals that are to be installed as part of the subdivision at 250 Dandenong-Hastings Road. This would provide limited "green time" for vehicles entering and exiting Bayliss Road, but would importantly not have any detrimental impact on through traffic along Westernport Highway.

However, if further analysis concludes that signals are not appropriate at this location, we believe that left-in/left-out access to Bayliss Road at its existing intersection with Westernport Highway should be provided at the very least.

4. PUBLIC TRANSPORT

The subject site and surrounding area is very poorly served by public transport with more than a 1.5 kilometre walk required to access the nearest bus route.

There is potential to significantly improve service to the area by public transport by providing a train station near Abbotts Road. We understand that an opportunity

may exist to create a new rail passenger/bus interchange and carpark on the north side of Abbotts Road on two privately owned lots which are currently vacant.

This location is approximately midway between the Dandenong and proposed Lynbrook Railway Stations and would be well situated for employees of the surrounding industrial area. Appropriate upgrading of existing pedestrian and cycle paths to this interchange from the surrounding areas would also be beneficial.

The two lots that have been identified as a potential public transport interchange are located outside of the area of the Development Plan and it is therefore recommended that Council pursue the opportunity of purchasing these lots.

5. CONCLUSIONS

Having visited the site, perused relevant documents and plans, and addressed the traffic engineering related issues at set out at Schedule 3 to the Development Plan Overlay for Amendment C11, we are of the opinion that:-

(a) the cross-sections that are proposed as part of the internal road network within Stage 1 exceed Council's minimum requirement and are satisfactory,

(b) the proposed footpaths (internal and external) that are proposed as part of the Stage 1 works are satisfactory,

(c) the existing cross-section of Abbotts Road along the site's northern boundary will adequately cater for the ultimate traffic expected following the completion of the link between South Gippsland Highway and Scoresby Highway,

(d) Bayliss Road should be closed to the west of the internal road that is proposed towards the south east corner of the subject site,

(e) signals should be installed at the intersection that will be created on Abbotts Road as part of the Stage 1 works,

(f) some form of access should be retained to Bayliss Road at its existing intersection with Westernport Highway, and

(g) Council should pursue the opportunity of purchasing two vacant lots that are located on the north side of Abbotts Road near the railway line for the potential creation of a rail/bus interchange.

APPENDIX A1.1 – ADDITIONAL TRAFFIC ENGINEERING ADVICE

9822 7444

TraffixGroup

Traffic Engineers and Transport Planners

Our Reference: 5106L0357

21st November, 2002

BY: 2240

Directors:
Henry H Turnbull
Alan S Prentice
Charmaine C Dunstan
Associates:
William D de Waard
Nathan B Woolcock

Traffix Group Pty Ltd ABN 32 100 481 570
Suite 8, 431 Burke Road
Glen Iris Victoria 3146
Ausdoc DX12407 Camberwell
Telephone 03 9822 2888
Facsimile 03 9822 7444
Email admin@traffixgroup.com.au

Mr Warren Wood
Town Planner – Major Projects
City of Greater Dandenong
P.O.Box 200
SPRINGVALE VIC 3171

Dear Sir,

PROPOSED INDUSTRIAL SUBDIVISION IN LYNDHURST
PLANNING SCHEME AMENDMENT C11 (STAGE 1)
LYNDHURST DEVELOPMENT PLAN: EASTERN STAGE

We refer to the letter from Mr Alan Gundry, Planning Officer from VicRoads, dated 21 November 2002 in relation to the Lyndhurst Development Plan.

Mr Gundry notes that the Development Plan does not provide detailed traffic assessments in relation to traffic generation from development sites. It is true that traffic generation was not directly addressed in our earlier traffic assessment of the proposed amendment however, a detailed Traffic Study, the Dandenong South Traffic Study by John Piper Traffic dated March 2002 for the City of Greater Dandenong provides an overall traffic engineering assessment for development volumes for the Greater Dandenong South industrial area.

Significantly, road needs on both the local and arterial network are identified in the John Piper Traffic Report based on overall development generation and not individual allotments. This is in accordance with appropriate traffic engineering practice.

VicRoads note three intersections as being of 'particular concern' in relation to future operations. These are Abbotts Road/South Gippsland Highway, Bayliss Road/South Gippsland Highway (sic) and the Colemans Road/Dandenong Valley Highway intersections.

In addition, VicRoads seek Council's support for providing additional road reservation along Abbotts Road to ultimately cater for four through lanes plus turning movements.

Abbotts Road Reservation

The Abbotts Road reservation between Remington Drive and the South Gippsland Highway has been purposely limited to provide a single lane in each direction with turning lanes at critical points. We support Council's view that the appropriate link route between the South Gippsland Highway and Abbotts Road/Colemans Road/Dandenong Valley Highway should be via Remington Drive and other alternative road proposals should not be allowed to deviate VicRoads attention from the need to continue with the Remington Drive proposal and the associated rail crossing.

Abbotts Road/South Gippsland Highway

Upgrading the Abbotts Road/South Gippsland Highway intersection is not consistent with directing traffic via Remington Drive in the future and is not a desirable outcome in relation to limiting the role of Abbotts Road as providing local access.

Direct access from Monash Drive to the Western Port Highway is proposed to provide limited access for some development south of Abbotts Road.

Bayliss Road/Western Port Highway

The Bayliss Road/Western Port Highway intersection is a complicated arrangement engineered by VicRoads as part of their highway development proposals and access restoration works.

The limited capacity of Bayliss Road has been factored into the consideration of the layout for the industrial subdivision and accordingly, only limited traffic movements can be expected in this area.

A major upgrade of the Bayliss Road/Western Port Highway intersection is inappropriate and not envisaged as part of the current Development Plan Approval.

Colemans Road/Dandenong Valley Highway

The treatment of Colemans Road/Dandenong Valley Highway will in some part be dependant on the connectivity provided with Bangholme Road to the west and the possible further connection to the Scoresby Freeway.

It is our understanding that current proposals are undecided about the link but that these are more likely to influence the requirements at Dandenong Valley Highway than other issues associated with the subject development land. In any event, the development of the Colemans Road/ Bangholme Road/Dandenong Valley Highway intersection is one which needs to be assessed based on regional traffic management such as raised in the John Piper Traffic report.

Shared Bicycle Paths

We agree with the comments in relation to shared paths being a minimum width of 2 metres and accordingly, would suggest an appropriate amendment to the plan at the detail design stage.

Future rail/road freight interchange and crossing requirements

Mr Gundry notes that land should be made available for the future upgrade of the rail service including future rail/road freight interchange.

We understand that there is no proposed rail/road freight interchange and accordingly, there is no requirement to put land aside for this purpose.

More importantly, Mr Gundry raises the spectre of a rail overpass on Abbotts Road. There is no likelihood of any further requirement to provide Abbotts Road as a grade separated crossing however, we understand that Remington Drive is intended to be grade separated across the railway line.

We trust these comments are of assistance and note that the matters raised by Mr Gundry have previously been considered by Council and/or its consultants and should not delay consideration of the Development Plan Approval.

Yours faithfully,
TRAFFIX GROUP PTY LTD

HENRY H TURNBULL

APPENDIX A1.2 – VICROADS COMMENTS LETTER

BY:.....

Mr Andrew McCulloch
Manager Strategic and Statutory Planning
City of Greater Dandenong
P.O. Box 200
SPRINGVALE VIC 3171

21 November 2002
Our Ref: SY DAN 000
Your Ref: 02-00304-01

Dear Mr McCulloch

LYNDHURST DEVELOPMENT PLAN
EASTERN STAGE

I refer to your letter dated 8 October 2002, regarding the above matter. VicRoads provide the following comments on the proposed Development Plan.

Section 3.0 of Schedule 3 (To The Development Plan Overlay) of the Greater Dandenong Planning Scheme states that :-

"The development plan must describe:
Transport management measures to accompany development and must include an integrated transport plan to address what infrastructure changes are required to be developed including additions to the arterial road network, prohibition of access to some roads at certain points.....and Lynbrook".

The submitted Development Plan does not provide adequate traffic assessment details relating to the traffic that will be generated from the development site, and it's likely consequence on the surrounding arterial road network. A more detailed traffic assessment report is required to allow VicRoads to undertake an assessment of the development on the surrounding arterial road network.

Attached for your information is a copy of the draft "*VicRoads Major Land Use Development Proposals - Guidelines for Development Traffic Assessment Reports*" for your information. Please note that the guidelines are in draft, but do reflect the type of information VicRoads will be formally seeking for major developments.

The Development Plan proposes Financial Considerations & Staging (Section 9). Council should request the inclusion of an additional item for "Provision of improvements to local road intersections with the declared road network". The provider should be the Developer, with the timing being upon development as required.

Of particular concern are the future operations of the Abbotts Road and Bayliss Road intersections with the South Gippsland Highway and the Coleman Road – Dandenong Valley Highway intersection. Each new development activity in the area should contribute towards the future upgrade of the intersections, should the traffic assessment reports indicated the need.

Council should ensure that the road reservation for Abbotts Road is sufficient. Advice from VicRoads Traffic Management is that the current capacity of Abbotts Road may not be adequate to cater for the future traffic demands. Consideration should be given to reserving additional land for Abbotts Road (ie say, to cater for a four through traffic lanes, with provision for turning movements into and out of Abbotts Road).

The new shared paths should be a minimum of 2.0 meters wide, as compared to 1.8 meters specified in the Development Plan (refer to AustRoads Part 14 - Bicycles Figure 6-19).

Consideration should be given to the need to reserve adequate land for the future upgrade of the rail service. Issues such as the need for a future rail/road freight interchange should be considered, as well as the needs of the rail level crossing with Abbotts Road (ie should land be reserved for the future grade separation of the rail crossing?).

Thank you for the opportunity to comment on the Development Plan. Should you have any enquiries regarding this matter, please contact me on telephone number 9881 8091.

Yours sincerely

ALAN GUNDRY
PLANNING OFFICER

Attach.

APPENDIX A2 – JCA ENGINEERING AND SERVICING REPORT

john chivers
& ASSOCIATES P/L
Surveyors - Engineers - Planners

1st Floor 260 Main Street
Lilydale 3140
Tel: (03) 9735 4888
Survey Fax: (03) 9735 1473
Engineering Fax: (03) 9735 3278
Email: jca@jchivers.com.au
Website: www.jchivers.com.au
A.C.N. 083 816 915

Our Reference: 8439

1st August, 2002

ABBOTTS ROAD INDUSTRIAL AREA LYNDHURST

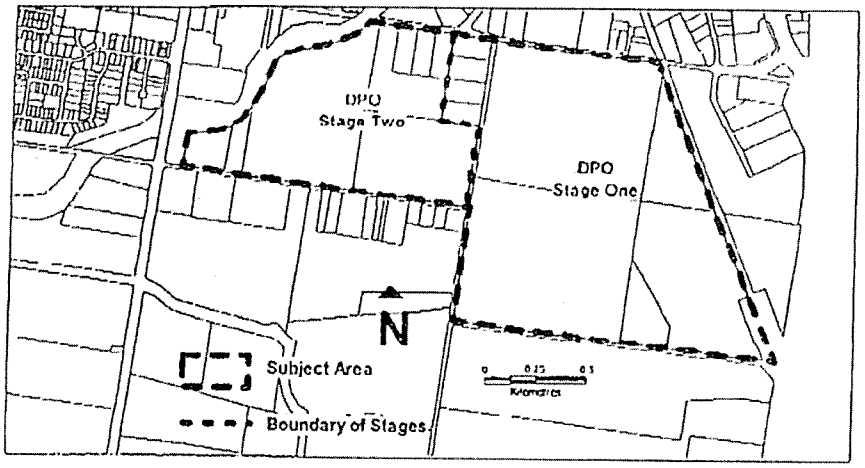
AMENDMENT C11 DEVELOPMENT PLAN OVERLAY STAGE 1

Engineering and Servicing Report

1 INTRODUCTION

Amendment C11 to the Greater Dandenong Planning Scheme introduces new planning controls to land south of Abbotts Road, Lyndhurst. A requirement of these new controls is for a Development Overlay Plan to be incorporated into the Planning Scheme. This report considers the engineering and servicing issues that need to be addressed as part of the Development Overlay for Stage One of the rezoned area.

The area incorporated into Stage One is the area generally bounded by Abbotts Road, the South Gippsland Railway Line, Bayliss Road and Taylors Road. The area also includes 4 lots to the west of Taylors Road. The map below shows the area included.



2 ROAD NETWORK

2.1 Existing Road Network and wider traffic flow issues

Issues relating to the upgrading of the existing road network, the arterial road network connectivity and managing wider traffic flow issues are being dealt with by others.

2.2 New Subdivision Roads

New road infrastructure will be created as part of the subdivision of the various parcels of land within the rezoned area. The road network pattern will be consistent with the plans presented as part of this overall development plan.

All new roads created as part of any subdivision of the area will have a 26m wide road reserve width, a 14m wide road between the backs of kerb leaving a 6m wide naturestrip on each side.

The proposed road reserve and pavement widths are wider than would normally be required in industrial estates. The additional width will be provided to accommodate B-Double truck turning movements into any of the development sites. Road pavement compositions, kerb profiles and general construction standards will be in accordance with the City of Greater Dandenong's engineering standards and requirements as appropriate.

The 6m wide naturestrip provides adequate width for installation of all services required to supply developments likely to be proposed.

A typical cross section showing the proposed road arrangement is included in Appendix A of this report.

2.3 Road Access across Melbourne Water Open Channel

The proposed subdivision road network includes a crossing of the Melbourne Water Open Channel which traverses the area between the railway line and Taylors Road. This road will provide a link from the Bayliss Road properties back to Abbotts Road. A bridge or culvert structure will be constructed over the open drain to facilitate road construction. The level of this structure would need to be such that it provides safe passage of vehicles in a 1 in 100 year flood situation. We would expect that this level would be consistent with the levee banks which are to be constructed as part of the final stage of the open channel construction. The proposed bridge or culvert structure will be designed to cater for the anticipated traffic loadings from an industrial subdivision and to the requirements of Melbourne Water and the City of Greater Dandenong.

3 STORMWATER DRAINAGE

3.1 Main Drainage

As mentioned above the area under consideration is traversed by a Melbourne Water controlled open channel which forms part of the Lyndhurst North Drainage Scheme. This channel runs in an east / west direction approximately midway through the area forming part of the main drainage control for this area and the Lyndhurst industrial and residential areas to the east. The channel then runs south along Taylors Road before heading west discharging via a retarding basin to the Eastern Contour Drain and then ultimately into the Eumemmerring Creek.

3.2 Local Drainage

The northern portion of the area in stage one amounting to approximately ¾ of the area can be drained by the extension of piped drains which will discharge into the Melbourne Water open channel. The balance of the area drains to the south and a pipe drain will be need to be constructed along Bayliss Road and then west into a retarding basin that is proposed to be constructed as part of Melbourne Water's Lyndhurst North Drainage Scheme.

Piped drainage works will need to be constructed to service individual sites and the road network within subdivisions as they occur.

Melbourne Water have indicated that properties would need to be filled above the level of flow within the open channel and to overcome the poor surface grading of the area to avoid flooding of any future developments. The extent of filling required is discussed in more detail in a later section of this report.

A plan showing Melbourne Water's proposed drainage layout to service the area is included in Appendix B of this report.

3.3 Maintaining a Secure Drainage Discharge Point for Landfill Site

A drainage discharge point for the Landfill site in Taylors Road will be provided either by direct connection to Melbourne Water's Open Drain on the north side of the property or the drainage which will need to be constructed along Bayliss Road as part of the development of lots further east along Bayliss Road.

3.4 Water Sensitive Urban Design Principles

The principles of water sensitive urban design focus on constructing infrastructure which minimises the transfer of pollutants such as sediment, litter and nutrients from developed sites into receiving waters such as creeks, rivers and Port Phillip Bay.

The "Best Practice Environmental Management Guidelines for Urban Stormwater", a joint publication developed with input from Melbourne Water, EPA, Department of Natural Resources and Environment and others. This publication provides guidelines for the implementation and design of various measures to minimise the discharge of pollutants from sites.

In this area the control of pollutants will be incorporated into the main drainage infrastructure with Melbourne Water proposing the construction of wetlands to be incorporated into the retarding basin which is proposed as part of the Lyndhurst North Drainage Scheme west of Taylors Road. This wetland will provide treatment facilities for the control of sediment and nutrient loads for the area in consideration here as well as parts of the wider catchment to the east.

A wetland is also proposed to be constructed in an area adjacent to the forest area and the Melbourne Water open channel approximately central to the area in consideration. This wetland will provide opportunities for improving the quality of stormwater discharges which emanate from the forest area and the developments east of the railway line.

The incorporation of other controls closer to the source, such as swale drains within roads, to assist in the infiltration of stormwater back into the ground and the retention of pollutants is not considered appropriate for industrial sites of this nature and particularly these sites for the following reasons:

- The flat topography of this area coupled with the need to fill allotments to achieve sufficient fall to provide adequate drainage means that any drainage openings need to be kept as high as possible to prevent surcharging of stormwater onto roads, carparks and allotments. The construction of open swale drains would lower the drainage inlets relative to road and lot levels and therefore lift the road and site levels in the order of 0.5m above that which could be achieved with conventional construction approach.
- We are also of the belief that swale drains are not an appropriate means for controlling the larger flows that occur in industrial subdivisions compared to residential as a result of wider road pavements, carparks, hardstand areas, etc.
- The flat topography of this area will decrease the efficiency and increase the maintenance requirements of any open swale type drains. Flatter drains will be subject to localised ponding due to the inability to finish earth to tight level controls needed on flat grades. The flatter grades will also cause any silt and debris to "drop out" early as a result of the slower velocities further increasing the need and cost of cleaning out and maintaining.

3.5 Stormwater Re-use Opportunities

The re-use of stormwater involves the collection of runoff water from roofed and paved areas, collecting and storing it for later use to irrigate gardens. Consideration can also be given to the re-use of stormwater for non-potable uses such as toilet flushing although this would need to be limited to "clean" roof water.

While industrial sites have significant roof and hardstand areas generating runoff there potential for re-use opportunities is relatively small due to small garden areas and non-potable water demands.

We consider that the adverse environmental effects associated with the extraction and manufacture of materials required for re-use system infrastructure would out weigh the small benefits gained in re-use water.

3.6 Sediment and litter control during construction

Sediment and litter generated during construction activities from both the subdivision infrastructure and the development of specific sites will be controlled in accordance with the EPA's publication "Construction Techniques for Sediment Pollution Control"

This publication suggests measures for controlling litter and sediment such as:

- Providing cut off drains or mounds to prevent runoff onto exposed areas.
- Providing silt fences to collect sediment from exposed areas before it becomes concentrated and flows into watercourses or drainage lines.
- Revegetation of exposed areas
- Provision of Rubbish collection facilities.
- etc.

A construction site management plan should be developed for each construction activity addressing the proposed work methods, potential sources of pollution and contaminants and measures proposed to control such.

3.6 Impact of increased stormwater on Eumemmerring Creek

As indicated above Melbourne Water are proposing the construction of a wetland and retarding basin within the Lyndhurst North Drainage Scheme to treat and control stormwater from this and adjoining areas before discharging into the Eastern Contour Drain and then the Eumemmerring Creek. Melbourne Water in establishing their design parameters for these facilities will be considering the capability of the Eumemmering Creek to manage any increased stormwater and will set design parameters accordingly.

4 OTHER SERVICES

4.1 Sewerage

South East Water are the authority responsible for sewerage in this area and they have indicated that the area being considered could be provided with gravity sewerage services. This will be achieved by the extension of a branch sewer from the existing Eumemmering Creek Main Sewer along Abbotts Road and Taylors Road and into the industrial area.

Reticulated sewerage services would need to be extended of this Branch Sewer Extension to service each proposed development or lot.

Sewerage connection points will be available for the landfill site from the sewerage infrastructure that is constructed as part of the adjoining subdivisions. Waste water from the landfill site is currently pumped back to sewer in Abbotts Road. This system will be able to be reduced and connected to the sewer mains that will need to be constructed within Taylors Road serving developments immediately north of the Landfill site.

4.2 Water Supply

South East Water have indicated that adequate water supply is available within Abbotts Road and Monash Drive to service the area being considered. Limited supply could also be drawn from mains in Dandenong-Hastings Road.

Upgrading of existing infrastructure may be required in the immediate vicinity of the sites to accommodate future development and long term demands.

Water mains would also need to be extended to service each proposed lot or development.

4.3 Electricity

United Energy have verbally indicated that adequate electricity supply is available in Abbotts Road and the surrounding network to service the development of the area under consideration. Extensions of the network will be required to get supply to certain sections of the development area under consideration and to each proposed lot or development within the area.

4.4 Telecommunications

Telstra have infrastructure in the vicinity and around the development area being considered and while some local upgrading may be required as part of extension of services into proposed development sites we would not envisage any major problems in providing services to the area.

4.5 Gas

The area is traversed by Gas and Oil transmission mains which will not service this area for direct connections.

Gas supply is traditionally not extended into industrial subdivisions until a user with a specific demand requires gas supply. In these cases the extension of mains are subject to individual negotiations between the future customer and the gas company. In practice the future customer would need a significant supply requirement to offset installation costs and these customers would take these arrangements into account when purchasing lots.

Gas supply mains do however exist in Abbotts Road and we would expect that these could be extended to service developments if required by future customers.

5 FILLING OF DEVELOPMENT SITES

As mentioned in the drainage section of this report, filling of the sites will be required to ensure they are not subject to flooding from flows in the Melbourne Water Open Channel, to overcome poor surface gradings and provide sufficient fall to effectively drain the sites to the appropriate outlets.

The relatively high levels of the drainage outlets combined with the flat gradings of the area have resulted in the need to fill significant areas to enable the construction of drainage with sufficient fall to enable self cleansing of the drains which will be constructed within the subdivisions and still maintain cover and match the designated outlet levels.

The extent and depth of filling required will be dependent on development layouts for the sites and detailed drainage and sewer designs.

A preliminary assessment of the extent of filling has been carried out. The approximate extent and depth of filling required is shown on a plan included with the Overall Development Plan submission.

These computations suggest that indicative depths of filling on 200 Abbotts Road will be in the order of 1.5m to 2m in the north east corner and in the vicinity of 1m to 1.5m along the southern boundary. The

depth of filling required reduces to significantly in the north west corner adjacent to the corner of Taylors Road and Abbotts Road as the natural levels of the land increase.

The lots on the west side of Taylors Road are required to drain back to and along Taylors Road which requires the lots to be filled at the rear to create sufficient fall for drainage to Taylors Road. The depth of filling required in the rear western corner adjacent to Abbotts Road approaches 3m in depth, to overcome the natural westerly fall of the land. As an alternative consideration has been given to construction of drainage along the western boundaries of these lots and then discharging to Taylors Road. This alternative resulted in similar if not slightly higher depths of filling.

We would expect that no additional filling other than minor regrading would be required on the Landfill site as the tipping operations will fill the site above the level required to obtain free drainage.

Our initial computations also suggest that filling will be required on the Bayliss Road properties in the south east of the area being considered to match the main channel levee bank and lift them to sufficient levels to provide free outlets for the construction of drainage to and within the proposed lots. The extent of filling is limited to the northern portion of the land and a section adjacent to the Railway line boundary. The depths of filling required range in depth from 0.5m to 1.5m. A small section of low lying area in the south west corner adjacent to Bayliss Road will most probably need to be filled to provide sewer control to this area.

Detail design of the various services will confirm the need for and extent of filling required on the various parcels of land.

6 CONCLUSION

The proposed industrial area bounded by Abbotts Road, Taylors Road, Bayliss Road and the railway line can be provided with the services normally expected in estates of this nature.

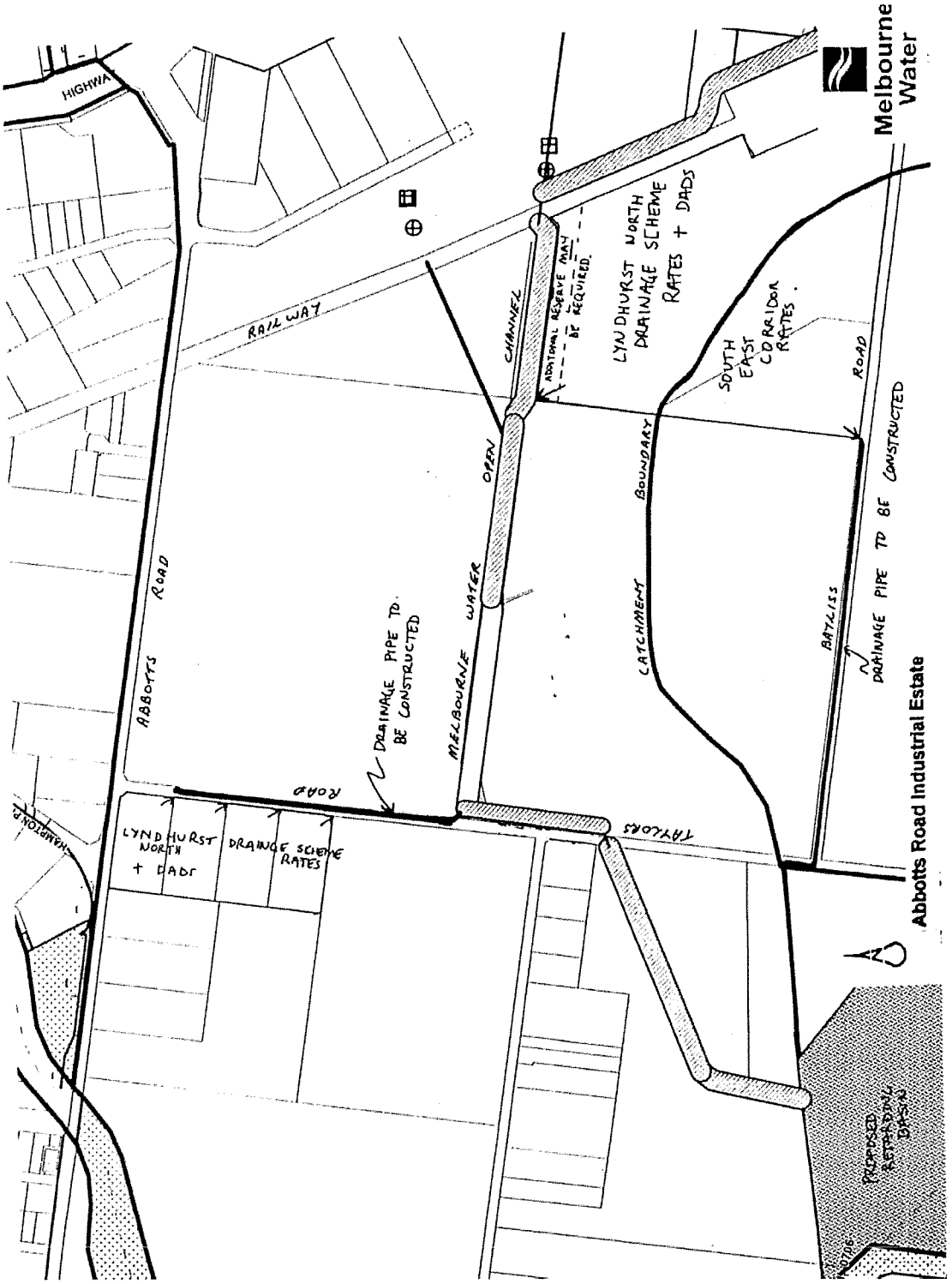
Roads within the subdivisions will be fully constructed and serviced to meet the requirements of the relevant authorities. Controls will be set in place to control sediment and pollutants being discharged into the drainage system during construction and permanent water quality features are incorporated into Melbourne Water's drainage scheme for the area to reduce sediment and nutrient loads being discharged into the Eumemmerring Creek.

Services with sufficient capacity are either available or within close proximity to the area being considered and these can be extended into this area under normal subdivision servicing agreements.

Alan Burrows BEng (Civil) MIEAust
Manager Engineering

r:\word.dat\correspondence - survey and engineering\8000\8439 - planning servicing report - 200 abbotts road, lyndhurst.doc

APPENDIX B – MELBOURNE WATER'S PROPOSED DRAINAGE LAYOUT



APPENDIX A3 – BIOSIS ECOLOGICAL ASSESSMENT REPORT

Ecological assessment of land south of Abbots Road, Lyndhurst, Victoria

Revised Draft Report

July 2002

Andrew J Hill and Aaron Organ

BIOSIS RESEARCH

Revised draft report for Pall Mall Assests Pty Ltd.

Ecological assessment of land south of Abbots Road, Lyndhurst, Victoria

July 2002

Andrew J Hill and Aaron Organ

Project no. 2913

BIOSIS RESEARCH Pty. Ltd. A.C.N. 006 075 197
Natural & Cultural Heritage Consultants

Melbourne: 322 Bay Street Port Melbourne 3207
Ph: (03) 9646 9499 Fax: (03) 9646 9242
email: melbourne@biosisresearch.com.au

Sydney: 10 Bartley Street Chippendale 2008
Ph (02) 9690 2777 Fax: (02) 9690 2577
email: sydney@biosisresearchl.com.au

ACKNOWLEDGEMENTS

For technical and scientific assistance in this project we thank:

- Sally McCormick, Sally Koehler, Biosis Research Pty. Ltd.
- Brad Dale, NRE, for the use of the Atlas of Victorian Wildlife and Flora Information System.
- Damien Cook, Wetland Ecosystems.
- Kevin Rule, Eucalypt specialist.
- Cameron Beardsell, Consultant Ecologist
- Adam Muir, NRE
- Fred Krumins, Devcon Group

ABBREVIATIONS

AVW	Atlas of Victorian Wildlife (NRE)
CAMBA	China – Australia Migratory Bird Agreement
EPBC	*Environmental Protection and Biodiversity Act 1999*
EVC	Ecological vegetation class
FFG	*Flora and Fauna Guarantee Act 1988* (Vic.)
FIS	Flora Information System (NRE)
IUCN	International Union for the Conservation of Nature
JAMBA	Japan – Australia Migratory Bird Agreement
LGA	Local Government Authority
NRE	Department of Natural Resources & Environment, Victoria
VFD	Victorian Fish Database

CONTENTS

Figures

1.0 SUMMARY

Biosis Research Pty. Ltd. was commissioned by Devcon Group Pty. Ltd., on behalf of Pall Mall Assets, Pty. Ltd. to address ecological issues arising from Amendment C11 and from Schedule three to the Development Planning Overlay (DPO3), which are currently being assessed under the Greater Dandenong Planning Scheme.

The study area, Development Plan Overlay – Stage One (DPOS1), which is part of the overall DPO3, is located south of Abbots Road, west of the Cranbourne railway line, north of Bayliss Road and east of Taylors Road, including four blocks near the corner of Abbots and Taylors Roads, in Lyndhurst, and is approximately 137 hectares in size (Figure 1). Part of the study area consists of an operating Landfill site. The land north of the Landfill and the Mills property was the focus during this assessment, as the Landfill site and Mills property are completely modified, plus the Mills property has been surveyed previously (Mueck 1999).

The land which is the focus of this study, comprises remnant woodland vegetation in the south and east, and along the western boundary, including some woodland areas on the four land holdings to the west of Taylors Road. There are also several small isolated patches of woodland in the middle of the site. Several small sites consisting of ephemeral wetland vegetation are located in the east. The remainder of the site has been cleared and consists of extensive areas of introduced vegetation.

Flora

A total of 81 vascular plant species were recorded of which 57 (70%) were native plant species (Appendix 2).

There were four pre-existing flora data records within the study area (NRE Flora Information System), one from the triangular area of woodland, one from the southern boundary and two from the ephemeral wetlands. These records contained an additional 27* indigenous flora species which are most likely to occur within the study area. The FIS also contains an additional 59 site records (quadrats, local area plant lists, herbarium records and incidental records) from within approximately five kilometres of the study area. These data include additional indigenous flora species, some of which may occur within the study area.

*(one record from Damien Cook, pers. comm.)

No species of national significance (or listed under the EPBC Act) were recorded within the study area.

One species of national significance , River Swamp Wallaby-grass *Amphibromus fluitans* (status: Vulnerable, EPBC Act), was identified from the FIS to have previously been recorded from the study area. River Swamp Wallaby-grass is apparently confined to swamps principally in the north of the state, and is uncommon in the south, probably due to alteration of habitat (Walsh and Entwisle 1994). This species is likely to occur in the study area, within the ephemeral wetlands and/or any low-lying areas.

One species of state significance, Studley Park Gum *Eucalyptus studleyensis* (status: endangered, NRE 2000A) was recorded within the study area. Several trees were recorded in the north eastern corner of the study site (see Appendix 4 – map of significant trees). This species is a hybrid between the Swamp Gum *Eucalyptus ovata* and River Red Gum *Eucalyptus camaldulensis*.

Two plant species of state significance, Annual Bitter-cress* *Cardamine paucijuga* (status: vulnerable, NRE 2000a) and Grey Billy-buttons *Craspedia canens* (status: endangered, NRE 2000a), were identified from the FIS to have previously been recorded from the study area. Annual Bitter-cress is a small annual herb that occurs in moist and riparian habitats (Walsh and Entwisle 1996). Grey Billy-buttons is a small perennial herb only known from grasslands, often bordering swamps (Walsh and Entwisle 1999). Both of these species are likely to occur in the study area, within the ephemeral wetlands and/or any low-lying areas.
*(record from Damien Cook, pers. comm.)

Overall the areas of remnant vegetation may potentially support any one of these nationally and state listed species. A spring/summer flora survey would be required, after a significant rainfall event, to determine whether any of these additional species occur in the study area, particularly within ephemerally wet areas.

Twenty four of the recorded plant species are considered regionally significant in the Gippsland Plain Bioregion (Table 1).

The vegetation of the study area is comprised of small to large areas of woodland vegetation, small areas of wetland and Swamp Scrub vegetation, and large areas of predominantly introduced vegetation (Figure 2).

The pre-1750 vegetation of the study area has been mapped as *Plains Grassy Woodland* and *Heathy Woodland* (NRE in prep). The remnant vegetation has more recently been mapped by Oates and Taranto (2001) as *Plains Grassy Woodland* and *Heathy Woodland*, but additional EVC's, *Plains Grassy Wetland* and *Swamp Scrub*, are also located on site (Figure 2).

Plains Grassy Woodland, *Swamp Scrub* and *Plains Grassy Wetland* (also FFG

listed. as the Herb-rich Plains Grassy Wetland (West Gippsland)) are listed as endangered in the Gippsland Plain Bioregion (NRE 2000d), and have state conservation significance. *Heathy Woodland* is most likely depleted in the Gippsland Plain Bioregion (NRE 2000d), but is most likely to be rare in west Gippsland, and has a regional significance. The conservation significance of the remnant vegetation is shown on Figure 2.

Fauna

A total of 48 vertebrate fauna species was recorded from the study area during the present fauna habitat assessment. This includes 39 bird species (33 native), three mammal species (one native), two native reptiles and four native frogs (Appendix 3.1).

The AVW contains an additional 154 native vertebrate fauna species, which have been recently (post-1970) recorded from the local area, including 10 mammal species, 133 native bird species, 6 native reptile and five amphibian species.

A number of these additional terrestrial species are likely to use habitat resources within the study area as residents or visitors on a regular, occasional or vagrant basis, particularly in the woodland habitat and wetland areas.

Four broad fauna habitat types were identified within the study area including modified woodland (River Red Gum and Manna Gum woodland), Swamp Scrub, wetlands and introduced pasture.

No species of national, state or regional conservation significance were recorded during the present assessment. Two fauna species of national (Painted Snipe and Australasian Bittern) and at least five fauna species (Eastern Broad nosed Bat, Latham's Snipe, Barn Owl, Dollarbird and Common Spadefoot) of regional conservation significance have previously been recorded from the study area (Beardsell *et. al.* unpub. & Cook pers. comm.). A number of additional species of conservation significance have previously been recorded from within five kilometres of the study area (AVW), a umber of which are likely to use habitat resources in the study area.

Seven bird species listed as 'migratory' (Silver Gull, Pacific Black Duck, Australian Wood Duck, Masked Lapwing, Brown Goshawk, Brown Falcon, Black-shouldered Kite and Nankeen Kestrel), and one 'marine' species (Silver Gull) under the EPBC Act 1999 were recorded from the study site during the present assessment. An additional 48 bird species listed as 'migratory' and nine species listed as 'marine' under this Act have previously been recorded from the local area (Appendix 3.3). Although all of these species could visit parts of the study area on a regular, rare or vagrant basis, the study area does not provide important or limiting habitat for any of them.

Conservation Significance

On the basis of the available information conservation significance for flora and fauna values has been assigned (Figure 2). Due to the modified nature of some of the study area, specific areas of conservation significance have been identified. The Plains Grassy Woodland within the triangular woodland is considered to be of State conservation significance. The large area of woodland in the south is considered to be of at least High Regional conservation significance, possibly of State conservation significance. The remnant patches of Plains Grassy Wetland are considered to be of State conservation significance, as they are considered to be greater than 1% in area of all that remains of this vegetation community in Victoria. The remaining areas of woodland, Swamp Scrub and scattered mature River Red Gums vary between High Local and Local conservation significance. The remainder of the study site has negligible conservation significance.

Habitat hectare calculations are listed in Section 6.1, and potential impacts and mitigation strategies are discussed in Section 7.

1.10INTRODUCTION

10.1 Project Background

Biosis Research Pty. Ltd. was commissioned by Devcon Group Pty. Ltd., on behalf of Pall Mall Assets Pty. Ltd. to address ecological issues arising from Amendment C11 and from Schedule three to the Development Planning Overlay (DPO3), which are currently being assessed under the Greater Dandenong Planning Scheme.

Several changes to Amendment C11 are recommended by the Panel and Council including:

- the triangular parcel of remnant woodland adjacent to the railway line within the study area, is not considered suitable for inclusion in the industrial zone,
- the Environmental Significance Overlay (ESO2) should not cover the Mills Land,
- a DPO be applied to the whole site (with Councils' suggestions as outlined in the 11 June 2002, Supplementary Report), and
- the provisions of the DPO3 reflect the concerns of NRE in relation to the recognition and protection of ephemeral wetlands.

In recent times several studies have been undertaken on different parts of the study site. A flora assessment of the Mills property was undertaken by Mueck (1999), and he concluded that the site had negligible conservation significance, apart from the scattered mature River Red Gums *Eucalyptus camaldulensis*. A recent assessment of the conservation value of the trees north of the Mills property, excluding the triangular parcel of land, was undertaken by Bennison and Hill (2001) (see Appendix 5 for a copy of the report). This report identified trees of category 1, 2 and 3, and recommended an ecological assessment of the study site.

a. Objective

The objective of this study is to provide information that would be requested by Council under DPO3.

b. Study Area

The study area, Development Plan Overlay – Stage One (DPOS1), which is part of the overall DPO3, is located south of Abbots Road, west of the Cranbourne railway line, north of Bayliss Road and east of Taylors Road, including four blocks near the corner of Abbots and Taylors Roads, in Lyndhurst, and is approximately 137 hectares in size (Figure 1). Part of the study area consists of an operating Landfill

site. The land north of the Landfill and the Mills property was the focus during this assessment, as the Landfill site and Mills property are completely modified, plus the Mills property has been surveyed previously (Mueck 1999).

The land which is the focus of this study, comprises remnant woodland vegetation in the south and east, and along the western boundary, including some woodland areas on the four land holdings to the west of Taylors Road. There are also several small isolated patches of woodland in the middle of the site. Several small sites consisting of ephemeral wetland vegetation are located in the east. The remainder of the site has been cleared and consists of extensive areas of introduced vegetation.

i. Bioregion

The study area is located within the Gippsland Plain Bioregion, which covers large areas of south eastern Victoria from around Melbourne in the west to Lakes Entrance in the east, excluding the Strzelecki Ranges (NRE 1997).

2. METHODS

a. Flora

i. Taxonomy

Plant names (taxonomy) used in this report follow Ross (2000). Vegetation community names follow the typology of vegetation in Victoria developed by the Department of Natural Resources and Environment (NRE in prep., Oates and Taranto 2001).

ii. Literature and Database Review

Pre-existing information in the Flora Information System and other local and regional surveys and inventories were reviewed.

iii. Field Survey

The composition, structure and condition of the vegetation was assessed during site inspections on 5 and 27 June, 2002. A list of vascular plants (fern, conifers, flowering plants) observed was compiled during these site inspections.

iv. Limitations

The flora survey was conducted in early winter, which is not an optimal time for flora surveys. Furthermore the ephemeral wetland areas were basically dry. Some species may have been overlooked due to dormancy or lack of key taxonomic material required for identification. This is most significant for wetland vegetation, as most species remain dormant until triggered by a significant rainfall event. More species may have been recorded with more time in the field and with the survey effort spread over a greater period of time, particularly after a significant rainfall event in spring or summer.

b. Fauna

i. Taxonomy

Common and scientific names used in this report follow Menkhorst (1995) for mammals, Christidis and Boles (1994) for birds, and Cogger (2000) for reptiles and frogs.

ii. Literature and Database Review

Post-1970 records of all terrestrial vertebrate fauna species from the Cranbourne West area (which includes the study site) were obtained from the NRE Atlas of Victorian Wildlife (AVW). Using the Victorian Fauna Display database.

iii. Field Survey

The type, condition and conservation significance of fauna habitat was assessed. Fauna species observed during this assessment were also recorded. The study area was inspected on 5 June, 2002.

iv. Limitations

The fauna survey was conducted early winter, which is generally not considered as an optimal time for such work. For example, during the colder times of year reptile activity declines, and fewer reptiles are expected to be recorded.

A higher number species may have been recorded if the survey was undertaken over a longer period of time, during a more optimal time for fauna survey (i.e. late spring through to early summer), and using various other survey methods such as trapping or spotlighting. However, the use of the AVW records from the general area partially offsets these limitations.

c. Defining Significant Species and Communities

A number of categories and criteria are formally applied to assess the conservation significance of flora and fauna. The significance of flora species, plant communities, fauna species and particular sites of conservation value is evaluated on a geographic scale with four levels: **national, state, regional** and **local.** The definition and application of the criteria are detailed in Appendix 1.

3. RESULTS

a. Flora

i. Plant Species

A total of 81 vascular plant species were recorded of which 57 (70%) were native plant species (Appendix 2). Several specimens of River Red Gum *Eucalyptus camaldulensis* from the study area are considered to be unusual specimens. The adult leaves are broader and coarser than the typical River Red Gum and some of the trees have opercula resembling those found on the Gippsland Red Gum *Eucalyptus tereticornis* (Damien Cook and Kevin Rule, pers. comm.). Further taxonomic work may indicate that these unusual taxa are a subspecies of River Red Gum (Damien Cook and Kevin Rule, pers. comm.). Furthermore, some eucalypt species hybridise quite readily and there appears to be an individual on site, which is a cross between Swamp Gum *Eucalyptus ovata* and Coast Manna Gum *Eucalyptus viminalis* ssp. *pryoriana* (Kevin Rule, pers.comm.).

There were four pre-existing flora data records within the study area (NRE Flora Information System), one from the triangular area of woodland, one from the southern boundary and two from the ephemeral wetlands. These records contained an additional 27* indigenous flora species which are most likely to occur within the study area. The FIS also contains an additional 59 site records (quadrats, local area plant lists, herbarium records and incidental records) from within approximately five kilometres of the study area. These data include additional indigenous flora species, some of which may occur within the study area.
*(one record from Damien Cook, pers. comm.)

ii. Significant Plant Species

National significance

No species of national significance (or listed under the EPBC Act) were recorded within the study area.

One species of national significance , River Swamp Wallaby-grass *Amphibromus fluitans* (status: Vulnerable, EPBC Act), was identified from the FIS to have previously been recorded from the study area. River Swamp Wallaby-grass is apparently confined to swamps principally in the north of the state, and is uncommon in the south, probably due to alteration of habitat (Walsh and Entwisle 1994). This species is likely to occur in the study area, within the ephemeral wetlands and/or any low-lying areas.

One additional species of national significance, Swamp Everlasting *Bracteantha palustris* (status: Vulnerable, EPBC Act), was identified on the FIS, from within approximately five kilometres of the study area. This species may occur within the

study area, within ephemerally wet areas.

State significance

One species of state significance, Studley Park Gum *Eucalyptus studleyensis* (status: endangered, NRE 2000a) was recorded within the study area. Several trees were recorded in the north eastern corner of the study site (see Appendix 4 – map of significant trees). This species is a hybrid between the Swamp Gum *Eucalyptus ovata* and River Red Gum *Eucalyptus camaldulensis*.

Two plant species of state significance, Annual Bitter-cress* *Cardamine paucijuga* (status: vulnerable, NRE 2000a) and Grey Billy-buttons *Craspedia canens* (status: endangered, NRE 2000a), were identified from the FIS to have previously been recorded from the study area. Annual Bitter-cress is a small annual herb that occurs in moist and riparian habitats (Walsh and Entwisle 1996). Grey Billy-buttons is a small perennial herb only known from grasslands, often bordering swamps (Walsh and Entwisle 1999). Both of these species are likely to occur in the study area, within the ephemeral wetlands and/or any low-lying areas.
*(record from Damien Cook, pers. comm.)

Five additional species of state significance (NRE 2000a), Wetland Blown-grass *Agrostis avenacea* var. *perennis* (status: poorly known), Grey Spike-sedge *Eleocharis macbarronii* (status: poorly known), Gilgai Blown-grass *Agrostis billardierei* var. *filifolia* (status: vulnerable), Swamp Billy-buttons *Craspedia paludicola* (status: vulnerable) and Pale Swamp Everlasting *Helichrysum aff. rutidolepis* (status: vulnerable), were identified on the FIS from within approximately five kilometres of the study area. Some of these species may occur within the study area, particularly within ephemerally wet areas.

Overall the areas of remnant vegetation may potentially support any one of these nationally and state listed species. A spring/summer flora survey would be required, after a significant rainfall event, to determine whether any of these additional species occur in the study area, particularly within ephemerally wet areas.

Regional Significance

Twenty four of the recorded plant species are considered regionally significant in the Gippsland Plain Bioregion (Table 1).

Table 1: Recorded plant species of regional significance

Scientific Name	Common Name
Alternanthera denticulata s.l.	**Lesser Joyweed**

One additional species of national significance, Swamp Everlasting *Bracteantha palustris* (status: Vulnerable, EPBC Act), was identified on the FIS, from within approximately five kilometres of the study area. This species may occur within the study area, within ephemerally wet areas.

State significance

One species of state significance, Studley Park Gum *Eucalyptus studleyensis* (status: endangered, NRE 2000a) was recorded within the study area. Several trees were recorded in the north eastern corner of the study site (see Appendix 4 – map of significant trees). This species is a hybrid between the Swamp Gum *Eucalyptus ovata* and River Red Gum *Eucalyptus camaldulensis*.

Two plant species of state significance, Annual Bitter-cress* *Cardamine paucijuga* (status: vulnerable, NRE 2000a) and Grey Billy-buttons *Craspedia canens* (status: endangered, NRE 2000a), were identified from the FIS to have previously been recorded from the study area. Annual Bitter-cress is a small annual herb that occurs in moist and riparian habitats (Walsh and Entwisle 1996). Grey Billy-buttons is a small perennial herb only known from grasslands, often bordering swamps (Walsh and Entwisle 1999). Both of these species are likely to occur in the study area, within the ephemeral wetlands and/or any low-lying areas.
*(record from Damien Cook, pers. comm.)

Five additional species of state significance (NRE 2000a), Wetland Blown-grass *Agrostis avenacea* var. *perennis* (status: poorly known), Grey Spike-sedge *Eleocharis macbarronii* (status: poorly known), Gilgai Blown-grass *Agrostis billardierei* var. *filifolia* (status: vulnerable), Swamp Billy-buttons *Craspedia paludicola* (status: vulnerable) and Pale Swamp Everlasting *Helichrysum aff. rutidolepis* (status: vulnerable), were identified on the FIS from within approximately five kilometres of the study area. Some of these species may occur within the study area, particularly within ephemerally wet areas.

Overall the areas of remnant vegetation may potentially support any one of these nationally and state listed species. A spring/summer flora survey would be required, after a significant rainfall event, to determine whether any of these additional species occur in the study area, particularly within ephemerally wet areas.

Regional Significance

Twenty four of the recorded plant species are considered regionally significant in the Gippsland Plain Bioregion (Table 1).

Table 1: Recorded plant species of regional significance

Scientific Name	Common Name
Alternanthera denticulata s.l.	Lesser Joyweed
Amphibromus nervosus	Common Swamp Wallaby-grass
Austrodanthonia duttoniana	Brown-back Wallaby-grass
Austrodanthonia geniculata	Kneed Wallaby-grass
Azolla filiculoides	Pacific Azolla
Carex inversa	Knob Sedge
Crassula helmsii	Swamp Crassula
Dianella longifolia var. *longifolia*	Pale Flax-lily
Eleocharis acuta	Common Spike-sedge
Eryngium vesiculosum	Prickfoot
Eucalyptus microcarpa	Grey Box
Hemarthria uncinata var. *uncinata*	Mat Grass
Isolepis inundata	Swamp Club-sedge
Juncus amabilis	Hollow Rush
Juncus holoschoenus	Joint-leaf Rush
Lobelia pratioides	Poison Lobelia
Muellerina eucalyptoides	Creeping Mistletoe
Myriophyllum crispatum	Upright Water-milfoil
Neopaxia australasica	White Purslane
Persicaria decipiens	Slender Knotweed
Senecio quadridentatus	Cotton Fireweed
Solanum laciniatum	Large Kangaroo Apple
Thelionema caespitosum	Tufted Lily
Trachymene anisocarpa	Parsnip Trachymene

Local significance

Large areas of pre-European vegetation in the local area have been cleared for agricultural, industrial and residential purposes. Therefore it is considered that all indigenous species recorded in the study area are of at least local conservation significance.

4.1.3 Plant communities & vegetation condition

The vegetation of the study area is comprised of small to large areas of woodland vegetation, small areas of wetland and swamp scrub vegetation, and large areas of predominantly introduced vegetation (Figure 2). The woodland vegetation is dominated by mature and semi – mature River Red Gums, Swamp Gums and Coast Manna Gums *Eucalyptus viminalis* ssp. *pryoriana*, with a sparse to moderately dense indigenous understorey of Hedge Wattle *Acacia paradoxa* and Prickly Tea-tree *Leptospermum continentale*. The groundcover of these parts areas consists of a mix of indigenous species such as Weeping Grass *Microlaena stipoides* var. *stipoides* and Common Spike-sedge *Eleocharis acuta*, and

introduced species such as Sheep Sorrel *Acetosella vulgaris* and Brown-top Bent *Agrostis capillaris*.

The wetland vegetation consists of a mix of indigenous species, including Poison Lobelia *Lobelia pratioides*, Common Spike-sedge, Common Swamp Wallaby-grass *Amphibromus nervosus*, Prickfoot *Eryngium vesiculosum* and White Purslane *Neopaxia australasica*, and introduced specie such as Yorkshire Fog *Holcus lanatus*, Paspalum *Paspalum dilatatum* and Hairy Bird's-foot Trefoil *Lotus suaveolens*.

The swamp scrub vegetation consists of Swamp Paperbark *Melaleuca ericifolia* over mostly introduced flora species.

The predominantly introduced vegetation consisted of Paspalum, Yorkshire Fog, Brown-top Bent and Sweet Vernal-grass *Anthoxanthum odoratum*.

Classification of native vegetation in Victoria follows a typology in which 'ecological vegetation classes' (EVCs) are the primary level of classification. Each EVC contains one or more 'floristic communities' (NRE in prep.). NRE has classified and mapped native vegetation in the Melbourne area not covered by existing mapping completed for Regional Forest Agreements (Oates and Taranto 2001).

The pre-1750 vegetation of the study area has been mapped as *Plains Grassy Woodland* and *Heathy Woodland* (NRE in prep). The remnant vegetation has more recently been mapped by Oates and Taranto (2001) as *Plains Grassy Woodland* and *Heathy Woodland*, but additional EVC's, *Plains Grassy Wetland* and *Swamp Scrub*, are also located on site (Figure 2).

Cook (in prep. a), describes the *Plains Grassy Wetland* community present within the study site as both Herb-rich plains grassy wetland: deep marsh and Herb-rich plains grassy wetland (west Gippsland): Meadow on sandy-loam topsoil. For the *Plains Grassy Woodland* it has affinities with Plains Grassy Woodland (West Gippsland): Tertiary Sediments, seasonally damp sites.

Significant EVCs

Plains Grassy Woodland, *Swamp Scrub* and *Plains Grassy Wetland* (also FFG listed. as the Herb-rich Plains Grassy Wetland (West Gippsland)) are listed as endangered in the Gippsland Plain Bioregion (NRE 2000d), and have state conservation significance. *Heathy Woodland* is most likely depleted in the Gippsland Plain Bioregion (NRE 2000d), but is most likely to be rare in west Gippsland, and has a regional significance. The conservation significance of the remnant vegetation is shown on Figure 2.

4.2 Fauna

4.2.1 Species

A total of 48 vertebrate fauna species was recorded from the study area during the present fauna habitat assessment. This includes 39 bird species (33 native), three mammal species (one native), two native reptiles and four native frogs (Appendix 3.1).

There are approximately 10 pre-existing fauna data on the study area (NRE Atlas of Victorian Wildlife). The AVW contains 164 previous fauna surveys within 5 kilometres of the study area. These 164 fauna surveys include both lists of species as well as incidental records of unusual species. From this local area, there has been a moderate level of survey for mammals, birds and amphibians and low survey effort for reptiles).

The AVW contains an additional 154 native vertebrate fauna species, which have been recently (post-1970) recorded from the local area, including 10 mammal species, 133 native bird species, 6 native reptile and five amphibian species.

A number of these additional terrestrial species are likely to use habitat resources within the study area as residents or visitors on a regular, occasional or vagrant basis, particularly in the woodland habitat and wetland areas.

4.2.2 Habitats

Four broad fauna habitat types were identified within the study area including modified woodland (River Red Gum and Manna Gum Woodland), Swamp Scrub, wetlands and introduced pasture. Brief descriptions are given below. An assessment of their quality is given in Table 2.

Modified Woodland

Red Gum Woodland

Corresponding vegetation communities: Plains Grassy Woodland.

Location: An area of River Red Gum woodland occurs over a large low-lying area, located in the south-eastern section of the study area (Figure 2). The woodland forms part of the larger triangle remnant east of the study area, adjacent to the railway track.

Structure: The overstorey vegetation is dominated by a mixed aged stand of River Red Gums, up to a height of 25-30 metres, and other overstorey eucalyptus

and wattle species. Many of the Red Gums are quite old (likely to be 150-200 plus, years old) and contain numerous hollows of varying sizes. The tree canopy is typically quite open, however, in areas their canopies inter-connect. The majority of the trees are in excellent health. Midstorey vegetation is generally quite sparse, and consists of a mixture of native (Hedge Wattle and Prickly Tea-tree) and introduced species (Gorse and Blackberry) to a height of approximately 2.5 metres, while the understorey vegetation comprises both native and introduced grass species. The removal of cattle from the site has lead to a proliferation in natural regeneration, particularly large numbers of young River Red Gums. There are also moderate levels of ground debris such as logs, sticks and leaf litter throughout the site.

Due to the depleted nature of larger trees within the local area, every tree is important in providing habitat for many fauna species (especially large mature hollow-bearing trees). Clusters of woodland trees are likely to be useful to a higher diversity of fauna than isolated individual trees, while clustered trees are most likely to better retain their health and viability. Further degradation or removal of remnant vegetation within the study area will have an impact on native fauna species. The remnant Woodland in the study area forms part of a larger area of Red Gum Woodland west of the rail track.

Fauna: Remnant trees in the study area provide nesting and foraging habitat for a number of common bird species such as Dusky Woodswallow. Tree hollows provide habitat for possum species (Common Brushtail Possum and Common Ringtail Possum) nesting resources for birds (Galahs, Sulphur-crested Cockatoo and parrots), and roosting sites for a high number of native bat species. Honeyeaters, wattlebirds and lorikeets are likely to use these trees for foraging activities especially during flowering periods, and birds of prey (Black-shouldered Kite, Nankeen Kestrel, Brown Goshawk) may also use these trees as roost sites. Introduced bird species (Common Starling, Common Myna and Spotted turtle Dove) are also likely to utilise tree hollows.

Manna Gum Woodland

Corresponding vegetation community: Heathy Woodland

Location: A strip of Manna Gum Woodland occurs along the western boundary of the study area. A number of small isolated pockets of Manna Gums (greater than 40 trees) also occur within the study area (Figure 2).

Structure: The overstorey vegetation is dominated by a large number of mature Coastal Manna Gums *Eucalyptus pryoriana*, which are densely spaced. Very few of these trees support hollows and there is little regeneration present. The midstorey is almost non existent, while the understory vegetation predominately comprises introduced species to a height no greater than a metre. There are also

moderate levels of ground debris such as logs, sticks and leaf litter throughout the site.

Fauna: Manna Gum Woodland is likely to provide suitable nesting and foraging habitat for a number of common birds species including Eastern Rosella, Noisy Miner, Red-rumped Parrot and Australian Magpie. Honeyeaters (White-plumed Honeyeater) and wattlebirds (Red Wattlebird and Little Wattlebird) are likely to use these trees for foraging activities especially during flowering periods, while birds of prey may also use these trees as roost sites. Introduced bird species (Common Starling, Common Myna and Spotted turtle Dove) are also likely to utilise tree hollows.

Swamp Scrub

Corresponding vegetation communities: Swamp Scrub

Location: Two small areas within two of the land holdings west of Taylors Road.

Structure: This habitat type comprises relatively small areas of shrubs (relatively young). The understorey comprises dense areas of grass species. There is very little ground material such as logs and rocks present.

Fauna: Fauna species most likely to use this habitat type include, common reptile and frog species (Common Froglet and Lowland Copperhead), and bird species such as small Wrens and Thornbills etc.

Wetlands

Ephemeral Wetland

Corresponding vegetation community: Plains Grassy Wetland

Location and Structure: This habitat is characterised by a large low lying area in the south eastern portion of the study area. Although dry during the present assessment this area floods periodically during periods of high rainfall (C. Beardsell pers. comm.). During inundation the wetland is likely to be quite shallow and would support a mixture of native and introduced grass and herb species. A number of large River Red Gums are also scattered over this area. A newly constructed drainage channel exists along the southern boundary of the study area, which is likely to alter the flooding regime and water retention rates through many areas in the study area. This may actually be deleterious to fauna habitat at the site.

Fauna: Ephemeral wetland is likely to provide suitable foraging habitat for a number of wader species such as White-faced Heron, Latham's Snipe and the state significant Painted Snipe and Great Egret. This habitat also provides

suitable breeding habitat for a number of frog species such as Brown Tree Frog, Whistling Tree Frog, Spotted Marsh Frog and the regionally significant Common Spadefoot Toad.

Drainage Channel

Corresponding vegetation community: None

Location and Structure: A newly constructed drainage channel runs east-west along the southern boundary of the study area. The channel is approximately 2-3 metres in width and contains flowing water. At present a large proportion of the channels contains no vegetation along its banks. However, the western section of the channel supports dense areas of native (reed and sedge species) and introduced vegetation (Blackberries and Gorse), to a height of approximately 2.5 metres.

Fauna: Areas along the channel, which contain no vegetation are likely to provide very little fauna habitat except for duck species (Pacific Black Duck and Australian Wood Duck) and a foraging point (water source) for introduced species such as Common Starling and Common Myna. Areas where the channel contains vegetation (western section) provide habitat for common bird species such as Golden-headed Cisticola, Red-browed Firetail and Superb Fairy-wren. This area also provides suitable breeding habitat for frog species including Common Froglet, Brown Tree Frog and Spotted Marsh Frog.

Artificial Dams

Corresponding vegetation community: None

Location and Structure: Six small artificial (man made) dams exist in the study area (Figure 2). They all differ in depth and contain a varying degree of fringing and aquatic vegetation, and some have dried up. The edges of some of the dams contain a small amount of material such as rock and logs.

Fauna: The dams are likely to provide a foraging habitat for common birds and suitable breeding habitat for frogs. The regionally significant Eastern Broad-nosed Bat, along with a number of other bat species were caught (in a harp trap) on the banks of the dam (adjacent to the Red Gum Woodland), during a previous survey in 1989 (C. Beardsell pers. comm.).

Introduced pasture:

Corresponding vegetation community: Predominantly Introduced Vegetation

Location and structure: This habitat type typically occurs wherever native vegetation has been completely or substantially removed and replaced with

exotic grass species, and exists over much of the study area. Introduced pasture grass reaches a height of up to 2 metres.

Fauna: Relatively few additional fauna species would be expected to use this habitat type, notable common country birds such as Australian Magpie, Willie Wagtail and Welcome Swallow. Other birds species observed foraging in this habitat include Flame Robin, Red-rumped Parrot, Straw-necked Ibis and White Ibis. Raptors such as Brown Falcon, Nankeen Kestrel and Black-shouldered Kite were also observed foraging over this habitat.

Although this habitat is not considered to support many fauna species, it may act as a broad open space, which allows ground-dwelling fauna to disperse to more optimal habitats.

4.2.3 Habitat Quality

The table below refers to the four habitat types and their respective habitat quality.

Table 2: Fauna habitat types and their quality

Habitat	Habitat quality
Modified Woodland	
Red Gum Woodland	Moderate-High
Manna Gum Woodland	Low-Moderate
Swamp Scrub	Low-Moderate
Wetlands	
Ephemeral wetland	Moderate-High
Drainage channel	Low-Moderate
Artificial dams	Moderate
Introduced Pasture	Low

4.2.4 Hollow-dependant fauna

A large number of native vertebrate species recorded from the local area (from the present survey and Atlas of Victorian Wildlife AVW) are known to use tree hollows. This includes 26 bird species and 10 mammal species (Appendix 3.4).

Some of these species are also considered to be only partially dependent upon tree hollows (Appendix 3.4). That is, a particular species has been known to use tree hollows on occasions for breeding, roosting or other activities, but will also perform these activities in areas away from tree hollows.

A large number of additional native fauna species have a total dependence upon tree hollows are listed in (Appendix 3.4). That is, at least part of the life-cycle of these species is critically linked to the availability of tree hollows; usually for breeding and/or roosting activities. This includes a number of species of ducks, cockatoos, parrots, owls and bats. Trees that are alive or dead throughout the study area provide habitat for at least six native bat species including White-striped Freetail Bat, Lesser Long-eared Bat, Gould's Wattled Bat, Large Forest bat, Little Forest Bat and the regionally sigificant Eastern Broad-nosed Bat (AVW, C. Beardsell pers. comm.). It is highly likely that hollow bearing trees within the study area would provide habitat for the other native bat species.

Trees must reach a certain age before they begin to form hollows suitable for use by fauna. It is thought that the River Red Gums and Coastal Manna Gums, such as those found within the study site, must reach an age of greater than 100-150 years before they begin to form hollows. Therefore, there is a long period between seedling germination and suitable hollow formation. Furthermore, some fauna species will use man-made nest-boxes as an artificial substitute to tree hollows.

There are numerous hollow-bearing eucalyptus within the study area. Many of these trees have multiple hollows of different sizes. The presence of a range of hollow sizes can also be an important habitat feature. Hollow-dependent fauna species vary in their requirements for hollows, especially considering the opening size and shape, depth and height from the ground.

The loss of hollow-bearing trees in native forests has been listed as a potentially threatening process under the *Flora and Fauna Guarantee Act 1988*. This site falls under the definition of a native forest provided within the listing for this threatening process. This listing provides recognition that the loss of hollow-bearing trees will have a detrimental impact upon some local fauna species. With the clearance for farming, residential and industrial development that has in the local area large hollow-bearing trees are a scarce commodity.

4.2.5 Significant Fauna

National significance

No species of national conservation significance were recorded during the present assessment. Two species of national significance (Painted Snipe and Australasian Bittern) have previously been recorded from the study area (Brereton *et. al.* unpub. & C Beardsell pers. comm.).

The Atlas of Victorian Wildlife contains recent (post 1970) records of two species (Warty Bell Frog and Yarra Pygmy Perch) of national conservation significance within five kilometres of the study area (Appendix 3.2) (Figure 3).

Painted Snipe *Rostratula benghalensis*

Painted Snipe (vulnerable in Australia, endangered in Victoria) are uncommon summer visitors to Victoria. They are usually found on shallow temporary or infrequently filled wetlands with emergent vegetation. There has been on previous record of this species (1989) within the study area (AVW & C. Beardsell pers. comm). Suitable habitat (ephemeral wetland and artificial dam) exists for this species within the study area.

Australasian Bittern *Botaurus poiciloptilus*

Australasian Bitterns occur through south-eastern and south-western mainland Australia and also Tasmania. This species has narrow habitat preferences, preferring shallow, vegetated freshwater or brackish swamps (Garnett and Crowley 2000). For breeding they typically require areas with small and tall sedges. However, for foraging activities they will feed in more open vegetation (Garnett and Crowley 2000). There has been one previous record of this species from just outside the study area in a wet drainage channel adjacent to the rail line (C. Beardsell pers. comm.). There is marginal habitat for this species within the study area.

Warty Bell Frog *Litoria raniformis*

The Warty Bell Frog is largely associated with permanent water bodies - streams, lagoons, farm dams and old quarry sites (Cogger 2000). However, this species may be found occasionally in ephemeral wetlands. The species is largely aquatic, preferentially inhabiting vegetation and debris within or at the edges of water bodies. Breeding usually extends from August through to April the following year when the males can be heard calling (Hero et al. 1991).

There has been a noticeable decline in this species throughout its range in south-eastern Australia over the past decade. In particular, this species is known to have entirely disappeared from many localities from which it was

previously known (Tyler 1997). The AVW contains one previous records (most recent in 1970) of this species 7.2 kilometres south east of Dingley. Although the study area contains wetland habitats (artificial dam, ephemeral wetland and drainage channel) the Warty Bell Frog is unlikely to use habitat resources within the study area.

Yarra Pygmy Perch *Edelia obscura*

This species has been recorded from all coastal systems in Victoria west of Frankston to just over the border in Bool Lagoon, South Australia (McDowall, 1996). It inhabits well-vegetated streams and is usually found in small groups, often mixed with Southern Pygmy Perch *Nannoperca australis*, but seem to prefer slightly stronger flows (McDowall, 1996). There is no suitable habitat for this species within the study area.

State significance

No fauna species of state conservation significance were recorded during the present survey.

From the Atlas of Victorian Wildlife database, 17 species of state conservation significance have been recorded from the local area (Appendix 3.2) (Figure 3). Of these species of state conservation significance:

- Baillon's Crake and Lewin's Rail have both been recorded on one occasion (1972) from within the local area. These species generally inhabit dense vegetation (reed beds, etc) in wet areas often on swamp edges. The low-lying (often-inundated) areas within the study area may occasional provide suitable habitat for these species. However, there is no important or limiting habitat for either of these species.

- Six duck or geese species (Australian Shoveller, Freckled Duck, Hardhead, Blue-billed Duck, Musk Duck and Cape Barren Goose) for which there is no suitable habitat.

- Two are waterbird species (Glossy Ibis, Royal Spoonbill), for which there is very little habitat for either of these species. These two species may use wetland and wet depressions within the study area (during flooding) for foraging activities on rare occasions.

- Three are egret species including Great Egret, Little Egret and Intermediate Egret. Although there is suitable habitat for these species in areas during periods of inundation (particularly for the Great Egret) there is no breeding or important foraging habitat for any of these species.

- One tern species (Caspian Tern), which has been recorded once (1972)

within the local area. This species prefers coastal and marine habitats, but is occasionally recorded in close proximity to wetlands inland from the coast. This species may occasional fly over the study area.

- An additional three fauna species (Black Falcon, Grey Crowned-Babbler, Yellow-bellied Glider) for which there is currently no suitable habitat.

Overall, the study area is unlikely to provide important or limiting habitat for any of these state significant fauna species.

Regional significance

No fauna species of regional conservation significance were recorded during the present survey.

At least five species of regional conservation significance have previously been recorded from the study area (C. Beardsell & D. Cook pers comm). These include Dollarbird, Barn Owl, Common Spadefoot Toad, Lathams Snipe and Eastern Broad-nosed Bat. All of these regionally significant species, with the exception of Dollarbird and Latham's Snipe are likely to be resident within the study area. Dollarbird has been observed over the past couple of years using woodland habitats (D. Cook pers. comm), while Latham's Snipe is a summer migrant to Victoria from breeding grounds in Japan, and is likely to visit the study area on an occasional basis.

A further 30 species previously recorded within the local area (5 kilometres surrounding the study area) are considered to be of regional conservation significance (AWV). These species are listed in Appendix 3.2.

A number of these regionally significant fauna species may occasionally use habitat within the study area, either on an irregular or an uncommon basis.

Local significance

All other native fauna species recorded within the vicinity of the study area are of at least local conservation significance. A high diversity of locally common bird species were recorded during the present survey.

Migratory and Marine Birds

Seven bird species listed as 'migratory' (Silver Gull, Pacific Black Duck, Australian Wood Duck, Masked Lapwing, Brown Goshawk, Brown Falcon, Black-shouldered Kite and Nankeen Kestrel), and one 'marine' species (Silver Gull) under the EPBC Act 1999 were recorded from the study site during the present assessment. An additional 48 bird species listed as 'migratory' and nine species listed as 'marine' under this Act have previously been recorded from the

local area (Appendix 3.3). Although all of these species could visit parts of the study area on a regular, rare or vagrant basis, the study area does not provide important or limiting habitat for any of them.

The list of migratory species under the EPBC Act is a compilation of species listed under three international conventions: China-Australia Migratory Bird Agreement (CAMBA), Japan-Australia Migratory Bird Agreement (JAMBA) and the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention).

5.0 CONSERVATION SIGNIFICANCE

On the basis of the available information conservation significance for flora and fauna values has been assigned (Figure 2). Due to the modified nature of some of the study area, specific areas of conservation significance have been identified. The Plains Grassy Woodland within the triangular woodland is considered to be of State conservation significance. The large area of woodland in the south is considered to be of at least High Regional conservation significance, possibly of State conservation significance. The remnant patches of Plains Grassy Wetland are considered to be of State conservation significance, as they are considered to be greater than 1% in area of all that remains of this vegetation community in Victoria. The remaining areas of woodland, Swamp Scrub and scattered isolated River Red Gums vary between High Local and Local conservation significance. The remainder of the study site has negligible conservation significance. The conservation significance of the study area is assigned for the following reasons:

- The presence of one FFG listed community, Herb-rich Plains Grassy Wetland (West Gippsland).
- The presence of one state significant flora species, Studley Park Gum.
- The potential occurrence of several flora species of national and state significance (see Section 4.1.2).
- The additional presence of two endangered (Plains Grassy Woodland and Swamp Scrub) and one most likely rare (Heathy Woodland) EVC in the Bioregion, within the study area.
- Two fauna species of national (Painted Snipe and Australasian Bittern) and at least five fauna species (Eastern Broad nosed Bat, Latham's Snipe, Barn Owl, Dollarbird and Common Spadefoot) of regional conservation significance have previously been recorded from the study area.
- Provides potential habitat for a number of additional significant fauna species.
- Parts of the site have been previously assessed as being of state and regional conservation significance (See Section 5.1).
- The presence of at least twenty flora species of regional conservation significance (see Table 1).
- The habitat value of the larger woodland and wetland areas area considered to be moderate to high.
- The woodland habitat contains a number of mature hollow-bearing eucalypts.

5.1 Previous Assessments

A large area, including the swampy areas in the study area, the Plains Grassy Woodland west of the railway reserve and the Plains Grassy Woodland east of

the rail track are recognised as a site of state zoological conservation significance (Brereton *et. al.* unpub.) During this previous assessment in 1989 of the Lyndhurst Red Gum Swamp, up to 70 Latham's Snipe were recorded, believed to be the largest population recorded in south eastern Melbourne. Other significant fauna values noted from the site include four native bat species (trapped a the small dam in the study area), the state significant Painted Snipe, and although parts of the Lyndhurst Swamp to the east of the sudy areas has been disturbed the study area is still likely to provide habitat for these species.

Part of the study area, south of Abbotts Road, is included in a much larger site of regional significance (for both flora and fauna) described in a study of sites of ecological significance in the south-east of Melbourne (Cook in prep.b). The significant site comprises wetland vegetation east of the Dandenong-Cranbourne railway line, including part of the study area, the western side of the rail reserve, and the Red Gum woodland west of the railway line and south of Abbotts Road.

Cook (in prep.a) has documented sites of ecological significance, of grasslands, grassy woodlands and grassy wetlands on the west gippsland plains, and lists the Abbots Road woodland as being of State conservation significance.

As described above the Mills property has previously been surveyed and was described as having negligible conservation significance, apart from the scattered mature River Red Gums (Mueck 1999).

6.0 IMPLICATIONS OF LEGISLATION AND GOVERNMENT POLICY

The relevant biodiversity legislation is as follows:

Environment Protection and Biodiversity Conservation Act 1999 (Cwlth)

No flora, fauna or ecological community listed under Commonwealth legislation (EPBC Act) were recorded from the study area. One plant species listed under this Act, River Swamp Wallaby-grass *Amphibromus fluitans* (Vulnerable), has previously been recorded and most likely still occurs within the study area. One plant species listed under this Act, Swamp Everlasting *Bracteantha palustris* (Vulnerable), has been recorded from the local area and may potentially occur within the study site.

Two fauna species listed under the EPBC Act have previously been recorded within the local area (Painted Snipe and Australasian Bittern), and suitable habitat still exists. The AVW has 2 records (Warty Bell Frog and Yarra Pygmy Perch) of species listed under the Act from the local area, but neither would be expected to use the study site.

Based on current information, a referral under the EPBC Act should be considered before any proposed development of the site.

Flora and Fauna Guarantee Act 1988 (Vic.)

No flora and fauna listed as threatened under State legislation (FFG Act) were recorded from the study area. One flora community, Herb-rich Plains Grassy Wetland (West Gippsland) is listed as threatened under State legislation (FFG Act) was recorded from the study area.

Eleven fauna species (listed in Table A3.2) listed under the FFG Act have been previously recorded from the local area (AVW). The study area only provides suitable habitat for the Australasian Bittern.

The loss of hollow-bearing trees is considered a threatening process listed under the FFG Act (No. 100).

Permits are required to take listed taxa or communties under the FFG Act, however, in most instances this applies only to public land. Therefore the proposed development is unlikely to require a FFG Act permit.

Planning and Environment Act 1987 (Vic.)

A planning permit is required under the *Planning and Environment Act 1987* to remove, lop or destroy native vegetation on a landholding of more than 0.4 hectares, unless certain exemptions apply. NRE is a mandatory referral

authority for applications to clear 10 or more hectares of native vegetation.

As there is indigenous vegetation present on the site, a permit to clear native vegetation is therefore required under the *Planning and Environment Act 1987*.

State Government Policy

The State Government is developing new policies on native vegetation protection in Victoria. Where removal of remnant native vegetation is proposed, the 'no net loss' goal of the *Victorian Biodiversity Strategy* (NRE 1997) and the updated 'net gain' goal of the *Draft Native Vegetation Management Framework* (NRE 2000c) are relevant. The primary goal of the Draft Framework policy is to ensure that there is 'a reversal, across the entire landscape, of the long-term decline in the extent and quality of native vegetation, leading to a Net Gain'. The Draft Framework refers to gains in terms of extent and quality. Currently the 'no net loss' goal is government policy, but some government agencies are considering 'net gain' when reviewing any proposed vegetation disturbance.

Gains in extent include:

- New areas of revegetation primarily for biodiversity conservation.
- New areas of revegetation for land protection or greenhouse which have included sufficient locally indigenous species to be considered part of the native vegetation estate.

Gains in quality include:

- Improved management of threatening processes within existing native vegetation through voluntary efforts.
- Improved management of threatening processes within existing native vegetation through funded projects.
- Supplementary plantings into depleted existing native vegetation.

The simplest measure of what is lost and what gain is required for mitigation would be the area of habitat lost. However, the no net loss strategy does not only refer to area but also to quality. This information is useful to identify opportunities for improvement to habitat through appropriate management. Such improvements would increase the overall "carrying capacity" of those habitats in terms of the levels of biodiversity that they can support.

The measure of "carrying capacity" proposed is called the *habitat-hectare*. Indicators of habitat quality have been selected, and values assigned which are able to evaluate the extent and quality (in habitat-hectares) of vegetation that is lost, and to estimate potential gains in vegetation quality that can be used to off-set losses (See Appendix 4 for a more detailed explanation).

See below for habitat hectare calculations for the study area (Section 6.1).

The state policy emphasises the need to maximise the retention of native vegetation and protect threatened species. Bearing this in mind, as much remnant vegetation on site should be retained and incorporated into public open space or sensitive urban design, if this is not achievable then the effectiveness for the study area to function as an important and viable wildlife corridor is threatened.

In line with the *Draft Native Vegetation Management Framework* (NRE 2000c) is the *Draft Port Phillip and Westernport Native Vegetation Plan* (NRE 2000d), which is a guide for local government in assessing applications for native vegetation removal and net gain requirements and in determining permit conditions.

Port Phillip and Westernport Draft Native Vegetation Plan (NRE 2000d)

This document has been prepared to develop a strategic and co-ordinated approach to the problem of the continuing decline in quantity and quality of native vegetation throughout the Port Phillip and Westernport region.

The Draft Plan summarises the biodiversity values of the region, and provides guidance to local government on how clearing applications should be assessed, based on regional priorities.

Native vegetation in the local area has a 'very high priority' for retention in the Draft Native Vegetation Plan (Map 25) (NRE 2000d). The Plan proposes that applications for clearing in this area be refused except for projects of statewide importance approved by the Minister. The Draft Native Vegetation Plan is proposed and is not existing Government policy, but does indicate the environmental significance of vegetation in the region and the State Government's intention to protect what remains.

6.1 Habitat hectare calculations

The habitat scores and habitat-hectare values have been calculated for areas of remnant native vegetation and are listed in the tables below. The habitat-hectare values are calculated for each EVC with a specific vegetation condition (habitat score), and totalled for each EVC. Small areas, such as the farm dams and isolated trees are not included in these calculations. Furthermore, the large areas of predominantly introduced vegetation are also not considered in these calculations.

Table 3: Habitat scores

Site	EVC type	L tree	Tree C	Under	Recruit	Weed	Litter	Log	Patch	Neigh	Dist	Hab Score	Standard -ised
1	PGW	3	3	5	3	0	3	0	1	0	0	18.0	
2	SS	0	0	10	6	4	0	0	1	0	0	21.0	26.2
3	PGW	5	0	5	3	0	0	0	1	0	0	14.0	
4	HW	5	3	5	3	2	0	0	1	0	0	19.0	
5	HW	5	3	10	6	5.5	0	0	1	0	0	30.5	
6	HW	0	3	5	3	2	0	0	1	0	0	14.0	
7	PGW	8	3	10	6	2	3	0	6	1.2	0	39.2	
8	PGW	8	3	10	3	5.5	0	0	6	1.2	0	36.7	
9	GWe	0	0	10	0	2	0	0	1	0.3	0	13.3	20.5

Shortened headings include, Large Trees, Tree Cover, Understorey, Recruitment, Cover of Weeds, Organic Litter, Logs, Patch Size, Neighbourhood, Distance to Core Area, Habitat Score and Standardised Habitat Score, respectively.
PGW = Plains Grassy Woodland, SS = Swamp Scrub, HW = Heathy Woodland
GWe = Plains Grassy Wetland. See Figure 2 for locations of these EVCs.

Based on the above habitat score calculations the habitat hectare values of the study area can be determined. The relevant areas of native vegetation are multiplied by the habitat score, and the habitat hectare values for each EVC are calculated and listed in the table below.

Table 4: EVC types within the study area and their habitat hectare value

EVC type	EVC name	Area	Habitat Score	Habitat Hectare Value
PGW	Plains Grassy Woodland	0.3	18/100	0.05
	Plains Grassy Woodland	0.9	14/100	0.13
	Plains Grassy Woodland	13.21	39.2/100	5.18
	Plains Grassy Woodland	12.2	36.7/100	4.48
SS	Swamp Scrub	0.19	26.2/100	0.05
HW	Heathy Woodland	0.42	19/100	0.08
	Heathy Woodland	5.4	30.5/100	1.65
	Heathy Woodland	1.62	14/100	0.23
GWe	Plains Grassy Wetland	1.37	20.5/100	0.28

See Figure 2 for locations of these EVCs.

Therefore there are a total of 9.84 habitat hectares of Plains Grassy Woodland (4.48 hh in triangular woodland), 1.96 habitat hectares of Heathy Woodland, 0.05 habitat hectares of Swamp Scrub and 0.28 habitat hectares of Plains Grassy Wetland within the study site.

7.0 POTENTIAL IMPACTS & MITIGATION MEASURES

7.1 Potential Impacts of Development

The proposed development within the DPOS1, excluding the operational Landfill site, would have varying impacts on the flora and fauna values of the site. There would be removal of remnant vegetation and habitat from the study area and this would be an impact on biodiversity at the State, regional and local level. However, within areas of predominantly introduced vegetation, there would be negligible impacts from development. Furthermore there is likely to be no direct impacts on the the triangular remnant of woodland as this area is proposed to be retained and managed (Fred Krumins pers. comm.).

Potential direct impacts include:

- Depletion of populations of national, state and regionally significant flora. Most locally significant flora would be similarly affected.
- Decrease in available fauna habitat, particularly within the woodland habitat in the south of the study area.
- The likely removal of a number of large hollow-bearing trees.
- The loss of state significant vegetation communities.

Potential indirect impacts include:

- Increased weed invasion/degradation of any retained vegetation/habitat due to lower area/perimeter ratios and physical and drainage disturbances.
- Increased mortality for native fauna associated with the loss of suitable habitat.
- The altered hydrology of the wetlands and woodlands, with changes in soil level and drainage.
- Insufficient refuge areas for wildlife during peak flood events.

Viewed in the context of ongoing development in the immediate area and the Gippsland Plain Bioregion, the proposed development will contribute to the cumulative and on-going loss of vegetation and fauna habitat in the local area and bioregion.

7.2 Potential Site Scenarios and Mitigation Measures

Currently just over half of the study area, excluding the Landfill site, has negligible conservation significance and therefore there will be minimal impacts from development on flora and fauna values at these sites. However, based on the current conceptual layout for development in the land north of the Landfill site and the remainder of the site, there will be relatively high impacts on flora and fauna values.

As the overall potential impact depends upon the amount of development on site, there are several strategies that can be investigated in order to determine the level of these impacts. These are discussed below and general mitigation strategies follow.

7.2.1 Site scenarios and implications

Retain all native vegetation

If all the native vegetation remnants on site are retained and managed, and the development is located within areas of negligible conservation significance, the impacts on flora and fauna values will be reduced significantly. There would also be no loss of habitat hectares.

Clearing of all the native vegetation

If the site was cleared completely, excluding both the Landfill site and the triangular woodland area, the impacts on flora and fauna values would be relatively high. These impacts could be reduced by managing the retained triangular woodland and salvaging/translocating flora species for any revegetation works. Generally landscape plantings have a minimal effect on the reduction of impacts. The impact in terms of habitat hectares would be the most significant if all the native vegetation was cleared, as there would be a loss of 7.65 habitat hectares.

Management of the woodland

Managing the triangular woodland area would involve developing an ecological management plan. This would include an environmental weed management plan and a strategy to allow for natural regeneration. If natural regeneration was poor revegetation may be considered, with plants propagated from site indigenous material.

In terms of habitat hectare assessment, managing modified vegetation remnants in order to enhance their flora and fauna values will generally result in a

habitat score increase of approximately 15/100 over a ten year period, with a solid commitment and with the work undertaken by an experienced bushland regenerator (Hill 2002a, Hill 2002b, Hill 2002c). Therefore for the site, a loss of 7.65 habitat hectares, would require management of an area of modified native vegetation of approximately 50 hectares, of a similar or threatened EVC. The triangular woodland area is only 12 hectares and therefore additional off site areas may be required for management. Any discussions about 'off sets' in terms of habitat hectares should be undertaken with NRE.

Salvage translocation

The salvage/translocation strategy is a rather detailed, time consuming, costly and satisfactory techniques are still in their infancy. It depends upon the size of the areas being translocated, the species to be translocated, monitoring, the level of weeds present at both the salvage site and the recipient site and the environmental conditions of the recipient site. Salvage involves the relocation of plants, or new individuals propagated from the salvage site. The relocating of flora species to the recipient site can be achieved by either collecting seed or cuttings from the plant *in situ* (option a) or *ex situ* (option b) and propagating new plants which are then planted or broadcasting the collected seed, or by transplanting the whole plant (including tubers) (option c). Each salvage option is discussed below.

Option a: Collecting seed *in situ* or directly from the plant is feasible once the seed has matured. For most flora species, such as wallaby grasses *Austrodanthonia* spp and Blown grasses *Agrostis* spp, seed release occurs in early to late summer or early autumn. All the dominant and significant flora species should be specifically targeted. However, the greater diversity of plants collected the better.

Option b: The collection of seed from the plant *ex situ*, basically means the seed is collected from the plant which has already been removed from its natural environment, i.e. the plant has been transplanted to a suitable holding facility such as an indigenous nursery and once the seed has been set it can be collected. All the dominant and significant flora species should be specifically targeted. However, the greater diversity of plants collected the better.

From the collected seed, many plants can be propagated, which can then be relocated to an appropriate location, and some of the collected seed could be broadcast over the recipient site.

Option c: Relocating by transplanting the whole plant can be carried out in a number of ways. First, sods of earth that contain the flora species, to a size which can be managed by two people, can be excavated. The sods can then be stored either on site, and/or in a suitable holding facility such as an indigenous

nursery. It is preferable that they are only moved once, and it is important that similar environmental conditions are maintained during their temporary residence, such as hydrological conditions. To aid in the movement of the sods of earth, hessian or a similar material, can be used. Only sods of earth that contain predominantly native flora species should be used, to minimise the problem of weed invasion.

Flora species can be also be salvaged by planting individuals that have been propagated from divisions of the whole plant. Once excavated the parent plant can be propagated vegetatively, and stored in a suitable holding facility, such as an indigenous nursery, until planting. This process can be applied to flora species such as Prickfoot *Eryngium vesiculosum* and Poison Pratia *Lobelia pratioides*. Cuttings of plant material can also be collected from the parent plant for many species, for propagation within an indigenous nursery.

There is no one method that will result in all the dominant and significant species being salvaged/transplanted. Therefore, a mix of all of the above options can be used to maximise the range of species collected. Due to the infancy of the habitat hectare assessment procedure, little work has been undertaken on assessing the habitat score of salvaged/translocation sites. It is anticipated that with appropriate management, the site may have a habitat hectare score of between 10/100 and 20/100, as there are many variables, such as weed levels, species diversity, size, recruitment etc., which need to be considered. It is more than likely the score will be less than the salvage site, and therefore a much larger area will be required to off set the loss of habitat hectares. Once again, NRE should be consulted to determine the appropriate strategy.

Retention of some additional significant areas

Apart from the two potential development scenarios mentioned above, there are several other development scenarios that may potentially reduce the overall impacts on flora and fauna values. These include:

- To retain and manage all areas of State conservation significance (ie Plains Grassy Wetland and the triangular woodland). This would result in a loss of 7.37 habitat hectares. Based on these figures approximately 50 hectares of modified native vegetation would have to be managed. Impacts may be reduced by managing the remnants and salvaging/translocating species for revegetation works as described above.

- To retain and manage all areas of State and High Regional conservation significance (ie Plains Grassy Wetland and Plains Grassy Woodland). This would result in a loss of 2.19 habitat hectares. Based on these figures there would be enough modified native vegetation on site to manage to meet the 'off set' requirements. Impacts may be reduced by managing the remnants

and salvaging/translocating species for revegetation works as described above.

- Another scenario which has been suggested by Fred Krumins (pers. comm.), is that the triangular woodland and the Plains Grassy Wetland remnants, apart from the northern most area, be retained and managed. This would result in a loss of 7.43 habitat hectares. Based on these figures approximately 50 hectares of modified native vegetation would have to be managed. Impacts may be reduced by managing the remnants and salvaging/translocating species for revegetation works as described above.

- An additional scenario which incorporates that suggested by Fred Krumins (pers. comm.), is that the triangular woodland and the Plains Grassy Wetland remnants, apart from the northern most area, and the Heathy Woodland on the eastern edge of Taylors Road, be retained and managed. This would result in a loss of 5.9 habitat hectares. Based on these figures approximately 40 hectares of modified native vegetation would have to be managed. Impacts may be reduced by managing the remnants and salvaging/translocating species for revegetation works as described above.

Based on the habitat hectare assessment, most of the options require additional areas to be managed in order to meet the 'no net loss' policy, as relatively large areas of native vegetation are proposed to be disturbed. Any discussions about 'off sets' under the 'no net loss' policy should be undertaken with NRE.

Removal of scattered remnant mature trees

If these trees cannot be retained then in order to reduce the impacts from the loss of mature trees, appropriate numbers (consult with NRE) should be propagated, with material (seeds) obtained from the individuals concerned and planted on site. It should be noted, the retention of a mature tree located between two relatively tall factories, which is therefore isolated, is not really considered to be an appropriate retention strategy and off set plantings may need to be considered.

7.2.2 General Mitigation Measures

Generally to reduce impacts associated with any industrial development the following additional mitigation measures are recommended:

- Sites of conservation significance should be retained, especially the areas of high regional and state significance, to preserve the ecological values of the site.

- The areas of remnant vegetation to be retained should be linked within the site and to any other remnants adjacent to the site i.e. maintain a link across

the site to the triangular woodland.

- Sites to be retained should be fenced prior to construction, to protect them from accidental disturbance.
- The triangular woodland and any other retained areas should be managed for conservation goals, and environmental management plans developed.
- If any areas of conservation significance were to be disturbed a flora survey during an appropriate time of the year, such as after a significant rainfall event during spring or summer should be undertaken.
- Weed control and conservation management of any other retained areas of native vegetation, should be undertaken.
- Hydrological conditions should be maintained in the woodland and wetland remnants i.e. they require periodical flooding.
- Retain indigenous trees where possible within the development.
- Re-establish native vegetation (see next dot point for priorities) to provide fauna habitat and linkages across the site, and consider other opportunities for habitat enhancement such as wetland creation for any retarding basins.
- Revegetation within public open space should use indigenous species and be consistent with existing vegetation. Natural regeneration wherever possible is preferred to planting, since the result is authentic self-sown native vegetation rather than plantations. Planting should be deferred for at least two years within 50 metres of existing indigenous trees and shrubs, and until it is established that natural regeneration is insufficient despite concerted attempts at habitat manipulation to create conditions for seedling establishment and growth.
- Sealed roads should border any areas of remnant vegetation. Roads intercept nutrient-rich runoff from gardens and buildings, reduce the incidence of dumped garden waste, unauthorised plantings and incursions into the reserve, and significantly reduce further weed invasion.

8.0 CONCLUSION

On the basis of the available information conservation significance for flora and fauna values has been assigned (Figure 2). Due to the modified nature of some of the study area, specific areas of conservation significance have been identified. The Plains Grassy Woodland within the triangular woodland is considered to be of State conservation significance. The large area of woodland in the south is considered to be of at least High Regional conservation significance, possibly of State conservation significance. The remnant patches of Plains Grassy Wetland are considered to be of State conservation significance, as they are considered to be greater than 1% in area of all that remains of this vegetation community in Victoria. The remaining areas of woodland, Swamp Scrub and scattered isolated River Red Gums vary between High Local and Local conservation significance. The remainder of the study site has negligible conservation significance.

The proposed development within the DPOS1, excluding the operational Landfill site, would have varying impacts on the flora and fauna values of the site. There would be removal of remnant vegetation and habitat from the study area and therefore this will result in an impact on biodiversity at the State, regional and local level. However, within areas of predominantly introduced vegetation, there would be negligible impacts from development. Furthermore there is likely to be no direct impacts on the the triangular remnant of woodland as this area is proposed to be retained and managed (Fred Krumins pers. comm.).

Currently just over half of the study area, excluding the Landfill site, has negligible conservation significance and therefore there will be minimal impacts from any development on flora and fauna values at these sites. However, based on the current conceptual layout for development in the land north of the Landfill site and the remainder of the site, there will be relatively high impacts on flora and fauna values.

The habitat scores and habitat-hectare values were calculated for areas of remnant native vegetation. In terms of habitat hectare assessment, managing modified vegetation remnants in order to enhance their flora and fauna values will generally result in a habitat score increase. This increase can be used to 'off set' vegetation loss. Any discussions about 'off sets' in terms of habitat hectares should be undertaken with NRE.

APPENDICES

APPENDIX 1

A1. SIGNIFICANCE ASSESSMENT

The common language meaning of significance is 'importance; consequence' (Macquarie Dictionary). While the general meaning of this is clear, in natural resource assessment this meaning needs to be defined in scientific terms.

A1.1 Significant Species and Communities

Species and community conservation significance is defined as follows:

A taxon or community is significant at a particular geographic level (national, state, regional, local) when it is considered to be rare or threatened at that level.

A taxon is an officially recognised species, subspecies or variety of a species (plural: taxa). The significance of a taxon or community is a function of its rarity within a specified geographic context: nation, state, region, local area. In each context a taxon or community has a conservation status: not rare, rare, vulnerable, endangered, extinct. 'Threatened' is a combination of the 'vulnerable' and 'endangered' categories.

The significance of the taxon or community is the largest geographic context in which it is at least rare. For example, if a species is uncommon in a state and rare within a region of that state, it has regional significance within that region.

A1.2 Sites

Site conservation significance is defined as follows:

A site is significant at a particular geographic level (national, state, regional, local) when it is considered to make a substantial contribution to biodiversity at that level.

As a guideline, one per cent of the total extant population of a significant species within a specified geographic area or of the total extant area of a significant ecological community within a specified geographic area is a threshold for 'substantial contribution'. Comprehensive data are not always available for such assessments and interpretation of available data and information is usually required.

In some cases a site may be small when viewed in isolation but it forms an integral and functional part of a larger site of significance. If there is no ecological reason to divide the larger site, then the rating that applies to the larger site applies to the smaller site.

Sites with a particularly high level of local or regional significance are assigned 'high local' or 'high regional' significance, respectively. These terms are not applied to state and national levels of significance or to species and communities.

To determine whether a site makes a 'substantial contribution' to biological conservation, it is assessed against the following criteria:

- Size – overall size of site or habitats/vegetation communities within the site.
- Significant species and populations – number of significant species or populations known or likely to occur on the site.
- Significant habitat or vegetation communities – presence and extensiveness of significant habitats and vegetation communities on the site.
- Ecological integrity – degree of intactness, level of past disturbance (such as weed invasion) and overall condition of vegetation communities on the site.
- Richness and diversity – quantity of species, vegetation communities and habitats.
- Connectivity – Quality and quantity of linkages between site and adjacent areas of native vegetation/habitat (wildlife corridor value).
- Viability – level of existing and/or future disturbances, degree of existing and/or future fragmentation.
- Distribution – proximity of the site to known distribution limits for significant species, populations, habitats and/or vegetation communities.
- Level of conservation – representation of site attributes in conservation reserves.

As a guideline, *one per cent* of the total extant population of a significant species within a specified geographic area or of the total extant area of a significant ecological community within a specified geographic area is a threshold for 'substantial contribution'. Comprehensive data are seldom available and interpretation of limited available data and information is usually required.

A1.3 Scale: Geographic Context

Significance is determined within specified geographic contexts:

- Australia
- State Victoria
- Region Gippsland Plain Bioregion (NRE 1997).
- Local area Lyndhurst (area within five kilometres of the study area)

A1.4 Conservation Status: Degree of Threat

Official government lists define species and communities that are rare or threatened (and thus significant) at *national* and/or *state* levels. Most of these lists appear as schedules under legislation and are followed unless further evidence is available.

Species and communities that are rare or threatened at *regional* and *local* levels are determined from the available literature, data and information, and consultation with relevant individuals where relevant reports and government listings are not available.

National Significance

Species

Species of national significance are either:

- Flora or fauna listed as extinct, extinct in the wild, critically endangered, endangered, vulnerable or conservation dependent under the *Environment Protection and Biodiversity Conservation Act 1999*.
- Flora listed as rare in Australia in *Rare or Threatened Australian Plants* (Briggs and Leigh 1996).
- Fauna listed as extinct, endangered, vulnerable or rare in Australia in an Action Plan published by Environment Australia.

Communities

Ecological communities of national significance are either:

- Listed as critically endangered, endangered or vulnerable under the *Environment Protection and Biodiversity Conservation Act 1999*.
- Considered to be rare or threatened in Australia by Biosis Research using IUCN criteria where applicable (IUCN 2000).

Ecological communities include flora and/or fauna communities.

State Significance

Species

Species of state significance are either:

- Flora or fauna listed as threatened under the *Flora and Fauna Guarantee Act 1988* or with final recommendation for listing by the Scientific Advisory Committee.
- Flora listed as extinct, endangered, vulnerable or rare in Victoria in *Rare or Threatened Vascular Plants in Victoria – 2000* (NRE 2000a).
- Flora listed as poorly known in Australia in *Rare or Threatened Australian Plants* (Briggs and Leigh 1996).
- Fauna listed as extinct, critically endangered, endangered or vulnerable in *Threatened Vertebrate Fauna in Victoria – 2000* (NRE 2000b).
- Fauna listed as poorly known in Australia in an Action Plan published by Environment Australia.

Communities

Ecological communities of state significance are either:

- Listed as threatened under the *Flora and Fauna Guarantee Act 1988*.
- Considered to be rare or threatened in Victoria by Biosis Research using IUCN criteria where applicable (IUCN 2000).

Regional Significance

Species

Species of regional significance are either:

- Flora listed as poorly known in Victoria in *Rare or Threatened Vascular Plants in Victoria – 2000* (NRE 2000a).
- Flora recorded from less than 1% of documented sites (quadrats/defined area lists) from the Gippsland Plain Bioregion in the NRE Flora Information System, unless there is reason to believe they are undersampled in the available data.
- Fauna listed as data deficient or lower risk-near threatened in *Threatened Vertebrate Fauna in Victoria – 2000* (NRE 2000b).
- Fauna considered to be rare or threatened at the bioregional level by Biosis Research using IUCN criteria where applicable (IUCN 2000).

Communities

Ecological communities of regional significance are:

- Listed as an endangered, vulnerable or depleted ecological vegetation class within a particular bioregion in a Draft Native Vegetation Plan (e.g. NRE 2000d).
- Considered to be rare or threatened at the bioregional level by Biosis Research using IUCN criteria where applicable (IUCN 2000).

Local Significance

Species

Species of local significance are:

- Flora or fauna considered to be rare or threatened at the local level by Biosis Research using IUCN criteria where applicable (IUCN 2000).

Communities

Ecological communities of local significance are:

- Considered to be rare or threatened at the local level by Biosis Research using IUCN criteria where applicable (IUCN 2000).

No Significance

Species and ecological communities are not significant when they are considered not to be rare or threatened at any geographic level by Biosis Research using IUCN criteria where applicable (IUCN 2000). Species that are not indigenous to a given study area have no flora significance. Plantings generally have no flora significance but may be significant for fauna.

A1.5 Habitat Assessment

Floristic and structural features of the vegetation form a habitat type, which provides a set of resources to support a community of fauna species. Habitat types correspond broadly to vegetation communities. Lines drawn

around these habitats do not represent rigid boundaries, as many species move between habitats or utilise more than one habitat according to changing conditions or seasons.

The value of a habitat will assist in the final determination of significance. This is determined by a number of features, including:

- Habitat status
- Size/connectivity
- Condition
- Significant species
- Other features

Three categories are used to evaluate habitat value:

High: Ground flora containing a high number of indigenous species; vegetation community structure, ground, log and litter layer intact and undisturbed; a high level of breeding, nesting, feeding and roosting resources available; a high richness and diversity of native fauna species.

Moderate: Ground flora containing a moderate number of indigenous species; vegetation community structure, ground log and litter layer moderately intact and undisturbed; a moderate level of breeding, nesting, feeding and roosting resources available; a moderate richness and diversity of native fauna species.

Low: Ground flora containing a low number of indigenous species, vegetation community structure, ground log and litter layer disturbed and modified; a low level of breeding, nesting, feeding and roosting resources available; a low richness and diversity of native fauna species.

Other habitat features, such as its value as a habitat corridor, or the presence of remnant communities, or unusual ecology or community structure, may also be used to assess habitat quality.

APPENDIX 2

A2. FLORA RESULTS

Table A2.1: Plant species recorded from the study site.

Plant names (taxonomy) follows Ross (2000).

Significance:

- e **Endangered in the State (NRE 2000a)**
- R **regional**
- r **not considered to be genuinely rare in the bioregion**

Note: **All indigenous species have at least local significance**

Significance	Scientific Name	Common Name
Indigenous Species		
	Acacia melanoxylon	Blackwood
	Acacia oxycedrus	Spike Wattle
	Acacia paradoxa	Hedge Wattle
	Agrostis avenacea	Common Blown-grass
R	*Alternanthera denticulata s.l.*	Lesser Joyweed
	Amperea xiphoclada var. *xiphoclada*	Broom Spurge
R	*Amphibromus nervosus*	Common Swamp Wallaby-grass
R	*Austrodanthonia duttoniana*	Brown-back Wallaby-grass
R	*Austrodanthonia geniculata*	Kneed Wallaby-grass
	Austrodanthonia racemosa var. *racemosa*	Stiped Wallaby-grass
	Austrostipa spp.	Spear-grass
R	*Azolla filiculoides*	Pacific Azolla
R	*Carex inversa*	Knob Sedge
	Centella cordifolia	Centella
R	*Crassula helmsii*	Swamp Crassula
R	*Dianella longifolia* var. *longifolia*	Pale Flax-lily
R	*Eleocharis acuta*	Common Spike-sedge
r	*Epilobium billardierianum*	Variable Willow-herb
r	*Epilobium hirtigerum*	Hairy Willow-herb
R	*Eryngium vesiculosum*	Prickfoot
	Eucalyptus camaldulensis	River Red-gum
R	*Eucalyptus microcarpa*	Grey Box
	Eucalyptus ovata	Swamp Gum
	Eucalyptus viminalis ssp. *pryoriana*	Coast Manna-gum
e	*Eucalyptus* X *studleyensis*	Studley Park Gum
	Geranium spp.	Crane's Bill
	Gonocarpus tetragynus	Common Raspwort
R	*Hemarthria uncinata* var. *uncinata*	Mat Grass
	Hibbertia fasciculata var. *prostrata*	Bundled Guinea-flower
R	*Isolepis inundata*	Swamp Club-sedge

R	*Juncus amabilis*	Hollow Rush
R	*Juncus holoschoenus*	Joint-leaf Rush
	Juncus pallidus	Pale Rush
r	*Juncus pauciflorus*	Loose-flower Rush
r	*Juncus sarophorus*	Broom Rush
	Juncus spp.	Rush
	Lepidosperma concavum	Sandhill Sword-sedge
	Leptospermum continentale	Prickly Tea-tree
R	*Lobelia pratioides*	Poison Lobelia
	Lomandra filiformis	Wattle Mat-rush
	Lomandra longifolia	Spiny-headed Mat-rush
r	*Lythrum hyssopifolia*	Small Loosestrife
	Microlaena stipoides var. *stipoides*	Weeping Grass
	Melaleuca ericifolia	Swamp Paperbark
R	*Muellerina eucalyptoides*	Creeping Mistletoe
R	*Myriophyllum crispatum*	Upright Water-milfoil
R	*Neopaxia australasica*	White Purslane
	Oxalis exilis	Shady Wood-sorrel
R	*Persicaria decipiens*	Slender Knotweed
	Poa spp.	Tussock-grass
	Pteridium esculentum	Austral Bracken
	Senecio glomeratus	Annual Fireweed
R	*Senecio quadridentatus*	Cotton Fireweed
R	*Solanum laciniatum*	Large Kangaroo Apple
R	*Thelionema caespitosum*	Tufted Lily
R	*Trachymene anisocarpa*	Parsnip Trachymene
r	*Typha* spp.	Cumbungi

Introduced Species

Acetosella vulgaris	Sheep Sorrel
Agrostis capillaris	Brown-top Bent
Anthoxanthum odoratum	Sweet Vernal-grass
Arctotheca calendula	Cape Weed
Briza maxima	Large Quaking-grass
Bromus catharticus	Prairie Grass
Callitriche stagnalis	Common Starwort
Cirsium vulgare	Spear Thistle
Cotula coronopifolia	Water Buttons
Cynodon dactylon	Couch
Cyperus eragrostis	Drain Flat-sedge
Cyperus tenellus	Tiny Flat-sedge
Ehrharta erecta	Panic Veldt Grass
Ehrharta longiflora	Annual Veldt Grass
Genista linifolia	Genista
Helminthotheca echioides	Ox-tongue
Holcus lanatus	Yorkshire Fog
Hypochoeris radicata	Cat's Ear
Lagurus ovatus	Hare's Tail
Leontodon taraxacoides ssp. *taraxacoides*	Hairy Hawkbit
Lilaea scilloides	Lilaea

Lolium spp.	Rye-grass
Lotus suaveolens	Hairy Bird's-foot Trefoil
Melaleuca spp.	Honey-myrtle
Mentha pulegium	Pennyroyal
Paspalum dilatatum	Paspalum
Paspalum distichum	Water Couch
Pennisetum clandestinum	Kikuyu
Plantago lanceolata	Ribwort
Romulea rosea	Onion Grass
Rosa rubiginosa	Sweet Briar
Rubus fruticosus spp. agg.	Blackberry
Rumex spp.	Dock
Solanum nigrum s.l.	Black Nightshade
Sonchus oleraceus	Common Sow-thistle
Sporobolus africanus	Rat-tail Grass
Trifolium fragiferum var. *fragiferum*	Strawberry Clover
Ulex europaeus	Gorse
Vellereophyton dealbatum	White Cudweed
Vulpia spp.	Fescue

APPENDIX 3

A3.1. FAUNA RESULTS

Table A3.1. Terrestrial vertebrate fauna observed within the Lyndhurst study area during the present assessment.

Notes to table:

Significance of species is designated by:

N	National
S	State
R	Regional
L	Local
*	Introduced

Type of record:

H	heard
S	seen
T	trapped
I	Incidental (scat, fur, bones)

Status	Common Name	Scientific Name	Type of record
	Mammals		
L	Common Brushtail Possum	*Trichosurus vulpecula*	S
*	European Rabbit	*Oryctolagus cuniculus*	S
*	Red Fox	*Canis vulpes*	S
	Birds		
L	Australian Pelican	*Pelecanus conspicillatus*	S
L	Silver Gull	*Larus novaehollandiae*	S
L	Masked Lapwing	*Vanellus miles*	S
L	Australian White Ibis	*Threskiornis molucca*	S
L	Straw-necked Ibis	*Threskiornis spinicollis*	S
L	White-faced Heron	*Egretta novaehollandiae*	S
L	Australian Wood Duck	*Chenonetta jubata*	S
L	Pacific Black Duck	*Anus superciliosa*	S
L	Brown Goshawk	*Accipiter fasciatus*	S
L	Black-shouldered Kite	*Elanus axillaris*	S
L	Brown Falcon	*Falco berigora*	S
L	Nankeen Kestrel	*Falco cenchroides*	S
L	Eastern Rosella	*Platycercus eximius*	S
L	Red-rumped Parrot	*Psephotus haematonotus*	S
L	Fan-tailed Cuckoo	*Cacomantis flabelliformis*	S

Status	Common Name	Scientific Name	Type of record
L	Welcome Swallow	*Hirundo neoxena*	S
L	Grey Fantail	*Rhipidura fulignosa*	H
L	Willie Wagtail	*Rhipidura leucophrys*	S
L	Grey Shrike-thrush	*Colluricincla harmonica*	S
L	Magpie-lark	*Grallina cyanoleuca*	S
L	Flame Robin	*Petroica phoenicea*	S
L	Brown Thornbill	*Acanthiza pusilla*	A
L	Golden-headed Cisticola	*Cisticola exilis*	S
L	Superb Fairy-wren	*Malurus cyaneus*	S
L	Dusky Woodswallow	*Artamus cyanopterus*	S
L	Mistletoebird	*Dicaeum hirundinaceum*	S
L	Silvereye	*Zosterops lateralis*	S
L	White-plumed Honeyeater	*Lichenostomus penicillatus*	S
L	Noisy Miner	*Manorina melanocephala*	S
L	Red Wattlebird	*Anthochaera carunculata*	S
L	Little Wattlebird	*Anthochaera chrysoptera*	S
L	Red-browed Finch	*Neochmia temporalis*	S
L	Australian Magpie	*Gymnorhina tibicen*	S
*	Spotted Turtle-dove	*Streptopelia chinensis*	S
*	Common Blackbird	*Turdus merula*	S
*	House Sparrow	*Passer domesticus*	S
*	European Goldfinch	*Carduelis carduelis*	S
*	Common Starling	*Sturnus vulgaris*	S
*	Common Myna	*Acridotheres tristis*	S
	Reptiles		
L	Garden Skink	*Lampropholis guichenoti*	T
L	Weasel Skink	*Saproscincus mustelinus*	T
	Amphibians		
L	Common Froglet	*Crinia signifera*	H
L	Southern Brown Tree Frog	*Litoria ewingii*	H
L	Spotted Marsh Frog	*Limnodynastes tasmaniensis*	T
L	Whistling Tree Frog	*Litora verreauxii*	T

A3.2. SIGNIFICANT FAUNA SPECIES

Table A3.2. Vertebrate fauna species recently (post 1970) recorded by AVW within the vicinity of the study area that satisfy the criteria for national or state significance .

Significance of species is designated by:

N	National
S	State
R	Regional

Status of species is designated by:

CEn	critically endangered
End	endangered
Vul	vulnerable
LR	lower risk-near threatened
Ins	Insufficiently known
L	Listed under FFG Act
Mi	migratory species listed under the EPBC Act
Ma	marine species listed under the EPBC Act

Sources used to derive species status

NRE	Threatened Vertebrate Fauna in Victoria (NRE 2000b).
FFG	*Victorian Flora and Fauna Guarantee Act 1988*
EPBC	*Environment Protection and Biodiversity Conservation Act 1999*
Act Pl	Action Plans (Maxwell et al.1996 for marsupials and monotremes, Garnett and Crowley 2000 for birds, Cogger et al.1993 for reptiles, Tyler 1997 for amphibians)

Common Name	Scientific Name	NRE 2000b	FFG Act	EPBC Act	Action Plan	Status	Likely use of the study are
Mammals							
Yellow-bellied Glider (southern subspecies)	*Petaurus australis*	-	-	-	LR	S	Unlikely
Eastern Broad-nosed Bat	*Scotorepens orion*	-	-	-	-	R	Possible resider
Water Rat	*Hydromys chrysogaster*	-	-	-	-	R	Unlikely
Birds							
Brown Quail	*Coturnix ypsilophora*	Ins	-	-	-	R	Rare visitor
Lewin's Rail (eastern)	*Rallus pectorolis*	End	L	-	LR	S	Unlikely
Buff-banded Rail	*Gallirallus philippensis*	-	-	-	-	R	Unlikely
Baillon's Crake	*Porzana pusilla*	Vul	-	-	-	S	Unlikely
Pied Cormorant	*Phalacrocorax varius*	-	-	Ma	-	R	Unlikely

Darter	*Anhinga melanogaster*	-	-	-	-	R	Unlikely
White-winged Black Tern	*Chlidonias leucopterus*	-	-	Ma	-	R	Unlikely
Whiskered Tern	*Chlidonias hybridus*	LR	-	Ma	-	R	Unlikely
Caspian Tern	*Sterna caspia*	Vul	L	Mi/Ma	-	S	Unlikely
Pacific Gull	*Larus pacificus*	LR	L	Ma	-	R	Occasional visitor
Banded Lapwing	*Vanellus tricolor*	-	-	Mi	-	R	Rare visitor
Banded Stilt	*Cladorhynchus leucocephalus*	-	-	Mi	-	R	Unlikely
Red-necked Avocet	*Recurvirostra novaehollandiae*	-	-	Mi	-	R	Unlikely
Eastern Curlew	*Numenius madagascariensis*	-	-	Mi	-	R	Unlikely
Black-tailed Godwit	*Limosa limosa*	-	-	Mi	-	R	Unlikely
Wood Sandpiper	*Tringa glareola*	-	-	Mi	-	R	Unlikely
Common Sandpiper	*Actitis hypoleucos*	-	-	Mi	-	R	Unlikely
Marsh Sandpiper	*Tringa stagnatilis*	-	-	Mi	-	R	Unlikely
Australasian Bittern	*Botaurus poiciloptilus*	End	L	-	Vul	N	Rare visitor
Latham's Snipe	*Gallinago hardwickii*	-	-	Mi	-	R	Regular visi
Painted Snipe	*Rostratula benghalensis*	End	-	Mi	Vul	N	Rare visitor
Glossy Ibis	*Plegadis falcinellus*	Vul	-	-	-	S	Rare visitor
Royal Spoonbill	*Platalea regia*	Vul	-	-	-	S	Rare visitor
Little Egret	*Egretta garzetta*	Cen	L	-	-	S	Unlikely
Intermediate Egret	*Ardea intermedia*	Cen	L	-	-	S	Unlikely
Great Egret	*Ardea alba*	End	L	Mi	-	S	Occasional visitor
Cape Barren Goose	*Cereopsis novaehollandiae*	Vul	-	-	-	S	Unlikely
Australasian Shoveler	*Anas rhynchotis*	Vul	-	Mi	-	S	Unlikely
Pink-eared Duck	*Malacorhynchus membranaceus*	-	-	Mi	-	R	Unlikely
Freckled Duck	*Stictonetta naevosa*	End	L	Mi	-	S	Unlikely
Hardhead	*Aythya australis*	Vul	-	Mi	-	S	Unlikely
Blue-billed Duck	*Oxyura australis*	Vul	-	Mi	-	S	Unlikely
Musk Duck	*Biziura lobata*	Vul	-	Mi	-	S	Unlikely
Spotted Harrier	*Circus assimilis*	-	-	Mi	-	R	Rare visitor
Collared Sparrowhawk	*Accipiter cirrhocephalus*	-	-	Mi	-	R	Occasional visitor
Little Eagle	*Hieraaetus morphnoides*	-	-	Mi	-	R	Occasional visitor
Letter-winged Kite	*Elanus scriptus*	-	-	Mi	-	R	Vagrant visitor
Peregrine Falcon	*Falco peregrinus*	-	-	Mi	-	R	Occasional visitor
Black Falcon	*Falco subniger*	End	-	Mi	-	S	Vagrant visitor
Barn Owl	*Tyto alba*	-	-	-	-	R	Likely resident
Dollarbird	*Eurystomus orientalis*	-	-	-	-	R	Likely visitor
Little Corella	*Cacatua sanguinea*	-	-	-	-	R	Rare visitor

Long-billed Corella	*Cacatua tenuirostris*	-	-	-	-	R	Rare visitor
Blue-winged Parrot	*Neophema chrysostoma*	-	-	-	-	R	Occasional visitor
Grey-crowned Babbler	*Pomatostomus temporalis*	End	L	-	LR	S	Unlikely
Weebill	*Smicrornis brevirostris*	-	-	-	-	R	Rare visitor
Brown Songlark	*Cincloramphus cruralis*	-	-	-	-	R	Occasional visitor
Rufous Songlark	*Cincloramphus mathewsi*	-	-	-	-	R	Occasional visitor
Long-toed Stint	*Calidris subminuta*	Ins	-	-	-	R	Unlikely
Pectoral Sandpiper	*Calidris melanotos*	Ins	-	-	-	R	Unlikely
Frogs							
Common Spadefoot Toad	*Neobatrachus sudelli*	-	-	-	-	R	Likely resident
Warty Bell Frog	*Litoria raniformis*	Vul	L	Vul	Vul	N	Unlikely
Fish							
Yarra Pygmy Perch	*Edelia obscura*	LR	L	-	Vul	N	Unlikely

Note: Bold indicates that it has previously been recorded from the study area (Beardsell &Cook pers. comm.)

A3.3. MIGRATORY AND MARINE SPECIES

Table A3.3. Fauna species listed as migratory or marine under the EPBC Act that have been recently (post 1970) recorded from the vicinity of the study area (Atlas of Victorian Wildlife).

Species denoted in bold were recorded within the study area during the present assessment.

Mi – migratory species listed under the EPBC Act

Ma – marine species listed under the EPBC Act

Common Name	Scientific Name	Mi/Ma
Great Cormorant	*Phalacrocorax carbo*	Ma
Little Black Cormorant	*Phalacrocorax sulcirostris*	Ma
Pied Cormorant	*Phalacrocorax varius*	Ma
Little Pied Cormorant	*Phalacrocorax melanoleucos*	Ma
White-winged Black Tern	*Chlidonias leucopterus*	Ma
Whiskered Tern	*Chlidonias hybridus*	Ma
Caspian Tern	*Sterna caspia*	Ma/Mi
Silver Gull	*Larus novaehollandiae*	Ma
Pacific Gull	*Larus pacificus*	Ma
Red-kneed Dotterel	*Erythrogonys cinctus*	Mi
Masked Lapwing	*Vanellus miles*	Mi
Banded Lapwing	*Vanellus tricolor*	Mi
Pacific Golden Plover	*Pluvialis fulva*	Mi
Double-banded Plover	*Charadrius bicinctus*	Mi
Red-capped Plover	*Charadrius ruficapillus*	Mi
Black-fronted Dotterel	*Elsevornis melanops*	Mi
Black-winged Stilt	*Himantopus himantopus*	Mi
Banded Stilt	*Cladorhynchus leucocephalus*	Mi
Red-necked Avocet	*Recurvirostra novaehollandiae*	Mi
Eastern Curlew	*Numenius madagascariensis*	Mi
Whimbrel	*Numenius phaeopus*	Mi
Little Curlew	*Numenius minutus*	Mi
Black-tailed Godwit	*Limosa limosa*	Mi
Bar-tailed Godwit	*Limosa lapponica*	Mi
Wood Sandpiper	*Tringa glareola*	Mi
Grey-tailed Tattler	*Heteroscelus brevipes*	Mi
Common Sandpiper	*Actitis hypoleucos*	Mi
Common Greenshank	*Tringa nebularia*	Mi
Marsh Sandpiper	*Tringa stagnatilis*	Mi
Curlew Sandpiper	*Calidris ferruginea*	Mi
Red-necked Stint	*Calidris ruficollis*	Mi
Sharp-tailed Sandpiper	*Calidris acuminata*	Mi
Latham's Snipe	*Gallinago hardwickii*	Mi

Great Egret	*Ardea alba*	Mi
Australian Wood Duck	*Chenonetta jubata*	Mi
Australian Shelduck	*Tadorna tadornoides*	Mi
Pacific Black Duck	*Anas superciliosa*	Mi
Chestnut Teal	*Anas castanea*	Mi
Grey Teal	*Anas gracilis*	Mi
Australasian Shoveler	*Anas rhynchotis*	Mi
Pink-eared Duck	*Malacorhynchus membranaceus*	Mi
Freckled Duck	*Stictonetta naevosa*	Mi
Hardhead	*Aythya australis*	Mi
Blue-billed Duck	*Oxyura australis*	Mi
Musk Duck	*Biziura lobata*	Mi
Spotted Harrier	*Circus assimilis*	Mi
Swamp Harrier	*Circus approximans*	Mi
Brown Goshawk	*Accipiter fasciatus*	Mi
Collared Sparrowhawk	*Accipiter cirrhocephalus*	Mi
Little Eagle	*Hieraaetus morphnoides*	Mi
Whistling Kite	*Haliastur sphenurus*	Mi
Black-shouldered Kite	*Elanus axillaris*	Mi
Letter-winged Kite	*Elanus scriptus*	Mi
Australian Hobby	*Falco longipennis*	Mi
Peregrine Falcon	*Falco peregrinus*	Mi
Black Falcon	*Falco subniger*	Mi
Brown Falcon	*Falco berigora*	Mi
Nankeen Kestrel	*Falco cenchroides*	Mi
White-throated Needletail	*Hirundapus caudacutus*	Mi
Bassian Thrush	*Zoothera lunulata*	Mi
Ruff	*Philomachus pugnax*	Mi
Arctic Tern	*Sterna paradisaea*	Ma
Common Tern	*Sterna hirundo*	Ma
Long-toed Stint	*Calidris subminuta*	Mi
Pectoral Sandpiper	*Calidris melanotos*	Mi

A3.4. HOLLOW-DEPENDENT FAUNA

Table A3.4. The following native fauna species recorded from either within the study area or within a five kilometre radius of the study area have been identified as having at least some dependence upon hollow-bearing trees. (* = species recorded at the site during the present assessment).

Common Name	Scientific Name	Dependence upon tree hollows
Birds		
*Australian Wood Duck	*Chenonetta jubata*	Total
Australian Shelduck	*Tadorna tadornoides*	Total
Chestnut Teal	*Anas castanea*	Total
Grey Teal	*Anas gracilis*	Total
Pink-eared Duck	*Malacorhynchus membranaceus*	Partial
Peregrine Falcon	*Falco peregrinus*	Partial
*Nankeen Kestrel	*Falco cenchroides*	Partial
Southern Boobook	*Ninox novaeseelandiae*	Total
Barn Owl	*Tyto alba*	Partial
Rainbow Lorikeet	*Trichoglossus haematodus*	Total
Sulphur-crested Cockatoo	*Cacatua galerita*	Total
Little Corella	*Cacatua sanguinea*	Total
Long-billed Corella	*Cacatua tenuirostris*	Total
Galah	*Cacatua roseicapilla*	Total
Crimson Rosella	*Platycercus elegans*	Total
*Eastern Rosella	*Platycercus eximius*	Total
*Red-rumped Parrot	*Psephotus haematonotus*	Total
Blue-winged Parrot	*Neophema chrysostoma*	Partial
Laughing Kookaburra	*Dacelo novaeguineae*	Total
*Dusky Woodswallow	*Artamus cyanopterus*	Partial
Sacred Kingfisher	*Todiramphus sanctus*	Partial
Dollarbird	*Eurystomus orientalis*	Total
Tree Martin	*Hirundo nigricans*	Total
*Welcome Swallow	*Hirundo neoxena*	Partial
Fairy Martin	*Hirundo ariel*	Partial
*Grey Shrike-thrush	*Colluricincla harmonica*	Partial
Mammals		
Common Ringtail Possum	*Pseudocheirus peregrinus*	Partial
*Common Brushtail Possum	*Trichosurus vulpecula*	Total

Lesser Long-eared Bat	*Nyctophilus geoffroyi*	Total
Eastern Broad-nosed Bat	*Scotorepens orion*	Total
Common Bent-wing Bat	*Miniopterus schreibersii*	Total
Gould's Wattle Bat	*Chalinolobus gouldii*	Total
Large Forest Bat	*Vespadelus darlingtoni*	Total
Little Forest Bat	*Vespadelus vulturnus*	Total
Southern Forest Bat	*Vespadelus regulus*	Total
Large Forest Bat	*Vespadelus darlingtoni*	Total

APPENDIX 4

A4. NO NET LOSS ASSESSMENT

Introduction

The principle of 'no net loss' is derived from the Victorian Government's Biodiversity Strategy. The strategy comprises three documents, one of which, *Victoria's Biodiversity – Directions in Management*, sets out goals for biodiversity management. The first of these is:

To ensure that within Victoria:

there is a reversal, across the entire landscape, of the long-term decline in the extent and quality of native vegetation, leading to a net gain with the first target being no net loss by the year 2001;

This has become known as the "no net loss" goal. There are currently no formal mechanisms for implementing the no net loss goal, however planning authorities may take the policy into account when determining applications under existing approvals processes.

The Department of Natural Resources and Environment have prepared a series of guidelines for the application of the no net loss principle (NRE 2000c). This methodology is still in the developmental stage, however it provides a technique for determining vegetation losses and gains, measured in terms of both quality and quantity.

There is a staged approach to achieving no net loss in terms of the effect of a particular proposed development:

First:

- Avoid losses in extent and quality of native vegetation
- Minimise losses in extent and quality of native vegetation

Then:

- Mitigate.

Under the existing approvals processes, implementation of "no net loss" will firstly require a greater emphasis on:

- fully exploring the avoidance option
- fully exploring the potential to minimise losses
- assessment of whether a site has ecological values that cannot be mitigated if lost (e.g. high significance for conservation, listed community, critical ecological function, etc.).

The consideration of actions to achieve "no net loss" will **only** begin after this stage. To achieve no net loss, where a loss of vegetation or habitat is unavoidable, mitigation actions will need to provide equal or greater gains in habitat. Gains are measured by comparing the expected habitat provided by a site in 10 years if mitigation is not undertaken with the expected habitat at ten years if mitigation is undertaken.

Assessment against 'no net loss' - measuring losses and gains

The "no net loss" strategy refers to quality as well as quantity. This applies both to assessments of what is lost and in identifying opportunities for improvement through appropriate management. Such improvements would increase the overall "carrying capacity" of those habitats in terms of the levels of biodiversity that they can support.

A combined quality/quantity measure has been adopted and is called the *habitat-hectare*. One hectare of vegetation that retains 100% of its natural "carrying capacity is equivalent to one habitat-hectare. If an area of habitat had lost 50% of its carrying capacity, then one hectare would equal 0.5 habitat-hectares, ten hectares would equal five habitat-hectares, and so on. Carrying capacity is determined by habitat quality and quantity. Quality is derived from an assessment of condition and viability which comprise a 'habitat score'

Improvements through management provide opportunities for gains in habitat-hectares that may be used to off-set losses in native vegetation. To achieve "no net loss", the improvements in vegetation quality/quantity used to off-set vegetation losses must be maintained permanently, for example by reservation or management agreements.

Habitat-hectare Gains

For a given area, improvements in the habitat score and hence gains in habitat-hectares can be achieved by improvement in either vegetation condition or viability. Possible management actions that would achieve gains in one or more vegetation condition criteria (structural and floristic intactness, weed levels) include:

- Control (or removal) of grazing by domestic stock (e.g. by fencing)
- Cessation of clearing/logging/firewood collection
- Rabbit control
- Weed control
- Restoration of appropriate ecological burning regimes
- Enrichment planting (e.g. to replace a missing or severely depleted structural layer)
- Reduction in disturbance (e.g. control of trampling, vehicle traffic, recreational pressure)
- Restoration of natural hydrology (e.g. flooding patterns, water quality)

Possible management actions that would achieve gains in viability criteria (size and connectivity) include:

- Encouragement of gradual expansion of remnant stands through natural regeneration (e.g. by fencing, weed control)
- Control or prevention of stock access
- Revegetation to establish or improve links between existing stands of vegetation
- Revegetation of degraded/cleared sites within existing stands of native vegetation
- Revegetation to increase the size or improve the shape (to reduce the perimeter length) of a remnant stand of native vegetation.
- Revegetation of areas unconnected to existing vegetation (least effective option)

In terms of timing, mitigation actions should be undertaken as soon as possible, and preferably far in advance of the loss of vegetation. In the calculations

of potential habitat-hectare gains that follow, the improvements in vegetation quality are those predicted to have been achieved at ten years after works are complete.

Mechanisms are required to ensure that such no net loss mitigation sites are permanently managed for biodiversity conservation. Development and satisfactory implementation of a management plan for each site is an important component of no net loss mitigation.

To achieve no net loss, where a loss of vegetation or habitat will occur, mitigation actions will need to provide equal or greater gains in habitat. Gains are measured by comparing the expected habitat provided by a site in 10 years if mitigation is not undertaken with the expected habitat at ten years if mitigation is undertaken.

No Net Loss Criteria

In relation to mitigation under no net loss, the following nexus criteria apply:

1. Areas selected for enhancement or restoration should contain the same habitat type (Ecological Vegetation Class) as the area impacted and be in the same bioregion.

2. Areas selected for revegetation should be revegetated as the same habitat type and should conform to minimum standards for Ecological Vegetation Class (EVC) reinstatement (e.g. performance criteria based on dominants, major character species).

3. Mitigation areas should have a similar or more effective ecological function as the area impacted.

4. The vegetation of mitigation areas should be the same or better quality after mitigation improvements have been undertaken compared with the vegetation lost.

5. Mitigation areas should preferably be close to the impact area.

6. Mitigation actions should not be delayed, and, if possible, should occur before the loss occurs.

7. The time to equivalence should be minimised.

The habitat score is calculated for the whole area where condition is relatively uniform, or is calculated separately for sub-areas where condition varies.

In the context of no net loss, and a proposal to clear native vegetation, the habitat-hectare can be used to measure:

- the current value of the area of native vegetation to be cleared (vegetation loss);
- the current value of potential no net loss mitigation site(s);
- predicted 'improved' value at a defined time in the future of potential no net loss mitigation site(s) (resulting from conservation management, replanting, weed control etc); and

potential gain in habitat-hectares (improved value less current value) for potential no net loss mitigation site(s), which can be used to off-set the proposed vegetation loss.

APPENDIX 5

A5. SIGNIFICANT TREE ASSESSMENT

REFERENCES

Backhouse, G.N. & Jeanes, J.A. 1995, *The orchids of Victoria*, The Miegunyah Press, Melbourne, Victoria

Bennison R and Hill A J 2001, Assessment of the Conservation value of trees, Abbots Road, Lyndhurst. Report for Pall Mall Assests.

Brereton R., Shultz M., Lyon R.,& Mcak F. *South east Melbourne Sites of Zoological significance*. Arthur Rylah Institute unpublished report.

Briggs, J.D. & Leigh, J.H. 1996, *Rare or Threatened Australian Plants*, CSIRO Australia & Australian Nature Conservation Agency.

Christidis, L. & Boles, W.E. 1994, *The Taxonomy and Species of Birds of Australia and its Territories*, Monograph No. 2. Royal Australasian Ornithologists Union, Melbourne.

Cogger, H. 2000, *Reptiles and Amphibians of Australia*, Reed Books, Australia.

Cook D. (in prep.a). Grasslands, Grassy Woodlands and Grassy Wetlands on the west Gippsland Plains, *Sites of ecological significance (draft)*. Report to DCNR.

Cook D. (in prep.b). *Sites of ecological significance on the heavy soil plains south-east of Melbourne (draft)*. Report to DCNR.

Garnett, S.T. and Crowley, G.M. 2000, *The Action Plan for Australian Birds 2000*, Environment Australia, Canberra.

Hero, J-M., Littlejohn, M. and Marantelli, G. (1991). *Frogwatch field guide to Victorian frogs*. Department of Conservation and Environment, East Melbourne.

Hill A J 2002a, No Net Loss assessment of the proposed Princess Highway duplication between Flynn and Sale, Victoria, (Unpublished report by Biosis Research Pty. Ltd. for VicRoads).

Hill A J 2002b, No Net Loss assessment of the 'Castle Bend' property, south of Shepparton, Victoria, (Unpublished report by Biosis Research Pty. Ltd. for VicRoads).

Hill A J 2002c, No Net Loss assessment of Bass Highway road reserve, Stage 5: Stanley Road to King Road, Victoria. (Unpublished report by Biosis Research Pty. Ltd. for VicRoads).

IUCN 2000, 2000 *IUCN Red List of Threatened Species*, IUCN Species Survival Commission.

McDowall,R. 1996, *Freshwater Fishes of South-eastern Australia*. Reed Books, New South Wales.

Menkhorst, P.W. (ed.) 1995, *Mammals of Victoria: Distribution, Ecology and Conservation*, Oxford University Press, Melbourne.

Mueck 1999, An assessment of the flora values of farmland at Bayliss Road, Lyndhurst, Victoria. (By Biosis Research Pty. Ltd.)

NRE 1997, *Victoria's Biodiversity – Directions in Management*, Department of Natural Resources & Environment, Victoria.

NRE 2000a, *Rare or Threatened Vascular Plants in Victoria – 2000*, Department of Natural Resources & Environment, Victoria.

NRE 2000b, *Threatened Vertebrate Fauna in Victoria - 2000*, Department of Natural Resources & Environment, Victoria.

NRE 2000c, *Restoring Our Catchments: Victoria's Draft Native Vegetation Management Framework*, Department of Natural Resources & Environment, Victoria.

NRE 2000d, Draft Port Phillip and Westernport Native Vegetation Plan, Department of Natural Resources & Environment, Victoria.

NRE in prep., A typology for vegetation in Victoria: Towards a census of Victorian plant communities, Department of Natural Resources & Environment, Melbourne.

Oates, A. and Taranto, M. 2001, *Vegetation mapping of the Port Phillip & Westernport region*, Department of Natural Resources & Environment, Victoria.

Ross, J.H. 2000, *A Census of the Vascular Plants of Victoria* (6th edition), Royal Botanical Gardens, Victoria.

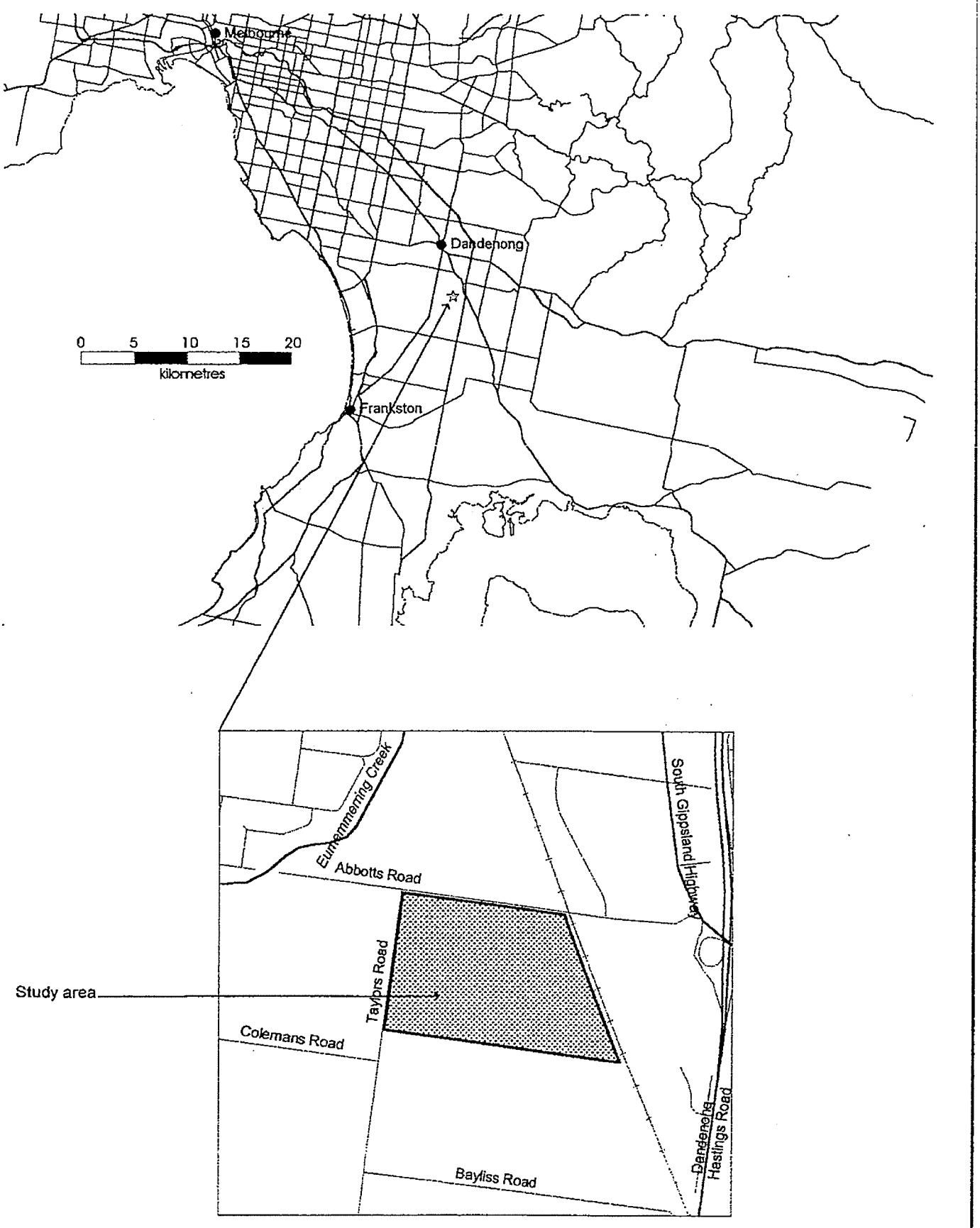
Tyler, M. J. 1997. *The Action Plan for Australian Frogs.* Environment Australia. Canberra, Australia.

Walsh, N.G. and Entwisle, T. J. 1994, *Flora of Victoria Volume 2. Ferns and Allied Plants, Conifers and Monocotyledons*, Inkata Press, Melbourne.

Walsh, N.G. and Entwisle, T. J. 1996, *Flora of Victoria Volume 3. Dicotyledons: Winteraceae to Myrtaceae*, Inkata Press, Melbourne.

Walsh, N.G. and Entwisle, T. J. 1999, *Flora of Victoria Volume 4. Dicotyledons: Cornaceae to Asteraceae*, Inkata Press, Melbourne.

FIGURES



Acknowledgement: VicRoads

BIOSIS RESEARCH Pty Ltd

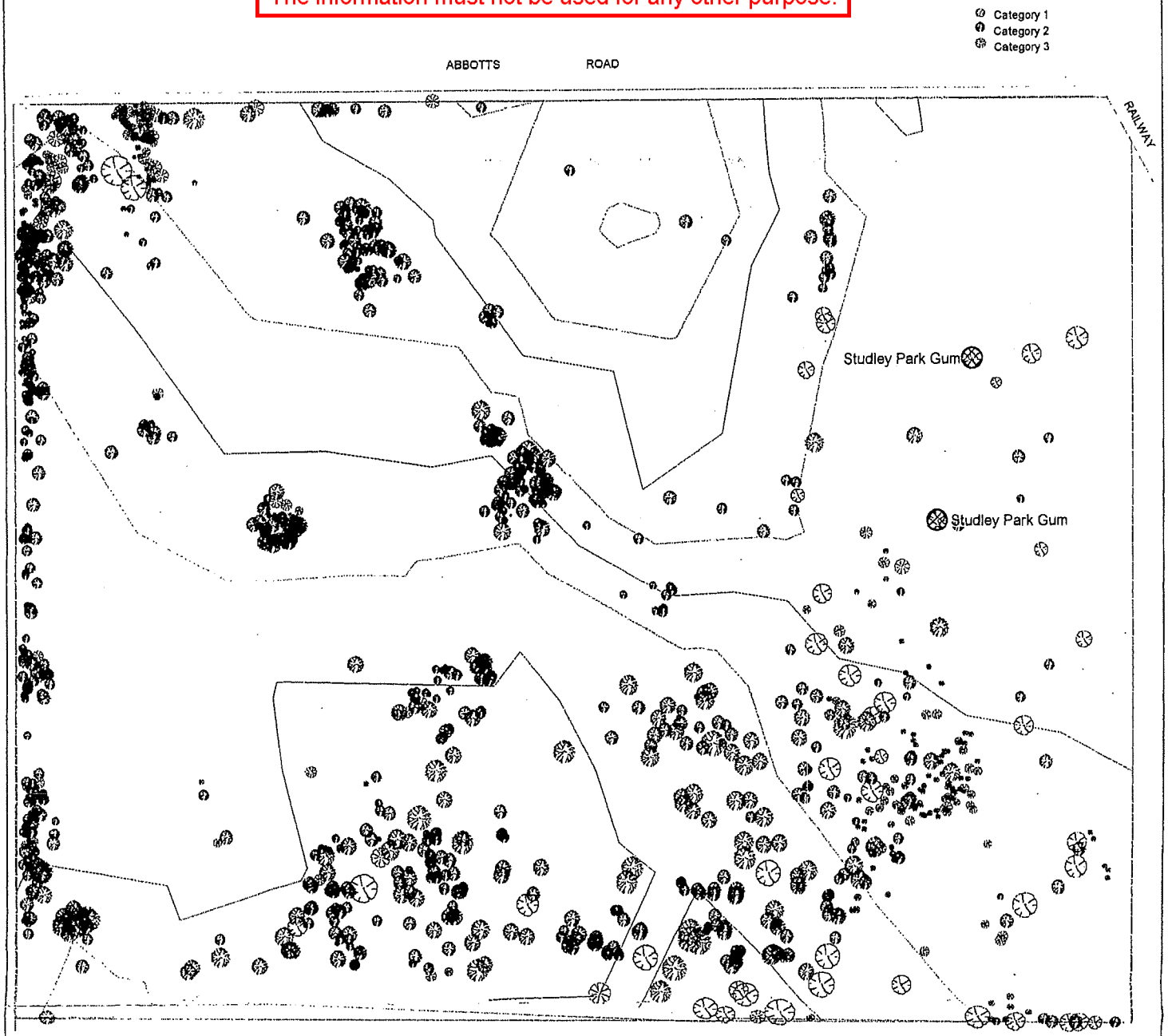
322 Bay Street
Port Melbourne
VICTORIA 3207

Figure 1: Location of the study area, Lyndhurst.

DATE: 17 June 2002
Checked by: AH | File number: 2913
Location: \projects\2900s\2913\Mapping\2913 Fig1.wor

Scale: 0 250 500 750 1000 metres

N W E S



BIOSIS RESEARCH Pty Ltd

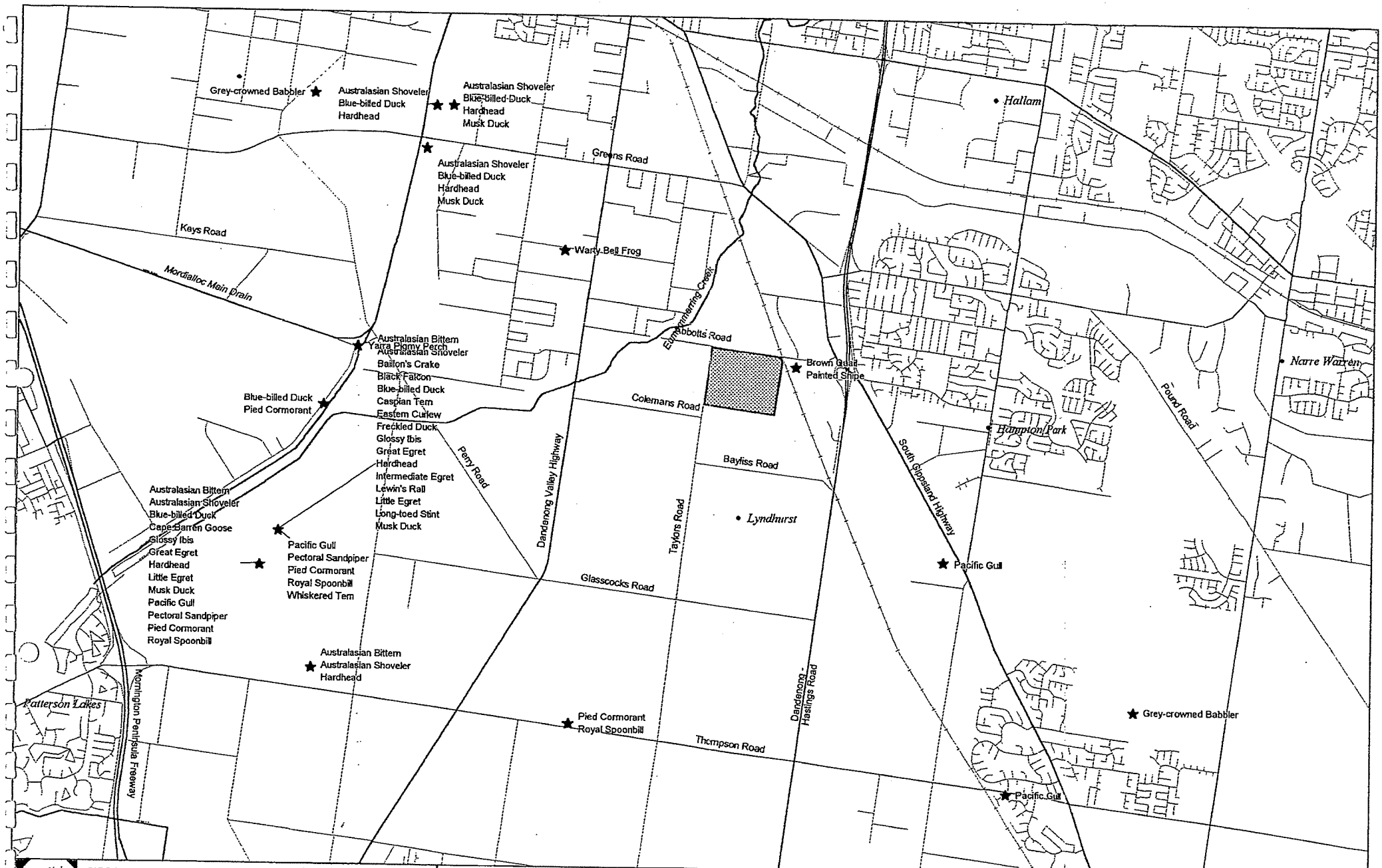
322 Bay Street
Port Melbourne
VICTORIA 3207

Figure 2: Trees at Abbotts Road, Lyndhurst.

DATE: 20 December 2001
Checked by: AH | File number: 2084
Location: \projects\2000s\2084\Mapping\2084 Fig 2.wor

Scale: 0 30 60 90 120 150 metres

N W E S



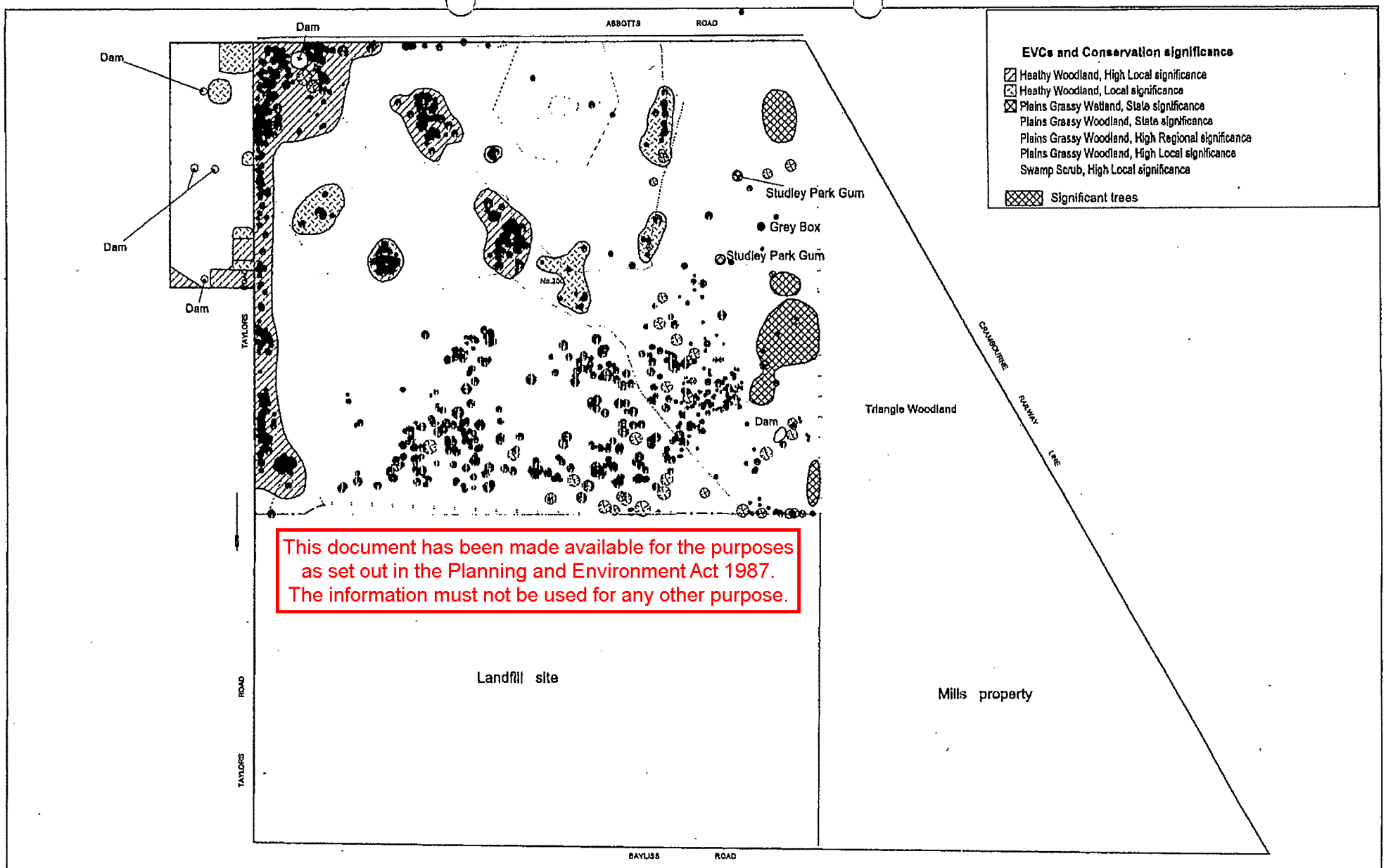
BIOSIS RESEARCH Pty Ltd
322 Bay Street
Port Melbourne
VICTORIA 3207

Figure 3: Locations of significant fauna records in the area surrounding the study site.

DATE: 17 June 2002
Checked by: AO
File number: 2913
Location: ...\projects\2900s\2913\Mapping\2913 Fig 3.wor

Scale: 0 0.4 0.8 1.2 1.6 2.0 kilometres

Figure 3: Locations of significant fauna records.



BIOSIS RESEARCH Pty Ltd
322 Bay Street
Port Melbourne
VICTORIA 3207

Figure 4: Sites of conservation significance and EVCs within the study area.

DATE: 10 July 2002
Checked by: AH
File number: 2913
Location: ...\projects\2900s\2913\Mapping\2913 Fig 4.wor

Scale: 0 0.5 1.0 1.5 2.0 2.5 kilometres

Figure 4: Sites of conservation significance and EVCs within the study area.

APPENDIX A4 – CULTURAL HERITAGE MANAGEMENT PLAN

M3 INDUSTRIAL ESTATE, 95-117 BAYLISS ROAD, LYNDHURST

CULTURAL HERITAGE MANAGEMENT PLAN

AAV CHMP No. 10333

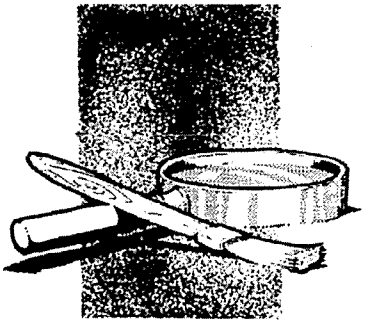
Commissioned by Devcon Group Pty Ltd
Sponsored by Pellicano Investments Pty Ltd

Completed 1 December 2008

Prepared by

Andrea Murphy and Dr Tom Rymer

Tardis Enterprises Pty Ltd
archaeologists & heritage advisors
Suite 4 / 46-50 Old Princes Hwy
Beaconsfield
Victoria 3807



M3 Industrial Estate, 95-117 Bayliss Road, Lyndhurst

CULTURAL HERITAGE MANAGEMENT PLAN

Name and Location of Activity:	M3 Industrial Estate, 95-117 Bayliss Road, Lyndhurst.
Lot Number:	APS443552 & 2PS322846
AAV Management Plan Identifier:	10333
Sponsor:	Pellicano Investments Pty Ltd
Cultural Heritage Advisors:	Andrea Murphy & Dr Tom Rymer (Tardis Enterprises Pty Ltd)
Plan Date:	December 1st , 2008

Aboriginal Heritage Act 2006
Section 65

Cultural Heritage Management Plan - Notice of Approval

I, Ian Hamm, A/Executive Director, Aboriginal Affairs Victoria, acting under authority delegated to me by the Secretary, Department of Planning and Community Development, hereby approve the cultural heritage management plan referred to below:

M3 INDUSTRIAL ESTATE, 95-117 BAYLISS ROAD, LYNDHURST

Cultural Heritage Management Plan number: 10333

Sponsor: Pellicano Investments Pty Ltd

Cultural Heritage Advisors: Andrea Murphy & Dr Tom Rymer [Tardis Enterprises P/L]

Authors: Ms Andrea Murphy & Dr Tom Rymer

Cover Date: 1 December 2008
Pages: xvii + 167

Received for Approval: 1 December 2008

Pursuant to s.65(6) of the Act this cultural heritage management plan takes effect upon the granting of this approval.*

Signed: .....
IAN HAMM

Dated: 9 DEC 2008

** This notice of approval should be inserted after the title page and bound with the body of the management plan.*

Some information regarding specific site details contained within this report is of a sensitive nature eg MGA co-ordinates and site plans.

Before releasing contents of this report to the general public permission should first be obtained from the relevant authorities/communities

EXECUTIVE SUMMARY

This cultural heritage management plan presents the results and recommendations of a complex cultural heritage assessment of M3 Industrial Estate (hereafter referred to as 'the activity') and has been commissioned by Devcon Group Pty Ltd (ABN 80 053 001 184) on behalf of the sponsor Pellicano Investments Pty Ltd (ABN 80 004 361 942). The industrial estate is to be located at 95-117 Bayliss Road, Lyndhurst, approximately 38km southeast of Melbourne in the municipality of the City of Greater Dandenong (Map 1a). The land is owned by the sponsor, Pellicano Investments Pty Ltd, and comprises a total of 36 hectares. The activity comprises 13 industrial lots with associated road and services infrastructure (Map 1b). The likely impact on the surface of the land and buried former land surfaces will be significant and will likely harm any Aboriginal cultural heritage, if present.

Currently there is no relevant Registered Aboriginal Party (RAP) in relation to the proposed activity area; therefore, as required under Section 54 of the *Aboriginal Heritage Act 2006* a *Notice of Intent to Prepare a Cultural Heritage Management Plan* was submitted to the Deputy Director, Aboriginal Affairs Victoria (AAV) on 18 March 2008. AAV notified Pellicano Investments Pty Ltd on 20 March 2008 that they will evaluate the plan when completed (Appendix 1). Although there are currently no RAPs in relation to the activity area, representatives from the Bunurong Land Council Aboriginal Corporation (BLCAC) and Boon Wurrung Foundation Limited (BWFL) were consulted during the project and participated in the fieldwork including (Section 1.3).

This CHMP includes a complex assessment of the activity area comprising a desktop assessment (Sections 2-4), ground surface survey (Section 5) and subsurface testing (Section 6). A total of nine Aboriginal sites are recorded within the activity area and are rated as having the following scientific and specific cultural significance (from Table 15):

VAHR No Site Name	Specific Cultural Significance	Scientific Significance
7921-0394 Bayliss Rd Scarred Tree	Abstract	Low-moderate
7921-0483 Parham 3 Scarred Tree	Abstract	Low-moderate
7921-0484 Bayliss Rd	None	None
7921-0485 Parham 5 Scarred Tree	Abstract	Moderate
7921-0906 Bayliss Rd Scarred Tree 2	Abstract	Moderate
7921-0956 Bayliss Road 2	None	None
7921-0957 Bayliss Road 3	None	None

EXECUTIVE SUMMARY

VAHR No Site Name	Specific Cultural Significance	Scientific Significance
7921-0958 Bayliss Road 4	None	None
7921-0959 Bayliss Road 5	None	None

This plan indicates that the activity will not harm sites VAHR 7921-0394, 0483, 0485, and 0906. Harm is unavoidable to sites VAHR 7921-0484, 0956, 0957, 0958 and 0959. The activity was redesigned to avoid and preserve sites assessed as possessing scientific value.

In Section 8.1 the following Aboriginal cultural heritage management issues were identified and discussed in detail including:

1. Statutory areas of Aboriginal cultural heritage sensitivity;
2. Known Aboriginal cultural heritage;
3. Avoiding harm to known Aboriginal cultural heritage;
4. Minimising harm to known Aboriginal cultural heritage;
5. Management of known Aboriginal cultural heritage;
6. Specific harm avoidance, minimisation and management measures to known Aboriginal cultural heritage sites;
7. Custody and management of Aboriginal cultural heritage; and
8. Contingency plans.

Future access to the sites by Aboriginal communities and the handling of sensitive cultural heritage information was also considered (Section 8.2)

Based on the findings of this report the following recommendations are made (from 8.3):

Recommendation 1: VAHR 7921-0394 (Scarred Tree)

Prior to and during the Activity

Scarred tree VAHR 7921-0394 will not be harmed during the conduct of the activity and will be preserved within the development. Specific management measures are required to avoid inadvertent harm to the site both during and after the conduct of the activity. The following management measures must be adopted prior to the activity commencing:

EXECUTIVE SUMMARY

1. The installation of protective fencing of the known extent of Aboriginal cultural heritage to be preserved with the development at VAHR 7921-0394 prior to the commencement of the activity. The minimum extent of the fencing should be 5m from the tree drip-line and comprise sturdy construction.

2. Signage restricting access to the extent of the site during the conduct of the activity. Visible signage should indicate that the area is a Heritage No Go Zone. These exclusion zones should also be marked on all working plans for the activity.

3. Provide information about avoiding the site in an induction manual or training for contractors engaged during the conduct of the activity.

After the Activity

4. After the activity is completed the responsible manager for land containing preserved Aboriginal cultural heritage must implement ongoing maintenance and protective measures by engaging specialist input, if required, to ensure tree longevity and vigour, but at a minimum mulch within the drip-line of the trees to preserve health and ensure future works will avoid harm to the trees.

Recommendation 2: VAHR 7921-0483 (Scarred Tree)

Prior to and during the Activity

Scarred tree VAHR 7921-0483 will not be harmed during the conduct of the activity and will be preserved within the development. Specific management measures are required to avoid inadvertent harm to the site both during and after the conduct of the activity. The following management measures must be adopted prior to the activity commencing:

1. The installation of protective fencing of the known extent of Aboriginal cultural heritage to be preserved with the development at VAHR 7921-0483 prior to the commencement of the activity. The minimum extent of the fencing should be 5m from the tree drip-line and comprise sturdy construction.

2. Signage restricting access to the extent of the site during the conduct of the activity. Visible signage should indicate that the area is a Heritage No Go Zone. These exclusion zones should also be marked on all working plans for the activity.

3. Provide information about avoiding the site in an induction manual or training for contractors engaged during the conduct of the activity.

After the Activity

4. After the activity is completed the responsible manager for land containing preserved Aboriginal cultural heritage must implement ongoing maintenance and protective measures by engaging specialist input, if required, to ensure tree longevity and vigour, but at a minimum mulch within the drip-line of the trees to preserve health and ensure future works will avoid harm to the trees.

Recommendation 3: VAHR 7921-0485 (Scarred Tree)

Prior to and during the Activity

Scarred tree VAHR 7921-0485 will not be harmed during the conduct of the activity and will be preserved within the development. Specific management measures are required to avoid inadvertent harm to the site both during and after the conduct of the activity. The following management measures must be adopted prior to the activity commencing:

1. The installation of protective fencing of the known extent of Aboriginal cultural heritage to be preserved with the development at VAHR 7921-0485 prior to the commencement of the activity. The minimum extent of the fencing should be 5m from the tree drip-line and comprise sturdy construction.

2. Signage restricting access to the extent of the site during the conduct of the activity. Visible signage should indicate that the area is a Heritage No Go Zone. These exclusion zones should also be marked on all working plans for the activity.

3. Provide information about avoiding the site in an induction manual or training for contractors engaged during the conduct of the activity.

After the Activity

4. After the activity is completed the responsible manager for land containing preserved Aboriginal cultural heritage must implement ongoing maintenance and protective measures by engaging specialist input, if required, to ensure tree longevity and vigour, but at a minimum mulch within the drip-line of the trees to preserve health and ensure future works will avoid harm to the trees.

Recommendation 4: VAHR 7921-0906 (Scarred Tree)

Prior to and during the Activity

Scarred tree VAHR 7921-0906 will not be harmed during the conduct of the activity and will be preserved within the development. Specific management measures are required to avoid inadvertent harm to the site both during and after the conduct of the activity. The following management measures must be adopted prior to the activity commencing:

1. The installation of protective fencing of the known extent of Aboriginal cultural heritage to be preserved with the development at VAHR 7921-0906 prior to the commencement of the activity. The minimum extent of the fencing should be 5m from the tree drip-line and comprise sturdy construction.

2. Signage restricting access to the extent of the site during the conduct of the activity. Visible signage should indicate that the area is a Heritage No Go Zone. These exclusion zones should also be marked on all working plans for the activity.

3. Provide information about avoiding the site in an induction manual or training for contractors engaged during the conduct of the activity.

After the Activity

4. After the activity is completed the responsible manager for land containing preserved Aboriginal cultural heritage must implement ongoing maintenance and protective measures by engaging specialist input, if required, to ensure tree longevity and vigour, but at a minimum mulch within the drip-line of the trees to preserve health and ensure future works will avoid harm to the trees.

Recommendation 5: VAHR 7921-0484 (Stone Artefact Scatter)

Prior to the Activity

Stone artefact scatter site VAHR 7921-0484 has *no* scientific and *no* specific cultural significance. The activity will effectively destroy the context of this site. The activity plans indicate that harm is unable to be avoided or minimised. The extent, nature and significance of the site was determined during the assessment. The inherent cultural values of the site mean that management of harm through salvage is not considered likely to provide any further contextual or substantial archaeological knowledge of the site, activity area or surrounding region. It is considered highly unlikely that salvage excavations will recover additional stone artefacts that will further contribute to the scientific or cultural knowledge of the known site as demonstrated during the complex assessment. Based on the site's incapacity to address current research questions, no further archaeological investigation or salvage is recommended. No harm avoidance, minimisation or management measures are required prior to the activity commencing.

Recommendation 6: VAHR 7921-0956 (Stone Artefact Scatter)

Prior to the Activity

Stone artefact scatter site VAHR 7921-0956 has *no* scientific and *no* specific cultural significance. The activity will effectively destroy the context of this site. The activity plans indicate that harm is unable to be avoided or minimised. The extent, nature and significance of the site was determined during the assessment. The inherent cultural values of the site mean that management of harm through salvage is not considered likely to provide any further contextual or substantial archaeological knowledge of the site, activity area or surrounding region. It is considered highly unlikely that salvage excavations will recover additional stone artefacts that will further contribute to the scientific or cultural knowledge of the known site as demonstrated during the complex assessment. Based on the site's incapacity to address current research questions, no further archaeological investigation or salvage is recommended. No harm avoidance, minimisation or management measures are required prior to the activity commencing.

Recommendation 7: VAHR 7921-0957 (Stone Artefact Scatter)

Prior to the Activity

Stone artefact scatter site VAHR 7921-0957 has *no* scientific and *no* specific cultural significance. The activity will effectively destroy the context of this site. The activity plans indicate that harm is unable to be avoided or minimised. The extent, nature and significance of the site was determined during the assessment. The inherent cultural values of the site mean that management of harm through salvage is not considered likely to provide any further contextual or substantial archaeological knowledge of the site, activity area or surrounding region. It is considered highly unlikely that salvage excavations will recover additional stone artefacts that will further contribute to the scientific or cultural knowledge of the known site as demonstrated during the complex assessment. Based on the site's incapacity to address current research questions, no further archaeological investigation or salvage is recommended. No harm avoidance, minimisation or management measures are required prior to the activity commencing.

Recommendation 8: VAHR 7921-0958 (Stone Artefact Scatter)

Prior to the Activity

Stone artefact scatter site VAHR 7921-0958 has *no* scientific and *no* specific cultural significance. The activity will effectively destroy the context of this site. The activity plans indicate that harm is unable to be avoided or minimised. The extent, nature and significance of the site was determined during the assessment. The inherent cultural values of the site mean that management of harm through salvage is not considered likely to provide any further contextual or substantial archaeological knowledge of the site, activity area or surrounding region. It is considered highly unlikely that salvage excavations will recover additional stone artefacts that will further contribute to the scientific or cultural knowledge of the known site as demonstrated during the complex assessment. Based on the site's incapacity to address current research questions, no further archaeological investigation or salvage is recommended. No harm avoidance, minimisation or management measures are required prior to the activity commencing.

Recommendation 9: VAHR 7921-0959 (Stone Artefact Scatter)

Prior to the Activity

Stone artefact scatter site VAHR 7921-0959 has *no* scientific and *no* specific cultural significance. The activity will effectively destroy the context of this site. The activity plans indicate that harm is unable to be avoided or minimised. The extent, nature and significance of the site was determined during the assessment. The inherent cultural values of the site mean that management of harm through salvage is not considered likely to provide any further contextual or substantial archaeological knowledge of the site, activity area or surrounding region. It is considered highly unlikely that salvage excavations will recover additional stone artefacts that will further contribute to the scientific or cultural knowledge of the known site as demonstrated during the complex assessment. Based on the site's incapacity to address current research questions, no further archaeological investigation or salvage is recommended. No harm avoidance, minimisation or management measures are required prior to the activity commencing.

Recommendation 10: Artefact Storage and Custody

Prior to the Activity

This recommendation relates to stone artefacts retrieved during the assessment component of the CHMP. Any Aboriginal cultural heritage found during the activity must be dealt with according to the following requirements and is specified within the Contingency Plan (Recommendation 4.2). Currently there is no relevant RAP for the activity area. Artefacts retrieved during the activity will be retained by the cultural heritage advisor. All artefacts will be stored in bags that have provenance information recorded on the labels. Artefacts will be retained by the cultural heritage advisor for 12 months after the activity is completed or until a RAP is approved, whichever is earlier. If no RAP is approved then custody of the artefacts will be offered in order of priority to the following

- any relevant registered native title holder;
- any relevant native title party;
- any relevant Aboriginal person or persons with traditional or familial links;
- any relevant Aboriginal body or organisation which has historic or contemporary interest in Aboriginal heritage;
- the owner of the land;
- the Museum of Victoria (s.61(e)).

Recommendation 11: Contingency Plan

During the Activity

A Contingency Plan is required to manage potential issues including: specific measures in the unlikely event that any Aboriginal cultural heritage beyond known cultural heritage will be unexpectedly discovered during the activity; any contingency plans required in relation to disputes, delays and other obstacles that may affect the conduct of the activity; reviewing compliance with the cultural heritage management plan and mechanisms for remedying non-compliance; the notification of the discovery of Aboriginal cultural heritage during the carrying out of the activity; and requirements relating to the custody and management of any Aboriginal cultural heritage found during the course of the activity (s.61(d) *Aboriginal Heritage Act 2006*, sch.2, cl.13 *Aboriginal Heritage Regulations 2007*).

Although this assessment has demonstrated that the proposed activity is unlikely to harm Aboriginal cultural heritage apart from VAHR 7921-0484, 0956 to 959, the following Contingency Plan prescribes management measures in the unlikely event that any Aboriginal cultural heritage outside the expectations of the above complex assessment and recommendations is discovered; in particular, additional stone artefact scatters, shell middens, earth features, stone features and human remains, during any stage of the activity. The sponsor must ensure that the relevant Contingency Plan is followed. To assist in this aim, a checklist has been provided (Appendix 8).

Recommendation 11.1 Preamble

At the time of preparation of this CHMP, no RAP has been appointed with responsibility for the activity area.

Under the previous Aboriginal cultural heritage legislation, both the BLCAC and BWFL were involved with cultural heritage management in the region.

Currently neither BLCAC nor BWFL have any statutory responsibility for the activity area.

Recommendation 11.2 Contingency for the Discovery of Aboriginal Cultural Heritage Discovered during the Activity*

- This contingency plan must be followed if any unexpected cultural heritage is discovered during the activity. In the activity area unexpected cultural heritage comprises:

    1. Stone artefact scatters that contain cultural heritage attributes which, when assessed, are below the analytical threshold of moderate scientific significance outlined in Section 7 and may include attributes such as stone artefact concentrations less than 46 artefacts per m^2 or significantly disturbed environmental deposits;

    2. Stone artefact scatters that contain cultural heritage attributes which, when assessed, equal or exceed the analytical threshold of moderate scientific significance outlined in Section 7 and may include attributes such as significant stone artefact concentrations (46 or more artefacts per m^2); features (e.g.: hearths); occupation deposits or surfaces (Appendix 4 – Glossary and stratified occupation deposits, surfaces or features.

    3. Shell middens, earth and stone features; and

    4. Human remains.

- A person making such a discovery will immediately suspend any relevant works at the location and within a 5m radius of the relevant site extent;

- If not already in attendance, that person shall immediately notify the nominated Project Delegate for AAV and the nominated Project Delegate for the Sponsor;

AAV – Project Delegate	Ian Hamm Deputy Director Aboriginal Affairs Victoria 1 Spring Street Melbourne VIC 3000 03 9208 3333

Sponsor – Project Delegate	Kim Belfield Devcon Pty Ltd 395 Ferntree Gully Rd Mt Waverley VIC 3149 03 9541 6600

- The Sponsor's Project Delegate will notify the heritage advisor, and if necessary to prevent any further disturbance, the location will be isolated by a fence, safety webbing or other suitable barrier and works may recommence outside this 5m area of exclusion;

- The heritage advisor will evaluate the Aboriginal cultural heritage. The heritage advisor will determine if it is part of an already known site or should be registered as a new site. The heritage advisor must report the discovery to the Secretary by updating and / or completing site records and advise on possible management strategies;

- If a RAP exists for the area at the time of the discovery, the heritage advisor will facilitate the involvement of the RAP in the onsite investigation and assessment of significance of the Aboriginal cultural heritage;

- If the Aboriginal cultural heritage is assessed by the heritage advisor, in consultation with the RAP (if one exists), as a site with below moderate scientific significance, then after recording the material, no further management is required and works may proceed. The heritage advisor must submit relevant documentation to Site Registry, AAV;

- If Aboriginal cultural heritage other than that described above is discovered, the heritage advisor in consultation with the RAP (if one exists) and the Sponsor, should explore all options to avoid impact to the Aboriginal cultural heritage. If impact is unavoidable, then it should be minimised where possible and salvage excavation of the Aboriginal cultural heritage undertaken to minimise impact. In consultation with the RAP (if one exists) salvage excavation methodology should be carried out in accordance with proper archaeological practice taking into account occupational health and safety issues. After recording the material works may proceed. The heritage advisor must complete the appropriate Victorian Aboriginal Heritage Registry forms and submit a report to AAV detailing the results of excavations. If human remains are discovered the contingency in Recommendation 4.3 must be followed;

- Within a period not exceeding three (3) working days a decision must be made by the heritage advisor in consultation with the RAP (if one exists) and the Sponsor, as to the process to be followed to manage the Aboriginal cultural heritage in a culturally appropriate manner, and how to proceed with the works.

Failure of parties to reach an agreed course of action in this manner will be classed as a Dispute under this agreement;

- Work may recommence within the 5m radius exclusion zone:
  - When the appropriate protective measures have been taken;
  - Where the relevant Aboriginal cultural heritage records have been updated and / or completed;
  - Where all parties agree there is no prudent or feasible course of action; or
  - Once any relevant dispute has been resolved.
- Where relevant, the cultural heritage advisor, Sponsor and RAP (if one exists) will ensure that the above steps are followed and that legal obligations and requirements are complied with at all times.
- Custody and management of any artefactual material discovered during the activity must be arranged by the cultural heritage advisor in consultation with the RAP (if one exists). Currently there is no relevant RAP for the activity area. All artefacts will be stored in bags that have provenance information recorded on the labels. Artefacts will be retained by the cultural heritage advisor for 12 months after the activity is completed or until a RAP is approved, whichever is earlier. If no RAP is approved then custody of the artefacts will be offered in order of priority to the following:
  - Any relevant Native Title holder;
  - Any relevant person/s with demonstrable traditional or familial links;
  - Any relevant Aboriginal body with historical or contemporary interests;
  - The land owner; or
  - The Museum of Victoria (s.61(e)).

*In the case of the discovery of human remains, the procedures stated in the *Contingency for the Discovery of Skeletal Remains* included in this plan must be followed.

Recommendation 11.3 Contingency Plan for the Discovery of Human Skeletal Remains

If any suspected human remains are found during the activity, works must cease. The Victoria Police and the State Coroner's Office should be notified immediately. If there are reasonable grounds to believe that the remains are Aboriginal, the Department of Sustainability and Environment's Emergency Coordination Centre must be contacted immediately on 1300 888 544.

EXECUTIVE SUMMARY

This advice has been developed further and is described in the following 5 step contingency plan. Any such discovery at the activity area must follow these steps.

1 Discovery:

- If suspected human remains are discovered, all activity in the vicinity must *stop* to ensure minimal damage is caused to the remains; and
- The remains must be left in place, and protected from harm or damage.

2 Notification

- Once suspected human skeletal remains have been found, the Coroner's Office and Victoria Police must be notified immediately;
- If there is reasonable grounds to believe that the remains could be Aboriginal, the DSE Emergency Coordination Centre must be immediately notified on 2300 888 544;
- All details of the location and nature of the human remains must be provided to the relevant authorities;
- If it is confirmed by these authorities that the discovered remains are Aboriginal skeletal remains; the person responsible for the activity must report the existence of the human remains to the Secretary, DPCD, in accordance with s.17 of the *Aboriginal Heritage Act 2007.*

3 Impact Mitigation or Salvage:

- The Secretary, after taking reasonable steps to consult with any Aboriginal person or body with an interest in the Aboriginal human remains, will determine the appropriate course of action as required by s.18(2)(b) of the Act;
- An appropriate impact mitigation or salvage strategy as determined by the Secretary must be implemented. This will depend on the circumstances in which the remains were found, the number of burials found and the type of burials, and the outcome of consultation with any Aboriginal person or body;
- Any activity must remain halted until the completion of these strategies, with the exception of works that are necessary to meet any occupational health and safety requirements.

4 Curation and Further Analysis:

- The treatment of salvaged Aboriginal human remains must be in accordance with the will of AAV.

5 Reburial*:

- Any reburial site(s) must be fully documented by an experienced and qualified archaeologist, clearly marked and all details provided to AAV; and
- An appropriate cultural heritage management plan must be put in place to ensure that the remains are not disturbed in the future.

*A likely outcome would be that AAV will request that the disturbed remains be reburied in a location close to discover.

Recommendation 11.4 Contingency Plan for Dispute Resolution

As there is no RAP currently appointed for the activity area, contingency plans for dispute resolution are not applicable.

Recommendation 11.5 Provision for Review

Review of this plan can be undertaken at any time by project delegates representing the Sponsor and AAV, or an agreed independent reviewer, to ensure that all parties are complying with the terms of the plan. A checklist is provided in Appendix 8.

Recommendation 12 Other Considerations

The only Aboriginal cultural heritage to be preserved in the activity area after the activity is conducted will be scarred trees VAHR 7921-0394, 0483, 0485 & 0906. These sites will be located on private allotments. Any person requiring access to this land must apply in writing to the landowner for permission.

Information regarding specific site details contained within this report is of a sensitive nature, e.g.: MGA coordinates and site plans. Before releasing contents of this report to the general public permission should first be obtained from the relevant authorities / communities.

CONTENTS PAGE

CONTENTS PAGE

CONTENTS **PAGE**

TABLES (In Text)

FIGURES

PHOTOGRAPHS (In Text)

CONTENTS **PAGE**

ACKNOWLEDGEMENTS

Tardis Enterprises Pty Ltd would like to thank the following people for their assistance:

Kim Belfield – Devcon Group Pty Ltd
Sonia Murray, Robert Ogden, Dann Turnbull, Izzy Pepper, Mark Wandin, and Shaun Kelly – Bunurong Land Council Aboriginal Corporation
Robyn Gibson, Alvin Rajkovic, Shane Nicolson, and Tamara Hunt – Boon Wurrung Foundation Limited

ABBREVIATIONS

AAV	Heritage Services Branch, Aboriginal Affairs Victoria
AHC	Aboriginal Heritage Council
BLCAC	Bunurong Land Council Aboriginal Corporation
BWFL	Boon Wurrung Foundation Limited
CHMP	Cultural Heritage Management Plan
CHP	Cultural Heritage Permit
DPCD	Department of Planning and Community Development
DSE	Department of Sustainability and Environment
GPS	Global Positioning System
LV	Land Victoria
SLV	State Library of Victoria
VAHR	Victorian Aboriginal Heritage Register

** Throughout this report several technical terms are used that may not be familiar to some readers. An extensive glossary has been included as Appendix 4 and should be referenced for an explanation of terms.*

*** It should be noted that archaeological reports relating to Aboriginal and historic sites / places and the recommendations contained therein, may be independently reviewed by Aboriginal Affairs Victoria, the relevant Aboriginal community, and Heritage Victoria. Although the findings of a consultant's report will be taken into consideration, recommendations by an archaeological consultant for actions in relation to the management of a site should not be taken to imply automatic approval of those actions by Aboriginal Affairs Victoria, Heritage Victoria or the relevant Aboriginal community.*

1 INTRODUCTION

This cultural heritage management plan (CHMP) is prepared under the *Aboriginal Heritage Act 2006* (Section 47) and *Aboriginal Heritage Regulations 2007* (Regulations 6, 22, 37, 38 & 46) and has been commissioned by Devcon Group Pty Ltd (ABN 80 053 001 184) on behalf of the sponsor Pellicano Investments Pty Ltd (ABN 80 004 361 942). Tardis Enterprises Pty Ltd (ABN 45 726 098 396) key personnel Andrea Murphy (project manager) and Dr Tom Rymer (project archaeologist) prepared this CHMP. Andrea Murphy holds a Masters Prelim in archaeology and has over twenty years experience in all facets of cultural heritage management. Tom Rymer has a doctorate in archaeology and over ten years experience in excavation overseas and cultural heritage management in Victoria (see Appendix 7 – Authors' CVs).

M3 Estate is located at 95-117 Bayliss Road, Lyndhurst, approximately 38 km southeast of Melbourne in the municipality of the City of Greater Dandenong (Map 1a). The land is owned by Pellicano Investments Pty Ltd and comprises a total of 36 hectares. The activity is a proposed industrial subdivision.

Currently there is no relevant Registered Aboriginal Party (RAP) in relation to the proposed activity area; therefore, as required under Section 54 of the *Aboriginal Heritage Act 2006* a *Notice of Intent to Prepare a Cultural Heritage Management Plan* was submitted to the Deputy Director, Aboriginal Affairs Victoria (AAV) on 18 March 2008. AAV notified Pellicano Investments Pty Ltd on 20 March 2008 that they will evaluate the plan when completed (Appendix 1). Although there are currently no RAPs in relation to the activity area, representatives from the Bunurong Land Council Aboriginal Corporation (BLCAC) and Boon Wurrung Foundation Limited (BWFL) were consulted during the project and participated in the fieldwork including (Section 1.3).

1.1 Activity Description

The activity is a proposed industrial development comprising (Map 1b):

- 13 Lot Warehouses of varying sizes (development and subdivision);
- Railway Reserve; and
- Associated road (National Drive) and services.

The masterplan shown in Map 1b is indicative of the proposed industrial development. Under the development model warehouses are built to operator's specific requirements as required and as permitted in accordance with land zoned Industrial 1 pursuant to the City of Greater Dandenong Planning Scheme.

Pursuant to sch.2 cl.6(2)(b) *Aboriginal Heritage Regulations 2007*, the activity area will be used and developed as a warehouse industrial estate in accordance with the zone. The use or development of the lots in the activity area permitted by Industrial Zone 1 under the relevant planning scheme is described as follows (GDPS 2008):

- "To implement the State Planning Policy Framework and the Local Planning Policy Framework, including the Municipal Strategic Statement and local planning policies.

- To provide for manufacturing industry, the storage and distribution of goods and associated uses in the manner which does not affect the safety and amenity of local communities."

The use of lots specified in the Table of Uses (33.01-1) under Industrial Zone 1 for the Greater Dandenong Planning Scheme (GDPS 2008) includes: warehouse, industry, apiculture, carnival, circus, crop raising, extensive animal husbandry, informal outdoor recreation, mail centre, mineral exploration, mining, minor utility installation, natural systems, railway, road, search for stone, service station, shipping container storage, telecommunications facility, tramway, adult sex bookshop, agriculture, caretaker's house, convenience shop, education centre, equestrian supplies, leisure & recreation, lighting shop, materials recycling, mineral, stone or soil extraction, office, party supplies, place of assembly, restricted retail premises, retail premises or utility installation. Prohibited uses include accommodation, cinema based entertainment facility, hospital, intensive animal husbandry and shop (other than specified above).

The earthworks of the activity will require clear, cut, grade and fill (Map 2). Fill requirements are predominantly located in the north of the activity area to a depth of 2m, while the southern area has not yet been evaluated for filling due to possible drainage redesign. Previously recorded Aboriginal scarred tree sites have been preserved and incorporated into the development design. For the purpose of the cultural heritage assessment, it will be assumed that the cut and fill will likely impact the remainder of the activity area in development areas (Maps 1b & 1c) including present and buried former land surfaces. In these areas the activity will likely harm previously recorded Aboriginal stone artefact scatter VAHR7921-0484 and other Aboriginal cultural heritage, if present (sch.2 cl.6(1)(b) *Aboriginal Heritage Regulations 2007*).

1.2 Extent of the Activity Area Covered by the Cultural Heritage Management Plan

M3 Estate is located at 95-117 Bayliss Road, Lyndhurst, approximately 38 km southeast of Melbourne in the municipality of the City of Greater Dandenong (Map 1a). This property comprises two parcels (Lots APS443552 & 2PS322846 / Parish of Eumemmerring / County of Mornington) and measures approximately 36 hectares. The property is bounded to the north by parkland, to the east by railway line reserve and Southern Circle Cement, to the south by Bayliss Road and to the west by the Sita landfill site.

The activity area is situated on a lowland plain comprising a floodplain to the north and very gentle sandy rises to the south. The salient prominent structures and works in, and natural features of, the activity area are (sch.2 cl.7(1)(c) *Aboriginal Heritage Regulations 2007*, Map 1c):

- Farmhouses, outbuildings and infrastructure in the south;
- Dam in the northwest;
- Market gardens in the south;
- Lowland floodplain in the north;
- Very gentle sandy rises in the south; and
- Scattered old growth Red Gums in the east and north.

1.3 Persons Involved in the Preparation of this Plan

Apart from representatives of current RAP applicants (see Section 1.4), the persons below participated in the preparation of this plan in the following capacities:

- Andrea Murphy (principal, Tardis Enterprises Pty Ltd): project management, report editing;
- Dr Tom Rymer (senior archaeologist, Tardis Enterprises Pty Ltd): project archaeologist, report writing;
- Kathleen Hislop, Tim Hill (archaeologist, Tardis Enterprises Pty Ltd): fieldwork supervisor;
- Stacey Kennedy (archaeologist, Tardis Enterprises Pty Ltd): background research;
- Bronwyn Naismith, Bradley Ward, Jay Yost (archaeologists, Tardis Enterprises Pty Ltd): fieldwork assistant;
- Robert Ogden, Dann Turnbull, Izzy Pepper, Mark Wandin, Shaun Kelly (BLCAC): fieldwork representative(s);
- Alvin Rajkovic, Shane Nicolson, Tamara Hunt (BWFL): fieldwork representative;
- Kim Belfield (Town Planner, Devcon Group Pty Ltd);

Tardis Enterprises Pty Ltd key personnel qualifications and experience are detailed in Appendix 7.

1.4 Documentation of Consultation

Currently there is no RAP appointed for traditional Bunurong land; therefore, the sponsor lodged a *Notice of Intent to Prepare a Cultural Heritage Management Plan* with the Heritage Services Branch, AAV (Appendix 1). Ian Hamm, the Deputy Director, AAV, notified the sponsor on 25 March 2008 that they would evaluate the plan when completed (Appendix 1). When evaluating this CHMP, the Secretary is required to "consult with, and consider the views of, any Aboriginal person or Aboriginal body that the Secretary considers relevant to the application (s.65(3) *Aboriginal Heritage Act 2007*). The Victorian Aboriginal Heritage Register (VAHR) at AAV was consulted for the presence of Aboriginal cultural heritage within or near the activity area. In addition, the representatives of local Aboriginal groups that participated in the project were consulted for any specific cultural knowledge known about the activity area.

Prior to the current legislation both BLCAC and BWFL have represented the Aboriginal community in regards to the cultural heritage management in traditional Bunurong land. Under the current legislation both groups have applied for, but not received, RAP status. Dr Tom Rymer contacted both groups to request Aboriginal community participation in the assessment components of this investigation. Aboriginal community participants are listed in Section 1.3.

The following were consulted as part of this assessment:

- Aboriginal Affairs Site Registry;
- State Library of Victoria;
- Land Victoria;
- Public Records Office;
- Local Aboriginal Groups (non-RAP status); and
- Land Managers.

1.5 Additional Information regarding the Activity Area

BLCAC and BWFL were requested to supply any relevant information regarding the oral tradition, Aboriginal cultural heritage or specific cultural significance of the activity area (email, 5.9.2008, sch.2 cl.8(4) *Aboriginal Heritage Regulations 2007.*

No information regarding any relevant oral tradition, Aboriginal cultural heritage or specific cultural significance of the activity area was provided by either group.

DESKTOP ASSESSMENT

A desktop assessment is a compulsory component of a CHMP (r.56(1), *Aboriginal Heritage Regulations 2007*). The desktop assessment must satisfy the requirements detailed in the *Aboriginal Heritage Regulations 2007* (r.57 & sch.2) as well as in the approved form (r.64, *Aboriginal Heritage Regulations 2007*) and include the following: a search of the Victorian Aboriginal Heritage Register (Section 4.3); an identification and determination of the geographic region of which the activity area forms a part that is relevant to the Aboriginal heritage that may be present in the activity area (Section 2.2); a review of reports and published works about Aboriginal cultural heritage in the region (Section 4.4); a review of historical and ethnohistorical accounts of Aboriginal occupation of the region (Sections 4.1 & 4.2); a review of landforms or geomorphology of the activity area (Section 2.2); and a review of the history of the use of the activity area (Section 3). Although a desktop may also include the collection and review of oral history relating to the activity area, it is not compulsory; however, a formal request was made for this information (Section 1.5). Additional information considered relevant to the assessment is also presented (e.g.: climate, flora and fauna).

2 ENVIRONMENTAL DESCRIPTION

The importance of understanding the past and present environment is two-fold. Firstly, it is the pre-European settlement that was the evolving context for Aboriginal land use in the region. Secondly, to understand the changes in the environment since European settlement is to bring an understanding of what Aboriginal archaeological sites may have survived and their potential location. This information is used to produce an Aboriginal sites prediction model specific to the activity area.

2.1 Pleistocene and Early Holocene

The Pleistocene and early Holocene environment within the activity area region was one of gradual and continuous change. Aboriginal people are known to have occupied south-eastern Australia during the late Pleistocene (c. 30,000 – 10,000 years BP) from archaeological evidence found at Keilor (Coutts 1977, 1978, 1980) and Hunter Island (Bowdler 1984). The changing environmental conditions provided different sets of resources for the human populations inhabiting the area. During the Pleistocene, sea levels were in general much lower than present.

The activity area is located within the north western section of the South Victorian Uplands, an area of moderately dissected ridges associated with the Mornington Peninsula (LCC 1991: Map 9). The central region is comprised of low-lying areas that have in the past been frequently inundated by floodwater and prior to European settlement and shallow drainage schemes would have been wetland during the winter months. The now drained Carrum Swamp once stretched along the eastern shore of Port Phillip Bay, and its eastern boundary was located approximately 1 km west of the activity area (Presland 1994: 11).

The landform of the activity area was formed as a result of changing sea levels over the past 20,000 to 10,000 years. During this time, sea levels fluctuated and average temperatures were up to 80C below the current mean. Rainfall was higher and sea levels lower; at the height of the last ice age, the sea was approximately 160m below present levels (White & O'Connell 1982: 15). Consequently, a land bridge existed between mainland Australia and

Tasmania, with the Yarra River flowing across the grassy plain west of the activity area and flowed out through the Port Phillip Heads. During this time the Yarra River cut a steep bend in what is now Carrum Swamp (Rhodes 2001: 11) and Lyndhurst comprised steep slopes rimmed by sandstone escarpments. A series of dunes formed above this escarpment; the remnant of this geological activity is likely the gentle sandy rises in the south of the activity area. Between 14,000 and 10,000 years, climatic conditions changed to become warmer and wetter resulting in rising sea levels. Port Phillip Bay flooded around 10,000 years ago though formation of the current coastline did not stabilise until 4,000 years ago. As current dune barriers systems developed, blocking off previous discharge points for the region's rivers and creeks, a series of freshwater swamps developed known as Carrum Swamp.

The past distance to the coast line and proximity to large areas of swampland is relevant to this activity as it provides an indicator of potential Aboriginal archaeological site types, location and antiquity. For example, any sites associated with the exploitation of wetland resources, most likely to relate to the last 1 to 4,000 years, whilst deeply buried terrestrial sites on the remnant dune systems in Lyndhurst could potentially relate to Pleistocene occupation.

2.2 Regional Geography, Geology, Geomorphology and Landform

The activity area lies within the South Victorian Uplands geomorphic unit of the moderately dissected ridge of the Mornington Peninsula (Rowan 1990). However, the activity area is more accurately described located on lowland plains with Eumemmerring Creek running to the north-west from a distance approximately 2km. The barrier complex of the Carrum Swamp lies to the west, the Moorabbin sand and clay pans to the north-west, the dissected uplands of the Dandenongs to the northeast and the Gippsland flood plains to the east (Map 3, DPI 2007). The activity area geology predominately comprises mostly Holocene, paludal, lagoon and swamp deposits of silt and clay to the north and west and Pleistocene Aeolian dune deposits of sand, clay and calcareous sand to the south. There may also be a component of Pliocene to Miocene fluvial sandstone, conglomerate, siltstone and ironstone. Relatively undisturbed Pleistocene sand sheets have contained Pleistocene age Aboriginal sites at Bend Road, Dandenong. The paludal Holocene deposits have likely accumulated since the stabilisation of the present sea level and the formation of Carrum Swamp to the west. The previously recorded stone artefact scatter was located within the sandy landform (VAHR 7921-0484).

2.3 Climate

The climate of the activity area is characterised by cool wet winters and moderate summers with short dry periods. The average annual rainfall is in excess of 700mm. The average temperatures range from a winter minimum of 30°C to a summer maximum of 26°C (LCC 1991: 60). The climate of the activity area would not have constrained either Aboriginal or European occupation.

2.4 Fauna and Flora

Reconstruction of the pre-European flora indicated that the activity area region comprised swamp scrub along the flood plain of Eumemmerring Creek and tributaries with a woodland and grassland mosaic with some patches of heathy woodland on the plains to the south and

grassy woodland to the north (Map 4). To the west were grassy wetlands associated with the margins of Carrum Swamp further to the west. The activity area falls within the Plains Woodland/Plains Grassland Mosaic EVC (DSE 2007). The woodlands-grasslands mosaic would have contained a minimum combination of eucalypt woodland to 15m tall with a sparse under-storey of shrubs with a grassy and herbaceous ground layer. River Red gum would have been the dominant tree canopy species. The activity area is not located within a vegetation transitional zone, which reduces the potential for density of significant archaeological sites.

3 HISTORIC BACKGROUND AND LAND USE

The following historical information is presented in support of land use changes in the historic past. This Section provides a brief overview in order to assess disturbance to the activity area.

Though the Portuguese possessed maps of Western Port and Port Phillip Bays by 1493, the first recorded visit by Europeans was by George Bass in 1798. Bass was followed by Lieutenant Grant in 1801. Later that same year Murray carried out a detailed investigation of Western Port, during which time contact was made with local Aboriginal people (Sullivan 1981: 13). From 1798 to 1826 sealers were the most common visitors, establishing various coastal bases such as Phillip Island (Gunson 1974: 16). The men involved in the exploitation of seals travelled from Tasmania, often bringing Aboriginal women and men with them. Seals were then a common sight along the coast and at saltwater inlets. However, such was the wholesale destruction of their colonies that by 1832, sealing was no longer profitable. Tasmanian ships also visited the bays during this period to obtain wattle bark (for the use in tanning) from the black wattle that flourished on the mainland (Edgecombe 1989: 14).

Until 1826 the destructive and disruptive effects on Port Phillip Bay and Western Port by Europeans had been limited to the coastal fringe. Later in that year a military settlement was established at Red Point (Corinella) to forestall possible claims and colonisation by the French. The next phase of European settlement was spurned by Major Mitchell's journey overland journey from Sydney to Portland, which inspired eager squatters to find a path from Melbourne to Mitchell's highly rated grazing lands of Gippsland.

Europeans first settled the Dandenong / Cranbourne areas during the 1830-40s. The first Europeans to visit the Dandenong area were the men associated with the establishment in 1837 of Captain William Lonsdale's cattle station (Bigning). His nephew Alfred Langhorne was employed as Lonsdale's overseer, as Lonsdale was too busy as Victoria's first Police Magistrate to reside on the property. It was also Captain Lonsdale who established the Native Police Corps based at Dandenong, in an attempt to combat the rampant lawlessness of the Port Phillip district at this time. George Langhorne, Alfred's brother, was to become a missionary and for a short period, was also the local Aboriginal Protector.

Assistant Aboriginal Protector, William Thomas prepared a map of the Western Port region between 1839 and 1841 (Map 5). This figure shows that at this time a track roughly corresponding to South Gippsland Highway existed and the nearest settler to the present activity area was 'Bakkhouse', correctly spelt as Bacchus in Spreadborough and Anderson (1983). Henry Bacchus and his partner J.M. Wooley held the run of 'Biging' or 'Barnham'

from 1840 to 1843 (Gunson 1974: 34). The homestead for this run was located on the north bank of Eumemmerring Creek, now the suburb of Keysborough.

During the 1830s five brothers known as the Ruffy Bros were the first to settle permanently in the area. They arrived from Van Dieman's Land in 1836 and squatted on the extensive Tomaque run (between Dandenong and Cranbourne). They appear to have had the Cranbourne Inn, a likely source for the name of the locality (Gunson 1974: 19). H.B. Foot made the first survey of the Cranbourne and Lyndhurst district in 1852 when the township of Cranbourne was reserved out of the pastoral runs Mayune, Towbeet and Barker's Heifer Station (Gunson 1974: 56). A later run that also included the activity area was Lyndhurst that was first gazetted on October 17th 1865 to Edwarde Hearne, changing hands twice before being forfeited in 1871 (Spreadborough & Anderson 1983: 335). Lyndhurst is named after Lord Lyndhurst, a parliamentarian, who, when he died in 1863, was Lord Chancellor (Gunson 1974: 57). The first landowner of the activity area was Jas Quirk who purchased allotments 66, 67 and 47 in 1859 (Map 6). These lots were between 137 and 161 acres. The activity area is within Lot 67 which was to later be bisected by the Great Southern Railway and establishment of the Lyndhurst Railway Station.

It was not until the 1860s that a District Roads Board was established in the region in order to plan routes and build roads and bridges. With the creation of new main roads came early roadside Inns, built to cater for the increasing number of travellers through the district (Hicks 1991: 20). Railways followed soon after, with the line to Cranbourne completed by 1887. The Lyndhurst Station did not attract a village; as Cranbourne was sufficiently close (Gunson 1974: 165). Hicks identifies the building of railways as one of the most important factors in the growth of the region as 'it facilitated the marketing of perishable produce from dairy farms, market gardens and orchards, expanding significantly the economic potential of the district' (Hicks 1991: 22). The population of Cranbourne and nearby area remained small and it was not until the 1950s that major development began (Hicks 1991: 27).

Since initial European settlement of the Dandenong plains, grazing and cropping have dominated pastoral activities. The first industry for this region was timber collection that was undertaken prior to land sales. This industry flourished during the 1840s when the amount of Red gum both standing and on the ground, seemed inexhaustible and was widely used for housing, fuel, commercial and infrastructure developments and fencing. This activity was responsible for the initial clearing in well-drained areas.

Draining of Carrum Swamp has had the greatest post-contact impact on the activity area. In 1868 the Dandenong Shire Council made channels across the swamp to carry the creek waters to the Mordialloc and Kananook Creeks, resulting in some land being taken for grazing and cultivation. In 1878 Patterson River was cut through the swamp and coastal sand to Port Phillip Bay as a further drainage measure. The river begins roughly where the Dandenong and Eumemmerring Creeks intersect at Bangholme.

Flooding in 1889 overcame the channels and the artificial river, and the Carrum Trust was formed to enlarge all outlets and construct small channels for irrigation during dry periods. Further floods in 1923-4 resulted in enlargement of the drains by the State Rivers and Water Supply Commission, which partly superseded the Trust by 1910.

The Trust was abolished in 1936, and the Dandenong Valley Authority took over responsibility in 1966. The Authority oversaw the construction of the Patterson Lakes water-sport complex near the mouth of the 'river' in the 1980s (Australian Places Website). These cumulative drainage works resulted in the present activity area changing from intermittent wetlands to dry arable land.

Photograph 1 clearly shows that by 1960 approximately half of the activity area had been subject to comprehensive ploughing for market gardening. Whilst ploughing prior to the advent of tractors in the 1920s was limited, once this technology became widely available the entire region was heavily worked for crops (hay, barley), installation of shallow drainage schemes and pasture improvement. Since this time the south of the activity area has been subject to intensive significant ground disturbance for market gardening. Due to this land use history, sites in this area are unlikely to have intact archaeological deposits within the top 50cm.

3.1 European Impact in the Activity Area

Since European settlement of the activity area during the 1830-40s, dramatic changes have been made to the Lyndhurst region, particularly in relation to water sources, native vegetation and fauna. These changes are associated with pastoral activities (such as clearing of vegetation, ploughing, major and minor drainage works). Examination of archival air photos (1960) of the activity area shows ploughing in the south was once more extensive than in recent years.

Tree clearance, development of the land for pastoral and market garden activities would have adversely impacted on any archaeological site that existed. As a result of past land use, cultural material (such as stone tools) would have been disturbed, re-deposited, or even destroyed. Many scarred tree sites that existed prior to tree clearance may have been destroyed. Only mature original red gum trees that have been retained may still contain evidence of pre-contact cultural use. Repeated ploughing will have destroyed the spatial and temporal integrity of any site to an average depth of 500-600mm, whilst localised areas of disturbance (such as dams, stock ruts and tree stump removal) may have resulted in significant disturbance to a greater depth. The activity area may have also been subject to both soil introduction and removal as part of former market garden activities.

The extensive wetland area known as Carrum Swamp extended from Dandenong foothills to Mordialloc and margins of which are close to the present activity area. Virtually all of the former Carrum Swamp wetlands have now been drained. The now well-defined Dandenong and Eumemmerring Creeks, situated to the north and west of the activity area, were once associated with wetlands (including the activity area), which flooded the entire valley on an annual basis. Deepening and re-alignment of waterways such as these creeks, and draining of the wetlands, now gives the impression that wetland areas are rare, when originally these would have been a common feature of all low lying areas.

Intensive agriculture has occurred within the southern half of the activity area for over forty-five years (Photograph 1). The aerial photograph shows ploughed fields in the southern half exposing the sandy nature of the soils. The intensive use over such an extensive period of time has resulted in high ground disturbance. Most of the old growth native vegetation appears to have been cleared except for some remnant trees in the east and the north. A

number of these trees have been recorded as culturally scarred trees (see Section 4). There are no mature eucalypt trees remaining associated with the very gentle sandy rises. Trees are associated with the lowland plain which is subject to frequent inundation. Along the northern boundary of the property a drain has been excavated to assist drainage.

In summary, the European activities that would have acted to degrade archaeological resources within the activity area are:

- Multiple episodes of vegetation clearance;
- Repeated ploughing;
- Dam construction;
- Long-term grazing; and
- Market gardening

Photograph 1 Aerial Photograph of the Activity Area (MMAP 1960)

4 ABORIGINAL BACKGROUND

4.1 History and Ethnohistory

Ethnohistorical information used to establish pre-settlement Aboriginal spatial organisation is mostly based on observations made by Europeans during the initial period of contact and subsequent settlement of the activity area. Early historical accounts of Aboriginal land use within and surrounding the activity area are scant, with information provided by, for example, Thomas (nd).

The information used to establish pre-settlement Aboriginal spatial organisation is mostly based on observations made by Europeans during the initial period of contact and subsequent settlement of the region. Early historical accounts of Aboriginal land use surrounding the activity area are scant, with most descriptions by the Assistant Aboriginal Protector William Thomas (Thomas Journals 1840-1843) and early European landowners of the area. It was William Thomas who saw the need to provide a settled life for the Aborigines and establish protectorate stations, first at Arthur's Seat (1839-40) and then at Narre Narre Warren (1840-43).

Accounts of Aboriginal life at the time of European contact in the region have been provided by Presland (1994) and Goulding (1988). Detailed examination of the social and territorial organisation of Aboriginal society is provided by Barwick (1984) and Clark (1990). Only summaries of this information are provided within this section.

The activity area lies within the traditional lands of the *Bunurong / Boon Warrung* tribe (Map 7). The *Bunurong* (Western Port) tribes belonged to the inter-marriage network and language ties group known as the *Kulin*, which inhabited areas around Melbourne. At the time of contact the *Kulin* nation was made up of the *Bunurong*, *Woiworung*, *Jajowrong*, *Taunguong* and *Wathaurung* (Presland 1994: 40).

The territory of the *Bunurong* is thought to have extended north from the coast at Western Port Bay to the Dandenong Ranges (Thomas in Gaughwin & Sullivan 1984: 86). The northern boundary is thought to have been delineated by the source streams in the Dandenong Ranges, while the western boundary is thought to have been Werribee River, and the eastern boundary was to the east of Tarwin River (Gaughwin & Sullivan 1984: 87). Early Aboriginal population numbers made by observers are, at best estimates. An 1839 census of the *Bunurong* by Thomas suggested that at the time of colonisation, this tribe comprised of approximately 500 persons or 'six square miles per person' (Thomas nd ML 9: 47). Other descriptions of Bunurong territory suggest that the territory (Massola 1959: 180):

> ... extended along the coast from Werribee River on the east, to Cape Liptrap on the west, in an area taking in Williamstown (Koort-Boork-Boork), St Kilda (Euro-yoroke), the eastern environs of Port Phillip (Nerm) and all of Westernport (Warn-mer-in). Inland it reached to the Dandenong Ranges (Cor-han-warabul), Mirboo, Warragul, Neerim and the Upper Latrobe.

European contact with the *Bunurong* around Western Port was initially by sealers and whalers frequenting Bass Strait from the late 1790s. During this time, Aboriginal women were kidnapped from both Tasmania and the mainland for use as labourers and concubines, often resulting in hostile confrontations. The missionary Langhorne (Thomas nd ML: 61) mentioned

that tribes of the Western Port had the 'occasional affray' with sealers and he believed that this early contact had greatly reduced their numbers.

Intermarriage and exchange of goods between the *Kulin* tribes is known to have occurred (Sullivan 1981: 36). *Kulin* people often met for inter-clan gatherings, such as that recorded in 1844 when groups of *Woiworung* people were camped on the site of the future MCG, and a group of *Bunurong* were camped on the site of the future Government House (Presland 1994: 47). Notices of planned gathering were distributed to neighbours via message sticks, and during these inter-tribal gatherings marriages were arranged, and disputes settled. Greenstone from the Mt William quarries in the *Woiworung* territory appears to have been transported or traded into the *Bunurong* territory (McBryde 1984). Within the *Kulin*, some tribes were more likely to exchange wives or hold corroborees with certain other tribes. The *Bunurong* had ceremonial links with, and most often married, members of *Taungurong* and *Wathaurung* tribes (Gaughwin 1981: 59). However, these alignments did not prevent warfare between the tribes (Thomas nd ML 1, 23 March, 1839).

Assistant Aboriginal Protector Thomas and early settlers in the Western Port region have recorded aspects of the seasonal movements by the *Bunurong* through their territory (Map 5). Gaughwin (1981) considers that the *Bunurong* continued their seasonal exploitation in a circular pattern from Melbourne and the Mornington Peninsula during the initial period of contact. One of these seasonal routes passes through Dandenong and along a similar alignment to the South Gippsland Highway, adjacent to the present activity area (1981: 75). This trip was thought to take about one month with an average stay of one to two nights at each campsite while the resources within a 10km radius were exploited (Sullivan 1981: 37). During these travels Thomas observed that 'Blacks seldom travel more than 8 or 9 miles per day', (Thomas nd PRO Letter 3 July, 1840). It must be noted that ethno-historical information of movements made by Aboriginals during this time, apart from reflecting an already disrupted population, would also be dependent on the seasonal exploitation and availability of resources that had also been impacted by European settlement.

Hunting was mainly done by men, with plant foods and small animals largely collected by women and children. These included liquid amber from the black wattle tree, tuberous roots, as well as the hearts of fern trees (Snoek 1987: 8). A large variety of plants were not only valued for their potential food resources, but also for their medicinal uses and their suitability for the manufacture of implements (Snoek 1987: 8-9).

Thomas noted that Aboriginal people would congregate around swamps to spear eels (Gaughwin 1981: 75). Eels were noted by Thomas as being an important food and allowed people to stay at one camp spot for extended periods (Gaughwin & Sullivan 1984: 89-90). It has also been noted that lyrebirds, wombats, wallabies and other animals were hunted in the hills in summer (Snoek 1978: 7).

The *Bunurong* clan whose estate included the present activity area were the *Mayone buluk* meaning people of the swamp (Clan 2, Figure 8). Their territory is thought to have been "Carrum Swamp, the coastal strip at the head of Western Port and the upper portion of the Mornington Peninsular" (Barwick 1984: 177). The clan was patrilineal and belonged to the *bunjil* moiety system. Clan leaders were known as *arweet*, and the leader at the time of European contact was Mortrungo (1797/8-1848), his heir was Buggup (1820-48), who was a corporal in the Native Police Corps. A Dr Bailey also recorded much ethnographic

information during the 1840s and cites clan member Manmangenur (c. 1821-1845) as a recognised authority within this group (Barwick 1984: 117).

There is little specific ethnographic information of the lifestyles of the *Mayone buluk* clan at the time of European settlement. The few instances and recollections cited by early residents make no reference to clans or clan estates, movements or names. However, snippets of information cited within local histories can be assumed to be that of *Mayone buluk* clan members.

Rhodes (2001) has complied relevant ethnographic evidence for the City of Greater Dandenong. In this activity Rhodes notes that several campsites and locations in which a range of activities occurred in the Dandenong region. Rhodes provides incorrect present day locations for campsites mentioned. *Narmnup*, is situated somewhere near Cardinia Creek north of Berwick, and not around Lyndhurst. Another location noted by Thomas in 1841 where possums were hunted was on a large water hole on the Eumemmerring Creek 5km south of Dandenong known as *Parnhun*. Rhodes considers this as being near Coleman's Road, on the former edge of a swamp near the Keys pastoral station, north-west of the present activity area. Whilst neither of these ethnographic sites included the activity area, such evidence does serve to indicate the economic importance of the activity area region, (specifically areas bordering the Carrum Swamp) to pre-contact Aboriginal people.

There are currently no recorded Aboriginal burial sites located within the generally locality. However, there is historical evidence that burial sites within the Western Port region were both common and conspicuous. Members of the *Kulin* were known to both bury their dead, as well as place them in tree hollows that were then often burnt. Burial sites are cited as occurring within sandy locations. There is historic evidence that a burial ground also occurs at Keysborough. Thus, based on this scant information, burial sites may still exist in undisturbed sandy locations within the region.

The meteorites that landed near Cranbourne were believed by early European settlers to have been significant to local Aboriginals. It is reported that Aboriginals often camped at the location of these meteorites, on the property Ironbank, and became very distressed by the meteorites removal (Smith 1989: 16). These meteorites are now housed in the Melbourne and London Museums. The meteorites impact sites are located outside of the present activity area to the south and east.

The ethno-historical information provides evidence that the *Bunurong* tribe occupied Western Port in an organised manner. Clans generally had areas in which they spent much of their time and provided the basis for all their needs. The Red gums in the activity area region and margins of the former Carrum Swamp would have been an important element in the exploitation and occupation of this region.

Aboriginal population numbers decreased rapidly after white settlement in the Western Port area due to dispossession of land and associated resources, and the spread of diseases brought into the area by Europeans settlers. By 1856 the remaining *Bunurong* lived mostly at *Moody Yallock* (Mordialloc), exploiting the swamp and adjacent coastline. Currently there is no RAP for the activity area and the legislative management of sites remains with the Secretary for DPCD.

4.2 Resources Available to Aboriginal People

The resources available for Aboriginal subsistence in the past would have been rich. The activity area and surrounding region contain a variety of productive ecological zones such as: riverine, mountainous, lacustrine and terrestrial that would have been attractive for hunter-gathers.

It is likely that areas associated with water bodies and drainage systems were the focus of exploitation by Aboriginal people near the activity area. Within each ecological zone, there would have been variations in staple species diversity and abundance, and this in turn would have influenced site location (Walsh 1987).

The activity area would have contained a large number and wide variety of fauna species associated with forests and wetlands prior to European settlement. With the demise of native habitat, the number and range of species that once existed has been greatly reduced. Arboreal and land mammal species that would have been commonplace throughout the activity area are: brushtail possum, Leadbeaters possum, ringtail possum, horseshoe bat, tiger quoll, native rat, wallaby, kangaroo, echidna, emu and koala. Within wetlands and associated with waterways would have existed: black swan, ducks, ibis, fish and crustacean (LCC 1991: 111). Detailed lists of plants and animal species known to exist within the Western Port and Port Phillip areas can be obtained from Gaughwin (1981), Sullivan (1981), Presland (1994) and Gott (1983).

Red gum (*Eucalyptus camaldulensis*) were once more numerous along watercourses and within flood plain areas. Because of their smooth bark and large size, they were commonly used for the manufacture of bark and wooden implements by Aboriginal people (Edwards 1972: 31). Apart from the manufacture of wooden and bark implements and access to food resources, the bark from these trees would also have been removed for other non-utilitarian purposes such as ceremonial and social. Austral Bracken was used for medicinal purposes, with the juice of the stem applied to relieve the itching of insect bites, as well as for food. The underground stems of the plant were collected and eaten as a starchy staple food (Lane 1996: 3). The sugary extrusions of sap which formed on the leaf of the Manna Gum were collected and eaten by Aboriginal people, and the smoke of its burning leaves was thought to reduce fever (Lane 1996: 3). It is beyond the scope of this activity to reconstruct the resource structure at a local scale; however, some of the food resources that were utilised by Aboriginal people are wetland root crops (such as *Typa*, *Triglochin*) and dry land root crops (such as *Microseris scaigera*).

Some stone resources used by Aboriginal people in the past were available in areas near the present activity area. Basalt, often used for grindstones and axes, was obtainable from surface outcrops at Berwick and possibly Cranbourne (Murphy 1997, Thomas *et al* 1967: 55). Most of these larger deposits have now been quarried for road metal. Quartz, like basalt, is readily available within the surrounding region (Queenscliff 1:250,000 Geological Series Mapsheet). Quartz pebbles are located within most creeks and drainage lines, and quartzite is exposed throughout the nearby Dandenong hills. Siltstone and mudstone, two other materials occasionally used for the manufacture of stone artefacts, readily occur within the foothills near the activity area. Hornfels, a material frequently used for axes, can be sourced from the 'Haunted Hills' formation west of Lang Lang. Neither silcrete nor chert occurs naturally within the activity area. These highly sought after stone materials occur 10 to 50km

to the south and south-west of the activity area along the coast and on the Mornington Peninsular (Gaughwin 1981, McConnell in Gaughwin & Sullivan 1981: 159).

4.3 Victorian Aboriginal Heritage Register: Recorded Aboriginal Sites

There are 35 previously recorded Aboriginal sites within 3km of the activity area including 16 scarred trees, eight surface artefact scatters and 11 sub-surface artefact scatters. (Those within 1km are presented in Table 1.) Four of these VAHR 7921-0394, 0483, 0484 and 0485 are located within the present activity area and comprise three scarred trees and one surface stone artefact scatter (Table 2 in bold italics; Map 1c). The location and site types demonstrate the sensitivity of the activity area region. Red gum scarred trees are generally recorded on the lowland plains landform which was subject to frequent inundation as part of the extensive Carrum Swamp complex. Stone artefact scatters are generally located on sandy rises in the Cranbourne Sands surrounding the wetlands. None have been excavated to proper archaeological standards in order to make a detailed scientific significance assessment.

Table 1 Recorded Aboriginal Sites within 3km of the Activity Area

VAHR No Site Name Ref / Recorder	Site Type	Location	Site Size Contents	Scientific Significance**
7921-0394 Bayliss Rd Rhodes 2001 Within activity area	*Scarred Tree*	*Nth of Bayliss Rd & Lyndhurst Station, 200m nth of Blue Circle Southern Cement Lowland plain - floodplain.*	*1 definite Aboriginal scar – 150 x 80cm on Red Gum Good – poor*	*High*
7921-0483 Parham 3 Rhodes 2002 Within activity area.	*Scarred Tree*	*100m east of railway, nth of Bayliss Rd, Sth of Abbotts Rd, Lyndhurst. Lowland plain - floodplain*	*1 definite Aboriginal scar – 190 x 30cm on Red Gum Good – healthy*	*Moderate*
7921-0484 Parham 4 Rhodes 2002 Within activity area	*Stone Artefact Scatter*[S]	*100m west of railway, nth of Bayliss Rd, Sth of Abbotts Rd, Lyndhurst Lowland plain – sandy rise*	*1 chert core*	*Low*
7921-0485 Parham 5 Rhodes 2002 Within activity area	*Scarred Tree*	*100m west of railway, nth of Bayliss Rd, Lyndhurst Lowland Plain - floodplain*	*1 definite Aboriginal scar – 138 x 18cm on Red Gum Good – healthy*	*High*
7921-0182 Lyndhurst 1 Presland 1984	Stone Artefact Scatter[S]	60m east of Western Port Hwy, nth of Presbyterian Church Lowland plain - floodplain	10 x 10m Silcrete flakes & microliths Fair – ploughed	NA*

VAHR No Site Name Ref / Recorder	Site Type	Location	Site Size Contents	Scientific Significance**
7921-0214 Dandenong 1 Smith 1989	Scarred Tree	600m SE of railway crossing & Western Port Hwy, 50m nth of fence line Lowland plain - floodplain	1 definite Aboriginal scar 275 x 70cm on River Red Gum Good	High
7921-0262 Lynbrook 1 Brown 1995	Scarred Tree	Near corner Lynbrook Bvd & Patterson Dr Lowland plain - floodplain	1 probable Aboriginal scar – 35 x 23cm on Red Gum Poor – healthy	Low
7921-0263 Lynbrook 2 Brown 1995	Scarred Tree	East of Astely Dr in parkland? Lowland plain - floodplain	1 probable Aboriginal scar – 40 x 15cm on Red Gum Fair – healthy	Low
7921-0264 Lynbrook 3 Brown 1995	Scarred Tree	East of Astely Dr in parkland? Lowland plain - floodplain	1 probable Aboriginal scar – 22 x 9cm on Red Gum Poor – dead	Low
7921-0265 Lynbrook 4 Brown 1995	Scarred Tree	Durack Av?, Lynbrook Lowland plain - floodplain	1 probable Aboriginal scar – 30 x 12cm on Red Gum Poor – dead	Low
7921-0343 Abbotts Rd 1 Sciusco 1996	Scarred Tree	Nth of Abbotts Rd between railway & Gaine Rd Lowland plain - floodplain	1 definite Aboriginal scar – 75 x 20cm on Red Gum, definite Good – healthy	Moderate
7921-0371 Lynbrook 5 Johnston 1999	Scarred Tree	Sth of Carboni Cres, Lynbrook Lowland plain - floodplain	2 definite Aboriginal scars – 115 x 23cm, 40 x 9cm on Red Gum Good – healthy	NA*
7921-0467 Valentine Park 1 Haley & Weaver 2001	Stone Artefact Scatter[S]	At Figtree Walk Undulating plain	1 x 1m 1 silcrete flake	NA*
7921-0481 Parham 1 Rhodes 2002	Scarred Tree	Sth of Abbotts Rd off National Dr, Lyndhurst Lowland plain - floodplain	1 possibly natural scar – 105 x 20m on Messmate Good – healthy	Moderate
7921-0482 Parham 2 Rhodes 2002	Scarred Tree	900m east of Dandenong Frankston Rd, 700m sth of Abbotts Rd, Lyndhurst Lowland plain - floodplain	2 definite Aboriginal scars (toe holds) – 12 x 13cm, 15 x 16cm on Red Gum Good – dead	NA*

VAHR No Site Name Ref / Recorder	Site Type	Location	Site Size Contents	Scientific Significance**
7921-0489 Valentine Park 4 Haley 2002	Stone Artefact Scatter[SS]	Moreton Bay Bvd, Lynbrook Undulating plain – dune – crest	100 x 100m x 100cm Silcrete, quartz, quartzite & basalt flakes, cores & microliths Good	NA*
7921-0570 Lynbrook Station 1 Rhodes 2003	Stone Artefact Scatter[S]	Lynbrook Station, Lynbrook Lowland plain – floodplain	1 x 1m 1 silcrete flake Highly disturbed	NA*
7921-0607 Parnmoorak	Stone Artefact Scatter[SS]	200m SE of Gippsland Hwy & Western Port Hwy Interchange, west of Sth Gippsland Hwy Undulating plain	25 x 20m x 70cm 14 stone artefacts: 12 flakes, 1 core & 1 core fragment (12 silcrete, 1 quartz & 1 chert) Good	NA*

S=surface; SS=subsurface; *=Scientific significance rating not available from site card or report; **=as attributed by original recorder.

4.4 Previous Aboriginal Cultural Heritage Investigations

The activity area was subject to previous cultural heritage assessment by Rhodes (2001 & 2002). Only the 2001 project conducted ground surface survey of the present activity area. The region has been subject to various large and numerous local cultural heritage investigations.

Regional Investigations:

Gaughwin's Western Port Catchment activity (1981) extended from Western Port, including both Phillip and French Islands, to and including the lower foothills of the Dandenong Ranges (1981:4). Gaughwin's site survey was generally confined to the coastal region, and only limited sample surveys were undertaken in the northern regions of her activity area. Gaughwin did not survey the present activity area. Gaughwin recorded a total of 264 sites with less than 1% located away from the coast or coastal plains. Gaughwin considered proximity to water an important factor in site location, as 45% of her sites were found to be within 100 metres of water (1981: 92-5). Based on ethnographic data Gaughwin (1981: 120) also adds that sites within the undulating hills of the Dandenong Ranges are expected to be situated on the slopes or crest of the hills.

Smith (1989) undertook a regional Aboriginal archaeological investigation of the Berwick to Pakenham Corridor. The present activity area lies to the west of this corridor. Smith recorded a total of 62 Aboriginal archaeological sites during this activity. These sites comprise 32 surface scatters of stone artefacts, 15 scarred tree sites, and 15 isolated artefact

occurrences. The highest site and artefact densities were found to occur on sandy ridges in the Cranbourne area, particularly those associated with water. This finding has also been previously noted by Presland (1983: 89) and Gaughwin (1981). The dominant stone material types identified in the surface scatters by Smith (1989) were chert and quartz. The majority of artefact types recorded at these sites were flaked pieces and flakes, with less than 2% of the recorded assemblage consisting of formalised tools (Smith 1989: 47).

The present activity area conforms to Smith's landscape unit "Floodplains" (1989: 12; Figure 2). The site prediction model formulated for this landscape unit by Smith is applicable to the present activity area and concludes that:

- Scarred trees are the most likely site type to occur in this landscape unit. A relatively high density of scarred tree sites occur in this unit despite the degree of clearing that has occurred over this unit;
- Scarred tree sites could occur anywhere in this unit wherever river Red gums still exist;
- Artefact scatters appear to be quite rare in this unit but it is not really known if this is an actual archaeological patterning or as a result of very poor ground surface visibility in this area [investigations since 1989 have demonstrated a high number of surface lithic sites exist].

The general conclusions made by Smith (1989: 61) are that due to the then poor surface visibility within the Berwick-Pakenham Corridor, it was considered that many more sites than those recorded during the site survey occur. Furthermore, due to the degree of disturbance to the landscape within much of the corridor, it will be expected that most of these sites will be disturbed to some extent.

Murphy (1997) undertook a desktop Aboriginal archaeological investigation of an area described by the City of Casey as the Foreshore & Non-Urban Foreshore, an area that stretches from Cranbourne to Western Port. The predictive archaeological model generated by this activity concluded that surface scatters and isolated artefact occurrences are the most likely site types to occur within the activity area, and that the majority of these sites will be located within 100m of a past or present water supply. The highest archaeological site densities will be found within the Cranbourne Sand, ridges and hummocks landform unit (Murphy 1997: 19; Figure 3). It was also concluded that the sites located within Cranbourne Sands, ridges and hummocks landform unit may possibly be much older than those identified on the present coast line. Aboriginal quarry sites and scarred trees were considered to be a rare site type within this activity area due to lack of suitable resources.

Rhodes (2001) undertook an Aboriginal heritage activity of the Greater City of Dandenong. This activity reviewed all ethnographic and archaeological investigations that have currently been undertaken within the City's boundaries. Rhodes also included a short period of ground survey and recorded one scarred tree and one isolated stone artefact. The results of this research were used to construct a predictive model for Aboriginal archaeological sites. Areas of greatest potentially are considered to be undeveloped areas containing numbers of pre-contact Red gums as well as undisturbed elevated ground (Rhodes: Figure 9). Using these criteria, Rhodes assessed the present activity area as having potential for scarred trees and to lesser extent lithic sites. Rhodes surveyed the present activity area during this investigation and recorded scar tree site VAHR7921-0394.

Small-Scale Investigations

Marshall and Webb (2001) conducted an earlier cultural heritage assessment of the Kelly Bros Market Gardens, Colemans Road for Watsons Pty Ltd. The survey concentrated on extensive areas of ploughed market garden beds with high ground surface visibility. Stone artefacts were recorded in ten different locations (Map 2). Except for an isolated artefact in the centre of the property, find spots were all in the western side of the property toward Colemans Rd. Two sites were recorded comprising VAHR7921-0398 and 0399. All find spots were associated with sandy deposits. It was apparent to the investigators that the artefacts associated with VAHR7921-0398 were likely dispersed from a more discrete area closer to Eumemmerring Creek and probably reflected the effect of intensive ploughing and planting in the area, which has moved sediments widely across the area. In some locations the pre-contact ground surface was originally 1m higher than present as suggested by the comparison of the ground levels between windrows and nearby garden beds. Artefacts were found within loose unconsolidated sand sediments and were identified as low density 'loose' occurrences. Both sites were assessed having low scientific significance. Areas of sand and clay were mapped across the activity area (Map 2). It was concluded that: "there [was] a possibility of further Aboriginal archaeological material in the un-surveyed areas, but this is likely to occur at a similar low density. It is highly unlikely that there are any substantial *in situ* deposits". A collection of artefacts by Aboriginal community representatives and archaeologist was undertaken.

Bell (2005) conducted a cultural heritage assessment of 40 Olive Road, Lynbrook, for a proposed Aged-Care Facility. The survey of the 4ha property encountered poor ground surface visibility which constrained the effectiveness in identifying Aboriginal sites. Rising slopes either side of a drainage line was identified as an area of potential archaeological sensitivity. Sub-surface testing was recommended. Paynter *et al* (2006) conducted the sub-surface testing investigation on behalf of DeNova Group. Eight transects and one hand excavated test pit was excavated. Initial sub-surface testing recorded artefacts from five of eight transects. Two sites were recorded including Olive Rd 1 and Olive Rd 2 Olive Rd 1 comprised 172 artefacts from transects 3, 4, 5 and 6. Artefacts were recovered from 55 to 60cm depth from a dark grey sandy soil on a rise overlooking a shallow drainage line and 300m from potable water. A test pit was excavated adjacent to transect 4 but no artefacts were recovered. Artefacts were found in clusters within two transects. One artefact was recovered from transect 6 and recorded as a separate site Olive Rd 2. Salvage and impact minimisation plans were recommended for both sites.

Barker (2007) conducted a cultural heritage assessment and sub-surface testing investigation of 75-92 Colemans Road, Dandenong South for Abacus Property Group Pty Ltd. This property is located approximately 1km northwest of the present activity area. A previous cultural heritage assessment by Rhodes (2006) resulted in subsequent mechanical sub-surface testing and controlled hand excavation of 1x1m test pits in sensitive areas identified in the report. Seven new Aboriginal sites were recorded including VAHR7921-0809 to 0815. VAHR7921-0809 was assessed having high scientific significance based primarily on the size of the site and the presence of potential Pleistocene aged stone assemblages. A charcoal feature was identified in transect 1 approximately at the 17m mark at a depth of 50 to 70cm from which a sample was taken and dated to 7,806±51 years BP (Barker 2007: iv). Barker (iv, 54, 55, 64) believes this date along with stone assemblage evidence of raw material and artefact type change indicates that stone tool assemblages between 50 and

100cm in depth likely date to the Late Pleistocene (20,000 to 30,000 years BP). On the other hand, the assemblage to a depth of 50cm likely dates from the mid-Holocene onwards (5,000 to 8,000 years BP) (Barker 2007: 50). Deposits were considered to be rather uniform Aeolian sand deposits typical of coastal dunes (Barker 2007: 53). Except for European ground disturbance as indicated in the example of transect 1 (where a clear line presumably indicates the depth of disturbed deposits, p. 119), no other clear stratigraphic change is noted except coffee rock at the bottom. No controlled hand excavated test pits were conducted at this site during the investigation. AAV7921-0810 was assessed having low scientific significance primarily because of disturbance to artefact bearing deposits by market gardening. The site has been dated to the recent Holocene based on the evidence of stone tool types and raw material (Barker 2007: 59). VAHR7921-0811 was assessed having high scientific significance based on its size, research potential and relative lack of disturbance (Barker 2007: vi, 123). VAHR7921-0812 (Kelly 4) was assessed having high scientific significance based on its research potential and relative lack of disturbance. AAV7921-0813 (Kelly 5) was assessed having low scientific significance based on disturbance by European land use. Two scarred trees were also recorded (VAHR7921-0814 & 0815). A range of mitigation measures was recommended for the sites including preservation, engineering solutions, further excavation, artefact collection, preservation in open space and cultural heritage interpretation.

La Trobe University conducted mechanical subsurface testing and controlled hand excavations at Bend Road, Keysborough (Hewitt & de Lange 2007; Allen, Hewitt & de Lange 2008) following on from initial sub-surface testing conducted by Tardis Enterprises Pty Ltd. Tardis Enterprises Pty Ltd recorded two stone artefact scatters: AAV7921-0735 (Bend Road 1) and AAV7921-0736 (Bend Road 2). Both sites, and in particular AAV7921-0735, were considered likely to have high scientific significance due to the large numbers of stone artefacts within both disturbed upper deposits (from historic ploughing) and intact lower deposits. Subsequent testing by La Trobe University concluded that the lower deposits contained stone artefacts "more or less *in situ*" (Hewitt & de Lange 2007: 16). Optically stimulate luminescence (OSL) dating determined an age of 35,000 years BP placing the lower deposits in the Pleistocene (Hewitt & de Lange 2007: 16).

Three artefact horizons ("diffuse bands") were identified. The upper level (0-300mm) consisted of flakes and angular fragments of various raw materials but mostly quartz. The middle level (300-700mm) comprised predominantly silcrete with backed blades and microliths typical of the Australian Small Tool Tradition. The lower level (Pleistocene) had larger artefacts made form poorer quality and coarser-grained materials. The authors concluded that the investigation "produced persuasive evidence ... for the greatest antiquity of human occupation to date within Victoria" (Hewitt & de Lange 2007: 117). It was recommended that the site be precisely defined and registered to ensure its on-going protection.

Numerous small-scale local investigations have been conducted in the activity area region and are summarised in Table 2.

Table 2 Local Investigations in Lyndhurst

Reference	Investigation Type	Survey Coverage, Ground Surface Visibility	Aboriginal Cultural Heritage	Areas of Archaeological Potential
Brown 1995 Lynbrook Estate	Field Survey	45 hectares	Located four additional probable scarred trees (VAHR7921-0262-265)	Low/moderate hill slope
Rhodes & Bell 2003 Lynbrook	Field Survey	1.3 hectares, very poor	Isolated artefact VAHR7921-0570	Low
Weaver & Haley 2002 Anco Turf Farm, Lyndhurst	Field Survey	50 Hectares, very low	Six Aboriginal archaeological sites (VAHR7921-0443-0448) were identified and recorded and comprise one artefact scatter, four isolated artefact occurrences and a scarred tree.	Moderate on elevated sections
Weaver & Haley 2001 Valentine Park, Lyndhurst	Field Survey	21 hectares, low	None	Moderate
Chamberlain 2003 Anco Turf Farm	Field Survey	21 hectares, very good	4 new Aboriginal stone artefact sites (VAHR7921-0548-0551)	Elevated sections
Marshall 1995 Lynbrook Estate	Field Survey	N/A	Nil	Elevated sandy areas
Murphy & Amorosi 2003 Stage 15, Lynbrook Estate	Sub-Surface Testing	N/A	One scatter of stone tools VAHR7921-0588)	Elevated sandy locations
Murphy 2001 Lyndhurst	Field Survey	161 hectares	9 scarred trees 1 surface scatter/contact site	Raised sandy hill – further cultural deposits, possibly human burials
Murphy 2004 Lyndhurst	Field Survey	1.5 km	Nil (relocated 2 previously recorded)	Raised sandy hill – further cultural deposits, possibly human burials

Reference	Investigation Type	Survey Coverage, Ground Surface Visibility	Aboriginal Cultural Heritage	Areas of Archaeological Potential
Lane 1996 Lyndhurst	Field Survey & Sub-surface testing	8km linear	Nil	Adjacent to drainage line
Rhodes & Bell 2003 Eclipse Park, Lyndhurst	Sub-Surface Testing	N/A	Five Aboriginal lithic sites (VAHR7921-0563-0567)	Elevated sandy locations
Nicholls & Chamberlain 2003 Marriott Land, Lyndhurst	Field Survey	320 acres, very poor	Nil	Low rises
Rhodes 2004 Primary School, Lyndhurst	Field Survey, monitoring	6000m	Nil	Nil

Activity Area Specific Investigations:

Rhodes (2001), Dandenong Aboriginal Heritage Activity, was discussed in detail above. Scarred tree AAV7921-0394 was recorded during this investigation.

Rhodes (2002) conducted a cultural heritage assessment of the activity area on behalf of Devcon Group Pty Ltd as part of a larger industrial estate. The nature of the industrial estate was not presented nor the use of lots as required under Regulation 46 of the Aboriginal Heritage Regulations 2007. The extent and nature of the activity is not described. The present activity area was characterised as floodplain and sandy rises. The present activity area comprised survey unit 3 of the investigation and encountered good ground surface visibility at the market gardens in the south but poor for the remainder due to heavy pasture. Three new sites and one existing Aboriginal site were recorded. Scarred trees VAHR 7921-0394, 0483 and 0485 were assessed having high, moderate and high scientific significance respectively. Stone artefact scatter VAHR 7921-0484 comprised a single chert core in disturbed sandy deposits on a rise and was assessed with low scientific significance. Two areas of potential sensitivity for archaeological sites were identified on sandy rises in the south of the activity area (Figure 3). Rhodes noted that the geotechnical activity identified that the sandy rises comprised a top 30cm layer of sand above compact sandy clay (Rhodes 2002: 25). Rhodes made detailed management recommendations for the scarred trees sites including preservation, protection and management during planning and construction phases of the development, and protection and management by Council. Monitoring of the areas of archaeological sensitivity on the sandy rises in the south was recommended. It should be noted that monitoring is no longer considered an appropriate management recommendation under the new Guidelines issued by AAV (2007). Since areas of known and potential archaeological sensitivity for Aboriginal cultural heritage have been identified on the

sandy rises, any significant ground disturbance to these areas would likely harm known and predicted Aboriginal cultural heritage. Any such harm would be reckless and negligent and liable to a penalty up to $1,134,200.00 under Sections 27 and 28 of the *Aboriginal Heritage Act 2006*.

Discussion:

The previous regional studies and localised surveys have located a limited range of Aboriginal archaeological sites within the Lyndhurst district and comprise scarred trees, surface scatters of stone artefacts and isolated stone artefact occurrences. Each of the previous studies has generally encountered poor ground surface visibility conditions, and much of the land assessed has been heavily disturbed. No burial sites have been previously recorded in the region. There have been no sites near the activity area from which dates for occupation have been obtained, except recently by Barker (2007 see above). It has been argued that Aboriginal stone artefacts dating to the Late Pleistocene may still be preserved relatively intact below ground surface disturbance caused by market gardening. However, in general, the majority of lithic sites are located on the present ground surface they will most likely date to the last 4,000 years (recent) and more probably the last 1,000 years. Aboriginal scarred tree sites will date to the last 600 years (the approximate life span of Red gums).

The previously recorded sites reflect the archaeological potential of the Cranbourne sands landform. In general, artefacts have been located wherever good ground surface visibility is found, or within sub-surface testing areas. The area of highest stone artefact density is currently within the 'Fig Tree Hill' property and Bend Road sites at Keysborough. The majority of sites are found on the top slopes of the dunes, though lesser number of artefacts is also located on bottom and mid slopes. Due to the nature of preservation conditions with sandy soil, artefacts will be found extending from the surface sands to on top of the Baxter sandstone, a much older geological formation.

The activity area lies within a region and landform (Cranbourne Sands) that has a demonstrated high sensitivity for Aboriginal cultural heritage. However, European development and land practices, in particular, market gardening, have significantly disturbed this cultural heritage in a large percentage of the region dramatically impacting its scientific significance in those areas. In particular this can be identified within the present activity area and adjacent properties, with a significant caveat. Early sites may still be preserved in areas of significant ground disturbance such as market gardening. The lack of controlled hand excavation in the activity area region has resulted in a general assessment of scientific significance and sensitivity for Aboriginal cultural heritage values and archaeological sites; however, with the introduction of recent Aboriginal heritage legislation, and the necessity for more detailed archaeological data sets from controlled excavation, these values will become known in greater detail and precision.

Sub-surface stone artefact scatters are the most likely Aboriginal sites to be located in the region followed by scarred trees. Other site types are unlikely to occur, although human burial are always possible within sand dune landforms.

4.5 Aboriginal Cultural Heritage Prediction Model for the Activity Area and Implications for this Investigation

From the desktop investigation the implications for the activity area are:

- One Aboriginal stone artefact scatter (VAHR 7921-0494) and three scarred trees (VAHR 7921-0394, 0483 & 0485) are recorded within the activity area;
- Previous cultural heritage studies have concluded that there is potential for Aboriginal archaeological sites to occur in sand deposits below levels of disturbance caused by market gardening, i.e.: below 50cm in depth (e.g.: Paynter 2006, Barker 2007);
- The activity area has been surveyed on two previous occasions (Rhodes 2001 & 2002);
- The sand dune - sand sheet landform bordering Carrum Swamp has been demonstrated to contain Late Pleistocene Aboriginal sub-surface stone artefact scatter sites (Bend Road, Keysborough);
- Similarly, Barker (2007) suggests VAHR 7921-0809, located approximately 1km from the present activity area, contains Aboriginal sub-surface stone artefact scatter deposits dating to the Late Pleistocene, c. 20,000 to 30,000 years BP, although this requires scientific confirmation;
- The most common site type will be sub-surface stone artefact scatters dating to the Late Holocene within the last 6,000 years and scarred trees on mature remnant eucalypts dating to the last 400-500 years;
- Sub-surface sites within the top 50cm of disturbed deposits will have little spatial or temporal integrity which will lower their scientific significance;
- Aboriginal cultural scarring may be found on mature remnant native trees over 200 years old. Only a very few remnant native occur within the activity area;
- Aboriginal human burials, although unlikely, may occur within sand dune deposits. Due to the extensive ground surface disturbance, human burials would have likely already been identified. Any remaining burials will likely be heavily disturbed by market gardening;
- Other sites types such as quarries or ceremonial sites are unlikely to be present;
- The potential for a site of high scientific significance within the activity area is low.

STANDARD ASSESSMENT

A standard assessment is required if the results of a desktop assessment show that it is reasonably possible that Aboriginal cultural heritage is present in the activity area (r.58(1) *Aboriginal Heritage Regulations 2007*). A standard assessment usually comprises a ground survey of the activity area.

The desktop assessment (Sections 2 – 5) demonstrated that a cultural heritage survey was required to assess the known and potential cultural heritage values of the activity area likely to be impacted by the proposed activity.

5 SURVEY

5.1 Aims and Methodology

A cultural heritage site survey was conducted on Wednesday 15 August, 2007 by Dr Tom Rymer (Supervisor, Tardis Enterprises Pty Ltd), Robert Ogden (representative, BLCAC) and Shane Nicolson (representative, BWFL). The ground survey was conducted is a systematic manner (r.59(3)(a) *Aboriginal Heritage Regulations 2007*) and in accordance with proper archaeological practice, (r.59(5) *Aboriginal Heritage Regulations 2007*) examining the entire activity area on foot with each individual walking linear transects 20m apart, examining all areas and extensively sampling all landform patterns, elements and attributes. The systematic sampling strategy enabled all areas of good ground surface visibility to be identified and intensively examined. Linear transects were placed so that all landforms were systematically sampled in order to identify:

- All areas of high ground surface visibility for targeted detailed surface inspection;
- All areas of potential archaeological sensitivity; and
- All landform elements.

All mature trees were examined to determine the presence or absence of cultural scars (r.59(3)(b) *Aboriginal Heritage Regulations 2007*).

No caves, rock shelters or cave entrances were identified within the activity area (r.59(3)(c) *Aboriginal Heritage Regulations 2007*).

Apart from the degree of ground surface visibility, no substantive obstacles were encountered in completing the standard assessment (cl.6(6) sch.2 *Aboriginal Heritage Regulations 2007*).

Archaeological visibility refers to the amount of ground surface that is clearly visible for site inspection. The greater the ground surface visibility, the more effective are surface site surveys. Examples of high surface visibility are vehicular & pedestrian tracks, dune blow outs (100% per m^2); and examples of poor visibility are areas of heavy vegetation cover (0-10% per m^2). Unfortunately, it is often the case that highly visible archaeological sites are also often highly disturbed. High ground surface visibility is therefore often related to the amount of disturbance that has occurred. This disturbance may be manmade (such as drainage

lines, vehicle tracks), by stock (overgrazing, tracks), or due to natural processes (erosion by wind or water).

5.2 Results

During the survey of the activity area previously recorded Aboriginal scarred tree sites VAHR 7921-0398, 0483 and 0485 were relocated. Stone artefact scatter VAHR 7921-0484 was unable to be relocated due to lack of ground surface visibility. One new Aboriginal site VAHR 7921-0906 (Bayliss Rd Scarred Tree 2) was recorded. The locations of recorded sites are shown in Map 8.

Poor ground surface visibility was observed during the majority of the field survey with excellent visibility in some areas resulting in poor to fair overall effective survey coverage. The activity area was divided into two survey units (Map 8) reflecting different landforms. Survey Unit 1 includes the southern half of the property with the gentle sandy rises. Survey Unit 2 comprises the northern half with the lowland plain which would have been subject to frequent inundation in the past. The level of effective survey coverage did not constrain the results of the survey to detect obtrusive sites such as scarred trees but did constrain the detection of stone artefact surface scatters. This is confirmed by the relocation of previously recorded scarred trees VAHR 7921-0394, 0483 and 0485 compared to the inability to relocate surface artefact site VAHR 7921-0484.

Detailed notes were made and photographs taken during the survey. The activity area was treated as two survey units for the purposes of this assessment (Table 3). The two survey units reflect the different levels of disturbance and different landform types.

Table 3 Survey Units & Effective Survey Coverage (Map 8)

Survey Unit	Description	Ground Surface Visibility	Effective Survey Coverage
1. Southern half	The southern half of the activity area comprises gentle sandy rises which have been extensively ploughed over the previous 50 years for market gardening. Two houses & associated farm outbuildings are located in this area facing Bayliss Road and have caused significant ground disturbance in this area. Visibility was generally very poor in grassed paddocks (0-10% per m^2). Very good to excellent visibility was found in recent market garden plots and under windrows (70-100% per m^2). The highest sensitivity was assessed in areas 1a comprising prominent but gentle sandy rises	0-100%	5%

2. Northern half & eastern margin	The northern half of the activity area comprises lowland plains possibly subject to frequent inundation prior to European settlement. It was heavily grassed with no visibility except with some very good to excellent visibility (70-100% per m2) under isolated trees, under windrows, at fence gates, isolated patches around the dam & along the embankment at the northern boundary.	6-100%	<5%

Photograph 2

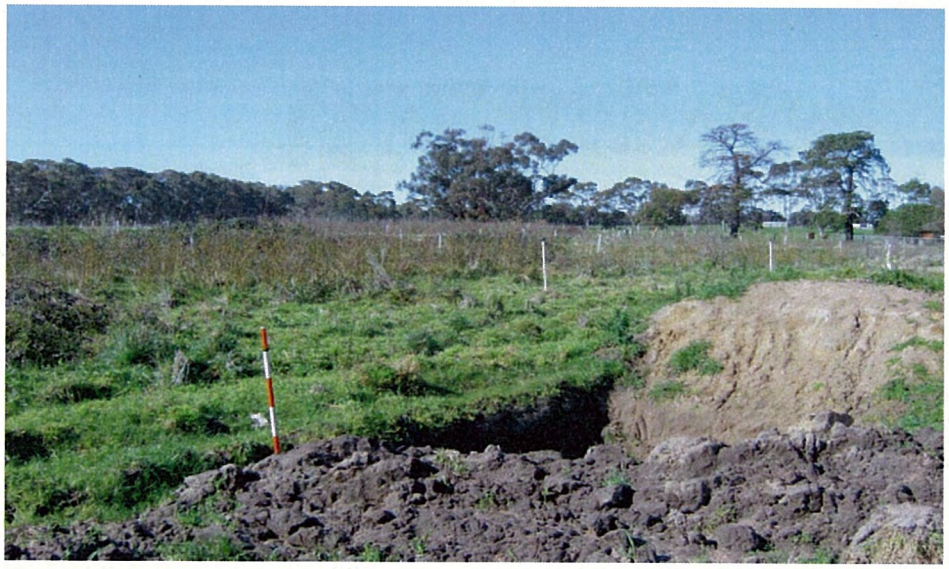
Survey Unit 1: Poor visibility on former market garden plot

Photograph 3

Survey Unit 1: Excellent visibility under windrow

Photograph 4

Survey Unit 1: Very poor visibility in paddocks in the west



Photograph 5

Survey Unit 1: Poor visibility in abandoned market garden

Photograph 6

Survey Unit 1: Poor visibility in abandoned market garden

Photograph 7

Survey Unit 2: Very poor visibility on low-lying plain; facing west

Photograph 8

Survey Unit 2: Very good visibility limited to tracks and gates; facing north

Photograph 9

Survey Unit 2: Very good visibility limited to small exposures, note drain on left along northern boundary of the activity area; facing east

5.3 Aboriginal Cultural Heritage – Archaeological Sensitivity

Areas designated as having potential Aboriginal cultural heritage sensitivity are those evaluated as likely containing archaeological sites. These are usually areas that have poor ground surface visibility so it possible that surface and / or sub-surface deposits may exist, but are currently obscured by factors such as thick vegetation or sediment deposits. Areas of Aboriginal cultural heritage sensitivity may or may not be areas of Aboriginal cultural heritage sensitivity as defined under the *Aboriginal Heritage Regulations 2007*. Areas may be deemed as being of none, low, moderate or highly likely to contain Aboriginal cultural material. Based on the desktop and standard assessments (Section 2 – 5), the activity area has been assessed as having the following cultural heritage sensitivity.

Survey Unit 1:

The southern half of the activity area contains high potential for low densities of stone artefacts primarily in disturbed depositional contexts as indicated by previously recorded site VAHR 7921-0484. Stone artefact sites will be located on the low sandy rises and artefacts can be distributed throughout the sandy profile down to the underlying basal geology. These areas of potential archaeological sensitivity are hatched in Map 8.

The highest risk to as unrecorded archaeological sites is the potential for sub-surface stone artefact sites to be present within the low sandy rises. This landform has been continually disturbed by over 45 years of market gardening which has likely disturbed deposits to a depth of at least 50cm in depth. Ground disturbance decreases the temporal and spatial integrity of archaeological deposits and subsequently reduces the scientific significance of sites. However, not all of the area can be definitively demonstrated to have suffered this degree of disturbance and, despite significant ground disturbance, recent investigations argue that archaeological deposits can be preserved intact below disturbed market garden deposits (Paynter 2006, Barker 2007).

Aboriginal burial sites as always possible in sandy locations although considered highly unlikely in the present activity area.

Survey Unit 2:

The northern half of the activity area has none to low potential for low numbers of stone artefacts, which, if present, represents archaeological 'cultural background noise'. Over the period that the activity area land form has been stable (min. 4,000 years), Aboriginal people have been traversing the landscape, dropping or otherwise discarding stone artefacts on a regular basis. This activity results in archaeological 'cultural background noise'. Cultural background noise results in very low density of artefacts spread across the landscape which only provides low resolution, low quality behavioural information with little spatial or chronological integrity.

The northern half of the activity area (and most eastern margin) has demonstrated a high sensitivity for Aboriginal scarred trees as indicated by the previously recorded sites VAHR 7921-0394, 0483 and 0485.

Table 4 Aboriginal Cultural Heritage Sensitivity

Aboriginal Cultural Material	Location	Level of Likely Sensitivity
Scarred Trees	Northern half and eastern margin (Survey Unit 2)	High
Disturbed low density sub-surface stone artefact scatters	Southern half on low sandy rises (in Survey Unit 1)	High
Undisturbed low density sub-surface stone artefact scatters	Southern half on low sandy rises (in Survey Unit 1)	Low – Moderate
Low density subsurface stone artefact scatters	Northern half on the flood plain (Survey Unit 2)	None – Very Low
Aboriginal Burials	Southern half on low sandy rises (in Survey Unit 1)	Low

5.4 Aboriginal Cultural Heritage – Discussion

A full discussion of known Aboriginal cultural heritage is found in Section 6.4 incorporating the results of the complex assessment. This section only refers to the survey results and areas of archaeological sensitivity requiring further assessment.

The results of the ground surface survey conform to the site prediction model presented in Section 4.5. Sites VAHR 7921-0394, 0483 and 7921-0485 were relocated and the assessment of the activity area by Rhodes (2001 & 2002) confirmed.

All the scarred trees are located on the floodplain which is subject to frequent inundation. The presence of these sites confirms the sensitivity of this landform in the region for culturally scarred trees on remnant old growth eucalypts.

Although VAHR 7921-0484 was unable to be relocated, the presence of this site on a sandy rise landform confirms the sensitivity of this landform in the region for stone artefact scatters. In this instance, the land has been continually disturbed by over 45 years of market gardening which has likely disturbed deposits to a depth of at least 50cm in depth. Ground disturbance decreases the temporal and spatial integrity of archaeological deposits, and subsequently reduces the scientific significance of sites. However, not all of the area can be definitively demonstrated to have suffered this degree of disturbance and recent investigations argue that archaeological deposits can be preserved intact below disturbed market garden deposits (Paynter 2006, Barker 2007).

The primary issues identified during the survey were the management of previously recorded scarred trees and artefact scatter sites, and the potential for as yet undiscovered sub-surface stone artefact scatter sites on the sandy rises in the south of the activity area.

The standard assessment has demonstrated that Aboriginal cultural heritage is, or is likely to be, present in the activity area and it is not possible to identify the extent, nature and significance of the Aboriginal cultural heritage in the activity area unless a complex assessment is carried out (r.61(1) *Aboriginal Heritage Regulations 2007*).

5.5 Aboriginal Cultural Heritage – Consultation – Survey Results

Prior to the field investigations, the consultants contacted the two RAP applicants (BLCAC, BWFL) to provide relevant background and invite field participation. Robert Odgen (BLCAC) and Shane Nicholson (BWFL) participated in the fieldwork component. On completion of the survey the consultant discussed with both representatives the implications of the survey results and subsequent assessment of archaeological sensitivity. Both representatives considered the sandy rises to be sensitivity for stone artefact scatter sites citing stone artefact sites closer to Eumemmerring Creek at Colemans Road.

COMPLEX ASSESSMENT

A complex assessment is required if the desktop or standard assessment shows that Aboriginal cultural heritage is, or is likely to be, present in the activity area and it is not possible to identify the extent, nature and significance of the Aboriginal cultural heritage unless a complex assessment is carried out (r.60(1) *Aboriginal Heritage Regulations 2007*). The complex assessment was conducted in accordance with proper archaeological practice (r.61(3) *Aboriginal Heritage Regulations 2007*).

The standard assessment (Section 5) identified the potential for as yet undiscovered sub-surface stone artefact scatter sites on the sandy rises in the south of the activity area and possible subsurface deposits associated with stone artefact scatter VAHR 7921-0484 in Survey Unit 2.

6 SUB-SURFACE TESTING

6.1 Aims and Methodology

Aims

Phase 1 comprised the excavation of two controlled hand excavated 1x1m test pits (TP1 & 2) to determine the stratigraphy and general sub-surface nature of the activity area, in particular at the location of previously recorded Aboriginal site VAHR 7921-0484 (r.61(4) *Aboriginal Heritage Regulations 2007*).

Phase 2 comprised mechanical trench excavations to determine the presence or absence of Aboriginal cultural heritage values in the area of potential archaeological sensitivity identified during the desktop and standard assessment (Sections 2 - 5). It also provided a preliminary assessment of the nature, extent and significance of any recorded sites. When cultural material was identified machine transects ceased and relocated to sample other areas.

Phase 3 comprised the excavation of controlled hand excavated 1x1m test pits and controlled hand excavated 50x50cm probes to investigate in detail the nature, extent and significance of Aboriginal cultural heritage identified during Phase 2.

Methodology

The placement of Phase 1 hand excavated test pits was initially determined by the location of previously recorded site VAHR 7921-0484. The location of Phase 2 mechanical test pits was based on a systematic sampling strategy of the area of potential archaeological sensitivity identified in Section 5.3 by placing test pits 50m to 100m apart on a grid using GDA94 MGA coordinates. This strategy aimed to sample landform profiles predicted to have highest Aboriginal cultural heritage values (Section 5.3). In Phase 3 the location of test pits was initially determined by the presence of stone artefacts recovered from trenches. Initial test pits provided information on the likely significance of Aboriginal cultural heritage. Subsequent test pits and probes provided comprehensive information on the nature, extent and significance of sites. For sites assessed likely having below moderate scientific significance, the extent of sites was determined by the probes. Test pits and probes were placed between 10m and 50m apart along cardinal points until site boundaries were identified beyond reasonable

doubt (0 artefacts). A random control sample of probes was also excavated on the floodplain in the area of lowest potential archaeological sensitivity.

Trench locations were recorded with a hand-held GPS using GDA94 MGA coordinates and marked onto an activity area plan. Trenches were systematically excavated in thin 5cm scrapes using an excavator with a 600mm trimming bucket. Trench dimensions were 3m x 50cm. Each scrape was carefully monitored and excavated material 100% mechanically sieved using 5mm mesh. Detailed notes were recorded for each trench including landform context, dimensions, stratigraphy, sediment descriptions, disturbance and the presence (or absence) of archaeological materials. If five or more stone artefacts, occupation deposits or features were identified mechanical excavations ceased immediately for subsequent testing during Phase 3, to be further uncovered and assessed by controlled excavation. Photographs were taken of each trench including detailed views of stratigraphic profiles. All artefacts were recorded in detail and photographed. Artefacts are bagged, tagged and stored in a secure facility ready for transfer to a designated custodian (Section 8).

Test pits were also recorded with a hand-held GPS using GDA94 MGA coordinates and marked onto an activity area plan. Test pits were excavated by hand in 5cm arbitrary layers and stratigraphic units. All sediments were 100% sieved using 5mm mesh. Artefacts found undisturbed by excavation were individually point provenanced to the nearest centimetre. Samples were collected for dating and environmental analyses when appropriate. Detailed notes were recorded for each test pit including stratigraphy, sediment descriptions, pH levels, disturbance, and presence (or absence) of archaeological materials. Photographs were taken of each excavation including detailed views of stratigraphic profiles. All artefacts were recorded in detail and photographed. Artefacts were bagged, tagged and stored in a secure facility ready for transfer to a designated custodian (Section 8).

Probes were also recorded with a hand-held GPS using GDA MGA coordinates and marked onto an activity area plan. Probes were excavated by shovel in 5cm arbitrary layers and stratigraphic units. If artefacts were identified trowels were used to clarify artefact density and discard context. All sediments were 100% sieved using 5mm mesh. Artefacts were recorded according to layer and stratigraphic unit. Shovel probe methodology was the same as for 1x1m test pits. Only probes containing artefacts were photographed.

Obstacles

Obstacles encountered during the subsurface testing included houses, dams and farm infrastructure which did not enable all areas to be tested in order not to harm private property and for occupational health and safety reasons (sch.2 cl.9 *Aboriginal Heritage Regulations 2007*). These areas were outside areas predicted to have highest subsurface cultural heritage values and the obstacles are not considered to have significantly constrained the effectiveness of assessment in determining the Aboriginal cultural heritage values of the activity area.

Fieldwork

Phase 1 and 2 fieldwork was conducted over 22 days from June to September 2008 by Tom Rymer, Kathleen Hislop and Tim Hill (Field Supervisors, Tardis Enterprises Pty Ltd), Bronwyn

Naismith (Archaeologist, Tardis Enterprises Pty Ltd), Robert Ogden (Representative, BLCAC) and Shane Nicolson (Representative, BWFL).

6.2 Results

A total of 23 mechanical trenches, 11 test pits and 21 probes were excavated (Tables 5 - 7, Map 9).

Table 5 Trench Details

No	VAHR 7921-xxxx	Depth[1]	Coordinates[2]	No of Arts[3]
T1	-	135cm	345710E 5787610N	-
T2	-	125cm	345760E 5787610N	-
T3	-	100cm	345760E 5787510N	-
T4	-	80cm	345760E 5787460N	-
T5	-	100cm	345710E 5787460N	-
T6	0956	105cm	345660E 5787460N	1
T7	-	65cm	345711E 5787519N	-
T8	-	60cm	345666E 5787560N	-
T9	-	60cm	345660E 5787617N	-
T10	-	115cm	345610E 5787610N	-
T11	-	110cm	345566E 5787612N	-
T12	0958	75cm	345570E 5787716N	4
T13	0958	75cm	345560E 5787760N	2
T14	0958	110cm	345510E 5787760N	2
T15	0958	100cm	345460E 5787760N	4
T16	0958	100cm	345460E 5787810N	3
T17	-	75cm	345410E 5787810N	-
T18	0959	105cm	345460E 5787660N	1
T19	-	80cm	345410E 5787660N	-
T20	-	65cm	345310E 5787710N	-
T21	0957	130cm	345310E 5787660N	2
T22	0957	130cm	345260E 5787660N	1
T23	-	85cm	345410E 5787710N	-

[1]Each trench is 3m long & 50cm wide, [2]NW corner, GDA94 MGA Zone 55 coordinates, [3]Number of stone artefacts

Table 6 Test Pit Details

No	VAHR 7921-xxxx	Depth[1]	Coordinates[2]	No of Arts[3]
TP1	0484	95cm	345710E 5787560N	2
TP2	0484	130cm	345760E 5787560N	1
TP3	0958	100cm	345550E 5787680N	-
TP4	0958	90cm	345557E 578758N	-
TP5	0958	110cm	345508E 5787759N	-
TP6	0958	105cm	345457E 5787754N	3
TP7	0958	100cm	345458E 5787804N	32
TP8	0959	100cm	345456E 5787658N	20
TP9	0957	110cm	345309E 5787662N	-
TP10	0957	120cm	345256E 5787661N	12
TP11	0956	115cm	345664E 5787464N	-

[1]Each test pit is 1m x 1m, [2]NW corner, GDA94 MGA Zone 55 coordinates, [3]Number of stone artefacts

Table 7 Probe Details

No	VAHR 7921-xxxx	Depth[1]	Coordinates[2]	No of Arts[3]
P1	0957	85cm	345285E 5787640N	3
P2	0958	110cm	345458E 5787680N	-
P3	0956	95cm	345663E 5787480N	-
P4	0956	95cm	345680E 5787463N	-
P5	0958	65cm	345796E 5787571N	-
P6	0958	75cm	345460E 5787824N	-
P7	0958	105cm	345472E 5787804N	-
P8	0958	90cm	345577E 5787744N	-
P9	0958	50cm	345623E 5787683N	-
P10	-	35cm	345694E 5787811N	-

No	VAHR 7921-xxxx	Depth[1]	Coordinates[2]	No of Arts[3]
P11	-	35cm	345648E 5787929N	-
P12	0958	80cm	345440E 5787805N	2
P13	0957	100cm	345285E 5787640N	-
P14	0957	90cm	345285E 5787680N	-
P15	0957	110cm	345260E 5787680N	-
P16	0958	60cm	345447E 5787754N	-
P17	0959	70cm	345470E 5787658N	-
P18	0959	70cm	345460E 5787650N	2
P19	0959	70cm	345450E 5787660N	-
P20	0959	70cm	345460E 5787670N	2
P21	0959	50cm	345460E 5787640N	-

[1]Each probe is 50cm x 50cm, [2]NW corner, GDA94 MGA Zone 55 coordinates, [3]Number of stone artefacts

6.3 Aboriginal Cultural Heritage – Archaeological Sites

Five new and four previously recorded archaeological sites were recorded during this assessment. Sites are detailed below.

Previously Recorded Site Details:

VAHR 7921-0394

Site Name:	Bayliss Rd Scarred Tree
VAHR No:	7921-0394
PRP Coordinates:	345690E 5787850N
Cadastral Description:	Lot A PS443552 / Parish of Eumemmerring / County of Mornington / City of Greater Dandenong
Site Type:	Scarred Tree
Cultural Status:	Definite Aboriginal origin
Location:	430m north of Bayliss Rd, 100m west of railway
Landform:	Lowland plain – floodplain
Tree Type:	Red Gum
Tree Condition:	Poor health
Scar Dimensions:	150 x 80cm
Scar Condition:	Fair
Scientific Significance:	Low-moderate
Likely Impact:	None - to be preserved by the activity

*Primary Reference Point GDA94 MGA Zone 55 Coordinates

Nature

VAHR 7921-0394 is a scarred tree of definite Aboriginal origin. The mature red gum is in poor health with a scar in poor condition. The scar is symmetrical with significant regrowth on a tree of considerable age. The scar and tree conform to the bulk of standard criteria used in determining scars of cultural origin and has therefore was the likely reason Rhodes recorded the site with the VAHR.

Extent

The known site dimensions measure approximately 20m x 20m. The extent of the site is determined by a 5m buffer around the drip line of the tree.

Significance

Evidence from this investigation including the presence of the definite cultural scar, its condition and health of the tree rates the site having *low-moderate* scientific significance. A comprehensive analysis of scientific assessment is found in Section 7.

Photograph 10

VAHR 7921-0394, General view, facing west

Photograph 11

VAHR 7921-0394, Detail view, facing southwest

VAHR 7921-0483

Site Name:	Parham 3 Scarred Tree
VAHR No:	7921-0483
PRP Coordinates:	345810E 5787560N
Cadastral Description:	Lot A PS443552 / Parish of Eumemmerring / County of Mornington / City of Greater Dandenong
Site Type:	Scarred Tree
Cultural Status:	Probable Aboriginal origin
Location:	150m north of Bayliss Road, 120m west of railway
Landform:	Lowland plain – floodplain
Tree Type:	Red Gum
Tree Condition:	Good health
Scar Dimensions:	190 x 30cm
Scar Condition:	Poor
Scientific Significance:	Low-moderate
Likely Impact:	None - to be preserved by the activity

*Primary Reference Point GDA94 MGA Zone 55 Coordinates

Nature

VAHR 7921-0483 is a scarred tree of definite Aboriginal origin. The mature Red gum tree is in good health with a scar in poor condition. The scar is symmetrical with significant regrowth on a tree of considerable age. The scar and tree conform to the bulk of standard criteria used in determining scars of cultural origin and was therefore was the likely reason Rhodes recorded the site with the VAHR.

Extent

The known site dimensions measure approximately 20m x 20m. The extent of the site is determined by a 5m buffer around the drip line of the tree.

Significance

Evidence from this investigation including the presence of the cultural scar, its condition and health of the trees rates the sties having low-moderate scientific significance. A comprehensive analysis of scientific significance is found in Section 7.

Photograph 12

VAHR 7921-0483 general view facing south

Photograph 13

VAHR 7921-0483 detail view facing south

VAHR 7921-0484

Site Name:	Bayliss Rd
VAHR No:	7921-0484
PRP Coordinates:	345735E 5787560N
Cadastral Description:	Lot A PS443552 / Parish of Eumemmerring / County of Mornington / City of Greater Dandenong
Site Type:	Subsurface stone artefact scatter
Landform / Topography:	Sand dune – middle slope
Test Pits:	TPs1 & 2
Dimensions:	50m x 1m x 35cm (depth)
Site Contents:	3 complete & broken flakes (silcrete, crystal quartz & basalt)
Site Artefact Density per m^2:	Maximum=2, minimum=1, average=1.5
Potential for Additional Material:	None
Scientific Significance:	No
Threat:	Industrial Subdivision

*Primary Reference Point GDA94 MGA Zone 55 Coordinates

Nature

VAHR 7921-0484 is a very low density subsurface stone artefact scatter (Maps 10 & 12). Stone artefacts were recovered from the surface during the survey by Rhodes (2002) and 15cm to 35cm depth from TPs 1 and 2. Artefacts were found in highly disturbed environmental deposits comprising loose dark grey silty sand (Unit 1, Appendix 2). The deposit profile comprises disturbed deposits up to 70cm in depth overlying compact silty sand to a depth of 130cm and basal hard orange clay (Appendix 2). Test pit profiles are essentially similar with observed differences relating primarily to the effects of chemical leaching and saturation (Appendix 2). No evidence was found of occupation deposits or features (Appendix 4 - Glossary). No suitable sample material was available for radiometric dating or environmental analyses. The evidence suggests that the site has no temporal or spatial integrity. Market gardens are generally known to import and export sand within and between activity areas, and although there is no specific information for specific occurrences of sand import export to have occurred in this particular instance, the high disturbance caused by continual cultivation at the site provides little confidence that the artefacts have any relationship to past Aboriginal behaviour in the activity area. At best the evidence may indicate casual discard in the general location.

Extent

The known site dimensions measure approximately 50m x 1m x 35cm depth. The extent is determined by the presence of artefacts found during the surface survey (Rhodes 2002) and within test pits (TP1 & 2). No artefacts were found in surrounding trenches (T7 & 8) or probes (P5) (Map 9). Stone artefacts were recovered from 15cm to 35cm in depth. Basal clay deposits were encountered at 95cm to 130cm depth.

Significance

Evidence from this investigation including the low density of stone artefacts in highly disturbed deposits, the lack of occupation deposits or features, or other significant criteria, rates the site having *no* scientific significance. A comprehensive analysis of scientific significance assessment is found in Section 7.

Photograph 14

VAHR 7921-0484 general view facing northeast

Photograph 15

VAHR 7921-0484 artefacts

VAHR 7921-0485

Site Name:	Parham 5 Scarred Tree
VAHR No:	7921-0485
PRP Coordinates:	345320E 5787980N
Cadastral Description:	Lot A PS443552 / Parish of Eumemmerring / County of Mornington / City of Greater Dandenong
Site Type:	Scarred Tree
Cultural Status:	1 definite Aboriginal scar

Location:	500m north of Bayliss Rd, 430m west of railway
Landform:	Lowland plain – floodplain
Tree Type:	Red Gum
Tree Condition:	Good health
Scar Dimensions:	138 x 18cm
Scar Condition:	Good
Scientific Significance:	Moderate
Likely Impact:	None - to be preserved by the activity

*Primary Reference Point GDA94 MGA Zone 55 Coordinates

Nature

VAHR 7921-0485 is a scarred tree of definite Aboriginal origin. The mature Red Gum tree is in good health with a scar in good condition. The scar is relatively symmetrical with significant regrowth on a tree of considerable age. The scar and tree conform to the bulk of standard criteria used in determining scars of cultural origin and has therefore been recorded with the VAHR. The bark may have been removed for a carrying dish.

Extent

The known site dimensions measure approximately 20m x 20m. The extent of the site is determined by a 5m buffer around the drip line of the tree.

Significance

Evidence from this investigation including the presence of the cultural scar, its condition and health of the tree rates the site having moderate scientific significance. A comprehensive analysis of scientific assessment is found in Section 7.

Photograph 16

VAHR 7921-0485 general view facing north

Photograph 17

VAHR 7921-0485 detail view facing north

Sites Recorded as Part of the Current Assessment:

VAHR 7921-0906

Site Name:	Bayliss Rd Scarred Tree 2
VAHR No:	7921-0906
PRP Coordinates:	345420E 5788060N
Cadastral Description:	Lot A PS443552 / Parish of Eumemmerring / County of Mornington / City of Greater Dandenong
Site Type:	Scarred Tree
Cultural Status:	1 probable Aboriginal scar
Location:	500m north of Bayliss Rd, 430m west of railway
Landform:	Lowland plain – floodplain
Tree Type:	Red Gum
Tree Condition:	Good health
Scar Dimensions:	200 x 25cm
Scar Condition:	Good
Scientific Significance:	Moderate
Threats:	Industrial subdivision development

*Primary Reference Point GDA94 MGA Zone 55 Coordinates

Nature

VAHR 7921-0906 is a scarred tree of probable Aboriginal origin (Maps 10 & 15). The mature Red Gum is in good health with a scar in good condition. The scar is symmetrical on a tree on a tree of likely considerable age. The scar and tree conform to the bulk of standard criteria used in determining scars of cultural origin and has therefore been recorded with the VAHR.

Extent

The known site dimensions measure approximately 20m x 20m. The extent of the site is determined by a 5m buffer beyond the drip line of the tree.

Significance

Evidence from this investigation including the presence of the probable cultural scar, its condition and health of the tree rates the site having moderate scientific significance. Scarred trees are a diminishing site-type to clearing and tree death. A comprehensive analysis of scientific significance assessment is found in Section 7.

Photograph 18

VAHR 7921-0906 general view facing north

Photograph 19

VAHR 7921-0906 detail view facing north

VAHR 7921-0956

Site Name:	Bayliss Rd 2
VAHR No:	7921-0956
Site Type:	Very low density subsurface stone artefact scatter
PRP Coordinates*:	345660E 5787460N
Cadastral Description:	Lot A PS443552 / Parish of Eumemmerring / County of Mornington / City of Greater Dandenong
Landform / Topography:	Sand dune – middle slope
Trenches:	T6
Trench Contents:	1 quartzite split flake
Trench Artefact Density per m^2:	1
Test Pits & Probes:	TP11, P3 & 4
Test Pit & Probe Contents:	None
Test Pit & Probe Artefact Density per m^2:	NA
Site Contents:	1 quartzite split flake
Site Artefact Density per m^2:	1
Known Extent:	1m x 1m x 80cm (depth)
Disturbance:	Ploughing top 30cm, bioturbation to 105cm
Likely Additional Material:	None
Scientific Significance:	None
Threat:	Industrial subdivision

*Primary Reference Point GDA94 MGA Zone 55 Coordinates

Nature

VAHR 7921-0956 is a very low density stone artefact scatter (Maps 10 & 16). A single stone artefact was recovered at 70cm to 80cm depth from trench (T6, Appendix 3). The artefact was found in environmental deposits at the top of Unit 3 comprising compact medium brown sandy silt. Basal hard orange clay is encountered at 105cm depth. Test pit and probe excavations (TP11, P3 & 4) did not recover any additional artefacts associated with the site (Map 16). No evidence was found of occupation deposits or features (Appendix 4 - Glossary). No suitable sample material was available for radiometric dating or environmental analyses. The evidence demonstrates that the site most likely reflects a single stone artefact discard or loss event at the location.

Extent

The known site dimensions measure approximately 1m x 1m x 80cm depth. The extent is determined by the presence of a single artefact found in trench T6. A single stone artefact was recovered from 70cm to 80cm depth. Basal hard orange clay was encountered at 105cm depth.

Significance

Evidence from this investigation including the single stone artefact, the lack of occupation deposits or feature, or other significance criteria, rates the site having *no* scientific significance. A comprehensive analysis of scientific significance assessment is found in Section 7. It is considered unlikely that additional stone artefacts are associated with the site.

Photograph 20

VAHR 7921-0956 general view (approximate location indicated by red arrow) facing south

Photograph 21

VAHR 7921-0956 artefacts

VAHR 7921-0957

Site Name:	Bayliss Rd 3
VAHR No:	7921-0957
Site Type:	Very low density subsurface stone artefact scatter
PRP Coordinates*:	345285E 5787660N
Cadastral Description:	Lot A PS322846 / Parish of Eumemmerring / County of Mornington / City of Greater Dandenong
Landform / Topography:	Sand dune – gentle rise – middle and lower slope
Trenches:	T21 & 22
Trench Contents:	3 stone artefacts: 1 broken flake & 2 angular fragments (silcrete, quartzite & quartz)
Trench Artefact Density per m^2:	≈1
Test Pits & Probes:	TP9 (n=0), TP10 (n=12), P1 (n=3)
Test Pit & Probe Contents:	15 silcrete stone artefacts: 9 complete, broken & split flakes; 4 angular fragments
Test Pit & Probe Artefact Density per m^2:	Maximum=12, minimum=0, average (estimated)=4
Site Contents:	18 stone artefacts: 12 complete, broken & split flakes & 6 angular fragments (silcrete, quartzite & quartz)
Site Artefact Density per m^2:	Maximum=12, minimum=1, average=3.2
Known Extent:	50m x 20m x 1m
Disturbance:	Ploughing top 35cm to 75cm, bioturbation to 120cm
Likely Additional Material:	Very low numbers of stone artefacts
Scientific Significance:	None
Threat:	Industrial subdivision

*Primary Reference Point GDA94 MGA Zone 55 Coordinates

Nature

VAHR 7921-0957 is a very low density subsurface stone artefact scatter (Maps 10 & 17). Stone artefacts were recovered 10cm to 100cm in depth from T21 & 22, TP10 and P1. The generalised deposit profile for the site comprised the following: loose dark grey silty sand up to 35cm in depth; compact brown silty sand; and basal hard orange clay or weathered sandstone (Appendix 2). Differences between the profiles consist of disturbance to different depths by market gardening or the differential leaching and saturation of deposits. For example, TP9 had disturbed deposits (Unit 1) to a depth of 35cm while TP10 had disturbed deposits to a depth of 75cm. The majority of stone artefacts were recovered from TP10 (n=12) from a depth of 40cm to 45cm depth in loosely compacted deposits indicative of ploughing disturbance from market gardening. Occasional stone artefacts were recovered from relatively undisturbed deposits below the plough zone (e.g.: T21). Stone artefacts associated with disturbed deposits account for 87.5% (n=14). As argued at VAHR 7921-0484, stone artefacts associated with deposits disturbed by market gardening in this site likely have little spatial or temporal integrity, and may even be introduced into the activity area. This is further supported by the heterogeneous colours of the recovered silcrete artefacts (Appendix 2). No evidence was found of occupation deposits or features (Appendix 4 - Glossary). No suitable sample material was available for radiometric dating or environmental analyses. The evidence demonstrates that the site has been highly disturbed. Stone artefacts may or may not be associated with Aboriginal behaviour within the known extent of the site. At best the site reflects occasional stone artefact loss or discard.

Extent

The known site dimensions measure approximately 50m x 20m x 100cm depth. The extent is determined by the presence of artefacts found within trenches (T21 & 22), test pits (TP10) and probes (P1). Stone artefacts were recovered from 10cm to 100cm depth. Basal hard orange clay and weathered sandstone was encountered at 85cm to 130cm depth.

Significance

Evidence from this investigation; including the low density of stone artefacts, the lack of occupation deposits, features, or other significance criteria, and high ground disturbance by market garden ploughing; rates the site having *no* scientific significance. A comprehensive analysis of scientific significance assessment is found in Section 7. It is considered highly unlikely that further excavation will recover additional stone artefacts that will further contribute to the scientific or cultural knowledge of the site as demonstrated during the complex assessment.

Photograph 22

VAHR 7921-0957 general location (red ring) facing southwest

Photograph 23

VAHR 7921-0957 artefacts

VAHR 7921-0958

Site Name:	Bayliss Road 4
VAHR No:	7921-0958
Site Type:	Low density subsurface stone artefact scatter
PRP Coordinates*:	345510E 5787760N
Cadastral Description:	Lot A PS443552 / Parish of Eumemmerring / County of Mornington / City of Greater Dandenong
Landform / Topography:	Sand dune – gentle rise – middle and lower slope
Trenches:	T12 (n=4), T13 (n=2), T14 (n=2), T15 (n=4), T16 (n=3)
Trench Contents:	15 stone artefacts: 10 complete & broken flakes; 3 complete & broken tools; 1 silcrete core; 1 angular fragment (8 silcrete, 1 quartzite, 4 basalt, 2 crystal quartz)

Trench Artefact Density per m^2:	2.27
Test Pits:	TP3 (n=0), TP4 (n=0), TP5 (n=0), TP6 (n=3), TP7 (n=32)
Test Pit Contents:	35 stone artefacts: 23 complete broken & split flakes; 1 complete tool & 11 angular fragments (31 silcrete & 4 quartz)
Test Pit Artefact Density per m^2:	Maximum=32, minimum=0, average=9.2
Probes:	P2 (n=0), P12 (n=2)
Probe Contents:	2 silcrete stone artefacts: 1 broken flake & 1 complete tool
Probe Artefact Density per m^2	Projected: Maximum=8, minimum=0, average=4
Site Contents:	52 stone artefacts: 34 complete, broken & split flakes; 1 complete blade; 4 complete & broken tools; 1 core & 12 angular fragments (42 silcrete, 4 quartz, 2 crystal quartz, 4 basalt, 1 quartzite)
Site Artefact Density per m^2:	Maximum=32, minimum=0, average (estimated)=4.3
Known Extent:	170m x 150m x 80cm depth
Disturbance:	Ploughing & pipe installation up to 75cm depth, bioturbation up to 110cm
Likely Additional Material:	Very low numbers of stone artefacts
Scientific Significance:	No
Likely Impact:	Will be effectively destroyed

*Primary Reference Point GDA94 MGA Zone 55 Coordinates

Nature

VAHR 7921-0958 is a very low density stone artefact scatter (Maps 10 & 18). Stone artefacts were recovered from 20cm to 80cm depth from trenches, test pits and probes (see above). The majority of stone artefacts (71%, n=52) were recovered from test pit TP7. The stone artefacts from TP7 likely represent a very minor knapping event involving partial reduction of a piece of imported light brown fine-grained silcrete. Artefact point provenancing indicates that this event is likely localised to the 1x1m test pit (see Figure 1). The general deposit profile of the site comprises: highly or significantly disturbed loose dark grey silt sand up to 75cm depth; compact medium grey / medium brown / light grey silty sand with occasional incipient coffee rock development; and basal hard orange clay or weathered sandstone from 90cm to 110cm depth. Differences between the profiles consist of disturbance to different depths by market gardening or the differential leaching and saturation of deposits. No evidence was found of occupation deposits or significant features (Appendix 4 – Glossary). No suitable sample material was available for radiometric dating or environmental analyses. The evidence demonstrates that the place likely experienced ephemeral but repeated Aboriginal behaviour which generally resulted in the loss or casual discard of stone artefacts. Occasionally behaviour involved minor stone knapping events.

Extent

The known site dimensions measure approximately 170m x 150m x 80cm depth. The extent is determined by the presence of artefacts found in trenches, test pits and probes (Map 18).

Stone artefacts were recovered from 10cm to 80cm depth. Basal hard orange clay or weathered sand stone are encountered at 90cm to 110cm depth.

Significance

Evidence from this investigation; including the low density of stone artefacts, the lack of occupation deposits or significant features (apart from the possible knapping event) and high to significant ground disturbance by pipe installation and market garden ploughing; rates the site having *no* scientific significance. A comprehensive analysis of scientific significance assessment is found in Section 7.

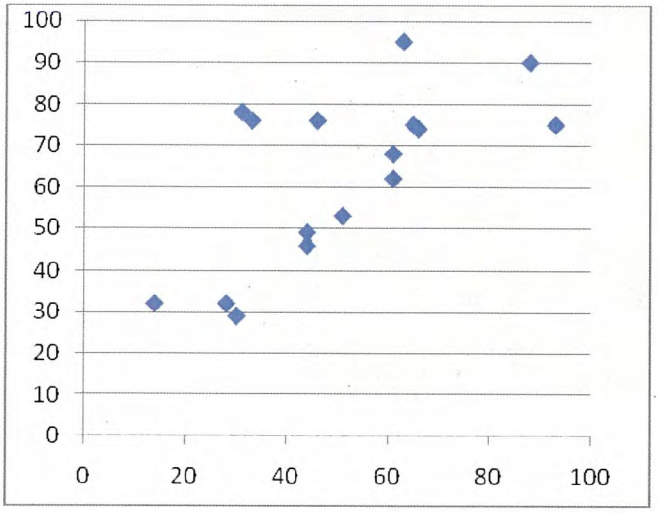


Figure 1 VAHR 7921-0958 TP7 Artefact Point Provenance

Photograph 24

VAHR 7921-0958 general view (approximate location indicated by red oval) facing south

Photograph 25

VAHR 7921-0958 artefacts

VAHR 7921-0959

Site Name:	Bayliss Road 5
VAHR No:	7921-0959
Site Type:	Very low density subsurface stone artefact scatter
PRP Coordinates*:	345460E 5787660N
Cadastral Description:	Lot A PS443552 / Parish of Eumemmerring / County of Mornington / City of Greater Dandenong
Landform / Topography:	Sand dune – gentle rise – crest
Trenches:	T18
Trench Contents:	1 silcrete complete flake
Trench Artefact Density per m²:	0.67
Test Pits & Probes:	TP8 (n=20), P18 (n=2), P20 (n=2)
Test Pit & Probe Contents:	24 silcrete stone artefacts: 21 complete & broken flakes, 1 complete blade & 2 angular fragments
Test Pit & Probe Artefact Density per m²:	20
Site Contents:	21 silcrete stone artefacts: 19 complete & broken flakes & 2 angular fragments
Site Artefact Density per m²:	Maximum=20, minimum=0.67, average=8.3
Known Extent:	4m x 4m x 45cm
Disturbance:	Market gardening to
Likely Additional Material:	Unlikely
Scientific Significance:	Very low
Threat:	Industrial subdivision

*Primary Reference Point GDA94 MGA Zone 55 Coordinates

Nature

VAHR 7921-0959 is a very low density stone artefact scatter (Map 10 & 19). Stone artefacts were recovered from 50cm to 60cm depth from trench T18, 30cm to 45cm from test pit TP8, and 20cm to 30cm from probes P18 and P20. The majority of stone artefacts were recovered from TP8 (95%, n=20). The stone artefacts from TP8 are of dubious spatial and temporal integrity due to significant disturbance caused by the installation of a terracotta pipe to a depth of 75cm (Appendix 2, Photograph 45). The general deposit profile of the site comprises: loose dark grey silty sand to 30cm depth; compact light brown silty sand to 100cm and basal hard orange clay. No evidence was found of occupation deposits or significant features (Appendix 4 – Glossary). No suitable sample material was available for radiometric dating or environmental analyses. The evidence demonstrates that the place likely experienced ephemeral Aboriginal discard behaviour, with a significant component of the site suffering significant disturbance making interpretation of the majority of the cultural material unreliable.

Extent

The known site dimensions measure approximately 4m x 4m x 60cm. The extent is determined by the presence / absence of artefacts found in trenches, test pits and probes (Map 18). Stone artefacts were recovered from 30cm to 60cm depth. Basal hard orange clay was encountered at 100cm depth.

Significance

Evidence from this investigation; including the low density of stone artefacts, the lack of occupation deposits or significant features and significant ground disturbance by pipe installation and market garden ploughing; rates the site having *no* scientific significance. A comprehensive analysis of scientific significance assessment is found in Section 7.

Photograph 26

VAHR 7921-0959 general view (approximate location indicated by red arrow) facing south

Photograph 27

VAHR 7921-0959 artefacts

6.4 Stone Artefacts

A total of 99 stone artefacts were recovered from trenches, test pits and probes (Table 8). The highest number of artefacts as well as density per m^2 was recovered from test pit excavations. However this was due to the relatively high number of artefacts recovered from only two test pits (TP7 n=32, TP8 n=20). Viewed in the context of the extensive subsurface testing conducted during this assessment, these relatively high numbers of artefacts can be considered as rare anomalies within the general context of the overall very low artefact density within the activity area. The highest number of artefacts was recovered from VAHR 7921-0958 (n=52), but taking into consideration the size and low artefact density of the site overall (4.3 per m^2), this is not surprising. The second highest number of artefacts was found at VAHR 7921-0959 which also had the highest artefact density (8.3 per m^2). This must be considered within the context of the very small extent of the site which skews the importance of density calculations in such instances, that is, the lack of artefacts recovered from adjacent excavations are not reflected in density calculations. Sites VAHR 7921-0484, 0956 and 0957each have low numbers and density of artefacts.

Table 8 Artefact Numbers & Densities

VAHR 7921-xxxx	0484	0956	0957	0958	0959	Total
T*	-	1 (<1)	3 (1)	15 (2.27)	1 (<1)	20
TP*	3 (1.5)	-	12 (12)	35 (7)	20 (20)	70
P*[1]	-	-	3 (12)	2 (8)	4 (8)	9
Total	3 (1.5)	1 (<1)	18 (4)	52 (4.3)	25 (8.3)	99

*T=trench, TP=test pit, P= probe; 1=artefact density calculated x4

Complete, broken and split flakes (n=71) dominate the assemblage followed by angular fragments (n=21), tools (n=4), blades (n=2) & cores (n=1) (Table 9). The assemblage components and percentage composition is typical of the region, that is, domination by flakes and angular fragments with small components of other data classes. This is reflected in sites with reasonable samples of stone artefacts at VAHR 7921-0958 and to a lesser extent VAHR 7921-0959. The presence of stone tools from the ASTT (Australian Small Tool Tradition) is reflected in the assemblage and dates the sites to within the last 4,000 years.

Table 9 Artefact & Data Classes

VAHR 7921-xxxx	0484	0956	0957	0958	0959	Total
Complete, broken & split flakes	3	1	12	34	21	71
Complete & broken blades	-	-	-	1	1	2
Complete & broken tools	-	-	-	4	-	4
Cores & core fragments	-	-	-	1	-	1
Angular fragments	-	-	6	12	3	21
Total	3	1	18	52	25	99

Silcrete (n=82) dominates the raw material of the assemblage followed by minor components of quartz (n=9), basalt (n=5) and quartzite (N=3) (Table 10). This pattern is consistent at sites with over ten artefacts (VAHR 7921-0957, 0958 & 0959). Silcrete was the preferred raw material for the manufacture of stone artefacts at the site, and conforms to the regional preference for this raw material.

Table 10 Site & Artefact Raw Material

VAHR 7921-xxxx	0484	0956	0957	0958	0959	Total
Silcrete	1	-	15	41	25	82
Quartz	1	-	2	6	-	9
Quartzite	-	1	1	1	-	3
Basalt	1	-	-	4	-	5
Total	3	1	18	52	25	99

6.5 Aboriginal Cultural Heritage – Discussion

This complex assessment has demonstrated that the activity area has two different sets of Aboriginal cultural heritage values: *low-moderate* to *moderate* scientific significance in relation to Aboriginal scarred trees and *no* scientific significance in relation to stone artefact scatter sites.

The north of the activity area once formed part of the Eumemmerring Creek floodplain and likely contained abundant mature Red Gums. Those few remaining exhibit evidence of

Aboriginal modification in the form of bark removal for the production of wooden artefacts leaving the resultant scars seen today. This site-type was likely abundant in the region, and even today comprise a significant component of sites recorded in the region (see Section 4.3). Scarred trees in good condition are generally considered to have significant scientific values. They also have abstract cultural values. Red Gum trees in the region were likely one of the major resources that attracted Aboriginal groups to pass through the activity area itself as indicated by the presence of VAHR 7921-0394, 0483, 0485 and 0906. Each scarred tree site is rather typical of those found in the region generally, that is, of small to medium sized scars with none representing a rare scarred tree example, such as a canoe or carved tree.

In contrast to the cultural heritage values of the scarred trees, stone artefacts scatters VAHR 7921-0484, 0957, 0958 and 0959 are not only typical of the region, but illustrate that the activity area was *not* the focus of intensive Aboriginal for the region, in particular, was not likely a place for extended camping. All sites are very low density stone artefact scatters that have suffered significant ground disturbance by market gardening for more than 45 years (Section 3). They are generally rather small except for VAHR 7921-0958. Only two elevated artefact counts were recovered despite the intensive excavations, and these were restricted to individual excavations, one of which exhibited extensive disturbance to depth (TP8). Sites were rated having *no* scientific significance. Even when there were some criteria which elevated scientific significance, this was counteracted by the degree of disturbance.

Of greatest significance in assessing the cultural heritage values of stone artefact scatter sites in the activity area is the fact that stone artefacts are found primarily in significantly disturbed deposits or in deposits which are likely to have suffered a high degree of disturbance. Artefacts in test pits TP1, 2, 8, 10 and probes P1, 12, 18 and 20 are all within significantly disturbed deposits. Only test pit TP7 is likely to have any spatial or temporal and hence behavioural integrity, representing a minor knapping event. In this case the entire event has been salvaged within the extent of a 1x1m test pit.

Stone artefacts and raw material are also typical of the region, with evidence of minor episodes of manufacture, curation and discard, primarily utilising silcrete. There was no evidence to indicate that the sites are associated with the period prior to 4,000 or the Pleistocene. Stone artefacts can be attributed to the Australian Small Tool Tradition and there was no deeply buried artefacts with any attributes (intrinsic or extrinsic) of the Pleistocene that has been suggested for nearby sites (i.e.: Colemans Road, Barker 2007).

Stone artefact scatters were restricted to the upper slopes of the sandy rises in the south of the activity area. The sand extends to a depth not greater than 120cm. The sandy rises would have afforded a dry area for brief stops by Aboriginal groups during wet periods, possibly when the floodplain was wet or flooded. Stone artefact scatter sites closer to Eumemmerring Creek were likely the primary focus of Aboriginal camping. This is indicated by the larger, denser sites found at Coleman's Road (see Section 4). This area has a historic waterhole and evidence of Aboriginal occupation up to the 1950s.

The complex assessment falls within the expectations of the site prediction model (Section 4.5). Apart from Aboriginal scarred trees with up to moderate scientific significance, the activity area as a whole has no scientifically significant Aboriginal cultural heritage values.

6.6 Aboriginal Cultural Heritage – Consultation

Aboriginal community representatives (BLCAC & BWFL) participated in the fieldwork and consulted in the fieldwork methodology. BLCAC & BWFL have no legislative responsibility for the activity area. When evaluating this assessment, the Secretary is required to "consult with, and consider the views of, any Aboriginal person or Aboriginal body that the Secretary considers relevant to the application (s.65(3) *Aboriginal Heritage Act 2007*). It is the ethical and statutory responsibility of the Victorian Aboriginal Heritage Council (AHC) to register RAPs for the activity area region (s.132(2)(a) *Aboriginal Heritage Act 2006*). The council must determine an application for registration within 120 days after receiving the application (s.151(1) Aboriginal Heritage Act 2006). At the time of CHMP submission for evaluation both BLCAC (6.7.2007) and BWFL (1.6.2007) have RAP applications outstanding beyond 12 months.

7 ASSESSMENT OF CULTURAL AND SCIENTIFIC SIGNIFICANCE

The following section outlines criteria for assessing heritage significance that are applicable in the cultural and scientific assessment of Aboriginal archaeological sites identified within the activity area.

Assessment of site significance is complex and encompasses a range of heritage values. The heritage values of a site or place are broadly defined as the 'aesthetic, historic, spiritual scientific or social values for past, present or further generations' (Australia ICOMOS, *The Illustrated Burra Charter* 1999). Cultural significance considers aesthetic, historic, spiritual and social values (Section 7.1), while scientific significance is considered separately (Sections 7.2 & 7.3). The Burra Charter is an internationally recognised document in assessing any form of heritage.

7.1 Aboriginal Sites – Cultural Significance

Cultural Significance

Where places/sites have a demonstrated variable and specific 'cultural significance', then the Burra Charter conservation principles take precedence. Where communities cannot provide specific evidence for cultural significance for a site/location, general scientific significance assessment is to be adopted (Table 11). It is assumed that all cultural material will have generalised cultural significance to Aboriginal people.

Aesthetic Significance

'Aesthetic value includes aspects of sensory perception for which criteria can and should be stated. Such criteria may include consideration of form, scale, colour, texture and materials of the fabric; the smells and sounds associated with the place and its use' (Australian ICOMOS, *The Illustrated Burra Charter* 1999: 73).

In terms of Aboriginal sites, few could be considered to have any specific aesthetic values according to the above definitions apart from some rock art, engravings and rock arrangements including economic structures such as fish traps and wells. Fish traps for example may also demonstrate an aesthetic ideal. Surface and sub-surface lithic deposits do not possess any aesthetic significance. This is consistent with the Australian Heritage Commission definition that aesthetic value has 'a certain quality of a place which provides a sensory experience to a person [public or expert assessor], participation in or viewing a landscape, of such strength that is has a positive impact on human thought' (Australian Heritage Commission, A Preliminary Proposal for Assessment of Aesthetic Values for Regional Assessment).

Does the site have:

- Abstract qualities (also known as scenic or visual quality)?
- Evocative responses (by both public and expert assessors)?
- Meanings (normally long-standing)?

- Landscape integrity (level of degradation)?
- Landmark quality (recognised by broader community)?

Historic Value

'A place may have historic value because it has influenced, or has been influenced by, an historic figure, event, phrase or activity. It may also have historic value as the site of an important event. For any given place the significance will be greater where evidence of the association or event survives *in situ*, or where the settings are substantially intact, than where it has been changed or evidence does not survive. However, some events or associations may be so important that the place retains significance regardless of subsequent treatment' (Australian ICOMOS, *The Illustrated Burra Charter* 1999: 73).

In terms of Aboriginal sites, historic value can be represented as an identifiable sequence of long-term and contiguous occupation. Additionally, sites / locations may have been important during the historic period. Such sites / places / locations / routes should also be registered as Aboriginal historic places. The level of significance must be based on a regional review of the particular Aboriginal historic site type.

Does the site have:

- Evidence of long-term and continuous occupation?
- Associations with a particular event?

Social Value

'Social value embraces the qualities for which a place has become a focus of spiritual, political, national or other current sentiment to a majority or a minority group' (Australian ICOMOS, *The Illustrated Burra Charter* 1999: 73).

Aboriginal sites can be socially significant in a number of ways. Specific sites can have social significance to the general community (e.g.: Willandra Lakes) and at another level, the general undeveloped landscape and all that it contains will have specific values to any traditional groups of Aboriginals that have maintained a more or less continuous presence on their traditional lands. Clearly, the best people to determine social value are traditional Aboriginal groups. In cases where information to assist in assessing social significance is difficult, specialist input, such as an anthropologist, needs to be sought. However, most sites in Victoria relate to evidence of Aboriginal occupation over the past 6 000 years, though some sites reflect much greater antiquity to early Pleistocene. These sites have no specific traditional significance and are mostly unknown until located during archaeological survey.

The Commission has further refined criteria for assessing social value:

- Is it an existing community landmark or signature?
- Does the site / place have strongly symbolic qualities that define a community?

- Does the site / place have specific spiritual or traditional connection between past and present?
- Does the site / place represent / embody important collective (community) meanings?
- Does the site / place have associations with events having a profound effect on a community?
- Does the site / place represent attitudes, beliefs or behaviours fundamental to community identity?
- Does the site / place have an essential community function which leads to a special attachment?
- Does the site / place have longevity of use or association, including continuity to the present?

Table 11 Cultural Significance Assessment

VAHR 7921-xxxx	0394	0483	0484	0485	0906	0956	0957	0958	0959
Query	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No
Aesthetic									
Abstract quality	Yes	Yes	No	Yes	Yes	No	No	No	No
Evocative response	No	No	No	No	No	No	No	No	No
Meaning	No	No	No	No	No	No	No	No	No
Landscape integrity	No	No	No	No	No	No	No	No	No
Landmark quality	No	No	No	No	No	No	No	No	No
Historic									
Long term & continuous occupation	No	No	No	No	No	No	No	No	No
Association with event	No	No	No	No	No	No	No	No	No
Social									
Existing community landmark / signature	No	No	No	No	No	No	No	No	No
Definitive symbolic qualities	No	No	No	No	No	No	No	No	No
Spiritual or traditional connection between past & present	No	No	No	No	No	No	No	No	No
Important collective meaning	No	No	No	No	No	No	No	No	No
Representative of attitudes, beliefs or behaviours	No	No	No	No	No	No	No	No	No
Community function	No	No	No	No	No	No	No	No	No
Long-term use or association	No	No	No	No	No	No	No	No	No

7.2 Aboriginal Sites – Scientific Significance Assessment

'The scientific or research value of a place will depend upon the importance of the data involved or its rarity, quality or representativeness to the degree which the place may contribute further substantial information' (Australia ICOMOS, *The Illustrated Burra Charter* 1999: 73). Schiffer and Gumerman (1977: 211-212) consider 'a site or a resource ... to be scientifically significant when its further study may be expected to help answer current research questions. This is scientific significance as defined as research potential'. Some sites have evidence that may span many thousands of years and therefore have the potential to answer significant research questions regarding natural history, human evolution and adaptation.

The enactment of the *Aboriginal Heritage Act 2006* and *Aboriginal Heritage Regulations 2007* has required the introduction of a new scientific significance assessment framework to replace earlier frameworks. This framework rates Aboriginal sites in greater detail so that more transparent cultural heritage outcomes and management strategies can be formulated. It comprises a structured query-based analysis which aims to produce detailed site assessments and clear links to site management recommendations. Selected site attributes examine in greater detail questions of site contents, condition and representativeness.

The body of evidence accumulated to date indicates that some site attributes are more significant than others. For example, stratified occupation deposits are usually in better condition, rarer and contain more significant cultural material than artefact horizons in environmental deposits. However, as archaeological data bases grow and change the significance of criteria may change. This does not mean that the assessment of archaeological scientific significance is subjective but that it is affected by the interaction of various disciplinary forces including theory, research questions, methodology, knowledge base and the nature of the archaeological record.

Artefact Scatter Sites

The stone artefact scatter is a common site-type found in Victoria and consequently comprises a high proportion of sites recorded on the Aboriginal Affairs Victoria Site Registry. Scientific significance is assessed in this investigation by the examining the following criteria.

Artefact Density

Sites with higher artefact densities per m^2 contain larger amounts and more varied information. Higher artefact densities usually represent more intensive and varied human behaviour. For example, focussed Aboriginal activity, such as longer-term campsites, will generally leave high concentrations of cultural material. In contrast, Aboriginal people traversing the landscape, dropping or otherwise discarding stone artefacts on a regular basis will often leave a very low density of artefacts. This is considered to represent 'background cultural noise' and is identified by artefact densities with less than five artefacts per metre. The higher the density of stone artefacts within a site, the higher its scientific significance.

Formal artefact density calculations for site scientific significance assessments are based on the results of hand excavated 1x1m^2 test pits. Test pit locations will usually be determined upon presence / absence evidence and initial artefact density calculations from mechanical

sub-surface testing. The density scale used in Section 7.2 is based on consulting experience. Site artefact density data from the AAV site registry is not used because it is not of sufficient accuracy for rating scientific significance. It is envisaged that benchmark data from AAV site registry will be available in the future.

Extent of Artefact Densities

Larger sites are usually considered to have higher scientific significance than smaller ones because they generally contain more information. Furthermore, larger sites were likely the focus of more intensive and varied Aboriginal behaviour. If sites have artefact densities of 46 per metre or above, then they are likely to be assessed having at least moderate scientific significance (see below). Based on consulting experience a significant size threshold is notionally considered here to be at least 50x50m in extent. Site-size data from the AAV site registry is not used because it is not of sufficient accuracy for rating scientific significance. It is envisaged that benchmark data from AAV site registry will be available in the future.

Environmental Deposits

An environmental deposit is a stratigraphic layer formed by the laying down of deposits by environmental agents such as wind and water. These may bury artefacts to form stratigraphic layers but do not form occupation deposits. If artefacts are within environmental deposits they habitually form artefact horizons. The temporal and spatial integrity of artefact horizons within environmental deposits will depend on the formation and depositional and post-depositional formation processes of these deposits. Generally they have less temporal and spatial integrity than occupation deposits and, with all other criteria being equal, have less scientific significance. They comprise the overwhelming artefact scatter type encountered during complex assessments.

Disturbance

Disturbance of archaeological sites can take many forms and include both environmental and human agents not only at the time of deposition but also after sites have been abandoned. Disturbance can be categorised as low, high or significant. Low disturbance is when archaeological deposits or features have little discernable disturbance so they are essentially intact and retain a high degree of spatial and temporal integrity. High disturbance is when agents have likely altered the temporal and spatial integrity to such an extent which has lowered their information potential and therefore scientific significance. Examples of high disturbance include deflation, native vegetation clearance, ploughing, rabbit burrowing, heavy stock trampling and stock rubs. Significant ground disturbance has altered the information potential of a site to such a degree that it has effectively destroyed the integrity of the site. Examples of significant ground disturbance include heavy natural erosion, or grading, excavating digging, dredging and deep ripping by machinery. The information potential remaining will essentially be the intrinsic attributes of the artefacts themselves.

Period and Number of Periods Represented

Most sites contain stone tool assemblages attributed to the Australian Small Tool Tradition which may be dated 6 000 and 7 000 years ago (Hiscock & Attenbrow 2004). The landform and depositional context is also usually attributed to the period of latest landscape formation

associated with present sea level stabilising 5 000 to 6 000 years BP (Marsden & Mallet 1975: 114-116; Bird 1993: 145; Douglas & Ferguson 1993: 387; Kershaw 1995: 669). Other periods, such as the Late Pleistocene and European Contact, are poorly represented in the archaeological knowledge base. Due to their rareness they are of high research interest and significance. Sites with more than one period represented allow the investigation of cultural change, interaction and adaptation over a longer period of time. Based on the criteria of research potential and rarity, these sites will have increased scientific significance.

Occupation Deposits, Occupation Surfaces and / or Features

An occupation deposit is formed by the laying down of deposits (artefacts and / or sediments) by human activities that bury artefacts and form distinct stratigraphic entities such as layers (e.g.: dense lens of stone artefacts & bone between environmental deposits, stratified shell deposits) or features (e.g.: hearths, occupation mounds). An occupation surface is a distinct layer or interface between depositional strata upon which human activities were carried out and artefacts / features deposited. Most commonly this may be represented by a prior land surface (e.g.: soil horizon) that has been subsequently buried by environmental deposits (e.g.: dune deposits). Occupation deposits, features and surfaces have a high degree of spatial and temporal integrity and therefore will have higher scientific significance than archaeological deposits with lower integrity (e.g.: artefact horizons in environmental deposits).

Stratified Occupation Deposits, Occupation Surfaces and / or Features

Sites with stratified occupation deposits, surfaces and / or features have the potential to investigate chronological change within sites; often with greater time depth and chronological resolution compared to sites with lower spatial and temporal integrity. They are rarer, have higher research potential, and therefore also have higher scientific significance.

Natural History Potential

Some sites have environmental evidence that may span many thousands of years and therefore have the potential to answer significant research questions regarding natural history, climatic and environmental conditions. This evidence can be used to investigate human evolution and adaptation. Generally this evidence is rarely found in Victorian sites and has high research potential and scientific significance.

Representativeness

Representativeness refers to the regional distribution of a particular site-type and its scientific significance. It is assessed to whether the site is common, occasional, rare or very rare in a given region. Assessments of representativeness are biased by current knowledge of the distribution and numbers of sites in a region. Current knowledge varies from place to place, depending on the extent and quality of previous archaeological research. Consequently, a site that is assigned low scientific significance based on other queries, but is considered a rare occurrence, may only be regarded as such in terms of current knowledge of the regional archaeology. Its rareness may not necessarily increase the site significance to moderate or above.

The representativeness used for archaeological sites are:

- Common occurrence;
- Occasional occurrence;
- Rare occurrence;
- Very rare occurrence.

Ensuring a representative sample of significant site-types is preserved provides opportunities for research questions and techniques not yet developed to be available for future archaeologists.

Stone artefact scatter sites identified during this investigation are rated according to the following queries and answers:

What is the artefact density per metre?

Stone Artefact Density (per m^2)*	Score
0 – 4	0
5 – 15	1
16 – 30	2
31 – 45	3
46 – 60	4
61 – 75	5
76 – 90	6
91+	7

*Minimum artefact size 10mm

If the artefact density rates 46 artefacts per metre or above, is the density spatially extensive (more than 50 x 50m)?
No = 0, Yes = +1

Are artefacts within environmental deposits?
No = occupation deposits (see below), Yes = 0

Are the environmental deposits disturbed?
No = 0, Yes (high) = -1, Yes (significant) = -2

Are European Contact or Pleistocene / Early Holocene periods represented?
No = 0, Yes = +1

Is more than one period represented?
No = 0, Yes = +1

Are there occupation deposits, occupation surfaces and / or features?
No = 0, Yes = +1

Are there stratified occupation deposits, occupations surfaces and / or features?
No = 0, Yes = +1

Is there an opportunity to research natural history (e.g.: climate & environmental changes)?
No = 0, Yes = +1

Is the site a common, occasional, rare or very rare occurrence?
C or O = 0, Rare = +1, Very rare = +2

Table 12 Artefact Scatter Sites – Score & Scientific Significance Rating

Score	Scientific Significance Rating
0	no
1	very low
2	low
3	low – moderate
4	moderate
5	moderate – high
6	high
7+	very high

Scarred Tree Sites

The scientific significance assessment for scarred trees varies from other site-types (e.g.: stone artefact scatters) because a scarred tree has different assessment criteria. Although scarred trees are a site type usually associated with traditional Aboriginal cultural activity, there are examples of scarred tree associated with non-Aboriginal activity (e.g.: survey blazes). Scarred trees are rated according to four criteria: scar origin, scar condition, tree condition and representativeness.

Scar origin takes into account the likeliness of the cultural scar resulting from Aboriginal activity. A scar must be of definite Aboriginal origin for a scarred tree to be rated moderate scientific significance or above. The *scar origin* ratings used for scarred trees are:

0 uncertain

1 probably Aboriginal

2 definitely Aboriginal

Scar condition takes into account the preservation of the scar. The *scar condition* ratings used for scarred trees are:

0 Destroyed

1 Poor

2 Fair

3 Good

4 Excellent

Tree condition takes into account the condition or health of the tree. The *tree condition* ratings used for scarred trees are:

0 Destroyed / removed

1 Fallen

2 Dead standing (stag)

3 Poor health (dying)

4 Good health

Representativeness refers to the regional distribution of scarred trees. Representativeness is assessed on whether the site is common, occasional, rare or very rare in a given region. Representativeness should take into account the type and condition of the scar as well as the species and condition of the tree involved. The *representativeness* ratings used for scarred trees are:

1 Common occurrence

2 Occasional occurrence

3 Rare occurrence

4 Very rare occurrence

Overall scientific significance ratings for scarred tree sites based on a cumulative score for scar origin, scar condition, tree condition and representativeness are:

0-2	No scientific significance
3-4	Very low scientific significance
5-6	Low scientific significance
7-8	Low-moderate scientific significance
9-10	Moderate scientific significance
11-12	Moderate-high scientific significance
13-14	High scientific significance

7.3 Aboriginal Sites – Scientific Significance Assessment

The individual scientific significance assessment rating of stone artefact scatters relevant to the present activity area is represented in Table 13 overleaf.

Table 13 Stone Artefact Scatter Significance Assessment Rating

VAHR 7921-xxxx	0484		0956		0957		0958		0959	
Query	Answer	Rating	Answer	Rating	Answer	Rating	Answer	Rating	Answer	Rating
Artefact density per m^2	1.5	0	<1	0	4	0	4.3	0	8.3	1
Extent of site	No	0	No	0	No	0	No	0	No	0
Environmental deposits	Yes	0	Yes	0	Yes	0	Yes	0	Yes	0
Disturbance	Yes	-2	Yes	-1[1]	Yes	-1[1]	Yes	-1[1]	Yes	-1[1]
Contact or Pleistocene / Early Holocene*	No	0	No	0	No	0	No	0	No	0
More than one period*	No	0	No	0	No	0	No	0	No	0
Occupation deposits, surfaces or features*	No	0	No	0	No	0	No	0	No	0
Stratified occupation deposits, surfaces or features*	No	0	No	0	No	0	No	0	No	0
Natural history research potential*	No	0	No	0	No	0	No	0	No	0
Representativeness*	C	0	C	0	C	0	C	0	C	0
Scientific Significance	No	-2	No	-2	No	-2	No	-1	No	-1

1=site has been significantly disturbed, but some artefacts are found in relatively intact deposits below disturbed units, therefore scored -1 rather than -2.

The individual scientific significance assessment rating of scarred trees relevant to the present activity area is represented in Table 14 below.

Table 14 Scarred Tree Significance Assessment Rating

VAHR 7921-xxxx	0394		0483		0485		0906	
Query	Answer	Rating	Answer	Rating	Answer	Rating	Answer	Rating
Scar Origin	Definite	2	Definite	2	Definite	2	Probable	1
Scar Condition	Fair	2	Poor	1	Good	3	Good	3
Tree Condition	Poor	1	Good	4	Good	4	Good	4
Represen-tativeness	Occasional	2	Common	1	Common	1	Common	1
Scientific Significance	Low-moderate 7		Low-moderate 8		Moderate 10		Moderate 9	

7.4 Aboriginal Cultural Heritage – Statement of Significance

European assessments of cultural significance (aesthetic, historic or social / spiritual) may not accord with those of the Aboriginal community. It is up to the relevant Aboriginal community to decide the Aboriginal significance of any site or place within their custodianship. Although the Aboriginal community usually attributes general cultural significance to Aboriginal cultural heritage, the approach adopted here aims of produce an analytical, transparent and specific cultural significance assessment of Aboriginal cultural heritage based on criteria set out by internationally recognised guidelines.

M3 Estate is situated approximately 2km to the south of Eumemmerring Creek. Eumemmerring Creek flowed into the now drained Carrum Swamp which once stretched along the eastern shore of Port Phillip Bay, and its eastern boundary was located approximately 1 km west of the activity area. The past distance to the coast line and proximity to large areas of swampland means that sites associated with the exploitation of wetland resources most likely relate to the last 4,000 years, whilst deeply buried terrestrial sites on dune systems could potentially relate to Pleistocene occupation. Large subsurface stone artefact scatters are associated with sand dunes adjacent to Eumemmerring Creek to the northwest of M3 Estate at Colemans Road. Investigations at these sites have suggested possible Pleistocene occupation, but have yet to be conclusively demonstrated. In addition the region has demonstrated high sensitivity for Aboriginal scarred trees, primarily on Red Gums on the former floodplains. The general widespread occurrence of Aboriginal scarred trees throughout the region and the concentration of larger sites adjacent to the margins of Carrum Swamp and Eumemmerring Creek demonstrate that the activity area region was of general significance to past Aboriginal groups.

In the activity area the salient landforms are a floodplain in the north and gentle undulating sandy rise in the south. The current activity area landform pattern appears primarily to relate to the formation of Carrum Swamp which stabilised approximately 4,000 years ago. There is

no particular archaeological, ethnohistorical, anthropological or cultural evidence that suggests the activity area had any particular cultural significance to Aboriginal peoples in the past. The archaeological evidence demonstrates that Aboriginal people collected bark from Red Gums for a variety of purposes. Subsurface stone artefact scatter sites are situated on the sandy rises and are characterised by very low average stone artefact densities. Sites are differentiated by size and the presence of the very occasional small cluster of stone artefacts, the latter likely representing very minor discrete knapping events. These events were infrequent and low intensity with the result that only one example was recorded during the complex assessment. They were also not sufficient to have any impact on individual site scientific significance assessments. The activity area has also suffered extensive market gardening over the years. The nature of the sites and their disturbance by market gardening means that the activity area has low scientific value.

In general, the activity area has very low, if any, scientific or cultural values apart from obtrusive Aboriginal scarred trees sites. Stone artefact scatter sites VAHR 7921-0484, 0956, 0957, 0958 & 0959 have little to offer regional archaeological knowledge, except in contrasting these sites to larger, significant sites located nearer the important and rich resource zones at Eumemmerring Creek and Carrum Swamp, well away from the present activity area.

Table 15 Aboriginal Sites – Cultural & Scientific Significance Summary

VAHR No Site Name	Specific Cultural Significance	Scientific Significance
7921-0394 Bayliss Rd Scarred Tree	Abstract	Low-moderate
7921-0483 Parham 3 Scarred Tree	Abstract	Low-moderate
7921-0484 Bayliss Rd	None	None
7921-0485 Parham 5 Scarred Tree	Abstract	Moderate
7921-0906 Bayliss Rd Scarred Tree 2	Abstract	Moderate
7921-0956 Bayliss Road 2	None	None
7921-0957 Bayliss Road 3	None	None
7921-0958 Bayliss Road 4	None	None

VAHR No Site Name	Specific Cultural Significance	Scientific Significance
7921-0959 Bayliss Road 5	None	None

8 CULTURAL HERITAGE MANAGEMENT RECOMMENDATIONS

Cultural heritage management is a legal, ethical and scientific process that aims to reconcile the interests of various stakeholders including the landowner / developer, traditional owners (for Aboriginal cultural heritage), government departments / agencies and relevant community groups. Appropriate cultural heritage management seeks to avoid harm to cultural heritage places by a high impact activity. The most common type of harm is associated with developments that disturb or modify the ground surface, which are typically residential, industrial and infrastructure developments. Any activity that exposes or disturbs in any way the fabric or content of a place reduces its cultural heritage significance. Places can be impacted if their context is reduced to a point where there are no other related reference features in the local landscape to provide context and therefore broader interpretation of a site. This is referred to as the level of cultural landscape integrity.

Determining an appropriate management strategy for a cultural heritage place requires the establishment of its cultural and scientific significance. When a place can be demonstrated to be of sufficient cultural and / or scientific significance then the management aim in the first instance is to avoid harm to significant values. Best cultural heritage practice seeks to avoid harm to cultural heritage places by appropriate input into development design. Ideally, best management practice is to allocate open space / park / reserve over the site location to ensure long-term protection and eliminate the need for costly harm minimisation measures or site salvage works. If avoidance in not possible then, as a last resort, harm minimisation or carefully managed destruction may be appropriate.

8.1 Aboriginal Cultural Heritage – Management Issues

The *Aboriginal Heritage Act 2006* (s.27 & 28) protects Aboriginal cultural heritage places (including archaeological sites) and objects (including archaeological artefacts) from a person who does an act that harms (injures, damages, defaces, desecrates or destroys) or is likely to harm Aboriginal cultural heritage. Such activities are an offence and liable to heavy penalties (s.27 & 28), except when conducted in the course of preparing a cultural heritage management plan, in accordance with a cultural heritage permit or in accordance with an approved cultural heritage management plan (s.29).

The proposed activity is a high impact activity in statutory areas of Aboriginal cultural heritage sensitivity. A complex assessment identified the nature, extent and significance of known Aboriginal cultural heritage. A CHMP is required to manage these Aboriginal cultural heritage values. Statutory matters to be considered in approving a CHMP include whether the activity will avoid harm to Aboriginal cultural heritage; if the activity is unable to avoid harm, whether the activity will minimise harm to Aboriginal cultural heritage; any specific measures required for the management of Aboriginal cultural heritage both during and after the activity; any contingency plans for disputes, delays and other obstacles that may affect the conduct of the activity and requirements relating to the custody and management of Aboriginal cultural heritage during the course of the activity (s.61 *Aboriginal Heritage Act 2006*). In addition, contingency plans are required to resolve any disputes between the sponsor and relevant RAP (if one exits) in relation to the implementation of the plan or the conduct of the activity; reviewing compliance with the CHMP and mechanisms for remedying non-compliance; the management of Aboriginal cultural heritage found during the activity; and the notification of

the discovery of Aboriginal cultural heritage during the carrying out of the activity (sch.2, cl.13 *Aboriginal Heritage Regulations 2007*).

The proposed activity has the following Aboriginal cultural heritage management issues:

1. Statutory areas of Aboriginal cultural heritage sensitivity;
2. Known Aboriginal cultural heritage;
3. Avoiding harm to known Aboriginal cultural heritage;
4. Minimising harm to known Aboriginal cultural heritage;
5. Management of known Aboriginal cultural heritage;
6. Specific harm avoidance, minimisation and management measures to known Aboriginal cultural heritage sites;
7. Custody and management of Aboriginal cultural heritage; and
8. Contingency plans.

1. Statutory Areas of Aboriginal Cultural Heritage Sensitivity

The proposed activity is a high impact activity within statutory areas of Aboriginal cultural heritage sensitivity (s.47 *Aboriginal Heritage Act 2006*; r.22 & 23 *Aboriginal Heritage Regulations 2007*). Statutory areas of Aboriginal cultural heritage sensitivity include sand dunes / sand sheets and registered Aboriginal cultural heritage places (VAHR 7921-0394, 0483-0485, 0906 & 0956-0959).

The complex assessment investigated in detail the Aboriginal cultural heritage values within the activity area, generally, and in the statutory areas of Aboriginal cultural heritage sensitivity in particular. The general Aboriginal cultural heritage values were investigated by survey of a standard assessment (Section 5) and phase 1 of the complex assessment in an area identified having archaeological sensitivity for subsurface stone artefact scatters (Survey Unit 1) and the particular values of registered sites during phases 2 and 3 (Section 6).

2. Known Aboriginal Cultural Heritage

The standard assessment recorded four Aboriginal scarred tree sites (VAHR 7921-0394, 0483, 0485 & 0906) while the complex assessment investigated in detail the nature, extent and significance of five registered stone artefact scatter sites (VAHR 7921-0484, 0956-959) within the activity area (Map 10).

Scarred trees VAHR 7921-0394 and 0483 were rated having *low-moderate* scientific and *abstract* specific cultural significance, while VAHR 7921-0485 and 0906 were rated having *moderate* scientific and *abstract* cultural significance. Stone artefact scatters VAHR 7921-0484 and 0956 to 0959 were rated having *no* scientific and *no* specific cultural significance.

See Section 7.4 for a statement of significance for Aboriginal cultural heritage values within the activity area.

3. Avoiding Harm to Known Aboriginal Cultural Heritage

Will the activity be conducted in a way that avoids harm to Aboriginal cultural heritage (s.61(a) Aboriginal Heritage Act 2006*)?*

Avoiding harm to Aboriginal cultural heritage sites is achieved by relocating high impact activities away from significant elements of a particular place and protecting the place within a conservation zone. In most instances, the boundary of a conservation zone will be determined by controlled excavation. If avoidance is adopted, then the management plan must prescribe how the conservation zone will protect cultural heritage values in the short and long term, what activities can take place and who has future management responsibility.

The activity area is being developed within the planning framework of the State Planning Policy Framework (SPPF). The activity area is within the Urban Growth Boundary (UGB) resulting from *Melbourne 2030 – Planning for Sustainable Growth*. The activity area is within land designated Industrial Zone 1 under the relevant planning scheme. The proposed industrial estate therefore falls within the long-term strategic planning requirements for the expansion and creation of sustainable industry in Melbourne's growth areas.

Unfortunately, within the framework of these strategic planning requirements, it is not possible to conduct the current activity in a way that avoids harm to all known Aboriginal cultural heritage identified during the assessment. In this particular instance, roads, services and industrial placement and allocation are required to take into account environmental nett gain preservation of land to the north of the activity area which has taken strategic planning preference.

Despite these constraints the sponsor has been able to design the development to avoid harm to, and preserve a representative sample of, Aboriginal cultural heritage values identified during the assessment component of this CHMP. The masterplan preserves in the development:

- All *low-moderate* to *moderate* scientific Aboriginal cultural heritage values comprising scarred trees VAHR 7921-0394, 0483, 0485 & 0906 (Map 20).

4. Minimising Harm to Known Aboriginal Cultural Heritage

If it does not appear possible to conduct the activity in a way that avoids harm to Aboriginal cultural heritage, will the activity be conducted in a way that minimises harm to Aboriginal cultural heritage (s.61(b) Aboriginal Heritage Act 2006*)?*

Harm minimisation prevents or limits physical interference to a cultural heritage place. Minimisation measures reduce the adverse impact to a place and the specific measures recommended are a direct response to the nature of the high impact activity, site-type, site significance and level of risk. Examples of typical minimisation measures include: alternative construction measures to minimise the ground disturbance footprint or covering significant

deposits with 300mm (minimum) of packing sand, geotextile fabric or similar protective material.

Although harm was avoided to sites VAHR 7921-0395, 0483, 0485 and 0906; harm was unable to be minimised to sites VAHR 7921-0484, 0956, 0957, 0958 and 0959.

5. Management of Known Aboriginal Cultural Heritage

If Aboriginal cultural heritage will be, or is likely to be, affected by the activity, and harm avoidance or minimisation is unable to be achieved; specific Aboriginal heritage management measures are required (s.61(c) Aboriginal Heritage Act 2006*).*

Management issues may include salvage excavation; fencing of Aboriginal cultural heritage during the activity; signage restricting access to Aboriginal cultural heritage during and after the conduct of the activity; and providing information about avoiding Aboriginal cultural heritage in an induction manual, or training for contractors engaged during the activity.

Salvage excavation is the controlled excavation (and destruction) of all, or part, of a site to recover specific information to address research questions beyond those required to determine the extent, nature and significance of a site gathered during the assessment and required under the Regulations (r.61). In regards to stone artefact scatter sites, salvage is likely to occur only in very few circumstances. For example, excavations may have recovered a unique artefact type within a regional context and salvage excavations may provide additional samples of this unique artefact type.

Management measures to be recommended in this CHMP include:

1. The installation of protective fencing of the known extent of Aboriginal cultural heritage to be preserved within the development;

2. Signage restricting access to part of that Aboriginal cultural heritage during the conduct of the activity;

3. Providing information about avoiding harm to known Aboriginal cultural heritage to be preserved in open space in an induction manual or training for contractors engaged during the conduct of the activity; and

4. Prescribing management controls to ensure preserved Aboriginal cultural heritage is not harmed during and after the activity.

6 Specific Harm Avoidance, Minimisation and Management Measures to Known Aboriginal Cultural Heritage Sites

Recommendations on specific harm avoidance, minimisation and management measures to known Aboriginal cultural heritage are discussed for each registered site taking into account matters discussed above.

VAHR 7921-0394, 0483, 0485, 0906 (Map 20)

Each of these sites was assessed having either *low-moderate* or *moderate* scientific significance and abstract specific cultural significance and will be protected within the development (Maps 10 & 20). Management to prevent harm to these sites will be achieved by the installation of temporary fencing and signage; prescribing management controls over these sites to ensure they are not harmed both during and after the activity; and including information about avoiding harm in an induction manual and training for contractors engaged during the conduct of the activity.

The following management measures must be adopted:

1. The installation of protective fencing of the known extent of Aboriginal cultural heritage to be preserved within the development at VAHR 7921-0394, 0483, 0485 and 0906 prior to the commencement of the activity. The minimum extent of fencing should be 5m from the tree drip-line and comprise sturdy construction.

2. Signage restricting access to part of that Aboriginal cultural heritage during the conduct of the activity. Visible signage should indicate that the area is a *Heritage No Go Zone*.

3. Provide information about avoiding VAHR 7921-0394, 0483, 0485 and 0906 in an induction manual or training for contractors engaged during the conduct of the activity; and

4. Prescribing management controls over the extent of each site to ensure sites are not harmed after the activity. The responsible manager must implement ongoing maintenance and protective measures such as obtaining expert advice, mulching within the drip-line of the tree to preserve health and ensuring future works in the area avoid harm to the tree.

VAHR 7921-0484 and 0956 to 0959

Each of these sites was assessed having *no* scientific and *no* specific cultural significance (Section 7; Maps 10, 13, 16-19). The proposed activity will effectively destroy the sites. Harm is unable to be avoided or minimised by placement into open space due to strategic planning requirements (see Point 3). The extent, nature and significance of the sites were determined during the assessment. The inherent cultural heritage values of the sites mean that management of harm through salvage excavation is not considered likely to make any further contextual or substantial archaeological knowledge of the site, the activity area or surrounding region. It is considered highly unlikely that salvage excavations will recover additional stone artefacts or other archaeological evidence that will further contribute to the scientific or cultural knowledge of the sites as demonstrated during the complex assessment. Based on the sites incapacity to address current research questions, salvage is not an appropriate management option (see also Point 5).

7. Custody and Management of Aboriginal Cultural Heritage

Requirements relating to the custody and management of Aboriginal cultural heritage must be outlined (s.61(e) Aboriginal Heritage Act 2006*).*

Stone artefacts retrieved during the complex assessment are currently held by the cultural heritage advisor. All artefacts are stored in bags that have provenance information recorded on labels. Any Aboriginal cultural heritage found during the activity is also to be dealt with according to the following requirements and is also specified within the Contingency Plan (Recommendation 4.2). Currently there is no relevant RAP for the activity area. Artefacts will be retained by the cultural heritage advisor for 12 months or until a RAP is approved, whichever is earlier. If no RAP is approved then custody of the artefacts will be offered to the following in order of priority:

- Any relevant native title holder;
- Any relevant native title party;
- Any relevant Aboriginal person or persons with traditional or familial links;
- Any relevant Aboriginal body or organisation which has historical or contemporary interest in Aboriginal heritage;
- The owner of the land;
- The Museum of Victoria (s.61(e)).

8. Contingency Plan

A Contingency Plan is required to manage potential issues including: specific measures in the unlikely event that any Aboriginal cultural heritage beyond known cultural heritage will be unexpectedly discovered during the activity; any contingency plans required in relation to disputes, delays and other obstacles that may affect the conduct of the activity; reviewing compliance with the cultural heritage management plan and mechanisms for remedying non-compliance; the notification of the discovery of Aboriginal cultural heritage during the carrying out of the activity; and requirements relating to the custody and management of any Aboriginal cultural heritage found during the course of the activity (s.61(d) *Aboriginal Heritage Act 2006*, sch.2, cl.13 *Aboriginal Heritage Regulations 2007*).

A Contingency Plan outlines management measures in the unlikely event that any Aboriginal cultural heritage beyond known cultural heritage will be unexpectedly discovered during the activity. Obtrusive site-types demonstrated not to be present within the activity area include quarries and rock art. Unexpected site-types include additional stone artefact scatters, shell middens, earth features, stone features and human remains. Only unexpected site-types are usually addressed in Contingency Plans.

8.2 Other Considerations

Although not required under the Act, Aboriginal Affairs Victoria (AAV 2007: Section 8.10) provides for a management plan to consider other matters such as: Aboriginal access to heritage places within the activity area; protocols for handling sensitive information; RAP (if one exists) involvement in future stages of the activity; cultural awareness training for employees and contractors; and ongoing liaison between sponsor and RAP (if one exists).

The only other consideration not dealt with elsewhere in the CHMP is future access to Aboriginal heritage within the activity area and protocols for handling sensitive information. Aboriginal cultural heritage to be preserved in the activity area after the activity is completed will be VAHR7921-0394, 0483, 0485 and 0906. These sites will be located in a private industrial lots. Any person requiring access must apply in writing to the landowner for permission.

Information regarding specific site details contained within this report is of a sensitive nature, e.g.: MGA coordinates and site plans. Before releasing contents of this report to the general public permission should first be obtained from the relevant authorities / communities.

8.3 Aboriginal Cultural Heritage Specific Recommendations

Based on the findings of this report the following recommendations are made:

Recommendation 1: VAHR 7921-0394 (Scarred Tree)

Prior to and during the Activity

Scarred tree VAHR 7921-0394 will not be harmed during the conduct of the activity and will be preserved within the development. Specific management measures are required to avoid inadvertent harm to the site both during and after the conduct of the activity. The following management measures must be adopted prior to the activity commencing:

1. The installation of protective fencing of the known extent of Aboriginal cultural heritage to be preserved with the development at VAHR 7921-0394 prior to the commencement of the activity. The minimum extent of the fencing should be 5m from the tree drip-line and comprise sturdy construction.

2. Signage restricting access to the extent of the site during the conduct of the activity. Visible signage should indicate that the area is a Heritage No Go Zone. These exclusion zones should also be marked on all working plans for the activity.

3. Provide information about avoiding the site in an induction manual or training for contractors engaged during the conduct of the activity.

After the Activity

4. After the activity is completed the responsible manager for land containing preserved Aboriginal cultural heritage must implement ongoing maintenance and protective measures by engaging specialist input, if required, to ensure tree longevity and vigour,

but at a minimum mulch within the drip-line of the trees to preserve health and ensure future works will avoid harm to the trees.

Recommendation 2: VAHR 7921-0483 (Scarred Tree)

Prior to the Activity

Scarred tree VAHR 7921-0483 will not be harmed during the conduct of the activity and will be preserved within the development. Specific management measures are required to avoid inadvertent harm to the site both during and after the conduct of the activity. The following management measures must be adopted prior to the activity commencing:

1. The installation of protective fencing of the known extent of Aboriginal cultural heritage to be preserved with the development at VAHR 7921-0483 prior to the commencement of the activity. The minimum extent of the fencing should be 5m from the tree drip-line and comprise sturdy construction.

2. Signage restricting access to the extent of the site during the conduct of the activity. Visible signage should indicate that the area is a Heritage No Go Zone. These exclusion zones should also be marked on all working plans for the activity.

3. Provide information about avoiding the site in an induction manual or training for contractors engaged during the conduct of the activity.

After the Activity

4. After the activity is completed the responsible manager for land containing preserved Aboriginal cultural heritage must implement ongoing maintenance and protective measures by engaging specialist input, if required, to ensure tree longevity and vigour, but at a minimum mulch within the drip-line of the trees to preserve health and ensure future works will avoid harm to the trees.

Recommendation 3: VAHR 7921-0485 (Scarred Tree)

Prior to and during the Activity

Scarred tree VAHR 7921-0485 will not be harmed during the conduct of the activity and will be preserved within the development. Specific management measures are required to avoid inadvertent harm to the site both during and after the conduct of the activity. The following management measures must be adopted prior to the activity commencing:

1. The installation of protective fencing of the known extent of Aboriginal cultural heritage to be preserved with the development at VAHR 7921-0485 prior to the commencement of the activity. The minimum extent of the fencing should be 5m from the tree drip-line and comprise sturdy construction.

2. Signage restricting access to the extent of the site during the conduct of the activity. Visible signage should indicate that the area is a Heritage No Go Zone. These exclusion zones should also be marked on all working plans for the activity.

3. Provide information about avoiding the site in an induction manual or training for contractors engaged during the conduct of the activity.

After the Activity

4. After the activity is completed the responsible manager for land containing preserved Aboriginal cultural heritage must implement ongoing maintenance and protective measures by engaging specialist input, if required, to ensure tree longevity and vigour, but at a minimum mulch within the drip-line of the trees to preserve health and ensure future works will avoid harm to the trees.

Recommendation 4: VAHR 7921-0906 (Scarred Tree)

Prior to and during the Activity

Scarred tree VAHR 7921-0906 will not be harmed during the conduct of the activity and will be preserved within the development. Specific management measures are required to avoid inadvertent harm to the site both during and after the conduct of the activity. The following management measures must be adopted prior to the activity commencing:

1. The installation of protective fencing of the known extent of Aboriginal cultural heritage to be preserved with the development at VAHR 7921-0906 prior to the commencement of the activity. The minimum extent of the fencing should be 5m from the tree drip-line and comprise sturdy construction.

2. Signage restricting access to the extent of the site during the conduct of the activity. Visible signage should indicate that the area is a Heritage No Go Zone. These exclusion zones should also be marked on all working plans for the activity.

3. Provide information about avoiding the site in an induction manual or training for contractors engaged during the conduct of the activity.

After the Activity

4. After the activity is completed the responsible manager for land containing preserved Aboriginal cultural heritage must implement ongoing maintenance and protective measures by engaging specialist input, if required, to ensure tree longevity and vigour, but at a minimum mulch within the drip-line of the trees to preserve health and ensure future works will avoid harm to the trees.

Recommendation 5: VAHR 7921-0484 (Stone Artefact Scatter)

Prior to the Activity

Stone artefact scatter site VAHR 7921-0484 has *no* scientific and *no* specific cultural significance. The activity will effectively destroy the context of this site. The activity plans indicate that harm is unable to be avoided or minimised. The extent, nature and significance of the site was determined during the assessment. The inherent cultural values of the site mean that management of harm through salvage is not considered likely to provide any further contextual or substantial archaeological knowledge of the site, activity area or surrounding region. It is considered highly unlikely that salvage excavations will recover additional stone artefacts that will further contribute to the scientific or cultural knowledge of the known site as demonstrated during the complex assessment. Based on the site's incapacity to address current research questions, no further archaeological investigation or salvage is recommended. No harm avoidance, minimisation or management measures are required prior to the activity commencing.

Recommendation 6: VAHR 7921-0956 (Stone Artefact Scatter)

Prior to the Activity

Stone artefact scatter site VAHR 7921-0956 has *no* scientific and *no* specific cultural significance. The activity will effectively destroy the context of this site. The activity plans indicate that harm is unable to be avoided or minimised. The extent, nature and significance of the site was determined during the assessment. The inherent cultural values of the site mean that management of harm through salvage is not considered likely to provide any further contextual or substantial archaeological knowledge of the site, activity area or surrounding region. It is considered highly unlikely that salvage excavations will recover additional stone artefacts that will further contribute to the scientific or cultural knowledge of the known site as demonstrated during the complex assessment. Based on the site's incapacity to address current research questions, no further archaeological investigation or salvage is recommended. No harm avoidance, minimisation or management measures are required prior to the activity commencing.

Recommendation 7: VAHR 7921-0957 (Stone Artefact Scatter)

Prior to the Activity

Stone artefact scatter site VAHR 7921-0957 has *no* scientific and *no* specific cultural significance. The activity will effectively destroy the context of this site. The activity plans indicate that harm is unable to be avoided or minimised. The extent, nature and significance of the site was determined during the assessment. The inherent cultural values of the site mean that management of harm through salvage is not considered likely to provide any further contextual or substantial archaeological knowledge of the site, activity area or surrounding region. It is considered highly unlikely that salvage excavations will recover additional stone artefacts that will further contribute to the scientific or cultural knowledge of the known site as demonstrated during the complex assessment. Based on the site's incapacity to address current research questions, no further archaeological investigation or

salvage is recommended. No harm avoidance, minimisation or management measures are required prior to the activity commencing.

Recommendation 8: VAHR 7921-0958 (Stone Artefact Scatter)

Prior to the Activity

Stone artefact scatter site VAHR 7921-0958 has *no* scientific and *no* specific cultural significance. The activity will effectively destroy the context of this site. The activity plans indicate that harm is unable to be avoided or minimised. The extent, nature and significance of the site was determined during the assessment. The inherent cultural values of the site mean that management of harm through salvage is not considered likely to provide any further contextual or substantial archaeological knowledge of the site, activity area or surrounding region. It is considered highly unlikely that salvage excavations will recover additional stone artefacts that will further contribute to the scientific or cultural knowledge of the known site as demonstrated during the complex assessment. Based on the site's incapacity to address current research questions, no further archaeological investigation or salvage is recommended. No harm avoidance, minimisation or management measures are required prior to the activity commencing.

Recommendation 9: VAHR 7921-0959 (Stone Artefact Scatter)

Prior to the Activity

Stone artefact scatter site VAHR 7921-0959 has *no* scientific and *no* specific cultural significance. The activity will effectively destroy the context of this site. The activity plans indicate that harm is unable to be avoided or minimised. The extent, nature and significance of the site was determined during the assessment. The inherent cultural values of the site mean that management of harm through salvage is not considered likely to provide any further contextual or substantial archaeological knowledge of the site, activity area or surrounding region. It is considered highly unlikely that salvage excavations will recover additional stone artefacts that will further contribute to the scientific or cultural knowledge of the known site as demonstrated during the complex assessment. Based on the site's incapacity to address current research questions, no further archaeological investigation or salvage is recommended. No harm avoidance, minimisation or management measures are required prior to the activity commencing.

Recommendation 10: Artefact Storage and Custody

Prior to the Activity

This recommendation relates to stone artefacts retrieved during the assessment component of the CHMP. Any Aboriginal cultural heritage found during the activity must be dealt with according to the following requirements and is specified within the Contingency Plan (Recommendation 4.2). Currently there is no relevant RAP for the activity area. Artefacts retrieved during the activity will be retained by the cultural heritage advisor. All artefacts will be stored in bags that have provenance information recorded on the labels. Artefacts will be retained by the cultural heritage advisor for 12 months after the activity is completed or until a

RAP is approved, whichever is earlier. If no RAP is approved then custody of the artefacts will be offered in order of priority to the following

- any relevant registered native title holder;
- any relevant native title party;
- any relevant Aboriginal person or persons with traditional or familial links;
- any relevant Aboriginal body or organisation which has historic or contemporary interest in Aboriginal heritage;
- the owner of the land;
- the Museum of Victoria (s.61(e)).

Recommendation 11: Contingency Plan

During the Activity

A Contingency Plan is required to manage potential issues including: specific measures in the unlikely event that any Aboriginal cultural heritage beyond known cultural heritage will be unexpectedly discovered during the activity; any contingency plans required in relation to disputes, delays and other obstacles that may affect the conduct of the activity; reviewing compliance with the cultural heritage management plan and mechanisms for remedying non-compliance; the notification of the discovery of Aboriginal cultural heritage during the carrying out of the activity; and requirements relating to the custody and management of any Aboriginal cultural heritage found during the course of the activity (s.61(d) *Aboriginal Heritage Act 2006*, sch.2, cl.13 *Aboriginal Heritage Regulations 2007*).

Although this assessment has demonstrated that the proposed activity is unlikely to harm Aboriginal cultural heritage apart from VAHR 7921-0484, 0956 to 959, the following Contingency Plan prescribes management measures in the unlikely event that any Aboriginal cultural heritage outside the expectations of the above complex assessment and recommendations is discovered; in particular, additional stone artefact scatters, shell middens, earth features, stone features and human remains, during any stage of the activity. The sponsor must ensure that the relevant Contingency Plan is followed. To assist in this aim, a checklist has been provided (Appendix 8).

Recommendation 11.1 Preamble

At the time of preparation of this CHMP, no RAP has been appointed with responsibility for the activity area.

Under the previous Aboriginal cultural heritage legislation, both the BLCAC and BWFL were involved with cultural heritage management in the region.

Currently neither BLCAC nor BWFL have any statutory responsibility for the activity area.

Recommendation 11.2 Contingency for the Discovery of Aboriginal Cultural Heritage Discovered during the Activity*

- This contingency plan must be followed if any unexpected cultural heritage is discovered during the activity. In the activity area unexpected cultural heritage comprises:

    1. Stone artefact scatters that contain cultural heritage attributes which, when assessed, are below the analytical threshold of moderate scientific significance outlined in Section 7 and may include attributes such as stone artefact concentrations less than 46 artefacts per m^2 or significantly disturbed environmental deposits;

    2. Stone artefact scatters that contain cultural heritage attributes which, when assessed, equal or exceed the analytical threshold of moderate scientific significance outlined in Section 7 and may include attributes such as significant stone artefact concentrations (46 or more artefacts per m^2); features (e.g.: hearths); occupation deposits or surfaces (Appendix 4 – Glossary and stratified occupation deposits, surfaces or features.

    3. Shell middens, earth and stone features; and

    4. Human remains.

- A person making such a discovery will immediately suspend any relevant works at the location and within a 5m radius of the relevant site extent;

If not already in attendance, that person shall immediately notify the nominated Project Delegate for AAV and the nominated Project Delegate for the Sponsor;

Sponsor – Project Delegate	Kim Belfield Devcon Pty Ltd 395 Ferntree Gully Rd Mt Waverley VIC 3149 03 9541 6600
AAV – Project Delegate	Ian Hamm Deputy Director Aboriginal Affairs Victoria 1 Spring Street Melbourne VIC 3000 03 9208 3333

- The Sponsor's Project Delegate will notify the heritage advisor, and if necessary to prevent any further disturbance, the location will be isolated by a fence, safety webbing or other suitable barrier and works may recommence outside this 5m area of exclusion;

- The heritage advisor will evaluate the Aboriginal cultural heritage. The heritage advisor will determine if it is part of an already known site or should be registered as a new

site. The heritage advisor must report the discovery to the Secretary by updating and / or completing site records and advise on possible management strategies;

- If a RAP exists for the area at the time of the discovery, the heritage advisor will facilitate the involvement of the RAP in the onsite investigation and assessment of significance of the Aboriginal cultural heritage;

- If the Aboriginal cultural heritage is assessed by the heritage advisor, in consultation with the RAP (if one exists), as a site with below moderate scientific significance, then after recording the material, no further management is required and works may proceed. The heritage advisor must submit relevant documentation to Site Registry, AAV;

- If Aboriginal cultural heritage other than that described above is discovered, the heritage advisor in consultation with the RAP (if one exists) and the Sponsor, should explore all options to avoid impact to the Aboriginal cultural heritage. If impact is unavoidable, then it should be minimised where possible and salvage excavation of the Aboriginal cultural heritage undertaken to minimise impact. In consultation with the RAP (if one exists) salvage excavation methodology should be carried out in accordance with proper archaeological practice taking into account occupational health and safety issues. After recording the material works may proceed. The heritage advisor must complete the appropriate Victorian Aboriginal Heritage Registry forms and submit a report to AAV detailing the results of excavations. If human remains are discovered the contingency in Recommendation 4.3 must be followed;

- Within a period not exceeding three (3) working days a decision must be made by the heritage advisor in consultation with the RAP (if one exists) and the Sponsor, as to the process to be followed to manage the Aboriginal cultural heritage in a culturally appropriate manner, and how to proceed with the works.

Failure of parties to reach an agreed course of action in this manner will be classed as a Dispute under this agreement;

- Work may recommence within the 5m radius exclusion zone:
  - When the appropriate protective measures have been taken;
  - Where the relevant Aboriginal cultural heritage records have been updated and / or completed;
  - Where all parties agree there is no prudent or feasible course of action; or
  - Once any relevant dispute has been resolved.

- Where relevant, the cultural heritage advisor, Sponsor and RAP (if one exists) will ensure that the above steps are followed and that legal obligations and requirements are complied with at all times.

- Custody and management of any artefactual material discovered during the activity must be arranged by the cultural heritage advisor in consultation with the RAP (if one exists). Currently there is no relevant RAP for the activity area. All artefacts will be stored in bags that have provenance information recorded on the labels. Artefacts will be retained by the cultural heritage advisor for 12 months after the activity is completed or until a RAP is approved, whichever is earlier. If no RAP is approved then custody of the artefacts will be offered in order of priority to the following:

  - Any relevant Native Title holder;
  - Any relevant person/s with demonstrable traditional or familial links;
  - Any relevant Aboriginal body with historical or contemporary interests;
  - The land owner; or
  - The Museum of Victoria (s.61(e)).

*In the case of the discovery of human remains, the procedures stated in the *Contingency for the Discovery of Skeletal Remains* included in this plan must be followed.

Recommendation 11.3 Contingency Plan for the Discovery of Human Skeletal Remains

If any suspected human remains are found during the activity, works must cease. The Victoria Police and the State Coroner's Office should be notified immediately. If there are reasonable grounds to believe that the remains are Aboriginal, the Department of Sustainability and Environment's Emergency Coordination Centre must be contacted immediately on 1300 888 544.

This advice has been developed further and is described in the following 5 step contingency plan. Any such discovery at the activity area must follow these steps.

1 Discovery:

- If suspected human remains are discovered, all activity in the vicinity must ***stop*** to ensure minimal damage is caused to the remains; and
- The remains must be left in place, and protected from harm or damage.

2 Notification

- Once suspected human skeletal remains have been found, the Coroner's Office and Victoria Police must be notified immediately;
- If there is reasonable grounds to believe that the remains could be Aboriginal, the DSE Emergency Coordination Centre must be immediately notified on 2300 888 544;

- All details of the location and nature of the human remains must be provided to the relevant authorities;

- If it is confirmed by these authorities that the discovered remains are Aboriginal skeletal remains; the person responsible for the activity must report the existence of the human remains to the Secretary, DPCD, in accordance with s.17 of the *Aboriginal Heritage Act 2007.*

3 Impact Mitigation or Salvage:

- The Secretary, after taking reasonable steps to consult with any Aboriginal person or body with an interest in the Aboriginal human remains, will determine the appropriate course of action as required by s.18(2)(b) of the Act;

- An appropriate impact mitigation or salvage strategy as determined by the Secretary must be implemented. This will depend on the circumstances in which the remains were found, the number of burials found and the type of burials, and the outcome of consultation with any Aboriginal person or body;

- Any activity must remain halted until the completion of these strategies, with the exception of works that are necessary to meet any occupational health and safety requirements.

4 Curation and Further Analysis:

- The treatment of salvaged Aboriginal human remains must be in accordance with the will of AAV.

Reburial*:

- Any reburial site(s) must be fully documented by an experienced and qualified archaeologist, clearly marked and all details provided to AAV; and

- An appropriate cultural heritage management plan must be put in place to ensure that the remains are not disturbed in the future.

*A likely outcome would be that AAV will request that the disturbed remains be reburied in a location close to discover.

Recommendation 11.4 Contingency Plan for Dispute Resolution

As there is no RAP currently appointed for the activity area, contingency plans for dispute resolution are not applicable.

Recommendation 11.5 Provision for Review

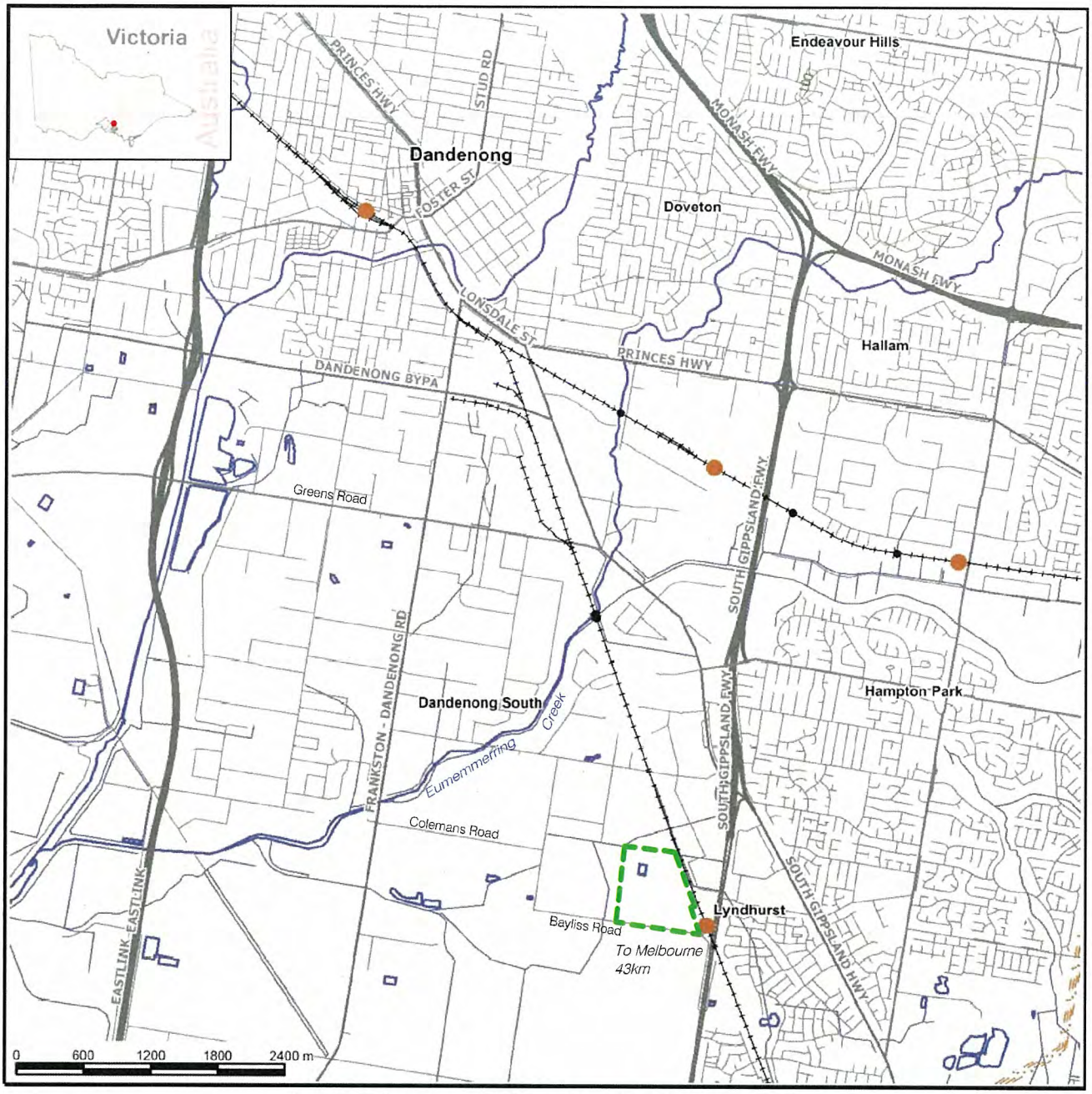
Review of this plan can be undertaken at any time by project delegates representing the Sponsor and AAV, or an agreed independent reviewer, to ensure that all parties are complying with the terms of the plan. A checklist is provided in Appendix 8.

Recommendation 12 Other Considerations

The only Aboriginal cultural heritage to be preserved in the activity area after the activity is conducted will be scarred trees VAHR 7921-0394, 0483, 0485 & 0906. These sites will be located on private allotments. Any person requiring access to this land must apply in writing to the landowner for permission.

Information regarding specific site details contained within this report is of a sensitive nature, e.g.: MGA coordinates and site plans. Before releasing contents of this report to the general public permission should first be obtained from the relevant authorities / communities.

9 MAPS



Base Map Courtesy of Victorian Department of Primary Industries

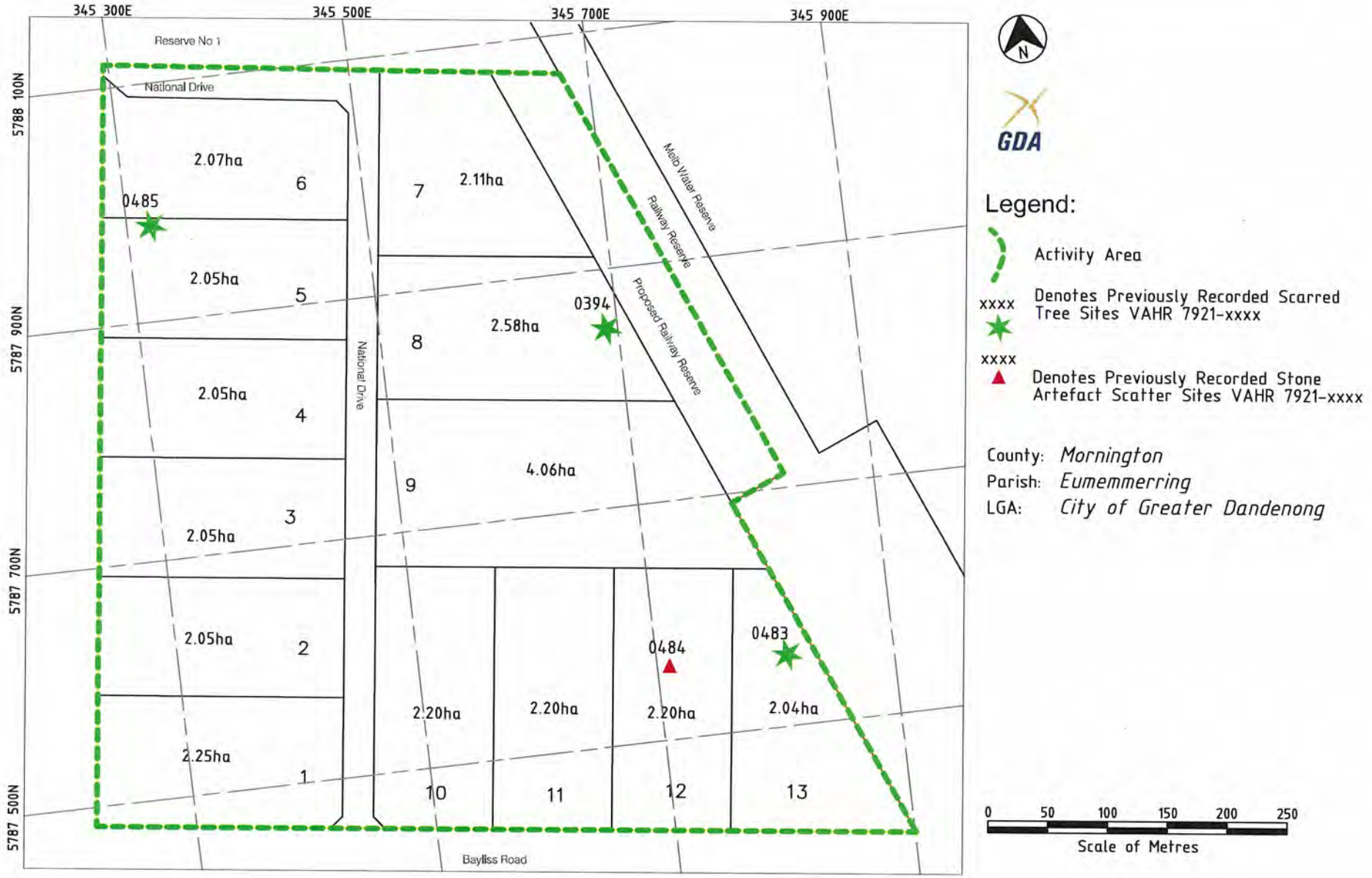
Legend:

Area Boundary

County: *Mornington*
Parish: *Eumemmerring*
LGA: *City of Greater Dandenong*

Map 1a Activity Area, Regional Location

(Melway Ref: 95 K11)



Map1b Extent of Activity Area: Indicative Masterplan

Tardis Enterprises Pty Ltd, *archaeologists & heritage advisors*

Base Map Courtesy of Victorian Department of Primary Industries

Legend:

Activity Area

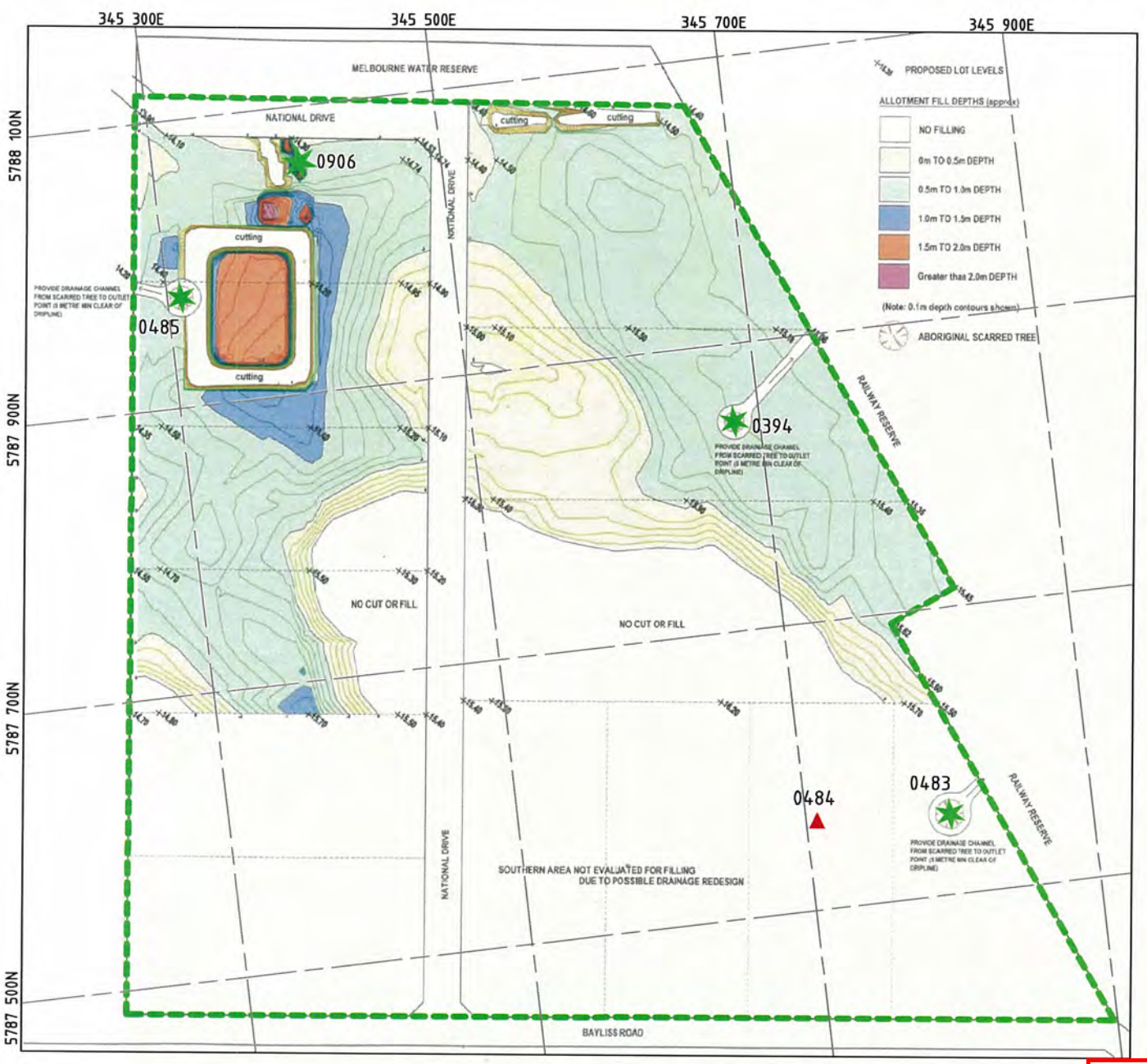
xxxx Denotes Previously Recorded Scarred Tree Sites VAHR 7921-xxxx

Denotes Previously Recorded Stone Artefact Scatter Sites VAHR 7921-xxxx

LGA: *City of Greater Dandenong*

Map 1c Extent of Activity Area: Existing Conditions

Tardis Enterprises Pty Ltd, *archaeologists & heritage advisors*



N

GDA

Legend:

Activity Area

XXXX Denotes Previously Recorded Scarred Tree Sites VAHR 7921-xxxx

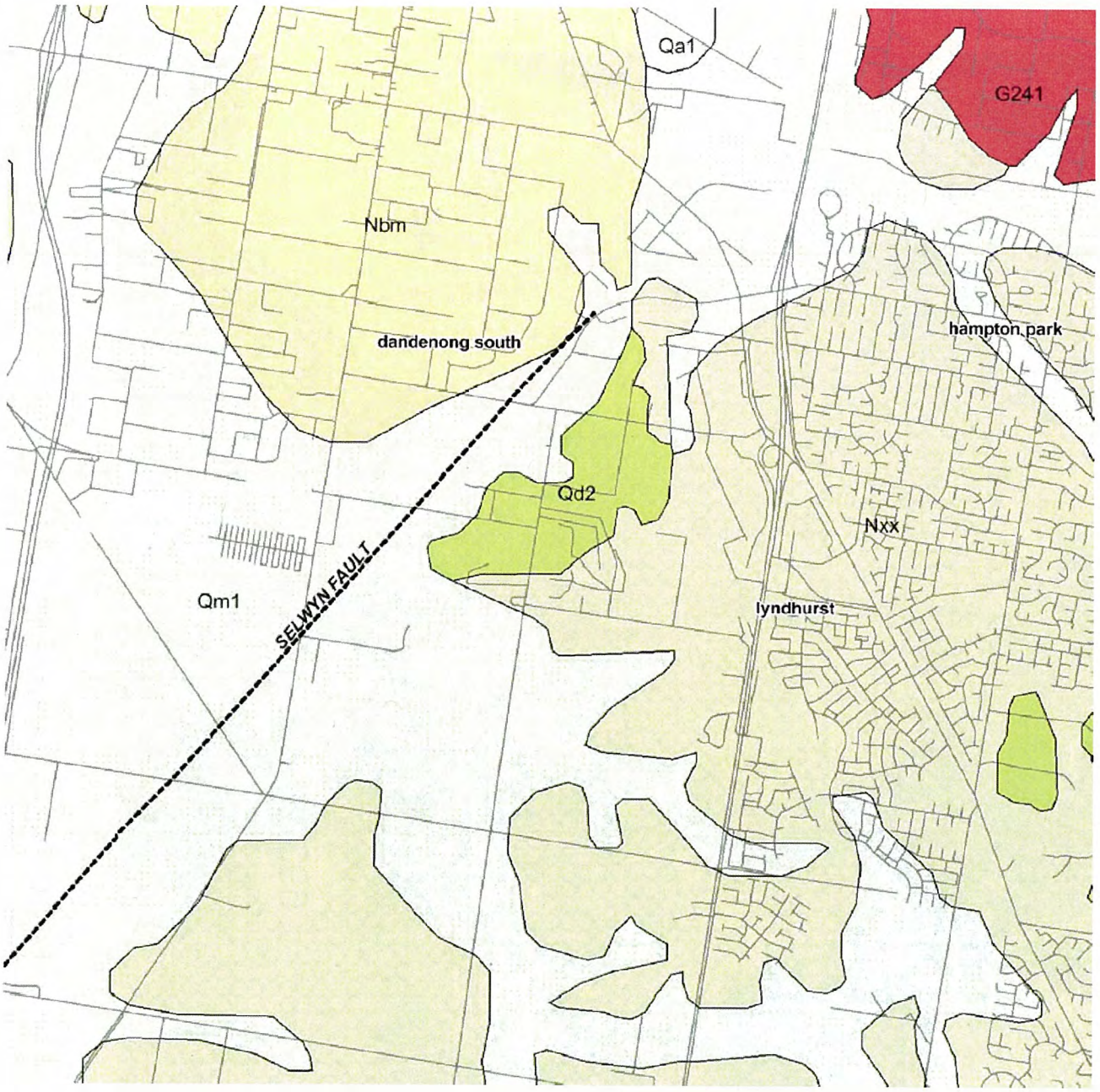
XXXX Denotes Previously Recorded Stone Artefact Scatter Sites VAHR 7921-xxxx

County: *Mornington*
Parish: *Eumemmerring*
LGA: *City of Greater Dandenong*

0 50 100 150
Scale of Metres

Map 2 Indicative Cut and Fill

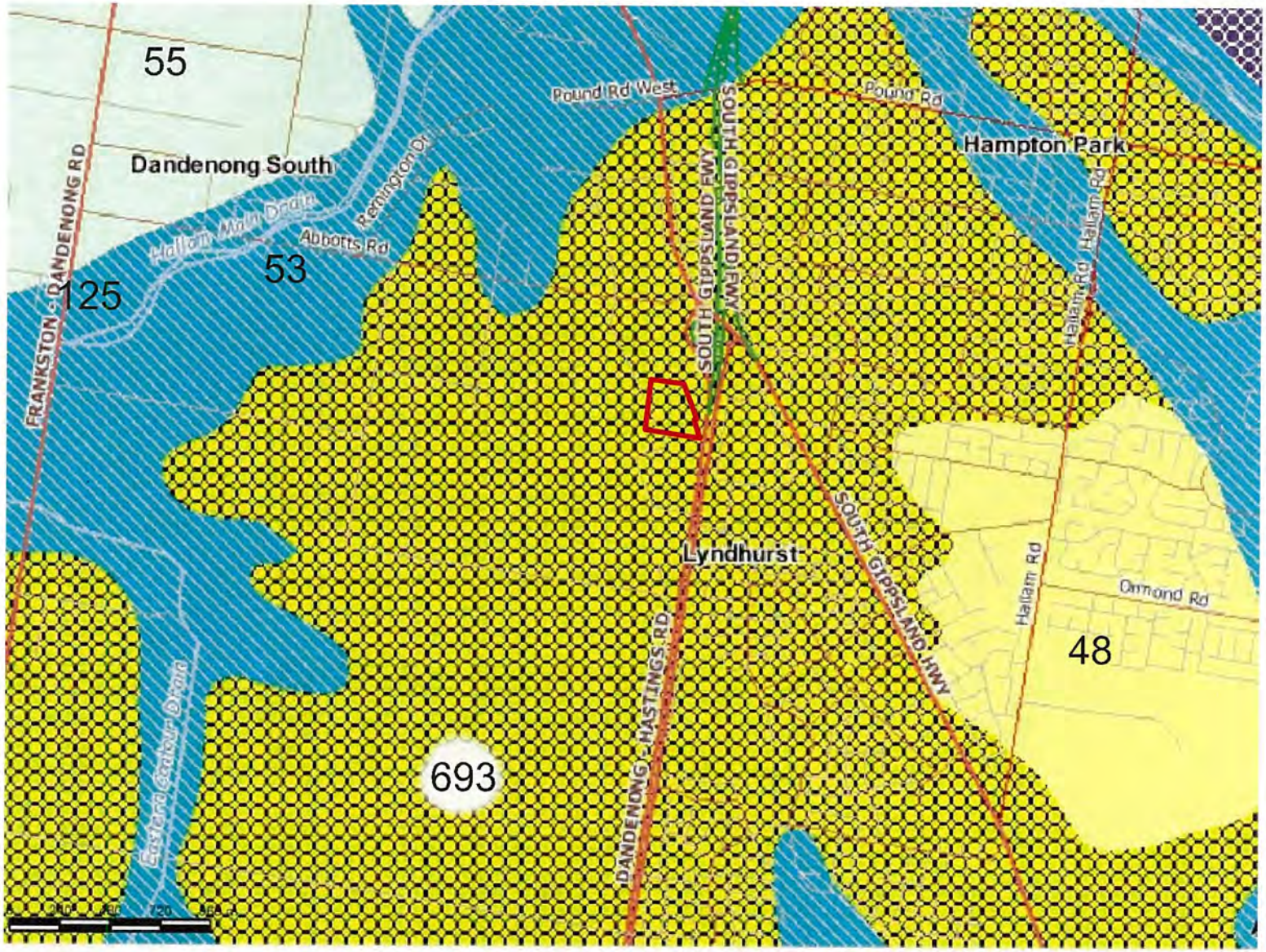
Tardis Enterprises Pty Ltd, *archaeologists & heritage advisors*



Legend:

G241	Lysterfiels Granodiorite Daw Wellington Volcanic Group
Qa1	Unnamed Alluvium
Qd2	Unnamed Dune Deposits
Qm1	Unnamed Swamp and Lake Deposits
Nbm	Moorabool Viaduct Sand
Nxx	Baxter Sandstone

Map 3 Geology of the Activity Area

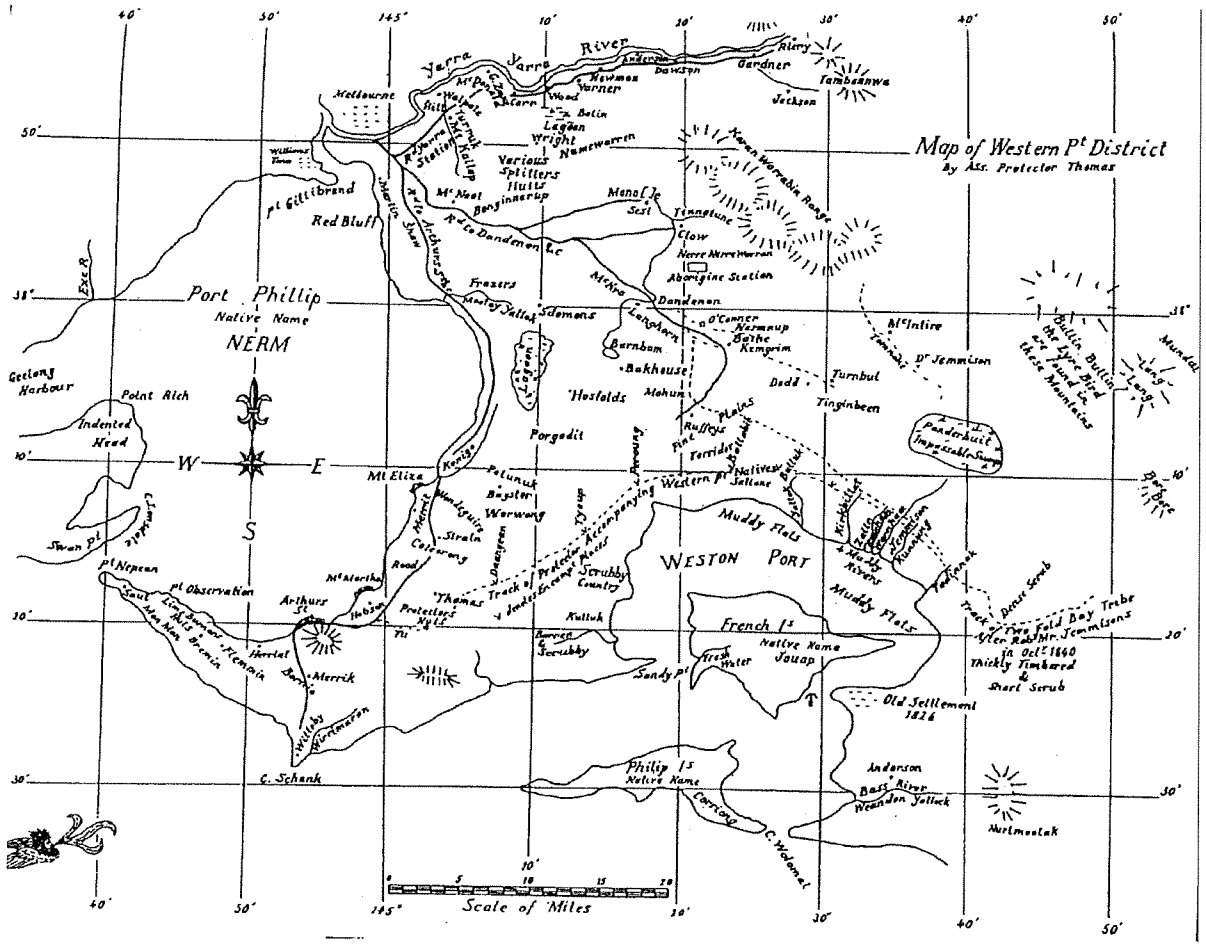


Legend:

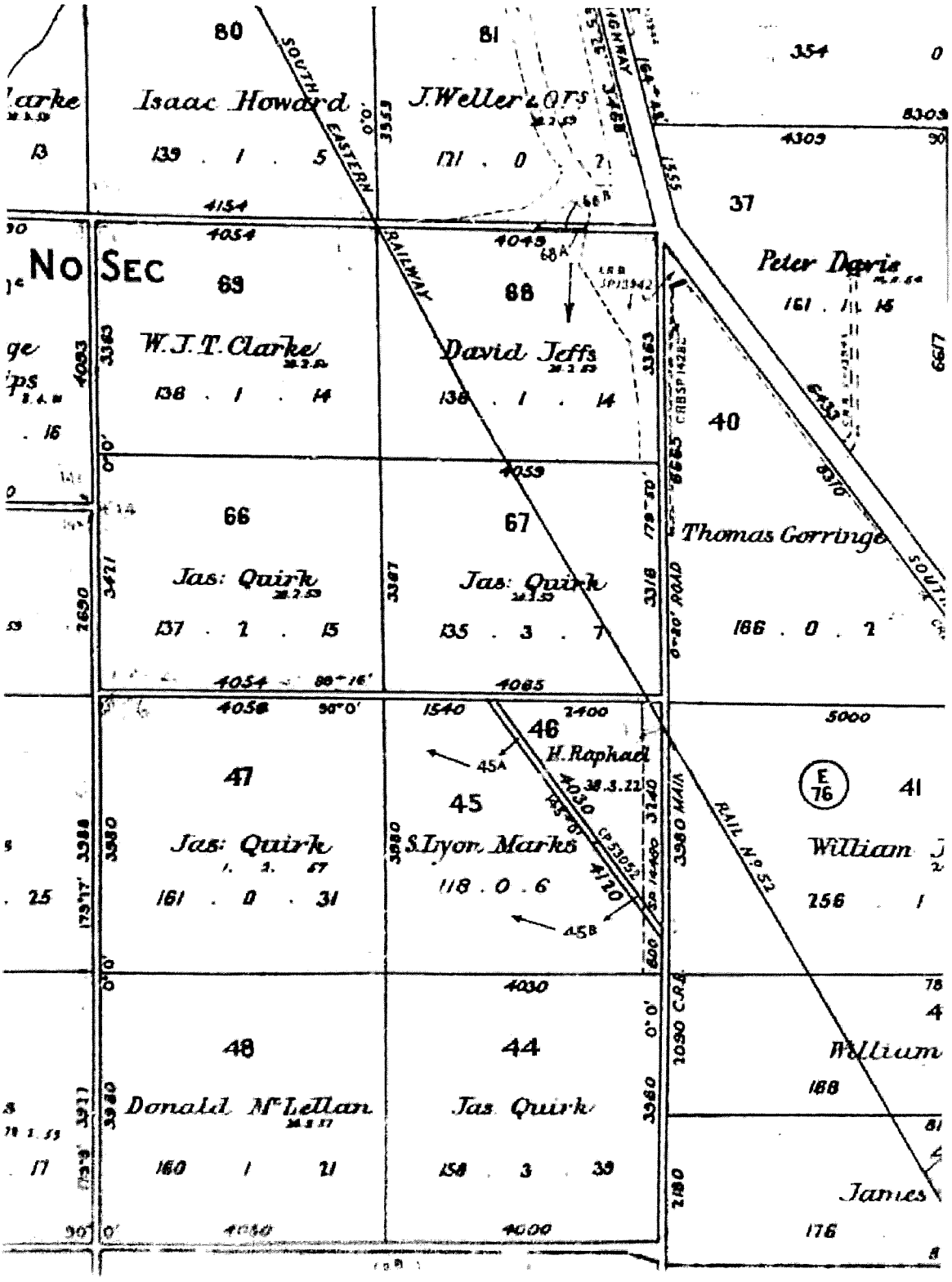
48 - Heathy Woodland 53 - Swamp Scrub 55 - Plains Grassy Woodland 125 - Plains Grassy Wetland
693 - Plains Woodland/Plains Grassland Mosaic activity are blocked out in red

) Activity Area Boundary

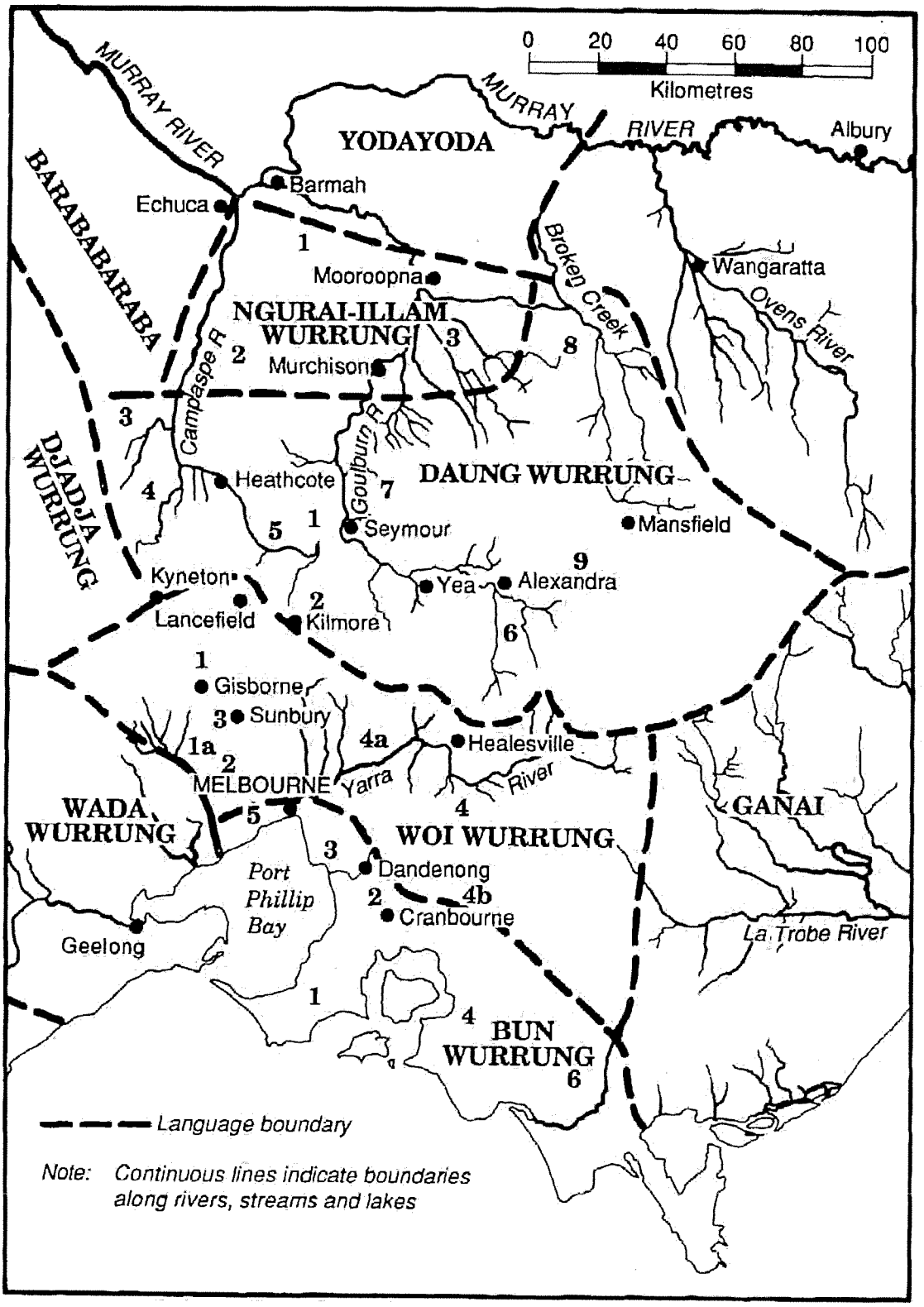
Map 4 Ecological Vegetation Classes (pre-1750) in the Activity Area



Map 5 **Early Plan of European Settlement by Thomas (from Coutts 1983)**



Map 6 Parish of Eumemmering nd



Map 7 East Kulin Language Areas and Clans

Legend:

Activity Area

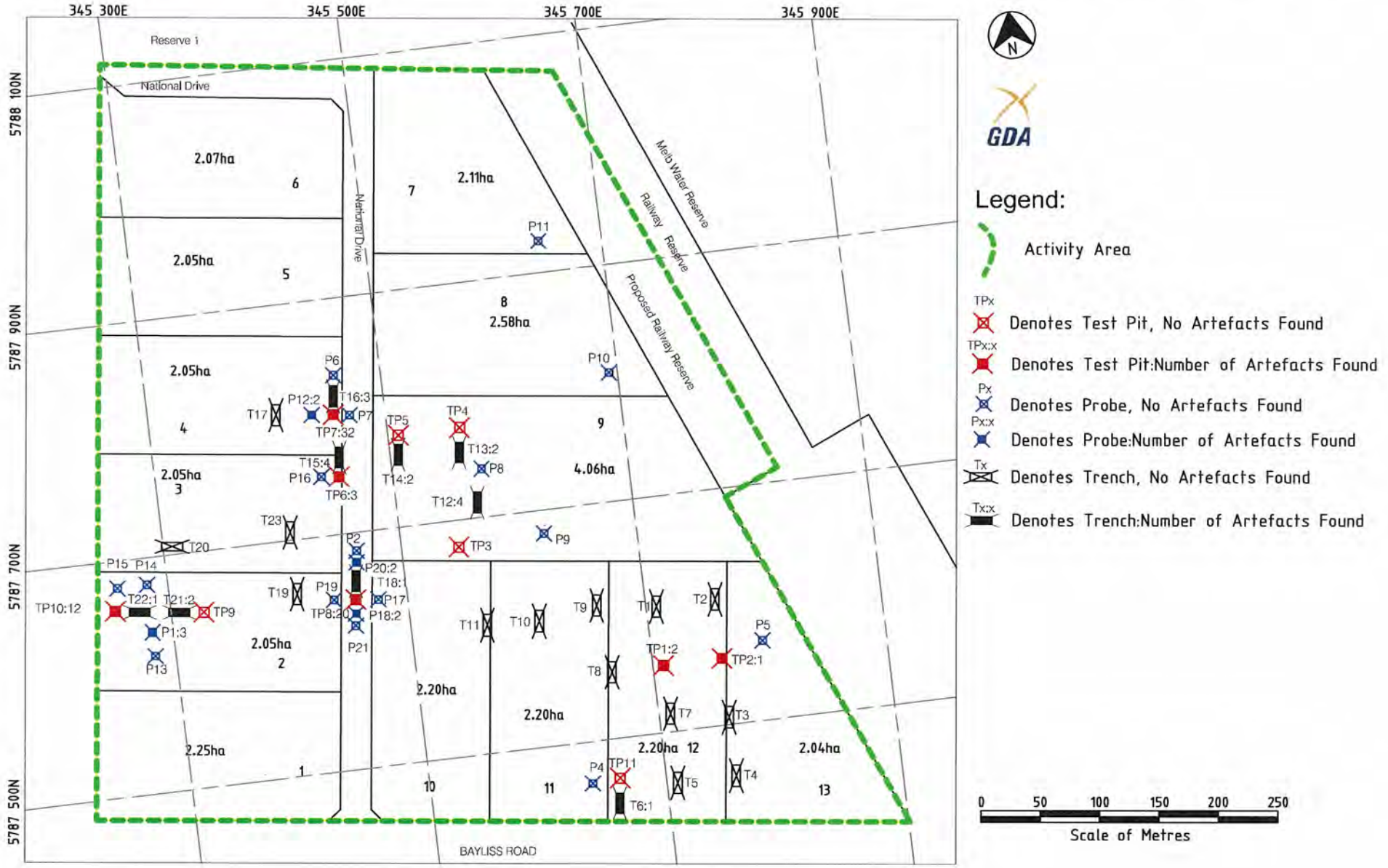
LGA: *City of Greater Dandenong*

X Denotes Survey Unit 'x'

Area of Potential Archaeological Sensitivity

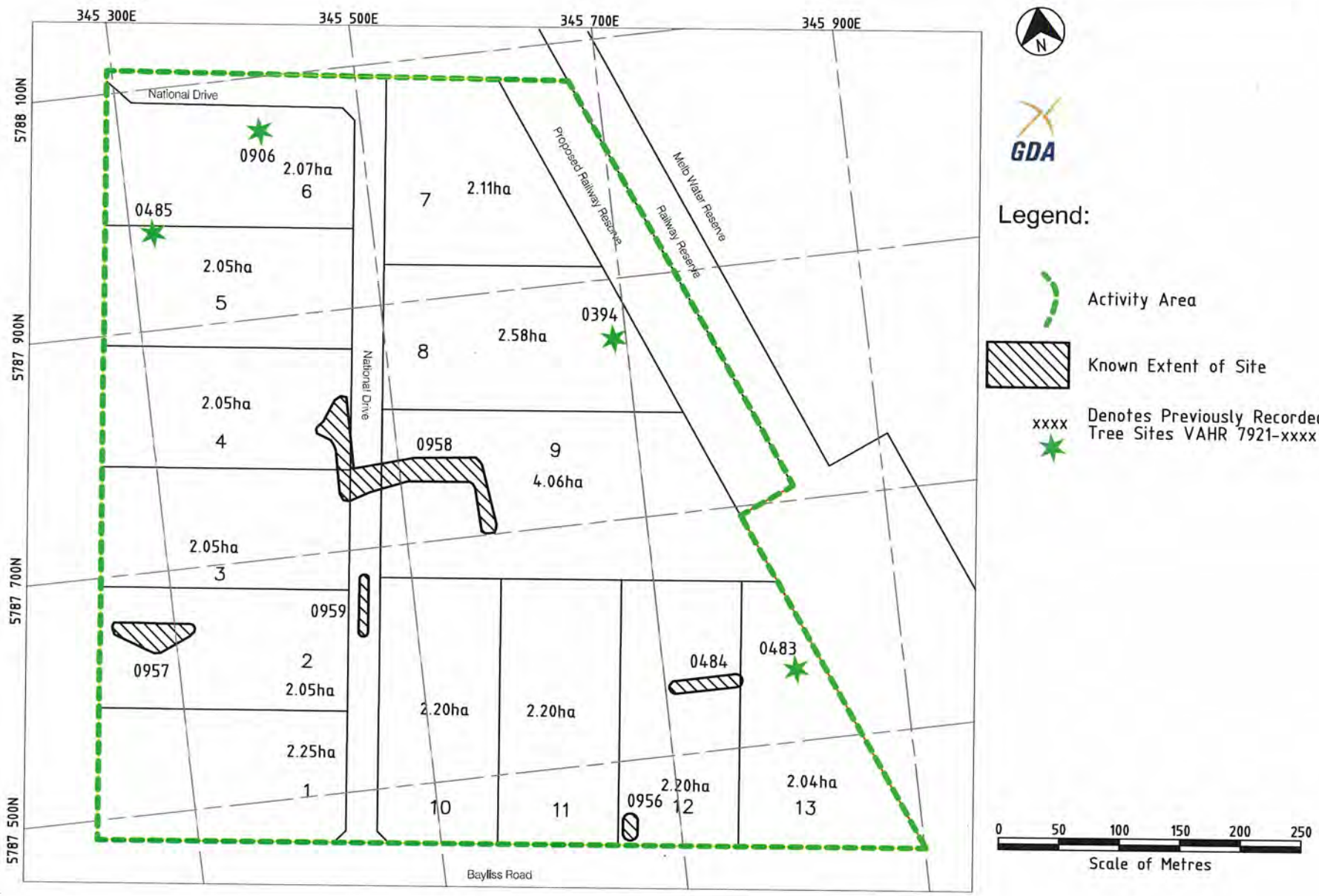
Map 8 Survey Units & Areas of Potential Archaeological Sensitivity

Tardis Enterprises Pty Ltd, *archaeologists & heritage advisors*



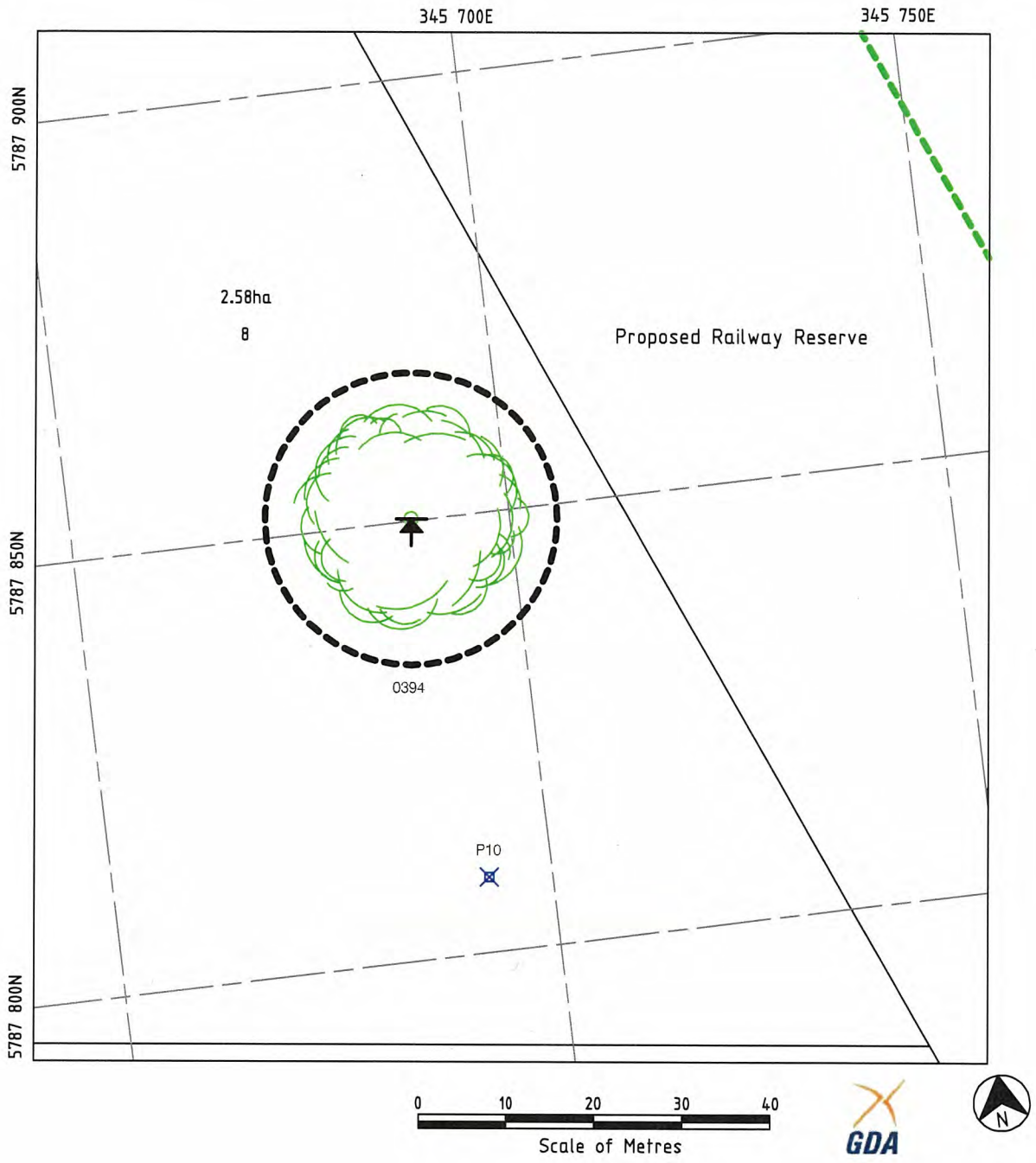
Map 9 Trench, Test Pit & Probe Locations

Tardis Enterprises Pty Ltd, *archaeologists & heritage advisors*



Map 10 Known Extent of Sites in the Activity Area

Tardis Enterprises Pty Ltd, *archaeologists & heritage advisors*



Legend:

Activity Area Boundary

Known Extent of Site

PRP 345690E, 5787850N

Tx — Denotes Trench, No Artefacts Found

Tx:x — Denotes Trench:Number of Artefacts Found

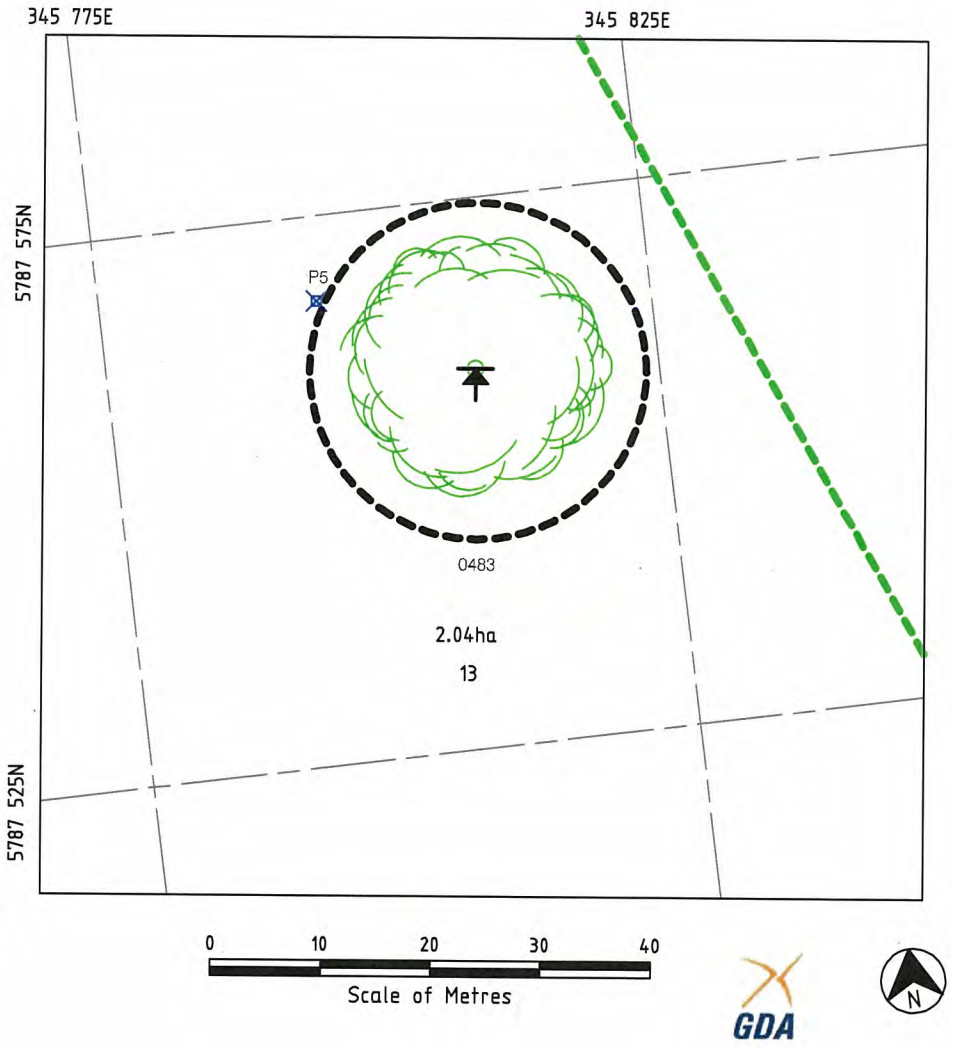
TPx — Denotes Test Pit, No Artefacts Found

TPx:x — Denotes Test Pit:Number of Artefacts Found

Px — Denotes Probe, No Artefacts Found

Px:x — Denotes Probe:Number of Artefacts Found

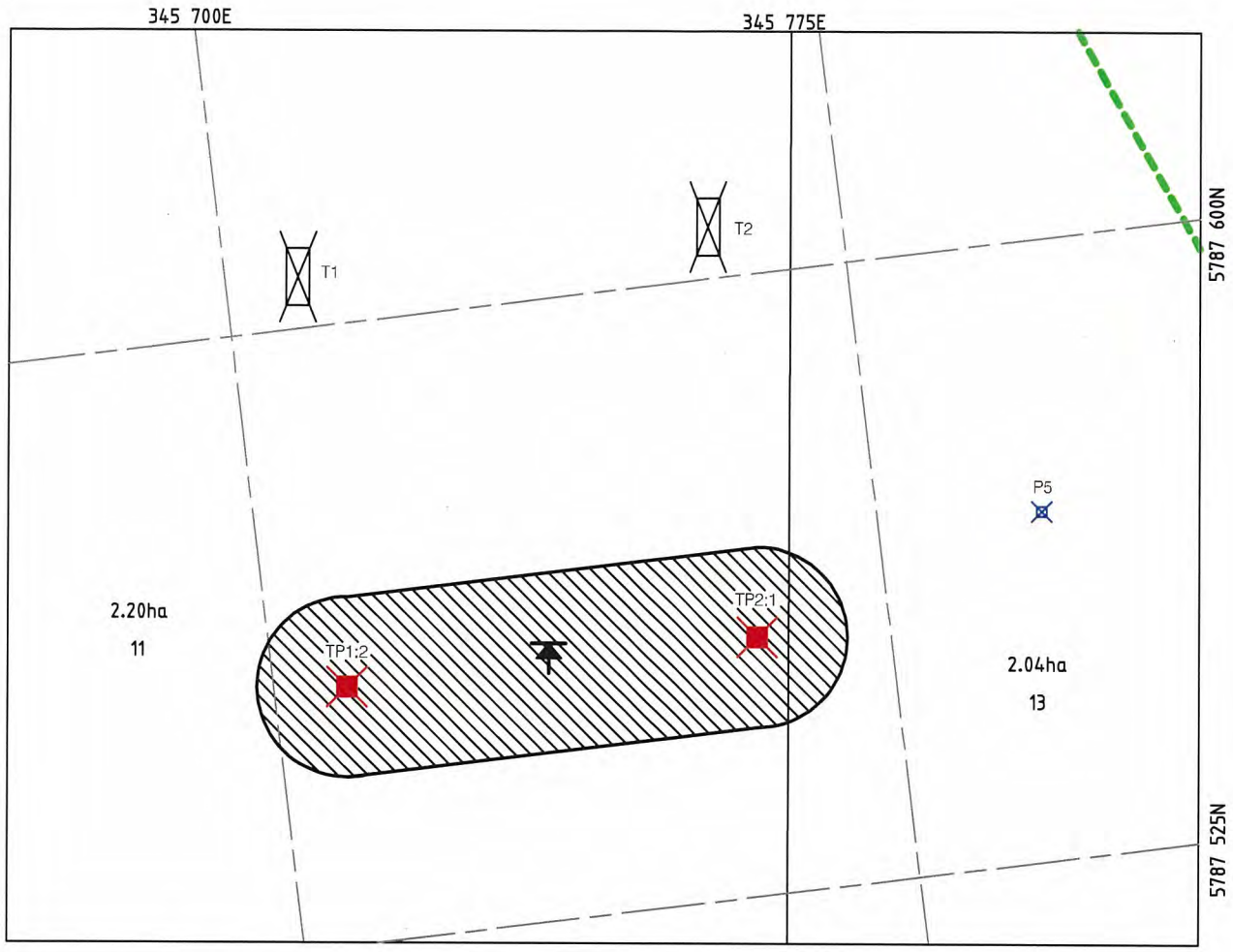
Map 11 VAHR 7921-0394 Site Plan

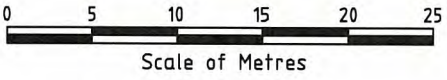


Legend:

- Activity Area Boundary
- Known Extent of Site
- PRP 345810E, 5787560N
- Tx — Denotes Trench, No Artefacts Found
- Tx:x — Denotes Trench:Number of Artefacts Found
- TPx — Denotes Test Pit, No Artefacts Found
- TPx:x — Denotes Test Pit:Number of Artefacts Found
- Px — Denotes Probe, No Artefacts Found
- Px:x — Denotes Probe:Number of Artefacts Found

Map 12 VAHR 7921-0483 Site Plan





GDA

Legend:

Activity Area Boundary

Known Extent of Site

PRP 345735E, 5787560N

Tx — Denotes Trench, No Artefacts Found

Tx:x — Denotes Trench:Number of Artefacts Found

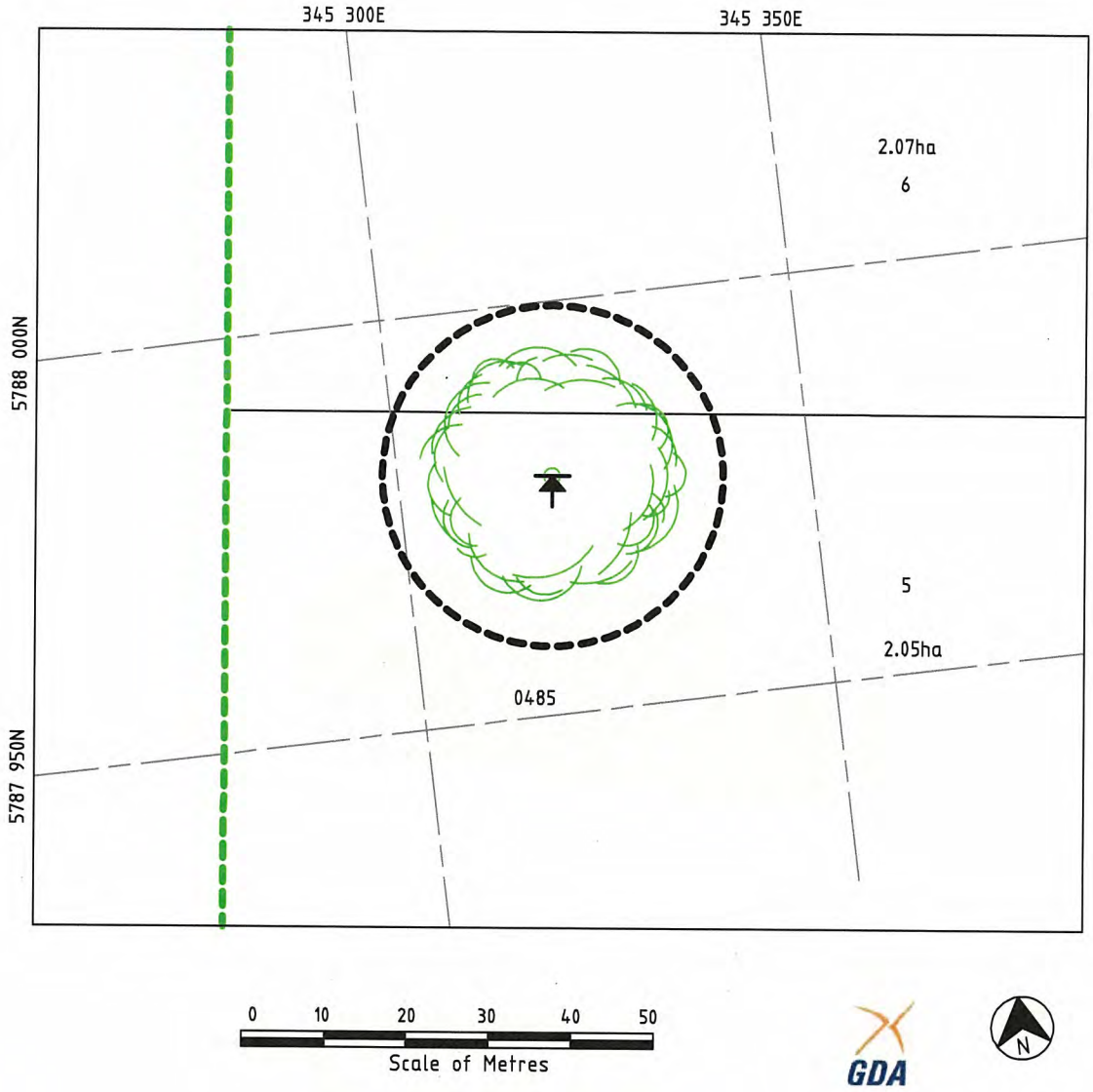
TPx — Denotes Test Pit, No Artefacts Found

TPx:x — Denotes Test Pit:Number of Artefacts Found

Px — Denotes Probe, No Artefacts Found

Px:x — Denotes Probe:Number of Artefacts Found

Map 13 VAHR 7921-0484 Site Plan



Legend:

Activity Area Boundary

Known Extent of Site

PRP 345320E, 5787980N

Tx — Denotes Trench, No Artefacts Found

Tx:x — Denotes Trench:Number of Artefacts Found

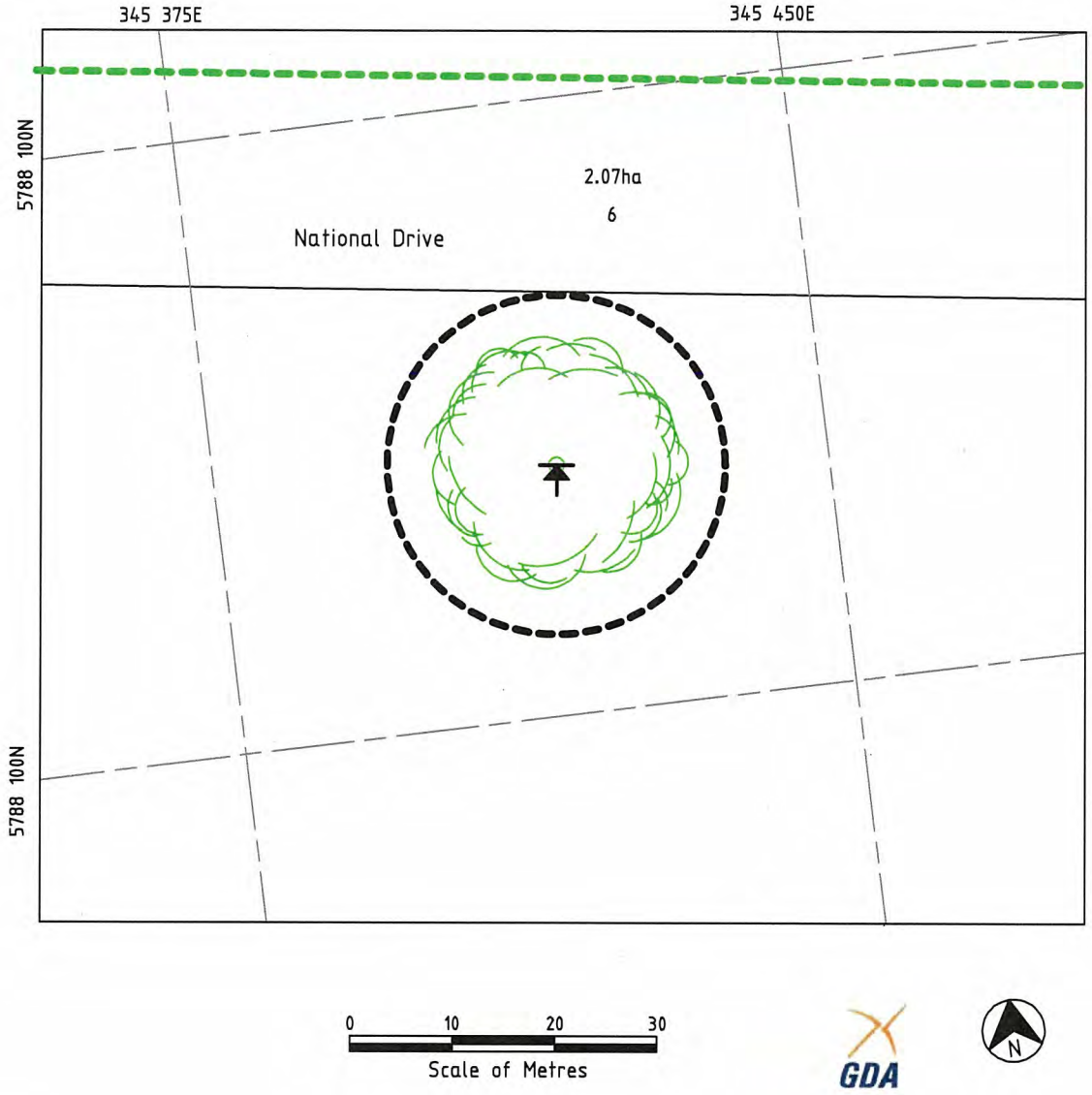
TPx — Denotes Test Pit, No Artefacts Found

TPx:x — Denotes Test Pit:Number of Artefacts Found

Px — Denotes Probe, No Artefacts Found

Px:x — Denotes Probe:Number of Artefacts Found

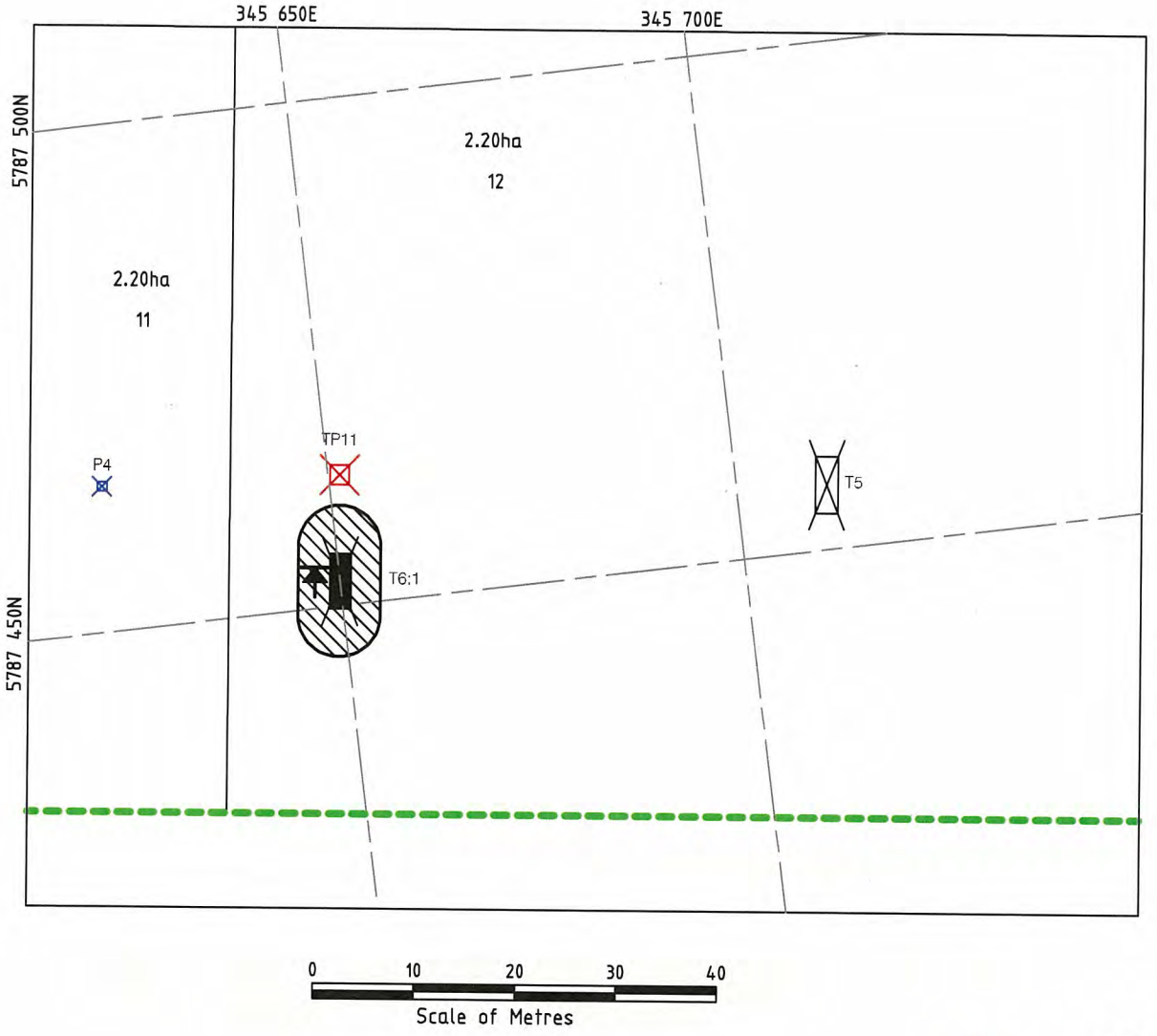
Map 14 VAHR 7921-0485 Site Plan



Legend:

- Activity Area Boundary
- Known Extent of Site
- PRP 345420E, 5788060N
- Tx — Denotes Trench, No Artefacts Found
- Tx:x — Denotes Trench:Number of Artefacts Found
- TPx — Denotes Test Pit, No Artefacts Found
- TPx:x — Denotes Test Pit:Number of Artefacts Found
- Px — Denotes Probe, No Artefacts Found
- Px:x — Denotes Probe:Number of Artefacts Found

Map 15 VAHR 7921-0906 Site Plan



Legend:

Activity Area Boundary

Known Extent of Site

PRP 345660E, 5787460N

Tx — Denotes Trench, No Artefacts Found

Tx:x — Denotes Trench:Number of Artefacts Found

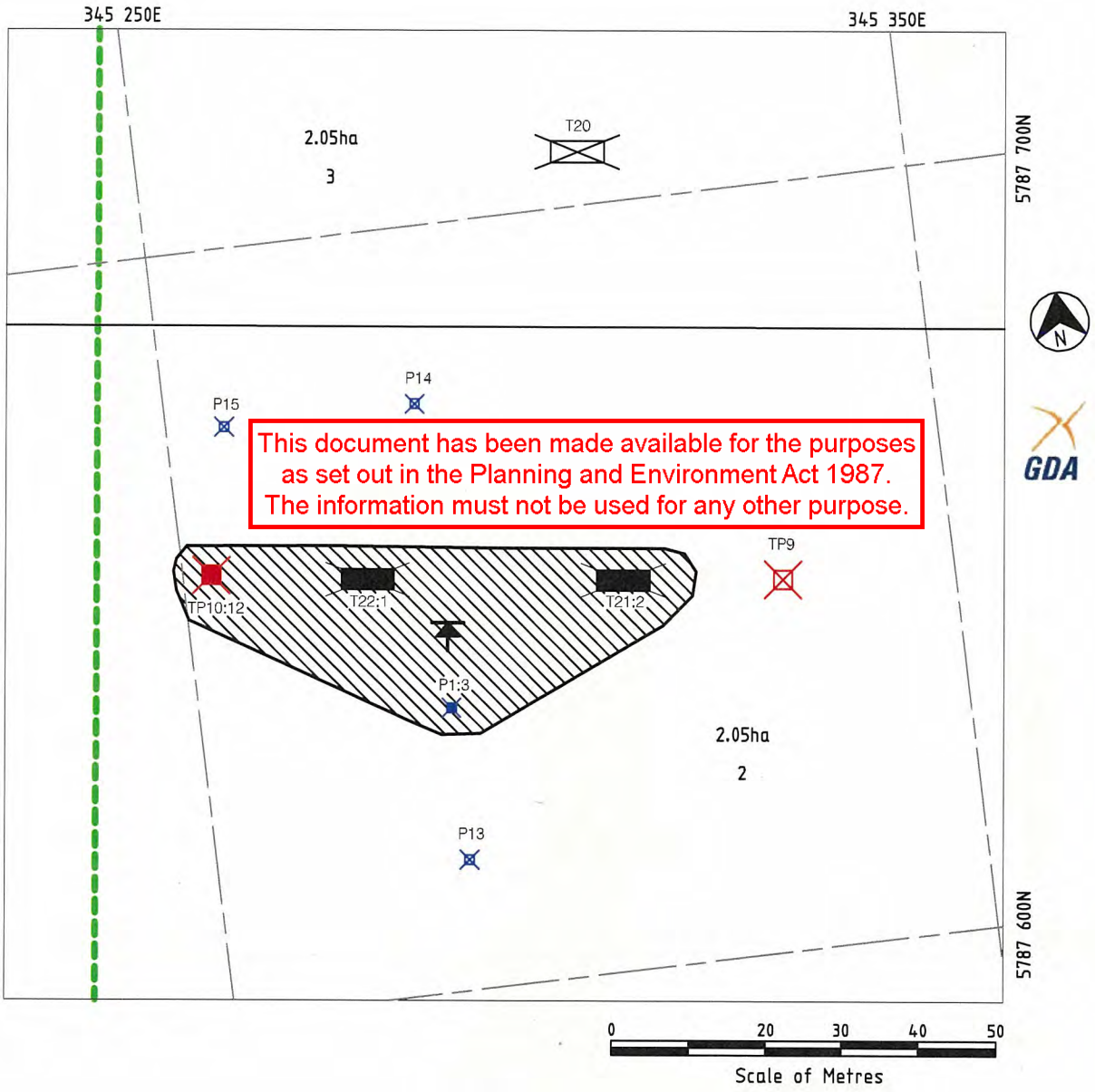
TPx — Denotes Test Pit, No Artefacts Found

TPx:x — Denotes Test Pit:Number of Artefacts Found

Px — Denotes Probe, No Artefacts Found

Px:x — Denotes Probe:Number of Artefacts Found

Map 16 VAHR 7921-0956 Site Plan



Legend:

Activity Area Boundary

Known Extent of Site

PRP 345285E, 5787660N

Tx — Denotes Trench, No Artefacts Found

Tx:x — Denotes Trench:Number of Artefacts Found

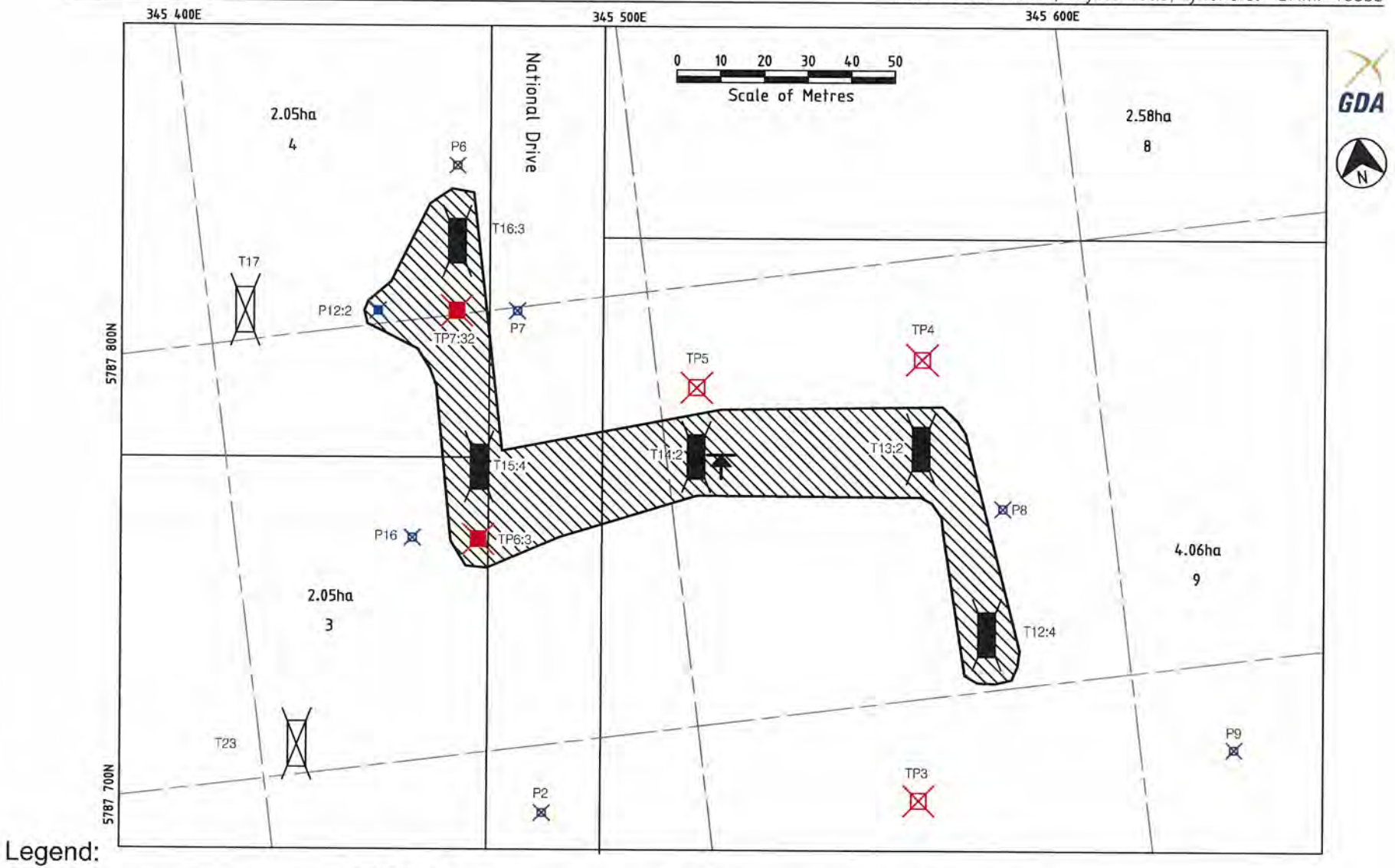
TPx — Denotes Test Pit, No Artefacts Found

TPx:x — Denotes Test Pit:Number of Artefacts Found

Px — Denotes Probe, No Artefacts Found

Px:x — Denotes Probe:Number of Artefacts Found

Map 17 VAHR 7921-0957 Site Plan



Legend:

PRP 345510E, 5787760N

Known Extent of Site

Tx Denotes Trench, No Artefacts Found

TPx Denotes Test Pit, No Artefacts Found

Px Denotes Probe, No Artefacts Found

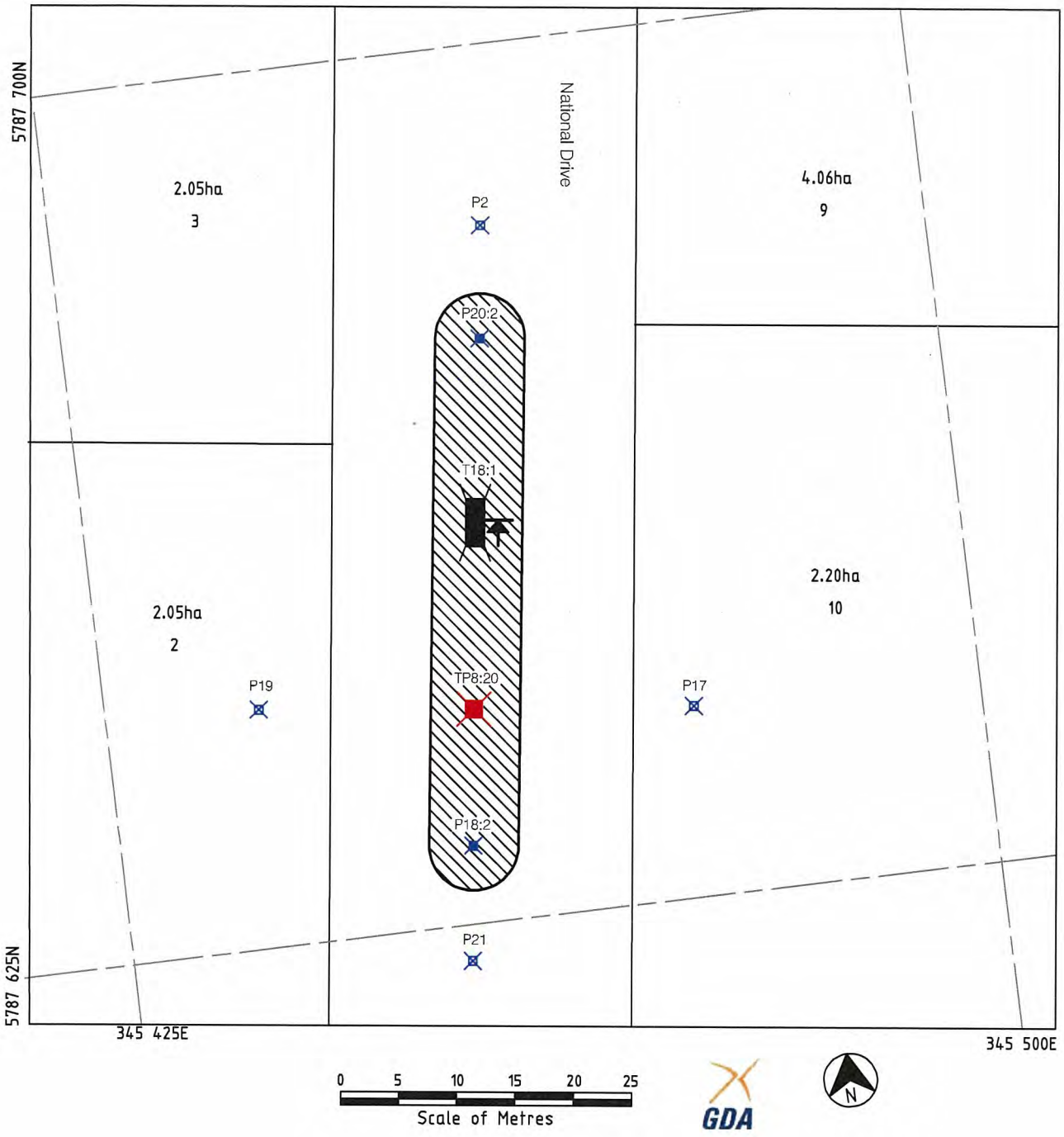
Px:x Denotes Test Pit:Number of Artefacts Found

Denotes Probe:Number of Artefacts Found

Tx:x Denotes Trench:Number of Artefacts Found

Map 18 VAHR 7921-0958 Site Plan

Tardis Enterprises Pty Ltd, *archaeologists & heritage advisors*



Legend:

Known Extent of Site

PRP 345460E, 5787660N

Tx — Denotes Trench, No Artefacts Found

TPx — Denotes Test Pit, No Artefacts Found

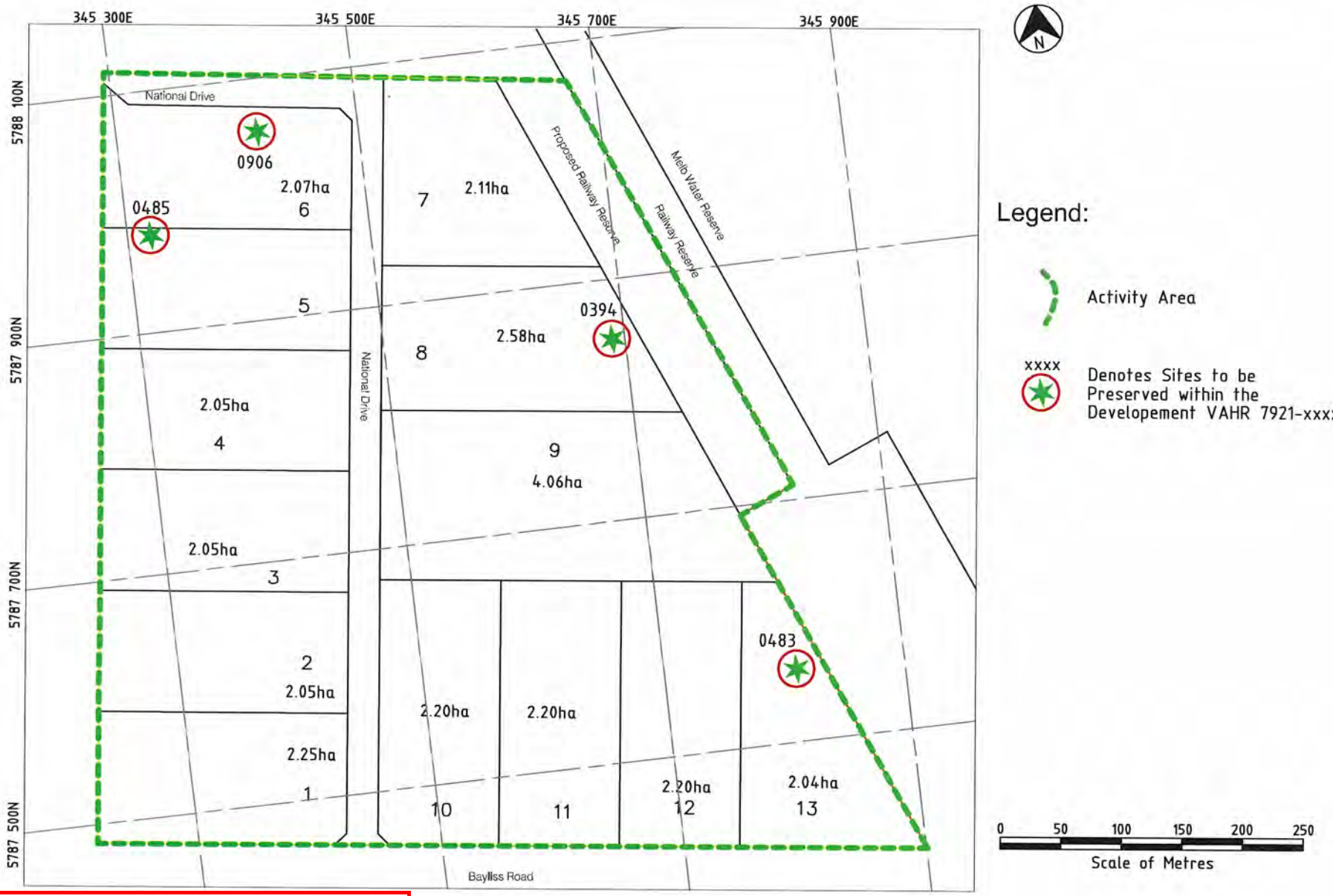
Px — Denotes Probe, No Artefacts Found

Tx:x — Denotes Trench:Number of Artefacts Found

TPx:x — Denotes Test Pit:Number of Artefacts Found

Px:x — Denotes Probe:Number of Artefacts Found

Map 19 VAHR 7921-0959 Site Plan



Map 20 Sites to be Retained

10 SITE GAZETTEER

VAHR No	Site Name	PRP*	Site Type
7921-0394	Bayliss Rd Scarred Tree	345690E 5787850N	Scarred Tree
7921-0483	Parham 3 Scarred Tree	345810E 5787560N	Scarred Tree
7921-0484	Bayliss Rd	345735E 5787560N	Artefact Scatter
7921-0485	Parham 5 Scarred Tree	345320E 5787980N	Scarred Tree
7921-0906	Bayliss Rd Scarred Tree 2	345420E 5788060N	Scarred Tree
7921-0956	Bayliss Rd 2	345660E 5787460N	Artefact Scatter
7921-0957	Bayliss Rd 3	345285E 5787660N	Artefact Scatter
7921-0958	Bayliss Rd 4	345510E 5787760N	Artefact Scatter
7921-0959	Bayliss Rd 5	345460E 5787660N	Artefact Scatter

*PRP=Primary Reference Point GDA94 MGA Zone 55 Coordinates

APPENDIX 1 – CHMP DOCUMENTATION

1033

Department of Planning and Community Development

1 Spring Street
Melbourne, Victoria 3000
GPO Box 2392
Melbourne, Victoria 3001
Australia
Telephone (03) 9208 3333
Facsimile (03) 9208 3680

25 March 2008

IH11/0094

Mr Nando Pellicano
Pellicano Investments Pty Ltd
c/- P O Box 5190
PINEWOOD VIC 3149

Dear Mr Pellicano

NOTICE OF INTENT TO PREPARE A CULTURAL HERITAGE MANAGEMENT PLAN, INDUSTRIAL SUBDIVISION 95, 117 BAYLISS ROAD, DANDENONG

I am writing to acknowledge your written notice of intention to prepare a management plan, received on the 20 March 2008, for the industrial subdivision 95, 117 Bayliss Road, Dandenong.

Your notification has been allocated the AAV Project Number 10333. Please quote this number when making any future enquiries to AAV regarding this plan.

There is currently no relevant Registered Aboriginal Party in relation to the proposed activity area. Therefore, AAV will evaluate the plan when completed.

Please contact Mr Harry Webber, Coordinator - Heritage Assessments directly on (telephone) 9208 3266 if you have enquiries regarding this advice. For any other enquiries relating to the *Aboriginal Heritage Act* 2006, please contact the AAV Heritage Policy Team on (free call) 1800 762 003.

Yours sincerely

Ian Hamm
Deputy Director
Aboriginal Affairs Victoria

Victoria
The Place To Be

Notice of Intent to prepare a Cultural Heritage Management Plan for the purposes of the *Aboriginal Heritage Act* 2006

This form can be used by the Sponsor of a Cultural Heritage Management Plan to complete the notification provisions pursuant to s.54 of the *Aboriginal Heritage Act* 2006 (the "Act").

SECTION 1 – Sponsor Information

Name of Sponsor: Nardo Pellicano

Business Name: Pellicano Investments P/L

Postal Address: C/- PO Box 5190, PINEWOOD 3149

Telephone Number: 9541 6600 Fax number: 9541 6699

Mob:

Email Address: C/- kim@devcon.com.au

SECTION 2 – Description of proposed activity and location

- Clearly identify the project name (if applicable).
- Clearly identify the proposed activity and its extent in respect to the area for which the plan is to be prepared (attach a copy of a title search and indicate street address where applicable).
- Attach a map (to scale, with a north arrow and indicating the municipal district - if any) that clearly identifies the area and boundaries in respect of which the cultural heritage management plan is to be prepared.

See Attached

SECTION 3 – Expected start and finish date for the cultural heritage management plan

Start date: / / Finish date: / /

SECTION 4 – Contact details for land owner/manager (where different to sponsor).

Kim Bellfield, Town Planning Consultant
Devcon Group P/L
PO Box 5190
Pinewood 3149
Ph. 9541 6600

SECTION 5 – List the relevant registered Aboriginal parties (if any)

This section should only be completed where there is a registered Aboriginal party in relation to the Plan

SECTION 6 – Signature of Sponsor

I certify that to the best of my knowledge and belief that the information supplied is correct and complete.

Signed: _____ Date: / /

[Sponsor]

SECTION 7 – Checklist

☐ Ensure appropriate attachment/s are completed and attached to this notification (see section 2 of this form).

Please ensure this notice and all attached items are sent to the:

Deputy Director
Aboriginal Affairs Victoria
Department for Victorian Communities
GPO Box 2392
MELBOURNE VIC 3001

Notes:

- **Ensure that any relevant registered Aboriginal party/s are also notified. A registered Aboriginal party is allowed up to 14 days to provide a written response to a notification specifying whether or not it intends to evaluate the management plan.**
- **In addition to notifying the Deputy Director and any relevant registered Aboriginal party/s, a sponsor must also notify any owner and/or occupier of any land within the area to which the management plan relates.**

Title: M3 Estate CHMP
Address: 95 – 117 Bayliss Rd, Dandenong South
Municipality: City of Greater Dandenong

APPENDIX 2 – TRENCH, TEST PIT & PROBE DETAILS

Trench, Test Pit and Probe Details

VAHR 7921-xxxx	No	Landform	Disturbance	Profile Description	Density – Score – Rating	PH	Organic Material
-	T1	GR, M	VC, MG (0-70cm)	[1] 0-25cm significantly disturbed loose dark grey silty sand [2] 25- 85cm significantly disturbed loose medium grey silty sand [3] 85-135cm compact light grey silty sand [4] 135cm hard orange clay	0 – 0 – none	6	OR
-	T2	GR, L	VC, MG (0-50cm)	[1] 0-50cm significantly disturbed loose dark grey silty sand [2] 50-110cm compact light grey silty sand [3] 110cm hard orange clay	0 – 0 – none	5.5	OR
-	T3	GR, L	VC, MG (0-50cm)	[1] 0-50cm significantly disturbed loose dark grey silty sand [2] 50-100cm compact light grey silty sand [3] 100cm hard orange clay	0 – 0 – none	5.5	OR
-	T4	GR, L	VC. MG (0-35cm)	[1] 0-35cm significantly disturbed loose dark grey silty sand [2] 35-45cm compact medium grey silty sand [3] 45-80cm compact medium brown sand with gravel [4] 80cm hard orange clay	0 – 0 – none	5.5	OR
-	T5	GR, M	VC, MG (0-40cm)	[1] 0-40cm significantly disturbed loose dark grey silty sand [2] 40-100cm compact medium grey to brown silty sand with gravel at depth [3] 100cm hard orange clay	0 – 0 – none	5.5	OR
0956	T6	GR, M	VC, MG (0-30cm)	[1] 0-30cm significantly disturbed loose dark grey silty sand [2] 30-70cm compact light grey silty sand [3] 70-105cm compact medium brown sandy clay with coffee rock [4] 105cm hard orange clay	1 – 0 – none	5.5	OR
-	T7	GR, M	VC, MG (0-35cm)	[1] 0-35cm significantly disturbed loose dark grey silty sand [2] 35-45cm compact light grey silty sand [3] 45-65cm compact medium brown sand with coffee rock [4] 65cm hard orange clay	0 – 0 – none	6	OR

VAHR 7921-xxxx	No	Landform	Disturbance	Profile Description	Density – Score – Rating	PH	Organic Material
-	T8	GR, C	VC, MG (0-45cm)	[1] 0-25cm significantly disturbed loose dark grey silty sand [2] 25-45cm significantly disturbed medium grey silty sand [3] 45-60cm compact light grey silty sand [4] 60cm hard orange clay	0 – 0 – none	5	OR
-	T9	GR, M	VC, MG (0-30cm)	[1] 0-30cm significantly disturbed loose dark grey silty sand [2] 30-45cm significantly disturbed medium brown silty sand [3] 45-60cm compact light grey silty sand with coffee rock [4] 60cm hard orange clay	0 – 0 – none	6	OR
-	T10	GR, C	VC, MG (0-50cm)	[1] 0-50cm significantly disturbed loose dark grey silty sand [2] 50-75cm compact medium brown silty sand [3] 75-115cm compact light grey silty sand [4] 115cm hard orange clay	0 – 0 – none	5	OR
-	T11	GR, C	VC, MG (0-45cm)	[1] 0-45cm significantly disturbed loose dark grey silty sand [2] 45-95cm compact light grey silty sand [3] 95-115cm compact light grey silty sand with coffee rock [4] 115cm hard orange clay	0 – 0 – none	5	OR
-	T12	GR, M	VC, MG (0-35cm)	[1] 0-35cm significantly disturbed dark grey silty sand [2] 35-60cm compact medium grey silty sand [3] 60-75cm compact light grey silty sand [4] 75cm hard orange clay	4 – 0 – none	6	OR
0958	T13	GR, L	VC, MG (0-35cm)	[1] 0-35cm significantly disturbed dark grey silty sand [2] 35-75cm compact medium grey silty sand [3] 75cm hard orange clay	2 – 0 – none	6	OR
0958	T14	GR, M	VC, MG (0-45cm)	[1] 0-45cm significantly disturbed dark grey silty sand [2] 45-65cm compact medium orangey brown silty sand [3] 65-110cm compact light grey silty sand [4] 110cm hard orange clay	2 – 2 – none	5.5	OR

VAHR 7921-xxxx	No	Landform	Disturbance	Profile Description	Density – Score – Rating	PH	Organic Material
0958	T15	GR, M	VC, MG (0-35cm)	[1] 0-35cm significantly disturbed dark brown silty sand [2] 35-60cm compact medium brownish grey silty sand [3] 60-100cm light brown silty sand with gravel [4] 100cm hard orange clay	4 – 4 – none	5	OR
0958	T16	GR, L	VC, MG (0-55cm)	[1] 0-55cm significantly disturbed loose dark grey silty sand [2] 55-100cm compact light grey silty sand [3] 100cm hard orange clay	3 – 0 – none	6	OR
-	T17	GR, L	VC, MG (0-35cm)	[1] 0-35cm significantly disturbed loose dark grey silty sand [2] 35-55cm compact medium grey silty sand [3] 55-75cm compact light grey silty sand [4] 75cm hard orange clay	0 – 0 – none	5.5	OR
0959	T18	GR, C	VC, MG (0-20cm)	[1]0-20cm significantly disturbed loose dark grey silty sand [2] 20-70cm compact light grey silty sand [3] 70-105cm compact orangey grey silty sand [4] 105cm hard orange clay	1 – 0 – none	6	OR
-	T19	GR, U	VC, MG (0-45cm)	[1] 0-45cm significantly disturbed loose medium grey silty sand [2] 45-80cm compact light grey silty sand [3] 80cm hard orange clay	0 – 0 – none	6	OR
-	T20	GR, L	VC, MG (0-20cm)	[1] 0-20cm disturbed loose dark grey silty sand [2] 20-40cm compact greyish brown silty sand [3] 40-60cm hard orange clay	0 – 0 – none	5.5	OR
0957	T21	GR, L	VC, MG (0-25cm)	[1] 0-25cm disturbed loose dark brown silty sand [2] 25-80cm compact brownish grey silty sand [3] 80-110cm compact orangey brown silty sand [4] 110-130cm compact light grey silty sand [5] 130cm hard orange clay	2 – 0 – none	5.5	OR

VAHR 7921-xxxx	No	Landform	Disturbance	Profile Description	Density – Score – Rating	PH	Organic Material
0957	T22	GR, U	VC, MG (0-40cm)	[1] 0-40cm disturbed loose dark grey silty sand [2] 40-85cm compact medium grey silty sand [3] 85-130cm compact mottled greyish brown silty sand [4] 130-140cm compact brown sand with gravel [5] 140cm hard orange clay	1 – 0 – none	6	OR
-	T23	GR, M	VC, MG (0-30cm)	[1] 0-40cm significantly disturbed loose dark grey silty sand [2] 40-85cm compact light grey silty sand with incipient coffee rock with depth [3] 85cm hard orange clay	0 – 0 – none	5.5	OR
0484	TP1	GR, M	VC, MG (0-30cm)	See profile drawing below	2 – 0 – none	5.5	OR
0484	TP2	GR, L	VC, MG (0-35cm)	As above	1 – 0 – none	5	OR
0958	TP3	GR, C	VC, MG (0-20cm)	[1] 0-20cm significantly disturbed loose dark grey silty sand [2] 20-40/70cm compact medium grey silty sand [3] 40/70-75cm compact medium brown silty sand with light brown mottling [4] 75-100cm compact light grey silty sand with very occasional weakly cemented coffee rock [5] 100cm hard orange clay	0 – 0 – none	5.5	OR
0958	TP4	GR, M	VC, MG (0-50cm)	[1] 0-50cm significantly disturbed dark grey silty sand [2] 50-90cm compact light grey silty sand with occasional dark grey tubules [3] 90cm hard orange clay	0 – 0 – none	5.5	OR
0958	TP5	GR, U	VC, MG (0-40cm)	[1] 0-40cm significantly disturbed loose dark grey silty sand [2] 40-80cm compact medium brown silty sand [3] 80-110cm compact light grey silty sand with weakly cemented coffee rock [4] 110cm hard orange clay	0 – 0 – none	5.5	OR
0958	TP6	GR, U	VC, MG (0-50cm)	See profile drawing below	3 – 0 – none	5	OR
0958	TP7	GR, M	VC, MG (0-30cm)	As above	32 – 3 – low-moderate	5.5	OR
0959	TP8	GR, C	VC, MG (0-75cm)	As above	20 – 2 – low	5	OR

VAHR 7921-xxxx	No	Landform	Disturbance	Profile Description	Density – Score – Rating	PH	Organic Material
0957	TP9	GR, L	VC, MG, ST (0-35cm)	[1] 0-35cm significantly disturbed loose dark grey silty sand [2] 35-80cm compact light grey silty sand [3] 80-110cm compact brown grey silty sand [4] 110cm hard orange clay	0 – 0 – none	5.5	OR
0957	TP10	GR, U	VC, MG, ST (0-75cm)	See profile drawing below	12 – 1 – very low	6	OR
0956	TP11	GR, M	VC, MG, ST (0-70cm)	As above	0 – 0 – none	5	OR
0957	P1	GR, M	VC, MG, ST (0-65cm)	As above	12 – 1 – very low	5	OR
0958	P2	GR, U	VC, MG (0-60cm)	[1] 0-50cm significantly disturbed loose dark grey silty sand [2] 50-70cm significantly disturbed loose medium grey silty sand [3] 70-110cm compact medium orange brown silty sand [4] 110cm hard orange clay	0 – 0 – none	5.5	OR
0956	P3	GR, M	VC, MG (0-40cm)	[1] 0-40cm significantly disturbed loose dark grey silty sand [2] 40-95cm compact medium brown silty sand	0 – 0 – none	6	OR
0956	P4	GR, C	VC, MG (0-40cm)	[1] 0-40cm significantly disturbed loose dark grey silty sand [2] 40-95cm compact medium grey silty sand [3] 95cm weathered sandstone	0 – 0 – none	5.5	OR
0958	P5	GR, L	VC, MG (0-40cm)	[1] 0-40cm significantly disturbed loose dark grey silty sand [2] 40-65cm compact light grey silty sand [3] 65cm hard orange clay	0 – 0 – none	6	OR
0958	P6	GR, L	VC, MG (0-30cm)	[1] 0-30cm significantly disturbed loose dark grey silty sand [2] 30-75cm compact light grey silty sand [3] 75cm hard orange clay	0 – 0 – none	5.5	OR
0958	P7	GR, L	VC, MG (0-60cm)	[1] 0-20cm significantly disturbed loose dark grey silty sand [2] 20-60cm significantly disturbed loose medium grey silty sand [3] 60-105cm compact light grey silty sand [4] hard orange clay	0 – 0 – none	5	OR
0958	P8	GR, M	VC, MG (0-45cm)	[1] 0-45cm significantly disturbed loose dark grey silty sand [2] 45-90cm compact light grey silty sand [3] 90cm weathered sandstone	0 – 0 – none	5	OR

VAHR 7921-xxxx	No	Landform	Disturbance	Profile Description	Density – Score – Rating	PH	Organic Material
0958	P9	GR, L	VC, MG (0-40cm)	[1] 0-40cm significantly disturbed loose dark grey silty sand [2] 40-50cm compact medium grey silty sand [3] 50cm weathered sandstone	0 – 0 – none	5	OR
-	P10	F	VC, ST (0-15cm)	[1] 0-15cm disturbed compact dark grey silty clay [2] 15-35cm compact medium grey silty clay [3] 35cm hard mottled grey and orange clay	0 – 0 – none	5	OR
-	P11	F	VC, ST (0-15cm)	[1] 0-15cm disturbed compact medium brown silty clay [2] 15-35cm compact mottled medium and dark brown silty clay [3] 35cm hard mottled orange & brown clay	0 – 0 – none	5	OR
0958	P12	GR, L	VC, MG (0-35cm)	See profile drawing below	2 – 0 – none	5.5	OR
0957	P13	GR, M	VC, MG (0-20cm)	[1] 0-20cm significantly disturbed light grey silty sand [2] 20-100cm compact light orange sand [3] hard orange clay	0 – 0 – none	5.5	OR
0957	P14	GR, M	VC, MG (0-30cm)	[1] 0-30cm significantly disturbed light grey silty sand [2] 30-100cm compact light orange silty sand [3] hard orange clay	0 – 0 – none	5	OR
0957	P15	GR, M	VC, MG (0-20cm)	[1] 0-20cm significantly disturbed light grey silty sand [2] 20-90cm compact dark grey sand [3] 90-120cm compact orange clayey sand [4] 120cm hard clay	0 – 0 – none	5.5	OR
0958	P16	GR, C	VC, MG (0-20cm)	[1] 0-20cm significantly disturbed light grey silty sand [2] 20-70cm compact light brown sand [3] 70cm same as [2]	0 – 0 – none	5.5	OR
0959	P17	GR, C	VC, MG (0-30cm)	[1] 0-30cm significantly disturbed light grey silty sand [2] 30-70cm compact light brown sand [3] 70cm same as [2]	0 – 0 – none	5.5	OR
0959	P18	GR, C	VC, MG (0-20cm)	See profile drawing below	2 – 0 – none	5.5	OR
0959	P19	GR, C	VC, MG (0-30cm)	[1] 0-30cm significantly disturbed light grey silty sand [2] 30-70cm compact light brown sand [3] 70cm same as [2]	0 – 0 – none	5.5	OR
0959	P20	GR, C	VC, MG (0-35cm)	See profile drawing below	2 – 0 – none	5	OR

VAHR 7921-xxxx	No	Landform	Disturbance	Profile Description	Density – Score – Rating	PH	Organic Material
0959	P21	GR, M	VC, MG (0-25cm)	[1] 0-25cm significantly disturbed light grey silty sand [2] 25-60cm compact light orange sand [3] 60cm hard orange clay	0 – 0 – none	5.5	OR

GR=gentle rise, C=crest, U=upper slope, M=mid-slope, L=lower slope, F=floodplain, VC=vegetation clearance, ST=stock trampling, MG=market gardening, OR=occasional roots

Trench Stratigraphic Details and Artefact Numbers

Depth	Spit	T6		T12		T13		T14		T15		T16		T18		T21		T22	
		Arts	Unit	Arts	Unit	Arts	Unit	Arts	Unit	Arts	Unit	Arts	Unit	Arts	Unit	Arts	Unit	Arts	Unit
0-10	1		1		1		1		1		1		1		1		1		1
10-20	2									1									
20-30	3			1											2		2		
30-40	4		2		2		2				2								
40-50	5					1		1	2			1							2
50-60	6			3						2			2	1			2	1	
60-70	7				3	1		1		1	3	1				1			
70-80	8	1	3			2			3			1			3				
80-90	9			4													3		3
90-100	10															1			
100-110	11	1								4		3							
110-120	12							2						1			4		4
120-130	13																		
130-140	14															2			
140↓																		1	

Test Pit & Probe Units and Artefacts

		TP1		TP2		TP6		TP7		TP8		TP10		P1		P12		P18		P20	
Depth	Spit	Arts	Unit	Arts	Unit	Arts	Unit	Arts	Unit	Arts	Unit	Arts	Unit	Arts	Unit	Arts	Unit	Arts	Unit	Arts	Unit
0-5	1		1		1		1		1		1		1		1		1		1		1
5-10	2																				
10-15	3											*1*									
15-20	4	*1*																			
20-25	5			*1*								*3*						*2*		*1*	
25-30	6	*1*											2	*2*					2	*1*	
30-35	7		2				2		2	*3*				*1*							2
35-40	8									*16*					2		2				
40-45	9				2					*1*		*7*									
45-50	10							*2*													
50-55	11					*1*		*27*			2-5					*2*					
55-60	12				2		2	*1*				*1*					2				
60-65	13					*1*			3												
65-70	14					*1*		*2*							3			*2*		*2*	
70-75	15		3		3																
75-80	16								3												
80-85	17															*2*					
85-90	18						3				5		3	*3*							
90-95	19																				
95-100	20	*2*			3				4												
100-105	21							*32*		*20*			4								
105-110	22					*3*															
110-115	23																				
115-120	24																				
120-125	25											*12*									
125-130	26																				
130↓				*1*																	

Trench, Test Pit and Probe Photographs

Photograph 28

Trench 6 profile after excavation

Photograph 29

Trench 11 profile after excavation

Photograph 30

Trench 12 profile after excavation

Photograph 31

Trench 13 profile after excavation

Photograph 32

Trench 14 profile after excavation

Photograph 33

Trench 15 profile after excavation

Photograph 34

Trench 16 profile after excavation

Photograph 35

Trench 18 profile after excavation

Photograph 36

Trench 21 profile after excavation

Photograph 37

Trench 22 profile after excavation

Photograph 38

TP1 (7921-0484) after excavation

Photograph 39

TP2 (7921-0484) after excavation

Photograph 40

VAHR 7921-0958 TP3 after excavation

Photograph 41

VAHR 7921-0958 TP4 after excavation

Photograph 42

VAHR 7921-0958 TP5 after excavation

Photograph 43

VAHR 7921-0958 TP6 after excavation

Photograph 44

VAHR 7921-0958 TP7 after excavation

Photograph 45

VAHR 7921-0959 TP8 after excavation

Photograph 46

VAHR 7921-0957 TP9 after excavation

Photograph 47

VAHR 7921-0957 TP10 after excavation

Photograph 48

VAHR 7921-0956 TP11 after excavation

Photograph 49

VAHR 7921-0957 P1 after excavation

Photograph 50

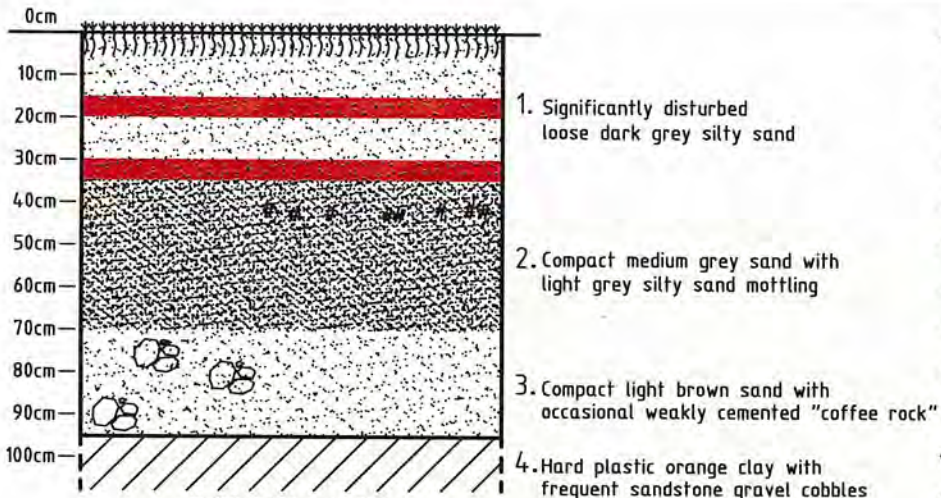
VAHR 7921-0958 P12 after excavation

Photograph 51

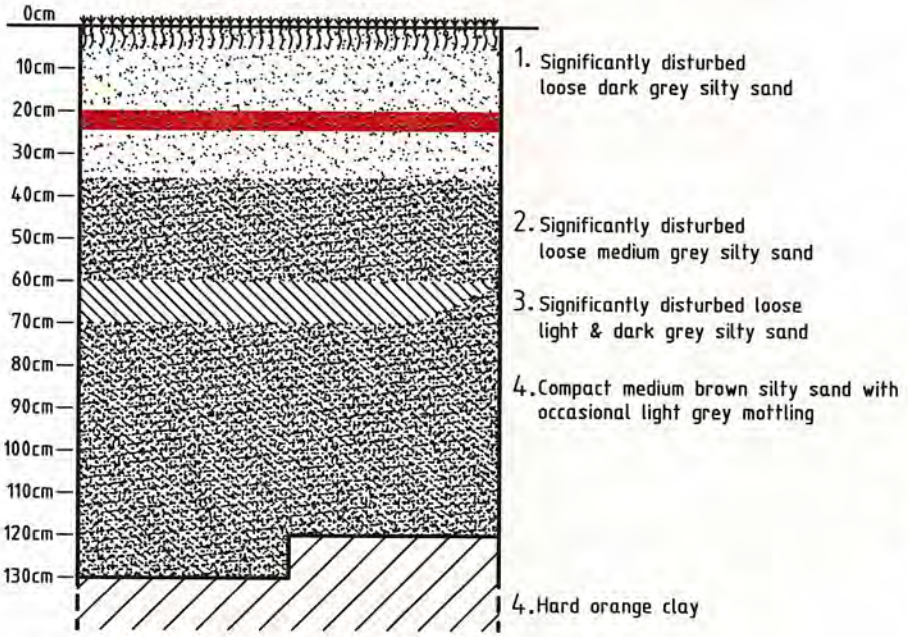
VAHR 7921-0959 P18 after excavation

Photograph 52

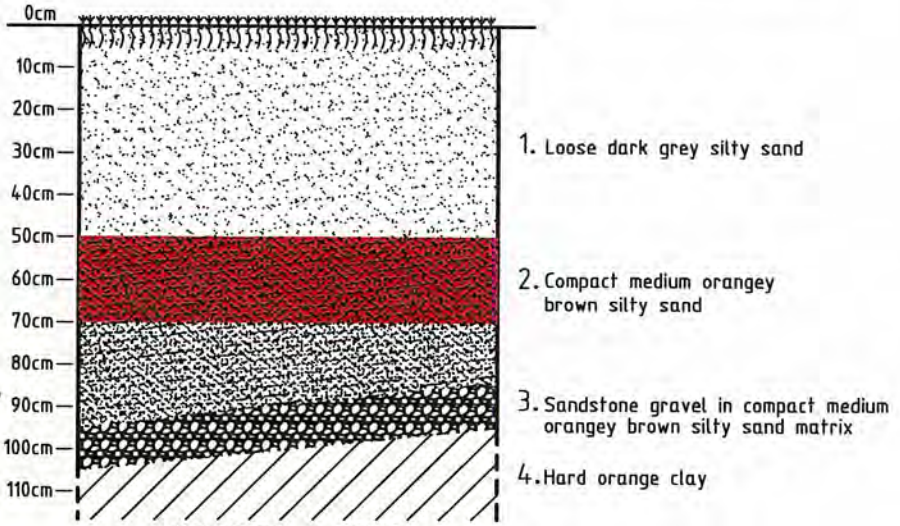
VAHR 7921-0959 P20 after excavation



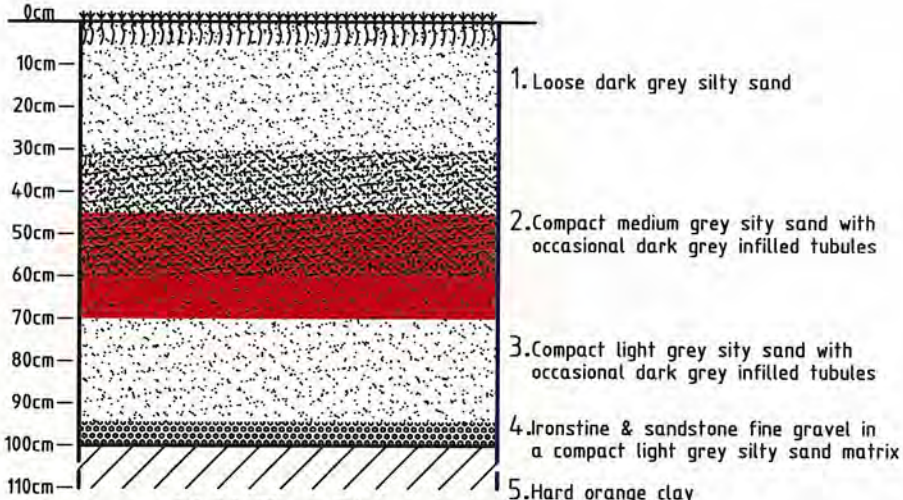
0484 Test Pit 1
2 artefacts found



0484 Test Pit 2
1 artefact found



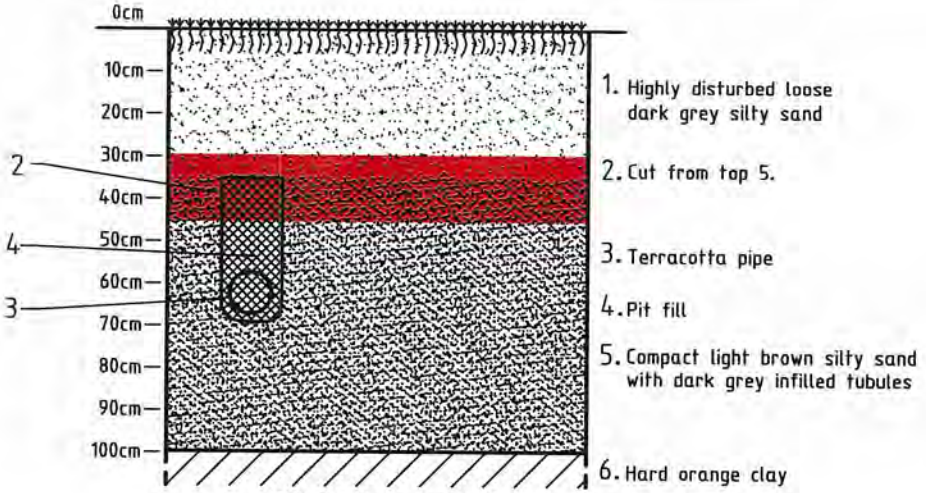
0958 Test Pit 6
3 artefacst found



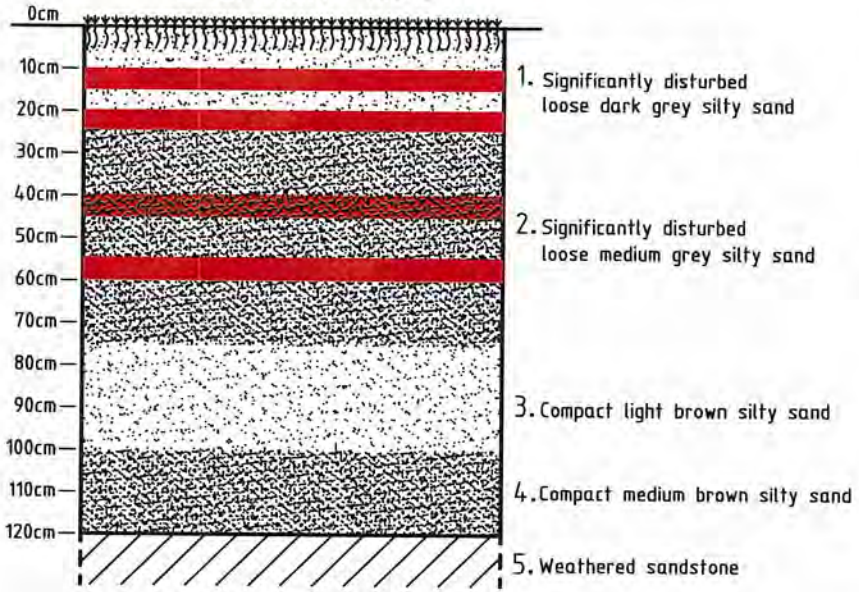
0958 Test Pit 7
32 artefacts found

LEGEND:
Not Excavated
Artefact Horizon
3. xxxxx Denotes Stratigraphic Unit Number
Charcoal
Coffee Rock

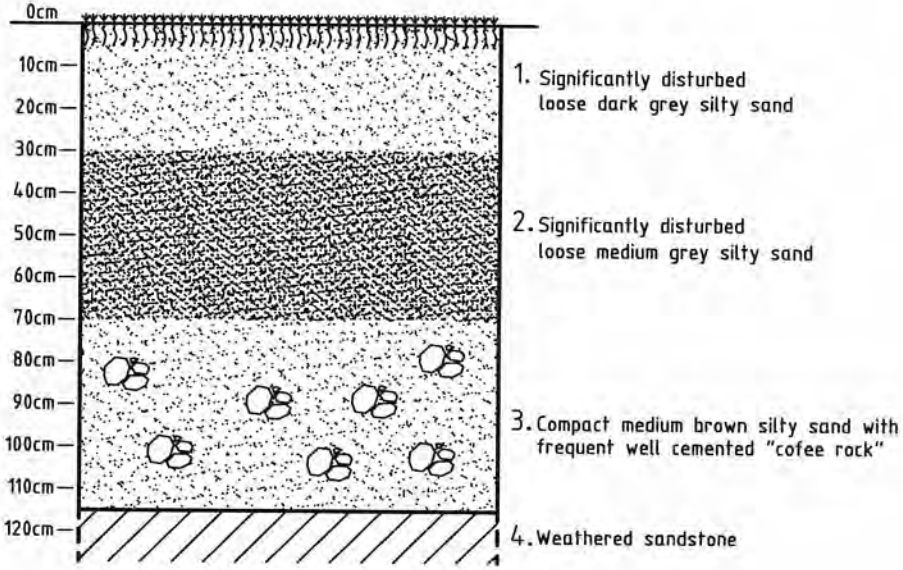
VAHR 7921- 0484 & 0958 Test Pit Profiles



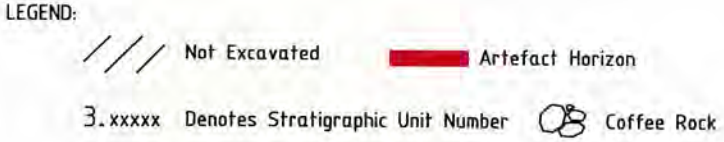
0959 Test Pit 8
20 artefacts found



0957 Test Pit 10
12 artefacts found



0956 Test Pit 11
No artefacts found



VAHR 7921-0956, 0957 & 0959 Test Pit Profiles

APPENDIX 3 – ARTEFACT INVENTORY

Trench Artefacts

Site	T	Spit	Depth (cm)	Unit	Material	Data Class	Plat-form	Termin-ation	Tool Type	Cortex %	Dim (mm)	L (mm)	W (mm)	Th (mm)	Comments
956	6	8	70-80	2	quartzite	split flake	broad	feather			21				medium brown coarse-grained
958	12	3	20-30	1	silcrete	complete flake	broad	feather				32	16	5	medium brown fine-grained
958	12	6	50-60	2	silcrete	complete tool	focal		point			25	15	5	light brown fine-grained, retouch on distal end
958	12	6	50-60	2	silcrete	complete flake	broad	feather				23	20	7	light brown medium grained
958	12	6	50-60	2	basalt	broken flake	broad				17				
958	13	5	40-50	2	silcrete	complete flake	broad	feather				33	26	5	light brown medium grained; possible usewear both lateral margins
958	13	7	60-70	2	basalt	complete flake	broad	feather		45		35	25	12	dark grey fine-grained; possble core rejuvination
958	14	5	40-50	2	basalt	broken tool	focal		point	10	32				dark grey fine-grained; distal piece missing; backed on left lateral
958	14	7	60-70	3	silcrete	complete tool			geometri c microlith			20	7	3	medium red fine-grained
958	15	2	10-20	1	silcrete	angular fragment					15				light brown fine-grained
958	15	6	50-60	2	silcrete	core			multi			29	27	19	light brown fine-grained
958	15	6	50-60	2	crystal quartz	broken flake	broad				11				distal piece missing
958	15	7	60-70	3	quartzite	complete flake	broad	feather				15	21	6	medium brown coarse-grained
958	16	5	40-50	1	basalt	broken flake	broad				19				dark grey fine-grained; weathered

Site	T	Spit	Depth (cm)	Unit	Material	Data Class	Plat-form	Termin-ation	Tool Type	Cortex %	Dim (mm)	L (mm)	W (mm)	Th (mm)	Comments
958	16	7	60-70	2	silcrete	complete flake	broad	feather				31	13	4	light brown fine-grained
958	16	8	70-80	2	crystal quartz	complete flake	focal	feather				37	16	5	possible point
959	18	6	50-60	2	silcrete	complete flake	broad	feather				26	6	5	light grey fine-grained
957	21	7	60-70	2	quartzite	angular fragment					17				medium brown coarse-grained
957	21	10	90-100	3	quartz	angular fragment					14				
957	22	6	50-60	2	silcrete	broken flake	focal				17				medium brown fine-grained

Test Pit Artefacts

Site	TP	Spit	Depth (cm)	Unit	Material	Data Class	Plat-form	Termin-ation	Tool Type	Cortex%	Dim (mm)	L (mm)	W (mm)	Th (mm)	Comments
484	1	4	15-20	1	silcrete	complete flake	focal	feather				13	6	3	light brown fine-grained
484	1	7	30-35	1	basalt	broken flake					15				dark grey fine-grained
484	2	5	20-25	1	crystal quartz	broken flake		feather			8				
958	6	11	50-55	2	quartz	complete flake	broad	feather				20	17	5	
958	6	13	60-65	2	quartz	angular fragment				5	17				
958	6	14	65-70	2	silcrete	complete flake	focal	feather				9	12	3	light brown fine-grained
958	7	10	45-50	2	silcrete	complete tool			gm			11	6	2	light brown fine-grained
958	7	10	45-50	2	silcrete	complete flake	broad	feather				10	11	1	light brown fine-grained

Site	TP	Spit	Depth (cm)	Unit	Material	Data Class	Plat-form	Termin-ation	Tool Type	Cortex%	Dim (mm)	L (mm)	W (mm)	Th (mm)	Comments
958	7	11	50-55	2	silcrete	broken flake		feather			15				light brown fine-grained
958	7	11	50-55	2	silcrete	complete flake	focal	feather				16	12	3	light brown fine-grained
958	7	11	50-55	2	silcrete	angular fragment					24				light brown fine-grained
958	7	11	50-55	2	silcrete	broken flake		feather			14				light brown fine-grained
958	7	11	50-55	2	silcrete	broken flake	focal				12				light brown fine-grained
958	7	11	50-55	2	silcrete	complete flake	focal	feather				19	4	2	light brown fine-grained
958	7	11	50-55	2	silcrete	complete flake	focal	feather				15	14	3	light brown fine-grained
958	7	11	50-55	2	silcrete	angular fragment					22				light yellow brown fine-grained
958	7	11	50-55	2	silcrete	complete flake	focal	feather				10	16	2	light brown fine-grained
958	7	11	50-55	2	silcrete	broken flake	focal				16				light brown fine-grained, proximal piece
958	7	11	50-55	2	silcrete	angular fragment					8				light brown fine-grained
958	7	11	50-55	2	silcrete	complete flake	focal	feather				19	12	3	light brown fine-grained
958	7	11	50-55	2	silcrete	broken split flake					11				light brown fine-grained
958	7	11	50-55	2	silcrete	angular fragment					6				light brown fine-grained
958	7	11	50-55	2	silcrete	angular fragment					10				light brown fine-grained
958	7	11	50-55	2	silcrete	angular fragment					5				light brown fine-grained
958	7	11	50-55	2	silcrete	broken split flake					9				light brown fine-grained

Site	TP	Spit	Depth (cm)	Unit	Material	Data Class	Plat-form	Termin-ation	Tool Type	Cortex%	Dim (mm)	L (mm)	W (mm)	Th (mm)	Comments
958	7	11	50-55	2	silcrete	angular fragment					10				light brown fine-grained
958	7	11	50-55	2	silcrete	angular fragment					7				light brown fine-grained
958	7	11	50-55	2	silcrete	broken flake					7				light brown fine-grained, medial piece
958	7	11	50-55	2	silcrete	broken split flake		feather			13				light brown fine-grained
958	7	11	50-55	2	silcrete	complete flake	focal	feather				17	7	2	light brown fine-grained
958	7	11	50-55	2	silcrete	complete flake	broad	feather				18	13	4	light brown fine-grained
958	7	11	50-55	2	silcrete	complete flake	broad	feather				13	14	5	light brown fine-grained
958	7	11	50-55	2	silcrete	broken flake	broad					14	9	3	light brown fine-grained
958	7	11	50-55	2	silcrete	complete flake	focal	feather				19	5	4	light brown fine-grained
958	7	11	50-55	2	silcrete	complete flake	broad	feather				23	11	2	light brown fine-grained
958	7	12	55-60	2	silcrete	broken flake					10				light brown fine-grained
958	7	14	65-70	3	quartz	angular fragment					14				
958	7	14	65-70	3	quartz	angular fragment					10				
959	8	7	30-35	1	silcrete	complete flake	focal	feather				9	5	2	medium red fine-grained
959	8	7	30-35	1	silcrete	angular fragment					8				medium brown fine-grained
959	8	7	30-35	1	silcrete	complete flake	broad	feather				29	9	3	light brown fine-grained, blade flake
959	8	8	35-40	2	silcrete	broken flake		feather			18				light brown fine-grained

Site	TP	Spit	Depth (cm)	Unit	Material	Data Class	Plat-form	Termin-ation	Tool Type	Cortex%	Dim (mm)	L (mm)	W (mm)	Th (mm)	Comments
959	8	8	35-40	2	silcrete	complete flake	broad					33	8	4	light brown fine-grained, blade flake
959	8	8	35-40	2	silcrete	complete flake	broad	feather				30	17	2	light brown fine-grained, attempted point
959	8	8	35-40	2	silcrete	complete flake	broad	hinge				27	10	6	light brown fine-grained
959	8	8	35-40	2	silcrete	broken flake	broad				21				light brown fine-grained, proximal piece
959	8	8	35-40	2	silcrete	broken flake	broad				20				light brown fine-grained
959	8	8	35-40	2	silcrete	complete flake	focal	feather				17	5	2	light brown fine-grained, blade flake
959	8	8	35-40	2	silcrete	broken flake		feather			10				light brown fine-grained
959	8	8	35-40	2	silcrete	complete flake	focal	feather				19	12	1	light brown fine-grained
959	8	8	35-40	2	silcrete	complete flake	focal	feather				17	11	1	light brown fine-grained
959	8	8	35-40	2	silcrete	broken flake	broad				15				light brown fine-grained, proximal piece
959	8	8	35-40	2	silcrete	broken flake		feather			15				light brown fine-grained, distal piece
959	8	8	35-40	2	silcrete	broken flake	broad				21				light brown fine-grained, proximal piece
959	8	8	35-40	2	silcrete	complete flake	focal	feather				27	12	2	light brown fine-grained, blade flake
959	8	8	35-40	2	silcrete	complete flake	focal	feather				34	11	3	light brown fine-grained
959	8	8	35-40	2	silcrete	angular fragment				10	42				medium brown fine-grained

Site	TP	Spit	Depth (cm)	Unit	Material	Data Class	Plat-form	Termin-ation	Tool Type	Cortex%	Dim (mm)	L (mm)	W (mm)	Th (mm)	Comments
959	8	9	40-45	2	silcrete	broken flake	focal				18				light brown fine-grained
957	10	3	10-15	1	silcrete	complete flake	focal	hinge				20	4	3	light brown fine-grained, blade flake
957	10	5	20-25	1	silcrete	broken flake		feather			12				dark red fine-grained
957	10	5	20-25	1	silcrete	broken flake		feather			16				light brown fine-grained, distal piece
957	10	5	20-25	1	silcrete	angular fragment					14				light brown fine-grained
957	10	9	40-45	2	silcrete	broken flake	focal				11				light brown fine-grained, proximal piece
957	10	9	40-45	2	silcrete	broken flake		feather			20				light brown fine-grained
957	10	9	40-45	2	silcrete	broken flake		feather			10				light brown fine-grained
957	10	9	40-45	2	silcrete	angular fragment					7				light red fine-grained
957	10	9	40-45	2	silcrete	complete flake	focal	feather				17	7	4	medium red fine-grained
957	10	9	40-45	2	silcrete	angular fragment					12				medium red fine-grained
957	10	9	40-45	2	silcrete	angular fragment					12				dark red medium grained
957	10	12	55-60	2	silcrete	complete flake	broad	feather				19	11	4	medium red fine-grained

Probe Artefacts

Site	P	Spit	Depth (cm)	Unit	Material	Data Class	Plat-form	Termin-ation	Tool Type	Cortex%	Dim (mm)	L (mm)	W (mm)	Th (mm)	Comments
957	1	6	25-30	1	silcrete	broken flake		feather			12				medium brown fine-grained, distal piece
957	1	6	25-30	1	quartz	broken flake	focal				10				
957	1	7	30-35	2	silcrete	split flake	broad	feather			22				medium brown fine-grained, right lateral
958	12	11	50-55	2	silcrete	complete tool			point			22	10	4	dark grey fine-grained, weathered
958	12	11	50-55	2	silcrete	broken flake		feather			13				dark grey fine-grained, distal piece
959	18	5	20-25	1	silcrete	complete flake	focal	feather	blade			39	19	4	medium red fine-grained, use-wear (?) right lateral
959	18	5	20-25	1	silcrete	broken flake					15				medium brown fine-grained, failed gm
959	20	5	20-25	1	silcrete	angular fragment					25				medium grey / red fine-grained
959	20	6	25-30	1	silcrete	complete flake	focal	feather				16	9	2	medium brown fine-grained

APPENDIX 4 – GLOSSARY

TYPES OF ABORIGINAL ARCHAEOLOGICAL SITES

Artefact Scatter: A surface scatter of stone artefacts is defined as being the occurrence of five (5) or more items of cultural material within an area of about 100 square metres (AAV 1993). Artefact scatters are often the only physical remains of places where Aborigines have camped, prepared and eaten meals and worked stone material.

Burials: Burial sites may occur in association with campsites, in mounds or shell middens or in specific burial grounds that lack any other cultural material. Softer ground was chosen for burials, and any sandy area can be expected to contain burials. Burial sites can contain one or a number of individuals. Burials sites and cemeteries are a common archaeological site type in the sand country adjoining the Murray River, though are a rare feature in the southern part of Victoria.

Contact Site: These are sites relating to the period of first contact between Aboriginal and European people. These sites may be associated with conflict between Aborigines and settlers, mission stations or reserves, or historic camping places. The artefact assemblage of contact sites will often include artefacts manufactured from glass.

Hearth: Usually a sub-surface feature found eroding out of a river or creek bank or in a sand dune - it indicates a place where Aboriginal people cooked food. The remains of a hearth are usually identifiable by the presence of charcoal and sometimes clay balls (like brick fragments) and hearth stones. Remains of burnt bone or shell are sometimes preserved within a hearth.

In Situ: Refers to cultural material that is discovered as being undisturbed and considered to be in its original context. That is, material which, when identified is considered to be in the same location as the time it was abandoned.

Isolated Artefact Occurrence: An isolated artefact is defined as being the occurrence of four (4) or less items of cultural material within an area of about 100 metres (AAV 1993: 1). It/they can be evidence of an ephemeral (or one off) activity location, the results of an artefact being lost or discarded during travel or evidence of an artefact scatter which is otherwise obscured by poor ground surface visibility.

Midden Sites: 'Midden' is a term borrowed from the Danish. It originally applied to the accumulations of shell and other food remains left by Mesolithic man in that country. Australian Midden sites are an accumulation of hearth and food debris, which has built up a deposit on the ground surface over a length of time. Middens are generally comprised of charcoal and either freshwater or coastal shell species, depending on the site's location. Midden sites may also contain stone artefacts, and the food refuse of other native animals such as small mammals. Their thick deposit of burnt shells and dark grey/black deposit can distinguish midden sites within the landscape. Coastal shell middens are often found in close association with rock platforms. Freshwater shell middens are found in close proximity to areas that provided freshwater mussels.

Mound Sites: Mound sites are accumulation of hearth (fire place) debris, which has over time built a thick deposit on the ground's surface. Mounds are generally comprised of charcoal; burnt clay balls and burnt food refuse such as native animal bones. Mound sites may also contain stone artefacts. On rare occasions mound sites may also contain human burial remains. Mound sites can be distinguished in the landscape by their characteristic dark grey/black deposit and height above surrounding land. Mounds that have been utilised over long periods can obtain dimensions of over 100 metres in length and 1 metre in height. Mound sites are generally situated close to major streams, and large water bodies. In times of flood, mound sites are often become marooned, and provide dry land points from which surrounding resources could have been exploited.

Scarred Tree: Scars on trees may be the result of removal of strips of bark by Aborigines for the manufacture of utensils, canoes or for shelter; or resulting from small notches chopped into the bark to provide toe and hand holds for climbers after possums, koalas and/or views of the surrounding area. A scar made by humans as opposed to naturally made by branches falling off, *etc.* is distinguished by the following criteria: symmetry and rounded ends, scar does not extend to the ground, some re-growth has occurred around the edges of the scar, and no holes or knots present in the heartwood.

ABORIGINAL ARTEFACT TYPES

Artefact: Any product made by human hands or caused to be made through human actions.

Anvil: A portable flat stone, usually a river pebble, which has been used as a base for working stone. Anvils that have been used frequently have a small circular depression in the centre where cores were held while being struck. An anvil is often a multifunctional tool used also as a grindstone and hammer stone.

Blade: A long parallel sided flake from a specially prepared core. Blade flakes are twice as long as they are wide.

Bipolar: A core or a flake, which, presumably, has been struck on an anvil. That is, the core from which the flake has been struck has been rotated before the flake has been struck off. Bifacial platforms tend to indicate that the flake has come off a heavily worked core.

Core: An artefact from which flakes have been detached using a hammer stone. Core types include blade, single platform, multiplatform and bipolar forms. These artefacts exhibit a series of negative flake scars, each of which represents the removal of a flake.

Core Types:

Unidirectional cores - These cores have scars originating from a single platform, and all the flakes struck from the core have been struck in the same direction from that platform.

Bidirectional cores - These cores have two platforms, one opposite the other; flakes have been struck from each of the platforms, and thus from opposite directions.

Bifacial cores - These kinds of core have a single platform, but the flakes struck from it have been detached from two core faces.

Multidirectional cores - These cores have two or more platforms and there is no clear pattern, either in the orientation of the platforms or in the orientation of the scars resulting from the striking of flakes from those platforms.

Bipolar core - Nodules or cobbles that are flaked using an anvil. The resulting artefacts exhibit crushing on their proximal, distal and often their lateral margins, where they have been rotated.

Complete Flake: An artefact exhibiting a ventral surface (where the flake was originally connected to the core), dorsal surface (the surface that used to be part of the exterior of the core, platform and/or flake scar).

Broken Flake: Defined by the part of the flake remaining, i.e. proximal (where the platform is present), medial (where neither the platform nor termination is present), or distal (where the termination is present).

Lithic: Anything made of stone.

OTHER TERMS

Artefact Horizon: A discernable horizontal distribution of artefacts within an environmental deposit. An artefact horizon has generally suffered a degree of post depositional disturbance that has affected the spatial and temporal integrity of the deposits and associated artefact assemblage.

Archaeological Site: A place/location of either Aboriginal or non-Aboriginal origin. Aboriginal archaeological sites have been formed prior to the European settlement of Australia, and may be in any of the forms outlined in section 1.

BP: Before present. The 'Present' is defined as 1950.

Cultural Heritage: Something that is inherited or passed down because it is appreciated and cherished. Categories of cultural heritage include; built structures and their surrounds, gardens, trees; cultural landscapes; sites; areas; precincts; cemeteries; ruins and archaeological sites; shipwrecks; sites of important events; commemorative sites; contents of buildings and significant relics, objects artefacts and collections of objects.

Cultural Landscape Integrity: The level of which the local landscape reflects the environment in which pre-contact Aboriginal people or early European settlers lived. The integrity includes all relevant aspects such as level and type of vegetation cover, hydrology, landforms and structures. A site located in a landscape of high cultural integrity has greater heritage value as it remains in context, and is therefore able to impart a greater level of information to the broader community.

Environmental Deposit: A stratigraphic layer formed by the laying down of deposits by environmental agents such as wind and water. These may bury human artefacts to form stratigraphic layers but do not form occupation deposits.

Historic Archaeological Site: These are places where non-Aboriginal activities have occurred, and which little extant (standing) features remain. The bulk of evidence for historic occupation/utilisation is comprised of remains (artefacts/foundations etc) that are located on the ground's surface or in a sub-surface context. The primary heritage value of an archaeological site is scientific.

Historic Site: Sites/Areas that contain extant (standing) remains of pre-1950 non-Aboriginal occupation. Historic sites may or may not also contain archaeological remains (Aboriginal and/or historic).

Holocene, Recent or Postglacial Period: The time from the end of the Pleistocene Ice Age (c 10 300 BP) to the present day.

Horizon: A term used to describe a layer of archaeological material that is *in situ*.

Heritage Place/Site: An area or region of land that represents a particular focus of past human activity or concentration of *in situ* cultural material. A place includes any structures, buildings or works upon or integral with the land, and any artefacts or other physical relic associated with the land, or it may have no visible evidence of human activity, being rather the site of a past event of importance or the embodiment of a particular belief or legend. Examples might range from an Aboriginal ceremonial ground, a pioneers house and contents, a shop, the remains of an early whaling station or a recent fish farm, Captain Cook's landing place, a 40 000 year old Aboriginal campsite or a 1990s brick-veneer house, a shipwreck, an industrial or mining landscape, a bus stop, a Macassan trepanger campsite or the Surfer's Paradise Caravan Park, a garbage dump, the local war memorial, a garden, an Aboriginal rock painting or a band rotunda.

Potential: Based on collated existing data and site inspection an area or specific site may contain the potential for extant or archaeological deposits. Background research will present the most likely site types, contents and state of preservation. Relative levels of potential are described as Low (10-30% probability), Moderate (40-60% probability) and High (70% and above probability).

Pleistocene: The geological period corresponding with the last or Great Ice Age. The onset of the Pleistocene is marked by an increasingly cold climate, by the appearance of Calambrian mollusca and Villafranchian fauna with elephant, ox, and horse species, and by changes in foraminifera. The oldest form of man had evolved by the Early Pleistocene, and in archaeological terms the cultures classed as Palaeolithic all fall within this period. The date for the start of the Pleistocene is not well established, and estimates vary from 3.5 to 1.3 million years ago. The period ends with the final but gradual retreat of the ice sheets, which reached their present conditions around 10 300 BP.

Occupation Deposit: The laying down of deposits by human activities that bury artefacts to form distinct stratigraphic entities such as layers (e.g.: dense lens of stone artefacts & bone between environmental deposits, stratified shell deposits) or features (hearths, occupation mounds). Occupation deposits have a high degree of spatial and temporal integrity.

Occupation Surface: A distinct layer or interface between depositional strata upon which human activities were carried out and artefacts/features deposited. Most commonly this may be a prior land surface (e.g.: soil horizon) that has been subsequently buried by later environmental deposits (e.g.: dune deposits).

Visibility: Refers to the degree to which the surface of the ground can be observed. This may be influenced by natural processes such as wind erosion or the character of the native vegetation, and by land use practices, such as ploughing or grading. It is generally expressed in terms of the percentage of the ground's surface visible for an observer on foot (Bird 1992). For example 10% visibility equates to 10cm^2 per 1 m^2 of ground surface that is not covered by vegetation or soil deposit. The following applies to descriptions of ground surface visibility within this report.

0%	=	No visible ground surface
0 – 10%	=	Very Poor
10 – 30%	=	Poor
30 – 50%	=	Fair
50 – 70%	=	Good
70 – 90%	=	Very Good
90 – 100%	=	Excellent

Raw Material: Organic or inorganic matter that has not been processed by people.

Slope Wash: A term used to describe a specific process of re-deposition of cultural material. Cultural material (most often stone artefacts) that is situated on any sloping land is vulnerable to the affects of slope wash. The term relates to the downward movement of cultural material primarily due to erosion of their original context. This downward movement is most often caused by clearing of vegetation that exposes the ground surface to the affects of water erosion. The result is that cultural material will move down the slope over a period of time. How far material may move is dependent on the gradient and the intensity of the erosion.

REFERENCES

Aboriginal Affairs Victoria 1997. *Guidelines for Conducting and Reporting upon Archaeological Surveys in Victoria*. AAV, Melbourne.

Bird, C F M 1992. *Archaeology of the Goulburn River Basin. A Background Study*. Heritage Services Branch, Aboriginal Affairs Victoria.

Clark D & J P Wesson 1980. Alcoa Portland Aluminium Smelter. *Working Paper* No. 2.

Mulvaney, D J 1975. *The Prehistory of Australia*. Harmondsworth, Penguin.

Oxford University Press 1976. *Concise Oxford Dictionary of Current English*. Oxford University Press, Oxford.

Pearson, M & S Sullivan 1995. *Looking After Heritage Places – The Basics of Heritage Planning for Managers, Landowners and Administrators*. Melbourne University Press.

Heritage Victoria 2000. *Victorian Heritage Strategy*. Heritage Victoria, Department of Infrastructure.

Holdaway, S & N Stern 2004. *A Record in Stone: The Study of Australia's Flaked Stone Artefacts*. Museum Victoria and Aboriginal Studies Press, Australian Institute of Aboriginal and Torres Strait Islander Studies, Canberra.

APPENDIX 5 – SUMMARY OF LEGISLATION

Aboriginal Heritage Legislation

The following is a summary of the Aboriginal Heritage Act 2006 as described in the Aboriginal Heritage Regulations 2007 Regulatory Impact Statement. The Act commenced operation on 28 May 2007.

In 2006 the Victorian Government passed the Aboriginal Heritage Act 2006, to provide more effective protection of Aboriginal cultural heritage and broaden Aboriginal community involvement in decision-making arrangements.

The Aboriginal Heritage Act 2006:

- Replaces outdated State and Federal legislation governing the protection and management of Aboriginal cultural heritage in Victoria;
- Ensures that the protection of Aboriginal cultural heritage is an integral part of planning and land development processes;
- Provides increased certainty for developers and land managers in relation to the types of developments that require cultural heritage management plans;
- Establishes an Aboriginal Heritage Council, comprised of traditional owners, to provide a state wide voice for Aboriginal people in the management of cultural heritage. The council will register Aboriginal parties as cultural heritage decision makers for areas in Victoria, and advise the Minister for Aboriginal Affairs in relation to the protection of Aboriginal cultural heritage;
- Gives Registered Aboriginal Parties responsibility for protection and maintaining Aboriginal places and objects of cultural heritage significance within their areas, through providing cultural heritage management plans, advising on heritage permits, entering into heritage agreements and negotiating the repatriation of Aboriginal human remains;
- Provides dispute resolution and review mechanisms through mediation and the Victorian Civil and Administrative Tribunal;
- Provides a range of measures to improve compliance with, and enforcement of, the legislation, including cultural heritage audits, stop orders, modernised offences and penalties, and increased responsibility and accountability for inspectors;
- Retains the power of the Minister for Aboriginal Affairs to make interim and ongoing protection declarations over significance Aboriginal places or objects;
- Broadens Aboriginal community involvement in heritage protection to include traditional owners (The Allen Consulting Group 2007: 2-3).

Further information regarding the Act can be obtained from the AAV website at:
http://www1.dpcd.vic.gov.au/aav/

Aboriginal Heritage Regulations

Regulations have been developed to support the operation of the Aboriginal Heritage Act 2006. They provide further information on aspects of the Act, clarifying roles and expected standards that are required under the Act to:

- Maximise certainty about when and how to prepare a cultural heritage management plan, thereby better protecting Aboriginal cultural heritage and reducing delays to development;
- Ensure that fair payment is made for the evaluation of a cultural heritage management plan and that the Government receives appropriate payment for assessing applications for permits and advice on the Register (The Allen Consulting Group 2007: 4).

The regulations also specify:

- The circumstances in which a cultural heritage management plan is required;
- The standards for the preparation of a cultural heritage management plan and for a map in a cultural heritage agreement;
- Fees for evaluating a cultural heritage management plan;
- Fees for an application for a cultural heritage permit;
- Fees for an application to the Secretary for advice as to whether a record exists on the Register in relation to a nominated area of land (The Allen Consulting Group 2007: 3).

Further information regarding the Regulations can be obtained from the AAV website at: http://www1.dpcd.vic.gov.au/aav/

In summary, all Aboriginal cultural heritage is protected under the Aboriginal Heritage Act 2006.

Part 4, Division 2 of the *Aboriginal Heritage Act 2006* states that certain activities will require a Cultural Heritage Management Plan (CHMP) to be prepared. A CHMP is required for an activity if all or part of the activity area is deemed as culturally sensitive and that the activity is of high impact to the area. High impact activities are described in the *Aboriginal Heritage Regulations 2007* Part 2, Division 5.

Alternatively, the proponent may prepare a voluntary CHMP. A voluntary CHMP can avoid delays if any Cultural Heritage Permits (CHPs) are required over the course of development works.

CHPs are required if an activity will harm, or is likely to harm, Aboriginal cultural heritage. Applications are mode to the Department for Planning and Community Development. This process can take over 30 days to process.

APPENDIX 6 - CORRESPONDENCE

Date	Time	From	To	Type	Item	Action
16.5.2008	10.00	TomR Tardis	RobynG BWFL	Email	Invite representative for fieldwork	
16.5.2008		TomR Tardis	SoniaM BLCAC	Email	As above	
5.8.2008	10.30	TomR Tardis	RobynG BWFL	Email	Invite representative for fieldwork	
5.8.2008		TomR Tardis	SoniaM BLCAC	Email	As above	
8.8.2008	8.45	TomR Tardis	KimB Devcon	Email	Advised excavation team start date & access requirements	
5.9.2008		TomR Tardis	RobynG BWFL	Email	Requested information on specific cultural information and oral tradition in connection with the activity area	
5.9.2008		TomR Tardis	SoniaM BWFL	Email	As above	
8.10.2008		TomR Tardis	KimB Devcon	Email	Sent Draft for review	
?.10.2008		Tardis	AAV	Post	CHMP – Registered Post to AAV	30 days

APPENDIX 7 – AUTHORS' SUMMARY CVs

ANDREA MURPHY
Project director

Andrea Murphy is a Senior Cultural Heritage Advisor with extensive experience and qualifications in both indigenous and non-indigenous cultural heritage assessment and management, including EES & EIS projects, major urban excavations, desktop assessments, site survey, excavation, monitoring and production of site management strategies. Andrea has been the manager of Tardis Enterprises Pty Ltd, cultural heritage consultants for 12 years and a heritage professional for more than 23 years.

AWARDS

Winner of the 2003 UNESCO Asia-Pacific Cultural Heritage Conservation Award

QUALIFICATIONS

Bachelor of Arts (Prehistory)
La Trobe University

Master of Arts (Historic Archaeology)
La Trobe University

AFFILIATIONS

Member of:

Australian Society of Historic Archaeology

Australian Association of Consulting Archaeologists

Australian Anthropological and Archaeological Society

Historic Gardens Society

National Trust

Royal Historical Society

RECENT RELEVANT EXPERIENCE

MAJOR CULTURAL HERITAGE PROJECTS IN VICTORIA

- Pipeline routes
- Optical fibre cable routs
- Road and highway/freeway infrastructure
- Rail infrastructure – urban and regional fast rail
- Urban developments
- Waterway rehabilitation works
- Wind farms
- Archaeological excavations
- Local government advisor and project manager
- Defence advisor and project manager
- Parks advisor and project manager

TOM RYMER
senior archaeologist & heritage advisor

Tom Rymer is a senior archaeologist and heritage advisor with over ten years experience in major international research excavations as well as commercial indigenous and non-indigenous cultural heritage projects. Tom has a strong background in research, survey, archaeological excavation, artefact analysis and technical report production.

QUALIFICATIONS

Doctor of Philosophy (Archaeology) – La Trobe University, 2005

RECENT RELEVANT EXPERIENCE

MAJOR INTERNATIONAL PROJECTS

- BRITISH EXCAVATIONS AT JERABLUS-TAHTANI, SYRIA
- AUSTRALIAN-CYPRUS EXPEDITION AT MARKI-ALONIA

MAJOR CULTURAL HERITAGE PROJECTS IN VICTORIA

- ROAD AND HIGHWAY/FREEWAY INFRASTRUCTURE
- URBAN DEVELOPMENTS
- MIXED USE ZONE DEVELOPMENTS
- GOLF COURSE DEVELOPMENTS

SUMMARY OF EXPERIENCE

- RESEARCH
- SITE EXCAVATION
- SITE SURVEY AND RECORDING
- ARCHAEOLOGICAL TESTING
- ARCHAEOLOGICAL MONITORING
- ARTEFACT ANALYSIS
- DRAFTING
- REPORT WRITING AND PRODUCTION

APPENDIX 8 – CHECKLIST FOR CONTINGENCY COMPLIANCE

CHECKLIST FOR COMPLIANCE WITH CHMP 10333			
Discovery of unexpected cultural material		Yes	No
1	Has all activity within 5m ceased?		
2	Has the Heritage Advisor been advised?		
3	Has the find/s been left in place?		
4	In relation to suspected human remains, has the Coroner's Office been notified?		
5	Has an appropriate mitigation / salvage strategy been developed?		
6	Has the mitigation / salvage works been implemented?		
7	Have the salvaged finds / remains been treated in accordance with the direction of the RAP?		
Reburial			
8	Has a suitably qualified archaeologist and physical anthropologist been engaged to fully document the remains and reburial?		
9	Has the reburial site been clearly marked?		
10	Have all details been provided to AAV?		
11	Has a strategy been developed to ensure no further disturbance will occur to the remains (such as Section 173 in the Planning and Provision Act)?		
Changes to Activity			
12	Has statutory approval been obtained for any changes to the activity?		

REFERENCES

Aboriginal Affairs Victoria	2002	*Guidelines for Conducting and Reporting of Archaeological Surveys in Victoria*. Aboriginal Affairs Victoria.
	2007	*Guide to Preparing Aboriginal Cultural Heritage Management Plans*. Aboriginal Affairs Victoria.
Aiken, DL & AP Kershaw		Holocene Vegetation and Environmental History of Cranbourne Botanical Garden, Victoria. *Proceeds of the Royal Society of Victoria* 105 (1): 67-80.
Allen, J & G Hewitt, J de Lange	2008	Report on Bend Road Archaeological Investigations, Bend Road 1 Phases 1 to 3. Report for Theiss John Holland.
Australian ICOMOS	1999	The Australian ICOMOS Charter for the Conservation of Places of Cultural Significance. (The Burra Charter) Sydney, Australia ICOMOS.
Barker, M	2007	Archaeological Subsurface Testing Report: Colemans Road, Dandenong South. A report by Heritage Insight Pty Ltd to Abacus Property Group Pty Ltd.
Barwick, DE	1984	Mapping the Past: An Atlas of Victorian Clans 1835-1904 Part 1. *Aboriginal History* 8(1-2): 101-131.
Bell, J	2005	Proposed Aged Care Facility, Olive Road, Lynbrook Indigenous Archaeological Assessment. A report by Heritage Insight Pty Ltd.
	2005	Eden Rise Estate: Monitoring of AAV Site 7921-0655. A report by Heritage Insight Pty Ltd to Case Meallin & Associates Pty Ltd & Pask Group Pty Ltd.
Bird, E	1993	*The Coast of Victoria: the Shaping of Scenery*. MUP
Bowdler, S	1984	Hunter Hill, Hunter Island: Archaeological Investigations of a Prehistoric Tasmanian Site. *Terra Australis 8* Department of Prehistory, Research School of Pacific Studies, ANU, Canberra
Brown, S	1995	A Survey for Aboriginal Archaeological Sites on Lynbrook Estate: Section A, Lyndhurst, Victoria. A report by du Cros & Associates Pty Ltd to the Urban Land Authority.
Chamberlain, M	2003	An Archaeological Survey Anco Farm Lyndhurst. Breese Pitt Dixon. A report by TerraCulture Pty Ltd to Breese Pitt Dixon Pty Ltd.
Clark, ID	1990	Aboriginal Languages and Clans. An Historical Atlas of Western and Central Victoria. *Monash Publications in Geography* No 37.

	1998	The Journals of George Augustus Robinson, Chief Protector, Port Phillip Aboriginal Protectorate. Heritage Matters, Melbourne.
Coutts, PJF	1977	Salvage Operations. *Records of the Victoria Archaeological Survey* No 4, Ministry for Conservation, Melbourne.
	1978	The Keilor Archaeological Project. *Records of the Victoria Archaeological Survey* No 8, Ministry for Conservation, Melbourne.
	1980	Werribee River Carbon Date. *Records of the Victoria Archaeological Survey* No 10, Ministry for Conservation, Melbourne.
Department of Primary Industries (DPI)	2007	Victorian Department of Primary Industries Explore Victoria Online – GeoVic Interactive Map, accessed Nov 2007.
Department of Sustainability and Environment (DSE)	2008	Victorian Department of Sustainability and Environment Biodiversity Interactive Map, http://nre.vic.gov.au, accessed June 2008.
Dodson, J & R Fullagar, L Head	1992	Dynamics of Environment and People in the Forested Crescents of Temperate Australia. In J Dodson (ed) *Australia and the South-West Pacific*. Melbourne, Longman Cheshire. pp 115-1159.
Douglas, JG & JA Ferguson	1993	*Geology of Victoria*. Victoria Division, Geological Society of Australia, Melbourne.
Edgecombe, J	1989	*Phillip Island and Western Port*. J M Edgecombe, Sydney.
Edwards, R	1972	*Aboriginal Bark Canoes of the Murray Valley*. Rigby, Adelaide. South Australian Museum.
Gaughwin, D	1981	Sites of Archaeological Significance in the Western Port Catchment. A report to the Environmental Studies Division, Ministry for Conservation, Victoria.
Gaughwin, D & M Sullivan	1984	Aboriginal Boundaries and Movements in Western Port, Victoria. *Aboriginal History* 8(1): 80-98.
Gott, B	1983	Muirnong – Microseris scapigera. A Study of Staple Food of Victorian Aborigines. *Australian Aboriginal Studies* 2-17.
Goulding, M	1988	Aboriginal Occupation of the Melbourne Area, District 2
Gunson, N	1974	*The Good Country: Cranbourne Shire*. Cheshire, Melbourne.

Hewitt, G & J de Lange	2007	Report on Bend Road Archaeological Investigations, Bend Road 2 Phases 1 to 4. Report to Theiss John Holland.
Hicks, P	1991	Berwick-Pakenham Corridor Historical Survey. A Report to the Ministry for Planning and Environment.
Lane, S	1996	Dandenong-Hastings Rd Archaeological Survey & Subsurface Testing Report, Lyndhurst, Victoria. A report to VicRoads.
Land Conservation Council (LCC)	1991	*Melbourne Area. District Review.* Descriptive Report. Land Conservation Council, Melbourne.
Marshall, B	1995	An Archaeological Survey of the Lynbrook (Balance) Residential Estate, Lyndhurst. Urban Land Authority.
Marsden, M A H & H Mallet	1975	Quaternary Evolution, Morphology and Sediment Distribution, Western Port Bay. *Proceedings of the Royal Society of Victoria* 87: 107-138.
Marshall, B & C Webb	2001	An Archaeological Assessment of Kelly Bros Market Gardens, Lyndhurst. A report by TerraCulture Pty Ltd to Watsons Pty Ltd.
Martin, S	2006	Historical Assessment: Settlers Run Estate, Pearcedale Road, Cranbourne. A report by Sara Martin to Tardis Enterprises Pty Ltd.
Massola, A	1959	History of the Coast Tribe. *Victorian Naturalist* 76(7): 180-183.
McConnell, A	1981	Description of Stone Material Types. In H Sullivan, An Archaeological Survey of the Mornington Peninsula, Victoria. A report to the Ministry for Conservation. pp 158-160.
McBryde, I	1984	Kulin Greenstone Quarries: The Social Contexts of Production and Distribution for the Mt William Site. *World Archaeology* 16(2): 267-285.
McDougall, K	1987	Sites of Botanical Significance in the Western Region of Melbourne. Department of Conservation, Forests and Land.
Mulvaney, D J	1970	The Green Gully Burial: An Introduction. *Memoirs of the National Museum of Victoria* 30: 1-2.
Murphy, A	1997	An Overview of the Aboriginal Archaeology within the Non-Urban South & Non-Urban Foreshore, Victoria. A report to the City of Casey.
	2001	Proposed Cemetery, Lyndhurst: A Preliminary Cultural Heritage Investigation. A report by Tardis Enterprises Pty Ltd to Reeds Consulting.

	2002	Ranfurlie Archaeological Monitoring Project, 825 Cranbourne-Frankston Road, Cranbourne. A report by Tardis Enterprises Pty Ltd to Amstel Golf Club.
	2004	Proposed Glasscock's Road Extension, Lyndhurst: Cultural Heritage Assessment. A report by Tardis Enterprises Pty Ltd to the City of Casey.
Murphy, A & L Amorosi	2003	Stage 15A, Lynbrook Estate, Lynbrook: Archaeological Subsurface Testing Investigation. A report by Tardis Enterprises Pty Ltd to VicUrban.
Nicholls, C & M Chamberlain	2003	An Archaeological Survey of the Marriott Property, Thompsons Road, Lyndhurst. A report by TerraCulture Pty Ltd to Watsons Pty Ltd.
Paynter, N & D Rhodes & J Bell	2006	Subsurface Testing for Indigenous Archaeological Sites, 40 Olive Road, Lynbrook. A report by Heritage Insight Pty Ltd to DeNova Group Pty Ltd.
Presland, G	1983	An Archaeological Survey of the Melbourne Metropolitan Area. *Victoria Archaeological Survey Occasional Report Series* No 15. Aboriginal Affairs Victoria.
Presland, G	1994	*Aboriginal Melbourne. The Lost Land of the Kulin People*. McPhee Gribble Publishers, Victoria.
Rhodes, D	2001	City of Greater Dandenong Aboriginal Heritage Activity. City of Greater Dandenong.
	2002	An Archaeological Survey of a Proposed Industrial Estate Estate at Lyndhurst, Dandenong South. A report by Heritage Insight Pty Ltd to Devcon Group Pty Ltd.
	2004	Archaeological Survey of a Proposed Primary School Development, Lynbrook. A report by Heritage Insight Pty Ltd to the Department of Education.
Rhodes D & J Bell	2003	Eclipse Park Stud Estate Archaeological Survey and Subsurface Testing. A report by Heritage Insight Pty Ltd to Devcon Group Pty Ltd.
	2004	Shire of Cardinia Urban Growth Corridor Aboriginal Heritage Study. A report by Heritage Insight Pty Ltd to the Shire of Cardinia.
Rosengren, N & M Williams	1979	*Sites of Geomorphological / Geological Significance in the Western Port Region. Study Area 1, Top of the Bay Area*. Interim Report, Environmental Studies Program, Ministry for Conservation, Victoria. Melbourne.

Rowan, J	1990	*Land System of Victoria*. Land Conservation Council, Melbourne.
Schiffer, MF & CJ Gumerman	1977	*Conservation Archaeology: A Guide for Cultural Resource Management Studies*. Academic Press, New York.
Sciusco, L	1996	Archaeological Survey of a Pipeline Easement Between Dandenong - Hastings Road and Knowles Road, Cranbourne. A report for the Ministry for Conservation.
Smith, L	1989	The Berwick-Pakenham Corridor. The Archaeological Survey of Aboriginal Sites. A report to the Victoria Archaeological Survey, Ministry for Planning and Development.
Snoek, W	1987	Archaeological Survey of Dandenong Creek and Police Paddocks. A report for the Dandenong Valley Authority and the Victoria Archaeological Survey.
Spreadborough, R & H Anderson	1983	*Victorian Squatters*. Red Rooster Press.
Sullivan, H	1981	An Archaeological Survey of Mornington Peninsula, Victoria. *Victoria Archaeological Survey Occasional Report* No 6. Department of Conservation and Environment.
Thomas, D E et al	1967	Geology of the Melbourne District, Victoria. *Geological Survey of Victoria*. Bulletin No 59. Mines Department, Melbourne, Victoria.
Thomas, W	1838-67	William Thomas Papers, 1838-67. Uncatalogued manuscripts, Set 214, Items 1-24. Mitchell Library, Sydney.
	nd	ML Private Papers, 16 volumes and 8 boxes of papers, journals, letterbooks, reports, etc.
	nd	PRO Official Reports, original manuscripts, two papers. Public Records Office, Melbourne, Victoria.
Thomson, M	2002	Cultural Heritage Assessment Terminal Station, Thompsons Road, Cranbourne, Victoria. A report by Biosis Research Pty Ltd to TXU Networks and United Energy.
	2005	An Archaeological Monitoring Program along Thompsons Road, Lyndhurst, Victoria. A report by Biosis Research Pty Ltd to VicRoads.

Walsh, FJ	1987	The Influence of the Spatial and Temporal Distribution of Plant Food Resources on Traditional Martujarra Subsistence Strategies. *Australian Archaeology* 25: 88-101.
Weaver, F & M Haley	2001	Valentine Park, 250 Dandenong-Hastings Road, Lyndhurst, Victoria. A report by Practical Archaeological Services Pty Ltd to Breese Pitt Dixon Pty Ltd.
Weaver, F & M Haley	2002	*Anco Turf Farm* 340 Dandenong-Hastings Road, Lyndhurst, Victoria: Proposed Residential Development, A Survey for Aboriginal and Historic Archaeological Sites. A report by Practical Archaeological Services Pty Ltd to Australand Holdings Limited.
White, JP & JF O'Connell	1982	*A Prehistory of Australia, New Guinea Sahul.* Academic Press, Sydney.

APPENDIX A5 – DPO CHECKLIST

LYNDHURST DPO3 - EAST
CHECK LIST - REFERENCE

DPO 3 REQUIREMENT	DPO ITEM REFERENCE	DPO PLAN REFERENCE
Exhibition	Council ___ September 2002	N/A
Not more than 2 stages	Complied with	Clause 43.03 plan -page 3 & Physical Context Plan - page 4
Provision of arterial Road - Remington Drive / Colemans Road	Not within DPO -East	N/A
Appropriate road alignment preventing through traffic Colemans / Bayliss Road	3.2.2 - page 10	Road Network Plan page 12 & - Traffix Appendix
Appropriate treatment of non-urban interfaces	Section 8	Vegetation Retention/ planting Plan page 20
Appropriate treatment & buffering of interfaces between :		
existing tipping areas	Section 8.5 -8.7	
Open space	Section 8.8	
Areas of environmental significance	Sections 8.9 & 8.10	
Railway line - active frontages	Section 3.1	Rail Network Plan page 9
Building setbacks consistent with Remington Drive	Section3.2 And Clause 22.03 still applies	Road Section Plan page 13
DPO shows potential open space network and linkages :	Section 4	Vegetation Retention/ planting Plan page 20
linked by walking / cycle paths	Section 3.3	Pedestrian Network Plan page 16
integrated with abutting	Section 3.3	Pedestrian Network Plan page 16
links along waterways	Section 3.3	Pedestrian Network Plan page 16
DPO consistent with best practice stormwater	Section 5.2	N/A
Identify significant vegetation	Section 4.1.2	Vegetation Retention/ planting Plan page 20 & - Biosis Appendix & -Terracultre Appendix

DPO 3 DESCRIPTION	DPO ITEM REFERENCE	DPO PLAN REFERENCE
SEGA elements	Section 1.1	N/A
Location of significant sites:		
environmental	4.1.2	Vegetation Retention/ planting Plan page 20 & - Biosis Appendix & -Terracultre Appendix
cultural	Section 7	Terraculture Appendix
Transport hierarchy:		
walking	Section 3.3	Pedestrian Network Plan page 16
automobiles	Section 3.2	Road Network Plan page 12 & - Traffix Appendix
bicycles	Section 3.3	Pedestrian Network Plan page 16
fixed rail	Section 3.1	Rail Network Plan page 9
aeroplanes	N/A - remote from airfields	
Physical infrastructure	Section 5	
Funding:		
Public	Section 3.1 0- Railway Station	Rail Network Plan page 9
Private	Section 9.1	
Staging of development	Section 9.2	
Treatment of Drainage assets	Section 5.2	
Site works	Section 4.1	Concept Fill Plan page 18
Energy efficient building design	Section 5.9	
Pipeline protection	Section 4.3	Pipeline referral Plan page 23
Fencing around environmental features	Sections 8.8 , 8.10 & 7.3.2	

APPENDIX A6 – DPO SCHEDULE 3

SCHEDULE 3 TO THE DEVELOPMENT PLAN OVERLAY

Shown on the planning scheme map as **DPO3**

1.0 Requirement before a permit is granted

A permit may be granted before a development plan has been prepared to the satisfaction of the responsible authority for:

- Any building or works associated with the use of the land for agriculture.
- Extensions or alterations to an existing building or works constituting an area not greater than 10% of the area of the existing building or works.

2.0 Conditions and requirements for permits

A permit must not prejudice the outcomes shown in the South-Eastern Growth Area Plan or any likely outcome of the development plan.

If appropriate, a permit must include conditions that address the following matters:

- Any requirements of the development plan.
- Provision of public open space.
- Connection to reticulated sewerage, electricity and water supply systems.
- Retention and protection of existing native vegetation.
- On site treatment of stormwater.
- Maximisation of energy efficiency.
- Provision of all weather access to each lot and building envelope.
- Protection of existing environmental features including vegetation, soil and water.
- Construction of the vehicular and pedestrian circulation network.
- Covenants on lot titles including controls over the planting of non indigenous trees and shrubs.
- Protection of significant flora and fauna (ie communities listed under the *Flora and Fauna Guarantee Act* 1988 and species listed as threatened by the Department of Natural Resources and Environment).

3.0 Requirements for development plan

The development plan must be exhibited to the public for a period of four weeks before the responsible authority considers the plan for approval. The comments of the public and the following authorities must be taken into account when the responsible authority considers the plan for approval:

- The Department of Natural Resources and Environment.
- The Casey City Council.
- The Country Fire Authority.
- The Roads Corporation.
- The Director of Public Transport.
- The Victorian Rail Track Corporation.

- Relevant freight and passenger rail operators.
- The Environment Protection Authority.
- Relevant telecommunications, electricity, gas and water providers.
- Origin Energy, Elgas or any other owners or operators of gas, LPG or oil transmission pipelines in the area.

The development plan must meet the following requirements:

- The development plan must be prepared in no more than two stages as shown on Figure one below.

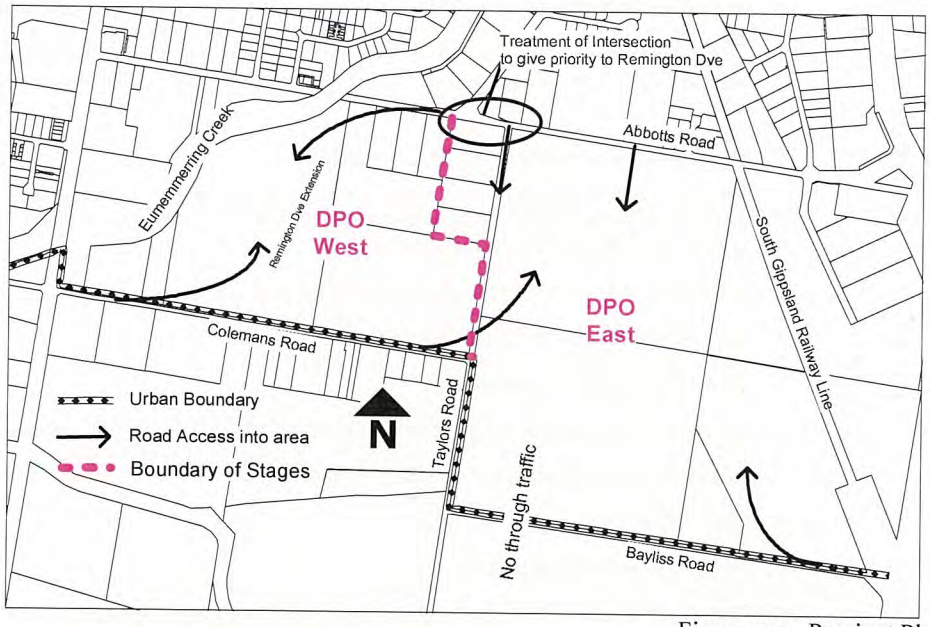


Figure one Precinct Plan

- Provision of an arterial road linking Remington Drive and Colemans Road at a standard equal to that of Remington Drive north of Abbotts Road and to the requirements of Council and the Roads Corporation.
- Appropriate road alignment and treatment (as outlined in Figure one) to prevent the use of Colemans, Taylors and Bayliss Roads as through routes from Dandenong Frankston Road to the Westernport Highway or vice versa.
- Appropriate treatment of the non-urban interface incorporating landscape setbacks.
- Appropriate treatment and buffering of the interfaces between existing tipping areas, open space, areas of environmental significance and the railway line incorporating active frontages to these where possible.
- Building setbacks consistent with those in the Remington Drive estate.
- The development plan must show the potential open space network and linkages to other existing or proposed open space areas. The public open space areas must:
  - Be linked through the provision of walking and cycle trails and rights of way.
  - Be integrated with open space contributions from abutting subdivisions.
  - Incorporate, where possible, links between major parks and activity areas, along waterways and natural drainage corridors, connecting places of natural and cultural interest, as well as maintaining public accessibility on public land immediately adjoining waterways.
- The development plan must be consistent with best practice environmental management of urban stormwater.

- Identification and measures for the conservation of remnant redgums and other locally indigenous vegetation, including an environmental assessment of significant sites by a suitably qualified consultant to the satisfaction of the responsible authority and Department of Natural Resources and Environment.

The development plan must describe:

- Any element of the South-Eastern Growth Area Plan which is appropriate to the development of the area.
- The location of sites, features and objects of environmental and cultural significance.
- The existing and proposed integrated transport hierarchy. Integrated transport means a unified system or strategy accounting for and providing synergy between all methods and modes of transporting people, goods and services, including but not limited to walking, automobiles, bicycles, fixed rail links and aeroplanes.
- The location of major physical infrastructure.
- The proposed arrangements for the funding and provision of works, physical and social facilities and services from public and private sources.
- The proposed staging of development.
- Treatment of drainage assets as landscape features in addition to their functional requirements which do not compromise significant vegetation or landscape.
- The potential for site works (fill and excavation).
- The measures proposed to encourage energy efficient building design.
- The measures proposed to protect the existing gas, LPG and oil pipelines running through the area.
- The construction details of fencing around significant environmental features.
- Vehicular and pedestrian circulation networks.
- Transport management measures to accompany development and must include an Integrated Transport Plan to address what infrastructure changes are required to be developed including additions to the arterial road network, prohibition of access to some roads at certain points, a railway station in close proximity to Abbotts Road and the pedestrian and bicycle network connecting to Dandenong Creek and Lynbrook.
- How development will comply with best practice environmental management of urban stormwater.
- How overland drainage lines will be protected and enhanced.
- Land capability including an assessment of the effectiveness of storm water being treated within the lot boundaries and the effect of change from rural to urban land use on the Eumemmerring Creek.
- How areas of environmental significance will be protected using buffer zones.
- How indigenous flora and fauna values will be retained, enhanced and protected.
- How land degradation will be controlled and degraded areas will be restored.
- How road and public open space areas will be landscaped with indigenous vegetation.
- How the planting of non-indigenous flora by future owners will be controlled.
- How noxious and environmental weeds and pest animals will be controlled including the need to minimise the spread of weeds and soil pathogens.
- How essential services will be provided.

APPENDIX A7 – ENVIRONMENTAL MANAGEMENT PLAN

Environmental Management Plan for land south of Abbotts Road, Lyndhurst, Victoria

30 August 2005

Andrew J Hill and Catherine Costello

This copy of Environmental Management Plan for land south of Abbotts Road, Lyndhurst, as required by the approved Development Plan (Eastern Stage) pursuant to Clause 43.04 Schedule 1 of the Greater Dandenong Planning Scheme has been prepared to the satisfaction of the Responsible Authority and Department of Sustainability and Environment.

Signed: [signature] and dated 28 October 2005

by Manager Planning and Design

for City of Greater Dandenong

BIOSIS
RESEARCH

Report for Devcon Group

Environmental Management Plan for land south of Abbotts Road, Lyndhurst, Victoria

30 August 2005

Andrew J Hill and Catherine Costello

Project no. 3204

ACKNOWLEDGMENTS

Biosis Research acknowledges the contribution of the following people and organisations in preparing this report:

Department of Sustainability and Environment

- for access to ecological databases (Atlas of Victorian Wildlife, Flora Information System)
- Michelle McHugh

City of Greater Dandenong

- Darren Wilson
- Michael Smith
- Daryl Browne

Devcon

- Fred Krumins

Biosis Research Pty Ltd

- Sally Mitchell
- Ben Crockett
- Stephen Mueck
- Aaron Organ

CONTENTS

FIGURES

SUMMARY

Biosis Research was commissioned to prepare an Environmental Management Plan (EMP) for land within an industrial estate south of Abbotts Road, Lyndhurst. The Development Plan for the estate requires the preparation of an EMP and specifies the items that should be included.

The EMP is the over-arching document to protect the environmental values of the site during development. A specific Reserve Management Plan (Hill and Costello 2005) has also been prepared.

Priority management actions

Issues	Actions
Fencing and access control	Install and maintain temporary fencing to protect the Heathy Woodland strip on Taylors Road which is to be retained permanently. Install and maintain temporary fencing to protect Heathy Woodland in the remaining patch of Quality Zone 5 to allow for salvage of propagating material from this area during the period before it is cleared. Install temporary fencing around any scattered trees to be retained. The fence should be located five meters beyond the drip-line of the tree (including dead branches), and be at least 1 meter in height. Construct and maintain the permanent fence around the perimeter of the Conservation Reserve ('triangle woodland' and land east of National Drive) as agreed with Council and DSE except where a suitable fence already exists.
Contractor awareness	Instruct contractors and earthmoving personnel about the requirements for protection of retained areas, including the need to keep out of such areas and ensure that soil, construction materials, sediment and any other contaminants are kept outside the fence. Install signs on temporary and permanent fencing indicating 'Conservation area - No Unauthorised Entry' or similar.

Issues	Actions
Refuse management	Remove all refuse present in the conservation reserve with minimal disturbance to the soil and surrounding vegetation (i.e. removal by hand with minimal use of vehicles). Enforce local laws regarding rubbish disposal and control. Ensure that refuse is prevented from blowing around the site, and is placed in appropriate receptacles for disposal.
Drainage and erosion management	Obtain and implement specialist hydrological advice on the management of suitable hydrological conditions for the Conservation Reserve. Install sediment barriers, such as silt fencing comprising steel posts and geotextile at the base of any fill batter that is formed adjacent to the reserves to trap any sediment that would otherwise enter the reserve. On completion of earthworks, cover the batter with geotextile matting, weed-free mulch or other suitable material to prevent the movement of sediment from exposed earth batters. These batters will eventually be planted (see appropriate plantings Section 3.1.4). Use techniques (such as are provided in EPA guidelines) to ensure that concentrated drainage/run-off (stormwater) from industrial sites does not enter the conservation reserves.
Habitat restoration and landscaping	Plant indigenous species in landscaped areas adjacent to reserves. Heathy Woodland species should be used for the Heathy Woodland strip, and Plains Grassy Woodland species adjacent to the Conservation Reserve. A selection of species are provided Section 3.1.4). Salvage logs from trees that are cleared during development and relocate in and around the plantings in the vegetation buffer. Ensure logs are stockpiled without soil or other debris.

Net Gain Assessment

The vegetation of the study area varies in condition from poor to moderate and consists of three EVCs: Plains Grassy Woodland and Plains Grassy Wetland which are 'Endangered' in the bioregion, and Heathy Woodland, which is of 'Least Concern' in the bioregion (DSE 2003).

A total of 16.25 hectares of Plains Grassy Woodland is to be retained and managed within the Conservation Reserve. A further 5.77 hectares (containing 2.17 habitat hectares) of Plains Grassy Woodland will be removed.

A total of 1.30 hectares of Heathy Woodland is to be retained and managed within the Heathy Woodland strip on Taylors Road. A further 3.15 hectares (containing 0.7 habitat hectares) of Heathy Woodland will be removed.

A total of 0.95 hectares of Plains Grassy Wetland is to be retained and managed within the Conservation Reserve. A further 0.42 hectares (containing 0.09 habitat hectares) of Plains Grassy Wetland will be removed.

Under the proposed subdivision plan a total of **4.1 habitat hectares** are required to achieve net gain (3.26 habitat hectares of Plains Grassy Woodland, 0.14 habitat hectares of Plains Grassy Wetland and 0.70 habitat hectares of Heathy Woodland).

Provided that vegetation management and revegetation of a high standard are achieved, the offset requirements for vegetation removal can be met on-site over a ten year timeframe through conservation management of the Manna Gum strip and Conservation Reserve, and revegetation to provide the shortfall.

Total tree offset requirements are:

1) Protect 116 large old trees, and 16 medium trees; and

2) Recruit 865 new trees.

The tree protection requirement cannot be fully met on-site. A total of 59 large old trees and 114 medium trees from Plains Grassy Woodland, and 26 large old trees and 32 medium trees from Heathy Woodland will be retained and protected within the Conservation Reserve and Taylors Road retention area (data provided by Paul Flintoff).

1.0 INTRODUCTION

Biosis Research was commissioned by the Devcon Group, on behalf of Pall Mall Assets Pty Ltd, to prepare an Environmental Management Plan (EMP) for land within an industrial estate south of Abbotts Road, Lyndhurst (Figure 1). A Development Plan (Lyndhurst Industrial Development Plan Stage 1) has been prepared for the area in accordance with Schedule 3 of Clause 43.04 of the Greater Dandenong Planning Scheme. This Development Plan is required under Amendment C11 of the Greater Dandenong Planning Scheme and was adopted by Council in December 2002.

Clause 6.2 of the DP requires the preparation of an EMP for the whole of the subject land. The items that should be included in the EMP are specified, and form the basis of the current EMP.

The EMP will form part of a Section 173 Agreement under the Planning and Environment Act 1987 and be prepared to the satisfaction of Council and the Department of Sustainability and Environment DSE (then Department of Natural Resources and Environment NRE). The EMP must be endorsed by Council and implementation of the Plan, including commencement of the Reserve Management Plan must begin within six months of issue of the first permit.

The EMP is the over-arching document to protect the environmental values of the site during development and includes a specific Reserve Management Plan (Hill and Costello 2005), Net Gain assessment and management actions for the site. It applies to Parcels I and K, which contain the areas of environmental significance within the Development Plan (DP) area.

Several ecological assessments have been conducted within the subject land, which have identified significant flora and fauna values throughout the site, particularly in the south and east (Bennison and Hill 2001, Hill and Organ 2002 and Organ and Hill 2002). Significant parts of the site are being retained and will be managed according to the Reserve Management Plan (RMP). Except for retained woodland along Taylors and Abbotts Road, the remainder of the land is planned for development.

Permits have been issued for development of Lots 1 and 2, and these areas, which abut the northern and western boundaries of the reserve, are fully developed.

The present EMP contains revisions to address comments on an earlier version (Hill 2005) by DSE and Council, and discussions during a meeting of interested parties on 22 July 2005. It also includes new data on the numbers of trees to be retained within the site.

1.1 Study Area

The industrial estate is located to the south of Abbotts Road, Lyndhurst (Figure 1). The study area for the Net Gain assessment and EMP are Parcels I and K, which contain the areas of environmental significance within the DP area. These parcels are bounded by Taylors Road, Abbotts Road, Cranbourne rail line, and, on the southern boundary, a landfill site and additional industrial land.

The vegetation of the study area comprises small to large areas of woodland vegetation, small areas of wetland, and large areas of predominantly introduced vegetation with occasional scattered trees.

Three areas of conservation significance within the estate are being retained and protected, and are described below. Areas 1 and 2 (see below) will ultimately be transferred to Council for management and are referred to within this report and depicted in Figure 3 as the Conservation Reserve.

1. Native vegetation on the eastern boundary (Parcel K, 'triangle woodland'). This area is identified under Schedule 2 to the Environmental Significance Overlay of the Greater Dandenong Planning Scheme as the Abbotts Road Vegetation Protection Area, and is stated to contain the most extensive stand of River Red Gum in the region;
2. Wetland and woodland vegetation that adjoins the triangle woodland, and is located to the east of National Drive (not constructed) and south of Lots 1 and 2 ('wetland/woodland area'); and
3. Woodland adjacent to Taylors Road and Abbotts road ('Heathy Woodland strip').

The study area is within the Gippsland Plain bioregion (DSE 2003).

2.0 AIMS

The aims of this EMP are to:

- protect the proposed Conservation Reserve and the Heathy Woodland strip from disturbance associated with the development of the industrial estate;
- maintain the biodiversity of the site by maintaining natural ecosystem processes within areas of retained native vegetation; and
- assess the proposed development of the land in terms of the Net Gain policy (NRE 2002) and identify offset requirements.

The more detailed management requirements for reserved areas are provided in a separate reserve management plan (RMP) in accordance with Section 6.4 of the DP.

3.0 MANAGEMENT ACTIONS

The management recommendations contained in the section of the EMP apply during the period of development of the industrial allotments and are expected to be fully implemented over the short to medium-term (within five years).

The management of the site will be funded by the owner of the property in a manner that maintains its ecological values. The overall co-ordination of the EMP works should be assigned to a qualified botanist/ecologist or others as approved by the Responsible Authority.

3.1 Protection of the Reserves and Trees during and after construction

3.1.1 Fencing and Access Control

Issues

Fencing **must** be established as soon as practicable to prevent accidental damage from machinery or human traffic to the reserves and any trees to be retained. Temporary fencing is necessary to protect areas from accidental damage during development of adjacent land. Temporary fencing is therefore required, where not already present, for the following areas:

- the Heathy Woodland strip and Conservation Reserve;
- areas that are expected to be cleared in the longer term, and are currently proposed for species salvage (e.g. the largest Heathy Woodland patch (Quality Zone 5) that remains in the north-east of the site); and
- trees that are to be retained (if any). Given the extent of filling that is required across the whole site, we are advised that it is unlikely that any scattered trees (i.e. outside the area shown as 'retained' in Figure 3) will be retained within Parcels I and K.

Permanent fencing should be established around the Conservation Reserve as soon as practicable. Permanent fencing is required to prevent entry by motor bikes, firewood collectors and people dumping rubbish. The DP requires that the reserve area should be fenced on completion of adjoining developments with black-coated chain wire mesh at least 2.1 metres in height.

The proponent has agreed to provide chain mesh fencing around the Conservation Reserve as specified, as soon as approval is obtained from Melbourne Water and VicTrack, which are the adjoining land managers on the southern and eastern boundaries. At Council's request the posts will be 2.4 metres high to allow installation of barbed wire if required. Two gates

will be provided into the reserve of adequate width to allow for access by emergency and maintenance machinery and vehicles.

The fences should be constructed with minimal impact on the reserves and trees. Soil from trenches and post-holes should not be placed within the fenced areas and any disturbance within these areas minimised.

Civil works and site filling are to be completed by or supervised by Devcon. Devcon should ensure that site personnel are instructed about the significance of fenced out areas within the subject land (including areas under temporary protection) and of the prescriptions regarding vehicular and personal access to these areas. Retained areas must be protected from trampling, soil disturbance or inflows of sediment or other pollutants.

Signs should be installed on temporary and permanent fencing to indicate that unauthorised entry is prohibited.

Actions

1. Install and maintain temporary fencing to protect the Heathy Woodland strip which is to be retained permanently.

2. Install and maintain temporary fencing to protect Heathy Woodland in the remaining patch of Quality Zone 5 (Figure 2) to allow for salvage of propagating material from this area during the period before it is cleared.

3. Install temporary fencing around any scattered trees to be retained. The fence should be located five meters beyond the drip-line of the tree (including dead branches), and should be at least 1 metre in height.

4. Construct and maintain the permanent fence around the perimeter of the Conservation Reserve as agreed with Council and DSE except where a suitable fence already exists.

5. Instruct contractors and earthmoving personnel about the requirements for protection of retained areas, including the need to keep out of such areas and ensure that soil, construction materials, sediment and any other contaminants are kept outside the fence.

6. Install signs on temporary and permanent fencing indicating 'Conservation Area - No Unauthorised Entry' or similar.

Performance Measures

Successful implementation will be measured by:

- The presence of temporary and permanent fencing and signage as described above.
- Maintenance of permanent fencing around the Conservation Reserve in good repair at all times.

3.1.2 Refuse

Litter and other refuse generated during site development and building construction requires appropriate containment and disposal. If rubbish is allowed to accumulate within reserve areas, it can result in smothering of native vegetation and provide harbour for pest animals. The presence of litter and rubbish also encourages others to dump refuse in the area.

Naturally occurring rocks or logs within the reserves do not require removal, and should be left undisturbed as fauna habitat.

Action

1. Remove all refuse present in the conservation reserve with minimal disturbance to the soil and surrounding vegetation (i.e. removal by hand with minimal use of vehicles within the conservation reserve).
2. Enforce local laws regarding rubbish disposal and control.
3. Ensure that refuse is prevented from blowing around the site, and is placed in appropriate receptacles for disposal.

Performance Measures

Successful implementation will be measured by:

- Absence of refuse in the conservation reserve and tree areas, especially during construction periods on adjacent sites.
- Presence of naturally occurring rocks or logs within the reserves.
- Absence of refuse accumulating or being blown onto permanent and temporary fences.

3.1.3 Drainage and Erosion Management

Developments adjacent to the Conservation Reserve must avoid disruption to the reserve hydrology. Plains Grassy Woodland and Plains Grassy Wetland require seasonally water-logged soils or periods of shallow inundation. The areas of

Grassy Wetland (Quality Zone 9) are part of a broad-shallow drainage line. The land to the north of this drainage line is now filled and fully developed. There is potential for 'harvesting' of water from this building area to provide additional water for the Conservation Reserve.

Developments adjacent to the Conservation Reserve may potentially result in additional or contaminated flows into this area. During land filling and construction, drainage flows should be managed to prevent the entry of water flows containing sediment or other pollutants.

Action

1. Obtain and implement specialist hydrological advice on the management of suitable hydrological conditions for the Conservation Reserve.

2. Install sediment barriers, such as silt fencing comprising steel posts and geotextile at the base of any fill batter that is formed adjacent to the reserves to trap any sediment that would otherwise enter the reserve.

3. On completion of earthworks, cover the batter with geotextile matting, weed-free mulch or other suitable material to prevent the movement of sediment from exposed earth batters. These batters will eventually be planted (see appropriate plantings in Table 1).

4. Use techniques (such as are provided in EPA guidelines) to ensure that concentrated drainage/run-off (stormwater) from industrial sites does not enter the Conservation Reserve.

Performance Measures

Successful implementation will be measured by:

- Occurrence of periodic waterlogging/shallow flooding within the Conservation Reserve after significant rainfall events.
- No evidence of sediment inflows into the reserve following rainfall events.
- Other performance measures defined as a result of hydrological advice.

3.1.4 Appropriate Species for Planting Near Reserves

Landscaping provides opportunities for plantings using some of the flowering plant species from the site. Indigenous species will also be planted on the surrounding batter to provide a transition to the reserves, and be located within the vegetation buffers (Figure 3). Some of the woodland species proposed for these areas are listed below for their respective EVC (Table 1).

Actions

1. Plant indigenous species in landscaped areas adjacent to reserves. Heathy Woodland species should be used for the Heathy Woodland strip, and Plains Grassy Woodland species adjacent to the Conservation Reserve. A selection of species are provided in Table 1.

Performance Measures

Successful implementation will be measured by:

- Landscaping/revegetation of exposed batters/nearby areas with indigenous species and low weed levels.

Table 1: Species suitable for landscape/buffer plantings.

Scientific Name	Common Name
Heathy Woodland Strip	
Acacia oxycedrus	Spike Wattle
Acacia paradoxa	Hedge Wattle
Leptospermum continentale	Prickly Tea-tree
Amperea xiphoclada var. *xiphoclada*	Broom Spurge
Eucalyptus viminalis ssp. *pryoriana*	Coast Manna-gum
Lepidosperma concavum	Sandhill Sword-sedge
Lomandra longifolia	Spiny-headed Mat-rush
Solanum laciniatum	Large Kangaroo Apple
Trachymene anisocarpa	Parsnip Trachymene
Plains Grassy Woodland/Wetland Conservation Reserve	
Leptospermum continentale	Prickly Tea-tree
Lomandra longifolia	Spiny-headed Mat-rush
Carex inversa	Knob Sedge
Juncus pauciflorus	Loose-flower Rush
Dianella longifolia var. *longifolia*	Pale Flax-lily
Eucalyptus camaldulensis	River Red-gum
Eucalyptus microcarpa	Grey Box
Eucalyptus ovata	Swamp Gum
Microlaena stipoides var. *stipoides*	Weeping Grass
Senecio quadridentatus	Cotton Fireweed
Solanum laciniatum	Large Kangaroo Apple
Themeda triandra	Kangaroo Grass

3.1.5 Design requirements for Construction Adjacent to the Reserve Areas

No specific design requirements are necessary. The building on lot 2 is already constructed, and the setback is such that shading of the Conservation Reserve is not significant. A road abuts the remainder of the western boundary, so shading

from the west is also unlikely.

3.1.6 Habitat restoration

Logs and other coarse woody debris in the natural environment play a significant role in providing habitat for fauna species. These resources are limited across the landscape as logs are often removed for firewood and/or cleared for aesthetic reasons. Under the Net Gain policy there is provision to carefully place logs in revegetation works to achieve a gain in habitat score.

Trees that are to be removed within the development provide a supply of logs that can be used to supplement existing habitat features.

Actions

1. Salvage logs from trees that are cleared during development and replace in and around the plantings in the vegetation buffer.
2. Ensure logs are stockpiled without soil or other debris.

Performance measures

Successful implementation will be measured by:

- Careful placement of logs within areas marked on Figure 3.

3.2 Management of Vegetation Loss

3.2.1 Status and Conservation of the Studley Park Gum

Throughout the reserve areas there are several eucalypt species, including River Red-gum, Swamp Gum, Coast Manna Gum and hybrids (Kevin Rule, pers. comm.). Several trees adjacent to the boundary of the 'triangle' woodland and within the woodland east of National Drive are hybrids between River Red-gum and Swamp Gum, and each shows distinct variations. The natural hybrid between River Red Gum and Swamp Gum, sometimes referred to as Studley Park Gum *Eucalyptus X studleyensis*, occurs widely throughout Victoria although the published name refers specifically to a small population occurring in the Studley Park area.

These trees are represented by several specimens located throughout the reserves and are currently considered by DSE to be endangered within the State (FIS 2004).

3.2.2 Potential for Tree Retention

Tree species are scattered over the entire site. Significant numbers are to be retained and protected within the reserves.

We are advised that, due to the requirement for filling over the remainder of the site, there is little potential to retain additional trees within the industrial estate.

3.2.3 Translocation and Seed Collection

Native vegetation outside the reserve areas supports a number of plant species that are considered to be of local and regional significance for conservation and/or are otherwise absent from the area set aside. This material provides the best opportunity, both ecologically and economically, to rehabilitate disturbed areas within the site and to further conserve the biodiversity of the site.

Some of the Plains Grassy Wetland remnants have already been translocated to one of the small dams in the south of the site. Sods were translocated to the small dam by a tractor and these will be monitored as recommended by the RMP.

Heathy Woodland in the north-west of the subject land are now the only areas that remain where there is potential to salvage propagating material (seeds and/or vegetative material) for use in reserve plantings and/or landscaping.

Actions

1. Salvage and store seed and/or vegetative material from Heathy Woodland patches for use in landscaping and/or planting in the Heathy Woodland strip, using an appropriate contractor or indigenous nursery.

2. Use shrubs and trees propagated from locally collected seed and/or plants for buffer plantings and planting within the Heathy Woodland strip if any opportunities arise.

Performance measures

Successful implementation will be measured by:

- Collection, propagation and re-establishment of plants from outside the reserve areas.

- Established landscaping within the industrial estate using locally collected material.

4.0 NET GAIN

4.1.1 Introduction

State Government policy (NRE 2002): *Victoria's Native Vegetation Management – A Framework for Action*), and the regional *Native Vegetation Plans*, has adopted the principle that there should be a net gain in the extent/quality of native vegetation throughout the state, whereby there is:

a reversal, across the whole landscape, of the long-term decline in the extent and quality of native vegetation, leading to a Net Gain (NRE 2002).

The Framework is an incorporated document under the provisions of the *Planning and Environment Act 1987* (Victorian Planning Provisions) and provides State Government policy for the protection, enhancement and revegetation of native vegetation across Victoria. In association with the Draft Native Vegetation Plans, which have been prepared for each Catchment Management Authority, the Framework provides decision-making tools for native vegetation management.

There is a **three step approach** to ensure Net Gain:

1. Avoid adverse impacts, particularly through avoiding vegetation clearance.
2. If impacts cannot be avoided, minimise impacts through appropriate consideration in planning processes and expert input to project design and management.
3. Identify appropriate offset options.

The first priority of the Framework is to explore options to avoid impacts, or, if that is not possible, to minimise the clearance of native vegetation. If these options have been explored, and vegetation loss is unavoidable, the final step is the identification of suitable offsets.

Under the Framework, Net Gain losses and offsets are assessed in terms of:

- Habitat hectares, which is a measurement of habitat quality and quantity (Parkes et al. 2003, DSE 2004).
- Tree protection and/or replacement for the removal of large and medium trees, including both scattered trees and those within native vegetation.
- The role of native vegetation in land and water protection.

Offsets for permitted clearing can be achieved by improvements in the quality or extent of native vegetation in a selected 'offset area'. The conservation

significance of vegetation to be removed is also taken into account when the extent of offsets are determined.

A manual for the assessment of habitat quality has recently been published (DSE 2004, www.dse.vic.gov.au), however the remaining technical documents (Operational Guidelines and Net Gain manual) are not yet available.

This report details a Net Gain assessment for the vegetation that would be cleared for the proposed development and calculates a habitat hectare score utilising a standard field assessment sheet and methodology of Parkes et al. (2003). At the time of the assessment, the DSE manual was not available.

Potential offset sites outside the study area, were not examined as part of this assessment.

4.1.2 Net Gain Assessment Methodology

4.1.2.1 Habitat Hectare Assessment

Most of the habitat hectare assessment was carried out on 27 June 2002 with some minor revisions on 19 November 2003, including large/medium old tree assessments and polygon revision. The polygons mapped on 27 June 2002 were based on a poor quality aerial photograph and defined from tree cover. As a result of the 19 November 2003 revisions, the polygon boundaries were accurately mapped, taking note of where the understorey was considered to be > 11% indigenous cover or not. This resulted in Site 7 being reduced in size from 13.2 hectares to 9.34 hectares (this includes 1.07 hectares for Site 10), and the creation of Site 10, which had virtually no tree canopy compared with the remainder of Site 7. Another habitat hectare investigation was undertaken on the 21 September 2004 within Site 7. Vegetation quality zones are given in Figure 2.

Vegetation loss in terms of habitat hectares was undertaken on land bound by Abbots Road, Taylors Road, the Landfill site and Mills property, and the Cranbourne Railway line.

Habitat Hectare Analysis

Under the Framework, habitat hectares are calculated only where the indigenous understorey cover below indigenous trees is equal to or greater than 10% of the DSE-determined benchmark for the particular EVC. Such sites are termed 'patches' of native vegetation.

The habitat hectares approach is site-based. Each 'patch' of continuous native vegetation may consist of one or more Ecological Vegetation Classes (EVC) and may consist of one or more quality zones. Habitat quality is assessed for each

vegetation quality zone, which is a single EVC with a sufficiently uniform condition. The assessment process compares the vegetation at the study site against 'benchmark' descriptions generated by DSE. Habitat score is calculated by assessing the vegetation using defined criteria (DSE 2004). The *habitat score* is a value between 0 and 100, with extensive intact vegetation having a theoretical score of 100.

The *habitat hectare* value of a quality zone is given by its habitat score (expressed as a decimal between 0 and 1) multiplied by its actual area in hectares. For example, 4 hectares of vegetation with a habitat score of 50 contains 2.0 habitat hectares.

The habitat score is used to quantify vegetation losses arising from clearing, and also gains that may be obtained through protective measures and conservation management of existing vegetation.

The conservation status of the particular EVC is determined by using Victoria's Native Vegetation Management: A Framework for Action, Technical Support Maps for Local Government Authorities (DSE 2003). The score and the conservation status of the EVC are then combined to yield a conservation significance rating, which is outlined in the Vegetation Management Framework (NRE 2002). This figure in turn determines the net outcome multiplier required to satisfy the provisions of Net Gain.

Tree Assessment

Offset requirements for remnant trees are dependent on a number of factors, including their size. The size definition of a 'large old tree' is provided in the DSE benchmark for the relevant EVC. Only indigenous canopy trees are recorded.

'Large old trees' within vegetation patches are subject to offset requirements, as outlined in the Native Vegetation Management Framework (NRE 2002: Table 6, p 55).

Scattered old trees outside vegetation 'patches' are also subject to Net Gain. In such areas, medium and large old trees require offsetting in terms of protection and recruitment. The required amount of protection and/or recruitment for the loss of each tree is dependent on the density of the scattered old trees and their conservation significance.

For areas where there are greater than eight 'Old Trees' per hectare, the offset ratios are outlined in the Native Vegetation Management Framework (NRE 2002 p. 55).

For areas where there are less than eight 'Large Old Trees' per hectare, the specific offset ratios will be specified in the regional Native Vegetation Plans, when finalised.

Offset requirements for small trees are not included in the Native Vegetation Management Framework (NRE 2002), however they may be included in the operational guidelines and/or the regional Native Vegetation Plans when they are released.

The tree assessment with regard to the proposed clearance of old trees for the current development involves:

- Measurement of scattered large and medium old trees from the area proposed for development, where the understorey has an indigenous cover of less than 10%. These sizes are defined separately for each Ecological Vegetation Class (EVC).

- Measurement of large old trees within patches of native vegetation (with an indigenous understorey cover of greater than 10%), which are proposed to be cleared.

Large and medium trees are defined from EVC benchmark data supplied by DSE for Plains Grassy Woodland and have a 80 cm Diameter at Breast Height (DBH) and 60 cm DBH, respectively. Large and medium trees are defined from EVC benchmark data supplied by DSE for Heathy Woodland and have a 50 cm Diameter at Breast Height (DBH) and 37.5 cm DBH, respectively.

Limitations

The assessments were mainly conducted during winter, which is not optimal for flora survey within these EVCs. It is possible that some species may have been dormant at the time of survey, however the habitat hectare assessment is not considered to be limited by seasonal constraints.

Potential offset sites were not investigated and there are several criteria that must be met before a site can be used as an offset (NRE 2002).

4.1.3 Net Gain Results

4.1.3.1 Habitat hectare analysis

The vegetation of the study area varies in condition from poor to moderate and consists of three EVCs: Plains Grassy Woodland and Plains Grassy Wetland which are 'Endangered' in the bioregion, and Heathy Woodland, which is of 'Least Concern' in the bioregion (DSE 2003).

All examples of Plains Grassy Woodland and Plains Grassy Wetland are by definition either of 'high' or 'very high' conservation significance, depending on habitat score. Patches of Heathy Woodland are of 'medium' or 'low' conservation significance, as defined by Appendix 3 in the Vegetation Management Framework (NRE 2002).

A plan of proposed subdivision, as proposed by Pall Mall Assets, illustrates areas to be retained, and areas to be cleared for development (Figure 3). During habitat hectares assessment, several vegetation quality zones were mapped, based on the quality of the vegetation, EVC, and the presence of overstorey trees.

A summary of the habitat assessment for each vegetation quality zone is provided in Table 2, and the areas of each EVC to be removed and retained are given in Table 3.

Table 2: Habitat score calculations.

Polygon Number		Score out of	1	4	5	6	7	8	9	10	TOTALS
Mapping label											
EVC name			PGW	HW	HW	HW	PGW	PGW	PGWet	PGW	
EVC number											
Site condition	Large Old Trees	10	3	5	5	0	8	8	na	3	
	Canopy Cover	5	3	3	3	3	3	3	na	0	
	Lack of Weeds	15	5	5	10	5	10	10	10	10	
	Understorey	25	3	3	6	3	6	3	0	6	
	Recruitment	10	0	2	5.5	2	2	5.5	2	2	
	Organic Matter	5	3	0	0	0	3	0	3	3	
	Logs	5	0	0	0	0	0	0	na	0	
Landscape	Patch Size	10	1	1	1	1	6	6	1	6	
	Neighbourhood	10	0	0	0	0	1.2	1.2	0.3	1.2	
	Distance to Core	5	0	0	0	0	0	0	0	0	
Site Condition Score			17	18	29.5	13	32	29.5	15	24	
Standardised Site Condition Score									20.45		
Landscape Score			1	1	1	1	7.2	7.2	1.3	7.2	
HABITAT SCORE (/100)			**0.18**	**0.19**	**0.31**	**0.14**	**0.39**	**0.37**	**0.22**	**0.31**	
Area of the Quality Zone to be cleared (Hectares)			0.00	4.70	0.00	1.07	0.53	1.38	1.24	0.42	**9.340**
HABITAT HECTARES			0.000	0.893	0.000	0.150	0.208	0.506	0.270	0.131	**2.158**

PGW = Plains Grassy Woodland; HW = Heathy Woodland; PGWet = Plains Grassy Wetland.

Table 3: Summary of areas to be removed and retained

EVC type/Site No.	EVC	Total Area hectares	Area retained hectares	Area removed hectares	Area removed hab has
1	PGW	0.5	0.5	0	0
7	PGW	8.26	3.56	4.7	1.84
8	PGW	12.19	12.19	0	0
10	PGW	1.07		1.07	0.33
	Total PGW	**22.02**	**16.25**	**5.77**	**2.17**
4	HW	0.53	0	0.53	0.10
5	HW	2.68	1.30	1.38	0.43
6	HW	1.24		1.24	0.17
	Total HW	**4.45**	**1.30**	**3.15**	**0.70**
9	PGWet	**1.37**	**0.95**	**0.42**	**0.09**
TOTALS		**27.84**	**18.5**	**9.34**	**2.96**

PGW = Plains Grassy Woodland; HW = Heathy Woodland; PGWet = Plains Grassy Wetland.

In summary:

A total of 16.25 hectares of Plains Grassy Woodland is to be retained and managed within the Conservation Reserve. A further 5.77 hectares (containing 2.17 habitat hectares) of Plains Grassy Woodland will be removed.

A total of 1.30 hectares of Heathy Woodland is to be retained and managed within a conservation reserve (the Heathy Woodland strip). A further 3.15 hectares (containing 0.7 habitat hectares) of Heathy Woodland will be removed.

A total of 0.95 hectares of Plains Grassy Wetland is to be retained and managed within conservation reserves. A further 0.42 hectares (containing 0.09 habitat hectares) of Plains Grassy Wetland will be removed.

Under the proposed subdivision plan a total of 5.83 habitat hectares will or has been removed by development (2.17 habitat hectares of Plains Grassy Woodland, 0.09 habitat hectares of Plains Grassy Wetland and 0.70 habitat hectares of Heathy Woodland) (Figure 3).

Tree assessment within native vegetation.

Victoria's Native Vegetation Management: A Framework for Action (NRE 2002) specifies that where large old trees are to be removed from an area of native vegetation, the trees must be replaced at an appropriate ratio which depends on the conservation significance of the vegetation. The tree replacement ratio is specified in the Victorian Native Vegetation Framework (NRE 2002) as being a certain number of trees to be protected and recruited. Large trees in Plains Grassy Woodland have a DBH of > 80 cm and in Heathy Woodland a DBH of > 50 cm.

The numbers of trees to be removed within the native vegetation patches are listed in Table 4.

Table 4: Tree removal within native vegetation patches

EVC	Size Class	Numbers to be removed
Plains Grassy Woodland	Large (>80cm)	16
Heathy Woodland	Large (>50cm)	38

4.1.3.2 Scattered Tree Assessment

The Framework (NRE 2002a) also specifies that where trees are removed from predominantly introduced vegetation (with an indigenous understorey cover of less than 10%), the trees must be replaced at an appropriate ratio which depends on the size of the patch, conservation significance, and the density of trees affected.

For areas where there are greater than eight scattered old trees per hectare, offset ratios for medium and large old trees are outlined in the Native Vegetation Management Framework (NRE 2002b:55). There are no specific offsets provided for trees smaller than medium size.

For areas where there are less than eight scattered old trees per hectare, the specific offset ratios will be specified in the Regional Native Vegetation Plans, when finalised. In the interim, there are offset requirements described in the Draft Regional Native Vegetation Plans which can be used, or the ratios mentioned above for areas where there are greater than eight scattered old trees per hectare could be used. For the purposes of this report, in the absence of the Regional Native Vegetation Plan, the offset ratios in the Framework for parcels of land with *more* than eight scattered old trees per hectare have been used.

Offset requirements for small trees are not included in the Native Vegetation Management Framework (NRE 2002), however they may be included in the operational guidelines and/or the regional Native Vegetation Plans when they are released.

Numbers of scattered large and medium trees are given in Table 5:

Table 5: Tree removal outside vegetation patches.

EVC	Size Class	Numbers to be removed
Plains Grassy Woodland	Large (>80cm)	13
Plains Grassy Woodland	Medium (>60cm)	8
Heathy Woodland	Large (>50cm)	10
Heathy Woodland	Medium (>37.5 cm)	21

4.1.4 Estimate of required offsets

4.1.4.1 Habitat hectares

Offset requirements (Net Gain targets) vary according to the conservation status of EVCs and the habitat score for each polygon assessed. For instance, polygons containing EVCs with a higher conservation status, and/or a higher quality rating (habitat score) will receive a higher conservation significance value than polygons that contain EVCs of lower conservation priority and/or quality. This is relevant for determining the degree of Net Gain that is required under the Native Vegetation Management Framework.

The Framework proposes that responses to Net Gain at the local level, including the assessment of clearing applications, should reflect the conservation value of the vegetation. Under the Framework, clearing areas of high conservation significance is "generally not permitted". If clearing is permitted, the policy requires an offset area of at least 1.5 times the area to be cleared. For areas of low conservation significance, no multiplier is required.

The proposed subdivision of the site will result in the removal of native vegetation at the site, and therefore offsets will be required to meet the objectives of net gain. The Conservation Reserve and Heathy Woodland strip are to be retained (Figure 3) and will provide opportunities for habitat hectare gains, tree protection and tree recruitment.

Plains Grassy Woodland and Plains Grassy Wetland vegetation within the study area are of 'high' conservation significance (NRE 2002), and therefore at least 1.5 times the loss (of vegetation) in habitat hectares is required. Heathy Woodland vegetation within the study area has 'low' conservation significance (NRE 2002), and no multiplier is required.

The conservation significance of the vegetation and offset requirements for the development are provided in Table 6:

Table 6: Habitat hectare offset requirements for Net Gain.

Quality Zone		4	5	6	7	9	10	TOTAL
Bioregion		GP	GP	GP	GP	GP	GP	
EVC		HW	HW	HW	PGW	PGWet	PGW	
EVC Conservation Status		LC	LC	LC	E	E	E	
Conservation Significance	Conservation Status x Hab Score	LOW	LOW	LOW	HIGH	HIGH	HIGH	
	Threatened Species Rating	N/A	N/A	N/A	N/A	N/A	N/A	
	Other Site Attribute Rating	N/A	N/A	N/A	N/A	N/A	N/A	
	Overall Conservation Significance	**Low**	**Low**	**Low**	**High**	**High**	**High**	
Net Outcome Ratio		1	1	1	1.5	1.5	1.5	
Area of loss (hectares)		0.53	1.38	1.24	4.70	0.42	1.07	**9.340**
Hab ha loss (habitat hectares)		0.101	0.421	0.174	1.842	0.091	0.334	**2.963**
Net Gain offset required (habitat hectares)		**0.101**	**0.421**	**0.174**	**2.764**	**0.137**	**0.501**	**4.097**

Under the proposed subdivision plan a total of **4.1 habitat hectares** are required to achieve net gain (3.26 habitat hectares of Plains Grassy Woodland, 0.14 habitat hectares of Plains Grassy Wetland and 0.70 habitat hectares of Heathy Woodland).

4.1.5 Habitat hectare offset criteria

The methods of offsetting vegetation losses are dependent on the EVC to be cleared and its conservation significance. Additional criteria for achieving these offsets are included in the Native Vegetation Framework (NRE 2002b:54) and are summarised below for vegetation of high and low conservation significance:

High

- Offsets must be from the same EVC, or a very high significance EVC in the Gippsland Plain bioregion.
- Offset sites must have a similar or more effective ecological function, or land protection function, as areas impacted by the vegetation loss.
- The existing vegetation proposed to function as an offset must be at least 75 % of the quality of the area being lost.
- The proportion of revegetation included in the offset (in habitat hectares) must not be greater than 25 % of the habitat hectares lost.

Low

- Offsets can be from any EVC in the Gippsland Plain bioregion, or a very high or

high significance EVC in an adjacent bioregion.

- Offset sites must have a similar or more effective land protection function, as areas impacted by the vegetation loss.
- The existing vegetation proposed to function as an offset must be at least 50 per cent of the quality of the area being lost.
- Up to 100% of the offset may be achieved through revegetation.

4.1.6 Tree Offsets

Trees in native vegetation

The number of other large old trees requiring protection and new trees to be recruited which are required to offset permitted large tree clearance within native vegetation (indigenous understorey cover of greater than 10%), are listed in Table 7. The trees are proposed to be removed from sites with high and low conservation significance (see Figure 2).

Table 7: Offsets required for the loss of trees within native vegetation (indigenous understorey cover greater than 10%).

Tree Size and number removed	EVC and significance	Number of large trees protected and new trees recruited to meet offset
16 Large	Plains Grassy Woodland (high conservation significance)	64 (16 x *4*) other large old trees protected 320 (16 x *20*) new trees recruited
38 Large	Heathy Woodland (low conservation significance)	No specific 'other large old tree protection' offset

Numbers in brackets in 3rd column: number of trees from current assessment multiplied by number (Italics) taken from Framework (NRE 2002).

Scattered Trees

In the absence of finalised tree offset guidelines, the ratios in the Framework for parcels of land with *more* than eight scattered old trees per hectare have been used. This may provide an overestimate of the offset requirements for the site, but provides a guide for achieving Net Gain in the absence of the Regional Native Vegetation Plans.

Using these offset ratios, the number of trees required to offset the loss of medium and

large trees (where the indigenous understorey cover is less than 10%) are listed in Table 8.

Table 8: Offsets required for the loss of scattered trees (indigenous understorey cover of less than 10%).

Tree Size and number removed	EVC	Number of large trees protected and new trees recruited to meet offset
13 Large	Plains Grassy Woodland (high conservation significance)	52 (13 x *4*) other large old trees protected 260 (13 x *20*) new trees recruited
8 Medium	Plains Grassy Woodland (high conservation significance)	16 (8 x *2*) other medium trees protected 80 (8 x *10*) new trees recruited
10 Large	Heathy Woodland (low conservation significance)	0 (10 x *0*) other large old trees protected 100 (10 x *10*) new trees recruited
21 Medium	Heathy Woodland (low conservation significance)	0 (21 x *0*) other medium old trees protected 105 (21 x *5*) new trees recruited

Numbers in brackets in 3rd column: number of trees from current assessment multiplied by number (Italics) taken from the Framework (NRE 2002).

Overall Tree offsets

The total required tree offsets for **Plains Grassy Woodland** are:
Protect 116 (52 + 64) other large old trees, and 16 other medium trees, and recruit 660 (320 + 260 + 80) new trees.

The total required tree offsets for **Heathy Woodland** are:
Recruit 205 (105 +100) new trees.

Total tree offset requirements are:

1) Protect 116 large old trees, and 16 medium trees; and

2) Recruit 865 new trees.

4.1.7 Potential Options to achieve Net Gain

Offsets that may be achieved on-site within the conservation reserves (Conservation Reserve and Heathy Woodland Strip) are given in Table 9. Gains are achieved through vegetation management, foregoing allowed uses (i.e. allowable tree removal on rural land), active management (e.g. weed control) of retained vegetation, and revegetation (buffer plantings, such as Melbourne Water buffer and Mills property), and/or enhancement planting within the Conservation Reserve.

4.1.7.1 Management of existing vegetation

Habitat gains could be achieved through 'maintenance' (foregoing allowed uses such as stock grazing, removal of fallen timber, etc) and 'improvement' (active management through elimination of high threat weeds and rabbits) of existing vegetation on the proposed offset site (Conservation Reserve) and Heathy Woodland strip along Taylors Road.

Management commitments to achieve Net Gain include:

- retaining all standing trees, dead or alive (maintenance);
- excluding grazing (maintenance);
- retaining all fallen timber (maintenance);
- blocking off any artificial drains where this will improve the hydrological conditions for Plains Grassy Woodland and Plains Grassy Wetland (improvement);
- careful placement of logs (improvement);
- eliminating rabbits and burrows (improvement);
- supplementary plantings of understorey species where applicable (improvement); and
- reducing the cover of 'high threat' weed species (improvement).

Table 9: Quantification of offsets through management of remnant vegetation within the study area.

Quality Zone			7			8			5			1			9		
Site			Current Score	Maintenance	Improvement	Current Score	Maintenance	Improvement	Current Score	Maintenance	Improvement	Current Score	Maintenance	Improvement	Current Score	Maintenance	Improvement
EVC		Scores out of	PGW			PGW			HW			PGW			PGWet		
Site condition	Large Old Trees	10	8	na	na	8	0.8	na	5	na	na	3	na	na	na	na	na
	Canopy Cover	5	3	na	0.4	3	0.3	0.4	3	na	0.4	3	na	0.4	na	na	na
	Understorey	25	10	na	2.5	10	1	2.5	10	na	2.5	5	na	2.5	10	na	2.5
	Lack of Weeds	15	2	na	1.75	5.5	1.75	1.75	5.5	na	1.75	0	na	2	2	na	1.75
	Recruitment	10	6	na	2	3	0.3	1.5	6	na	2	3	na	1.5	0	na	0
	Organic Matter	5	3	na	2	0	0.6	3	0	na	3	3	na	2	3	na	2
	Logs	5	0	na	0*	0	0.6	0*	0	na	0*	0	na	5	na	na	na
Sum of maintenance/improvement gains					8.65		5.35	9.15			9.65			13.4			6.25
Adjustment for missing Site Condition components (75/55, for Plains Grassy Wetland																	77/55
Adjusted sum of Maintenance + Improvement Gain																	8.75
Improved security & prior mgt (20% of original score)				0.078			0.074			0.06			0.036			0.046	

Total gain in Habitat Points per hectare		0.165		0.22		0.157		0.17		0.134
Hectares		3.56		12.19		1.30		0.5		0.95
Net Gain (Habitat hectares)		0.586		2.67		0.203		0.085		0.127

na Not applicable

PGWet	Plains Grassy Wetland
HW	Heathy Woodland
PGW	Plains Grassy Woodland

The potential habitat improvement points gained over a 10 year period as a result of undertaking the above management activities are outlined in Table 9 for each retained vegetation quality zone. Management of the remnant Plains Grassy Woodland, Plains Grassy Wetland and Heathy Woodland within the study area over a 10 year period would yield an overall increase of 3.34 habitat hectares of Plains Grassy Woodland, 0.127 habitat hectares of Plains Grassy Wetland and 0.203 habitat hectares of Heathy Woodland. The offset requirement and gains available for each EVC are summarised in Table 10:

Table 10: Habitat hectare offset requirement and gains available for each EVC

EVC	Offset required	Gain available	Surplus/deficit
PGW	3.26	3.34	+ 0.077
HW	0.70	0.20	-0.492
PGWet	0.14	0.13	-0.01

The deficit in Plains Grassy Wetland can be met from the excess gains available in Plains Grassy Woodland. The largest deficit is in Heathy Woodland. If the remaining surplus Plains Grassy Woodland gain (0.067 habitat hectares) is used to partially offset this deficit, it is effectively 'worth more' because an EVC of higher conservation significance is being used to offset vegetation which is defined as 'low'. Taking into account this multiplier effect, the 0.067 habitat hectares of Plains Grassy Woodland is worth 0.067 x 1.5/1 habitat hectares; i.e. 0.10 habitat hectares if used to offset Heathy Woodland.

The remaining deficit when all available gains are used up is 0.39 habitat hectares, which is required to fully offset the loss in Heathy Woodland. This may be fully met by revegetation. An area of approximately 3 hectares would be required if a gain of 0.12 habitat hectares per hectare is assumed. There are no suitable areas for revegetation of Heathy Woodland within the estate. Revegetation of Plains Grassy Woodland/Wetland may be achieved instead. As this vegetation is of higher significance, the offset required and area to be planted would be proportionally reduced to (0.39 x 1/1.5 = 0.26) habitat hectares and 2.2 hectares respectively.

4.1.7.2 Revegetation

Revegetation must meet minimum DSE standards to qualify as an offset. These standards include the following guidelines:

- Locally indigenous species must be used.
- Planting densities must be relative to the EVC benchmark.
- Sites must be adequately prepared (e.g. weed control/mulching) and protected (fencing).
- Post-planting maintenance must be carried out (e.g. weed control).

Currently there are 3.5 hectares designated for buffer plantings (along the Melbourne Water drain and in Mills property, see Figure 3). Revegetation within the Conservation Reserve may be preferable from an ecological perspective. There is approximately 5 hectares within the Conservation Reserve that currently supports introduced vegetation and would be available for revegetation works.

Provided that vegetation management and revegetation of a high standard are achieved, the offset requirements for vegetation removal can be met on-site over a ten year timeframe.

4.1.7.3 Tree Offsets

The loss of any large old trees needs to be offset with tree recruitment and tree protection. The Conservation Reserve and Manna Gum strip are both suitable sites in which tree recruitment can be expected to occur. The management plan (RMP) will include recommendations to encourage tree regeneration. Natural regeneration is preferable in ecological terms that planting of trees, although planting may be beneficial in strategic locations, or where natural recruitment does not occur.

Table 11 provides details of the trees available for protection on site.

Table 11: Tree protection requirement and trees available for each EVC

EVC	Offset required	Gain available	Surplus/deficit
PGW	116 large (52 for 'scattered' trees; 64 for 'patch' trees); 16 medium	59 large 114 medium	-57 large +98 medium
HW	None specified	26 large 32 medium	

The tree protection requirement identified above was calculated using the Framework ratios for trees in native vegetation, and scattered trees (although the ratio for > 8 trees per hectare was extrapolated to the present site; see Section

4.1.6), and cannot be fully met on-site. The 59 large old trees (LOTs) to be protected in Plains Grassy Woodland provide most of the 'protect' requirement for large trees in patches native vegetation, however 5 additional trees would be required to fully offset this loss. There is a surplus of medium trees above what is required.

There is no 'protect' requirement for the loss of trees within the Heathy Woodland patches, however 26 large old trees and 32 medium trees are to be protected.

DSE and Council should be consulted in regard to a suitable outcome for tree offsets. Additional tree recruitment and/or revegetation in the Conservation Reserve may be an option, in conjunction with the protection of the 58 trees in the Heathy Woodland patch.

FIGURES

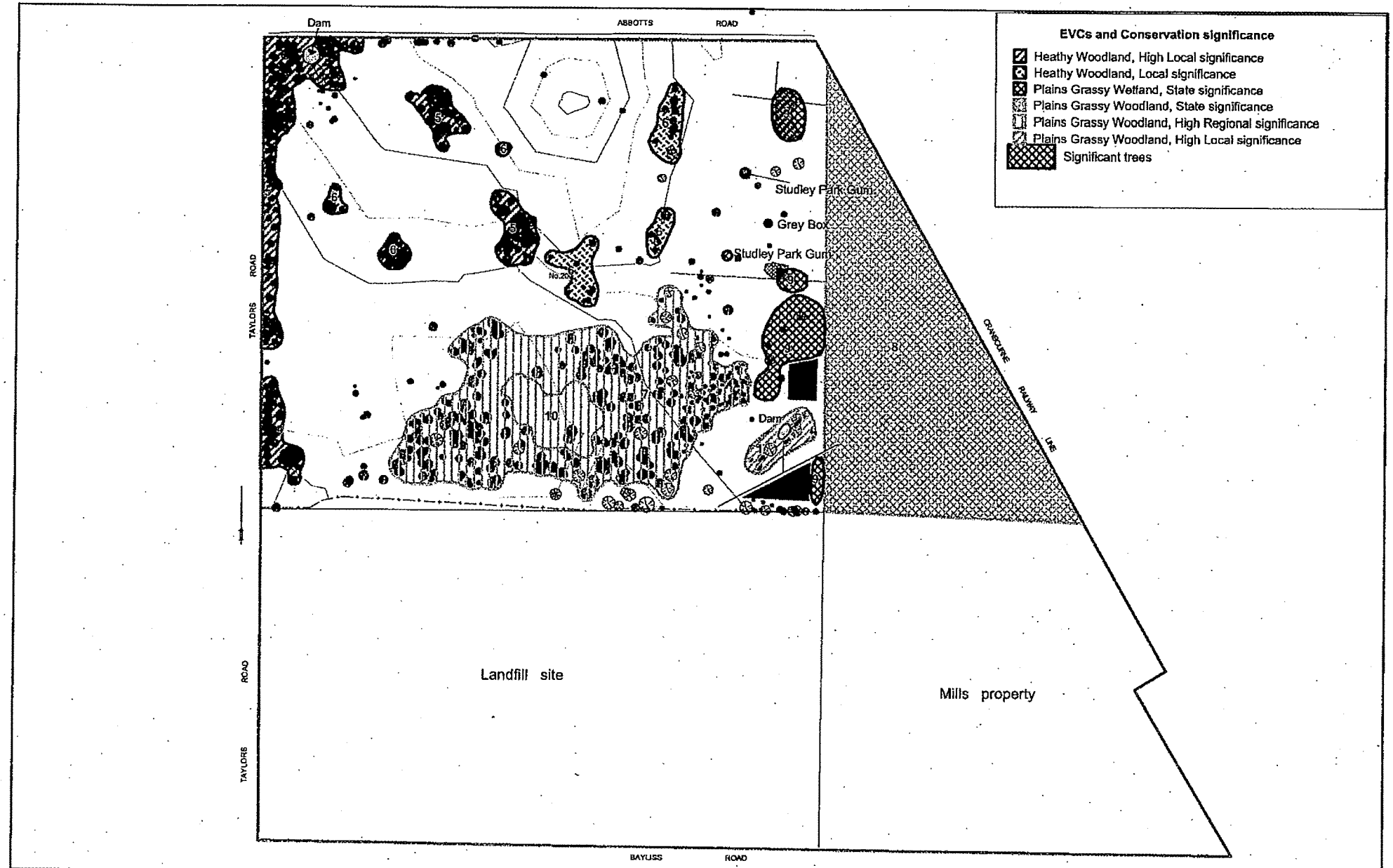
BIOSIS RESEARCH Pty Ltd
322 Bay Street
Port Melbourne
VICTORIA 3207

Figure 1: Location of potential offset sites examined.

DATE: 13 October 2003
Checked by: AH
File number: 3204
Location: \projects\MRG 3200s\3204\Mapping\3204 Fig 1.wor

Scale: 1 0 1 2 3 4 kilometres

N W E S



BIOSIS RESEARCH Pty Ltd

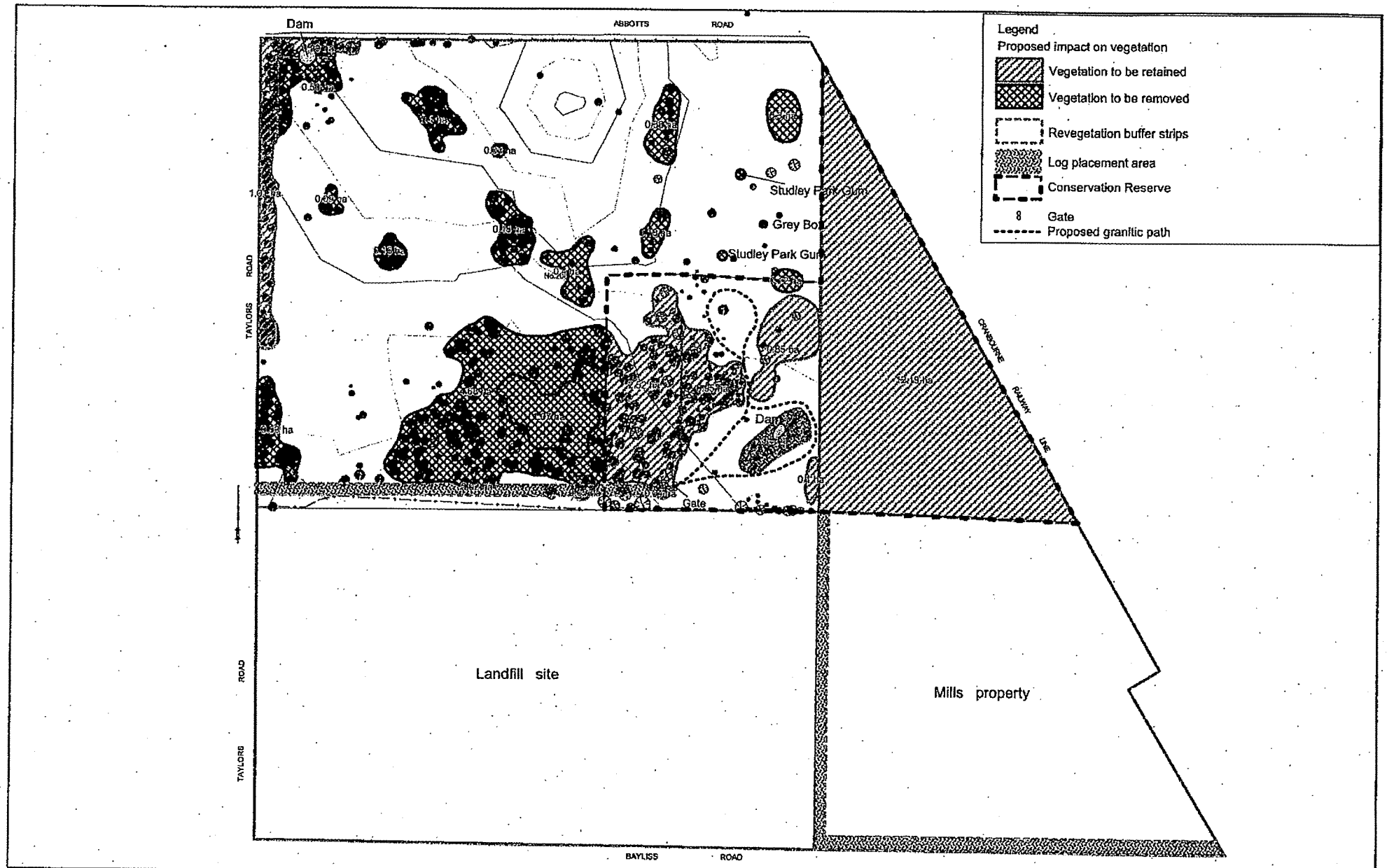
322 Bay Street
Port Melbourne
VICTORIA 3207

Figure 2: Vegetation assessed using the Habitat Hectare methodology.

DATE: 10 June 2005
Checked by: CC
File number: 3204
Location: ...\projects\MRG 3200s\3204\Mapping\3204 Fig 2.wor

Scale: 0 50 100 150 200 250 metres

Figure 2: Vegetation assessed using the Habitat Hectare methodology.



BIOSIS RESEARCH Pty Ltd
38 Bertie Street
Port Melbourne
VICTORIA 3207

Figure 3: Vegetation to be retained and lost and revegetation buffer strips.

DATE: 3 June 2005
Checked by: CC
File number: 3204
Location: ...\projects\IRG 3200s\3204\Mapping\3204 Fig 3.wor

Scale: 0 50 100 150 200 250 metres

Figure 3: Vegetation to be retained and lost and revegetation buffer strips.

REFERENCES

Bennison R and Hill A J 2001, Assessment of the conservation value of trees, Abbotts Road, Lyndhurst. Biosis Research Pty. Ltd.

DSE 2003, *Victoria's Native Vegetation Management: A Framework for Action: Technical Support Maps for Local Government Authorities*, Department of Sustainability and Environment.

DSE 2004. *Native Vegetation: sustaining a living landscape. Vegetation quality assessment manual – Guidelines for applying the habitat hectares scoring method Version 1.3.* Department of Sustainability and Environment.

DSE in prep., *A typology of vegetation in Victoria: Towards a census of Victorian plant communities*, Department of Natural Resources and Environment, Victoria.

Hill A J 2004, A reserve management plan for the Woodland/Wetland areas, south of Abbotts Road, Lyndhurst, Victoria. Biosis Research Pty. Ltd.

Hill A J and Organ A 2002, Ecological assessment of land south of Abbotts Road, Lyndhurst, Victoria. Biosis Research Pty. Ltd.

NRE 2002, *Victoria's Native Vegetation Management: A Framework for Action.* Department of Natural Resources and Environment, Victoria.

Organ A and Hill A J 2002, Assessment of the conservation value of trees, Abbotts Road, Lyndhurst, Stage 2. Biosis Research Pty. Ltd.

Parkes D, Newell G and Cheal D 2003, *Assessing the quality of native vegetation: The 'habitat hectares' approach.* Ecological Management and Restoration Vol 4. Supplement S29 – S38.

Port Phillip and Westernport Catchment and Land Protection Board 2000, *Draft Port Phillip and Westernport Native Vegetation Plan*, Port Phillip and Westernport CALP Board, Department of Natural Resources & Environment, Victoria.

APPENDIX

APPENDIX 1

DSE Vegetation Quality Field Assessment Sheet

Vegetation Quality Field Assessment Sheet

Version 1.3 - October 2004

Department of Sustainability and Environment

Site Name/No. ..... Location ..... Date .....

Assessor(s) ..... Map Name/No. ..... AMG .....

Tenure ..... EVC ..... Bioregion .....

'Site Condition Score'

Large Trees — Score

Category & Description	% Canopy Health*		
	> 70%	30-70%	< 30%
None present	0	0	0
> 0 to 20% of the benchmark number of large trees/ha	3	2	1
> 20% to 40% of the benchmark number of large trees/ha	4	3	2
> 40% to 70% of the benchmark number of large trees/ha	6	5	4
> 70% to 100% of the benchmark number of large trees/ha	8	7	6
≥ the benchmark number of large trees/ha	10	9	8

Large trees are defined by diameter at breast height (dbh) - see EVC benchmark.

* Estimate proportion of an expected healthy canopy cover that is present (i.e. not missing due to tree death or decline, or mistletoe infestation).

Tree Canopy Cover — Score

Category & Description	% Canopy Health *		
	> 70%	30-70%	< 30%
< 10% of benchmark cover	0	0	0
< 50% or > 150% of benchmark cover	3	2	1
≥ 50% or ≤ 150% of benchmark cover	5	4	3

Tree canopy is defined as those canopy tree species reaching ≥ 80% of mature height - see EVC benchmark description.

* Estimate proportion of an expected healthy canopy cover that is present (i.e. not missing due to tree death or decline, or mistletoe infestation).

Lack of Weeds — Score

Category & Description	'high threat' weeds*		
	None	≤ 50%	> 50%
> 50% cover of weeds	4	2	0
25 - 50% cover of weeds	7	6	4
5 - 25% cover of weeds	11	9	7
< 5% cover of weeds**	15	13	11

* proportion of weed cover due to 'high threat' weeds - see EVC benchmark for guide.

'High threat' weed species are defined as those introduced species (including non-indigenous 'natives') with the ability to out-compete and substantially reduce one or more indigenous life forms in the longer term assuming on-going current site characteristics and disturbance regime.

The EVC benchmark lists typical weed species for the EVC in the bioregion and provides an estimate of their 'invasiveness' and 'impact'. In general, those weed species considered to have a *high impact* are considered *high threat* regardless of their invasiveness.

** if total weed cover is negligible (<1%) and high threat weed species are present then score '13';

Understorey Life forms

LF Code from EVC benchmark	# spp observed / Benchmark spp.	% cover observed / Benchmark % cover	Present (✓)	Modified (✓)
	/	/		
	/	/		
	/	/		
	/	/		
	/	/		
	/	/		
	/	/		
	/	/		
	/	/		
	/	/		
	/	/		
	/	/		
	/	/		
	/	/		
	/	/		
	/	/		

Present

For life forms with benchmark cover of < 10%, considered 'present' if
- any specimens are observed.

For life forms with benchmark cover of ≥ 10%, considered 'present' if
- the life form occupies at least 10% of benchmark cover.

Modified (apply only where life form is 'present')

For life forms with benchmark cover of <10%, then considered substantially 'modified' if the life form has either:
- < 50% of the benchmark species diversity; or
- no reproductively-mature specimens are observed.

For life forms with benchmark cover of ≥ 10%, then considered substantially 'modified' if the life form has either:
- < 50% of benchmark cover; or
- < 50% of benchmark species diversity; or
- ≥ 50% of benchmark cover due largely to immature canopy specimens but the cover of reproductively-mature specimens is < 10% of the benchmark cover.

Understorey — Score

Category & Description		
All strata and lifeforms effectively absent		0
Up to 50% of life forms present		5
≥ 50% to 90% of lifeforms present	• of those present, ≥ 50% substantially modified	10
	• of those present, < 50% substantially modified	15
≥ 90% of lifeforms present	• of those present, ≥ 50% substantially modified	15
	• of those present, < 50% substantially modified	20
	• of those present, none substantially modified	25

Victoria
The Place To Be

Vegetation Quality Field Assessment Sheet

Version 1.3 October 2004

Recruitment

Score

Category & Description			High diversity*°	Low diversity*°
No evidence of a recruitment 'cohort'+	within EVC not driven by episodic events		0	0
	within EVC driven by episodic events^	clear evidence of appropriate episodic event	0	0
		no clear evidence of appropriate episodic event	5	5
Evidence of at least one recruitment 'cohort' in at least one life-form	proportion of native woody species present that have adequate recruitment°	< 30%	3	1
		30 - 70%	6	3
		≥ 70%	10	5

+ 'cohort' refers to a group of woody plants established in a single episode (can include suppressed canopy species individuals).

^ refer to EVC benchmark for clarification.

° treat multiple eucalypt canopy species as one species.

* high diversity defined as ≥ 50% of benchmark woody species diversity.

Species Recruitment

Woody species recorded in habitat zone	Adequate Recruitment (✓)
Eucalypt canopy (combined species)	
number of woody spp. in EVC benchmark (SS and taller)	

Logs

Score

Category & Description	Large logs present*	Large logs absent#
< 10% of benchmark length	0	0
< 50% of benchmark length	3	2
≥ 50% of benchmark length	5	4

Large logs defined as those with diameter ≥ 0.5 of benchmark large tree dbh.

* present if large log length is ≥ 25% of EVC benchmark log length.

absent if large log length is < 25% of EVC benchmark log length.

Organic Litter

Score

Category & Description	Dominated by native organic litter	Dominated by non-native organic litter
< 10% of benchmark cover	0	0
< 50% or > 150% of benchmark cover	3	2
≥ 50% or ≤ 150% of benchmark cover	5	4

'Landscape Context Score'

Patch Size

Score

Category & Description	
< 2 ha	1
Between 2 and 5 ha	2
Between 5 and 10 ha	4
Between 10 and 20 ha	6
≥ 20 ha, but 'significantly disturbed'*	8
≥ 20 ha, but not 'significantly disturbed'*	10

* 'significantly disturbed' defined as per RFA 'Old Growth' analyses eg. roading, coupes, grazing etc. – effectively most patches within fragmented landscapes.

Distance to Core Area

Score

Distance	Core Area not significantly disturbed*	Core Area significantly disturbed*
> 5 km	0	0
1 to 5 km	2	1
< 1 km	4	3
contiguous	5	4

* defined as per RFA 'Old Growth' analyses.

Neighbourhood

Score

Radius from site	% Native vegetation *	Weighting	
100 m		0.03	
1 km		0.04	
5 km		0.03	
		subtract 2 if the neighbourhood is 'significantly disturbed'	
		Add Values and 'round-off'	

* to nearest 20%.

Multiply % native vegetation x Weighting for each radius from the zone (eg. 40% x 0.03 = 1.2); then add values to obtain final Neighbourhood Value.

Final Habitat Score

	'Site Condition Score'							'Landscape Context Score'			
Component	Large Trees	Tree Canopy Cover	Lack of Weeds	Understorey	Recruitment	Organic Litter	Logs	Patch Size	Neighbourhood	Distance to Core Area	Total
Score											100

www.dse.vic.gov.au

APPENDIX A8 – RESERVE MANAGEMENT PLAN

ABZECO

Applied Botany, Zoology & Ecological Consulting

10 year Offset Management Plan for the M2 Council Reserve, M2 Estate, National Drive, Dandenong South.

Prepared for Pall Mall Assets Pty Ltd

Richard Francis & Karl Just

Report 0633, Version 1.3

28th November 2008

Abzeco Pty Ltd ABN 93113245435. Suite 1 / 4 Brisbane St. Eltham 3095 T:03-9431-5444 F:03-9431-5443 www.abzeco.com.au

Table of Contents

1 Introduction

Abzeco was commissioned by Devcon Group, on behalf of Pall Mall Assets Pty Ltd, to prepare a Offset Management Plan (OMP) for a 21.6 Ha flora and fauna reserve set aside within the M2 industrial estate, National Drive, Dandenong South (see Figure 1). This OMP is required under Amendment C11 of the Greater Dandenong Planning Scheme.

This plan satisfies the requirements of condition 6.6 "A Reserve Management Plan (RMP) must be developed to DSE & Council satisfaction and submitted to DSE by 30 November, 2005. This should include specific management actions for offsets to achieve Net Gain, including offsets for large old trees. A revegetation plan must form a component of the OMP, including locations of revegetation, species to be planted, site preparation and maintenance and replacement planting regimes" as a Reserve Management Plan for the purposes of managing vegetation on site to achieve net gain requirements.

The reserve area includes Grassy Woodland, Grassy Wetland and exotic pasture areas, east of National Drive (see Figure 1 on pg. 5). Offsets for clearances approved to date are to be realised within this reserve. Clearances have been approved within the Dandenong South Industrial Development Plan Stage 1 (LDP1) area on land in the M2 Estate and at 935, 945 & 965 Taylors Road. Any permitted clearance associated with the M3 Development at 95-115 Baylis Road, Lyndurst, is also to be offset within the reserve.

A second area of vegetation, reserved as a tree preservation zone under the plan of subdivision (PS509208P) on the east side of Taylors Road, is not addressed in this OMP. It is likely that this area will be impacted through future applications for provision of driveway access and servicing. At this time the area is protected under a 173 agreement and all gains remain available for offsetting any future vegetation clearance. Management of this reserve will be treated as development plans for adjacent lots are completed and approved on a case by case basis.

This OMP specifies management actions considered adequate, if undertaken to a high standard, to improve vegetation quality and quantity across the site and in doing so achieve a net gain to compensate the loss of native vegetation as a result of development in the LDP1 area.

Upon acceptance by the relevant authorities the OMP is to be implemented by the City of Greater Dandenong for the entirety of the liability period. Restoration works to achieve the net gain liability will be funded in full by Pall Mall Assets Pty Ltd for the specified management period.

Priority management aims are as summarised below. Management actions have been informed by the *DSE Vegetation Gain Approach* (DSE 2007) and through discussion on site with Darren Wilson (City of Greater Dandenong) and Michelle McHugh (Senior DSE flora and fauna officer).

1.1 Management Aims

Key management aims and objectives presented in this OMP are to:

- maintain and enhance the biodiversity of the reserve through active habitat management;
- control threats to the native flora and fauna of the site, including pest plants, animals and destructive human activities; and,
- improve the quantity, quality and viability of indigenous vegetation, to achieve the net gain offset liability.

1.2 Background on Study Site

1.2.1 Pre-European

According to online DSE pre-1750 vegetation mapping the study area was a mosaic of Plains Woodland/Plains Grassland. This vegetation type would have been dominated by open, old growth River Red Gum Grassy Woodland, with an understorey of scattered shrubs over a grassy, herb-rich ground flora dominated by Kangaroo grass. This grassy woodland would have supported a diversity of Macropods, arboreal mammals, bats, reptiles, frogs and birds.

This vegetation type is likely to have included areas of Plains Grassy Wetland supporting a diverse range of aquatic and semi-aquatic flora species, forming shallow ephemeral wetlands during the wetter months. These ephemeral wetlands would have provided valuable habitat for breeding frogs and foraging and nesting areas for native birds.

Historically the landscape was most likely burnt on a regular basis by the local aboriginal tribe, the Bunurong. This management practice would have contributed to the vegetation structure, ecological productivity and biological diversity of the grassland ecosystem.

1.2.2 Post-European arrival

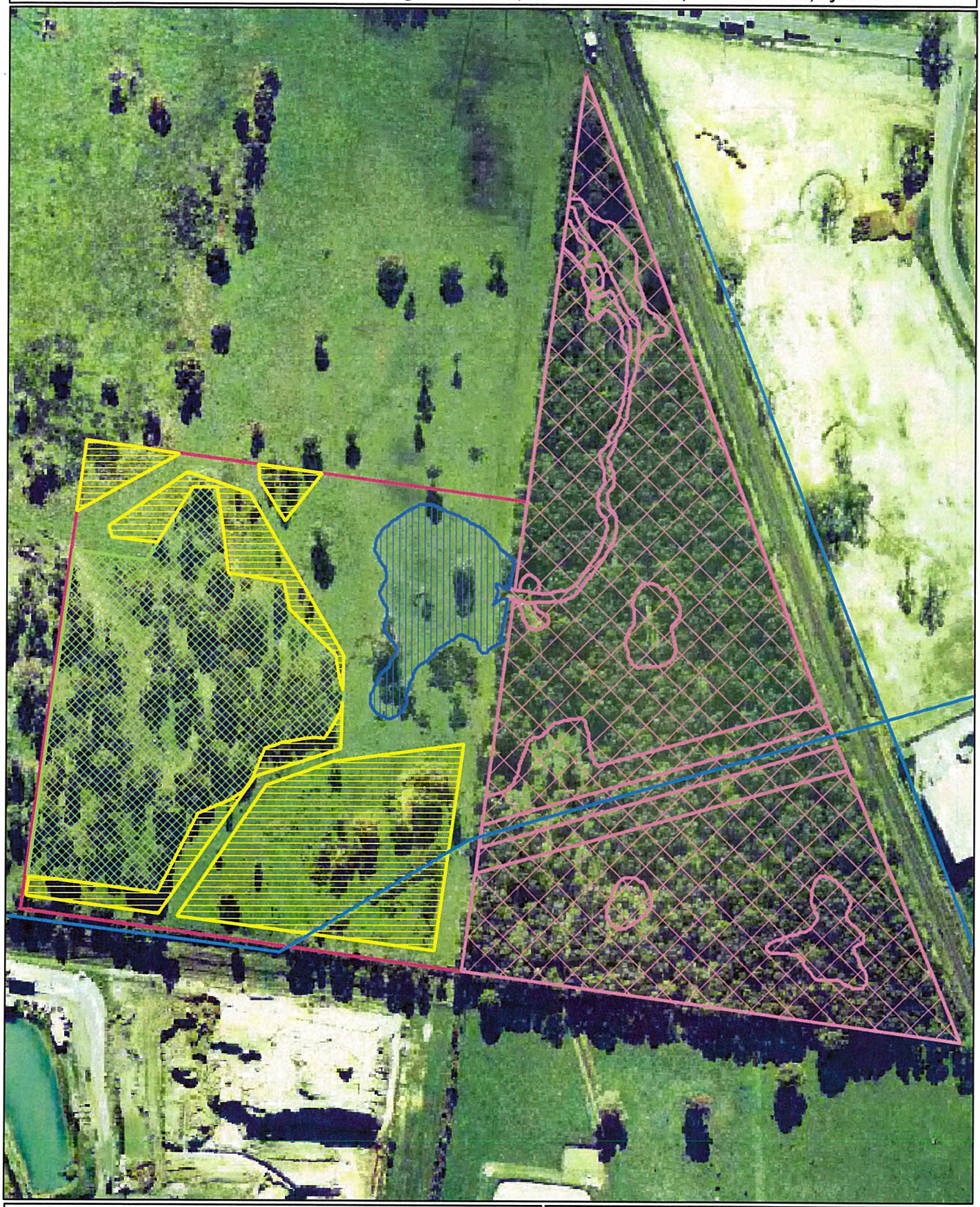
Since European settlement grassy ecosystems throughout the region have been highly modified through disturbance, clearance and changes to land management practices. The introduction of domestic stock, rabbits, foxes and a vast array of exotic plants, combined with alteration to burning frequency, timing and intensity has led to such problems as soil erosion, loss of plant and animal diversity and the entrenchment of noxious weeds.

In the study site many large trees appear to have been cleared and germination events have resulted in large areas of thick, even aged re-growth. Regeneration of Red Gums in this manner generally indicates an extended period without grazing activity or fire has occurred. The grassland understorey has been depleted to the point where exotic grasses dominate most of the understorey with Kangaroo Grass and indigenous herbs largely absent and any remaining 'intact' understorey patches are dominated by Weeping Grass. The areas of grassy wetland are highly invaded by pasture grasses, threatening the survival of remaining native species through exclusion and biomass accumulation.

1.2.3 Land use of the surrounding area

Surrounding areas were inspected from within the site and from aerial photographs. The majority of land surrounding the site has been developed for industrial purposes, consisting of large warehouses and yards. Areas of open space and disturbed remnant woodland are scattered between blocks and on roadsides. Land to the south of the site is currently undeveloped rural grazing properties and retains a number of scattered very large old trees in exotic pasture.

Figure 1a: Location and extent of Management Areas, M2 Estate Reserve, National Drive, Lyndhurst



Legend

- Watercourse
- Management Zone 1
- Management Zone 2
- Management Zone 3
- Management Zone 4

20 10 0 20 40 60 80 Meters

Sale 1:2,500

F

Survey Date: Last visited July 2008

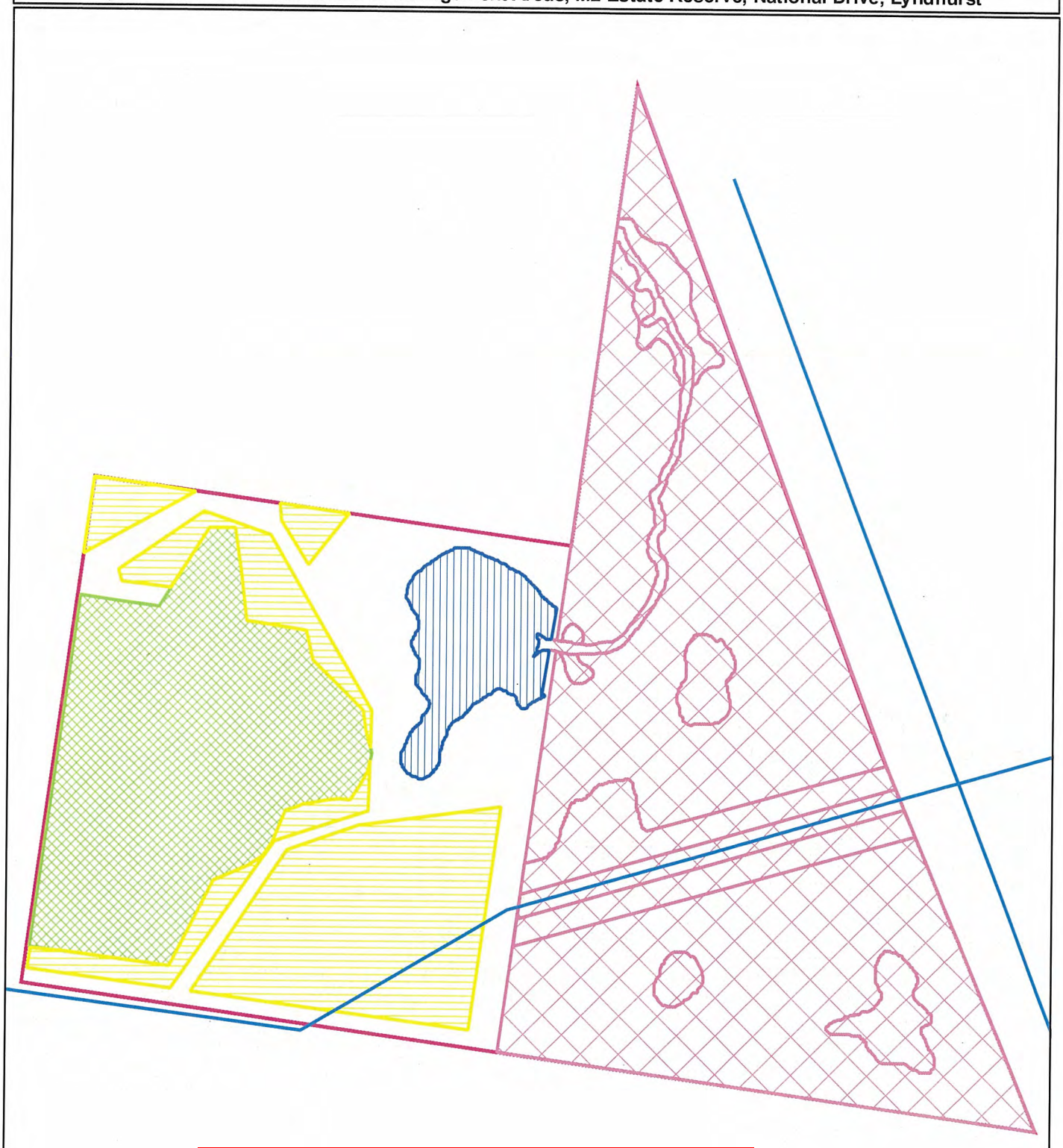
Created by : Richard Francis 17/07/2008

File: J:\Jobs\Devcon M2EstateLyndhurst\M2ReserveRevegPlan\
Figure1a-ManagementAreasM2Reserve-V1.0-July2008.pdf

Abzeco Pty. Ltd
Suite 1/4 Brisbane Street
Eltham VIC 3095
Ph 03 9431 5444
www.abzeco.com.au

ABZECO
Applied Botany, Zoology & Ecological Consulting

Figure 1b: Location and extent of Management Areas, M2 Estate Reserve, National Drive, Lyndhurst



Legend

- Watercourse
- Management Zone 1
- Management Zone 2
- Management Zone 3
- Management Zone 4

20 10 0 20 40 60 80 Meters

Sale 1:2,500

F

Survey Date: Last visited July 2008

Created by : Richard Francis 17/07/2008

File: J:\Jobs\Devcon M2EstateLyndhurst\M2ReserveRevegPlan\Figure1b-ManagementAreasM2Reserve-V1.0-July2008.pdf

Abzeco Pty. Ltd
Suite 1/4 Brisbane Street
Eltham VIC 3095
Ph 03 9431 5444
www.abzeco.com.au

ABZECO
Applied Botany Zoology & Ecological Consulting

2 Net Gain

This offset management plan is intended to guide vegetation restoration and revegetation works to achieve a net gain for permitted vegetation clearance within the M2 Estate development site and at 935, 945 & 965 Taylors Road.

2.1 Net gain targets for clearance within the M2 estate

All calculations for clearance within the M2 Estate (east of Taylors Road) are based on figures provided in the previous vegetation quality assessment undertaken by Biosis Research (Hill and Costello 2005). As these figures are from approved documents upon which planning decisions have been based to date they will be used to inform this document.

The Biosis report states;

> *"A total of 16.25 hectares of Plains Grassy Woodland is to be retained and managed within the Conservation Reserve. A further 5.77 hectares (containing 2.17 habitat hectares) of Plains Grassy Woodland will be removed.*
>
> *A total of 1.30 hectares of Heathy Woodland is to be retained and managed within the Heathy Woodland strip along Taylors Road. A further 3.15 hectares (containing 0.7 habitat hectares) of Heathy Woodland will be removed.*
>
> *A total of 0.95 hectares of Plains Grassy Wetland is to be retained and managed within the Conservation Reserve. A further 0.42 hectares (containing 0.09 habitat hectares) of Plains Grassy Wetland will be removed.*
>
> *Under the proposed subdivision plan a total of* ***4.1 habitat hectares*** *are required to be achieve a net gain (3.26 habitat hectares of Plains Grassy Woodland, 0.14 habitat hectares of Plains Grassy Wetland and 0.70 habitat hectares of Heathy Woodland).*
>
> *Provided that vegetation management and revegetation of a high standard are achieved, the offset requirements for vegetation removal can be met on-site over a ten year timeframe through conservation management of the Manna Gum strip and Conservation Reserve, and revegetation to provide the short fall.*
>
> *Total tree offset requirements are:*
>
> 1. *Protect 116 large old trees, and 16 medium trees; and*
> 2. *Recruit 865 new trees.*
>
> *The tree protection requirement cannot be fully met on-site. A total of 59 large old trees and 114 medium trees from Plains Grassy Woodland, and 26 large old trees and 32 medium trees from Heathy Woodland will be retained and protected within the Conservation Reserve and Taylors Road retention area (data provided by Paul Flintoff)".*

Note: Liability calculations provided in the approved Biosis documents (Hill & Costello, 2005).

2.2 Net gain targets for clearance in the DPO west of Taylors Road

All calculations of net gain liability within lots 935, 945 and 965 Taylors Road are from Abzeco Reports 0703.1. 0703.2 and 0703.3.

2.2.1 Net gain targets for clearance at 935 Taylors Road

This section provides a break-down of the net gain targets for permitted clearance at 935 Taylors Road, Dandenong South. All figures are taken from the net gain report completed for the development site (Just & Francis 2007b).

				Habitat Hectares Target		
				Losses and Gain Target		
EVC No.	EVC Name	Conservation Significance	HZs from Table 1.1 that contribute to this target	Total Losses (HHA)	Net Gain Multiplier	Gain Target (HHA)
48	HW	Low	1,2,3	0.15	1	**0.15**

Table 1.0: Required net gain targets for permitted clearance of habitat zones, Lot 935 Taylors Road, Dandenong South.

'Scattered' Tree Targets		
Old Tree Targets		
No. of 'Scattered' trees lost		No. of trees to be recruited
Mature	5	*70*
Total no. of trees to be recruited		**109**

Table 1.1: Rrequired net gain targets for permitted clearance of 'scattered' trees using the 'recruitment only' model, 935 Taylors Road, Dandenong South.

2.2.2 Net gain targets for clearance at 945 Taylors Road

This section provides a break-down of vegetation approved for clearance. All figures are taken from a previous net gain report completed for the development site (Just & Francis 2007b). Offset Liability Calculations for permitted vegetation clearance of 'scattered' trees have been calculated based on the 'recruitment only' option.

Estimated recruitment requirement for trees less than Medium Old (0-60) for Vegetation of High Conservation Significance				
ID	**DBH**	**Recruitment target**	**Losses**	**Recruits**
3	41cm	30	1	30
4	46.5cm	30	1	30
5	56cm	30	1	30
			Sub-Total	**90**

Table 2.0: Total required offsets under a 'recruitment-only' model for permitted clearance of 'scattered' 'mature' trees at Lot 945 Taylors Road, Dandenong South.

'Protect & recruit' offsets for permitted clearance of scattered old trees				
Large -old tree clearance	Protection offset ratio #	Large -old trees to be protected	Recruitment offsets#	Recruits for Large-old clearance
2	4	8	X20	40

#Based on figures from Appendix 5.4 of the Port Phillip & Westernport CMA Region Native Vegetation Plan (2006).

Table 2.1: Required offsets for permitted clearance of scattered large-old trees at Lot 945 Taylors Road, Dandenong South.

2.2.3 Net gain targets for clearance at 965 Taylors Road

This section provides a break-down of the net gain targets for permitted clearance at 965 Taylors Road, Dandenong South. All figures are taken from a previous net gain report completed for the development site (Just & Francis 2007b).

				Habitat Hectares Target		
				Losses and Gain Target		
EVC No.	EVC Name	Conservation Significance	HZs from Table 1.1 that contribute to this target	Total Losses (HHA)	Net Gain Multiplier	Gain Target (HHA)
55	PGW	High	1	0.10	1.5	0.154
48	HW	Low	2	0.02	1	0.02
				0.12		**0.174**

Table 3.0: Required net gain targets for permitted clearance of habitat zones, Lot 965 Taylors Road, Dandenong South.

Calculations for 'protect & recruit' offsets for proposed old tree clearance within habitat zones					
Old Tree Target for Vegetation of Low, high and Very High Conservation Significance					
Tree Size Class	Tree clearance	Protection offset ratio*	Large-old trees to be protected	Recruitment offsets: Large-old trees	Recruits for Large-old clearance
Large-old trees	2	4	8	X20	40
Medium-old trees	3	2	6	X20	60
	Large-old Tree Protection		**14***		
	Large-old Tree Recruitment Offset				100

* Of the 14 Large-old Trees to be protected at least 5 are to be Eucalyptus x studleyensis.

Table 3.1: Required 'protect & recruit' offsets for proposed clearance of large-old trees.

'Scattered' Tree Targets		
Old Tree Targets		
No. of 'Scattered' trees lost		No. of trees to be recruited
Mature	11	*209*

Table 3.2: Required recruitment targets for permitted clearance of 'mature' trees at 965 Taylors Road, Dandenong South.

2.2.4 Net gain targets for proposed clearance at M3 Estate, 95-115 Baylis Road, Dandenong South

This section provides a break-down of the net gain targets should proposed clearance of vegetation associated with the M3 Estate application be permitted. All figures are taken from a previous net gain report completed for the development application (Urlus et al 2008) and as such any clearance remains subject to approval from the relevant regulatory authorities.

Note: The gains listed below represent the clearance porposed by the applicant, i.e. all vegetation other than the protected Aboriginal Scar Trees be lost as a result of approved development.

			Habitat Hectares Target		
			Losses and Gain Target		
EVC No.	EVC Name	Conservation Significance	Total Losses (HHA)	Net Gain Multiplier	Gain Target (HHA)
55	PGW	High	0.104	1.5	0.156

Table 4.0: Required net gain targets for permitted clearance of habitat zones, M3 Estate, 95-115 Baylis Road, Dandenong South.

Calculations for 'protect & recruit' offsets for proposed old tree clearance					
Old Tree Recruitment Target for Vegetation of Very High Conservation Significance					
Tree Size Class	Tree clearance	Protection offset ratio #	Large-old trees to be protected	Recruitment offsets: Large-old trees #	Recruits for Large-old clearance
Very Large-old trees	12	"	"	x 180	2,160
Large-old trees	10	"	"	x 120	1,200
	Large-old Tree Protection		-		
	Large-old Tree Recruitment Offset				3,360

Table 4.1: Required 'Recruitment only' offsets for proposed clearance of 'Old' scattered trees and trees in zones at M3 Estate, 95-115 Baylis Road, Dandenong South.

A Gain of 0.3 Habitat Hectares in Plains Grassy Woodland vegetation remains available to Pellicano Projects in the M2 reserve after all other required offset targets have been achieved. This available gain is more than sufficient to offset the Net Gain target of 0.156 Habitat Hectares listed in table 4.0 above.

The revegetation of Management Zone 1 with 17,245 new plants is more than sufficient to offset all recruitment targets associated with the M2 DPO area (1,413) and the M3 target in table 4.1 above.

2.3 Summary of net gain targets for approved vegetation loss

This section provides a summary of the net gain targets for permitted clearance in the DPO area as stated in the previous sections 2.1-2.4.

EVC	M2 Estate	935	945	965	Total liability
Plains Grassy Woodland	3.26	0	0	0.1	***3.36***
Heathy Woodland	0.7	0.15	0	0.02	***0.87***
Plains Grassy Wetland	0.14	0	0	0	***0.14***

Tree Class	M2 Estate Protection liability	935 Protection liability	945 Protection liability	965 Protection liability	Total
Large-old Trees	116	0	8	8	***132***
Medium-old Trees	16	0	0	6	***22***
Recruitment Liability	865	109	130	309	***1,413***

Tables 5.0 & 5.1 above: Summary of the net gain liabilities for permitted clearance within the DPO area

2.4 Gain scoring calculations to achieve Net Gain targets

Tables 6 & 7 provide gain scoring calculations for maintenance and active management of retained remnant vegetation within the M2 Estate reserve. All calculations are based on figures obtained from the vegetation quality assessment undertaken by Biosis Research (Hill & Costello 2005). A map of the habitat zones identified by Biosis is provided in Appendix 1 to this report.

The gain target for Low conservation significance Heathy Woodland of 0.87 is to be offset in High conservation significance Plains Grassy Woodland vegetation. As per footnote 11, table 3.4B of the Appendices to the Port Phillip and Western Port Native Vegetation Plan (PPWCMA 2006) the reduction in the target gain is calculated by first dividing the 'Low' multiplier by the 'High' multiplier. This figure is the proportion of the target gain to be offset in the 'High' conservation significance vegetation (see table 6 below).

				Revised Net Gain Target for Heathy Woodland				
EVC No.	EVC Name	Conservation Significance	Target Gain for Heathy Woodland	Low Sig. Net Gain Multiplier	High Sig. Net Gain Multiplier	Low Multiplier / High Multiplier	Gain Target adjustment equation	Revised Gain for Offsetting Low Sig. in High Sig.
48	HW	Low	0.87	1	1.5	**0.67**	**0.67 x 0.87**	**0.58**

Table 6.0: Calculation of adjusted gain target for offsetting Low conservation significance vegetation with High conservation significance vegetation as per PPWCMA Native Vegetation Plan (PPWCMA 2006)

2.4.1 Land Use Rights

In order for some gains to be achieved, such as, through agreement to remove or modify grazing activity or to retain fallen timber, there must be an existing use right to forgo. Use rights are specified under s. 52.17 of the planning scheme but may be constrained or expanded through other mechanisms, such as restrictions in planning overlays, a conservation covenant or section 173 agreements on title.

In the case of the conservation reserve in the M2 Estate there are several zones and overlays under the City of Greater Dandenong Planning Scheme that cover all or part of the site. It is understood that there are no other legal encumbrances that affect use rights. In order to assist in accurately determining existing use rights the developer (Pellicano Projects trading as Pall Mall Assets) has instructed Abzeco to follow the interpretation provided by their planning consultant on this matter (Devcon Group).

Our instructions are that grazing was removed from the land and legal firewood collection ceased when the DPO was issued. There are currently no permit requirements for grazing of the site. The rights to graze stock and collect firewood were foregone under the development Plan overlay developed for this development.

OFFSET IDENTIFIER			Offset HZ-1			Offset HZ-7			Offset HZ-8				
EVC Number			55										
EVC Name			Plains Grassy Woodland										
Current Score			18			39			37				
Conservation Significance			High			High			High				
		Possible Score	Current Site Condition	Maintenance	Improvement	Current Site Condition	Maintenance	Improvement	Current Site Condition	Maintenance	Improvement		
Site Condition*	Large Old Trees	10	3	3	0	8	2	0	8	1	0		
	Canopy Cover	5	3	0.6	0.4	3	0.6	0.4	3	0.3	0.4		
	Understorey	25	3(5)	0.5	2.5	6(5)	0.5	2.5	3(5)	0.5	2.5		
	Lack of Weeds	15	5	0	2	10	0	2	10	0	2		
	Recruitment	10	0	0	0	6	0.6	0	5.5(6)	0.5	0		
	Organic Litter	5	3	0.3	0	3	0.3	0	0	0	0		
	Logs	5	0	0.4	5	0	0.4	5	0	0.4	5		
Subtotals of columns		##.#	0.17	**4.8**	**9.9**	0.32	**4.4**	**9.9**	0.30	**2.7**	**9.9**		
Bonus Gain				**2[1]**			**2[1]**			**2[2]**			
Bonus+Maintenance+ Improvement Gain/100		0.##		**0.17**			**0.16**			**0.15**			
Recognition of prior management 10% of Current Habitat Score		0.##	0.18	**0.02**		0.39	**0.04**		0.37	**0.04**			
Improved Security 20% of Current Habitat Score		0.##	0.18	**0.04**		0.39	**0.08**		0.37	**0.07**			
Total Gain per hectare		0.##		**0.23**			**0.28**			**0.26**			
Area of proposed offset		#.##		0.5			2.07	1.49		12.19			
Net Gain (HabHa)		#.##		0.12			0.58	0.42		3.17		Totals	Surplus
Liability Target (HabHa)												**3.99[5]**	
Contribution to Target (HabHa)		#.##		**0.12**			**0.58[3]**	**0.42[4]**		**3.17**		**4.29**	**+0.30**
Very Large Old Trees to be protected		#	**0**										
Large Old Trees to be protected		#	**116**									**59**	**-57**
Medium Old Trees to be protected		#	**16**									**114**	**+98**

* - Site condition figures from Hill et al (2005) (see Appendix 1 & 2).

[1] – Recruitment and weed suppression bonus gain for works specifically to improve hydrology of the zone.

[2] – Recruitment bonus gain for works associated with the swale drain to improve the hydrology of HZ9.

[3] – Adjusted Gain liability for offsetting Low conservation significance with High conservation significance.

[4] – Remaining gain available for offsetting gain target.

[5] – Liability Target from; M2 Estate (3.26 Plains Grassy Woodland and 0.70 Heathy Woodland) plus 0.17 from 965 Taylors Rd and 0.15 from 935 Taylors Rd with target reduced due to account for difference in conservation significance between Heathy Woodland clearance are and Grassy Woodland offset area.

Table 7: Calculation of net gain offsets available in Plains Grassy Woodland vegetation through maintenance and active management of retained remnant vegetation (see also Appendix 1). These figures follow the DSE's Native Vegetation – Vegetation Gain Approach (DSE 2006a).

OFFSET IDENTIFIER			Offset HZ-9		
EVC Number			125		
EVC Name			Plains Grassy Wetland		
Current Score			23		
Conservation Significance			High		
		Possible Score	Current Site Condition	Maintenance	Improvement
Site Condition	Large Old Trees	10	Na	0	0
	Canopy Cover	5	Na	0	0
	Understorey	25	0	0	0.625
	Lack of Weeds	15	10	0	1
	Recruitment	10	2	1.5	0
	Organic Litter	5	3	1.5	1
	Logs	5	Na	0	0
Subtotals of columns		##	0.15	3	2.625
Bonus Gain				12.5[1]	
Bonus+ Maintenance + Improvement Gain/100		0.##		0.18	
Adjustment 75/55*Gain				0.25	
Recognition of prior management 10% of Current Habitat Score		0.##	0.22	0.02	
Improved Security Gain 20% of Current Habitat Score		0.##	0.22	0.04	
Total Gain per hectare		0.##		0.31	
Area of proposed offset		#.##		0.95	
Net Gain (HabHa)		#.##		0.29	
Net Gain Multiplier				1	
Liability Target (HabHa)				0.14	Surplus
Contribution to Target (HabHa)		#.##		0.29	0.15

[1] – Recruitment and weed suppression bonus gain for works specifically to improve hydrology of the zone 27.5 (50% of maximum site condition score) – 15 (Current condition score) = 12.5 (gain/Ha) (Section 8, DSE 2006b).

Table 8: Calculation of net gain offsets available in Plains Grassy Wetland vegetation through maintenance and active management of retained remnant vegetation (see also Appendix 1). These figures follow the DSE's Native Vegetation – Vegetation Gain Approach (DSE 2006a) for calculating gains in Grassland communities.

EVC	Location	Loss/ Target	Gain	Remainder
Plains Grassy Woodland	M2	3.26	4.29	+1.03
Plains Grassy Woodland	965	0.15	0	-0.15
Heathy Woodland	M2	(0.70) 0.47[1]	0	-0.47
Heathy Woodland	965	(0.02) 0.01[1]	0	-0.01
Heathy Woodland	935	(0.15) 0.10[1]	0	-0.10
Plains Grassy Wetland	M2	0.14	0.29	+0.15
Totals		**4.13**	**4.58**	**0.45[2]**

[1] – Adjusted Gain for offsetting Low conservation significance vegetation in High conservation significance. This figure is calculated by dividing the gain multiplier for Low conservation significance vegetation by gain multiplier for High conservation significance vegetation; 1/1.5 = 0.67. This figure represents the proportion by which the target gain is reduced, e.g. 0.70 x 0.67 = 0.47.

[2] – The remaining Gain of 0.45 Habitat Hectares from 'High' conservation significance remains available for use by the current land owner (Pall Mall Assets Pty. Ltd.) or third parties nominated by them.

Tree Class	Liability	Retained	Remainder
Large Old Trees	132	59*	-73
Medium Old Trees	22	114*	+92
Totals	**154**	**173**	**-**

* - Figures supplied by client for previous reporting by Biosis.

Tables 9.0 & 9.1 above: Summary of the Net Gain target and tree protection balance using the final maintenance and active management calculations presented in tables 6 and 7. As Heathy Woodland is of Low Bioregional Conservation Significance, under the offsetting criteria provided in the Framework the 0.87 liability can be achieved in the Plains Grassy Woodland areas as they are of High Bioregional Conservation Significance.

Accounting for the deficit in Large-old tree protection

Assuming that two Medium-old trees can be considered equivalent to one Large-old tree for the purposes of 'protection' the remaining 92 Medium-old trees in the conservation reserve could be used to reduce the current Large-old tree protection deficit by 46 trees to -27.

As 27 Large-old trees are not available the 'recruitment only' model would be required to offset the loss. By back-calculating, under the current 'protect and recruit' guidelines the protection of 27 trees equates to a loss of seven Large-old trees (27 ÷ 4).

Under the current 'recruitment only' guidelines the loss of seven Large-old trees requires offsetting by the recruitment of 840 new plants (120 plants per Large-old tree lost).

Total Recruitment target	2,114 new plants + 10% = 2,325 plants to be planted

Table 9.2: Summary of the total recruitment target (plus 10% to account losses post planting) for the loss of 'Old' and 'mature' trees in the DPO area. Includes the targets for M2 Estate, 965, 945 & 935 Taylors Road, Dandenong South.

2.5 Management actions required to achieve gain targets

Based on the Decision-making Process for Habitat Gain Scoring for Active Management the commitments within intact vegetation types are as follows;

Plains Grassy Woodland;

- Tree Canopy Cover – Retain all canopy trees (dead or alive), control exotic herbivores
- Understorey – Exclude stock, supplementary planting*
- Lack of Weeds – Control Woody environmental Weeds, maintain high threat herb/grass cover
- Recruitment – Control Woody environmental Weeds, maintain high threat herb/grass cover
- Organic Litter – Burning to manage organic litter and for control of Woody Weeds.
- Logs – Introduction of logs into habitat Zone 1 only is permitted, large logs available.
- Protect 5 *Eucalyptus* x *studleyensis* trees to offset the loss form clearance at 965 Taylors Road.

Plains Grassy Wetland areas;

- Understorey – Periodic Biomass Reduction may be required. Control Woody Environmental Weeds; maintain high threat herb/grass cover.
- Lack of Weeds – Eliminate Woody environmental Weeds, maintain high threat herb/grass cover.
- Recruitment – Periodic Biomass Reduction may be required; mowing at appropriate seasonal timing. Maintain high threat herb/grass cover; return to more suitable hydrological conditions/inundation frequency by providing additional ruff-off from adjacent development area.
- Organic Litter – Periodic Biomass Reduction may be required; mowing at appropriate seasonal timing.

*The requirement for supplementary planting where sufficient natural recruitment is not anticipated, and, current lack of weed score <7, includes woody life forms only unless site conditions are considered suitable for sustainable recruitment or additional management measures are employed. Additional Gains may be negotiated for works that are likely to achieve higher quality outcomes. Restoration works proposed will include scattered planting of large tufted graminoids and woody species in areas with relatively 'intact' understorey or dense patches in areas of degraded understorey.

3 Managing the Vegetation for Net Gain

3.1 Current condition of Management Zones

The study site has been divided into four separate management zones relating to vegetation quality, composition and restoration methodology, being;

- Management Zone 1 – Restoration/Revegetation area
- Management Zone 2 – Relatively intact Grassy Woodland
- Management Zone 3 –Grassy Woodland with Degraded Understorey
- Management Zone 4 – Species Poor Plains Grassy Wetland

These management zones are described in detail below and shown in figures 2a and 2b on pages 20 and 21.

Management Zone 1 – Restoration/Revegetation Area

This zone includes approximately 3 Ha of open exotic grass dominated areas with some scattered trees and a dam. Management zone 1 encompasses some sections of habitat zones 7 and 9 and all of habitat zone 1 (see Appendix 1 & 2). The area has been cleared of most indigenous vegetation and is now dominated by pasture grasses and noxious weeds, with some scattered Eucalypt trees and small areas of native grasses, mostly *Microlaena stipoides*. A small dam dominated by *Typha* sp. and exotic grasses also occurs within this management zone. A narrow drainage channel bisecting the southern section of the zone supports a dense cover of exotic grass and herb species.

Prior to disturbance this area would have supported a mosaic of Plains Grassy Woodland / Plains Grassy Wetland / Plains Swampy Woodland. Most of this management zone is not an 'intact' patch and as such has been regarded as an area suitable for revegetation.

Management Zone 2 - Relatively intact Grassy Woodland

This zone is 3.74 Ha and includes most of habitat zone 7. The area is dominated by a mature overstorey of *Eucalyptus camaldulensis, Eucalyptus ovata* and *Eucalyptus* x *studlyensis*, with a number of younger trees of varying ages. Much of the understorey is 'intact', dominated by large patches of Weeping Grass, *Microlaena stipoides* with a few scattered plants of *Themeda triandra, Lomandra longifolia, Lomandra nana* (regionally rare) and *Senecio* spp.. Native shrub species are limited to a few dense thickets of *Acacia paradoxa* and scattered young plants of *Leptospermum continentale*. The zone has scattered areas dominated by the exotic pasture grasses **Ehrharta erecta* and **Sporobolus africanus* and small dense stands of **Ulex europaeus* that have been sprayed out recently. The presence of *E. ovata* and thickets of *L. continentale* suggest a Plains Swampy Woodland influence in the southern section of the patch.

Prior to disturbance this area would have supported a mosaic of Plains Grassy Woodland / Plains Swampy Woodland. The current dominant EVC of this management zone is Plains Grassy Woodland with a relatively 'intact' understorey suitable for restoration.

Management Zone 3 - Grassy Woodland with Degraded Understorey

This zone is 12.19 Ha and includes all of habitat zone 8. The area consists of a large stand of *Eucalyptus camaldulensis* woodland with a disturbed understorey dominated by exotic pasture grasses, including **Ehrharta erecta* and patches or scattered plants of woody weeds such as **Ulex europaeus*, **Fraxinus* sp., **Rubus fruticosus*, and **Crataegus monogyna*. Patches of Gorse are generally large dense stands, Blackberry occurs as scattered generally small low patches and both Hawthorn and Dessert Ash are occasional scattered plants. Understorey trees and shrubs are limited to a

small stand of *Melaleuca ericifolia*, a single plant of *Ozothamnus ferrugineus* and *Allocasuarina paludosa*. A low diversity and patchy cover of native understorey species are scattered throughout the area, consisting mostly of small patches of Weeping Grass with a few native herbs or shrubs. A small drainage channel running through the zone is densely weed infested, although a number of native aquatic plants do occur here including *Carex appressa, Persicaria decipiens* and *Poa clelandii.*

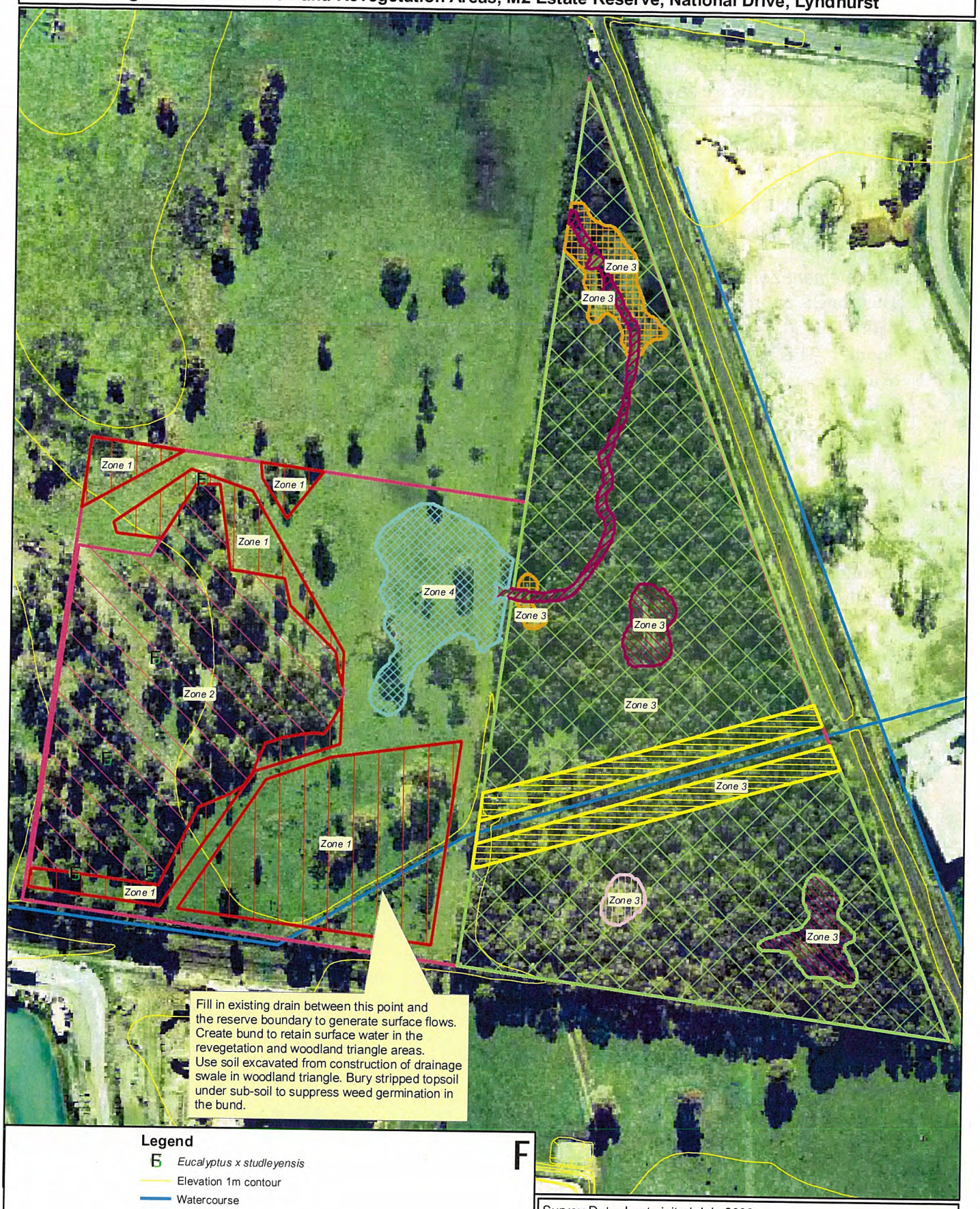
The dominant EVC of this management zone is Plains Grassy Woodland with a highly modified understorey suitable for restoration through planting and weed management.

Management Zone 4 – Species Poor Plains Grassy Wetland

This zone is approximately 0.88 Ha and includes some of habitat zone 9. The area lies within a natural broad, poorly drained depression, and as a consequence receives seasonal inundation and flooding. This has led to the formation of grassy wetland vegetation with a low cover and diversity of aquatic and semi-aquatic herbs and graminoids including *Eryngium vesiculosum, Villarsia reniformis, Hemarthria uncinata, Neopaxia australasica, Amphibromus nervosus, Eleocharis acuta* and *Lobelia pratioides*. As a result of past land use, regular mowing and most likely alteration to natural hydrology these areas have become largely dominated by pasture grasses such as **Paspalum dilatatum* and other common pasture weeds, with indigenous species occurring as scattered patches or individual plants.

The dominant EVC of this area is Plains Grassy Wetland and is considered suitable for restoration through improved management including improved hydrology, weed control and supplementary planting.

Figure 2a: Restoration and Revegetation Areas, M2 Estate Reserve, National Drive, Lyndhurst



Legend

- Eucalyptus x studleyensis
- Elevation 1m contour
- Watercourse

Restoration Areas

- Allocasuarina Dominated Planting
- Plains Grassy Wetland Restoration
- Plains Grassy Woodland Restoration
- Sedge/Tussock Swale Planting
- Shrub Planting
- Swamp Scrub
- Swamp Scrub/Plains Swampy Woodland Revegetation
- Tussock Planting
- Understorey Tree Planting

20 10 0 20 40 60 80 Meters

Sale 1:2,500

Survey Date: Last visited July 2008

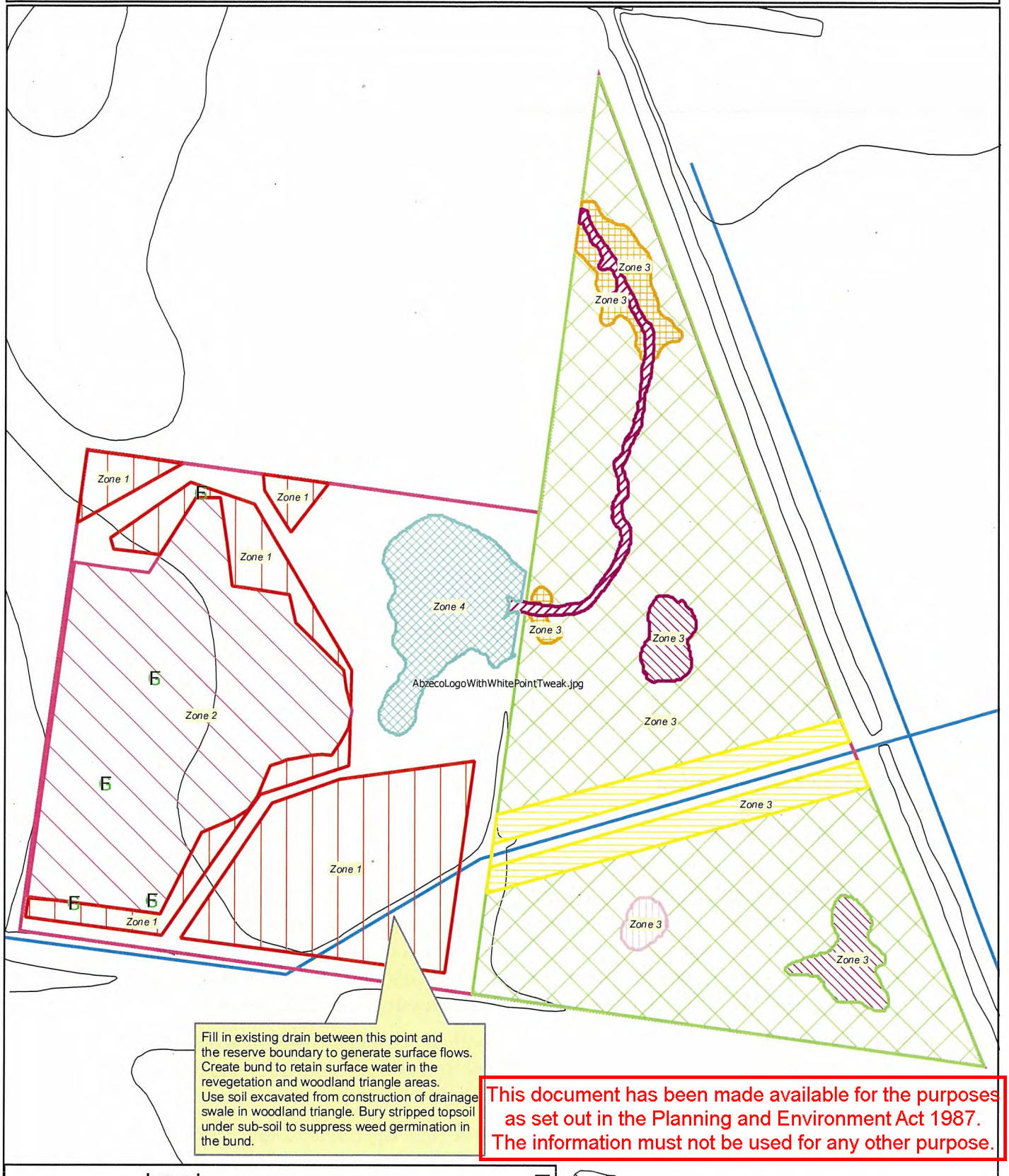
Created by : Richard Francis 17/07/2008

File: J:\Jobs\Devcon M2EstateLyndhurst\M2ReserveRevegPlan\Figure2a-RestorationRevegetationAreas-V1.0-Sep2008.pdf

Abzeco Pty. Ltd
251 St Georges Road
Northcote 3070
Ph 03 9489 1922
www.abzeco.com.au

ABZECO
Applied Botany, Zoology & Ecological Consulting

Figure 2b: Restoration and Revegetation Areas, M2 Estate Reserve, National Drive, Lyndhurst



Legend

Б *Eucalyptus x studleyensis*

Elevation 1m contour

Watercourse

Restoration Areas

- Allocasuarina Dominated Planting
- Plains Grassy Wetland Restoration
- Plains Grassy Woodland Restoration
- Sedge/Tussock Swale Planting
- Shrub Planting
- Swamp Scrub
- Swamp Scrub/Plains Swampy Woodland Revegetation
- Tussock Planting
- Understorey Tree Planting

20 10 0 20 40 60 80 Meters

Sale 1:2,500

F

Survey Date: Last visited July 2008
Created by : Richard Francis 17/07/2008
File: J:\Jobs\Devcon M2EstateLyndhurst\M2ReserveRevegPlan\ Figure2b-RestorationRevegetationAreas-V1.0-July2008.pdf

Abzeco Pty. Ltd
251 St Georges Road
Northcote 3070
Ph 03 9489 1922
www.abzeco.com.au

ABZECO
Applied Botany, Zoology & Ecological Consulting

3.2 Restoration Objectives and Methodology

In this section the specific active management objectives and methodology required to achieve net gain obligations are presented and discussed for each management zone. Where applicable, explanation is given on the ecological basis for specific management actions to guide their application to a high standard.

3.2.1 Infrastructure Requirements

Fencing

Existing cyclone fencing constructed by the developer under instruction from the City of Greater Dandenong and DSE to exclude detrimental human activity will require ongoing monitoring and maintenance indefinitely. It is likely that detrimental human incursions will diminish once the surrounding area is developed and occupied.

Earthworks

The construction of a shallow drainage swale through the trees in triangle is to be undertaken under the direction and supervision of an experienced bushland contractor. This swale is to be excavated with a small machine and soil is to be used to fill-in the existing open drain where it crosses the open area. This filling in of the existing drain will increase the frequency and duration of periodic inundation of the woodland and revegetation area. To ensure sufficient surface water is retained and flows directed to a suitable point of discharge a low bund is to be constructed insode the southern boundary. See map figure 2a & 2b.

3.2.2 Pest Management

Rabbit and Hare Control

Control of rabbits and hares may be required prior to planting for revegetation and to promote successful natural regeneration. Rabbit numbers should be assessed twice yearly, once mid-summer for control before the end of the summer drought period and again in early spring (September/October) to determine rabbit density and any control requirements. This timing of control will interrupt breeding cycles and create suitable conditions for plant establishment and survival. It is most likely to maintain a low population density throughout the year.

Any rabbit control actions should be followed up with monitoring to determine if a suitable level of control was achieved. Ongoing monitoring and control of rabbits is required to comply with improvement gain offsetting obligations for a period of 10 years.

Monitoring of rabbit activity at the site should include site inspection to locate active burrows/warrens, with sufficient effort taken to observe any likely harbor areas such as log or rock piles, blackberry and Gorse patches. Following a baiting program all burrows are to be fumigated and closed as per poison manufacturer's instructions. Should a baiting program not be warranted due to low rabbit and hare numbers fumigation of any active warrens should be undertaken as a minimum. Warrens should always be left untreated until after a scheduled baiting program has been completed to ensure effective control. Always follow-up a baiting and fumigation program with inspection and follow all steps and precautions as per the manufacturer's instructions.

Any rabbit baiting within the site should be restricted to Pindone on infertile grain or carrots. The use of carrot baits is considered a risk to off target species, in particular birds and their use should be avoided if possible. 1080 is considered a risk, although very remote, to domestic companion animals. As Pindone can be easily treated through vitamin K injection and, with correct application, equally effective rabbit control can be achieved there is no reason to consider 1080 use. Pindone baiting is to be conducted as per manufacturer's specifications by experience pest animals managers.

It should be noted that rabbit baiting is generally conducted using bait trails cut into the soil. The vermin control contractor should be directed by an experienced bushland management professional to best ensure the most appropriate location for any bait trails to control rabbits and to reduce potential for significant detrimental impacts to indigenous vegetation. Bait stations may be a more appropriate technique for areas with intact ground flora. Carrots may be a viable safe method when there is plenty of green pick.

Weed Control

Weed control programs will target woody weeds in all areas with control of high threat grassy and herbaceous weeds for the most part limited to higher quality areas and revegetation patches. Grassy and herbaceous weeds will mostly be managed through mowing to reduce seed set and for fuel/biomass management.

The control of Gorse and other woody weeds throughout the management zones is to be undertaken systematically over the ten year management period. Control of Gorse thickets should be carried out as follows:

- Spray plants with herbicide during the growing season.
- Burn plants and surrounding area to stimulate dormant seed bank.
- Spray or hand pull emergent seedlings in autumn/winter.
- A second burn (e.g. scorch with Weed Dragon - gas fired torch) to stimulate germination of any remaining seed.
- Spray or hand pull emergent seedlings autumn/winter.
- Monitor infected areas and take appropriate follow up action as required (e.g. hand weeding, cut & paint, spraying, burning).

Areas that support Gorse infestations should not be included in revegetation until eliminated.

Control of scattered exotic woody plants should be carried out as follows:

- Cut & paint with suitable herbicide
- Burn immediate vicinity with gas fired torch.
- Monitor areas and spray or hand pull emergent seedlings.

Blackberry thickets should be sprayed with an appropriate herbicide during the growing season. Smaller plants can be controlled using the cut & paint method. Hand-pull or spot spray seedlings.

Preparation for revegetation with thickets of shrubs and large grasses is to include three separate applications of broad spectrum herbicide. Final herbicide application should include the use of pre-emergent herbicide for ongoing weed suppression during plant establishment in suitable areas (use only as per manufacturers specifications).

Broad areas are to be revegetated using woody species only. Site preparation should be undertaken through mowing and repeated spot or strip spraying with suitable broad spectrum herbicide. Spot or strip spraying should be undertaken sufficiently prior to planting to allow for death and at least partial decay of weeds. The need for follow-up spraying can be mitigated through the use of pre-emergent herbicides to suppress germination.

Mowing of terrestrial exotic grass dominated areas should be undertaken regularly. The timing of mowing should be sufficient to reduce seed set. Regular mowing can assist the spread of Weeping Grass (*Microlaena stipoides*) as this species is able to spread with rhizomes. Monitoring of mowing areas for recruitment of indigenous species should be undertaken in late spring. Any areas supporting regeneration of woody species should be clearly marked by an agreed method (e.g. established through discussion with the mowing contractor) and mowing of these avoided.

Revegetation areas will require weed control until plants are established. This is only necessary for CaLP Act listed species and woody weeds. Should exotic grasses threaten to smother plantings brush-cutting may be required. Weeding requirements will reduce in revegetation areas as the relatively dense plantings spread to form a vigorous canopy over the exotic ground flora.

Ecological Thinning

In areas that support mature River Red Gums dense thickets of generating saplings can result. This is usually the case in areas lacking natural processes that would reduce their survival such as in areas lacking 'natural' grazing pressures or appropriate fire regimes. Dense thickets of eucalypt saplings can deplete soil moisture and nutrient level and can result in stress and death to 'Old' trees. This is currently occurring in management zone 3 and is likely to occur post management burning in management zone 2. Thinning out of saplings by cut & paint herbicide application method should be undertaken to ensure stem densities do not exceed 1 recruit per 100 square metres. The benchmark density for immature trees in EVC 55 Plains Grassy Woodland is 5%, which equates to an average of approximately 1 per 200 m^2.

Management Burning

Management Zone 2 is likely to benefit from the use of fire to assist in weed control and to promote natural regeneration. Fire may stimulate soil stored seed and facilitate the establishment of plant species otherwise no present in the site. Considering the nature of this zone fire in spring should be considered as this would best facilitate weed control and provides the best opportunity for indigenous flora to re-establish before the autumn-winter flush of weeds. Burning in autumn promotes open ground at a time when exotic flora is germinating. As fauna species are not likely to be significantly impacted by spring burning there is an opportunity to consider. Fire is currently scheduled for autumn however, a Fire Management Plan is to be developed to the satisfaction of the relevant authorities and it is this plan that should specify the timing and conditions under which fire is to be utilised on the site if at all.

3.3 Revegetation

DSE provides guidelines for plant densities to achieve targets in revegetation areas after 10 years. These guidelines also require the use of current industry practices. A key requirement of the revegetation guidelines is to plant an additional 20% of the required target plant numbers to account for losses over the establishment period. As the planting densities used in this document are to follow current industry practices, rather than the DSE planting standards, and most threats to plant survival are to be adequately managed, an additional 10% of plant numbers, rather than 20%, has been applied.

3.3.1 Management Zone 1 - Revegetation to achieve a Swamp Scrub/Plains Swampy Woodland Mosaic

This zone is to be more frequently inundated through changes to the current drainage and revegetated with a range of species common to Swamp Scrub/Plains Swampy Woodland mosaic vegetation over an area of 3 Ha into the vigorous exotic pasture areas.

The DSE *Revegetation Planting Standards* (DSE, 2006c) suggest planting density should achieve survival of 2900 plants/Ha after the 10-year establishment period (see table 10 below).

Life Form	Target No./Ha Per 5% BM cover	Swamp Scrub BM Cover	No. Plants /Ha	Plains Swampy Woodland BM Cover	No. Plants /Ha	Target No./Ha for Mosaic Vegetation Type
Trees	***50/Ha***	-	-	10	**50**	**50**
Large Shrub	***50***	50	**500**	5	**50**	**300**
Medium Shrubs	***200***	10	**400**	15	**600**	**500**
Small Shrubs	***500***	1	**100**	-	-	**50**
Large Tufted Graminoids	***500***	10	**1000**	30	**3000**	**2000**
Total/Ha			**2000**		**3700**	**2900**

Table 10: Revegetation survival targets at ten years for understorey life forms based on the bioregional EVC benchmarks1. Note; current DSE planting standards do not adequately address canopy species in Swamp Scrub and to compensate canopy species have been treated as for a Large Shrub.

Using DSE's *Revegetation Planting Standards* Large Tufted Graminoids are to be with a ten year survivorship target of 2,000 per hectare. Planting of this nature requires high levels of ongoing weed control maintenance effort in order to suppress weeds, which are not subject to adequate competition from the indigenous trees, shrubs and graminoids. This can change after 3-4 years when ground flora is often shaded out by woody species. Given the susceptibility of key species in this vegetation type to herbicides, weeding would need to be largely undertaken by hand, at substantial expense.

Following discussion with the City of Greater Dandenong (Darren Wilson) it has been determined that the most appropriate strategy for restoring these exotic dominated areas by current industry practices is through the establishment of a dense stand of indigenous woody species. Planting of Large Tufted Graminoids would then be undertaken after year seven, when woody species are established to a sufficient height for lateral light to penetrate and conditions become more suited to ground flora plantings.

Given the highly weed invaded nature of this management zone, revegetation with a range of woody species is a practical approach for strategic long term management. Only after woody plants are established and grown to sufficient height to allow lateral light penetration should ground flora species be established. This zone is low lying and poorly drained with a proposed increase to soil moisture through regular inundation from storm water runoff generated in adjacent development areas. For these reasons revegetation with a mosaic of Swamp Scrub / Plains Swampy Woodland vegetation type is proposed. Shrub density will be high with scattered trees.

The revegetation of this area should also be considered an opportunity to significantly increase the biodiversity of the site. As the reserve area is large and given that surrounding land is likely to suffer further habitat loss, in order to promote and maintain faunal diversity in the area high habitat quality is required in this reserve. This can only be achieved through provision of a range of plant species to provide continuous flowering and through the addition and retention of key

[1] Benchmarks downloaded from;
www.dse.vic.gov.au/conserv/EVC-PDF/GipP0053_61.pdf
www.dse.vic.gov.au/conserv/EVC-PDF/GipP0651.pdf

structural habitat such as rocks and logs. To achieve this planting lists include a number of tree and shrub species not currently present at the site but known to occur in the local area.

Swamp Scrub dominated vegetation will be established particularly in the southern section of the zone, where there is likely to be frequent inundation and water logging following high rainfall events. This vegetation type will grade into Plains Swampy Woodland.

Prior to planting regular mowing should be undertaken to reduce biomass in the planting area and reduce weed seed set. Spraying out of pasture (with a suitable broad spectrum herbicide) as spots or in strips to produce areas of bare ground for planting should be undertaken. A second spray following the initial death of the pasture species should be undertaken after a flush of exotic germination has occurred. A third spray should then occur following at least partial breakdown of weeds and sufficiently prior to planting (as per herbicide manufacturers specifications). Where appropriate a suitable residual pre-emergent herbicide should be used in the final herbicide application to achieve sustained weed control around plants (as per herbicide manufacturer specifications).

Following successful weed control and prior to planting any available stockpiled logs should be added to the revegetation areas in a random manner to provide a range of habitat niches.

Placement of plants and logs should provide for retention of narrow clear areas for access (see figure 2). These tracks should be marked out prior to plant placement with tall stakes marked with high visibility paint. The maintenance tracks should be mown regularly to clearly define their location and limit weed seed set along the tracks. In time, growth of surrounding plants will suppress the grass beneath them and create a clearly defined easily mown corridor.

The proposed planting without guards assumes that any necessary rabbit control has been undertaken prior to planting.

Establishment of ground flora species should occur only after lateral light penetration is sufficient to promote growth. After 3 to 4 years canopy connectivity is such that most exotic ground flora die out leaving bare ground that accumulates litter from the overgrowing trees and shrubs. This accumulation of indigenous litter is thought to alter soil chemistry and in the process promote indigenous microbial activity. After approximately 7 to 12 years, depending on the vegetation type, tree density and environmental conditions, as canopy height is more elevated and mid-storey branching much reduced, light penetration increases sufficiently to support ground flora. This occurrence is generally accompanied by a marked increase in weed cover which indicates suitable conditions for exotic ground flora control and supplementary planting with indigenous ground flora species and small shrubs.

Planting in this area will achieve the restoration of degraded remnant areas previously mapped by Biosis as 'intact' vegetation and areas of open exotic grassland. Planting of the Open exotic grassland areas will achieve the required recruitment targets while planting of the former habitat zone areas will achieve required maintenance and improvement targets.

Swamp Scrub/Plains Swampy Woodland Revegetation

The proposed planting of woody species is to occur at the following densities;

- Trees planted @ 1 plant per 30 m²
- Understorey Trees @ 1 plant per 4 m²
- Medium Shrubs planted @ 1 plant per 2 m²

Scientific Names	Common Names	Size (m) HxW	No.
Trees @ 1 per 30 m² over 30,000 m²			
Acacia dealbata	Silver Wattle	8x4	70
Acacia melanoxylon	Blackwood	10x5	60
Allocasuarina littoralis	Black Sheoke	8x4	60
Eucalyptus cephalocarpa	Mealy Stringybark	25x10	40
Eucalyptus ovata	Swamp Gum	15x8	50
Eucalyptus radiata	Narrow-leaf Peppermint	20x10	50
		Sub-Total	***330***
Understorey Trees @ 1 per 4 m² over 30,000 m²			
Leptospermum lanigerum	Woolly Tea-tree	5x3	765
Melaleuca ericifolia	Swamp Paperbark	8x4	550
Melaleuca squarrosa	Scented Paperbark	5x3	750
		Sub-Total	***2,065***
Medium Shrubs @ 1 per 2 m² over 30,000 m²			
Acacia paradoxa	Hedge Wattle	4x3	400
Acacia verniciflua	Varnish Wattle	3x4	400
Acacia verticillata	Prickly Mosses	4x4	500
Allocasuarina paludosa	Swamp Sheoke	2x2	400
Allocasuarina paradoxa	Dwarf Sheoke	2x2	400
Banksia marginata	Silver Banksia	3x6	400
Bursaria spinosa	Sweet Bursaria	5x3	550
Cassinia aculeata	Dogwood	3x1.5	550
Cassinia longifolia	Shiny Cassinia	4x3	550
Coprosma quadrifida	Prickly Currant-bush	4x2	550
Goodenia ovata	Hop Goodenia	2x3	550
Hakea nodosa	Yellow Hakea	3x2	400
Leptospermum continentale	Prickly Tea-tree	4x2	550
Olearia lirata	Snowy Daisy Bush	3x3	550
Ozothamnus ferrugineus	Tree Everlasting	4x3	550
Solanum laciniatum	Large Kangaroo Apple	3x3	550
Viminaria juncea	Golden Spray	5x3	400
		Sub-Total	***8,250***
		TOTAL	***10,645***

After woody species have established and conditions are deemed suitable, planting of LTG's should achieve as a minimum 2,000 plants per Ha (plus 10% for losses);

- 8,800 LTG's planted in small and large clumps, with occasional scattered plants. Planting should respond to site conditions and be informed or undertaken by an experienced bushland restoration professional.

Scientific Names	Common Names	Size (m) HxW	No.
Large Tufted Graminoids @ 2,000 per Ha			
Carex appressa	Tall Sedge	1x1	800
Carex brownii	Sedge	1.2x1	750
Carex gaudichaudiana	Tufted Sedge	0.4x0.3	750
Dianella longifolia (laevis)	Pale Flax-lily	1x1	750
Gahnia radula (or G. sieberiana if not possible)	Saw Sedge	1x1	750
Lomandra longifolia	Spiny-headed Mat-rush	1x1	1,000
Poa labillardierei	Tussock-grass	1.2x1	1,000
Themeda triandra	Kangaroo Grass	1x1	800
		Sub-Total	***6,600***

Life Form	Density	Area (m²)	Sub-Total	+10%*	Total
Trees	1 per 100 m²	30,000	300	30	*330*
Understorey Trees	1 per 16 m²	30,000	1,875	190	*2,065*
Medium Shrubs	1 per 4 m²	30,000	7,500	750	*8,250*
LTG's	2,000 per Ha	30,000	6,000	600	*6,600*
					17,245

Table 11: Summary of plant numbers for restoration of Management Zone 1, with allowance for losses. Planting in this zone also achieves the required recruitment target of 2,114 new plants

3.4 Restoration of Remnant Areas

3.4.1 Management Zone 2 – Plains Grassy Woodland with understorey

This is the most 'intact' area of remnant understorey vegetation in the reserve. Given the large areas of Weeping Grass much of this zone is considered suitable for supplementary planting with a range of graminoid, herbaceous and woody species common to this vegetation type.

Before any supplementary planting the entire zone should be burnt and follow-up weed control undertaken for a minimum two year period by experienced bushland managers. This process will allow for the germination of much of the dormant soil-stored seed, corms or tubers of both indigenous and exotic origin. Burning should not be undertaken until a majority of the *Leptospermum continentale* plants present have formed mature seed capsules and where possible burning should exclude the patches of *Acacia paradoxa* to retain cover for small birds and the single *Allocasuarina littoralis* plant to prevent accidental death.

Prior to burning all exotic flora should be killed. Dead plant material should be left as fuel with any seed heads removed. Timing of control should be such that dead plants contribute dry fuel to increase fire intensity in their vicinity in an attempt to kill exotic surface seed and to stimulate germination of deeper seed and fire tolerant species such as **Ulex europaeus, Acacia pycnantha* and *Acacia paradoxa.*

Burning should occur in late summer or early autumn, depending on weather patterns, to ensure conditions following the burn are most likely to be suitable for survival of indigenous germinants.

It is vital that in the first year following the burn control of exotic grasses, in particular **Ehrharta erecta,* is undertaken no less often than every 5-6 weeks. Under suitable conditions this species is able to germinate and set viable seed within a 5-6 week period. Successful control of **Ehrharta erecta* and any other exotic species will not be achieved unless prevented from setting viable seed. Any exotic plant species found bearing seed should be carefully hand pulled or de-headed and

bagged immediately on the spot. *Do not carry seed laden exotic plants through a restoration area* - carry a bag to them. Some soil disturbance from hand weeding is unavoidable and should not be regarded as negative, as stimulation of germination of weed seed in the soil at this time is desirable.

In order to achieve successful control of exotic grasses application of low concentrations of Glyphosate or grass-specific herbicides can be used on germinants and actively growing plants amongst established indigenous grasses. For this method to be successful without significant off-target impacts the timing of application, concentration of the herbicide and experience of the operator are critical. In the first instance it is important that any attempt to use a method of this nature be first trialed in a small area on the periphery of the intended control zone and monitored for a two week period. Once perfected, control methods of this nature are a valuable tool for the control of winter-active exotic grasses amongst indigenous species. In general only grass-specific herbicides can be used in areas with small indigenous dicotyledonous species.

Should a significant flush of exotic thistles occur post burn it should not be regarded as a failure or major management issue. It is common in reclaimed pasture areas for thistle species to act as fire ephemerals. They should be prevented from seeding through de-heading by brush-cutting and killed by spot spraying, wick-wiping or allowed to die out as vegetation recovers. Succession of this nature is a natural component of vegetation recovery. Thistles are only an ongoing management concern in areas where disturbance is ongoing, such as in overgrazing by stock or rabbits and where weeds are sprayed annually without the gaps created being filled by perennial indigenous species.

Planting for enhancement of understorey diversity should not occur until successful post-burn control of exotic grasses has been achieved and an assessment of indigenous plant species diversity and density undertaken. It is difficult to accurately predict the results of these management actions but it is likely that some increase in plant density and diversity will be achieved for most life forms due to a mass germination event and germination of species currently only present as dormant seed in the soils stored seed bank. The greatest benefit from these actions is likely to be from the elimination of exotic grass species. For the purpose of calculating supplementary planting density it will be assumed that an increase in understorey cover for all life forms currently present is achieved as a result of burning and two year weed control period. Any required supplementary planting will aim to increase diversity and therefore should include obligate seeder species with canopy stored seed that no longer persist such as Banksia, Hakea and Sheoke species.

It is likely that although much of the area will be free of exotic weeds within the 2 year period currently weed dominated areas will require more prolonged treatment. Within this zone are several small patches dominated by exotic grasses and woody weeds. If post-fire germination in these patches is dominated by exotic grass species (as is expected) treatment in these areas should include the use of a suitable pre-emergent herbicide. Due to their weed-dominated condition these small patches are better managed as revegetation sites. Dense planting with shrubs and large tufted graminoids only is likely to be the most appropriate treatment. Planting with woody species only in the first instance would allow for follow-up spraying with grass specific and pre-emergent herbicide prior to grass establishment. This planting sequence allows for the possibility of an exotic germination event stimulated by the planting of shrubs. Alternatively, or as well as, depletion of the seed bank can be promoted in these areas through 'scarifying' the soil by light raking in spring and autumn to promote weed germination, under suitable conditions, prior to a final preparatory spray with herbicide before planting.

Supplementary understorey planting will include patchy sparse plantings of native shrubs and relatively uniform planting of ground flora. Determining the final proportions of each species to be

used in supplementary planting should be left until an assessment of post fire vegetation recovery is undertaken, two years after the burn.

Following planting hand weeding is likely to be required, particularly around the base of planted plants. Some level of control of exotic flora species will be required indefinitely.

A two year period of weed control undertaken in this management zone without the use of a fire will not achieve a sufficient level of weed control. In particular the soil-stored seed bank would not be depleted sufficiently and any dormant seed hidden in the soil seed bank would not regenerate. Supplementary planting effort would need to be higher and biomass management would be very difficult in the absence of indigenous herbivores. Planting into the site at the densities proposed under a no-burn scenario is likely to lead to a significant flush of weed germination as a result of soil disturbance. The key benefit of utilising fire is in reducing the soil stored weed seed bank prior to planting. Follow-up weed control labour effort is significantly reduced although overall cost may be similar as undertaking a burn has associated costs and weed control effort is high for the first two years post burn.

The ongoing use of fire as a management tool in this zone should be considered.

Estimated Supplementary Planting Requirements

Restoration targets will be achieved through supplementary planting to increase the cover and diversity of life forms characteristic of Plains Grassy Woodland. In this management zone Eucalypt cover is currently sufficient and further Eucalypt recruitment as a result of management activities is anticipated. As a guide, supplementary planting is to achieve the following;

- Planting of Understorey Trees (T) to achieve 5% cover in areas where regeneration fails to reach the bench mark cover.

  Indicative plant density for 5% cover of T = 1 plant per 200m² (187 plants in 3.74 Ha)
  Estimate of supplementary planting requirements – 40 (~20% of total)

- Planting of Medium Shrubs (MS) to achieve 10% cover in areas where regeneration fails to reach the bench mark state.

  Indicative plant density for 10% cover of MS = 1 plant per 20m² (1,870 plants in 3.74 Ha)
  Estimate of supplementary planting requirements – 375 (~20% of total)

- Planting of Small Shrubs (SS) and prostrate shrubs (PS) to achieve 1% cover of each life form in areas where regeneration fails to reach the bench mark state.

  Indicative plant density for 1% cover of SS or PS = 1 plants per 50m² (750 plants in 3.74 Ha)
  Estimate of supplementary planting requirements – 600 (~80% of total)

- Planting of Large Tufted Graminoids (LTG) to achieve 5% cover in areas where regeneration fails to reach bench mark levels.

  Indicative plant density for 5% cover of LTG = 1 plant per 5m² (7,480 plants in 3.74 Ha)
  Estimate of supplementary planting requirements – 2,245 (~30% of total)

Estimated Total supplementary planting requirements; 3260 + 326 (10%) = 3,586 plants in 3.74 Ha

Species selection for supplementary planting into Plains Grassy Woodland

Scientific Names	Common Names	HxW (m)
Understorey Trees		
Acacia implexa	Lightwood	10x5
Acacia mearnsii	Black Wattle	10x5
Acacia melanoxylon	Blackwood	10x5
Allocasuarina littoralis	Black Sheoke	8x4
Medium Shrubs		
Acacia genistifolia	Spreading Wattle	2x3
Acacia paradoxa	Hedge Wattle	4x3
Acacia oxycedrus	Spike Wattle	5x4
Acacia ulicifolia	Juniper Wattle	2x2
Allocasuarina paludosa	Swamp Sheoke	2x2
Banksia marginata	Silver Banksia	3x6
Correa reflexa	Common Correa	2x2
Daviesia latifolia	Hop Bitter-pea	2x3
Dillwynia cinerascens	Grey Parrot-pea	1x0.5
Dillwynia glaberrima	Smooth Parrot-pea	1.5x1
Dillwynia sericea	Showy Parrot-pea	1.5x1
Hakea decurrens	Bushy Needlewood	4x2
Hakea nodosa	Yellow Hakea	3x2
Indigophera australis	Austral Indigo	2x2
Leptospermum continentale	Prickly Tea-tree	4x2
Viminaria juncea	Golden Spray	5x3
Small Shrubs		
Hovea linearis	Common Hovea	0.4x0.3
Pimelea humilis	Common Rice Flower	0.4x1
Platylobium obtusangulum	Common Flat-pea	0.4x1
Prostrate Shrubs		
Bossiaea prostrata	Creeping Bossiaea	0.2x1
Hardenbergia violacea	Purple Coral-pea	Variable
Graminoids		
Austrostipa rudis	Veined Spear Grass	1x0.6
Dianella longifolia (laevis)	Pale Flax-lily	0.8x0.7
Lomandra longifolia	Spiny-headed Mat-rush	1x1
Microlaena stipoides	Weeping Grass	0.4x1
Poa labillardierei	Tussock-grass	1.2x1
Themeda triandra	Kangaroo Grass	1x1

3.4.2 Management Zone 3 – Plains Grassy Woodland with low quality understorey

Given the highly weed invaded nature of ground flora in this zone restoration will concentrate on re-establishing understorey trees and creating a number of dense, irregular shaped, patches of indigenous shrubs in association with patches of Large Tufted Graminoids. Considering the intractable nature of the weed cover throughout much of the zone planting of the entire area is not likely to be sustainable in the long term due the cost and maintenance requirements over such a large area. Restoration of this zone will concentrate on restoring habitat suitable for the range of fauna most likely to utilise the area. Plantings of grasses will be limited to large, hardy species strategically associated with patches of woody shrubs.

Preparation of replanting areas should involve three separate applications of broad spectrum herbicide and include the use of pre-emergent herbicide for ongoing weed suppression during plant establishment. Each application of herbicide should be undertaken no sooner than four weeks or longer than 6 weeks from the previous application in order to interrupt the seeding cycle of some high-risk grassy weeds. In this instance mulch is not recommended. The site is well treed (sheltered) and poorly drained, under these conditions mulch tends to increase soil moisture and increase mobile organic nutrients which benefits exotic flora over indigenous species.

Following plant death (after the second herbicide application) depletion of the seed bank in revegetation patches should be promoted by 'tickling' of the soil through light raking to stimulate germination, under suitable conditions. This should be followed-up by a final knockdown spray including application of a suitable pre-emergent herbicide (e.g. Simizine). Timing of this final spray should be conducted at a time that will allow planting to occur at a suitable time of year (following the withholding period[2]) as per herbicide manufacturers specifications.

A range of indigenous shrubs will be planted in several dense irregularly shaped thickets to provide habitat for birds, reptiles and invertebrates. Although plantings will be scattered dense patches achieving high covers in a small area overall life form covers will be equivalent to the Plains Grassy Woodland EVC benchmark condition. On the periphery of the shrub thickets dense swards of large tufted graminoids and large herbs will be established. This planting structure is likely to be robust and viable to maintain in the long term through weed control and plant replacement.

Where large trees occur within densely planted patches only small shrubs, graminoids and herbs are to be planted under the canopy area. This is to avoid introducing to much competition with the older trees.

A key component of proposed improvements to the hydrology of retained grassy wetland areas adjacent to the woodland is a shallow vegetated swale that will be constructed through this management zone from its northern point to convey storm water flows from proposed industrial buildings in the industrial estate. This swale will wind through the trees following an existing informal path. Vegetation along the swale will consist of densely planted native sedges, rushes and grasses with scattered shrubs. An existing small low lying area on the western edge of the zone will be included in the flow path and revegetated with Swampy Woodland species including *Melaleuca ericifolia* with some plants propagated from the small remnant stand in the northern section of this zone.

To further restore and enhance the hydrological conditions at the site the existing swale drain is to be re-directed to discharge into the southern section of the site. This is to be achieved through directing the channel into the southern area and filling in some of the existing channel. Water will sheet flow during high flow events and will be collected by the remaining section of channel or enter directly into the main drain system immediately south of the site.

Supplementary Planting Requirements for Understorey Restoration

Restoration through planting of scattered understorey trees throughout the zone and with scattered dense patches of shrubs and tussocks to provide habitat for a range of invertebrates, arboreal mammals and birds. The aim is to increase the cover and diversity of life forms characteristic of Plains Grassy Woodland vegetation type using practical, achievable methods. In this management zone Eucalypt cover is very high and exotic grassy weed cover is very high,

[2] In this instance the withholding period is the time that must elapse between the application of the chemical and planter contact with the treated soil. This information should be obtained from the manufacturer of the herbicide.

dominated by the high threat grassy weed *Ehrharta erecta*. Revegetation of the understorey is to achieve the following;

The aim of restoration in this zone is to achieve DSE life form density targets as an average across the entire zone.

To achieve this understorey trees are to planted at a uniform density across the site, with shrub and graminoid life forms planted in discrete clumps, rather than spaced, in order to achieve a satisfactory, manageable outcome with the level of resources available.

Scattered planting of Understorey Trees throughout area

- Planting of Understorey Trees @ 1 per 30 m²

Scientific Names	Common Names	Size (m) HxW	No.
Understorey Trees @ 1 per to 30 m² over 81,904 m²			
Acacia implexa	Lightwood	10x5	800
Acacia mearnsii	Black Wattle	10x5	800
Acacia melanoxylon	Blackwood	10x5	800
Allocasuarina littoralis	Black Sheoke	8x4	600
		Total	***3,000***

Thickets of Understorey Trees and Shrubs (with Large Tufted Graminoids)

- Planting of Medium Shrubs @ 1 per 4 m²

Scientific Names	Common Names	Size (m) HxW	No.
Medium Shrubs @ 1 per 4 m² over 3,400 m²			
Acacia genistifolia	Spreading Wattle	2x3	50
Acacia paradoxa	Hedge Wattle	4x3	50
Acacia oxycedrus	Spike Wattle	5x4	50
Acacia ulicifolia	Juniper Wattle	2x2	50
Allocasuarina paludosa	Swamp Sheoke	2x2	100
Banksia marginata	Silver Banksia	3x6	50
Correa reflexa	Common Correa	2x2	85
Daviesia latifolia	Hop Bitter-pea	2x3	100
Dillwynia cinerascens	Grey Parrot-pea	1x0.5	50
Dillwynia glaberrima	Smooth Parrot-pea	1.5x1	50
Dillwynia sericea	Showy Parrot-pea	1.5x1	50
Hakea decurrens	Bushy Needlewood	4x2	50
Hakea nodosa	Yellow Hakea	3x2	50
Indigophera australis	Austral Indigo	2x2	50
Leptospermum continentale	Prickly Tea-tree	4x2	50
Viminaria juncea	Golden Spray	5x3	50
		Total	***935***

Thicket of Large Tufted Graminoids (fringing and under shrubs in thickets)

- Planting of Large Tufted Graminoids (LTG) @ 4 per 1 m²

Scientific Names	Common Names	Size (m) HxW	No.
Large Tufted Graminoids @ 4 per 1 m² over 10,000 m²			
Austrostipa rudis	Veined Spear Grass	1x0.6	5,000
Dianella longifolia (laevis)	Pale Flax-lily	0.8x0.7	5,000
Lomandra longifolia	Spiny-headed Mat-rush	1x1	10,000
Poa labillardierei	Tussock-grass	1.2x1	12,000
Themeda triandra	Kangaroo Grass	1x1	12,000
		Total	***44,000***

Swampy Woodland Planting – in association with the existing drain

- Planting of Understorey Trees (T) @ 1 per 16 m²
- Planting of Medium Shrubs (MS) @ 1 per 4 m²

Scientific Names	Common Names	Size (m) HxW	No.
Understorey Trees @ 1 per 16 m² over 2,760 m²			
Leptospermum lanigerum	Woolly Tea-tree	5x3	75
Melaleuca ericifolia	Swamp Paperbark	8x4	50
Melaleuca squarrosa	Scented Paperbark	5x3	75
		Sub-Total	***200***
Medium Shrubs @ 1 per 4 m² over 2,760 m²			
Acacia verticillata	Prickly Mosses	4x4	50
Allocasuarina paludosa	Swamp Sheoke	2x2	50
Allocasuarina paradoxa	Dwarf Sheoke	2x2	50
Banksia marginata	Silver Banksia	3x6	50
Bursaria spinosa	Sweet Bursaria	5x3	50
Coprosma quadrifida	Prickly Currant-bush	4x2	50
Goodenia ovata	Hop Goodenia	2x3	100
Hakea nodosa	Yellow Hakea	3x2	50
Leptospermum continentale	Prickly Tea-tree	4x2	100
Olearia lirata	Snowy Daisy Bush	3x3	100
Ozothamnus ferrugineus	Tree Everlasting	4x3	50
Solanum laciniatum	Large Kangaroo Apple	3x3	50
Viminaria juncea	Golden Spray	5x3	50
		Sub-Total	***800***
		TOTAL	***1,000***

Life Form	Density	Area (m²)	Sub-Total	+10%*	Total
Understorey Trees	1 per 30 m²	81,904	2,730	270	*3,000*
Understorey Trees	1 per 16 m²	2,760	175	25	*200*
Medium Shrubs	1 per 4 m²	3,400	850	85	*935*
Medium Shrubs	1 per 4 m²	2,760	700	100	*800*
LTG's	4 per 1 m²	10,000	40,000	4,000	*44,000*
					48,935

* An additional 10% of planting numbers is used to account for losses over the establishment period.

Table 12: Summary of plant numbers for restoration of Management Zone 3, with allowance for losses.

Constructed Open Drainage Swale

A vegetated drainage swale will be constructed running from the north east corner of the property, through the red gum woodland triangle of management zone 3 before discharging into the grassy wetland of management zone 4. The swale will discharge roof run-off from a proposed adjacent warehouse, improving the hydrology and ecology of the area.

The swale should be roughly trapezoidal in cross section with (approximately) a top width of 4 metres, base width of 1 metre and depth of 300mm. Water flow calculations indicate that a heavily vegetated swale of these dimensions will allow for the occasional inundation of the Red Gum Woodland.

The swale is to be planted with a range of rushes, sedges, grasses and shrub species which provide for dense ground habitat and scattered shrubs, of particularly high value to small birds.

Vegetated Open Swale Planting;

- Planting of Shrubs & Understorey Trees @ 1 per to 16 m²
- Planting of Large Tufted Graminoids (LTG) @ 4 per 1 m²

Scientific Names	Common Names	Size (m) HxW	No.	No. + 10%
Shrubs & Understorey Trees @ 1 per 16 m² over 2150 m²				
Leptospermum continentale	Prickly Tea-tree	2x2	35	40
Leptospermum lanigerum	Woolly Tea-tree	5x3	35	40
Melaleuca ericifolia	Swamp Tea-tree	8x3	30	30
Melaleuca squarrosa	Scented Paperbark	5x2	35	40
		Sub-Total	***135***	***150***
Graminoids / Herbs @ 4 per 1 m² over 2150 m²				
Amphibromus nervosus	Veined Swamp Wallaby Grass	0.4x0.8	300	330
Carex appressa	Tall Sedge	1x1	1000	1100
Carex brownii	Sedge	1.2x1	500	550
Carex gaudichaudiana	Tufted Sedge	0.4x0.3	500	550
Carex tereticaulis	Common Sedge	1x1	1000	1100
Cyperus lucidus	Leafy Flat Sedge	1x1	500	550
Glyceria australis (planted in clumps)	Australian Sweet-grass	1x1	800	880
Juncus amabilis	Hollow Rush	1x0.5	300	330
Juncus australis	Austral Rush	0.3x0.8	300	330
Juncus holoschoenus	Joint-leaved Rush	0.5x0.4	300	330
Juncus flavidus	Yellow Rush	1x0.5	300	330
Juncus pallidus	Pale Rush	2x1.5	500	550
Lomandra longifolia	Spiny-headed Mat-rush	1x1	1000	1100
Persicaria sp.	Knotweed	1x1	300	330
Poa labillardierei	Tussock-grass	1.2x1	1000	1100
		Sub-Total	***8,600***	***9,460***

Life Form	Density	Area (m²)	Sub-Total	+10%*	Total
Understorey Trees	1 per 10 m²	2,150	135	15	*150*
Graminoids/Herbs	4 per 1 m²	2,150	8,600	860	*9,460*
					9,700

* An additional 10% of planting numbers is used to account for losses over the establishment period.
Table 13: Summary of plant numbers for the Swale in Management Zone 3, with allowance for losses.

3.4.3 Management Zone 4 - Restoration of Remnant Plains Grassy Wetland

The regular inundation of this area, which includes "Habitat Zone 9 - Plains Grassy Wetland" from Hill & Costello (2005), with roof water run-off from large industrial buildings is proposed. The intention of this process is to create conditions beneficial to indigenous aquatic and semi-aquatic species and less favourable to exotic terrestrial flora, particularly winter-active weed species. Some control of exotic grasses is likely to be required to provide further advantage over exotic flora. Seasonal flooding is likely to drown out exotic species such as **Paspalum dilatatum*, **Anthoxanthum odoratum* and **Holcus lanatus* allowing existing native species such as *Eryngium vesiculosum*, *Eleocharis acuta* and *Villarsia reniformis* to spread into these areas.

Control of exotic grasses should not be undertaken until after two spring-summer periods from the addition of storm water run-off. This will allow conditions within the grassy wetland to alter in favour of aquatic and semi-aquatic species thus reducing the cover of many opportunistic exotic species and reducing resources required for weed control. Two growing seasons should be sufficient to boost indigenous flora cover and seed set so that rapid establishment in areas made available through the control of grassy weeds is likely to occur. Should exotic flora be knocked out without change to the current drainage regime it is likely the gaps created would be colonised by a succession of mostly exotic species without significant benefit from the efforts. A more gradual process that allows for a natural transition is more likely to achieve the desired result for the minimum effort and herbicide use.

Monitoring of biomass accumulation will be necessary particularly for the first two years. Biomass reduction should only be undertaken when soils are firm, not waterlogged, and indigenous species have finished flowering and seed set. The period for biomass reduction through slashing is from late December through to early March. Actual timing will differ year to year in response to seasonal variation and should be informed by an experienced bushland manager. December is generally the time when aquatic plants set seeds and thus slashing should not occur until after most seeds have dropped/released.

3.5 Summary & Estimated Costing of Management Actions by Zone

Individual management zones differ from one another by either floristics, EVC type and weed infestations and so require a different range of revegetation and management actions. A summary of management actions for each zone is provided below. A breakdown of quantities and time allowance by year for management actions and costs over the ten year management period is provided below. A detailed works schedule by season is provide in Section 5 of this report. The total site area is 21.6 Ha and the overall gain available is 8.15 Habitat Hectares.

Summary of Total Estimated Costs

Task	Cost
General Management Costs	77,200.00
Management Zone 1	116,490.00
Management Zone 2	188,320.00
Management Zone 3	257,270.00
Management Zone 4	*40,800.00*
Total Cost (ex-GST)	***680,080.00***

General Management Requirements

The entire site is to be assessed and monitored at regular intervals, all works undertaken are to be recorded and any departure from the works schedule is explained.

General Site Management Monitoring of pest plants and animals across the site
Reporting on works undertaken and any departure from the works schedule
Reporting on the outputs, outcomes and any lessons to be learnt from unforeseen works requirements

Area (Ha) **21.6**

Revegetation Area

	Commitment required for each task in each year										Costing		
Task	Yr. 1	Yr. 2	Yr. 3	Yr. 4	Yr. 5	Yr. 6	Yr. 7	Yr. 8	Yr. 9	Yr. 10	Total	Rate	Cost
Site inspections (days)	4	4	4	4	4	4	4	4	4	4	40	560	22,400.00
Rabbit Control	1	1	1	1	1	1					6	1,500	9,000.00
Monitoring & Reporting	5	5	5	5	5	5	5	5	5	10	55	560	30,800.00
Excavation – drainage	1										1	15,000	15,000.00
Section Total Estimate												***Sub-total***	***77,200.00***

Management Zone 1 – Revegetation with Swamp Scrub/Plains Swampy Woodland Mosaic

The long term objective within this zone is establishing a dense stand of woody species throughout that will suppress weeds. In time as the vegetation matures Large Tufted Graminoids will be planted to achieve the required life form covers.

- Site preparation; spraying out planting zones and control of rabbits and woody weeds.
- Regular mowing to manage biomass and weed seed set.
- Planting of 10,645 woody species.
- Planting of 6,600 Large Tufted Graminoids.

Management Zone 1 Scattered trees amongst exotic grasses and herbs
This management unit includes some sections of areas assessed as Habitat Zone 7, 9 and all of Habitat Zone 1
Revegetation with Woody Species to achieve a Swamp Scrub/Plains Swampy Woodland Mosaic
Includes follow-up planting with LTG's at year 9
This area is currently dominated by pasture and weed species with few remnant trees, on poorly drained soils

Area (Ha) 3.62

Revegetation Area

	Commitment required for each task in each year										Costing		
Task	Yr. 1	Yr. 2	Yr. 3	Yr. 4	Yr. 5	Yr. 6	Yr. 7	Yr. 8	Yr. 9	Yr. 10	Total	Rate	Cost
Weed Control (days)	20	20	20	20	20	15	20	20	20	20	195	400.00	78,000.00
Supply of Plants		10,645						6,600			17,245	1.00	17,245.00
Planting		10,645						6,600			17,245	1.00	17,245.00
Brush-cutting/Mowing (days)	2	4	2	2							10	400.00	4,000.00
Section Total Estimate											***Sub-total (ex-GST)***		***116,490.00***

Management Zone 2 - Plains Grassy Woodland

The long term objective within this zone is to control woody weeds and establish scattered understorey thickets of indigenous shrubs and ground flora. This zone contains a healthy, mature *Eucalyptus* overstorey, with a relatively intact understorey. Natural regeneration and supplementary planting will enhance diversity and provide food, refuge and habitat for native birds and mammals.

Control of woody species, particularly Gorse, **Ulex europaeus*, will require a long term program of spaying, hand weeding of germinants and burning. No indigenous plantings will occur in these areas of woody weed infestation until eliminated.

Areas dominated or with high cover of exotic grasses will be mown as/if required for biomass management and to reduce weed seed set.

Summary of Actions to Achieve Gains:

- Control exotic herbivores
- Supplementary plantings with 3,586 shrubs and graminoids
- Control woody weeds
- Control and eliminate high threat weeds
- Burning to manage biomass accumulation and to promote germination from the soil stored seed bank

Management Zone 2

Relatively 'intact' Plains Grassy Woodland with some elements of Swamp Woodland in the southern section
This management unit includes most of the area assessed as Habitat Zone 7
Restoration of Plains Grass Woodland vegetation is proposed through understorey management
This area is relatively 'intact', supporting Eucalypts with an understorey of indigenous grasses and shrubs

Area (Ha)
Intact Grassy Woodland
2.65

	Commitment required for each task in each year										Costing		
Task	Yr. 1	Yr. 2	Yr. 3	Yr. 4	Yr. 5	Yr. 6	Yr. 7	Yr. 8	Yr. 9	Yr. 10	Total	Rate	Cost
Weed Control (days)	50	50	65	60	40	40	30	30	20	20	405	400.00	162,000.00
Burn Plan Report (days)	6										6	800.00	4,800.00
Ecological Burn (Ha)			1								1	15,000.00	15,000.00
Supply Plants						3,260					3,260	1.00	3,260.00
Planting						3,260					3,260	1.00	3,260.00
Section Total Estimate												***Sub-total***	***188,320.00***

Management Zone 3 Plains Grassy Woodland

The long term objective within this zone is to control woody weeds and establish scattered thickets of indigenous shrubs and ground species. This zone contains a healthy, mature *Eucalyptus* overstorey, and plantings will provide food, refuge and habitat for native birds and possibly mammals. A drainage swale is to be constructed, running from the north-eastern section, through the woodland, to the Plains Grassy Wetland Vegetation in Zone 9. The swale will be planted out with sedges and shrubs.

Control of woody species, particularly Gorse, Ulex europaeus, will require a long term program of spaying, hand weeding of germinants and burning. No indigenous plantings will be centered in these areas of woody weed infestation. Areas supporting high cover of exotic grasses will require mowing for biomass management.

Summary of Actions to Achieve Gains:

- Control exotic herbivores.
- Supplementary plantings of trees, shrubs and large tufted graminoids.
- Periodic Biomass Reduction through mowing/slashing during summer/autumn drought period as necessary prior to curing.
- Control woody weeds.
- Maintain or reduce high threat weed cover.
- Introduce logs of varying sizes in areas currently dominated by exotic grasses. These logs are available from clearance within the development.

Management Zone 3 Dense woodland of E. camaldulensis over a degraded understorey dominated by Erharta erecta
This management unit includes all of the area assessed as Habitat Zone 8
Understorey restoration with shrubs, large herbs and large graminoids is proposed
This area is currently dominated by Eucalypts with exotic grass dominated understorey on poorly drained soils

Area (Ha) 12.19

Degraded Grassy Woodland Area

	Commitment required for each task in each year										Costing		
Task	Yr. 1	Yr. 2	Yr. 3	Yr. 4	Yr. 5	Yr. 6	Yr. 7	Yr. 8	Yr. 9	Yr. 10	Total	Rate	Cost
Mowing/brushcutting	2	2	2	2	2	2	2	2	2	2	20	400.00	8,000.00
Weed Control	50	50	40	40	30	30	30	20	20	20	330	400.00	132,000.00
Supply of Plants		58,635									58,635	1.00	58,635.00
Planting		58,635									58,635	1.00	58,635.00
Section Total Estimate												***Sub-total***	***257,270.00***

Management Zone 4 – Plains Grassy Wetland

The objective within this zone is to enhance and restore the Plains Grassy Wetland vegetation by creating a seasonal flooding event within this area. The proposed method for this flooding is for the drainage swale to discharge all runoff into the natural depression occurring within this area, therefore favoring the growth of semi-aquatic indigenous plants and drowning exotic pasture grasses currently present.

Also required will be a biomass reduction program, which will involve mowing any areas within the zone that do not contain native vegetation and that require reduction of excess biomass of exotic species.

Summary of Actions to Achieve Gains:

- Restore hydrological regime - drainage swale construction.
- Restore hydrological regime - existing drainage swale modification.
- Periodic Biomass Reduction (mowing/slashing during late summer/autumn).
- Control woody weeds.
- Maintain or reduce high threat weed cover.

Management Zone 4

Degraded but 'intact' Plains Grassy Wetland in poorly drained soils suitable for restoration
This management unit includes some sections of the area assessed as Habitat Zone 9
Management through improved hydrology, weed control and biomass reduction is proposed
This area is currently dominated by mix of pasture and weed species scattered indigenous herbs and grasses
The site is characterised by low lying poorly drained soils, forming a large shallow depression

Area (Ha) 0.88

Degraded Grassy Wetland Area

	Commitment required for each task in each year										Costing		
Task	Yr. 1	Yr. 2	Yr. 3	Yr. 4	Yr. 5	Yr. 6	Yr. 7	Yr. 8	Yr. 9	Yr. 10	Total	Rate	Cost
Brush-cutting/Slashing (days)	1	1	1	1	1	1	1	1	1	1	10	400	4,000.00
Weed Control (days)	15	15	10	10	8	8	8	6	6	6	92	400	36,800.00
Section Total Estimate												***Sub-total***	***40,800.00***

4 Monitoring of Actions and Outcomes

Monitoring and assessment of the restoration project is essential to ensure that management actions are achieving desired outcomes. The outcomes of certain elements of the project such as rabbit and weed control are difficult to predict and therefore require ongoing monitoring to inform the timing and extent of management actions.

Works Records, Reporting and Assessment of Outcomes

An annual report on works undertaken that quantifies the hours spent on each task and includes any relevant quantities (e.g. plants planted, plant losses, rabbit numbers, kg's of bait laid) must be completed and submitted to the regulatory authority.

At year five and again at the completion of the project (year 10) a report that includes habitat quality assessment of revegetation and restoration areas is to be undertaken by a suitably qualified and experienced person and submitted to the regulatory authority. This report should present a breakdown of works completed against the works proposed to be undertaken in this Management Plan. The report should also present habitat quality assessment of restoration areas and survivourship in revegetation areas to determine performance and outcomes against the stated aims.

The year 5 and final report must cover the following:

- *Revegetation Areas*
    - Assess life form cover and survivorship. If plant cover/density is below the required outcome then an explanation of why losses were greater than predicted.
    - Provide an estimate of works requirements and associated costs to achieve the required outcomes.
    - Suggestions as to how future management actions should be drafted to limit the likelihood of a similar occurrence in future.
    - For the year 5 report provide a statement on the likelihood of achieving the required outcomes through the remaining specified works program.
- *Restoration Areas*
    - Undertake Vegetation Quality Assessment of each management zone where restoration was required to be undertaken.
    - If life form cover is below the required outcome provide an explanation of why this has occurred.
    - Provide an estimate of works requirements and associated cost to achieve the required outcomes.
    - Suggestions as to how future management actions should be drafted to limit the likelihood of a similar occurrence in future.

- For the year 5 report provide a statement on the likelihood of achieving the required outcomes through the remaining specified works program.

- *Weed infestations*
  - Mapping of the extent and cover of weeds across the reserve.
  - If weed cover and extent is greater than the required outcome provide a breakdown as to why this has occurred.
  - Provide an estimate of cost to achieve the required outcomes.
  - Suggestions as to how future management actions should be drafted to limit the likelihood of a similar occurrence in future.
  - For the year 5 report provide a statement on the likelihood of achieving the required outcomes through the remaining specified works program.
- *Pest Animal infestations*
  - An assessment of rabbit and hare population density and evidence of rabbit/hare damage.
  - If pest animal density and damage is greater than the required outcome provide an explanation as to why this has occurred.
  - Provide an estimate of costs to achieve the required outcomes.
  - Suggestions as to how future management actions should be drafted to limit the likelihood of a similar occurrence in future.
  - For the year 5 report provide a statement on the likelihood of achieving the required outcomes through the remaining specified works program.

5 Works Schedules

The works schedules provided below detail works requirements by season for tendering purposes and have been produced to satisfy the requirements for an offset plan agreement between Pall Mall Assets Pty Ltd and the responsible authority.

Given the long timeframe of the offset works, and given that ecological conditions can change in ways that cannot be anticipated the following works schedule should be considered a guide only, particularly for the later years of the schedule. Site management should be adaptive and respond appropriately to changes in conditions on the site, particularly any new weed invasions that occur.

5.1 Detailed works schedule by year, season and task

Activity Yr1	Summer	Autumn	Winter	Spring
Site Inspection/ Monitoring of entire site **Management Zones 1,2,3&4**	Inspect entire site in first week of January, record details of current condition including any rabbit activity, weed issues, general ecological observations. Record required active management works including timing and methods. **Days = 1**	Inspect site in the first week of March and of May, record details of current condition including any rabbit activity, weed issues, general ecological observations. Record required active management works including timing and methods. **Days = 1**	Inspect site in the first week of July and of September, record details of current condition including any rabbit activity, weed issues, general ecological observations. Record required active management works including timing and methods. **Days = 1**	Inspect site in first week of November, record details of current condition including any rabbit activity, weed issues, general ecological observations. Record required active management works including timing and methods. **Days = 1**
Rabbit Control	Assess rabbit activity and undertake baiting with Pindone as appropriate.			
Weed control **Management Zone 1**	Mark out areas with intact ground flora. Prep area for planting by mowing then Boom & Spot Spray across zone, taking care in remnant patches to only spot spray for woody plant establishment. Assess rabbit activity and undertake baiting with Pindone as appropriate.Key Target Species; *Phalaris aquatica, Holcus lanatus, Paspalum spp., Ehrharta spp., Ulex europaeus* **Days = 4 + 1 (mowing)**	Continue to prep area for planting by mowing then Boom & Spot Spray across zone, taking care in remnant patches to only spot spray for woody plant establishment. Key Target Species; *Phalaris aquatica, Holcus lanatus, Paspalum spp., Ehrharta spp., Ulex europaeus* **Days = 4**	Spot Spray/hand weed across zone, taking care to avoid existing plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Paspalum spp., Ehrharta spp., Arctotheca calendula, Hypochoeris radicata, Plantago lanceolata, Ulex europaeus* Aim: control around planted plants **Days = 4**	Spot Spray/hand weed across zone, taking care to avoid existing plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Paspalum spp., Ehrharta spp., Arctotheca calendula, Hypochoeris radicata, Plantago lanceolata, Ulex europaeus* Aim: control around planted plants **Days = 8 + 1 (mowing)**
Planting **Management Zone 1**		The timing of planting will depend on a number of factors, most importantly being the timing of weed control. Terrestrial species may be established in the dryer zones during Autumn if site preparation is completed. Wetter areas are best left until Spring. Planting is with 10,645 woody plants in total. Watering of stock prior to planting, no guarding, watering in on day of planting.		

Weed control **Management Zone 2**	Spot Spray/hand weed across zone, taking care to avoid existing plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Ulex europaeus.* Aim: <1% Weed Cover **Days = 20**	Spot Spray/hand weed across zone, taking care to avoid existing plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Ulex europaeus.* Aim: <1% Weed Cover **Days = 10**	Spot Spray/hand weed across zone, taking care to avoid existing plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Ulex europaeus.* Aim: <1% Weed Cover **Days = 10**	Spot Spray/hand weed across zone, taking care to avoid existing plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Ulex europaeus.* Aim: <1% Weed Cover **Days = 25**
Weed control **Management Zone 3**	Mark out areas with intact ground flora. Spot Spray across zone in preparation for understorey tree planting. Spray out planting patches, taking care to avoid existing plants. Spraying out Gorse & Blackberry. Cut & paint Hawthorn and Desert Ash. Mark out and spray out the swale construction area. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Ulex europaeus, Rubus fruticosus, Crataegus monogyna, Fraxinus sp.* Aim: Control woody weeds; Weed free planting areas **Days = 10+1 (mowing)**	Follow-up Spot Spray across zone in preparation for understorey tree planting. Spray out planting patches, taking care to avoid existing plants. Burn dead Gorse & Blackberry. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Ulex europaeus.* Aim: Control woody weeds; Weed free planting areas **Days = 10**	Monitor/control Hawthorn, Gorse & Blackberry seedlings. Spot spray around planted plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Ulex europaeus.* Aim: Control woody weeds; Weed free planting areas **Days = 15**	Monitor/control Hawthorn, Gorse & Blackberry seedlings. Spot spray around planted plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Ulex europaeus.* Aim: Control woody weeds; Weed free planting areas **Days = 15 + 1 (mowing)**
Construction of Swale	Swale to be constructed after weed treatment of the alignment is undertaken. Soil excavated during construction is to be used for partial filling in of the existing contour drain and for creating a bund to retard surface flows in the revegetation and woodland triangle areas. Excavation is to be completed prior to any planting in this section of the management zone. Timing of construction to be determined based on consideration of weather conditions and success of weed control. As access to this area is via ground prone to inundation and water logging works undertaken during late summer early autumn would be preferable.			
Planting of Woodland Management Zone 3		The timing of planting will depend on a number of factors, most importantly being the timing of weed control. Planting should commence in Autumn as soon as site preparation is completed. No terrestrial planting should be undertaken beyond September 30. Planting is with 48,935 plants in total. Watering of stock prior to planting, no guarding, watering in on day of planting.		
Planting of Swale Management Zone 3		The timing of planting will depend on a number of factors, most importantly being the timing of weed control and construction. Planting should commence in Autumn as soon as site preparation is completed. No terrestrial planting should be undertaken beyond September 30. Wetter areas are best left until Spring. Planting is with 9,700 plants in total. Watering of stock prior to planting, no guarding, watering in on day of planting.		
Weed control **Management Zone 4**	Spot Spray/hand weed across zone, taking care to avoid existing plants. Key Target Species; *Phalaris aquatica, Paspalum spp., Holcus lanatus, Hypochoeris radicata, Plantago lanceolata* Aim: <1% Weed Cover **Days = 6**	Spot Spray/hand weed across zone, taking care to avoid existing plants. Key Target Species; *Phalaris aquatica, Paspalum spp., Holcus lanatus, Hypochoeris radicata, Plantago lanceolata* Aim: <1% Weed Cover **Days = 2**	Spot Spray/hand weed across zone, taking care to avoid existing plants. Key Target Species; *Phalaris aquatica, Paspalum spp., Holcus lanatus, Hypochoeris radicata, Plantago lanceolata* Aim: <1% Weed Cover **Days = 2**	Spot Spray/hand weed across zone, taking care to avoid existing plants. Brush-cutting of exotic plants. Key Target Species; *Phalaris aquatica, Paspalum spp., Holcus lanatus, Hypochoeris radicata, Plantago lanceolata* Aim: <1% Weed Cover **Days = 5 + 1 (brush-cutting)**

Record Keeping, Monitoring & Report Preparation	Record works undertaken, timing and time spent against each task into the Annual Works Record Sheet. Note any departure from works schedule. Prepare a Burn Plan for Management Zone 2 to inform Management Burning for Biodiversity outcomes. **Days = 7**	Provide Annual Works Summary to regulatory Authorities. This is to include a breakdown of timing and time spent against tasks and methods. Any deviation from the works schedule should be noted and a brief explanation provided. **Days = 2**	Record works undertaken, timing and time spent against each task into the Annual Works Record Sheet. Note and explain any departure from works schedule. **Days = 1**	Record works undertaken, timing and time spent against each task into the Annual Works Record Sheet. Note and explain any departure from works schedule. **Days = 1**
Activity Yr2	**Summer**	**Autumn**	**Winter**	**Spring**
Site Inspection/ Monitoring of entire site **Management Zones 1,2,3&4**	Inspect entire site in first week of January, record details of current condition including any rabbit activity, weed issues, general ecological observations. Record required active management works including timing and methods. **Days = 1**	Inspect site in the first week of March and of May, record details of current condition including any rabbit activity, weed issues, general ecological observations. Record required active management works including timing and methods. **Days = 1**	Inspect site in the first week of July and of September, record details of current condition including any rabbit activity, weed issues, general ecological observations. Record required active management works including timing and methods. **Days = 1**	Inspect site in first week of November, record details of current condition including any rabbit activity, weed issues, general ecological observations. Record required active management works including timing and methods. **Days = 1**
Rabbit Control	Assess rabbit activity and undertake baiting with Pindone as appropriate.			
Weed control **Management Zone 1**	Spot Spray/hand weed across zone, taking care to avoid existing plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Paspalum spp., Ehrharta spp., Arctotheca calendula, Hypochoeris radicata, Plantago lanceolata, Ulex europaeus* Aim: control around planted plants **Days = 4 + 2 (mowing)**	Spot Spray/hand weed across entire site, taking care to avoid existing plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Paspalum spp., Ehrharta spp., Arctotheca calendula, Hypochoeris radicata, Plantago lanceolata, Ulex europaeus* Aim: control around planted plants **Days = 2**	Spot Spray/hand weed across entire site, taking care to avoid existing plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Paspalum spp., Ehrharta spp., Arctotheca calendula, Hypochoeris radicata, Plantago lanceolata, Ulex europaeus* Aim: control around planted plants **Days = 4**	Spot Spray/hand weed across entire site, taking care to avoid existing plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Paspalum spp., Ehrharta spp., Arctotheca calendula, Hypochoeris radicata, Plantago lanceolata, Ulex europaeus* Aim: control around planted plants **Days = 10 + 2 (mowing)**
Weed control **Management Zone 2**	Spot Spray/hand weed across zone, taking care to avoid existing plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Ulex europaeus.* Aim: <1% Weed Cover **Days = 12.5**	Spot Spray/hand weed across zone, taking care to avoid existing plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Ulex europaeus.* Aim: <1% Weed Cover **Days = 10**	Spot Spray/hand weed across zone, taking care to avoid existing plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Ulex europaeus.* Aim: <1% Weed Cover **Days = 12.5**	Spot Spray/hand weed across zone, taking care to avoid existing plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Ulex europaeus.* Aim: <1% Weed Cover. **Days = 25**
Weed control **Management Zone 3**	Monitor/control Hawthorn, Gorse & Blackberry seedlings. Spot spray around planted plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Ulex europaeus.* Aim: Control woody weeds; Weed free planted areas. **Days = 10 + 1 (mowing)**	Monitor/control Hawthorn, Gorse & Blackberry seedlings. Spot spray around planted plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Ulex europaeus.* Aim: Control woody weeds; Weed free planted areas. **Days = 10**	Monitor/control Hawthorn, Gorse & Blackberry seedlings. Spot spray around planted plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Ulex europaeus.* Aim: Control woody weeds; Weed free planted areas. **Days = 15**	Monitor/control Hawthorn, Gorse & Blackberry seedlings. Spot spray around planted plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Ulex europaeus.* Aim: Control woody weeds; Weed free planted areas. **Days = 15 + 1 (mowing)**

Weed control **Management Zone 4**	Spot Spray/hand weed across zone, taking care to avoid existing plants. Key Target Species; *Phalaris aquatica, Paspalum spp., Holcus lanatus, Hypochoeris radicata, Plantago lanceolata* Aim: <1% Weed Cover **Days = 5 + 1 (brushcutting)**	Spot Spray/hand weed across zone, taking care to avoid existing plants. Key Target Species; *Phalaris aquatica, Paspalum spp., Holcus lanatus, Hypochoeris radicata, Plantago lanceolata* Aim: <1% Weed Cover **Days = 2**	Spot Spray/hand weed across zone, taking care to avoid existing plants. Key Target Species; *Phalaris aquatica, Paspalum spp., Holcus lanatus, Hypochoeris radicata, Plantago lanceolata* Aim: <1% Weed Cover **Days = 2**	Spot Spray/hand weed across zone, taking care to avoid existing plants. Brush-cutting of exotic plants. Key Target Species; *Phalaris aquatica, Paspalum spp., Holcus lanatus, Hypochoeris radicata, Plantago lanceolata* Aim: <1% Weed Cover **Days = 5 + 1 (brush-cutting)**
Record Keeping, Monitoring & Report Preparation	Record works undertaken by task each with hours into the Annual Works Record Sheet. Note any departure from works schedule. **Days = 1**	Provide Annual Works Summary to regulatory Authorities. Any deviation from the works schedule should be noted and a brief explanation provided. **Days = 2**	Record works undertaken by task each with hours into the Annual Works Record Sheet. Note any departure from works schedule. **Days = 1**	Record works undertaken by task each with hours into the Annual Works Record Sheet. Note any departure from works schedule. **Days = 1**
Activity Yr3	**Summer**	**Autumn**	**Winter**	**Spring**
Site Inspection/ Monitoring of entire site **Management Zones 1,2,3&4**	Inspect offset site in first week of January, record details of current condition and required active management works. **Days = 1**	Inspect offset site in the first week of March and of May, record details of current condition and required active management works. **Days = 2**	Inspect offset site in the first week of July and of September, record details of current condition and required active management works. **Days = 1**	Inspect offset site in first week of November, record details of current condition and any required active management works. **Days = 2**
Rabbit Control	Assess rabbit activity and undertake baiting with Pindone as appropriate.			
Weed control **Management Zone 1**	Spot Spray/hand weed across zone, taking care to avoid existing plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Paspalum spp., Ehrharta spp., Arctotheca calendula, Hypochoeris radicata, Plantago lanceolata, Ulex europaeus* Aim: control around planted plants **Days = 4 + 1 (mowing)**	Spot Spray/hand weed across entire site, taking care to avoid existing plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Paspalum spp., Ehrharta spp., Arctotheca calendula, Hypochoeris radicata, Plantago lanceolata, Ulex europaeus* Aim: control around planted plants **Days = 2**	Spot Spray/hand weed across entire site, taking care to avoid existing plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Paspalum spp., Ehrharta spp., Arctotheca calendula, Hypochoeris radicata, Plantago lanceolata, Ulex europaeus* Aim: control around planted plants **Days = 4**	Spot Spray/hand weed across entire site, taking care to avoid existing plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Paspalum spp., Ehrharta spp., Arctotheca calendula, Hypochoeris radicata, Plantago lanceolata, Ulex europaeus* Aim: control around planted plants **Days = 10 + 1 (mowing)**
Weed control **Management Zone 2**	Spot Spray/hand weed across zone, taking care to avoid existing plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Ulex europaeus.* Aim: <1% Weed Cover **Days = 10**	Spot Spray/hand weed across zone, taking care to avoid indigenous germinants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Cirsium vulgare, Arctotheca calendula, Ulex europaeus.* Aim: <1% Weed Cover **Days = 5**	Post burn Spot Spray/hand weed across zone, taking care to avoid indigenous germinants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Cirsium vulgare, Arctotheca calendula, Ulex europaeus.* Aim: <1% Weed Cover **Days = 15**	Post burn Spot Spray/hand weed across zone, taking care to avoid indigenous germinants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Cirsium vulgare, Arctotheca calendula, Ulex europaeus.* Aim: <1% Weed Cover **Days = 20**

Management Burning for Biodiversity	Prepare for & conduct a Management Burn for Biodiversity outcomes in Management Zone 2 as per burn plan.			
Weed control **Management Zone 3**	Monitor/control Hawthorn, Gorse & Blackberry seedlings. Spot spray around planted plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Ulex europaeus.* Aim: Control woody weeds; Weed free planted areas. **Days = 5 + 1 (mowing)**	Monitor/control Hawthorn, Gorse & Blackberry seedlings. Spot spray around planted plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Ulex europaeus.* Aim: Control woody weeds; Weed free planted areas. **Days = 5**	Monitor/control Hawthorn, Gorse & Blackberry seedlings. Spot spray around planted plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Ulex europaeus.* Aim: Control woody weeds; Weed free planted areas. **Days = 15**	Monitor/control Hawthorn, Gorse & Blackberry seedlings. Spot spray around planted plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Ulex europaeus.* Aim: Control woody weeds; Weed free planted areas. **Days = 15 + 1 (mowing)**
Weed control **Management Zone 4**	Spot Spray/hand weed across zone, taking care to avoid existing plants. Key Target Species; *Phalaris aquatica, Paspalum spp., Holcus lanatus, Hypochoeris radicata, Plantago lanceolata* Aim: <1% Weed Cover **Days = 3**		Spot Spray/hand weed across zone, taking care to avoid existing plants. Key Target Species; *Phalaris aquatica, Paspalum spp., Holcus lanatus, Hypochoeris radicata, Plantago lanceolata* Aim: <1% Weed Cover **Days = 2**	Spot Spray/hand weed across zone, taking care to avoid existing plants. Brush-cutting of exotic plants. Key Target Species; *Phalaris aquatica, Paspalum spp., Holcus lanatus, Hypochoeris radicata, Plantago lanceolata* Aim: <1% Weed Cover **Days = 5 + 1 (brush-cutting)**
Record Keeping, Monitoring & Report Preparation	Record works undertaken by task each with hours into the Annual Works Record Sheet. Note any departure from works schedule. **Days = 1**	Provide Annual Works Summary to regulatory Authorities. Any deviation from the works schedule should be noted and a brief explanation provided. **Days = 2**	Record works undertaken by task each with hours into the Annual Works Record Sheet. Note any departure from works schedule. **Days = 1**	Record works undertaken by task each with hours into the Annual Works Record Sheet. Note any departure from works schedule. **Days = 1**
Activity Yr4	**Summer**	**Autumn**	**Winter**	**Spring**
Site Inspection/ Monitoring Management Areas 1,2,3&4	Inspect offset site in first week of January, record details of current condition and required active management works. **Days = 1**	Inspect offset site in the first week of March and of May, record details of current condition and required active management works **Days = 2**	Inspect offset site in the first week of July and of September, record details of current condition and required active management works **Days = 1**	Inspect offset site in first week of November, record details of current condition and any required active management works **Days = 2**
Rabbit Control	Assess rabbit activity and undertake baiting with Pindone as appropriate.			
Weed control **Management Zone 1**	Spot Spray/hand weed across zone, taking care to avoid existing plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Paspalum spp., Ehrharta spp., Arctotheca calendula, Hypochoeris radicata, Plantago lanceolata, Ulex europaeus* Aim: control around planted plants **Days = 6 + 1 (mowing)**	Spot Spray/hand weed across entire site, taking care to avoid existing plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Paspalum spp., Ehrharta spp., Arctotheca calendula, Hypochoeris radicata, Plantago lanceolata, Ulex europaeus* Aim: control around planted plants **Days = 2**	Spot Spray/hand weed across entire site, taking care to avoid existing plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Paspalum spp., Ehrharta spp., Arctotheca calendula, Hypochoeris radicata, Plantago lanceolata, Ulex europaeus* Aim: control around planted plants **Days = 2**	Spot Spray/hand weed across entire site, taking care to avoid existing plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Paspalum spp., Ehrharta spp., Arctotheca calendula, Hypochoeris radicata, Plantago lanceolata, Ulex europaeus* Aim: control around planted plants **Days = 10 + 1 (mowing)**

Weed control **Management Zone 2**	Spot Spray/hand weed across zone, taking care to avoid indigenous germinants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Cirsium vulgare, Arctotheca calendula, Ulex europaeus.* Aim: <1% Weed Cover **Days = 10**	Spot Spray/hand weed across zone, taking care to avoid indigenous germinants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Cirsium vulgare, Arctotheca calendula, Ulex europaeus.* Aim: <1% Weed Cover **Days = 5**	Spot Spray/hand weed across zone, taking care to avoid indigenous germinants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Cirsium vulgare, Arctotheca calendula, Ulex europaeus.* Aim: <1% Weed Cover **Days = 15**	Spot Spray/hand weed across zone, taking care to avoid indigenous germinants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Cirsium vulgare, Arctotheca calendula, Ulex europaeus.* Aim: <1% Weed Cover **Days = 20**
Weed control **Management Zone 3**	Monitor/control Hawthorn, Gorse & Blackberry seedlings. Spot spray around planted plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Ulex europaeus.* Aim: Control woody weeds; Weed free planted areas. **Days = 5 + 1 (mowing)**	Monitor/control Hawthorn, Gorse & Blackberry seedlings. Spot spray around planted plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Ulex europaeus.* Aim: Control woody weeds; Weed free planted areas. **Days = 5**	Monitor/control Hawthorn, Gorse & Blackberry seedlings. Spot spray around planted plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Ulex europaeus.* Aim: Control woody weeds; Weed free planted areas. **Days = 15**	Monitor/control Hawthorn, Gorse & Blackberry seedlings. Spot spray around planted plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Ulex europaeus.* Aim: Control woody weeds; Weed free planted areas. **Days = 15 + 1 (mowing)**
Weed control **Management Zone 4**	Spot Spray/hand weed across zone, taking care to avoid existing plants. Key Target Species; *Phalaris aquatica, Paspalum spp., Holcus lanatus, Hypochoeris radicata, Plantago lanceolata* Aim: <1% Weed Cover **Days = 3**		Spot Spray/hand weed across zone, taking care to avoid existing plants. Key Target Species; *Phalaris aquatica, Paspalum spp., Holcus lanatus, Hypochoeris radicata, Plantago lanceolata* Aim: <1% Weed Cover **Days = 2**	Spot Spray/hand weed across zone, taking care to avoid existing plants. Brush-cutting of exotic plants. Key Target Species; *Phalaris aquatica, Paspalum spp., Holcus lanatus, Hypochoeris radicata, Plantago lanceolata* Aim: <1% Weed Cover **Days = 5 + 1 (brush-cutting)**
Record Keeping, Monitoring & Report Preparation	Record works undertaken by task each with hours into the Annual Works Record Sheet. Note any departure from works schedule. **Days = 1**	Provide Annual Works Summary to regulatory Authorities. Any deviation from the works schedule should be noted and a brief explanation provided. **Days = 2**	Record works undertaken by task each with hours into the Annual Works Record Sheet. Note any departure from works schedule. **Days = 1**	Record works undertaken by task each with hours into the Annual Works Record Sheet. Note any departure from works schedule. **Days = 1**
Activity Yr5	**Summer**	**Autumn**	**Winter**	**Spring**
Site Inspection/ Monitoring of entire site Management Zones 1,2,3&4	Inspect offset site in first week of January, record details of current condition and required active management works. **Days = 1**	Inspect offset site in the first week of March and of May, record details of current condition and required active management works. **Days = 2**	Inspect offset site in the first week of July and of September, record details of current condition and required active management works. **Days = 1**	Inspect offset site in first week of November, record details of current condition and any required active management works. **Days = 2**

Rabbit Control	Assess rabbit activity and undertake baiting with Pindone as appropriate.			
Weed control **Management Zone 1**	Spot Spray/hand weed across entire site, taking care to avoid existing plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Paspalum spp., Ehrharta spp., Arctotheca calendula, Hypochoeris radicata, Plantago lanceolata, Ulex europaeus* Aim: control around planted plants. **Days = 6**	Spot Spray/hand weed across entire site, taking care to avoid existing plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Paspalum spp., Ehrharta spp., Arctotheca calendula, Hypochoeris radicata, Plantago lanceolata, Ulex europaeus* Aim: control around planted plants. **Days = 2**	Spot Spray/hand weed across entire site, taking care to avoid existing plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Paspalum spp., Ehrharta spp., Arctotheca calendula, Hypochoeris radicata, Plantago lanceolata, Ulex europaeus* Aim: control around planted plants. **Days = 2**	Spot Spray/hand weed across entire site, taking care to avoid existing plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Paspalum spp., Ehrharta spp., Arctotheca calendula, Hypochoeris radicata, Plantago lanceolata, Ulex europaeus* Aim: control around planted plants. **Days = 10**
Weed control **Management Zone 2**	Spot Spray/hand weed across zone, taking care to avoid indigenous germinants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Cirsium vulgare, Arctotheca calendula, Ulex europaeus.* Aim: <1% Weed Cover **Days = 5**	Spot Spray/hand weed across zone, taking care to avoid indigenous germinants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Cirsium vulgare, Arctotheca calendula, Ulex europaeus.* Aim: <1% Weed Cover **Days = 5**	Spot Spray/hand weed across zone, taking care to avoid indigenous germinants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Cirsium vulgare, Arctotheca calendula, Ulex europaeus.* Aim: <1% Weed Cover **Days = 10**	Spot Spray/hand weed across zone, taking care to avoid indigenous germinants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Cirsium vulgare, Arctotheca calendula, Ulex europaeus.* Aim: <1% Weed Cover **Days = 20**
Weed control **Management Zone 3**	Monitor/control Hawthorn, Gorse & Blackberry seedlings. Spot spray around planted plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Ulex europaeus.* Aim: Control woody weeds; Weed free planted areas **Days = 5 + 1 (mowing)**	Monitor/control Hawthorn, Gorse & Blackberry seedlings. Spot spray around planted plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Ulex europaeus.* Aim: Control woody weeds; Weed free planted areas **Days = 5**	Monitor/control Hawthorn, Gorse & Blackberry seedlings. Spot spray around planted plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Ulex europaeus.* Aim: Control woody weeds; Weed free planted areas **Days = 10**	Monitor/control Hawthorn, Gorse & Blackberry seedlings. Spot spray around planted plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Ulex europaeus.* Aim: Control woody weeds; Weed free planted areas **Days = 10 + 1 (mowing)**
Weed control **Management Zone 4**	Spot Spray/hand weed across zone, taking care to avoid existing plants. Key Target Species; *Phalaris aquatica, Paspalum spp., Holcus lanatus, Hypochoeris radicata, Plantago lanceolata* Aim: <1% Weed Cover **Days = 3**			Spot Spray/hand weed across zone, taking care to avoid existing plants. Brush-cutting of exotic plants. Key Target Species; *Phalaris aquatica, Paspalum spp., Holcus lanatus, Hypochoeris radicata, Plantago lanceolata* Aim: <1% Weed Cover **Days = 5 + 1 (brush-cutting)**
Record Keeping, Monitoring & Report Preparation	Record works undertaken by task each with hours into the Annual Works Record Sheet. Note any departure from works schedule. **Days = 1**	Provide Annual Works Summary to regulatory Authorities. Any deviation from the works schedule should be noted and a brief explanation provided. **Days = 2**	Record works undertaken by task each with hours into the Annual Works Record Sheet. Note any departure from works schedule. **Days = 1**	Record works undertaken by task each with hours into the Annual Works Record Sheet. Note any departure from works schedule. **Days = 1**

Activity Yr6	Summer	Autumn	Winter	Spring
Site Inspection/ Monitoring of entire site **Management Zones 1,2,3&4**	Inspect offset site in first week of January, record details of current condition and required active management works. **Days = 1**	Inspect offset site in the first week of March and of May, record details of current condition and required active management works **Days = 2**	Inspect offset site in the first week of July and of September, record details of current condition and required active management works **Days = 1**	Inspect offset site in first week of November, record details of current condition and any required active management works **Days = 2**
Rabbit Control	Assess rabbit activity and undertake baiting with Pindone as appropriate.			
Weed control **Management Zone 1**	Spot Spray/hand weed across entire site, taking care to avoid existing plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Paspalum spp., Ehrharta spp., Arctotheca calendula, Hypochoeris radicata, Plantago lanceolata, Ulex europaeus* Aim: control around planted plants **Days = 4**	Spot Spray/hand weed across entire site, taking care to avoid existing plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Paspalum spp., Ehrharta spp., Arctotheca calendula, Hypochoeris radicata, Plantago lanceolata, Ulex europaeus* Aim: control around planted plants **Days = 2**	Spot Spray/hand weed across entire site, taking care to avoid existing plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Paspalum spp., Ehrharta spp., Arctotheca calendula, Hypochoeris radicata, Plantago lanceolata, Ulex europaeus* Aim: control around planted plants **Days = 2**	Spot Spray/hand weed across entire site, taking care to avoid existing plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Paspalum spp., Ehrharta spp., Arctotheca calendula, Hypochoeris radicata, Plantago lanceolata, Ulex europaeus* Aim: control around planted plants **Days = 7**
Weed control **Management Zone 2**	Spot Spray/hand weed across zone, taking care to avoid indigenous germinants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Cirsium vulgare, Arctotheca calendula, Ulex europaeus.* Aim: <1% Weed Cover **Days = 5**	Spot Spray/hand weed across zone, taking care to avoid indigenous germinants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Cirsium vulgare, Arctotheca calendula, Ulex europaeus.* Aim: <1% Weed Cover **Days = 5**	Spot Spray/hand weed across zone, taking care to avoid indigenous germinants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Cirsium vulgare, Arctotheca calendula, Ulex europaeus.* Aim: <1% Weed Cover **Days = 10**	Spot Spray/hand weed across zone, taking care to avoid indigenous germinants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Cirsium vulgare, Arctotheca calendula, Ulex europaeus.* Aim: <1% Weed Cover **Days = 20**
Plantings		Plant 3,260 plants into weed free areas as detailed it this management plan (as climatic conditions allow). Water plants just prior to planting, water in all plants on day of planting, no guarding. Planting densities will vary across the site – more densely where there is less natural regeneration and in areas where exotic grass control has occurred leaving bare ground. Planting to be delayed in areas that requiring further weed control, less dense where existing indigenous vegetation is present. Person experienced in restoration to determine distribution of plants across the zone and inform planting methods.		
Weed control **Management Zone 3**	Monitor/control Hawthorn, Gorse & Blackberry seedlings. Spot spray around planted plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Ulex europaeus.* Aim: Control woody weeds; Weed free planted areas **Days = 5 + 1 (mowing)**	Monitor/control Hawthorn, Gorse & Blackberry seedlings. Spot spray around planted plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Ulex europaeus.* Aim: Control woody weeds; Weed free planted areas **Days = 5**	Monitor/control Hawthorn, Gorse & Blackberry seedlings. Spot spray around planted plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Ulex europaeus.* Aim: Control woody weeds; Weed free planted areas **Days = 10**	Monitor/control Hawthorn, Gorse & Blackberry seedlings. Spot spray around planted plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Ulex europaeus.* Aim: Control woody weeds; Weed free planted areas **Days = 10 + 1 (mowing)**

Weed control **Management Zone 4**	Spot Spray/hand weed across zone, taking care to avoid existing plants. Key Target Species; *Phalaris aquatica, Paspalum spp., Holcus lanatus, Hypochoeris radicata, Plantago lanceolata* Aim: <1% Weed Cover **Days = 3**			Spot Spray/hand weed across zone, taking care to avoid existing plants. Brush-cutting of exotic plants. Key Target Species; *Phalaris aquatica, Paspalum spp., Holcus lanatus, Hypochoeris radicata, Plantago lanceolata* Aim: <1% Weed Cover **Days = 5 + 1 (brush-cutting)**
Record Keeping, Monitoring & Report Preparation	Record works undertaken by task each with hours into the Annual Works Record Sheet. Note any departure from works schedule. **Days = 1**	Provide Annual Works Summary to regulatory Authorities. Any deviation from the works schedule should be noted and a brief explanation provided. **Days = 2**	Record works undertaken by task each with hours into the Annual Works Record Sheet. Note any departure from works schedule. **Days = 1**	Record works undertaken by task each with hours into the Annual Works Record Sheet. Note any departure from works schedule. **Days = 1**
Activity Yr7	**Summer**	**Autumn**	**Winter**	**Spring**
Site Inspection/ Monitoring Management Areas 1,2,3 & 4	Inspect offset site in first week of January, record details of current condition and required active management works. **Days = 1**	Inspect offset site in the first week of March and of May, record details of current condition and required active management works **Days = 2**	Inspect offset site in the first week of July and of September, record details of current condition and required active management works **Days = 1**	Inspect offset site in first week of November, record details of current condition and any required active management works **Days = 2**
Weed control **Management Zone 1**	Spot Spray/hand weed across entire site, taking care to avoid existing plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Paspalum spp., Ehrharta spp., Arctotheca calendula, Hypochoeris radicata, Plantago lanceolata, Ulex europaeus* Aim: control around planted plants **Days = 6**	Spot Spray/hand weed across entire site, taking care to avoid existing plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Paspalum spp., Ehrharta spp., Arctotheca calendula, Hypochoeris radicata, Plantago lanceolata, Ulex europaeus* Aim: control around planted plants **Days = 2**	Spot Spray/hand weed across entire site, taking care to avoid existing plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Paspalum spp., Ehrharta spp., Arctotheca calendula, Hypochoeris radicata, Plantago lanceolata, Ulex europaeus* Aim: control around planted plants **Days = 2**	Spot Spray/hand weed across entire site, taking care to avoid existing plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Paspalum spp., Ehrharta spp., Arctotheca calendula, Hypochoeris radicata, Plantago lanceolata, Ulex europaeus* Aim: control around planted plants **Days = 10**
Weed control **Management Zone 2**	Spot Spray/hand weed across zone, taking care to avoid indigenous germinants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Cirsium vulgare, Arctotheca calendula, Ulex europaeus.* Aim: <1% Weed Cover **Days = 5**	Spot Spray/hand weed across zone, taking care to avoid indigenous germinants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Cirsium vulgare, Arctotheca calendula, Ulex europaeus.* Aim: <1% Weed Cover **Days = 5**	Spot Spray/hand weed across zone, taking care to avoid indigenous germinants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Cirsium vulgare, Arctotheca calendula, Ulex europaeus.* Aim: <1% Weed Cover **Days = 10**	Spot Spray/hand weed across zone, taking care to avoid indigenous germinants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Cirsium vulgare, Arctotheca calendula, Ulex europaeus.* Aim: <1% Weed Cover **Days = 10**

Weed control **Management Zone 3**	Monitor/control Hawthorn, Gorse & Blackberry seedlings. Spot spray around planted plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Ulex europaeus.* Aim: Control woody weeds; Weed free planted areas **Days = 5 + 1 (mowing)**	Monitor/control Hawthorn, Gorse & Blackberry seedlings. Spot spray around planted plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Ulex europaeus.* Aim: Control woody weeds; Weed free planted areas **Days = 5**	Monitor/control Hawthorn, Gorse & Blackberry seedlings. Spot spray around planted plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Ulex europaeus.* Aim: Control woody weeds; Weed free planted areas **Days = 10**	Monitor/control Hawthorn, Gorse & Blackberry seedlings. Spot spray around planted plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Ulex europaeus.* Aim: Control woody weeds; Weed free planted areas **Days = 10 + 1 (mowing)**
Weed control **Management Zone 4**	Spot Spray/hand weed across zone, taking care to avoid existing plants. Key Target Species; *Phalaris aquatica, Paspalum spp., Holcus lanatus, Hypochoeris radicata, Plantago lanceolata* Aim: <1% Weed Cover **Days = 3**			Spot Spray/hand weed across zone, taking care to avoid existing plants. Brush-cutting of exotic plants. Key Target Species; *Phalaris aquatica, Paspalum spp., Holcus lanatus, Hypochoeris radicata, Plantago lanceolata* Aim: <1% Weed Cover **Days = 5 + 1 (brush-cutting)**
Record Keeping, Monitoring & Report Preparation	Record works undertaken by task each with hours into the Annual Works Record Sheet. Note any departure from works schedule. **Days = 1**	Provide Annual Works Summary to regulatory Authorities. Any deviation from the works schedule should be noted and a brief explanation provided. **Days = 2**	Record works undertaken by task each with hours into the Annual Works Record Sheet. Note any departure from works schedule. **Days = 1**	Record works undertaken by task each with hours into the Annual Works Record Sheet. Note any departure from works schedule. **Days = 1**
Activity Yr8	**Summer**	**Autumn**	**Winter**	**Spring**
Site Inspection/ Monitoring Management Areas 1,2,3 & 4	Inspect offset site in first week of January, record details of current condition and required active management works. **Days = 1**	Inspect offset site in the first week of March and of May, record details of current condition and required active management works **Days = 2**	Inspect offset site in the first week of July and of September, record details of current condition and required active management works **Days = 1**	Inspect offset site in first week of November, record details of current condition and any required active management works **Days = 2**
Weed control **Management Zone 1**	Spot Spray/hand weed across entire site, taking care to avoid existing plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Paspalum spp., Ehrharta spp., Arctotheca calendula, Hypochoeris radicata, Plantago lanceolata, Ulex europaeus* Aim: control around planted plants **Days = 6**	Spot Spray/hand weed across entire site, taking care to avoid existing plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Paspalum spp., Ehrharta spp., Arctotheca calendula, Hypochoeris radicata, Plantago lanceolata, Ulex europaeus* Aim: control around planted plants **Days = 2**	Spot Spray/hand weed across entire site, taking care to avoid existing plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Paspalum spp., Ehrharta spp., Arctotheca calendula, Hypochoeris radicata, Plantago lanceolata, Ulex europaeus* Aim: control around planted plants **Days = 2**	Spot Spray/hand weed across entire site, taking care to avoid existing plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Paspalum spp., Ehrharta spp., Arctotheca calendula, Hypochoeris radicata, Plantago lanceolata, Ulex europaeus* Aim: control around planted plants **Days = 10**

Planting Management Zone 1		Planting during Autumn if site preparation is completed. Planting to be completed prior to September 30. Planting is with 6,600 graminoids. Watering of stock prior to planting, no guarding, watering in on day of planting.		
Weed control **Management Zone 2**	Spot Spray/hand weed across zone, taking care to avoid indigenous germinants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Cirsium vulgare, Arctotheca calendula, Ulex europaeus.* Aim: <1% Weed Cover **Days = 5**	Spot Spray/hand weed across zone, taking care to avoid indigenous germinants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Cirsium vulgare, Arctotheca calendula, Ulex europaeus.* Aim: <1% Weed Cover **Days = 5**	Spot Spray/hand weed across zone, taking care to avoid indigenous germinants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Cirsium vulgare, Arctotheca calendula, Ulex europaeus.* Aim: <1% Weed Cover **Days = 10**	Spot Spray/hand weed across zone, taking care to avoid indigenous germinants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Cirsium vulgare, Arctotheca calendula, Ulex europaeus.* Aim: <1% Weed Cover **Days = 10**
Weed control **Management Zone 3**	Monitor/control Hawthorn, Gorse & Blackberry seedlings. Spot spray around planted plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Ulex europaeus.* Aim: Control woody weeds; Weed free planted areas **Days = 3 + 1 (mowing)**	Monitor/control Hawthorn, Gorse & Blackberry seedlings. Spot spray around planted plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Ulex europaeus.* Aim: Control woody weeds; Weed free planted areas **Days = 2**	Monitor/control Hawthorn, Gorse & Blackberry seedlings. Spot spray around planted plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Ulex europaeus.* Aim: Control woody weeds; Weed free planted areas **Days = 5**	Monitor/control Hawthorn, Gorse & Blackberry seedlings. Spot spray around planted plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Ulex europaeus.* Aim: Control woody weeds; Weed free planted areas **Days = 10 + 1 (mowing)**
Weed control **Management Zone 4**	Spot Spray/hand weed across zone, taking care to avoid existing plants. Key Target Species; *Phalaris aquatica, Paspalum spp., Holcus lanatus, Hypochoeris radicata, Plantago lanceolata* Aim: <1% Weed Cover **Days = 3**			Spot Spray/hand weed across zone, taking care to avoid existing plants. Brush-cutting of exotic plants. Key Target Species; *Phalaris aquatica, Paspalum spp., Holcus lanatus, Hypochoeris radicata, Plantago lanceolata* Aim: <1% Weed Cover **Days = 3 + 1 (brush-cutting)**
Record Keeping, Monitoring & Report Preparation	Record works undertaken by task each with hours into the Annual Works Record Sheet. Note any departure from works schedule. **Days = 1**	Provide Annual Works Summary to regulatory Authorities. Any deviation from the works schedule should be noted and a brief explanation provided. **Days = 2**	Record works undertaken by task each with hours into the Annual Works Record Sheet. Note any departure from works schedule. **Days = 1**	Record works undertaken by task each with hours into the Annual Works Record Sheet. Note any departure from works schedule. **Days = 1**
Activity Yr9	**Summer**	**Autumn**	**Winter**	**Spring**
Site Inspection/ Monitoring Management Areas 1,2,3 & 4	Inspect offset site in first week of January, record details of current condition and required active management works. **Days = 1**	Inspect offset site in the first week of March and of May, record details of current condition and required active management works **Days = 2**	Inspect offset site in the first week of July and of September, record details of current condition and required active management works **Days = 1**	Inspect offset site in first week of November, record details of current condition and any required active management works **Days = 2**

Weed control **Management Zone 1**	Spot Spray/hand weed across entire site, taking care to avoid existing plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Paspalum spp.; Ehrharta spp., Arctotheca calendula, Hypochoeris radicata, Plantago lanceolata, Ulex europaeus* Aim: control around planted plants **Days = 6**	Spot Spray/hand weed across entire site, taking care to avoid existing plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Paspalum spp., Ehrharta spp., Arctotheca calendula, Hypochoeris radicata, Plantago lanceolata, Ulex europaeus* Aim: control around planted plants **Days = 2**	Spot Spray/hand weed across entire site, taking care to avoid existing plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Paspalum spp., Ehrharta spp., Arctotheca calendula, Hypochoeris radicata, Plantago lanceolata, Ulex europaeus* Aim: control around planted plants **Days = 2**	Spot Spray/hand weed across entire site, taking care to avoid existing plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Paspalum spp., Ehrharta spp., Arctotheca calendula, Hypochoeris radicata, Plantago lanceolata, Ulex europaeus* Aim: control around planted plants **Days = 10**
Weed control **Management Zone 2**	Spot Spray/hand weed across zone, taking care to avoid indigenous germinants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Cirsium vulgare, Arctotheca calendula, Ulex europaeus.* Aim: <1% Weed Cover **Days = 3**	Spot Spray/hand weed across zone, taking care to avoid indigenous germinants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Cirsium vulgare, Arctotheca calendula, Ulex europaeus.* Aim: <1% Weed Cover **Days = 2**	Spot Spray/hand weed across zone, taking care to avoid indigenous germinants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Cirsium vulgare, Arctotheca calendula, Ulex europaeus.* Aim: <1% Weed Cover **Days = 5**	Spot Spray/hand weed across zone, taking care to avoid indigenous germinants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Cirsium vulgare, Arctotheca calendula, Ulex europaeus.* Aim: <1% Weed Cover **Days = 10**
Weed control **Management Zone 3**	Monitor/control Hawthorn, Gorse & Blackberry seedlings. Spot spray around planted plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Ulex europaeus.* Aim: Control woody weeds; Weed free planted areas **Days = 3 + 1 (mowing)**	Monitor/control Hawthorn, Gorse & Blackberry seedlings. Spot spray around planted plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Ulex europaeus.* Aim: Control woody weeds; Weed free planted areas **Days = 2**	Monitor/control Hawthorn, Gorse & Blackberry seedlings. Spot spray around planted plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Ulex europaeus.* Aim: Control woody weeds; Weed free planted areas **Days = 5**	Monitor/control Hawthorn, Gorse & Blackberry seedlings. Spot spray around planted plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Ulex europaeus.* Aim: Control woody weeds; Weed free planted areas **Days = 10 + 1 (mowing)**
Weed control **Management Zone 4**	Spot Spray/hand weed across zone, taking care to avoid existing plants. Key Target Species; *Phalaris aquatica, Paspalum spp., Holcus lanatus, Hypochoeris radicata, Plantago lanceolata* Aim: <1% Weed Cover **Days = 3**			Spot Spray/hand weed across zone, taking care to avoid existing plants. Brush-cutting of exotic plants. Key Target Species; *Phalaris aquatica, Paspalum spp., Holcus lanatus, Hypochoeris radicata, Plantago lanceolata* Aim: <1% Weed Cover **Days = 3 + 1 (brush-cutting)**
Record Keeping, Monitoring & Report Preparation	Record works undertaken by task each with hours into the Annual Works Record Sheet. Note any departure from works schedule. **Days = 1**	Provide Annual Works Summary to regulatory Authorities. Any deviation from the works schedule should be noted and a brief explanation provided. **Days = 2**	Record works undertaken by task each with hours into the Annual Works Record Sheet. Note any departure from works schedule. **Days = 1**	Record works undertaken by task each with hours into the Annual Works Record Sheet. Note any departure from works schedule. **Days = 1**

Activity Yr10	Summer	Autumn	Winter	Spring
Site Inspection/ Monitoring Management Areas 1,2,3 & 4	Inspect offset site in first week of January, record details of current condition and required active management works. **Days = 1**	Inspect offset site in the first week of March and of May, record details of current condition and required active management works **Days = 2**	Inspect offset site in the first week of July and of September, record details of current condition and required active management works **Days = 1**	Inspect offset site in first week of November, record details of current condition and any required active management works **Days = 2**
Weed control Management Zone 1	Spot Spray/hand weed across entire site, taking care to avoid existing plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Paspalum spp., Ehrharta spp., Arctotheca calendula, Hypochoeris radicata, Plantago lanceolata, Ulex europaeus* Aim: control around planted plants **Days = 6**	Spot Spray/hand weed across entire site, taking care to avoid existing plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Paspalum spp., Ehrharta spp., Arctotheca calendula, Hypochoeris radicata, Plantago lanceolata, Ulex europaeus* Aim: control around planted plants **Days = 2**	Spot Spray/hand weed across entire site, taking care to avoid existing plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Paspalum spp., Ehrharta spp., Arctotheca calendula, Hypochoeris radicata, Plantago lanceolata, Ulex europaeus* Aim: control around planted plants **Days = 2**	Spot Spray/hand weed across entire site, taking care to avoid existing plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Paspalum spp., Ehrharta spp., Arctotheca calendula, Hypochoeris radicata, Plantago lanceolata, Ulex europaeus* Aim: control around planted plants **Days = 10**
Weed control Management Zone 2	Spot Spray/hand weed across zone, taking care to avoid indigenous germinants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Cirsium vulgare, Arctotheca calendula, Ulex europaeus.* Aim: <1% Weed Cover **Days = 3**	Spot Spray/hand weed across zone, taking care to avoid indigenous germinants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Cirsium vulgare, Arctotheca calendula, Ulex europaeus.* Aim: <1% Weed Cover **Days = 2**	Spot Spray/hand weed across zone, taking care to avoid indigenous germinants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Cirsium vulgare, Arctotheca calendula, Ulex europaeus.* Aim: <1% Weed Cover **Days = 5**	Spot Spray/hand weed across zone, taking care to avoid indigenous germinants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Cirsium vulgare, Arctotheca calendula, Ulex europaeus.* Aim: <1% Weed Cover **Days = 10**
Weed control Management Zone 3	Monitor/control Hawthorn, Gorse & Blackberry seedlings. Spot spray around planted plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Ulex europaeus.* Aim: Control woody weeds; Weed free planted areas **Days = 3 + 1 (mowing)**	Monitor/control Hawthorn, Gorse & Blackberry seedlings. Spot spray around planted plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Ulex europaeus.* Aim: Control woody weeds; Weed free planted areas **Days = 2**	Monitor/control Hawthorn, Gorse & Blackberry seedlings. Spot spray around planted plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Ulex europaeus.* Aim: Control woody weeds; Weed free planted areas **Days = 5**	Monitor/control Hawthorn, Gorse & Blackberry seedlings. Spot spray around planted plants. Key Target Species; *Phalaris aquatica, Holcus lanatus, Ehrharta spp., Paspalum spp., Hypochoeris radicata, Plantago lanceolata, Ulex europaeus.* Aim: Control woody weeds; Weed free planted areas **Days = 10 + 1 (mowing)**
Weed control Management Zone 4	Spot Spray/hand weed across zone, taking care to avoid existing plants. Key Target Species; *Phalaris aquatica, Paspalum spp., Holcus lanatus, Hypochoeris radicata, Plantago lanceolata* Aim: <1% Weed Cover **Days = 3**			Spot Spray/hand weed across zone, taking care to avoid existing plants. Brush-cutting of exotic plants. Key Target Species; *Phalaris aquatica, Paspalum spp., Holcus lanatus, Hypochoeris radicata, Plantago lanceolata* Aim: <1% Weed Cover **Days = 3 + 1 (brush-cutting)**

Record Keeping	Record works undertaken by task each with hours into the Annual Works Record Sheet. Note any departure from works schedule. **Days = 1**	Provide Annual Works Summary to regulatory Authorities. Any deviation from the works schedule should be noted and a brief explanation provided. **Days = 1**	Record works completed itemised by task with hours completed. Provide final Works Summary with any deviation from the works schedule noted and explained. Reporting to include a final Habitat Hectare assessment score of offset site and an explanation of key management outcomes and any deficiencies. Include notes on successful methods and areas where improvements could be made, suggest different techniques that could be applied in future, to assist ongoing management of the site and to inform others with similar projects. **Days = 8**

Table 14. Detailed year by season breakdown of active management works to achieve target gains in the M2 Estate Council Reserve, National Drive, Dandenong South.

6 References

DNRE (2002) *Victoria's Native Vegetation Management – A Framework For Action*. Department of Natural Resources and Environment, East Melbourne, August, 2002.

DNRE (2002a) *Local Government Authority – Bioregional Conservation Status of EVCs – Area Statement*. Department of Natural Resources and Environment.

DSE (2004) *Vegetation Quality Assessment Manual – Guidelines for applying the Habitat Hectares Scoring method*, version 1.3, Victorian Government, Department of Sustainability and Environment, Melbourne

DSE (2006a) *Native Vegetation – Guide for assessment of referred planning permit applications*. Victorian Government, Department of Sustainability and Environment, East Melbourne.

DSE (2006b) *Native Vegetation – Vegetation Gain Approach – Technical basis for calculating gains through improved native vegetation management and revegetation*. Victorian Government, Department of Sustainability and Environment, East Melbourne.

DSE (2006c) *Native Vegetation – Revegetation Planting Standards - Guidelines for establishing native vegetation for net gain accounting*. Victorian Government, Department of Sustainability and Environment, East Melbourne.

Hill, A.J., Costello, C, (2005). *Environmental Management Plan for land south of Abbots Road, Dandenong South, Victoria*. Biosis Research, Port Melbourne.

Urlus, J. Francis, R. & Just, K. (2008) *Flora and Fauna report on land at 95-115 Baylis Road, Dandenong South*, Prepared for Pellicano Projects, Abzeco Report 0819 V1.0, September 2008

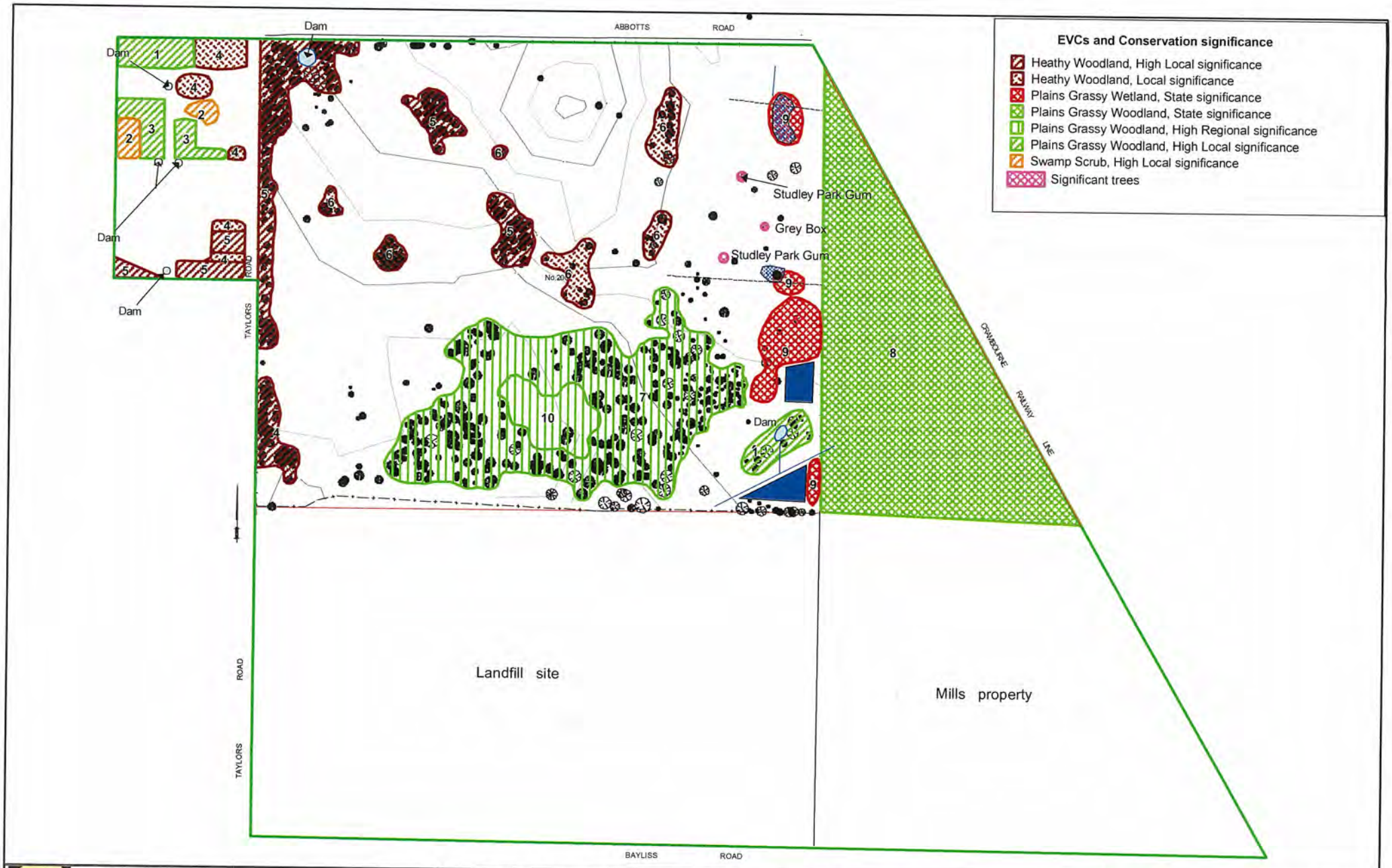
Appendix 1 – Habitat Hectare Calculations from Biosis Research reporting (Hill et al 2005)

Table 2: Habitat score calculations.

Polygon Number		Score out of	1	4	5	6	7	8	9	10	TOTALS
Mapping label											
EVC name			PGW	HW	HW	HW	PGW	PGW	PGWet	PGW	
EVC number											
Site condition	Large Old Trees	10	3	5	5	0	8	8	na	3	
	Canopy Cover	5	3	3	3	3	3	3	na	0	
	Lack of Weeds	15	5	5	10	5	10	10	10	10	
	Understorey	25	3	3	6	3	6	3	0	6	
	Recruitment	10	0	2	5.5	2	2	5.5	2	2	
	Organic Matter	5	3	0	0	0	3	0	3	3	
	Logs	5	0	0	0	0	0	0	na	0	
Landscape	Patch Size	10	1	1	1	1	6	6	1	6	
	Neighbourhood	10	0	0	0	0	1.2	1.2	0.3	1.2	
	Distance to Core	5	0	0	0	0	0	0	0	0	
Site Condition Score			17	18	29.5	13	32	29.5	15	24	
Standardised Site Condition Score									20.45		
Landscape Score			1	1	1	1	7.2	7.2	1.3	7.2	
HABITAT SCORE (/100)			**0.18**	**0.19**	**0.31**	**0.14**	**0.39**	**0.37**	**0.22**	**0.31**	
Area of the Quality Zone to be cleared (Hectares)			0.00	4.70	0.00	1.07	0.53	1.38	1.24	0.42	**9.340**
HABITAT HECTARES			0.000	0.893	0.000	0.150	0.208	0.506	0.270	0.131	**2.158**

PGW = Plains Grassy Woodland; HW = Heathy Woodland; PGWet = Plains Grassy Wetland.

Appendix 2 – Map of Assessed Habitat Zones from Biosis Research reporting (Hill et al 2005)



BIOSIS RESEARCH Pty Ltd

322 Bay Street
Port Melbourne
VICTORIA 3207

Figure 2: Vegetation assessed using the Habitat Hectare methodology.

DATE: 26 November 2003
Checked by: AH
File number: 3204
Location: ...\projects\MRG 3200s\3204\Mapping\3204 Fig 2.wor

Scale: 0 50 100 150 200 250 metres

Figure 2: Vegetation assessed using the Habitat Hectare methodology.