5. Appendices

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Appendix A

Protected Plants Clearing Permit (WA0009354)

Permit

Protected Plant Clearing Permit

This wildlife authority is issued under the following legislation: Nature Conservation (Administration) Regulation 2017 Part 2 Division 1.

Permit number: WA0009354 **Valid from:** 24 August 2018 to 23 August 2020

Activity: Clearing endangered, vulnerable or near threatened plants

Role	Name	Registered address	
Principal Holder:	Saunders Havill Group Pty Ltd	9 Thompson St BOWEN HILLS QLD 4006 Australia	
Person In Charge:	Mark Clancy	Mark Clancy	
Business name:	144972949	**ABN/ACN**	Nature Conservation (Wildlife) Regulation 2006 /
Activity location/licensed premises	LOT 1/sp297192		

Schedule

Family or Species or Schedule	Details	Category	Quantity	Unit
Species	bush house or weeping paperbark or swamp teatree, Melaleuca irbyana	Live	277	Hectares

Jenny Keys
Department of Environment and Science
Delegate of the administering authority
Nature Conservation Act 1992

Date issued: 24 August 2018

Enquiries:
Wildlife Assessment Team
Email: wildlife@des.qld.gov.au
WA0009354
Postal Address: PO Box 102, Toowoomba, QLD, 4350

ABN 46 640 294 485

Legislative Requirements and Conditions of Wildlife Authority

Legislative Requirements

PPCLR06 Where monitoring by the permit holder of impact management actions with respect to endangered, vulnerable or near threatened species in the clearing area identifies that those actions appear to be unsuccessful or failing, the permittee must notify DES immediately in order to discuss the significant residual impact of the clearing and furthermore discuss any potential implementation of an offset action in accordance with the Queensland Environmental Offset Policy.
This requirement may be found in Section 284(1) 0f the Nature Conservation (Wildlife Management) Regulation 2006

Nature Conservation

PPCLR01 This permit does not exempt the permit holder from obtaining other approvals relevant to the harvest of whole protected plants at the site.

PPCLR02 Activities carried out under this authority, unless otherwise authorised, apply to non-protected areas only.
This requirement may be found in section 15 of the Nature Conservation (Administration) Regulation 2017

PPCLR03 This permit includes the clearing of least concern protected plants within the clearing area.

Conditions

PPCM01 Activities relating to the impact of EVNT plant species under this permit must be in accordance with the procedures and actions outlined in the following documents, except where conditions below indicate otherwise:

'Impact Management Plan Melaleuca irbyana 432-520 Greenbank Road, Greenbank prepared for Mirvac QLD Pty Ltd 3 July 2018', and associated appendices and supporting documentation.

PPCM02 The permit holder is to notify DES in writing at least 48 hours in advance of clearing commencing, for example, via an email to wildlife.management@ehp.qld.gov.au

PPCM04 Should the project not proceed, in addition to the requirement to rehabilitate the area/s once cleared, the site/s must not be further disturbed and must be maintained to ensure erosion and weed control.

PPCM08 It is the permit holder's responsibility to ensure that the proposed rehabilitation area with EVNT species *Melaleuca irbyana* is legally secured.

Department of Environment and Science
www.des.qld.gov.au ABN 46 640 294 485

Queensland Government

PPCM09 Rehabilitation and/or translocation reporting must be maintained from the commencement date of clearing and continue for a minimum period of 24 months.
The written report (including advice on each monitoring period) must be lodged with the Wildlife Assessment Team, Department of Environment and Heritage Protection, via an email to wildlife@des.qld.gov.au within 10 business days after each annual period.

Department of Environment and Science
www.des.qld.gov.au ABN 46 640 294 485

Appendix B

Impact Management Plan Melaleuca irbyana 43-520 Greenbank Road, Greenbank prepared for Mirvac QLD Pty Ltd, dated 3 July 2018

Impact Management Plan
Melaleuca irbyana

432-520 Greenbank Road, Greenbank
Prepared for Mirvac Queensland Pty Ltd
3 July 2018

Job No. 7598

Document Control

Document: Impact Management Plan for 432-520 Greenbank Road, prepared by Saunders Havill Group for Mirvac Queensland Pty Ltd.

Document Issue

Issue	Date	Prepared By	Checked By
A	14.02.2018	KG / JG	AD
B	03.07.2018	JG	AD

Prepared by

ABN 24 144 972 949
www.saundershavill.com

Reports and plans by others may be included in this document.

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Abbreviations and Acronyms

DES Department of Environment and Science (Qld) (formally EHP)
EDQ Economic Development Queensland (Qld)
EHP Former Department of Environment and Heritage Protection (Qld) (now DES)
EVNT Endangered, Vulnerable or Near Threatened (as defined by the NCA)
NCA *Nature Conservation Act 1992* (Qld)
NCWR Nature Conservation (Wildlife) Regulation 2006
PDA Priority Development Area (herein referencing the Greater Flagstone Priority Development Area)
SHG Sunders Havill Group

1. Introduction

Saunders Havill Group (SHG) was engaged by Mirvac Queensland Pty Ltd (Mirvac) to prepare an Impact Management Plan (IMP) for *Melaleuca irbyana* (Swamp Tee Tree) specimens located within the Greenbank project area located at 432-520 Greenbank Road, Greenbank.

The Greenbank project was referred to the Commonwealth Department of the Environment and Energy (DEE) on behalf of Mirvac by SHG and deemed a Controlled Action for potential impacts on the Koala and Grey-headed Flying-fox under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) to be assessed on Preliminary Documentation. Of note, Area 1 was approved by the DEE to be excised from the referral area. The Preliminary Documentation for the assessment of the project is nearing completion.

The Greenbank project has received preliminary approval under the Greater Flagstone Urban Development Area Development Scheme 2011 (PDA Development Scheme) by Economic Development Queensland (EDQ) who are the administering authority for development in the Greater Flagstone Priority Development Area (PDA).

As part of a protected plants flora trigger survey in accordance with the Protected Plants Guidelines, specimens of *M. irbyana*, listed as Endangered under the *Nature Conservation Act 1992* (NCA), were recorded within the Greenbank project area. This IMP has been prepared to support a clearing permit (protected plants) application to the Department of Environment and Science (DES) in accordance with Section 3.2 of the *Nature Conservation (Wildlife Management) Regulation 2006 – Protected Plants Assessment Guidelines*.

The IMP has been prepared in accordance with Section 3.2.1 of the *Protected Plants Assessment Guidelines,* as follows:

> **3.2.1 Impact management plan**
>
> An impact management plan must include the following sections:
>
> - attempts to avoid and minimise impact
> - nature of impact
> - management of impact
> - justification of impact management
> - survival of plant in the wild

Contextually, the site is located 30 kilometres (km) south of Brisbane and 10 km west of Logan Village, within the western suburb of Greenbank. The site is bound by Greenbank and Teviot Roads to the west and is predominately surrounded by rural residential development. Wearing Park immediately adjoins the site to the east and Greenbank Shopping Centre and Community Centre are located opposite the site, on the western side of Teviot Road. The site is located approximately 1.5 km southeast of Greenbank Military Training Camp and 500 metres east of the Brisbane – Sydney Railway Line. An infrastructure easement traverses the site parallel to the northern boundary. The site remains one of the last large rural properties in the immediate landscape predominately comprised of rural residential development. Refer to Figure 1 for the site context and Figure 2 for the site aerial.

The proposed clearing works will be undertaken over parts of the 412 hectare (ha) site to facilitate a master planned development and will be subject to future operational works approvals from EDQ. It is noted that a NCA Protected Plants Flora Survey has been undertaken and exemption obtained from the DES, formally the Department of Environment and Heritage Protection (EHP), for clearing over Area 1 to the west (Lot 2 & Lot 3 on SP297192 and along the boundary fence

line to support existing operational works approvals (Ref: APP0007102, APP0007278, respectively). No EVNT species were recorded within these clearing areas.

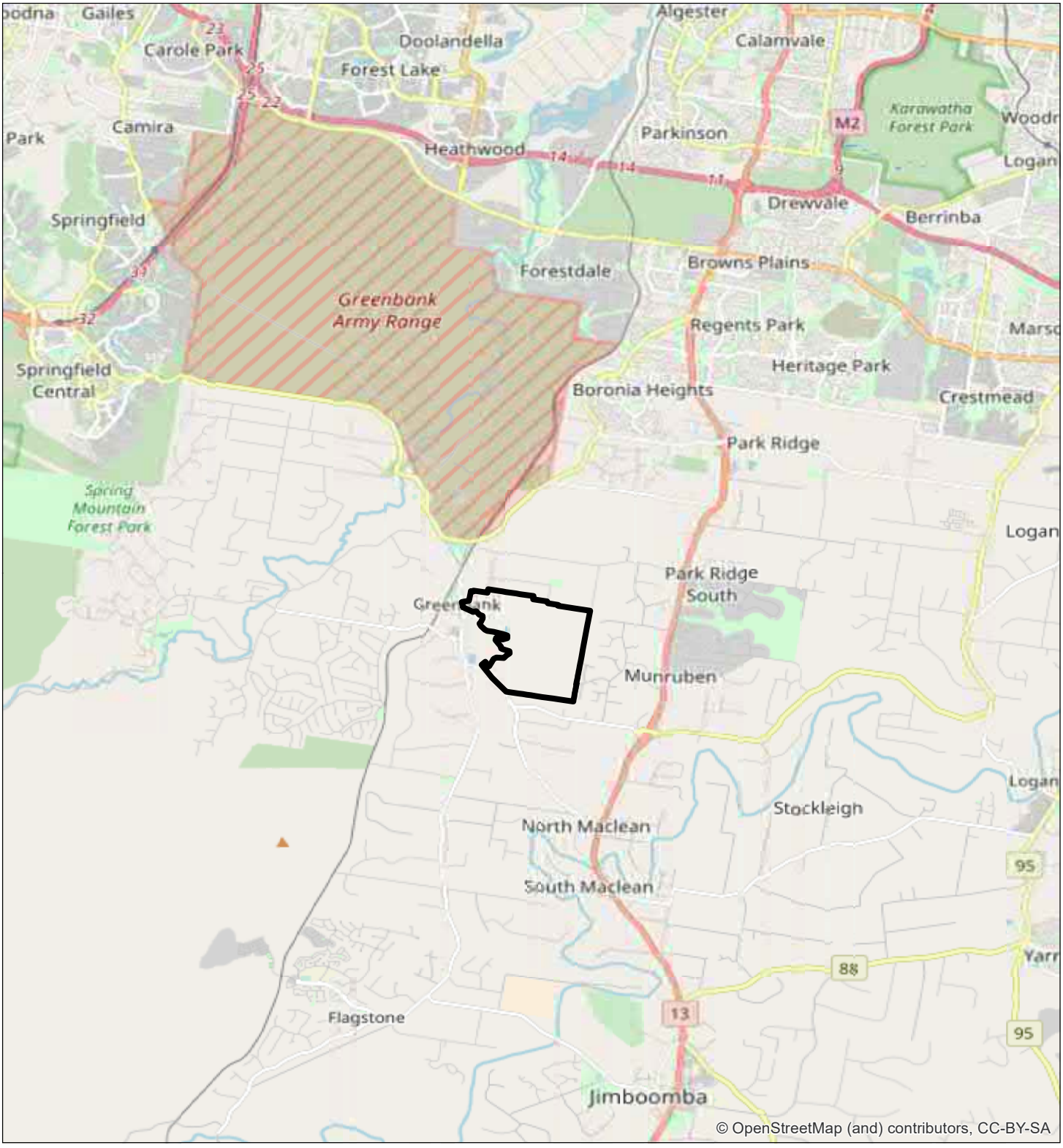
Flora surveys were conducted where clearing is proposed, including within areas mapped as 'High risk' under the Protect Plants Flora Survey Trigger Map High Risk (refer Figure 3) and as per the Flora Survey Guidelines – Protected Plants.

1.1. Property Summary

Key site details are provided in Table 1 below.

Table 1: Property Summary

Address	423-520 Greenbank Road, Greenbank
RPD	Lot 1 on SP297192
Local Government Area	Logan City
Administering Authority	Economic Development Queensland
Priority Development Area	Greater Flagstone PDA
Planning Scheme	Greater Flagstone PDA Development Scheme
Area Classification / Zone	Urban Living
Existing Land Use	Rural



Legend

Site DCDB

Figure 1

Site Context

File ref. 7598 E Figure 1 NCA 2 Site Context B
Date *19/02/2018*
Project *Greater Flagstone Project, Greenbank (1/SP297192)*

0 1,000 2,000 3,000 4,000 *m*

N

Scale (A4): 1:125,000 [GDA 1994 MGA Z56]

mirvac

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Layer Sources QLD GIS Layers (QLD Gov. Information Service 2017)

Legend

Project Site DCDB

Qld DCDB

Figure 2

Site Aerial

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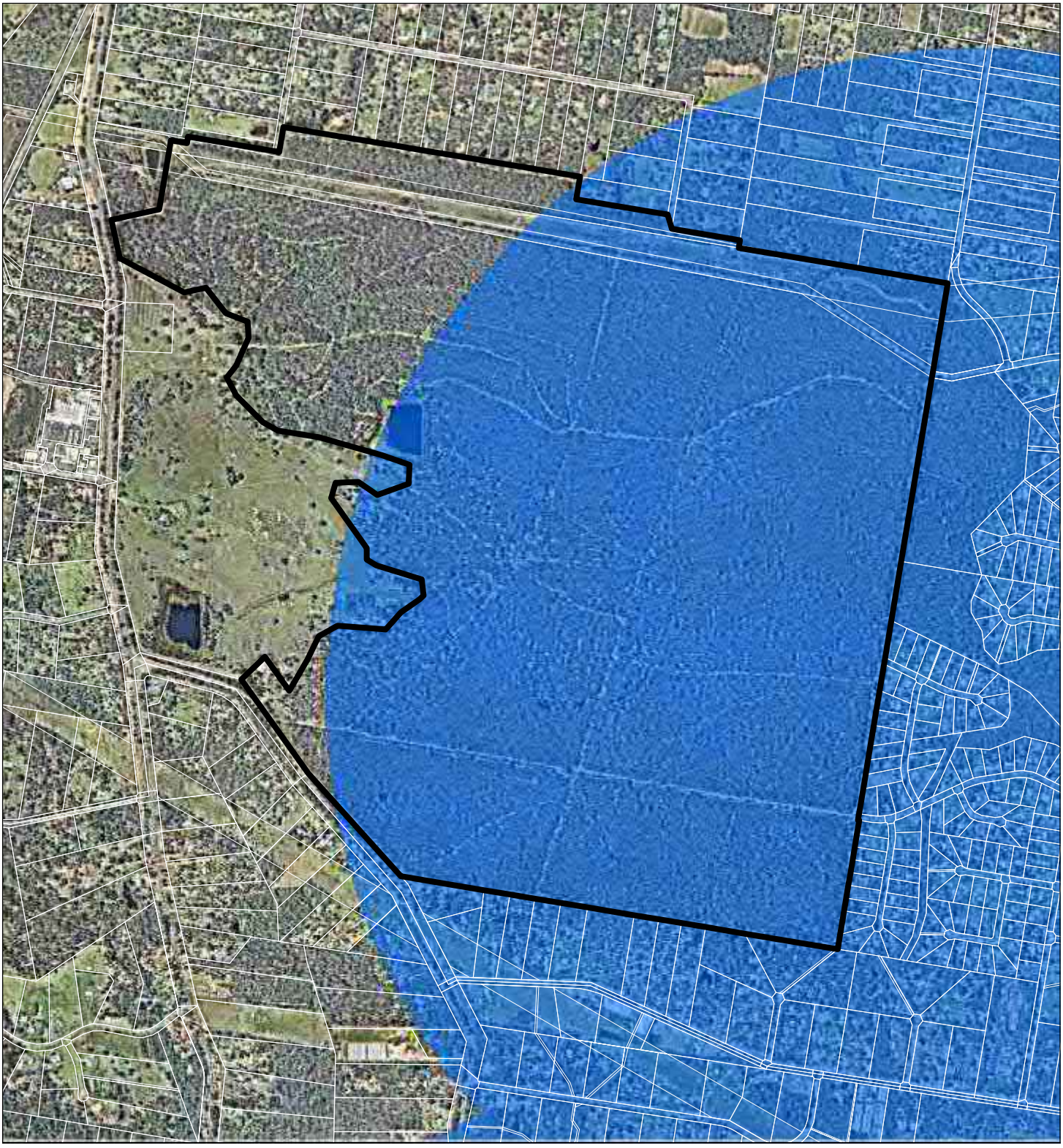
File ref. 7598 E Figure 2 NCA 2 Site Aerial B
Date *19/02/2018*
Project *Greater Flagstone Project, Greenbank (1/SP297192)*

0 100 200 400 600 800 *m*

N

Scale (A4): 1:17,000 [GDA 1994 MGA Z56]

Layer Sources QLD GIS Layers (QLD Gov. Information Service 2017), Aerial (Nearmap 2017)



Legend

- Project Site DCDB
- Qld DCDB
- Flora survey trigger area

Figure 3

NCA - Protected Plants Flora Survey Trigger Mapping

File ref. 7598 E Figure 3 NCA 2 Protected Plants B
Date *19/02/2018*
Project *Greater Flagstone Project, Greenbank (1/SP297192)*

0 100 200 400 600 800 *m*

N

Scale (A4): 1:17,000 [GDA 1994 MGA Z56]

mirvac

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Layer Sources QLD GIS Layers (QLD Gov. Information Service 2017), aerial (Nearmap 2017)

1.2. Nature Conservation Act 1992

The *Nature Conservation Act 1992* (NCA) classifies and protects significant areas (Protected Areas) and protects threatened plant and animal species. The Nature Conservation (Wildlife) Regulation 2006 (NCWR) lists plant and animal species presumed extinct, endangered, vulnerable, near threatened, least concern, international or prohibited.

The Queensland Government has adopted a regulatory framework that captures activities that pose a high risk to plant biodiversity. Under the framework, when a non-exempt clearing activity is proposed within a 'High Risk' area, the proponent of that activity is required to complete a flora survey prior to commencement of clearing. The Protected Plants Flora Survey Trigger Map shows 'High Risk' areas for protected plants and is used to help determine flora survey and clearing permit requirements for a particular location.

A search of the Protected Plants Flora Survey Trigger Mapping indicated proposed clearing areas within the subject site are overlayed as 'High Risk' and so are subject to flora survey requirements (refer Figure 3).

Prior to flora surveys, the schedules of the NCWR were considered in this report using a Wildlife Online Database Search with a 10 km radius from the site. Three (3) flora species listed under the NCWR were identified as having the potential to occur on site and are presented in Table 1. Refer to Appendix A for full search results.

Table 2: Wildlife Online Search Results–Flora

Scientific Name	Common Name	NCA Status
Marsdenia coronata	Slender Milkvine	Vulnerable
Plectranthus habrophyllus	-	Endangered
Melaleuca irbyana	-	Endangered

2. Nature of the Impact

2.1. Background

The only EVNT species located within the Greenbank project area was *Melaleuca irbyana* (Swamp Tea Tree). The profile of this species is detailed below in Section 2.2.

2.2. Protected Plant Profile

Melaleuca irbyana, a member of the Myrtaceae family, is listed as a threatened species under Schedule 2 of the *Nature Conservation (Wildlife) Regulation 2006* (NCWR) and is classified as "endangered". *Melaleuca irbyana* is also included as part of Endangered Regional Ecosystems (RE) 12.3.18, 12.3.19, 12.9-10.11 and 12.9-10.27 under the *Vegetation Management Act 1999* (VMA). This vegetation community is also listed as a Critically Endangered when present as a Threatened Ecological Community under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC).

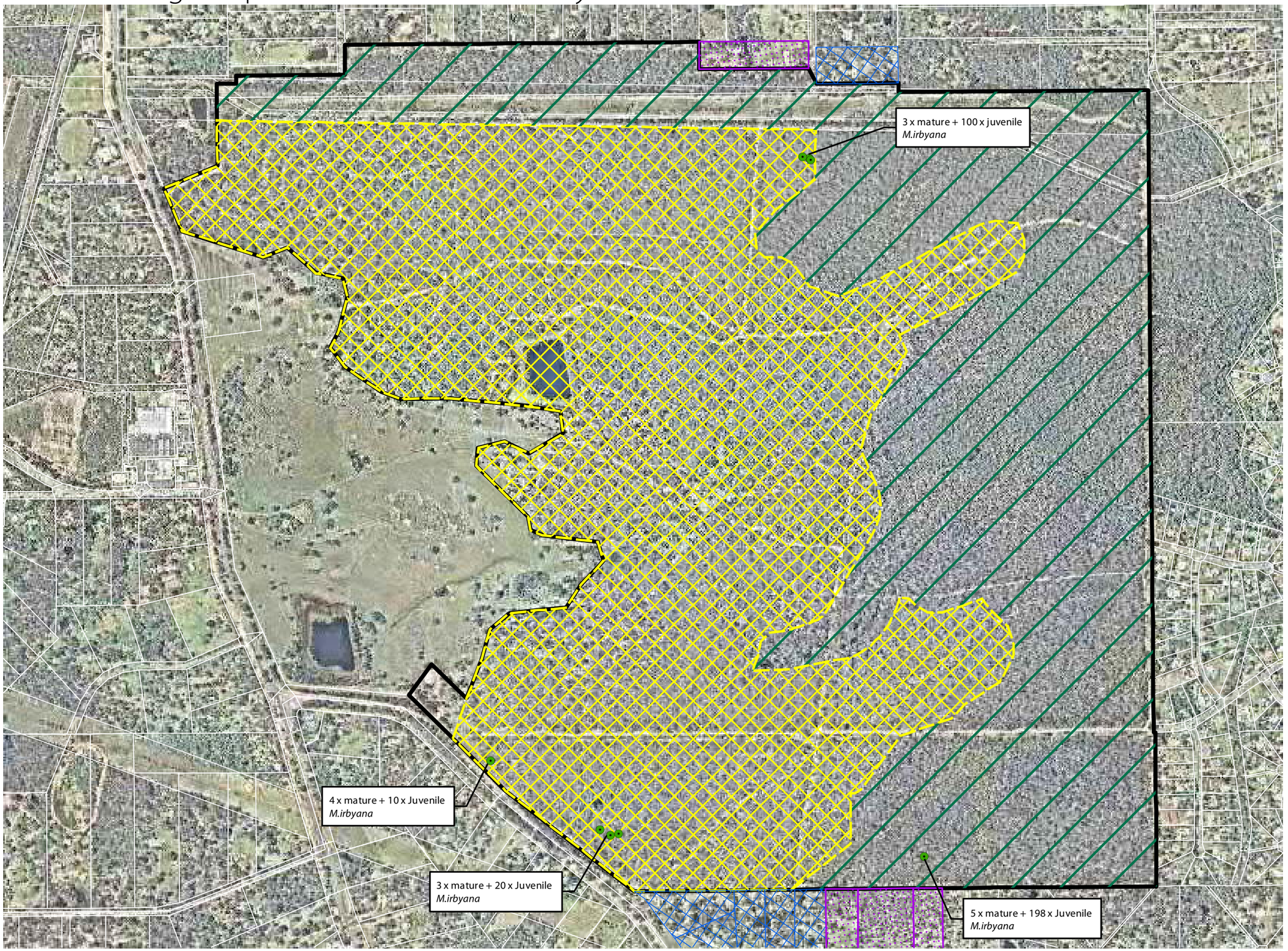
M. irbyana forms communities that occur in two (2) structural forms: the more common form consists of a dominant eucalypt canopy with an understorey containing *M. irbya*na thickets 8-12 metres in height; the less common form is an open forest or thicket of *M. irbyana* with emergent eucalypt trees. The understorey is sparse and can comprise of grasses, sedges, and herbs with a few shrubs, vines and possibly orchids present. There are fairly clear descriptions of *M. irbyana* communities, however, there are no clear indications of the point at which an individual tree or small number of trees are considered to be part of a community. An individual tree may still contribute reproductively to a community, or may have the potential to regenerate and in time create a community.

Logan City Council defines an *M. irbyana* community as, "*where Melaleuca irbyana occur in a patch size of 0.25 hectares or greater, or where a patch of Melaleuca irbyana less than 0.25 hectares adjoins a second patch and the sum of the patches is greater than 0.25 hectares*". This definition has been determined using methodology from the *Melaleuca irbyana* (Swamp Tea-tree) Community 1:25,000 Scale Mapping Project (Ryan, 2010).

2.3. *Melaleuca irbyana* On-site

The entire site was traversed as part of previous and contemporary NCA searches. While *Melaleuca irbyana* were not previously recorded in the Clearing Impact Area associated with Area 1 and the Perimeter Clearing works extents, surveys conducted as part of this reporting, over the balance of the site, recorded the species in four (4) separate locations. Refer to Plan 1 for *Melaleuca irbyana* onsite locations.

1. Clearing Impact - *Melaleuca irbyana*



NOTES
This plan was prepared as a desktop assessment tool.
The information on this plan is not suitable for any other purpose.
Property dimensions, areas, numbers of lots and contours and other physical features shown have been compiled from existing information and may not have been verified by field survey. These may need verification if the development application is approved and development proceeds, and may change when a full survey is undertaken or in order to comply with development approval conditions. No reliance should be placed on the information on this plan for detailed design or for any financial dealings involving the land. Saunders Havill Group therefore disclaims any liability for any loss or damage whatsoever or howsoever incurred, arising from any party using or relying upon this plan for any purpose other than as a document prepared for the sole purpose of accompanying a development application and which may be subject to alteration beyond the control of the Saunders Havill Group. Unless a development approval states otherwise, this is not an approved plan.

Layer Sources: QLD GIS Layers (QLD Gov. Information Service 2016). Aerial (Qld Gov. and Google 2016)

* This note is an integral part of this plan/data. Reproduction of this plan or any part of it without this note being included in full will render the information shown on such reproduction invalid and not suitable for use.

LEGEND

- Project DCDB
- Development footprint
- Conservation area
- NCA flora survey trigger area
- No Access under NCA Exemption (AP0007102)
- Surveyed under NCA Exemption (AP0007102)
- Mature *Melaleuca irbyana* specimen

Note: Juvenile *Melaleuca irbyana* are specimens less than 2 metres tall

Issue	Date	Description	Drawn	Checked
A	5/03/2018	Preliminary	TC	AD
B	11/06/2018	Updated impact area	TC	AD

Transverse Mercator | GDA 1994 | Zone 56 | 1:10,000 @A3

0 50 100 200 300 400 m

saunders havill group

mirvac

Everleigh

ADDRESS/RPD: Teviot Road, Greenbank (1/SP297192) 11/06/2018 7598 E 01 NCA 2 Impact Plan B

Location 1:

Location 1 is situated in the northern aspect of the site, adjacent to the power easement. This patch is located within mapped composite 'Of Concern' Regional Ecosystem RE12.9-10.2/12.9-10.7 as confirmed via PMAV 2016/002969 certified on the 11th of May 2017. Refer to Plan 1 for *Melaleuca irbyana* on site locations and Table 3 for a description of the Regional Ecosystems). This patch of *Melaleuca irbyana* (Swamp Tea-tree) consisted of three (3) established specimens and one-hundred (100) juveniles. This patch of *Melaleuca irbyana* was surrounded by vegetation dominated by *Acacia spp., Allocasuarina littoralis* (Black She-oak) and *Alphitonia excelsa* (Soap Tree) regrowth with *Corymbia citriodora* (Spotted Gum) dominated canopy.

Photo Plate 1: Location 1

Location 2:

Location 2 is situated towards the south-western property boundary, adjacent to Greenbank Road. This patch is located within mapped non-remnant vegetation as confirmed via PMAV 2016/002969 certified on the 11th of May 2017. This *Melaleuca irbyana* (Swamp Tea-tree) patch consisted of three (3) established specimens and twenty (20) juveniles. This patch of *Melaleuca irbyana* was found within a regrowth vegetation community, with surrounding vegetation dominated by *Allocasuarina littoralis* (Black She-oak) and *Acacia spp*. regrowth.

Photo Plate 2: Location 2

Location 3:

Location 3 is situated towards the south-western property boundary, adjacent to Greenbank Road and approximately 380 m west of Location 2. This patch is located within mapped non-remnant vegetation as confirmed via PMAV 2016/002969 certified on the 11th of May 2017. This patch of *Melaleuca irbyana* (Swamp Tea-tree) consisted of four (4) established specimens and ten (10) juveniles. The patch of *Melaleuca irbyana* was found within a regrowth vegetation community, with surrounding vegetation dominated by *Acacia spp., Allocasuarina littoralis* (Black She-oak) and *Alphitonia excelsa* (Soap Tree) regrowth.

Photo Plate 3: Location 3

Location 4:

Location 4 is situated towards the southern property boundary, approximately 800 m east of Location 2. This patch is located within mapped composite 'Of Concern' Regional Ecosystem RE12.9-10.2/12.9-10.7 as confirmed via PMAV 2016/002969 certified on the 11th of May 2017. These Regional Ecosystems are described in Table 3 below. This patch consists of five (5) established specimens and one hundred and ninety-eight (198) juveniles. This patch of *Melaleuca irbyana* was surrounded by vegetation dominated by *Acacia spp., Allocasuarina littoralis* (Black She-oak) and *Alphitonia excelsa* (Soap Tree) regrowth with *Corymbia citriodora* (Spotted Gum) dominated canopy.

Photo Plate 4: Location 4

Table 3: Regional Ecosystems Descriptions

Status	Code	Description
Endangered	12.9-10.12	Corymbia intermedia, Angophora leiocarpa, Eucalyptus seeana +/- E. siderophloia, E. tereticornis, E. racemosa subsp. racemosa, C. citriodora subsp. variegata woodland to open forest. Lophostemon suaveolens is often present as a sub-canopy or understorey tree. Occasional Melaleuca quinquenervia on lower slopes. Does not include areas dominated by Eucalyptus racemosa subsp. racemosa. Occurs on Cainozoic and Mesozoic sediments. (BVG1M: 9g).
Of Concern	12.9-10.7:	Eucalyptus crebra +/- E. tereticornis, Corymbia tessellaris, Angophora leiocarpa, E. melanophloia woodland. Occurs on Cainozoic and Mesozoic sediments. (BVG1M: 13c).
Of Concern	12.3.11	Eucalyptus tereticornis +/- E. siderophloia and Corymbia intermedia open forest to woodland. Corymbia tessellaris, Lophostemon suaveolens and Melaleuca quinquenervia frequently occur and often form a low tree layer. Other species present in scattered patches or low densities include Angophora leiocarpa, E. exserta, E. grandis, C. trachyphloia, C. citriodora subsp. variegata, E. latisinensis, E. tindaliae, E. racemosa and Melaleuca sieberi. E. seeana may be present south of Landsborough and Livistona decora may occur in scattered patches or low densities in the Glenbar SF and Wongi SF areas. Occurs on Quaternary alluvial plains and drainage lines along coastal lowlands. Rainfall usually exceeds 1000mm/y. (BVG1M: 16c)
Least Concern	12.3.6:	Melaleuca quinquenervia +/- Eucalyptus tereticornis, Lophostemon suaveolens, Corymbia intermedia open forest to woodland with a grassy ground layer dominated by species such as Imperata cylindrica. Eucalyptus tereticornis may be present as an emergent layer. Occurs on Quaternary floodplains and fringing drainage lines in coastal areas. (BVG1M: 22a)
Least Concern	12.9-10.2:	Corymbia citriodora subsp. variegata open forest or woodland usually with Eucalyptus crebra. Other species such as Eucalyptus tereticornis, E. moluccana, E. acmenoides and E. siderophloia may be present in scattered patches or in low densities. Understorey can be grassy or shrubby. Shrubby understorey of Lophostemon confertus (whipstick form) often present in northern parts of bioregion. Occurs on Cainozoic and Mesozoic sediments. (BVG1M: 10b).

Based on the information provided in **Section 2.2**, the specimens located on site are not consistent with a *Melaleuca irbyana* community due to the patches predominately containing juvenile individuals with very few mature specimens. Importantly, these patches are not associated with Endangered Regional Ecosystems. Locations 1 and 4 were confirmed via a certified PMAV to be located within composite 'Of Concern' Regional Ecosystem RE12.9-10.2/12.9-10.7 while locations 2 and 3 were located within non-remnant areas.

While Location 1 contains a substantial amount of juvenile species, overall, the significance of these patches is considered less than if they formed part of a broader existing community. The habitat value they currently provide is considered relatively limited, with no obvious noteworthy habitat for flora or fauna observed at the time of survey.

2.4. Avoidance and Minimisation of Impact

The proposed works are for the development of Greenbank master planned development in the Greater Flagstone PDA. Preliminary approval for the context plan and master plan has been issued by EDQ. These plans were informed by detailed analysis of the site by specialist consultants, including a detailed ecological analysis by SHG. Subsequently, areas for development shown are concentrated to areas of least constraint. Areas of highest ecological value have been identified for retention as conservation.

The proposed works will include the creation of residential allotments, a proposed school site, new roads, park and conservation areas and corridors. Minimisation of overall clearing impacts are evident through location of the proposed development, located outside Endangered remnant vegetation and waterway corridors. Rehabilitation of conservation areas and waterways is proposed as part of the development.

The proposed earthworks to facilitate the development footprint will require the removal of three (3) relatively small patches of predominately juvenile *Melaleuca irbyana* specimens, and ongoing property boundary maintenance within 100 m of a fourth patch. These specimens are located within Of Concern and non-remnant regrowth areas (refer Plan 1).

As per the EDQ endorsed Natural Environment Site Strategy, extensive conservation of greater than 89 hectares of proposed Conservation Parkland adjoining Norris Creek and Wearing Park is proposed as part of the development. In accordance with best practice management, restoration and rehabilitation works will seek to stabilise and reverse the negative effects of ongoing habitat fragmentation. The intent is for managed areas of rehabilitation and restoration to rectify canopy gaps and restore bare or denuded areas to provide additional habitat and refugia within the lower strata to maintain connectivity with external approval corridors and improve terrestrial corridor viability. Rehabilitation works within the conservation area and waterway corridors will include weed management and replanting with native species consistent with mapped Regional Ecosystems to augment ecological values and enhance connectivity.

Melaleuca irbyana grows in flat areas that are periodically waterlogged, in eucalypt forest, mixed forest and *Melaleuca* woodland with a sparse and grassy understorey. The species prefers poorly draining, heavy clay soils (Byrnes 1984; Barlow 1987). The proposed conservation land rehabilitation works will include establishing a *Melaleuca irbyana* thicket within remnant woodland forest to the north of the central waterway. This land is relatively low lying and adjoins an ephemeral waterway that contains permanent billabongs. The proposal *Melaleuca irbyana* planting site is therefore considered ideal for the species, which is dependent on specific groundwater and / or surface water hydrology. Impacts to *Melaleuca irbyana* have been minimised to the greatest practical extent and include establishing a *Melaleuca irbyana* community, on the project site, within future conservation land and managing potential impacts from ongoing works that will occur within 100 m of a retained patch.

2.5. Survival of the Plant in the Wild

Based on the current disturbed nature of the site and the locations of the *Melaleuca irbyana* specimens along property boundaries, it is not anticipated that the removal of three (3) relatively small patches of predominately juvenile *Melaleuca irbyana* specimens will significantly hinder the future success of the species in the area. Importantly, the fourth patch is to be preserved within the conservation area and proposed rehabilitation works seek to establish a *Melaleuca irbyana* community on the site allowing the community to be protected in perpetuity.

3. Offset Assessment

The *Protected Plants Assessment Guideline* states that an offset compensates for residual impacts after impact management requirements of the guideline have been met. The specimens located are not considered to constitute ecological communities (as described in Section 2.2.), and therefore the viability of *Melaleuca irbyana* local populations are not considered to be impacted by this proposal.

The proposed earthworks to facilitate the development footprint will require the removal of three (3) relatively small patches of predominately juvenile *Melaleuca irbyana* specimens. In consideration of the extensive rehabilitation works proposed within the onsite conservation land, including the establishment of an *Melaleuca irbyana* thicket, the proposed rehabilitation works will ensure a net gain in *Melaleuca irbyana* across the site. IN light of rehabilitation efforts, the removal of small patches of *Melaleuca irbyana* specimens is not considered to impose a Significant Residual Impact, as defined under the DES policy, and therefore offsets are not considered applicable in this case.

3.1. Rehabilitation works

It is considered that the proposed rehabilitation works will mitigate the impact to the extent that the impact on the Matter of State Environmental Significance (MSES) would not be considered significant.

To demonstrate this mitigation of impact, a response to the four (4) points of consideration within Section 1.2 of the *Significant Residual Impact Guideline* is provided below.

- **The extent and duration of impact on the matter and its sensitivity to disturbance.**

  The impact on the matter is the removal of three (3) relatively small patches of predominately juvenile *Melaleuca irbyana* specimens from former paddock areas that have already been subject to high disturbance from cattle grazing and historical clearing. A fourth patch will be retained with ongoing adjoining works within 100 m limited to the maintenance of the nearby property boundary. The sites are described in detail in Section 2.3, shown in Plan 1 and summarised below:

  - Location 1: 3 x mature s + 100 juvenile specimens, located within the north-east along a drainage feature
  - Location 2: 4 x mature + 10 juvenile specimens, located along the southern boundary
  - Location 3: 3 mature +20 juvenile specimens, located along the southern boundary
  - Location 4: 5 mature + 198 juvenile specimens, located along the southern boundary in the south-west

- **Timeframe for rehabilitation relative to the impact occurring and the ability of the matter to maintain its viability during this timeframe.**

  The rehabilitation proposed is the planting of six hundred and twenty-five (625, equates to 140 cleared specimens at 4:1 plus an additional 65 specimens over 5,000 m^2 at 1 per 8 m^2) advanced tube stock specimens of *M. irbyana* within a relatively isolated portion of the central waterway corridor of the conservation zone (refer Plans 2 to 4). Although it is expected that these plantings will take approximately four (4) years to reach the size of the impacted matter, they will be planted in a thicket to replicate as close to natural conditions for a *M. irbyana* ecological community as possible and maintained as part of the extensive rehabilitation works for the conservation zone. The area of planting of this thicket adjoins the central waterway corridor and is not within 100 m of future development areas. This location has been chosen to avoid human disturbance and as far away as possible from conflicting uses.

It is noted that the rehabilitated creek corridor will be handed over to Logan City Council following the on-maintenance period. Further, the fourth patch of *M. irbyana* that is to be retained within the conservation area will be subject to regular compatible weed suppression and monitored for persistence as part of site maintenance due to its proximity to ongoing property boundary maintenance works within 100 m.

- **Likely success of rehabilitation works to return the impacted matter to its original condition, and;**

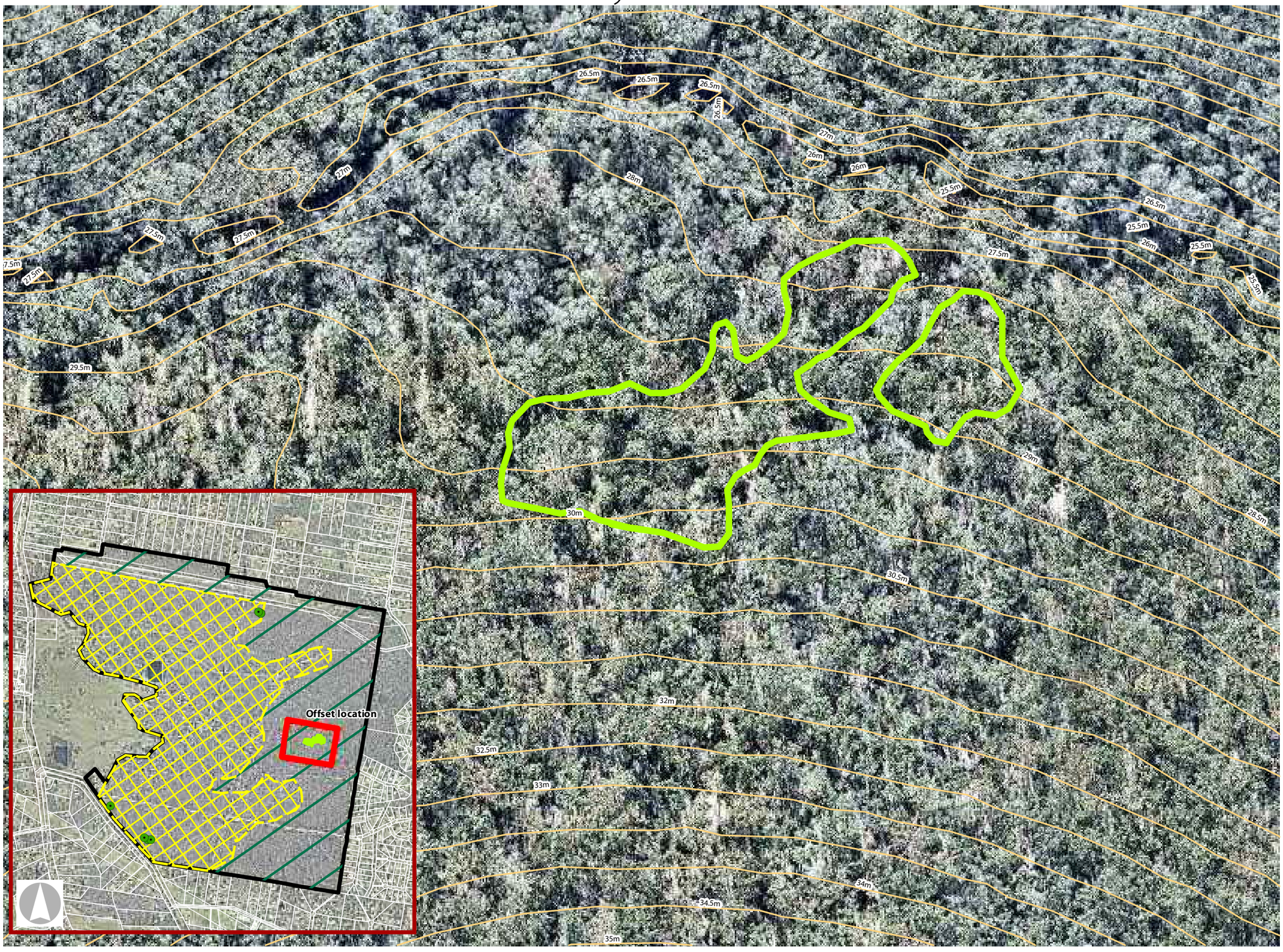
  It is important to note that the Regional Ecosystems within and adjoining the creek corridor reflect those where the *M. irbyana* patches are currently located on-site. The proposed rehabilitation area was chosen after detailed ecological survey of site attributes, including the prevailing low-lying topography, proximity to the creek, and canopy gaps with limited existing understorey (refer Plans 2 & 4). Thus, the planting of *M. irbyana* in the creek corridor has a high likelihood of success given the suitable landscape and habitat. Given that the impact is the removal of a 140 single individual specimens of *M. irbyana* which are almost entirely juveniles, the planting of six hundred and twenty-five (625) specimens of *M. irbyana* as a thicket within the conservation zone to be rehabilitated will far exceed the original condition of the impacted matter at an offset ratio of greater than 4:1.

- **The time-lag effect—between impact and rehabilitation successfully delivering the original condition for the matter—on the matter's viability.**

  As mentioned previously, the removal of three small patches of *M. irbyana* is not considered to significantly impact upon the viability of local populations nor remove significant habitat values. Although there will be a time-lag between the removal of the predominantly juvenile *M. irbyana* specimens and the maturity of the tube stock of *M. irbyana* to be planted. Overall, the rehabilitation proposed is considered a far superior ecological outcome for viability of local populations.

  The extent and number of *M. irbyana* to be planted is intended to establish a self-sustaining thicket of *M. irbyana* in a safe and secluded buffer environment that is capable of mitigating the proposed impacts. It is acknowledged that any future unavoidable loss of *M. irbyana* from the development area will be assessed by DES on a case by case basis.

2. Offset Assessment - *Melaleuca irbyana*



NOTES
This plan was prepared as a desktop assessment tool.
The information on this plan is not suitable for any other purpose.
Property dimensions, areas, numbers of lots and contours and other physical features shown have been compiled from existing information and may not have been verified by field survey. These may need verification if the development application is approved and development proceeds, and may change when a full survey is undertaken or in order to comply with development approval conditions. No reliance should be placed on the information on this plan for detailed design or for any financial dealings involving the land. Saunders Havill Group therefore disclaims any liability for any loss or damage whatsoever or howsoever incurred, arising from any party using or relying upon this plan for any purpose other than as a document prepared for the sole purpose of accompanying a development application and which may be subject to alteration beyond the control of the Saunders Havill Group. Unless a development approval states otherwise, this is not an approved plan.

Layer Sources: QLD GIS Layers (QLD Gov. Information Service 2016). Aerial (Nearmap 2018)

* This note is an integral part of this plan/data. Reproduction of this plan or any part of it without this note being included in full will render the information shown on such reproduction invalid and not suitable for use.

LEGEND

- Project DCDB
- Development footprint
- Conservation area
- Mature *Melaleuca irbyana* specimen to be impacted by clearing works
- Melaleuca Irbyana planting/rehab site (Approx. 5,000m²)
- Contours (0.5m)

Note: Juvenile *Melaleuca irbyana* are specimens less than 2 metres tall

Issue	Date	Description	Drawn	Checked
A	11/06/2018	Preliminary	TC	AD

Transverse Mercator | GDA 1994 | Zone 56 | 1:1,095 @A3

0 5 10 20 30 40 m

saunders havill group

mirvac

Everleigh

ADDRESS/RPD: Teviot Road, Greenbank (1/SP297192) 11/06/2018 7598 E 02 NCA 2 Offset Plan A

3. Melaleuca Irbyana - Rehabilitation/Planting Site Notes

INTRODUCTION

Saunders Havill Group (SHG) was engaged by MIRVAC to prepare an Impact Management Plan (IMP) for the clearing of 140 *Melaleuca irbyana* (Swamp Tree Tree) specimens. The replacement plants will be located within the approved conservation area of the Everleigh project (herein referred to as 'the site'). The clearing works, current and future will facilitate the creation of residential lots, a school and internal roads for the site's ultimate development layout.

The rehabilitation proposal for the clearing of 140 *Melaleuca Irbyana* is the planting of four (4) advanced tube stock specimens of *Melaleuca Irbyana* per tree cleared. A total of 625 (560+65 additional) *Melaleuca Irbyana* will be planted as a result. The planting area is proposed within the site's conservation zone (refer Plan 2) and will cover 5,000 m^2. The specific location of the planting area was determined onsite by Ecologists from SHG. The percentage of exiting canopy cover and the land zone features were taken into consideration when determining the optimal location for planting. Although it is expected that these plantings will take approximately four (4) years to reach the size of the impacted matter, they will be planted in a thicket to replicate as close to natural conditions for a *Melaleuca Irbyana* ecological community as possible and maintained as part of the rehabilitation works for the conservation zones. The area of planting of this thicket is centralised within the conservation zone and adjacent the waterway corridor, as stipulated by the EDQ approved NESS, and not within 100m of future development areas.

This Rehabilitation Plan is drafted to identify and manage the site disturbances for the planting of the 625 *Melaleuca Irbyana* specimens within a 5,000m^2. The planting will involve low impact weed removal and the retention of any existing native vegetation in the immediate area.

SITE PREPARATION

Once the planting locations have been determined not to impact existing native vegetation, the location is to be spot sprayed prior to soil cultivation. Herbicides must be applied by appropriately qualified/supervised persons in accordance with the Agricultural Chemicals and Distribution Control Act 1966 at rates identified on registered product labels, or on an Australian Pesticides and Veterinary Medicines Authority (APVMA) issued off-label permit where applicable. Refer to South East Queensland Ecological Restoration Framework for additional guidance.

The planting will provide a net benefit of greater than 4 to 1 in an area protected under the NESS.
Rehabilitation treatment is to generally include the following points:

- A number of weeds are recorded for removal within shrub & ground layer
- Weed removal and management will utilise low impact methods
- Planting of the 625 specimens will be planted at approximately 1 per 8m^2 to form a *Melaleuca Irbyana* thicket.

Ecologists from SHG have assessed the site's vegetation. Broadly, it was determined that the assisted natural regenerate approach will be used on site. This approach is described below:

ASSISTED NATURAL REGENERATION

Applies:

- To natural areas where the native plant community is largely healthy and functioning
- When native plant seed is still stored in the soil or will be able to reach the site from nearby natural areas, by birds or other animals, wind or water
- Where the natural regeneration processes (seedling germination, root suckering, etc.) are being inhibited by external factors, such as weed invasion, soil compaction, cattle grazing, mechanical slashing, etc.
- When limited human intervention, such as weed control, minor amelioration of soil conditions, erection of fencing, cessation of slashing, etc. will be enough to trigger the recovery processes through natural regeneration
- When the main management issue is weed infestation and/or current land use practices

Role of planting:

- Planting in such areas should be limited to where species cannot return to site without direct intervention.

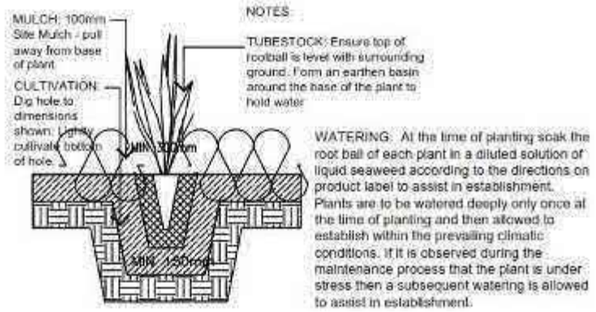
Goal vegetation community:

- The re-establishing plant community will be substantially similar in structure, composition and diversity to the original vegetation

MULCH

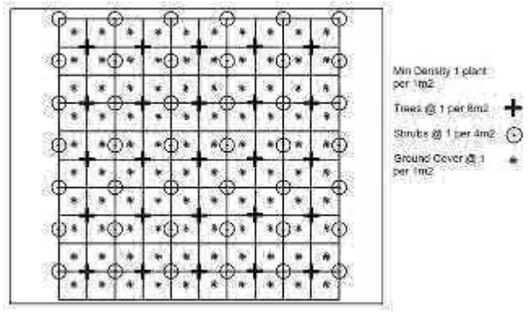
Areas to be blanket mulched to a minimum depth of 100mm leaving a 50mm gap surrounding the trunk of planted stock. Areas which are too steep or where overland flows may occur, a combination of mulch and Jute mat and or suitably anchored natural fibre weed mat installed to manufactures specifications have been specified.

Each individual planting location should be spot cultivated to at least 2 times the depth and twice the width of the plant stock size. Refer detail for more specifications:



PLANTING

Planting locations shall be generally set out in accordance with a typical random grid pattern as shown on this drawing sheet below with the *Melaleuca Irbyana* to be planted at 1 per 8m^2.



All stock shall be advanced tube stock specimens of *Melaleuca Irbyana*, well formed, and hardened off to suit final revegetation location, nursery stock. The root system should be well formed without being tube bound or large roots extruding from the tube container. The environmental coordinator has the right to inspect and reject stock prior to planting.

INSTALLATION

The following outlines the preferred installation methodology for revegetation works within the rehabilitation areas. It has been designed to maximise plant establishment success rates and minimise plant mortality. Revegetation works shall be either undertaken or directly supervised by an experienced and qualified bush regenerator. All works shall be in accordance with the provisions of this sheet, local government policies and Australian Standards. Plant installation methods shall include:

- Plants are to be vigorous, well established, hardened off, consistent with species or variety, free from disease and insect pests, with large root systems and no evidence of having been restricted or damaged.
- Plants are to be planted immediately after delivery to the planting site. If not possible, they should be stored in the shade and watered sufficiently during the day.
- Planting is to be undertaken in accordance with the planting grid contained within this drawing sheet.
- Excavate planting medium to a depth suitable for the installation of tube or pot specimens. In areas where planting substrate is deemed to be very poor (compacted, nutrient depauperate, hydrophobic etc.) and above areas of potential frequent inundation and water flow, topsoil may be used or the ground mechanically ripped where access is feasible.
- Pre-water plant hole, if soil is dry, to decrease root stress upon planting and assess the infiltration of water through the soil
- Incorporate into the planting substrate the appropriate quantity of prepared water crystals or other suitable hydrating product such as Hortex 'Rainsaver' or 'Moisturaid'.
- Place plant into hole and backfill ensuring that the plant is upright and the stem is not covered in any less than 10mm or any more than 20mm of planting medium
- Plants are to be watered thoroughly immediately after planting (ensure deep irrigation) and thereafter as required during the construction phase of the development depending on climatic conditions. Creation of a concave hollow around the base of each plant will aid water infiltration to the plant roots.
- A complete, slow release fertiliser is recommended, and is to be administered appropriately during planting. Top dressing with slow release fertiliser is preferred to avoid toxic levels of fertiliser accumulating in the plant hole around the plant roots.
- To ensure successful establishment, all planting surfaces must be covered in:
    - 100mm layer of high quality weed-free composted chip mulch (site mulch) - Note: to avoid possible stem rot in some 'drier' species ensure mulch is 'dished' and not covering plant stem by more than 200mm
    - suitable individual anchored natural fibre weed mat; or
    - As presented within other section, where available mulch material will be sourced from cleared vegetation material if adequately seasoned.
- A long term slow release fertiliser, such as Nutricote or similar product should be used for all plantings after initial plant establishment.
- Seedlings and saplings are to be encouraged and maintained throughout the establishment period.

MAINTENANCE & MONITORING

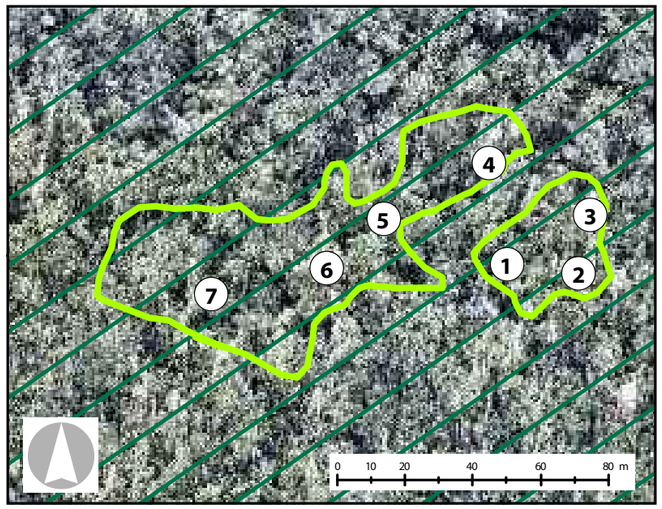
MAINTENANCE SCHEDULE

Maintenance schedule for revegetation areas of the proposed development as specified on the Landscape Plans

ESTABLISHMENT	*Establishment is to occur at the completion of the primary and secondary weed removal phases and any rehabilitation planting. During this period any failed stock are to be replaced and/ or defects identified then reparations are to be made to site works.*
1. Watering	Watering shall be carried out to ensure establishment of revegetation.
	At the time of planting soak the root ball of each plant in a diluted solution of liquid seaweed according to the directions on product label to assist in establishment.
	Plants are to be watered deeply only once at the time of planting and then allowed to establish within the prevailing climatic conditions. If it's observed during the maintenance process that the plant is under stress then a subsequent watering is allowed
2.Weed Removal	Weeds evident during the Establishment period but should be removed as part of a monthly weed management program. Best Practice weed management techniques should be employed for weed removal amongst revegetation areas.
	Where grass seeding or turf establishes within planted areas it should be treated with approved herbicide for waterways.
MAINTENANCE	*(Weeks 13- 2 years)*
1. Watering	No specified watering regime is provided during the maintenance period. The intent is for the area to become self sufficient in utilising natural rain patterns and run off. Watering should occur during extended dry periods to ensure continued establishment
2. Weed Removal	Weeds should be tended to on a monthly program. Treatment techniques vary within the landscape planted areas versus revegetation and retention areas.
3. Management	Throughout the establishment and maintenance periods areas where planting stock has not achieved a 90% success survival additional planting shall be installed.
4. Erosion Control	Prior to the commencement of works and to remain throughout the establishment and maintenance period an erosion and sediment control measures shall be employed over the rehabilitaion area of the site.

Issue	Date	Description	Drawn	Checked
A	3/07/2018	Preliminary	TC	MS

4. Melaleuca Irbyana - Rehabilitation/Planting Site Photos



LEGEND

- Project DCDB
- Development footprint
- Conservation area
- Mature *Melaleuca irbyana* specimen to be impacted by clearing works
- Melaleuca Irbyana planting/rehab site (Approx. 5,000m²)
- Contours (0.5m)

Note: Juvenile *Melaleuca irbyana* are specimens less than 2 metres tall

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Layer Sources: QLD GIS Layers (QLD Gov. Information Service 2016), Aerial (Nearmap 2018)

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Issue	Date	Description	Drawn	Checked
A	11/06/2018	Preliminary	TC	AD

Transverse Mercator | GDA 1994 | Zone 56 | 1:1,095 @A3

saunders havill group

mirvac

Everleigh

4. Summary and Conclusion

Saunders Havill Group has been engaged by Mirvac Queensland Pty Ltd to complete an Impact Management Plan (IMP) for *Melaleuca irbyana* located within the extent of works for the Everleigh Greenbank project. This IMP is intended to support a clearing permit (protected plants) application to the Department of Environment and Science (DES) in accordance with the *Nature Conservation (Wildlife Management) Regulation 2006 - Protected Plants Assessment Guidelines*.

Earthworks associated with the development will necessitate the removal of three (3) relatively small patches of predominantly juvenile *M. irbyana* and the retention of a fourth within the conservation area but within 100 m of ongoing property boundary maintenance. The Protected Plants Assessment Guideline states that an offset compensates for residual impacts after impact management requirements of the guideline have been met. Activities are not anticipated to adversely impact on the viability of any localised *M. irbyana* ecological communities, and the removal of three small *M. irbyana* patches is not considered to impose a Significant Residual Impact as defined under the DES policy in consideration of proposed rehabilitation works within the central creek corridor of the conservation zone. Therefore, offsets are not considered applicable in this case. It is important to note that investment in the conservation zone rehabilitation works proposed, i.e. revegetation and weed removal and the establishment of 625 tube stock *M. irbyana* plantings, is considered to provide a superior ecological outcome relative to the removal of a single specimen at an offset ratio greater than 4:1.

5. Appendices

Appendix A

Wildlife Online Search

Nature Conservation Act 1992

Appendix A

Wildlife Online Search

Nature Conservation Act 1992

Queensland Government

Wildlife Online Extract

Search Criteria: Species List for a Specified Point
Species: All
Type: All
Status: Rare and threatened species
Records: All
Date: All
Latitude: -27.7401
Longitude: 152.9975
Distance: 10
Email: keiragrundy@saundershavill.com
Date submitted: Wednesday 14 Feb 2018 16:50:28
Date extracted: Wednesday 14 Feb 2018 17:00:02

The number of records retrieved = 13

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	amphibians	Limnodynastidae	*Adelotus brevis*	tusked frog		V		3
animals	amphibians	Myobatrachidae	*Crinia tinnula*	wallum froglet		V		3/3
animals	birds	Cacatuidae	*Calyptorhynchus lathami lathami*	glossy black-cockatoo (eastern)		V		3
animals	birds	Falconidae	*Falco hypoleucos*	grey falcon		V		1
animals	birds	Psittacidae	*Lathamus discolor*	swift parrot		E	CE	1
animals	birds	Strigidae	*Ninox strenua*	powerful owl		V		5
animals	mammals	Dasyuridae	*Dasyurus maculatus maculatus*	spotted-tailed quoll (southern subspecies)		V	E	15
animals	mammals	Macropodidae	*Petrogale penicillata*	brush-tailed rock-wallaby		V	V	2
animals	mammals	Phascolarctidae	*Phascolarctos cinereus*	koala		V	V	515
animals	mammals	Pseudocheiridae	*Petauroides volans volans*	southern greater glider		V	V	12/2
plants	higher dicots	Apocynaceae	*Marsdenia coronata*	slender milkvine		V		2/2
plants	higher dicots	Lamiaceae	*Plectranthus habrophyllus*			E	E	6/6
plants	higher dicots	Myrtaceae	*Melaleuca irbyana*			E		7/6

CODES

I - Y indicates that the taxon is introduced to Queensland and has naturalised.

Q - Indicates the Queensland conservation status of each taxon under the *Nature Conservation Act 1992.* The codes are Extinct in the Wild (PE), Endangered (E), Vulnerable (V), Near Threatened (NT), Least Concern (C) or Not Protected ( ).

A - Indicates the Australian conservation status of each taxon under the *Environment Protection and Biodiversity Conservation Act 1999.* The values of EPBC are Conservation Dependent (CD), Critically Endangered (CE), Endangered (E), Extinct (EX), Extinct in the Wild (XW) and Vulnerable (V).

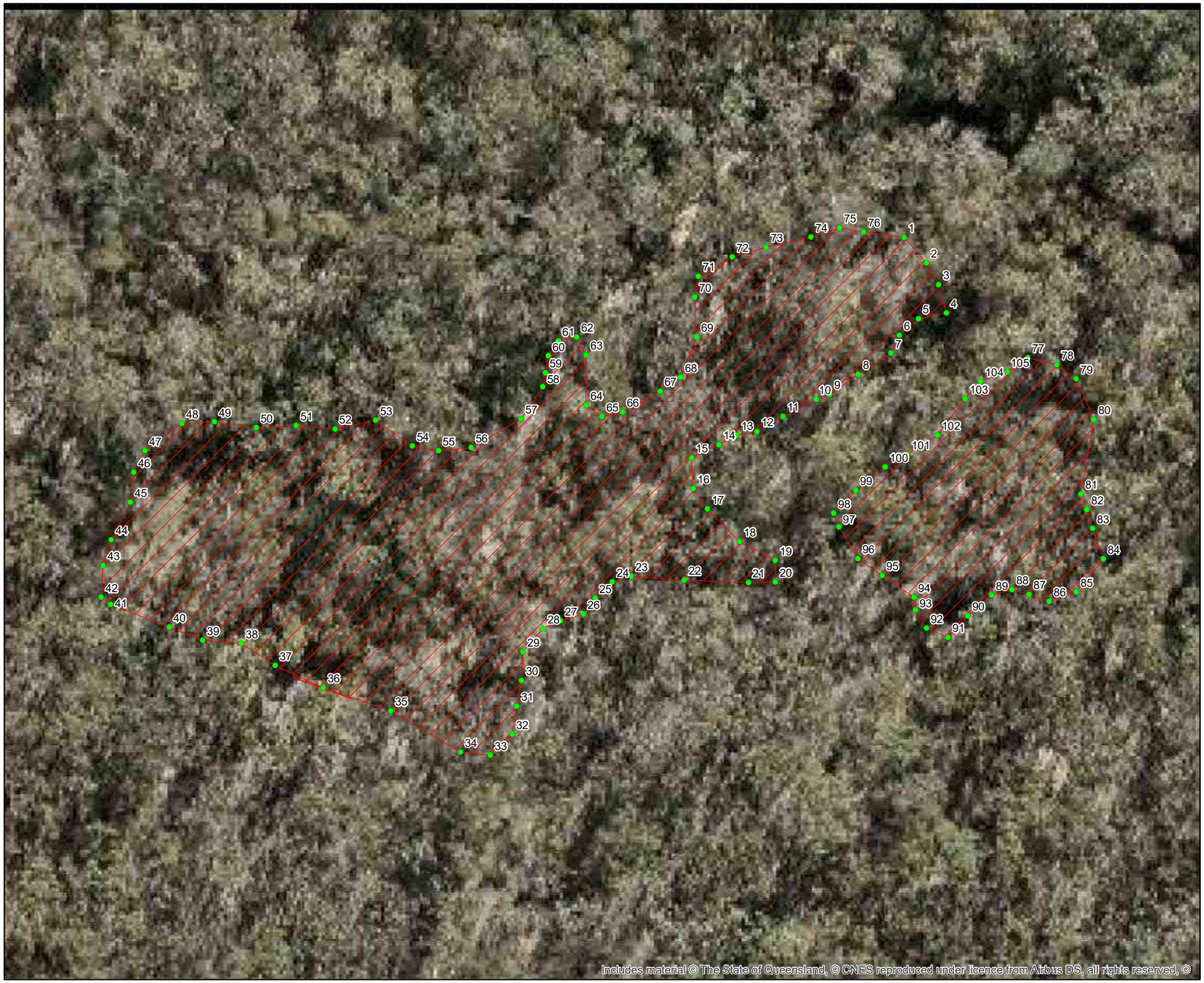
Records – The first number indicates the total number of records of the taxon for the record option selected (i.e. All, Confirmed or Specimens).
This number is output as 99999 if it equals or exceeds this value. The second number located after the / indicates the number of specimen records for the taxon.
This number is output as 999 if it equals or exceeds this value.

Appendix C

Declared Area Map

Derived Reference Points for GPS
Projection: UTM (MGA Zone 56)
Datum: GDA94

Point	Easting	Northing	Point	Easting	Northing
1	500604	6931430	54	500530	6931398
2	500607	6931426	55	500534	6931398
3	500609	6931423	56	500538	6931398
4	500610	6931419	57	500546	6931403
5	500606	6931418	58	500549	6931407
6	500603	6931415	59	500550	6931409
7	500602	6931412	60	500550	6931412
8	500597	6931409	61	500552	6931414
9	500593	6931406	62	500554	6931415
10	500591	6931405	63	500556	6931412
11	500586	6931403	64	500556	6931405
12	500582	6931401	65	500558	6931403
13	500579	6931400	66	500561	6931404
14	500576	6931399	67	500567	6931407
15	500572	6931397	68	500570	6931409
16	500572	6931392	69	500573	6931415
17	500574	6931389	70	500572	6931421
18	500579	6931384	71	500573	6931424
19	500584	6931381	72	500578	6931427
20	500584	6931378	73	500583	6931428
21	500580	6931378	74	500590	6931430
22	500571	6931378	75	500594	6931431
23	500563	6931379	76	500598	6931431
24	500560	6931378	77	500623	6931412
25	500557	6931375	78	500627	6931411
26	500555	6931373	79	500630	6931409
27	500552	6931372	80	500633	6931402
28	500549	6931371	81	500631	6931391
29	500546	6931367	82	500632	6931389
30	500546	6931363	83	500632	6931386
31	500545	6931359	84	500634	6931381
32	500545	6931355	85	500630	6931376
33	500541	6931352	86	500626	6931375
34	500537	6931352	87	500623	6931376
35	500526	6931358	88	500620	6931377
36	500516	6931362	89	500617	6931376
37	500509	6931365	90	500614	6931373
38	500504	6931369	91	500611	6931369
39	500498	6931369	92	500607	6931371
40	500493	6931371	93	500606	6931374
41	500484	6931374	94	500605	6931376
42	500483	6931376	95	500601	6931379
43	500483	6931380	96	500597	6931381
44	500484	6931384	97	500594	6931386
45	500487	6931390	98	500593	6931388
46	500487	6931394	99	500597	6931392
47	500489	6931398	100	500601	6931395
48	500495	6931402	101	500604	6931397
49	500500	6931402	102	500609	6931400
50	500506	6931401	103	500613	6931406
51	500512	6931401	104	500616	6931408
52	500518	6931401	105	500620	6931410
53	500524	6931402			



Declared Area Map 2019/002656 - Sheet 2 of 2

Lot on Plan:
1/SP297192

Local Government:	Logan City	Satellite Image:	Logan 2017 10cm SISP
Centre:	Toowoomba	Prepared By:	JDC
Region:	South	Map Date:	9 October 2019
Map Reference:		File Reference:	-

Legend

- Derived Reference Points for GPS
- Declared Area
- Property boundary
- QLD DCDB

0 0.01 0.02 0.03 0.04 km

NON-STANDARD MAP

Disclaimer:
While every care is taken to ensure the accuracy of this product, the Department of Natural Resources and Mines makes no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and disclaims all responsibility and all liability (including without limitation, liability in negligence) for all expenses, losses, damages (including indirect or consequential damage) and costs which you might incur as a result of the product being inaccurate or incomplete in any way and for any reason.

Horizontal Datum: Geocentric Datum of Australia 1994 (GDA94 MGA Zone 56)

Cadastral data provided with the permission of the Department of Natural Resources and Mines

Property boundaries shown on this map are provided as a locational aid only. DCDB boundaries do not represent legal cadastral boundaries.

N

Queensland Government

Appendix D

Wildlife Online Search

Nature Conservation Act 1992

Queensland Government

Wildlife Online Extract

Search Criteria: Species List for a Specified Point
Species: Plants (including other non-animals such as fungi and protists)
Type: All
Status: Rare and threatened species
Records: All
Date: All
Latitude: -27.737
Longitude: 152.995
Distance: 10
Email: keiragrundy@saundershavill.com
Date submitted: Wednesday 08 Jul 2020 12:17:20
Date extracted: Wednesday 08 Jul 2020 12:20:02

The number of records retrieved = 3

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
plants	land plants	Apocynaceae	*Marsdenia coronata*	slender milkvine		V		6/2
plants	land plants	Lamiaceae	*Coleus habrophyllus*			E	E	8/8
plants	land plants	Myrtaceae	*Melaleuca irbyana*			E		6/4

CODES

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A - Indicates the Australian conservation status of each taxon under the *Environment Protection and Biodiversity Conservation Act 1999.* The values of EPBC are Conservation Dependent (CD), Critically Endangered (CE), Endangered (E), Extinct (EX), Extinct in the Wild (XW) and Vulnerable (V).

Records – The first number indicates the total number of records of the taxon for the record option selected (i.e. All, Confirmed or Specimens).
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This number is output as 999 if it equals or exceeds this value.

Appendix E

Evolve Environmental *Melaleuca irbyana* Assessment Audit Reports

Everleigh by Mirvac

Melaleuca irbyana offset planting.

Introduction

Evolve Environmental Solutions have been engaged by Mirvac to undertake installation & establishment of their Melaleuca irbyana offset planting at their master planned community situated at 146 Teviot Rd Greenbank - Everleigh. Scope of works has provision for weed management in the offset area, installation of offset planting, watering, ongoing weed management and monitoring. Establishment period runs over 24 months utilising an adaptive management approach to achieve a holistic and resilient offset plant. This current activity report documents the initial site inspection and planting of the offset on behalf of Mirvac.

Progress to Date

26th March 2019 proposed offset site inspected and photo monitoring points installed.

Commencement of weed treatment.

27th March completion weed treatment and ground preparation for installation of Melaleuca irbyana. Plant stock sourced from Wallum Nursery 1237 New Cleveland Rd Gumdale.

28th March all plants installed, tree guards and weed suppression mats being installed. Commenced watering regime. Weed suppression mats are 400mm x 400mm palm fibre mats pinned down with three 200mm U- pins. Palm fibre matting 1600gsm. Corflute tree guards with 1 x hardwood stake have been installed to protect juvenile plants from potential fauna damage.

Limited weeds found during inspection of site, however there were scattered clumps of Lantana camara and Senecio madagascariensis (Fireweed). All examples were manually removed from site.

Images attached show offset site pre-planting.

Images taken prior to completion of works – 28/3/19.

Photo Monitoring Point 1

Photo Monitoring Point 2

Photo Monitoring Point 3

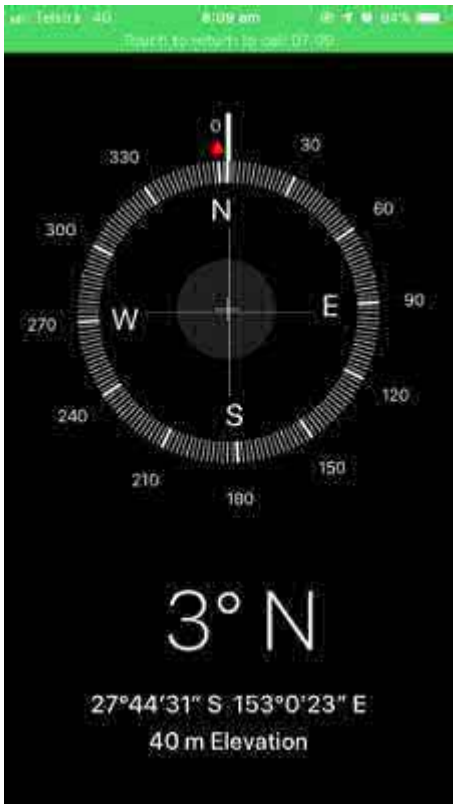

Photo Monitoring Point 4

Images below are taken in from PMP 1-4 in order from E,N,S & W.

EVOLVE
environmental solutions

EVOLVE
environmental solutions

EVOLVE
environmental solutions

EVOLVE
environmental solutions

EVOLVE
environmental solutions

Recipient: Jason Augustine

Company: Mirvac

Via: Email – jason.augustine@mirvac.com

Technical Memorandum 2 – Everleigh – *Melaleuca irbyana* assessment

Dear Jason,

Below is a quick synopsis of the planting of the 625 *Melaleuca irbyana* that was conditioned as part of the Impact Management Plan that was prepared by **Saunders Havill Group** (SHG) on the 11/06/2018 as per the requirements of the Natural Environment Site Strategy (NESS). This technical memorandum follows on from 12.04.2019 to 12.12.2019.

Works Completion

Below is a summarised account of works that have taken place relating to the planting of the 625 *Melaleuca irbyana* at 146 Teviot Greenbank.

DATE	TASK
26.03.2019	Proposed offset site inspected and photo monitoring points established.
26.03.2019	Initial Weed Treatment commenced
27.03.2019	Completion of initial weed treatment
27.03.2019	Ground preparation for required planting of 625 *Melaleuca irbyana*
28.03.2019	All *Melaleuca irbyana* (625) installed with tree guards (Corflute tree guards with 1 x hardwood stake) and weed suppression mats (400mm x 400mm palm fibre, pinned with 200mm U pins). Provides both protection from fauna and weed incursion
09.04.2019	Watering of *Melaleuca irbyana*
12.04.2019	Watering of *Melaleuca irbyana*
31.05.2019	Watering of *Melaleuca irbyana*
19.06.2019	Watering of *Melaleuca irbyana*
16.08.2019	Watering of *Melaleuca irbyana* + Maintenance weeding
17.10.2019	Watering of *Melaleuca irbyana* + Maintenance weeding

01.11.2019	Watering of *Melaleuca irbyana* + installation of 80 plant due to failure
07.11.2019	Watering of *Melaleuca irbyana* (newly planted plants only)
21.11.2019	Watering of *Melaleuca irbyana* (newly planted plants only)
12.12.2019	Watering of *Melaleuca irbyana*

Offset Monitoring Point Locations

Offset monitoring points were established in March 2018. Since the establishment of these points, 4 monitoring events have taken place. Please refer to monitoring point locations below.

Monitoring Point	**GPS Coordinates**	**Site Photos**
1	27°44’8” S 153°0’31” E	 **North**  **East**

		 **South**	 **West**
2	27°44’31” S 153°0’19” E	 **North**	 **East**

		 **South**	 **West**
3	27°44’22” S 153°0’24” E	 **North**	 **East**

		  **South** **West**
4	27°44’31” S 153°0’23” E	  **North** **East**

			
		South	**West**

Table 1: Monitoring point descriptions

There is little in terms of planting descriptions to occur at this stage due to slow growth rate. At current, few specimens have protruded from the tree guards. As growth continues itemised descriptions of the monitoring points will occur.

Site Assessment

Site conditon was assessed by the team leader of the job. The following items were noted:

- Plant growth is stunted, meaning the rate of growth of the plants is considered slow;
- Plants are alive but not thriving; and
- 80 plants were replanted in November due to failure

Due to soil composition and what appears to be free draining soil it will be important to water species and think of methods that allow for heavier inundation. Further evidence of this is evident from the failure of 80 plants. Whilst watering has occurred periodically failure has still occurred to 80 specimens.

Corrective Actions

- Replacement of 80 Melaleuca *irbyana* plants due to failure.

Closing

Plant species are all alive however, growth appears stunted and slow. Planting area does not allow for inundation in the current location. 80 plant have failed and have been replanted. Due to expected high temperature in the up coming summer period success will largely be dictated by rainfall. Whilst heavy watering will aid in the success of the planted species ultimately rainfall be key in the success of the planted specimens.

Recipient: Jason Augustine

Company: Mirvac

Via: Email – jason.augustine@mirvac.com

Technical Memorandum – Everleigh – *Melaleuca irbyana* assessment

Dear Jason,

Below is a quick synopsis of the planting of the 625 *Melaleuca irbyana* that was conditioned as part of the Impact Management Plan that was prepared by **Saunders Havill Group** (SHG) on the 11/06/2018 as per the requirements of the Natural Environment Site Strategy (NESS). The memorandum is for the period of 26.03.2020 to 12.04.2020.

Works Completion

Below is a summarised account of works that have taken place relating to the planting of the 625 *Melaleuca irbyana* at 146 Teviot Greenbank.

DATE	TASK
26.03.2019	Proposed offset site inspected and photo monitoring points established.
26.03.2019	Initial Weed Treatment commenced
27.03.2019	Completion of initial weed treatment
27.03.2019	Ground preparation for required planting of 625 *Melaleuca irbyana*
28.03.2019	All *Melaleuca irbyana* (625) installed with tree guards (Corflute tree guards with 1 x hardwood stake) and weed suppression mats (400mm x 400mm palm fibre, pinned with 200mm U pins). Provides both protection from fauna and weed incursion
09.04.2019	Watering of *Melaleuca irbyana*
12.04.2019	Watering of *Melaleuca irbyana*

Offset Monitoring Point Locations

Offset monitoring points were established in March 2018. Since the establishment of these points, 4 monitoring events have taken place. Please refer to monitoring point locations below.

Monitoring Point	**GPS Coordinates**	**Site Photos**
1	27°44’8” S 153°0’31” E	 **North**  **East**

			
		South	**West**
2	27°44’31” S 153°0’19” E		
		North	**East**

		  **South** **West**
3	27°44’22” S 153°0’24” E	  **North** **East**

		 **South**	 **West**
4	27°44’31” S 153°0’23” E	 **North**	 **East**

			
		South	**West**

Table 1: Monitoring point descriptions

There is little in terms of planting descriptions to occur at this stage due to slow growth rate. At current, few specimens have protruded from the tree guards. As growth continues itemised descriptions of the monitoring points will occur.

Site Assessment

Site conditon was assessed by the team leader of the job. The following items were noted:

- Plant growth is stunted, meaning the rate of growth of the plants is considered slow; and
- Plants are alive but not thriving.

Due to soil composition and what appears to be free draining soil it will be important to water species and think of methods that allow for heavier inundation.

Corrective Actions

Nil

Closing

Plant species are all alive however, growth appears stunted and slow. Planting area does not allow for inundation in the current location. Watering will be key.

Everleigh - Mirvac

Melaleuca irbyana Assessment Audit – Everleigh Greenbank

22/05/2020

Job Number: 150

Evolve Environmental Solution Pty. Ltd.

Document Control

Document: *Melaleuca irbyana* Assessment Audit – Everleigh Greenbank

Document Issue

Issue	Date	Prepared By	Checked By
Issue A	09/06/2020	Adam Hutchinson	Adam Hutchinson

Prepared by

ABN: 16 155 844 232

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Introduction

Evolve Environmental Solutions (Evolve) were engaged by **Mirvac** to undertake the installation and establishment of 625 *Melaleuca irbyana* at 146 Teviot Rd Greenbank. This work is in accordance with the Impact Management Plan that was prepared by **Saunders Havill Group** (SHG) on the 11/06/2018 as per the requirements of the Natural Environment Site Strategy (NESS). The scope entails for weed management in the offset area, installation of offset planting, watering, ongoing weed management and monitoring. Establishment period runs over 24 months utilising an adaptive management approach to achieve a holistic and resilient offset planting

Works Completion

Below is a summarised account of works that have taken place relating to the planting of the 625 *Melaleuca irbyana* at 146 Teviot Greenbank.

DATE	TASK
26.03.2019	Proposed offset site inspected and photo monitoring points established.
26.03.2019	Initial Weed Treatment commenced
27.03.2019	Completion of initial weed treatment
27.03.2019	Ground preparation for required planting of 625 *Melaleuca irbyana*
28.03.2019	All *Melaleuca irbyana* (625) installed with tree guards (Corflute tree guards with 1 x hardwood stake) and weed suppression mats (400mm x 400mm palm fibre, pinned with 200mm U pins). Provides both protection from fauna and weed incursion
09.04.2019	Watering of *Melaleuca irbyana*
12.04.2019	Watering of *Melaleuca irbyana*
31.05.2019	Watering of *Melaleuca irbyana*
19.06.2019	Watering of *Melaleuca irbyana*
16.08.2019	Watering of *Melaleuca irbyana* + Maintenance weeding
17.10.2019	Watering of *Melaleuca irbyana* + Maintenance weeding
01.11.2019	Watering of *Melaleuca irbyana* + installation of 80 plant due to failure
07.11.2019	Watering of *Melaleuca irbyana* (newly planted plants only)

21.11.2019	Watering of *Melaleuca irbyana* (newly planted plants only)
12.12.2019	Watering of *Melaleuca irbyana*
12.03.2020	Installation of replacement plants, planting to occur with auger and water spike
19.05.2020	Installation of replacement plants, planting to occur with auger and water spike + watering of *Melaleuca irbyana* + Site audit

Table 1: Works Completion Table (*Note: Photo Monitoring taken once per quarter)

Offset Monitoring Point Locations

Offset monitoring points were established in March 2018. Since the establishment of these points, 4 monitoring events have taken place.

Please refer to monitoring point locations below.

Monitoring Point	GPS Coordinates	Site Photos
1	27°44’8” S 153°0’31” E	 **North**  **East**

			
		South	**West**

2	27°44’31” S 153°0’19” E	 **North**	 **East**

			
		South	**West**

3	27°44’22” S 153°0’24” E	 **North**  **East**

		  **South** **West**

4	27°44’31” S 153°0’23” E	 **North**	 **East**

			
		South	**West**

Table 2: Monitoring point descriptions

There is little in terms of planting descriptions to occur at this stage due to slow growth rate and planting failures. At current, few specimens have protruded from the tree guards. As growth continues itemised descriptions of the monitoring points will occur.

Everleigh Photo Monitoring Points

Legend

- Photo Monitoring Points
- DCDB

EVOLVE environmental solutions

N

540 Meters

Environmental Site Audit

On Tuesday the 19th of May 2020 two ecologists from Evolve conducted a condition audit on the state of the 625 *Melaleuca irbyana* at 146 Teviot Greenbank. The audit was conducted to assess the following:

- Health and vigor of the planted specimens;
- Provide any dieback count;
- Assessment of the offset area in general for any weed incursion; and
- Conduct the routine photo monitoring

Following the audit, a key goal is to provide rectification works requirements and recommendations of the offset to ensure compliance.

Site Audit Results

The site audit assessed the *Melaleuca irbyana* planting requirements as stipulated in the Impact Management Plan written by **SHG**. The following counts were noted:

- Of the 625 *Melaleuca irbyana* planted the audit found 192 of these plants to be dead;
- Of the 625 *Melaleuca irbyana* planted the suit 193 plants to be of questionable vigor; and
- The remaining 240 *Melaleuca irbyana* were considered to be healthy.

No weed incursion was found in the *Melaleuca irbyana* planting area. There were visible signs of fauna (probably wallabies and kangaroos) grazing on the tops of the planted specimens.

The audit revealed mixed success of on ground planting more than likely due to climatic effects than fauna disturbance .

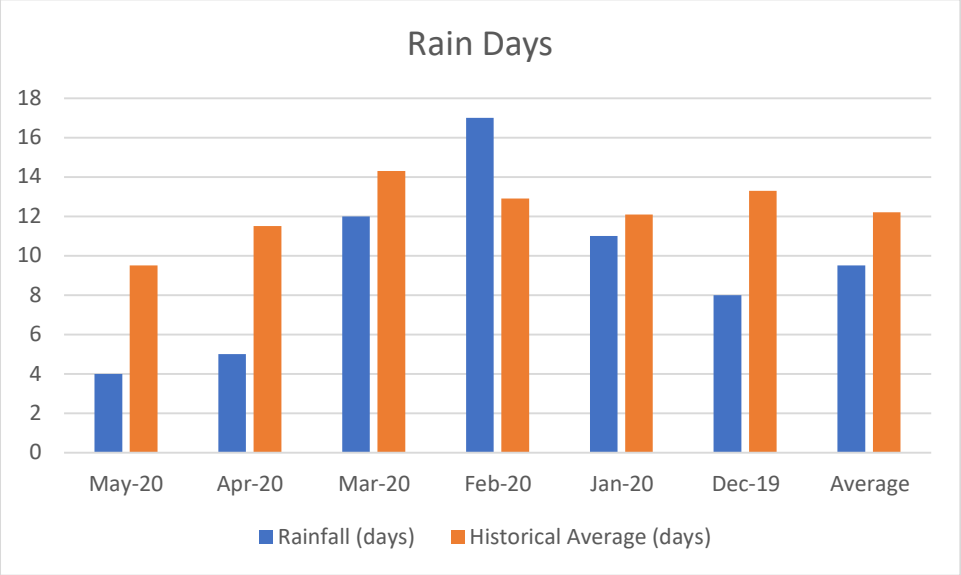
Climatic Variations (Past 6 Months)

Month	Rainfall (mm)	Historical Average (mm)
May 2020	2.2mm	66.8mm
April 2020	3.0mm	64.5mm
March 2020	82.2mm	120.7mm
February 2020	320.1mm	136.2mm
January 2020	113.6mm	154.2.mm
December 2019	86.8mm	133.6mm
Average	**101.37mm**	**112.66mm**
Total	**607.9mm**	**676mm**

Table 3: Rainfall data Everleigh May 2020 to December 2019

Month	Rainfall (days)	Historical Average (days)
May 2020	4 days	9.5 days
April 2020	5 days	11.5 days
March 2020	12 days	14.3 days
February 2020	17 days	12.9 days
January 2020	11 days	12.1 days
December 2019	8 days	13.3 days
Average	**9.5 days**	**12.2 days**
Total	**57 days**	**73.6 days**

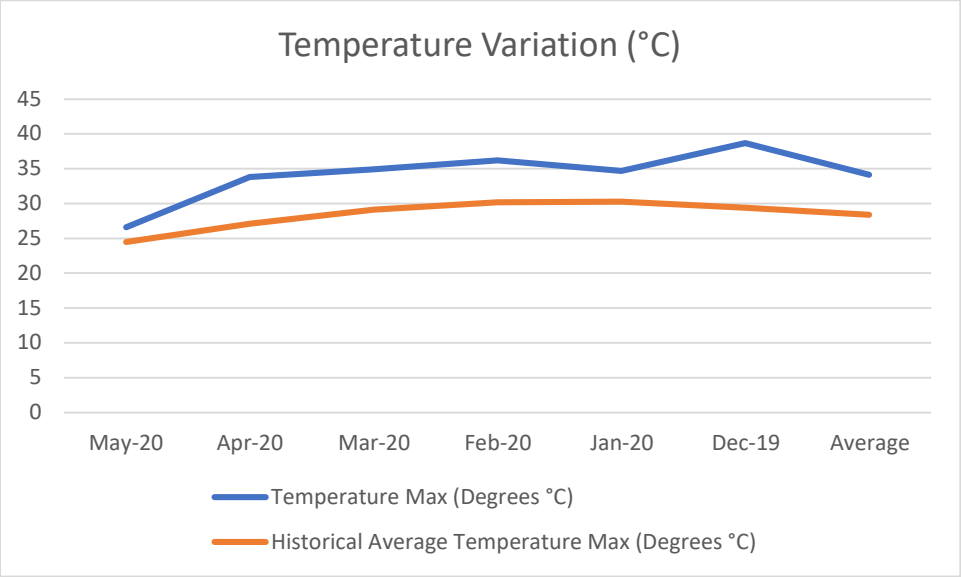
Table 4: Rain days data Everleigh May 2020 to December 2019



Graph 1: Rain days data Everleigh May 2020 to December 2019

Month	Temperature Max (Degrees °C)	Historical Average Temperature Max (Degrees °C)
May 2020	26.6°C	24.5°C
April 2020	33.8°C	27.1°C
March 2020	34.9°C	29.1°C
February 2020	36.2°C	30.2°C
January 2020	34.7°C	30.3°C
December 2019	38.7°C	29.4°C
Average	**34.14°C**	**28.4°C**

Table 5 Temperature data Everleigh May 2020 to December 2019



Graph 2: **Temperature Data Everleigh May 2020 to December 2019**

Variations in climatic factors have heavily affected optimal growing conditions. Whilst total rainfall and rain days did not fluctuate to what could be considered to be a large variation they were down on the statistical average. Maximum temperature rates fluctuated greatly with peak days overall particularly in January reaching 38.7°C. The heat effect has negatively affected the survival rate of the planted specimens. Hence alterations to the planting methodology and maintenance must occur to ensure survival and vigor as per the stipulations of **SHG's** Impact Management Plan.

Recommendations

Due to the site audit findings the following measures have been implemented to ensure planting success:

- Replacement plants are to be planted with an auger and water spike. Approximately 5L of water + fertiliser is to be delivered with the water spike during the planting process to ensure the plant is given ample nutrients and water to ensure early establishment;
- Conduct a full site audit of the planted area on a bi monthly basis to ensure reporting to the client and if appropriate alternative actions can occur to promote plant vitality and compliance;

- As / if additional plants die, implement the auger + water spike planting methodology on all new plantings; and
- Monitor rainfall gauges near the Everleigh site and increase watering when appropriate.

The following items are recommendations to be considered:

- Consider planting from die back in a more suitable location;
- Plant success will pose secondary challenges from native fauna in terms of a food source. Several kangaroo and wallaby scats have been located in the planting area, which eludes to selective grazing. This is a common problem and often accounts for slower growth rates. It is recommended that either:
    - The panting area be cordoned off to remove the risk of selective grazing during the establishment phase; or
    - Wire cages be installed over the tree guards to reduce grazing risk.

Conclusion

Evolve Environmental Solutions (Evolve) were engaged by **Mirvac** to undertake the installation and establishment of 625 *Melaleuca irbyana* at 146 Teviot Rd Greenbank. This work is in accordance with the Impact Management Plan that was prepared by **Saunders Havill Group** (SHG) on the 11/06/2018 as per the requirements of the Natural Environment Site Strategy (NESS). The scope entails for weed management in the offset area, installation of offset planting, watering, ongoing weed management and monitoring. Establishment period runs over 24 months utilising an adaptive management approach to achieve a holistic and resilient offset planting.

Site audit findings have highlighted the need for an alternative watering and planting procedure (mentioned above) to ensure the success of all new plantings. Additionally, grazing from native fauna has been highlighted as a potential risk and methods have be suggested (not yet implemented) to combat these risks. Studies of rainfall and temperature data has highlighted the changes in climatic conditions on the Everleigh site and the requirements to increase watering and soil conditioning techniques.

The next full site audit will be undertaken in July 2020.

Everleigh - Mirvac

Melaleuca irbyana Assessment Audit – Everleigh Greenbank

18/08/2020

Job Number: 15ENV

Evolve Environmental Solution Pty. Ltd.

Document Control

Document: *Melaleuca irbyana* Assessment Audit – Everleigh Greenbank

Document Issue

Issue	Date	Prepared By	Checked By
Issue A	18/08/2020	Zoe Lutz	Adam Hutchinson

Prepared by

ABN: 16 155 844 232

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Evolve Environmental Solutions (Evolve) were engaged by **Mirvac** to undertake the installation and establishment of 625 *Melaleuca irbyana* at 146 Teviot Greenbank. This works is in accordance with the Impact Management Plan that was prepared by **Saunders Havill Group** (SHG) on the 11/06/2018 as per the requirements of the Natural Environment Site Strategy (NESS). The scope entails for weed management in the offset area, installation of offset planting, watering, ongoing weed management and monitoring. Establishment period runs over 24 months utilising an adaptive management approach to achieve a holistic and resilient offset planting

Works Completion

Below is a summarised account of works that have taken place to date relating to the planting of the 625 *Melaleuca irbyana* at 146 Teviot Greenbank.

DATE	TASK
26.03.2019	Proposed offset site inspected and photo monitoring points established.
26.03.2019	Initial Weed Treatment commenced
27.03.2019	Completion of initial weed treatment
27.03.2019	Ground preparation for required planting of 625 *Melaleuca irbyana*
28.03.2019	All *Melaleuca irbyana* (625) installed with tree guards (Corflute tree guards with 1 x hardwood stake) and weed suppression mats (400mm x 400mm palm fibre, pinned with 200mm U pins). Provides both protection from fauna and weed incursion
09.04.2019	Watering of *Melaleuca irbyana*
12.04.2019	Watering of *Melaleuca irbyana*
31.05.2019	Watering of *Melaleuca irbyana*
19.06.2019	Watering of *Melaleuca irbyana*
16.08.2019	Watering of *Melaleuca irbyana* + Maintenance weeding
17.10.2019	Watering of *Melaleuca irbyana* + Maintenance weeding
01.11.2019	Watering of *Melaleuca irbyana* + installation of 80 plant due to failure
07.11.2019	Watering of *Melaleuca irbyana* (newly planted plants only)

21.11.2019	Watering of *Melaleuca irbyana* (newly planted plants only)
12.12.2019	Watering of *Melaleuca irbyana*
12.03.2020	Installation of replacement plants, planting to occur with auger and water spike
18.05.2020	Installation of replacement plants, planting to occur with auger and water spike + watering of *Melaleuca irbyana* + Site audit
12.06.2020	Site audit and water spiking of all 571 living plants
29.06.2020	Watering of all plants using water spike
29.07.2020	Site audit including monitoring photos

Table 1: Works Completion Table (*Note: Photo Monitoring taken once per quarter)

Offset Monitoring Point Locations

Offset monitoring points were established in March 2018. Since the establishment of these points, 8 monitoring events have taken place.

Please refer to monitoring point locations below.

Monitoring Point	GPS Coordinates	Site Photos
1	27°44’8” S 153°0’31” E	**North**  **East** 

		South 	**West** 

2	27°44’31” S 153°0’19” E	**North** 	**East** 

		South 	**West** 

3	27°44’22” S 153°0’24” E	**North** 	**East** 

		South 	**West** 

4	27°44’31” S 153°0’23” E	**North** 	**East** 

		South 	**West** 

Table 2: Monitoring point descriptions

There is little in terms of planting descriptions to occur at this stage due to slow growth rate and planting failures. At current, few specimens have protruded from the tree guards. As growth continues itemised descriptions of the monitoring points will occur.

Plan 1: Photo Monitoring Point

Environmental Site Audit

On Wednesday the 29th of July 2020 an ecologist from Evolve Environmental conducted a condition audit on the state of the 625 *Melaleuca irbyana* at 146 Teviot Greenbank. The audit was conducted to assess the following:

- Health and vigor of the planted specimens;
- Provide any dieback count;
- Assessment of the offset area in general for any weed incursion; and
- Conduct the routine photo monitoring.

Following the audit, a key goal is to provide rectification works requirements and recommendations of the offset to ensure compliance.

Site Audit Results

The site audit assessed the *Melaleuca irbyana* planting requirements as stipulated in the Impact Management Plan written by **SHG**. The following counts were noted during the site audit on 29.07.2020

- Of the 625 *Melaleuca irbyana* planted the audit found 66 of these plants to be dead;
- Of the 625 *Melaleuca irbyana* planted the suit 19 plants to be of questionable vigor; and
- The remaining 540 *Melaleuca irbyana* were considered to be healthy.

A loss of 12 plants (approximately 2%) is recorded as occurring in the period between site audits on 12.06.2020 and 29.07.2020.

No weed incursion was found in the *Melaleuca irbyana* planting area. There were visible signs of fauna (probably wallabies and kangaroos) grazing on the tops of the planted specimens, a group of Eastern Grey Kangaroos were seen along the access track, close to the planting site.

The audit revealed an overall improvement in planting condition with evidence of regrowth in many plants previously recorded as being in dubious health and a substantial reduction in plant loss compared to the previous period. Plants that are in sub optimal condition appear to be so due to climatic effects rather than fauna disturbance.

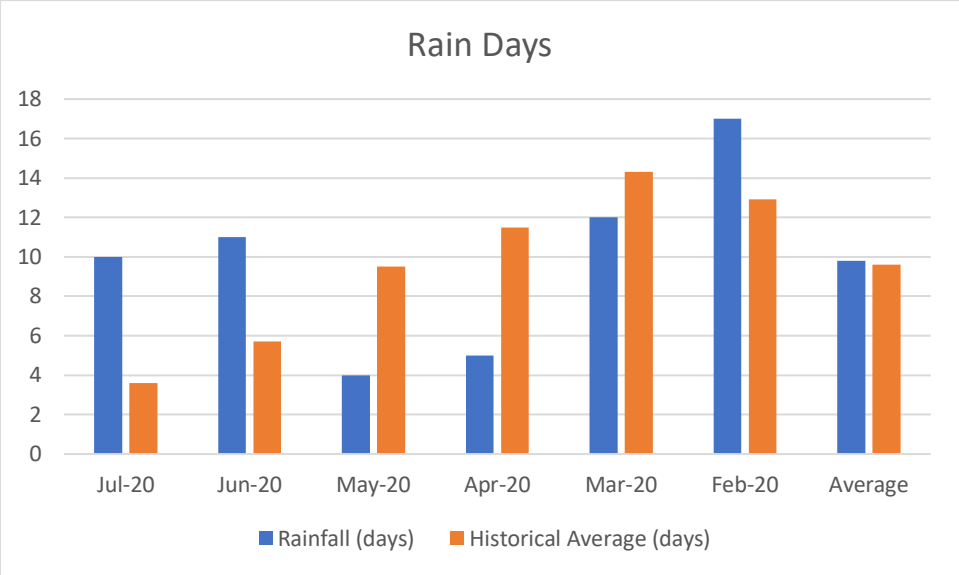
Climatic Variations (Past 6 Months)

Month	Rainfall (mm)	Historical Average (mm)
July 2020	49.4mm	25.8mm
June 2020	34.4mm	66.3mm
May 2020	2.2mm	66.8mm
April 2020	3.0mm	64.5mm
March 2020	82.2mm	120.7mm
February 2020	320.1mm	136.2mm
Average	**81.88mm**	**80.05mm**
Total	**491.3mm**	**480.30mm**

Table 3: Rainfall data Everleigh February 2020 to July 2020

Month	Rainfall (days)	Historical Average (days)
July 2020	10 days	3.6 days
June 2020	11 days	5.7 days
May 2020	4 days	9.5 days
April 2020	5 days	11.5 days
March 2020	12 days	14.3 days
February 2020	17 days	12.9 days
Average	**9.8 days**	**9.6 days**
Total	**59 days**	**57.5 days**

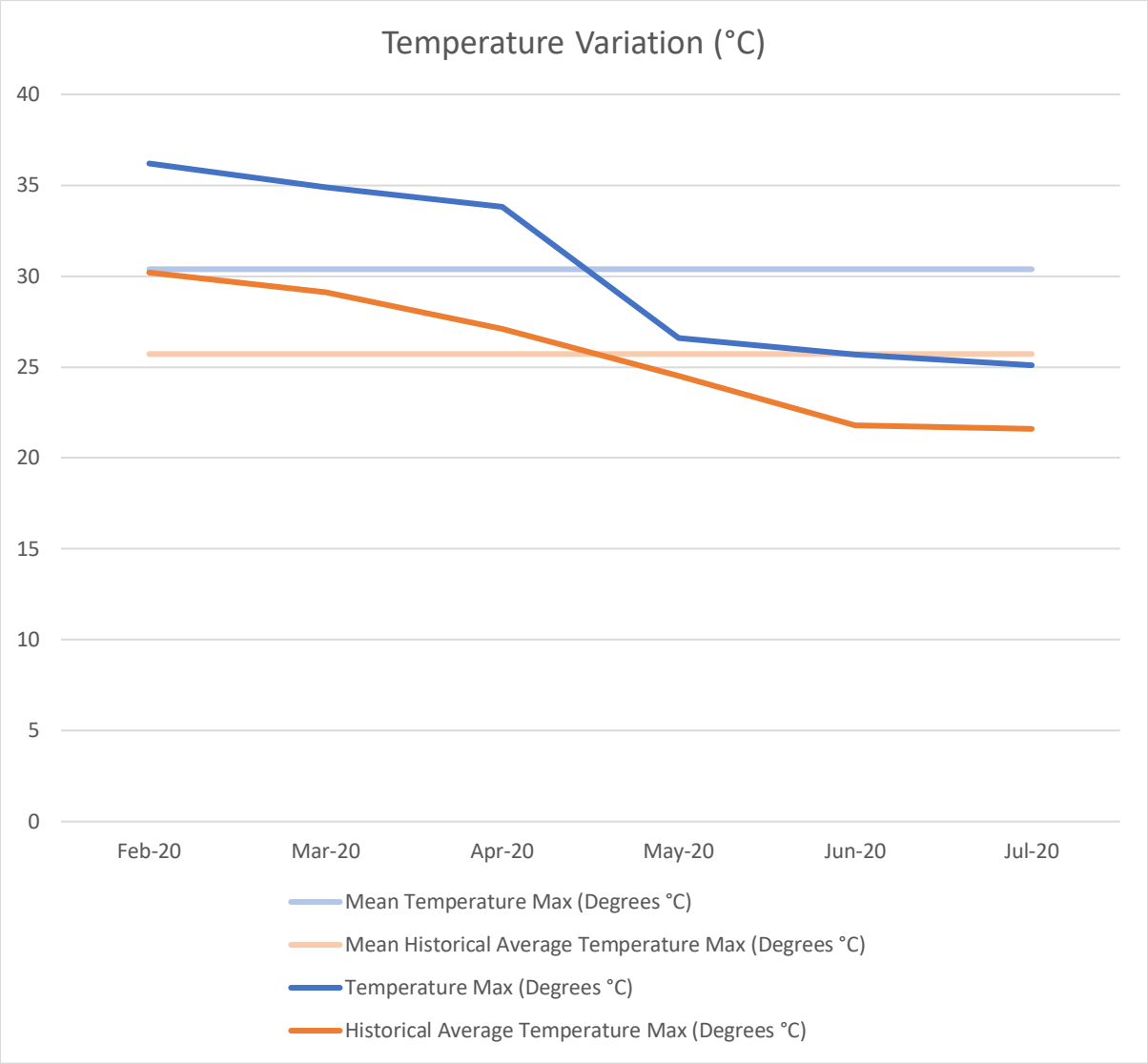
Table 4: Rain days data Everleigh July 2020 to February 2020



Graph 1: Rain days data Everleigh July 2020 to February 2020

Month	Temperature Max (Degrees °C)	Historical Average Temperature Max (Degrees °C)
July 2020	25.1°C	21.6°C
June 2020	25.7°C	21.8°C
May 2020	26.6°C	24.5°C
April 2020	33.8°C	27.1°C
March 2020	34.9°C	29.1°C
February 2020	36.2°C	30.2°C
Average	**34.14°C**	**28.4°C**

Table 5 Temperature data Everleigh July 2020 to February 2020



Graph 2: **Temperature Data Everleigh July 2020 to February 2020**

Variations in climatic factors have heavily affected optimal growing conditions. Wetter July conditions combined with an adjusted watering regime have seen positive outcomes in terms of plant vigour and survival. Temperatures continue to be higher than the historical average posing ongoing challenges in terms of the planted specimens continued survival. Continuance of the implemented alterations to planting methodology and maintenance are essential to ensuring the survival and vigor of planted specimens as per the stipulations of **SHG's** Impact Management Plan.

Recommendations

Due to the site audit findings the following measures have been implemented to ensure planting success:

- Replacement plants are to be planted with an auger and water spike. Approximately 5L of water + fertiliser is to be delivered with the water spike during the planting process to ensure the plant is given ample nutrients and water to ensure early establishment;
- Conduct a full site audit of the planted area on a bi monthly basis to ensure reporting to the client and if appropriate alternative actions can occur to promote plant vitality and compliance;
- As / if additional plants die, implement the auger + water spike planting methodology on all new plantings; and
- Monitor rainfall gauges near the Everleigh site and increase watering when appropriate.

Plant condition has had a considerable improvement over the last two months. Increase in success can be attributed to the new fertilizing and watering regime. Following the actioned maintenance should see months of no replacement planting being required. It is at this stage that once the plants are considered self-sustaining that off maintenance will be achieved.

The following items are recommendations to be considered:

- Plant success will pose secondary challenges from native fauna in terms of a food source. Several kangaroo and wallaby scats have been located in the planting area, which eludes to selective grazing. This is a common problem and often accounts for slower growth rates. It is recommended that either:
    - The panting area be cordoned off to remove the risk of selective grazing during the establishment phase; or
    - Wire cages be installed over the tree guards to reduce grazing risk.

Conclusion

Evolve Environmental Solutions (Evolve) were engaged by **Mirvac** to undertake the installation and establishment of 625 *Melaleuca irbyana* at 146 Teviot Greenbank. This works

is in accordance with the Impact Management Plan that was prepared by **Saunders Havill Group** (SHG) on the 11/06/2018 as per the requirements of the Natural Environment Site Strategy (NESS). The scope entails for weed management in the offset area, installation of offset planting, watering, ongoing weed management and monitoring. Establishment period runs over 24 months utilising an adaptive management approach to achieve a holistic and resilient offset planting.

Site audit findings have highlighted the need for an alternative watering and planting procedure (mentioned above) to ensure the success of all new plantings. Additionally, grazing from native fauna has been highlighted as a potential risk and methods have be suggested (not yet implemented) to combat these risks. Studies of rainfall and temperature data has highlighted the changes in climatic conditions on the Everleigh site and the requirements to increase watering and soil conditioning techniques.

The next full site audit will be undertaken in September 2020.

Everleigh - Mirvac

Melaleuca irbyana Assessment Audit – Everleigh Greenbank

03/12/2020

Job Number: 15ENV

Evolve Environmental Solution Pty. Ltd.

Document Control

Document: *Melaleuca irbyana* Assessment Audit – Everleigh Greenbank

Document Issue

Issue	Date	Prepared By	Checked By
Issue A	03/12/2020	Zoe Lutz	Adam Hutchinson

Prepared by

ABN: 16 155 844 232

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Works Completion

Below is a summarised account of works that have taken place to date relating to the planting of the 625 *Melaleuca irbyana* at 146 Teviot Greenbank.

DATE	TASK
26.03.2019	Proposed offset site inspected and photo monitoring points established.
26.03.2019	Initial Weed Treatment commenced
27.03.2019	Completion of initial weed treatment
27.03.2019	Ground preparation for required planting of 625 *Melaleuca irbyana*
28.03.2019	All *Melaleuca irbyana* (625) installed with tree guards (Corflute tree guards with 1 x hardwood stake) and weed suppression mats (400mm x 400mm palm fibre, pinned with 200mm U pins). Provides both protection from fauna and weed incursion
09.04.2019	Watering of *Melaleuca irbyana*
12.04.2019	Watering of *Melaleuca irbyana*
31.05.2019	Watering of *Melaleuca irbyana*
19.06.2019	Watering of *Melaleuca irbyana*
16.08.2019	Watering of *Melaleuca irbyana* + Maintenance weeding
17.10.2019	Watering of *Melaleuca irbyana* + Maintenance weeding
01.11.2019	Watering of *Melaleuca irbyana* + installation of 80 plant due to failure
07.11.2019	Watering of *Melaleuca irbyana* (newly planted plants only)

21.11.2019	Watering of *Melaleuca irbyana* (newly planted plants only)
12.12.2019	Watering of *Melaleuca irbyana*
12.03.2020	Installation of replacement plants, planting to occur with auger and water spike
18.05.2020	Installation of replacement plants, planting to occur with auger and water spike + watering of *Melaleuca irbyana* + Site audit
12.06.2020	Site audit and water spiking of all 571 living plants
29.06.2020	Watering of all plants using water spike
29.07.2020	Site audit including monitoring photos
03.08.2020	Watering of all plants using water spike
02.11.2020	Installation of replacement plants, utilizing auger and water spike watering, all installed plants fitted with tree guards (Corflute tree guards with 1 x hardwood stake), existing *Melaleuca irbyana* deep watered with using water spike. Audit of existing plants conducted.
20.11.2020	Watering of all plants using water spike
03.12.2020	Site audit conducted, including monitoring photos. Watering of all specimens.

Table 1: Works Completion Table (*Note: Photo Monitoring taken once per quarter)

Offset Monitoring Point Locations

Offset monitoring points were established in March 2018. Since the establishment of these points, 9 monitoring events have taken place. Please refer to monitoring point locations below.

Monitoring Point	Site Photos	
1 27°44’8” S 153°0’31” E	North 	East 
	South 	West 

2 **27°44’31” S** **153°0’19” E**	**North** 	**East** 
	South 	**West** 

3 **27°44’22” S** **153°0’24” E**	**North** 	**East** 
	South 	**West** 

4 **27°44’31” S** **153°0’23” E**	**North** 	**East** 
	South 	**West** 

Table 2: Monitoring point descriptions

There is little in terms of planting descriptions to occur at this stage due to slow growth rate and planting failures. At current, few specimens have protruded from the tree guards. As growth continues itemized descriptions of the monitoring points will occur.

Figure 1; Established *M. irbyana* protruding from tree-guard

Plan 1: Photo Monitoring Point

Environmental Site Audit

On Thursday 3rd December 2020 an ecologist from Evolve Environmental conducted a condition audit on the state of the 625 *Melaleuca irbyana* at 146 Teviot Greenbank. The audit was conducted to assess the following:

- Health and vigor of the planted specimens;
- Provide any dieback count;
- Assessment of the offset area in general for any weed incursion; and
- Conduct the routine photo monitoring.

Following the audit, a key goal is to provide rectification works requirements and recommendations of the offset to ensure compliance.

Site Audit Results

The site audit assessed the *Melaleuca irbyana* planting requirements as stipulated in the Impact Management Plan written by **SHG**. The following counts were noted during the site audit on 03.12.2020

- Of the 625 *Melaleuca irbyana* planted the audit found 191 of these plants to be dead;
- The remaining 434 *Melaleuca irbyana* were considered to be healthy.

A loss of 101 plants is recorded as occurring in the period between plant number audits on 02.10.2020 and 03.12.2020.

No weed incursion was found in the *Melaleuca irbyana* planting area. There were visible signs of fauna (probably wallabies and kangaroos) grazing on the tops of the planted specimens.

The audit revealed plants health and vigour being negatively impacted by the on-set of a seasonally warmer climate, the majority of plant losses were confined to replacement rather than established. Plants that are in sub optimal condition appear to be so due to climatic effects rather than fauna disturbance, signs of heat stress were noted, particularly on the top leaves of plants where they protruded from tree guards.

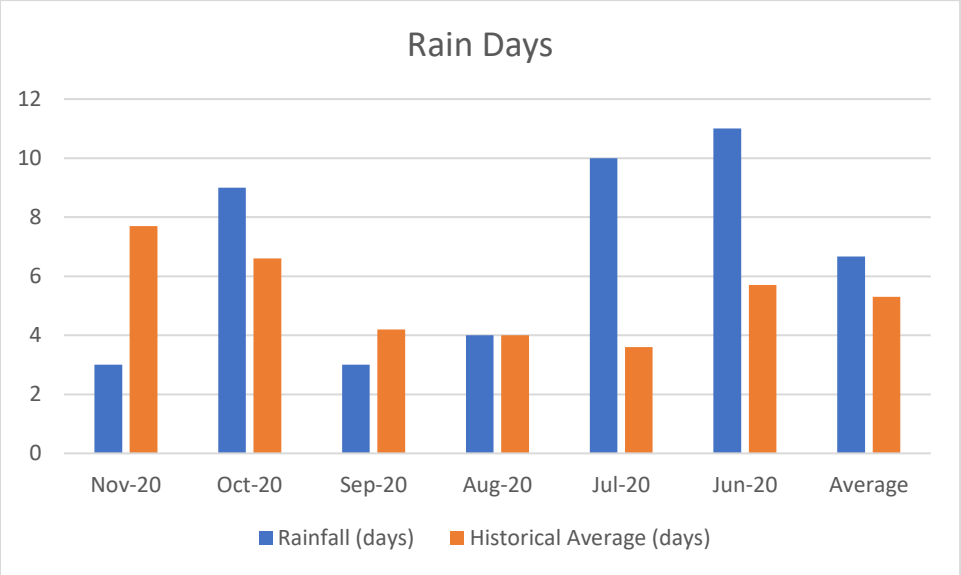
Climatic Variations (Past 6 Months)

Month	Rainfall (mm)	Historical Average (mm)
November 2020	28.8	97.6
October 2020	71.8	78.4
September 2020	11.4	34.6
August 2020	22.4	36.2
July 2020	49.4	25.8
June 2020	34.4	66.3
Average	**36.367**	**56.48**
Total	**218.2mm**	**338.90mm**

Table 3: Rainfall data Everleigh June 2020 to November 2020

Month	Rainfall (days)	Historical Average (days)
November 2020	3 days	7.7 days
October 2020	9 days	6.6 days
September 2020	3 days	4.2 days
August 2020	4 days	4.0 days
July 2020	10 days	3.6 days
June 2020	11 days	5.7 days
Average	**6.7 days**	**5.3 days**
Total	**40 days**	**31.8 days**

Table 4: Rain days data Everleigh June 2020 to November 2020

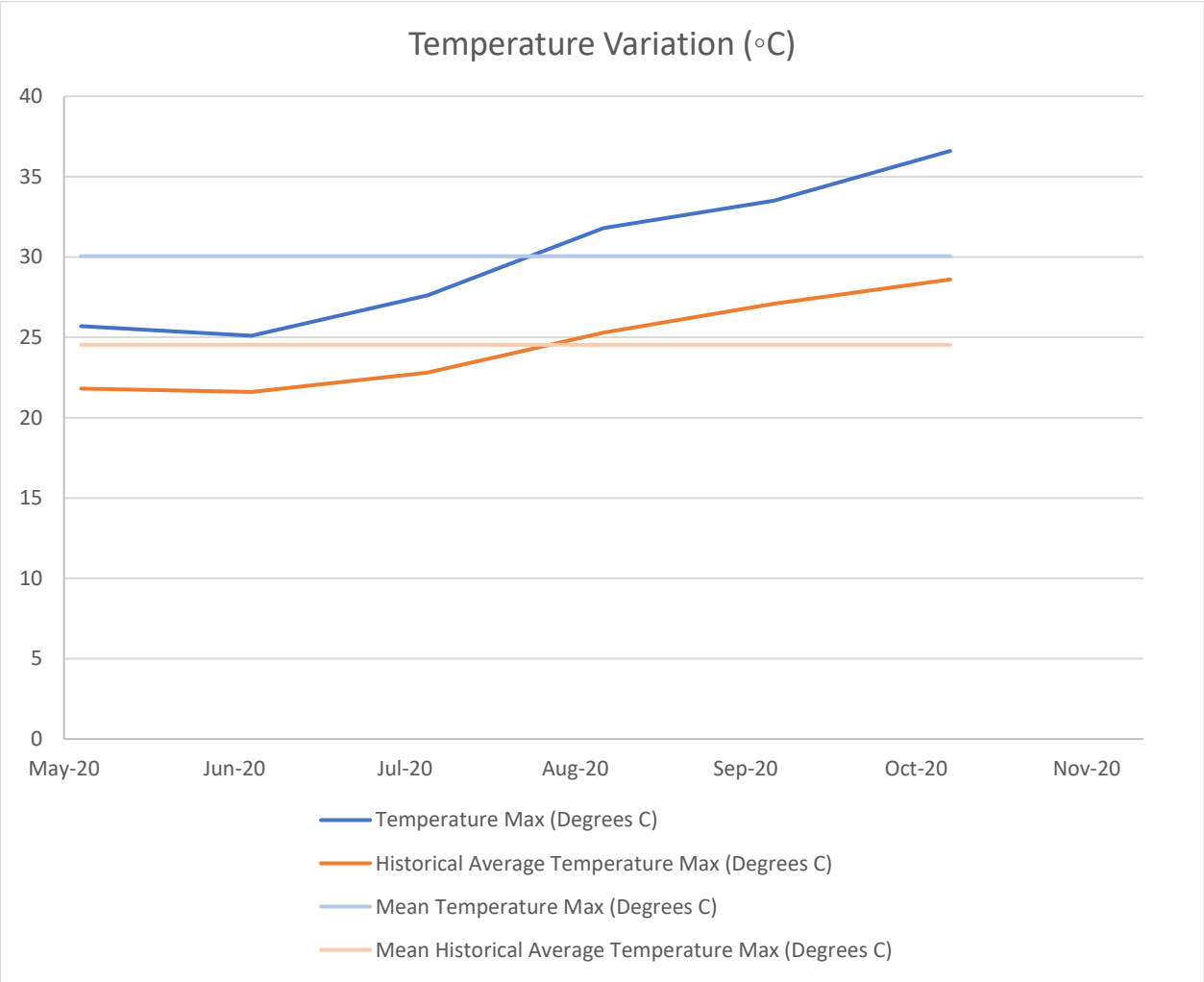


Graph 1: Rain days data Everleigh June 2020 to November 2020

While the number of rainfall days has been higher than the historical average over this period both the average monthly and total rainfall has been lower than the corresponding historical data.

Month	Temperature Max (Degrees °C)	Historical Average Temperature Max (Degrees °C)
November 2020	36.6 °C	28.6°C
October 2020	33.5°C	27.1°C
September 2020	31.8°C	25.3°C
August 2020	27.6°C	22.8°C
July 2020	25.1°C	21.6°C
June 2020	25.7°C	21.8°C
Average	**30.05°C**	**24.53°C**

Table 5 Temperature data Everleigh June 2020 to November 2020



Graph 2: **Temperature Data Everleigh June 2020 to November 2020**

Variations in climatic factors have heavily affected optimal growing conditions. Temperatures continue to be higher than the historical average posing ongoing challenges in terms of the planted specimens continued survival. Continuance of the implemented alterations to planting methodology and maintenance are essential to ensuring the survival and vigor of planted specimens as per the stipulations of **SHG's** Impact Management Plan.

Recommendations

Due to the site audit findings the following measures have been implemented to ensure planting success:

- Replacement plants are to be planted with an auger and water spike. Approximately 5L of water + fertilizer is to be delivered with the water spike during the planting process to ensure the plant is given ample nutrients and water to ensure early establishment;
- Conduct a full site audit of the planted area on a bi monthly basis to ensure reporting to the client and if appropriate alternative actions can occur to promote plant vitality and compliance;
- As / if additional plants die, implement the auger + water spike planting methodology on all new plantings; and
- Monitor rainfall gauges near the Everleigh site and increase watering when appropriate.

Plant condition has fluctuated in the last two months, the key driver of plant health is climatic variation, maintenance schedules will be adjusted to compensate for changes in rainfall and temperature. Following the actioned maintenance should see months of no replacement planting being required. It is at this stage that once the plants are considered self-sustaining that off maintenance will be achieved.

The following items are recommendations to be considered:

- Plant success will pose secondary challenges from native fauna in terms of a food source. Several kangaroo and wallaby scats have been located in the planting area, which alludes to selective grazing. This is a common problem and often accounts for slower growth rates. It is recommended that either:

- The planting area be cordoned off to remove the risk of selective grazing during the establishment phase; or
- Wire cages be installed over the tree guards to reduce grazing risk.

Conclusion

Evolve Environmental Solutions (Evolve) were engaged by **Mirvac** to undertake the installation and establishment of 625 *Melaleuca irbyana* at 146 Teviot Greenbank. This works is in accordance with the Impact Management Plan that was prepared by **Saunders Havill Group** (SHG) on the 11/06/2018 as per the requirements of the Natural Environment Site Strategy (NESS). The scope entails for weed management in the offset area, installation of offset planting, watering, ongoing weed management and monitoring. Establishment period runs over 24 months utilizing an adaptive management approach to achieve a holistic and resilient offset planting.

Site audit findings have highlighted the need for an alternative watering and planting procedure (mentioned above) to ensure the success of all new plantings. Additionally, grazing from native fauna has been highlighted as a potential risk and methods have be suggested (not yet implemented) to combat these risks. Studies of rainfall and temperature data has highlighted the changes in climatic conditions on the Everleigh site and the requirements to increase watering and soil conditioning techniques.

The next full site audit will be undertaken in February 2021.