

21 December 2015

**Our Ref: N15042**

The Secretary

NSW Department of Planning and Environment

GPO Box 39

Sydney NSW 2001

**Att: Natasha Harras**

Dear Natasha,

RE: THE DAN LAND, 290 AND 302 MINMI ROAD FLETCHER - SECTION 75W  
APPLICATION TO MODIFY CONCEPT PLAN 06\_0031

I refer to the above Section 75W application to modify Concept Plan 06\_0031, your e-mail of 28 September 2015 and Newcastle City Council's letter of 22 September 2015 raising various matters. Thank you for the opportunity to respond. This submission has been prepared to respond to the matters raised, and should be read in conjunction with our letter of 25 August 2015.

1. DESCRIPTION OF PROPOSED CHANGES TO PROJECT APPROVAL

As part of the current application to modify the Concept Plan, we now also seek to:

- Modify the Project Approval for the site. In particular we seek to modify conditions A1 and A2 in Schedule 4 of the Project Approval dated 29 September 2006;
- Modify the Statement of Commitments dated 30 May 2007;
- Gain approval from Director-General for Stage 10 Road Layout and Design as per the requirements of condition B10 in Schedule 4.

## Conditions of Project Approval to be modified

Conditions A1 and A2 in Schedule 4 are proposed to be modified as follows (proposed modifications in bold):

### A1. Development Description

*Project approval is granted only to the carrying out of development described in detail below:*

1. A **437** lot community title subdivision and construction of associated works including streets, stormwater management works, utility services and bulk earthworks;
2. Public domain improvements, including new parks as part of a network of landscaped public open spaces, and street trees and
3. The use of the land for housing and related purposes and environmental conservation.

### A2. Development in Accordance with Plans and Documentation

**The development shall be in accordance with the following plans and documentation:**

- a) Dan Land Preferred Project Report dated August 2006 and **modified** Statement of Commitments dated 30 May 2007 prepared by Planning Workshop Australia;
- b) Dan Land Plan of Proposed Lots dated 19 September 2006 prepared by Monteath and Powys (ref no 03/020) **as amended by drawing MP-001 dated 26.10.2015 titled Proposed Subdivision Outlook Stage 10 prepared by ADW Johnson (refer Attachment 1);**
- c) Dan Land Figure 18: Proposed Staging of Development dated 24 May 2007 prepared by Johnson Partners (ref no. 50030) **as amended by drawing MP-001 dated 26.10.2015 titled Proposed Subdivision Outlook Stage 10 prepared by ADW Johnson;**
- d) Dan Land Landscape Masterplan dated 5 June 2007 prepared by Moir Landscape Architecture (project no 0276, dwg no LMP01/REV 11) as amended by **Landscape Masterplan for Stage 10 dated November 2014 prepared by Terras Landscape Architects (refer Attachment 2);**
- e) Dan Land Vegetation Management Plan Report dated 20 July 2006 prepared by Moir Landscape Architecture (Project No. 0276 - Rev1), incorporating Vegetation Management Plan dated 25 May 2007, project no 0276, dwg no VMP01/REV G) as amended by **Vegetation Management Plan for Stage 10 prepared by Terras Landscape Architects dated 14 December 2012 (refer Attachment 4);**
- f) Dan land Preferred Project Report Appendix 6 - Community Management Statement

## Statement of Commitments to be modified

The Statement of Commitments dated 30 May 2007 to be modified as follows:

- A1.1 *The proposed development will be carried out strictly in accordance with the details set out on the approved subdivision plans (including community and precinct plans) prepared by Monteath and Powys, dated 2 March 2006, ref 03/020, **as amended by drawing MP-001***

**dated 26.10.2015 titled Proposed Subdivision Outlook Stage 10 prepared by ADW Johnson, except as otherwise provided for by this Statement of Commitments;**

A 3.1 Amending the table to reflect a local street width of **13.5m and deleting reference to footway widths for local streets.**

#### **Condition B10 of Schedule 4**

Condition B10 of Schedule 4 relates directly to Stage 10 and was inserted in a modification to the Project Approval dated 24 July 2007. Condition B10 is set out as follows:

##### *B10. Stage 10 Road Layout and Design*

*A Construction Certificate for Stage 10 is not to be issued unless an amended Plan of Proposed Lots, Staging Plan, Landscape Master Plan and Vegetation Management Plan incorporating amendments to the road layout and design in Stage 10 has been submitted to the satisfaction of the Director General.*

*The amendments are to comprise the following:*

*(a) In order to ensure consistency with the approved Concept Plan, provision is to be made for an appropriate road and pathway connection to the residential subdivision approved on Lot 2 in DP 1009255 by Council under DA 97/0555, provided the Director-General is satisfied that a corresponding road connection within this subdivision is able to be achieved to the common boundary with the Dan Land.*

*(b) The eastern most intersection with Minmi Road is to be deleted, with the eastern perimeter road within Stage 10 to be redesigned to terminate with a cul-de-sac not closer than 5m from the alignment of Minmi Road. A pedestrian pathway is to be constructed linking the cul-de-sac with the proposed Minmi Road footpath.*

*(c) The proposed cul-de-sac opposite Highland Way is to be deleted and the western perimeter road within Stage 10 to be extended to an intersection with Minmi Road at Highland Way.*

An amended Plan of Proposed Lots for Stage 10 is included at **Attachment 1**. Stage 10 represents the final stage in the development of the overall estate. A Landscape Master Plan for Stage 10 is included at **Attachment 2**. A Vegetation Management Plan is included at **Attachment 3**.

As set out in drawing MP001 at **Attachment 1**, the relocation of the easternmost vehicular access point to Minmi Road to be opposite Highland Way is proposed to comply with the requirements of Condition B10(b) and (c) of Modification approval dated 24 July 2007. The implications of this change are discussed in the Traffic Impact Assessment prepared by GHD in support of the proposed modifications at **Attachment 5**.

With respect to Condition B10(a), the perimeter road (Road No.1) has been designed as low as possible whilst still permitting lot access to allow for future connection from the development to the east if it is deemed feasible. It is proposed to dedicate the area from the road pavement to the boundary of the site as road reserve to provide legal access for a future road connection. It should be noted however that the topography in the area of this proposed road connection is problematic due to the location of an incised gully between the two developments.

## 2. DESCRIPTION OF PROPOSED CHANGES TO CONCEPT PLAN APPROVAL

As per our letter of 25 August 2015, the Section 75W application also seeks to modify Condition A2 *Development in Accordance with Plans and Documentation* in Schedule 2 of the approved modified Concept Plan in the following manner:

- a. Replace existing Condition A2 b) with the following:

Dan Land Concept Plan dated 29 May 2007 prepared by Planning Workshop Australia **as amended by drawing MP-001 dated 26.10.2015 titled Proposed Subdivision Outlook Stage 10 prepared by ADW Johnson;**

- b. Replace existing Condition A2 c) with the following:

Dan Land Proposed Lot Layout dated 28 September 2006 prepared by Planning Workshop Australia **as amended by drawing MP-001 dated 26.10.2015 titled Proposed Subdivision Outlook Stage 10 prepared by ADW Johnson;**

## 3. ASSESSMENT OF THE IMPACTS

The impacts associated with the proposed changes are discussed in detail below.

### Lot Size

The approved lot layout drawing dated 28 September 2006 prepared by Planning Workshop Australia shows 337 residential lots, including 30 small lots and corner lots and 8 super lots in Stage 10 designated for townhouses (approximately 250m<sup>2</sup>) and courtyard housing (approximately 420m<sup>2</sup>). **Table 1** below shows the dwellings the super lots would have yielded.

**Table 1 - Stage 10 Possible Super Lot Yield**

Type	Average lot size (m <sup>2</sup> )	gross area (m <sup>2</sup> )	net area (take out 20% for roads) (m <sup>2</sup> )	Dwellings
<b>Townhouses</b>	250	5916.4	4733.1	19
<b>Courtyard housing</b>	420	43178.6	34542.9	82
<b>Small/corner lots</b>	450			30
<b>TOTAL</b>				131

By way of comparison, drawing MP 001 at **Attachment 1** shows 136 residential lots and 2 open space lots across the whole of Stage 10, resulting in **437** lots across the whole estate when completed. 92 of the lots shown in drawing MP001 have an area less than 420m<sup>2</sup>. Importantly, the proposed layout in drawing MP 001 includes a range of lot sizes which was envisaged as per the approved drawing dated 28 September 2006. An overlay of the existing and proposed subdivision layout is included at **Attachment 4**.



The overall development footprint as set out in Drawing MP-001 has been reduced slightly to achieve a more efficient layout, responsive to the local topography, when compared with that shown in the approved lot layout dated 28 September 2006, prepared by Planning Workshop Australia. This change is also designed to reduce the proximity of residential lots to steep gully areas. In addition, each of the component areas as set out in the Lot Layout drawing dated 28 September 2006 now include the following:

- Townhouses - average lot size of 321m<sup>2</sup> compared to 250m<sup>2</sup> approved. This is due in part to the eastern-most lots needing to be wider to accommodate appropriate asset protection zones as well as the nature of the topography;
- Courtyard housing - average lot size of 420m<sup>2</sup> as per the original approval;
- Small lot/corner lot housing - average lot size of 390m<sup>2</sup> compared to 450m<sup>2</sup> approved.

Overall, the average lot sizes proposed in drawing MP-001 are not dissimilar to the lot sizes set out in the approved Lot Layout drawing dated 28 September 2006.

### **Traffic**

A Traffic Impact Assessment (TIA) prepared by GHD in support of the proposed modification is included at **Attachment 6**. The key findings of the Traffic Impact Assessment are:

- The existing intersection of Minmi Road and Highway Way currently operates with spare capacity when including expected back ground traffic growth in 2026;
- When including background traffic growth and the Proposed Stage 10 traffic generation for 2026, the proposed new roundabout would operate with spare capacity at LoS A in both AM and PM peaks;
- The proposed roundabout provides a traffic calming device on Minmi Road by providing a slowing point for vehicles travelling east and west on Minmi Road;
- Adequate sight distances for driveways on Minmi Road can be obtained.

The TIA concludes that the proposed modifications to Stage 10 of the Outlook Estate would not adversely impact on the operation and amenity of Minmi Road.

### **Community Facilities**

In terms of community facilities, a community park with playground equipment and BBQ area is proposed in the community land north of Stage 6 to serve the whole estate. The proposed layout plan also incorporates two open space lots (Lots 137 and 138). There will be no additional impact on community facilities as a result of the amended lot layout.

## **4. NEWCASTLE CITY COUNCIL LETTER DATED 22 SEPTEMBER 2015 - MATTERS RAISED**

### **Total Lot Yield and Lot Sizes**

Total lot yield and lot sizes have been addressed in detail under 3 above.

## **Newcastle Local Environmental Plan 2012 and Supporting Documents**

The site is currently zoned R2 Low Density Residential pursuant to Newcastle Local Environmental Plan (LEP) 2012 and has a minimum lot size of 450m<sup>2</sup>. As requested by Council, **Attachment 6** includes a plan which overlays the proposed subdivision layout onto the relevant zoning map. As discussed above, the average lot sizes proposed in drawing MP-001 are not dissimilar to the lot sizes set out in the approved Lot Layout drawing dated 28 September 2006 prepared by Planning Workshop Australia. With respect to the LEP minimum lot size, it is worth noting that Schedule 6A, clause 3B(f) of the Act sets out that the provisions of an environmental planning instrument or any development control plan do not have effect to the extent to which they are inconsistent with the terms of the approved Concept Plan.

## **Newcastle Local Planning Strategy**

The amended subdivision is consistent with the vision and objectives for Fletcher as set out in Newcastle's Local Planning Strategy. Fletcher is identified in the strategy as a residential suburb. The Concept Plan approval makes reference to the Stage 10 area to be developed for future residential use. This use will not change as a result of the modified layout for Stage 10.

## **Retention of Trees**

An amended Landscape Master Plan (**Attachment 3**) and Vegetation Management Plan (**Attachment 4**) for Stage 10 are provided in accordance with the requirements of Condition B2 of Schedule 2 of the amended Concept Plan Approval.

## **External Road and Pedestrian Connectivity**

This matter has been addressed above. With respect to Condition B10(a), the perimeter road (Road No.1) has been designed as low as possible whilst still permitting lot access to allow for future connection from the development to the east if it is deemed feasible. It is proposed to dedicate the area from the road pavement to the boundary of the site as road reserve to provide legal access for a future road connection. It should be noted however that the topography in the area of this proposed road connection is problematic due to the location of an incised gully between the two developments.

## **Traffic and Parking Impacts and Safety**

A Traffic Impact Assessment prepared by GHD is provided at **Attachment 5**. The conclusions of the TIA are set out under 3 above.

With respect to road widths, Commitment A3.1 of the Statement of Commitments which formed part of the original concept approval in 2006 sets a requirement for local streets to have a width of 15.5m, including 4.5m footway then 7.5m carriageway then 3.5m footway. The Stage 10 proposed layout adopts a local street width of 13.5m, which is the same as the street widths under the current approval for Stage 10. The Stage 10 development consists of local roads within the estate and there is no connection through road to other developments. The reduced carriageway widths provide a low speed traffic environment servicing local access within the estate. As the estate consists solely of residential dwellings, it is envisaged that on-street manoeuvring and parking opportunities will be sufficient for the estate. As discussed above, this application proposes to amend the table in commitment A3.1 to reflect a local street width of 13.5m.

With respect to impacts on kerbside parking and cycling, the TIA notes that the environment of Minmi Road is changing with residential developments taking place and that direct access from

Stage 10 is consistent with other existing development along Minmi Road. The TIA does recommend however that the existing speed limit change location on Minmi Road west of Highland Way be reviewed and moved further west to provide a lower speed environment on Minmi Road through the residential areas. The proposed roundabout will also provide a traffic calming device on Minmi Road by providing a slowing point for vehicles travelling east and west on Minmi Road.

### **Lot Layout**

An amended Plan of Proposed Lots for Stage 10 addressing Council's comments is included at **Attachment 1**.

- Lots 15 and 110 have now been provided frontage to a public road.
- Lots 11 and 34 are proposed to have access from Road No 1 whilst lots 10,33, 131 and 132 can access from the proposed parking lane on Minmi Road.
- Vehicle access to lots 128, 129, 130, 110 and 111 has been amended.
- Access to lots 69 and 70 has been amended.
- The layout of Lots 50,51, 52 and 53 has been amended to ensure that a shared battle axe does not support more than two lots
- Previous Lot 53 (now Lot 54) incorporates a splayed boundary to ensure footway width is maintained;

I trust that the above addresses the matters raised. Should you have any further queries or require any further information in relation to the above, please contact me.

Yours sincerely,

A handwritten signature in black ink, appearing to read 'A. Biller'.

ANDREW BILLER

ASSOCIATE

CITY PLAN STRATEGY AND DEVELOPMENT PTY LIMITED

**ATTACHMENTS:**

**Attachment 1** - Drawing MP-001 dated 18.8.2015 titled Proposed Subdivision Outlook Stage 10 prepared by ADW Johnson

**Attachment 2** - Landscape Masterplan for Stage 10

**Attachment 3** - Vegetation Management Plan for Stage 10

**Attachment 4** - Overlay of the existing and proposed subdivision layout

**Attachment 5** - Traffic Impact Assessment

**Attachment 6-** Overlay of the proposed subdivision layout onto the relevant zoning map

## **Attachment 1**

Drawing MP-001 dated 18.8.2015 titled Proposed Subdivision  
Outlook Stage 10 prepared by ADW Johnson





## LEGEND

- PROPOSED LOT BDY
- PROPOSED RETAINING WALL
- PROPOSED LOTS
- PROPOSED OPEN SPACE
- APZ
- RIPARIAN CORRIDOR
- FUEL MANAGED ZONE
- PROPOSED FIRETRAIL

- NOTES:
- All dimensions and areas are approximate only and subject to final survey.
  - Stage 10 may be developed in sub stages of a minimum 30 lots per stage.
  - Lot numbers identify the number of lots however these may not be the final lot numbers

## PROPOSED SUBDIVISION OUTLOOK STAGE 10

location: OUTLOOK ESTATE  
MINIMI ROAD FLETCHER

council: NEWCASTLE

dwg ref: MP-001

pm: ND

client:  
NORTHWEST  
RESIDENTIAL



central coast office ph: (02) 4305 4300  
hunter office ph: (02) 4978 5100

www.adwjohanson.com.au

ver.	date	comment	drawn	level information	scale (A3 original size)
E	26.10.15	LOTS AMENDED	JD	DATUM: N/A CONTOUR INTERVAL: 0.5m	0 30 60 75m SCALE: 1:1500 (FULL)

working beyond expectations

## **Attachment 2**

### **Landscape Masterplan for Stage 10**



# development application

**stage 10 outlook**



**site details:**  
MINMI ROAD, FLETCHER  
**client:**  
NORTHWEST RESIDENTIAL  
**date:**  
DECEMBER 2015  
**job number:**  
9496.5  
**drawn:**  
SGK  
**revision:**  
B

# landscape design report

## outlook stage 10

# 01

december 2015

### Site General Description

The following landscape design report has been prepared in accordance with the requirements of City of Newcastle's Development Control Plan 2012.

Stage 10 of the Outlook residential subdivision is located within the eastern portion of the subdivision footprint and fronts Minmi Road, Fletcher. Stage 10 consists of 137 residential lots and a further 2 lots proposed as open space/parkland areas.

### Soil Type

Site soil falls into the Berefield Soil Landscape. This is characterised by undulating low hills on permian sediments. The dominant A horizon soil type consist of a friable brownish black loam, although It is anticipated that soils may have been disturbed in some areas of the site due to grazing and other agricultural activities. Proposed landscape works will require soil testing with possible amelioration prior to incorporation into landscape works. Should the soil quantities or quality not be high enough for landscape use then imported soil will be required.

### Vegetation

Most of the site consists of remnant or re-growth trees in pasture, however pockets of the original site vegetation remain within the 2 gully lines that run through Stage 10, although the understorey for the most part consists of Lantana.

### Landscape Character - Visual Amenity

The dominant landscape character of the site is rural, particularly looking north toward Hexham Swamp, however residential housing is located across the southern side of Minmi Road and parts of the site look onto previously built stages of The Outlook subdivision.

The two vegetated gully lines and adjoining fuel managed vegetation zones will provide visual relief between areas of stage 10 and previous stages of The Outlook.

The proposed park areas will also provide some visual relief, particularly from Minmi Road as the existing trees are proposed for retention. Supplementary tree planting within the western park will further break up views to the existing subdivision stages.

### Proposed Landscape Works and Objectives

#### Streetscape

Medium sized street trees are proposed throughout the subdivision. Lots with a 10m frontage will not support 1 tree per lot with the required 3m driveway offset, however with the management of driveway locations 1 tree every second lot can be achieved. Refer to 01/03 on sheet 3 for the proposed layout.

#### Batters

A number of batters will be created due to roadworks. These are to be mass planted with native grasses, groundcovers and trees. Refer to sheet 02 for batter locations.

#### Parkland

2 parkland areas are proposed within Stage 10, both are located along the Minmi Road frontage. Existing healthy trees are to be retained within the parks and supplementary planting to be undertaken, particularly within the western park to provide shade and a visual buffer. Child play equipment is also proposed for the parks.

#### Fuel Managed Zone

These zones are located between proposed lots and existing gully vegetation. Existing native trees are to be retained where possible and weeds are to be removed. The understorey is to consist of slashed pasture. Some supplementary planting of native grasses may be required within steep areas where slashing cannot be undertaken.

#### Riparian Zone

The riparian zone is located within the 2 gully lines. Lantana has formed an impenetrable barrier around the perimeter of the gullies. Lantana and other weeds are to be removed and supplementary planting is to be undertaken to regenerate the original vegetation communities. This will require significant ongoing maintenance. Refer to Vegetation Management Plan prepared by Terras Landscape Architects (December 2015).

### References

Environmental Appraisal and Planning Pty Ltd, 2003, Flora Fauna and Ecological Assessments for Proposed Rezoning of Lots 2 and 11 Minmi Road, Fletcher

Matthei, L.E, 1995, Soil Landscapes of Newcastle 1:100 000 Sheet Report, Department of Land & Water Conservation, Sydney.

Moir Landscape Architecture, 2006. Vegetation Management Plan -F

Newcastle City Council, 2012, Development Control Plan 2012,

#### site details:

MINMI ROAD, FLETCHER

#### client:

NORTHWEST RESIDENTIAL

#### date:

DECEMBER 2015

#### job number:

9496.5

#### drawn:

SGK

#### scale:

NTS @ A3

#### rev. number:

B



# landscape masterplan

## outlook stage 10

02

december 2014



### legend

- EXISTING TREE RETAINED
- EXISTING TREE REMOVED
- PROPOSED STREET TREE (Acmena smithii)
- PROPOSED STREET TREE (Hymenosporum flavum)
- ASSETT PROTECTION ZONE
- FUEL MANAGED ZONE
- RIPARIAN ZONE
- PARKLAND
- RESIDENTIAL LOTS
- LANDSCAPED BATTERS

### site details:

MINMI ROAD, FLETCHER

client:

NORTHWEST RESIDENTIAL

date:

DECEMBER 2014

job number:

9496.5

scale:

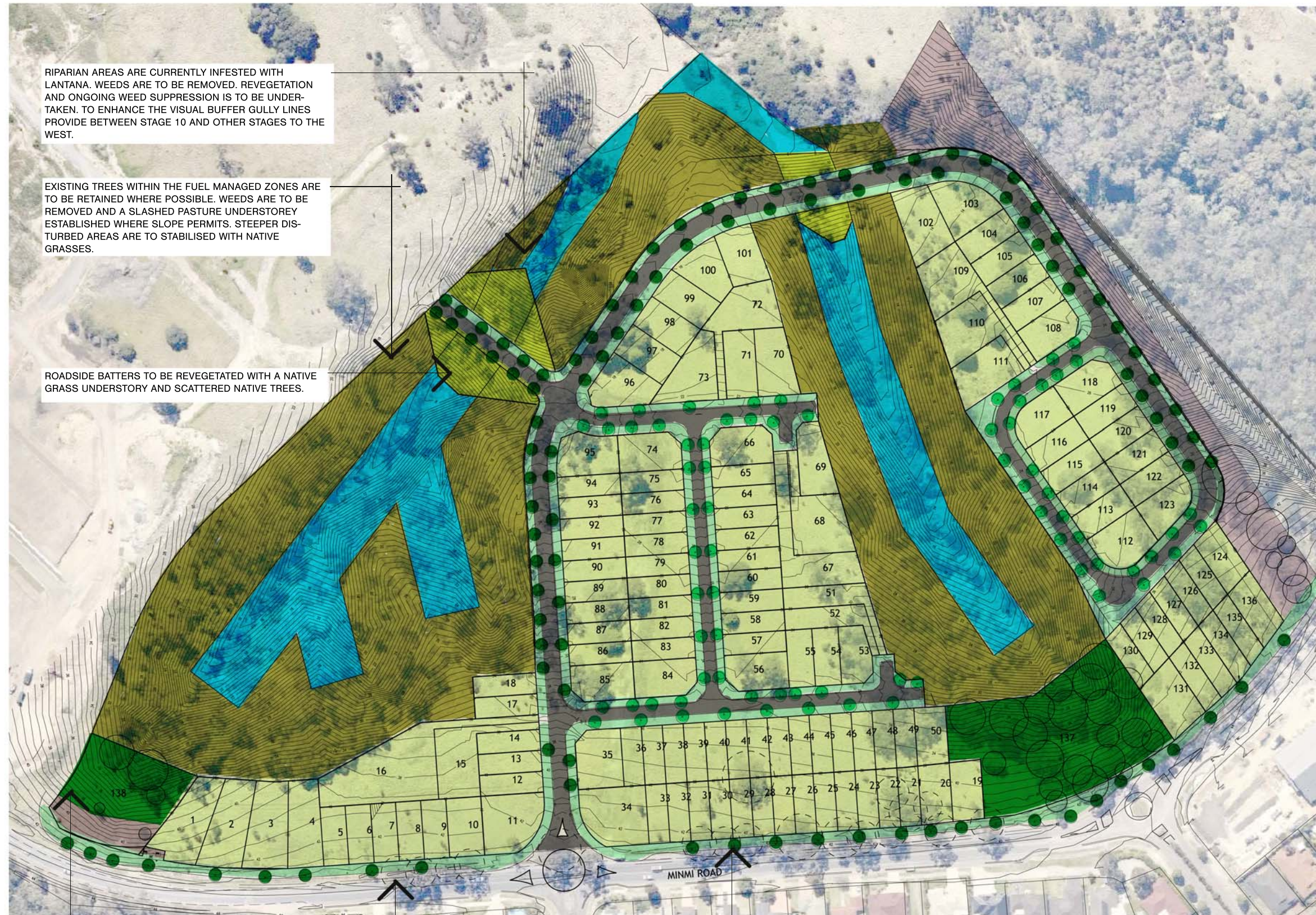
1-2000 @ A3

drawn:

SGK

rev. number:

B



RIPARIAN AREAS ARE CURRENTLY INFESTED WITH LANTANA. WEEDS ARE TO BE REMOVED. REVEGETATION AND ONGOING WEED SUPPRESSION IS TO BE UNDERTAKEN. TO ENHANCE THE VISUAL BUFFER GULLY LINES PROVIDE BETWEEN STAGE 10 AND OTHER STAGES TO THE WEST.

EXISTING TREES WITHIN THE FUEL MANAGED ZONES ARE TO BE RETAINED WHERE POSSIBLE. WEEDS ARE TO BE REMOVED AND A SLASHED PASTURE UNDERSTOREY ESTABLISHED WHERE SLOPE PERMITS. STEEPER DISTURBED AREAS ARE TO BE STABILISED WITH NATIVE GRASSES.

ROADSIDE BATTERS TO BE REVEGETATED WITH A NATIVE GRASS UNDERSTOREY AND SCATTERED NATIVE TREES.

PARKLAND AREAS TO PROVIDE RECREATIONAL SPACES FOR RESIDENTS. PARKLAND TO INCLUDE CHILDRENS PLAY EQUIPMENT. EXISTING HEALTHY TREES TO BE RETAINED WHERE POSSIBLE. SUPPLEMENTARY TREE PLANTING TO BE PROVIDED WHERE REQUIRED TO REPLACE DISEASED OR HAZARDOUS TREES.

EXISTING TREES LOCATED ALONG THE MINMI ROAD FRONTAGE WHERE ADJACENT TO PROPOSED LOTS WILL REQUIRE REMOVAL DUE TO PROPOSED ROAD WORKS AND SERVICE INSTALLATION. THE MAJORITY OF THE EXISTING TREES HAVE A LOW USEFUL LIFE EXPECTANCY.

LOTS WITH A 10M WIDE FRONTAGE WILL REQUIRE DRIVEWAYS TO BE LOCATED IN A SYMPATHETIC MANNER TO ALLOW FOR STREET TREES TO BE PLANTED ON EVERY SECOND LOT BOUNDARY TO MAINTAIN THE REQUIRED 3M OFFSET FROM DRIVEWAYS. REFER TO 01/L03 FOR THE PROPOSED STREET TREE TREATMENT.



# landscape detail & suggested species

**outlook stage 10**

03

december 2014

## Suggested street tree species



*Acmena smithii* (Lilly Pilly)



*Hymenosporum flavum* (Native Frangipani)

## Suggested roadside batter species



*Alphitonia excelsa* (Red Ash)



*Eucalyptus grandis* (Flooded Gum)



*Glochidion ferdinandi* (Cheese Tree)



*Syncarpia glomulifera* (Turpentine)



*Carex appressa* (Tall Rush)



*Kennedia rubicunda* (Dusky Coral Pea)



*Lomandra longifolia* (Spiny Matt-Rush)



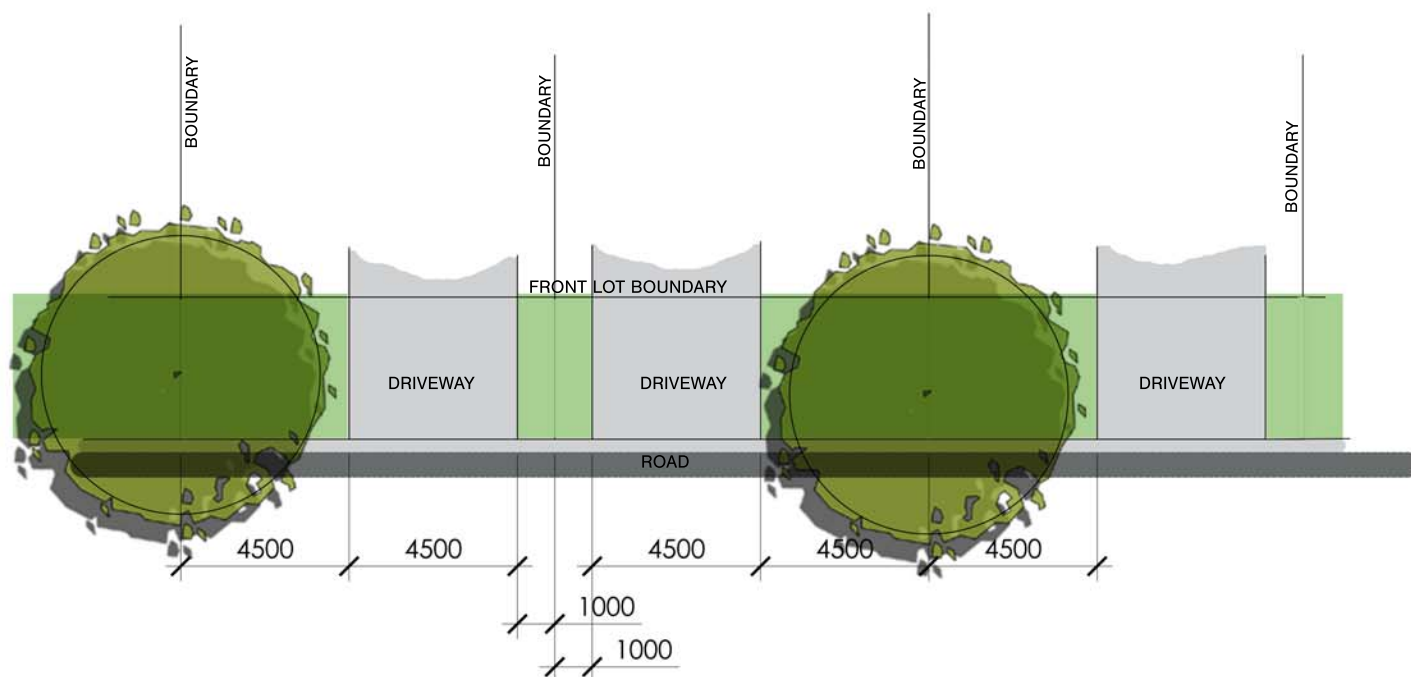
*Hibbertia scandens* (Twining Guinea Flower)



*Hardenbergia violacea* (False Sarsparilla)



*Hibiscus heterophyllus* (Native Rosella)



01/03 proposed treatment of street verge in front of 10m wide lots

1/200@A3

**site details:**  
MINIMI ROAD, FLETCHER  
**client:**  
NORTHWEST RESIDENTIAL  
**date:**  
DECEMBER 2014  
**job number:**  
9496.5  
**scale:**  
AS NOTED @ A3  
**drawn:**  
SGK  
**rev. number:**  
B

## **Attachment 3**

### **Vegetation Management Plan for Stage 10**



# vegetation management plan

project – stage 10 outlook





date: 19-05-14  
project no: 9496.5  
site Minmi Road, Fletcher  
council: City of Newcastle  
proposal: Residential Subdivision

## vegetation management plan

### project – stage 10 outlook

#### REFERENCED DRAWINGS

L01	Site Plan
L02	Extent of Weeds
L03	Management Zones
L04	Suggested Plant Species

REV NO	DESCRIPTION	DATE
A	DA	14.12.15



## Table of Contents

<b>1.</b>	<b>INTRODUCTION AND BACKGROUND .....</b>	<b>4</b>
1.1	SITE CHARACTERISTICS	5
1.2	PROPOSED DEVELOPMENT	5
1.3	OBJECTIVES	5
<b>2.</b>	<b>VEGETATION MANAGEMENT .....</b>	<b>6</b>
2.1	WEED REMOVAL	6
2.2	THE RETENTION OF EXISTING NATIVE VEGETATION	7
2.3	REVEGETATION	7
2.4	ACCESS	8
	<b>MANAGEMENT STRATEGIES.....</b>	<b>8</b>
2.5	THE RETENTION OF EXISTING NATIVE VEGETATION	8
2.6	TREE PROTECTION	9
2.7	WEED REMOVAL	9
2.8	INITIAL WEED REMOVAL	10
<b>3.</b>	<b>SCOPE OF WORKS .....</b>	<b>11</b>
3.1	SITE PREPARATION	11
3.2	SPECIES AND STOCK SELECTION	11
3.3	PLANTING TECHNIQUES	11
3.4	ONGOING WEED CONTROL	11
3.5	ONGOING MONITORING, MAINTENANCE AND PLANT ESTABLISHMENT	12
3.6	PLANT ESTABLISHMENT AND PROTECTION	12
3.7	CONTROL OF ACCESS	12
3.8	EROSION AND SEDIMENTATION CONTROL	12
<b>4.</b>	<b>MANAGEMENT ACTIVITIES.....</b>	<b>14</b>
4.1	GENERAL	14
4.2	REQUIRED VEGETATION MANAGEMENT ACTIVITIES	14
4.3	COMMISSIONING	15
4.4	LITTER AND REFUSE	15
4.5	OPERATION	15
4.6	FLOOD MANAGEMENT	15
4.7	PEST AND WEED CONTROL	15
4.8	WATERING	15
4.9	SEDIMENT ACCUMULATION	15
4.10	TIMING FOR MAINTENANCE ACTIVITIES	16
<b>5.</b>	<b>SITE SUPERVISION, MONITORING AND REPORTING.....</b>	<b>17</b>
5.1	SITE SUPERVISION	17
5.2	MONITORING, MAINTENANCE AND REPORTING	17
5.3	CHECKLISTS AND LOGS	18
5.4	VEGETATION MANAGEMENT TIMING	19
<b>6.</b>	<b>REFERENCES.....</b>	<b>20</b>
<b>7.</b>	<b>APPENDICES .....</b>	<b>21</b>
7.2	ACCEPTED WEED REMOVAL TECHNIQUES	22
7.3	MAINTENANCE SCHEDULE	24
7.4	DRAWINGS VMP-01	25



7.5	DRAWINGS VMP-02	26
7.6	DRAWINGS VMP-03	27
7.7	DRAWINGS VMP-04	28
7.8	SITE IMAGES	29



## 1. INTRODUCTION AND BACKGROUND

This Vegetation Management Plan (VMP) has been prepared by Terras Landscape Architects to provide details on the management of existing and proposed vegetation associated with the gully lines and existing mature trees within the proposed development footprint, with particular emphasis applied to the Stage 10 component of The Outlook subdivision. The subject site is located on Minmi Road, Fletcher and extends north toward Hexham Swamp. This VMP is an update to the VMP prepared by Moir Landscape Architecture (2006) as requested by Newcastle City Council due to the modification of Stage 10 of the Outlook Subdivision.

This VMP provides the detail for vegetation management with regards to the issues outlined below:

- Extent of existing vegetation to be retained and protected.
- Existing vegetation affected by the development.
- Undesirable plant species and removal techniques to be employed to enhance existing vegetation remnants.
- Native plant species proposed to be used for revegetation and landscape works.
- Details of the proposed revegetation work.
- Vegetation maintenance, establishment, monitoring and reporting.
- Staging for restoration to be undertaken.

### Vegetation Management Plans

A VMP is a site-specific document that provides guidelines for the management and rehabilitation of native vegetation communities within that site while taking into consideration vegetation communities adjoining the site, whether or not they are threatened communities. The document describes the strategic and management objectives of the plan and the existing condition of the site with respect to the natural resources available. It details the management guidelines in relation to a list of issues applicable to the land, e.g. biodiversity conservation, vegetation and weeds, fauna, bushfire, streams and stormwater management, recreation, works and infrastructure, pollution control and education and community involvement.

A schedule of works details the implementation of the plan, the duration and priority. The plan is supported by maps, diagrams and plant species lists to describe the existing vegetation, management zones, constraints, vegetation and natural features to be retained, proposed vegetation, minor sediment and erosion control and stabilisation works to be undertaken, etc.

principals:  
phillip williams  
steve rushworth  
ABN:  
67 129 348 842  
phone:  
+61 2 4929 4926  
Fax:  
+61 2 4926 3069  
address:  
412 king st, newcastle,  
nsw 2300  
[www.terras.com.au](http://www.terras.com.au)



## 1.1 SITE CHARACTERISTICS

### Terminology:

"Development Site" refers to the entire subdivision.

"The Site" refers to the Stage 10 the proposed subdivision.

The site has frontage to Minmi Road, Fletcher and extends north to the southern edge of Hexham Swamp. The site has previously been used for grazing.

A residential subdivision is located to the south across Minmi Road of Stage 10 with the exception of a small area of bushland interface on the extreme western edge of Stage 10.

To the west of Stage 10 are previously constructed stages of The Outlook subdivision.

To the east is a pocket of bushland and the Sanctuary subdivision.

The majority of the sites vegetation consists of pasture with scattered trees. The gully lines still retain remnant vegetation although heavily infested with Lantana.

Vegetation communities identified in the Flora and Fauna Assessment by Environmental Appraisal and Planning Pty Ltd (2003)

- Tall Dry Sclerophyll Forest. (Now a woodland)
- Dry Rainforest – within gully lines
- Tall Wet Sclerophyll Forest – within gully lines

No threatened flora species were identified on site.

## 1.2 PROPOSED DEVELOPMENT

The proposed development (stage 10) comprises of a 137 lot subdivision and 2 lots proposed as open space/park. A number of stages further to the west of stage 10 have been constructed.

It is proposed that the revegetation works be divided into 3 vegetation zones reflective of existing vegetation as well as the level of inundation:

- Zone 1: Pasture grass with existing tree cover
- Zone 2: Open pasture grass
- Zone 3: Gully area (Riparian Zone)

## 1.3 OBJECTIVES

- to control water quality and flow as well as minimise the spread of weeds from site;
- to be maintain creek lines with appropriate plant species as specified on the attached plans (9496.5 VMP-01-02) Prepared by Terras Landscape Architects, and
- to ensure creek lines continue to function in accordance with the design.

principals:  
phillip williams  
steve rushworth  
ABN:  
67 129 348 842  
phone:  
+61 2 4929 4926  
Fax:  
+61 2 4926 3069  
address:  
412 king st, newcastle,  
nsw 2300  
www.terras.com.au

## 2. VEGETATION MANAGEMENT

The proposed vegetation management includes:

1. Retention of existing native vegetation;
2. weed removal, suppression and ongoing control;
3. Maintaining bank stability and minimising erosion potential;
4. Planting of native vegetation including trees, shrubs and grasses both within the riparian corridor and in areas channelling water into the corridor with native vegetation. Planting and establishment methods are to be used to ensure survival rates are adequate;
5. limiting the transportation of weed seeds into the riparian zone, and
6. monitoring and maintenance of vegetation, weeds and over planting.

### 2.1 WEED REMOVAL

Table 1: Main Weed Species Identified On-Site to be Removed.

SCIENTIFIC NAME	COMMON NAME	NOXIOUS WEED CLASS
<i>Lantana camara</i>	Lantana	4 / WONS
<i>Ligustrum sinense</i>	Small-leaf Privet	
<i>Rubus fruticosus</i>	Blackberry	4 / WONS
<i>Senecio madagascariensis</i>	Fireweed	WONS
<p>Class 4:</p> <p><u>Defined under the Noxious Weeds Act 1993 as:</u></p> <p>Plants that pose a potentially serious threat to primary production, the environment or human health, are widely distributed in an area to which the order applies and are likely to spread in the area or to another area.</p> <p>WONS / Weeds of National Significance:</p> <p><u>Defined under the Noxious Weeds Act 1993 as:</u></p> <p>These weeds are regarded as the worst weeds in Australia because of their invasiveness, potential for spread, and economic and environmental impacts.</p> <p><b>Note:</b> <i>Lantana camara</i> is not declared within the Newcastle LGA.</p>		

The main weed species have been identified as occurring within the site outlined in Table 1. The removal and monitoring of these species is essential to enable the long term viability of the proposed vegetation and prevention of further infestation. Follow-up weed control will be required over the maintenance period to ensure the eradication of weed species and will occur at regular intervals as specified. 8.2 describes accepted weed removal techniques in further detail for specific species and type of weeds.



## 2.2 THE RETENTION OF EXISTING NATIVE VEGETATION

As existing vegetation is almost always affected adversely by most types of development, it is highly desirable that the remaining remnant vegetation on the site is identified and protected. This will require the early identification and control of any potential factors that may cause damage to existing vegetation communities on site. Awareness of all significant remnant vegetation areas is crucial to ensure protection measures are carried throughout to coincide the various stages of construction.

Correct protection, initial weed removal and maintenance procedures are central to the successful retention of the vegetation located within the Development Site's boundaries, in particular areas adjacent to civil construction works.

Individual trees, groups of trees or vegetation remnants to be retained are exposed to many direct and/or indirect threats as a result of development. These threats can have adverse effects on both the health and long-term viability of any vegetation that is to be retained within the Development Site. These may include:

- damage to retained trees or other vegetation by machinery and engineering processes during the course of construction;
- alterations to site hydrology and previous drainage patterns;
- damage to roots and root zones due to excavation required for benched sites, roads, trenches etc.;
- compaction of soil by heavy machinery within close proximity of mature trees
- erosion and sedimentation caused by clearing for development;
- exposure of retained trees to wind loading following the removal of neighbouring trees and other vegetation previously providing shelter, and
- damage from future land management and activities, impacts due to residents, weed infestation and bushfire management.

## 2.3 REVEGETATION

The proposed revegetation and bushland management shall be undertaken in association with the development of the estate. Revegetation is to take place primarily within the vegetated riparian zone (VRZ), incorporating tree and shrub planting to be undertaken in accordance with City of Newcastles DCP, 2015, No revegetation is to take place within the dripline of existing trees to ensure minimal damage to established root systems. Additional tree planting shall be undertaken within and outside of the VRZ to compensate for trees removed in construction of the subdivision.

Revegetation using competitive native species that will maintain sufficient ground cover will aid in preventing the return and establishment of problem weed species. Native species planted in suitable positions as selected and listed below will create shade essentially out-competing undesirable weed species. Cover of fast-growing native species shall be achieved and maintained. It is essential that weed control occurs throughout native seedling establishment. Having revegetation coinciding with certain seasons will also ensure a competitive advantage over weed species can be achieved.

principals:  
phillip williams  
steve rushworth  
ABN:  
67 129 348 842  
phone:  
+61 2 4929 4926  
Fax:  
+61 2 4926 3069  
address:  
412 king st, newcastle,  
nsw 2300  
www.terras.com.au



## 2.4 ACCESS

Access to management areas and storage of materials on site during the development and construction phases requires appropriate planning to ensure protection of native remnant vegetation throughout the duration of construction works.

Access to the revegetation area during construction will be restricted as part of the site management plan. Under these operations, access issues include preventing the unnecessary movement of people and equipment through vulnerable/protected areas of the site. Suitable protective fencing shall be erected by the civil contractor as discussed further in this report where required to prevent access. The briefing of contractors shall be undertaken to ensure protection of all required areas as identified in this report.

## MANAGEMENT STRATEGIES

### 2.5 THE RETENTION OF EXISTING NATIVE VEGETATION

The protection and enhancement of the existing native and indigenous vegetation will be undertaken using a variety of management strategies. These will include:

- Identification of existing native vegetation to be retained.
- Implementation of vegetation protection guidelines where required (civil contractor, fencing contractor) .
- Revegetation.
- Weed control.
- Ongoing site maintenance, monitoring and reporting.

All weed removal and site preparation is to be undertaken by a qualified and experienced bush regenerator. The successful contractor will be required to provide proof of qualifications and details of experience to the client's agent.

Prior to any works being undertaken on site the head contractor shall fence and protect any trees and native vegetation remnants to be retained in locations where adjoining civil works are to occur. Tree and vegetation protection shall be coordinated during construction. (Refer to drawing number 9496.5 VMP-01-02, Terras Landscape Architects).

To ensure ongoing protection of retained vegetation, protection measures are to remain in place throughout the relevant development and construction phases as required. Protection measures such as these prevent the accidental disturbance or removal of desired native vegetation from the site during construction.

As all trees within the revegetation zone are to be retained, the following guidelines shall be followed for any trees that are located within potential construction areas:

principals:  
phillip williams  
steve rushworth  
ABN:  
67 129 348 842  
phone:  
+61 2 4929 4926  
Fax:  
+61 2 4926 3069  
address:  
412 king st, newcastle,  
nsw 2300  
www.terras.com.au



## 2.6 TREE PROTECTION

- Earthworks around subject trees are to be undertaken in the presence of a qualified arborist or ecologist who may provide additional on-site advice.
- Machine digging within the root mass of the subject tree be minimised and where possible hand digging be undertaken.
- Any exposed roots of the subject tree should be wrapped and protected during exposure and be replaced in a similar position prior to disturbance.
- Inspection of retained trees by a qualified person should be conducted at 6 and 12 months after development completion of works

Existing vegetation will require removal where conflict exists with the construction of the subdivision and associated engineered batters with protection provided to trees in close proximity, not affected by construction. The Civil Contractor shall fence off trees/vegetation to be retained and protected where required prior to any construction work being undertaken. Refer to drawing number 9496.5 VMP-01-02 Prepared by Terras Landscape Architects

Protective fencing offsets shall be determined using AS 4970-2009 Protection of Trees on Development Sites. Generally fencing shall be offset the radial distance from the trunk calculated at  $12 \times$  the trunk diameter when measured at 1.4m high.

There shall be no stockpiling of materials or machinery entering identified vegetation protection zones.

Approved tree removal operations in the vicinity of retained trees are to be undertaken in a manner that avoids canopy damage, root damage to retained vegetation and soil compaction.

## 2.7 WEED REMOVAL

Effective weed removal and control is necessary both to protect and preserve existing vegetation and to allow long-term establishment of proposed native vegetation to be planted on site.

Weed control shall include:

- the use of herbicides;
- mechanical removal and clearing;
- weed matting and mulching; and,
- increasing the density of surrounding native vegetation.

All weed control will be carried out using minimal disturbance techniques. Details of weed control techniques to be used are provided in section 8.2. The use of these best management practice techniques will aim to maintain and enhance the integrity of the existing native indigenous vegetation.



## 2.8 INITIAL WEED REMOVAL

While all weeds as identified in Table 2 shall be removed throughout the site, the primary focus shall be the removal of Lantana and Blackberry to its listing on the City of Newcastle's Noxious Weed List for their potential to spread through the landscape.

An integrated weed management approach utilising a variety of control methods is desirable to eradicate most weed species. The below mentioned techniques have been selected for application in this situation due to suitability to this site. The below mentioned points shall be taken into consideration by the bush regeneration contractor at all times when undertaking weed removal:

- Weed removal and associated techniques are undertaken at the correct times of the year to ensure optimum results are achieved. Correct timing reduces cost and effort in the long term and improves eradication results dramatically. Where this cannot be done, additional visits may be required to remove regrowth.
- The revegetation team shall take all due care to minimise disturbance to existing desirable vegetation and surrounding land.
- Mulch shall be placed to all disturbed areas of ground due to weed removal. This will aid in preventing re-colonisation of weed species throughout disturbed areas. Steep eroded areas may require regrading & jute mesh/erosion control matting to be pinned down and placed over mulch to prevent soil runoff.
- The contractor shall keep records of all herbicide applications and use only registered and accepted herbicides.
- Appropriate herbicide training shall be undertaken ensuring all safety precautions are adhered to at all times.
- The contractor shall ensure any spray drift is kept to an absolute minimum.
- Herbicide control shall be undertaken when weeds are actively growing.
- The contractor shall take all care not to poison existing desirable vegetation when undertaking herbicide control methods.
- If required, the contractor shall be required to make good in areas where spray drift and/or wrong applications have resulted in the loss of desirable vegetation.
- The correct herbicide shall be selected and used appropriately to ensure effective results on all weeds.
- Do not undertake herbicide control when weed species are under stress, e.g. periods of extreme hot or cold weather.
- All herbicide spraying is to be undertaken using only the knap-sack spray apparatus. All other methods of herbicide application are not to be used onsite unless discussed and approved in writing by the client's agent.
- Herbicide control is not to be used within or near watercourses unless approved. The contractor shall obtain all required permits prior to use of suitable herbicides near any watercourse.
- Weed removal shall be carried out as described below and utilising weed removal techniques outlined in section 8.2 of this report.
- Should the contractor feel that techniques selected in this report will prove ineffective or inefficient; the contractor shall notify the client's agent nominating alternative procedures for review and discussion. Approved changes shall be issued in writing by the client's agent to the contractor.

principals:  
phillip williams  
steve rushworth  
ABN:  
67 129 348 842  
phone:  
+61 2 4929 4926  
Fax:  
+61 2 4926 3069  
address:  
412 king st, newcastle,  
nsw 2300  
www.terras.com.au



### **3. SCOPE OF WORKS**

#### **3.1 SITE PREPARATION**

Site preparation shall include the removal and control of all problem weeds identified on-site. The bushland revegetation contractor shall visit the site and make themselves familiar with the extent of works.

Revegetation using applicable native species, as suggested on the attached drawings prepared by Terras Landscape Architects (9496.5 VMP-01-02) is required as soon as possible or after weed infestations are removed. The use of competitive native species that will maintain sufficient ground cover will aid in preventing the return and establishment of problem weed species seedlings. Native species located in suitable positions as selected and listed below will create shade essentially out competing undesirable weed species. Cover of fast-growing native species shall be achieved and maintained. It is essential that weed control occurs throughout native seedling establishment and subsequent management period.

#### **3.2 SPECIES AND STOCK SELECTION**

A list of native, indigenous vegetation selected for revegetation at this site is provided on the attached drawings prepared by Terras Landscape Architects (9496.5 VMP-01-02) It is preferred that plant material is sourced from local provenance seed and propagated for future revegetation. The use of local provenance plant material may not be possible throughout the initial stages of revegetation. All planting shall generally be undertaken utilising tube-stock (i.e. forestry tubes or equivalent with appropriately developed root systems capable of sustaining above ground vegetative material.)

#### **3.3 PLANTING TECHNIQUES**

Prior to any revegetation planting, all initial weed removal and engineering activity such as erosion stabilisation must be undertaken and completed. Planting shall commence as soon as practicable and where applicable upon completion of initial weed removal.

#### **3.4 ONGOING WEED CONTROL**

Ongoing monitoring, maintenance and weed control shall be undertaken in accordance with this plan and as required to further reduce and eradicate weed populations throughout the site. All areas found to have weed infestation shall be monitored and treated thoroughly for a minimum of 2 years and until such time as a maximum of 5% weed cover is achieved. Newly exposed or disturbed areas (due to initial weed removal or construction works) will be subject to new weed growth and shall require continued weed removal procedures, monitoring and maintenance throughout this period. Replenishment of mulch may be required to further reduce the possibility of weed re-infestation.

The contractor shall undertake weed removal as required on a regular basis in order to maintain a weed free environment.

principals:  
phillip williams  
steve rushworth  
ABN:  
67 129 348 842  
phone:  
+61 2 4929 4926  
Fax:  
+61 2 4926 3069  
address:  
412 king st, newcastle,  
nsw 2300  
www.terras.com.au



### **3.5 ONGOING MONITORING, MAINTENANCE AND PLANT ESTABLISHMENT**

Ongoing monitoring and plant establishment is important to establish and retain high quality, successful vegetation cover and minimise weed re-colonisation. The contract shall include a plant establishment period of 12 months and a management period of 4 years and until such time as 80% survival rate of each species is achieved. During this period the plants shall be checked for pests and disease, fauna damage and general health and vigour. Plants found to be dead or dying shall be progressively replaced under general maintenance.

Where plants are failing they shall be replaced with suitable substitutes as recommended by a registered landscape architect, ecologist or bush regenerator. Where erosion occurs, re-stabilise using mulch, followed by replanting to minimise long term maintenance issues. Weeding shall occur as outlined in previous sections. Steep eroded areas may require jute mesh/erosion control matting to be pinned down and placed over mulch to prevent soil runoff.

Maintenance activities shall include weeding, spot spraying, watering, monitoring of plant losses from heat or other factors, poor growth, animal, construction damage, and unsuitable species.

### **3.6 PLANT ESTABLISHMENT AND PROTECTION**

Initial protection of all individual tree and shrub plantings shall be undertaken using protective biodegradable tree sleeves held with bamboo stakes. Locations shall be mulched with bark or a weed mat product to provide the best opportunity for plant establishment.

### **3.7 CONTROL OF ACCESS**

All areas under going planting shall be fenced/marked off to ensure that machinery, stockpiling of materials, access tracks, service layouts and general construction activity is prevented from accessing these areas. Protective fencing shall remain erected until construction works are complete for that particular stage.

It is often difficult to enforce this over large sites with numerous parties working on the site, however with the proper fencing, site supervision and site meetings/induction will ensure the best method to ensure the protection of these areas. The use of the Gro-tube protective sleeving will ensure visibility of revegetation areas generally. Gro-tubes also provide a secure micro-climate for new plantings to establish well in.

Fencing to restrict cattle entering the area shall be erected in order to prevent damage to naturally regenerating native species as well as newly planted trees, shrubs and grasses.

### **3.8 EROSION AND SEDIMENTATION CONTROL**

Many factors that occur on site throughout construction phases have the potential to contribute to erosion and unnecessary damage to both the site itself and adjoining

principals:  
phillip williams  
steve rushworth  
ABN:  
67 129 348 842  
phone:  
+61 2 4929 4926  
Fax:  
+61 2 4926 3069  
address:  
412 king st, newcastle,  
nsw 2300  
www.terras.com.au



land. Factors that may cause adverse effects can include; storage of fill, removal of selected trees and surrounding grass cover in open areas and to a lesser extent, weed control and revegetation of remnant patches. It is important to understand the adverse effects caused due to erosion and sedimentation. In some cases areas some distance from the initial disturbance may be affected by actions else where on site.

Soil stabilisation works will be implemented as per the *Managing Urban Stormwater: Soils and Construction* commonly known as *The Blue Book* (Landcom, 2006) and local council requirements. It is a standard requirement for construction activity to provide sediment control where required. Erosion zones shall be planted with suitable fast-growing native grass species immediately to reduce the potential for any further erosion or weed infestation to occur. Establishment and maintenance of cover is essential to ensure erosion areas do not amplify in size. Steep eroded areas may require jute mesh erosion control matting to be pinned down and placed over 75mm thick mulch to prevent soil runoff.

principals:  
phillip williams  
steve rushworth  
ABN:  
67 129 348 842  
phone:  
+61 2 4929 4926  
Fax:  
+61 2 4926 3069  
address:  
412 king st, newcastle,  
nsw 2300  
[www.terras.com.au](http://www.terras.com.au)

## 4. MANAGEMENT ACTIVITIES

### 4.1 GENERAL

The time allocated to maintenance shall be varied according to the stage of the development. Initial establishment of the reworked dams and detention basins shall be given additional time to ensure the proper establishment and function of the system.

The landscape management schedule includes but is not limited to the prescribed instructions. The contractor shall perform additional tasks should they be required.

### 4.2 REQUIRED VEGETATION MANAGEMENT ACTIVITIES

Construction of the proposed stormwater control devices will be undertaken in various stages. Vegetation management including the activities outlined below are to coincide with the main civil construction stage.

TASK		DESCRIPTION	ACTIVITY
01	Protection of native vegetation where required	Areas to be fenced and protected Where required.	Civil Contractor, Landscape Architect – Site Supervisor.
02	Collect native indigenous seed from site and propagate stock to provide tube-stock for revegetation of the remnants and other areas undergoing rehabilitation.	Source and collect seed for propagation	Bush Regeneration Team  (Seed collection and propagation may not be possible depending on germination periods and construction schedules)
03	Weed removal	Weed removal by bush regeneration methods or manual spraying with approved herbicides.	Bush Regeneration contractor. Landscape Architect
04	Erosion control.	Erosion control undertaken where required, monitor and maintain  Planting of suitable fast growing native grass species undertaken  Pin jute matting on batters to stabilise batters	Civil contractor , Bush Regeneration Team,  and Site supervisor
05	Revegetation of disturbed areas	Soil stabilisation and revegetation undertaken.	Project Ecologist supervising a Bush Regeneration contractor.
06	Ongoing site monitoring, maintenance (including plant watering, weed control, plant replacement, protection and fuel load reduction), sediment control fencing decommissioning.	Soil stabilisation, weed control, and native vegetation establishment.	Bush Regeneration contractor. Landscape Architect contractor-site supervisor.
07	Reporting	Follow up reports including images to ensure the processes and activities have been completed with recommendations for additional works	Bush Regeneration contractor.



#### **4.3 COMMISSIONING**

1. Inspect the revegetation area as required
2. Monitor and ensure the proper function of the stormwater control devices during the initial establishment of the planting works.
3. Monitor and repair any erosion and replace all lost macrophyte plantings as required
4. Remove any rubbish within the wetland area throughout the maintenance period

#### **4.4 LITTER AND REFUSE**

1. Ensure the litter trap for the collection of gross pollutants is maintained in a functional condition at all times.
2. Removal of accumulated litter from the area is required. Discard all litter and other refuse material. All trash, litter, leaves, etc. shall be collected and deposited off site to approved waste areas or as otherwise directed by the superintendent

#### **4.5 OPERATION**

1. Provide routine monitoring and maintenance activities as outlined and specified in this maintenance plan.
2. Do not let any plants above the permanent water level dry out. Water when required as specified

#### **4.6 FLOOD MANAGEMENT**

1. Inspect the site after storm events to ensure that any plant damage is repaired.
2. Remove litter and waste after storm events and dispose off site in an environmentally responsible manner.
3. Replace any lost or missing plants causing minimal disturbance to existing planted areas.

#### **4.7 PEST AND WEED CONTROL**

1. Undertake adequate weed control measures on any non-desirable plants or weeds as required. Hand removal is required for weeds situated in close proximity to the water level whilst approved glyphosate can be used on weed species situated on elevated areas.
2. Check that the vegetation is not adversely affected by wildlife (predation).
3. Regularly remove, by hand, rubbish and weed growth that may occur throughout the basin area and dispose of in a suitable manner.
4. The maintenance contractor must keep records of each chemical application. Details are to include location, target identification, operators name, treatment date and time, risk assessment including prevailing conditions and product and equipment used and application rates.

#### **4.8 WATERING**

It is the contractor's responsibility to ensure that all plants receive adequate water regardless of weather conditions. Planted areas situated above the permanent water line are to be kept moist at all times throughout the establishment period. The maintenance contractor shall ensure all macrophyte planting receives adequate water for successful establishment when required.

#### **4.9 SEDIMENT ACCUMULATION**

1. Ensure any excess sedimentation accumulated on site is removed.

principals:  
phillip williams  
steve rushworth  
ABN:  
67 129 348 842  
phone:  
+61 2 4929 4926  
Fax:  
+61 2 4926 3069  
address:  
412 king st, newcastle,  
nsw 2300  
www.terras.com.au





2. Sediment shall be disposed of in accordance with the 'Waste Minimisation and Management Act' 1995. And with the approval of the Cessnock City Council.

#### 4.10 TIMING FOR MAINTENANCE ACTIVITIES

Refer to the Landscape Management Schedule (Section 8.1) for the timing of recurrent maintenance activities.

principals:  
phillip williams  
steve rushworth  
ABN:  
67 129 348 842  
phone:  
+61 2 4929 4926  
Fax:  
+61 2 4926 3069  
address:  
412 king st, newcastle,  
nsw 2300  
[www.terras.com.au](http://www.terras.com.au)



## 5. SITE SUPERVISION, MONITORING AND REPORTING

### 5.1 SITE SUPERVISION

- A copy of the bushland contractor's works specification is to be submitted to Newcastle City Council. An initial site inspection is to be undertaken in the company of an appointed Newcastle City Council representative prior to undertaking and work identified in this VMP, if requested.
- The bush regeneration contractor shall be responsible for over-seeing the appropriate methodology, location, maintenance, monitoring and reporting of all rehabilitation works. Submissions and reporting shall be undertaken and provided as outlined in Section 6.2 below.
- An engineer shall be responsible for the supervision of any erosion or sediment control works undertaken, if applicable. This person shall ensure all environmental guidelines are adhered to during all operations.
- Any excavation works and/or fill placement are to be undertaken by an experienced excavator contractor, proficient in the use of the machinery and an ability to carry out minimal disturbance.
- All weed control, revegetation and maintenance works will be undertaken by an experienced and certified bush regeneration contractor.
- The contractor shall report to the client's agent for any clarifications or issues encountered throughout the program.

### 5.2 MONITORING, MAINTENANCE AND REPORTING

Monitoring, maintenance and reporting shall be undertaken on a regular basis to ensure the successful establishment of all plantings, monitoring of weed regrowth and stabilisation success. Regular monitoring shall be undertaken by the contractor for a minimum of 2 years and until such time as 80% survival rate of each species and a maximum of 5% weed cover is achieved. Monitoring sessions shall also address the performance criteria as outlined below. The sessions will need to be more frequent in the early stages following planting, the frequency decreasing with time.

- The contractor shall submit annual reports detailing works undertaken, the results of that work, identifying future works programs and making and necessary recommendations to enhance the VMP, if requested.

The frequency and duration of monitoring should be flexible, and re-assessed following each session. However, as an initial guide, monitoring is likely to be required:

principals:  
phillip williams  
steve rushworth  
ABN:  
67 129 348 842  
phone:  
+61 2 4929 4926  
Fax:  
+61 2 4926 3069  
address:  
412 king st, newcastle,  
nsw 2300  
www.terras.com.au



- Monthly for the first 6 months,
- Once every 3 months for the following 18 months,
- Subsequent years if required. Frequency to be discussed. At this time a decision could be made as to whether monitoring can be discontinued.

If it is necessary to increase or decrease monitoring at any given time the contractor shall discuss options with the landscape architect.

Monitoring sessions would indicate the specific maintenance requirements for the site. Such maintenance is likely to involve (but not necessarily be restricted to):

- Control of weeds,
- Watering as required,
- Control of pests or diseases,
- Correction of any significant nutrient deficiencies,
- Replacement of failed plantings,
- Correction of any bank/slope instability or erosion problems, and
- Any other unanticipated problems.

Biannual reports are to be prepared by the contractor to record the results and actions identified throughout each monitoring and maintenance session. Reports shall be submitted to the clients agent. Reports are to be inclusive of but not be limited to; up to date photographs of areas treated, current progress or issues encountered, providing viable options for the remedy of any such issues, an outline of future maintenance and monitoring activities, any recommended amendments to the proposed program and reason for proposed amendments.

### 5.3 CHECKLISTS AND LOGS

A landscape management schedule is made part of this specification. The contractor shall review this schedule as required and complete all applicable items on the list in intervals as specified.

The contractor shall keep a log of all maintenance undertaken on site. Details included within the log shall include date, time, work undertaken and any relevant responses/recommendations with respect to work undertaken. Submit log records to the site superintendent within 24 hours of being requested to do so.

principals:  
phillip williams  
steve rushworth  
ABN:  
67 129 348 842  
phone:  
+61 2 4929 4926  
Fax:  
+61 2 4926 3069  
address:  
412 king st, newcastle,  
nsw 2300  
www.terras.com.au

## 5.4 VEGETATION MANAGEMENT TIMING

GOAL	ESTIMATED PERIOD OF TIME	ACTIVITY
<b>SHORT TERM</b>  <b>(Major eradication and revegetation works to be undertaken within the maintenance period)</b>	0-2 years	<ul style="list-style-type: none"> <li>Native Seed collection (provenance seed) and propagation by bush regeneration contractor.</li> <li>Tree and vegetation protection where required.</li> <li>Erosion control measures undertaken where required.</li> <li>Initial weed removal undertaken using specified techniques.</li> <li>Secondary weed removal undertaken using specified techniques.</li> <li>Revegetation of nominated areas preferably with plants propagated from provenance seed collection.</li> <li>Monitoring of weed re-infestations and removal as required.</li> <li>Replacement of any lost, stolen or any dead plants</li> <li>General maintenance and replacement of plant stock as required to ensure effective competition with weed species.</li> <li>Maintenance and replacement of revegetation plant species as required.</li> <li>Ongoing monitoring and maintenance for 2 years and until an 80% survival rate for each species and a maximum weed cover of 5% is achieved.</li> <li>Self sustaining vegetation remnants with little or no weed infestation.</li> </ul>
<b>LONG TERM</b>  <b>(Minor Monitoring &amp; Maintenance Activities + Desired Outcomes )</b>	2-20 years	<ul style="list-style-type: none"> <li>Self-sustaining native seed bank and natural recolonisation of native species occurring</li> <li>Minor monitoring and maintenance activities to be undertaken as required.</li> <li>Nil weed infestation.</li> <li>Weeds species eradicated from the native remnants site.</li> <li>Self sustaining native vegetation remnants.</li> </ul>
<p><b>Note:</b> Activities/goals listed under the long term category are intended as desired outcomes due to successful establishment and maintenance throughout the initial short term period (for 2 years and until an 80% survival rate for each species and a maximum weed cover of 5% is achieved). Although self-sustaining, monitoring should be undertaken periodically throughout the long term period to monitor the success of weed eradication and revegetation. Should additional work be required throughout this period it shall be undertaken as approved by the clients agent.</p>		

principals:  
 phillip williams  
 steve rushworth  
 ABN:  
 67 129 348 842  
 phone:  
 +61 2 4929 4926  
 Fax:  
 +61 2 4926 3069  
 address:  
 412 king st, newcastle,  
 nsw 2300  
 www.terras.com.au



## 6. REFERENCES

Department of Primary Industries, Office of Water (2012) *Guidelines for Riparian Corridors on Waterfront land*.

Landcom (2006) *Managing Urban Stormwater : Soils and Construction*.

Environmental Appraisal and Planning Pty Ltd (2003) *Flora and Fauna Assessment*

Standards Australia (2009) AS 4970-2009 *Protection of Trees on Development Sites*.

principals:  
phillip williams  
steve rushworth  
ABN:  
67 129 348 842  
phone:  
+61 2 4929 4926  
Fax:  
+61 2 4926 3069  
address:  
412 king st, newcastle,  
nsw 2300  
[www.terras.com.au](http://www.terras.com.au)



## 7. APPENDICES

principals:  
phillip williams  
steve rushworth  
ABN:  
67 129 348 842  
phone:  
+61 2 4929 4926  
Fax:  
+61 2 4926 3069  
address:  
412 king st, newcastle,  
nsw 2300  
[www.terras.com.au](http://www.terras.com.au)



## 7.2 ACCEPTED WEED REMOVAL TECHNIQUES

Weeds to be removed. The following techniques are recommended by the [NPWS] National Trust, NSW National Parks and Wildlife Service and Australian Association of Bush Regenerators.

### WOODY WEED REMOVAL TECHNIQUES

**Removal Techniques:**

- Cut and Paint (Woody weeds to 10 cm basal diameter)
- Stem Injection
- Frilling or Chipping

**Notes**

- Plants should be actively growing and in good health;
- Deciduous plants should be treated in spring and autumn when leaves are fully formed;
- For multi-stemmed plants, inject or chip below the lowest branch or treat each stem individually; and
- Herbicides must be injected immediately before plant cells close (within 30 seconds) and translocation of herbicide ceases.

### SMALL HAND-PULLABLE PLANTS

**Removal Techniques:**

- Hand removal

**Notes**

- Leave weeds so roots are not in contact with the soil e.g. hang in a tree, remove from site or leave on a rock.

### VINES AND SCRAMBLERS

**Removal Techniques:**

- Hand removal

**Notes**

- Take hold of one runner and pull towards yourself;
- Check points of resistance where fibrous roots grow from the nodes;
- Cut roots with a knife or dig out with a trowel and continue to follow the runner;
- The major root systems need to be removed manually or scrape/cut and painted with herbicide;
- Any reproductive parts need to be bagged.

**Removal Techniques:**

- Stem Scraping

**Notes**

- Scrape 15 to 30 cm of the stem with a knife to reach the layer below the bark/outer layer; and immediately apply herbicide along the length of the scrape.

principals:  
phillip williams  
steve rushworth  
ABN:  
67 129 348 842  
phone:  
+61 2 4929 4926  
Fax:  
+61 2 4926 3069  
address:  
412 king st, newcastle,  
nsw 2300  
www.terras.com.au



#### WEEDS WITH UNDERGROUND REPRODUCTIVE STRUCTURES

##### Removal Techniques:

##### HAND REMOVAL OF PLANTS WITH A TAPROOT

- Remove and bag seeds or fruits;
- Push a narrow trowel or knife into the ground beside the tap root, carefully loosen the soil and repeat this step around the taproot;
- Grasp the stem at ground level, rock plant backwards and forwards and gently pull removing the plant; and
- Tap the roots to dislodge soil, replace disturbed soil and pat down.

##### CROWNING

- Remove and bag stems with seed or fruit;
- Grasp the leaves or stems together so the base of the plant is visible;
- Insert the knife or lever at an angle close to the crown;
- Cut through all the roots around the crown; and
- Remove and bag the crown.

##### STEM SWIPING

- Remove any seed or fruit and bag; and
- Using a herbicide applicator, swipe the stems/leaves.

##### HERBICIDE TREATMENT

- Isolated spray with 'Glyphosate'.

principals:  
phillip williams  
steve rushworth  
ABN:  
67 129 348 842  
phone:  
+61 2 4929 4926  
Fax:  
+61 2 4926 3069  
address:  
412 king st, newcastle,  
nsw 2300  
[www.terras.com.au](http://www.terras.com.au)





### 7.3 MAINTENANCE SCHEDULE

principals:  
phillip williams  
steve rushworth  
ABN:  
67 129 348 842  
phone:  
+61 2 4929 4926  
Fax:  
+61 2 4926 3069  
address:  
412 king st, newcastle,  
nsw 2300  
[www.terras.com.au](http://www.terras.com.au)

MAINTENANCE SCHEDULE STAGE 10 OUTLOOK														
THE FOLLOWING ACTIVITIES ARE TO BE UNDERTAKEN ON A RECURRENT BASIS TO ENSURE THE HEALTH AND VIGOUR OF THE REVEGETATION AREA.														
ACTIVITY		1 <sup>ST</sup> TWELVE MONTHS								SUBSEQUENT MONTHS				AS REQUIRED
		1	2	3	4	5	6	9	12	15	18	21	24	*
1		STORM AND FLOOD MANAGEMENT												
1.1	INSPECT AND ASSESS SITE FOR STORM DAMAGE.													<input checked="" type="checkbox"/>
1.2	REMOVE ANY RUBBISH OR DEBRIS.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
1.3	REPAIR ANY AREAS AFFECTED BY EROSION CAUSED BY STORM DAMAGE/HIGH FLOW RATES.													<input checked="" type="checkbox"/>
1.4	REPLANT ANY AREAS WHERE PLANTS HAVE BEEN DAMAGED OR WASHED AWAY. VARY SPECIES IF REQUIRED.													<input checked="" type="checkbox"/>
1.5	REMOVE ANY EXCESSIVE SEDIMENTATION OCCURRING WITHIN AREA.													<input checked="" type="checkbox"/>
2		PLANT MANAGEMENT AND WEED CONTROL												
2.1	INSPECT AND ASSESS SITE FOR ANY PLANT LOSSES OR WEED INFESTATIONS.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
2.2	REPLACE LOST PLANTS WITH EITHER SAME SPECIES OR MORE APPROPRIATE SPECIES.													<input checked="" type="checkbox"/>
2.3	UNDERTAKE WEED CONTROL, BY HAND, REMOVING COLLECTED MATERIAL FROM SITE.													<input checked="" type="checkbox"/>
2.4	IF WEED SOURCE OCCURRING FROM ADJOINING AREAS, APPROACH OWNERS TO SEEK MORE SUITABLE CONTROL.													<input checked="" type="checkbox"/>
2.5	APPLY SLOW RELEASE FERTILISER IN SPRING (VARY TO SUIT).			<input checked="" type="checkbox"/>						<input checked="" type="checkbox"/>				
2.6	INPECT PLANTS FOR MOISTURE STRESS.	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>					
3		LITTER MANAGEMENT												
3.1	INSPECT AND ASSESS SITE FOR ANY BUILD UP OF LITTER AND/OR DUMPING.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
3.2	REMOVE ANY LITTER OR DEBRIS.													<input checked="" type="checkbox"/>
3.3	IF DUMPING IS RECURRING, LOCATE SOURCE (IF POSSIBLE) AND REPORT TO COUNCIL.													<input checked="" type="checkbox"/>
4		PEST CONTROL												
4.1	INSPECT AND ASSESS PLANT MATERIAL FOR PESTS AND OR OTHER DISEASE.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
4.2	CONDUCT PEST/PREDATION CONTROL IF AFFECTING PLANT VIGOUR USING ENVIRO. SENSITIVE METHODS.													<input checked="" type="checkbox"/>
5		MANAGEMENT OF SEDIMENT AND BIOACCUMULATION												
5.1	INSPECT AND ASSESS SITE FOR BUILD-UP OF SEDIMENTATION AND BIO-MASS.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
5.2	CAREFULLY REMOVE SEDIMENTATION ENSURING PLANTS ARE LEFT INTACT.													<input checked="" type="checkbox"/>
5.3	REMOVE BUILD-UP OF BIO-MASS WHERE THERE IS A RISK OF CONGESTED FLOWS.													<input checked="" type="checkbox"/>
NOTES														
*	INDICATES MAINTENANCE ACTIVITIES TO BE UNDERTAKEN AS REQUIRED AS A FOLLOW-UP TO UNDERTAKING INSPECTIONS. (E.G. MAJOR STORM EVENT [I.E. GREATER THAN 1 IN 10] OR DURING ROUTINE INSEPECTIONS).													



#### 7.4 DRAWINGS VMP-01

principals:  
phillip williams  
steve rushworth  
ABN:  
67 129 348 842  
phone:  
+61 2 4929 4926  
Fax:  
+61 2 4926 3069  
address:  
412 king st, newcastle,  
nsw 2300  
[www.terras.com.au](http://www.terras.com.au)



# vegetation management plan

## outlook stage 10

# 01

december 2015



### legend

- EXISTING TREE RETAINED
- EXISTING TREE REMOVED

- ASSET PROTECTION ZONE
- FUEL MANAGED ZONE
- RIPARIAN ZONE
- PARKLAND
- RESIDENTIAL LOTS
- LANDSCAPED BATTERS

**site details:**  
MINIMI ROAD, FLETCHER  
**client:**  
NORTHWEST RESIDENTIAL  
**date:**  
DECEMBER 2015  
**job number:**  
9496.5  
**scale:**  
1-2000 @ A3  
**drawn:**  
SGK  
**rev. number:**  
B







7.5 DRAWINGS VMP-02

principals:  
phillip williams  
steve rushworth  
ABN:  
67 129 348 842  
phone:  
+61 2 4929 4926  
Fax:  
+61 2 4926 3069  
address:  
412 king st, newcastle,  
nsw 2300  
[www.terras.com.au](http://www.terras.com.au)



# vegetation management plan

## outlook stage 10

# 02

december 2015



**site details:**  
MINIMI ROAD, FLETCHER  
**client:**  
NORTHWEST RESIDENTIAL  
**date:**  
DECEMBER 2015  
**job number:**  
9496.5  
**scale:**  
1:2000 @ A3  
**drawn:**  
SGK  
**rev. number:**  
B





7.6 DRAWINGS VMP-03

principals:  
phillip williams  
steve rushworth  
ABN:  
67 129 348 842  
phone:  
+61 2 4929 4926  
Fax:  
+61 2 4926 3069  
address:  
412 king st, newcastle,  
nsw 2300  
[www.terras.com.au](http://www.terras.com.au)

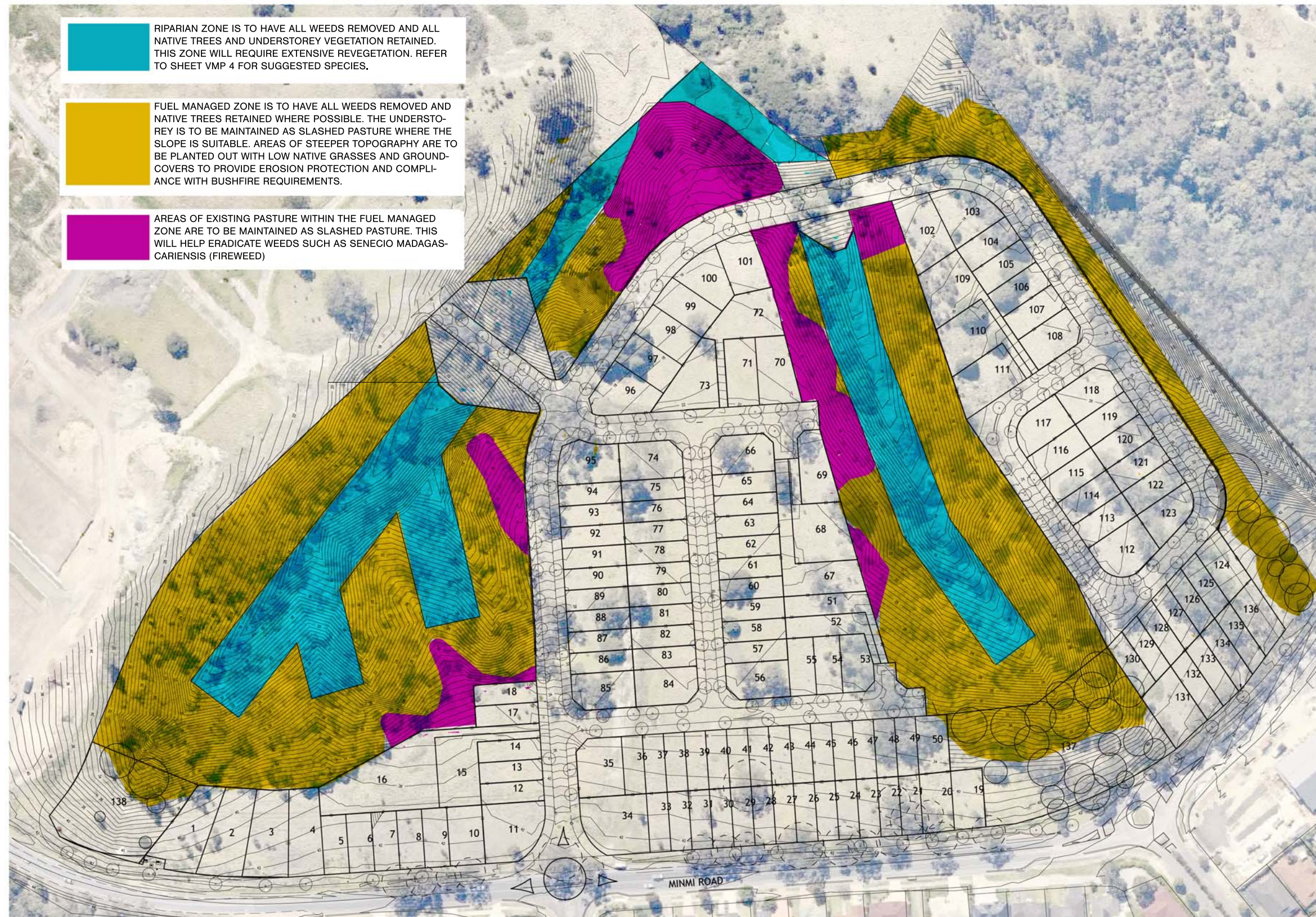


# vegetation management plan

## outlook stage 10

# 03

december 2015



**site details:**  
MINMI ROAD, FLETCHER  
**client:**  
NORTHWEST RESIDENTIAL  
**date:**  
DECEMBER 2015  
**job number:**  
9496.5  
**scale:**  
1:2000 @ A3  
**drawn:**  
SGK  
**rev. number:**  
B





7.7 DRAWINGS VMP-04

principals:  
phillip williams  
steve rushworth  
ABN:  
67 129 348 842  
phone:  
+61 2 4929 4926  
Fax:  
+61 2 4926 3069  
address:  
412 king st, newcastle,  
nsw 2300  
[www.terras.com.au](http://www.terras.com.au)

# vegetation management plan

## outlook stage 10

04

december 2015

### Suggested re-vegetation species

Botanical Name	Common Name	Pot Size
<b>Trees</b>		
<i>Alphitonia excelsa</i>	Red Ash	2.5litre
<i>Eucalyptus grandis</i>	Flooded Gum	2.5 litre
<i>Eucalyptus saligna</i>	Blue Gum	2.5 litre
<i>Glochidion ferdinandi</i>	Cheese Tree	2.5 litre
<i>Syncarpia glomulifera</i>	Turpentine	2.5 litre
<i>Hymenosporum flavum</i>	Native Frangipani	2.5 litre
<b>Shrubs</b>		
<i>Acacia falcata</i>	Wattle	tubestock
<i>Breynia oblongifolia</i>	Coffee Bush	tubestock
<i>Ficus coronata</i>	Sandpaper Fig	tubestock
<i>Hibiscus heterophyllus</i>	Native Rosella	tubestock
<i>Melaleuca linariifolia</i>	Snow in Summer	tubestock
<i>Melaleuca stypheloides</i>	Prickly Paper Bark	tubestock
<i>Polyscias sambucifolius</i>	Elderberry Panax	tubestock
<b>Groundcovers and Grasses</b>		
<i>Carex appressa</i>	Tussock Sedge	tubestock
<i>Cissus antarctica</i>	Kangaroo Vine	tubestock
<i>Commersonia fraseri</i>	Brush Kurrajong	tubestock
<i>Cymbopogon refractus</i>	Barbed Wire Grass	tubestock
<i>Dianella caerulea</i>	Flax Lily	tubestock
<i>Kennedia rubicunda</i>	Dusky Coral Pea	tubestock
<i>Hardenbergia violacea</i>	Native Sarsparilla	tubestock
<i>Hibbertia scandens</i>	Twining Guinea Flower	tubestock
<i>Imperata cylindrica</i>	Blady Grass	tubestock
<i>Lomandra longifolia</i>	Spiny Matt-Rush	tubestock
<i>Themeda australis</i>	Kangaroo Grass	tubestock
<i>Viola hederacea</i>	Native Violet	tubestock



Alphitonia excelsa (Red Ash)



Eucalyptus grandis (Flooded Gum)



Glochidion ferdinandi (Cheese Tree)



Syncarpia glomulifera (Turpentine)



Carex appressa (Tall Rush)



Kennedia rubicunda (Dusky Coral Pea)



Lomandra longifolia (Spiny Matt-Rush)



Hibbertia scandens (Twining Guinea Flower)



Hardenbergia violacea (False Sarsparilla)



Hibiscus heterophyllus (Native Rosella)

**site details:**  
MINIMI ROAD, FLETCHER  
**client:**  
NORTHWEST RESIDENTIAL  
**date:**  
DECEMBER 2015  
**job number:**  
9496.5  
**scale:**  
N/A  
**drawn:**  
SGK  
**rev. number:**  
B

## 7.8 SITE IMAGES

The following images are intended to act as a reference and document the condition of the site's vegetation at the time fieldwork was undertaken.



Image 1.

Lantana camara forms an impenetrable barrier around the perimeter of the gullies.





Image 2.  
Pasture areas around the gully.

principals:  
phillip williams  
steve rushworth  
ABN:  
67 129 348 842  
phone:  
+61 2 4929 4926  
Fax:  
+61 2 4926 3069  
address:  
412 king st, newcastle,  
nsw 2300  
[www.terras.com.au](http://www.terras.com.au)



Image 3.

Many of the trees along Minmi Road have a short Useful Life Expectancy.



Image 4.

Lantana infestation in upper slope areas.





Image 5.

A number of trees have germinated since grazing has ceased.

## **Attachment 4**

Overlay of the existing and proposed subdivision layout





LEGEND

- PROPOSED LOT BDY
- EXISTING APPROVED BDY

drawing title:

OUTLOOK STAGE 10  
APPROVED BOUNDARY  
OVERLAY

location: OUTLOOK ESTATE  
MINIMI ROAD FLETCHER

council: NEWCASTLE

dwg ref: ESK-004 pm: ND

client:  
NORTHWEST  
RESIDENTIAL



central coast office ph: (02) 4305 4300  
hunter office ph: (02) 4978 5100

www.adwjohanson.com.au

ver.	date	comment	drawn	level information	scale (A3 original size)
A	30.10.15	FOR INFORMATION	JD	DATUM: N/A CONTOUR INTERVAL:	0 30 60 75m SCALE: 1:1500 (FULL)

working beyond expectations

## **Attachment 5**

### **Traffic Impact Assessment**



# Northwest Residential Pty Ltd.

## Outlook Estate Stage 10

### Traffic Impact Assessment

December 2015



# Table of contents

1.	Introduction.....	1
1.1	Location of the proposal .....	1
1.2	Purpose of this report.....	2
1.3	Limitations .....	2
1.4	Study assumptions.....	2
2.	Existing Conditions.....	3
2.1	Existing road characteristics .....	3
2.2	Existing traffic volumes .....	5
2.3	Existing intersection performance.....	7
2.4	Crash statistics.....	8
2.5	Public transport .....	9
2.6	Pedestrian and bicycle facilities .....	11
2.7	Key findings .....	11
3.	Proposed development .....	12
3.1	Proposal overview.....	12
4.	Traffic impact assessment .....	14
4.1	Projected traffic generation .....	14
4.2	Traffic distribution.....	14
4.1	Intersection performance .....	15
4.2	Public transport .....	18
4.3	Pedestrian and bicycle facilities .....	18
4.4	Key findings .....	18
5.	Access and parking .....	19
5.1	Development access.....	19
5.2	Proposed road widths within Stage 10 .....	19
5.3	Sight distance for driveways .....	19
5.4	Parking.....	20
5.5	Key findings .....	20
6.	Summary and conclusions .....	21
6.1	Key findings .....	21
6.2	Conclusion .....	21

## Table index

Table 2-1 Surveyed traffic volumes – 2015.....	6
Table 2-2 Surveyed traffic volumes – October 2015.....	6

Table 2-3 Heavy vehicles – volumes and proportion - 2015 .....	7
Table 2-4 Level of Service (LoS) criteria for intersections .....	8
Table 2-5 Existing intersection performance (2015) .....	8
Table 4-1 Traffic generation by land use.....	14
Table 4-2 Traffic generation based on lot location (per hour) .....	14
Table 4-3 Peak hour traffic distribution -percentage split.....	15
Table 4-4 Intersection performance AM and PM peak hour –traffic conditions 2016 (without development) .....	16
Table 4-5 Intersection performance AM and PM peak hour –traffic conditions 2016 (with development) .....	17
Table 4-6 Intersection performance AM and PM peak hour –traffic conditions 2026 (without development) .....	17
Table 4-7 Intersection performance AM and PM peak hour –traffic conditions 2026 (with development) .....	18

## Figure index

Figure 1 Proposal site location .....	1
Figure 2 Minmi Road facing east from Highland Way.....	4
Figure 3 Minmi Road facing west at Highland Way .....	4
Figure 4 Highland Way facing south from Minmi Road.....	5
Figure 5 Highland Way facing north at Minmi Road.....	5
Figure 6 Crash study area .....	9
Figure 7 Bus route 260 – Minmi to Stockland Jesmond via Fletcher, Maryland and Wallsend.....	10
Figure 8 Bus route 260 Stockland Jesmond to Minmi via Wallsend, Maryland and Fletcher .....	10
Figure 9 Bicycle paths .....	11
Figure 10 Stage 10 proposed lot layout .....	13
Figure 11 Potential trip distribution (Stage 10) – AM Peak .....	15
Figure 12 Potential trip distribution (Stage 10) – PM Peak .....	15
Figure 13 Proposed intersection layout.....	16
Figure 14 Driveway access locations.....	20

## Appendices

Appendix A – Traffic Surveys

Appendix B – Sidra Outputs

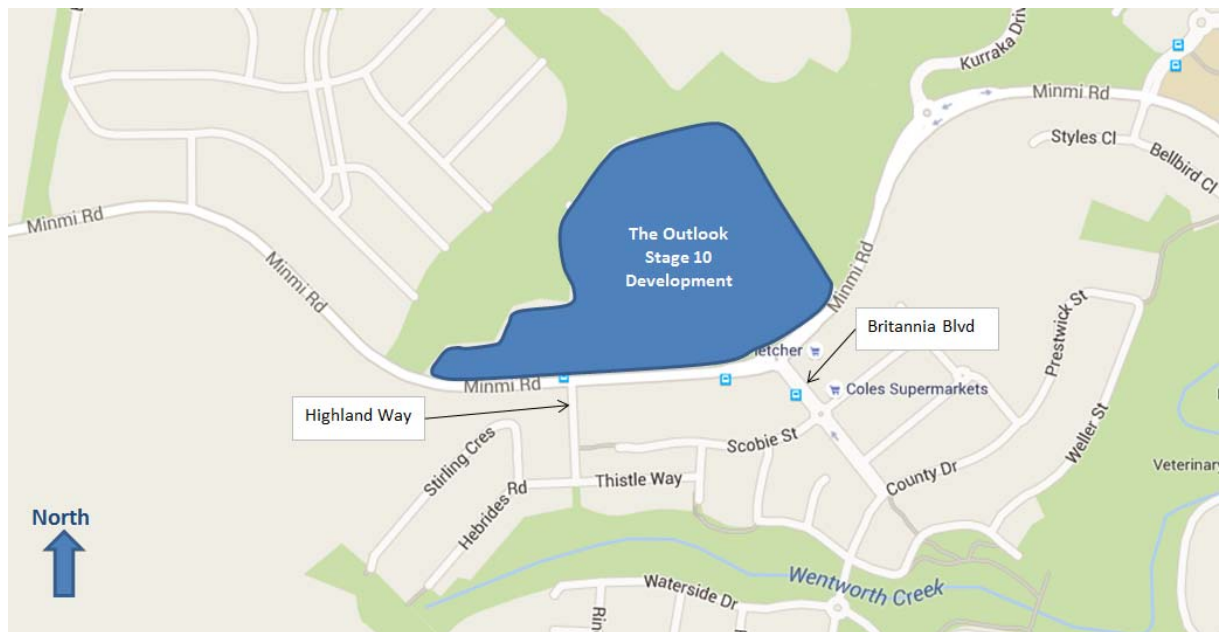
# 1. Introduction

Northwest Residential Pty Ltd has engaged GHD to undertake a traffic impact assessment in support of a Section 75W application pursuant to the Environmental Planning and Assessment Act 1979 to modify Concept Plan 06\_0031 and associated Project Approval relating to the Dan Land at 290 and 302 Minmi Road Fletcher. The proposed modification relates to Stage 10 of the development, and will result in an increase in the overall number of lots previously approved for the estate from 400 to 435. The assessment will focus on the impact the modified Stage 10 has on the intersection of Minmi Road and Highland Way and Minmi Road in the vicinity of the development.

## 1.1 Location of the proposal

Stage 10 of the Outlook Estate is located to the north of Minmi Road opposite Highland Way in West Fletcher as shown in Figure 1.

Figure 1 Proposal site location



Source: Google maps modified by GHD



## 1.2 Purpose of this report

This traffic impact assessment report discusses the following:

- Existing conditions – a review of existing road features, adjacent developments, traffic volumes, sight distances and crash data
- Proposal – provides details of the proposal and a review of additional traffic generated as a result
- Traffic impact assessment – provides an assessment of the performance of the existing intersections (queues, delays, level of service, safety) once the development is opened.

## 1.3 Limitations

This report: has been prepared by GHD for Northwest Residential Pty Ltd. and may only be used by Northwest Residential Pty Ltd. for the purpose agreed between GHD and the Northwest Residential Pty Ltd. as set out in section 1 of this report.

GHD otherwise disclaims responsibility to any person other than Northwest Residential Pty Ltd. arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report.

GHD disclaims liability arising from any of the assumptions being incorrect.

## 1.4 Study assumptions

This report has been limited by the following assumptions:

- Data collection has been limited to a seven day tube survey on Minmi Road and peak hour traffic intersection surveys at the intersection of Minmi Road and Highland Way, which have been provided by TCS for Surveys.
- Traffic generation has been based on the Stage 10 lot arrangement provided in the plan *Proposed Subdivision Outlook Stage 10, drawing reference MP-001 version E dated 26/10/15*. Refer to Figure 10.
- Proposed traffic generation from the development has been distributed on the surrounding road based on the existing traffic distribution determined from the traffic surveys.
- This report is based on a desktop study as agreed between GHD and North West Residential Pty Ltd and no site visits have been made.

Aerial photography dated 2015 from the Google Maps has been relied upon for the existing conditions of the road network and development patterns within the area.

## 2. Existing Conditions

This section provides an understanding of the existing road network conditions surrounding the site.

### 2.1 Existing road characteristics

#### 2.1.1 Functional road hierarchy

Roads are classified according to the functions they perform. The main purpose of defining a road's functional class is to provide a basis for establishing the policies which guide the management of the road according to their intended service or qualities. Functional road classification involves the relative balance of the mobility and access functions.

Roads and Maritime define four levels in a typical functional road hierarchy, ranking from high mobility and low accessibility, to high accessibility and low mobility. These road classes are:

**Arterial Roads** – controlled by Roads and Maritime, typically no limit in flow and designed to carry vehicles long distance between regional centres.

**Sub-Arterial Roads** – can be managed by either Council or Roads and Maritime under a joint agreement. Typically their operating capacity ranges between 10,000 and 20,000 vehicles per day, and their aim is to carry through traffic between specific areas in a sub region, or provide connectivity from arterial road routes (regional links).

**Collector Roads** – provide connectivity between local sites and the-arterial road network, and typically carry between 2,000 and 10,000 vehicles per day.

**Local Roads** – provide direct access to properties and the collector road system and typically carry between 500 and 4,000 vehicles per day.

#### 2.1.2 Minmi Road

Minmi Road adjacent to the study area operates as a collector road. Minmi Road in its entirety can be characterised as servicing two different functions, depending on the density of residential land use along its road frontage. Minmi Road between Maryland Drive West and Longworth Avenue is viewed to have a sub-arterial function servicing collector roads from recently developed and established residential centres. The function of this section of Minmi Road is to service local centres, education facilities and the Summerhill WMC, all of which are major generators of traffic during the commuter peak periods. The primary movement along this corridor is east-west between existing residential areas located in east Blue Gum Hills and Newcastle CBD, Wallsend and other major employment centres.

Minmi Road between Maryland Drive West and Brookfield Avenue is also viewed to have a sub-arterial function servicing collector roads from recently developed and future residential centres.

Minmi Road west of Brookfield Avenue is mostly rural in appearance with some ribbon type residential development at Highland County Estate and on the approach to Minmi Village. The road in this section of Minmi Road carries moderate levels of traffic.

The following are relevant characteristics of Minmi Road in the vicinity of the subject site:

- The speed environment is 70 km/h in rural settings and 60 km/h within or on approaches to urban development. This speed limit change occurs approximately 200 m west of the intersection with Highland Way. At this point, the speed of eastbound traffic travelling into Fletcher from Minmi is reduced from 70 km/h to 60 km/h and vice versa for westbound traffic

- The carriageway width varies between 7 and 13 m, incorporating two travel lanes, one in each direction, with double white centreline road markings
- A single circulating lane roundabout controls traffic at the intersection of Britannia Boulevard with Minmi Road. This access serves the eastern section of the Highland Way residential estate
- The intersection of Highland Way and Minmi Road is currently a T-intersection arrangement under give way traffic control. This access currently serves the western section of the Highland Way residential estate
- Footpaths are currently provided on southern side of the road.

Figure 2 Minmi Road facing east from Highland Way



Figure 3 Minmi Road facing west at Highland Way



### 2.1.3 Highland Way

Highland Way performs the function of a local road serving the western section of the Highland County residential estate. The following are relevant characteristics of Highland Way in the vicinity of the subject site:

- The speed environment is 50 km/h
- The carriageway is undivided and approximately 8 m wide
- Kerb and gutter runs along both sides of the road

- A 1.5 m wide footpath runs along the eastern side of the road
- The road provides access to local roads situated in the residential estate.

Figure 4 Highland Way facing south from Minmi Road



Figure 5 Highland Way facing north at Minmi Road



## 2.2 Existing traffic volumes

### 2.2.1 Existing daily volumes

Automated volume and classifications surveys were undertaken over a seven day period ending Tuesday 3<sup>rd</sup> November 2015 on Minmi Road east of Highland Way. The daily traffic volume is summarised in Table 2-1.



Table 2-1 Surveyed traffic volumes – 2015

Location	Direction	AM Peak Hour (8 am - 9 am) (vph)**	PM Peak Hour (3 pm – 4 pm) (vph)**	Daily (vpd)***
Minmi Road – East of Highland Way	Eastbound	416	362	3,928*
	Westbound	380	401	4,056*
	<b>Combined</b>	<b>796</b>	<b>763</b>	<b>7,984</b>

Notes:

1. \* the daily traffic volume has been based on the weekday average

2. \*\*(vph) = vehicles per hour.

### 2.2.2 Existing peak hour traffic

GHD engaged TCS for Surveys to undertake intersection counts during the AM and PM peak periods. The counts were undertaken on Tuesday 27th October 2015.

Table 2-2 summarises the existing surveyed traffic volumes at the intersection.

A copy of the intersection traffic survey data is provided in Appendix A.

Table 2-2 Surveyed traffic volumes – October 2015

Location	AM Peak Hour (7:45 am – 8:45 am) (vph)**	PM Peak Hour (4:45 pm – 5:45 pm) (vph)**	Daily (vpd)***
Minmi Road – east of Highland Way	819	712	7,984
Minmi Road – west of Highland Way	802	689	8,020*
Highland Way – south of Minmi Road	49	49	490*

Notes:

1. \* the daily traffic volume for these roads has been estimated based on the assumption that the peak hour traffic flow is approximately 10% of the daily traffic volume.

2. \*\*(vph) = vehicles per hour.

3. \*\*\* (vpd) = vehicles per day.

### 2.2.3 Heavy and light vehicle ratio

Table 2-3 provides an understanding of the heavy vehicle ratio for the surveyed intersections, based on the 2015 traffic survey.

Table 2-3 Heavy vehicles – volumes and proportion - 2015

Location	Vehicles per hour (vph)**	HCV* (vph)***	HCV* %
Minmi Road – east of Highland Way	819	30	4%
Minmi Road – west of Highland Way	802	31	4%
Highland Way – south of Minmi Road	49	3	6%

Note:

1. \* HCV – heavy commercial vehicles

2. \*\* (vpd) = vehicles per day.

## 2.3 Existing intersection performance

The performance of the existing road network is largely dependent on the operating performance of key intersections, which are critical capacity control points on the road network. SIDRA 6.1 intersection modelling software was used to assess the proposed peak hour operating performance of intersections on the surrounding road network. The criteria for evaluating the operational performance of intersections is provided by the Roads and Maritime Services *Guide to Traffic Generating Developments* 2002 and reproduced in Table 2-4. The criteria for evaluating the operational performance of intersections is based on a qualitative measure (i.e. Level of Service), which is applied to each band of average vehicle delay.

Table 2-4 Level of Service (LoS) criteria for intersections

Level of Service	Average Delay per Vehicle (secs/veh)	Traffic Signals, Roundabouts	Give Way & Stop Signs
A	< 14	Good operation	Good operation
B	15 to 28	Good with acceptable delays & spare capacity	Acceptable delays & spare capacity
C	29 to 42	Satisfactory	Satisfactory, but accident study required
D	43 to 56	Operating near capacity	Near capacity & accident study required
E	57 to 70	At capacity; at signals, incidents will cause excessive delays Roundabouts require other control modes	At capacity, requires other control mode
F	> 70	Over Capacity Unstable operation	Over Capacity Unstable operation

Source: Guide to Traffic Generating Developments (Roads and Maritime 2002)

Notes:

1. The average delay for priority-controlled intersections is selected from the movement on the approach with the highest average delay.
2. The level of service (LoS) for priority-controlled intersections is based on the highest average delay per vehicle for the most critical movement.
3. The degree of saturation is defined as the ratio of the arrival flow (demand) to the capacity of each approach.

The 2015 traffic flows were analysed using SIDRA to obtain the current operation of the intersection of Minmi Road and Highland Way. The results of the 2015 SIDRA assessment is summarised in Table 2-5. SIDRA outputs are provided in Appendix B.

Table 2-5 Existing intersection performance (2015)

Intersection	Priority Type	AM peak				PM peak			
		LoS	Average Delay (s)	Queue (m)	Degree of Saturation	LoS	Average Delay (s)	Queue (m)	Degree of Saturation
Minmi Road / Highland Way	Give way	A	9	1 (S)	0.22	A	8	1 (S)	0.19

Note:

1.\* Average delay is given in seconds per vehicle.

2.\*\* LoS – Level of Service

Table 2-5 indicates that the existing intersection of Minmi Road and Highway Way currently operates with spare capacity in both the AM and PM peaks.

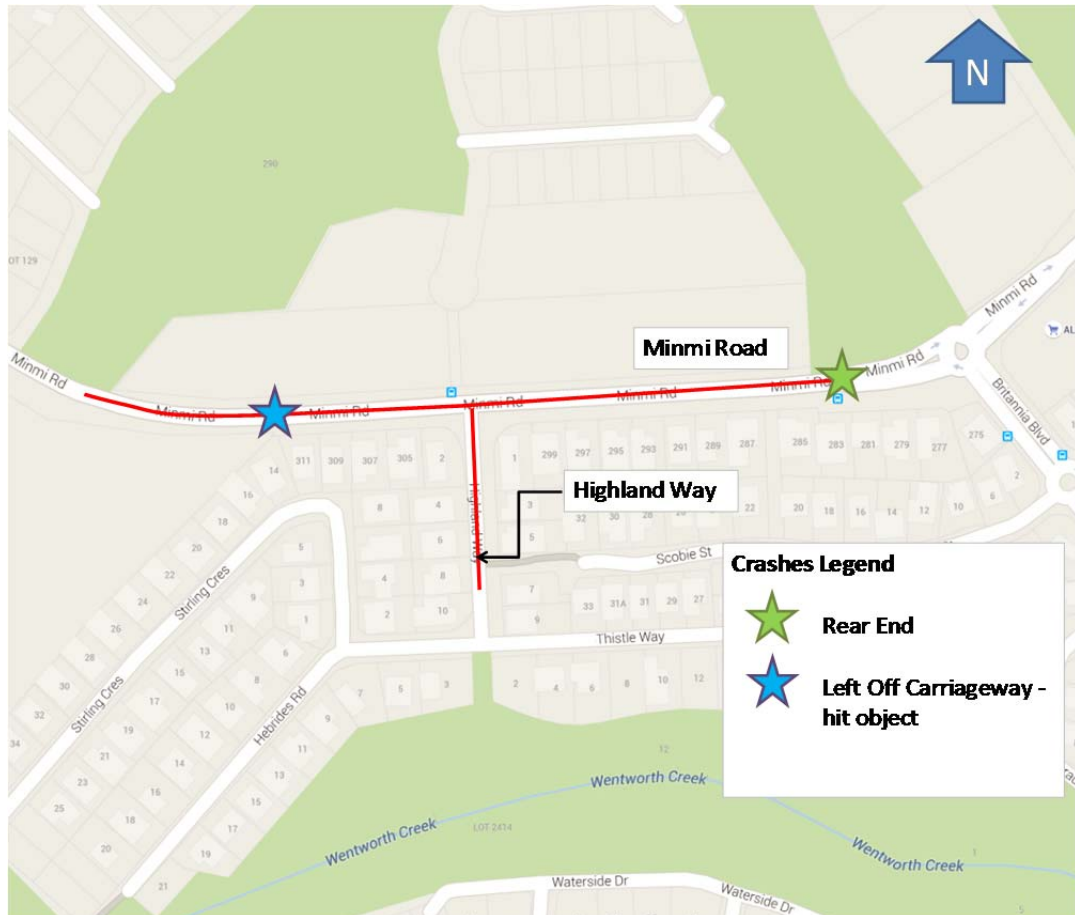
## 2.4 Crash statistics

Roads and Maritime has provided GHD with crash history for the past five years, from 2010 to 2015.

A total of two crashes were reported within the study area as shown in Figure 6. Both crashes resulted in no injuries.



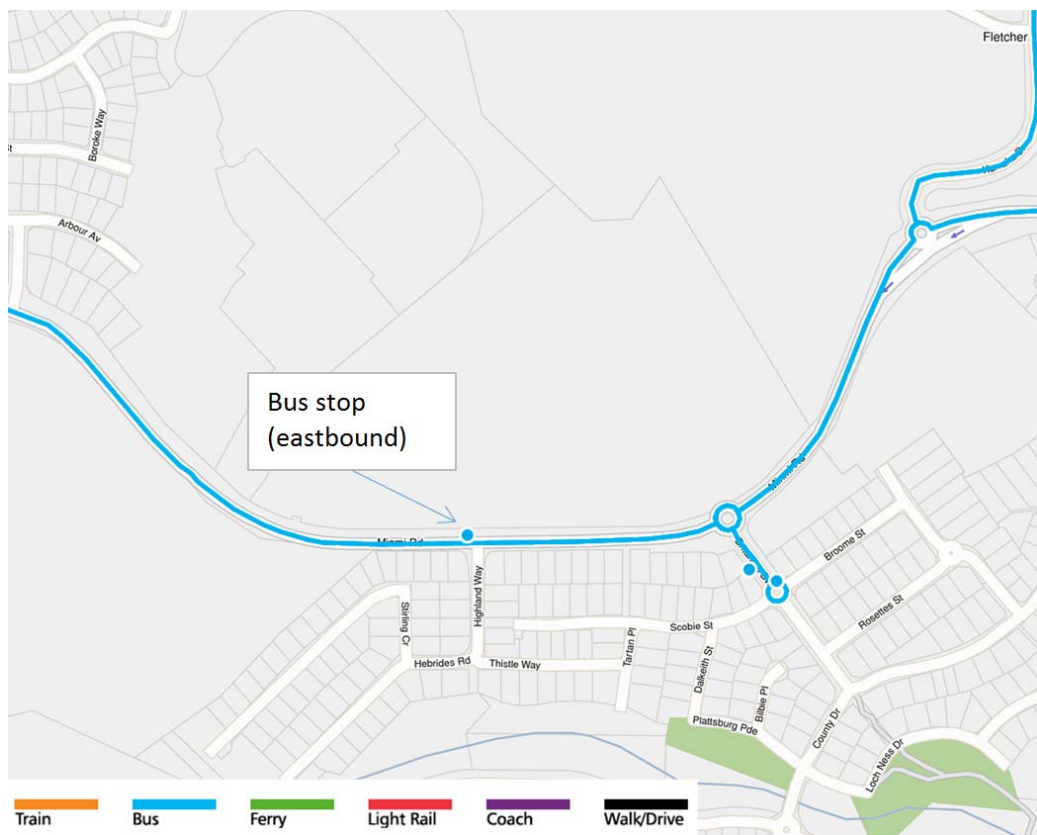
Figure 6 Crash study area



## 2.5 Public transport

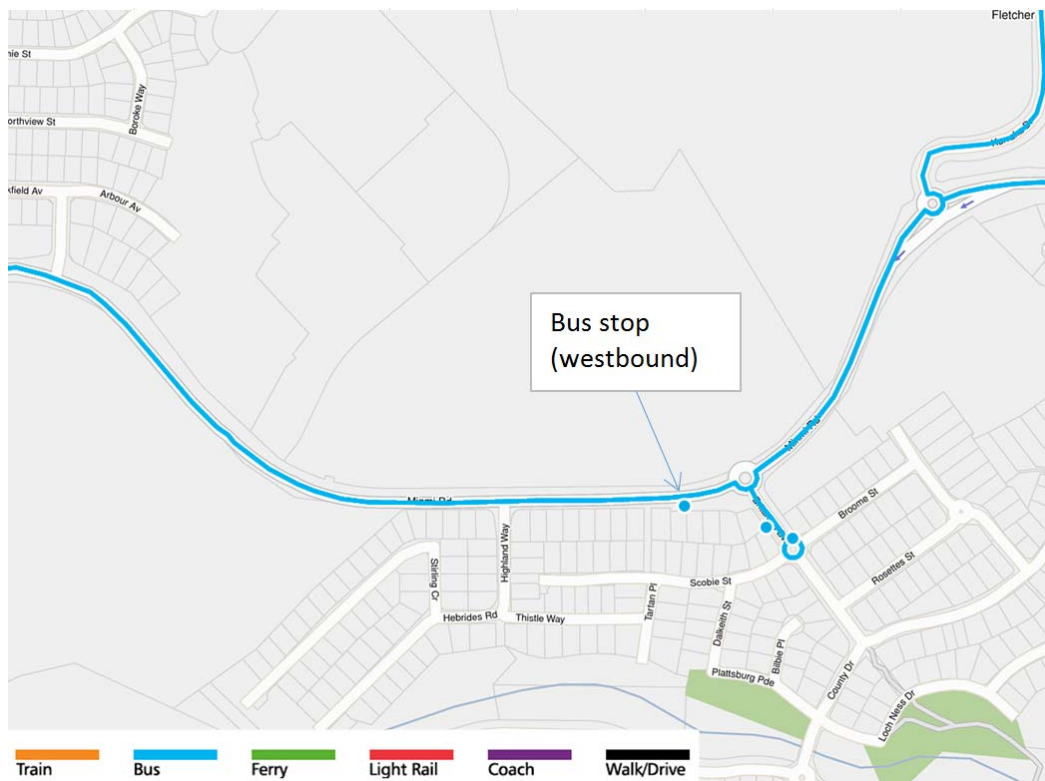
Bus route 260 is the only service that operates along Minmi Road. This service travels between Minmi and Stockland Jesmond via Wallsend, Maryland and Fletcher. There are two bus stops located within the study area as seen in Figure 7 and Figure 8, one on the northern side of Minmi Road at Highland Way, and another on the southern side of Minmi Road close to Britannia Boulevard. This bus route has five services operating in the morning peak between 6:00 – 9:30 am heading eastbound on Minmi Road. Between 3:00 pm and 7:00 pm, this bus route operates four services. There are six services operating eastbound and eight services operating westbound daily.

Figure 7 Bus route 260 – Minmi to Stockland Jesmond via Fletcher, Maryland and Wallsend



Source: Transport for NSW

Figure 8 Bus route 260 Stockland Jesmond to Minmi via Wallsend, Maryland and Fletcher

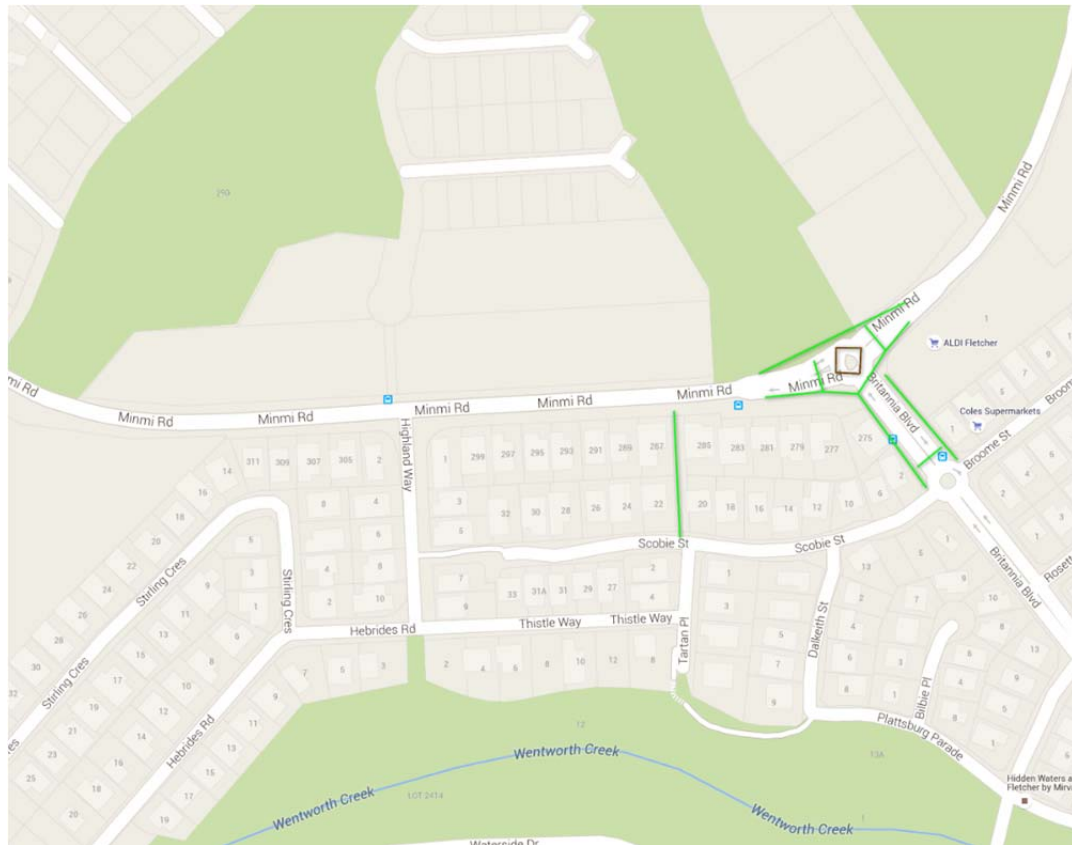


Source: Transport for NSW

## 2.6 Pedestrian and bicycle facilities

There is limited bicycle infrastructure in the study area with no formal bike lanes on Minmi Road, apart from some shared pedestrian cycle paths at the Minmi Road / Britannia Boulevard roundabout as shown in Figure 9 . Currently there is a footpath on the southern side of Minmi Road within the study area. The northern side currently does not have any formal footpath, apart from at the intersection of Minmi Road / Britannia Boulevard.

Figure 9 Bicycle paths



Source: Cycle Finder-Transport for NSW

## 2.7 Key findings

The existing intersection of Minmi Road and Highway Way currently operates with spare capacity in both the AM and PM peaks.

## 3. Proposed development

### 3.1 Proposal overview

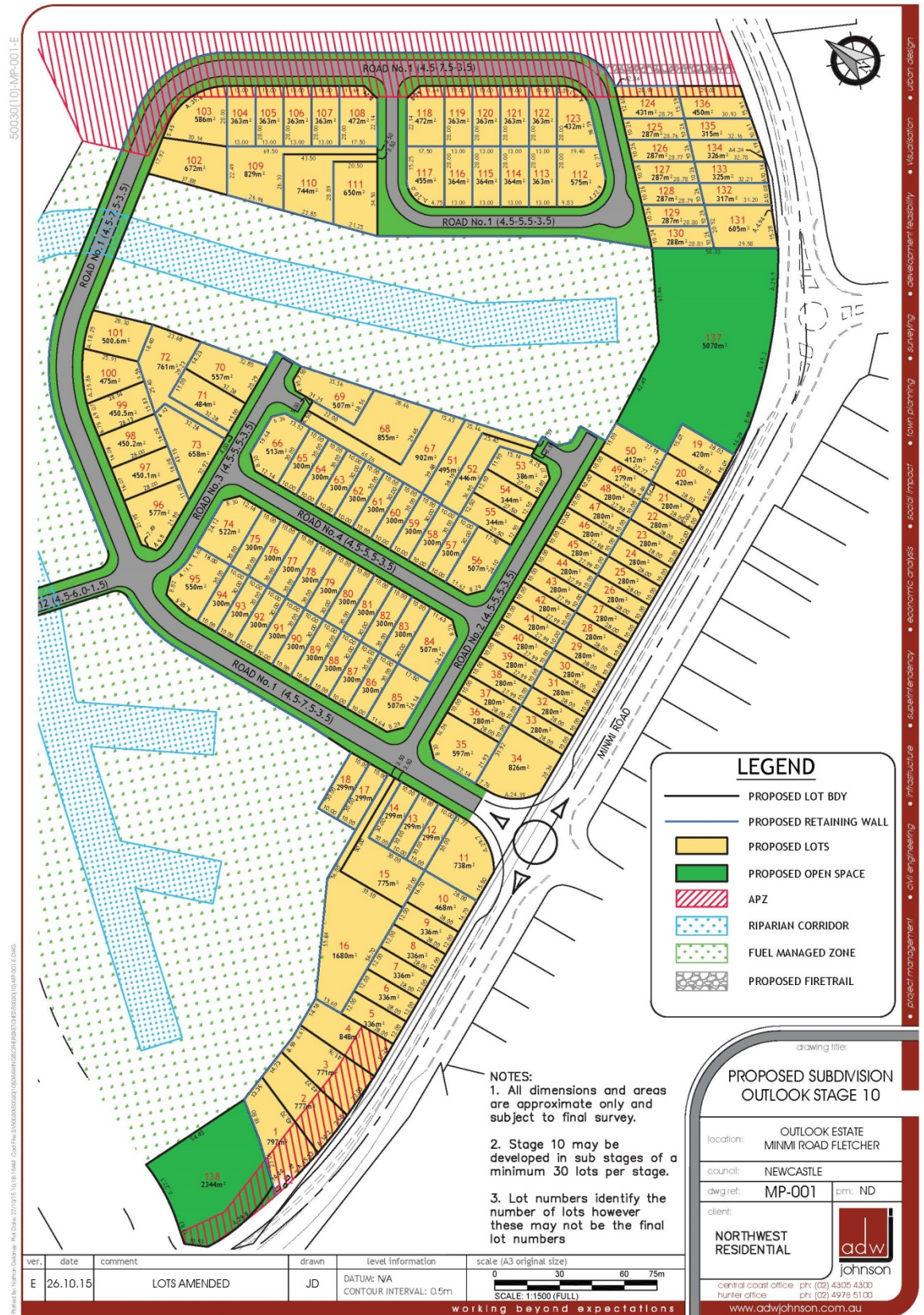
A modification has been submitted for Stage 10 of the Outlook Estate which has resulted in an increase in the number of lots previously approved. As a previous assessment for the 400 lot development has previously been approved and it is understood that the modifications to Stage 10 will mean that the total development for the Outlook Estate will be in the order of 435 lots an increase of 35 lots. The modified lot layout plan for Stage 10 provides 136 lots. This assessment focuses on the impact Stage 10 has on the intersection of Minmi Road and Highland Way and Minmi Road in the vicinity of the development.

The expected year of opening for Stage 10 is 2016.

Figure 10 shows the modified lot layout for Stage 10.



Figure 10 Stage 10 proposed lot layout



## 4. Traffic impact assessment

### 4.1 Projected traffic generation

The modified lot layout plan for Stage 10 provides for 136 residential dwelling lots.

Of these, 105 lots will be accessed through the proposed Stage 10 access road which will connect to Minmi Road opposite Highland Way. 10 lots will have direct driveway access on Minmi Road to the west of Highland Way and 21 lots will have direct driveway access on Minmi Road to the east of Highland Way.

An indication of the potential traffic generation from the proposed development has been obtained from the Roads and Maritime *Guide to Traffic Generating Developments (2002)*.

Table 4-1 provides a summary of the potential traffic generation for Stage 10.

Table 4-1 Traffic generation by land use

Land use	No. lots	Daily traffic generation rate	Peak hour traffic generation rate	Daily trips	Peak hour trips
Dwelling houses	136	9.0 / dwelling	0.85 / dwelling	1,224	116
<b>Total</b>				<b>1,224</b>	<b>116</b>

Table 4-2 provides a summary of the potential traffic generation based on the lot access location.

Table 4-2 Traffic generation based on lot location (per hour)

Location	Land use	No. lots	Peak hour traffic generation rate	Peak hour trips
Stage 10 access road	Dwelling houses	105	0.85 / dwelling	89
Direct access to Minmi Road west of Highland Way	Dwelling houses	10	0.85 / dwelling	9
Direct access to Minmi Road east of Highland Way	Dwelling houses	21	0.85 / dwelling	18
<b>Total</b>				<b>116</b>

### 4.2 Traffic distribution

Each land use has a different characteristic in regards to the percentage of incoming and outgoing traffic within the AM and PM peak hour periods. Table 4-3 provides an understanding of the traffic generation percentage split used in the analysis for this particular development.

Table 4-3 Peak hour traffic distribution -percentage split

Land use	AM Peak IN	AM Peak OUT	PM Peak IN	PM Peak OUT	Comments
Residential	20%	80%	80%	20%	Residents departing in the AM and returning in the PM

The traffic surveys undertaken as part of this assessment indicated that that traffic flow on Minmi Road was around 50 per cent westbound and 50 per cent eastbound. Therefore the development traffic has been based on the existing distribution. The potential traffic generation and distribution for the AM and PM peaks are shown in Figure 11 and Figure 12.

Figure 11 Potential trip distribution (Stage 10) – AM Peak

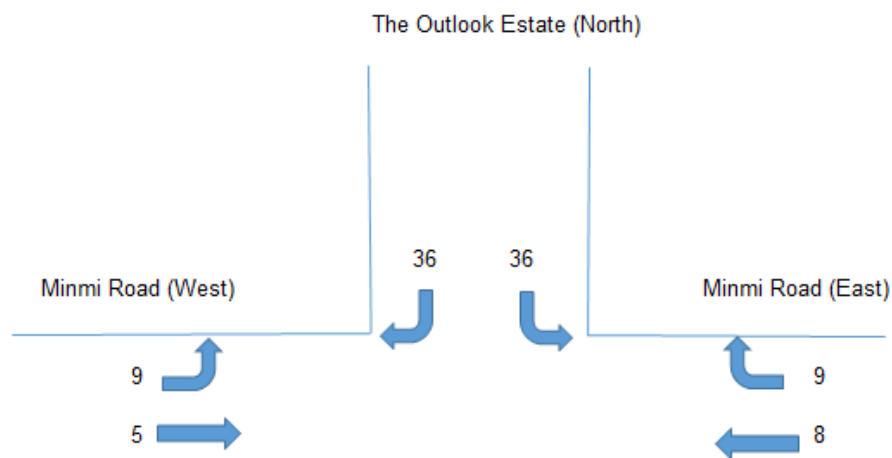
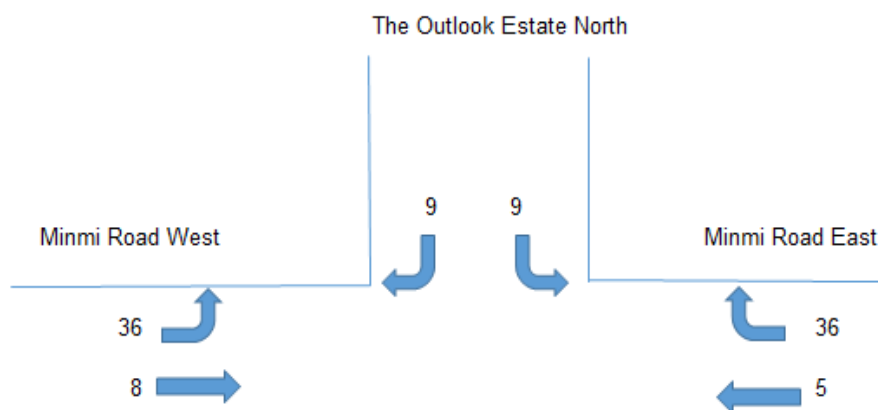


Figure 12 Potential trip distribution (Stage 10) – PM Peak



## 4.1 Intersection performance

### 4.1.1 Background traffic growth

In the report titled *Rezoning and Residential Subdivision Traffic Study* (GHD 2006) an annual growth rate of five per cent was used to forecast traffic volumes for Minmi Road. For the purpose of assessing this proposal five percent per annum has been assumed for background traffic growth.

#### 4.1.2 2016 Intersection operating performance

The future traffic volumes have been calculated by adding the traffic growth as outlined in Section 4.1.1 to the 2015 surveyed traffic flows presented in Table 2-2. Table 4-4 provides an understanding of the intersection performance in 2016 without adding the development traffic.

**Table 4-4 Intersection performance AM and PM peak hour –traffic conditions 2016 (without development)**

Intersection	Priority Type	AM peak				PM peak			
		LoS	Average Delay (s)	Queue (m)	Degree of Saturation	LoS	Average Delay (s)	Queue (m)	Degree of Saturation
Minmi Road / Highland Way	Give way	A	9	1 (S)	0.23	A	8	1 (W)	0.20

Table 4-4 shows that the existing intersection based on 2016 traffic conditions without the development traffic from Stage 10 would operate with spare capacity in both the AM and PM peak.

The proposed stage 10 development includes an upgrade of the intersection of Minmi Road, Highland Way to a roundabout to include the Stage 10 access road as shown in Figure 13.

**Figure 13 Proposed intersection layout**

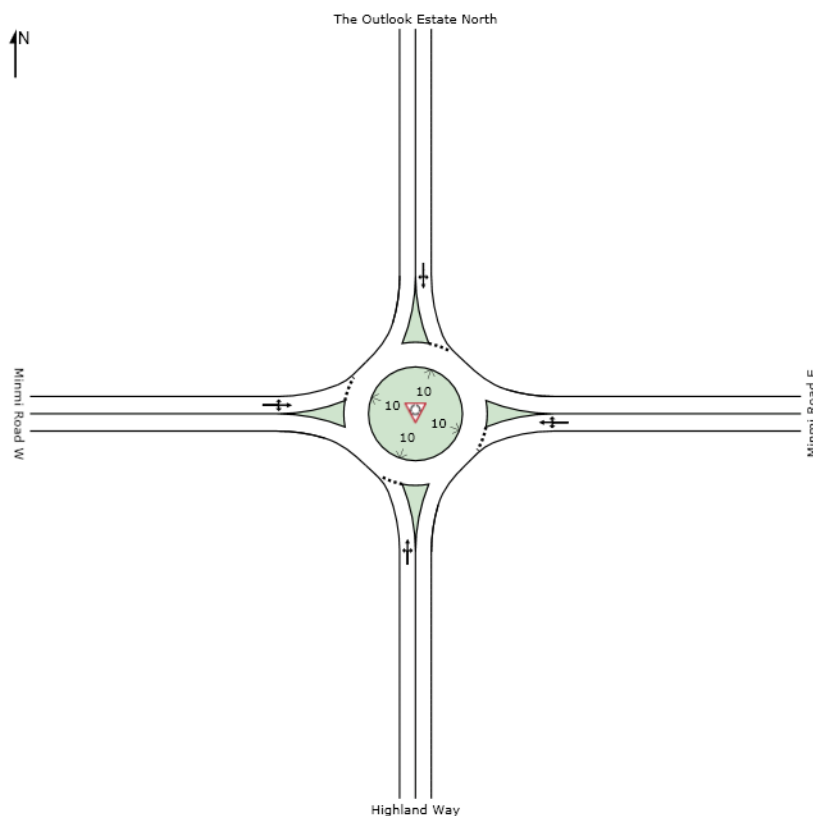


Table 4-5 provides a comparison analysis of the surrounding network intersection performance when the traffic from the development has been included.



Table 4-5 Intersection performance AM and PM peak hour –traffic conditions  
2016 (with development)

Intersection	Priority Type	AM peak				PM peak			
		LoS	Average Delay (s)	Queue (m)	Degree of Saturation	LoS	Average Delay (s)	Queue (m)	Degree of Saturation
Minmi Road / Highland Way	Roundabout	A	11	17 (W)	0.31	A	10	14 (W)	0.30

Table 4-5 shows that the proposed roundabout would operate with spare capacity at LoS A in 2016 once Stage 10 of the Outlook Estate has been developed.

#### 4.1.1 Future horizon year

A ten year horizon post development (2026) was analysed to assess the impact of the background traffic growth and development on the intersection of Minmi Road and Highland Way.

Our understanding of the timing of completion of various stages of the Outlook Estate is as follows:

- Stages 1 – 5 are already constructed and therefore the traffic generated is included in traffic surveys undertaken
- Stage 6 constructed but no dwellings to date (39 lots)
- Stage 7 to be completed 2016 (24 lots)
- Stage 8 to be completed 2016 (40 lots)
- Stage 9 to be 2017 (12 lots)

In total an additional 115 lots are yet to be constructed as part of other stages within the Outlook Estate development. The traffic generation from the above stages has been distributed onto Minmi Road along with the traffic growth discussed in Section 4.1.1 for the years 2018 through to 2026 to allow for potential development in the background growth.

Table 4-6 provides an understanding of the intersection performance in 2026 without adding the development traffic from Stage 10, this analysis is based on the current priority controlled layout.

Table 4-6 Intersection performance AM and PM peak hour –traffic conditions  
2026 (without development)

Intersection	Priority Type	AM peak				PM peak			
		LoS	Average Delay (s)	Queue	Degree of Saturation	LoS	Average Delay (s)	Queue	Degree of Saturation
Minmi Road / Highland Way	Give way	B	16	2(S)	0.36	A	12	1 (W)	0.30

Table 4-6 shows that in 2026 the existing priority controlled intersection would be operating with spare capacity when including expected background traffic growth.

Table 4-7 provides a comparison analysis of the intersection performance of Minmi Road and Highland Way when the traffic from Stage 10 has been included. This analysis has been based on the proposed roundabout which includes the new access road to Stage 10.

Table 4-7 Intersection performance AM and PM peak hour –traffic conditions  
2026 (with development)

Intersection	Priority Type	AM peak				PM peak			
		LoS	Average Delay (s)	Queue	Degree of Saturation	LoS	Average Delay (s)	Queue	Degree of Saturation
Minmi Road / Highland Way	Roundabout	A	14	33 (W)	0.48	A	11	24 (W)	0.43

Table 4-7 shows that when including background traffic growth and the proposed Stage 10 traffic generation for 2026 the proposed roundabout would operate with spare capacity at LoS A in both the AM and PM peaks.

## 4.2 Public transport

The existing bus stop located on the northern side of Minmi Road west of Highland Way may need to be relocated further west to ensure its proximity is not too close to the proposed roundabout. This should be incorporated into the roundabout design plans.

The new bus stop will need to be designed and installed in accordance to council specifications to meet the Disability Standard for Accessible Public Transport and be placed a minimum of 23 metres away from the roundabout to comply with Australian Road Rules. The bus stop can be placed near driveways as long as the front and rear doors of a standard 12.5 metre bus are close and adjacent to the kerb, with the kerb being the standard height at these locations.

## 4.3 Pedestrian and bicycle facilities

As part of the Stage 10 development a footpath and bicycle lane will be constructed along the northern side of Minmi Road adjacent to the Stage 10 development.

## 4.4 Key findings

The existing priority controlled intersection would operate with spare capacity when including expected background traffic growth in 2026.

When including background traffic growth and the proposed Stage 10 traffic generation for 2026 the proposed roundabout would operate with spare capacity at LoS A in both the AM and PM peaks.

## 5. Access and parking

This section addresses the parking and access provisions and requirements for the proposed development.

### 5.1 Development access

Stage 10 of the Outlook Estate will be accessed through a new road which will connect directly onto Minmi Road at a proposed roundabout with Minmi Road and Highland Way as shown in Figure 10.

There are several lots which will have direct driveway access onto Minmi Road. The environment of Minmi Road is changing with the residential developments taking place and this direct access from Stage 10 is consistent with other development along Minmi Road. It is recommended that the existing speed limit change location on Minmi Road west of Highland Way be reviewed and moved further west to provide a lower speed environment on Minmi Road through the residential areas.

The proposed roundabout would provide a traffic calming device on Minmi Road by providing a slowing point for vehicles travelling east and west on Minmi Road.

### 5.2 Proposed road reservation widths within Stage 10

Commitment A3.1 of the Statement of Commitments which formed part of the original approval in 2006 sets a requirement for local streets road reservation to have a width of 15.5 m. The Stage 10 proposed layout adopts a local street road reservation width of 13.5 m, which is the same as the reservation widths under the current approval for Stage 10.

The Stage 10 development consists of local roads within the estate and there is no connection through road to other developments. The reduced carriageway widths would provide a low-speed traffic environment servicing local access within the estate. As this estate is solely residential dwellings it is envisaged that on street manoeuvring and parking opportunities will be sufficient for the estate.

### 5.3 Sight distance for driveways

Actual driveway locations within individual lots have not yet been determined and will be provided as part of the development application for individual lots.

Driveways will need to be located to provide adequate entering sight distance to traffic on the road frontage and sight distance to pedestrians. Adequate sight distance for a 60 km/h road for a domestic driveway is 55 metres as outlined in Figure 3.2 of AS 2890.1. Adequate sight distance for driveways on Minmi Road can be obtained.

The lots located in the vicinity of the proposed roundabout should provide there driveway locations to the furthest boundary from the roundabout as shown in Figure 14.

.

Figure 14 Driveway access locations



## 5.4 Parking

Based on Newcastle City Council's DCP each residential development lot will need to provide the following parking provisions:

- One space per dwelling < 125 m<sup>2</sup>
- Two spaces per dwelling >125 m<sup>2</sup>

This will be assessed as part of the individual development applications for each lot.

## 5.5 Key findings

The proposed roundabout provide a traffic calming device on Minmi Road by providing a slowing point for vehicles travelling east and west on Minmi Road.

Adequate sight distance for driveways on Minmi Road can be obtained.



## 6. Summary and conclusions

### 6.1 Key findings

The existing intersection of Minmi Road and Highway Way currently operates with spare capacity in both the AM and PM peaks.

The existing priority controlled intersection would operate with spare capacity when including expected background traffic growth in 2026.

When including background traffic growth and the proposed Stage 10 traffic generation for 2026 the proposed roundabout would operate with spare capacity at LoS A in both the AM and PM peaks.

The proposed roundabout provide a traffic calming device on Minmi Road by providing a slowing point for vehicles travelling east and west on Minmi Road.

Adequate sight distance for driveways on Minmi Road can be obtained.

### 6.2 Conclusion

This traffic assessment for the modification to Stage 10 of the Outlook Estate indicates that the modifications to Stage 10 would not adversely impact on the operation and amenity of Minmi Road.

## Appendices

# Appendix A – Traffic Surveys

## **TCS Instruments**

### **Weekly Vehicle Counts (Virtual Week)**



#### **Datasets:**

**Site:** [00-001-EB-WB-] MINMI RD EAST OF HIGHLAND WAY  
**Direction:** 8 - East bound A>B, West bound B>A. **Lane:** 0  
**Survey Duration:** 9:30 Monday, 26 October 2015 => 8:12 Tuesday, 3 November 2015  
**Zone:** Australia (VIC ACT NSW)  
**File:** 00-001-EB-WB-03Nov2015.EC0 (Plus)  
**Identifier:** M755VSYY MC56-6 [MC55] (c)Microcom 02/03/01  
**Algorithm:** Factory default (v3.21 - 15275)  
**Data type:** Axle sensors - Paired (Class/Speed/Count)

#### **Profile:**

**Filter time:** 0:00 Tuesday, 27 October 2015 => 0:00 Tuesday, 3 November 2015  
**Included classes:** 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12  
**Speed range:** 0 - 200 km/h.  
**Direction:** West (bound)  
**Separation:** All - (Headway)  
**Name:** Default Profile  
**Scheme:** Vehicle classification (AustRoads94)  
**Units:** Metric (meter, kilometer, m/s, km/h, kg, tonne)  
**In profile:** Vehicles = 26618 / 57939 (45.94%)

Weekly Vehicle Counts (Virtual Week)

VirtWeeklyVehicle-6297  
Site: 00-001-EB-WB-.0.0EW  
Description: MINMI RD EAST OF HIGHLAND WAY  
Filter time: 0:00 Tuesday, 27 October 2015 => 0:00 Tuesday, 3 November 2015  
Scheme: Vehicle classification (AustRoads94)  
Filter: Cls(1 2 3 4 5 6 7 8 9 10 11 12 ) Dir(W) Sp(0,200) Headway(>0)

	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Averages	
								1 - 5	1 - 7
Hour									
0000-0100	5.0	9.0	10.0	10.0	17.0	32.0	34.0	10.2	16.7
0100-0200	5.0	3.0	3.0	5.0	6.0	12.0	23.0	4.4	8.1
0200-0300	6.0	3.0	7.0	4.0	4.0	5.0	12.0	4.8	5.9
0300-0400	15.0	9.0	16.0	13.0	12.0	11.0	9.0	13.0	12.1
0400-0500	55.0	57.0	51.0	61.0	51.0	13.0	23.0	55.0	44.4
0500-0600	134.0	126.0	134.0	132.0	135.0	60.0	43.0	132.2	109.1
0600-0700	228.0	226.0	233.0	249.0	235.0	79.0	45.0	234.2	185.0
0700-0800	268.0	282.0	299.0	293.0	275.0	156.0	67.0	283.4	234.3
0800-0900	364.0<	364.0<	398.0<	410.0<	362.0<	185.0	122.0	379.6<	315.0<
0900-1000	202.0	214.0	227.0	255.0	206.0	233.0	185.0	220.8	217.4
1000-1100	163.0	177.0	183.0	211.0	207.0	305.0<	233.0	188.2	211.3
1100-1200	202.0	194.0	163.0	196.0	216.0	277.0	241.0<	194.2	212.7
1200-1300	214.0	171.0	185.0	179.0	224.0	298.0<	248.0<	194.6	217.0
1300-1400	206.0	182.0	203.0	168.0	208.0	243.0	247.0	193.4	208.1
1400-1500	245.0	203.0	222.0	247.0	276.0	255.0	227.0	238.6	239.3
1500-1600	412.0<	397.0<	385.0<	404.0<	410.0<	278.0	218.0	401.6<	357.7<
1600-1700	326.0	313.0	364.0	364.0	367.0	216.0	208.0	346.8	308.3
1700-1800	368.0	331.0	366.0	350.0	376.0	220.0	195.0	358.2	315.1
1800-1900	204.0	188.0	229.0	218.0	273.0	182.0	146.0	222.4	205.7
1900-2000	131.0	142.0	125.0	140.0	182.0	140.0	111.0	144.0	138.7
2000-2100	70.0	92.0	97.0	96.0	113.0	88.0	98.0	93.6	93.4
2100-2200	75.0	68.0	79.0	101.0	81.0	82.0	61.0	80.8	78.1
2200-2300	33.0	31.0	40.0	35.0	61.0	65.0	34.0	40.0	42.7
2300-2400	14.0	12.0	17.0	33.0	38.0	62.0	7.0	22.8	26.1
Totals									
0700-1900	3174.0	3016.0	3224.0	3295.0	3400.0	2848.0	2337.0	3221.8	3042.0
0600-2200	3678.0	3544.0	3758.0	3881.0	4011.0	3237.0	2652.0	3774.4	3537.3
0600-0000	3725.0	3587.0	3815.0	3949.0	4110.0	3364.0	2693.0	3837.2	3606.1
0000-0000	3945.0	3794.0	4036.0	4174.0	4335.0	3497.0	2837.0	4056.8	3802.6
AM Peak	0800	0800	0800	0800	0800	1000	1100		
	364.0	364.0	398.0	410.0	362.0	305.0	241.0		
PM Peak	1500	1500	1500	1500	1500	1200	1200		
	412.0	397.0	385.0	404.0	410.0	298.0	248.0		

\* - No data.



## **TCS Instruments**

### **Weekly Vehicle Counts (Virtual Week)**



#### **Datasets:**

**Site:** [00-001-EB-WB-] MINMI RD EAST OF HIGHLAND WAY  
**Direction:** 8 - East bound A>B, West bound B>A. **Lane:** 0  
**Survey Duration:** 9:30 Monday, 26 October 2015 => 8:12 Tuesday, 3 November 2015  
**Zone:** Australia (VIC ACT NSW)  
**File:** 00-001-EB-WB-03Nov2015.EC0 (Plus)  
**Identifier:** M755VSYY MC56-6 [MC55] (c)Microcom 02/03/01  
**Algorithm:** Factory default (v3.21 - 15275)  
**Data type:** Axle sensors - Paired (Class/Speed/Count)

#### **Profile:**

**Filter time:** 0:00 Tuesday, 27 October 2015 => 0:00 Tuesday, 3 November 2015  
**Included classes:** 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12  
**Speed range:** 0 - 200 km/h.  
**Direction:** East (bound)  
**Separation:** All - (Headway)  
**Name:** Default Profile  
**Scheme:** Vehicle classification (AustRoads94)  
**Units:** Metric (meter, kilometer, m/s, km/h, kg, tonne)  
**In profile:** Vehicles = 25745 / 57939 (44.43%)

Weekly Vehicle Counts (Virtual Week)

VirtWeeklyVehicle-6296  
Site: 00-001-EB-WB-.0.0EW  
Description: MINMI RD EAST OF HIGHLAND WAY  
Filter time: 0:00 Tuesday, 27 October 2015 => 0:00 Tuesday, 3 November 2015  
Scheme: Vehicle classification (AustRoads94)  
Filter: Cls(1 2 3 4 5 6 7 8 9 10 11 12 ) Dir(E) Sp(0,200) Headway(>0)

	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Averages	
								1 - 5	1 - 7
Hour									
0000-0100	13.0	9.0	10.0	20.0	25.0	32.0	43.0	15.4	21.7
0100-0200	6.0	8.0	7.0	10.0	12.0	18.0	21.0	8.6	11.7
0200-0300	8.0	7.0	11.0	10.0	8.0	12.0	6.0	8.8	8.9
0300-0400	6.0	7.0	10.0	9.0	16.0	9.0	6.0	9.6	9.0
0400-0500	14.0	19.0	10.0	22.0	12.0	9.0	4.0	15.4	12.9
0500-0600	42.0	32.0	41.0	44.0	37.0	31.0	17.0	39.2	34.9
0600-0700	163.0	145.0	184.0	177.0	178.0	61.0	29.0	169.4	133.9
0700-0800	291.0	276.0	289.0	322.0	290.0	127.0	43.0	293.6	234.0
0800-0900	409.0<	408.0<	444.0<	410.0<	409.0<	183.0	88.0	416.0<	335.9<
0900-1000	203.0	238.0	207.0	231.0	225.0	229.0	168.0	220.8	214.4
1000-1100	190.0	179.0	169.0	173.0	177.0	243.0<	219.0	177.6	192.9
1100-1200	179.0	147.0	185.0	178.0	217.0	240.0	263.0<	181.2	201.3
1200-1300	200.0	152.0	161.0	196.0	194.0	273.0<	240.0	180.6	202.3
1300-1400	194.0	174.0	185.0	183.0	200.0	254.0	233.0	187.2	203.3
1400-1500	266.0	254.0	286.0	282.0	300.0	256.0	259.0<	277.6	271.9
1500-1600	357.0	366.0<	343.0	360.0	382.0<	249.0	240.0	361.6	328.1
1600-1700	390.0	335.0	341.0	389.0<	365.0	257.0	216.0	364.0	327.6
1700-1800	393.0<	353.0	426.0<	374.0	367.0	227.0	190.0	382.6<	332.9<
1800-1900	220.0	229.0	218.0	275.0	274.0	212.0	165.0	243.2	227.6
1900-2000	121.0	136.0	135.0	157.0	157.0	105.0	116.0	141.2	132.4
2000-2100	83.0	74.0	103.0	95.0	107.0	98.0	107.0	92.4	95.3
2100-2200	50.0	63.0	75.0	87.0	109.0	73.0	60.0	76.8	73.9
2200-2300	37.0	35.0	42.0	42.0	57.0	74.0	27.0	42.6	44.9
2300-2400	20.0	22.0	17.0	16.0	41.0	48.0	22.0	23.2	26.6
Totals									
0700-1900	3292.0	3111.0	3254.0	3373.0	3400.0	2750.0	2324.0	3286.0	3072.0
0600-2200	3709.0	3529.0	3751.0	3889.0	3951.0	3087.0	2636.0	3765.8	3507.4
0600-0000	3766.0	3586.0	3810.0	3947.0	4049.0	3209.0	2685.0	3831.6	3578.9
0000-0000	3855.0	3668.0	3899.0	4062.0	4159.0	3320.0	2782.0	3928.6	3677.9
AM Peak	0800	0800	0800	0800	0800	1000	1100		
	409.0	408.0	444.0	410.0	409.0	243.0	263.0		
PM Peak	1700	1500	1700	1600	1500	1200	1400		
	393.0	366.0	426.0	389.0	382.0	273.0	259.0		

\* - No data.

**Project :** S216-15 Minmi Rd & Highland Way  
**Site :**  
**Date :** Tuesday, 27 October 2015

	South to West			South to East		
TIME	Lights	Heavy	TOTAL	Lights	Heavy	TOTAL
0630 - 0645	1	0	1	3	0	3
0645 - 0700	3	0	3	6	0	6
<b>Hourly Total</b>	<b>4</b>	<b>0</b>	<b>4</b>	<b>9</b>	<b>0</b>	<b>9</b>
0700 - 0715	0	0	0	4	0	4
0715 - 0730	3	0	3	4	0	4
0730 - 0745	4	0	4	4	0	4
0745 - 0800	1	0	1	5	0	5
<b>Hourly Total</b>	<b>8</b>	<b>0</b>	<b>8</b>	<b>17</b>	<b>0</b>	<b>17</b>
0800 - 0815	2	0	2	3	0	3
0815 - 0830	1	0	1	7	0	7
0830 - 0845	6	1	7	7	0	7
0845 - 0900	4	0	4	3	0	3
<b>Hourly Total</b>	<b>13</b>	<b>1</b>	<b>14</b>	<b>20</b>	<b>0</b>	<b>20</b>
0900 - 0915	1	0	1	3	0	3
0915 - 0930	0	0	0	5	0	5
<b>Hourly Total</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>8</b>	<b>0</b>	<b>8</b>
1530 - 1545	1	0	1	3	0	3
1545 - 1600	0	0	0	2	0	2
<b>Hourly Total</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>5</b>	<b>0</b>	<b>5</b>
1600 - 1615	1	0	1	5	0	5
1615 - 1630	1	0	1	3	0	3
1630 - 1645	1	0	1	5	0	5
1645 - 1700	0	0	0	0	0	0
<b>Hourly Total</b>	<b>3</b>	<b>0</b>	<b>3</b>	<b>13</b>	<b>0</b>	<b>13</b>
1700 - 1715	3	0	3	3	0	3
1715 - 1730	1	0	1	3	0	3
1730 - 1745	1	0	1	1	0	1
1745 - 1800	2	0	2	2	0	2
<b>Hourly Total</b>	<b>7</b>	<b>0</b>	<b>7</b>	<b>9</b>	<b>0</b>	<b>9</b>
1800 - 1815	1	0	1	3	0	3
1815 - 1830	0	0	0	4	0	4
<b>Hourly Total</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>7</b>	<b>0</b>	<b>7</b>
<b>TOTAL</b>	<b>38</b>	<b>1</b>	<b>39</b>	<b>88</b>	<b>0</b>	<b>88</b>

	West to East			West to South		
TIME	Lights	Heavy	TOTAL	Lights	Heavy	TOTAL
0630 - 0645	35	2	37	0	0	0
0645 - 0700	43	3	46	0	0	0
<b>Hourly Total</b>	<b>78</b>	<b>5</b>	<b>83</b>	<b>0</b>	<b>0</b>	<b>0</b>
0700 - 0715	43	5	48	2	0	2
0715 - 0730	60	7	67	1	0	1
0730 - 0745	54	4	58	0	0	0
0745 - 0800	98	6	104	0	0	0
<b>Hourly Total</b>	<b>255</b>	<b>22</b>	<b>277</b>	<b>3</b>	<b>0</b>	<b>3</b>
0800 - 0815	90	3	93	1	0	1
0815 - 0830	124	5	129	1	0	1
0830 - 0845	95	7	102	2	1	3
0845 - 0900	61	0	61	4	0	4
<b>Hourly Total</b>	<b>370</b>	<b>15</b>	<b>385</b>	<b>8</b>	<b>1</b>	<b>9</b>

0900 - 0915	68	2	70	0	0	0
0915 - 0930	54	1	55	0	0	0
<b>Hourly Total</b>	<b>122</b>	<b>3</b>	<b>125</b>	<b>0</b>	<b>0</b>	<b>0</b>
1530 - 1545	93	3	96	5	0	5
1545 - 1600	81	1	82	3	0	3
<b>Hourly Total</b>	<b>174</b>	<b>4</b>	<b>178</b>	<b>8</b>	<b>0</b>	<b>8</b>
1600 - 1615	80	1	81	1	0	1
1615 - 1630	72	2	74	3	0	3
1630 - 1645	86	1	87	1	0	1
1645 - 1700	90	2	92	1	0	1
<b>Hourly Total</b>	<b>328</b>	<b>6</b>	<b>334</b>	<b>6</b>	<b>0</b>	<b>6</b>
1700 - 1715	85	2	87	4	0	4
1715 - 1730	93	1	94	2	0	2
1730 - 1745	92	0	92	1	0	1
1745 - 1800	64	0	64	1	0	1
<b>Hourly Total</b>	<b>334</b>	<b>3</b>	<b>337</b>	<b>8</b>	<b>0</b>	<b>8</b>
1800 - 1815	63	0	63	0	0	0
1815 - 1830	67	0	67	2	0	2
<b>Hourly Total</b>	<b>130</b>	<b>0</b>	<b>130</b>	<b>2</b>	<b>0</b>	<b>2</b>

<b>TOTAL</b>	<b>1791</b>	<b>58</b>	<b>1849</b>	<b>35</b>	<b>1</b>	<b>36</b>
--------------	-------------	-----------	-------------	-----------	----------	-----------

TIME	East to West			East to South		
	Lights	Heavy	TOTAL	Lights	Heavy	TOTAL
0630 - 0645	52	2	54	1	0	1
0645 - 0700	47	1	48	0	0	0
<b>Hourly Total</b>	<b>99</b>	<b>3</b>	<b>102</b>	<b>1</b>	<b>0</b>	<b>1</b>
0700 - 0715	55	3	58	1	0	1
0715 - 0730	63	2	65	2	0	2
0730 - 0745	69	1	70	1	0	1
0745 - 0800	83	5	88	1	0	1
<b>Hourly Total</b>	<b>270</b>	<b>11</b>	<b>281</b>	<b>5</b>	<b>0</b>	<b>5</b>
0800 - 0815	81	5	86	1	0	1
0815 - 0830	86	3	89	2	1	3
0830 - 0845	100	4	104	4	0	4
0845 - 0900	75	2	77	3	0	3
<b>Hourly Total</b>	<b>342</b>	<b>14</b>	<b>356</b>	<b>10</b>	<b>1</b>	<b>11</b>
0900 - 0915	58	0	58	2	0	2
0915 - 0930	57	2	59	2	0	2
<b>Hourly Total</b>	<b>115</b>	<b>2</b>	<b>117</b>	<b>4</b>	<b>0</b>	<b>4</b>
1530 - 1545	67	5	72	4	0	4
1545 - 1600	66	4	70	5	0	5
<b>Hourly Total</b>	<b>133</b>	<b>9</b>	<b>142</b>	<b>9</b>	<b>0</b>	<b>9</b>
1600 - 1615	83	3	86	5	0	5
1615 - 1630	69	2	71	7	0	7
1630 - 1645	70	1	71	0	0	0
1645 - 1700	69	2	71	4	0	4
<b>Hourly Total</b>	<b>291</b>	<b>8</b>	<b>299</b>	<b>16</b>	<b>0</b>	<b>16</b>
1700 - 1715	77	3	80	11	0	11
1715 - 1730	76	1	77	9	0	9
1730 - 1745	83	0	83	5	0	5
1745 - 1800	61	1	62	6	0	6
<b>Hourly Total</b>	<b>297</b>	<b>5</b>	<b>302</b>	<b>31</b>	<b>0</b>	<b>31</b>
1800 - 1815	38	1	39	8	0	8
1815 - 1830	45	1	46	3	0	3
<b>Hourly Total</b>	<b>83</b>	<b>2</b>	<b>85</b>	<b>11</b>	<b>0</b>	<b>11</b>

<b>TOTAL</b>	<b>1630</b>	<b>54</b>	<b>1684</b>	<b>87</b>	<b>1</b>	<b>88</b>
--------------	-------------	-----------	-------------	-----------	----------	-----------

## Appendix B – Sidra Outputs



# MOVEMENT SUMMARY

▽ Site: Base AM Peak - 2015

Minmi Road / Highland Way  
Giveaway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows		Deg. Satn	Average Delay	Level of Service	95% Back of Queue	Prop. Queued	Effective Stop Rate	Average Speed	
		Total veh/h	HV %	v/c	sec		Vehicles veh	Distance m	per veh	km/h	
South: Highland Way											
1	L2	11	9.1	0.049	6.0	LOS A	0.2	1.2	0.49	0.71	42.6
3	R2	22	0.0	0.049	8.9	LOS A	0.2	1.2	0.49	0.71	42.3
Approach		33	3.0	0.049	8.0	LOS A	0.2	1.2	0.49	0.71	42.4
East: Minmi Road E											
4	L2	11	9.1	0.191	5.6	LOS A	0.0	0.0	0.00	0.02	56.1
5	T1	358	2.2	0.191	0.0	LOS A	0.0	0.0	0.00	0.02	59.8
Approach		369	2.4	0.191	0.2	NA	0.0	0.0	0.00	0.02	59.7
West: Minmi Road W											
11	T1	428	4.9	0.229	0.0	LOS A	0.1	0.5	0.02	0.01	49.9
12	R2	5	20.0	0.229	6.9	LOS A	0.1	0.5	0.02	0.01	48.0
Approach		433	5.1	0.229	0.1	NA	0.1	0.5	0.02	0.01	49.9
All Vehicles		835	3.8	0.229	0.5	NA	0.2	1.2	0.03	0.04	53.6

Level of Service (LOS) Method: Delay (RTA NSW).

Vehicle movement LOS values are based on average delay per movement

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

**SIDRA INTERSECTION 6.1 | Copyright © 2000-2015 Akcelik and Associates Pty Ltd | sidrasolutions.com**

Organisation: GHD SERVICES PTY LTD | Processed: Thursday, 19 November 2015 12:02:24 PM

Project: G:\21\25031\Technical\SIDRA\Minmi Road\_Highland Road.sip6

# MOVEMENT SUMMARY

▽ Site: Base PM Peak - 2015

Minmi Road / Highland Way  
Giveaway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows		Deg. Satn	Average Delay	Level of Service	95% Back of Queue	Prop. Queued	Effective Stop Rate	Average Speed	
		Total veh/h	HV %	v/c	sec		Vehicles veh	Distance m	per veh	km/h	
South: Highland Way											
1	L2	5	0.0	0.015	5.5	LOS A	0.0	0.3	0.43	0.62	45.3
3	R2	7	0.0	0.015	7.9	LOS A	0.0	0.3	0.43	0.62	44.9
Approach		12	0.0	0.015	6.9	LOS A	0.0	0.3	0.43	0.62	45.0
East: Minmi Road E											
4	L2	29	0.0	0.175	5.5	LOS A	0.0	0.0	0.00	0.05	57.9
5	T1	311	1.9	0.175	0.0	LOS A	0.0	0.0	0.00	0.05	59.5
Approach		340	1.8	0.175	0.5	NA	0.0	0.0	0.00	0.05	59.4
West: Minmi Road W											
11	T1	365	1.4	0.193	0.0	LOS A	0.1	0.5	0.03	0.01	49.9
12	R2	8	0.0	0.193	6.0	LOS A	0.1	0.5	0.03	0.01	48.9
Approach		373	1.3	0.193	0.2	NA	0.1	0.5	0.03	0.01	49.8
All Vehicles		725	1.5	0.193	0.4	NA	0.1	0.5	0.02	0.04	53.8

Level of Service (LOS) Method: Delay (RTA NSW).

Vehicle movement LOS values are based on average delay per movement

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

**SIDRA INTERSECTION 6.1 | Copyright © 2000-2015 Akcelik and Associates Pty Ltd | sidrasolutions.com**

Organisation: GHD SERVICES PTY LTD | Processed: Thursday, 19 November 2015 12:02:55 PM

Project: G:\21\25031\Technical\SIDRA\Minmi Road\_Highland Road.sip6

# MOVEMENT SUMMARY

 **Site: 2016 AM Peak - with dev**

New Site  
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows		Deg. Satn	Average Delay	Level of Service	95% Back of Queue	Prop. Queued	Effective Stop Rate	Average Speed	
		Total veh/h	HV %	v/c	sec		Vehicles veh	Distance m	per veh	km/h	
South: Highland Way											
1	L2	11	0.0	0.041	6.3	LOS A	0.2	1.6	0.58	0.64	44.5
2	T1	1	0.0	0.041	6.4	LOS A	0.2	1.6	0.58	0.64	48.2
3	R2	23	0.0	0.041	9.7	LOS A	0.2	1.6	0.58	0.64	45.1
Approach		35	0.0	0.041	8.6	LOS A	0.2	1.6	0.58	0.64	45.0
East: Minmi Road E											
4	L2	12	8.3	0.286	4.8	LOS A	2.2	15.3	0.22	0.46	53.0
5	T1	383	2.1	0.286	5.0	LOS A	2.2	15.3	0.22	0.46	54.3
6	R2	9	0.0	0.286	8.3	LOS A	2.2	15.3	0.22	0.46	54.0
Approach		404	2.2	0.286	5.1	LOS A	2.2	15.3	0.22	0.46	54.3
North: The Outlook Estate North											
7	L2	36	0.0	0.090	7.8	LOS A	0.5	3.6	0.63	0.70	50.6
8	T1	1	0.0	0.090	8.2	LOS A	0.5	3.6	0.63	0.70	51.5
9	R2	36	0.0	0.090	11.5	LOS A	0.5	3.6	0.63	0.70	51.2
Approach		73	0.0	0.090	9.6	LOS A	0.5	3.6	0.63	0.70	50.9
West: Minmi Road W											
10	L2	9	0.0	0.323	3.7	LOS A	2.5	18.0	0.20	0.40	49.9
11	T1	454	4.6	0.323	3.9	LOS A	2.5	18.0	0.20	0.40	47.4
12	R2	5	20.0	0.323	7.4	LOS A	2.5	18.0	0.20	0.40	47.0
Approach		468	4.7	0.323	3.9	LOS A	2.5	18.0	0.20	0.40	47.5
All Vehicles		980	3.2	0.323	5.0	LOS A	2.5	18.0	0.25	0.45	50.2

Level of Service (LOS) Method: Delay (RTA NSW).

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Roundabout Capacity Model: SIDRA Standard.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

**SIDRA INTERSECTION 6.1 | Copyright © 2000-2015 Akcelik and Associates Pty Ltd | sidrasolutions.com**

Organisation: GHD SERVICES PTY LTD | Processed: Thursday, 19 November 2015 12:04:59 PM

Project: G:\21\25031\Technical\SIDRA\Minmi Road\_Highland Road.sip6

# MOVEMENT SUMMARY

▽ Site: Base AM Peak - 2016

Minmi Road / Highland Way  
Giveaway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows		Deg. Satn	Average Delay	Level of Service	95% Back of Queue	Prop. Queued	Effective Stop Rate	Average Speed	
		Total veh/h	HV %	v/c	sec		Vehicles veh	Distance m	per veh	km/h	
South: Highland Way											
1	L2	12	8.3	0.054	6.1	LOS A	0.2	1.3	0.50	0.72	42.5
3	R2	23	0.0	0.054	9.3	LOS A	0.2	1.3	0.50	0.72	42.1
Approach		35	2.9	0.054	8.2	LOS A	0.2	1.3	0.50	0.72	42.2
East: Minmi Road E											
4	L2	12	8.3	0.200	5.6	LOS A	0.0	0.0	0.00	0.02	56.2
5	T1	376	2.1	0.200	0.0	LOS A	0.0	0.0	0.00	0.02	59.8
Approach		388	2.3	0.200	0.2	NA	0.0	0.0	0.00	0.02	59.7
West: Minmi Road W											
11	T1	448	4.7	0.239	0.0	LOS A	0.1	0.5	0.02	0.01	49.9
12	R2	5	20.0	0.239	7.1	LOS A	0.1	0.5	0.02	0.01	48.0
Approach		453	4.9	0.239	0.1	NA	0.1	0.5	0.02	0.01	49.9
All Vehicles		876	3.7	0.239	0.5	NA	0.2	1.3	0.03	0.04	53.6

Level of Service (LOS) Method: Delay (RTA NSW).

Vehicle movement LOS values are based on average delay per movement

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

**SIDRA INTERSECTION 6.1 | Copyright © 2000-2015 Akcelik and Associates Pty Ltd | sidrasolutions.com**

Organisation: GHD SERVICES PTY LTD | Processed: Thursday, 19 November 2015 12:03:41 PM

Project: G:\21\25031\Technical\SIDRA\Minmi Road\_Highland Road.sip6

# MOVEMENT SUMMARY

 **Site: 2016 PM Peak - with dev**

New Site  
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Highland Way											
1	L2	5	0.0	0.014	5.9	LOS A	0.1	0.5	0.53	0.58	45.1
2	T1	1	0.0	0.014	6.0	LOS A	0.1	0.5	0.53	0.58	48.9
3	R2	7	0.0	0.014	9.5	LOS A	0.1	0.5	0.53	0.58	46.0
Approach		13	0.0	0.014	7.8	LOS A	0.1	0.5	0.53	0.58	45.9
East: Minmi Road E											
4	L2	1	0.0	0.241	4.5	LOS A	1.6	11.5	0.12	0.48	53.6
5	T1	331	1.8	0.241	4.9	LOS A	1.6	11.5	0.12	0.48	54.5
6	R2	36	0.0	0.241	8.2	LOS A	1.6	11.5	0.12	0.48	54.2
Approach		368	1.6	0.241	5.2	LOS A	1.6	11.5	0.12	0.48	54.5
North: The Outlook Estate North											
7	L2	9	0.0	0.019	5.7	LOS A	0.1	0.7	0.49	0.60	52.5
8	T1	1	0.0	0.019	6.2	LOS A	0.1	0.7	0.49	0.60	53.3
9	R2	9	0.0	0.019	10.1	LOS A	0.1	0.7	0.49	0.60	52.9
Approach		19	0.0	0.019	7.8	LOS A	0.1	0.7	0.49	0.60	52.7
West: Minmi Road W											
10	L2	36	0.0	0.304	3.9	LOS A	2.1	14.6	0.21	0.38	50.3
11	T1	391	1.3	0.304	3.6	LOS A	2.1	14.6	0.21	0.38	48.3
12	R2	8	0.0	0.304	7.5	LOS A	2.1	14.6	0.21	0.38	48.1
Approach		435	1.1	0.304	3.7	LOS A	2.1	14.6	0.21	0.38	48.4
All Vehicles		835	1.3	0.304	4.5	LOS A	2.1	14.6	0.18	0.43	51.0

Level of Service (LOS) Method: Delay (RTA NSW).

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Roundabout Capacity Model: SIDRA Standard.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

**SIDRA INTERSECTION 6.1 | Copyright © 2000-2015 Akcelik and Associates Pty Ltd | sidrasolutions.com**

Organisation: GHD SERVICES PTY LTD | Processed: Thursday, 19 November 2015 12:05:28 PM

Project: G:\21\25031\Technical\SIDRA\Minmi Road\_Highland Road.sip6



# MOVEMENT SUMMARY

▽ Site: Base PM Peak - 2016

Minmi Road / Highland Way  
Giveaway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows		Deg. Satn	Average Delay	Level of Service	95% Back of Queue	Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		Total veh/h	HV %	v/c	sec		veh	m		per veh	km/h
South: Highland Way											
1	L2	5	0.0	0.015	5.6	LOS A	0.1	0.4	0.44	0.62	45.2
3	R2	7	0.0	0.015	8.1	LOS A	0.1	0.4	0.44	0.62	44.8
Approach		12	0.0	0.015	7.0	LOS A	0.1	0.4	0.44	0.62	45.0
East: Minmi Road E											
4	L2	11	0.0	0.173	5.5	LOS A	0.0	0.0	0.00	0.02	58.2
5	T1	326	1.8	0.173	0.0	LOS A	0.0	0.0	0.00	0.02	59.8
Approach		337	1.8	0.173	0.2	NA	0.0	0.0	0.00	0.02	59.7
West: Minmi Road W											
11	T1	383	1.3	0.202	0.0	LOS A	0.1	0.6	0.02	0.01	49.9
12	R2	8	0.0	0.202	6.0	LOS A	0.1	0.6	0.02	0.01	48.9
Approach		391	1.3	0.202	0.2	NA	0.1	0.6	0.02	0.01	49.8
All Vehicles		740	1.5	0.202	0.3	NA	0.1	0.6	0.02	0.03	53.8

Level of Service (LOS) Method: Delay (RTA NSW).

Vehicle movement LOS values are based on average delay per movement

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

**SIDRA INTERSECTION 6.1 | Copyright © 2000-2015 Akcelik and Associates Pty Ltd | sidrasolutions.com**

Organisation: GHD SERVICES PTY LTD | Processed: Thursday, 19 November 2015 12:04:15 PM

Project: G:\21\25031\Technical\SIDRA\Minmi Road\_Highland Road.sip6

# MOVEMENT SUMMARY

 **Site: 2026 AM Peak - with dev**

New Site  
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows		Deg. Satn	Average Delay	Level of Service	95% Back of Queue	Prop. Queued	Effective Stop Rate	Average Speed	
		Total veh/h	HV %	v/c	sec		Vehicles veh	Distance m	per veh	km/h	
South: Highland Way											
1	L2	11	0.0	0.049	7.9	LOS A	0.3	2.0	0.68	0.70	43.7
2	T1	1	0.0	0.049	8.0	LOS A	0.3	2.0	0.68	0.70	47.2
3	R2	23	0.0	0.049	11.3	LOS A	0.3	2.0	0.68	0.70	44.2
Approach		35	0.0	0.049	10.1	LOS A	0.3	2.0	0.68	0.70	44.1
East: Minmi Road E											
4	L2	12	8.3	0.408	4.9	LOS A	3.7	26.0	0.26	0.45	52.9
5	T1	569	1.4	0.408	5.1	LOS A	3.7	26.0	0.26	0.45	54.2
6	R2	9	0.0	0.408	8.4	LOS A	3.7	26.0	0.26	0.45	53.8
Approach		590	1.5	0.408	5.1	LOS A	3.7	26.0	0.26	0.45	54.1
North: The Outlook Estate North											
7	L2	36	0.0	0.113	10.3	LOS A	0.7	4.8	0.76	0.79	49.0
8	T1	1	0.0	0.113	10.6	LOS A	0.7	4.8	0.76	0.79	49.8
9	R2	36	0.0	0.113	13.9	LOS A	0.7	4.8	0.76	0.79	49.5
Approach		73	0.0	0.113	12.1	LOS A	0.7	4.8	0.76	0.79	49.3
West: Minmi Road W											
10	L2	9	0.0	0.476	3.8	LOS A	4.6	33.0	0.24	0.40	49.7
11	T1	697	3.0	0.476	3.9	LOS A	4.6	33.0	0.24	0.40	47.3
12	R2	5	20.0	0.476	7.4	LOS A	4.6	33.0	0.24	0.40	46.8
Approach		711	3.1	0.476	3.9	LOS A	4.6	33.0	0.24	0.40	47.3
All Vehicles		1409	2.2	0.476	5.0	LOS A	4.6	33.0	0.29	0.45	50.0

Level of Service (LOS) Method: Delay (RTA NSW).

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Roundabout Capacity Model: SIDRA Standard.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

**SIDRA INTERSECTION 6.1 | Copyright © 2000-2015 Akcelik and Associates Pty Ltd | sidrasolutions.com**

Organisation: GHD SERVICES PTY LTD | Processed: Thursday, 19 November 2015 12:00:55 PM

Project: G:\21\25031\Technical\SIDRA\Minmi Road\_Highland Road.sip6

# MOVEMENT SUMMARY

▽ Site: Base AM Peak - 2026

Minmi Road / Highland Way  
Giveaway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Highland Way											
1	L2	12	8.3	0.097	7.2	LOS A	0.3	2.1	0.71	0.84	39.4
3	R2	23	0.0	0.097	15.9	LOS B	0.3	2.1	0.71	0.84	39.1
Approach		35	2.9	0.097	12.9	LOS A	0.3	2.1	0.71	0.84	39.2
East: Minmi Road E											
4	L2	12	8.3	0.294	5.6	LOS A	0.0	0.0	0.00	0.01	56.2
5	T1	561	1.4	0.294	0.0	LOS A	0.0	0.0	0.00	0.01	59.8
Approach		573	1.6	0.294	0.2	NA	0.0	0.0	0.00	0.01	59.8
West: Minmi Road W											
11	T1	691	3.0	0.364	0.1	LOS A	0.1	0.9	0.02	0.00	49.9
12	R2	5	20.0	0.364	9.7	LOS A	0.1	0.9	0.02	0.00	48.0
Approach		696	3.2	0.364	0.2	NA	0.1	0.9	0.02	0.00	49.9
All Vehicles		1304	2.5	0.364	0.5	NA	0.3	2.1	0.03	0.03	53.5

Level of Service (LOS) Method: Delay (RTA NSW).  
Vehicle movement LOS values are based on average delay per movement  
Minor Road Approach LOS values are based on average delay for all vehicle movements.  
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.  
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.  
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).  
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

# MOVEMENT SUMMARY

 **Site: 2026 PM Peak - with dev**

New Site  
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Highland Way											
1	L2	5	0.0	0.017	7.3	LOS A	0.1	0.7	0.64	0.63	44.3
2	T1	1	0.0	0.017	7.5	LOS A	0.1	0.7	0.64	0.63	48.0
3	R2	7	0.0	0.017	10.9	LOS A	0.1	0.7	0.64	0.63	45.2
Approach		13	0.0	0.017	9.3	LOS A	0.1	0.7	0.64	0.63	45.1
East: Minmi Road E											
4	L2	11	0.0	0.364	4.6	LOS A	2.9	20.5	0.14	0.46	53.6
5	T1	523	1.1	0.364	4.9	LOS A	2.9	20.5	0.14	0.46	54.6
6	R2	36	0.0	0.364	8.2	LOS A	2.9	20.5	0.14	0.46	54.2
Approach		570	1.1	0.364	5.1	LOS A	2.9	20.5	0.14	0.46	54.5
North: The Outlook Estate North											
7	L2	9	0.0	0.022	6.8	LOS A	0.1	0.8	0.60	0.64	51.7
8	T1	1	0.0	0.022	7.4	LOS A	0.1	0.8	0.60	0.64	52.5
9	R2	9	0.0	0.022	11.3	LOS A	0.1	0.8	0.60	0.64	52.1
Approach		19	0.0	0.022	8.9	LOS A	0.1	0.8	0.60	0.64	52.0
West: Minmi Road W											
10	L2	36	0.0	0.427	3.9	LOS A	3.4	24.0	0.24	0.38	50.1
11	T1	581	0.9	0.427	3.6	LOS A	3.4	24.0	0.24	0.38	48.1
12	R2	8	0.0	0.427	7.5	LOS A	3.4	24.0	0.24	0.38	47.9
Approach		625	0.8	0.427	3.7	LOS A	3.4	24.0	0.24	0.38	48.2
All Vehicles		1227	0.9	0.427	4.5	LOS A	3.4	24.0	0.20	0.43	51.0

Level of Service (LOS) Method: Delay (RTA NSW).

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Roundabout Capacity Model: SIDRA Standard.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

**SIDRA INTERSECTION 6.1 | Copyright © 2000-2015 Akcelik and Associates Pty Ltd | sidrasolutions.com**

Organisation: GHD SERVICES PTY LTD | Processed: Thursday, 19 November 2015 12:01:35 PM

Project: G:\21\25031\Technical\SIDRA\Minmi Road\_Highland Road.sip6

# MOVEMENT SUMMARY

▽ Site: Base PM Peak - 2026

Minmi Road / Highland Way  
Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Highland Way											
1	L2	5	0.0	0.024	6.5	LOS A	0.1	0.5	0.60	0.75	43.7
3	R2	7	0.0	0.024	12.2	LOS A	0.1	0.5	0.60	0.75	43.3
Approach		12	0.0	0.024	9.8	LOS A	0.1	0.5	0.60	0.75	43.5
East: Minmi Road E											
4	L2	11	0.0	0.271	5.5	LOS A	0.0	0.0	0.00	0.01	58.2
5	T1	518	1.2	0.271	0.0	LOS A	0.0	0.0	0.00	0.01	59.8
Approach		529	1.1	0.271	0.1	NA	0.0	0.0	0.00	0.01	59.8
West: Minmi Road W											
11	T1	573	0.9	0.300	0.1	LOS A	0.1	0.9	0.02	0.01	49.9
12	R2	8	0.0	0.300	7.7	LOS A	0.1	0.9	0.02	0.01	48.9
Approach		581	0.9	0.300	0.2	NA	0.1	0.9	0.02	0.01	49.9
All Vehicles		1122	1.0	0.300	0.3	NA	0.1	0.9	0.02	0.02	54.0

Level of Service (LOS) Method: Delay (RTA NSW).  
Vehicle movement LOS values are based on average delay per movement  
Minor Road Approach LOS values are based on average delay for all vehicle movements.  
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.  
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.  
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).  
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.



GHD

133 Castlereagh St Sydney NSW 2000

-

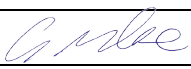
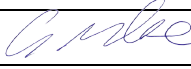
T: +61 2 9239 7100 F: +61 2 9239 7199 E: sydmail@ghd.com.au

© GHD 2015

This document is and shall remain the property of GHD. The document may only be used for the purpose for which it was commissioned and in accordance with the Terms of Engagement for the commission. Unauthorised use of this document in any form whatsoever is prohibited.

\\ghdnet\ghd\AU\Sydney\Projects\21\25031\WP\211771.docx

Document Status

Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
A	K McNatty	G McCabe		G McCabe		20/11/2015
0	K McNatty	G McCabe		G McCabe		4/12/2015

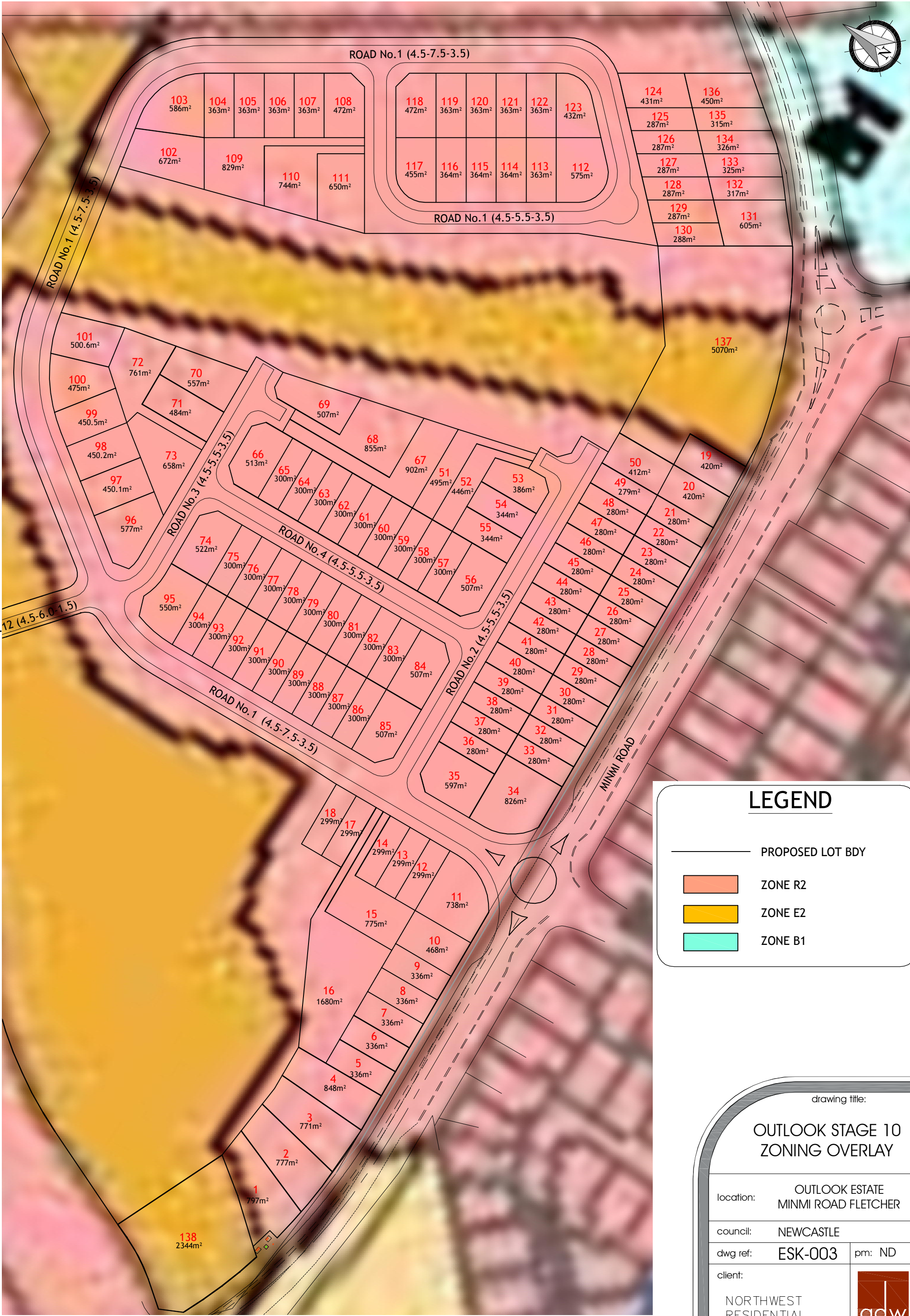
[www.ghd.com](http://www.ghd.com)



## **Attachment 6**

Overlay of the proposed subdivision layout onto the relevant zoning map





ver.	date	comment	drawn	level information	scale (A3 original size)
A	30.10.15	FOR INFORMATION	JD	DATUM: N/A CONTOUR INTERVAL:	0 30 60 75m SCALE: 1:1500 (FULL)

working beyond expectations

drawing title:

## OUTLOOK STAGE 10 ZONING OVERLAY

location:	OUTLOOK ESTATE MINIMI ROAD FLETCHER	
council:	NEWCASTLE	
dwg ref:	ESK-003	pm: ND
client:	NORTHWEST RESIDENTIAL	



central coast office ph: (02) 4305 4300  
hunter office ph: (02) 4978 5100

www.adwjohanson.com.au