

Wollondilly Shire Council
Planning Proposal to Rezone Land at Silverdale for
Low Density Residential, Medium Density Residential, E4
Environmental Living, B4 Mixed Business and B2 Local Centre
Stormwater Management Concept
Siteplus Project No. 13168– June 2014



STORMWATER MANAGEMENT CONCEPT

Rezoning of Land fronting Silverdale Road in the locality of Silverdale to allow for Low Density Residential, Medium Density Residential, Environmental Living, Local Centre, Mixed Development and Local Centre.

PREPARED FOR

Wollondilly Shire Council

PREPARED BY

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EXECUTIVE SUMMARY

Siteplus Pty Ltd has been commissioned by the North Silverdale Landowner Group on behalf of Wollondilly Council to prepare a Stormwater Management Concept (SWC) for the site on Silverdale Road, Silverdale.

The proposed site has a total area of approx. 68 hectares. The proposed rezoning will make up two residential precincts and one commercial precinct.

The existing site generally slopes towards the east and is traversed by water courses within the subject area. The site lies on an existing ridge with Silverdale Road. The site contains a number of existing farm dams, some of which can be utilised for stormwater treatment as the natural terrain drains all runoff to the dams making them an ideal location for stormwater treatment and control.

This report presents a Stormwater Management Concept (incorporating Water Sensitive Urban Design (WSUD)) strategy for the site incorporating elements such as bio-retention swales systems and gross pollutant traps.

The conceptual strategy has been designed and assessed to meet and comply with EPA best practice targets (refer to section 1.4). These elements will reduce potable water demand, reduce wastewater generation and protect downstream environments.

The results show that the proposed treatment train has a positive impact on the water quality discharging from the site. Improvements are achieved for all pollutants and reductions occur across all of the modeled pollutants.

In summary, the analysis shows that the proposed SWC elements have a positive impact on the water quality discharging from the site, and the standards imposed by Council and State government agencies are satisfied and as such, the development can be supported on stormwater quality considerations.

1. INTRODUCTION

1.1. Preliminary

1.1.1. Siteplus Engagement

Siteplus Pty Ltd has been commissioned by North Silverdale Landowner Group to prepare a Stormwater Management Concept for various land holdings subject to rezoning from rural to urban development at Silverdale Road, Silverdale as shown in Appendix A. The Stormwater Management Concept focuses on the possible treatment areas and measures available within the site. The aim of the Stormwater Management Concept is to ensure that the downstream receiving waters are protected from pollutants resulting by proposed development.

1.1.2. Scope of Work

Site Plus Pty Ltd has been engaged by the North Silverdale Landowner Group to carry out the following services:

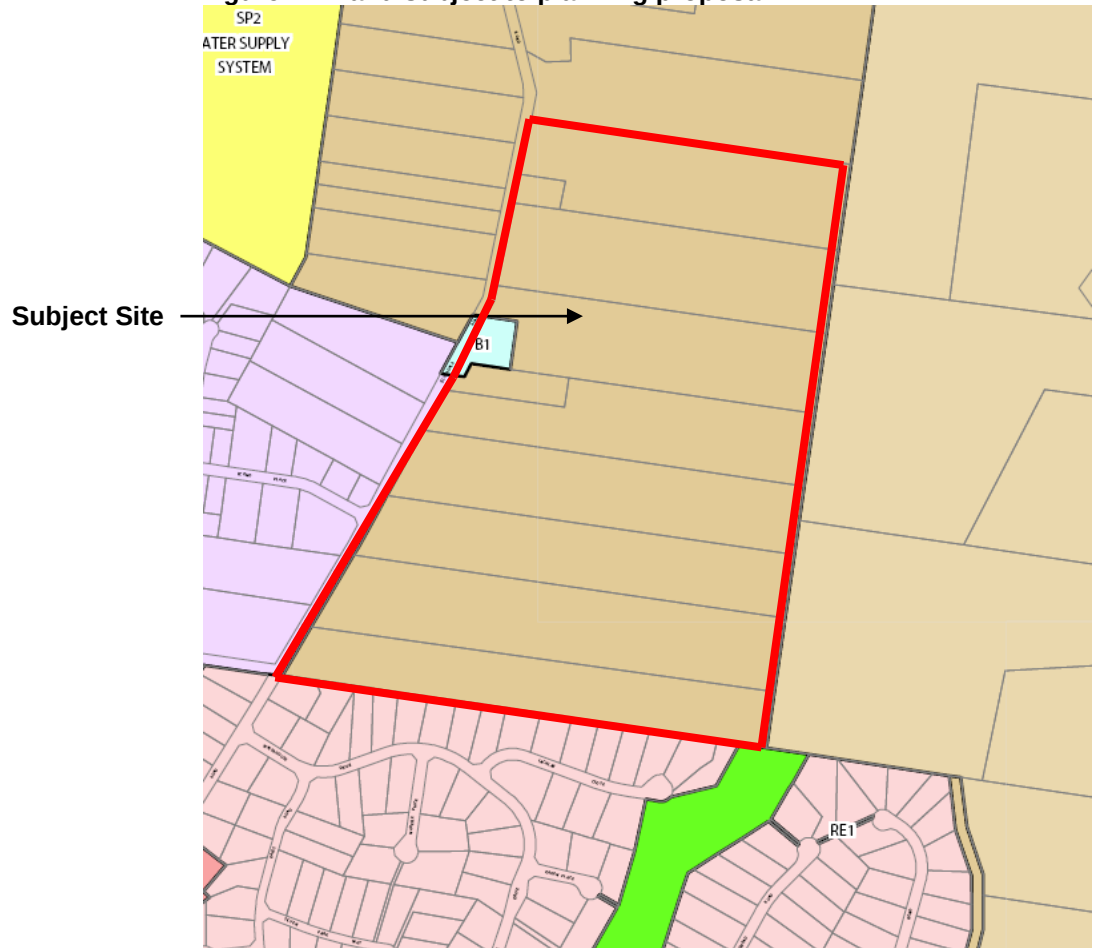
- Examine the existing site and determine the mean annual pollutant loads leaving the site within the stormwater column;
- Study the possible development area and its effects on water quality;
- Design appropriate water quality devices to remove pollutants from site storm water.

This study does not consider any pollutants outside the scope of MUSIC. Pollutants such as oils and metals within the stormwater have not been considered because they are outside the scope of MUSIC models

1.2. Subject Land

The site is located on the north side of Silverdale Road near the intersection with Silverdale Road, Silverdale, as shown in Figure 1.1 below.

Figure 1.1 Land subject to planning proposal



Source: www.legislation.nsw.gov.au

The site comprises ten separate land holdings as set out in Table 1.1 lot and DP description is included with land ownership. The total land is not in one complete landholding.

Table 1.1: Property Description and Ownership

Lot & DP	Address	Owner
Lot 6 DP 1086326	2350 Silverdale Road Silverdale	David Hanna Louie Hanna
Lot A 161634	2340 Silverdale Road Silverdale	Uncommitted
Lot 7 DP 38123	2330/ 2232 Silverdale Road Silverdale	Nader Mikhael
Lot 2 DP 519533	2324 Silverdale Road Silverdale	Sam Grima Antonia Grima
Lot 199 DP 1092447	2322 Silverdale Road Silverdale	Bruno Lopreiato Maria Lopreiato
Lot 200 DP 1092447	2320 Silverdale Road Silverdale	Bruno Lopreiato Maria Lopreiato
Lot 10 DP 38123	2300 Silverdale Road Silverdale	Michael Hanna Raymond Hanna Simon Hanna
Lot 11 DP 38123	2280 Silverdale Road Silverdale	Joe Casaceli
Lot 121 DP 747833	2260 Silverdale Road Silverdale	Michael Hanna Raymond Hanna Simon Hanna Bill Hanna
Lot 122 DP 747833	2250 Silverdale Road Silverdale	Joe Mifsud

1.3. Existing Site Features and Catchment

1.3.1. Topography and Landscape

The subject site is undulating and falls away to the east to steep slopes above Bents Basin and its tributaries. The site slopes towards the water courses and gradually gets steeper the closer towards the edge of Bents Basin. The Eastern edges of the site contain sections of exposed rock outcrops and denser vegetation.

Land within the site is gently undulating, and has been mostly cleared of woodland/forest vegetation. There are some disconnected remnant woodland areas within the site. With a portion of uncleared land is located along the eastern edge of the site.

There are a number of farm dams on site which define catchments. These are shown on the survey plan included in Appendix A.

Figure 1.2 Subject site and adjoining land uses



Source: www.nearmap.com.au

1.4. Stormwater Pollution Control Targets

The targets outlined below are the objectives and targets consistent with state wide water management objectives for new developments established by the NSW Government, and are accepted best practice WSUD targets. The NSW Government targets prevail as no localised standards have been set by other authorities such as Local Government.

The following targets are considered minimum standards for the proposed development at North Silverdale:

- 45% reduction in the mean annual load of Total Nitrogen (TN), compared to a typical urban development.
- 65% reduction in the mean annual load of Total Phosphorous (TP), compared to a typical urban development.
- 85% reduction in the mean annual load of Total Suspended Solids (TSS), compared to a typical urban development.

The water quality targets are based on the EPA best practice guidelines 'Managing Urban Stormwater'. The updated draft targets are 85:65:45 these targets have not yet been adopted but remain in draft form.

This study accepts the best management practices as set by the EPA and meets each target to ensure that the site meets stormwater quality targets into the future.

1.5. Stormwater Quality Improvement strategy

The proposed system implements a systematic approach to the removal of pollutants before disposal offsite. The system proposed removes larger pollutants first at the source followed by the smaller and dissolved pollutants further down the treatment train.

The larger gross pollutants will be removed by proposed Gross Pollutant Traps (GPT). Each GPT will remove the litter and coarse sediment and will ensure that the downstream Bio-retention swales and basins function correctly and the filter media voids do not clog with sediment reducing their pollutant removal capacities. The end of line bio-retention swales and basins remove the finer sediment and dissolved pollutants. This strategy ensures that all of the stormwater leaving the site from each catchment meets the 'Best Practice' requirements of the EPA.

2. CLIMATE INFORMATION

2.1. Climate Information

2.1.1. General

MUSIC requires historical rainfall data to determine the pollutant loadings leaving the site. It is best practice to use a sample year which consists of higher than average rainfall or wet year.

The data used was sourced from Penrith rain gauge in the period from 1997 to 2006 which has no non-recording periods and no accumulative rainfall periods. The Penrith rain gauge is the closest rain gauge straight line distance to the site with historical recordings. The data was recorded in 5 minute intervals to attain an accurate Metrological template.

2.1.2. Bureau of Meteorology Data

The Historical rainfall data used within the MUSIC model was attained from the Penrith rain gauge and consisted of 5 minute recordings from the year 1997 Figure 2.1 illustrates the recorded historical rainfall during the period from 1997 to 2005.

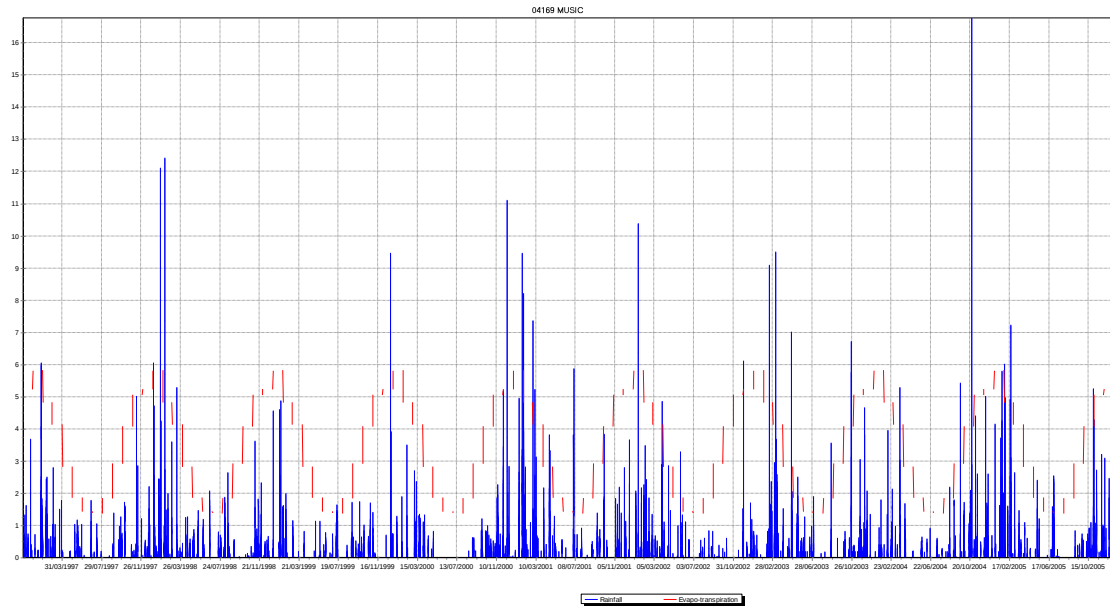
2.1.3. Evapo-transpiration Data

The evaporation or evapo-transpiration data is a required input for MUSIC. The evaporation data used for the subject model was also attained for the Silverdale region. A monthly average was used within the model and is shown through the red line in Figure 2.1.

2.1.4. Meteorological Template

The meteorological template combines both the evapo-transpiration and historical rainfall data. The meteorological template is shown in Figure 2.1 for the period from 1997 to 2005.

Figure 2.1. Meteorological Template for period from 1997 to 2006



Source: MUSIC model

3. SOURCE NODES

3.1. Site and Area Characteristics

The site abuts both large lot residential development to the south and large lot and rural land to the north. The south east and eastern boundaries adjacent to the site contain wooded areas. Silverdale Road abuts the western boundary of the site.

3.2. Proposed Development Sources

3.2.1. Urban Nodes

The site has been divided into four different urban catchments. These catchment areas represent the four main catchments within the subject site.

These catchments are shown in Appendix C and described in Table 3.1.

Table 3.1

Description	Hectare
Northern Catchment	15
Central Catchment	30
Eastern Catchment	6
Southern Catchment	17

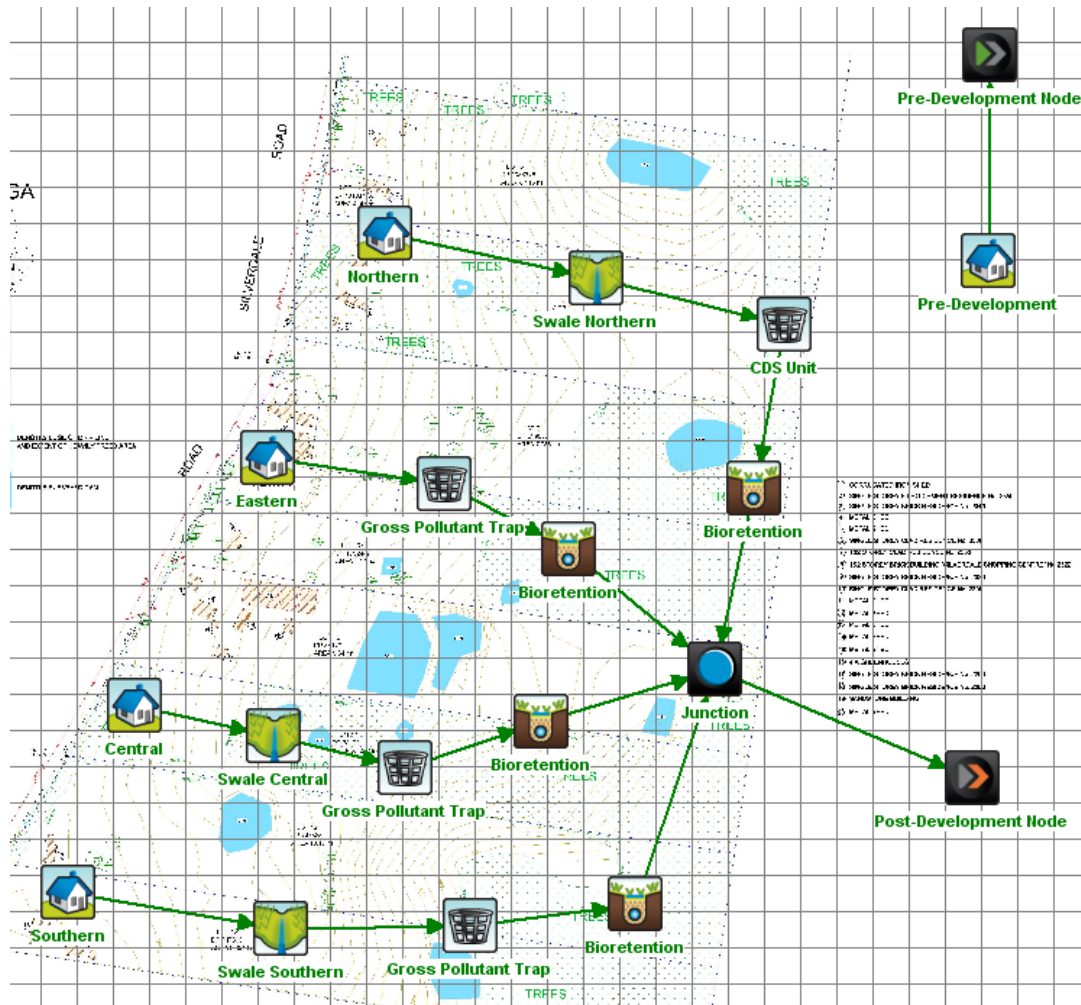


Figure 4. MUSIC Schematic Diagram

4. TREATMENT NODES

4.1. Treatment Train Proposed

The conceptual treatment train proposed for the site consists of a number of treatment measures to remove pollutants whilst conveying the stormwater offsite. The proposed treatment train removes pollutants in a systematic order. Larger pollutants are removed higher up the treatment train, and the smaller or dissolved pollutants are removed at the end of the treatment train through bio-mechanical means.

4.1.1. Gross Pollutant Traps

Gross Pollutant Traps (GPT's) are to be proposed upstream of piped drainage lines in commercial and residential areas before entering any proposed bio-retention systems. The GPT's will ensure that both large and small pollutants and debris are removed from the stormwater before entering the bio-retention swales. This systematic removal of larger pollutants minimises the maintenance requirement of the bio-retention swale as it reduces their sediment load. The conservative GPT parameters used within the MUSIC model are as follows:

- 80% removal of Gross pollutants
- 15% removal of suspended solids
- 0% removal of Nitrogen and Phosphorus

4.1.2. Bio-retention System

Four main bio-retention systems are proposed for the site as schematically shown in Appendix C. The swales and bio-basins are to treat and remove the dissolved pollutants (nitrogen and phosphorus) from the stormwater column before entering Bents Basin and its tributaries. Each of the Bio-retention systems will treat both the road and house runoff from the total commercial and residential development.

The bio-retention swales shown schematically in Figure 4.1 would need to be located within a two metre wide vegetated creek buffer zone and the residential development creating a large vegetated zone between the existing vegetation and the proposed development. There may be up to four separate discharge points from the site. Each would be at the end of a bio-retention system to maximise all the

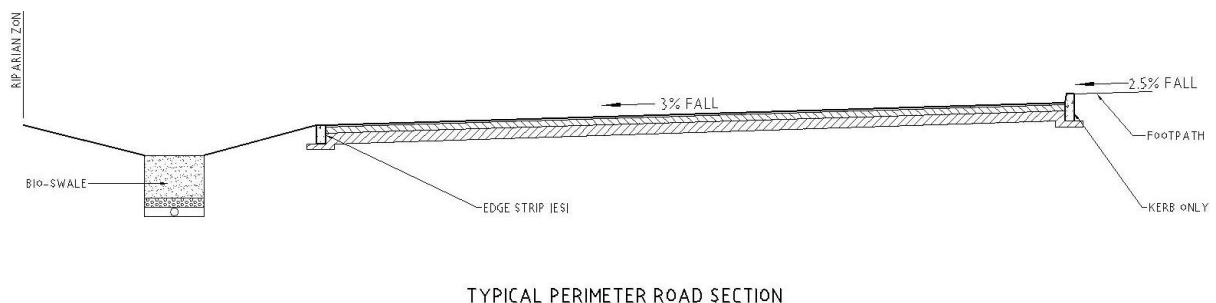
treatment time and minimise the impact on the existing drainage line. Figure 4.2 illustrates a possible arrangement for the perimeter roads and site bio-retention systems as the road surface directs sheet flow into the bio-system working with the natural terrain to treat and transport stormwater.

To treat the conceptual development areas shown in Appendix D to meet the necessary EPA standards the following bio-retention parameters are required:

- Northern precinct 15ha with 1500m² of bio-retention surface area including 1300m² of filter media area.
- East precinct 6ha with 600m² of bio-retention surface area including 450m² of filter media area
- Central precinct 30ha with 3000m² of bio-retention surface area including 2600m² of filter media area.
- Southern precinct 17ha with 1700m² of bio-retention surface area including 1400m² of filter media area

The above parameters are subject to change as the residential developable areas change.

Figure 4.1. Perimeter Road Section

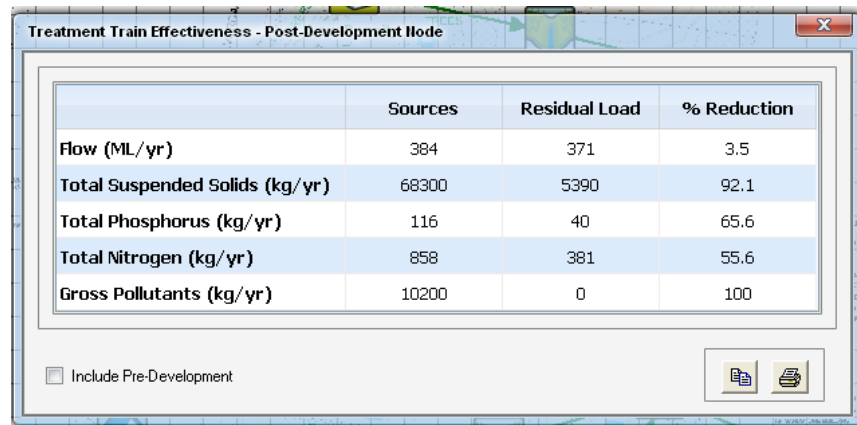


5. RESULTS

5.1. Mean Annual Pollutant Loads

To determine the effectiveness of the treatment train the historical metrological template was simulated through the treatment measures proposed. The table below outlines the annual percentage reduction of pollutants when the proposed water treatment controls have been implemented.

The MUSIC model finds that all the pollutants modelled have achieved the required urban stormwater best practice targets of 85% reduction in Total Suspended Solids, a 65% reduction of total Phosphorus, and a 45% total reduction in total Nitrogen.



	Sources	Residual Load	% Reduction
Flow (ML/yr)	384	371	3.5
Total Suspended Solids (kg/yr)	68300	5390	92.1
Total Phosphorus (kg/yr)	116	40	65.6
Total Nitrogen (kg/yr)	858	381	55.6
Gross Pollutants (kg/yr)	10200	0	100

☐ Include Pre-Development

Figure 5.1, MUSIC Model Treatment Train Effectiveness Results Table

The results confirm that the proposed treatment measures have an impact on the water quality discharging from the site. Improvements are achieved for all pollutants.

The above table demonstrates that the results in fact improve the quality of stormwater runoff over the existing situation. There are benefits across the full suite of pollutants modelled.

6. CONCLUSION

In conclusion the proposed stormwater treatment measures effectively remove pollutants to the EPA best practice requirements. The proposed measures remove a full range of pollutants from larger gross pollutants to smaller dissolved pollutants

The results indicate that the stormwater runoff from the site after the development will improve the water quality from its current state. Therefore the receiving water bodies downstream will benefit as a result of this development.

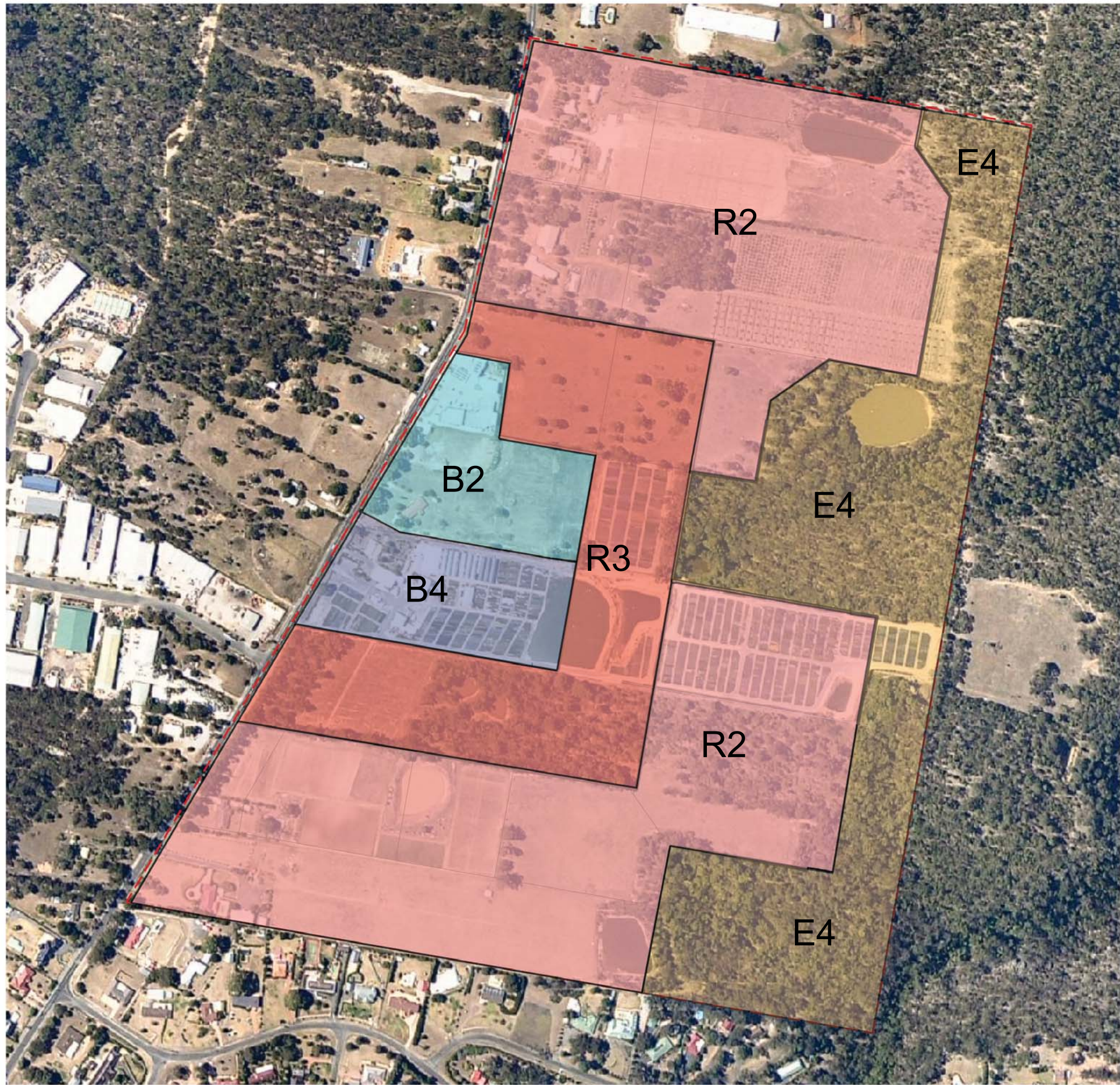
7. REFERENCES

<http://www.toolkit.net.au/music>

Upper Parramatta River Trust, 2004, *Water Sensitive Urban Design Technical Guidelines for Western Sydney*, Stormwater Trust, Sydney.

APPENDIX A

Proposed Zoning



LEGEND	
R2	R2 LOW DENSITY RESIDENTIAL
R3	R3 MEDIUM DENSITY RESIDENTIAL
B2	B2 LOCAL CENTRE
B4	B4 MIXED USE
E4	E4 ENVIRONMENTAL LIVING

PLAN
1:2500



planning engineering landscape design management

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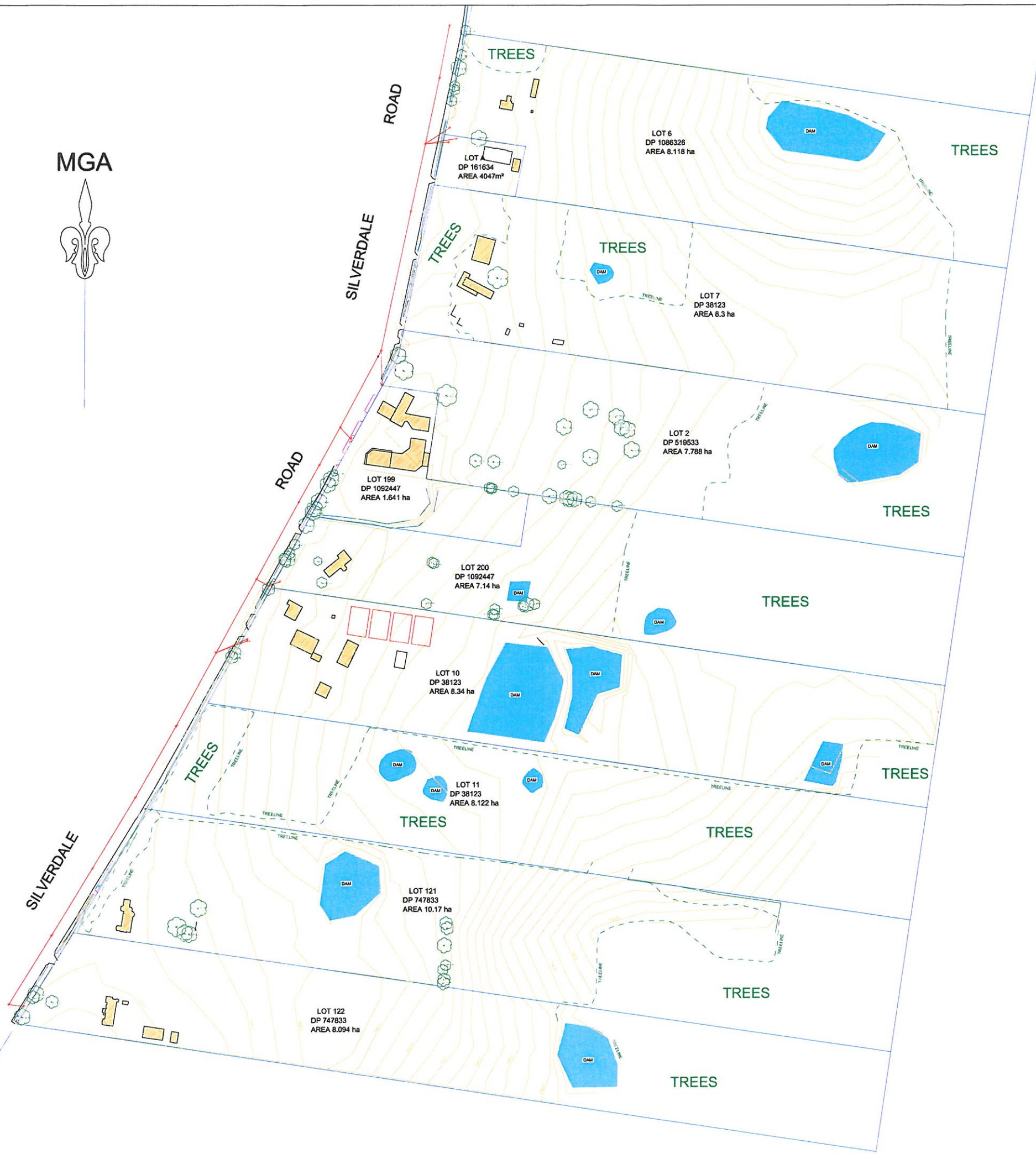
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B	June 2014	planning proposal	KM	VM
A	07.05.14	preliminary - for discussion only	KM	VM
Issue	Issue date	Issue description	dwn	app
scale	AS SHOWN	project	NORTH SILVERDALE PLANNING PROPOSAL	dwg title
AT A1				AERIAL ZONING MAP
date	27.03.2014	client:	NORTH SILVERDALE LANDOWNER GROUP	dwg no.
				PM 01/03
				project no.
				13168

APPENDIX B

Survey Plan



- NOTES :**
- * THIS DETAIL SURVEY IS NOT A 'SURVEY' AS DEFINED BY THE SURVEYING ACT, 2002.
 - * BEARINGS AND DISTANCES ARE BY TITLE AND ARE SUBJECT TO SURVEY INVESTIGATION
 - * BEARINGS RELATE TO MGA NORTH
 - * THE POSITION OF IMPROVEMENTS IN RELATION TO BOUNDARIES IS DIAGRAMMATIC ONLY
 - * NOT ALL SERVICES ARE SHOWN
 - * THE EXISTENCE OF UNDERGROUND SERVICES HAS NOT BEEN ESTABLISHED. IF THESE ARE CRITICAL IT IS ESSENTIAL THE APPROPRIATE AUTHORITIES BE CONTACTED PRIOR TO DEVELOPMENT WORKS.
 - * EXISTENCE OF SERVICES MUST BE VERIFIED BY CONTACTING DIAL BEFORE YOU DIG (DBYD) PH 1100. CRITICAL SERVICES MUST BE EXPOSED AND LOCATED. (NOT ALL SERVICE PROVIDERS ARE MEMBERS OF DBYD)
 - * THIS TITLE BLOCK IS AN INTEGRAL PART OF THIS DRAWING WHICH IS NOT TO BE REMOVED

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REV	AMENDMENTS	DATE

SHEET 1 OF 1 - DETAIL SURVEY

CLIENT : SILVERDALE CENTRE LAND OWNER GROUP

SURVEYOR : SCOTT D AARON B.
DATUM : AUSTRALIAN HEIGHT DATUM
ORIGIN :
JOB REF. : B1493
COMPUTER REF. :
DRAWING No. :
CHECKED :
DATE OF SURVEY : DECEMBER 2013
REDUCTION RATIO : 1:2000

PLAN OF: SILVERDALE ROAD
SILVERDALE

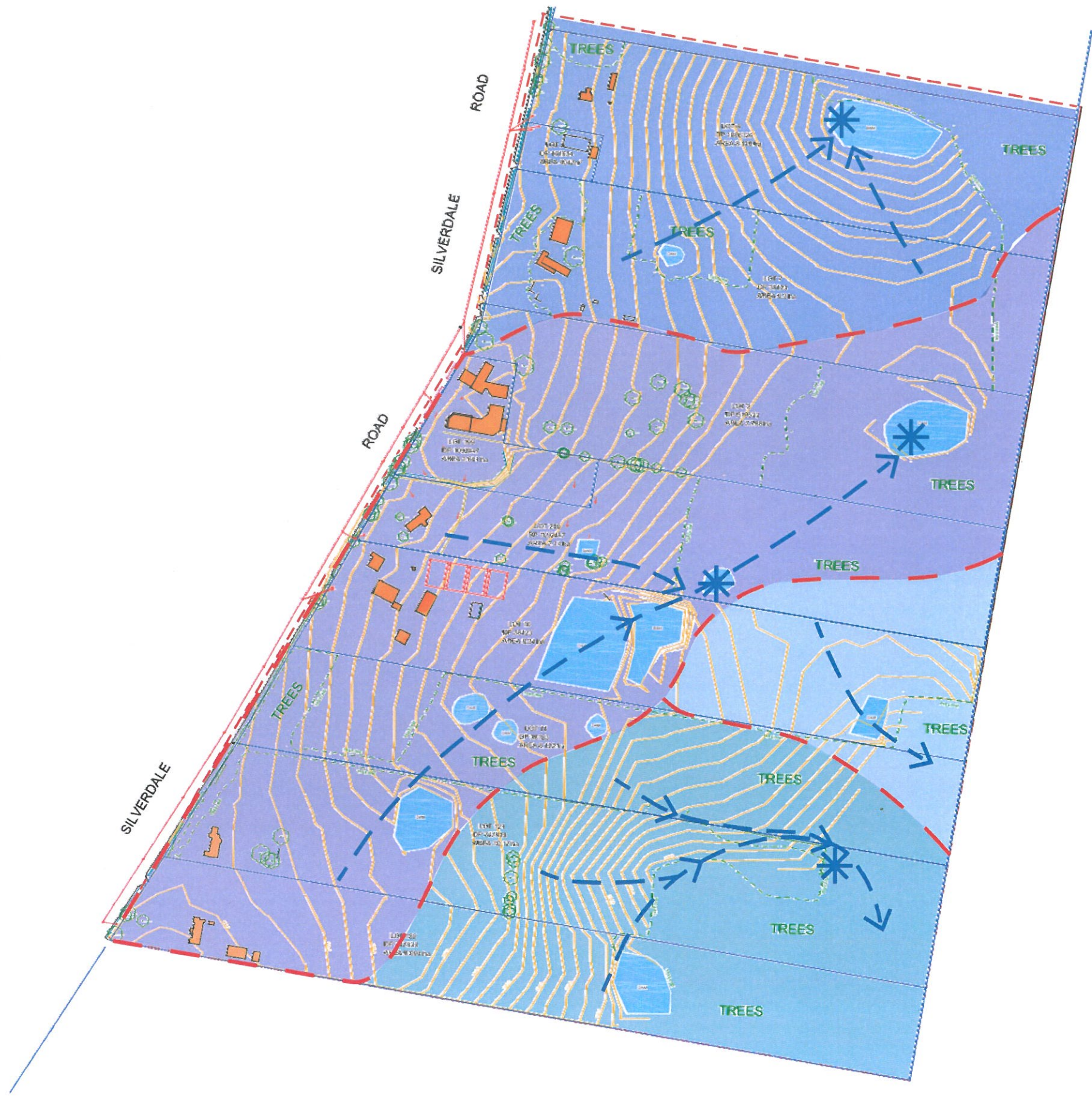
SHOWING: GENERAL DETAIL AND SITE LEVELS
PURPOSE: MASTERPLANNING

MACQUARIE PARK ABN 20 068 433 974
PO Box 4004 MACQUARIE CENTRE NSW 2113
SUITE 404, LEVEL 4 No13-15 LYON PARK ROAD,
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APPENDIX C

Catchments and Drainage



CATCHMENT AREAS	
NORTHERN CATHCMENT	15ha
CENTRAL CATCHMNT	30ha
EASTERN CATCHMENT	6ha
SOUTHERN CATCHMENT	17ha

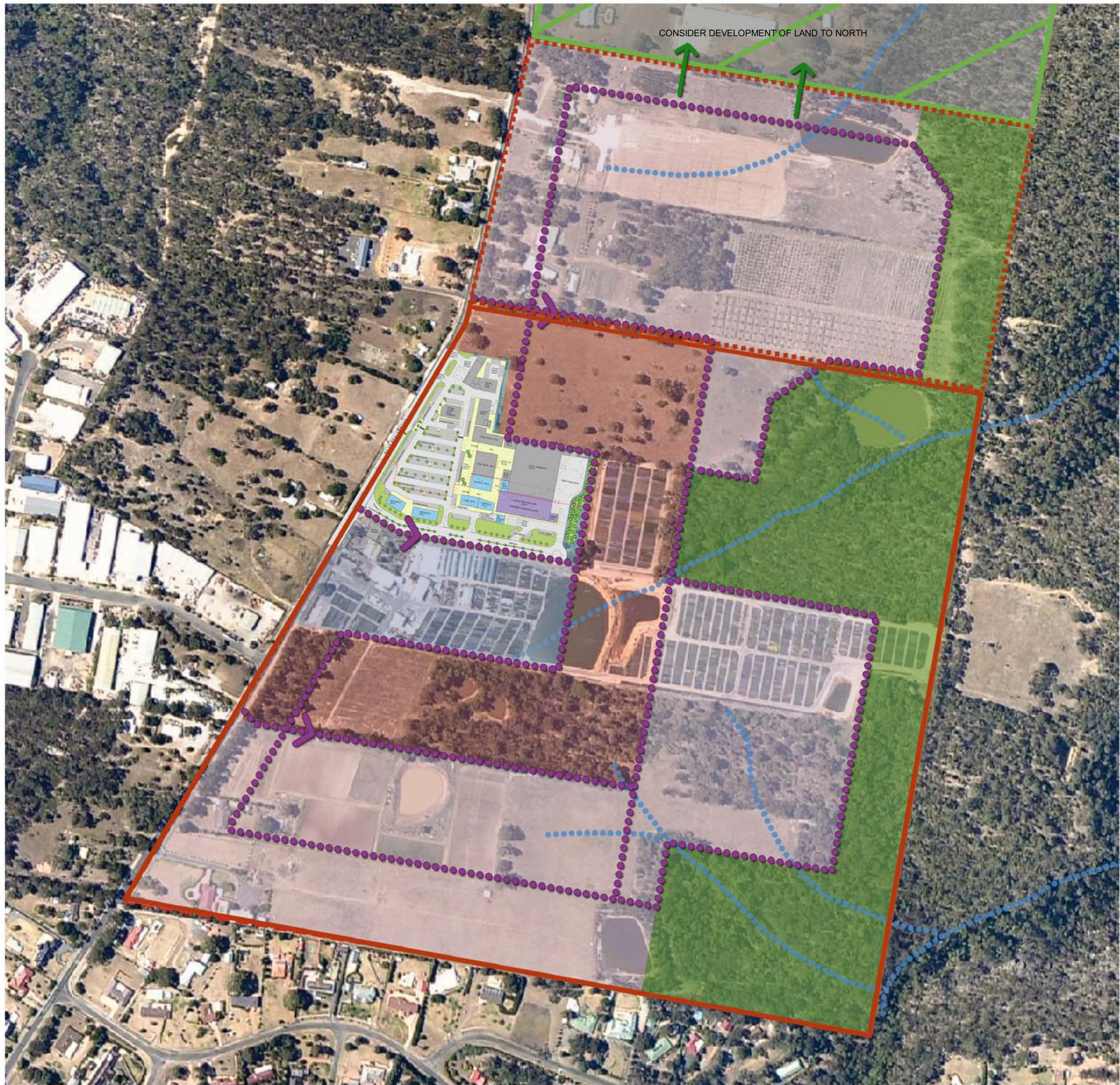
LEGEND

WSUD TREATMENT LINES
 INDICATIVE LOCATION FOR STORMWATER MANAGEMENT BASINS

PLAN
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APPENDIX D

Conceptual Development



- LEGEND**
- ENVIRONMENTAL LIVING
 - INDICATIVE LOCATION OF ROAD
 - LOW DENSITY RESIDENTIAL
 - MEDIUM DENSITY RESIDENTIAL
 - LOCAL CENTRE
 - MIXED USE
 - DRAINAGE LINES TO BE CONFIRMED
 - PROPOSED AREA (RETAIL SOUTHERN & EASTERN PRECINCTS) EXPANSION
 - DRAINAGE LINES TO BE CONFIRMED

PLAN
1:2500

