TJ & RF Fordham PTY LTD

Warradale Road, Silverdale

Water Cycle Management Plan

The Development of TRN Holdings

04169 – Revision C May 2011

siteplus

planning . engineering . landscape . design . management

WATER CYCLE MANAGEMENT PLAN

WARRADALE ROAD, SILVERDALE

PREPARED FOR

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EXECUTIVE SUMMARY

Siteplus Pty Ltd has been commissioned by TJ & RF Fordham Pty Ltd Pty Ltd to prepare a Water Cycle Management Plan for the site on Warradale Road, Silverdale.

The proposed site has a total area of 20.75 hectares. The proposed rezoning will make up two residential precincts on the east and west side of Megartys Creek along with and an industrial portion within the sites North western Corner.

The existing site generally slopes towards the two water courses within the subject site. Within the eastern precinct two existing dams are to 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 concept 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 WSUD targets and best practice. The WSUD 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 WSUD 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 TJ & RF Fordham Pty Ltd Pty Ltd (TJ & RF Fordham Pty Ltd) to prepare a Water Cycle Management Plan for the property at Warradale Road, Silverdale. The Water Cycle Management Plan focuses on the possible treatment areas and measures available within the site. The aim of the Water Cycle Management Plan is to ensure that the downstream receiving waters are protected from pollutants resulting by proposed development.

1.1.2. Scope of Work

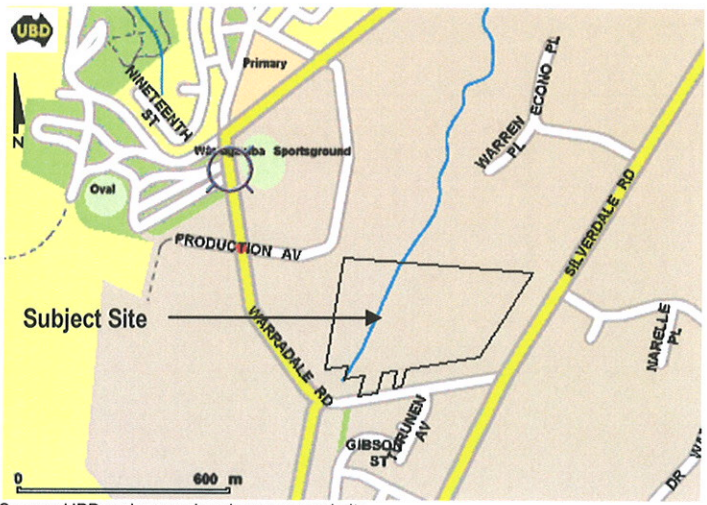
Siteplus Pty Ltd has been engaged by the TJ & RF Fordham Pty Ltd Pry Ltd to carry out the following services:

- Examine the existing site and determine the mean annual pollutant loads leaving the site within the stormwater;
- 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.

1.2. Subject Land

The site is located on the north side of Warradale Road near the intersection with Silverdale Road, Silverdale, as shown in Figure 2.1 below.



Source: UBD and www.whereis.com.au website.

1.3. Existing Site Features and Catchment

1.3.1. Topography and Landscape

The subject site is divided by Megaritys creek which runs north south through the subject site, another smaller water course also divides the north western corner of the site and runs into Megarity Creek 50m upstream of Government Road. The site slopes towards the water courses and gradually gets steeper the closer to Megarity Creek. The Creek banks contain sections of exposed rock outcrops and denser vegetation.

Land either side of Creek lines is gently undulating, and contains disturbed open woodland/forest vegetation with some signs of previous clearing.

The site does not currently convey high amounts of pollutant loads as the site is currently vacant.

Figure 2. Locality Map source: www.googlemaps.com

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 target prevail as no localise standards have been set by other authorities such as Local Government.

The following targets are considered minimum standards for the proposed development at Warradale Road:

- 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 Phosphorous (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 80:65:45 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 the larger pollutants first at the source followed by the smaller and dissolved pollutants.

The larger gross pollutants will be removed by proposed Gross pollutant traps (GPT). Each GPT will remove the litter and course sediment. Each GPT will ensure that the downstream Bio-retention swales and basins function correctly and do not clog the filter media voids with sediment thus reducing its pollutant removal capacity. The end of line bio-retention swales 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 3 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 3.

2.1.4. Meteorological Template

The meteorological template combines both the evapo-transpiration and historical rainfall data. The meteorological template is shown in Figure 3 for the period from 1997 to 2005.

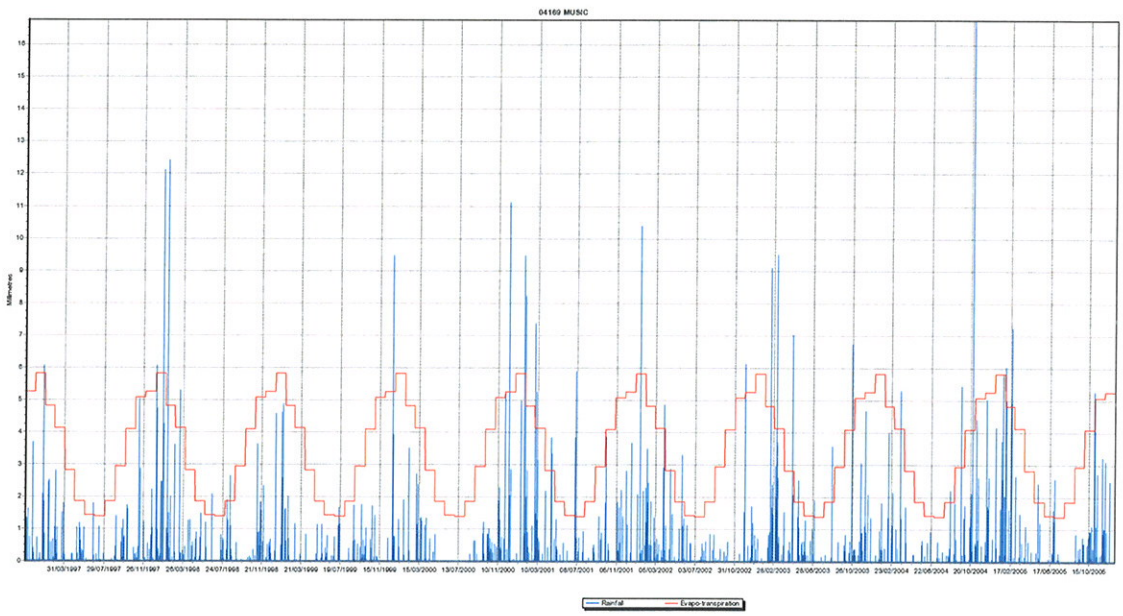


Figure 3. Meteorological Template for period from 1997 to 2006 source: MUSIC model

3. SOURCE NODES

3.1. Site and Area Characteristics

The site abuts both residential development and industrutial development. The south and eastern boundaries adjacent to the site contain residential urban development. On the north western boundary light industrial development abuts the site.

3.2. Proposed Development Sources

3.2.1. Urban Nodes

The site has been divided into five different urban catchments. The five catchments represent the five main catchment areas within the site. The catchment areas have been divided into different catchments based on the percentage of impervious within each catchment. Each catchment is treated by bio-mechanical means in the form of permeable pavement or a bio-retention system before being discharged downstream as shown in Figure 4.

Each urban node has a calculated impervious percentage based on the impervious surface areas within each catchment. The assumption made for the propouse of the rezoning are as follows:

- 75% impervious surfaces for residential areas of each side of Megaritys Creek.
- 80% Impervious for the Industrial development.

The default source node values have been used for each of the catchments modelled. The MUSIC model is shown in Figure 4.

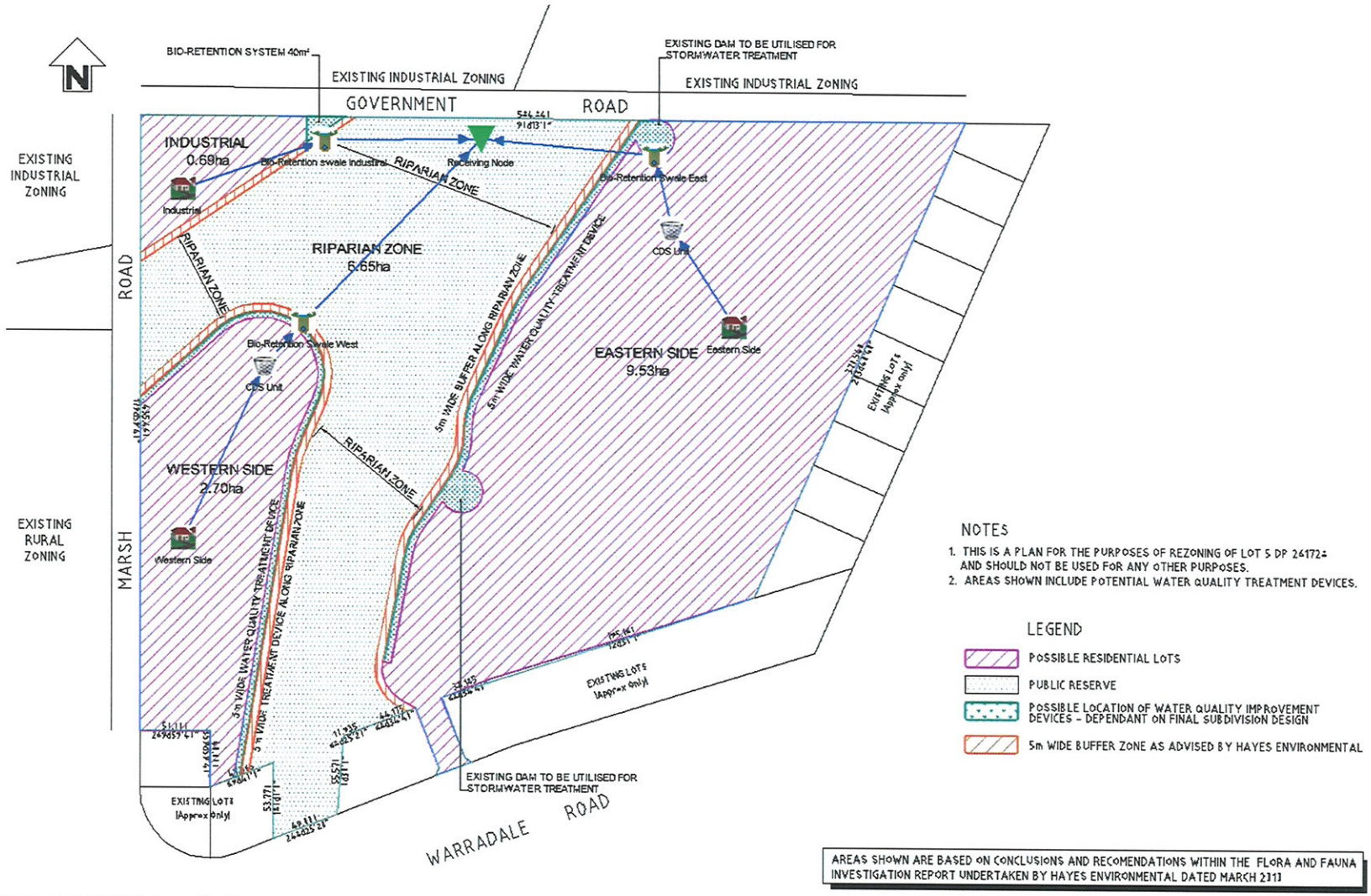


Figure 4. MUSIC Schematic Diagram

4. TREATMENT NODES

4.1. Treatment Train Proposed

The 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 entering the 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

Two main bio-retention systems are prposed on each side of Megaritys Creek. The bio swales are to treat and removed the dissolved pollutants (nitrogen and phosphorus) from the stormwater column before entering Megaritys Creek. Each of the Bio-retention systems will treat both the road and house runoff from the total residential development.

The bio-retention swales have been located between a 5m wide vegetated creek buffer zone and the residential development creating a large vegetated zone between the existing vegetation and the proposed development. On each side of Megaritys Creek there is to be one singular discharge point from the bio-retention systems to maximise the treatment time and minimise the impact on the existing creek line. Figure 6 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 proposed development areas shown in Figure 4 and Appendix A to meet the necessary EPA standards the following bio-retention parameters are required:

- East precinct residential area of 9.53ha. 2,500m^2 of bio-retention surface area including 1,750m^2 of filter media area.
- Western precinct residential area of 2.7ha. 1,870m^2 of bio-retention surface area including 1,300m^2 of filter media area.
- Industrial 0.69ha. 40m^2 of bio-retention surface area including 20m^2 of filter media area.

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

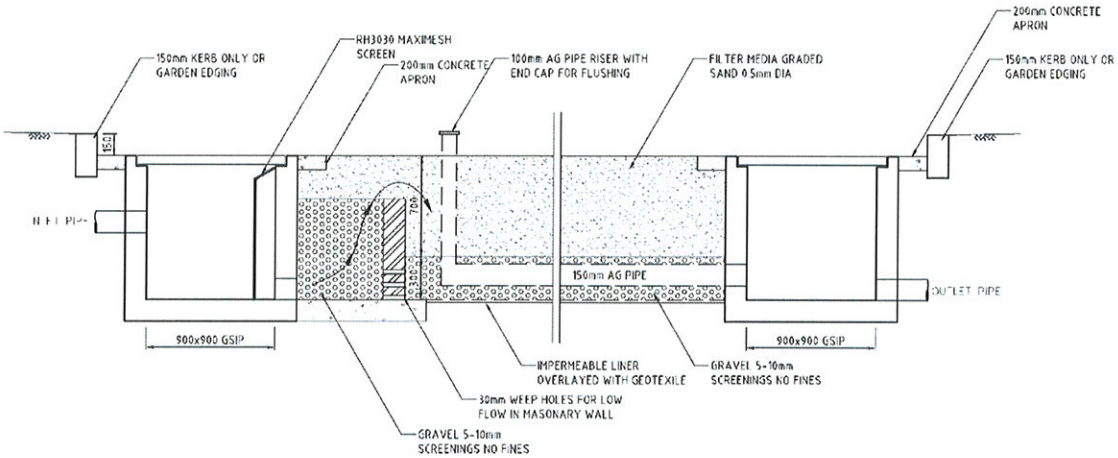


Figure 5. Bio-retention System Diagram source: WSUD Guidelines for Western Sydney

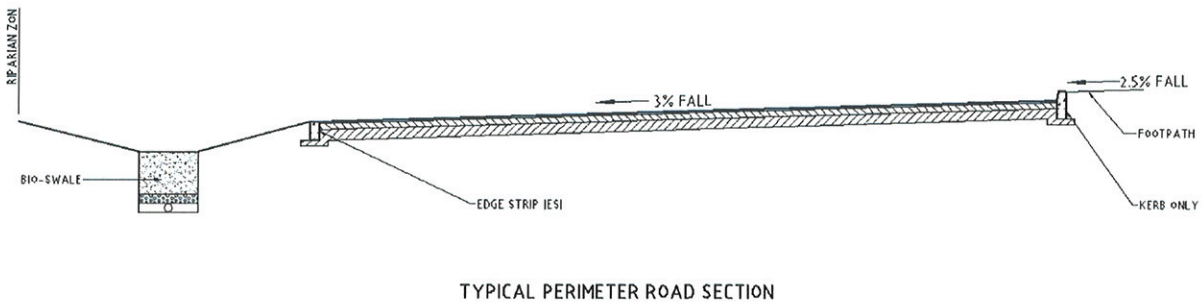


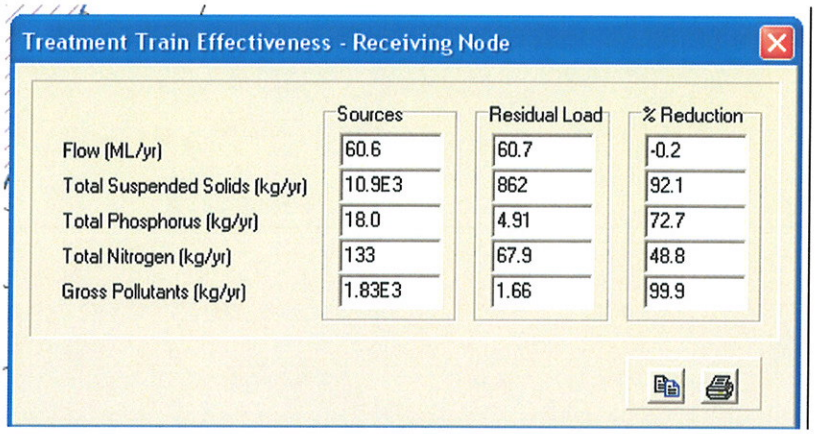
Figure 6. Perimeter Road Section

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 80% reduction in Total Suspended Solids, a 65% reduction of total Phosphorus, and a 45% total reduction in total Nitrogen.



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.

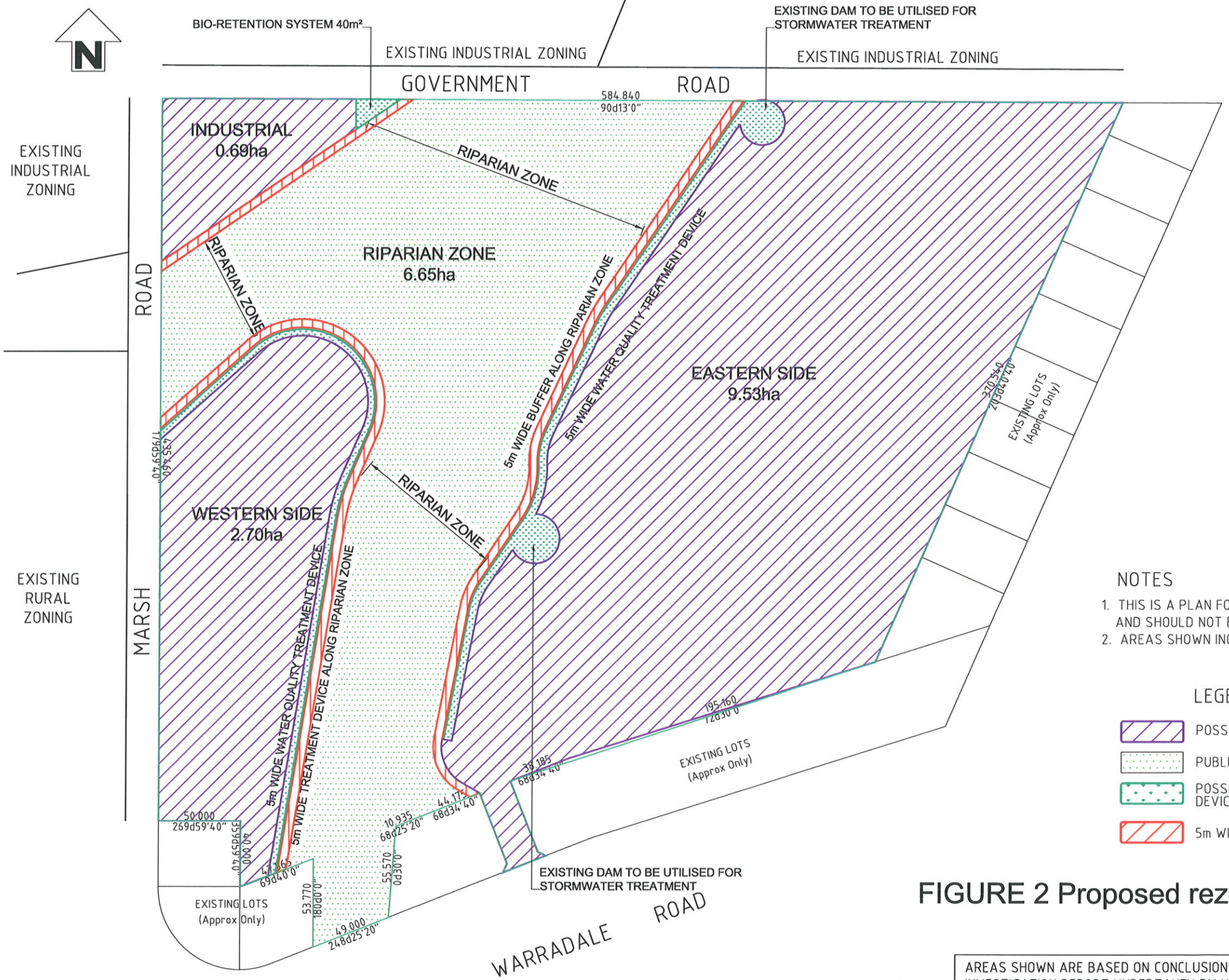
7. REFERENCES

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

Treatment Location Plan



NOTES

1. THIS IS A PLAN FOR THE PURPOSES OF REZONING OF LOT 5 DP 261728 AND SHOULD NOT BE USED FOR ANY OTHER PURPOSES.
2. AREAS SHOWN INCLUDE POTENTIAL WATER QUALITY TREATMENT DEVICES.

LEGEND

- POSSIBLE RESIDENTIAL LOTS
- PUBLIC RESERVE
- POSSIBLE LOCATION OF WATER QUALITY IMPROVEMENT DEVICES - DEPENDANT ON FINAL SUBDIVISION DESIGN
- 5m WIDE BUFFER ZONE AS ADVISED BY HAYES ENVIRONMENTAL

FIGURE 2 Proposed rezoning of the subject site.

AREAS SHOWN ARE BASED ON CONCLUSIONS AND RECOMENDATIONS WITHIN THE FLORA AND FAUNA INVESTIGATION REPORT UNDERTAKEN BY HAYES ENVIRONMENTAL DATED MARCH 2010

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REVISIONS	No.	DESCRIPTION	DRN	APP	DATE
	B	REVISED AS PER UPDATED REPORT BY HAYES ENVIRONMENTAL REPORT	A.C		13/04/10
	C	REVISED TO SUIT LOT LAYOUT	A.C		15/02/11

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Height Datum	A.H.D.
Drawn	A.C
Designed	A.C
Checked	
Approved	
Client Title	TRN GROUP
Dwg Status	PRELIMINARY
Local Authority	WOLLONDILLY
Dwg Title	PROPOSED REZONING LOT 5, DP 261728 SILVERDALE POSSIBLE WATER QUALITY SOLUTION
Ref & Dwg No	04169.P01
Sheet No	Sheet 1 of 1
Scale	1:2500 @ A3
Date	07/08/09
Rev	C
	A3