STORMWATER MANAGEMENT STRATEGY

DA Modification 9A

Huntlee Project – Stage 1

Job No: NL151661
Revision: B
Date: 02/08/2018

		BY	DATE
Prepared		BH	02/08/2018
Checked		BC	02/08/2018
Admin		BM	02/08/2018

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1 INTRODUCTION

Northrop Consulting Engineers have been engaged by Huntlee Pty Ltd to review the approved Stormwater Management Strategy with consideration to the changes now being proposed by Mod 9A. This report assesses the impacts of the proposed changes on the existing approved site Stormwater Management Strategy.

1.1 Project Background

1.1.1 Huntlee Urban Release Area

The Huntlee Project is a major Urban Release Area (URA) in the Hunter region which will provide housing for approximately 20,000 people accommodated within up to 7,300 dwellings. The project will deliver a new town comprising of a commercial center, residential precincts, open spaces, recreation areas, conservation reserves and supporting employment lands.

In 2013 the Huntlee Development Control Plan (DCP) was adopted by the Director-General of the Department of Planning and Infrastructure pursuant to the provisions of Section 74C of the Environmental Planning & Assessment Act, 1979 (the Act). The DCP applies to all development on the land in Zone R1 General Residential, Zone R2 Low Density Residential and Zone B4 Mixed Use within the Huntlee site and is to be used to assess all development applications.

Figure 1 below shows an extract from the DCP illustrating the extent of the Huntlee Project Area and respective LGA's.

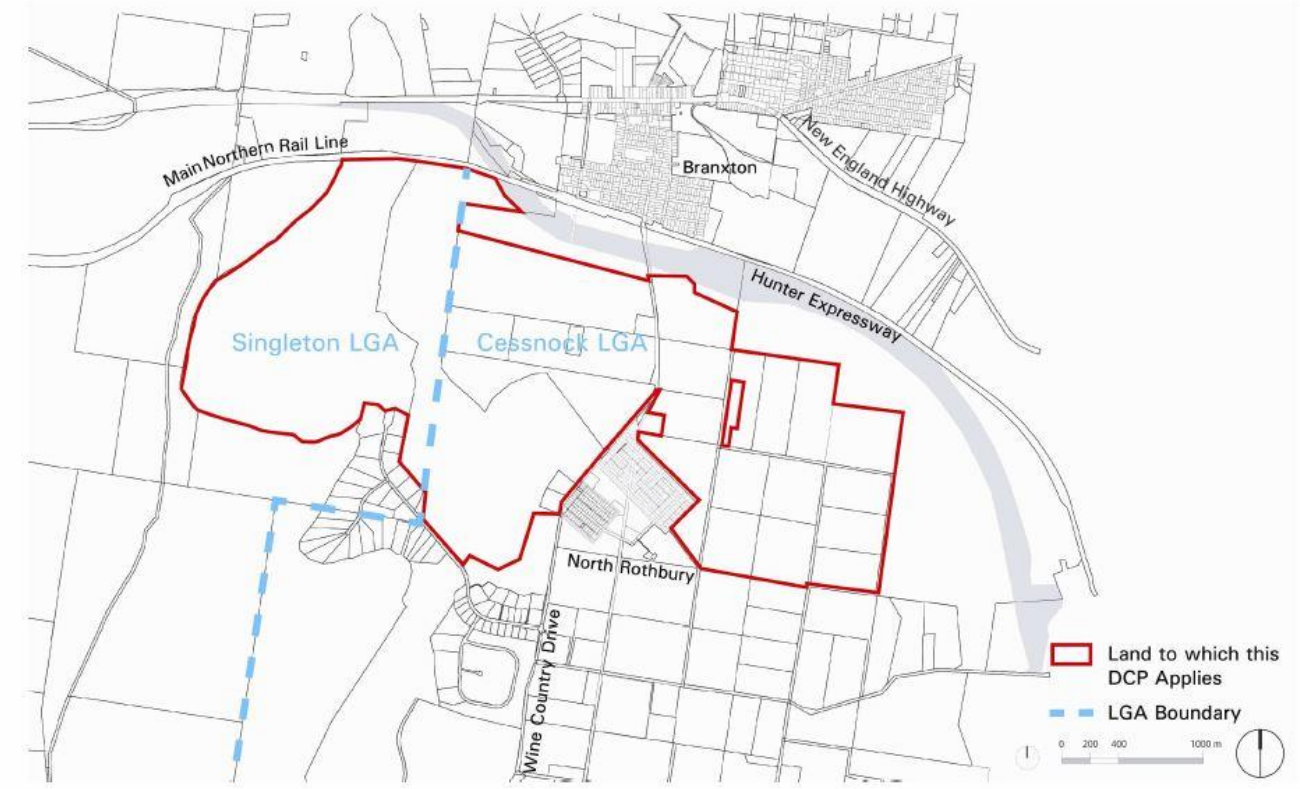

Figure 1: Huntlee Project Area (Extract from Huntlee DCP 2013)

1.1.2 Stage 1 Project Area

The Stage 1 Project Area covers approximately 360ha of the Huntlee URA. Stage 1 was granted approval in 2013 and is now well into the construction phase with approximately 175 dwellings already occupied. The Stage 1 Project Area in context of the overall Huntlee development framework is shown below in **Figure 2**. The Stage 1 development includes the first residential village extending north east of the existing North Rothbury township, aproximately 50 hectares of the Town Centre and 120 large residential lots off Wine Country Drive.

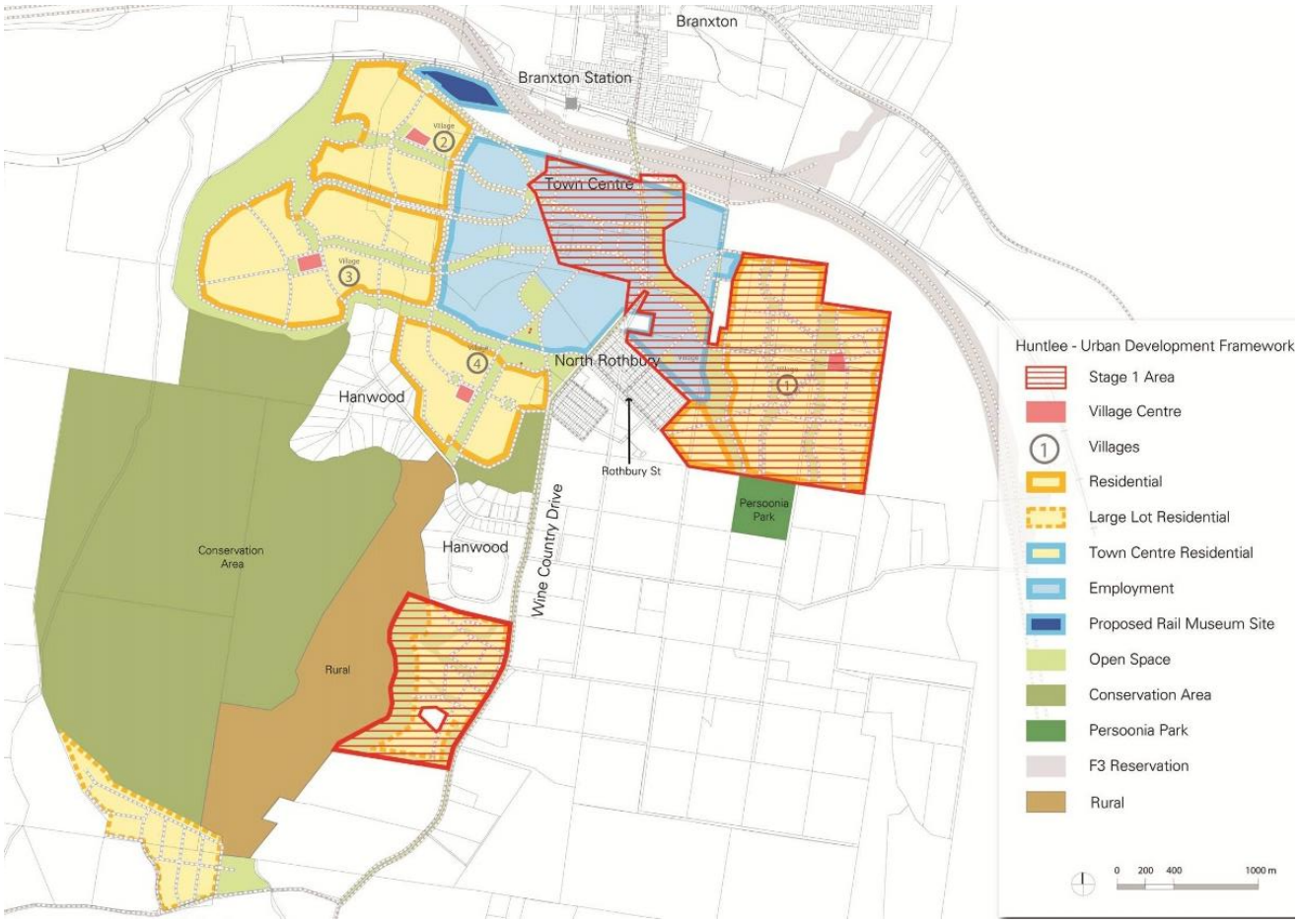

Figure 2: Stage 1 Project Area within Overall Huntlee Development Framework

1.2 Modification 9A

Mod 9A is now seeking to amend the Stage 1 layout. The modification is specifically seeking to subdivide two areas within the Town Centre across precincts TC1, TC2 and TC4 to the west of Wine Country Drive. **Figure 3** below shows the current approved layout, with **Figure 4** illustrating the additional lots proposed under Mod 9A. The revised overall master plan reflecting the proposed changes is provided for reference in Appendix A.

The additional lots are seeking to deliver a range of commercial sites with associated industrial services. Access to the northern development area is to be via Tollbar Avenue already constructed under the Stage 1 approval with the southern lots to be accessed via Wine Country Drive.

In addition to this, two new drainage reserves are proposed across the site, one at the sites northern boundary to cater for a sub-catchment within Precinct TC2, and a second within Precinct 1 to cater for lots subdivided under Sub-Stage 5A. The addition of the drainage reserve within Precinct TC2 can be seen in **Figure 4,** with the drainage amendments for sub-stage 5A shown across **Figures 5** to **6**.

Figure 3: Current Approved Layout across Precincts TC 1 - 5 within Stage 1

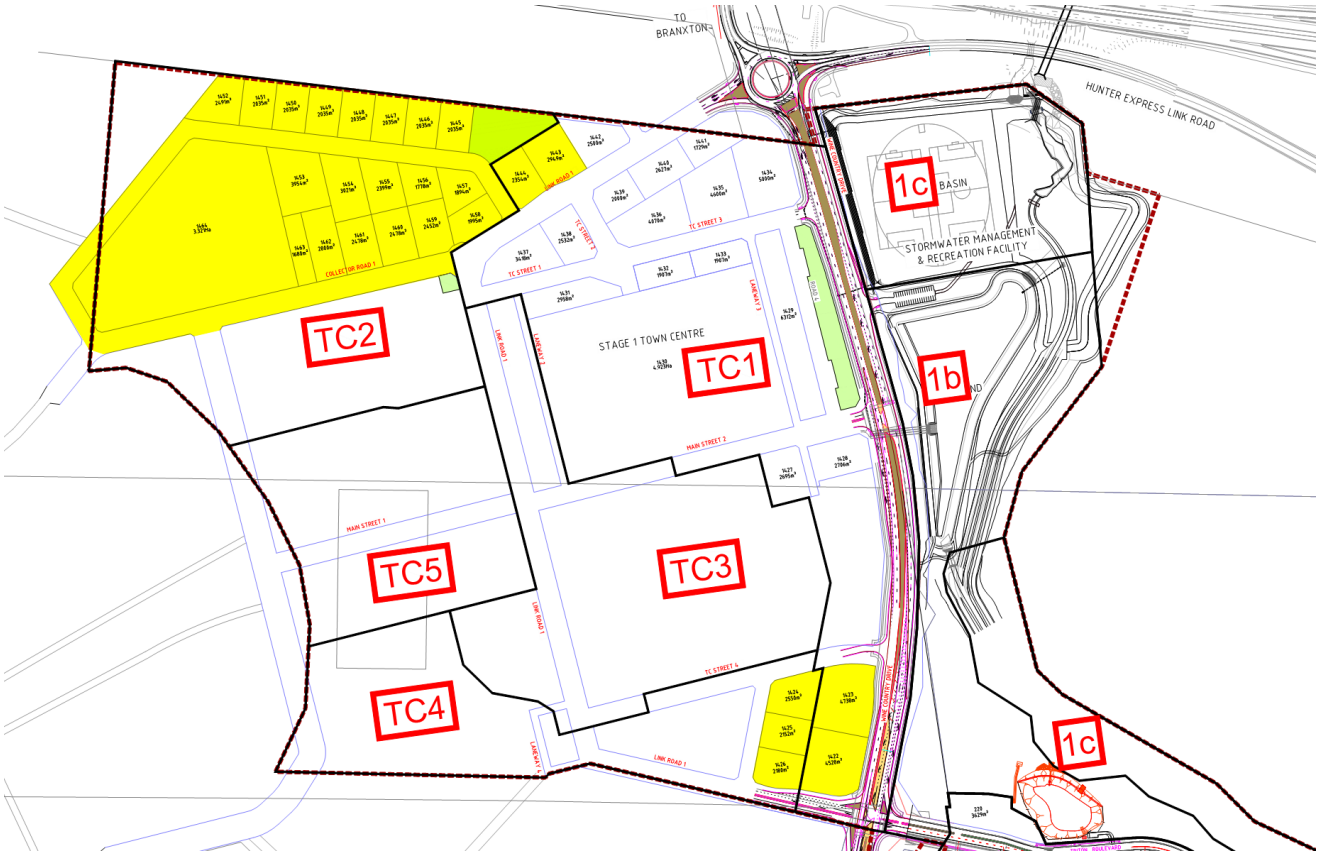

Figure 4: Proposed Mod 9A Layout across Precincts TC 1 - 5 within Stage 1

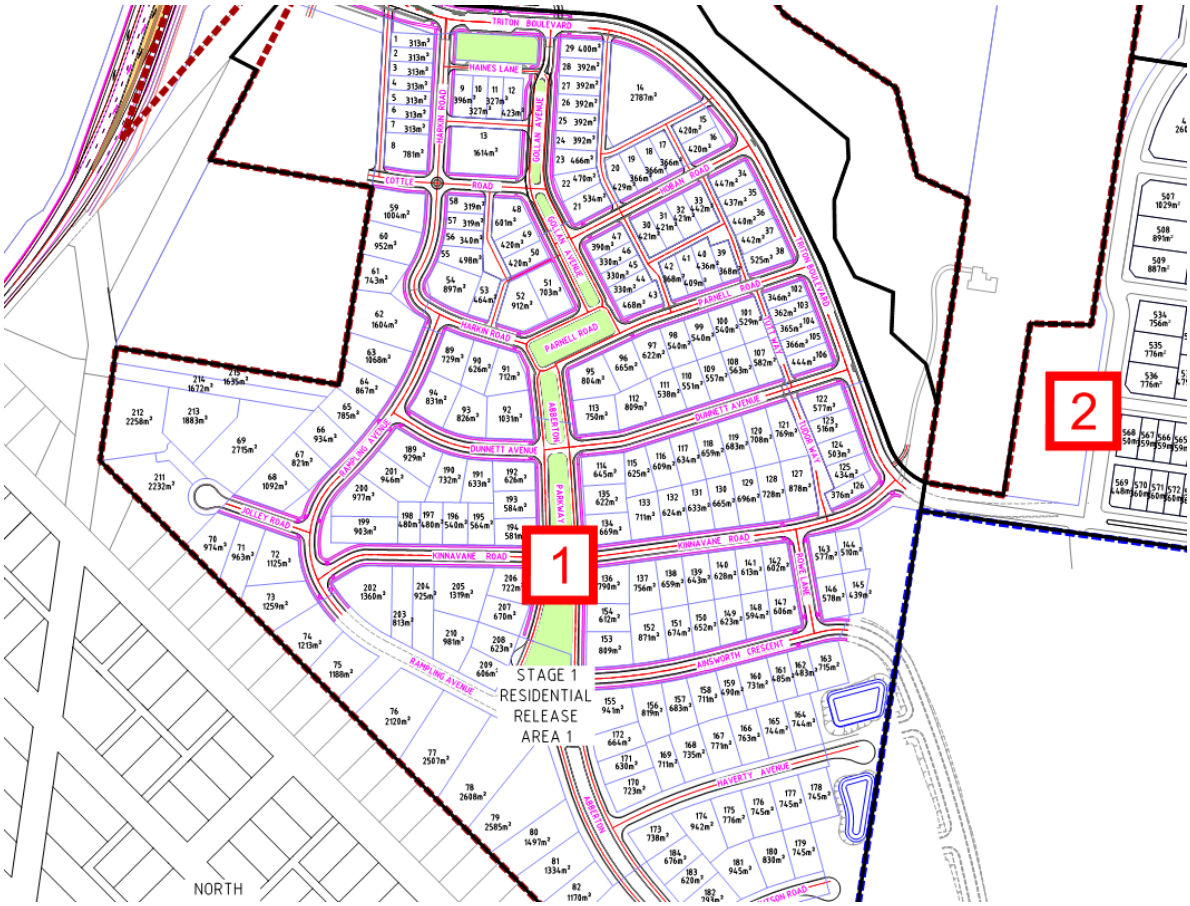

Figure 5: Current Approved Layout across Precinct 1 within Sub-Stage 5A

Figure 6: Proposed Mod 9A Layout across Precinct 1 within Sub-Stage 5A

2 Approved Stage 1 Stormwater Strategy

The Stormwater Strategy approved under the Stage 1 Development Application was based upon the *Trunk Stormwater and Flooding Assessment* - Stage *1 Project Application* prepared by WorleyParsons in 2012. The assessment was largely based upon two earlier studies undertaken by WorleyParsons in 2008 and 2010.

2.1 Site Wide Strategy

Natural drainage within Stage 1 of the Huntlee development is predominately characterised by two unnamed ephemeral watercourses, referred to as Tributary 1 and 2, which drain to Anvil Creek, a major branch of the Hunter River. In 2008, WorleyParsons were commissioned to undertake a trunk stormwater and flooding assessment of these tributaries. The objectives of the study were to assess the existing and developed state hydrology and to mitigate the effects of the proposed urban development on local and downstream flooding. The study also outlined a concept stormwater management strategy to mitigate the potential water quality impacts of the proposed development on receiving waters. The results of the study were collated in order to establish a concept stormwater and flooding management plan for the site.

Following this, in 2010, WorleyParsons were engaged to prepare a conceptual stormwater and riparian corridor management plan to revise the 2008 assessment. The revision was done to include the riparian corridor management concepts that were developed in consultation with the Department of Water and Energy (DWE) as part of the Project Application for Stages 1A and 1B. The study recommended detailed hydrologic and hydraulic modelling be undertaken to define the required flood conveyance corridor and to determine the design requirements for any online structures. Adoption of an 'improve or maintain' philosophy for all major watercourses within the proposed development area was also recommended.

In 2012 the results of these previous engineering investigations were collated to form a stormwater and flooding assessment to support the Stage 1 Development Application. The study undertook hydrologic and hydraulic modelling to define the required flood conveyance corridor and to determine the design requirements for all online structures proposed for Tributaries 1 and 2. The application identified the 100-year flood extents across the sub-catchments, established a detention policy to ensure no worsening impacts upon the up or downstream properties and outlined water quality treatment strategies to mitigate the effects of the development. The strategy presented proposed regional online detention basins with offline treatment trains to be provided for individual sub-catchments.

2.2 Tributary 2 Strategy

Figure 7 shows an extract from the WorleyParsons report which depicts the proposed water management strategy for each tributary. All areas seeking modification are located within the Tributary 2 catchment. As illustrated a regional online detention basin is proposed for the catchment with water quality basins offset along the riparian corridor.

Tributary 2 flows in a north-eastly direction to an existing culvert crossing immediately north of the site boundary. This existing culvert outlets on the northern side of the Hunter Expressway allowing flows to continue through to Anvil Creek. Development within the Tributary 2 catchment has commenced with detailed design of residential lots within precincts 1 to 3 now complete with construction well advanced. In addition, detailed design of precinct TC1 of the Town Centre has now been complete with construction also having commenced. The land release strategies for these precincts have utilised end of line bio-filtration basins as recommended within the 2012 WorleyParson's Assessment. They have also incorporated detention within the biofiltration basins as interim measures until such time as the regional online basin is constructed. At the time of writing this report construction of the Tributary 2 basin is yet to commence.

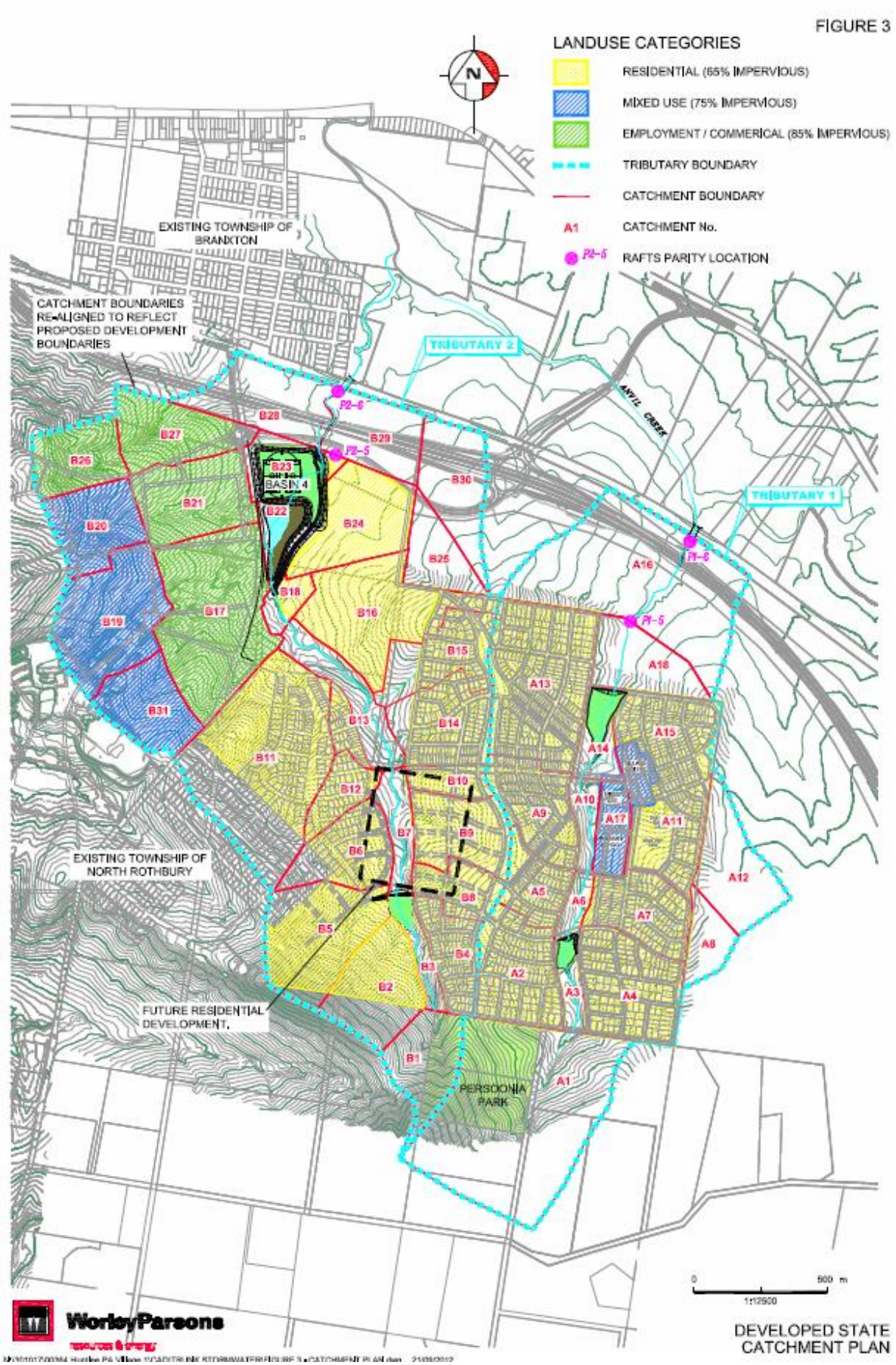

Figure 7: Stage 1 Project Application Stormwater Proposal (Worley Parsons, 2012)

As shown in **Figure 7**, under this assessment the southern and northern sites identified for modification within the town center fall across sub catchments B17 and B26-27 respectively. The drainage reserve proposed within Precinct 1 falls within sub-catchment B11. The approved strategies for each of the sub catchments are summarised below.

2.2.1 Sub catchment B17

Stormwater runoff from sub catchment B17 currently concentrates within a vegetated first order stream which crosses Wine Country Drive before meeting Tributary 2 within the site boundary. Drainage infrastructure consisting of a piped minor system and overland major system was proposed to formalise this conveyance in accordance with the development layout. Once developed, low flows were to be directed to a treatment train sized to cater for the entire contributing catchment, including sub catchments B19 and B31. The proposed treatment train was to consist of:

- A proprietary end of line Gross Pollutant Trap (GPT) for primary treatment;
- Biofiltration basin with approximate surface area of 3200m^2 for secondary treatment; and
- Constructed offline wetland with a permanent water volume of approximately 25,000m^3 for tertiary treatment.

High flows from the sub catchment were to bypass the proposed treatment train to directly discharge into Tributary 2. The online detention basin sized to cater for the regional catchment at the base of the site was then to attenuate post developed flows.

2.2.2 Sub catchments B26-27

Stormwater runoff from sub catchments B26 to B27 currently concentrates within a vegetated first order stream which discharges across the north eastern site boundary. External to the site, flows cross Wine Country Drive before discharging into Tributary 2 downstream of the Huntlee development boundary.

Drainage infrastructure consisting of a piped minor system and overland major system was proposed to capture and divert runoff to discharge into Tributary 2 within the site boundary. This diversion proposed to achieve attenuation of post developed flows within the regional online detention basin. Prior to this, low flows were to be directed to a treatment train consisting of a GPT for primary treatment and biofiltration basin with approximate surface area of 4700m^2 for secondary treatment. Due to its low position within the catchment flows were not proposed to enter the constructed wetland for tertiary treatment but rather directly discharge to Tributary 2.

2.2.3 Sub catchment B11

Similar to catchment B17, once developed, low flows from B11 were to be directed to a treatment train consisting of;

- A proprietary end of line Gross Pollutant Trap (GPT) for primary treatment;
- Biofiltration basin with approximate surface area of 4650m^2 for secondary treatment; and
- Constructed offline wetland with a permanent water volume of approximately 25,000m^3 for tertiary treatment.

Again, high flows from the sub catchment were to bypass the proposed treatment train to directly discharge into Tributary 2 with the regional online basin to attenuate post developed flows.

3 Proposed Stormwater Strategy Under Mod 9A

This modification is seeking to amend the approved stormwater strategy to maintain the current discharge location for sub-catchments B26-B27 and reflect the proposed TC2 layout. Both water quality mitigation and detention facilities are to be provided onsite within the proposed drainage reserve. In addition to this a drainage reserve to allow for additional detention facilities is proposed within sub-catchment B11 to ensure pre-developed flows within an existing inter-allotment drainage easement are maintained.

No changes to the approved stormwater strategy for sub-catchment B17 are proposed to reflect the layout changes across TC1 and TC3 as they are consistent with the current design intent of the approved Worley Parson report.

3.1 Proposed Stormwater Strategy for Sub-Catchment B26-27

The proposal for an offline treatment train consisting of a Gross Pollutant Trap (GPT) and bio-filtration basin sized to cater for the entire contributing sub-catchment once fully developed is to be maintained. Altering from the original proposal, the sub-catchment stormwater facilities are to be designed to also incorporate onsite detention volumes to attenuate post developed flows to pre-developed rates.

In accordance with the 2013 Huntlee DCP the proposed stormwater strategy is to adopt the following objectives;

- Minimise the potential impact of local and downstream flooding by ensuring no net increase in peak flows during events up to the 1% AEP storm in receiving waterways; and
- Mitigate the impacts of urban development on stormwater quality through adoption of Water Sensitive Urban Design Principles to reach the nominated pollutant load reduction targets.

The following provides a description of the proposed onsite detention and water quality treatment facilities for the catchment within TC2. This section of the report should be read in conjunction with the Concept Stormwater Management Plan drawing NL151661_SK01_A provided in Appendix B.

3.1.1 Onsite Stormwater Detention

Preliminary hydrological modeling has been undertaken to assess the contributing catchment in both the pre and post developed scenarios. Specifically, a model to predict the peak flows for a range of storm durations and AEP's to assess the impact of the proposed development on the hydrologic regime has been developed. The model was then used to develop mitigation measures which have been designed to ensure no net increase in peak flows during storm events up to the 1% AEP.

Modelling was undertaken using the computer software package DRAINS utilizing the ILSAX hydrological method. In accordance with Cessnock City Council Stormwater Drainage Design guidelines a type 3 soil was assigned with a grassed depression storage of 5mm and impervious depression storage of 1mm. Rainfall data for the model was obtained from the Bureau of Meteorology using AR&R87 intensity data.

The catchment area was investigated on the ground and through aerial imagery. A combination of detailed survey, LIDAR contour data and proposed design data was used to delineate pre and post developed catchments for the drainage course of 9.39 ha and 10.07 ha respectively. For the existing scenario the catchment was categorised as permeable with forested characteristics observed. For the post developed state the site the was modelled using a 86% impervious fraction determined from the following proposed land use categories:

- Industrial/commercial – average 90% impervious fraction per lot;
- Road Reserve – average 85% impervious fraction; and
- Drainage Reserve – average 10% impervious fraction.

The results from the peak storm events have been summarised below in **Table 1**.

Table 1: Peak Storm Event Site Discharge Flow Rates

AEP % Storm Event	Pre-developed Scenario Peak Discharge Flowrate (m3/s)	Post-developed Scenario Peak Discharge Flowrate (m^3/s)
20	0.749	2.58
10	0.982	2.90
5	1.30	3.44
2	1.67	3.78
1	2.00	4.25

As summarised in **Table 1** it is evident that the proposed development will increase peak flows within the catchment over a range of rainfall events. This net increase in peak flows is likely to have adverse effects on downstream properties and the regional hydrology. Detention measures have therefore been proposed to mitigate the negative impacts on the catchment regime at the site boundaries.

3.1.2 Detention Storage Volume

Through runoff routing in DRAINS it was determined a detention volume of approximately 3500m^3 was required to reduce peak developed flow rates to pre-developed, greenfield, rates. It is proposed that this volume will be provided as extended detention within the biofiltration basin. A piped outlet is to discharge via a headwall suitably designed to prevent erosion and scour with a high flow spillway to be designed to cater of major storm events. The results from the peak storm events with the integrated detention basin have been summarised below in **Table 2**.

Table 2: Peak Storm Event Site Discharge Flow Rates with Onsite Detention

AEP % Storm Event	Pre-developed Scenario Peak Discharge Flowrate (m3/s)	Detention Basin Peak Discharge Flowrate (m^3/s)
20	0.749	0.728
10	0.982	0.766
5	1.30	0.865
2	1.67	1.25
1	2.00	1.69

As summarised the basin will effectively attenuate runoff up to the 1% AEP peak flow and is therefore considered to effectively mitigate the effects of the development on stormwater quantity in accordance with the intent of the DCP. Detailed design to confirm the basin volume and outlet configuration is to be undertaken at CC Stage.

3.1.3 Onsite Stormwater Treatment

The performance of the proposed stormwater management strategy has been assessed using the conceptual computer software MUSIC (Version 6.2). MUSIC serves as a planning and decision support system that is used to estimate the efficiency of Stormwater Quality Improvement Devices (SQIDs) at capturing common stormwater pollutants including Total Suspended Solids, Total Nitrogen, Total Phosphorous and Gross Pollutants from stormwater runoff. Modelling involves the use of historical or synthesized long-term rainfall data and algorithms that can simulate the performance of stormwater treatment measures to determine stormwater pollution control.

Water quality is proposed to be managed through a treatment train approach to meet pollutant removal efficiency targets specified in the Huntlee DCP 2013. The relevant targets have been reproduced in **Table 3** below.

Table 3: Pollutant Removal Efficiency Targets.

Pollutant	Treatment Efficiency Target
Total Suspended Solids (TSS)	85% reduction in pollutant loads
Total Nitrogen (TN)	45% retention of average annual load
Total Phosphorous (TP)	45% retention of average annual load

Rainfall data was sourced from Bureau of Meteorology station 061174, located at Millfield. The data consisted of 6-minute pluviograph data from the period 1969 to 1973 and was chosen to be consistent with the "Trunk Stormwater and Flooding Assessment" undertaken by WorleyParsons (2012). This period was originally selected as it represents 5 consecutive years of approximate average rainfall.

Monthly areal potential evapotranspiration (PET) rates for the site were estimated from PET data provided in the Climate Atlas of Australia (BoM, 2001). The monthly average PET rates adopted for use in the MUSIC model are provided below in **Table 4.**

Table 4: Average Evaporation and Potential Evapotranspiration at the Huntlee Site

Month	Average Monthly Evaporation^ (mm/month)	Areal Potential Evapotranspiration (mm/month)
January	180	170
February	175	140
March	125	130
April	100	90
May	90	65
June	80	60
July	75	50
August	90	70
September	120	90
October	140	120
November	180	150
December	200	165

^Evaporation from a Class A evaporation pan.

Catchments within the development zone were modelled as an aggregate of multiple lots with the impervious area fraction estimated by land use. Three catchment categories were specified;

- Industrial/commercial – average 90% impervious fraction per lot;
- Road Reserve – average 85% impervious fraction; and
- Drainage Reserve – average 10% impervious fraction.

Catchment parameters and pollutant source data was obtained from the "NSW MUSIC Modelling Guidelines". The catchment and pollutant runoff parameters are provided in **Tables 5 to 8.**

Table 5: Music Catchment and Pollutant Runoff Parameters (NSW Music Modelling Guidelines).

Rainfall-Runoff Parameter	Industrial/Commercial	Road Reserve	Drainage Reserve
Impervious Area Properties			
Rainfall Threshold (mm/day)	1	1	1
Pervious Area Properties			
Soil Storage Capacity (mm)	88	88	88
Initial Storage (% of Capacity)	25	25	25
Field Capacity (mm)	70	70	70
Infiltration Capacity Coefficient –a	180	180	180
Infiltration Capacity Exponent –b	3	3	3
Ground Water Properties			
Initial Depth (mm)	10	10	10
Daily Recharge Rate (%)	25	25	25
Daily Baseflow Rate (%)	25	25	25
Daily Deep Seepage Rate (%)	0	0	0

Table 6: Pollutant Runoff Parameters for Total Suspended Solids (TSS).

Runoff Parameter	Industrial/Commercial	Road Reserve	Drainage Reserve
Baseflow Concentration Parameters			
Mean (log mg/L)	1.20	1.20	1.15
Std Dev (log mg/L)	0.17	0.17	0.17
Storm Flow Concentration Parameters			
Mean (log mg/L)	2.15	2.43	1.95
Std Dev (log mg/L)	0.32	0.32	0.32

Table 7: Pollutant Runoff Parameters for Total Phosphorous (TP).

Runoff Parameter	Industrial/Commercial	Road Reserve	Drainage Reserve
Baseflow Concentration Parameters			
Mean (log mg/L)	-0.85	-0.85	-1.22
Std Dev (log mg/L)	0.19	0.19	0.19
Storm Flow Concentration Parameters			
Mean (log mg/L)	-0.60	-0.30	-0.66
Std Dev (log mg/L)	0.25	0.25	0.25

Table 8: Pollutant Runoff Parameters for Total Nitrogen (TN).

Runoff Parameter	Industrial/Commercial	Road Reserve	Drainage Reserve
Baseflow Concentration Parameters			
Mean (log mg/L)	0.11	0.11	-0.05
Std Dev (log mg/L)	0.12	0.12	0.12
Storm Flow Concentration Parameters			
Mean (log mg/L)	0.30	0.34	0.30
Std Dev (log mg/L)	0.19	0.19	0.19

3.1.4 Proposed Treatment Train

In accordance with the current proposal a treatment train consisting of a GPT and biofiltration basin is to be adopted onsite. The gross pollutant trap will provide primary water quality treatment through removal of coarse pollutants such as litter and medium-sized sediments. The GPT will also aid in the protection of the downstream filter media. A proprietary Humegard GPT was modelled using the pollutant removal rates supplied by the manufacture.

A bio-filtration basin with an approximate media surface area of 1200m^2 will be implemented to provided secondary pollutant removal treatment via infiltration. The basin will be designed to pond and infiltrate stormwater runoff through a porous filter media approximately 500 mm deep which will support nutrient dependent plant species. Infiltrated stormwater will be captured in a subsurface drain and discharged via a headwall outlet. Stormwater will enter the basin via a riprap-lined weir designed to dissip

3.1.5 MUSIC Results

The estimated pollutant load reductions modelled in Music are presented in **Table 9.**

Table 9: Stormwater Quality Results.

Parameter	Source Load	Residual Load	% Reduction
Total Suspended Solids (kg/yr)	16200	2380	85.3
Total Phosphorus (kg/yr)	25.7	11.4	55.9
Total Nitrogen (kg/yr)	162	80.1	50.5
Gross Pollutants (kg/yr)	2170	69.6	96.8

As summarised in **Table 9**, the proposed treatment train will effectively meet all residual pollutant load reduction targets as recommended by the DCP. This strategy therefore is considered to effectively mitigate the effects of the development on stormwater quality in accordance with the intent of the DCP.

3.2 Proposed Stormwater Strategy for Sub-Catchment B11

The proposal for an offline treatment train consisting of a GPT and bio-filtration basin sized to cater for the entire contributing sub-catchment once fully developed with regional online detention facilities downstream is to be maintained. Altering from this, to enable development of an existing large lot within Precinct 1 and maintain the inter-allotment point of discharge additional detention facilities are proposed within sub-catchment B11. The facilities are to be designed to maintain flow volumes within the existing inter-allotment drainage easement during major storm events once its upstream catchment has been fully developed.

The following provides a description of the proposed facilities and should be read in conjunction with the Concept Stormwater Management Plan drawing NL150007_SK05.01_1 provided in Appendix C.

3.2.1 Onsite Stormwater Detention

In the developed scenario approximately 0.7ha of the large lot subdivision is to discharge via an existing inter-allotment drainage line. Preliminary hydrological modeling has been undertaken to assess the contributing catchment in both the pre and post developed scenarios. Specifically, a model to predict the peak flow during the 1% AEP to assess the impact of the proposed development on downstream properties has been developed.

Again, modelling was undertaken using the computer software package DRAINS utilizing the ILSAX hydrological method. In accordance with Cessnock City Council Stormwater Drainage Design guidelines a type 3 soil was assigned with a grassed depression storage of 5mm and impervious

depression storage of 1mm. Rainfall data for the model was obtained from the Bureau of Meteorology using AR&R87 intensity data.

The existing scenario was categorised as permeable with grassed characteristics observed. For the post developed state, the site was modelled using a 40% impervious fraction determined by its low density with an average lot size over 2000m^2.

Through runoff routing in DRAINS it was determined a detention volume of approximately 150m^3 was required to maintain discharge through the inter-allotment drainage line without impacting the downstream properties. The basin will utilise the existing pit and pipe outlet structure to minimise disturbance to downstream properties. **Table 10** shown below summarises the pre-developed and post developed overland flowrates conveyed across the downstream lots during the 1% AEP storm event.

Table 10 – Pre-Developed vs Post Developed IAD Overland Flow

OVERLAND FLOW DURING MAJOR STORM EVENT		
Overland Flow Path (behind Lot)	**Pre-Developed Flowrate (m^3/s)**	**Post-Developed Flowrate (m^3/s)**
258-257	0.001	0.001
257-256	0.252	0.082
256-255	0.310	0.155
255-254	0.266	0.166
254-253	0.099	0.047
OSD - 257	0.579	0.056

As summarised in Table 10 the proposed detention volume will comfortably reduce the post-developed overland flow below the pre-developed rates. During the major storm event basin depths are expected to reach a maximum of 1.05m at which point the emergency weir, to be constructed at a depth of 1m, will activate. With a velocity depth ratio of less than 0.1 expected over the weir at this point a turfed batter has been considered sufficient to avoid erosion and scour of the weir. Detailed design to confirm the basin volume and outlet configuration is to be undertaken at CC Stage.

4 Conclusion

The proposed Stormwater Management Strategy is considered to effectively meet the objectives of the 2013 Huntlee DCP and is therefore recommended to Council for adoption. The proposal will minimise the potential impact of local and downstream flooding by ensuring no net increase in peak flows during events up to the 1% AEP storm. Further to this through the adoption of Water Sensitive Urban Design Principles the effects of urbanisation on water quality will be mitigated in accordance with the required pollutant load reduction targets.

We trust this meets with Council's requirements however should you have any queries, please feel free to contact the undersigned on (02) 4943 1777.

Prepared by:

Brittany Hoey

Civil Engineer

Reviewed by:

Ben Clark

Principal Civil Engineer

APPENDIX A

Stage 1 Master Plan – Mod 9A

ISSUE	DATE	PURPOSE	ISSUE	DATE	PURPOSE
(0)	14/05/2018	PRELIMINARY REVIEW BY CLIENT			
(1)	17/05/2018	UPDATE TC LOTS, REMOVE KERBING TC			
(2)	18/05/2018	REMOVE BUS STOPS TC			

DRAWING STATUS

PRELIMINARY REVIEW

NOT FOR CONSTRUCTION

THIS IS A COLOUR DRAWING AND SHOULD NOT BE REPRODUCED IN BLACK AND WHITE

CLIENT

Huntlee

LWP bringing communities to life

SCALE 1:3000

SHEET SIZE A0

DRAWN BY ADM

CHECKED BY GJS

DRAWING TITLE 20406-1 TO 3000 (MOD9A)

PROJECT HUNTLEE STAGE 1 - DEVELOPMENT AREA
WINE COUNTRY DRIVE, HUNTLEE

CLIENT HUNTLEE PTY.LTD.

DALY.SMITH
EXPERIENCE YOU CAN TRUST

A: 3/48 Newcastle Street, Morisset NSW 2264
A: 4/9 Lambton Road, Broadmeadow NSW 2292
T: (02) 4973 2745 | F: (02) 4970 5366
E: mail@dalysmith.com.au
DALYSMITH.COM.AU

DALY.SMITH JOB No (Rev): **20406(2)**

SHEET NO: 1 OF 1

A0

Filename: X:\Data\20000-HUNTLEE\20406\DRAWINGS\20406 STAGE 1 - DE...
Plot Date: 18/05/2018 5:09:01 PM
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APPENDIX B

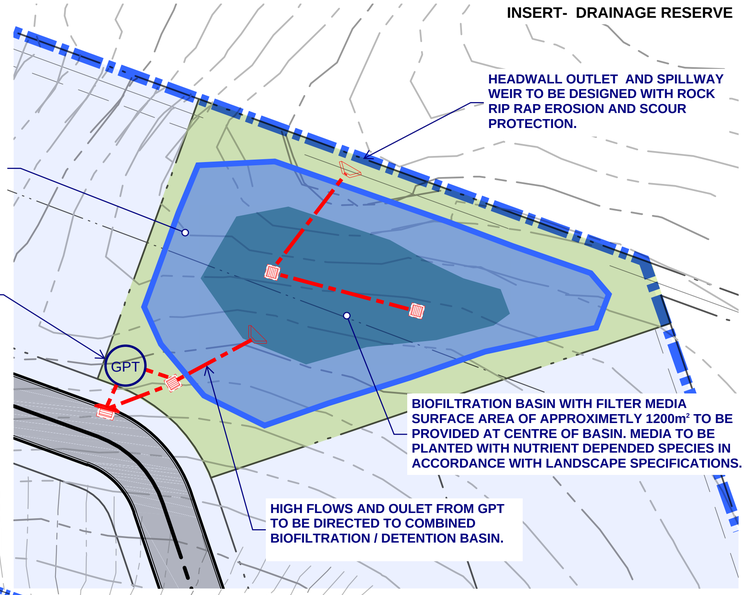
Concept Stormwater Management Plan – Precinct TC2

LEGEND

- DENOTES EXTENT OF DEVELOPED CATCHMENT
- DENOTES EXTENT OF DRAINAGE RESERVE
- DENOTES PROPOSED ONSITE DETENTION BASIN
- DENOTES PROPOSED BIOFILTRATION BASIN
- GPT - DENOTES PROPOSED GROSS POLLUTANT TRAP
- DENOTES PROPOSED STORMWATER PIT
- DENOTES PROPOSED STORMWATER PIPE

TOWN CENTRE PRECINCT 2

INSERT- DRAINAGE RESERVE



REFER INSERT

BIOFILTRATION / DETENTION BASIN

GPT

VERIFIER B CLARK
JOB MANAGER B CLARK
DESIGNED B HOEY
DRAWN W CRITTENDEN

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	PRELIMINARY	WC		BH	18.05.18

CLIENT

LWP bringing communities to life

Huntlee

DRAWING NOT TO BE USED FOR CONSTRUCTION UNLESS VERIFICATION SIGNATURE HAS BEEN ADDED

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SCALE 1:1000 @ A1 — 0 10 20 30 40 50m

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PROJECT: **HUNTLEE TOWN CENTRE**

DRAWING TITLE: **CONCEPT STORMWATER LAYOUT PLAN**

JOB NUMBER: **NL151661**

DRAWING NUMBER: **SK-C10.01**

REVISION: **1**

DRAWING SHEET SIZE = A1

APPENDIX C

Concept Stormwater Management Plan - Precinct 1

LEGEND

- DENOTES EXTENT OF DEVELOPED CATCHMENT
- DENOTES EXTENT OF DRAINAGE RESERVE
- DENOTES PROPOSED ONSITE DETENTION BASIN
- DENOTES PROPOSED STORMWATER PIT
- DENOTES EXISTING STORMWATER PIT
- DENOTES PROPOSED STORMWATER PIPE
- DENOTES EXISTING STORMWATER PIPE

WINE COUNTRY DRIVE

TRITON BOULEVARD

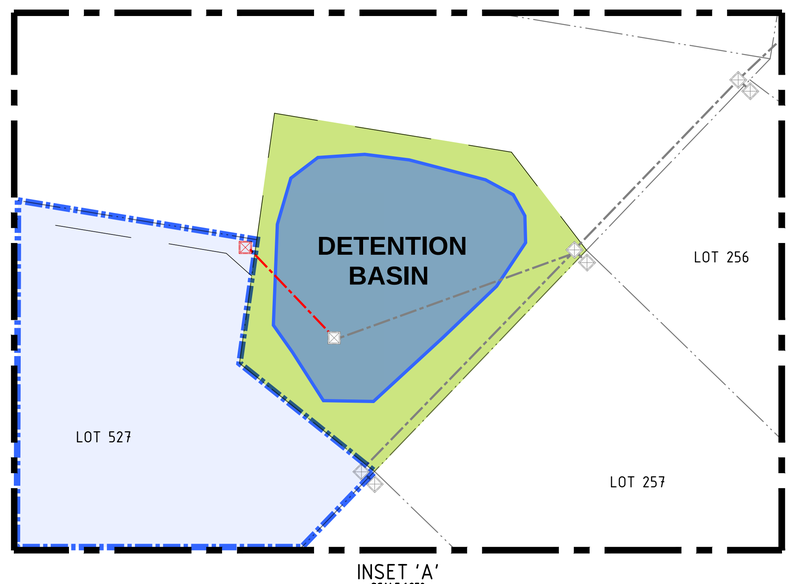
PROPOSED DRAINAGE RESERVE

STAGE 5A

INSET 'A'

PRECINCT 1

NORTH
ROTHBURY



INSET 'A'
SCALE 1:250

VERIFIER: P BURL
JOB MANAGER: B CLARK
DESIGNED: B BROWN
DRAWN: B BROWN

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	PRELIMINARY	WC		BH	02.08.18

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PLANS 1:1000 0 10 20 30 40 50m

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PROJECT
HUNTLEE PRECINCT 2
STAGE 5A

DRAWING TITLE
STORMWATER MANAGEMENT PLAN

JOB NUMBER **NL150007**

DRAWING NUMBER **SK5.01**

REVISION **1**

DRAWING SHEET SIZE = A1