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STORMWATER MANAGEMENT REPORT

ARMIDALE SECONDARY COLLEGE ARMIDALE NSW

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1 INTRODUCTION

Birzulis Associates Pty Ltd has been commissioned by NBRS Architecture Pty Ltd on behalf of Schools Infrastructure to prepare this Stormwater Management Report in support of a proposed development application to be lodged over the site.

The site is located on the southern side of Mann Street between Butler Street and Barry Street, Armidale, NSW. The proposed development is for a co-educational public secondary school consisting of numerous multi storey classroom buildings and car parks.

This report provides a summary of the stormwater management design principles and planning objectives for the management of stormwater quality and quantity. The objectives for the development are to provide an appropriate and economical stormwater management system which incorporates best practice in water sensitive urban design consistent with the requirements of Armidale Regional Council's (ARC) water quality objectives.

A set of drawings have been prepared to show that the proposed stormwater quantity and quality requirements for the development can be met. These drawings cover stormwater management elements which cover surface levels and drainage layouts.

The consent authority is Armidale Regional Council. The engineering and policy requirements of ARC have also been considered in the design. The stormwater management design had been discussed with the Stormwater Engineer at ARC throughout the design stages of this project. It was agreed that the use of rainwater tanks for water re-use and agricultural purposes would benefit the site, in conjunction with the use of an on-site detention tank.

2 SITE CHARACTERISTICS

2.1 Site Description

The proposed development is located in the suburb of Armidale on Butler Street with an area of approximately 18.3 hectares in area, as shown in **Figure 2.1**.

The site is bounded by Mann Street to the north, arboretorium to the south and low density residential land to the east and west.



Figure 2.1 Locality Plan

2.2 Proposed Development

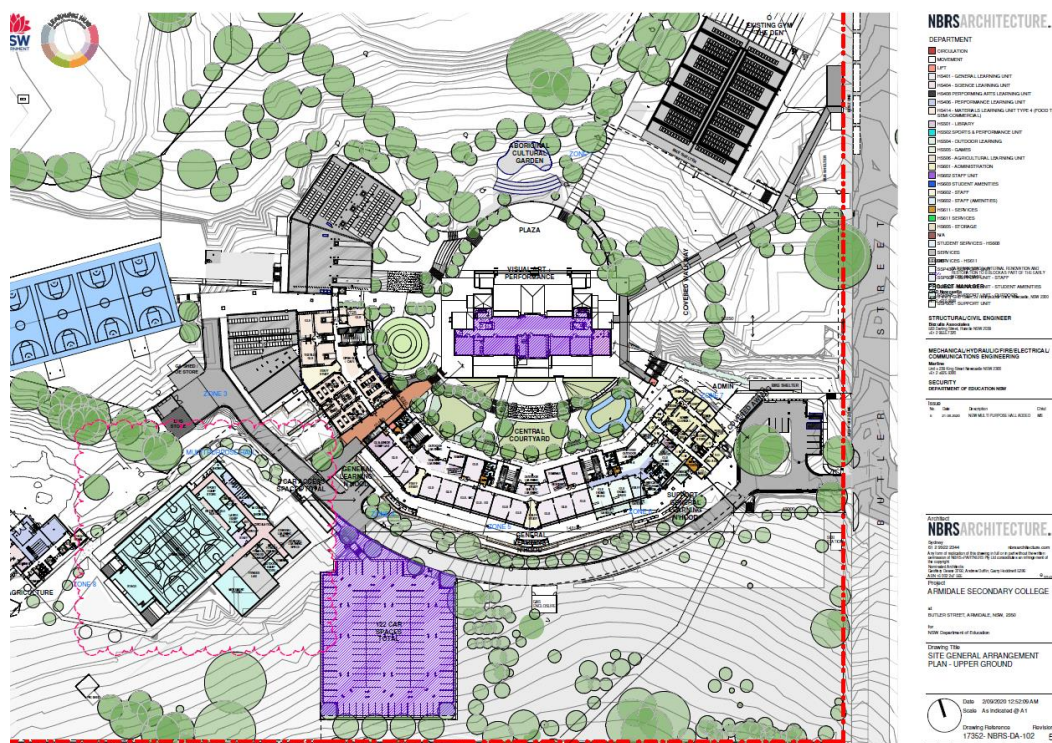
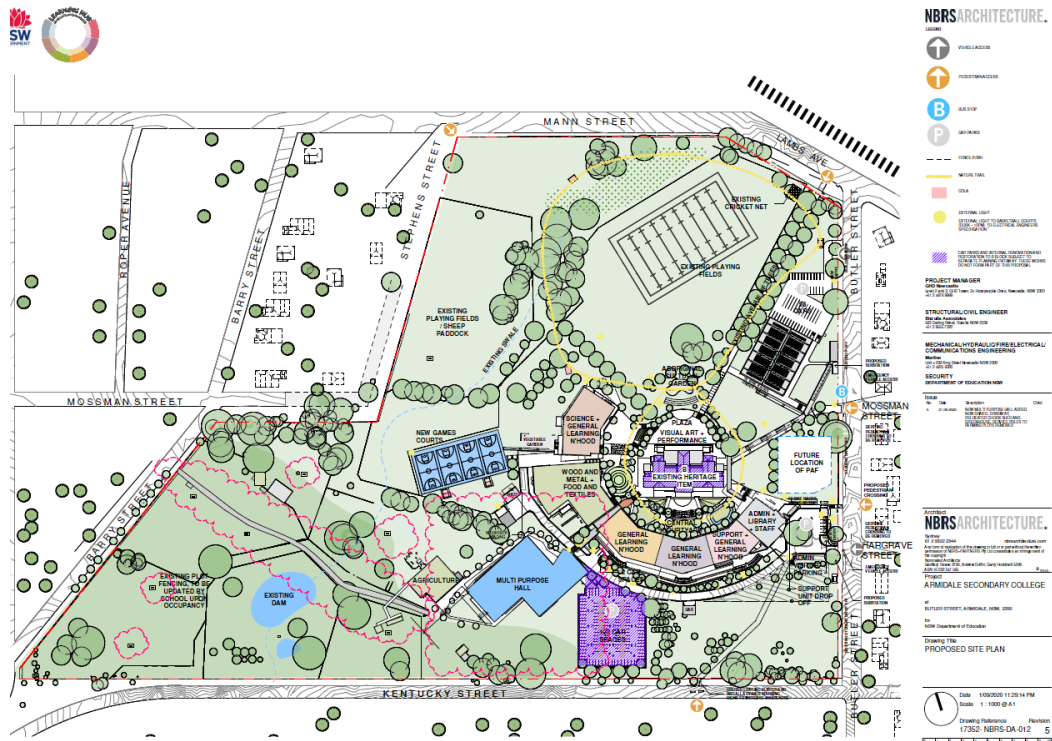
The proposed development is for the construction of a new secondary college.

An indicative layout of the development has been produced by NBRS Architecture and can be seen in **Figure 2.2**.

The development will include the following engineering components:

- ◆ Earthworks to provide foundation support for the classroom buildings including the excavation for underground on-site detention tanks;
- ◆ Construction of an access driveway off Butler Street;
- ◆ Maintaining the natural gradient of the site and overland flow path through the development site;

- ◆ Stormwater drainage system based on a major/ minor design philosophy;
- ◆ Management of stormwater quality using a treatment train approach to pollutant loads on a developed catchment in accordance with ARC's recommendations; and
- ◆ Management of stormwater quantity by reducing post developed flow to pre-developed over the range of storms between the 1 in 5 year Average Recurrence Interval (ARI) to the 1 in 20 year ARI as per council policy and recommendations.



3 STORMWATER DRAINAGE

3.1 Site Drainage

3.1.1 Existing Site Drainage

The property is currently developed as public high school with a large portion of the property utilized for agricultural purposes. All current overland flows travel towards the north of the site via a grassed channel and then into a headwall that drains under Mann Street into an underground reinforced concrete pipe approximately 1200mm diameter, travelling in a northerly direction. An additional stormwater outlet is to be proposed on Butler Street.

3.1.2 Proposed Site Drainage

The proposed system to be completed generally in accordance with the following general engineering practice, the guidelines of ARC and the following regime:

- The proposed stormwater drainage system for the development will comprise a minor and major system to safely and efficiently convey collected stormwater runoff from the development to the legal point of discharge
- The minor system is to consist of a piped drainage system which has been designed to accommodate the 1 in 5-year ARI storm event. This results in the piped system being able to convey all stormwater runoff up to and including the Q5 event. This meets the requirements of ARC stormwater criteria.
- The major system will be designed to cater for storms up to and including the 1 in 20-year ARI storm event. The major system will employ the use of defined overland flow paths, such as roads and open channels, to safely convey excess run-off from the site. Discussions were held with ARC stormwater engineer and a 1 in 20-year ARI storm event was deemed to be satisfactory due to the semi-rural nature of the site.
- The design of the stormwater system for this site will be based on relevant national design guidelines, Australian Standard Codes of Practice, the standards of ARC and accepted engineering practice. Runoff from buildings will generally be designed in accordance with AS 3500.3 National Plumbing and Drainage Code Part 3 – Stormwater Drainage. Overall site runoff and stormwater management will generally be designed in accordance with the Institution of Engineers, Australia publication “Australian Rainfall and Runoff” (2016 Edition), Volumes 1 and 2 (AR&R).
- The site area taken into consideration for stormwater design is shown in **Figure 3.1.**

Stormwater Management is required to be provided for water quantity and quality in accordance with the requirements of ARC DCP. Allowance for conveyance of the existing overland flow through the site will be required as discussed in **Section 5.2** of the report.

Further discussion on the Stormwater Management Strategy is provided in **Section 4** and **5** of this report.

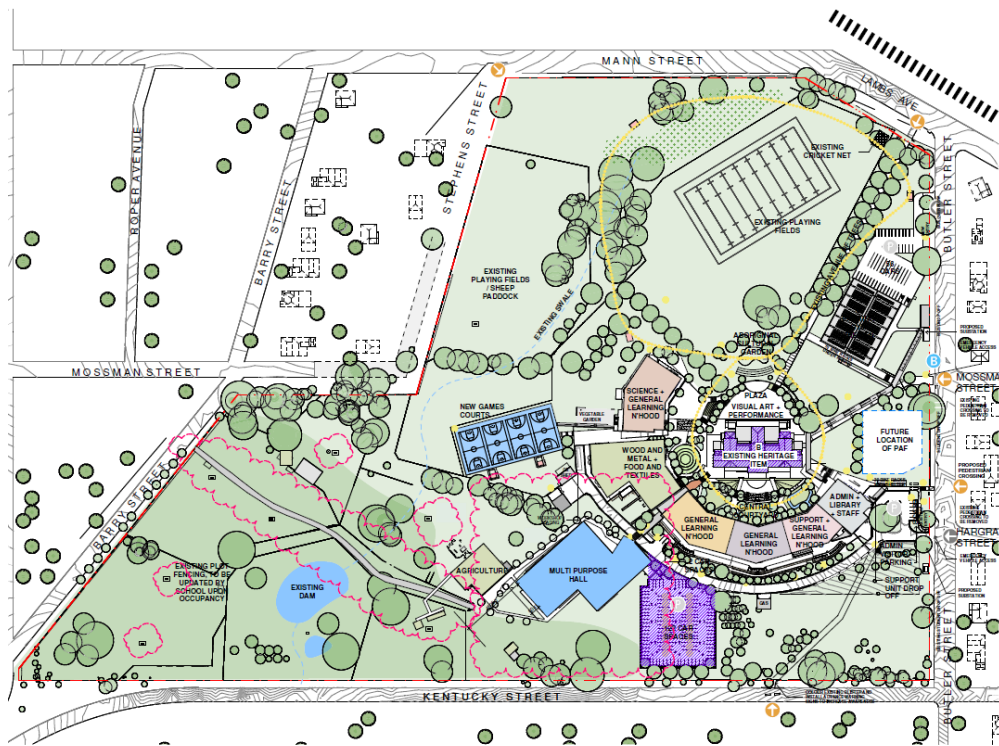


Figure 3.1. Site area taken for stormwater design.

4 INTEGRATED WATER MANAGEMENT PLAN

Armidale Regional Council requires water quantity management, or stormwater detention and/or retention to be provided to limit the runoff discharged from private property into the underground piped drainage system to pre-developed flow and to assist in mitigating the increased stormwater runoff generated by development.

Attenuation of stormwater runoff from the development is proposed to be managed via a number of detention tanks provided in strategic locations for the developed site. As discussed with Armidale Regional Council the objective is to attenuate stormwater flow from the development to pre-developed flows.

Sizing of the basin systems has been completed using DRAINS modelling software in accordance with Armidale Regional Council's stormwater policy for the 1 in 5 year ARI to 1 in 20 year ARI storms for various durations. The modelling accounts for the proposed developed catchment relating to the current site layout. In lieu of the sole use of on-site detention tanks, we believe it is more efficient and economical for the developed site to adopt rainwater tanks for water re-use and agricultural purposes to minimise the size of the on-site detention tank.

Table 4.1 provides details for the pre-development and post-development flows and storage for the total detention system.

ARI	Peak Flow (m3/s)	
	Pre-developed	Post-developed
	Site	Site (+ OSDs)
5	0.886	0.498
20	1.430	0.946

Table 4.1. Site and Detention Hydrology

Indicative location of the stormwater detention/retention system can be found on stormwater drawings **7070-BIRZ-SW-01 to SW-16**. The final arrangement of the tanks would be confirmed in the detailed-design stage, ensuring the flow arrangements of **Table 4.2** are achieved. Indicative hydrological and storage arrangements are shown below.

ARI	Post Developed Flow (m³/s)				Storage (m³)
	Un-attenuated	Attenuated			
		Att. Flow	Overflow	Total	
5	0.886	0.498	0	0.498	340
20	1.430	0.946	0	0.946	

Table 4.2. Detention/Retention Tank Hydraulics and Storage Requirements

The modelling has shown that, with the provision of a total storage volume of 340m³ contained in one modelled system, stormwater flows from the development will be attenuated to predevelopment flows. Detention storage will be fully active and will be provided as by underground tanks. The proposed detention system meets the policy requirements of Armidale Regional Council. As discussed with the Stormwater Engineer at ARC, it was agreed that the use of rainwater tanks for water re-use and agricultural purposes would benefit the site, in conjunction with the use of an on-site detention tank.

4.1 Non-Potable Water – Rainwater

Reuse

The rainwater harvesting system will include a booster pump assembly, stormwater filters all associated valves and pipe work in accordance with NSW Health Guidelines and AS3500 requirements. The harvested water service shall be used for toilet flushing and irrigation purposes (hose taps).

The rainwater harvesting system will incorporate an in-line pumping assembly located directly after the rainwater tank. The pump and associated equipment shall be capable of delivering non-potable water to the fixtures at the required pressures and on demand.

The rainwater harvesting system will have an automatic potable cold water air gap make-up supply complete with associated valves and equipment in accordance with all relevant standards and AS3500 requirements.

At the completion of works, the tank should be filled to a certain level as required with potable water, tested, commissioned and handed over fully operational.

5 STORMWATER QUALITY CONTROLS

5.1 Regional Parameters

There is a need to provide a preliminary design which incorporates the principles of Water Sensitive Urban Design (WSUD) and to target pollutants that are present in the stormwater so as to minimise the adverse impact these pollutants could have on receiving waters and to also meet the requirements specified by Armidale Regional Council.

5.2 Proposed Stormwater Treatment System

Developed impervious areas including roof, hardstand, car parking, roads and other extensive impervious areas are required to be treated by the Stormwater Treatment Measures (STM's). The STM's shall be sized according to the whole catchment area of the development. As a preliminary design input, we have allowed for a stormfilter filtration chamber to be installed at the first inlet point in the tank prior to stormwater runoff entering the rainwater tank. STM's for the development shall be based on a treatment train approach to ensure that ARC's objectives are met.

Components of the treatment train for the development are as follows:

Treatment of stormwater on the development is to be performed via the provision of a treatment train of proprietary systems;

- ◆ Primary treatment to the paved areas and car parks is via Enviropod pit inserts; and
- ◆ Secondary treatment of all site water will be treated via stormwater filters by Stormwater 360 (SW360).

5.3 Maintenance and Monitoring

It is important that each component of the water quality treatment train is properly operated and maintained. Maintenance and monitoring shall be in accordance with the Operational Stormwater Management Report for this site prepared by us.

6 FLOODING & OVERLAND FLOW

The assessed site has been identified by Armidale Regional Council as being unaffected by overland flow from an external catchment. Refer to the flood map in **Appendix C** (1 in 100 year Annual Exceedance Probability, based on Armidale Flood Study 2004 and Martins Gully Update 2011) provided by Armidale Regional Council.

A flood risk assessment for this site has been prepared by Eco Logical Australia. Please refer to report 'Eco Logical Australia 2018. *Armidale Future Secondary School Redevelopment Project, Flood Risk Assessment*. Prepared for NBRS Architecture' for further information.

7 CONCLUSION

This Civil Engineering Details Report has been prepared to support the application for a proposed development at Armidale High School, Butler Street, Armidale.

A Stormwater Management strategy for the site has been developed which provides a best practice solution within the constraints of the existing landform and proposed development layout. The strategy for stormwater quantity and quality management has been developed to reduce both peak flows and pollutant loads in stormwater leaving this site. The stormwater management for the development has been designed in accordance with Armidale Regional Council's Engineering Code Design Specification D5 - Stormwater Drainage Design (Dated September 2016).

The stormwater layout for the development maintains the existing catchment breakdown and a proposed two discharge points. A hydrological assessment has been undertaken which confirms local post development flows from the site will be less than pre-development flows and demonstrates that the site discharge would not adversely affect any land, drainage system or watercourse as a result of the development. A stormwater retention system comprising an active storage of 340m³ is proposed to attenuate developed stormwater flows to pre-developed flows. This will be provided by an underground retention tanks.

During the construction phase, an erosion and sediment control plan will be in place to ensure the downstream drainage system and receiving waters are protected from sediment laden runoff.

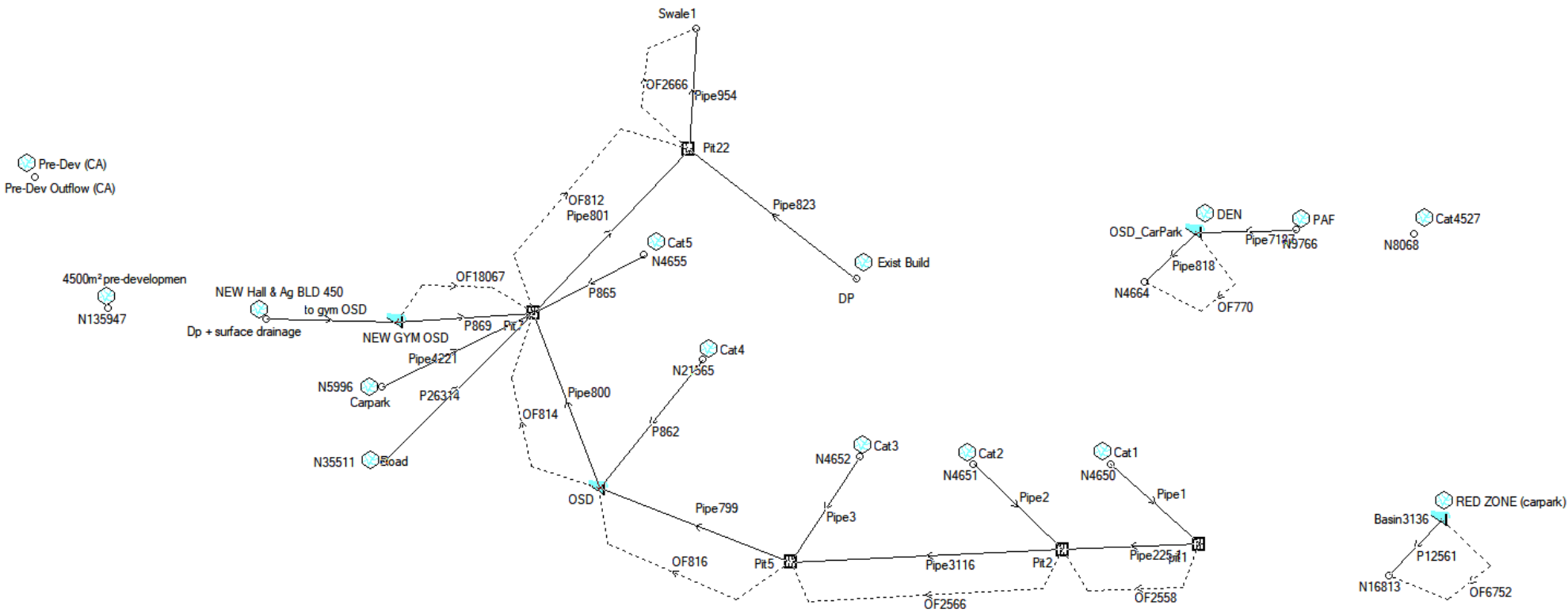
During the operational phase of the development, a treatment train incorporating the use Stormwater Treatment Measures (STM's) comprising a proprietary treatment train of Enviropod pit inserts, retention tanks and SW360 stormfilters been proposed to mitigate the increase in stormwater pollutant loads generated by the development. Best management practices have been applied to the development to ensure that the quality of stormwater runoff is not detrimental to the receiving environment.

It is recommended the management strategies in this report be approved and incorporated into the future detailed design.

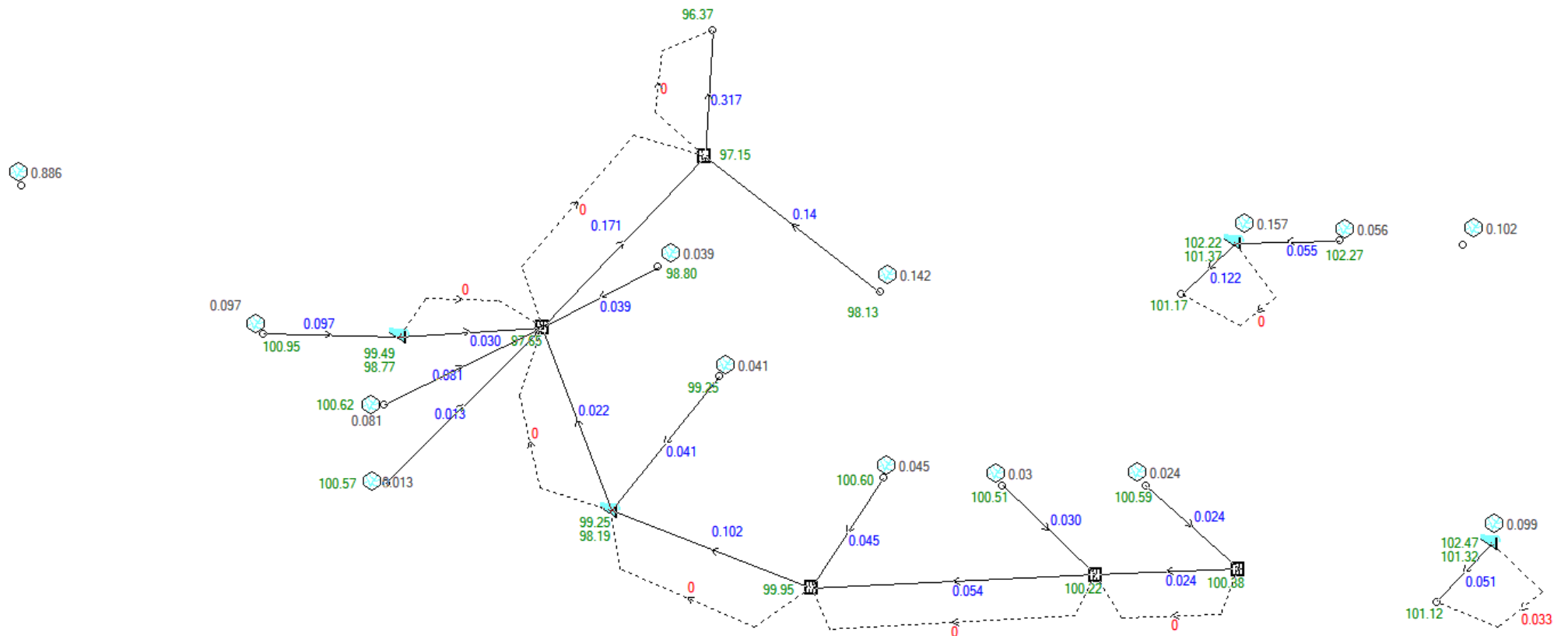
REFERENCES

- Managing Urban Stormwater: Harvesting and Reuse – 2006 (NSW DEC);
- Managing Urban Stormwater: Source Control – 1998 (NSW EPA);
- Managing Urban Stormwater: Treatment Techniques – 1997 (NSW EPA);
- Managing Urban Stormwater: Soils & Construction – 2004(LANDCOM); and
- Armidale Regional Council's Engineering Code Design Specification D5 - Stormwater Drainage Design (Dated September 2016).

APPENDIX A - DRAINS MODEL

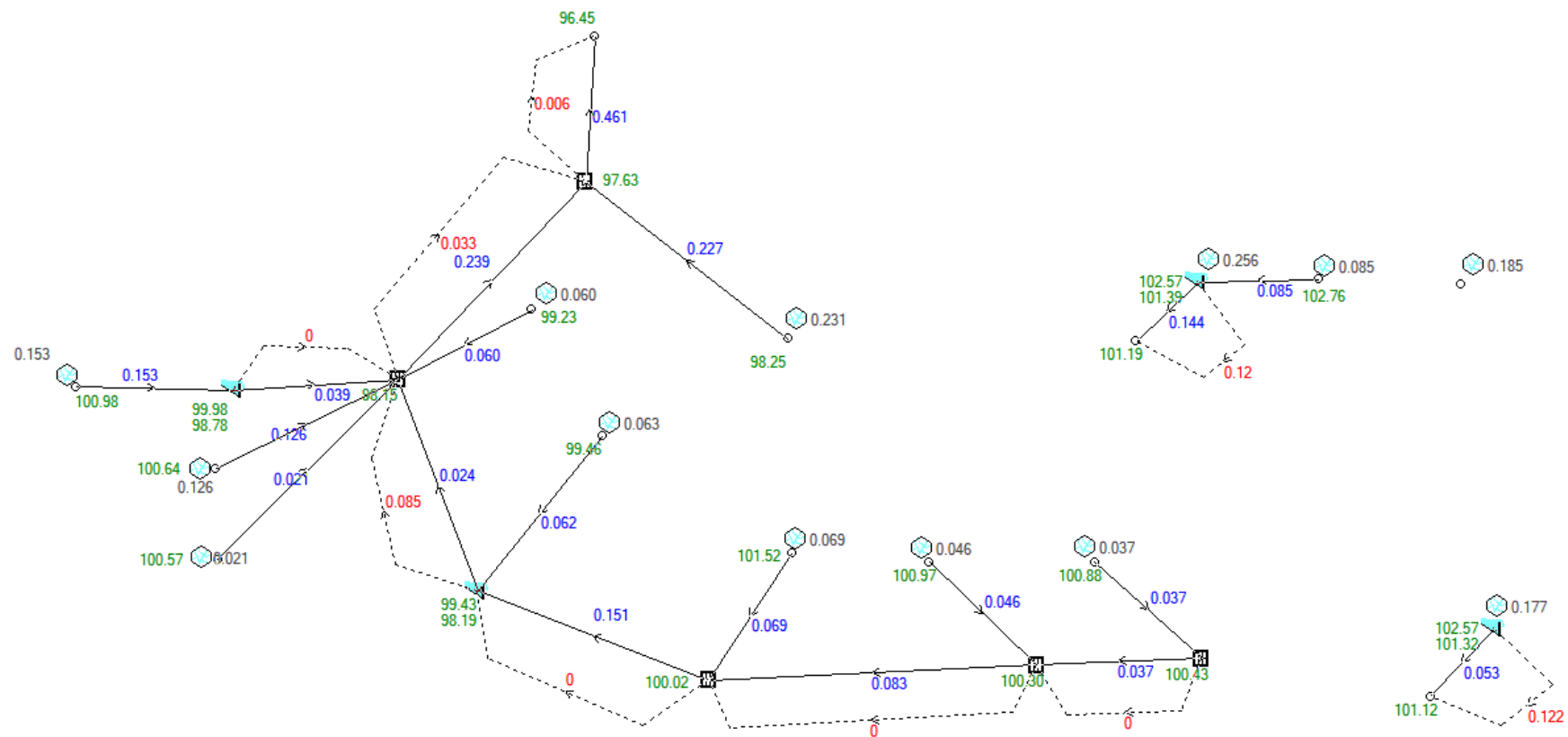


DRAINS MODEL



DRAINS RESULTS 5 YEAR ARI

1.43



DRAINS RESULTS 20 YEAR ARI

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