

APPENDIX B

STORMWATER REPORT

STORMWATER REPORT

Friday Flat Car Park 2

Prepared for **EVENT HOSPITALITY & ENTERTAINMENT** / 10 / 01 / 2019

181487 CAAE

Contents

1.0	Introduction.....	3
1.1	The Site.....	3
1.2	Relevant Documents	3
2.0	Proposed Development.....	4
3.0	Stormwater Quantity & Quality.....	4
3.1	On-Site Detention	4
3.2	Stormwater Quality	6
4.0	Flood Management	8
4.1	Flood Planning Levels	8
5.0	Construction Phase Stormwater Management.....	8
6.0	Conclusion.....	9

1.0 Introduction

Taylor Thomson Whitting (TTW) has been appointed by Event Hospitality and Entertainment to prepare a concept Civil plan and report to support the Development Application for the proposed works at the Friday Flat car park at Thredbo Resort.

1.1 The Site

The site is located within Kosciuszko National Park. The site's locality is shown in Figure 1, bounded by Friday Drive to the south-east and Bridal Trail Loop to the north-west. The existing site is undeveloped except for a dish drain falling to the north-east along Friday Drive.



Figure 1: Aerial Image (Nearmap)

1.2 Relevant Documents

- DRJD Architect Plans (18/12/18)
- NSW MUSIC Modelling Guidelines 2015

2.0 Proposed Development

The proposed development is a new car park with entry and exit on Friday Drive. Figure 2 shows the plan of proposed works. The site area is 5350m² with 80% of this impervious.

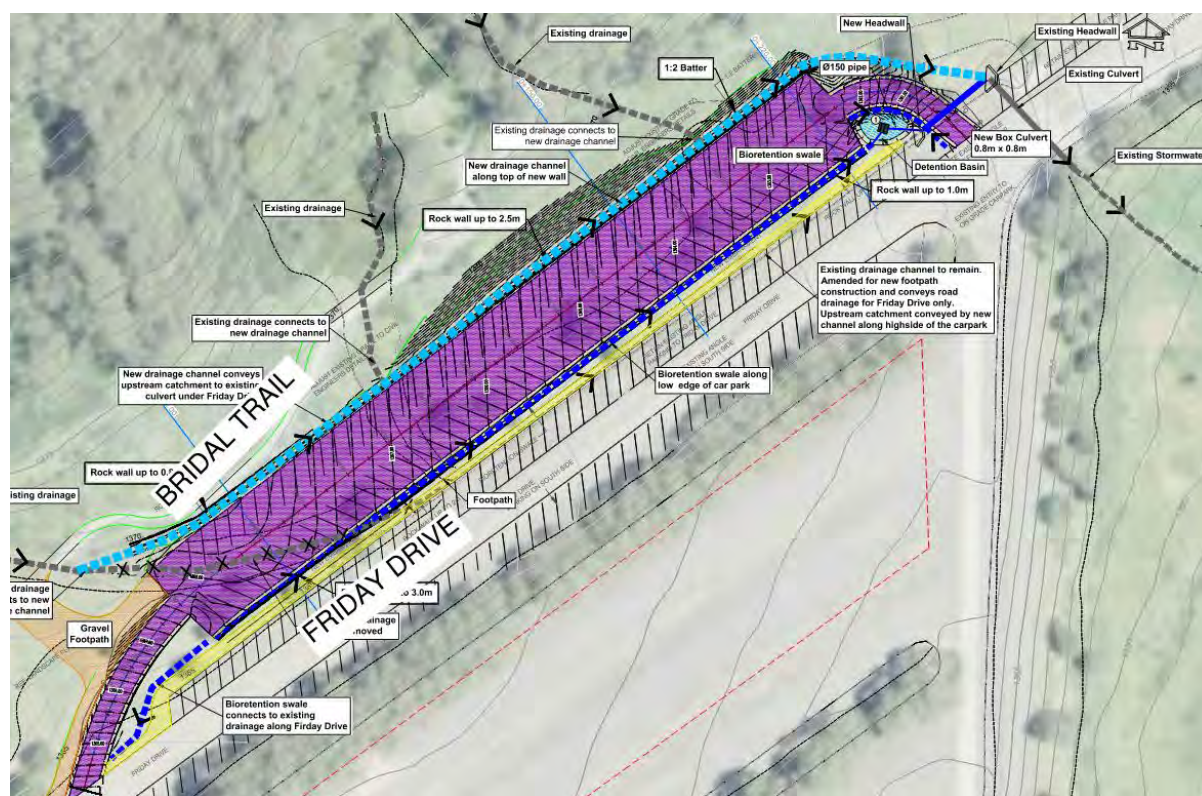


Figure 2: Proposed works

3.0 Stormwater Quantity & Quality

The proposed development will be increasing the impervious area of the site. An increase in impervious area will result in greater stormwater runoff and pollutants. The proposed development includes a treatment train that will reduce stormwater discharge and stormwater pollutants to levels compliant with state and national criteria. The car park generally drains from north-west to south-east towards a bioswale. This bioswale conveys stormwater to a detention basin where it is discharged to an existing culvert underneath Friday Drive.

3.1 On-Site Detention

On-site stormwater detention will be used to meet the stormwater discharge target. The target is for the overall volume of post-development runoff to be no greater than pre-development runoff. Bioswales and a detention basin will be constructed to facilitate on site detention and their positions are shown in Figure 3.

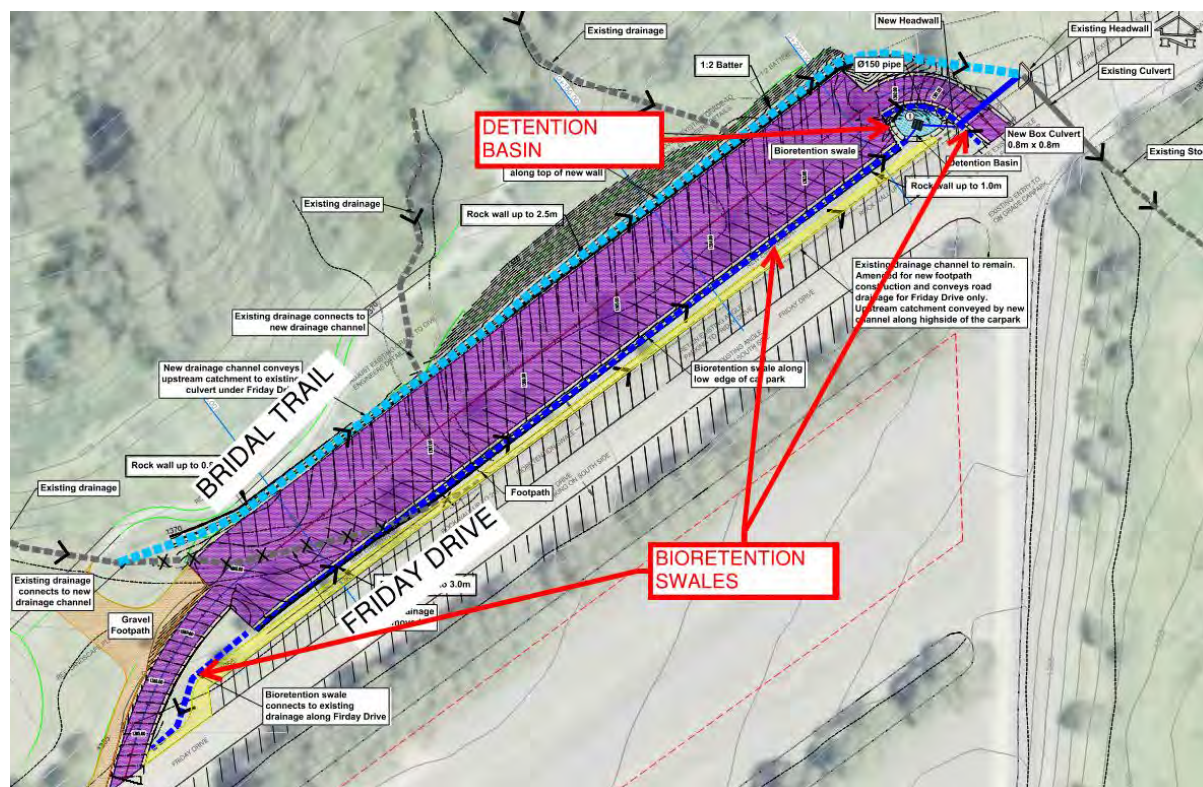


Figure 3: Location of detention basin and bioswales

DRAINS water quantity modelling software was used to determine stormwater discharge. The model was set up to compare the proposed site with pre-development conditions. Most of the site (4,350m²) drains to the detention basin via bioswales. The proposed footpath along Friday Drive will drain directly to Friday Drive and into the existing gutter without detention. The carpark entry and gravel footpath to the west of the car park drains to a bioswale that will detain stormwater.

The DRAINS model predicted that the detention basin needs to be a 85m³ detention basin with an orifice plate 90mm diameter and an outgoing pipe 150mm in diameter. The bioswale to the west of the car park needs to have a storage volume of 20m³. The combined detention meets the stormwater target of not increasing pre-development flow rates for the 5-year and 100-year ARI storms.

Figure 4 shows a typical cross-sectional of bioswale.

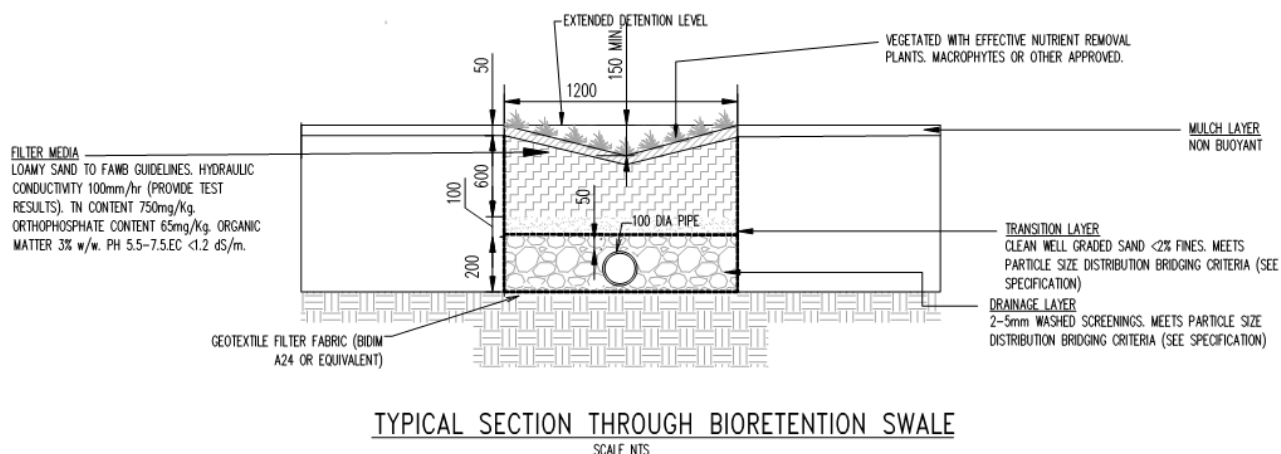


Figure 4: Bioswale cross-section

Table 1 compares the pre-development discharge rates to post development discharges

Table 1: Site discharge rates

	Pre-development (l/s)	Post development (l/s)
5-year ARI	21	20
100-year ARI	107	101

DRAINS predicted the detention basin will not overflow during the 20-year ARI storm. The basin will overflow during the 100-year ARI storm, with flows up to 59 l/s spilling over the top of the basin and into the proposed culvert connecting to the existing culvert under Friday Drive. The overflow rate has been included in the post development discharge rate.

3.2 Stormwater Quality

MUSIC was used to model the stormwater quality of the proposed site and determine compliance with the stormwater objectives. Stormwater on site is treated through several bioswales and 2 litter basket pit inserts (e.g. Stormwater350 enviropod). The bioswale is required to have a media filter area of 0.6m²/m and the length of each bioswale must be at least that shown in TTW’s civil engineering drawings.

The proposed site was split into sub-catchments and modelled according to land-use type. The impervious areas were modelled as “sealedroad” and the batters were modelled as pervious “Landscape” areas. The default pollutant concentration values were adjusted to reflect the NSW MUSIC Modelling Guidelines 2010. Table 2 shows the pollutant concentrations used in the model.

Table 2: Pollutant concentrations

Table 5-6 Base Flow Concentration Parameters (mg/L-log10) for NSW (adapted from Fletcher et al, 2004)

	TSS		TP		TN	
	Mean	Std. dev	Mean	Std. dev	Mean	Std. dev
Small Areas of Interest						
Roofs	n/a	n/a	n/a	n/a	n/a	n/a
Sealed road pavement	1.20	0.17	-0.85	0.19	0.11	0.12
Unsealed road pavement	1.20	0.17	-0.85	0.19	0.11	0.12
Landscaped areas	1.20	0.17	-0.85	0.19	0.11	0.12

Table 5-7 Storm Flow Concentration Parameters for NSW (mg/L-log10) for NSW (adapted from Fletcher et al, 2004)

	TSS		TP		TN	
	Mean	Std. dev	Mean	Std. dev	Mean	Std. dev
Small Areas of Interest						
Roofs	1.30	0.32	-0.89	0.25	0.30	0.19
Sealed road pavement	2.43	0.32	-0.30	0.25	0.34	0.19
Unsealed road pavement	3.00	0.32	-0.30	0.25	0.34	0.19
Landscaped areas	2.15	0.32	-0.60	0.25	0.30	0.19

The detention basin has been omitted from the MUSIC model. The layout of the MUSIC model is shown in Figure 5.

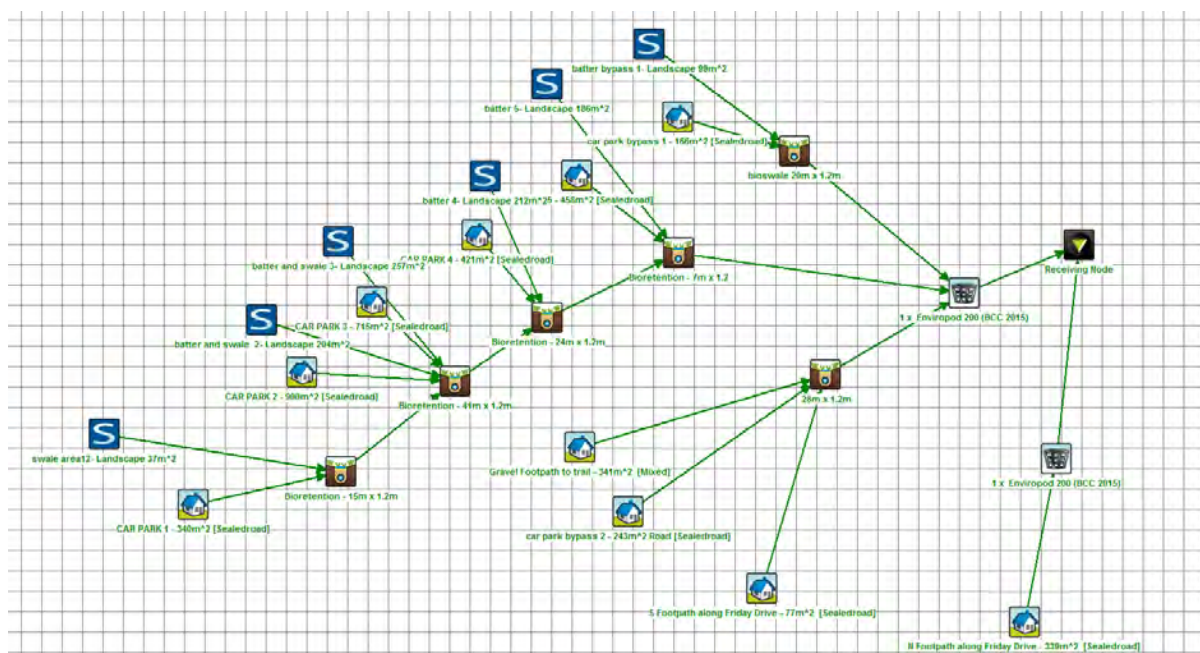


Figure 5: MUSIC model

The proposed treatment train meets the stormwater quality targets as shown in Table 3.

Table 3: Stormwater Quality

	Proposed site (% reduction)	Targets (% reduction)
Total Suspended Solids	86	85
Total Nitrogen	51	45
Total Phosphorous	68	65
Gross Pollutants	99	99

4.0 Flood Management

There is a large catchment upstream of the proposed site with several existing drainage paths running through the proposed site. These drainage paths connect to an existing culvert that crosses Friday Drive. The drainage paths will be intercepted by a catch drain and convey flow to the existing culvert that crosses Friday Drive. The proposed site may be subject to overland flows during large rainfall events; however, it has a low flood risk. The site is on a crest on Friday Drive and the existing grades will direct floodwaters away from the proposed site.

The proposed works will not impede the flow of floodwaters and maintains existing flow routes.

4.1 Flood Planning Levels

Historic Flood Levels for the proposed site have not been recorded and the flood information available for the Thredbo area do not highlight the proposed site as being a critical area. Further, the car park will be at least 1m above Friday Drive and so flooding is unlikely to be an issue. No Flood Planning Level for this site has been given as it has a low risk of mainstream flooding. It may be subject to overland flow from the upstream catchment, however this is mitigated with drainage directing upstream flows around the proposed site and towards an existing culvert that conveys flow beneath Friday Drive.

5.0 Construction Phase Stormwater Management

During the construction phase of the project, an erosion and sediment control plan will be implemented to prevent sediment laden stormwater from entering the council drainage network. Stormwater controls for the site are shown on Drawing C501 and are in accordance with the "Blue Book" - Managing Urban Stormwater: Soils and Construction (Landcom NSW).

In general the erosion and sediment control plan includes:

- Siltation fence around the perimeter of the site
- Vehicle wash down area
- Sedimentation trap

6.0 Conclusion

The proposed development consists of a car park with separate entry and exit onto Friday Drive.

- The proposed development will not increase stormwater discharge for the 5-year or the 100-year ARI storm. Stormwater will be detained in bioswales and a detention basin. The detention basin will have a volume of 64m³ with an orifice plate of 100mm diameter.
- NSW industry standard best practice for stormwater quality is to remove 85% of total suspended solids, 65% of total Phosphorous, 45% of total Nitrogen and 99% of gross pollutants. The proposed treatment train of bioswales and litter baskets achieve these targets. The bioswales need to have a media filter area of 0.6m² per meter. The bioswale is to be planted with macrophytes or equivalent.
- Overland flow from the upstream catchment and existing drainage routes will be collected in a channel and directed around the proposed site towards an existing culvert under Friday Drive. Existing flow routes will be maintained.
- The proposed car park has a low risk of flooding. It is at least 15m above Thredbo River and Friday Drive drains away from the site.

Prepared by
**TAYLOR THOMSON WHITTING
(NSW) PTY LTD**

Authorised By
**TAYLOR THOMSON WHITTING
(NSW) PTY LTD**



DUNCAN UPTON
Engineer

STEPHEN BRAIN
Technical Director

P:\2018\1814\181487\Reports\TTW\Thredbo CP2 Stormwater DA Report.docx