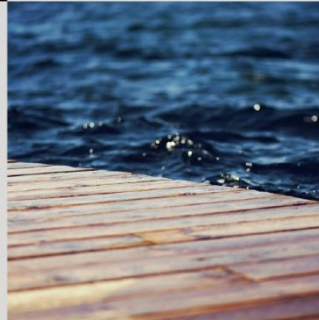




Civil Engineering Assessment Report

J7567-310_Ewingsdale_Rd_Byron_Bay-EA-REVA

310 Ewingsdale Rd, Byron Bay NSW 2481
Lot 3 DP551947

By Planit Consulting Pty Ltd
For 310 Ewingsdale Rd SPV1 Pty Ltd

March 2023



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1 Executive Summary

This Engineering Assessment has been prepared in support of the Development Application (DA) for the proposed development located at 310 Ewingsdale Road, Byron Bay NSW involving the demolition of the existing structures on-site and the construction of 20 town houses.

The subject site has a total footprint of 4,388m² and borders the 'Harvest Estate' residential area to the east west and south which, at the time of reporting, is in its civil construction stage. Once construction of Harvest Estate is completed, the site shall have access available to its internal road network.

Preliminary geotechnical investigations on the site found that soils are generally sand/ silty sand and that ground water is expected to be present below a depth of 0.1 to 0.6m.

Based on mapping provided by BSC, the subject site is located within close proximity (within 100m) of an area mapped as flood prone. Considering that proposed critical levels (including habitable floor levels and the basement entry level) are positioned above this level, no issues with flood immunity are foreseen.

The development works shall incorporate excavations and adjustments to levels for the purpose of providing a parking basement and an acoustic barrier parallel to the northern boundary of the site. Preliminary earthworks quantities associated with the development include a total cut of 7,114m³ and a total fill of 1,571 m³ (balance of 5,543 m³ in cut).

Access works associated with the site shall include the provision of an internal parking basement including private garage boxes, visitor parking modules and circulation aisles and a driveway crossover onto the future Harvest Estate.

In its post-development state, all runoff shall be directed towards the south into the drainage network as part of Harvest Estate. It is proposed that on-site detention is provided via rainwater tanks which shall capture all roof water. Modelling demonstrated that a system using 4x on-site detention tanks with a combined volume of 26m³ is adequately sized to meet on-site detention targets for all events up to the Q₁₀₀ target event.

To mitigate any potential adverse stormwater quality effects associated to the development, treatment measures are proposed based on MUSIC modelling:

- Ocean Protect Ocean Guard; and
- Ocean Protect StormFilter.

The control of stormwater quality during construction activities shall be achieved by the implementation of Erosion and Sediment Controls in accordance with the requirements of Landcom's 'Soils and Construction Volume 1 – Managing Urban Stormwater: Soils and Construction' (i.e. Blue Book).

Water reticulation shall be available via a 100mm PVC water and recycled water main within Harvest Estate. A peak instantaneous demand of 2.4l/s is expected. No issues with meeting this demand via the new 100mm main are anticipated.

Sewer reticulation will be available via the new pressure sewer main within Harvest Estate. A boundary kit should be provided within the site as well as 24h of emergency effluent storage which will be within the vicinity of 11m³-13m³.

No issues are foreseen with providing electrical and telecommunication services to the site. Provision of these services shall be subject to detailed design

Based on the assessment undertaken, it is believed that the proposed development can be readily serviced in a sustainable way.

2 Introduction

2.1 Project Background

This Engineering Assessment (EA) has been prepared in support of the Development Application (DA) for the proposed 20 townhouse development located at 310 Ewingsdale Road, Byron Bay NSW, which falls within the Byron Shire Council (BSC) Local Government Area (LGA). Planit was engaged by 310 Ewingsdale Rd SPV1 Pty Ltd to assess, and report on the engineering services associated with this development.

The proposed development process involves the demolition of the existing structures on-site and the construction of 20 town houses. Table 1 provides additional development details for the subject site.

Table 1 – Site Details Summary

Component	Details
Applicant	310 Ewingsdale Rd SPV1 Pty Ltd
Street Address	310 Ewingsdale Road, Byron Bay NSW
Local Government Area	Byron Shire Council (BSC)
Climatic Region	Sub-tropical
Zoning	DM
Proposed development type	Multi-residential
Site Area	4,388m ²
Map Reference	Lot 3 DP551947

2.2 Project Scope

This report presents the results of an assessment of:

- The subject site including:
 - o Locality;
 - o Existing Services;
 - o Soil characteristics;
 - o Flooding; and
 - o Topography.
- Civil Works (Earthworks and Roadworks) including:
 - o Bulk Earthworks;
 - o Service Trenching requirements; and
 - o Site access and (internal) roadworks.
- Stormwater management including:
 - o Catchment analysis;
 - o Stormwater Conveyance;
 - o Stormwater Quantity (on-site detention);
 - o Stormwater Quality; and
 - o Sediment and Erosion Control.
- Services assessment including:
 - o Potable water;
 - o Sewer;
 - o Power; and
 - o Telecommunication.
- Conclusions and recommendations.

To accompany and further detail the proposed design, a civil layout plan has been prepared and is presented in Appendix C.

3 Civil Site Assessment

3.1 Site Description

The subject site (Figure 1) has a total footprint of 4,388m² and is located at 310 Ewingsdale Road directly to the south of the Byron Bay Arts and Industrial Estate and approximately 3km to the west of the Byron Bay CBD. The site borders the 'Harvest Estate' residential area to the east west and south which, at the time of reporting, is in its civil construction stage. The site currently houses a number of structures including a main residence and four detached sheds/ outbuildings. The majority of the site is unoccupied and is covered in grass and trees.

Currently, the site has access onto Ewingsdale Road to the north via a gravel driveway and bitumen vehicular crossovers. Once construction of Harvest Estate is completed, the site shall have access available to its internal road network. This would however require site levels to be adjusted and formal access to be established.

The surrounding area is currently predominantly industrial and residential under-construction. One Harvest Estate will have been established; the site shall be surrounded by predominantly single-occupancy residential lots.



Figure 1: Subject Site (Nearmap, 2023)

A feature survey of the site has been prepared by Byron Bay Surveying is presented in Appendix A. To confirm the locations of existing services, a 'Dial Before You Dig' (DBYD) search has been requested within the vicinity of the development area, the results of which are included in Appendix B.

3.2 Description of Proposed Development

As per plans provided by Mackenzie Architects International (Appendix A), the proposed development (Figure 2) includes:

- Demolition of all existing buildings currently on-site;
- The provision of a new building (A) containing seven (7) three-bedroom townhouses;
- The provision of a new building (B) containing four (4) three-bedroom townhouses;
- The provision of a new building (C) containing four (4) three-bedroom townhouses;
- The provision of a new building (D) containing three (3) three-bedroom townhouses;
- The provision of a new building (E) containing two (2) three-bedroom townhouses; and
- A full-size basement containing forty-five (45) resident and visitor parking spaces.

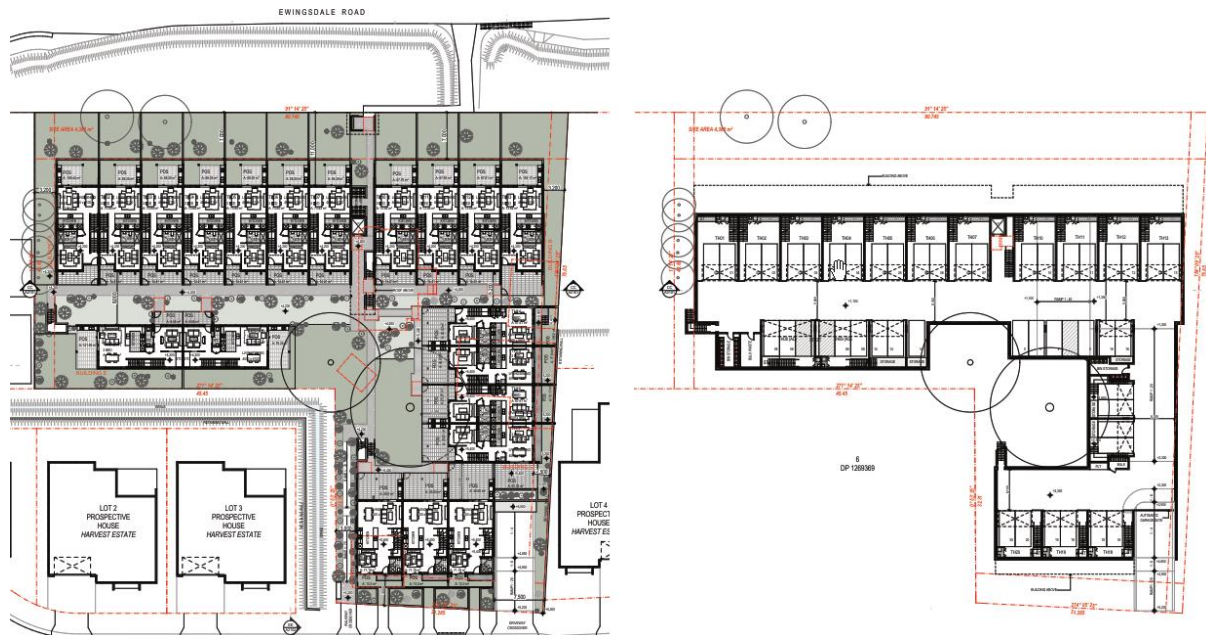


Figure 2: Proposed Development Site – Basement and Ground Floor (Source, MAI, 2023)

Proposed vehicular access to the site is via a new 5.5m wide crossover and driveway onto the internal road network within Harvest Estate (known as 'Road 02' on the approved plans) to the south. Additional pedestrian access to the site is via three (3) walkway crossings onto 'Road 2' to the south and one (1) pedestrian entry onto Ewingsdale Road to the north.

Service and utility connections including water, sewer, stormwater, telecom and power (Sections 5 and 6 of this report) shall generally be provided via their respective services networks within Harvest Estate.

3.3 Statutory Requirements and Engineering Standards

All civil works shall be in accordance with:

- The Byron Bay DCP (2014) and all codes and standards referenced in this documents;
- The Northern Rivers Local Government (NRLG) Development Guidelines including the design and construction manual and standard drawings as well as codes and standards referenced in these documents; and
- The Byron Shire Council's Comprehensive Guidelines for Stormwater Management.

3.4 Geotechnical Investigations

Preliminary geotechnical investigations on the site have been carried out by Pacific Geotech July 2022. These investigations found that:

- Soil profiles are typified by sands and silty sands;
- Ground water is expected to be present below a depth of 0.1 to 0.6m;
- Accordingly, no significant runoff infiltration rates can be achieved;
- Batters slopes of up to 1 in 1.5 can be achieved with the batter crest (or batter toe in case of batters >2m) to be offset 2m from structures;
- In-situ sands are considered suitable for re-use on site. However, in-situ silt should be disposed of; and
- The site has been classified as Class 'S' as per AS2870.

3.5 Acid Sulphate Soils (ASS)

A preliminary Acid Sulphate Soils Assessment has been prepared by AWC. It was found that the site has a low probability of ASS occurrence. However, indicators of potential sulphide oxidation were encountered during groundwater excavation.

Significant excavations will require dewatering due to shallow groundwater. Dewatering has the potential to impact the groundwater table beyond the work site which may allow oxidation of sulphides and acid production. Such excavations would be required for the proposed parking basement.

3.6 Flooding Planning

Based on mapping provided by BSC interactive mapping, the subject site is not located within a flood planning area (Figure 3). Accordingly, no flood assessment has been completed as part of this development.



Figure 3: Flood 1 in 100yr (Source: BSC Interactive Mapping)

It is noted that the site is located within close proximity (within 100m) of an area mapped as flood prone. However, the following has been taken into consideration:

- Based on the 2015 Belongil Creek Floodplain Risk Management Plan, a 2100 Flood Planning Level of 4.3m AHD has been assumed;
- Typical existing levels on the site are within the range of 4m AHD and 4.3m AHD and the lowest existing level on the site is 3.9m AHD; and
- Considering that proposed critical levels (including habitable floor levels and the basement entry level) are positioned above this level, no issues with flood immunity are foreseen.

3.7 Topography

The site is predominantly flat (0.5%-1%) with respective low and high points of 3.9m AHD and 4.5m AHD. The highpoint is located in the centre and the site falls towards the northern, eastern and western boundaries.

4 Earthworks and Roadworks

4.1 Bulk Earthworks

The development works shall incorporate excavations and adjustments to site levels for the purpose of:

- Providing a parking basement;
- Constructing an acoustic barrier parallel to the northern boundary of the site;
- Shaping of the overland flow path in accordance with the stormwater strategy; and
- Tying in with the proposed architectural levels.

Planit has carried out a preliminary earthworks analysis for the site. Earthworks quantities associated with the development are presented in Table 2.

Table 2 – Earthworks Quantities

Component	Quantity
Total Cut	7,114m ³
Total Fill	1,571 m ³
Balance	5,543 m ³ (cut)
Earthworks Footprint	4,051 m ³ (cut)
Deepest Cut	3.5m
Maximum Fill	2.3m

These quantities are preliminary and will need to be revised as part of detailed design to account for:

- Boxing out for paths, footings, outer extent of the basement structure, pools, etc;
- Final landscaping and drainage levels; and
- Spoil from trenching and underground infrastructure (refer section below).

4.2 Excavation for Underground Services and Utilities

It is proposed that a pressure sewer boundary kit is provided to connect to the Harvest Estate sewer network. This would include the provision of 24h of emergency sewer storage within an underground tank. Preliminary tank sizes are provided in Section 6 of this report.

In addition, an underground stormwater treatment system shall be provided.

Final system specification, size and configuration shall be subject to detailed design. It is noted that due to shallow ground water tables, buoyancy of any underground storage systems shall be taken in consideration for detailed design. Spoil from these underground systems shall be removed from site.

In addition these systems, internal trenching shall be provided for internal sewer, water, electrical and communications services, which shall generate relatively modest quantities of trench spoil.

4.3 Access and Roadworks

Access and roadworks associated with the site shall include the provision of:

- An internal parking basement including private garage boxes, visitor parking modules and circulation aisles; and
- The provision of a driveway crossover onto Road 02 within the future Harvest Estate.

The scope of these works are presented in the civil engineering plans provided in Appendix C. A traffic Impact Assessment for the development has been prepared by Planit Consulting, which has been included in the DA submission. Its key findings and recommendations in relation to the proposed access and roadworks include:

- The layout for the proposed internal road network, consists of 5.5m-6.1m wide circulation driveways and parking aisles and meets all relevant requirements in terms of serviceability;
- The proposed layout meets the development's demand in terms of parking;
- The proposed layout meets the development's demand for accessible parking; and
- A 5.5m wide vehicular crossover shall be provided for access. The proposed crossover meets the relevant Council and Australian standards and will allow for safe and convenient access and egress to and from the site.

5 Stormwater Management Plan

5.1 Catchment Analysis

In its pre-development state, all runoff from the site appears to be directed off-site via overland flow. Based on the contours shown on the survey provided (Appendix A), and as shown in Figure 4, the site is split up into two catchments:

- Catchment 1: runoff discharging towards Ewingsdale Road towards the north; and
- Catchment 2: runoff discharging towards the south (into a new drainage swale to be constructed as part of the Harvest Estate Development).

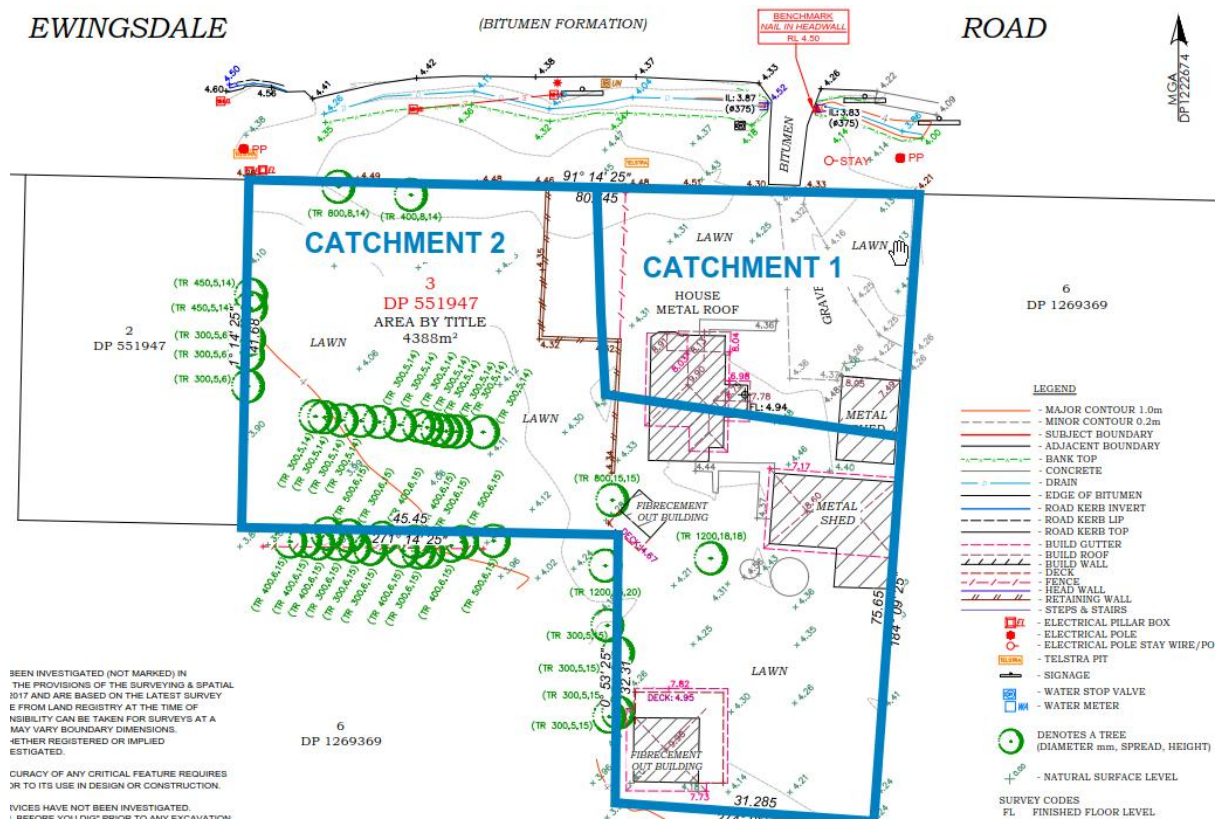


Figure 4: Pre-Development Catchment Plan (Adapted from Byron Bay Surveying, 2022)

In its post-development state, all runoff shall be directed towards The south into the drainage network as part of Harvest Estate. Post development catchments have been split up into roof and ground areas. A visual representation of the site' post development catchments is provided in Figure 5.

A breakdown of pre- and post-development catchment characteristics is provided in Table 3.

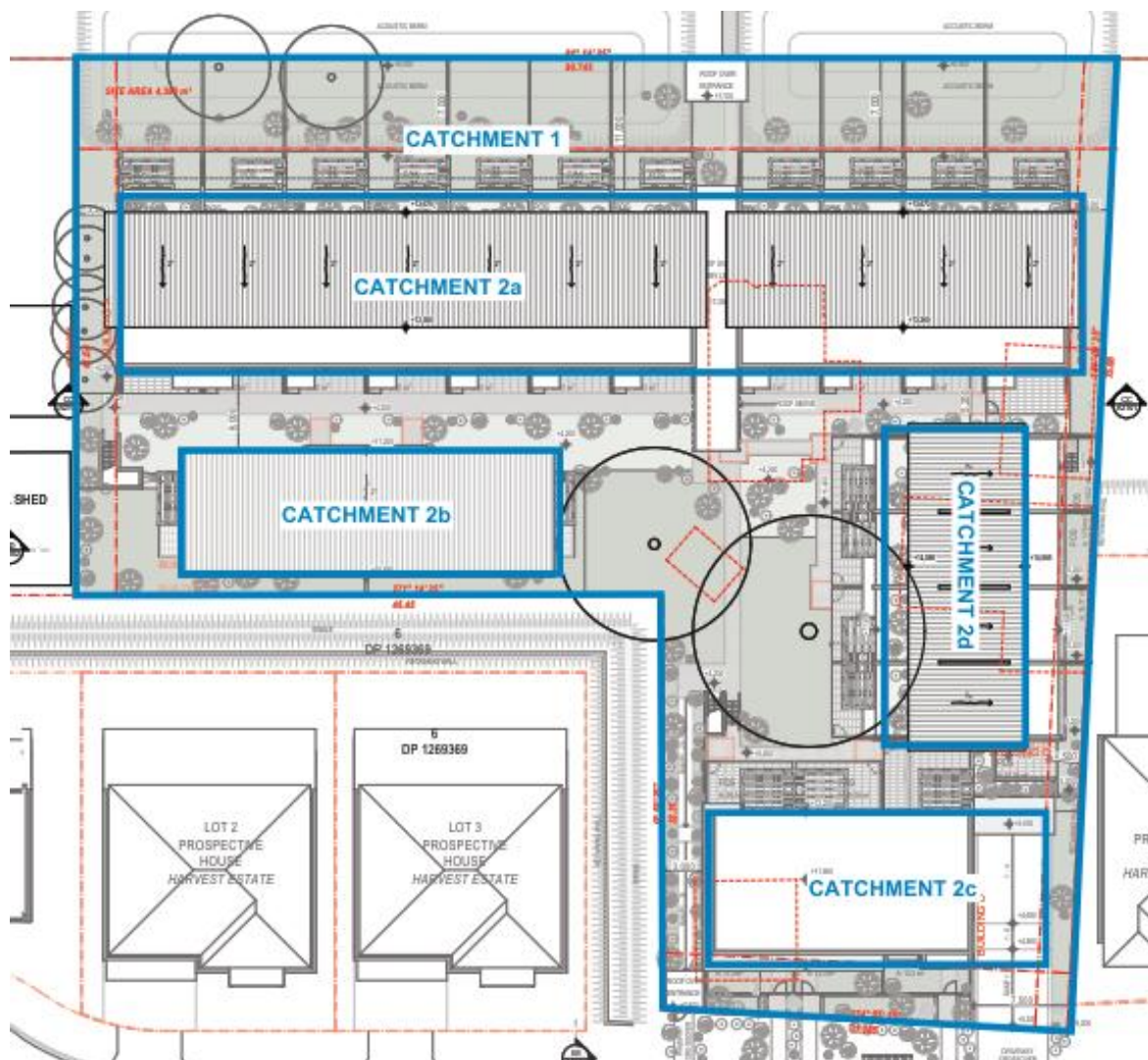


Figure 5: Post-Development Catchment Plan (Adapted from MAI, 2023)

Table 3 – Catchment Characteristics

Catchment	Total Size	Fraction Impervious	Discharge Point (Major event)	Discharge Point (Minor Event)
Pre-Development Catchments				
Catchment 1	1,018m ²	0.21	Overland Flow towards the north (Ewingsdale Road)	Overland Flow towards the north (Ewingsdale Road)
Catchment 2	3,370m ²	0.09	Overland Flow towards the south (Harvest Estate).	Overland Flow towards the south (Harvest Estate).
Post-Development Catchments				
Catchment 1	2,488m ²	0.3	Piped Flow towards the south (Harvest Estate).	Overland Flow towards the south (Harvest Estate).
Catchment 2a	1,025m ²	1	Piped Flow towards the south (Harvest Estate).	Overland Flow towards the south (Harvest Estate).
Catchment 2b	286m ²	1	Piped Flow towards the south (Harvest Estate).	Overland Flow towards the south (Harvest Estate).
Catchment 2c	269m ²	1	Piped Flow towards the south (Harvest Estate).	Overland Flow towards the south (Harvest Estate).
Catchment 2d	320m ²	1	Piped Flow towards the south (Harvest Estate).	Overland Flow towards the south (Harvest Estate).

5.2 Stormwater Conveyance

Council's requirements for stormwater conveyance are outlined in its 'Comprehensive Guidelines for Stormwater Management' (the Guidelines). It is proposed that all runoff from the site ground and roof areas is captured via an internal pit-and-pipe network and directed into a centralised treatment system.

This treatment system shall be sized to treat all runoff from roof and hardstand areas during rainfall events of a magnitude of up to the $Q_{3\text{month}}$ event. Outflow from the system shall be directed towards a drainage swale within Harvest Estate (nominated as the Lawful Point of Discharge (LPD) to the south of the site.

Roof water shall be captured in on-site detention tanks prior to discharge into the treatment system.

The proposed pit-and-pipe network shall be sized to convey all flows from rainfall events of a magnitude of up to the minor (Q_5) event. All overflow from larger events up to the major (Q_{100}) event shall be conveyed via overland flow towards the LPD.

Refer Figure 6 for a visual representation of the proposed network and the civil engineering drawings (Appendix C) for additional detail.



Figure 6- Proposed Stormwater Network

5.3 Stormwater Quantity

The Guidelines specify that on-site detention is required for all developments that result in an increased impervious footprint of the site. An on-site detention system shall be designed to ensure that post-development stormwater flows are no greater than the pre-development flows from equivalent events. Specifically, the peak flow from the proposed development for the 5-, 10-, 20-, 50- and 100-year ARI events, for all durations from 5min. to 3h, must not exceed the existing peak flow from the site.

As per the previous section of this report, it is proposed that on-site detention is provided via rainwater tanks which shall capture all roof water. Hydraulic modelling using Drains has been performed to size the proposed system.

Key modelling parameters were assigned as follows:

- | | |
|--------------------------------|--|
| • Rainfall Data: | From the Bureau of Meteorology |
| • Rainfall Model Type: | Horton/ILSAX using 1mm depression storage for paved areas and 5mm depression storage for grassed areas. |
| • Tank Specifications: | 2a: 16m ³ , 1.6m tall, 130mm orifice outlet
2b: 3.5m ³ , 1.4m tall, 80mm orifice outlet
2c: 3m ³ , 1m tall, 80mm orifice outlet
2d: 3.5m ³ , 1.4m tall, 80mm orifice outlet |
| • Pipe Sizes: | 225mm PVC |
| • Stormwater Treatment System: | Excluded from Model |

- Catchment sizes and fraction impervious: As per Table 3.

The Modelling Setup is presented in Figure 7 and results are summarised in Table 4.

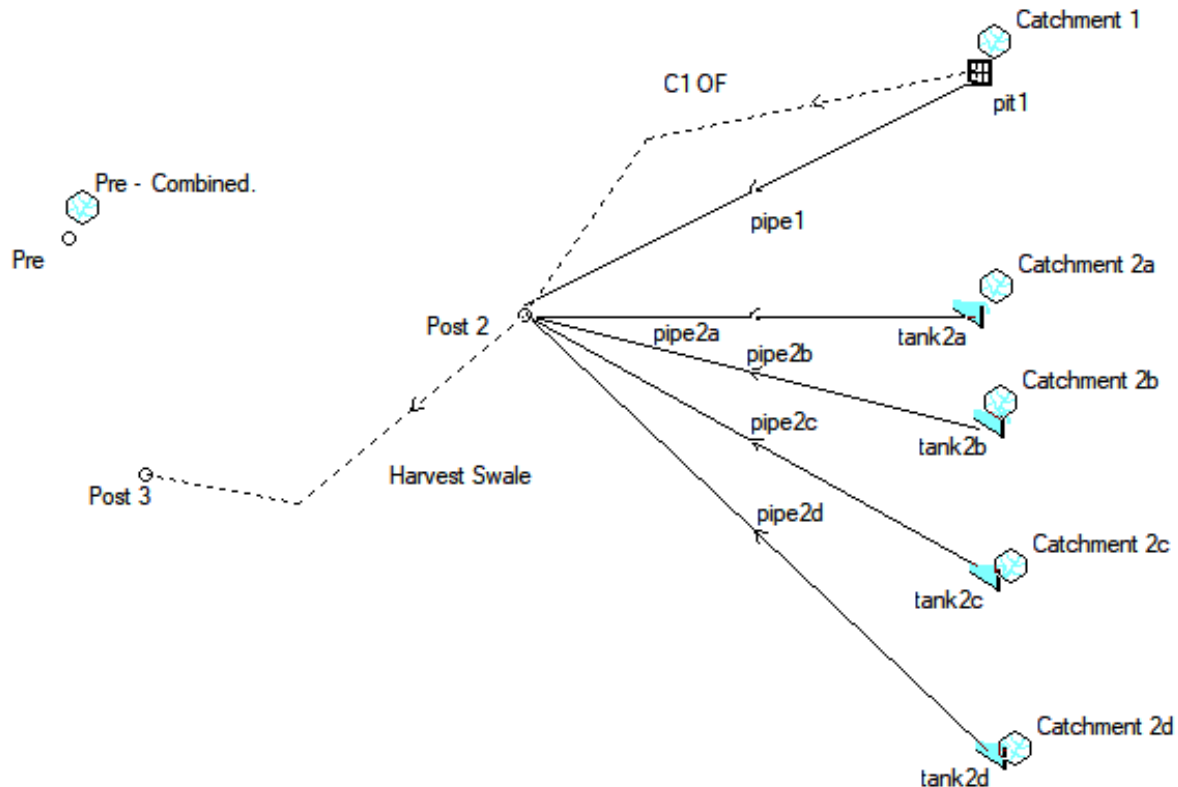


Figure 7 – DRAINS Modelling Setup

Table 4: On-Site Detention Calculations Summary

	Q ₂	Q ₅	Q ₁₀	Q ₂₀	Q ₅₀	Q ₁₀₀
Pre-Development Peak Flow	0.110 m ³ /s	0.136 m ³ /s	0.179 m ³ /s	0.136 m ³ /s	0.231 m ³ /s	0.261 m ³ /s
Post-Development Peak flow	0.109 m ³ /s	0.130 m ³ /s	0.160 m ³ /s	0.130 m ³ /s	0.196 m ³ /s	0.218 m ³ /s

It is demonstrated that the proposed system using 4x on-site detention tanks with a combined volume of 26m³ is adequately sized to meet on-site detention targets for all events up to the Q₁₀₀ target event.

5.4 Stormwater Quality

5.4.1 Stormwater Quality Objectives

To mitigate any potential adverse stormwater quality effects associated to the development, treatment measures are to be provided to improve the runoff quality prior to discharge off site in accordance with BSC's DCP. The degree of treatment for stormwater runoff prior to discharge offsite is noted by BSC's DCP Chapter B3. Figure 8 provides an extract from the document showing the required stormwater pollutant retention prior to discharge offsite.

Pollutant / Issue	Retention Criteria
Litter	70% of average annual load greater than 5mm.
Coarse Sediment	80% of average annual load for particles 0.5mm or less.
Fine Particles	50% of average annual load for particles 0.1mm or less.
Total Phosphorous	45% of average annual load.
Total Nitrogen	45% of average annual load.
Hydrocarbons, motor fuels, oils & grease	90% of average annual load.

Figure 8- Site Pollutant Retention Requirements (BSC's DCP Chapter B3)

5.4.2 Stormwater Quality Model

To demonstrate compliance with stormwater quality objectives, MUSIC software has been utilised. The model has generally been set up in accordance with WaterByDesign's 'MUSIC Modelling Guidelines (2018)'. Model parameters include:

- Rainfall Data. The 'Alstonville 6 Minute' rainfall data template from years 2000-2010 has been utilised for the Model. This data set is the most geographically appropriate information available for the purpose of stormwater quality modelling
- Rainfall Runoff Parameters which were assigned as per Figure 9.

Rainfall-Runoff Parameters

Impervious Area Properties

Rainfall Threshold (mm/day)

Pervious Area Properties

Soil Storage Capacity (mm)

Initial Storage (% of Capacity)

Field Capacity (mm)

Infiltration Capacity Coefficient - a

Infiltration Capacity Exponent - b

Groundwater Properties

Initial Depth (mm)

Daily Recharge Rate (%)

Daily Baseflow Rate (%)

Daily Deep Seepage Rate (%)

Figure 9 - Assigned Rainfall Runoff Parameters

- Catchments. The site's area has been modelled as a 'Roof' and a 'Mixed' catchment;
- Pollutant Loading. Pollutant loading values have been assigned in accordance with WaterByDesign's 'Music Modelling Guidelines (2018)';
- Treatment System Parameters The following stormwater quality features are proposed:
 - o Ocean Protect Ocean Guard Filter Baskets. To ensure that appropriate treatment parameters have been used for modelling purposes, the proposed 'Ocean Guard' filter MUSIC node has been obtained from Ocean Protect; and
 - o Ocean Protect StormFilter. To ensure that appropriate treatment parameters have been used for modelling purposes, the proposed filter's MUSIC node has been obtained from Ocean Protect; and

Refer to the proposed stormwater layout plan (Appendix C) for the proposed layout and tributary catchment areas for the proposed stormwater quality measures.

5.4.3 Stormwater Quality Results

Figure 10 presents the schematic layout (as per the stormwater quality model) and the treatment train effectiveness results.

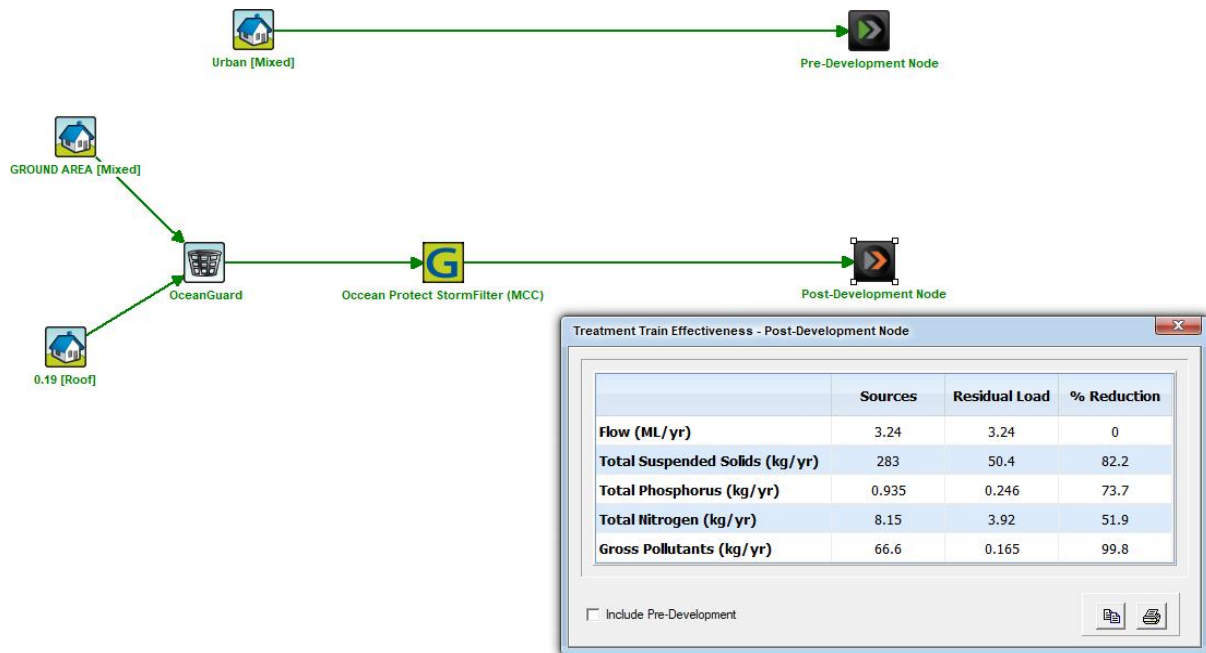


Figure 10- MUSIC Treatment Train Effectiveness Results

The assessment demonstrated that the proposed stormwater system meets BSC's quality objectives based on the following treatments:

- Ocean Protect Ocean Guard; and
- Ocean Protect StormFilter.

5.5 Sediment and Erosion Control

The objective of the proposed sediment and erosion control measures is to ensure that there is no worsening of stormwater quality nor any reduction in the environmental values of the downstream receiving waters as a result of construction activities on the subject site during the construction and operational phase of the development.

The control of stormwater quality during construction activities shall be achieved by the implementation of Erosion and Sediment Controls in accordance with the requirements of Landcom's 'Soils and Construction Volume 1 – Managing Urban Stormwater: Soils and Construction' (i.e. Blue Book). The measures are to be implemented prior to commencement of any construction works and should be inspected regularly, and after heavy storm events to ensure they are achieving their desired purpose. These measures include:

- 1.8m high hessian fence is to be installed around the proposed property boundaries;
- Minimise the number of site access points and provide stabilised site access (a single point for access and egress is preferred):
 - o Stabilised site access to be provided at access to shake down all vehicles entering and leaving the site, minimising the transport of sediment off-site. All vehicles must use the designated site access to enter or leave the site.
- Install downstream sediment barriers prior to commencement of any works:
 - o Sediment fences are to be installed downstream of works and exposed soils to ensure contaminated run-off is filtered and sediment captured before it can make its way into the downstream receiving environment; and
 - o Turf Strips where appropriate.
- External catchment is to be captured and redirected around the area of works and discharged at appropriate location.
- Earthworks are to be stabilised and protected as soon as final profiles are achieved;
- Stockpile materials in protected locations away from overland flow paths and protected by sediment fence boundaries. Stockpile locations will be located in an

elevated, level area. Upslope protection measures (i.e. sandbags or equal) are to be used to divert run-off in the event of rain, and sediment fences are to be installed downstream of any erodible stockpile.

- At the end of each day or in the event of rain or high winds, stockpiles are to be covered and secured. Appropriate locations of stockpiles are to be determined by the site manager at the time of construction.
- Use sediment fences on the low side of any areas of soil disturbance (e.g. road formation, house pad, soil stockpiles, etc) and use sediment filters around all stormwater inlets directly downstream of the nominated area of works;
- Water the site during construction to minimise the generation of dust onsite; and
- When wind speeds reach 35km/h, all dust generating construction activities must cease onsite.

The following inspection program shall be established by the Site Contractor and monthly Check Sheet reports submitted to the Supervising Engineer.

- Daily inspection of the site Stabilised Access point and amendments as necessary;
- Formal weekly inspection of erosion and sediment controls;
- Inspections after 10mm rainfall events in 24 hours; and
- Testing of runoff after significant rainfall events to ensure a maximum discharge of 50mg/L suspended solids.

In addition to the inspection details, the following information will be recorded:

- List frequency and method of removal of material from stabilised access point;
- Volume of material removed from in/around sediment controls;
- Location of site where material disposed; and
- Any repairs/additions as appropriate.

During the earthworks there is a potential for increased stormwater pollutants as a result of areas of exposed soils. Some minor importation of foreign soils may be required for the purposes of roadways, driveways and possibly building pads. This imported material is likely to have higher clay content and runoff potential in the short term before any surface finish is applied.

6 Services Assessment

6.1 Water

6.1.1 Existing Infrastructure

BSC provides reticulated water supply to tenants within the local area and is responsible for all reticulated water supply to the development. Water reticulation shall be available via the future 100mm PVC water and recycled water mains within Road 2 (parallel to the southern boundary of the site). Potable water is located on the northern end of Road 2 and recycled water on the southern end.

In addition, a 300mm water service is located to the north of the site within the Ewingsdale Road reserve.

A fire hydrant is located directly to the south of the site as well as directly to the north adjacent to Ewingsdale Road.

6.1.2 Proposed infrastructure

It is proposed that the point of connection shall be within the Future Harvest estate. A bulk water meter shall be provided along the southern boundary of the site (Refer the civil plans within Appendix C for the proposed location).

Should recycled water be required for the site, an under bored connection should be provided between the southern end of Road 2 and the subject site.

6.1.3 Anticipated Demand

A preliminary water network capacity assessment has been carried out to compare the pre- and post-development scenarios. A summary of findings is provided in Table 5. The total number of Equivalent Tenements (ET) was calculated based on the BSCs 'Water and Sewer Equivalent Tenements Policy(2018)' and the architectural plans provided by MAI. Peak instantaneous demand was calculated using a rate of 0.15L/s/ET as stated in the Northern Rivers Development Design Specification 'D11: Water Supply'.

Table 5: Water Demand Analysis

Scenario	Contributor											
	1-Bedroom Apartments		2-Bedroom Apartments		3+ Bedroom Apartments		Retail/ Commercial		Other		Total Daily Demand	
	No.	ET	No.	ET	No.	ET	m²	ET	m²	ET	ET	Peak
Pre-Development *	0	0	0	0	0	0	0	0	0	0	0	0.0L/s
Post-Development	0	0	0	0	20	16.0	0	0	0	0	16.0	2.4L/s

* Current demand from the site from the Harvest Estate development

Based on this analysis, a demand of 2.4l/s is expected. No issues with meeting this demand via the new 100mm main are anticipated. In addition, part of this demand may be met via the new recycled water main within Harvest Estate as well as on-site harvesting.

6.1.4 Firefighting Demand

To fire hydrants are located within the direct vicinity of the site. It is anticipated that these services are sufficient to meet the fire-fighting demand for the site.

6.2 Sewer

6.2.1 Existing Infrastructure

BSC provides reticulated sewer to residential customers within the local area and is responsible for all reticulated sewer to the development. Sewer reticulation will be available via the new pressure sewer

main on the southern end of Road 2 (towards the south of the site. No sewer connection point to the site shall be provided as part of the Harvest Estate development works.

6.2.2 Proposed Infrastructure

It is proposed that a pressure sewer connection is provided into the Harvest Estate network. A boundary kit shall be provided within the site as well as 24h of emergency effluent storage which will be within the vicinity of 11m³-13m³. Although the final specification shall form part of detailed design, it is anticipated that an Aquatec 'Duplex' or 'Triplex' PSS15000 system is adequately sized for the proposed development density.

Due to high ground water tables, the detailed design of the underground storage infrastructure shall take in account buoyancy.

An under bored pressure sewer connection shall be provided between the southern end of Road 2 and the subject site. Refer the civil plans within Appendix C for additional detail.

6.2.3 Anticipated Demand

A preliminary sewer network capacity assessment has been carried out to determine the pre- and post-development sewer demand for the site. Table 6 provides a summary of this comparative analysis. The provided values were calculated using WSA02 (Gravity Sewer Code of Australia), NRLG Specification D12 (Sewerage System), and BSCs 'Water and Sewer Equivalent Tenements Policy' (2018).

Table 6: Sewer Demand Comparative Analysis

Scenario	Contributor													
	1-Bedroom Apartments		2-Bedroom Apartments		3+ Bedroom Apartments		Retail/ Commercial		Other		Total Daily Demand		Dry Weather Flow	
	No.	ET	No.	ET	No.	ET	m ²	ET	m ²	ET	ET	EP	Ave.	Peak
Pre-Development*	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0L/s
Post-Development	0	0	0	0	20	20	0	0	0	0	20	64	0.13 L/s	1.24 L/s

* Current demand from the site from the Harvest Estate development

Based on this analysis, an increase in demand of peak instantaneous demand of 1.24/s is anticipated. No issues with meeting this demand via the new pressure main are anticipated.

6.3 Power

Essential Energy is the main service authority for power supply in the region and is responsible for building, operating and maintaining the electricity network within the area of the subject site. The provided site survey and DBYD records indicate that the site is currently been serviced via an overhead power line adjacent to Ewingsdale road to the north. In addition, underground power shall be available via Harvest Estate. Power supply shall form part of detailed design.

No issues with offsets from overhead power infrastructure and proposed buildings are anticipated.

6.4 Telecommunications

NBN and Telstra are the main telecommunications service suppliers to the area. Records and survey data indicate that a Telstra owned communications main is located parallel to the northern boundary of the site adjacent to Ewingsdale Road. In addition, NBN shall be available via Harvest Estate. Telecommunications supply shall form part of detailed design.

7 Conclusion/Recommendations

This engineering assessment undertaken for this site has identified that the proposed multi-residential development located at 310 Ewingsdale Road NSW can be readily serviced without major augmentation to existing infrastructure and that potential adverse impacts from additional infrastructure demand, traffic and stormwater can be adequately managed. Planit recommends the following:

- Dewatering shall be required as part of excavation for the proposed basement. Acid Sulphate Soils (ASS) may be encountered during excavation;
- The site is located to be within close vicinity of an area subject to inundation during flood events. However, due to the proposed elevations, no issues with flooding are anticipated for the operational phase of the development;
- Earthworks shall be required for the construction of a parking basement (cut) and acoustic mound (fill);
- Site access is to be in accordance with the Traffic Impact Study prepared in support of the development. It was found that adequate access and parking can be achieved;
- Runoff is to be discharged towards a drainage swale towards the south of the site using an internal pit-and-pipe network;
- The magnitudes of post-development stormwater flows can be adequately mitigated to those of equivalent pre-development flow through the use of rainwater tanks with a combined footprint of 26m³.
- Stormwater Quality objectives shall be met through the provision a proprietary treatment system as well as filter baskets placed within each stormwater pit proposed within the site;
- Sediment and Erosion Control measures in accordance with Landcom's 'blue book' are to be implemented during construction;
- Reticulated and recycled water supply shall be available to the site. No issues are foreseen in meeting the development's demand. The provision of new property connections may be required;
- Pressure sewer infrastructure shall be available to the site. A boundary kit with adequate emergency storage shall be provided as part of development works; and
- No issues are foreseen with bringing power and telecommunication services to the site.

Based on the assessment undertaken, it is believed that the proposed development can be readily serviced in a sustainable way.