CANBERRA TOWN PLANNING
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ABN 66 131 577 261

5 May 2021

Attn: Jenny Elphinstone
Douglas Shire Council
PO Box 723
MOSSMAN QLD 4873

Via email: enquiries@douglas.qld.gov.au

Dear Jenny,

RE: Response to Information Request (s13 DA Rules)
MCU2021_4080/1 - Material Change of Use for Research and Technology Industry (Pilot Plant)
Part of Lot 27 on RP804231

INTRODUCTION

We refer to your information request letter dated 9 April 2021 relating to the above-described development application and herein provide a full response in accordance with 13.2(a) of the Development Assessment (DA) Rules. This response is supported by the following information:

- Appendix A - Stormwater Quality Management Plan prepared by Premise
- Appendix B – Letter addressing water supply prepared by Premise

RESPONSE TO INFORMATION REQUEST

Council Item 1 – Stormwater Management Plan

1. Please provide the stormwater management plan as nominated in your report.

Our Response

Please refer to the Stormwater Quality Management Plan prepared by Premise at **Appendix A.**

Council Item 2 – Liquid Waste management

2. The proposal states that in the absence of a Trade Waste Agreement (TWA) or if liquid trade waste is not able to be accepted by our treatment plant (i.e. sampling results demonstrate that required parameters are non-compliant) the following will occur –

a. Trade Waste will be stored onsite until a TWA is in place or until the parameters are deemed acceptable for release to our treatment plant, or
b. If the applicant is unable to accommodate the volume of trade waste through onsite storage then the plant will shut down.

Onsite storage is considered an appropriate option.

For the proposed onsite storage option please provide further detail on the location and capacity of these onsite storage tanks.

Please also detail how many days of standard operations it would take to fill the storage tanks so that there is sufficient time to arrange for offsite disposal.

Our Response

A 20,000 litre on-site storage tank is planned to be installed on the western side of the new shed. The location is shown at Appendix D to the Stormwater Quality Management Plan (Appendix A). In the event that further water storage capacity is required, an additional 20,000 litre tank will be installed in parallel with the original tank to give sufficient capacity between tanker outloads.

It is estimated that the maximum volume of trade waste requiring disposal under worst case conditions (i.e. with the mill offline, site running at 100% throughput 24/7, both cane cleaners running at 100% water flow 24/7 etc.) would be 2,989L/hr. We note that realisation of these conditions for worst case generation of trade waste is very unlikely, with a more likely rate of trade waste generation being 1750L/hr depending on the performance of the prototype equipment.

Based on current plans and assuming the worst-case trade waste generation is realised, the site's tank would fill in under 7 hours. If the mill is online, the trade waste generation should be reduced to around 311 litres/hr, giving around 2.5 day's capacity.

Council Item 3 – Liquid Waste Management

3. *Shutting the plant down is not an acceptable solution. A more appropriate measure would be to engage the services of an approved regulated waste transporter to pump out the storage tanks when they are close to their storage capacity (records of pump outs must be maintained on file and produced upon request from an authorised person).*

   Please provide detail of appropriate measures/infrastructure that need to be in place to account for the ongoing management of liquid trade waste.

Our Response

An effluent holding tank will be installed on the Western side of the new shed. The location is shown at Appendix D to the Stormwater Quality Management Plan (Appendix A). In the event that further water storage capacity is required, an additional 20,000 litre tank will be installed in parallel with that tank to give sufficient capacity between tanker outloads.

An approved regulated waste transporter will be contracted to pump out the storage tanks. Records will be kept for all analyses and at each pump-out to cover chain of custody and Council requirements.

There is also potential for a trade waste agreement to be reached with Council to assist with the disposal of trade waste via the sewer manhole on site. Refer to the Response to Council Item 6 for further detail.

Council Item 4 – Leachate Management

4. *The accompanying reports provide broad based statements around the management of leachate from stockpiles to prevent contaminants entering the stormwater system. These statements mention that leachate will be managed under stormwater controls.*

Please provide specific detail on these controls of stormwater management to control leachate management (i.e.- what are these controls?).

Our Response

Please refer to the Stormwater Quality Management Plan prepared by Premise at **Appendix A.**

Council Item 5 – Leachate Management

5. *If the stormwater controls fail, the final control is to direct the leachate to the greater Mill's stormwater control processes and releases will be subject to the Far North Mill processes. It is noted that the majority of the existing infrastructure and processes at the Mossman Mill is old and requires ongoing maintenance. The processes currently in place may not likely be in line with current best practice and may not meet current expectations for baseline compliance.*
   Please provide detail of how the leachate is directed to the greater Mill's stormwater control processes. Please include detail as to what this process entails. Please include detail of the infrastructure utilised for this process. Please provide an assessment of the current infrastructure, being the state of repair and ability for the infrastructure to be in line with best practice methods. Please provide a report either demonstrating that current processes are acceptable and able to achieve intended best practice outcomes or alternatively the report should detail what upgrade are necessary to achieve this outcome. Please provide details of the proposed sampling to be conducted prior to release in order to ensure that the quality of the leachate is in line with the water quality parameters of the receiving waters.

Our Response

Following further investigations carried out during preparation of the Stormwater Quality Management Plan (**Appendix A**), it has been determined that it will not be necessary to direct stormwater and/or leachates to the Mill's stormwater control processes or to Mossman's wastewater treatment plant. Instead, all stormwater and leachates will be managed wholly onsite in accordance with either Option 1 or Option 2 presented in the Stormwater Quality Management Plan. These options have been determined to be suitable for accommodating all leachates and peak stormwater flows associated with the proposal.

We note that at this point in time, it is CocoNutZ Australia's preference to implement option 2, being the bioretention option, with the resulting treated product to be dispersed overground. It is likely that the bioretention basin would be situated to the north of the northern-most shed.

Inspection of the system would be mandatory after rain events in accordance with the Environmental Management Plan prepared by Wolter Consulting Group and submitted with the application.

Council Item 6 – Sewer

6. *The volume waste of discharged to sewer is minimal according to the figures given by CocoNutz in the submitted report (7140 l/day). However once plant is running at full capacity this could change. Council will need further advice to determine if pre-treatment is required as Mossman plant can easily be impacted by any trade waste. Council would prefer the waste to be tested and stored in a holding tank once the strength of the trade waste is determined this will work out the flowrate entering the sewer, or the alternate option is to truck waste to Port Douglas WWTP as discussed at the onsite meeting.*

Having regard to the above comment please provide further details of extent of discharge at full capacity and intended method to treat of waste.

Our Response

The flows listed as part of the original lodgement documentation did not include the 'clean in place' process or cane cleaning equipment and as such underestimated the likely volume of waste. It is estimated that the maximum volume of trade waste requiring disposal under worst case conditions (i.e. with the mill offline, site running at 100% throughput 24/7, both cane cleaners running at 100% water flow 24/7 etc.) would be 72,000L/day. We note that realisation of these conditions for worst case generation of trade waste is very unlikely, with a more likely rate of trade waste generation being 37,000-47,000L/day. The following arrangements are proposed for treatment, storage and disposal of trade waste:

- A 20,000 litre on-site storage tank is planned to be installed on the western side of the new shed. The location is shown at Appendix D to the Stormwater Quality Management Plan (Appendix A). An additional 20,000 litre tank will be installed in parallel with the original tank to bolster storage capacity if found to be necessary. pH will be tested and neutralised in the tank prior to disposal as appropriate.
- Trade waste stored in the storage tank(s) will be removed as follows:
    - During the crushing season, it will be possible to discharge 2,715L/hr directly to the Mill's water recovery system (for use in the Mill's processing operations) via a return pipeline that will be installed from the effluent holding tank; and
    - Via a commercial agreement with a company providing trade waste removal services. We note that these waste removal trucks typically have a capacity of around 25,000L and as such, as many as 4 tankers may need to be removed on a daily basis under worst case conditions during the off season; and/or;
    - In accordance with a trade waste agreement with Council. This would involve discharging trade waste via the sewer manhole at the site. There is potential for further testing and treatment of waste in addition to neutralisation (e.g. suspended solids, nitrogen levels) prior to discharge in agreement with Council.

No pre-treatment is currently planned for operations during the first crushing season (2021). There is potential to hire an effluent pre-treatment plant (from Coates hire or similar) until such time as design of a suitable effluent treatment plant can be informed by performance data from the pilot plant and installed.

Council Item 7 – Water

7. *Water is supplied along Kidd St by a private 100 mm water main as per map below. While Councils supply responsibility ends at the water meter on the property boundary, consideration should be given to any impact on the supply to the existing customer.*

   Please clarify with the design engineer that the proposed hourly volume of 4140 litres/hr will not adversely impact on the operational water usage by the Mill during the crushing season.

Our Response

Please refer to the letter addressing water supply prepared by Premise at **Appendix B**. We note that this letter was prepared by a Registered Professional Engineer Queensland (RPEQ).

Council Item 8 – Planning Amenity

8. *Please provide details of he impacts of the proposed development on the existing Mill residences (noise sensitive places) on the land having regard to:*

I. *the environment and the residences during the crushing season when there is substantial background noise and the Mill usually operates 24/7; and*

II. *the environment during the off-season, where operations are generally limited to maintenance activities during normal daylight hours.*

Our Response

Impacts to the residences located on the Mossman Mill site (mill residences) were excluded from the assessment for the reasons outlined below.

- The mill residences are situated in very close proximity to the Mossman Mill, a long-standing industrial operation. These residences are therefore subject to amenity impacts that do not comply with various modern policy requirements due to the Mill's existing use rights.
- Mill residences are the property of the Mossman Mill and are not separately titled. As such, they may not be sold separately without a development permit(s) to reconfigure the land. In the event that such permits were sought, amenity impacts would need to be addressed as part of that process;
- Leasing of mill residences is overseen by Raine and Horn in Mossman and all potential occupants are made fully aware of amenity impacts associated with the Mill, including 24/7 operations during the crushing season.

Notwithstanding the above, we note that acoustic impacts during both the crushing season and the off season will be established as part of planned further acoustic studies, including:

- Noise monitoring prior to the upcoming crush season to establish background noise during the off-season (we note that this is presently scheduled for mid May pending the suitability of weather conditions); and
- Noise monitoring during the upcoming crush season to confirm the accuracy of estimated background noise as detailed in the existing Acoustic Report submitted with the application.

As set out on page 15 of the Planning Report prepared by Canberra Town Planning, the improved confidence in the accuracy of acoustic modelling which these studies will facilitate will allow for an equally confident determination regarding appropriate attenuation measures and associated specifications. Notably, attenuation measures would be designed to protect the amenity of surrounding offsite residential properties, with the most sensitive offsite receiver being the dwelling adjoining the mill site on the northern side of Mill Road. Given the position of the mill houses in the same direction from the site as this dwelling, it follows that attenuation measures designed to protect this dwelling will also result in a level of attenuation of acoustic impacts to mill houses.

In the event that reasonable attenuation of noise affecting the mill houses cannot be practically achieved, these houses will no longer be tenanted as is appropriate. For example, findings of the planned additional acoustic modelling may identify that it is possible to comply with reasonable noise limits for all houses during the crushing season (due to the existing elevated background noise conditions) but only for the two southern-most houses during the off season. In this scenario, each house would only be leased during periods of anticipated compliance.

Furthermore, as per the Environmental Management Plan prepared by Wolter Consulting Group and submitted with the application, a complaints management system will be put in place to facilitate appropriate response and remedy of any noise complaints.

Council Item 9 – Planning Amenity

9. *Please provide details of lighting, during the off-season for the premises and in any particular the use of any external period during the evening hours.*

Our Response

At present, the Mill site has street lights which are on overnight throughout the year. These street lights would remain and the following additional lighting is proposed to be utilised overnight during the off-season:

- Strip lighting in the undercover parking area attached to the administration building.
- Two existing flood lights attached to the eastern end of sheds 1 and 2 would be used to facilitate safe movement between these sheds at night. The flood lights are installed at a heigh of approximately 4.8m and are currently angled towards Junction Road. In order to prevent impacts to residents and vehicles travelling along Junction Road, these lights will be angled down and shields will be installed to minimise light pollution.

In the event that the above measures prove insufficient to preserve the amenity of residents and ensure the safety of users of Junction Road, it would be possible to relocate these flood lights to the western end of sheds 1 and 2, thereby directing all light into the site.

Council Item 10 – Planning Amenity

10. During the crushing season billets usually arrive via tramways. Please provide detail as how and from where the billets moved to the factory premises during the crushing season.

Our Response

Billets will be transported from local cane farms to site via road by a private haulage contractor. Loading at farms will occur wholly on private land, making use of a haul out trailer which then transfers cane to the haulage vehicle. Cane will generally be provided by farms within 5-10km of the site, with three deliveries occurring each day.

Council Item 11 – Planning Amenity

11. Please update the acoustic report to include and provide for the consideration of the buildings (Sheds 4 and 5 and the connecting link area) south of the office buildings that will be utilised in the development.

Our Response

Sheds 4 and 5 will be used for storage purposes only and will not house any operational equipment. As such, use of these buildings is not associated with any substantial noise emissions and has therefore been excluded from the acoustic report prepared in support of the application.

Council Item 12 – Service run above ground between buildings

12. Please provide details of the nature of this service and the clearance height.

Our Response

We confirm that the following pipes are intended to be contained in the above-ground pipe rack, which would be between 0.5-1m above the ground. The proposed height of the pipe rack seeks to ensure convenient access for maintenance purposes.

- 1 x steam pipeline (50mm)
- 1 x potable water pipeline (50mm)
- 1 x cooling water pipeline (size to be determined, 50mm-110mm)
- 1 x condensate return pipeline (25mm)
- 1 x cooling water return pipeline (50-110mm)
- 1 x compressed air line (25mm)
- 1 x syrup pipeline (50mm)

- 3 x wash-out pipelines (32mm)
- 1 x water transfer pipe (32mm)

There is potential for low voltage signal cables to be run along the pipe rack in future. Given the planned presence of vehicles manoeuvring within this vicinity and in order to ensure both safety and prevent damage to these pipes, we are happy for appropriate safety measures to be conditioned such as the installation of warning signage and/or barriers.

Council Item 13 – Traffic Report and Movement Considerations

13. Heavy vehicle traffic associated with the Mill, in particular during the crushing season utilises Williams Street, rather than Front Street/ Mill Street.

Please advise to the agreement or otherwise to limit heavy vehicle movement to this normal heavy vehicle route for the propose development.

Our Response

We confirm that it is possible for all vehicle traffic associated with the proposed development to utilise the same routes as the Mill, being Williams Street, rather than Front Street. This may be conditioned as appropriate.

CONCLUSION

Should you have any further queries regarding this application, please contact the undersigned on 0488 055 642.

This letter is for the use only of the party to whom it is addressed and for no other parties. No responsibility is accepted to any third party who may use or rely on the whole or any part of the content of this letter.

Yours sincerely,

Hannah Neville
Senior Town Planner | Canberra Town Planning

Premise

COCONUTZ AUSTRALIA PTY LTD

R&D Facility – 34 Mill Street, Mossman

STORMWATER QUALITY MANAGEMENT PLAN

Report No: CAN-0001/R01
Rev: 1
30 April 2021

DOCUMENT AUTHORISATION					
Revision	**Revision Date**	**Report Details**			
1	30/04/21	Draft			
Prepared By		**Reviewed By**		**Authorised By**	
L. Hamilton		J.Cox		J. Cox	

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FIGURES

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APPENDICES

1. INTRODUCTION

Premise Australia Pty Ltd (here within referred to as "Premise") has been commissioned by CocoNutZ Australia Pty Ltd to prepare a Stormwater Quality Management Plan for the R&D Facility at 34 Mill Street, Mossman.

The Land Parcel which the development site and subject area pertain to include:

- Lot 27 on RP804231

The proposed works will comprise of the following components:

- Material change of use for research and technology industry; and
- Construction of an additional shed and associated bunkers

The shed and bunkers make up part of the material change of use including additional changes contained largely within existing buildings and structures on site.

Refer to **Figure 1** below for a Road Map Image of the site and its locality.

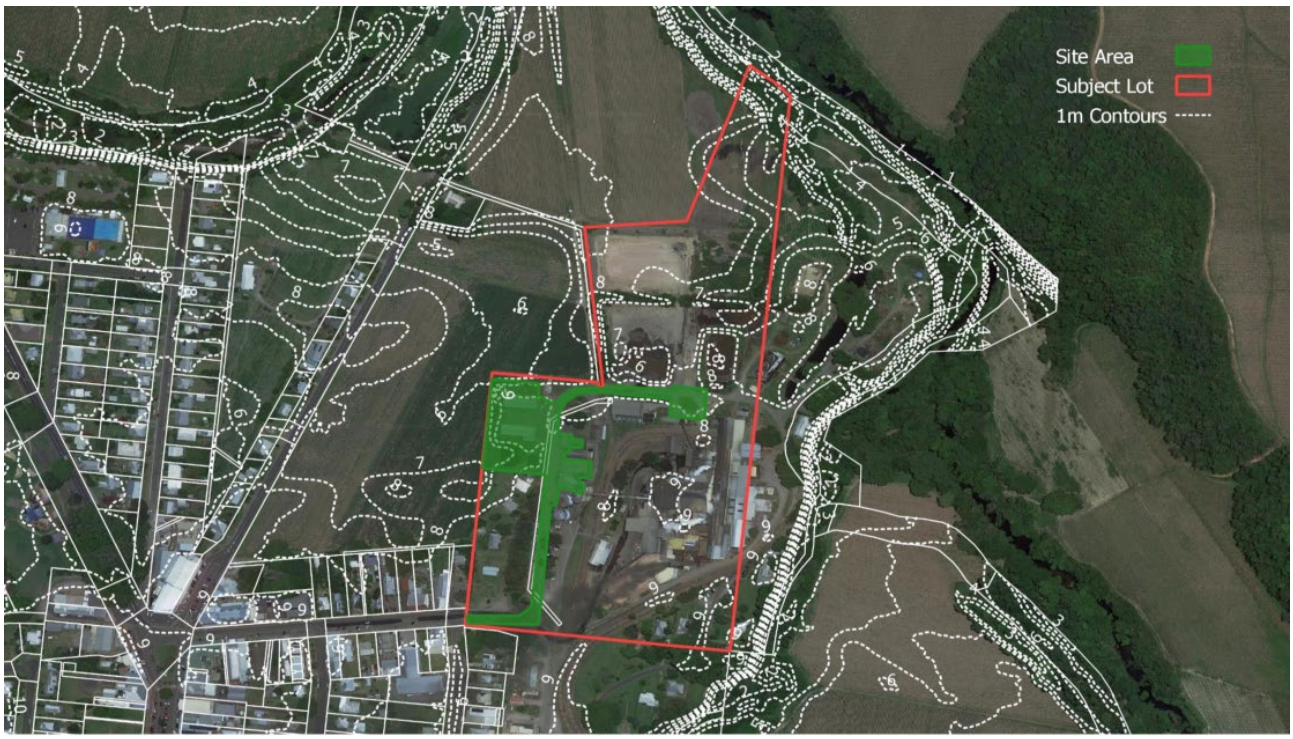


Figure 1 – Existing Study Area with Site area highlighted (Source: Planning Report – *Wolter Consulting*)

2. SITE CHARACTERISTICS

2.1 Site location

The subject site is located on Mill Street in Mossman and forms part of the existing Mossman Sugar Mill. It is formally known as Lot 27 on RP804231. The total area of the site is approximately 1.3ha and the total area of the proposed shed is approximately 365m².

The site is positioned at the north eastern edge of the Mossman Township, approximately 400m from Captain Cook Highway along Mill Street. It is located within the Douglas Shire Council Local Government Area.

2.2 Topography

The site is low lying and generally flat. Based off the topography, drainage of the subject site is generally as follows:

- Existing elevations range from R.L. 6.0-9.0
- Runoff flows generally from south to north
- Existing point of discharge to the creek adjacent to the site with runoff eventually contributing to Mossman River

3. PROPOSED DEVELOPMENT

The proposed development consists of the construction of an additional shed with associated bunkers for storage and a small hardstand area. The additional changes associated with the material change of use are largely to existing buildings and structures elsewhere on the site.
Figure 3 shows the proposed layout of the development.

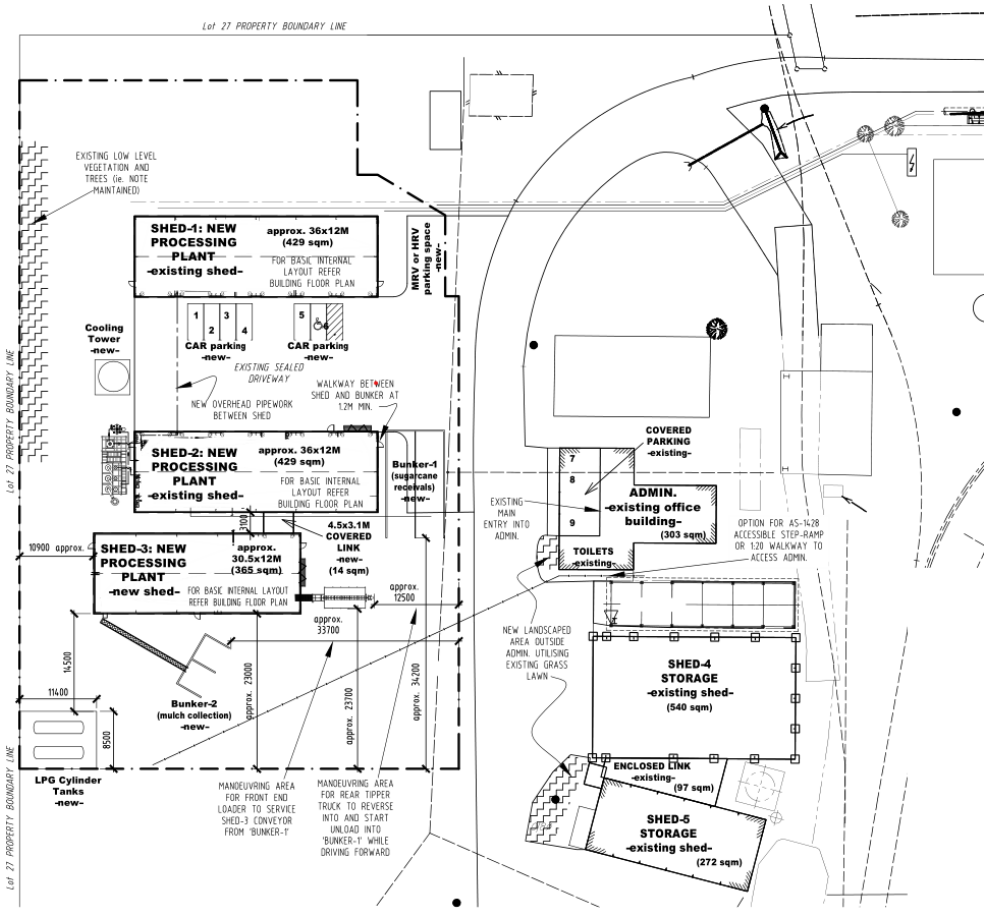


Figure 2 - Proposed Development Layout (Source: *Gregory G Terzi Building Design & Drafting*)

The proposed development plan has been attached in **Appendix A.**

3.1 Proposed Drainage

Proposed drainage for the shed includes collecting and conveying roofwater and surface runoff to a sump and pump system due to the gradient of the area being quite flat. The pump is intended to discharge to an effluent holding tank with a transfer pump to convey runoff to the Mill process and trade waste as a backup when the mill is offline.
A drainage layout plan has been prepared as part of the application and can be seen in **Appendix D**.

4. DATA

Data in the preparation of this report, information about the site was gathered from the following sources:

- Aerial LiDAR data by Department of Natural Resources and Mines;
- Proposed Site Layout provided by Gregory G Terzi Building Design & Drafting;
- Rainfall and Meteorological Data by the Australian Bureau of Meteorology;
- Aerial Imagery by Nearmap (Accessed on April 2021)

5. STORMWATER QUALITY

5.1 Stormwater Quality Treatment (Construction Phase)

During the construction phase various pollutants are generated which can find their way into the stormwater runoff. These pollutants can affect the quality of the stormwater runoff and hence pollute both the site and the downstream receiving environment. **Table 1** below outline the major sources of pollutants.

Table 1 Typical Construction Phase Pollutants

Construction Phase Pollutants
Litter from construction packaging, paper, food packaging, off cuts, etc.
Sediment from erosion of exposed soils and stockpiles.
Hydrocarbons - from fuel and oil spills, leaks from construction equipment.
Toxic Materials - cement slurry, solvents, cleaning agents, wash waters.
pH altering substances - cement slurry, wash waters.

Erosion and sediment control measures used during the construction phase of the development will be designed and installed in accordance with International Erosion Control Association (Australasia) - "Best Practice Erosion & Sediment Control – for building and construction sites" November 2008 as well as Table 9.4.5.3.b of the Douglas Shire Council Planning Scheme infrastructure Works Code.

5.2 State Planning Policy Compliance

The latest Stormwater Management Design Objectives (SMDO's) have been adopted from Table 9.4.5.3.c of the Douglas Shire Council Planning Scheme infrastructure Works Code for the operational phases of the development and are detailed in **Table 2** below.

Table 2 Stormwater Quality Objectives

Pollutant	**Reductions in mean annual load from unmitigated development (%)**
Suspended Solids	80
Total Phosphorus	60
Total Nitrogen	40
Gross Pollutants	90

5.3 Stormwater Quality Modelling

Stormwater Pollutant modelling for the development has been generated using the modelling program 'Model for Urban Stormwater Improvement Conceptualisation' (MUSIC), version 6.3.0, adhering to the prescribed Far North Queensland Regional Organisation of Councils Stormwater Quality Design Manual Version No. 03/17 (FNQROC). An assessment was undertaken for both a bioretention system or proprietary system manufactured by SPEL Environmental to provide 2 options of stormwater quality treatment for the development. Details of Catchment assumptions can be seen in **Table 3**.

Table 3 MUSIC Model Catchment Parameters

Catchment ID	Node Type	Total Area (ha)	Fraction Impervious
Shed Roof - Commercial	Industrial	0.036	100%
Bunkers 1 (Roof)	Industrial	0.003	100%
Bunkers 2 (Roof)	Industrial	0.014	100%
Concrete (Sealed Road)	Industrial	0.018	100%

A snapshot of the MUSIC model setup for both options can be seen below.

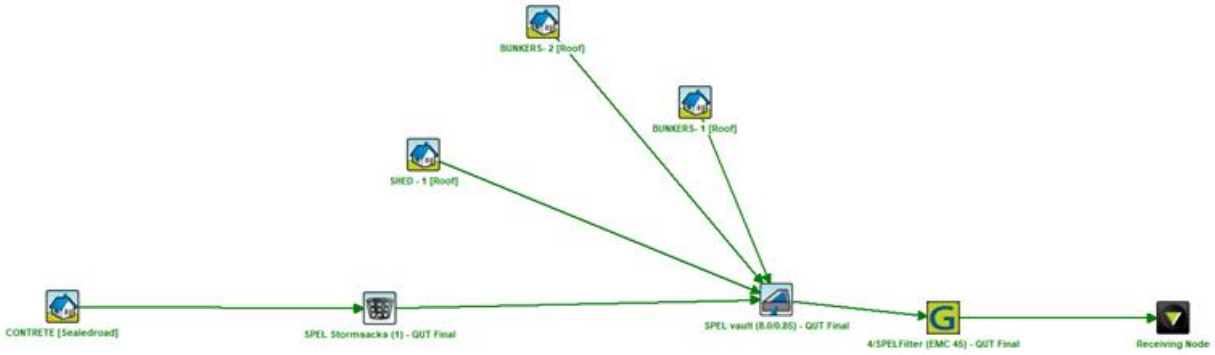


Figure 3 – Option 1 – SPEL Filter and Vault MUSIC Model layout

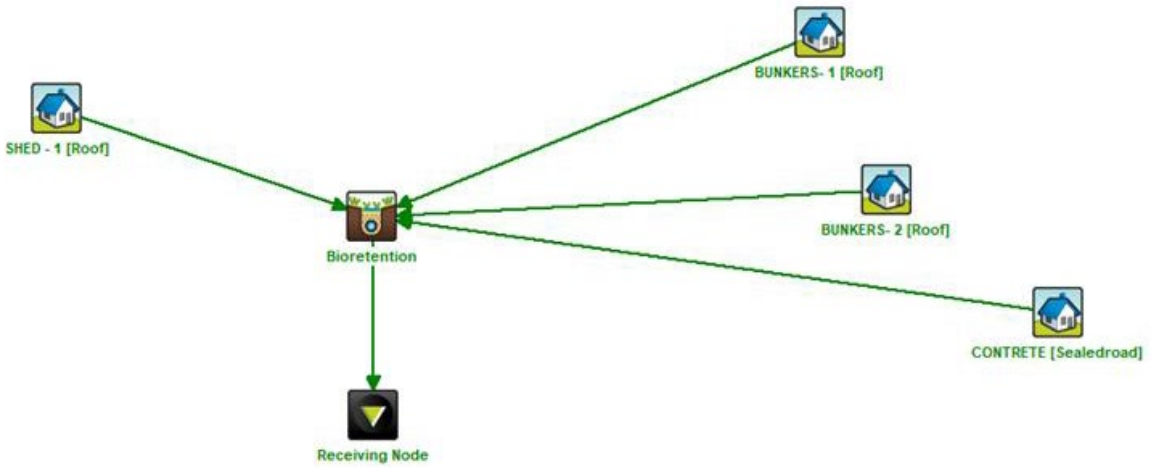


Figure 4: Option 1 – Bioretention MUSIC Model layout

5.4 SPEL StormSack – Option 1

The SPEL StormSack provides effective filtration of solid pollutants and debris typical of urban runoff. It is designed to rest on the flanges of conventional catch basin frames. The parameters for the treatment system are provided in the table below.

Table 4 Treatment Device parameters – Spel Stormsack

Component	Device Parameters
Low Flow By-pass (m3/s)	0
High Flow By-pass (m3/s)	0.01100
Total Suspended Solids (Inflow, outflow) 1 (mg/L)	0,0
Total Suspended Solids (Inflow, outflow) 2 (mg/L)	100.0, 39.0
Total Phosphorus Inflow (mg/L)	100.0
Total Phosphorus Outflow (mg/L)	72.0
Total Nitrogen Inflow (mg/L)	100.0
Total Nitrogen Outflow (mg/L)	55.0
Gross Pollutants Inflow (kg/ML)	15.0
Gross Pollutants Outflow (kg/ML)	0

5.5 SPELFilter and Vault – Option 1

The Stormwater Management StormFilter™ cleans stormwater through a patented passive filtration system, effectively removing pollutants to meet the most stringent regulatory requirements.
The StormFilter stormwater treatment system uses rechargeable, self-cleaning, media-filled cartridges to absorb and retain the most challenging pollutants from stormwater runoff including total suspended solids, hydrocarbons, nutrients, soluble heavy metals, and other common pollutants. The parameters for the treatment systems are provided in **Table 5** and **Table 6**.

Table 5 Treatment Device parameters – SPEL Vault

Component	Device Parameters
Low Flow By-pass (m3/s)	0
High Flow By-pass (m3/s)	100
Surface Area (m^2)	8.0
Extended Detention Depth (m)	0.85
Exfiltration Rate(mm/hr)	0.00
Evaporative Loss as % of PET	0.00
Low Flow Pipe Diameter (mm)	90.0
Overflow Wier Width (mm)	5.0

Table 6 Treatment Device parameters – SPELFilter (4 x EMC 45 Filters)

Component	Device Parameters
Low Flow By-pass (m3/s)	0
High Flow By-pass (m3/s)	0.01132
Total Suspended Solids (Inflow , outflow) 1 (mg/L)	0,0
Total Suspended Solids (Inflow , outflow) 2 (mg/L)	100.0, 22.0
Total Phosphorus Inflow (mg/L)	100.0
Total Phosphorus Outflow (mg/L)	41.0
Total Nitrogen Inflow (mg/L)	100.0
Total Nitrogen Outflow (mg/L)	58.0
Gross Pollutants Inflow (kg/ML)	15.0
Gross Pollutants Outflow (kg/ML)	0

5.6 Bioretention – Option 2

A bioretention has been identified as the second treatment solution option for the stormwater runoff generated from the development. The core assumption is that the runoff will be collected and conveyed to bioretention basin to be treated before leaving the site. The typical section for a bioretention basin as described in in the Deemed to Comply Solutions – Stormwater Quality Management (Water by Design) is shown below,

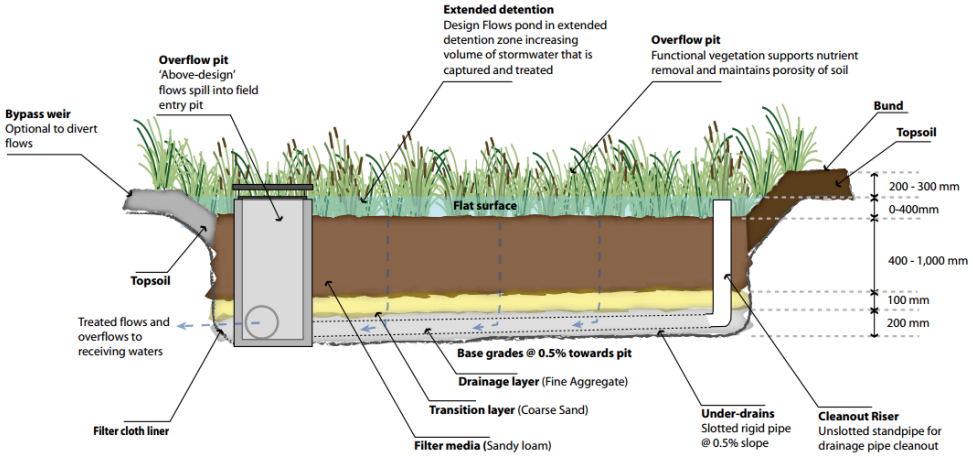


Figure 5: Typical Bioretention Section - Retrieved from Deemed to Comply Solutions (Water by Design)

Table 7 Treatment Device parameters – SPEL Vault

Component	Device Parameters
Low Flow By-pass (m3/s)	0
High Flow By-pass (m3/s)	100
Surface Area (m^2)	18.0
Extended Detention Depth (m)	0.30
Filter Area	18.0
Saturated Hydraulic Conductivity (mm/hour)	200
Filter Depth (m)	0.4
TN Content of Filter Media (mg/kg)	400
Orthophosphate Content of Filter Media (mg/kg)	55.0

5.7 Treatment Train Effectiveness

Table 8 and **Table 9** outline the effectiveness of the MUSIC Model Treatment Train in achieving the set Stormwater Management Design Objectives (SMDO's) for pollutant reduction for the proposed Development.

Table 8 Treatment Train Effectiveness at Receiving Node – Option 1 (SPEL)

Pollutant	Unmitigated Load (kg/yr)	Mitigated Load (kg/yr)	Reduction (%)
Suspended Solids (TSS)	63.2	11.9	91.3
Total Phosphorus (TP)	0.381	0.137	75.6
Total Nitrogen (TN)	6.83	2.76	50.9
Gross Pollutants > 5mm	37.5	0	100

Table 9 Treatment Train Effectiveness at Receiving Node – Option 2 (Bioretention)

Pollutant	Unmitigated Load (kg/yr)	Mitigated Load (kg/yr)	Reduction (%)
Suspended Solids (TSS)	63.2	11.9	89.5
Total Phosphorus (TP)	0.381	0.137	60.6
Total Nitrogen (TN)	6.83	2.76	61.8
Gross Pollutants > 5mm	37.5	0	100

6. STORMWATER QUALITY MAINTENANCE

Prior to commencement of construction, and Erosion an Sediment Control Plan (ESCP) will be prepared and implemented to minimise the impacts on stormwater quality. The plan will address site and catchment specific erosion control measures, generally adhering to the following control measures.

6.1 Pre-Construction

Before construction the following measures will be established and maintained for any disturbed areas:

- Stockpile areas to be designated to minimise impacts on site runoff;
- Provision of shakedown pit for any entry/exit points to the site; and
- Toolbox talk to inform any regular site personnel

6.2 During Construction

- Construction related activities will be contained within the subject site where possible to minimise areas of disturbance;
- Topsoil retention for site rehabilitation;
- Regular inspection of sediment control measures; and
- Dynamic response to any changing site conditions

6.3 Post-Construction

Following construction any disturbed areas will be stabilised through revegetation which is to be maintained until established.

6.4 Proprietary Devices

The stormwater quality devices that are to be supplied by SPEL have specific maintenance procedures. Refer to **Appendix B** for the maintenance plans provided by SPEL.

7. CONCLUSION

The Stormwater Quality Improvement Devices (SQID's) proposed for the development include the option of a SPEL Filter or a bioretention system. The MUSIC modelling of the proposed treatment train demonstrates the Douglas Shire Council's Pollutant Load SMDO's are achieved for the works.
As such, by implementing the treatment system outlined in this report into the proposed development, stormwater runoff from the site will be treated to the satisfaction of the Douglas Shire Council Planning Scheme.

8. QUALIFICATIONS

Our analysis and overall approach have been specifically catered for the requirements of CocoNutZ Australia Pty Ltd and may not be applicable beyond this scope. For this reason, any other third parties are not authorised to utilise this report without further input and advice from Premise.

9. RPEQ CERTIFICATION

As Registered Professional Engineer of Queensland (RPEQ) for this project, on behalf of Premise Australia Pty Ltd, I certify that the modelling undertaken as part of this assessment has been undertaken in accordance with current engineering best practice as recommended in the State Planning Policy.

Name: Jeremy Cox RPEQ No: 14732 Date: 30th April 2021

Signature: 

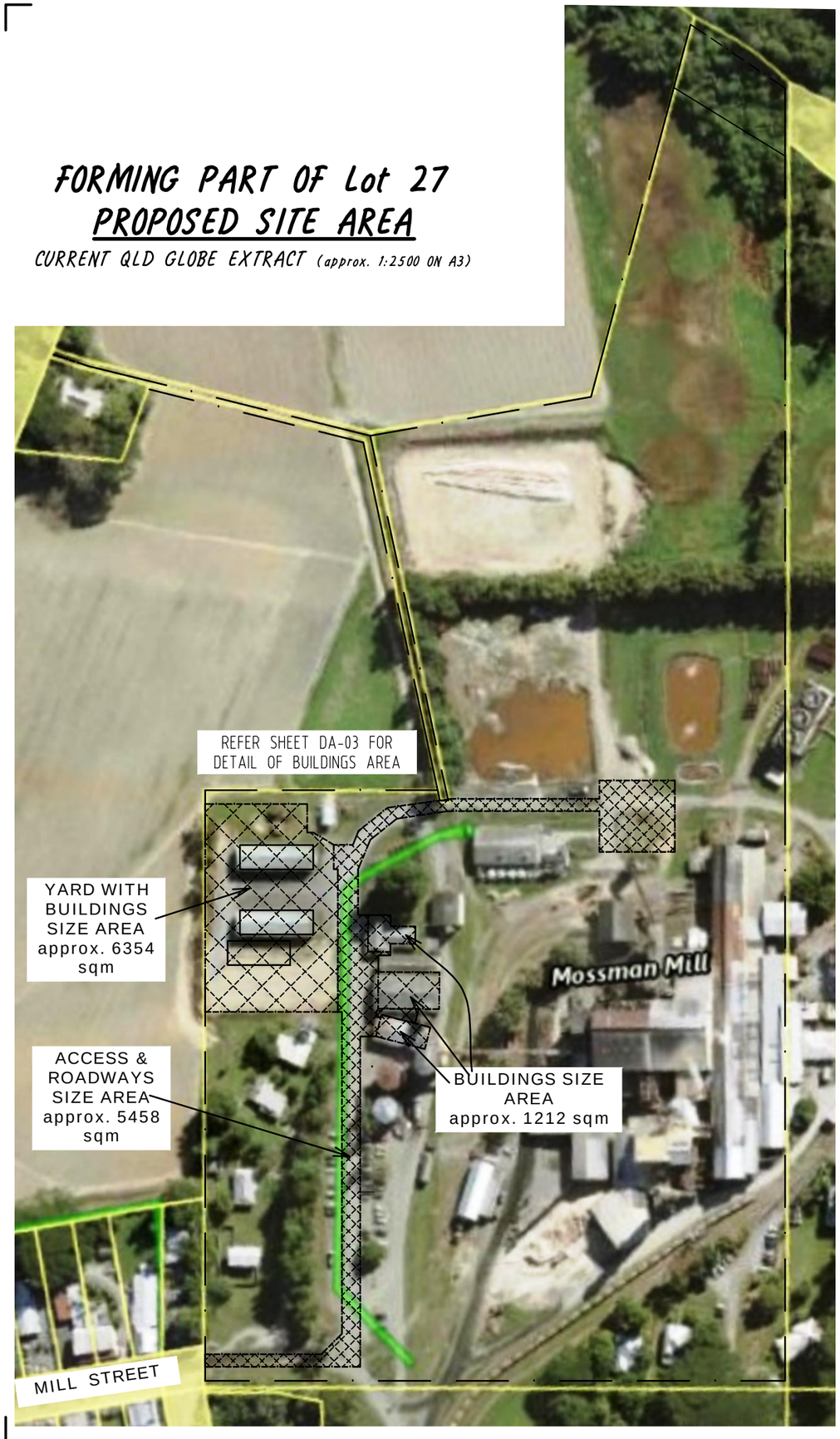
10. REFERENCES

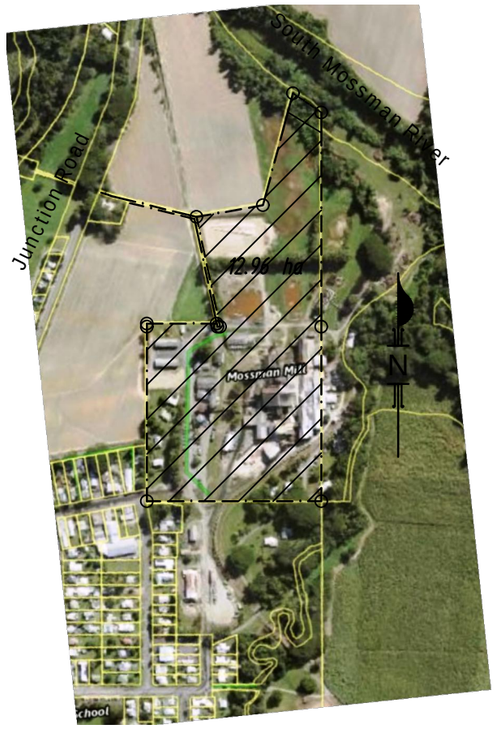
1. Institute of Public Works Engineering Australasia (QLD Division), et al, 2016. *Queensland Urban Drainage Manual (QUDM), Fourth Edition*. Brisbane.
2. Water by Design, 2010. *MUSIC Modelling Guidelines*, SEQ Healthy Water Ways Partnership, Brisbane
3. Ball J, Babister M, Nathan R, Weeks W, Weinmann E, Retallick M, Testoni I, *Australian Rainfall and Runoff: A Guide to Flood Estimation*, Commonwealth of Australia (Geoscience Australia), 2016, Canberra.
4. Bureau of Meteorology, *2016 IFDs – Rainfall Data.* Available at: http://www.bom.gov.au/water/designRainfalls/revised-ifd/?year=2016
5. Department of Infrastructure, Local Government and Planning, July 2017. *State Planning Policy (SSP),* Brisbane.
6. Douglas Shire Planning Scheme, 2018 V1.0.

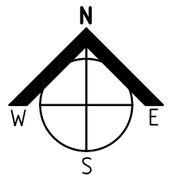
APPENDIX A
DEVELOPMENT PLAN

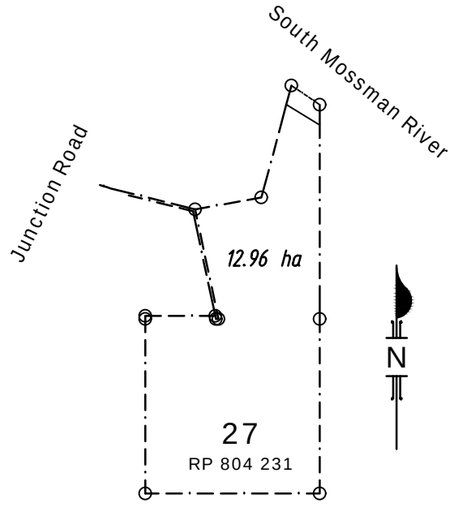
FORMING PART OF Lot 27
PROPOSED SITE AREA

CURRENT QLD GLOBE EXTRACT (approx. 1:2500 ON A3)









Lot 27 RP804231

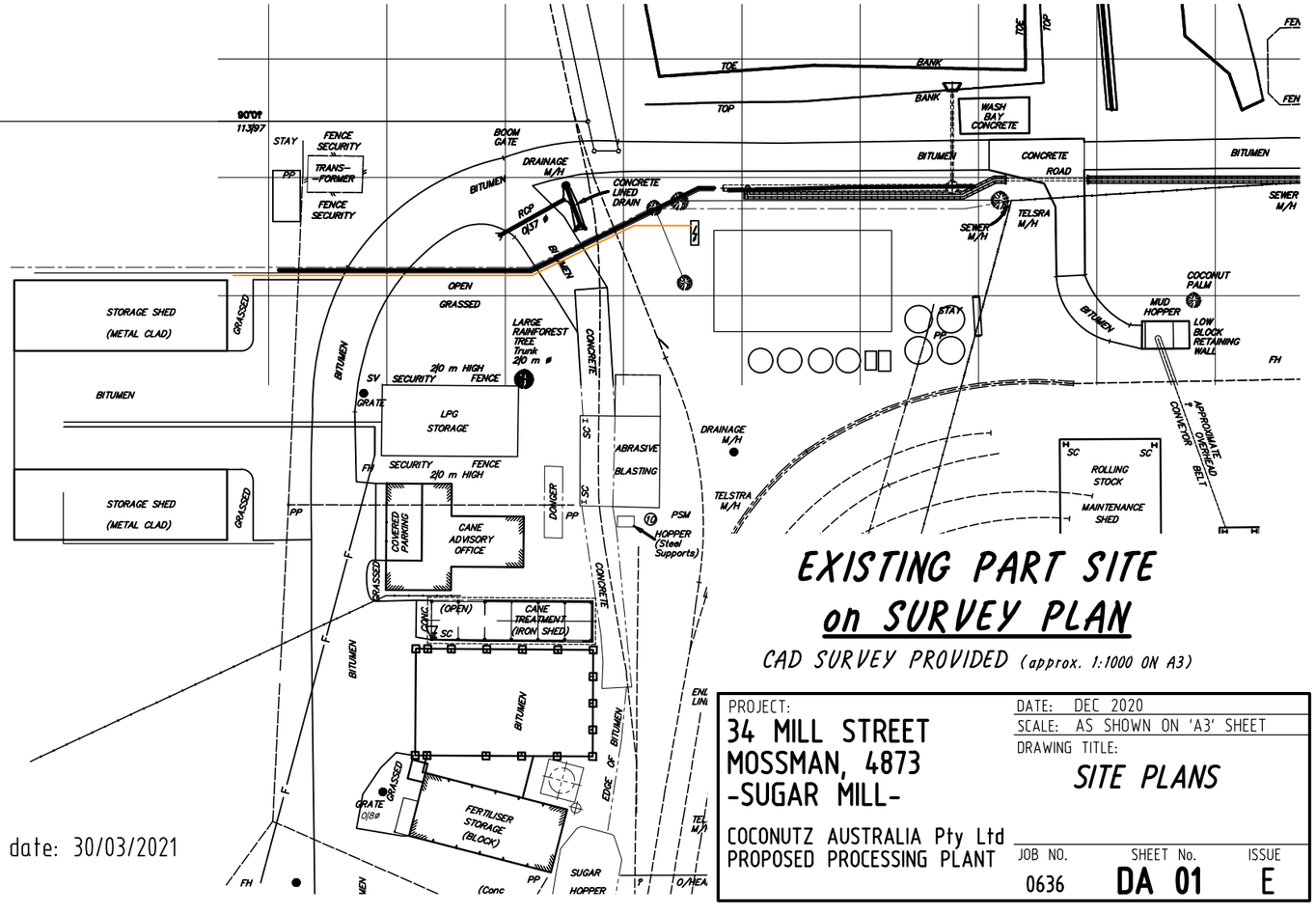
PROPERTY BOUNDARIES

(SCALE 1:10,000 ON A3)

phone: 0428 294 235 EDMONTON 4869. QUEENSLAND

GREGORY G TERZI Associate Diploma Architectural Technology **Building Design & Drafting**

-Building Designer- -Medium Rise- -QBCC LICENCE: 1117048-

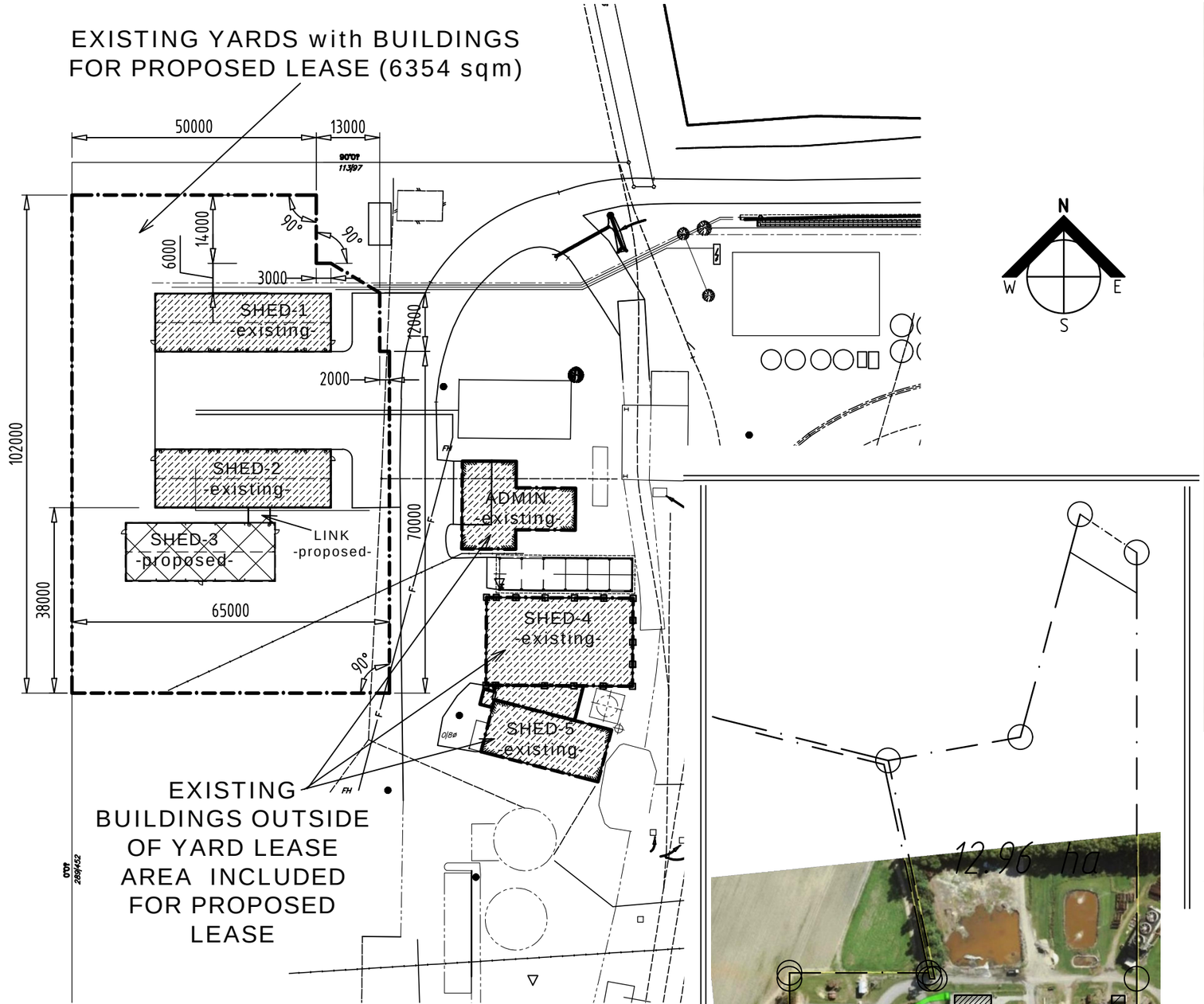


EXISTING PART SITE
on SURVEY PLAN

CAD SURVEY PROVIDED (approx. 1:1000 ON A3)

issue date: 30/03/2021

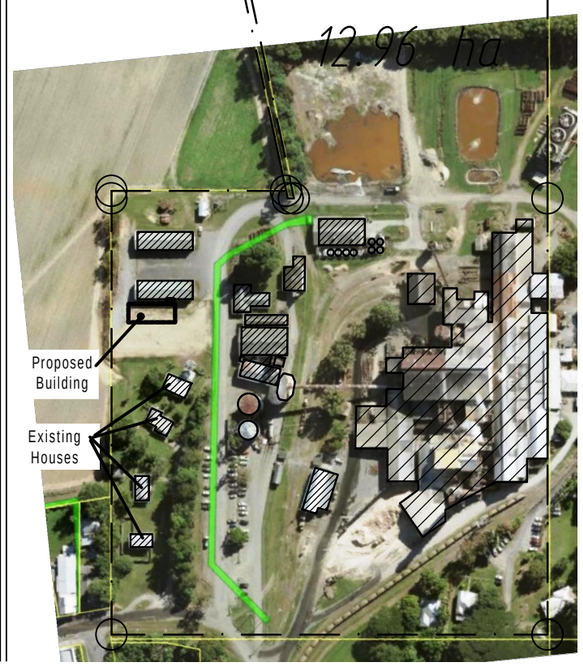
PROJECT: 34 MILL STREET MOSSMAN, 4873 -SUGAR MILL-	DATE: DEC 2020
	SCALE: AS SHOWN ON 'A3' SHEET
	DRAWING TITLE: SITE PLANS
COCONUTZ AUSTRALIA Pty Ltd PROPOSED PROCESSING PLANT	JOB NO. 0636 · SHEET No. DA 01 · ISSUE E

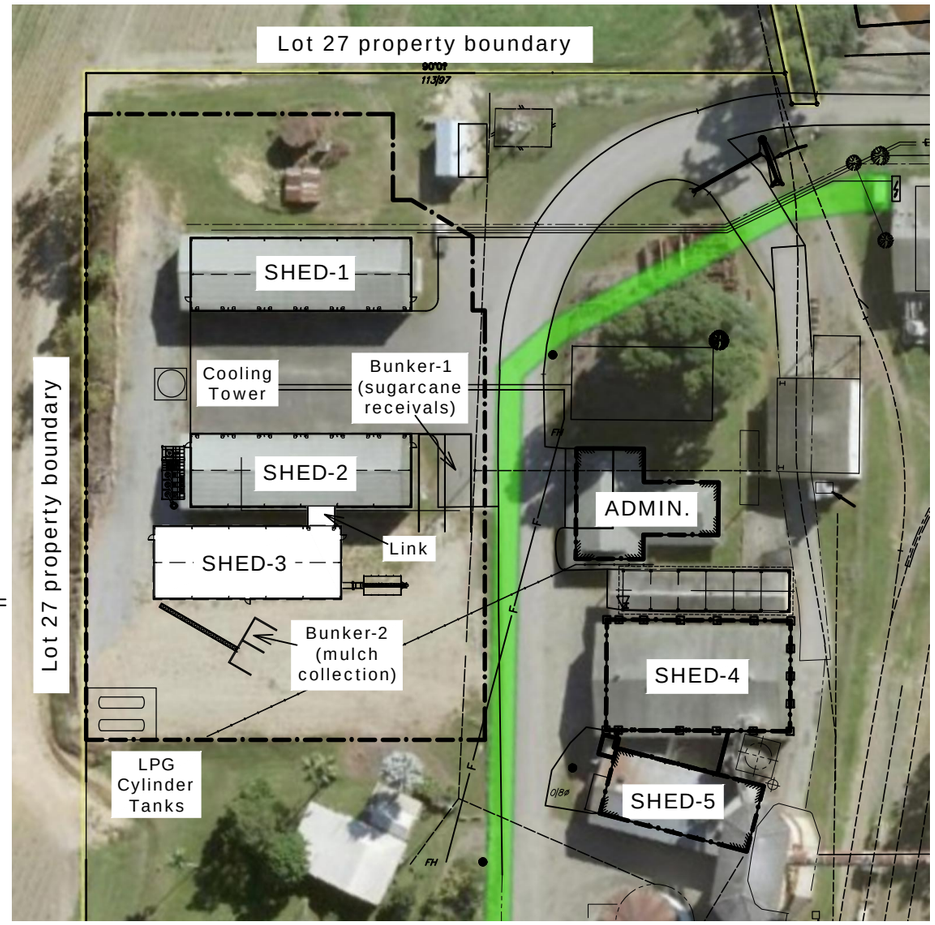


PROPOSED LEASED AREA & BUILDINGS on SURVEY PLAN

CAD SURVEY PROVIDED

(approx. 1:1000 ON A3)





PROPOSED LEASED AREA & BUILDINGS on AERIAL VIEW / SURVEY PLAN

CURRENT QLD GLOBE EXTRACT

(approx. 1:1000 ON A3)

PLANNING SCHEME INFO.

(approx. sqm)

PROPERTY BREAK DOWN FOR SITE COVER:

TOTAL SITE AREA = 12.96 ha OR 129,600 sqm

- PROPOSED BUILDINGS = approx. 0.3% of site
- EXISTING MILL AND OTHER ASSOCIATED MAIN BUILDINGS (Built-up) = approx. 13% of site
- EXISTING HOUSES = approx. 0.5% of site

REMAINING AREA = approx. 86.2% of site

issue date: 30/03/2021

phone: 0428 294 235 EDMONTON 4869. QUEENSLAND
GREGORY G TERZI Associate Diploma Architectural Technology Building Design & Drafting
-Building Designer- -Medium Rise- -QBCC LICENCE: 1117048-

PROJECT:
34 MILL STREET
MOSSMAN, 4873
-SUGAR MILL-

COCONUTZ AUSTRALIA Pty Ltd
PROPOSED PROCESSING PLANT

DATE: DEC 2020
SCALE: AS SHOWN ON 'A3' SHEET
DRAWING TITLE:
SITE PLANS

JOB NO. 0636 | SHEET No. DA 02 | ISSUE C

issue date: 30/03/2021

Lot 27 PROPERTY BOUNDARY LINE

EXISTING LOW LEVEL VEGETATION AND TREES (ie. NOTE MAINTAINED)

SHED-1: NEW PROCESSING PLANT -existing shed-
approx. 36x12M (429 sqm)
FOR BASIC INTERNAL LAYOUT REFER BUILDING FLOOR PLAN

MRV or HRV parking space -new-

Cooling Tower -new-

1 2 3 4 CAR parking -new-

5 6 CAR parking -new-

EXISTING SEALED DRIVEWAY

NEW OVERHEAD PIPEWORK BETWEEN SHED

WALKWAY BETWEEN SHED AND BUNKER AT 1.2M MIN.

SHED-2: NEW PROCESSING PLANT -existing shed-
approx. 36x12M (429 sqm)
FOR BASIC INTERNAL LAYOUT REFER BUILDING FLOOR PLAN

Bunker-1 (sugarcane receivals) -new-

3100

4.5x3.1M COVERED LINK -new- (14 sqm)

10900 approx.

SHED-3: NEW PROCESSING PLANT -new shed-
approx. 30.5x12M (365 sqm)
FOR BASIC INTERNAL LAYOUT REFER BUILDING FLOOR PLAN

approx. 12500

approx. 33700

14500

11400

8500

Bunker-2 (mulch collection) -new-

approx. 23000

approx. 23700

approx. 34200

LPG Cylinder Tanks -new-

MANOEUVRING AREA FOR FRONT END LOADER TO SERVICE SHED-3 CONVEYOR FROM 'BUNKER-1'

MANOEUVRING AREA FOR REAR TIPPER TRUCK TO REVERSE INTO AND START UNLOAD INTO 'BUNKER-1' WHILE DRIVING FORWARD

Lot 27 PROPERTY BOUNDARY LINE

COVERED PARKING -existing-

7 8 9

EXISTING MAIN ENTRY INTO ADMIN.

ADMIN. -existing office building- (303 sqm)

TOILETS existing

OPTION FOR AS-1428 ACCESSIBLE STEP-RAMP OR 1:20 WALKWAY TO ACCESS ADMIN.

NEW LANDSCAPED AREA OUTSIDE ADMIN. UTILISING EXISTING GRASS LAWN

SHED-4 STORAGE -existing shed- (540 sqm)

ENCLOSED LINK -existing- (97 sqm)

SHED-5 STORAGE -existing shed- (272 sqm)

DETAIL SITE PLAN on SURVEY PLAN

CAD SURVEY PROVIDED

(approx. 1:500 ON A3)

N W E S

phone: 0428 294 235 EDMONTON 4869. QUEENSLAND

GREGORY G TERZI Associate Diploma Architectural Technology **Building Design & Drafting**

-Building Designer- -Medium Rise- -QBCC LICENCE: 1117048-

PROJECT:
34 MILL STREET
MOSSMAN, 4873
-SUGAR MILL-

COCONUTZ AUSTRALIA Pty Ltd
PROPOSED PROCESSING PLANT

DATE: DEC 2020
SCALE: AS SHOWN ON 'A3' SHEET
DRAWING TITLE:
proposed
DETAIL SITE PLAN

JOB NO.	SHEET No.	ISSUE
0636	DA 03	D

APPENDIX B
STORMWATER QUALITY DEVICE PRODUCT SPECIFICATIONS

ISSUE FOR APPROVAL
NOT FOR CONSTRUCTION

Site Level Confirmation	
Finished Surface Level (FSL)	RL:
Access Cover Thickness	mm
Inlet Invert Level	RL:
Outlet Invert Level	RL:
Company:	
Name:	
Date:	

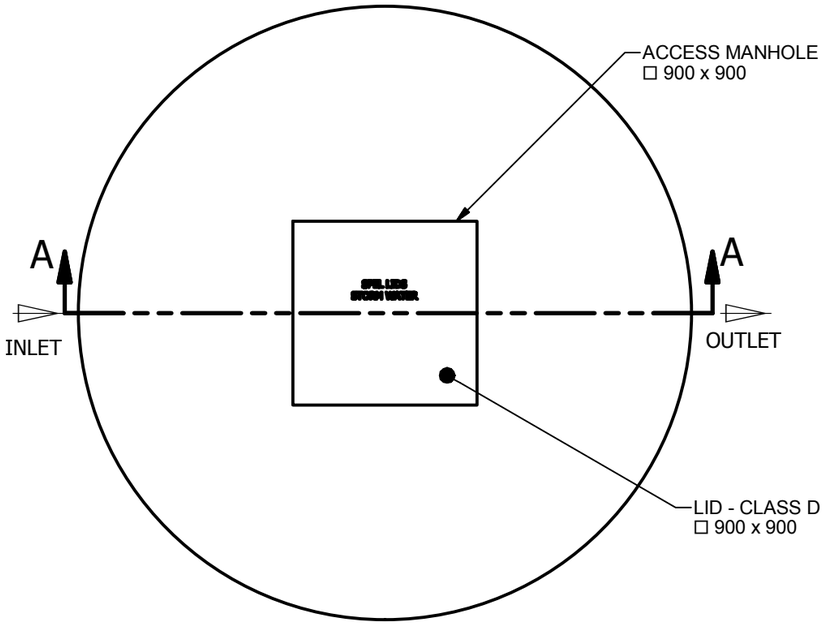
APPROVED..... ☐

NAME.....

SIGNED.....

DATE...../...../.....

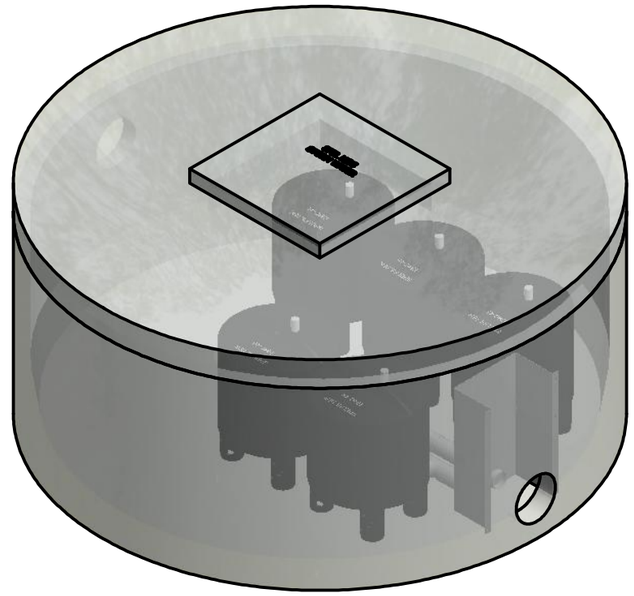
REVISION HISTORY				
REV	DESCRIPTION	BY	DATE	CHECKED BY
1	INITIAL RELEASE	P.Z.	03/04/2018	



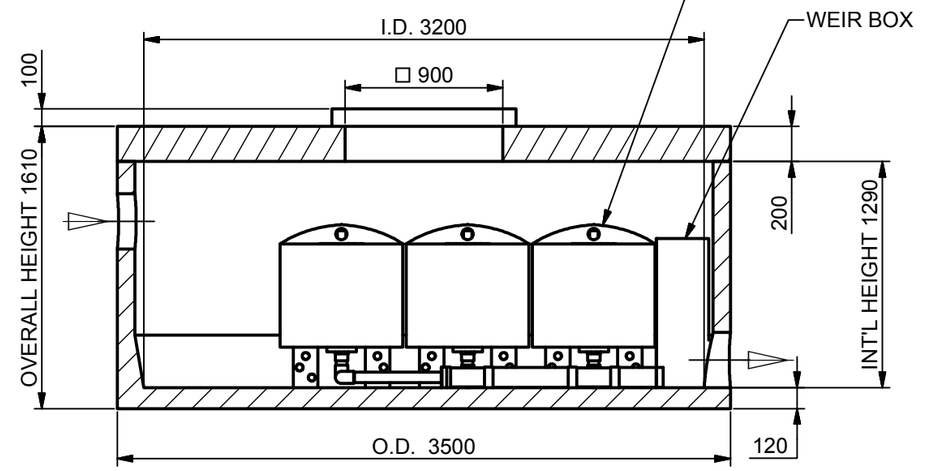
PLAN VIEW

TANK WEIGHTS	
TANK	LID
5.5 t	4.8 t

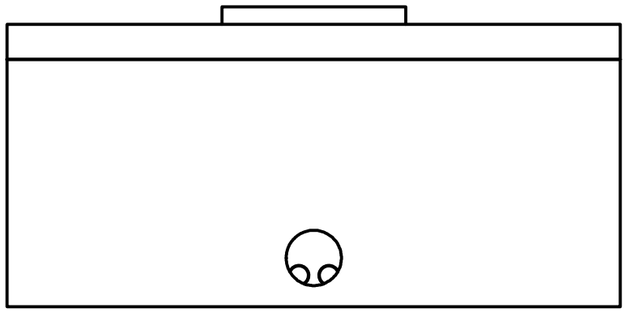
NOTE:
LIFTING WEIGHTS MAY VARY
DEPENDING ON CUSTOM DESIGN



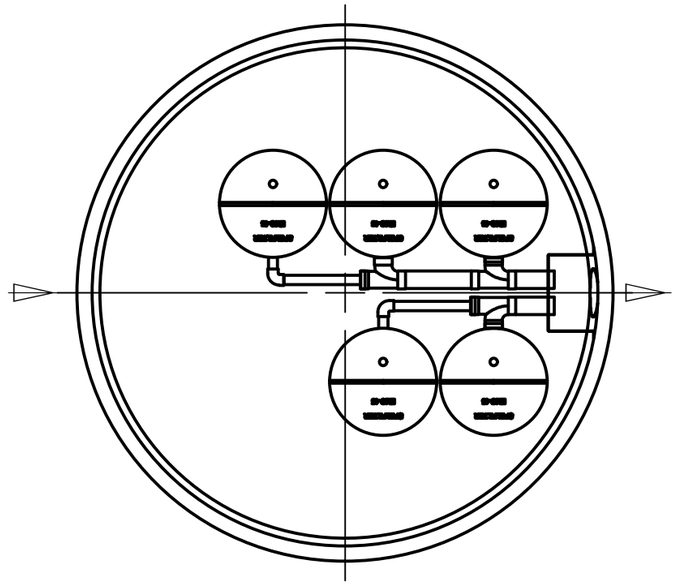
ISOMETRIC VIEW



SECTION A-A



SIDE VIEW



PLAN VIEW
COVER & LID REMOVED FOR CLARITY

TOLERANCE: ALL DIMENSIONS 10mm UNLESS OTHERWISE STATED.

CLIENT:

DISTRIBUTOR :

Drawn	P.Z.	Date 03-04-18
Check		Date
Verified		Date
Approved		Date
Request No.	RN1862	

SPEL ENVIRONMENTAL
INTEGRATED WATER SOLUTIONS
100 Silverwater Road Silverwater NSW 2128
PH: 1300 773 500 | E: sales@spel.com.au
www.spel.com.au

PROJECT :

TITLE
SPEL PRECAST TANK
10.2 kL CLASS D
SF.320D/05-29.CON.300
5 SPEL FILTER CARTRIDGES

SCALE	SIZE	SHEET	REV
N.T.S	A3	1	1

CUSTOMER CODE :

DWG No. SP18-SF11120-P

C:\Vault Working Folder\Designs\SPEL\PRODUCTS\FILTER\EMC-45\STANDARD\05 FILTERS\CONCRETE\PROJECTS\SPEL PRECAST T44 TANK\SPEL PRECAST T44 TANK 10.2 kL\SP18-SF11120-P.idw

REVISION HISTORY				
REV	DESCRIPTION	DESIGNER	DATE	CHECKED BY
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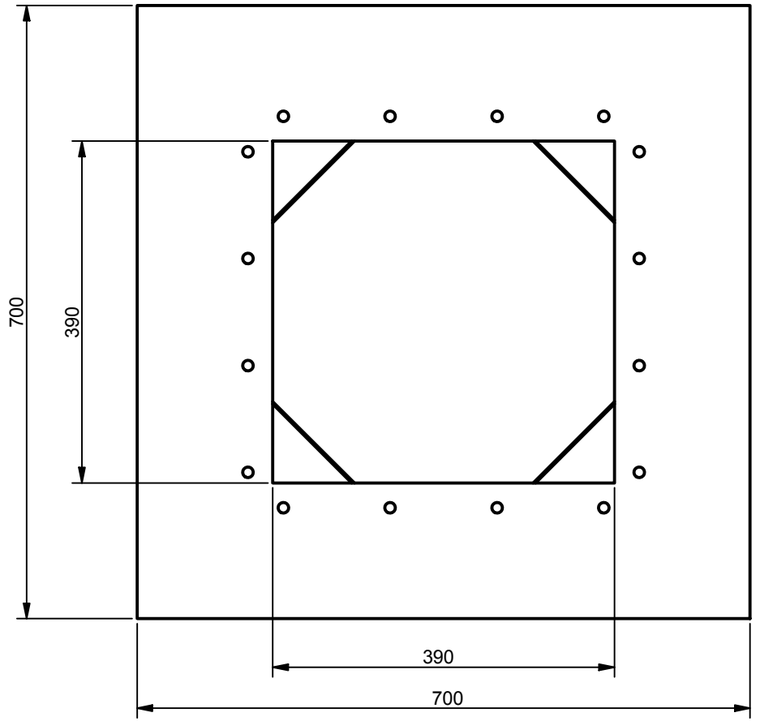
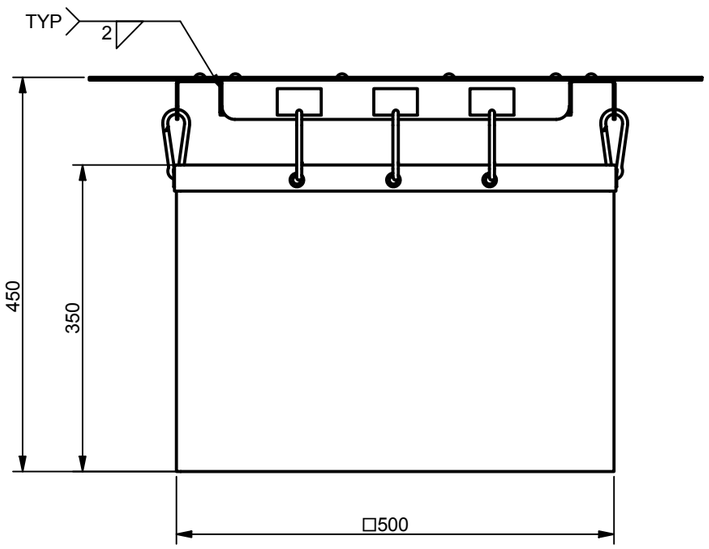
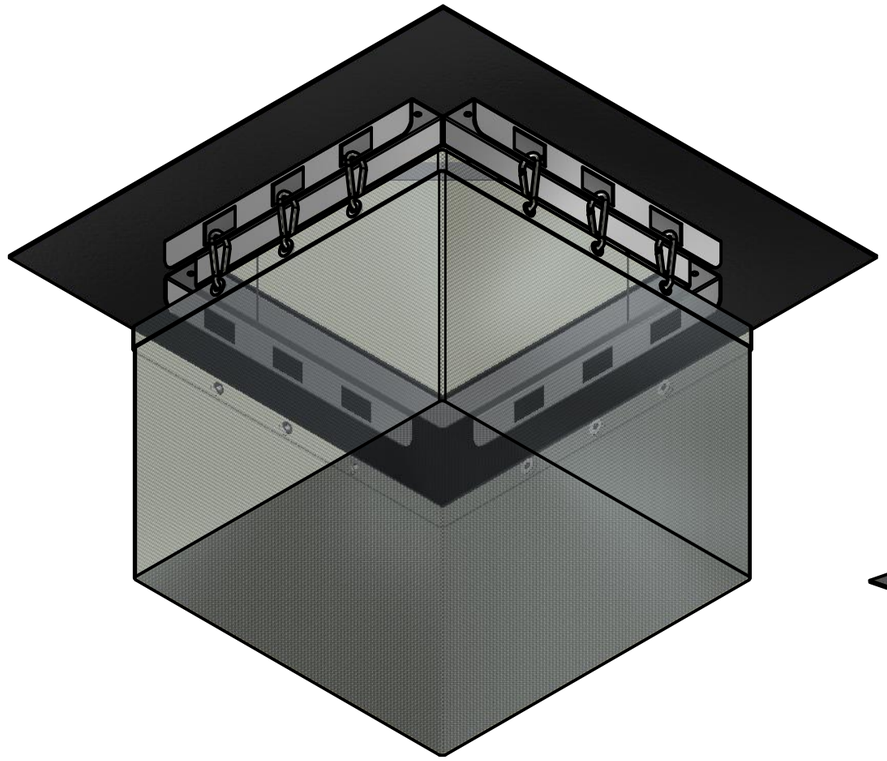


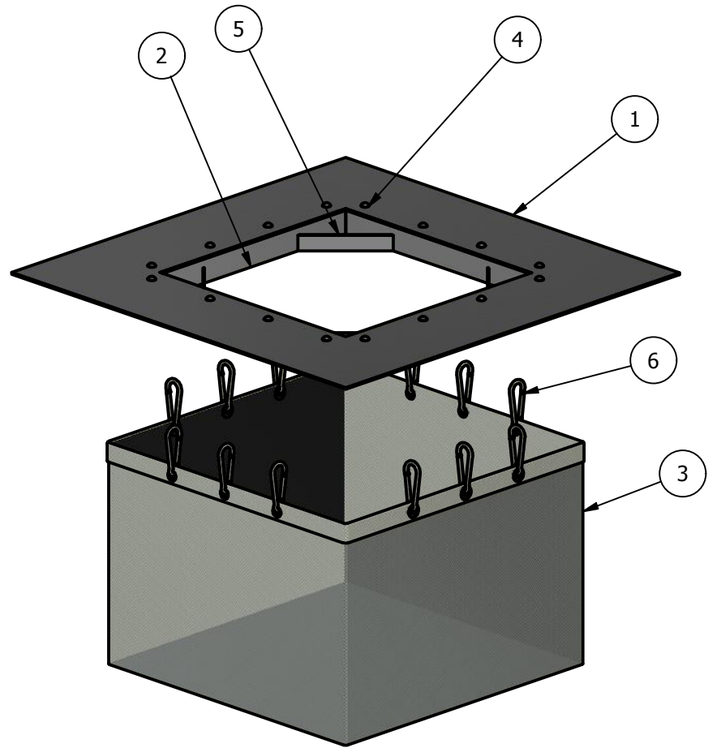
PLAN VIEW



ELEVATION VIEW



ISOMETRIC VIEW
BOTTOM VIEW



ISOMETRIC VIEW
EXPLOSION

PARTS LIST			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	PLASTIC SHEETING	HDPE
2	4	SHEET METAL BENDING	STAINLESS STEEL 304
3	1	TEXTILE FABRIC & MESH LINER	HDPE
4	16	BLIND RIVIT 7 DIA.	STAINLESS STEEL 304
5	4	CORNER ESTIFFENER - FLAT BAR 25 x 2 - 141 LG	STAINLESS STEEL 304
6	12	CARABINER CLIP 6	ALUMINIUM

CLIENT:

DISTRIBUTOR

Drawn	M.M	Date 25/03/2015
CHECKED BY		Date
Verified		Date
Approved		Date
Customer Code :		

SPEL ENVIRONMENTAL
INTEGRATED WATER SOLUTIONS
100 Silverwater Road Silverwater NSW 2128
PH: 1300 773 500 | E: sales@spel.com.au
www.spel.com.au

TITLE
SPEL STOMSACK
FRAME 600 x 600
BASKET MOUNTING ASSEMBLY DRAWING

REQUEST No.	SIZE	SHEET	REV
D20194	A3	1	1

SCALE	DWG No.
N.T.S	SP15-BB4610-S

Model Number

Job Number

SPEL StormSack

OPERATIONS & MAINTENANCE

www.spel.com.au

SPEL ENVIRONMENTAL
INTEGRATED WATER SOLUTIONS

Manual Introduction

CHAPTER 1

Maintenance of the SPEL StormSack is essential to preservation of its condition to ensure lifetime operational effectiveness.

The SPEL StormSack is a highly engineered water quality device that is deployed directly in the stormwater system as primary treatment to capture contaminants close to the surface. To ensure full operational capacity, it is vital to ensure that the pollutants it captures are periodically removed, and filtration components are thoroughly cleaned.

Maintenance frequencies and requirements of the SPEL StormSack are dependent on the biological factors of the site in which it is situated. These factors can include excessive sediment loading or occurrence of toxic chemicals due to the natural and unnatural factors such as site erosion, chemical spills or extreme storms.

This manual has been designed by the SPEL StormSack Manufacturer the client or device owner in the maintenance of the SPEL StormSacks.

This manual should be used in conjunction with the relevant site traffic management and safety plans, as well as any other provided documentation from SPEL.

SPEL StormSack Specifications/Features

CHAPTER 2

1. General Description

The SPEL StormSack provides effective filtration of solid pollutants and debris typical of urban runoff, while utilising the existing or new storm drain infrastructure. The StormSack is designed to rest on the flanges of conventional catch basin frames and is engineered for most hydraulic and cold climate conditions.

Components:

a. Adjustable Flange and Deflector: Aluminium Alloy 6063-T6
b. Splash Guard: neoprene rubber
c. StormSack: woven polypropylene geotextile with US Mesh 20
d. Corner Filler: Aluminium Allow 5052-H32
e. Lifting Tabs: Aluminium Allow 5052-H32
f. Replaceable Oil Boom: polypropylene 3 inch (76 mm) diameter
g. Mesh Liner: HDPE, diamond configuration
h. Support Hardware: CRES 300 Series

Sizes:

STANDARD SPEL STORMSACK TO SUIT PIT SIZES

- 450x450mm
- 600x600mm
- 900x600mm
- 900x900mm

Custom sizes (i.e. 1200x900mm) can be manufactured on short lead times.

Health and Safety

CHAPTER 3

1. Personal Health & Safety

When carrying out maintenance operations of the SPEL StormSack all contractors and staff personnel must comply with all current workplace health and safety legislation.

The below measures should be adhered as practically as possible:

- Comply with all applicable laws, regulations and standards
- All those involved are informed and understand their obligations in respect of the workplace health and safety legislation.
- Ensure responsibility is accepted by all employees to practice and promote a safe and healthy work environment.

2. Personal Protective Equipment

When carrying out maintenance operations of the SPEL StormSack, wearing the appropriate personal protective equipment is vital to reducing potential hazards. Personal protective equipment in this application includes:

- Eye protection
- Safety apron
- Fluorescent safety vest
- Form of skin protection
- Puncture resistant gloves
- Steel capped safety boots

3. Maintenance of the SPEL StormSacks is a specialist activity.

When carrying out maintenance operations of the SPEL StormSack, factors such as equipment handling methods, pollutants and site circumstances can impose potential risks to the maintainer and nearby civilians.

4. Captured Pollutants

The material captured by the SPEL StormSack can be harmful and needs to be handled correctly. The nature and amount of the captured pollutants depends on the characteristics of the site. Pollutants can include from organic material such as leaves and sticks through to debris such as plastics, glass and other foreign objects such as syringes.

5. Site Circumstances

It is essential that Occupational Safety and Health guidelines and site specific safety requirements are followed at all times. It is important that all following steps specified by SPEL are carried out to ensure safety in the entire maintenance operation. The general workplace hazards associated with working outdoors also need to be taken into account.

6. Equipment Handling

Handling activities such as a removing the drain grate a well as managing pedestrians and other non-worker personnel at the site should be exercised in accordance with specified safety procedures and guidelines.

CHAPTER 3

7. Confined Spaces

Confined space entry procedures are not covered in this manual. It is requested that all personnel carrying out maintenance of the SPEL StormSack must evaluate their own needs for confined space entry and compliance with occupational health and safety regulations

When maintenance operations cannot be carried out from the surface and there is a need to enter confined space, only personnel that currently hold a Confined Space Entry Permit are allowed to enter the confined space. All appropriate safety equipment must be worn, and only trained personnel are permitted to use any required breathing apparatus gear. Necessary measures and controls must always be exercised to meet the confined space entry requirements. Non trained staff are not permitted to participle in any confined space entries.

8. Traffic Management

Typically stormwater gully pits are situated on roads and carparks, or adjacent to roads in a footpath or swale. As traffic requirements vary depending on the circumstance of the site, separate traffic control plans should be prepared for each site.

The specific road safety requirements for each site can be obtained from the relevant road authority to ensure all maintenance operations comply with the laws and regulations. State government publications can also be useful to find out the signage requirements, placement of safety cones and barricades that are required when working on public roads.

Operations

CHAPTER 4

1. General Monitoring

The SPEL Stormsack must be checked on a regular basis to analyse whether it requires maintenance or cleaning.

As gully pit grates are usually quite heavy, it is vital to exercise the correct lifting techniques and also ensure that the area surrounding the open pit is shielded from access of non-work personnel.

To ensure optimal performance of the SPEL Stormsack, the material collected by the filter bag should not exceed the level of approximately a half to two thirds of the total bag depth. When this material collected is showing signs of exceeding this level they should be scheduled to be emptied.

It is also recommended that additional monitoring is conducted following moderate to extreme rainfall events, especially when previous months have had little or no rainfall.

2. Gully Pit Cover Removal

CHAPTER 4

Opening a Hinged Pit Cover

A. Insert the lifting hooks beneath the grate

B. Check hinge points are not damaged and debris is not caught in the hinge area

C. Fully open pit grate, ensuring that the grate will stay in the open position without any external forces applied. Grates that do not remain open without being held, should be removed or secured during maintenance activities.

Opening a Non-Hinged Pit Cover

A. Place lifting hooks beneath grate, where possible in the four corners of the grate. Concrete lids may have Gatic lifting points, a key arrangement or holes in the lid, which may require special equipment such as Gatic lifters. Alternatively if safe to do so grip the grade with your hands.

B. Position each person on either side of the grate.

C. Lift the grate, ensuring that good heavy lifting posture is used at all times.

D. Place the grate on angle on the gutter, to allow for the lifting hooks to be removed.

E. For extremely heavy one-piece grates and concrete Gatic covers, insert the lifters in place and slide the lids back.

CHAPTER 4

3. Cleaning Methods

Cleaning using an inductor truck

A. Open Gully pit
B. Place the indicator hose, suck out all of the sediment, organic leaf material, litter and other materials that were collected in the filter bag
C. Allow the filter bag to be sucked up in the inductor hose for a few seconds to allow for the filter mesh pores to be cleaned.
D. Use the inductor hose to remove any build-up of material around the overflows and in the bottom of the pit.
E. Remove filter back from pit
F. Remove any sediment and litter caught in the Gully pit grate
G. Back opening channels are to be cleared of any debris to ensure flow is not hindered.
H. Thoroughly examine the structural integrity of the filter bag and frame.
I. Reinstate filter bag and gully pit covers

Hand Maintenance

A. Open Gully pit
B. Using the correct lifting technique, lift the StormSack out by the diagonal lifting corners fitted to the frame.
C. For extremely heavy and overfilled bags either use a hydraulic lifting arm to lift the StormSack, or remove excess material using a shovel or etc. Take care not to damage the bag when removing litter form the bag.
D. Lift the StormSack clear of the stormwater pit.



E. Position the StormSack over the collection bin or vehicle.
F. Lift and empty the bag by holding the bottom lifting loops only.
G. Brush the StormSack with a stiff brush to remove the sediment from the filter pores.
H. Thoroughly examine the structural integrity of the filter bag and frame.
I. Reinstate StormSack and gully pit covers.



CHAPTER 4

4. SPEL StormSack Post Maintenance Inspection

After the SPEL Stormsack has been removed, emptied and cleaned, it should be thoroughly examined to sure that:

- There is no movement or damage to the Cage
- There is no movement or damage to the plastic pit seals
- Structural integrity is in good condition including all fixings, joints and connections.
- The filter bag pores are not clogged
- The filter bag is not damaged in anyway.

The gully pit, pipe inlet/outlets and its cover should also be inspected to ensure there is no damage, debris build up or any potential to cause the SPEL StormSack to operate inefficiently.

5. Material Disposal

Collected materials can be potentially harmful to humans and the environment.

Once all captured material from the SPEL Stormsack has been removed, it must be taken off site and disposed of at a transfer station or a similar approved disposal site.

CHAPTER 4

6. SPEL StormSack Repairs

Depending on the extent of the damage to the SPEL StormSack unit, it can usually be repaired.

Small tears to the filter bag can be repaired by either sewing the tear back together with additional fabric to increase the strength of the stitching, or by sewing a patch of filter material onto the filter bag.

If large tears or irreparable damage to the frame and structure are present, it is advisable to replace the components.

All required spare parts can be sourced from SPEL Environmental at a cost to the owner of the SPEL Stormsack.

7. Emergency Procedures

Spills and blockages can be detrimental to the performance of a stormwater management system, potentially damaging the surrounding built infrastructure, waterways and environment.

Spill Procedures

In the event of a spill discharging into a gully pit, all effected sediment must be removed from the filter bags and the filter bags are to be removed and replaced with new filter bags. All additional cleaning as a result of the spill should also be carried out in accordance with the normal operation procedures.

Blockages

In the unlikely event of surface flooding around a gully pit which has a SPEL StormSack fitted, the following steps should be carried out:

A. Check the overflow bypass.

B. If overflow is clear and surface flooding still exists remove the SPEL StormSack and check the outlet pipe for blockages. Removal of the SPEL StormSack can be difficult if clogged with sediment and holding water.

C. If the filter is clogged brush the side walls to dislodge particles trapped at the interface allowing water to flow through the filter.

D. If the outlet pipe is blocked, it is likely that a gully sucker truck will be required to unblock it. Litter can be removed from the SPEL StormSack using the gully sucker truck before the SPEL StormSack is removed. If a gully sucker truck is not available and the SPEL StormSacks need to be removed by hand follow the below steps.

   i. Remove excess debris by hand or brush the side of the filter bag

   ii. Remove entire SPEL Stormsack by taking hold of the inside of the frame.

   iii. Unblock the outlet pipe

HEAD OFFICE

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Fax: +61 2 8014 8699

DESIGN OFFICES

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Canberra	61 2 6128 1000
Queensland	61 7 3271 6960
Victoria & Tasmania	61 3 5274 1336
South Australia	61 8 8275 8000
West Australia	61 8 9350 1000
Northern Territory	61 2 8705 0255
New Zealand	64 9 276 9045

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SPEL ENVIRONMENTAL
INTEGRATED WATER SOLUTIONS

SPEL ENVIRONMENTAL
INTEGRATED WATER SOLUTIONS

SPELFilter

Operation & Maintenance Manual

www.spel.com.au

Contents

Introduction

Understanding how to correctly and safely maintain the SPELFilter is essential for the preservation of the filter's condition and its operational effectiveness. The SPELFilter is a highly engineered stormwater filtration device designed to remove sediments, heavy metals, nitrogen and phosphorus from stormwater runoff.

The filters can be housed in either a concrete or fibreglass structure that evenly distributes the flow between cartridges. Flow through the filter cartridges is gravity driven and self-regulating, which makes the SPELFilter system a low maintenance, high performance stormwater treatment device.

This manual will provide the necessary steps that are to be taken to correctly and efficiently ensure the life of the SPEL Filter product.

Specifications/Features

SPEL Environmental manufactures two height cartridges for varying site constraints as shown below. Each cartridge is designed to treat stormwater at a flow rate of 1.47 Litres per second and 2.83 Litres per second for the half-height cartridge (model No. SF.14-EMC) and full-height cartridge (model No. SF.29-EMC) respectively.

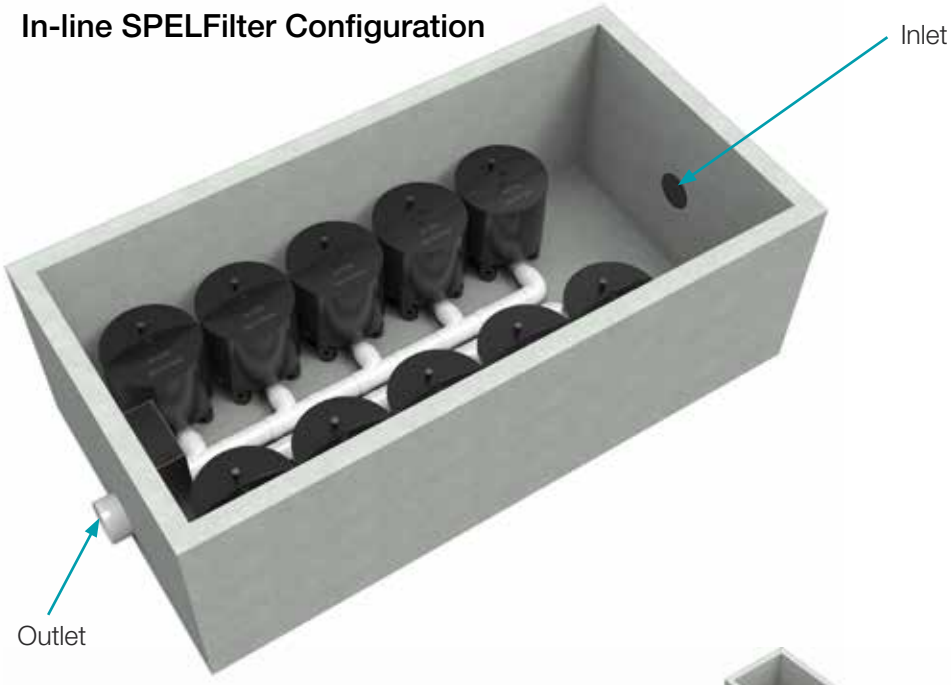
SPEL Filter - SF.14-EMC

SPEL Filter - SF.29-EMC

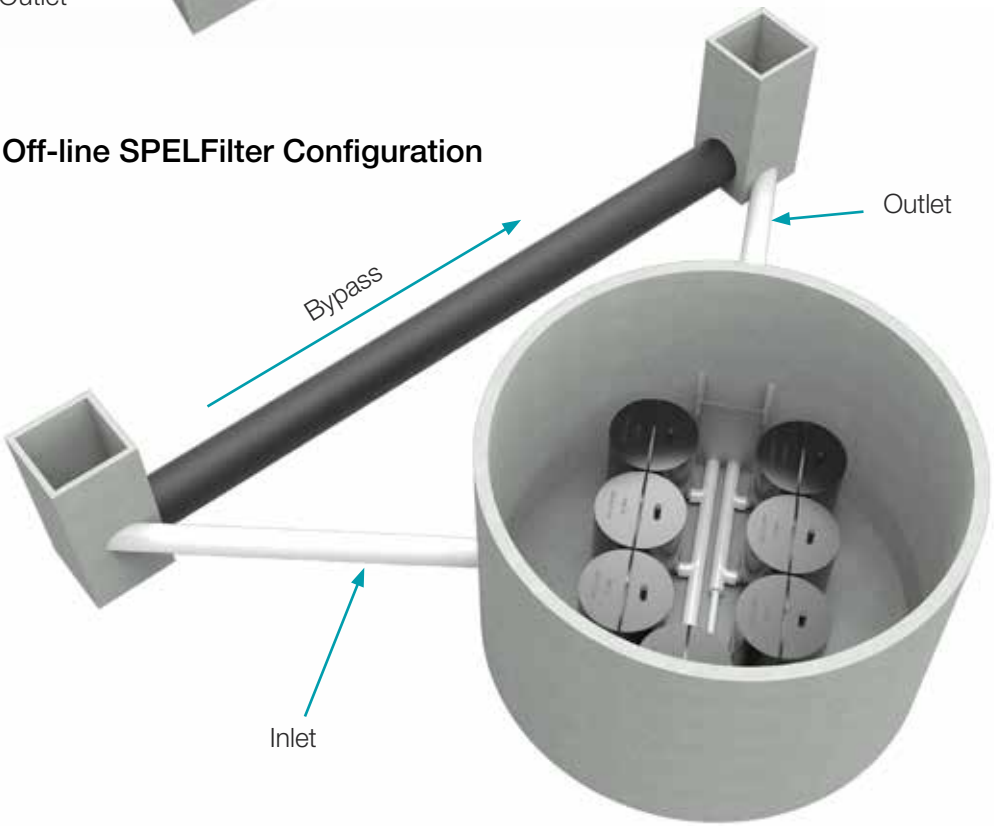
System Configuration

SPELFilter cartridges are installed in concrete or fibreglass tanks commonly referred to as 'vaults'. The vault selection and configuration are based on site characteristics and/or constraints; computational stormwater quality modelling; and selected SPELFilter models. Typical SPELFilter system configurations are shown below.

In-line SPELFilter Configuration



Off-line SPELFilter Configuration



Health and Safety

A. Personal Health & Safety

When carrying out the necessary installation operations of the SPEL Filter all contractors and staff personnel must comply with all current workplace health and safety legislation.
The below measures should be adhered to as practically as possible.

- Comply with all applicable laws, regulations and standards
- All those involved are informed and understand their obligations in respect of the workplace health and safety legislation.
- Ensure responsibility is accepted by all employees to practice and promote a safe and healthy work environment.

B. Personal Protective Equipment / Safety equipment

When carrying out the necessary installation operations of the SPEL Filter, wearing the appropriate personal protective equipment and utilising the adequate safety equipment is vital to reducing potential hazards.
Personal protective equipment / safety equipment in this application includes:

- Eye protection
- Safety apron
- Fluorescent safety vest
- Form of skin protection
- Puncture resistant gloves
- Steel capped safety boots
- Ear muffs
- Hard hat/s
- Sunscreen

C.Confined space

In the event access is required into the vault, confined space permits will be required which is not covered in this manual. Typical equipment required for confined space entry include:

- Harness
- Gas detector
- Tripod
- Spotter

D. Traffic Control

It is not uncommon for SPEL Filter cartridges to be installed underneath trafficable areas. Minimum traffic control measures will need to be put in place in accordance with traffic control plans set out by respective local and state road authorities.

Vaults are to be treated as confined space. Entry by permit only.

Monitor weather conditions prior to operation maintenance. Do not enter a vault during an episode of heavy rain as this can create a risk of drowning.

Maintenance frequency

The SPELFilter's design allows for a greater life span when frequently maintenance. Maintenance is broken up into three categories which include: standard inspection; general cleaning; and cartridge replacement.

Standard inspection

Standard inspections are conducted at regular four-month intervals. At this time, an approved trained maintenance officer or SPEL representative shall undertake all measures outlined in Maintenance Procedure, Standard Inspection.

General Cleaning

At the end of each standard inspection, trigger measures will identify if general cleaning is required. General cleaning will need to be executed immediate during standard inspections if the follow triggers are satisfied:

- Build-up of debris/pollutants within the vault greater than 150mm;
- Accumulation of debris/pollutants on the outlet chamber of the SPELFilter vault;
- After large storm events, tidal or flooding impacts at the request of the owner;

Cartridge Replacement

Stormwater treatment is dependent on the effectiveness of the SPELFilter cartridge system. As the SPELFilter ages, pollutants will inundate the cartridge and ultimately reduce the treatment flow rate. At this point, a SPELFilter flow test apparatus will be utilities to determine if replacement cartridges are required.

Based on the [site] concept modelling (MUSIC) and previous industry experience, we estimate the life of the SPELFilter to be between 6 - 8 years. As a minimum requirement, each SPELFilter cartridge should be replaced within 10 years.

The life cycle of the SPELFilter can be impacted if standard inspections and general maintenance is not undertaken in accordance with this operation and maintenance manual. Other factors that will affect the above life cycle of the SPELFilter include:

- Installation of cartridge system during construction phase and impacted by construction sediment loads;
- Neglecting to install pre-treatment using an industry approved GPT or a surface inlet pit trash bag such as the SPEL StormSack.
- Unforeseen environmental hazards affecting the SPELFilter functionality.

Maintenance Procedure

Stormwater pollutants captured and retained by the SPELFilter system need to be periodically removed to ensure environmental values are upheld. All associated maintenance works is heavily dependent on the site's operational activities and generated stormwater pollutants. To ensure the longevity of the installed SPELFilter treatment system, it is imperative that the procedures detailed in this manual are followed and all appropriate measures are actioned immediately.

Standard inspection

The standard inspection requires personal experience of SPEL products to visual inspection the vault and filter conditions.

Confined space requirements may not be required if a full inspection and assessment of each SPELFilter can be achieved at surface level without being deemed a confined space entry.

The standard inspection requires personal experience of SPEL products to visual inspection the vault and filter conditions.

Confined space requirements may not be required if a full inspection and assessment of each SPELFilter can be achieved at surface level without being deemed a confined space entry.

Site Inspection Procedures

1. Implement Pre-start safety measures.

Ensure that the area in which operational works are to be carried out is cordoned off, to prevent unauthorised access. Adequate safety barriers must be erected. Area in which work is to be carried out must be clean, safe and hazard free. (Refer to figure 4.)

2. Set-up Gantry Tri-pod above Manhole.

Assemble and position the gantry above the manhole safely and as practically as possible. Attach the winch or chain block to the gantry for lifting the SPEL Filters. Perform safety procedures ie. Attach harnesses etc. (if confined space).

3. Open manhole lid.

Once you have sent up the Gantry and ensured that the area is safe to operate in, you can proceed to open the manhole lid, using lid lifters.

4. Conduct Gas tests. (If tank is classed confined space)

Once the lids have been removed to a safe distance to prevent tripping, you must then proceed to conduct gas tests. Perform necessary gas tests according to the confined space regulations.

5. Once confined space has been deemed safe to operate in, enter tank safely.

Once you have carried out the required gas test and the work area is deemed safe, you may then enter the pit via a ladder or winch system to assess the work area you will be operating in. Ensure all confined space

6. SPELFilter system assessment.

Perform a review of the SPELFilter system using the SPELFilter assessment report/checklist. Sign off and forward a copy of the report to property manager and SPEL representative.

7. Reinstate SPELFilter system and disposal.

At the completion of the site inspection, ensure the site is reinstated back to its initial state and all pollutants are removed from the site in line with pollutant disposal procedures.

8. Sign off and forward a copy of the report to property manager and SPEL representative.

Maintenance Procedure (cont.)

General Cleaning

Vacuum out of Filter tank, removal and disposal of pollutants

At the completion of a standard inspection, general cleaning may be deemed neccessary immediately or scheduled for a future date. Steps undertaken for general cleaning should be in general accordance with the procedure outlined below but not limited.

1. Implement Pre-start safety measures.

Ensure that the area in which operational works are to be carried out is cordoned off, to prevent unauthorised access. Adequate safety barriers must be erected. Area in which work is to be carried out must be clean, safe and hazard free. (Refer to figure 4.)

2. Set-up Gantry Tri-pod above Manhole.

Assemble and position the gantry above the manhole safely and as practically as possible. Attach the winch or chain block to the gantry for lifting the SPEL Filters. Perform safety procedures ie. Attach harnesses etc. (if confined space).

3. Open manhole lid.

Once you have sent up the Gantry and ensured that the area is safe to operate in, you can proceed to open the manhole lid, using lid lifters.

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(If tank is classed confined space)

Once the lids have been removed to a safe distance to prevent tripping, you must then proceed to conduct gas tests. Perform necessary gas tests according to the confined space regulations.

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Once you have carried out the required gas test and the work area is deemed safe, you may then enter the pit via a ladder or winch system to assess the work area you will be operating in. Ensure all confined space

6. SPELFilter system assessment.

Perform a review of the SPELFilter system using the SPELFilter assessment report/checklist.

7. Pollutant removal from tank.

Perform clean-up using a licenced vacuum truck contractor or wet/dry vacuum, depending on level of sediment built up and/or tank size.

8. Reinstate SPELFilter system and disposal.

At the completion of the site inspection, ensure the site is reinstated back to its initial state and all pollutants are removed from the site in line with pollutant disposal procedures.

9. Sign off and forward a copy of the report to property manager and SPEL representative.

Maintenance Procedure (cont.)

Cartridge Replacement

SPEL Filter replacement procedures may vary depending on the configuration of the SPEL Filters, the type of vault and engineers specs. Replacement instructions for manhole SPEL Filter systems and precast vault SPEL Filter systems are contained in this section.

Custom SPEL Filter systems may have particular replacement issues that will be addressed during the design.

At the completion of a standard inspection, SPEL Filter replacement may be deemed neccessary immediately or scheduled for a future date. Steps undertaken for cartridge replacement should be in general accordance with the procedure outlined below but not limited.

1. Implement Pre-start safety measures.

Ensure that the area in which operational works are to be carried out is cordoned off, to prevent unauthorised access. Adequate safety barriers must be erected. Area in which work is to be carried out must be clean, safe and hazard free.

2. Set-up Gantry Tri-pod above Manhole.

Assemble and position the gantry above the manhole safely and as practically as possible. Attach the winch or chain block to the gantry for lifting the SPEL Filters. Perform safety procedures ie. Attach harnesses etc. (if confined space).

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Once the lids have been removed to a safe distance to prevent tripping, you must then proceed to conduct gas tests. Perform necessary gas tests according to the confined space regulations.

5. Once confined space has been deemed safe to operate in, enter tank safely.

Once you have carried out the required gas test and the work area is deemed safe, you may then enter the pit via a ladder or winch system to assess the work area you will be operating in. Ensure all confined space procedures are followed.

6. Remove exhausted cartridges.

Disconnect all internal pipe work from inside the vault. Un-bolt anti-floatation measures and remove cartridges from the vault using Gantry Tri-pod method.

7. Pollutant removal.

Using a wet/dry vacuum or sucker truck, suck out all the residual pollutant from the vault.

8. Install pipework and SPEL Filters.

Please refer to the below standard install diagrams for the SPEL Filters. Then refer to your site specific drawings, as site requirements may require something different to the standard layout. Lower filters into tank, position into place, connect filter outlet pipework with the supplied fittings.

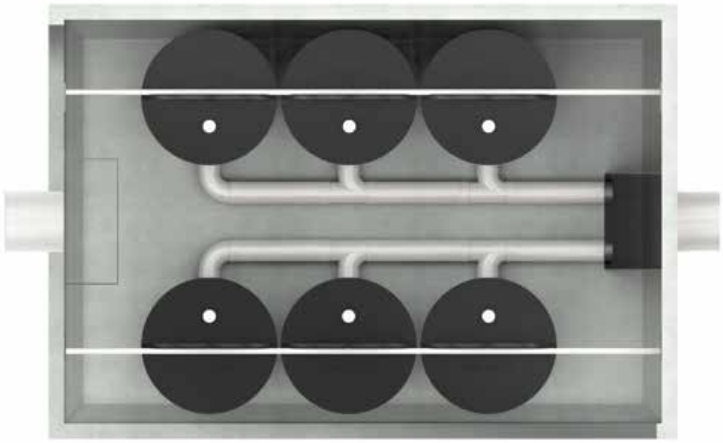
9. Install anti–floatation system.

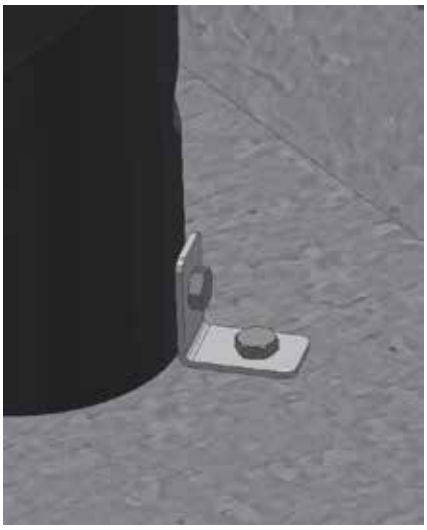
Please refer refer to the detailed drawings showing how the Anti – Floatation (Anchor) bars are to be installed.

10. Sign off and forward a copy of the report to property manager and SPEL representative.

Cartridge Replacement (cont.)

Standard install with PVC Outlet pipework and anti floatation bars





Alternative anti-floatation bolt down system

Site Exit and Clean Up

At the end of the scheduled maintenance, approved contractors or SPEL maintenance crew are required to reinstate the site to pre-existing conditions. Steps included but limited to are:

- Ensure all access covers are securely inserted back into their frames;
- Remove and dispose collected pollutants from the site in accordance with local regulator authorities;
- Retrieve all traffic control measures and maintenance tools; and
- Return all exhausted and/or damaged SPEL products to SPEL Environmental to begin recycling program.

APPENDIX C
MODEL INFORMATION

```
Source nodes
Location,SHED - 1,BUNKERS- 1,BUNKERS- 2,CONTRETE,Ground
ID,1,2,3,4,5
Node Type,UrbanSourceNode,UrbanSourceNode,UrbanSourceNode,UrbanSourceNode,UrbanSourceNode
Zoning Surface Type,Roof,Roof,Roof,Sealedroad,Revegetatedland
Total Area (ha),0.036,0.003,0.014,0.018,0.437
Area Impervious (ha),0.036,0.003,0.014,0.018,0
Area Pervious (ha),0,0,0,0,0.437
Field Capacity (mm),80,80,80,80,80
Pervious Area Infiltration Capacity coefficient - a,243,243,243,243,243
Pervious Area Infiltration Capacity exponent - b,0.6,0.6,0.6,0.6,0.6
Impervious Area Rainfall Threshold (mm/day),1,1,1,1,1
Pervious Area Soil Storage Capacity (mm),18,18,18,18,18
Pervious Area Soil Initial Storage (% of Capacity),10,10,10,10,10
Groundwater Initial Depth (mm),50,50,50,50,50
Groundwater Daily Recharge Rate (%),0,0,0,0,0
Groundwater Daily Baseflow Rate (%),31,31,31,31,31
Groundwater Daily Deep Seepage Rate (%),0,0,0,0,0
Stormflow Total Suspended Solids Mean (log mg/L),1.92,1.92,1.92,1.92,1.92
Stormflow Total Suspended Solids Standard Deviation (log mg/L),0.44,0.44,0.44,0.44,0.44
Stormflow Total Suspended Solids Estimation Method,Stochastic,Stochastic,Stochastic,Stochastic,Stochastic
Stormflow Total Suspended Solids Serial Correlation,0,0,0,0,0
Stormflow Total Phosphorus Mean (log mg/L),-0.59,-0.59,-0.59,-0.59,-0.59
Stormflow Total Phosphorus Standard Deviation (log mg/L),0.36,0.36,0.36,0.36,0.36
Stormflow Total Phosphorus Estimation Method,Stochastic,Stochastic,Stochastic,Stochastic,Stochastic
Stormflow Total Phosphorus Serial Correlation,0,0,0,0,0
Stormflow Total Nitrogen Mean (log mg/L),0.25,0.25,0.25,0.25,0.25
Stormflow Total Nitrogen Standard Deviation (log mg/L),0.32,0.32,0.32,0.32,0.32
Stormflow Total Nitrogen Estimation Method,Stochastic,Stochastic,Stochastic,Stochastic,Stochastic
Stormflow Total Nitrogen Serial Correlation,0,0,0,0,0
Baseflow Total Suspended Solids Mean (log mg/L),0.78,0.78,0.78,0.78,0.78
Baseflow Total Suspended Solids Standard Deviation (log mg/L),0.45,0.45,0.45,0.45,0.45
Baseflow Total Suspended Solids Estimation Method,Stochastic,Stochastic,Stochastic,Stochastic,Stochastic
Baseflow Total Suspended Solids Serial Correlation,0,0,0,0,0
Baseflow Total Phosphorus Mean (log mg/L),-1.11,-1.11,-1.11,-1.11,-1.11
Baseflow Total Phosphorus Standard Deviation (log mg/L),0.48,0.48,0.48,0.48,0.48
Baseflow Total Phosphorus Estimation Method,Stochastic,Stochastic,Stochastic,Stochastic,Stochastic
Baseflow Total Phosphorus Serial Correlation,0,0,0,0,0
Baseflow Total Nitrogen Mean (log mg/L),0.14,0.14,0.14,0.14,0.14
Baseflow Total Nitrogen Standard Deviation (log mg/L),0.2,0.2,0.2,0.2,0.2
Baseflow Total Nitrogen Estimation Method,Stochastic,Stochastic,Stochastic,Stochastic,Stochastic
Baseflow Total Nitrogen Serial Correlation,0,0,0,0,0
Flow based constituent generation - enabled,Off,Off,Off,Off,Off
Flow based constituent generation - flow file, , , , ,
Flow based constituent generation - base flow column, , , , ,
Flow based constituent generation - pervious flow column, , , , ,
Flow based constituent generation - impervious flow column, , , , ,
Flow based constituent generation - unit, , , , ,
OUT - Mean Annual Flow (ML/yr),0.536,44.7E-3,0.209,0.268,4.23
OUT - TSS Mean Annual Load (kg/yr),73.5,6.22,28.7,37.2,586
OUT - TP Mean Annual Load (kg/yr),0.193,16.1E-3,75.6E-3,97.2E-3,1.52
OUT - TN Mean Annual Load (kg/yr),1.25,0.104,0.484,0.629,9.84
OUT - Gross Pollutant Mean Annual Load (kg/yr),10.2,0.853,3.98,5.12,0.00
Rain In (ML/yr),0.57791,0.0481592,0.22474,0.288955,7.01516
ET Loss (ML/yr),0.0414888,0.0034573,0.0161346,0.0207444,2.787
Deep Seepage Loss (ML/yr),0,0,0,0,0
Baseflow Out (ML/yr),0,0,0,0,0
Imp. Stormflow Out (ML/yr),0.536422,0.0447018,0.208608,0.268211,0
Perv. Stormflow Out (ML/yr),0,0,0,0,4.22858
Total Stormflow Out (ML/yr),0.536422,0.0447018,0.208608,0.268211,4.22858
Total Outflow (ML/yr),0.536422,0.0447018,0.208608,0.268211,4.22858
Change in Soil Storage (ML/yr),0,0,0,0,-0.000367674
TSS Baseflow Out (kg/yr),0,0,0,0,0
TSS Total Stormflow Out (kg/yr),73.5406,6.21533,28.6523,37.1945,585.942
TSS Total Outflow (kg/yr),73.5406,6.21533,28.6523,37.1945,585.942
```

TP Baseflow Out (kg/yr),0,0,0,0,0
TP Total Stormflow Out (kg/yr),0.192748,0.016086,0.0756485,0.0972226,1.52396
TP Total Outflow (kg/yr),0.192748,0.016086,0.0756485,0.0972226,1.52396
TN Baseflow Out (kg/yr),0,0,0,0,0
TN Total Stormflow Out (kg/yr),1.24699,0.104336,0.484394,0.629223,9.83872
TN Total Outflow (kg/yr),1.24699,0.104336,0.484394,0.629223,9.83872
GP Total Outflow (kg/yr),10.2327,0.852723,3.97937,5.11633,0

No Imported Data Source nodes

USTM treatment nodes
Location,SPEL vault (8.0/0.85) - QUT Final
ID,7
Node Type,DetentionBasinNode
Lo-flow bypass rate (cum/sec),0
Hi-flow bypass rate (cum/sec),100
Inlet pond volume,0
Area (sqm),8
Initial Volume (m^3),
Extended detention depth (m),0.85
Number of Rainwater tanks,
Permanent Pool Volume (cubic metres),0
Proportion vegetated,0
Equivalent Pipe Diameter (mm),90
Overflow weir width (m),5
Notional Detention Time (hrs),0.109
Orifice Discharge Coefficient,0.6
Weir Coefficient,1.7
Number of CSTR Cells,1
Total Suspended Solids - k (m/yr),8000
Total Suspended Solids - C* (mg/L),20
Total Suspended Solids - C** (mg/L),20
Total Phosphorus - k (m/yr),6000
Total Phosphorus - C* (mg/L),0.13
Total Phosphorus - C** (mg/L),0.13
Total Nitrogen - k (m/yr),500
Total Nitrogen - C* (mg/L),1.4
Total Nitrogen - C** (mg/L),1.4
Threshold Hydraulic Loading for C** (m/yr),3500
Horizontal Flow Coefficient,
Reuse Enabled,Off
Max drawdown height (m),
Annual Demand Enabled,Off
Annual Demand Value (ML/year),
Annual Demand Distribution,
Annual Demand Monthly Distribution: Jan,
Annual Demand Monthly Distribution: Feb,
Annual Demand Monthly Distribution: Mar,
Annual Demand Monthly Distribution: Apr,
Annual Demand Monthly Distribution: May,
Annual Demand Monthly Distribution: Jun,
Annual Demand Monthly Distribution: Jul,
Annual Demand Monthly Distribution: Aug,
Annual Demand Monthly Distribution: Sep,
Annual Demand Monthly Distribution: Oct,
Annual Demand Monthly Distribution: Nov,
Annual Demand Monthly Distribution: Dec,
Daily Demand Enabled,Off
Daily Demand Value (ML/day),
Custom Demand Enabled,Off
Custom Demand Time Series File,
Custom Demand Time Series Units,
Filter area (sqm),
Filter perimeter (m),
Filter depth (m),
Filter Median Particle Diameter (mm),
Saturated Hydraulic Conductivity (mm/hr),
Infiltration Media Porosity,
Length (m),
Bed slope,
Base Width (m),
Top width (m),
Vegetation height (m),

```
Vegetation Type,
Total Nitrogen Content in Filter (mg/kg),
Orthophosphate Content in Filter (mg/kg),
Is Base Lined?,
Is Underdrain Present?,
Is Submerged Zone Present?,
Submerged Zone Depth (m),
B for Media Soil Texture,-9999
Proportion of upstream impervious area treated,
Exfiltration Rate (mm/hr),0
Evaporative Loss as % of PET,0
Depth in metres below the drain pipe,
TSS A Coefficient,
TSS B Coefficient,
TP A Coefficient,
TP B Coefficient,
TN A Coefficient,
TN B Coefficient,
Sfc,
S*,
Sw,
Sh,
Emax (m/day),
Ew (m/day),
IN - Mean Annual Flow (ML/yr),1.06
IN - TSS Mean Annual Load (kg/yr),123
IN - TP Mean Annual Load (kg/yr),0.354
IN - TN Mean Annual Load (kg/yr),2.18
IN - Gross Pollutant Mean Annual Load (kg/yr),15.1
OUT - Mean Annual Flow (ML/yr),1.06
OUT - TSS Mean Annual Load (kg/yr),54.6
OUT - TP Mean Annual Load (kg/yr),0.223
OUT - TN Mean Annual Load (kg/yr),2.07
OUT - Gross Pollutant Mean Annual Load (kg/yr),0.00
Flow In (ML/yr),1.05788
ET Loss (ML/yr),0
Infiltration Loss (ML/yr),0
Low Flow Bypass Out (ML/yr),0
High Flow Bypass Out (ML/yr),0
Orifice / Filter Out (ML/yr),1.05552
Weir Out (ML/yr),0.0022478
Transfer Function Out (ML/yr),0
Reuse Supplied (ML/yr),0
Reuse Requested (ML/yr),0
% Reuse Demand Met,0
% Load Reduction,0.0108934
TSS Flow In (kg/yr),122.914
TSS ET Loss (kg/yr),0
TSS Infiltration Loss (kg/yr),0
TSS Low Flow Bypass Out (kg/yr),0
TSS High Flow Bypass Out (kg/yr),0
TSS Orifice / Filter Out (kg/yr),54.3037
TSS Weir Out (kg/yr),0.251802
TSS Transfer Function Out (kg/yr),0
TSS Reuse Supplied (kg/yr),0
TSS Reuse Requested (kg/yr),0
TSS % Reuse Demand Met,0
TSS % Load Reduction,55.615
TP Flow In (kg/yr),0.354483
TP ET Loss (kg/yr),0
TP Infiltration Loss (kg/yr),0
TP Low Flow Bypass Out (kg/yr),0
TP High Flow Bypass Out (kg/yr),0
TP Orifice / Filter Out (kg/yr),0.222207
TP Weir Out (kg/yr),0.000762983
TP Transfer Function Out (kg/yr),0
TP Reuse Supplied (kg/yr),0
TP Reuse Requested (kg/yr),0
TP % Reuse Demand Met,0
TP % Load Reduction,37.1
TN Flow In (kg/yr),2.1818
TN ET Loss (kg/yr),0
TN Infiltration Loss (kg/yr),0
```

```
TN Low Flow Bypass Out (kg/yr),0
TN High Flow Bypass Out (kg/yr),0
TN Orifice / Filter Out (kg/yr),2.06809
TN Weir Out (kg/yr),0.00456202
TN Transfer Function Out (kg/yr),0
TN Reuse Supplied (kg/yr),0
TN Reuse Requested (kg/yr),0
TN % Reuse Demand Met,0
TN % Load Reduction,5.00299
GP Flow In (kg/yr),15.0647
GP ET Loss (kg/yr),0
GP Infiltration Loss (kg/yr),0
GP Low Flow Bypass Out (kg/yr),0
GP High Flow Bypass Out (kg/yr),0
GP Orifice / Filter Out (kg/yr),0
GP Weir Out (kg/yr),0
GP Transfer Function Out (kg/yr),0
GP Reuse Supplied (kg/yr),0
GP Reuse Requested (kg/yr),0
GP % Reuse Demand Met,0
GP % Load Reduction,100
PET Scaling Factor,

Generic treatment nodes
Location,SPEL Stormsacks (1) - QUT Final,4/SPELFilter (EMC 45) - QUT Final
ID,6,8
Node Type,GPTNode,GenericNode
Lo-flow bypass rate (cum/sec),0,0
Hi-flow bypass rate (cum/sec),0.011,0.01132
Flow Transfer Function
Input (cum/sec),0,0
Output (cum/sec),0,0
Input (cum/sec),10,10
Output (cum/sec),10,10
Input (cum/sec), ,
Output (cum/sec), ,
Input (cum/sec), ,
Output (cum/sec), ,
Input (cum/sec), ,
Output (cum/sec), ,
Input (cum/sec), ,
Output (cum/sec), ,
Input (cum/sec), ,
Output (cum/sec), ,
Input (cum/sec), ,
Output (cum/sec), ,
Input (cum/sec), ,
Output (cum/sec), ,
Input (cum/sec), ,
Output (cum/sec), ,
Gross Pollutant Transfer Function
Enabled,True,True
Input (kg/ML),0,0
Output (kg/ML),0,0
Input (kg/ML),15,15
Output (kg/ML),0,0
Input (kg/ML), ,
Output (kg/ML), ,
Input (kg/ML), ,
Output (kg/ML), ,
Input (kg/ML), ,
Output (kg/ML), ,
Input (kg/ML), ,
Output (kg/ML), ,
Input (kg/ML), ,
Output (kg/ML), ,
Input (kg/ML), ,
Output (kg/ML), ,
Input (kg/ML), ,
Output (kg/ML), ,
Input (kg/ML), ,
Output (kg/ML), ,
Total Nitrogen Transfer Function
```

```
Enabled,True,True
Input (mg/L),0,0
Output (mg/L),0,0
Input (mg/L),100,100
Output (mg/L),55,58
Input (mg/L), ,
Output (mg/L), ,
Input (mg/L), ,
Output (mg/L), ,
Input (mg/L), ,
Output (mg/L), ,
Input (mg/L), ,
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Input (mg/L), ,
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Input (mg/L), ,
Output (mg/L), ,
Input (mg/L), ,
Output (mg/L), ,
Input (mg/L), ,
Output (mg/L), ,
Total Phosphorus Transfer Function
Enabled,True,True
Input (mg/L),0,0
Output (mg/L),0,0
Input (mg/L),100,100
Output (mg/L),72,41
Input (mg/L), ,
Output (mg/L), ,
Input (mg/L), ,
Output (mg/L), ,
Input (mg/L), ,
Output (mg/L), ,
Input (mg/L), ,
Output (mg/L), ,
Input (mg/L), ,
Output (mg/L), ,
Input (mg/L), ,
Output (mg/L), ,
Input (mg/L), ,
Output (mg/L), ,
Input (mg/L), ,
Output (mg/L), ,
Total Suspended Solids Transfer Function
Enabled,True,True
Input (mg/L),0,0
Output (mg/L),0,0
Input (mg/L),100,100
Output (mg/L),39,22
Input (mg/L), ,
Output (mg/L), ,
Input (mg/L), ,
Output (mg/L), ,
Input (mg/L), ,
Output (mg/L), ,
Input (mg/L), ,
Output (mg/L), ,
Input (mg/L), ,
Output (mg/L), ,
Input (mg/L), ,
Output (mg/L), ,
Input (mg/L), ,
Output (mg/L), ,
Input (mg/L), ,
Output (mg/L), ,
TSS Flow based Efficiency Enabled,Off,Off
TSS Flow based Efficiency, ,
TP Flow based Efficiency Enabled,Off,Off
TP Flow based Efficiency, ,
TN Flow based Efficiency Enabled,Off,Off
TN Flow based Efficiency, ,
GP Flow based Efficiency Enabled,Off,Off
GP Flow based Efficiency, ,
```

```
IN - Mean Annual Flow (ML/yr),0.268,1.06
IN - TSS Mean Annual Load (kg/yr),37.2,54.6
IN - TP Mean Annual Load (kg/yr),97.2E-3,0.223
IN - TN Mean Annual Load (kg/yr),0.629,2.07
IN - Gross Pollutant Mean Annual Load (kg/yr),5.12,0.00
OUT - Mean Annual Flow (ML/yr),0.268,1.06
OUT - TSS Mean Annual Load (kg/yr),14.5,12.7
OUT - TP Mean Annual Load (kg/yr),70.0E-3,93.0E-3
OUT - TN Mean Annual Load (kg/yr),0.346,1.21
OUT - Gross Pollutant Mean Annual Load (kg/yr),0.00,0.00
Flow In (ML/yr),0.268245,1.05777
ET Loss (ML/yr),0,0
Infiltration Loss (ML/yr),0,0
Low Flow Bypass Out (ML/yr),0,0
High Flow Bypass Out (ML/yr),0,0.0083885
Orifice / Filter Out (ML/yr),0,0
Weir Out (ML/yr),0,0
Transfer Function Out (ML/yr),0.268245,1.04939
Reuse Supplied (ML/yr),0,0
Reuse Requested (ML/yr),0,0
% Reuse Demand Met,0,0
% Load Reduction,0,-0.000234291
TSS Flow In (kg/yr),37.1866,54.5337
TSS ET Loss (kg/yr),0,0
TSS Infiltration Loss (kg/yr),0,0
TSS Low Flow Bypass Out (kg/yr),0,0
TSS High Flow Bypass Out (kg/yr),0,0.861286
TSS Orifice / Filter Out (kg/yr),0,0
TSS Weir Out (kg/yr),0,0
TSS Transfer Function Out (kg/yr),14.5025,11.8082
TSS Reuse Supplied (kg/yr),0,0
TSS Reuse Requested (kg/yr),0,0
TSS % Reuse Demand Met,0,0
TSS % Load Reduction,61.0007,76.7676
TP Flow In (kg/yr),0.0972001,0.222912
TP ET Loss (kg/yr),0,0
TP Infiltration Loss (kg/yr),0,0
TP Low Flow Bypass Out (kg/yr),0,0
TP High Flow Bypass Out (kg/yr),0,0.00269004
TP Orifice / Filter Out (kg/yr),0,0
TP Weir Out (kg/yr),0,0
TP Transfer Function Out (kg/yr),0.0699863,0.090264
TP Reuse Supplied (kg/yr),0,0
TP Reuse Requested (kg/yr),0,0
TP % Reuse Demand Met,0,0
TP % Load Reduction,27.9977,58.3001
TN Flow In (kg/yr),0.629102,2.07248
TN ET Loss (kg/yr),0,0
TN Infiltration Loss (kg/yr),0,0
TN Low Flow Bypass Out (kg/yr),0,0
TN High Flow Bypass Out (kg/yr),0,0.0171199
TN Orifice / Filter Out (kg/yr),0,0
TN Weir Out (kg/yr),0,0
TN Transfer Function Out (kg/yr),0.346015,1.19167
TN Reuse Supplied (kg/yr),0,0
TN Reuse Requested (kg/yr),0,0
TN % Reuse Demand Met,0,0
TN % Load Reduction,44.9985,41.6744
GP Flow In (kg/yr),5.11635,0
GP ET Loss (kg/yr),0,0
GP Infiltration Loss (kg/yr),0,0
GP Low Flow Bypass Out (kg/yr),0,0
GP High Flow Bypass Out (kg/yr),0,0
GP Orifice / Filter Out (kg/yr),0,0
GP Weir Out (kg/yr),0,0
GP Transfer Function Out (kg/yr),0,0
GP Reuse Supplied (kg/yr),0,0
GP Reuse Requested (kg/yr),0,0
GP % Reuse Demand Met,0,0
GP % Load Reduction,100,100

Other nodes
Location,Receiving Node
```

ID,9
Node Type,ReceivingNode
IN - Mean Annual Flow (ML/yr),1.06
IN - TSS Mean Annual Load (kg/yr),12.7
IN - TP Mean Annual Load (kg/yr),93.0E-3
IN - TN Mean Annual Load (kg/yr),1.21
IN - Gross Pollutant Mean Annual Load (kg/yr),0.00
OUT - Mean Annual Flow (ML/yr),1.06
OUT - TSS Mean Annual Load (kg/yr),12.7
OUT - TP Mean Annual Load (kg/yr),93.0E-3
OUT - TN Mean Annual Load (kg/yr),1.21
OUT - Gross Pollutant Mean Annual Load (kg/yr),0.00
% Load Reduction,2.68E-3
TSS % Load Reduction,91.3
TN % Load Reduction,50.9
TP % Load Reduction,75.6
GP % Load Reduction,100

Links
Location,Drainage Link,Drainage Link,Drainage Link,Drainage Link,Drainage Link,Drainage Link,Drainage Link
Source node ID,4,6,7,1,3,2,8
Target node ID,6,7,8,7,7,7,9
Muskingum-Cunge Routing,Not Routed,Not Routed,Not Routed,Not Routed,Not Routed,Not Routed,Not Routed
Muskingum K, , , , , , ,
Muskingum theta, , , , , , ,
IN - Mean Annual Flow (ML/yr),0.268,0.268,1.06,0.536,0.209,44.7E-3,1.06
IN - TSS Mean Annual Load (kg/yr),37.2,14.5,54.6,73.5,28.7,6.22,12.7
IN - TP Mean Annual Load (kg/yr),97.2E-3,70.0E-3,0.223,0.193,75.6E-3,16.1E-3,93.0E-3
IN - TN Mean Annual Load (kg/yr),0.629,0.346,2.07,1.25,0.484,0.104,1.21
IN - Gross Pollutant Mean Annual Load (kg/yr),5.12,0.00,0.00,10.2,3.98,0.853,0.00
OUT - Mean Annual Flow (ML/yr),0.268,0.268,1.06,0.536,0.209,44.7E-3,1.06
OUT - TSS Mean Annual Load (kg/yr),37.2,14.5,54.6,73.5,28.7,6.22,12.7
OUT - TP Mean Annual Load (kg/yr),97.2E-3,70.0E-3,0.223,0.193,75.6E-3,16.1E-3,93.0E-3
OUT - TN Mean Annual Load (kg/yr),0.629,0.346,2.07,1.25,0.484,0.104,1.21
OUT - Gross Pollutant Mean Annual Load (kg/yr),5.12,0.00,0.00,10.2,3.98,0.853,0.00

Catchment Details
Catchment Name,Douglas_Option2
Timestep,6 Minutes
Start Date,1/01/1917
End Date,31/12/1962 11:54:00 PM
Rainfall Station, 31055 MOSSMAN
ET Station,User-defined monthly PET
Mean Annual Rainfall (mm), 1608
Mean Annual ET (mm), 2291

```
Source nodes
Location,SHED - 1,BUNKERS- 1,BUNKERS- 2,CONTRETE,Ground
ID,2,3,4,5,6
Node Type,UrbanSourceNode,UrbanSourceNode,UrbanSourceNode,UrbanSourceNode,UrbanSourceNode
Zoning Surface Type,Roof,Roof,Roof,Sealedroad,Revegetatedland
Total Area (ha),0.036,0.003,0.014,0.018,0.437
Area Impervious (ha),0.036,0.003,0.014,0.018,0
Area Pervious (ha),0,0,0,0,0.437
Field Capacity (mm),80,80,80,80,80
Pervious Area Infiltration Capacity coefficient - a,243,243,243,243,243
Pervious Area Infiltration Capacity exponent - b,0.6,0.6,0.6,0.6,0.6
Impervious Area Rainfall Threshold (mm/day),1,1,1,1,1
Pervious Area Soil Storage Capacity (mm),18,18,18,18,18
Pervious Area Soil Initial Storage (% of Capacity),10,10,10,10,10
Groundwater Initial Depth (mm),50,50,50,50,50
Groundwater Daily Recharge Rate (%),0,0,0,0,0
Groundwater Daily Baseflow Rate (%),31,31,31,31,31
Groundwater Daily Deep Seepage Rate (%),0,0,0,0,0
Stormflow Total Suspended Solids Mean (log mg/L),1.92,1.92,1.92,1.92,1.92
Stormflow Total Suspended Solids Standard Deviation (log mg/L),0.44,0.44,0.44,0.44,0.44
Stormflow Total Suspended Solids Estimation Method,Stochastic,Stochastic,Stochastic,Stochastic,Stochastic
Stormflow Total Suspended Solids Serial Correlation,0,0,0,0,0
Stormflow Total Phosphorus Mean (log mg/L),-0.59,-0.59,-0.59,-0.59,-0.59
Stormflow Total Phosphorus Standard Deviation (log mg/L),0.36,0.36,0.36,0.36,0.36
Stormflow Total Phosphorus Estimation Method,Stochastic,Stochastic,Stochastic,Stochastic,Stochastic
Stormflow Total Phosphorus Serial Correlation,0,0,0,0,0
Stormflow Total Nitrogen Mean (log mg/L),0.25,0.25,0.25,0.25,0.25
Stormflow Total Nitrogen Standard Deviation (log mg/L),0.32,0.32,0.32,0.32,0.32
Stormflow Total Nitrogen Estimation Method,Stochastic,Stochastic,Stochastic,Stochastic,Stochastic
Stormflow Total Nitrogen Serial Correlation,0,0,0,0,0
Baseflow Total Suspended Solids Mean (log mg/L),0.78,0.78,0.78,0.78,0.78
Baseflow Total Suspended Solids Standard Deviation (log mg/L),0.45,0.45,0.45,0.45,0.45
Baseflow Total Suspended Solids Estimation Method,Stochastic,Stochastic,Stochastic,Stochastic,Stochastic
Baseflow Total Suspended Solids Serial Correlation,0,0,0,0,0
Baseflow Total Phosphorus Mean (log mg/L),-1.11,-1.11,-1.11,-1.11,-1.11
Baseflow Total Phosphorus Standard Deviation (log mg/L),0.48,0.48,0.48,0.48,0.48
Baseflow Total Phosphorus Estimation Method,Stochastic,Stochastic,Stochastic,Stochastic,Stochastic
Baseflow Total Phosphorus Serial Correlation,0,0,0,0,0
Baseflow Total Nitrogen Mean (log mg/L),0.14,0.14,0.14,0.14,0.14
Baseflow Total Nitrogen Standard Deviation (log mg/L),0.2,0.2,0.2,0.2,0.2
Baseflow Total Nitrogen Estimation Method,Stochastic,Stochastic,Stochastic,Stochastic,Stochastic
Baseflow Total Nitrogen Serial Correlation,0,0,0,0,0
Flow based constituent generation - enabled,Off,Off,Off,Off,Off
Flow based constituent generation - flow file, , , , ,
Flow based constituent generation - base flow column, , , , ,
Flow based constituent generation - pervious flow column, , , , ,
Flow based constituent generation - impervious flow column, , , , ,
Flow based constituent generation - unit, , , , ,
OUT - Mean Annual Flow (ML/yr),0.536,44.7E-3,0.209,0.268,4.23
OUT - TSS Mean Annual Load (kg/yr),74.2,6.22,28.4,37.1,578
OUT - TP Mean Annual Load (kg/yr),0.193,16.0E-3,75.6E-3,97.6E-3,1.53
OUT - TN Mean Annual Load (kg/yr),1.26,0.104,0.488,0.626,9.80
OUT - Gross Pollutant Mean Annual Load (kg/yr),10.2,0.853,3.98,5.12,0.00
Rain In (ML/yr),0.57791,0.0481592,0.22474,0.288955,7.01516
ET Loss (ML/yr),0.0414888,0.0034573,0.0161346,0.0207444,2.787
Deep Seepage Loss (ML/yr),0,0,0,0,0
Baseflow Out (ML/yr),0,0,0,0,0
Imp. Stormflow Out (ML/yr),0.536422,0.0447018,0.208608,0.268211,0
Perv. Stormflow Out (ML/yr),0,0,0,0,4.22858
Total Stormflow Out (ML/yr),0.536422,0.0447018,0.208608,0.268211,4.22858
Total Outflow (ML/yr),0.536422,0.0447018,0.208608,0.268211,4.22858
Change in Soil Storage (ML/yr),0,0,0,0,-0.000367674
TSS Baseflow Out (kg/yr),0,0,0,0,0
TSS Total Stormflow Out (kg/yr),74.1805,6.21749,28.4343,37.1291,577.807
TSS Total Outflow (kg/yr),74.1805,6.21749,28.4343,37.1291,577.807
```

TP Baseflow Out (kg/yr),0,0,0,0,0
TP Total Stormflow Out (kg/yr),0.193346,0.0160304,0.0755876,0.0976024,1.53035
TP Total Outflow (kg/yr),0.193346,0.0160304,0.0755876,0.0976024,1.53035
TN Baseflow Out (kg/yr),0,0,0,0,0
TN Total Stormflow Out (kg/yr),1.26324,0.103501,0.488027,0.626378,9.80262
TN Total Outflow (kg/yr),1.26324,0.103501,0.488027,0.626378,9.80262
GP Total Outflow (kg/yr),10.2327,0.852723,3.97937,5.11633,0

No Imported Data Source nodes

USTM treatment nodes
Location,Bioretention
ID,1
Node Type,BioRetentionNodeV4
Lo-flow bypass rate (cum/sec),0
Hi-flow bypass rate (cum/sec),100
Inlet pond volume,
Area (sqm),18
Initial Volume (m^3),
Extended detention depth (m),0.3
Number of Rainwater tanks,
Permanent Pool Volume (cubic metres),
Proportion vegetated,
Equivalent Pipe Diameter (mm),
Overflow weir width (m),2
Notional Detention Time (hrs),
Orifice Discharge Coefficient,
Weir Coefficient,1.7
Number of CSTR Cells,3
Total Suspended Solids - k (m/yr),8000
Total Suspended Solids - C* (mg/L),20
Total Suspended Solids - C** (mg/L),
Total Phosphorus - k (m/yr),6000
Total Phosphorus - C* (mg/L),0.13
Total Phosphorus - C** (mg/L),
Total Nitrogen - k (m/yr),500
Total Nitrogen - C* (mg/L),1.4
Total Nitrogen - C** (mg/L),
Threshold Hydraulic Loading for C** (m/yr),
Horizontal Flow Coefficient,3
Reuse Enabled,Off
Max drawdown height (m),
Annual Demand Enabled,Off
Annual Demand Value (ML/year),
Annual Demand Distribution,
Annual Demand Monthly Distribution: Jan,
Annual Demand Monthly Distribution: Feb,
Annual Demand Monthly Distribution: Mar,
Annual Demand Monthly Distribution: Apr,
Annual Demand Monthly Distribution: May,
Annual Demand Monthly Distribution: Jun,
Annual Demand Monthly Distribution: Jul,
Annual Demand Monthly Distribution: Aug,
Annual Demand Monthly Distribution: Sep,
Annual Demand Monthly Distribution: Oct,
Annual Demand Monthly Distribution: Nov,
Annual Demand Monthly Distribution: Dec,
Daily Demand Enabled,Off
Daily Demand Value (ML/day),
Custom Demand Enabled,Off
Custom Demand Time Series File,
Custom Demand Time Series Units,
Filter area (sqm),18
Filter perimeter (m),30
Filter depth (m),0.4
Filter Median Particle Diameter (mm),
Saturated Hydraulic Conductivity (mm/hr),200
Infiltration Media Porosity,0.35
Length (m),
Bed slope,
Base Width (m),
Top width (m),
Vegetation height (m),

```
Vegetation Type,Vegetated with Effective Nutrient Removal Plants
Total Nitrogen Content in Filter (mg/kg),400
Orthophosphate Content in Filter (mg/kg),55
Is Base Lined?,Yes
Is Underdrain Present?,Yes
Is Submerged Zone Present?,No
Submerged Zone Depth (m),
B for Media Soil Texture,13
Proportion of upstream impervious area treated,
Exfiltration Rate (mm/hr),0
Evaporative Loss as % of PET,100
Depth in metres below the drain pipe,
TSS A Coefficient,
TSS B Coefficient,
TP A Coefficient,
TP B Coefficient,
TN A Coefficient,
TN B Coefficient,
Sfc,0.61
S*,0.37
Sw,0.11
Sh,0.05
Emax (m/day),0.008
Ew (m/day),0.001
IN - Mean Annual Flow (ML/yr),1.06
IN - TSS Mean Annual Load (kg/yr),146
IN - TP Mean Annual Load (kg/yr),0.383
IN - TN Mean Annual Load (kg/yr),2.48
IN - Gross Pollutant Mean Annual Load (kg/yr),20.2
OUT - Mean Annual Flow (ML/yr),1.01
OUT - TSS Mean Annual Load (kg/yr),14.7
OUT - TP Mean Annual Load (kg/yr),0.149
OUT - TN Mean Annual Load (kg/yr),0.939
OUT - Gross Pollutant Mean Annual Load (kg/yr),0.00
Flow In (ML/yr),1.05788
ET Loss (ML/yr),0.0495428
Infiltration Loss (ML/yr),0
Low Flow Bypass Out (ML/yr),0
High Flow Bypass Out (ML/yr),0
Orifice / Filter Out (ML/yr),0.82654
Weir Out (ML/yr),0.179501
Transfer Function Out (ML/yr),0
Reuse Supplied (ML/yr),0
Reuse Requested (ML/yr),0
% Reuse Demand Met,0
% Load Reduction,4.90039
TSS Flow In (kg/yr),145.931
TSS ET Loss (kg/yr),0
TSS Infiltration Loss (kg/yr),0
TSS Low Flow Bypass Out (kg/yr),0
TSS High Flow Bypass Out (kg/yr),0
TSS Orifice / Filter Out (kg/yr),2.16153
TSS Weir Out (kg/yr),12.5396
TSS Transfer Function Out (kg/yr),0
TSS Reuse Supplied (kg/yr),0
TSS Reuse Requested (kg/yr),0
TSS % Reuse Demand Met,0
TSS % Load Reduction,89.926
TP Flow In (kg/yr),0.382492
TP ET Loss (kg/yr),0
TP Infiltration Loss (kg/yr),0
TP Low Flow Bypass Out (kg/yr),0
TP High Flow Bypass Out (kg/yr),0
TP Orifice / Filter Out (kg/yr),0.104958
TP Weir Out (kg/yr),0.0438896
TP Transfer Function Out (kg/yr),0
TP Reuse Supplied (kg/yr),0
TP Reuse Requested (kg/yr),0
TP % Reuse Demand Met,0
TP % Load Reduction,61.0847
TN Flow In (kg/yr),2.48071
TN ET Loss (kg/yr),0
TN Infiltration Loss (kg/yr),0
```

TN Low Flow Bypass Out (kg/yr),0
TN High Flow Bypass Out (kg/yr),0
TN Orifice / Filter Out (kg/yr),0.526948
TN Weir Out (kg/yr),0.409894
TN Transfer Function Out (kg/yr),0
TN Reuse Supplied (kg/yr),0
TN Reuse Requested (kg/yr),0
TN % Reuse Demand Met,0
TN % Load Reduction,62.235
GP Flow In (kg/yr),20.1821
GP ET Loss (kg/yr),0
GP Infiltration Loss (kg/yr),0
GP Low Flow Bypass Out (kg/yr),0
GP High Flow Bypass Out (kg/yr),0
GP Orifice / Filter Out (kg/yr),0
GP Weir Out (kg/yr),0
GP Transfer Function Out (kg/yr),0
GP Reuse Supplied (kg/yr),0
GP Reuse Requested (kg/yr),0
GP % Reuse Demand Met,0
GP % Load Reduction,100
PET Scaling Factor,2.1

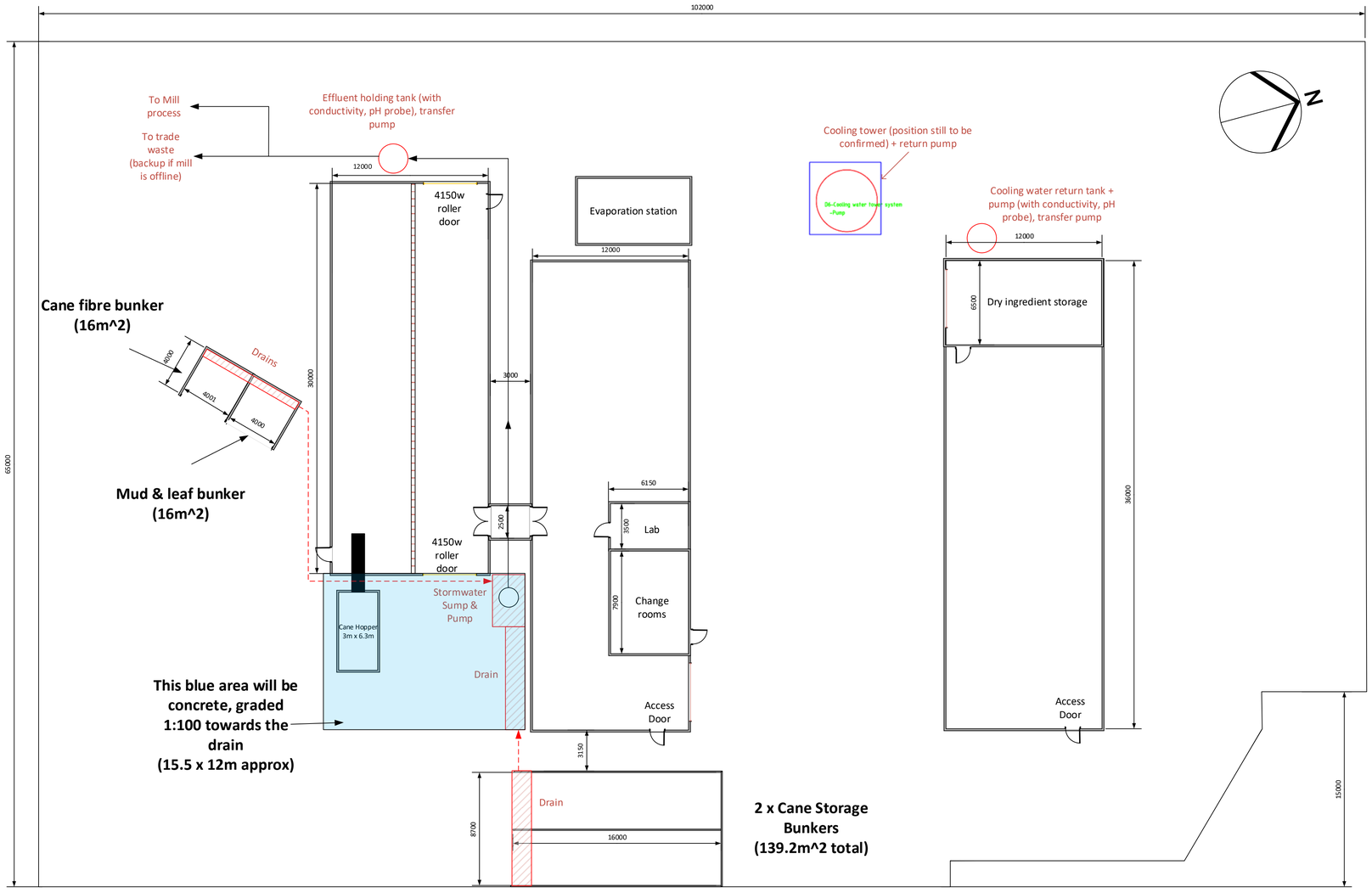
No Generic treatment nodes

Other nodes
Location,Receiving Node
ID,7
Node Type,ReceivingNode
IN - Mean Annual Flow (ML/yr),1.01
IN - TSS Mean Annual Load (kg/yr),14.7
IN - TP Mean Annual Load (kg/yr),0.149
IN - TN Mean Annual Load (kg/yr),0.939
IN - Gross Pollutant Mean Annual Load (kg/yr),0.00
OUT - Mean Annual Flow (ML/yr),1.01
OUT - TSS Mean Annual Load (kg/yr),14.7
OUT - TP Mean Annual Load (kg/yr),0.149
OUT - TN Mean Annual Load (kg/yr),0.939
OUT - Gross Pollutant Mean Annual Load (kg/yr),0.00
% Load Reduction,4.65
TSS % Load Reduction,89.9
TN % Load Reduction,62.2
TP % Load Reduction,61.0
GP % Load Reduction,100

Links
Location,Drainage Link,Drainage Link,Drainage Link,Drainage Link,Drainage Link
Source node ID,2,3,4,5,1
Target node ID,1,1,1,1,7
Muskingum-Cunge Routing,Not Routed,Not Routed,Not Routed,Not Routed,Not Routed
Muskingum K, , , , ,
Muskingum theta, , , , ,
IN - Mean Annual Flow (ML/yr),0.536,44.7E-3,0.209,0.268,1.01
IN - TSS Mean Annual Load (kg/yr),74.2,6.22,28.4,37.1,14.7
IN - TP Mean Annual Load (kg/yr),0.193,16.0E-3,75.6E-3,97.6E-3,0.149
IN - TN Mean Annual Load (kg/yr),1.26,0.104,0.488,0.626,0.939
IN - Gross Pollutant Mean Annual Load (kg/yr),10.2,0.853,3.98,5.12,0.00
OUT - Mean Annual Flow (ML/yr),0.536,44.7E-3,0.209,0.268,1.01
OUT - TSS Mean Annual Load (kg/yr),74.2,6.22,28.4,37.1,14.7
OUT - TP Mean Annual Load (kg/yr),0.193,16.0E-3,75.6E-3,97.6E-3,0.149
OUT - TN Mean Annual Load (kg/yr),1.26,0.104,0.488,0.626,0.939
OUT - Gross Pollutant Mean Annual Load (kg/yr),10.2,0.853,3.98,5.12,0.00

Catchment Details
Catchment Name,Douglas_Option2
Timestep,6 Minutes
Start Date,1/01/1917
End Date,31/12/1962 11:54:00 PM
Rainfall Station, 31055 MOSSMAN
ET Station,User-defined monthly PET
Mean Annual Rainfall (mm), 1608
Mean Annual ET (mm), 2291

APPENDIX D
STORMWATER LAYOUT


102000
65000
To Mill process
To trade waste (backup if mill is offline)
Effluent holding tank (with conductivity, pH probe), transfer pump
12000
4150w roller door
Evaporation station
12000
Cooling tower (position still to be confirmed) + return pump
D6-Cooling water tower system -Pump
Cooling water return tank + pump (with conductivity, pH probe), transfer pump
12000
6500
Dry ingredient storage
36000
Access Door
Cane fibre bunker (16m^2)
4000
4001
4000
Drains
Mud & leaf bunker (16m^2)
30000
3000
6150
2500
3500
Lab
4150w roller door
Stormwater Sump & Pump
Cane Hopper 3m x 6.3m
7900
Change rooms
Drain
This blue area will be concrete, graded 1:100 towards the drain (15.5 x 12m approx)
Access Door
3150
Drain
8700
16000
2 x Cane Storage Bunkers (139.2m^2 total)
15000
N

Premise Australia Pty Ltd
ABN: 82 620 885 832
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07 4772 0666
townsville@premise.com.au
premise.com.au

Our Ref: CNA-0001 L02-DM

4 May 2021

The Manager
CocoNutZ Australia Pty Ltd
34 Mill Street
MOSMAN QLD 4873

Attention: Mr Shaun Farquhar

Dear Shaun

KECAP MANIS PILOT PLANT – MILL STREET, MOSSMAN
PERFORMANCE OUTCOME PO3 – WATER SUPPLY

It is understood that a Development Application has been submitted to Douglas Shire Council (DSC) for a research and development facility (pilot plant) producing Kecap Manis at 34 Mill Street, Mossman located on part of Lot 27 RP804231. Lot 27 forms part of the existing Mossman Mill and the proposed development (Kecap Manis Pilot Plant) will be located on the same lot. The development site is currently serviced by a DN100 water main connected via Kidd Street and, for the purposes of this assessment, the site is considered an Industrial site.

Douglas Shire Council issued an Information Request on 9 April 2021. This letter has been prepared to address Water Item 7 of this Information Request and includes a water capacity analysis for connection of the proposed development.

Premise sketch (CNA-0001/SKC001) shows the alignment of the existing DN100 water main servicing the proposed development connecting to the assumed alignment of the DN100 water main on Mill Street. It is proposed to connect the proposed development via the existing water main as shown by the sketch.

Premise liaised with DSC to confirm if DSC have requirements for demand and pressure. In response to the query DSC responded with no specific requirements, refer below response from DSC.

"Currently we do not set any generic pressure/demand requirements for developments and normally rely on developers to determine their own requirements or volumes and then confirm with Council if they are achievable".

In the absence of minimum requirements specified by DSC, Premise have reviewed minimum service requirements from the following sources:

1. Water Supply Code of Australia (Water Services Association of Australia), 03-2011, Third Edition, Version 3.1;

2. Planning Guidelines for Water Supply and Sewerage (Queensland Water Supply Regulator, Water Supply and Sewerage Services, Department of Energy and Water Supply), April 2010, Chapter 6 amended March 2014;

3. SEQ Water and Sewerage Planning Guidelines, Version 1, 25 May 2012.

Source 1 specifies desirable minimum service pressure requirements for industrial / commercial developments to be 25m head (m H_2O) and Source 2 specifies the minimum pressure at the property boundary should be 25m (m H_2O). Source 3 provides minimum water pressure requirements for Allconnex Water (Gold Coast area) to be 22m (m H_2O).

Fire flow capacity is assessed by measuring the residual pressure when a fire flow (L/s) is applied. Source 1 does not provide any advice on requirements for fire flow capacity assessments. Source 2 provides fire flows for commercial industrial buildings to be 30L/s and minimum residual pressures to be 12m head (m H_2O). Source 3 specifies fire flows for industrial or commercial areas to be 30L/s with a minimum network pressure of 12m (m H_2O).

Based on the above literature review it is determined that the proposed development should achieve the following minimum requirements:

- Minimum service pressure during peak hour demand: 25m H_2O; and
- Minimum pressure during (30L/s) fire flow demand: 12m H_2O.

On 20 February 2020, water pressure testing was undertaken at the fire hydrant located on the development site at the end of the DN100 main. Table 1 summarises the pressures (kPa) recorded at various flow rates and calculates the hydraulic grade, being approximately one (1) tenth of the water pressure based on a first principles assessment. By subtracting the elevation from the hydraulic grade, the pressure (m H_2O) can be calculated for assessment against the minimum pressure requirements. A review of Queensland Globe contour layers determined the elevation of the proposed development to be flat and not exceeding 10m therefore, subtracting 10m from the hydraulic grade determines the pressure (m H_2O).

Table 1: Pressure Testing (20/02/2020)

FLOW (L/s)	PRESSURE (kPa)	HYDRAULIC GRADE (m)	PRESSURE (m H_2O)
0	840	~84	~74
5	700	~70	~60
10	560	~56	~46
15	420	~42	~32
20	175	~17.5	~7.5

Premise were provided with water usage requirements for the proposed development. Table 2 summarises the continuous water usage requirements and Table 3 summarises the intermittent water usage requirements. For the purposes of water capacity analysis, it is assumed that maximum peak hour demand will consist of the continuous water demand and the intermittent water usage. Combining the total continuous water usage (4,140L/hr) and the total intermittent peak flow water usage (6,600L/hr) equates to a total maximum peak hour demand of 10,740L/hr or 2.98L/sec.

Table 2: Development Water Usage (Continuous)

COMPONENT	FLOW (L/hr)
QUT Cane Cleaner	150
Roller Cane Cleaner	1,500
Boiler Feedwater Make-up	189
Fermation Media Mix	33
Toilet & Kitchen Facilities	34
Laboratory	34
Clean In Place	2,200
TOTAL	**4,140**

Table 3: Development Water Usage (Intermittent)

COMPONENT	FLOW (L/hr)
Pressure Washing Equipment	1,800
Safety Shower	4,800
TOTAL	**6,600**

Assessing the minimum pressure requirements against pressure testing shown by Table 1 (existing development), it is shown that minimum service pressure is achieved for peak flow. Minimum pressure requirements are not achieved for flows of 20L/s therefore, minimum pressure requirements for 30L/s fire flows will not be achieved either.

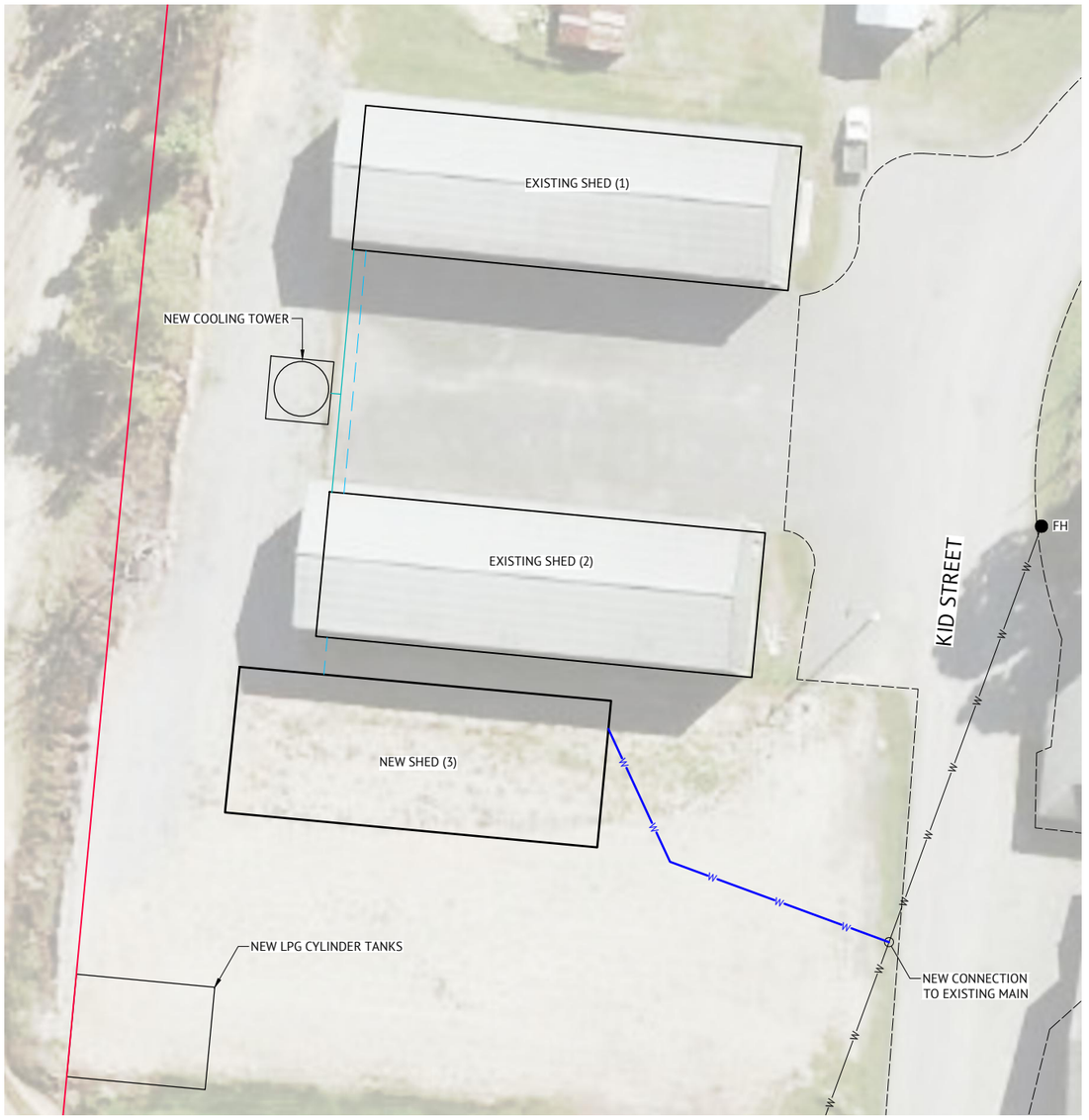
It is concluded that under the existing water reticulation network, the development achieves the minimum service pressure, however, does not achieve minimum pressure requirements under fire flow conditions. Therefore, if the site requires a fire-fighting water supply then an independent fire-fighting system generally consisting of dedicated water tank and booster pump(s) may be required.

Yours sincerely

ADAM PEASE
Civil Engineer (RPEQ 22556)

Enc: Premise Sketch: CNA-0001/SKC001

MOSSMAN MILL
SCALE 1:750m



INSET A
SCALE 1:250m

N

LEGEND:

- EXISTING ROAD EDGE
- EXISTING PROPERTY BOUNDARY (DCDB)
- EXISTING DN100 WATER MAIN - ASSUMED ALIGNMENT
- EXISTING DN100 WATER MAIN
- FH — EXISTING FIRE HYDRANT
- PROPOSED DN100 POTABLE WATER SUPPLY
- PROPOSED DN50 POTABLE WATER SUPPLY
- PROPOSED DN50 RAW WATER SUPPLY

PRELIMINARY - NOT FOR CONSTRUCTION

DATE	REV	DESCRIPTION	REC	APP
30/04/2021	1	PRELIMINARY - NOT FOR CONSTRUCTION	D.M	A.P

REVISIONS

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CHECKED D.BOYCE
PROJECT MANAGER D.BOYCE
ENGINEERING CERTIFICATION
A.PEASE RPEQ 22556

SCALE
0 5 10 15m
SCALE 1:250 (A1)
0 15 30 45m
SCALE 1:750(A1)
ORIGINAL SHEET SIZE A1

CLIENT COCONUTZ AUSTRALIA PTY LTD
PROJECT KECAP MANIS PILOT PLANT
LOCATION MILL STREET, MOSSMAN
SHEET TITLE PROPOSED WATER CONNECTION DETAIL

JOB CODE CNA-0001
SHEET NUMBER SKC001
REV 1