



PLANS AND DOCUMENTS
referred to in the PDA APPROVAL

28 JAN 2016

MEDQ

65-63 Abbotsford Road & 1-3 Folkestone Street, Bowen Hills

Engineering Services Report (ESR)

Rise Projects Pty Ltd

15 October 2015

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EXECUTIVE SUMMARY

ADG Engineers (Aust.) Pty Ltd was engaged by Rise Projects Pty Ltd to prepare an Engineering Services Report (ESR) to be self-certified in support of an EDQ Development Application for a 77 unit residential development located at 63-65 Abbotsford Road and 1-3 Folkestone Street, Bowen Hills.

The project is based on a 77 unit proposal defined by Mode Design. The development features a 9 storey apartment complex housing predominately 1 and 2 bedroom apartments along with 3 levels of basement car parking.

The purpose of this Engineering Report is to provide advice on the development proposal as detailed in the Mode architectural drawings in **Appendix A**. The works described herein are subject to further approvals and cover works required to service the proposed development including earthworks, roadworks, stormwater drainage, sewerage and water supply, electricity, communication and gas.

The report also comprises of stormwater quantity and quality assessments. The quantity assessment is undertaken to confirm a 'non-worsening' of peak flow discharges from the site and the quality assessment is undertaken to determine a suitable stormwater treatment solution to be implemented on site.

The quantity assessment has determined the post development catchment unmitigated will worsen the hydrological conditions of the existing catchment due to a small increase in impervious coverage. As a result 4m³ of on-site detention will be proposed to mitigate the development's peak stormwater flows.

The quality assessment includes a summary of the Water Sensitive Urban Design features included in the design. It is proposed to implement 3kL of reuse within the above ground poly-tank (combined detention/re-use), two 200s Enviropod litter baskets in ground level inlet pits and two stormfilter cartridges within a manhole in order to treat the majority of site flows.

The site appears to be adequately serviced by reticulated water, stormwater infrastructure, and electricity. These services will need to be connected during development. Information discussed in this report is inferred from DBYD records and information gathered via site investigation.

All relevant standards and guidelines are addressed in this report including criteria from the BCC Planning Scheme Policy, Queensland Urban Stormwater Quality Planning Guidelines (2010), BCC Land Development Guidelines, as well as the plumbing and drainage code AS 3500.3.

1 INTRODUCTION

1.1 GENERAL

ADG Engineers (Aust.) Pty Ltd was engaged Rise Projects Pty Ltd to prepare an Engineering Services Report (ESR) suitable for submission to be self-certified in support of a EDQ Development Application for a proposed 77 unit residential development located at 63-65 Abbotsford Road and 1-3 Folkestone Street, Bowen Hills.

The purpose of this engineering report is to provide advice on the development proposal as detailed in the Mode architectural drawings in **Appendix A**. The works described herein are subject to further approvals and cover works required to service the proposed development with regard to stormwater treatment.

The required infrastructure will be subject to the conditions attached to the Development Approval to be provided by Brisbane City Council and any nominated referral agencies.

1.2 PROPERTY DETAILS

The total site area is approximately 0.137ha. The existing land titles are provided in **Table 1** and the locality of the site is shown in **Figure 1**.

Table 1 - Property Detail

Title	Lots 1-2 on RP50667 & Lots 3-4 on RP10094
Street Address	1, 3 Folkestone St & 63, 65 Abbotsford Rd, Bowen Hills, QLD, 4006
Site Area	1,368 m ²

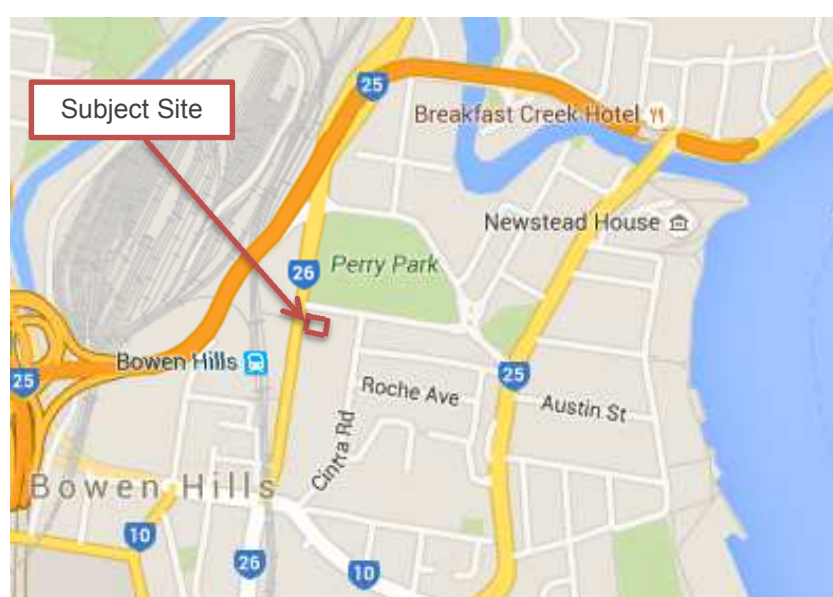


Figure 1 – Locality Map (As accessed from Google maps 22.09.2015)

1.3 Existing Site

The subject site is located at 63-65 Abbotsford Road and 1-3 Folkestone Street, Bowen Hills within the Brisbane City Council local government area. **Figure 1** displays the locality of the subject site. The site is bound by Abbotsford Road to the west, Folkestone Street to the north, existing residences to the south and a vacant lot to the east.

The subject site currently comprises of 3 residential dwellings, 2 on Folkestone Street and 1 on Abbotsford Road, along with a 2 story combined shop and dwelling on the corner of Folkestone Street and Abbotsford Road. The site slopes in a general north north-easterly direction with the steepest grade of approximately 13% in the south-eastern corner. The total site area is approximately 0.137ha. There is approximately 40m and 36m of road frontage on Folkestone Street and Abbotsford Road respectively. The eastern boundary of the site is approximately 36m in length while the southern boundary is approximately 40m in length. These features can be seen in **Figure 2** below. Refer to the detailed survey provided by FOCUS Surveying located in **Appendix B** for further information on the existing features of the site.



Figure 2 – Existing Site (As Accessed from Google Maps 22.09.2015)

1.4 Priority Infrastructure Upgrades



Figure 3 - Priority Infrastructure

The Brisbane City Council City Plan Map indicates that there is the following priority infrastructure within the vicinity of the site:

- A sewerage trunk main located beneath and running parallel with Folkestone Street.
- A water trunk main located beneath and running parallel with Abbotsford Road.
- A stormwater relief pipe located beneath Abbotsford Road.

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Appendix A

2 1 L P

R 63
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R 65 R
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Appendix B

2 2

RL 4 335
Appendix C B

2.2.1 Erosion and Sediment Control

R B
Appendix D.

2.2.2 Acid Sulfate Soils

R B
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Figure 4

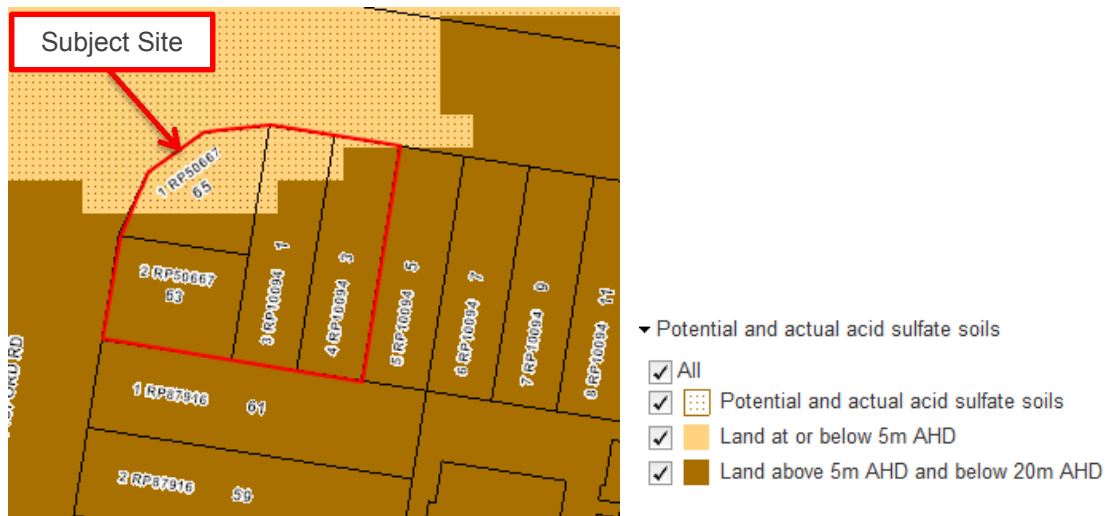


Figure 4 - Acid Sulfate Soils

3 ROADWORKS

3.1 Existing Infrastructure

The development is fronted by Folkestone Street to the north and Abbotsford Road to the west. Folkestone Street can be described as a neighbourhood road consisting of single traffic lane in each direction. Abbotsford Road is an arterial road with 3 traffic lanes in each direction. Both Folkestone Street and Abbotsford Road feature kerb and channel drainage on both sides with crossfalls from the road centreline towards the respective kerb and channels.

Currently, there is 2 vehicle crossovers and associated concrete driveways to the subject site from Abbotsford Road and a further 3 vehicle crossovers and associated concrete driveways to the site from Folkestone Street.

3.2 Proposed Infrastructure

ADG anticipate that a new vehicle crossover that a new vehicle crossover and associated access ramp into the basement will be constructed at the eastern end of the Folkestone Street site boundary. All existing vehicle crossovers are to be made redundant and demolished and removed offsite as part of the construction works.

Refer to the architectural drawings in **Appendix A** for further information. A copy of the filling, excavation and structures state code has been completed and is provided in **Appendix C**.

4 STORMWATER QUANTITY ASSESSMENT

The aim of the stormwater quantity assessment is to ensure that the development shall impose no adverse effects on downstream properties or receiving water bodies and that the conveyance of flows will be in a safe manner with minimal risk of human endangerment as well as the following objectives:

- Address the need for stormwater quantity control measures;
- Ensure there is no increase in peak discharge from the subject site for events up to and

including the 1 in 100 year ARI event; and

- Ensure proposed quantity control measures detain and convey flows in accordance with QUDM (2013) minimum freeboard recommendations.

4.1 Proposed Development and Associated Issues

One of the implications of an increase in impervious area is that the total volume and flow rate of stormwater runoff from the catchment may increase. It is essential that any increases are mitigated such that post-developed peak flows do not exceed those for the pre-developed case.

4.2 Upstream Catchment

There is an upstream catchment which contributes flows to the subject site. Site inspections and analysis of the BCC contour maps indicates that a portion of several lots to the south of the subject site shall discharge as sheet flow into the site.

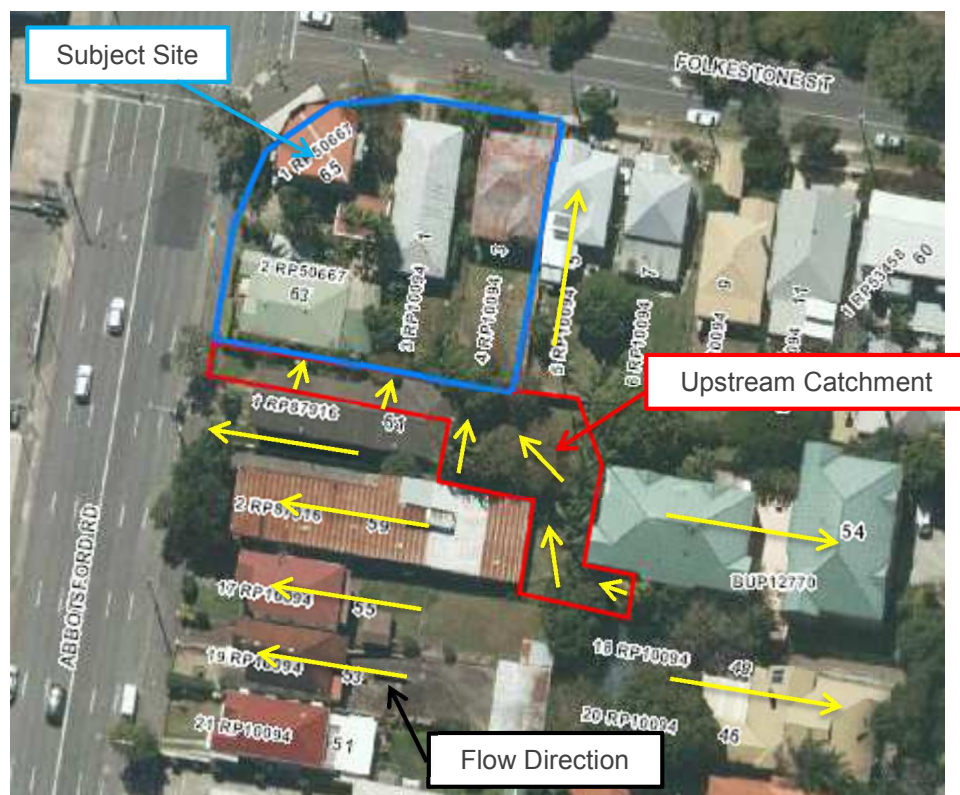


Figure 5 - Upstream Catchment

On-site inspections confirm areas of concrete pavers within the upstream catchment and as a result, it was determined that the upstream catchment was 50% impervious, with an area of approximately 500m². Considering the characteristics and the size of the catchment, a time of concentration of 7 minutes was calculated. Rational Method calculations were performed for the upstream catchment and the results of which can be seen in **Table 2** below. For details on how the runoff from the upstream catchment is conveyed post-development, please see **Section 4.6**

Table 2 - Upstream Hydrology

Catchment	Area (m ²)	% Impervious	Time of Concentration (T _c)	Q ₁₀ (m ³ /s)	Q ₅₀ (m ³ /s)
Upstream Catchment	500	50	7	0.021	0.032

4.3 Pre-Development Hydrology

The hydrology of the pre-developed catchments has been assessed in accordance with QUDM Section 4.0 using the Rational Method. From QUDM Section 4.0, the theoretical calculated peak discharge for storm events ranging from the 1 in 1 year to 1 in 100 year ARIs has been calculated and a summary of the results is presented in **Appendix F**.

The subject has a total area of 1,368m² and currently comprises of four residential lots featuring single dwellings. Each of respective dwellings discharges roof flows to the kerb and channel drainage via downpipes. The rest of the site area comprises of grass coverage and concrete/paved areas which discharge sheet flows to the street. The Coefficient of discharge (C₁₀) value was derived from QUDM Table 4.5.3 and Table 4.5.

QUDM Sections 4.6.6 and 4.6.8 were applied to determine a total time of concentration of 6 minutes. Rational Method calculations were performed, the results of which can be seen in **Table 8** below.

Table 3 - Pre-Development Hydrology

Catchment	Area (m ²)	% Impervious	Time of Concentration (T _c)	Q ₁₀ (m ³ /s)	Q ₁₀₀ (m ³ /s)
Pre-Development	1,368	58	6	0.064	0.109

4.4 Post-Development Hydrology

The total land area considered for the post-development was 1,368m².

A catchment plan for the post-developed site was determined based on preliminary architectural drawings, in which the site was divided into two separate catchments. The catchment plan can be seen in **Appendix G**. As per the pre-development flow regime, all water on the site is to be discharged to a gully pit on Abbotsford Road adjacent to the sites western boundary. Based on preliminary architectural drawings, the area and fraction impervious of the various catchments were determined. Subsequently, 1 in 10 year coefficients of runoff (C₁₀) values were adopted in accordance with QUDM Table 4.05.3 (a). F_y frequency factors were applied to determine runoff coefficients for various average recurrence interval (ARI) storm events in accordance with QUDM Table 4.05.2. The details of the individual catchments may be seen in **Table 4**.

Due to the size of the catchments, a standard inlet time of concentration of 5 minutes (QUDM Table 4.06.2) was obtained for catchments C1, C2 and C3. The Rational Method was applied to each of these catchments, and the results are demonstrated in **Table 9** below.

A summary of the rational method calculations is attached within **Appendix F**.

Table 4 - Post-Development Hydrology

Catchment I.D	Area (m ²)	% Impervious	Time of Concentration (T _c)	Q ₁₀ (m ³ /s)	Q ₁₀₀ (m ³ /s)
C1	1192	100%	5	0.051	0.084
C2	68	50%	5	0.003	0.006
C3	197	50%	5	0.016	0.029
Total	1,360	85%	5	0.070	0.119

4.5 Detention Analysis and Strategy

Using the Rational based detention volume sizing methods, an average volume was adopted to size the required detention tank within the subject site. The results of these calculations can be seen in **Table 5** below. Accordingly, a minimum volume of 4m³ is required for the proposed development to mitigate 1 in 100 year ARI flows to pre-developed rates.

To mitigate the stormwater peak flow it is proposed to construct an above ground poly detention tank to capture flows from the roof of the development incorporating 4m³ of detention volume. An orifice opening shall be located at the outlet of the tank to mitigate the outgoing stormwater flow for all events up to and including the 1 in 100 year ARI storm event. Detailed design and drawings of the proposed orifice openings, internal hydraulic pipeline including connection with the stormfilter manhole shall be provided as part of the future Operational Works application and subject to approvals.

In rainfall events exceeding 1 in 100 year ARI (or in the event that the orifice becomes blocked) flows will be able to by-pass the orifice and exit the detention tank via an overflow pipe.

For additional information refer to **Appendix H** for the conceptual stormwater drainage drawings.

The Q₂₀ event was the controlling event for calculation of required stormwater detention volume. A summary of the Rational based methods for detention calculations is attached within **Appendix F**.

Table 5 - Detention Tank Capacity

Pre-Developed Q ₂₀ (m ³ /s)	Developed Q ₂₀ (m ³ /s)	Vs Culp (m ³)	Vs Boyd (m ³)	Vs Carroll (m ³)	Vs Basha (m ³)	Vs Average (m ³)
0.089	0.074	2.7	6.1	2.9	4.4	4.0

4.6 Conveyance of Upstream Catchment

It is proposed that runoff from the minor upstream catchment be conveyed onto the site and caught in an Aco drain at the base of the courtyard retaining wall on the southern boundary of the development. A Manning's calculation was performed on the 200mm wide Aco drain (2% grade), which demonstrated that it has sufficient capacity to convey the major event. The summary of these calculations can be seen in **Table 6** below.

Table 6 – Conveyance of Upstream Catchment

Depth (mm)	Base Width (m)	Top Width (m)	Slope (%)	Required Capacity (m ³ /s)	Design Capacity (m ³ /s)
150	0.2	0.2	2	0.035	0.072

4.7 Onsite Detention Lifecycle Costs

A lifecycle cost analysis is not a part of the scope of this report. All stormwater infrastructure associated with the development shall be maintained and serviced by the owners of the development at no cost to Council.

4.8 Flooding Considerations

A Floodwise Property Report has been obtained for the site, which indicates that the subject site is in an area burdened by flooding from riverine. The Floodwise reports, detail a minimum habitable floor level of 3.2m AHD across the subject site. The current lowest ground level across the site is approximately 4.2m AHD which is well above the advised minimum habitable floor level. The Floodwise Property Report can be found in **Appendix I**.

5 STORMWATER QUALITY ASSESSMENT

This assessment identifies issues relating to stormwater runoff quality and assesses possible methods of treatment if required. The aim of this section of the report is to determine practical approaches to achieving improvements in the quality of the stormwater run-off from the site that can be readily implemented and as set out by the State Planning Policy.

This section will address following:

- Roof, pavement and hardstand runoff to relevant treatment devices;
- Landscaping runoff;
- Ensuring treatment device selection criteria are in accordance with Industry Best Practice and, WSUD Engineering Guidelines.

5.1 Site Analysis and Design Strategy

Currently no quality stormwater management measures are in place for the subject site. As the site area is less than 2,500m² no specific stormwater quality targets need to be achieved through the treatment train as per the Stormwater Code in Brisbane City Plan 2014 for high risk developments. However, as a Superior Design Outcome, it is proposed to improve the quality of the runoff via incorporation of a combination of Enviropods and Stormfilter cartridges, and on-site rainwater re-use. Section A of the Stormwater Code is applicable to the site. For the response to this code, please see **Appendix C**.

Best-management practice for stormwater treatment measures are to be implemented for the development and will consist of:

- Two 200s *EnviroPod* litter baskets placed within inlet pits, and
- A 3L/s Stormwater 360 *ZPG Stormfilter*

Roofwater runoff from the proposed structure will initially be directed to the above ground poly combined detention/re-use tank before outletting to a Stormwater360 Stormfilter Manhole (housing 3 filter cartridges) via one of two 200s *EnviroPod* litter basket\ prior to discharging from the site.

Courtyard runoff from the southern courtyards will discharge to a Stormwater360 Stormfilter Manhole (housing 3 filter cartridges) via one of two 200s *EnviroPod* litter basket\ prior to discharging from the site.

It is planned that stormwater that infiltrates the basement carpark will be discharged upstream of the *EnviroPod* treatment devices before discharging directly to the kerb and channel. However, pending the findings of the acid sulfate study these flows may require treatment on-site prior to discharge.

Internal hydraulic stormwater drainage shall be designed and constructed in accordance with AS3500.3 and all other relevant standards and guidelines.

For further information on the stormwater layout plan, refer to **Figure DA04 in Appendix H**.

5.2 Construction phase

During the construction phase of this development, there is a higher risk of sedimentation transport during construction due to the large areas of disturbed land. A sediment and erosion control plan is required for the lodgement of operational works and the following construction phase of the development.

A sediment and erosion control plan is required for the lodgement of operational works and shall be implemented during the construction phase of the development as follows:

Stage 1: Pre construction

- › All erosion and sediment control (ESC) devices are to be installed prior to any earth disturbing activities.

Stage 2: Construction

- › All ESC devices are to be maintained to operational levels, as specified in the management plans and drawings.
- › The maintenance plan needs to be in accordance with the Water by Design Construction and Establishment Guidelines.
- › During Excavation, the contractor shall provide a temporary sediment basin (sump pit) and pump out stormwater only once the water has settled and has achieved an acceptable quality to the satisfaction of Local Council (i.e. no turbidity and acceptable pH levels).
- › Once the lower basement floor slab is poured, the lift pit will serve as the temporary sediment basin with treatment and discharge carried out as stated above.

Stage 3: Pre-Operational Stage (all disturbed areas stabilized, 90% of all structures completed)

- › Property owner to implement a maintenance plan to ensure correct establishment of plants.
- › All ESC devices can be removed only if approved by the superintendent and engineers.

5.3 Operational phase

Once directed to be commissioned by the superintendent and engineers, the Stormwater Quality Improvement Devices (SQIDs) will provide the required level of stormwater quality treatment to runoff from the site prior to discharging into Council's stormwater drainage infrastructure. It is expected that sediment laden runoff and the erosion potential at the subject site during the operational phase will be minimal. This is due to the high amount of permanent impervious area in the form of roofs, paths, courtyards, driveways and other impervious structures. The proposed landscaped areas will be maintained in a manner that will minimise erosion.

Existing grassed and proposed landscaped areas will be maintained in a manner that will minimise erosion, some of which would be subject to erosion of top soil from garden beds, erosion of soil from behind retaining walls, etc.

Groundwater infiltration shall be collected and diverted to one of the two *EnviroPod* treatment devices prior to discharge to the Council drainage system. If deemed necessary by the Acid Sulfate study additional treatment will be provided to groundwater flows prior to stormwater discharging from the site. Details of the drainage path to the *EnviroPod* shall be provided by the Hydraulic engineer.

5.4 Design/Modelling Approach

5.4.1 EnviroPod

It has been assumed for the purposes of modelling that two (2) EnviroPods are required to collect stormwater runoff from the roof area and courtyard area. The EnviroPods will remove the majority of suspended soils and helps to provided more efficient treatment for the Stormfilter. The MUSIC Model Data for the enviropod can be found in **Appendix K**.

EnviroPod litter baskets consists of a steel frame and a cage. Within the cage a screening bag is attached to capture litter, debris, sediment and other pollutants from stormwater flows. The mesh size of the screening bag proposed for each *EnviroPod* within the site is to be 200 micro-meters. The

mesh size is small enough to capture heavy metals and hydrocarbons associated with solids in the stormwater flows.

5.4.2 Stormfilter

The 3L/s Stormfilter in the MUSIC Model below provides treatment for stormwater for the site after the stormwater has been treated by the Enviropods. The data from the MUSIC Model can be found in **Appendix K**.

5.4.3 Treatment Train

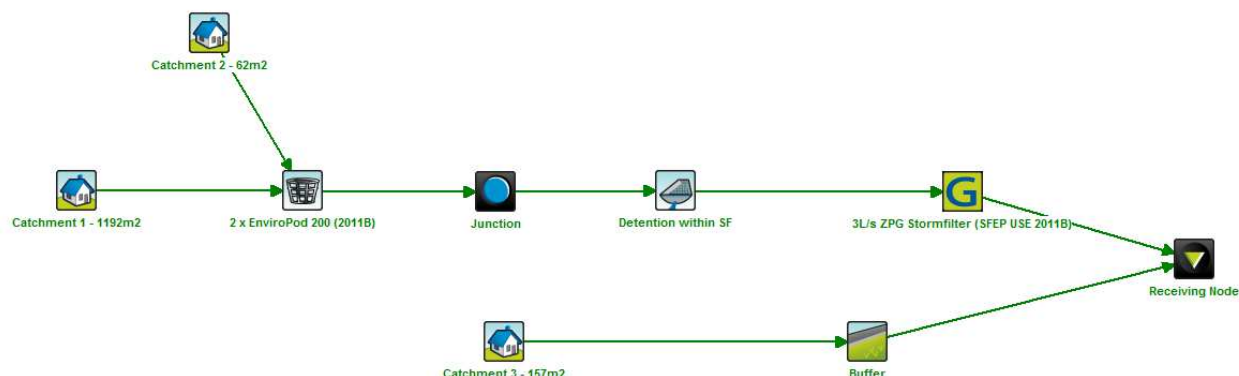


Figure 6 – MUSIC Modelling Treatment Train

Figure 6 above shows the treatment train for the subject site, the sizing of the above treatment devices is governed by reaching the reduction factors outlined in the SPP.

Appendix H shows the Stormwater Layout Plan. The roof and courtyard areas are treated by Enviropods, and Stormfilters. The 3L/s StormFilter discharges east to the stormwater gully pit within Abbotsford Road adjacent to the development.

5.5 Pollutant Modelling Results

	Sources	Residual Load	% Reduction
Flow (ML/yr)	1.39	1.39	0
Total Suspended Solids (kg/yr)	67.7	14.2	79
Total Phosphorus (kg/yr)	0.267	0.119	55.4
Total Nitrogen (kg/yr)	2.92	1.75	39.9
Gross Pollutants (kg/yr)	33.1	2.8	91.6

Figure 7- MUSIC Modelling Treatment Train Effectiveness

Figure 7 above shows the effectiveness of the treatment train based on the MUSIC modelling.

5.6 Asset Handover

All proposed devices will be installed on private land and will be maintained at no cost to council. Maintenance will be performed regularly to ensure all Stormwater Quality Improvement Device (SQID) remain in serviceable condition.

5.7 Maintenance of Enviropods and Stormfilters

Maintenance for a Stormwater 360 Stormfilter is required every 12 months and an Enviropod every 3 to 6 months. This maintenance can be provided by Stormwater 360 Australia. **Appendix J** has a detailed description provided by Stormwater 360 Australia of how to maintain and carry out maintenance on the proposed SQIDs for this site.

5.8 Lifecycle Costs

A lifecycle cost analysis is not a part of the scope of this report. All the recommended water quality treatment infrastructure lies within the development site and it shall be maintained and serviced by the owners of the development at no cost to Council.

5.9 Water Quality Monitoring

No water quality monitoring is proposed for this development at this stage due to the nature of the development and the fact that no monitoring currently takes place.

5.10 Compliance With SPP Guideline: State Interest – Water Quality

The State Planning Policy (SPP) Guideline concerning water quality (August 2014) was made effective on the 2nd of December 2013. Part C of the guidelines concern development assessment. The objective of Part C is stated on page 16 of the guidelines and is also reproduced below:

“...to ensure development is planned, designed, constructed and operated to manage stormwater and wastewater in ways that support the protection of receiving waters environmental values.”

In undertaking this SMP, ADG have considered the requirements of this policy. Although the proposed treatment train does not meet the targets listed in the State Planning Policy, they provide a Superior Design Outcome compared with an arrangement which proposes no SQID's.

Refer also to the applicable completed development assessment code in **Appendix C** for demonstration of compliance with the policy (stormwater only).

6 WATER AND SEWER EP

Under the current BCC Planning Scheme, the subject site is currently zoned as Emerging Community (see **Figure 8** below).

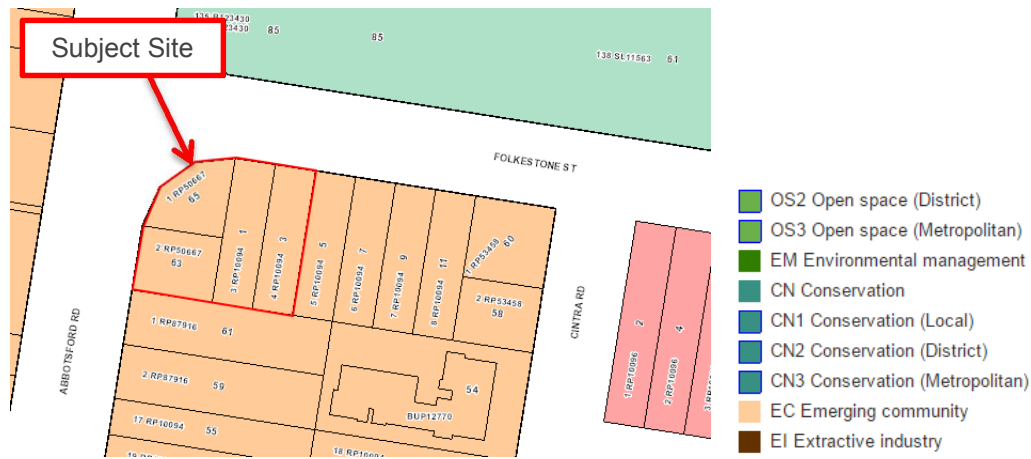


Figure 8 – BCC Current Zoning

Further to the BCC zoning, the subject site is also currently zoned as a Residential High Intensity Zone, Montpelier Precinct of the Bowen Hills Urban Development Area Development Schemed under the current EDQ zoning (see **Figure 9** below).

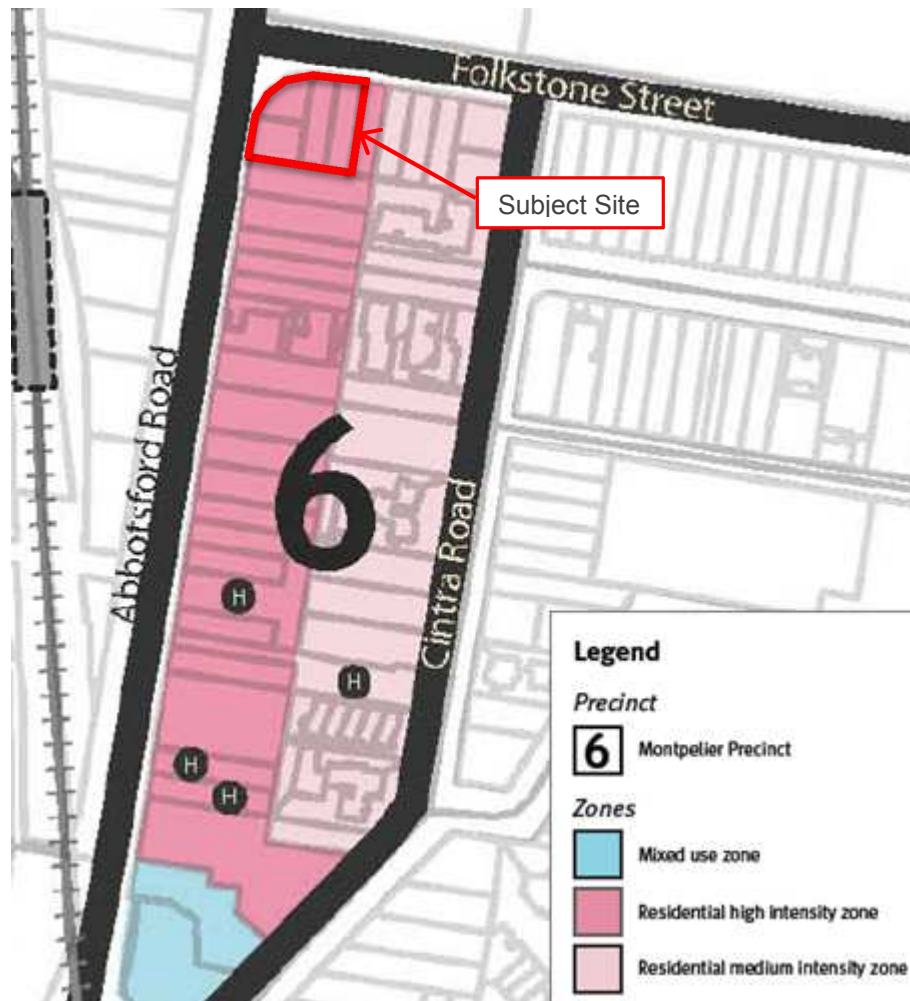


Figure 9- EDQ Current Zoning

The number of equivalent persons (EP) was used to calculate the demand rates of the proposed water and sewerage reticulations. For the development, the EP was calculated by applying population densities outlined in the Southeast Queensland (SEQ) Water Supply and Sewerage Design and Construction Code (SEQ WS&S D&C Code) Table A6.

The development density was calculated using 77 attached dwellings, which were modelled as 1.79 EP/dwelling.

Table 7 provides a summary of the EP calculations explained above.

Table 7 – Proposed Density

Use	Development Areas / Dwellings	Criteria	EP
Residential	77 Attached Dwellings	1.79 EP per dwelling	137.83
Total EP			137.83

7 WATER SUPPLY

7.1 Existing Infrastructure

A BCC eBIMAP search identified water infrastructure relevant to the subject site. This search showed that there is a 225mm CISL water reticulation main running along Abbotsford Road, adjacent to the site frontage. An additional 150mm CISL water reticulation main is also located along Folkestone Street on the opposite side to the proposed development. Please refer to the eBIMAP information in **Appendix E** for further information regarding the existing water infrastructure.

Current property connections to the water service mains on Folkestone Street and Abbotsford Road exist for the properties located on the subject site with frontage to Folkestone Street and Abbotsford Road respectively.

QUU is to be engaged via a SAN request to confirm impacts on the water reticulation network that will service the development.

7.2 Criteria

Table 4.1 of the South East Queensland (SEQ) Design & Construction Code Design Criteria (Version 1 July 2013) specifies the water demand criteria for the development. The water reticulation calculation criteria used in the assessment have been summarised below in **Table 8**.

Table 8 - Criteria for Water Demand

	Potable Water Supply
Average Daily Demand (AD)	230L/EP/Day
Non-Revenue Water	30 L/EP/Day
Mean Day Maximum Month (MDMM)	1.5 x AD
Peak Day (PD)	2.0 x AD
Peak Hour (PH)	3.5 x AD

7.3 Proposed Demand

Table 9 illustrates the expected site demand for the proposed development.

Table 9 - Expected Water Demand

Use	Proposed Development	Criteria	EP	AD Demand (L/s)	PH Demand (L/s)
Residential	77 Attached Dwellings	1.79 EP per dwelling	137.83	0.37	1.28
Total			137.83	0.37	1.28

7.4 Point of Connection

ADG Engineers anticipate that the proposed development will be connected to the existing QUU main along Abbotsford Road via replacement of the existing property connection to 63 Abbotsford Road. All other existing property connections are to be plugged at the main. Details of the proposed connections will be provided at the detailed design stage.

QUU is to be engaged via a SAN request to confirm impacts on the water reticulation network that will service the development.

8 SEWERAGE RETICULATION

8.1 Existing Infrastructure

A BCC eBIMAP search identified sewerage infrastructure relevant to the subject site. This search showed that there are QUU 150mm EW sewerage reticulation mains running along both Abbotsford Road and Folkestone Street, adjacent to the respective site frontages. The eBIMAP search also identified an additional 750mm CUR trunk sewerage reticulation main running along Folkestone Street on the opposite side to the development. It is worth noting that there is a Priority Infrastructure trunk sewer main to be completed in 2015, as described in **Section 1.4** of this report.

A sewerage easement has also been identified on the eBIMAP search. The easement located adjacent to and runs parallel with the sites southern boundary and houses a 150mm EW sewer main. Refer to the eBIMAP information in **Appendix E** for further information regarding the existing sewerage infrastructure.

8.2 Criteria

Table 10 of the SEQ WS&S D&C Code specifies the following sewage loading criteria for the development which is summarised below in **Table 10**

Table 10 – Existing Sewage Loading Criteria

	Sewer Loading
Average Dry Weather Flow (ADWF)	180L/EP/Day
Peak Dry Weather Flow (PDWF)	$d * SF + GWI$
Peak Wet Weather Flow (PWWF)	PDWF + RDF
Sanitary Flow (SF)	150L/EP/Day
Groundwater Infiltration (GWI)	30L/EP/Day
Rainfall Dependant Inflow (RDF)	360L/EP/Day
Peak Dry Weather Factor (d)	7.173 (interpolated from Table 10 of the SEQ WS&S D&C Code)

8.3 Flow Estimation

In accordance with the SEQ WS&S D&C Code, the expected site loading for the proposed development is presented in **Table 11**.

Table 11 – Expected Sewerage Loading

Use	Proposed Development	Criteria	EP	ADWF (L/s)	PWWF (L/s)
Residential	77 Attached Dwellings	1.79 EP per dwelling	137.83	0.29	2.34
Total			137.83	0.29	2.34

8.4 Point of Connection & Proposed Design

It is proposed that the site is to connect to the QUU 150mm EW sewer main in Folkestone Street along the northern boundary of the proposed development.

QUU will be engaged via a SAN request to confirm future impacts on the sewer reticulation network that will service the development.

9 ELECTRICAL SUPPLY

According to the DBYD and survey information, the following electrical infrastructure is located within the vicinity of the subject site:

- Overhead power lines along Folkestone Street adjacent to the site frontage.
- Low voltage underground electrical cabling adjacent to the site frontage on both Folkestone Street and Abbotsford Road.
- BCC traffic system cabling located beneath Abbotsford Road adjacent to the site frontage.

The survey and DBYD data can be found in **Appendix B** and **Appendix L** respectively.

ADG recommends that an electrical engineer should calculate the maximum demand of the proposed development and issue a request for a new supply to Energex.

10 COMMUNICATIONS

According to DBYD information, the following communications infrastructure is located within the vicinity of the subject site:

- Optus underground fibre optic cable network running along the Abbotsford Road adjacent to the subject site.
- Telstra underground services along Folkestone Street and Abbotsford Road adjacent to the respective site frontages
- Telstra underground services extending off the aforementioned main lines on Folkestone Street and Abbotsford Road into the site of the proposed development.
- NBN fibre optic cable located beneath Abbotsford Road on the opposite side of the road to the development.
- BCC fibre optic cabling and bits located adjacent to the site frontage on Abbotsford Road and the corner of Abbotsford Road and Folkestone Street.

The DBYD data can be found in **Appendix L**. It is proposed that the telecommunications consultant will negotiate the requirements of the proposed development telecommunications connection and the extent of any upgrading and possible relocation works to the system if necessary.

11 GAS

DBYD records indicate APA Group have a live gas line is located along Abbotsford Road adjacent to the development which bends around the Abbotsford Road and Folkestone Street corner and continues in an easterly direction along Folkestone Street adjacent to the sites northern boundary. Lots 1 and 3 Folkestone Street have gas property connections extending into the property off the Folkestone Street gas line while 65 Abbotsford Road has a property connection extending into the property off the Abbotsford Road line. Lot 63 Abbotsford Road does not appear to be connected to a gas line.

Additionally, the DBYD records indicate that an idle APA Group gas main is also located beneath Abbotsford Road adjacent to the subject site.

It is proposed that the development be connected to this main, should gas reticulation be deemed necessary to the development. The DBYD data can be found in **Appendix L**.

12 CONCLUSIONS

The site appears to be adequately serviced by reticulated water, stormwater infrastructure, sewerage, communications, gas and electricity. These services will need to be connected during development. Information discussed in this report is inferred from DBYD records and survey information.

As outlined in **Section 4** of this report, a detention tank with a volume of 4m³ will be able to provide sufficient detention to reduce all flows to pre-development levels. Additionally, a 3m³ re-use irrigation volume, in addition to enviropods, and stormfilter cartridges, will provide more than sufficient quality treatment for stormwater on the site.

In preparing this report, we have achieved all requirements for Stormwater Management Plans as described in QUDM standards, as well as a Superior Design outcome for water quality as required by the Urban Stormwater Quality Planning Guidelines 2010, the SPP, Brisbane City Council standards and Brisbane City Council City Plan 2014 for site of this size.

Detailed engineering diagrams and management requirements for the proposed development are to be produced prior to any works commencing on site with design certification prepared by a qualified stormwater engineer or scientist.

Appendix A

Mode Architectural Drawings



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FOLKESTONE STREET

ABBOTSFORD ROAD

LIGHT INDUSTRY

RESIDENTIAL

■ SITE LOCATION PLAN

■ PROPOSED MULTI-UNIT DWELLING
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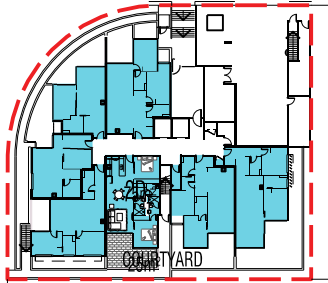
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DEVELOPMENT SUMMARY				
PROPERTY ADDRESS 63, 65 Abbotsford Rd Bowen Hills 4006 1, 3 Folkestone St Bowen Hills 4006				
RPD Lot 1, 2 on RP50667 Lot 3, 4 on RP10094				
Ward:HAMILTON				
Total Site Area: 1367m²				
RESIDENTIAL ACCOMODATION	GF	L02-08 (Sub-Total)	L09	Total
1 Bed	2	2 (14)	-	16
2 Bed	5	6 (42)	6	53
3 Bed	-	1 (7)	1	8
Total	7	9 (63)	7	77
ACCESSIBLE UNITS	GF	L02-08 (Sub-Total)	L09	Total
1 Bed	2	2 (14)	-	16
Total Accessible Units				16 or 21%
CAR PARKING SUMMARY				
REQUIRED				
Bowen Hills Urban Development Scheme				
Car Parking Ratios:				
For Residential: On average - 1 space per dwelling (Including visitors)				
	No. of Units	Rate		
1, 2 & 3 Bed	77	1		77
Total Required				82.8
PROVIDED				
	Resident	Visitor		
Ground Floor	-	1		
Basement Level 01	28	-		28
Basement Level 02	28	-		28
Basement Level 03	30	-		30
Total Provided	86	1		87

AREA STATISTICS		
GROSS FLOOR AREA		
		m²
Level 01 Ground		544
Level 02		769
Level 03		769
Level 04		769
Level 05		769
Level 06		769
Level 07		769
Level 08		769
Level 09		696
Gross Floor Area		6620
Site Area		1367
Plot Ratio		4.8
SITE COVER		
	m²	%
Site Area	1367	
Site Cover	1006	73.5
COMMUNAL OPEN SPACE		
	m²	
Communal Recreation	102	

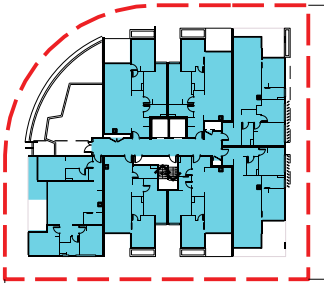
GROSS FLOOR AREA



LEVEL 01 GROUND
GFA: 544m²

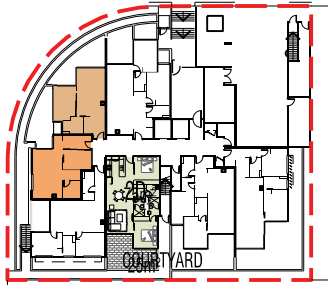


LEVEL 02-08
GFA: 769m²

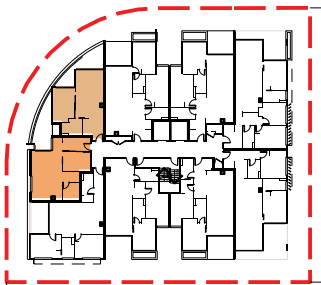


LEVEL 09
GFA: 696m²

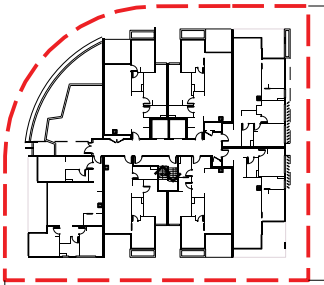
ACCESSIBLE UNITS



LEVEL 01 GROUND
ACCESSIBLE UNITS: 6&7

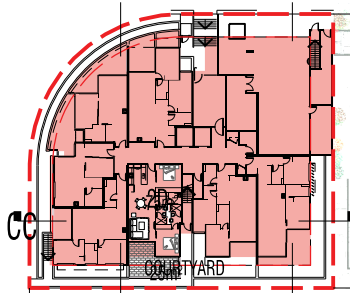


LEVEL 02-08
ACCESSIBLE UNITS: 8&9

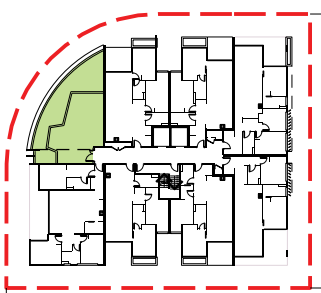


LEVEL 09

AREA CALCULATIONS



LEVEL 01 GROUND
SITE COVER 1006m²



LEVEL 09
COMMUNAL OPEN SPACE 102m²

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Abbotsford Road, Multi-unit Development
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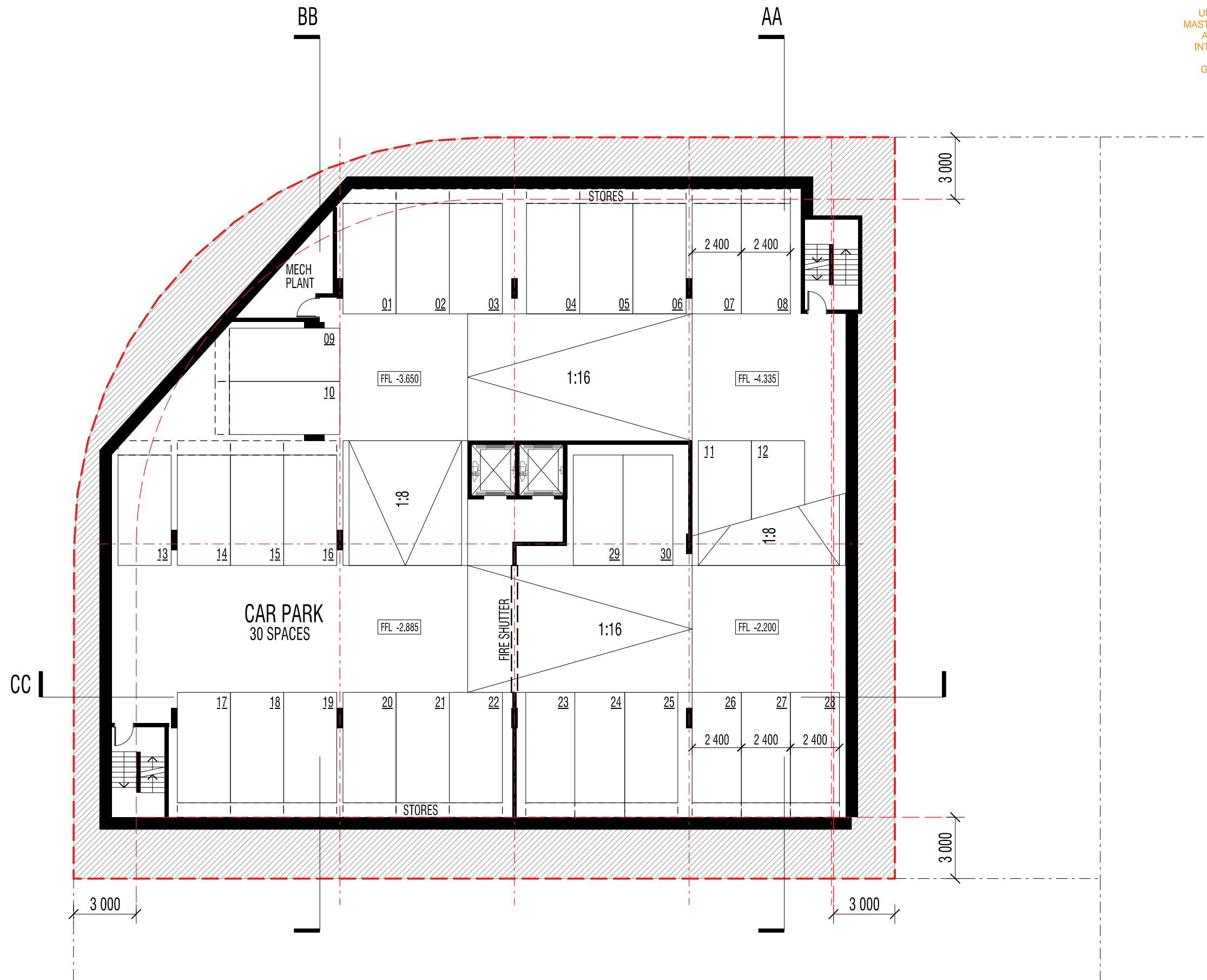
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■ BASEMENT 03

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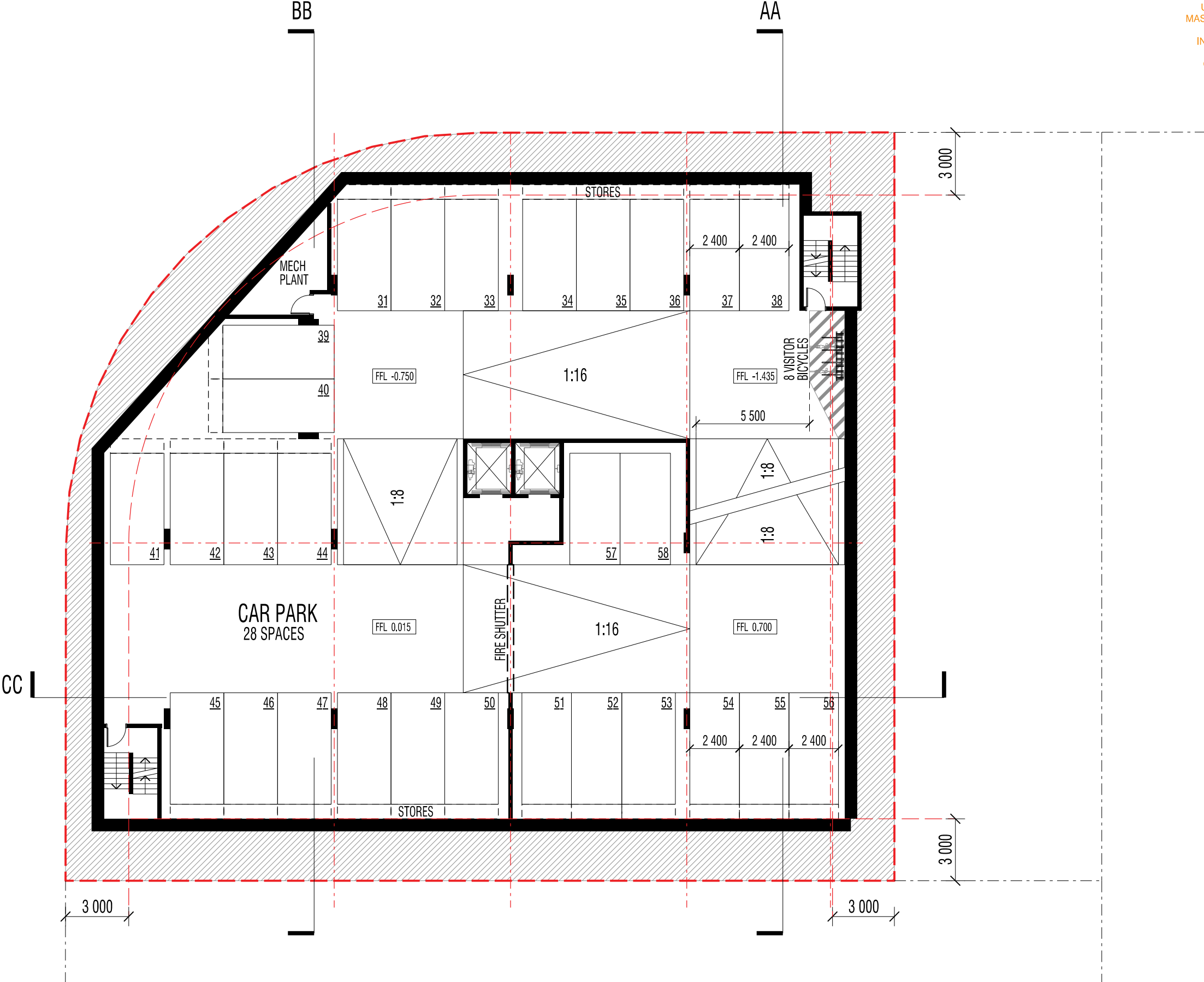
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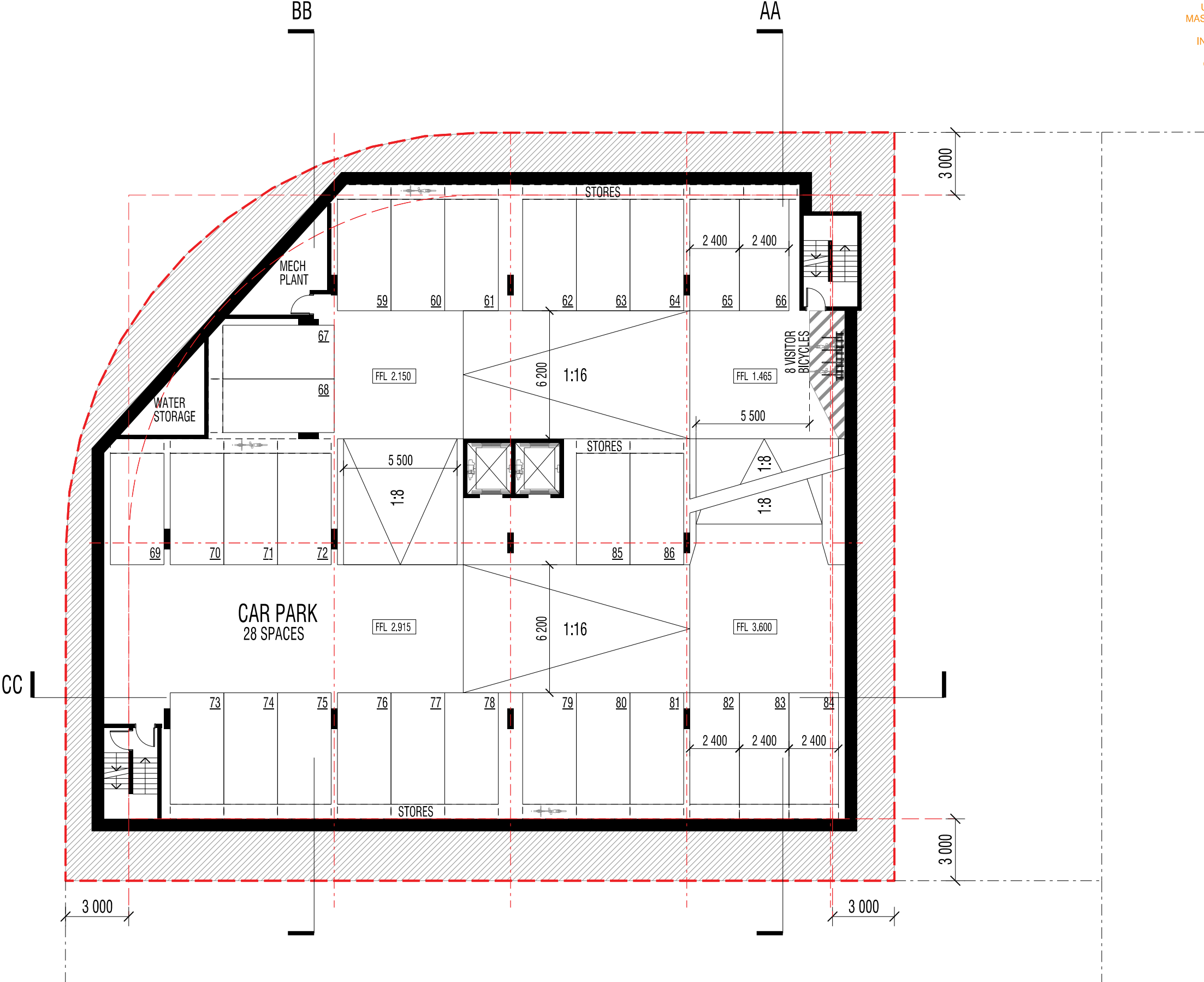
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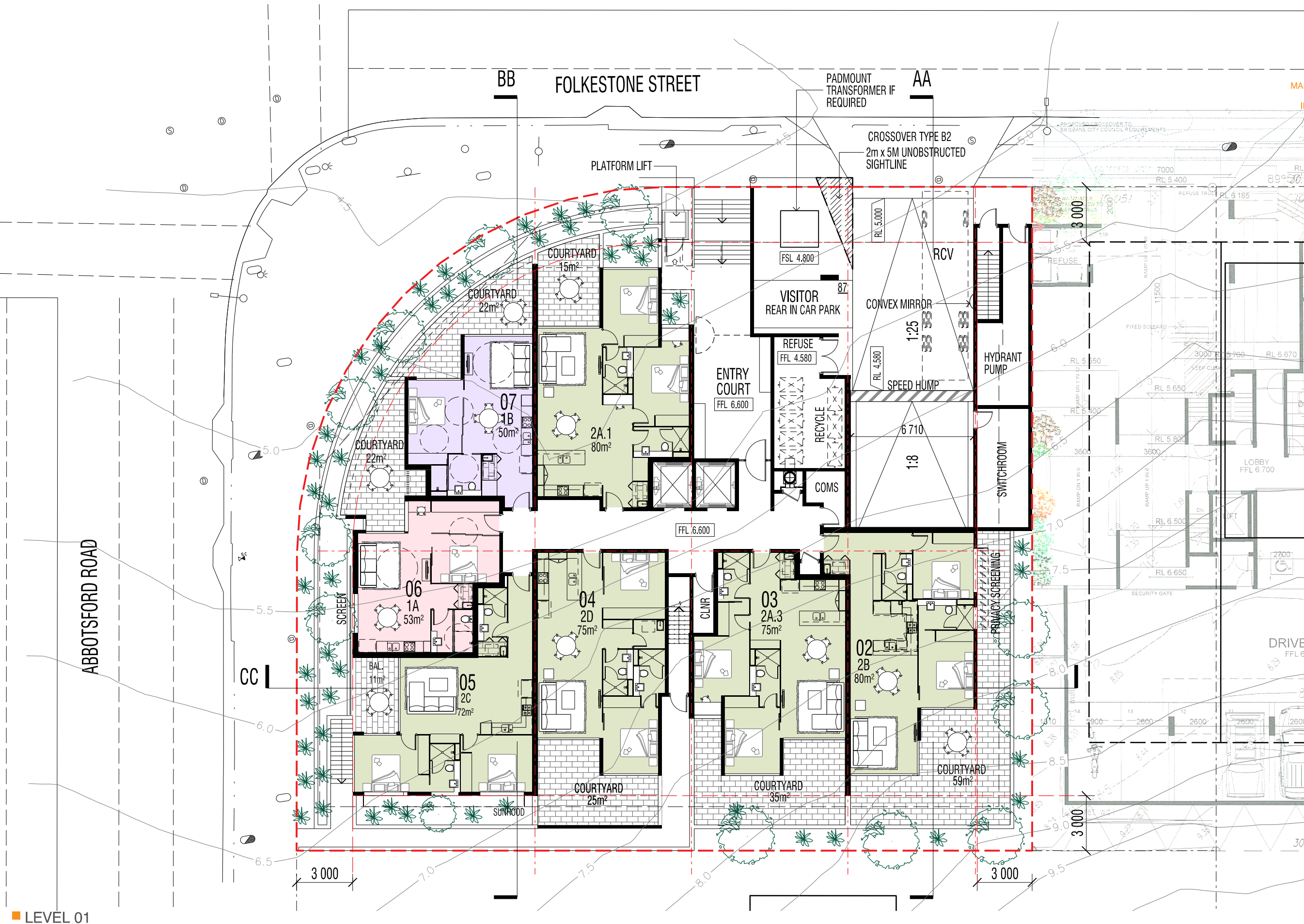
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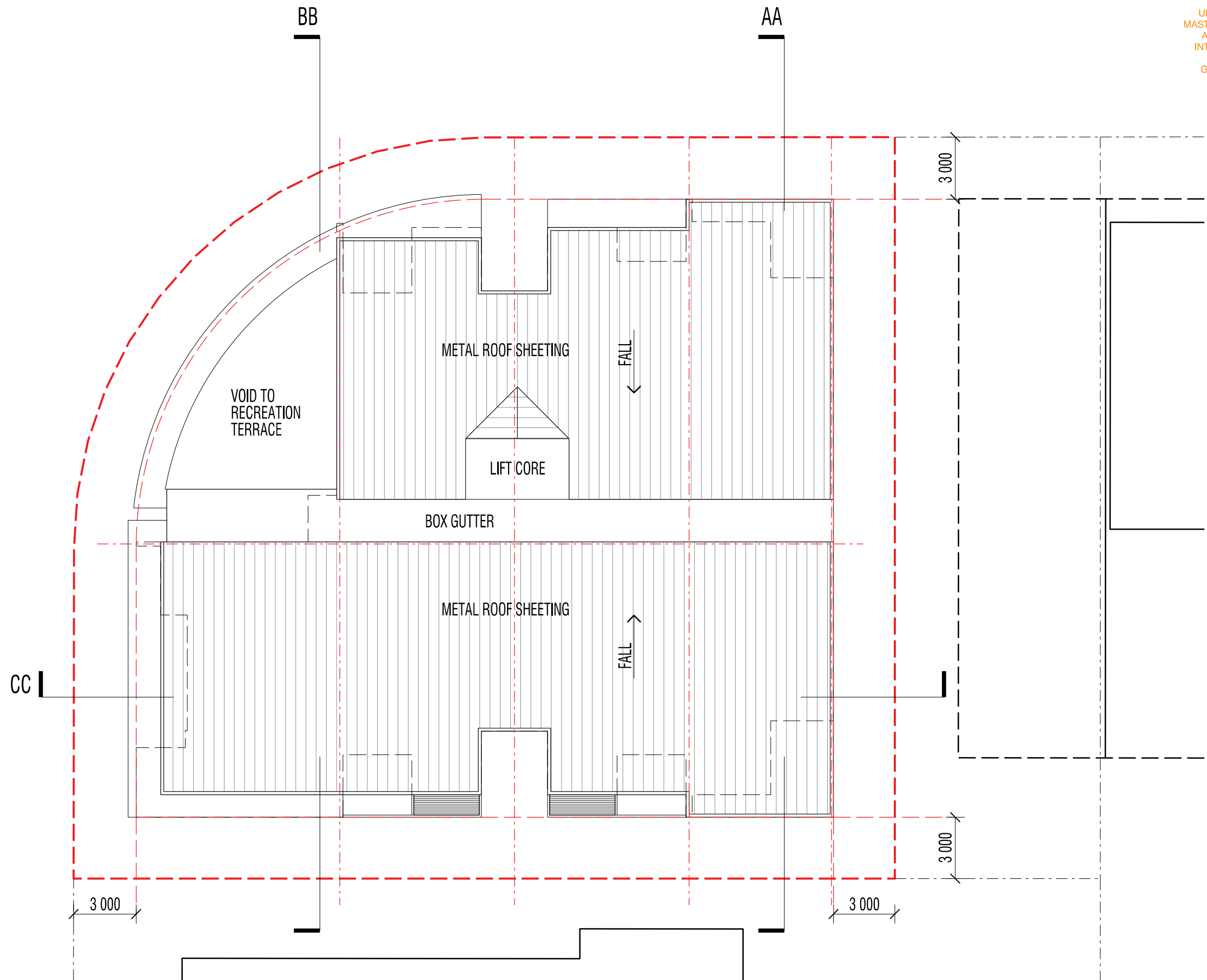
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■ NORTH ELEVATION

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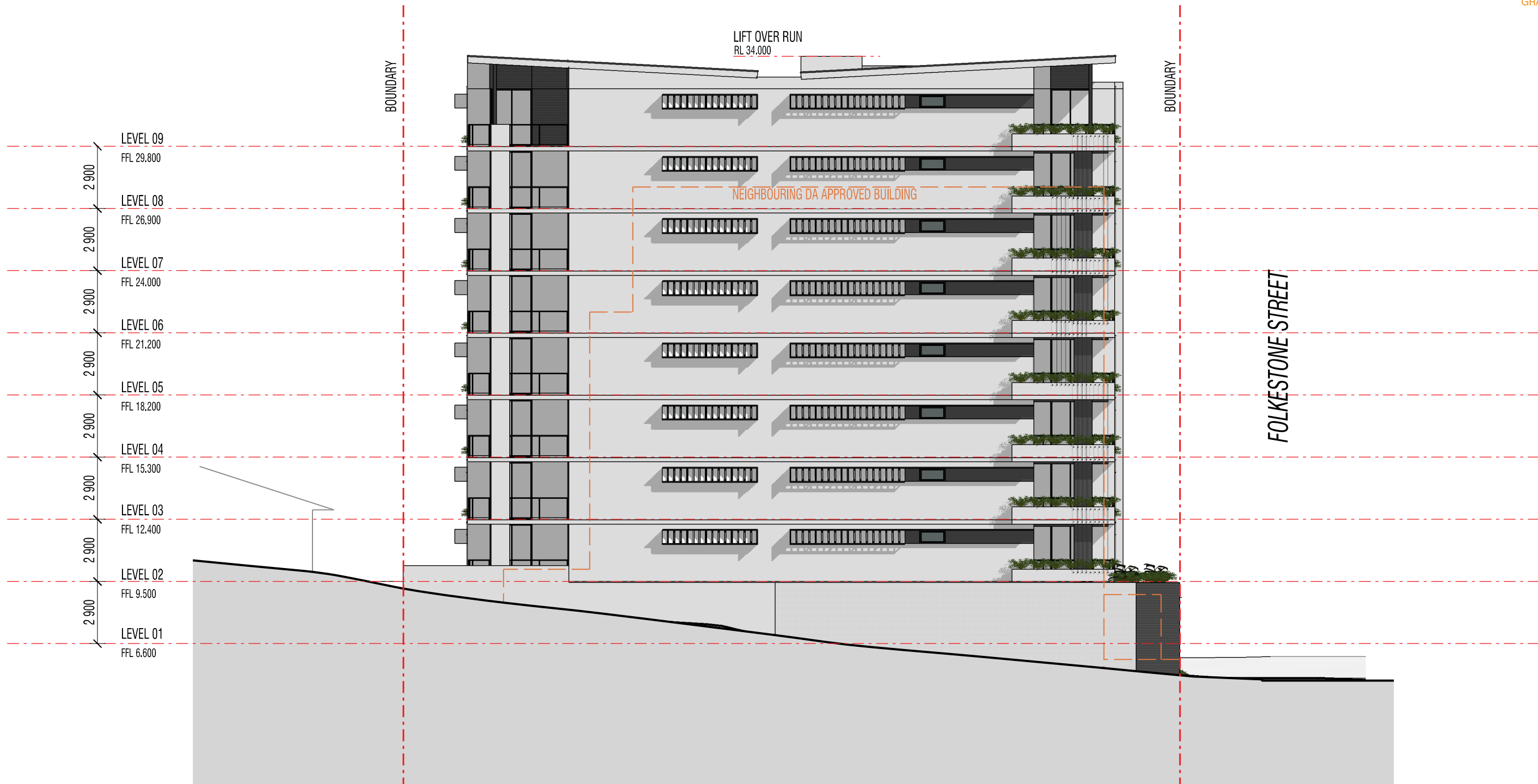
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EAST ELEVATION

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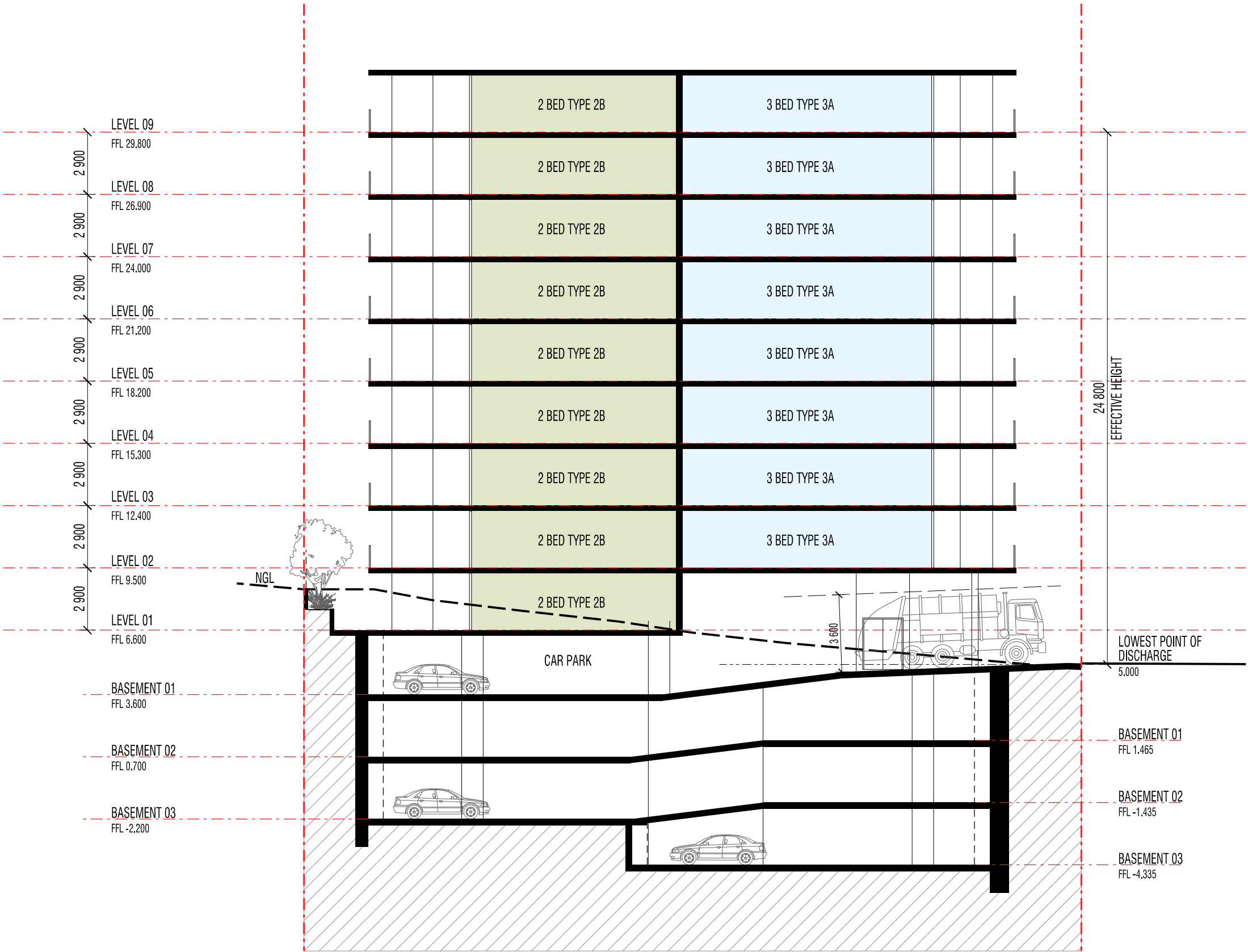
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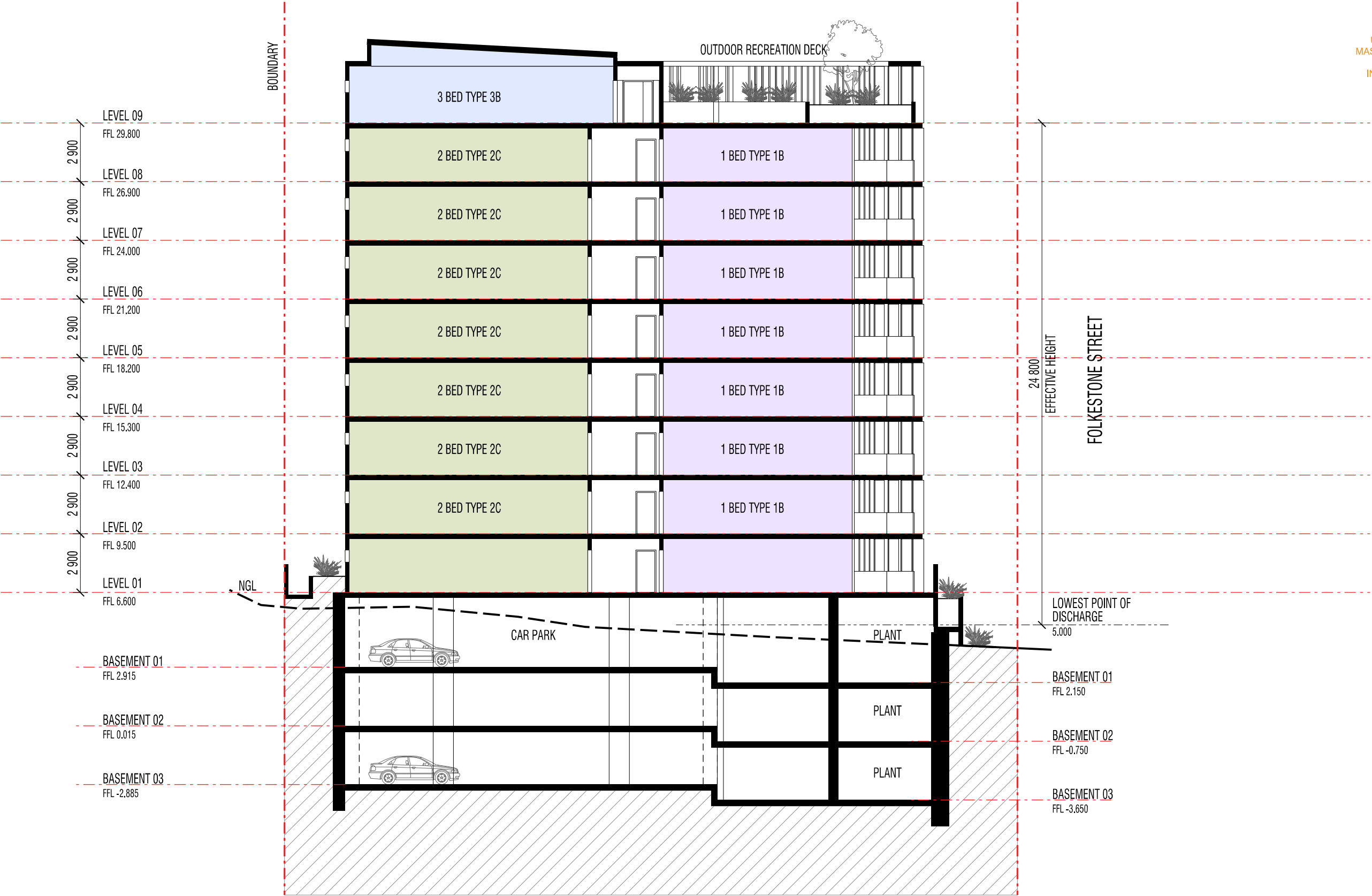
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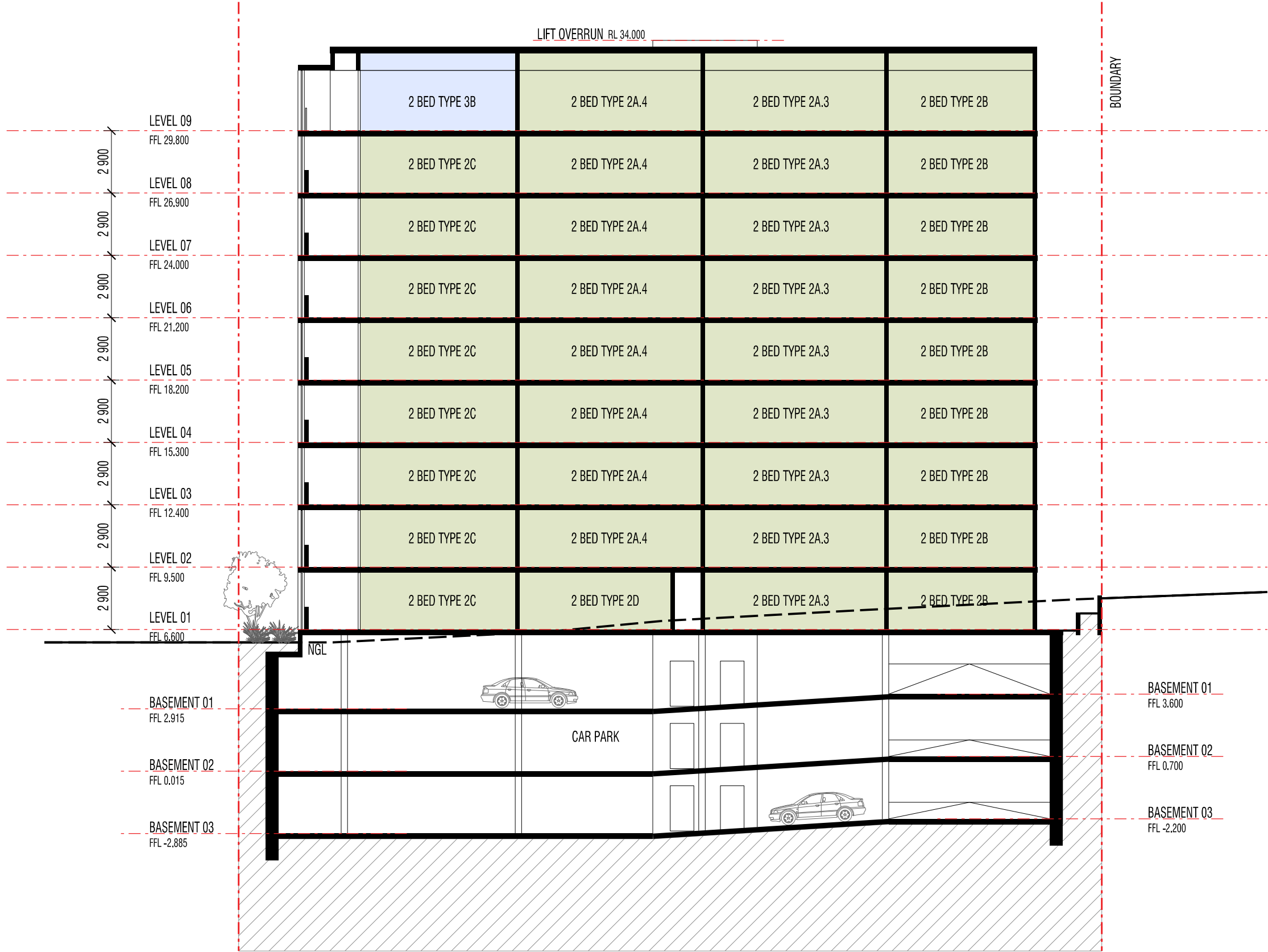
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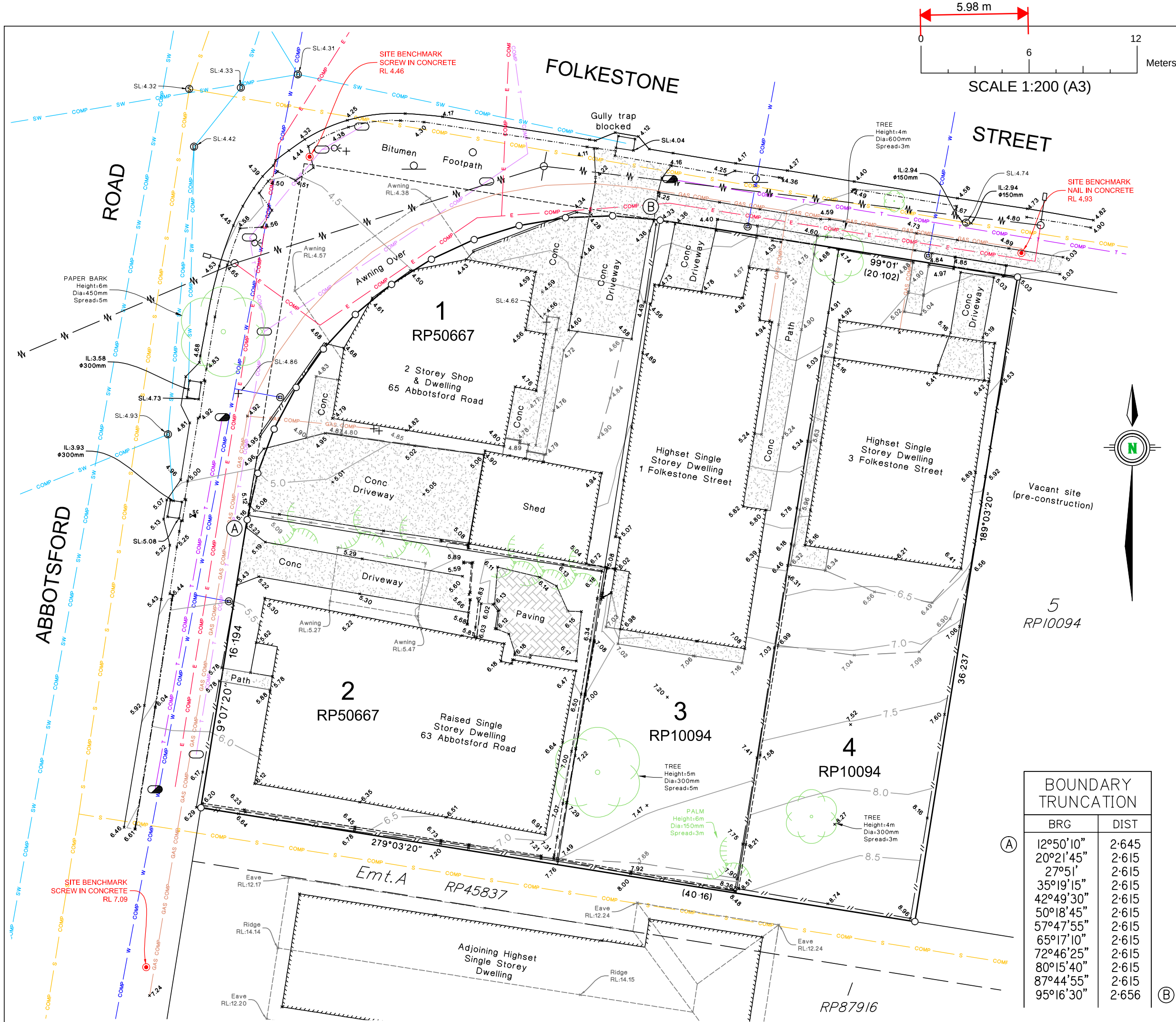
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PROJECT No: 15367BNE
DATE: 24.09.15
SCALE: 1:250@A3
DRAWING No: SK302

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Appendix B

FOCUS Survey



Client
Rise Projects

Project
Detail Survey of 1, 3 Folkestone St & 63, 65 Abbotsford Rd, Bowen Hills

Described as
Lots 3-4 on RP10094 & Lots 1-2 on RP50667

Scale: 1:200 at A3
Datum: AHD vide CORS
RL: -
Contour Int: 0.5m

Locality: Bowen Hills
LGA: Brisbane
Cadfile: RPR-304.DET.01 A

B INITIAL ISSUE
A FIRST DRAFT
Issue Description

SS 24.08.15 MP
PDS 21.08.15 MP
Drw Date Appd

NOTES The title boundaries shown hereon were not marked at the time of survey and have been compiled from IS254549. Services shown hereon have been located where possible by field survey. Prior to any demolition, excavation or construction on the site, the relevant authority should be contacted for possible location of further underground services and detailed locations of all services.

LEGEND		
AWN	Awning / eave	---
BIN	Bin	○
BU	Building	▬▬▬▬▬▬
BW	Bottom of wall	----
CG	Change of grade	---
ECO	Edge of concrete	---
ELP	Light Pole	○—□
EP	Electrical Pole	○—
FHY	Fire Hydrant	⊕
FNC	Fence	—//—
KCL	Kerb lip	---
KTB	Kerb top back	---
SGN	Traffic sign	○
SMH	Sewer Manhole	⊙
SWM	Stormwater Manhole	⊕
TB	Top of Bank	---
TEP	Telstra Pit	⊙
TRL	Traffic lights	⊕
TRP	Traffic Pit	○
TW	Top of wall	---
WMT	Water Meter	⊕
WV	Water Valve	⊕
UNDERGROUND SERVICES COMPILED		
Sewer main	S COMP	---
Stormwater drainage	SW COMP	---
Water main	W COMP	---
Telstra supply	T COMP	---
Traffic supply	T COMP	---
Gas supply	GAS COMP	---
Electricity supply	E COMP	---

FOCUS
ON SURVEYING

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info@focussurvey.com.au ph 3338 5095
a Suite 6, 214 Waterworks Road . Ashgrove . QLD . 4060

Sheet No.
1 of 1

Surveyed By:
PDS

Date Surveyed:
18.08.15

Dwg. No.
RPR-304.DET.01

Issue
A

Appendix C

BCC Code Response

PERFORMANCE OUTCOMES	ACCEPTABLE OUTCOMES	COMMENTS
Section C - Criteria for self-assessable and assessable development		
PO1 Development for filling or excavation minimises visual impacts from retaining walls and earthworks.	AO1 Development ensures that the total height of any cut and fill, whether or not retained, does not exceed: a) 2.5m in a zone in the Industry zones category; b) 1m in all other zones, or if adjoining a sensitive zone.	✓ To be confirmed during operational works phase.
PO2 Development of a retaining wall proposed as a result of filling or excavation: (a) is designed and constructed to be fit for purpose; (b) does not impact adversely on significant vegetation; (c) is capable of easy maintenance. Editor's note—A retaining wall also needs to comply with the Building Regulation and embankment gradients will need to comply	AO2.1 Development of a retaining structure, including footings, surface drainage and subsoil drainage: a) is wholly contained within the site; b) if the total height to be retained is greater than 1m, then: i. the retaining wall at the property boundary is no greater than 1m above the ground level; ii. all further terracing from the 1m high boundary retaining wall is 1 vertical unit:1 horizontal unit; iii. the distance between each successive retaining wall (back of lower wall to face of higher wall) is no less than 1m horizontally to incorporate planting areas.	✓ Retaining walls to be contained fully within the site. Refer to Architectural Drawings

Solution: ✓ = Acceptable Solution
A/S = Alternative Solution
N/A = Not applicable to this proposal

PERFORMANCE OUTCOMES	ACCEPTABLE OUTCOMES	COMMENTS
with the Building Regulation. Note—Guidance on the protection of native vegetation is included in the Biodiversity areas planning scheme policy.	AO2.2 Development of a retaining wall over 1m in height protects significant vegetation on the site and on adjoining land and is designed and constructed in accordance with the structures standards in the Infrastructure design planning scheme policy and certified by a Registered Professional Engineer Queensland.	NA
	AO2.3 Development provides a retaining wall finish that presents to adjoining land that is maintenance free if the setback is less than 750mm from the boundary.	NA
	AO2.4 Development for filling only uses clean fill that does not include any construction rubble or debris.	To be noted on operational works documents and addressed during construction stage
PO3 Development ensures that a rock anchor is designed and constructed to be fit for purpose.	AO3 Development ensures that a rock anchor: a) is constructed in accordance with the standards in the Infrastructure design planning scheme policy; b) where it extends beyond the property boundary, is supported by a letter of consent from the adjoining land and building owners.	To be addressed during detailed design.

Solution: ✓ = Acceptable Solution
A/S = Alternative Solution
N/A = Not applicable to this proposal

Fill and Excavation Code

Performance Criteria and Acceptable Solutions

PERFORMANCE OUTCOMES	ACCEPTABLE OUTCOMES	COMMENTS
PO4 Development protects all services and public utilities.	AO4 Development protects services and public utilities and ensures that any alteration or relocation of services or public utilities meets the standard design specifications of the responsible service authorities.	✓ Public services that are to be relocated as part of the development are to meet design specifications. This is to be addressed as part of detailed design.
PO5 Development provides surface and sub-surface drainage to prevent water seepage, concentration of run-off or ponding of stormwater on adjacent land.	AO5 Development ensures all flows and subsoil drainage are directed to a lawful point of discharge of a surface water diversion drain, including to the top or toe of a retaining wall in accordance with the stormwater drainage section of the Infrastructure design planning scheme policy.	✓ To be addressed as part of detailed design phase.

Solution: ✓ = Acceptable Solution
A/S = Alternative Solution
N/A = Not applicable to this proposal

PERFORMANCE OUTCOMES	ACCEPTABLE OUTCOMES	COMMENTS
PO6 Development ensures that the design and construction of all open drainage works is undertaken in accordance with natural channel design principles, being the development of a stormwater conveyance system for major flows, by using a vegetated open channel or drain that approximates the features and functions of a natural waterway to enhance or improve riparian values of those stormwater conveyance systems. Editor's note—Guidance on natural channel design principles can be found in the Council's publication Natural channel design guidelines.	AO6 No acceptable outcome is prescribed.	NA – See Engineering Report prepared by ADG Engineers
PO7 Development for filling or excavation: a) does not degrade water quality or adversely affect environmental values in receiving waters; b) ensures site sediment and erosion control standards are best practice.	AO7.1 Development for filling or excavation provides water quality treatment that complies with the stormwater drainage section of the Infrastructure design planning scheme policy.	To be noted on operational works documents and addressed during construction stage
	AO7.2 Development provides erosion and sediment control standards that are in accordance with the stormwater	To be noted on operational works documents and addressed during construction stage

Solution: ✓ = Acceptable Solution
A/S = Alternative Solution
N/A = Not applicable to this proposal

Fill and Excavation Code
Performance Criteria and Acceptable Solutions

PERFORMANCE OUTCOMES	ACCEPTABLE OUTCOMES	COMMENTS
	drainage section of the Infrastructure design planning scheme policy.	
PO8 Development for filling or excavation is conducted such that adverse impacts at a sensitive use due to noise and dust are prevented or minimised. Note—A noise and dust impact management plan prepared in accordance with the Management plans planning scheme policy can assist in demonstrating achievement of this performance outcome.	AO8.1 Development ensures that no dust emissions extend beyond the boundary of the site, including dust from construction vehicles entering and leaving the site.	To be noted on operational works documents and addressed during construction stage
	AO8.2 Development for filling or excavation activity only occurs between the hours of 6:30am and 6:30pm Monday to Saturday, excluding public holidays.	To be noted on operational works documents and addressed during construction stage
PO9 Development ensures that vibration generated by the filling or excavation operation does not exceed the vibration criteria in Table 9.4.3.3.D, Table 9.4.3.3.E, Table 9.4.3.3.F and Table 9.4.3.3.G. Note—A noise management report prepared in accordance with the Noise impact assessment planning scheme policy can	AO9 Development involving filling or excavation does not cause a ground-borne vibration beyond the boundary of the site.	To be addressed as part of the operational works phase.

Solution: ✓ = Acceptable Solution
 A/S = Alternative Solution
 N/A = Not applicable to this proposal

Fill and Excavation Code

Performance Criteria and Acceptable Solutions

PERFORMANCE OUTCOMES	ACCEPTABLE OUTCOMES	COMMENTS
assist in demonstrating achievement of this performance outcome.		
PO10 Development ensures that heavy trucks hauling material to and from the site do not affect the amenity of established areas and limits environmental nuisance impact on adjacent land.	AO10 Development ensures that heavy trucks hauling material to and from the site: a) occur for a maximum of 3 weeks; b) use a major road to access the site; c) only use a minor road for the shortest-most-direct route that has the least amount of environmental nuisance if there is no major road alternative.	To be noted on operational works documents and addressed during construction stage

Solution: ✓ = Acceptable Solution
A/S = Alternative Solution
N/A = Not applicable to this proposal

PERFORMANCE OUTCOMES	ACCEPTABLE OUTCOMES	COMMENTS
PO11 Development for filling or excavation protects the environment and community health and wellbeing from exposure to contaminated land and contaminated material.	AO11 Development does not involve: a) excavation on land previously occupied by a notifiable activity or on land listed on the Environmental Management Register or the Contaminated Land Register; b) filling with material containing a contaminant.	Complies
PO12 Development provides for: a) landscaping for water conservation purposes; b) water sensitive urban design measures which are employed within the landscape design to maximise stormwater use and to reduce any adverse impacts on the landscape; c) stormwater harvesting to be maximised and any adverse impacts of stormwater minimised.	AO12.1 Development provides landscaping which is designed using the standards in the Landscape design guidelines for water conservation planning scheme policy.	Complies
	AO12.2 Development ensures that the design and requirements for irrigation are in compliance with the standards in the Landscape design guidelines for water conservation planning scheme policy.	Complies
	AO12.3 Development provides areas of pavement, turf and mulched garden beds which are drained. Note—This may be achieved through the provision and/or treatment of swales, spoon drains, field gullies, sub-surface drainage and stormwater connections.	Complies

Solution: ✓ = Acceptable Solution
A/S = Alternative Solution
N/A = Not applicable to this proposal

Fill and Excavation Code

Performance Criteria and Acceptable Solutions

Solution: ✓ = Acceptable Solution
A/S = Alternative Solution
N/A = Not applicable to this proposal

PERFORMANCE OUTCOMES	ACCEPTABLE OUTCOMES	COMMENTS
Section A— Criteria for assessable development		
PO1 Development provides roads, pavement, edging and landscaping which: - a)are designed and constructed in accordance with the road hierarchy; - b)provide for safe travel for pedestrians, cyclists and vehicles; - c)provide access to properties for all modes; - d)provide utilities; - e)provide high levels of aesthetics and amenity, improved liveability and future growth; f) provide for the amelioration of noise and other pollution; - g)provide a high-quality streetscape; - h)provide a low-maintenance asset with a minimal whole-of-life cost. Note—This can be demonstrated in an engineering report prepared and certified by a Registered Professional Engineer Queensland in accordance with the Infrastructure design planning scheme policy.	AO1 Development provides roads and associated pavement, edging and landscaping which are designed and constructed in compliance with the road corridor design standards in the Infrastructure design planning scheme policy.	✓ To be noted on operational works documents and addressed during construction stage

Solution: ✓ = Acceptable Solution
A/S = Alternative Solution
N/A = Not applicable to this proposal

Infrastructure Design Code

Performance Criteria and Acceptable Solutions

PERFORMANCE OUTCOMES	ACCEPTABLE OUTCOMES	COMMENTS
PO2 Development provides road pavement surfaces which: a) are well designed and constructed; b) durable enough to carry the wheel loads of the intended types and numbers of travelling and parked vehicles; c) ensures the safe passage of vehicles, pedestrians and cyclists, the discharge of stormwater run-off and the preservation of all-weather access; d) allows for reasonable travel comfort.	AO2 Development provides road pavement surfaces which are designed and constructed in compliance with the road corridor design standards in the Infrastructure design planning scheme policy.	✓ To be noted on operational works documents and addressed during construction stage
PO3 Development provides a pavement edge which is designed and constructed to: a) control vehicle movements by delineating the carriageway for all users; b) provide for people with disabilities by allowing safe passage of wheelchairs and other mobility aids.	AO3 Development provides pavement edges which are designed and constructed in compliance with the road corridor design standards in the Infrastructure design planning scheme policy.	✓ To be noted on operational works documents and addressed during construction stage

Solution: ✓ = Acceptable Solution
A/S = Alternative Solution
N/A = Not applicable to this proposal

Infrastructure Design Code

Performance Criteria and Acceptable Solutions

PERFORMANCE OUTCOMES	ACCEPTABLE OUTCOMES	COMMENTS
PO4 Development provides verges which are designed and constructed to: - a)provide safe access for pedestrians clear of obstructions and access areas for vehicles onto properties; - b)provide a sufficient area for public utility services; - c)be maintainable by the Council.	AO4 Development provides verges which are designed and constructed in compliance with the road corridor design and streetscape locality advice standards in the Infrastructure design planning scheme policy.	✓ To be noted on operational works documents and addressed during construction stage
PO5 Development provides a lane or laneway identified in a neighbourhood plan which: - a)allows equitable access for all modes; - b)is safe and secure; - c)has 24-hour access; - d)is a low-speed shared zone environment; - e)has a high-quality streetscape.	AO5 Development provides a lane or laneway identified in a neighbourhood plan which is embellished in compliance with the streetscape locality advice standards in the Infrastructure design planning scheme policy.	NA

Solution: ✓ = Acceptable Solution
A/S = Alternative Solution
N/A = Not applicable to this proposal

Infrastructure Design Code

Performance Criteria and Acceptable Solutions

PERFORMANCE OUTCOMES	ACCEPTABLE OUTCOMES	COMMENTS
PO6 Development of an existing premises provides at the frontage to the site, if not already provided, the following infrastructure to an appropriate urban standard: a) an effective, high-quality paved roadway; b) an effective, high-quality roadway kerb and channel; c) safe, high-quality vehicle crossings over channels and verges; d) safe, accessible, high-quality verges compatible and integrated with the surrounding environment; e) safe vehicle access to the site that enables ingress and egress in a forward gear; f) provision of and required alterations to public utilities; g) effective drainage; h) appropriate conduits to facilitate the provision of required street-lighting systems and traffic signals.	AO6 Development of an existing premises provides at the frontage of the site, if not already existing, the following infrastructure to the standard that would have applied if the development involved new premises as stated in the road corridor design standards in the Infrastructure design planning scheme policy: a) concrete kerb and channel; b) forming and grading to verges; c) crossings over channels and verges; d) a constructed bikeway; e) a constructed verge or reconstruction of any damaged verge; f) construction of the carriageway; g) payment of costs for required alterations to public utility mains, services or installations; h) construction of and required alterations to public utility mains, services or installations; i) drainage works; j) installation of electrical conduits.	✓ Further information for these criteria will be part of the detailed design phase.

Solution: ✓ = Acceptable Solution
 A/S = Alternative Solution
 N/A = Not applicable to this proposal

Infrastructure Design Code

Performance Criteria and Acceptable Solutions

PERFORMANCE OUTCOMES	ACCEPTABLE OUTCOMES	COMMENTS
PO7 Development provides both cycle and walking routes which: a) are located, designed and constructed to their network classification (where applicable); b) provide safe and attractive travel routes for pedestrians and cyclists for commuter and recreational purposes; c) provide safe and comfortable access to properties for pedestrians and cyclists; d) incorporate water sensitive urban design into stormwater drainage; e) provide for utilities; f) provide for a high level of aesthetics and amenity, improved liveability and future growth; g) are a low-maintenance asset with a minimal whole-of-life cost; h) minimise the clearing of significant native vegetation. Note—This can be demonstrated in an engineering report prepared and certified by a Registered Professional Engineer Queensland in accordance	AO7 Development provides cycle and walking routes which are located, designed and constructed in compliance with the road corridor design and off-road pathway design standards in the Infrastructure design planning scheme policy.	NA

Solution: ✓ = Acceptable Solution
A/S = Alternative Solution
N/A = Not applicable to this proposal

Infrastructure Design Code

Performance Criteria and Acceptable Solutions

PERFORMANCE OUTCOMES	ACCEPTABLE OUTCOMES	COMMENTS
with the Infrastructure design planning scheme policy.		
PO8 Development provides refuse and recycling collection, separation and storage facilities that are located and managed so that adverse impacts on building occupants, neighbouring properties and the public realm are minimised.	AO8.1 Development provides refuse and recycling collection and storage facilities in accordance with the Refuse planning scheme policy.	✓ Refer to Architectural Drawings
	AO8.2 Development ensures that refuse and recycling collection and storage location and design do not have any adverse impact including odour, noise or visual impacts on the amenity of land uses within or adjoining the development. Note—Refer to the Refuse planning scheme policy for further guidance.	✓ Refer to Architectural Drawings

Solution: ✓ = Acceptable Solution
A/S = Alternative Solution
N/A = Not applicable to this proposal

Infrastructure Design Code

Performance Criteria and Acceptable Solutions

PERFORMANCE OUTCOMES	ACCEPTABLE OUTCOMES	COMMENTS
PO9 Development ensures that: a) land used for an urban purpose is serviced adequately with regard to water supply and waste disposal; b) the water supply meets the stated standard of service for the intended use and fire-fighting purposes.	AO9.1 Development ensures that the reticulated water and sewerage distribution system for all services is in place before the first use is commenced.	✓ Will be satisfied
	AO9.2 Development provides the lot with reticulated water supply and sewerage to a standard acceptable to the distributor–retailer.	✓ Will be satisfied
PO10 Development provides public utilities and street lighting which are the best current or alternative technology and facilitate accessibility, easy maintenance, minimal whole-of-life costs, and minimal adverse environmental impacts.	AO10.1 Development provides public utilities and street lighting which are located and aligned to: (a) avoid significant native vegetation and areas identified within the Biodiversity areas overlay map; minimise earthworks; avoid crossing waterways, waterway corridors and wetlands or if a crossing is unavoidable, tunnel-boring techniques are used to minimise disturbance, and a disturbed area is reinstated and restored on completion of the work. Note—Guidance on the restoration of habitat is included in the Biodiversity areas planning scheme	✓ Further information for these criteria will be part of the detailed design phase.

Solution: ✓ = Acceptable Solution
 A/S = Alternative Solution
 N/A = Not applicable to this proposal

Infrastructure Design Code

Performance Criteria and Acceptable Solutions

PERFORMANCE OUTCOMES	ACCEPTABLE OUTCOMES	COMMENTS
	policy.	
	AO10.2 Development provides compatible public utility services and street-lighting services which are co-located in common trenching for underground services.	✓ Further information for these criteria will be part of the detailed design phase.
	AO10.3 Development provides public utilities and street lighting which are designed and constructed in compliance with the public utilities standards in the Infrastructure design planning scheme policy.	✓ Further information for these criteria will be part of the detailed design phase.
PO11 Development ensures that land used for urban purposes is serviced adequately with telecommunications and energy supply.	AO11 Development provides land with the following services to the standards of the approved supplier: a) electricity; b) telecommunications services; c) gas service where practicable.	✓ Refer to the Engineering Report prepared by ADG Engineers. Further information for these criteria will be part of the detailed design phase.

Solution: ✓ = Acceptable Solution
 A/S = Alternative Solution
 N/A = Not applicable to this proposal

Infrastructure Design Code

Performance Criteria and Acceptable Solutions

PERFORMANCE OUTCOMES	ACCEPTABLE OUTCOMES	COMMENTS
PO12 Development ensures that major public projects promote the provision of affordable, high-bandwidth telecommunications services throughout the city.	AO12 Development provides conduits which are provided in all major Council and government works projects to enable the future provision of fibre optic cabling, if: (a) the additional expense is unlikely to be prohibitive; or (b) further major work is unlikely or disruption would be a major concern, such as where there is a limited capacity road; or (c) there is a clear gap in the telecommunications network; or (d) there is a clear gap in the bandwidth available to the area. Editor's note—An accurate, digital 'as built' three-dimensional location plan is to be supplied for all infrastructure provided in a road.	✓ Refer to the Engineering Services Report prepared by ADG Engineers. Further information for these criteria will be part of the detailed design phase.

Solution: ✓ = Acceptable Solution
A/S = Alternative Solution
N/A = Not applicable to this proposal

Infrastructure Design Code

Performance Criteria and Acceptable Solutions

PERFORMANCE OUTCOMES	ACCEPTABLE OUTCOMES	COMMENTS
PO13 Development provides public art identified in a neighbourhood plan or park concept plan which: a) is provided commensurate with the status and scale of the proposed development; b) is sited and designed: i. as an integrated part of the project design; ii. as conceptually relevant to the context of the location; iii. to reflect and respond to the cultural values of the community; iv. to promote local character in a planned and informed manner.	AO13 Development provides public art identified in a neighbourhood plan or park concept plan which is sited and designed in compliance with the public art standards in the Infrastructure design planning scheme policy.	NA
PO14 Development provides signage of buildings and spaces which promote legibility to help users find their way.	AO14 Development provides public signage: a) at public transport interchanges and stops, key destinations, public spaces, pedestrian linkages and at entries to centre developments; b) which details the location of the key destinations, public spaces and pedestrian linkages in the vicinity, the services available within the	NA

Solution: ✓ = Acceptable Solution
A/S = Alternative Solution
N/A = Not applicable to this proposal

Infrastructure Design Code

Performance Criteria and Acceptable Solutions

PERFORMANCE OUTCOMES	ACCEPTABLE OUTCOMES	COMMENTS
	development and where they are located. Editor's note—Signage is to be in accordance with Local Law Number 1 (Control of Advertisements Local Law).	
PO15 Development that provides community facilities which form part of the development is functional, safe, low maintenance, and fit for purpose.	AO15 Development that provides community facilities which form part of the development is designed in compliance with the community facilities standards in the Infrastructure design planning scheme policy.	NA
PO16 Development provides public toilets which: a) are required as part of a community facility or park; b) are located, designed and constructed to be: i. safe; ii. durable; iii. resistant to vandalism; iv. able to service expected demand; v. fit for purpose.	AO16 Development that provides public toilets is designed and constructed in compliance with the public toilets standards in the Infrastructure design planning scheme policy.	NA

Solution: ✓ = Acceptable Solution
A/S = Alternative Solution
N/A = Not applicable to this proposal

Infrastructure Design Code

Performance Criteria and Acceptable Solutions

PERFORMANCE OUTCOMES	ACCEPTABLE OUTCOMES	COMMENTS
Additional criteria for reconfiguring a lot		
PO17 Development provides bridges, tunnels, elevated structures and water access structures that are designed and constructed using proven methods, materials and technology to provide for: a) safe movement of intended users; b) an attractive appearance appropriate to the general surroundings and any adjacent structures; c) functionality and easy maintenance; d) minimal whole-of-life cost; e) longevity; f) current and future services. Note—All bridges and elevated and associated elements must be designed and certified by a Registered Professional Engineer Queensland in accordance with the Infrastructure design planning scheme policy.	AO17 Development that provides bridges, tunnels, elevated structures and water access structures is designed and constructed in compliance with the standards in the Infrastructure design planning scheme policy.	NA

Solution: ✓ = Acceptable Solution
A/S = Alternative Solution
N/A = Not applicable to this proposal

Infrastructure Design Code

Performance Criteria and Acceptable Solutions

PERFORMANCE OUTCOMES	ACCEPTABLE OUTCOMES	COMMENTS
PO18 Development provides culverts which are designed and constructed using proven methods, materials and technology to provide for: a) safety; b) an attractive appearance appropriate to the general surroundings; c) functionality and easy maintenance; d) minimal whole-of-life cost; e) longevity; f) future widening; g) current and future services; h) minimal adverse impacts, such as increase in water levels or flow velocities, and significant change of flood patterns. Note—All culverts and associated elements are to be designed and certified by a Registered Professional Engineer Queensland in accordance with the applicable design standards.	AO18 Development that provides culverts is designed and constructed in compliance with the structures standards in the Infrastructure design planning scheme policy.	NA

Solution: ✓ = Acceptable Solution
A/S = Alternative Solution
N/A = Not applicable to this proposal

Infrastructure Design Code

Performance Criteria and Acceptable Solutions

PERFORMANCE OUTCOMES	ACCEPTABLE OUTCOMES	COMMENTS
PO19 Development provides batters, retaining walls, and seawalls and river walls which are designed and constructed using proven methods, materials and technology to provide for: (b) safety; (c) an attractive appearance appropriate to the surrounding area; (d) easy maintenance; (e) minimal whole-of-life cost; (f) longevity; (g) minimal water seepage. Note—All retaining walls and associated elements are to be designed and certified by a Registered Professional Engineer Queensland in accordance with the applicable design standards.	AO19 Development that provides batters, retaining walls, seawalls and river walls is designed and constructed in compliance with the structures standards in the Infrastructure design planning scheme policy.	Will be satisfied, with additional information provided on Operational Works drawings at detailed design stage
If for development with a gross floor area greater than 1,000m²		

Solution: ✓ = Acceptable Solution
A/S = Alternative Solution
N/A = Not applicable to this proposal

Infrastructure Design Code

Performance Criteria and Acceptable Solutions

PERFORMANCE OUTCOMES	ACCEPTABLE OUTCOMES	COMMENTS
PO20 Development ensures that construction is managed so that use of public spaces and movement on pedestrian, cyclist and other traffic routes is not unreasonably disrupted and existing landscaping is adequately protected from short- and long-term impacts. Note—The preparation of a construction management plan can assist in demonstrating achievement of this performance outcome. Note—The Transport, access, parking and servicing planning scheme policy provides advice on the management of vehicle parking and deliveries during construction.	AO20 Development ensures that during construction: a) the ongoing use of adjoining and surrounding parks and public spaces, such as malls and outdoor dining, is not compromised; b) adjoining and surrounding landscaping is protected from damage; c) safe, legible, efficient and sufficient pedestrian, cyclist and vehicular accessibility and connectivity to the wider network are maintained.	✓ Further information for these criteria will be part of the detailed design phase.

Solution: ✓ = Acceptable Solution
A/S = Alternative Solution
N/A = Not applicable to this proposal

Infrastructure Design Code

Performance Criteria and Acceptable Solutions

PERFORMANCE OUTCOMES	ACCEPTABLE OUTCOMES	COMMENTS
PO21 Development ensures that construction and demolition activities are guided by measures that prevent or minimise adverse impacts including sleep disturbance at a sensitive use, due to noise and dust, including dust from construction vehicles entering and leaving the site. Note—A noise and dust impact management plan prepared in accordance with the Management plans planning scheme policy can assist in demonstrating achievement of this performance outcome.	AO21.1 Development ensures that demolition and construction: a) only occur between 6:30am and 6:30pm Monday to Saturday, excluding public holidays; b) do not occur over periods greater than 6 months.	✓ Further information for these criteria will be part of the detailed design phase.
	AO21.2 Development including construction and demolition does not release dust emissions beyond the boundary of the site.	✓ Further information for these criteria will be part of the detailed design phase.
	AO21.3 Development construction and demolition does not involve asbestos-containing materials.	✓ Further information for these criteria will be part of the detailed design phase.

Solution: ✓ = Acceptable Solution
A/S = Alternative Solution
N/A = Not applicable to this proposal

Infrastructure Design Code

Performance Criteria and Acceptable Solutions

PERFORMANCE OUTCOMES	ACCEPTABLE OUTCOMES	COMMENTS
PO22 Development ensures that: a) construction and demolition do not result in damage to surrounding property as a result of vibration; b) vibration levels achieve the vibration criteria in Table 9.4.4.3.B, Table 9.4.4.3.C, Table 9.4.4.3.D and Table 9.4.4.3.E. Note—A vibration impact assessment report prepared in accordance with the Noise impact assessment planning scheme policy can assist in demonstrating achievement of this performance outcome.	AO22 Development ensures that the nature and scale of construction and demolition do not generate noticeable levels of vibration.	✓ Further information for these criteria will be part of the detailed design phase.

Solution: ✓ = Acceptable Solution
A/S = Alternative Solution
N/A = Not applicable to this proposal

Potential and Actual Acid Sulfate Soils Overlay Code

Performance Criteria and Acceptable Solutions

PERFORMANCE OUTCOMES	ACCEPTABLE OUTCOMES	COMMENTS
Criteria for assessable development		
PO1 Development protects the environmental values and ecological health of receiving waters and does not subject assets to accelerated corrosion.	AO1 Development ensures that: a) no potential or actual acid sulfate soils are disturbed; or Note—This can be demonstrated through the submission of an acid sulfate soil investigation report with reference to the Potential and actual acid sulfate soils planning scheme policy. b) the disturbance impacts in an area that hosts potential acid sulfate soils are appropriately managed, if less than 500m³ of soil is disturbed and the watertable is not affected; or Note—This can be demonstrated through the submission of an acid sulfate soil investigation report and a preliminary acid sulfate soil management plan, with reference to the Potential and actual acid sulfate soils planning scheme policy. c) impacts are appropriately managed if 500m³ or more of soil is disturbed or the watertable in an area that hosts potential or actual acid sulfate soils is affected. Note—This can be demonstrated through the	✓ It is possible that acid sulfate soils will be disturbed as part of the development. An acid sulfate soils management plan is to be prepared as part of the operational works phase.

Solution: ✓ = Acceptable Solution
 A/S = Alternative Solution
 N/A = Not applicable to this proposal

Potential and Actual Acid Sulfate Soils Overlay Code

Performance Criteria and Acceptable Solutions

PERFORMANCE OUTCOMES	ACCEPTABLE OUTCOMES	COMMENTS
	submission of an acid sulfate soil investigation report and a full acid sulfate soil management plan, with reference to the Potential and actual acid sulfate soils planning scheme policy using levels of testing commensurate with the level of risk. If the investigation demonstrates that an acid sulfate soil management plan is not required, only an investigation report is required.	

Solution: ✓ = Acceptable Solution
A/S = Alternative Solution
N/A = Not applicable to this proposal

Stormwater Management Code
Performance Criteria and Acceptable Solutions

Performance Outcomes	Acceptable Outcomes	COMMENTS
Section A—If for a material change of use, reconfiguring a lot, operational work or building work Note—Compliance with the performance outcomes and acceptable outcomes in this section should be demonstrated by the submission of a site-based stormwater management plan for high risk development only.		
PO1 Development provides a stormwater management system which achieves the integrated management of stormwater to: (a) minimise flooding; (b) protect environmental values of receiving waters; (c) maximise the use of water sensitive urban design; (d) minimise safety risk to all persons; (e) maximise the use of natural waterway corridors and natural channel design principles. Editor's note—The stormwater management system to be developed to address PO1 is not intended to require management of stormwater quality.	AO1 Development provides a stormwater management system designed in compliance with the Infrastructure design planning scheme policy.	Complies.
PO2 Development ensures that the stormwater management system and site work does not adversely impact flooding or drainage characteristics of premises which are up slope, down slope or adjacent to the site.	AO2.1 Development does not result in an increase in flood level or flood hazard on up slope, down slope or adjacent premises.	Complies.
	AO2.2 Development provides a stormwater management system which is designed in compliance with the standards in the Infrastructure design planning scheme policy.	Complies.
PO3 Development ensures that the stormwater management system does not direct stormwater run-off through existing or proposed lots and property where it is likely to adversely affect the safety of, or cause nuisance to properties.	AO3.1 Development ensures that the location of the stormwater drainage system is contained within a road reserve, drainage reserve, public pathway, park or waterway corridor.	Complies. Development discharges to an existing gully pit on Abbotsford Road.
	AO3.2 Development provides a stormwater management system	Complies.

Stormwater Management Code
Performance Criteria and Acceptable Solutions

Performance Outcomes	Acceptable Outcomes	COMMENTS
	which is designed in compliance with the standards in the Infrastructure design planning scheme policy.	Development discharges to an existing gully pit on Abbotsford Road.
	AO3.3 Development obtains a lawful point of discharge in compliance with the standards in the Infrastructure design planning scheme policy.	Complies. The Abbotsford Road gully pit shall remain the Lawful Point of Discharge.
	AO3.4 Where on private land, all underground stormwater infrastructure is secured by a drainage easement.	Complies.
PO4 Development provides a stormwater management system which has sufficient capacity to safely convey run-off taking into account increased run-off from impervious surfaces and flooding in local catchments.	AO4.1 Development provides a stormwater conveyance system which is designed to safely convey flows in compliance with the standards in the Infrastructure design planning scheme policy.	Complies. Stormwater conveyed via internal pipe to lawful point of discharge.
	AO4.2 Development provides sufficient area to convey run-off which will comply with the standards in the Infrastructure design planning scheme policy.	Complies. Runoff conveyed via pipe to lawful point of discharge.
PO5 Development designs stormwater channels, creek modification works, bridges, culverts and major drains to protect and enhance the value of the waterway corridor or drainage path for fauna movement.	AO5 Development ensures the design of stormwater channels, creek modifications or other infrastructure, permits terrestrial and aquatic fauna movement.	NA No creeks, channels, bridges, culverts, or major drains required.
	AO6.1 Development locates stormwater detention and water quality treatment: (a) outside of a waterway corridor; (b) offline to any catchment not contained within the development.	Complies. Treatment manholes located outside of waterway corridors and catchment flow paths.
PO6 Development ensures that location and design of stormwater detention and water quality treatment: (a) minimises risk to people and property; (b) provides for safe access and maintenance; (c) minimises ecological impacts to creeks and waterways.	AO6.2 Development providing for stormwater detention and water quality treatment devices are designed in compliance with the standards in the Infrastructure design	Complies. Post-development flows do not exceed pre-development flows.

Stormwater Management Code
Performance Criteria and Acceptable Solutions

Performance Outcomes	Acceptable Outcomes	COMMENTS
	planning scheme policy.	
PO7 Development is designed, including any car parking areas and channel works to: (a) reduce property damage; (b) provide safe access to the site during the defined flood event.	A07.1 Development (including any ancillary structures and car parking areas) is located above minimum flood immunity levels in Table 9.4.9.3.B, Table 9.4.9.3.C, Table 9.4.9.3.D, Table 9.4.9.3.E and Table 9.4.9.3.F. Note—Compliance with this acceptable outcome can be demonstrated by the submission of a hydraulic and hydrology report identifying flood levels and development design levels (as part of a site-based stormwater management plan).	Complies. A 1 in 100 year (Q100) flood level of 3.20m AHD has been identified. Habitable floor levels of the development have been proposed at a minimum of 6.60m AHD. The basement entry will be constructed at a minimum level of 5.00m AHD.
	A07.2 Development including the road network provides a stormwater management system that provides safe pedestrian and vehicle access in accordance with the standards in the Infrastructure design planning scheme policy.	NA Development does not include road network.
PO8 Development designs stormwater channels, creek modification works and the drainage network to protect and enhance the environmental values of the waterway corridor or drainage path.	A08.1 Development ensures natural waterway corridors and drainage paths are retained.	Complies Development contained within site boundaries.
	A08.2 Development provides the required hydraulic conveyance of the drainage channel and floodway, while maximising its potential to maximise environmental benefits and minimise scour. Editor's note—Guidance on natural channel design principles can be found in the Council's publication Natural channel design guidelines.	NA No stormwater channels or creeks on development site.
	A08.3 Development provides stormwater outlets into waterways, creeks, wetlands and overland flow paths with	NA No natural waterways on development site.

Stormwater Management Code
Performance Criteria and Acceptable Solutions

Performance Outcomes	Acceptable Outcomes	COMMENTS
	energy dissipation to minimise scour in compliance with the standards in the Infrastructure design planning scheme policy.	
	AO8.4 Development ensures that the design of modifications to the existing design of new stormwater channels, creeks and major drains is in compliance with the standards in the Infrastructure design planning scheme policy.	To be complied with at detailed design stage.
PO9 Development is designed to manage run-off and peak flows by minimising large areas of impervious material and maximising opportunities for capture and re-use.	AO9 No acceptable outcome is prescribed.	Complies. Post-development flows do not exceed pre-development flows. A volume of re-use is provided on site.
PO10 Development ensures that there is sufficient site area to accommodate an effective stormwater management system. Note—Compliance with the performance outcome should be demonstrated by the submission of a site-based stormwater management plan for high-risk development only.	AO10 No acceptable outcome is prescribed.	Complies. Treatment system location shown in Stormwater Layout Plan
PO11 Development provides for the orderly development of stormwater infrastructure within a catchment, having regard to the: (a) existing capacity of stormwater infrastructure within and external to the site, and any planned stormwater infrastructure upgrades; (b) safe management of stormwater discharge from existing and future up-slope development; (c) implication for adjacent and down-slope development.	AO11.1 Development with up-slope external catchment areas provides a drainage connection sized for ultimate catchment conditions that is directed to a lawful point of discharge. AO11.2 Development ensures that existing stormwater infrastructure that is undersized is upgraded in compliance with the Priority infrastructure plan and the standards in the Infrastructure design planning scheme policy.	NA. A 200mm aco-drain is to be located along the southern boundary of the site to collect sheet flows from the upstream catchment and discharge them to an existing gully pit on Abbotsford Road. NA Existing stormwater infrastructure sufficiently sized for development.

Stormwater Management Code
Performance Criteria and Acceptable Solutions

Performance Outcomes	Acceptable Outcomes	COMMENTS
PO12 Development provides stormwater infrastructure which: (a) remains fit for purpose for the life of the development and maintains full functionality in the design flood event; (b) can be safely accessed and maintained cost effectively; (c) ensures no structural damage to existing stormwater infrastructure.	AO12.1 The stormwater management system is designed in compliance with the Infrastructure design planning scheme policy.	Complies. Refer to the Engineering Report by ADG.
	AO12.2 Development provides a clear area with a minimum of 2m radius from the centre of an existing manhole cover and with a minimum height clearance of 2.5m.	NA.
PO13 Development ensures that all reasonable and practicable measures are taken to manage the impacts of erosion, turbidity and sedimentation, both within and external to the development site from construction activities, including vegetation clearing, earthworks, civil construction, installation of services, rehabilitation, revegetation and landscaping to protect: (a) the environmental values and water quality objectives of waters; (b) waterway hydrology; (c) the maintenance and serviceability of stormwater infrastructure. Note—The Infrastructure design planning scheme policy outlines the appropriate measures to be taken into account to achieve the performance outcome.	AO13 No acceptable outcome is prescribed.	This will be addressed appropriately during the detailed design and operational works stages of this development.
PO14 Development ensures that: (a) unnecessary disturbance to soil, waterways or drainage channels is avoided; (b) all soil surfaces remain effectively stabilised against erosion in the short and long term.	AO14 No acceptable outcome is prescribed.	This will be addressed appropriately during the detailed design and operational works stages of this development.

Stormwater Management Code
Performance Criteria and Acceptable Solutions

Performance Outcomes	Acceptable Outcomes	COMMENTS
PO15 Development does not increase: (a) the concentration of total suspended solids or other contaminants in stormwater flows during site construction; (b) run-off which causes erosion either on site or off site.	AO15 No acceptable outcome is prescribed.	This will be addressed appropriately during the detailed design and operational works stages of this development.
Section B—Additional criteria which apply to high-risk development, being one or more of the following: (a) a material change of use for an urban purpose which involves greater than 2,500m ² of land that: (i) will result in an impervious area greater than 25% of the net developable area; or (ii) will result in 6 or more dwellings. (b) reconfiguring a lot for an urban purpose that involves greater than 2,500m ² of land and will result in 6 or more lots; (c) operational work for an urban purpose which involves disturbing greater than 2,500m ² of land.		
PO16 Development ensures that the entry and transport of contaminants into stormwater is avoided or minimised to protect receiving water environmental values. Note—Prescribed water contaminants are defined in the <i>Environmental Protection Act 1994</i> . Note—Compliance with the performance outcome should be demonstrated by the submission of a site-based stormwater management plan for high-risk development only.	AO16 Development provides a stormwater management system which is designed in compliance with the standards in the Infrastructure design planning scheme policy.	Complies. Site is less than 2500m ² , though a Superior Design outcome is proposed for Stormwater Quality incorporating stormfilter cartridges, enviropods and on-site re-use
PO17 Development ensures that: (a) the discharge of wastewater to a waterway or external to the site is avoided; or (b) if the discharge cannot practicably be avoided, the development minimises wastewater discharge through re-use, recycling, recovery and treatment.	AO17 No acceptable outcome is prescribed.	Complies. A Superior Design outcome is proposed for Stormwater Quality incorporating stormfilter cartridges, enviropods and on-site re-use

Stormwater Management Code
Performance Criteria and Acceptable Solutions

Performance Outcomes	Acceptable Outcomes	COMMENTS
Note—The preparation of a wastewater management plan can assist in demonstrating achievement of this performance outcome. Editor's note—This code does not deal with sewerage which is the subject of the Wastewater code.		

Appendix D
Erosion Hazard Assessment Form



Erosion Hazard Assessment - June 2014

Brisbane City Council (BCC), *Erosion Hazard Assessment* form must be read in conjunction with the *Erosion Hazard Assessment- Supporting Technical Notes* (June 2014 or later version) for explanatory terms and Certification information.

What is an Erosion Hazard Assessment?

Soil erosion and sediment from urban development, particularly during construction activities, is a significant source of sediment pollution in Brisbane's waterways. The Erosion Hazard Assessment determines whether the risk of soil erosion and sediment pollution to the environment is 'low', 'medium' or 'high'.

When is the EHA required?

An *Erosion Hazard Assessment* form must be completed and lodged with BCC for any Development Application (ie MCU or ROL) that will result in soil disturbance OR Operational Works or Compliance Assessment Application for 'Filling' or Excavation.

Failure to submit this form during lodgement of an application may result in assessment delays or refusal of the application.

Privacy Statement

The personal information collected on this form will be used by Brisbane City Council for the purposes of fulfilling your request and undertaking associated Council functions and services. Your personal information will not be disclosed to any third party without your consent, unless this is required or permitted by law.

Assessment Details

1 Please turn over and complete the erosion hazard assessment.

2 Based on the erosion hazard assessment overleaf, is the site:

☐ A 'low' risk site

Best practice erosion and sediment control (ESC) must be implemented but no erosion and sediment control plans need to be submitted with the development application. Factsheets outlining best practice ESC can be found at <http://www.waterbydesign.com.au/factsheets>

☒ A 'medium' risk site

If the development is approved, the applicant will need to engage a Registered Professional Engineer (RPEQ) or Certified Professional in Erosion and Sediment Control (CPESC) to prepare an ESC Program and Plan and supporting documentation — in accordance with the requirements of the Infrastructure Design Planning Scheme Policy.

☐ A 'high' risk site

If the development is approved, the applicant will need to engage a RPEQ and CPESC to prepare an ESC Program and Plan and supporting documentation — in accordance with the requirements of the Infrastructure Design Planning Scheme Policy. The plans and program will need to be certified by a CPESC.

3 Site Information and Certification

Application number (if known)

Site address

63, 65 Abbotsford Road & 1,3 Folkestone
Street, Bowen Hills

Postcode 4006

I certify that:

- ☒ I have made all relevant enquiries and am satisfied no matters of significance have been withheld from the assessment manager.
- ☒ I am a person with suitable qualifications and/or experience in erosion and sediment control.
- ☒ The Erosion Hazard Assessment was completed in accordance with the Erosion Hazard Assessment Supporting Technical Notes and the BCC Infrastructure Design Planning Scheme Policy.
- ☒ The Erosion Hazard Assessment accurately reflects the site's overall risk of soil erosion and sediment pollution to the environment.
- ☒ I acknowledge and accept that the BCC, as assessment manager, relies, in good faith, on this certification as part of its development assessment process and the provision of false or misleading information to the BCC constitutes an offence for which BCC may take punitive steps/ action against me/ enforcement action against me.

Certified by *Print name*

MITCH BLYTH

Certifier's signature

Date

07 / 10 / 12

Table 1: Low Risk Test

		Yes	No
1.1	is the area of land disturbance > 1000 m ²	☒	☐
1.2	does any land disturbance occur in a BCC mapped waterway corridor	☐	☒
1.3	is there any slope on site (longer than three metres in length) before, during or after construction that is steeper than 5%	☒	☐
1.4	does any land disturbance occur below 5 m AHD	☒	☐
1.5	does development involve endorsement of a staging plan	☐	☒
1.6	is there an upstream catchment passing through the site > 1 hectare	☐	☒

Have you answered 'yes' to any of the questions in Table 1?

Yes	No
☒	☐

If 'No' then site is low risk with respect to erosion and sediment control

If 'Yes' then proceed to Table 2

Table 2: Medium Risk Test

		Yes	No
2.1	is the area of land disturbance > 1 hectare	☐	☒

If 'No' then site is medium risk with respect to erosion and sediment control

If 'Yes' then proceed to Table 3

Table 3: High Risk Test

3.1	is there an upstream catchment passing through the site > 1 hectare	☐	☐
3.2	does any land disturbance occurs in a BCC mapped waterway corridor	☐	☐
3.3	is there any slope on site (longer than three metres in length) before, during or after construction that is steeper than 15%	☐	☐

Have you answered 'yes' to any of the questions in Table 3?

Yes	No
☐	☐

If 'No' then site is medium risk with respect to erosion and sediment control

If 'Yes' then site is high risk with respect to erosion and sediment control

Appendix E

eBIMAP Data

R

Layer: S P Report: S R																																	
Segment ID	Asset Status	Segment Type	Diameter	Material	Length (Actual)	Date Constructed	Date Retired	Downstream IL	Upstream IL	Downstream MH ID	Upstream MH ID	Drawing Number	Amended Drawing Number	Bedding Type				Cathodic Protection	External Coating	Grade	Joint Type	Easting 1	Northing 1	Sewer Line Name		Sewer Line Number	Remarks	Rock Excavated	Soil Type	Facet			
LS151487		R	150	R	R	62 841	1927	0	1 222	1 908	150525	150526			S	L	R	L	R	L	P	R	L		0 011	503808 802 6964437 952	PPL	BL				16	
LS150303		R	150	R	R	44 221	1927		2 957	4 538	149297	149298			S	L	R	L	R	L	P	R	L		0 036	503889 503 6964346 361	PPL	BL			S	16	
LS150306		R	150	R	R	40 361	1927	0	2 32	4 304	149300	149301			S	L	R	L	R	L	P	R	L		0 049	503796 106 6964320 562	PPL	BL				16	
LS151493		R	150	R	R	8 358	1927	0	0 707	0 811	152078	150525			S	L	R	L	R	R	L	P	R	L		0 012	503798 518 6964374 278	PPL	BL				16
LS152043		S	R	750	R	R	R	0	6 157	6 072	152077	152078	3018 373	S 57092											0 001	503805 246 6964370 519 BR	S	R	BR S	R 1027		16	
LS150304		R	150	R	L	24 597	1996	0	999	7 958	149298	149299									0		503885 417 6964322 109		PPL	BL					16		
LS150321		R	150	R	R	10 82	1927	0	1 652	2 167	152078	149300			S	L	R	L	R	L	P	R	L		0 048	503802 166 6964360 285	PPL	BL				16	
LS152044		S	R	675	R	R	R	0	5 995	5 828	152078	152079	3018 373	S 57092										0 002	503729 821 6964345 682 BR	S	R	BR S	R 1027			16	
LS150307		R	150	R	R	45 263	1927	0	4 77	7 724	149301	149302			S	L	R	L	R	L	P	R	L		0 065	503788 961 6964275 88	PPL	BL			S	16	
LS150310		R	150	R	R	57 861	1928	0	4 782	8 111	149301	149304												0 058	503853 122 6964311 544	PPL	BL				16		
LS150305		R	150	R	R	44 12	1927	0	2 213	2 917	149300	149297			S	L	R	L	R	R	L	P	R	L		0 016	503845 893 6964353 429	PPL	BL				16

Layer: S P Report: S P R																										
Property Connection ID	Asset Status	Segment ID	Connection Status	Chainage	Invert Level	Surface Level	Depth	Diameter	Tie Length	Length (Actual)	Date Constructed	Date Retired	Drainage Plan Number	Drawing Number	Amended Drawing Number	Jump Up	Jump Up Type	Easting 1	Northing 1	Easting 2	Northing 2	Remarks	Facet			
P 270860		LS150310	1	17 222	999	999	1 067	100 0		0 5	19280101	0		6762			0	PPL	BL	503813 694 6964317 065	503813 694 6964317 065			16		
P 263166		LS150305	1	26 213	999	999	0	100 0		0 5	19270101	0					0	PPL	BL	503828 735 6964355 403	503828 146 6964356 211			16		
P 263158		LS150303	1	3 404	3 484	5 008	0	100 0 787		2 591	19270101	0		6124			0	PPL	BL	503849 231 6964350 106	503849 568 6964352 833			16		
P 271685		LS151487	1	11 354	999	999	0	100 0		0 5	19270101	0					0	PPL	BL	503799 791 6964386 593	503799 791 6964386 593			16		
P 263167		LS150306	1	19 38	3 505	5 054	0	100 19 99		7 747	19270101	0		6130			0	PPL	BL	503805 707 6964336 811	503799 256 6964341 211			16		
P 271705		LS151493	1	8 358	999	999	1 801	100 3 844		12 378	19270101	0		6526			0	PPL	BL	503786 113 6964375 581	503798 518 6964374 278			16		
P 263162		LS150304	1	3 801	5 669	6 136	0	100 0		0 5	19960101	0		340429			0	PPL	BL	503889 451 6964341 799	503889 451 6964341 799			16		
P 263164		LS150305	1	36 957	3 142	4 666	0	100 0 254		2 691	19270101	0		6118			0	PPL	BL	503838 772 6964351 746	503839 054 6964354 501			16		
P 263161		LS150303	1	30 815	4 304	5 828	0	150 0 61		2 847	19270101	0		6172			0	PPL	BL	503877 497 6964345 625	503877 497 6964345 625			16		
P 263159		LS150303	1	21 641	3 935	5 511	0	100 1 549		2 489	19270101	0		6393			0	PPL	BL	503866 862 6964347 341	503867 318 6964349 957			16		
P 270857	S	LS150310	1	57 861	8 632	9 86	0	150 0		0 5	1928	0		272741	3016 82282		0	PPL	BL	503854 296 6964311 421	503854 296 6964311 421	S		16		
P 270859		LS150310	1	35 866	999	999	0	100 0		0 5	19280101	0		6762			0	PPL	BL	503832 075 6964314 157	503832 075 6964314 157			16		
P 263163		LS150304	1	24 201	999	999	0 799	100 0		0 5	19960101	0		6394			0	PPL	BL	503886 063 6964321 684	503885 483 6964322 499			16		
P 271704		LS151493	1	8 358	2 06	3 609	0	100 0		8 025	19270101	0		6311			0	PPL	BL	503790 978 6964378 867	503798 518 6964374 278			16		
P 270856		LS150310	1	57 861	11 226	11 899	0	150 1 298		25 999	19280101	0		6263			0	PPL	BL	503849 548 6964285 807	503853 122 6964311 544			16		
P 263160	S	LS150303	1	44 221	999	999	0	100 0		0 5	0	0		6394			0	PPL	BL	503890 345 6964345 193	503889 503 6964346 361			16		
P 263165		LS150305	1	26 975	2 874	4 398	0	100 0 991		2 667	19270101	0		6402			0	PPL	BL	503829 585 6964353 189	503829 555 6964355 99			16		

Layer: S Report: S R																			
Device ID	Asset Status	Device Number	Sewer Line Number	Reticulation Number	Sewer Line Name	Device Type	Device Use	Lid Type	Chainage	Surface Level	Date Constructed	Date Retired	Drawing Number	Amended Drawing Number	Position	Easting	Northing	Facet	
149297		1	6	27 23				L	44 12	4 73	1927				R	RR	R 503845 893 6964353 429	16	
149298		2	6	27 23				L	44 221	6 203	1927				R	RR	R 503889 503 6964346 361	16	
149300		1	4	27 23				L	10 82	4 17	1927				R	RR	R 503802 166 6964360 285	16	
149301		2	4	27 23				L	40 361	6 407	1927				R	RR	R 503796 106 6964320 562	16	
149304		1	4	27 23				L	57 861	9 86	1928				P	R	L 503853 122 6964311 544	16	
149299			6	27 23		PPL	BL	L	PPL	BL	24 597	8 757	1996	0	P	R	L 503885 417 6964322 109	16	
150525		1	5	27 23				L	8 358	3 618	1927	0			R	RR	R 503798 518 6964374 278	16	
152078		3	1027	27 23 B				L	114 626	3 844	1922	0			R	RR	R 503805 246 6964370 519	16	

Layer: S								P		Report:		P	
Drainage Plan ID	Drainage Plan Number	Asset Status	Combine Drain	Facet	Group Title Block	Multiple Blocks	Reticulation Number						
P115181	6311			16		0	0 27 23						
P115450	6118			16		0	0 27 23						
P115451	6124			16		0	0 27 23						
P115452	6393			16		0	0 27 23						
P115449	6402			16		0	0 27 23						
P115454	6394			16		0	0 27 23						
P428196	6172			16		0	0 27 23						
P428197	340429			16		0	0 27 23						
P432720	6190			16		0	0 27 23						
P115182	6526			16		0	0 27 23						
P115463	5958			16		0	0 27 23						
74195	6130		S	16			0 27 23						
18202	6130		S	16			0 27 23						

R

Layer: S		P		Report: S		R																								
Plant Number	Facet	Pid	Asset Status	Class	Data Source	Diameter	Width	Downstream Depth Invert	Upstream Depth Invert	Downstream IL	Upstream IL	Downstream MH ID	Upstream MH ID	Equipment Number	Easting	Northing	Length	Lining	Material	Month Constructed	Year Constructed	Number Of Barrels	Pipe Shape	Pipe Survey PID	Plan Number	Slope	Tidal	Waterway Planning Unit	SW Unique ID	Pipe Survey
16000288	16	288				600	0	999	999	0	0				503775 444 6964357 958	34 507	L	R	S L		4	1974		1 P P	0 5388			B 020	R 16000288	
16000036	16	36				375	0	999	999	0	8 315	1642	1643		503787 045 6964276 587	99 245	L				0	0		1 P P	0 P235			B 020	R 16000036	
16000295	16	295		L SS 2		1050	0	2 145	2 552	2 204	2 246	16314	16313		503788 739 6964336 66	12 965	L	PR	S R		5	1976		1 P P	0 5388			B 020	R 16000295	
16000051	16	51		L SS 2		600	0	2 012	1 387	1 832	3 167	1642	1658		503817 089 6964467 574	83 6	L	PR	S R		2	2003		1 P P	0 11088	1 62 6		B 020	R 16000051	
16000304	16	304				375	0	999	999	0	0				503810 374 6964364 436	13 467	L	PR	S R		2	1972		1 P P	0 4720			B 010	R 16000304	
16041420	16	41420		L SS 2		825	0	2 493	2 007	1 174	1 607	16317	1642634		503804 479 6964387 242	7 9	L	PR	S R		2	2003		1 P P	0 11088	1 18 2		B 020	R 16041420	
16000289	16	289				750	0	999	999	0	0				503811 005 6964379 818	77 667	L	S	S		4	1974		1 P P	0 5388			B 010	R 16000289	
16000298	16	298		L SS 2		1220	0	2 478	2 573	1 143	1 094	16316	16317		503805 868 6964362 964	15 369	L				5	1976		1 P P	0 5388	1 120		B 010	R 16000298	
16000052	16	52				600	0	999	999	0	0	16317	1642		503802 849 6964375 605	9 18	L	R	S L		4	1974		1 P P	0 5388			B 010	R 16000052	
16000290	16	290				450	0	999	999	0	0				503748 434 6964345 57	22 86	L	R	S L		4	1974		1 P P	0 5388			B 020	R 16000290	
16000297	16	297		L SS 2		0	0	2 475	1 734	1 146	1 881	16316	16315		503802 243 6964356 649	5 083	L	PR	S R		5	1976		1 P P	0 5388			B 010	R 16000297	
16000294	16	294		L SS 2		900	0	999	999	2 246	0 728	16313	16312		503748 673 6964344 073	46	L	PR	S R		5	1982		1 P P	0 5388	1 57		B 020	R 16000294	
16000296	16	296		L SS 2		0	0	1 582	2 145	2 033	2 204	16315	16314		503800 648 6964341 785	14 949	L	PR	S R		5	1976		1 P P	0 5388			B 020	R 16000296	

Layer: S		P		Report: S		R								
Plant Number	Facet	Pid	Equipment Number	Asset Status	Diameter	Width	Downstream IL	Upstream IL	Length	Class	Number Of Barrels	Plan Number	Waterway Planning Unit	SW Unique ID
16127029	16	127029			100	0	0	0	35 525	L SS S	1		B 020	16127029
16127030	16	127030			100	0	0	0	14 239	L SS S	1		B 020	16127030
16033363	16	33363			100	0	0	0	23 72	L SS S	1		B 020	16033363
16127031	16	127031			100	0	0	0	16 912	L SS S	1		B 020	16127031
16139803	16	139803			450	0	0	0	7 883	L SS S	1	11914	020	16139803
16139805	16	139805			100	0	0	0	12 636	L SS S	1	11914	020	16139805

Layer: S		Report: S		R																																
Plant Number	Facet	Pid	Equipment Number	Asset Status	Depth	Invert Level	Month Constructed	Year Constructed	Plan Number	Gully Inlet Orientation	Gully Inlet Size	Gully Inlet Type	Outlet Type	Number Of Chambers	Backstone Condition	Backstone Type	Easting	Northing	GPS Easting	GPS Northing	Grate						Grate Condition 1	Grate Condition 2	Grate Condition 3	Grate Condition 4	Location	Park Code	Pipe Survey Pid	Sag	Waterway Planning Unit	Sw Unique ID
16092114	16	92114			0	0						R L R		1			503825 533 6964356 94	503825 535 6964356 942	S	13 R S S B RS	1 S R P R LL L B R					0								B 010	16092114	
16092550	16	92550			0	0				RB L R		R L R		1			503804 202 6964342 545	503802 615 6964342 782	S	13 R S S B RS	1 S R P R LL L B R					0								B 020	16092550	
16092551	16	92551			0	0						R L R		1			503803 265 6964337 504	503801 795 6964337 682	S	13 R S S B RS	1 S R P R LL L B R					0								B 020	16092551	
16092543	16	92543			0	0						R L R		1			503781 469 6964331 399	503781 595 6964332 082		BL S R					0								B 020	16092543		
16092544	16	92544			0	0						R L R		1			503781 944 6964334 242	503781 945 6964334 242		BL S R					0								B 020	16092544		

Layer: S			Report: S			R																				
Plant Number	Facet	Pid	Asset Status	Type	MH Number	Diameter	Depth	Width	Material	Month Constructed	Year Constructed	Invert Level	MH Drop	Plan Number	Covered	Data Source	Date Source	Easting	Northing	Gully Inlet Geometry	Gully Inlet Type	Lid Level	Number Of Chambers	Pipe Survey Pid	Waterway Planning Unit	Sw Unique ID
16000313	16	313		R	L	5388 5	1350	999 99	0 S		5	1976	2 204	5388			B L L R R	503788 739 6964336 66				4 798	0		0 B 020	16000313
16000314	16	314		R	L	5388 4	1350	999 99	0 S		5	1976	1 881	5388			B L L R R	503800 648 6964341 785				4 349	0		0 B 020	16000314
16000316	16	316		P	L	5388 2	1500	999 99	2100 S		0	0	1 094	5388			B L L R R	503805 111 6964360 845				3 621	0		0 B 010	16000316
16000315	16	315		R	L	5388 3	1350	999 99	0 S		5	1976	1 146	5388			B L L R R	503802 243 6964356 649				3 615	0		0 B 020	16000315
16000324	16	324		R	L	4720 2B	0	999 99	0 S		0	0	0	4720			B L L R R	503810 374 6964364 436				0	0		0 B 010	16000324
16000318	16	318		R	L	5388	0	999 99	0 S		0	0	0	5388			B L L R R	503775 444 6964357 958				0	0		0 B 020	16000318
16000317	16	317		P	L	5388 1	1500	999 99	2100 S		5	1976	1 375	5388			B L L R R	503811 005 6964379 818				3 667	0		0 B 010	16000317
16000042	16	42		R	L	5388	0	999 99	0 S		2	2003	1 615	5388			B L L R R	503802 849 6964375 605				3 844	0		0 B 020	16000042
16042634	16	42634		R	L	3 1	1500	999 99	0 S		2	2003	1 607	11088			B L L R R	503804 479 6964387 242				3 614	0		0 B 020	16042634

--



Date : Oct 7, 2015
User : adglogin#1001701

Scale = 1:500
Metres 10 20

Location :
6,964,394
503,736 N 503,937
6,964,280

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Caution: This map may contain the locations of abandoned underground asbestos pipes. Council gives no warranty to the completeness or accuracy of these records. Appropriate care needs to be taken in all cases.



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R

Layer:		Report:															
Fitting ID	Fitting Number	Equipment Number	Asset Status	Segment1 ID	Segment2 ID	Fitting Type			Date Constructed	Date Retired	Drawing Number	Amended Drawing	Project Number	Asset Type	Description	Facet Number	Remarks
RS 13758		0 000010837909		RS133780		S	R S	L	17 07 1972	0				B		16	
RS 13759		0 000010837910		RS133781		S	R S	R	26 07 1972	0				B		16	

Layer:		Report:													
Hydrant ID	Asset Status	Segment1 ID	Hydrant Type		Date Constructed	Date Retired	Drawing Number	Amended Drawing	Catseye Installed	Site Location	Remarks	Description	Facet Number		
R 19197		RS28739	R	L	17 05 1979	0			20040401			R	16		
R 19206		RS198380	R	L	07 08 1972	0			20040501			R	16		

Layer: R		Report: R																	
Segment ID	Asset Status	Alignment	Diameter	Material		Graphical Length	Date Constructed	Date Retired	Drawing Number	Amended Drawing	Folio Number	External Coating	Job Classification			Reservoir Booster Zone			Water Region
RS133781		2 820	225	S	R SP	L	224 461 26 07 1972	0			269B		PR		B	S S PPL	R	LL R S 1 2 LL	S P PS 6
RS133780		2 820	150	S	R SP	L	18 052 17 07 1972	0			269		PR		B	S S PPL	R	LL R S 1 2 LL	S P PS 6
RS28739		1 600	150	S	R SP	L	225 059 17 05 1979	0			77 2		PR	S B	PR	S PPL	R	LL R S 1 2 LL	S P PS 6
RS198380		2 820	150	S	R SP	L	97 149 07 08 1972	0			268		PR	S B	PR	S PPL	R	LL R S 1 2 LL	S P PS 6

Layer: S		Report: S													
Zone ID	Facet	Zone Name													
B15943	12	R	LL R S 1 2 LL	S	P	PS									

Appendix F

Hydrology Calculations



CIVIL DESIGN SPREADSHEETS

Project ABBOTSFORD										Job # 18403				Rev 0					
Subject Upstream Catchment Runoff										Made by / date BLYTH 13.10.15									
										Checked / date BLYTH 13.10.15									
RATIONAL METHOD CALCULATIONS (UPSTREAM)																			
CATCH- MENT ID	AREA (ha)	Fi	Impervious Area (ha)	Pervious Area (ha)	C10	C1	C100	CA100	Sheet Flow Length (m)	Slope (%)	Mannings "n"	Sheet Flow Time (mins)	Channel Flow Time (mins)	Time of Conc. "tc" (mins)	Q1 Rainfall Intensity (mm/hr)	Q100 Rainfall Intensity (mm/hr)	Q1 Peak Flow (m3/s)	Q10 Peak Flow (m3/s)	Q100 Peak Flow (m3/s)
US1	0.050	0.50	0.025	0.025	0.78	0.62	0.936	0.047						7.0	104.3	286.5	0.009	0.021	0.037
Notes: 1) Rational method calculations are in accordance with QUDM (2013) Volume 1 Chapter 4.0 where $Q = CIA/360$ 2) Fraction Impervious and Mannings 'n' value estimated from site aerial imagery and topographical information 3) Intesity Frequency Duration Rainfall Data extracted from online Bureau of Meteorology 'Rainfall IFD Data System' 4) Time of concentration is sum of overland sheet flow time (Friend's eq.) plus channel time (Argue method) 5) C10 value for Fi values less than 0.10 assumes "medium" soil permeability and "poor" grass coverage																			



CIVIL DESIGN SPREADSHEETS

Project ABBOTSFORD	Job # 18403			Rev 0
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Subject Pre-Development Catchment Runoff	Made by / date BLYTH 13.10.15
	Checked / date BLYTH 13.10.15

RATIONAL METHOD CALCULATIONS (PRE-DEVELOPMENT)

PRE-DEV CATCH- MENT ID	AREA (ha)	Fi	Impervious Area (ha)	Pervious Area (ha)	C10	C1	C100	CA100	Sheet Flow Length (m)	Slope (%)	Mannings "n"	Sheet Flow Time (mins)	Channel Flow Time (mins)	Time of Conc. "tc" (mins)	Q1 Rainfall Intensity (mm/hr)	Q100 Rainfall Intensity (mm/hr)	Q1 Peak Flow (m3/s)	Q10 Peak Flow (m3/s)	Q100 Peak Flow (m3/s)
EX1	0.078	1.00	0.078	0.000	0.90	0.72	1	0.078						5.0	118.4	322.8	0.019	0.042	0.070
EX2	0.058	0.00	0.000	0.058	0.66	0.53	0.792	0.046						6.0	110.7	302.6	0.009	0.021	0.039

Notes:

- 1) Rational method calculations are in accordance with QUDM (2013) Volume 1 Chapter 4.0 where $Q = CIA/360$
- 2) Fraction Impervious and Mannings 'n' value estimated from site aerial imagery and topographical information
- 3) Intensity Frequency Duration Rainfall Data extracted from online Bureau of Meteorology 'Rainfall IFD Data System'
- 4) Time of concentration is sum of overland sheet flow time (Friend's eq.) plus channel time (Argue method)
- 5) C10 value for Fi values less than 0.10 assumes "medium" soil permeability and "poor" grass coverage

Project ABBOTSFORD	Job # 18403			Rev 0
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Subject Post-Development Catchment Runoff	Made by / date BLYTH 13.10.15
	Checked / date BLYTH

RATIONAL METHOD CALCULATIONS (POST-DEVELOPMENT)

POST-DEV CATCH- MENT ID	AREA (ha)	Fi	Impervious Area (ha)	Pervious Area (ha)	C10	C1	C100	CA100	Sheet Flow Length (m)	Slope (%)	Mannings "n"	Sheet Flow Time (mins)	Channel Flow Time (mins)	Time of Conc. "tc" (mins)	Q1 Rainfall Intensity (mm/hr)	Q100 Rainfall Intensity (mm/hr)	Q1 Peak Flow (m3/s)	Q10 Peak Flow (m3/s)	Q100 Peak Flow (m3/s)
C1	0.119	1.00	0.119	0.000	0.90	0.72	1	0.119						5.0	118.4	322.8	0.022	0.051	0.084
C2	0.006	0.50	0.003	0.003	0.78	0.62	0.936	0.006						5.0	118.4	322.8	0.001	0.003	0.006
C3	0.020	0.50	0.010	0.010	0.78	0.62	0.936	0.018						5.0	118.4	322.8	0.007	0.016	0.029

Notes:

- 1) Rational method calculations are in accordance with QUDM (2013) Volume 1 Chapter 4.0 where $Q = CIA/360$
- 2) Fraction Impervious and Mannings 'n' value estimated from site aerial imagery and topographical information
- 3) Intensity Frequency Duration Rainfall Data extracted from online Bureau of Meteorology 'Rainfall IFD Data System'
- 4) Time of concentration is sum of overland sheet flow time (Friend's eq.) plus channel time (Argue method)
- 5) C10 value for Fi values less than 0.10 assumes "medium" soil permeability and "poor" grass coverage

Project ABBOTSFORD	Job # 18403			Rev 0
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Subject Comparison of Pre vs Post Development Flows	Made by / date BLYTH 13.10.15
	Checked / date BLYTH

RATIONAL METHOD SUMMARY (PRE vs POST-DEVELOPMENT FLOWS)

POST-DEV CATCH- MENT ID	AREA (ha)	Fi	Impervious Area (ha)	Pervious Area (ha)	C10	C1	C100	CA100	Sheet Flow Length (m)	Slope (%)	Mannings "n"	Sheet Flow Time (mins)	Channel Flow Time (mins)	Time of Conc. "tc" (mins)	Q1 Rainfall Intensity (mm/hr)	Q100 Rainfall Intensity (mm/hr)	Q1 Peak Flow (m3/s)	Q10 Peak Flow (m3/s)	Q100 Peak Flow (m3/s)
TOTAL EX	0.136	0.58	0.078	0.058	0.80	0.64	0.96	0.131	300	0.47	0.022	18	1	6.0	110.7	302.6	0.028	0.064	0.109
TOTAL PR	0.136	0.85	0.115	0.021	0.87	0.69	1	0.136	300	0.47	1.022	851	2	5.0	118.4	322.8	0.031	0.070	0.119

Project ABBOTSFORD	Job # 18403			Rev 0
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Subject Initial Detention Volume Calculation - QUDM Method	Made by / date BLYTH 13.10.15
	Checked / date BLYTH

DETENTION SIZING (RATIONAL BASED METHODS)

Storm Event	Volumetric Coefficients of Runoff		Rainfall Intensities		Post-Development Peak Inflow	Desired Outflow (Pre-Development)	Inflow Volume	Reduction Ratio	Detention Volume Calculation Methods QUDM 5.05.1				Average of Methods	
ARI (yr)	Exist Cv	Post-Dev Cv	Exist I (mm/hr)	Post-Dev I (mm/hr)	Qi (m3/s)	Qo (m3/s)	Vi (m3)	r	CULP (m3)	BOYD (m3)	CARROL (m3)	BASHA (m3)	AVERAGE (m3)	
1	0.640	0.692	110.7	118.4	0.031	0.027	12	0.1355	0.7	1.7	0.8	1.2	1.1	
2	0.680	0.735	142.0	151.8	0.042	0.037	17	0.1309	0.9	2.2	1.0	1.6	1.4	
5	0.760	0.822	179.5	191.8	0.059	0.052	24	0.1299	1.3	3.1	1.4	2.2	2.0	
10	0.800	0.865	201.8	215.5	0.070	0.061	28	0.1296	1.5	3.6	1.7	2.6	2.4	
20	0.840	0.908	231.8	247.4	0.089	0.074	36	0.1704	2.7	6.1	2.9	4.4	4.0	
50	0.920	0.995	271.8	290.0	0.109	0.095	44	0.1333	2.5	5.8	2.7	4.1	3.8	
100	0.960	1.000	302.6	322.8	0.122	0.110	49	0.0953	1.8	4.6	2.0	3.2	2.9	

Appendix G

Catchment Plan

XREF'S:

LEGEND

- EXISTING SURFACE CONTOURS
- EXISTING PROPERTY BOUNDARY
- EXISTING EASEMENT BOUNDARY
- EXISTING NOMINAL KERB LINE
- EXISTING STORMWATER DRAINAGE
- EXISTING SEWER
- EXISTING WATER
- EXISTING UNDERGROUND ELECTRICITY
- EXISTING OVERHEAD ELECTRICITY
- EXISTING GAS
- EXISTING TELECOMMUNICATIONS
- EXISTING RETAINING WALL
- EXISTING FENCE

CATCHMENT BOUNDARY

CATCHMENT LABEL

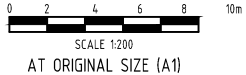
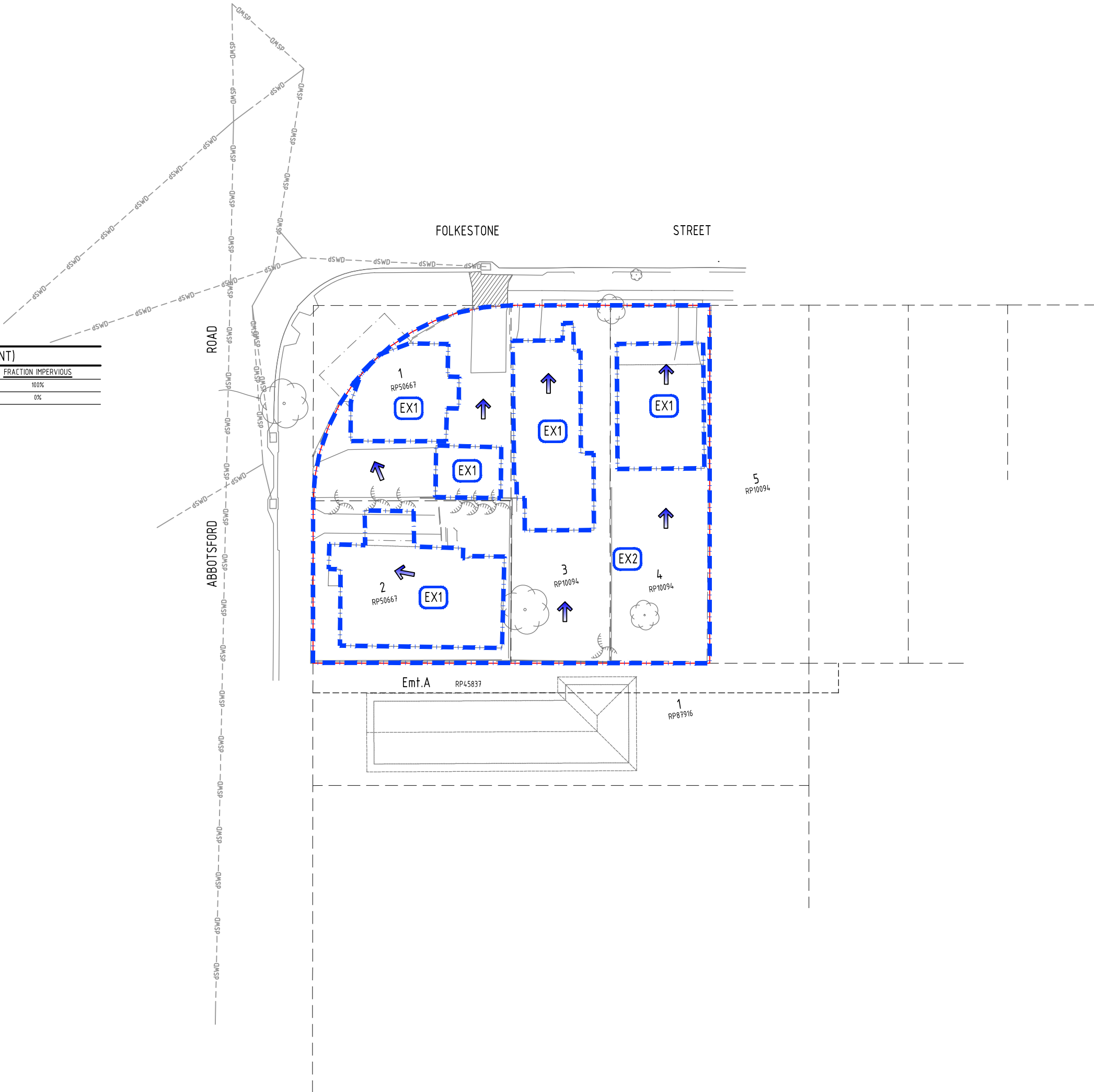
CATCHMENT FLOW DIRECTION

PROPOSED DRIVEWAY CROSSOVER

EXISTING DRIVEWAY CROSSOVER

CATCHMENT TABLE (PRE DEVELOPMENT)

CATCHMENT NAME	AREA (ha)	FRACTION IMPERVIOUS
EX1	0.0780	100%
EX2	0.0580	0%



01	13.10.15	Preliminary Issue	SW	MB
Rev	Date	Description	By	CHK

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Client
RISE PROJECTS PTY LTD
Project Name
63, 65 ABBOTSFORD ROAD & 1, 3 FOLKESTONE STREET
BOWEN HILLS, QLD 4006

Title
**PRE-DEVELOPMENT
STORMWATER DRAINAGE
CATCHMENT LAYOUT PLAN**

Discipline CIVIL	Status PRELIMINARY
Designed By MB	Checked By MB
Project No. 18403	Scale at A1 1:200
Drawing No. DA01	Revision 01

LEGEND

	EXISTING SURFACE CONTOURS
	EXISTING PROPERTY BOUNDARY
	EXISTING EASEMENT BOUNDARY
	EXISTING NOMINAL KERB LINE
	EXISTING STORMWATER DRAINAGE
	EXISTING SEWER
	EXISTING WATER
	EXISTING UNDERGROUND ELECTRICITY
	EXISTING OVERHEAD ELECTRICITY
	EXISTING GAS
	EXISTING TELECOMMUNICATIONS
	EXISTING RETAINING WALL
	EXISTING FENCE
	CATCHMENT BOUNDARY

EX1

CATCHMENT LABEL



CATCHMENT FLOW DIRECTION



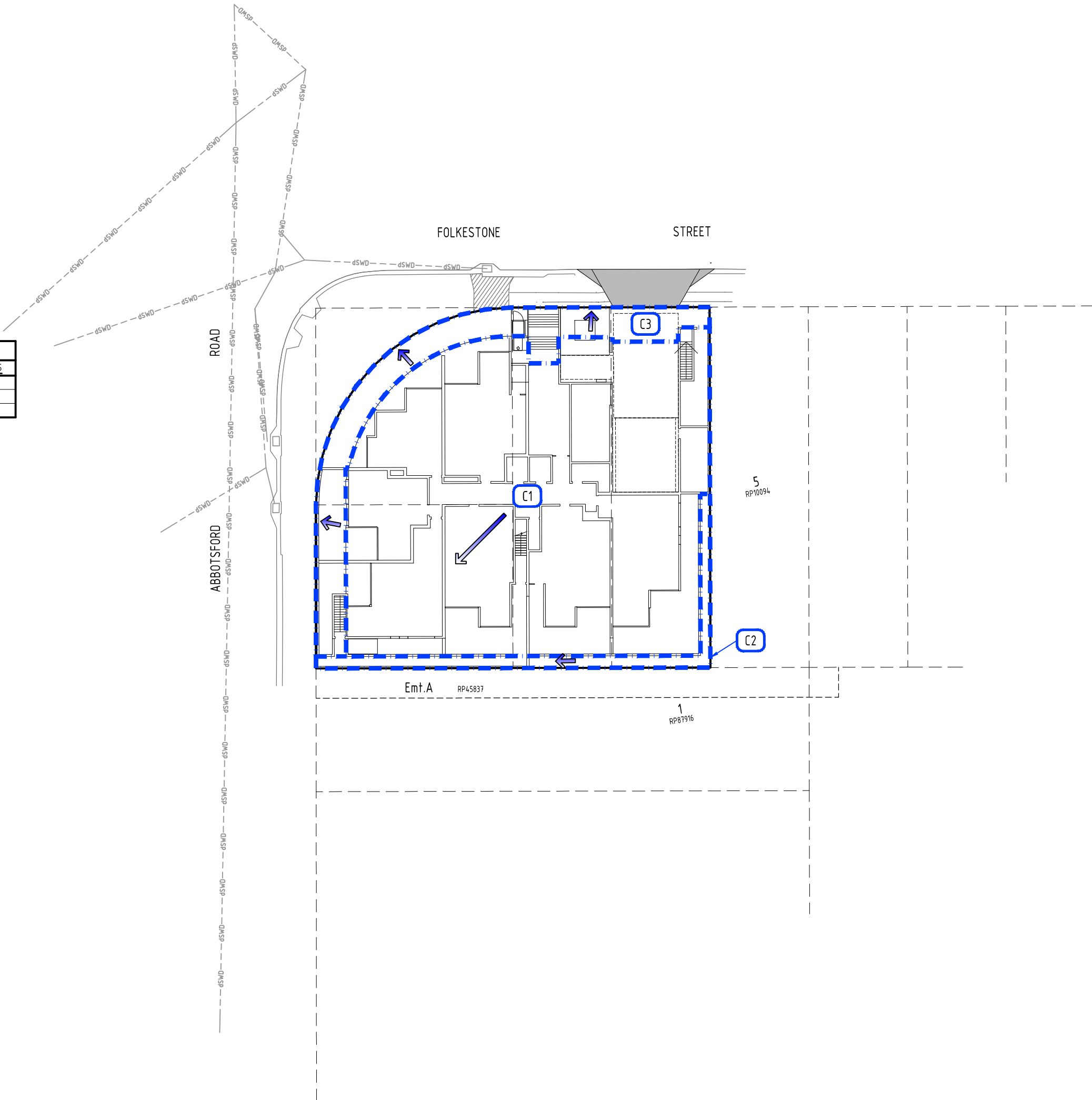
PROPOSED DRIVEWAY CROSSOVER



EXISTING DRIVEWAY CROSSOVER

CATCHMENT TABLE (POST DEVELOPMENT)

CATCHMENT NAME	AREA (ha)	FRACTION IMPERVIOUS
C1	0.1193	100%
C2	0.0062	50%
C3	0.0197	50%



SCALE 1:200

AT ORIGINAL SIZE (A1)

01	13.10.15	Preliminary Issue	SW	MB
Rev	Date	Description	By	Chk

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AUSTRALASIA / ASIA / EUROPE / MIDDLE EAST

Client
RISE PROJECTS PTY LTD
Project Name
63, 65 ABBOTSFORD ROAD & 1, 3 FOLKESTONE STREET
BOWEN HILLS, QLD 4006

Title
**POST-DEVELOPMENT
STORMWATER DRAINAGE
CATCHMENT LAYOUT PLAN**

Discipline CIVIL		Status PRELIMINARY
Designed By MB	Checked By MB	Approved By MB
Project No. 18403	Drawn By SW	Scale at A1 1:200
Drawing No. DA02		Revision 01

LEGEND

- EXISTING SURFACE CONTOURS
- EXISTING PROPERTY BOUNDARY
- EXISTING EASEMENT BOUNDARY
- EXISTING NOMINAL KERB LINE
- EXISTING STORMWATER DRAINAGE
- EXISTING SEWER
- EXISTING WATER
- EXISTING UNDERGROUND ELECTRICITY
- EXISTING OVERHEAD ELECTRICITY
- EXISTING GAS
- EXISTING TELECOMMUNICATIONS
- EXISTING RETAINING WALL
- EXISTING FENCE

CATCHMENT BOUNDARY

EX1

CATCHMENT LABEL



CATCHMENT FLOW DIRECTION



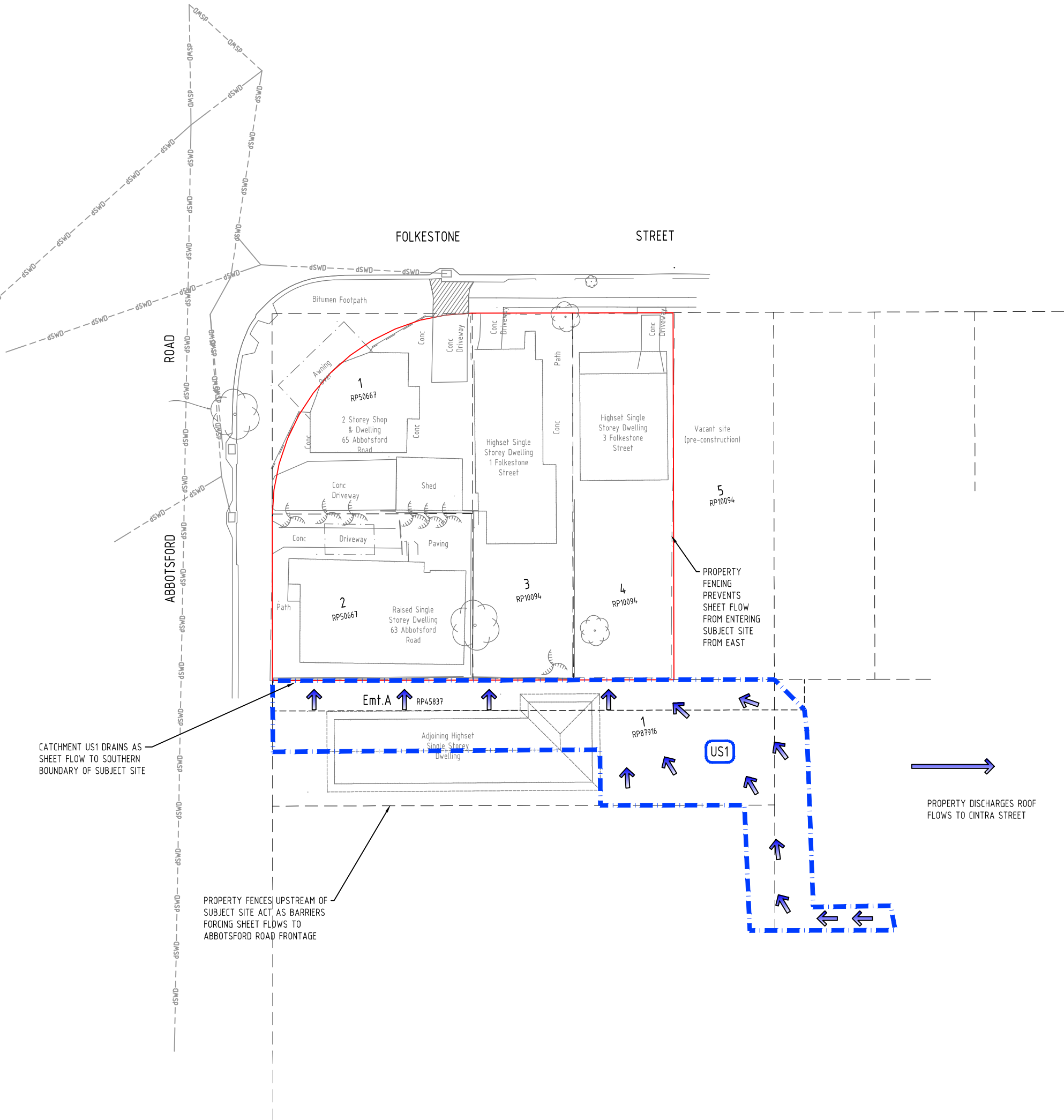
PROPOSED DRIVEWAY CROSSOVER



EXISTING DRIVEWAY CROSSOVER

CATCHMENT TABLE (PRE DEVELOPMENT)

CATCHMENT NAME	AREA (ha)	FRACTION IMPERVIOUS
US1	0.0500	50%



0 2 4 6 8 10m
SCALE 1:200
AT ORIGINAL SIZE (A1)

01	13.10.15	Preliminary Issue	BP	MB
Rev	Date	Description	By	CHK
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Client
RISE PROJECTS PTY LTD
Project Name
63, 65 ABBOTSFORD ROAD & 1, 3 FOLKESTONE STREET
BOWEN HILLS, QLD 4006

Title
UPSTREAM STORMWATER DRAINAGE CATCHMENT LAYOUT

Discipline CIVIL	Status PRELIMINARY
Designed By MB	Checked By MB
Project No. 18403	Drawn By SW
Drawing No. DA03	Revision 01

Appendix H

Stormwater Layout Concept

LEGEND

---	EXISTING SURFACE CONTOURS
---	EXISTING PROPERTY BOUNDARY
---	EXISTING EASEMENT BOUNDARY
---	PROPOSED BUILDING
---	EXISTING NOMINAL KERB LINE
--- SWD ---	EXISTING STORMWATER DRAINAGE
--- S ---	EXISTING SEWER
--- W ---	EXISTING WATER
--- E ---	EXISTING UNDERGROUND ELECTRICITY
--- OE ---	EXISTING OVERHEAD ELECTRICITY
--- G ---	EXISTING GAS
--- T ---	EXISTING TELECOMMUNICATIONS
---	EXISTING RETAINING WALL
---	EXISTING FENCE
--- SWD ---	PROPOSED STORMWATER DRAINAGE
--- W ---	PROPOSED WATER
--- S ---	PROPOSED SEWER
---	BASEMENT EXTENT
---	PROPOSED DRIVEWAY CROSSOVER
---	EXISTING DRIVEWAY CROSSOVER
---	FLOW DIRECTION



FLOW MITIGATION SOLUTION

THE PROPOSED SOLUTION TO MITIGATE FLOWS IS TO IMPLEMENT ABOVE GROUND DETENTION TANKS TO CAPTURE ROOF FLOWS BEFORE DISCHARGING TO EXISTING INFRASTRUCTURE IN THE WEST

WATER QUALITY NOTES:

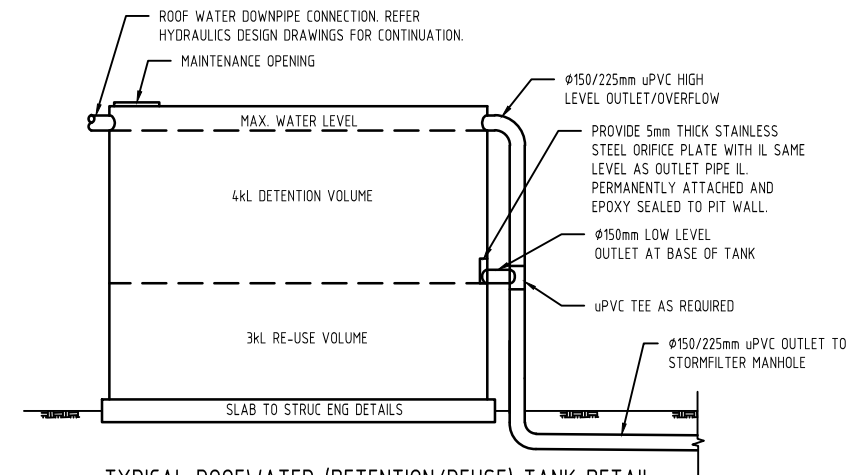
- 2 x GROUND LEVEL INLET PITS ARE TO BE FITTED WITH TRASH BASKETS.
- PROPOSED TANK WILL SERVE THE DUAL PURPOSE OF PROVIDING THE REQUIRED ON-SITE DETENTION IN ADDITION TO CAPTURING GROSS POLLUTANTS.

IFD DATA ADOPTED:

THE RAINFALL INTENSITY-FREQUENCY-DURATION (IFD) DATA ADOPTED FOR USE WITHIN THE DRAINAGE CALCULATIONS IS FOR LOCALITY: -27.444188S & 153.038764E ('BOWEN HILLS') AND IS CALCULATED IN ACCORDANCE WITH AUSTRALIAN RAINFALL AND RUN-OFF (1987 EDITION) USING COEFFICIENTS ISSUED BY THE BUREAU OF METEOROLOGY

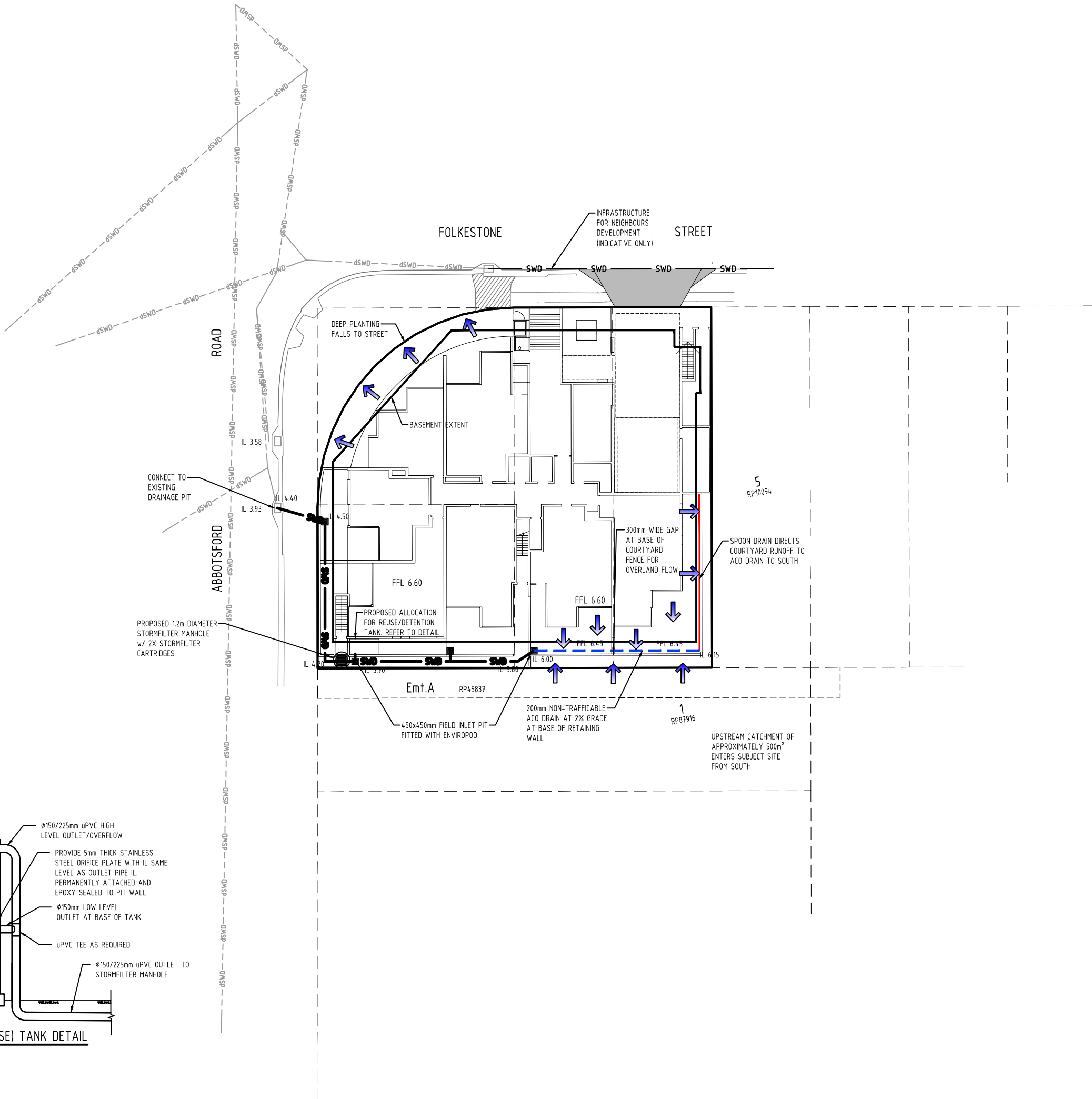
EXISTING SERVICES NOTE

EXISTING SERVICES MAY BE PLOTTED FROM BRISBANE CITY COUNCIL RECORDS AND 'D.B.Y.D.'. LOCATION AND LEVEL OF ALL EXISTING SERVICES ARE ASSUMED AND ARE TO BE CONFIRMED ON SITE PRIOR TO CONSTRUCTION. CONTRACTOR TO CONTACT 'DIAL BEFORE YOU DIG' FOR THE LOCATION OF EXISTING PUBLIC UTILITIES PRIOR TO EXCAVATION. ANY DAMAGE TO EXISTING SERVICES WILL BE REPAIRED BY AUTHORITIES AT THE CONTRACTORS EXPENSE.



TYPICAL ROOFWATER (DETENTION/REUSE) TANK DETAIL

NTS



0 2 4 6 8 10m
SCALE 1:200
AT ORIGINAL SIZE (A1)

01	13.10.15	Preliminary Issue	SW	MB
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Rev	Date	Description	By	Chk
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AUSTRALASIA / ASIA / EUROPE / MIDDLE EAST

Client
RISE PROJECTS PTY LTD

Project Name
**63, 65 ABBOTSFORD ROAD & 1, 3 FOLKESTONE STREET
BOWEN HILLS, QLD 4006**

Title
STORMWATER DRAINAGE LAYOUT PLAN

Discipline CIVIL	Status PRELIMINARY
----------------------------	------------------------------

Designed By MB	Checked By MB	Approved By MB
--------------------------	-------------------------	--------------------------

Project No. 18403	Drawn By SW	Scale at A1 1:200
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Drawing No. DA04	Revision 01
----------------------------	-----------------------

Appendix I

Floodwise Property Report



Brisbane City Council FloodWise Property Report

Report Reference

1444190701616

07/10/2015 14:05:01

Dedicated to a better Brisbane

THIS REPORT IS FOR BUILDING AND DEVELOPMENT PURPOSES ONLY

The FloodWise Property Report provides property or lot-based flood information for building and development requirements. This report provides information on estimated flood levels, habitable floor level requirements and more technical information on the four sources of flooding: river, creek / waterway, storm tide and overland flow. Refer to the Useful Definitions section for a glossary of terms.

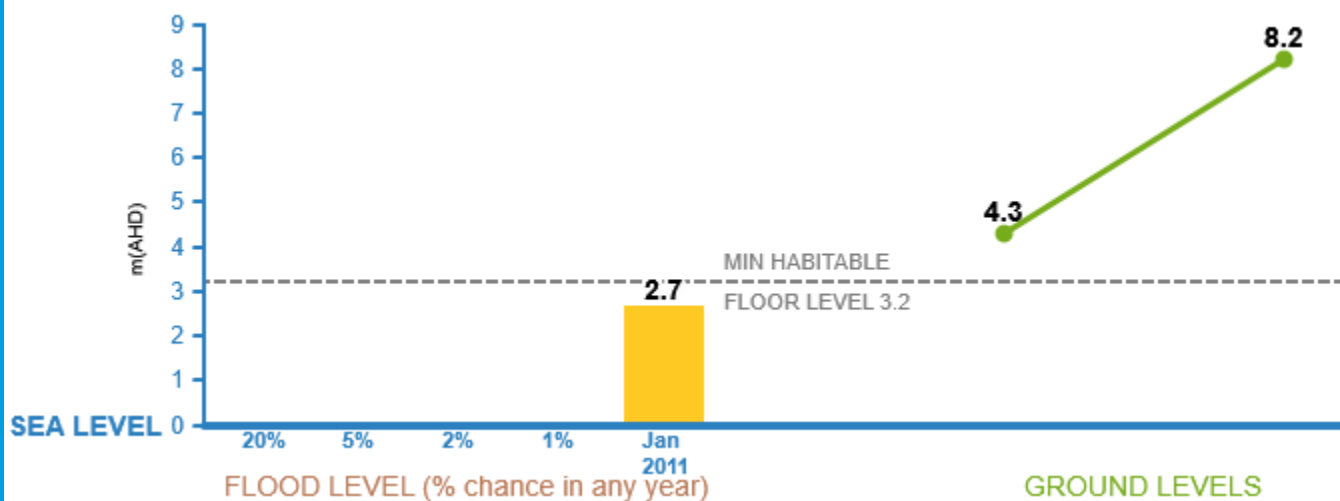
To find out more about how the contents of this report may affect building or development on this property, please visit www.brisbane.qld.gov.au/planning-building. For more general information about understanding your flood risk and how to prepare your property, family or business for potential flooding visit www.brisbane.qld.gov.au/beprepared

THIS IS A REPORT FOR:

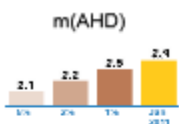
Rateable Address: 1 FOLKESTONE ST, BOWEN HILLS QLD 4006

Lot Details: L3 RP.10094

FLOOD LEVEL INFORMATION



EXPLANATION



m(AHD) - Metres Australia Height Datum. The level of 0.0m AHD is approximately mean sea level.

Flood Levels - The Flood level bar chart above shows the possible flooding level and percentage chance of that level being reached or exceeded in any year. If an orange bar shows, it is the calculated January 2011 flood level at this address or lot.

Minimum Habitable Floor Level - Applies to residential development only. Please refer to Council's planning scheme to learn how this may affect you. If a property is in an overland flow path, or a large allotment, a minimum habitable floor level cannot be provided. Refer flood and planning development flags below.

Ground Levels - The green line above shows this property's approximate lowest and highest ground levels based on latest available information (2009 airborne laser survey) to Council. If you are building, please confirm with a surveyor.

For further information and definitions please refer to the Useful Definitions page



Brisbane City Council FloodWise Property Report

Report Reference

1444190701616

07/10/2015 14:05:01

Dedicated to a better Brisbane

TECHNICAL SUMMARY

This section of the FloodWise Property Report contains more detailed flood information for this property so surveyors, builders, certifiers, architects and engineers can plan and build in accordance with Council's planning scheme. For more information about building and development in Brisbane please visit www.brisbane.qld.gov.au/planning-building or talk to a Development Assessment Planning Information Officer via Council's Contact Centre on (07) 3403 8888.

THIS IS A REPORT FOR:

Rateable Address: 1 FOLKESTONE ST, BOWEN HILLS QLD 4006

Lot Details: L.3 RP.10094

PROPERTY INFORMATION (Summary)

The following table provides a summary of flood information for this property. More detailed flood level information is provided in the following sections of this report.

PROPERTY SUMMARY	LEVEL (mAHD)
Minimum Ground Level	4.3
Maximum Ground Level	8.2
Min Habitable Floor Level	3.2
Residential Flood Level (RFL)	2.7
Residential Flood Level Source	RIVER
Source of Highest Flooding	RIVER
Flooding may also occur from	RIVER

ESTIMATED PEAK FLOODING LEVELS

The table below displays the peak estimated flood levels by probability for this property. Estimated flood level data should be used in conjunction with applicable planning scheme requirements - Refer to Flood Planning Development Information.

Note that the overland flow flooding level maybe higher than the levels below from other sources.

DESCRIPTION	LEVEL (mAHD)	SOURCE
20% AEP	N/A*	
5% AEP	N/A*	
2% AEP	N/A*	
1% AEP	N/A*	
January 2011	2.7	RIVER
RFL	2.7	RIVER

FLOOD PLANNING DEVELOPMENT INFORMATION

This section of the FloodWise Property Report contains information about Council's planning scheme overlays. Overlays identify areas within the planning scheme that reflect distinct themes that may include constrained land and/or areas sensitive to the effects of development.

FLOOD OVERLAY CODE

The Flood overlay code of Council's planning scheme uses the following information to provide guidelines when developing properties. The table below summarises the Flood Planning Areas (FPAs) that apply to this property. Development guidelines for the FPAs are explained in Council's planning scheme, which is available from www.brisbane.qld.gov.au/planning-building.

FLOOD PLANNING AREAS (FPA)		
RIVER	CREEK/WATERWAY	OVERLAND FLOW
FPA5		Not Applicable

COASTAL HAZARD OVERLAY CODE

There are currently no Coastal Hazard Overlays that apply to this property.



Brisbane City Council FloodWise Property Report

Report Reference

1444190701616

07/10/2015 14:05:01

Dedicated to a better Brisbane

Useful Definitions

Australian Height Datum (AHD) - The reference level for defining ground levels in Australia. The level of 0.0m AHD is approximately mean sea level.

Annual Exceedance Probability (AEP) - The probability of a flood event of a given size occurring in any one year, usually expressed as a percentage annual chance.

Defined Flood Level (DFL) - The DFL for Brisbane River flooding is a level of 3.7m AHD at the Brisbane City Gauge based on a flow of 6,800 m³/s.

Maximum and Minimum Ground Level - Highest and lowest ground levels on the property based on available ground level information. A Registered Surveyor can confirm exact ground levels.

Minimum Habitable Floor Level - The minimum level in metres AHD at which habitable areas of development (generally including bedrooms, living rooms, kitchen, study, family and rumpus rooms) must be constructed.

Council's Planning Scheme - The City Plan (planning scheme) has been prepared in accordance with the Sustainable Planning Act as a framework for managing development in a way that advances the purpose of the Act. In seeking to achieve this purpose, the planning scheme sets out the Council's intention for future development in the planning scheme area, over the next 20 years.

Residential Flood Level (RFL) - Residential flood level (RFL) for Brisbane River flooding equates to the flood level applicable to the extent of January 2011 floods as depicted by mapping on the Queensland Reconstruction Authority website or the Council's defined flood level (DFL) for the Brisbane River, whichever is higher.

Rateable Address - A Lot or Property may have more than one street address. The address shown on this report is the address used by Council for the Lot or property selected.

Property - A property will contain 1 or more lots. The *Multiple Lot Warning* is shown if you have selected a property that contains multiple lots.

Brisbane City Council's Online Flood Tools

Council provides a number of online flood tools:

- to guide planning and development
- to help residents and businesses understand their flood risk and prepare for flooding.

Planning and Development Online Flood Tools

Council's online flood tools for planning and development purposes include:

- FloodWise Property Report
- Flood Overlay Code

For more information on Council's planning scheme and online flood tools for planning and development:

- phone 07 3403 8888 to talk to a Development Assessment Customer Liaison Officer
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- visit a Regional Business Centre.

Helping residents and businesses be prepared for flooding

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- Flood Awareness Maps
- Flooding in Brisbane – A Guide for Residents
- Flooding in Brisbane – A Guide for Business
- Early Warning Alert Service. Visit www.brisbane.qld.gov.au/earlywarning to register for email, home phone or SMS severe weather alert updates.

Note: The Flood Awareness Maps show four levels of flood risk from high risk (flooding is very likely to occur) through to very low risk (very rare and extreme flood events). Flooding in the low and very low risk areas has no planning and development requirements and is therefore not reflected in the FloodWise Property Report.

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- Visit www.brisbane.qld.gov.au/beprepared
- Phone (07) 3403 8888.



Brisbane City Council FloodWise Property Report

Report Reference

1444190701616

07/10/2015 14:05:01

Dedicated to a better Brisbane

Disclaimer

1. Defined Flood Levels and Residential Flood Levels, and the Minimum Habitable Floor Levels are determined from the best available information to Council at the date of issue. These flood levels, for a particular property, may change if more detailed information becomes available or changes are made in the method of calculating flood levels.
2. Council makes no warranty or representation regarding the accuracy or completeness of a FloodWise Property report. Council disclaims any responsibility or liability in relation to the use or reliance by any person on a FloodWise Property Report.



Planning to build or renovate?

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You can also find the Brisbane City Plan 2014 and Neighbourhood Plans as well as other information and training videos to help with your building and development plans.



Brisbane City Council FloodWise Property Report

Report Reference

1444190715900

07/10/2015 14:05:15

Dedicated to a better Brisbane

THIS REPORT IS FOR BUILDING AND DEVELOPMENT PURPOSES ONLY

The FloodWise Property Report provides property or lot-based flood information for building and development requirements. This report provides information on estimated flood levels, habitable floor level requirements and more technical information on the four sources of flooding: river, creek / waterway, storm tide and overland flow. Refer to the Useful Definitions section for a glossary of terms.

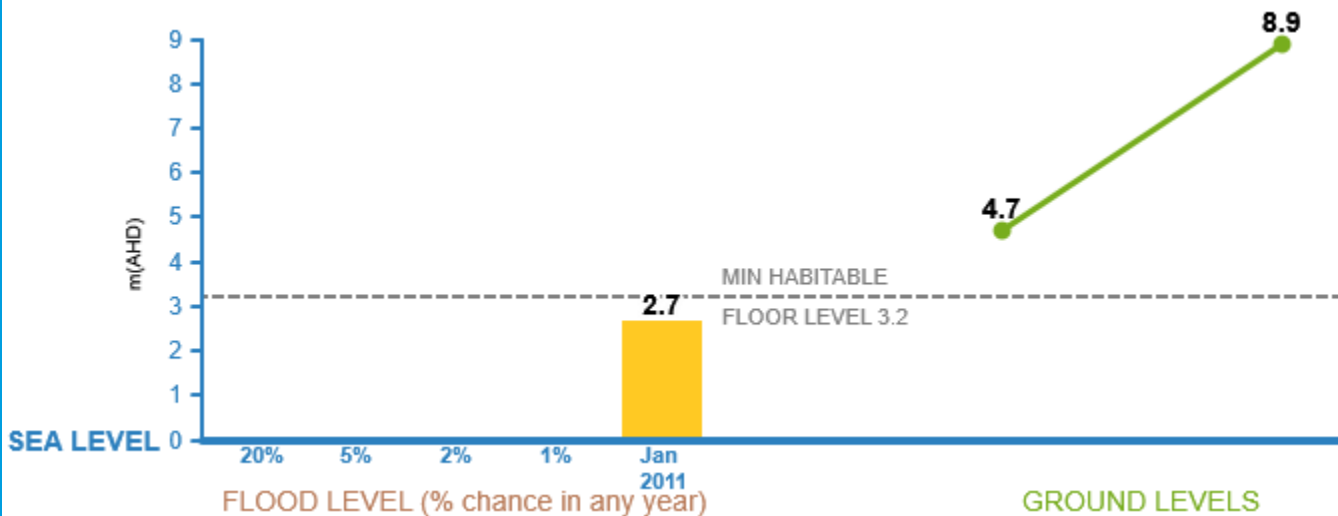
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THIS IS A REPORT FOR:

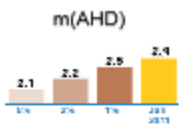
Rateable Address: 3 FOLKESTONE ST, BOWEN HILLS QLD 4006

Lot Details: L.4 RP.10094

FLOOD LEVEL INFORMATION



EXPLANATION



m(AHD) - Metres Australia Height Datum. The level of 0.0m AHD is approximately mean sea level.

Flood Levels - The Flood level bar chart above shows the possible flooding level and percentage chance of that level being reached or exceeded in any year. If an orange bar shows, it is the calculated January 2011 flood level at this address or lot.

Minimum Habitable Floor Level - Applies to residential development only. Please refer to Council's planning scheme to learn how this may affect you. If a property is in an overland flow path, or a large allotment, a minimum habitable floor level cannot be provided. Refer flood and planning development flags below.

Ground Levels - The green line above shows this property's approximate lowest and highest ground levels based on latest available information (2009 airborne laser survey) to Council. If you are building, please confirm with a surveyor.

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Brisbane City Council FloodWise Property Report

Report Reference

1444190715900

07/10/2015 14:05:15

Dedicated to a better Brisbane

TECHNICAL SUMMARY

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THIS IS A REPORT FOR:

Rateable Address: 3 FOLKESTONE ST, BOWEN HILLS QLD 4006

Lot Details: L.4 RP.10094

PROPERTY INFORMATION (Summary)

The following table provides a summary of flood information for this property. More detailed flood level information is provided in the following sections of this report.

PROPERTY SUMMARY	LEVEL (mAHD)
Minimum Ground Level	4.7
Maximum Ground Level	8.9
Min Habitable Floor Level	3.2
Residential Flood Level (RFL)	2.7
Residential Flood Level Source	RIVER
Source of Highest Flooding	RIVER
Flooding may also occur from	RIVER

ESTIMATED PEAK FLOODING LEVELS

The table below displays the peak estimated flood levels by probability for this property. Estimated flood level data should be used in conjunction with applicable planning scheme requirements - Refer to Flood Planning Development Information.

Note that the overland flow flooding level maybe higher than the levels below from other sources.

DESCRIPTION	LEVEL (mAHD)	SOURCE
20% AEP	N/A*	
5% AEP	N/A*	
2% AEP	N/A*	
1% AEP	N/A*	
January 2011	2.7	RIVER
RFL	2.7	RIVER

FLOOD PLANNING DEVELOPMENT INFORMATION

This section of the FloodWise Property Report contains information about Council's planning scheme overlays. Overlays identify areas within the planning scheme that reflect distinct themes that may include constrained land and/or areas sensitive to the effects of development.

FLOOD OVERLAY CODE

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FLOOD PLANNING AREAS (FPA)		
RIVER	CREEK/WATERWAY	OVERLAND FLOW
FPA5		Not Applicable

COASTAL HAZARD OVERLAY CODE

There are currently no Coastal Hazard Overlays that apply to this property.



Brisbane City Council FloodWise Property Report

Report Reference

1444190715900

07/10/2015 14:05:15

Dedicated to a better Brisbane

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Note: The Flood Awareness Maps show four levels of flood risk from high risk (flooding is very likely to occur) through to very low risk (very rare and extreme flood events). Flooding in the low and very low risk areas has no planning and development requirements and is therefore not reflected in the FloodWise Property Report.

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Brisbane City Council FloodWise Property Report

Report Reference

1444190715900

07/10/2015 14:05:15

Dedicated to a better Brisbane

Disclaimer

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Brisbane City Council FloodWise Property Report

Report Reference

1444190663600

07/10/2015 14:04:23

Dedicated to a better Brisbane

THIS REPORT IS FOR BUILDING AND DEVELOPMENT PURPOSES ONLY

The FloodWise Property Report provides property or lot-based flood information for building and development requirements. This report provides information on estimated flood levels, habitable floor level requirements and more technical information on the four sources of flooding: river, creek / waterway, storm tide and overland flow. Refer to the Useful Definitions section for a glossary of terms.

To find out more about how the contents of this report may affect building or development on this property, please visit www.brisbane.qld.gov.au/planning-building. For more general information about understanding your flood risk and how to prepare your property, family or business for potential flooding visit www.brisbane.qld.gov.au/beprepared

THIS IS A REPORT FOR:

Rateable Address: 63 ABBOTSFORD RD, BOWEN HILLS QLD 4006

Lot Details: L.2 RP.50667

This property has no flood levels or flags for building or development purposes

Brisbane City Council has not assigned flood level information for this property for building or development purposes.

For professional advice or a detailed assessment of a property contact a Registered Professional Engineer of Queensland.

For general information about your flood risk and how to prepare your home or business for potential flooding visit www.brisbane.qld.gov.au/beprepared.



Brisbane City Council FloodWise Property Report

Report Reference

1444190663600

07/10/2015 14:04:23

Dedicated to a better Brisbane

TECHNICAL SUMMARY

This section of the FloodWise Property Report contains more detailed flood information for this property so surveyors, builders, certifiers, architects and engineers can plan and build in accordance with Council's planning scheme. For more information about building and development in Brisbane please visit www.brisbane.qld.gov.au/planning-building or talk to a Development Assessment Planning Information Officer via Council's Contact Centre on (07) 3403 8888.

THIS IS A REPORT FOR:

Rateable Address: 63 ABBOTSFORD RD, BOWEN HILLS QLD 4006

Lot Details: L.2 RP.50667

No Defined Flood Levels (DFL), Residential Flood Level (RFL) or Overland Flow flags for this property

There are no Defined Flood Levels, Residential Flood Level, Overland Flow or other flood related flags associated with this property.

FLOOD PLANNING DEVELOPMENT INFORMATION

This section of the FloodWise Property Report contains information about Council's planning scheme overlays. Overlays identify areas within the planning scheme that reflect distinct themes that may include constrained land and/or areas sensitive to the effects of development.

FLOOD OVERLAY CODE

The Flood overlay code of Council's planning scheme uses the following information to provide guidelines when developing properties. The table below summarises the Flood Planning Areas (FPAs) that apply to this property. Development guidelines for the FPAs are explained in Council's planning scheme, which is available from www.brisbane.qld.gov.au/planning-building.

FLOOD PLANNING AREAS (FPA)		
RIVER	CREEK/WATERWAY	OVERLAND FLOW
FPA5		Not Applicable

COASTAL HAZARD OVERLAY CODE

There are currently no Coastal Hazard Overlays that apply to this property.



Brisbane City Council FloodWise Property Report

Report Reference

1444190751414

07/10/2015 14:05:51

Dedicated to a better Brisbane

THIS REPORT IS FOR BUILDING AND DEVELOPMENT PURPOSES ONLY

The FloodWise Property Report provides property or lot-based flood information for building and development requirements. This report provides information on estimated flood levels, habitable floor level requirements and more technical information on the four sources of flooding: river, creek / waterway, storm tide and overland flow. Refer to the Useful Definitions section for a glossary of terms.

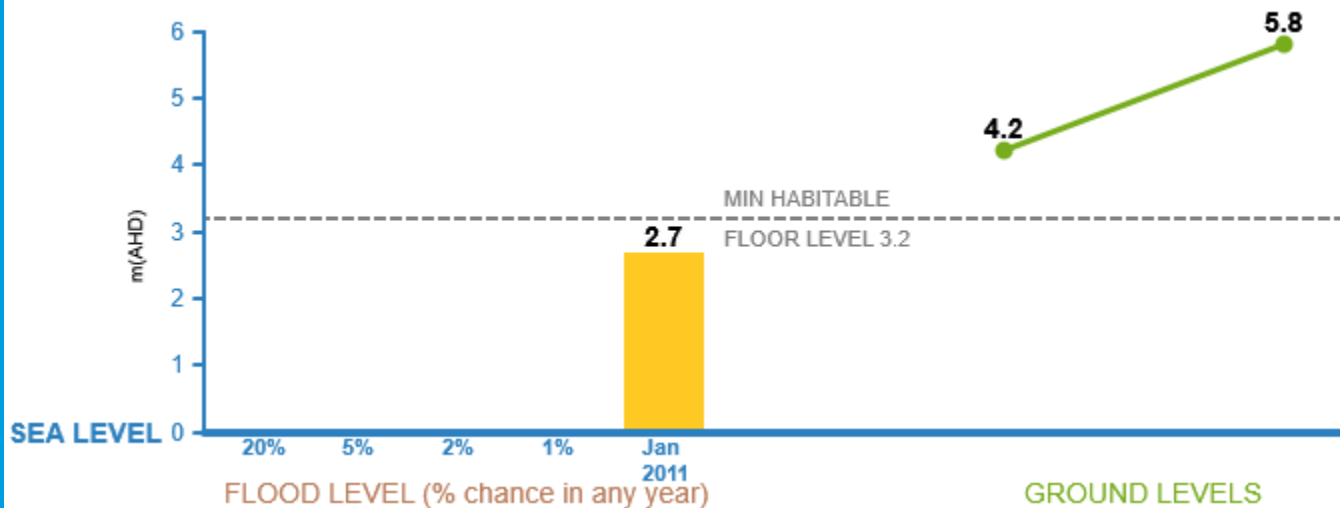
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THIS IS A REPORT FOR:

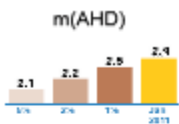
Rateable Address: 65 ABBOTSFORD RD, BOWEN HILLS QLD 4006

Lot Details: L.1 RP.50667

FLOOD LEVEL INFORMATION



EXPLANATION



m(AHD) - Metres Australia Height Datum. The level of 0.0m AHD is approximately mean sea level.

Flood Levels - The Flood level bar chart above shows the possible flooding level and percentage chance of that level being reached or exceeded in any year. If an orange bar shows, it is the calculated January 2011 flood level at this address or lot.

Minimum Habitable Floor Level - Applies to residential development only. Please refer to Council's planning scheme to learn how this may affect you. If a property is in an overland flow path, or a large allotment, a minimum habitable floor level cannot be provided. Refer flood and planning development flags below.

Ground Levels - The green line above shows this property's approximate lowest and highest ground levels based on latest available information (2009 airborne laser survey) to Council. If you are building, please confirm with a surveyor.

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Brisbane City Council FloodWise Property Report

Report Reference

1444190751414

07/10/2015 14:05:51

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TECHNICAL SUMMARY

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THIS IS A REPORT FOR:

Rateable Address: 65 ABBOTSFORD RD, BOWEN HILLS QLD 4006

Lot Details: L.1 RP.50667

PROPERTY INFORMATION (Summary)

The following table provides a summary of flood information for this property. More detailed flood level information is provided in the following sections of this report.

PROPERTY SUMMARY	LEVEL (mAHD)
Minimum Ground Level	4.2
Maximum Ground Level	5.8
Min Habitable Floor Level	3.2
Residential Flood Level (RFL)	2.7
Residential Flood Level Source	RIVER
Source of Highest Flooding	RIVER
Flooding may also occur from	RIVER

ESTIMATED PEAK FLOODING LEVELS

The table below displays the peak estimated flood levels by probability for this property. Estimated flood level data should be used in conjunction with applicable planning scheme requirements - Refer to Flood Planning Development Information.

Note that the overland flow flooding level maybe higher than the levels below from other sources.

DESCRIPTION	LEVEL (mAHD)	SOURCE
20% AEP	N/A*	
5% AEP	N/A*	
2% AEP	N/A*	
1% AEP	N/A*	
January 2011	2.7	RIVER
RFL	2.7	RIVER

FLOOD PLANNING DEVELOPMENT INFORMATION

This section of the FloodWise Property Report contains information about Council's planning scheme overlays. Overlays identify areas within the planning scheme that reflect distinct themes that may include constrained land and/or areas sensitive to the effects of development.

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FLOOD PLANNING AREAS (FPA)		
RIVER	CREEK/WATERWAY	OVERLAND FLOW
FPA5		Not Applicable

COASTAL HAZARD OVERLAY CODE

There are currently no Coastal Hazard Overlays that apply to this property.



Brisbane City Council FloodWise Property Report

Report Reference

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07/10/2015 14:05:51

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Minimum Habitable Floor Level - The minimum level in metres AHD at which habitable areas of development (generally including bedrooms, living rooms, kitchen, study, family and rumpus rooms) must be constructed.

Council's Planning Scheme - The City Plan (planning scheme) has been prepared in accordance with the Sustainable Planning Act as a framework for managing development in a way that advances the purpose of the Act. In seeking to achieve this purpose, the planning scheme sets out the Council's intention for future development in the planning scheme area, over the next 20 years.

Residential Flood Level (RFL) - Residential flood level (RFL) for Brisbane River flooding equates to the flood level applicable to the extent of January 2011 floods as depicted by mapping on the Queensland Reconstruction Authority website or the Council's defined flood level (DFL) for the Brisbane River, whichever is higher.

Rateable Address - A Lot or Property may have more than one street address. The address shown on this report is the address used by Council for the Lot or property selected.

Property - A property will contain 1 or more lots. The *Multiple Lot Warning* is shown if you have selected a property that contains multiple lots.

Brisbane City Council's Online Flood Tools

Council provides a number of online flood tools:

- to guide planning and development
- to help residents and businesses understand their flood risk and prepare for flooding.

Planning and Development Online Flood Tools

Council's online flood tools for planning and development purposes include:

- FloodWise Property Report
- Flood Overlay Code

For more information on Council's planning scheme and online flood tools for planning and development:

- phone 07 3403 8888 to talk to a Development Assessment Customer Liaison Officer
- visit www.brisbane.qld.gov.au/planning-building
- visit a Regional Business Centre.

Helping residents and businesses be prepared for flooding

Council has a range of free tools and information to help residents and businesses understand potential flood risks and how to be prepared. This includes:

- Flood Awareness Maps
- Flooding in Brisbane – A Guide for Residents
- Flooding in Brisbane – A Guide for Business
- Early Warning Alert Service. Visit www.brisbane.qld.gov.au/earlywarning to register for email, home phone or SMS severe weather alert updates.

Note: The Flood Awareness Maps show four levels of flood risk from high risk (flooding is very likely to occur) through to very low risk (very rare and extreme flood events). Flooding in the low and very low risk areas has no planning and development requirements and is therefore not reflected in the FloodWise Property Report.

For more information on Council's online flood tools for residents and business:

- Visit www.brisbane.qld.gov.au/beprepared
- Phone (07) 3403 8888.

Appendix J

SQID Maintenance

Operations and maintenance

StormFilter® EnviroPod Treatment Train



Our waterways. Our future.

Stormwater360
AUSTRALIA

Device details			
Location of Device			
GPS Coord	N:	E:	D P Number:
Relevant Council			
Company			
Contact	Email		Ph
Engineer			
Contact	Email		Ph
SFEP Treatment			
1			
2			
Frequency of Inspection/Maintenance		Maintenance Estimated Annual Cost	
	Inspections (time/year)	Major Maintenance	StormFilter
StormFilter			EnviroPod
			TOTAL
EnviroPod			

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Maintaining the EnviroPod® Stormwater Gully Pit Insert

Maintenance is as integral to every stormwater management system as it is to any other item of machinery or equipment.

The primary purpose of the EnviroPod® Stormwater Gully Pit insert is to filter out and remove pollutants from entering our waterways. To ensure that the EnviroPod® continues to function effectively, it is important that the pollutants it captures are periodically removed, and the filtration components properly cleaned.

Maintenance requirements and frequency are dependent on the pollutant load characteristics of each site, as well as the occurrence of events such as chemical spills or excessive sediment loading due to site erosion or extreme storms. Similarly, the system should be inspected after all major storm events.

Treatment Train Specifications



Performance Specification

The stormwater filtration treatment train shall consist of x 200 micron gully pit basket/s and x 460/690mm passive, siphon-actuated, radial flow, self cleaning media filtration cartridge system/s operating at a specific flow rate of not more than 1.5L/s/m².

The gully pit basket system shall consist of the following components;

- Removable 200 micron Nylon monofilament Precision woven Filtration Bag
- Fixed Galvanised Mesh Cage (no greater than 80mm x 80mm) around the Filtration Bag
- Recycled modified ABS plastic to seal the unit into the pit
- By-pass mechanism above the Filter with no moving parts
- System rigidly fixed to the walls of the pit.

The media filtration system shall be located within the following structure.

- Manhole
- DownPipe
- Linear
- Vault
- Large Box
- Detention.

Regardless of the system type, the media filtration system shall consist of the following components;

- Inlet energy dissipation
- Cartridge section
- Outlet section to bypass storm flows and convey treated stormwater
- Access Lids in roof slab for access to Cartridges
- Siphon actuated cartridges filled with proprietary ZPG™ filter media
- Specific flow rate of each individual cartridge limited not to exceed 1.5L/s/m²
- Air Lock Cap complete with one way Air Valve Flap
- Outer Hood complete with Scrubbing Regulators
- Automated high-energy turbulence on the screen face (only) at the end of storm flows to flush pollutants from the cartridge
- Centre Drainage Tube complete with Buoyancy Float
- Individual Cartridge Flow Restrictor Disc
- ¼ Turn Bayonet Fittings
- Under drain manifold to convey treated stormwater to the receiving environment.

Components of any proposed treatment train or technology



The components of any proposed the treatment train or technology, including a gully pit basket upstream of a radial flow cartridge filtration system, must be evaluated for a range of pollutants and these performance expectations must comply with current best practice guidelines, i.e. Water by Design "MUSIC Modeling Guidelines version 1.0 2010" for South East Queensland.

In short, the performance evaluation of any system must show:

- 1 Any reduction efficiencies are justified by rigorous scientific testing as determined by an independent peer reviewer and the results further peer reviewed and published in a credible scientific journal. Any potential or perceived conflicts of interest should be disclosed within the published article.
- 2 Published article providing insight into the pollutant composition (e.g. soluble vs particulate for nitrogen) and the mean concentration of inflow and outflow to compare to local and or regional conditions.
- 3 Performance evaluation undertaken in dry weather conditions or a method to take into account any potential leaching of nutrients that may occur in the system(s).
- 4 Evaluation is conducted using full-scale systems with details of treatable flow rates sampled and how they correlate to discrete removal efficiencies and comparisons to the designed treatable flow rates of the device. A comparison should also be made to the climatic conditions especially where un-restricted filters are used.

Maintenance Overview

The primary purpose of the Stormwater Treatment Train is to filter out and prevent pollutants from entering our waterways. Like any effective filtration system, periodically these pollutants must be removed to restore the system to its full efficiency and effectiveness.

- * Maintenance requirements and frequency are dependent on the pollutant load characteristics of each site. Maintenance must be performed in accordance with the Treatment Trains Operation and Maintenance Guidelines.

Introduction



This manual has been designed to assist you with cleaning and maintaining the EnviroPod Stormwater Gully Pit Insert, using the methods recommended by the manufacturer.

The cleaning process and methods described cover all aspects of the system, including:

- Removing the grate
- Cleaning the filter bag
- Inspecting the unit
- Rejuvenating the filter bag
- Re-installing the filter bags.

The manual should be used in conjunction with your site's traffic management and safety plans, as well as other appropriate Stormwater360 (IES) documents such as the IES Employee Health and Safety Manual. We also recommend that maintenance and cleaning contractors, or device owners, develop their own site-specific health and safety activity plans to ensure a safe work environment.

*** Please note:** This manual consists primarily of the processes and tasks associated with the hand maintenance and inductor maintenance procedures. It does not include details of the site's traffic management or occupational health and safety requirements. Contractors or IES staff should utilise their own Employee Health and Safety Manual, which details the policies and procedures for safe work.

Why cleaning and maintenance are so vitally important

Adhering to the inspection and maintenance schedule of each stormwater treatment device is essential to ensuring that it works properly throughout its estimated design life.

During each inspection and clean, details of the mass, volume and type of material that has been collected by the device should be recorded. This data will assist with the revision of future management plans and help determine maintenance interval frequency. It's also essential that qualified and experienced personnel carry out all maintenance (including inspections, recording and reporting) in a systematic manner. To ensure consistency, we recommend that one person be responsible for overseeing the management of the maintenance and cleaning process.

Maintenance of your stormwater management system is essential to ensuring ongoing at-source control of stormwater pollution. Maintenance also helps prevent structural failures (e.g. prevents blocked outlets) and aesthetic failures (e.g. debris build up).

Health and safety



The EnviroPod has been designed to trap and retain pollutants in stormwater runoff, helping to maintain the quality of water entering our aquatic ecosystems. Depending on the nature of your site, pollutants can range from organic material such as leaves and sticks through to debris such as broken glass, syringes or other potentially harmful materials.

Access to gully pits containing EnviroPods may require removing heavy protective grates, while cleaning such pits may entail working in confined spaces. For these reasons, all aspects of maintaining and cleaning your EnviroPod require careful adherence to Occupational Health and Safety (OH&S) guidelines. Doing so will ensure that all maintenance personnel are adequately protected and have been properly trained before taking part in any specialist activities. The same level of care needs to be taken to protect non-work personnel in and around the site, while appropriate traffic control measures must be put in place where collection pits are situated in, or adjacent to, roadways or car parks.

* The procedures indicated in the Operations section of this manual are recommended as the safest and most efficient manner of conducting the maintenance of EnviroPod units (Section 2), however contractors and cleaning staff may vary the procedure in response to the site conditions; varying work practices; or general preferences in the cleaning techniques. Please note that procedures outlined in this manual are not exhaustive, and that any changes made should always comply with general safe work practices.

Cleaning of EnviroPod filters and StormFilters is a specialist activity. The material collected by the devices can be harmful, and needs to be handled correctly. For example, sediments may contain heavy metals and carcinogenic substances as well as harmful objects such as broken glass and syringes. It is essential that Occupational Safety and Health guidelines are followed at all times, and that the following steps are carried out to ensure safe and successful maintenance operations.

In addition to the dangers associated with the cleaning and handling of material in the filter bags, precaution needs to be taken with activities such as removing the grate as well as with managing the traffic, pedestrians and other non-worker personnel at the site. The general workplace hazards associated with working outdoors also need to be taken into account.

2.1 Personnel health and safety

All contractors and staff must comply with all current workplace health and safety legislation and take all practicable steps to:

- Comply with all applicable laws, regulations and standards
- Ensure that all employees, contractors and visitors are informed of and understand their obligations in respect of current workplace health and safety legislation
- Ensure that employees understand and accept their responsibility to practice and promote a safe and healthy work environment.

* Take proper care. Pollutants can range from organic materials such as leaves and sticks through to debris such as broken glass, syringes or other potentially harmful materials.

While cleaning and maintaining filters, all relevant precautions must be taken to prevent contact with sediment and litter. This includes wearing the following personal protective and safety equipment:

- Puncture resistant gloves
- Steel capped safety boots
- Fluorescent safety vest
- Overalls or similar skin protection
- Safety apron (if necessary)*
- Eye protection (if necessary)*.

* Higher personal safety conditions may be required when maintaining units that may contain more hazardous material, for example pits where syringes have been observed or pits located in areas associated with such activities.



2.2 Traffic control

Stormwater collection pits are typically situated either in or on roads and car parks, or adjacent to roads in a footpath or swale. Traffic control requirements across all such locations differ with most of the state and local road authorities requiring the same controls to be implemented whether the work is to be conducted on the road or on the road reserve.

As traffic requirements differ depending on road usage and the specific road configuration, separate traffic control plans should be prepared for each site. Given that maintenance is typically a quick process, the contractor should liaise with the relevant road authority to determine the specific road safety requirements for each location to ensure that on site workers can conduct the cleaning operations safely and efficiently, while complying with all laws and regulations.

State government publications such as the NSW RMS *Traffic Control at Work Sites* safety manual outline the signage requirements, placement of barricades or witches hats and the positioning of traffic control personnel that's required when working on public roads. For increased safety, IES recommends that the maintenance vehicle be used to shield the work area from oncoming traffic.

Photo 1 shows the maintenance vehicle with cones placed around and positioned to shield the work area. **Photo 2** shows the head-on view, note the vehicle is positioned to allow access to the drive, whilst still blocking the pit from on-coming traffic. The vehicle has a flashing light on the roof and the hazard lights switched on.

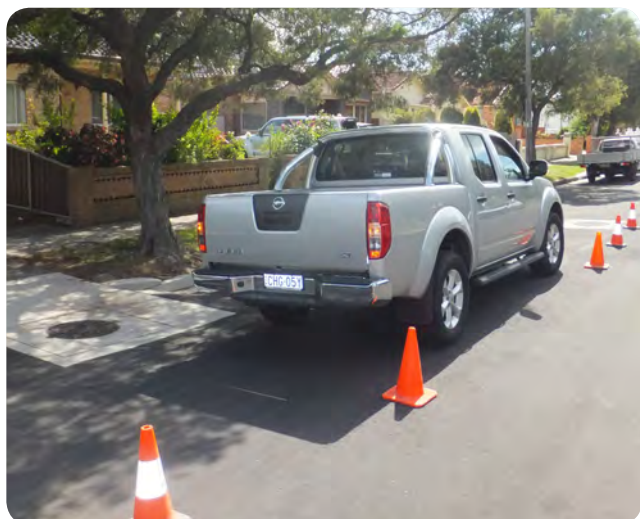


Photo 1 Vehicle positioned near pit, preventing traffic from passing close to the pit.

2.3 Confined spaces

Confined space entry procedures are not included as part of this manual. For IES employees these procedures are included as part of the IES Safety Manual. It is recommended that all contractors evaluate their own needs for confined space entry and compliance with Occupational Health and Safety regulations.

When repairs or maintenance activities cannot be conducted from the surface, and there is a need to enter and work in a confined space, only staff with current confined space training are permitted to operate in a confined space. Appropriate measures and controls must be put in place to meet confined space entry requirements. At all times the necessary safety equipment must be worn, and where gas or oxygen hazards occur, only staff trained in its use will use breathing apparatus gear. **Non-trained staff must not go into confined spaces.**

* Confined spaces pose a serious safety hazard for all personnel; however during the normal maintenance procedures there should be no reason to enter a confined space and all maintenance procedures are able to be conducted from the surface.

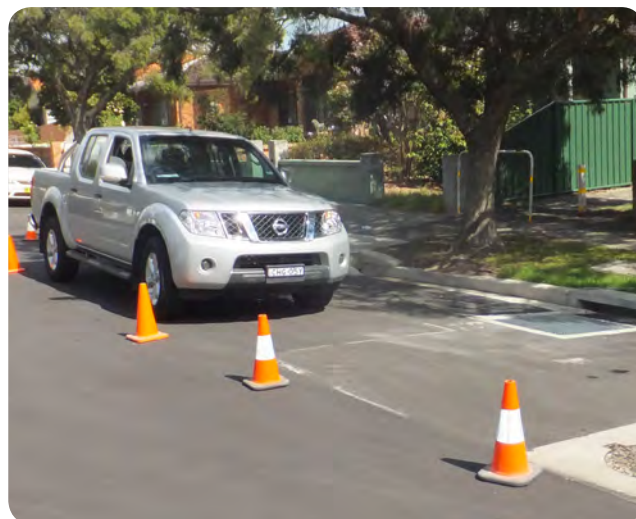


Photo 2 Head-on view, indicating the placement of the vehicle near the pit.

Operations



EnviroPod units need to be regularly inspected to determine whether they require maintenance or cleaning. This process involves several steps, and may require two or more maintenance personnel working together, as well the use of specialised equipment such as a hydraulic lifting arm or an inductor truck with a vacuum hose.

As gully pit grates are usually quite heavy, it is important that correct lifting procedures are adopted, and that the area surrounding the opened pit is shielded from access to non-work personnel.

If inspection reveals that the filter bag needs to be emptied and rejuvenated, the entire unit should also be examined to ensure that all connections and joints are sound. Any material that has accumulated in the overflow diversion channels or outlet pipes also needs to be removed, with those areas then being flushed. Where required, filter bags may need to be cleaned or repaired, and all waste material must be disposed of according to local guidelines at either an approved disposal site or transfer station.

This section outlines the procedures for cleaning the EnviroPod units. It has been written so that someone who has never previously encountered a stormwater pit or an EnviroPod unit can carry out such maintenance by simply following the outlined steps.

3.1 Maintenance and monitoring of EnviroPod filters

To ensure that each EnviroPod unit achieves optimal performance, the material collected by the filter bag should be emptied when the level of material is no more than approximately **half to two thirds** of the total bag depth or when there is evidence of material overflow. While the bag has a greater storage capacity, it is recommended that it is not left to fill completely prior to emptying, for the following reasons:

- the bags are capable of retaining a heavy mass of material (in excess of 50kg), which will make them more difficult to lift and empty
- material near the top of the bag can be re-suspended during high to extreme rainfall events
- blockage of the overflow sections can occur, when material is allowed to build up above the filter bag.

It is also recommended that additional monitoring is conducted following moderate to extreme rainfall events, especially when preceding months have had little or no rainfall. This increased frequency of monitoring is necessary as there is a greater accumulation of surface contamination during low rainfall periods, which will then enter the unit with the higher volumes of runoff generated during a major rainfall event. It is also important to ensure that the units have not been damaged due to high pipe velocities.

3.2 Stormwater pit cover removal

3.2.1 Hinged pit grates

These are the steps for opening a hinged pit grate:

- 1 Insert the lifting hooks beneath the grate.
(Position indicated in **Photo 3**)
- 2 Check hinge point is not damaged and debris is not caught in the hinge area.
- 3 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 cleaning or maintenance activities. **Photo 4** indicates the grate being opened and grate resting freely in the open position, respectively.

* **Please note:** Many cast iron hinges are not hinged securely (to enable the removal of the grate). This may result in the pit grate not being able to sit in an open position. Additionally the hinge pins may also be damaged or corroded, which may allow the grate to fall into the pit. Such pit grates can be removed using the method indicated below for non-hinged grates.



Photo 3 Lifting the grate



Photo 4 Fully open grate



Photo 5 Lowering grate

3.2.2 Non-hinged pit grates

To remove a non-hinged pit grate:

- 1 Place lifting hooks beneath grate, where possible in the four corners of the grate (see **Photo 6**). Concrete lids may have Gatic lifting points, a key arrangement or holes in the lid, which may require special equipment such as Gatic lifters
- 2 Position each person either side of the grate (see **Photo 7**)
- 3 Lift the grate, ensuring that good heavy lifting posture is used at all times
- 4 Place the grate on an angle on the gutter, to allow for the lifting hooks to be removed (see **Photo 8**)
- 5 For extremely heavy one-piece grates and concrete Gatic covers, insert the lifters in place and slide the lids back. Note some lids may still require two people



Photo 6 Insert hook near edge of grate



Photo 7 Position each lifter either side of the grate



Photo 8 Lift grate and move grate to one side



Photo 9 Lift grate above the support frame



Photo 10 Reinstated non hinged grate

3.3 Cleaning methods

One of the following maintenance methods should be used for servicing EnviroPod Filters:

3.3.1 Cleaning using an inductor truck

Follow these steps to safely and efficiently clean the EnviroPod using an inductor truck:

- 1 Open gully pit (See Section 3.2)
- 2 Place the inductor hose over the material collected in the filter bag and switch on the inductor
- 3 Using the inductor hose, suck out all of the sediment, organic leaf material, litter etc. collected in the filter bag
- 4 Allow the filter bag to be sucked up into the inductor hose for a few seconds to allow for the filter mesh pores to be cleaned. Care is to be taken that there are no sharp edges on the inductor hose that can damage the filter bag
- 5 If material has built up around the overflows, use the inductor hose to clear the accumulated material
- 6 Remove filter bag from the pit
- 7 Sediment retained in the gully pit grate is to be removed
- 8 Back-opening channels are to be cleared of any debris to ensure flow is not hindered. This debris can also be collected using the inductor truck
- 9 All gully pit waste is to be removed from the pit
- 10 Check the EnviroPod unit (Section 3.4)
- 11 Check filter bag (Section 3.4)
- 12 Reinstate filter bag and gully pit lids



Photo 11 Cleaning an EnviroPod using the inductor method

3.3.2 Hand maintenance

To clean the EnviroPod manually by hand, follow these steps:

- 1 Open gully pit (See Section 1)
- 2 Place the lifting hooks in the lifting loops of the filter bag (See **Photo 12**)
- 3 For extremely heavy and overfilled bags either use a hydraulic lifting arm to lift the bag, or remove excess material using a shovel or similar piece of equipment. IES prefers the use of a post hole shovel, due to the reduced strain on the back when digging and the ability of the shovel to grab material vertically
- 4 Lift the bag vertically off the supporting frame, ensuring that no undue pressure is placed on the filter bag. (See **Photo 13**)
- 5 Lift the bag clear of the stormwater pit (See **Photo 14**)
- 6 Position the bag over the truck or other collection vehicle, taking hold of the loops at the base of the bag (See **Photo 15** and **Photo 16**)
- 7 Lift and empty the filter bag by holding the bottom lifting loops only (See **Photo 17**)
- 8 Completely empty the filter bag (See **Photo 18**)
- 9 Brush the filter bag with a stiff brush to remove bound sediment from the filter pores
- 10 Check the EnviroPod unit (Section 3.4)
- 11 Check the filter bag (Section 3.5)
- 12 Reinstate filter bag, ensuring bag is installed the correct way (See **Photo 19** and **Photo 20**)
- 13 Reinstate gully pit lids (See **Photo 21** and **Photo 22**)



Photo 12 Place the lifting hooks through the bag loops



Photo 13 Lift the bag from the cage and support frame



Photo 14 Lift the bag from the stormwater pit



Photo 15 Lift the bag onto the collection vehicle



Photo 16 Grab the bottom lifting loops



Photo 17 Lifting the bottom bag loops empty the filter bag



Photo 18 Completely empty the contents of the filter bag



Photo 19 Reinstall filter bag



Photo 20 Ensure that the unit is positioned correctly, with the lifting loops on the inside



Photo 21 Correctly installed filter bag



Photo 22 Installed filter bag and sealed pit

* Please note: Under no circumstances are gully pit sediments to be backwashed into the gully pit.



Photo 23 Check seals are pushed against the pit walls



Photo 24 Check joining rivets (two piece unit shown above)

3.4 Unit inspection

After the EnviroPod filter bag has been removed, emptied and cleaned, the following should be checked to ensure that the unit has not been damaged:

- All connections and joints should be checked and broken rivets replaced (See **Photo 23**)
- The plastic pit seals should be inspected for unit movement or damage (See **Photo 24**)
- The cage should be inspected for damage or movement.

The overflow diversion channels, and the area between the EnviroPod cage and pit wall should also be inspected for any accumulated debris. Any observed debris should be removed and disposed of off-site. Accumulated material within the outlet pipe may also need to be flushed.

If spare parts are required, Stormwater360 is able to provide these at a cost to the owner of the EnviroPod unit, although these parts may also be obtained from other suppliers.

*** Please note:** If the units are not cleaned regularly, the mobilisation of material collected in the EnviroPod unit may occur. As such, cleaning of the units in accordance with this management plan is required. As this plan is based on observations and data collected during the monitoring period, ongoing adjustment of the cleaning frequency is generally required to improve the overall efficiency in the removal of collected material and prevent material overflow.

3.5 Filter bag inspection and rejuvenation

After the filter bags have been emptied and cleaned, they should be inspected to evaluate their condition. Given the nature of stormwater, the filter bag may become considerably clogged with fine sediment or damaged by various objects in stormwater as well as fauna. Sharp material such as sticks, combined with high velocity water and a large mass in the filter bag, can cause small tears in the filter material. Animals such as rats have also been known to chew through fine mesh filter bags located in gully pits near takeaway food outlets.

3.5.1 Clogged filters

Clogged filter bags can be cleaned using several different methods. If the techniques described in the general maintenance sections above do not adequately clean the filter bags, the following options should be considered:

- Using a stiff brush and a bucket of soapy water, scrub the filter bag surface.
- Remove filter bags from the pit and wash the bags using a high pressure water spray, taking care not to transfer the contamination elsewhere. Wastewater from the process should be collected and disposed of correctly.
- Remove the filter bags from the pits and the support rings and wash the bags in an industrial washing machine.

This final option typically results in the bags appearing like new, with no visible stain or pore clogging within the filter mesh.



Photo 25 Slightly clogged filter bag, indicated by the brown stain on in the centre of the bag



Photo 26 A clean used filter bag

3.5.2 Damaged filters

Damaged filter bags can often be repaired, provided the damage is small. Small tears in the fabric may occur due to several reasons, however the overall strength and structure of the nylon fabric typically prevents small tears becoming much larger. Although the bag is unlikely to tear further, care must be used when cleaning torn bags so as not to spill the collected material into the pit.

Small tears may 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 the filter material onto the filter bag. If large tears are present, the filter bag may need to be replaced as it is no longer able to function as intended.

3.6 Disposal of material

All gully pit wastes are to be taken off site and disposed of at a transfer station or similar approved disposal site. Stormwater sediments can contain lead, copper, zinc, mercury, hydrocarbons and PCBs, which are harmful to both humans and the receiving environment. Appropriate sampling and laboratory analysis may be required to classify the material as suitable for reuse, or disposal under appropriate local guidelines.

Emergency procedures



Spills and blockages can have an immediate impact on the performance of a stormwater management system, and can potentially result in serious damage to built infrastructure as well as the surrounding waterways and wetlands.

In these types of emergencies, it is important to act quickly to remediate the problem by removing affected sediment or clearing the cause of the blockage, so that the system can resume normal and effective functioning as soon as possible.

4.1 Spill procedures

In the event of a spill discharging into any gully pit, all sediment is to be extracted and the filter bags are to be removed and replaced with rejuvenated filter bags. Normal operation procedures apply to additional cleaning as a result of spills.

4.2 Blockages

In the unlikely event of surface flooding around a gully pit fitted with an EnviroPod the following steps should be carried out:

- 1** Check EnviroPod overflow bypass. The EnviroPod filter has been designed with an overflow mechanism built into the filter box. If surface flooding still exists, check the overflow slots underneath the rubber seal. If debris is lodged in the overflow slots it can be easily cleared by hand or a steel rod.
- 2** If overflow is clear and surface flooding still exists remove EnviroPod and check outlet pipe for blockages.
- 3** Removal of the EnviroPod may be difficult if the filter is clogged and the EnviroPod is holding water. If the filter is clogged, brush the sidewalls of the filter with a yard broom or similar. This will dislodge particles trapped at the interface allowing contained water to flow through the filter.
- 4** If the outlet pipe is blocked, it is likely that a gully sucker truck will be required to unblock it. Debris should be removed from the EnviroPod with the gully sucker truck before removal of the EnviroPod filter. If a gully sucker truck is not available and the EnviroPod needs to be removed by hand, follow the steps below:
 - a** Remove excess debris by hand or brush the side of the filter.
 - b** Lift and place filter ring through the filter box and into cage.
 - c** Remove Filter box.
 - d** Lift cage containing filter bag and ring out of the pit.
 - e** Unblock outlet pipe.

The Stormwater Management StormFilter®

For almost two decades the Stormwater Management StormFilter® has helped meet the most stringent stormwater quality requirements.

The system has been continually tested and refined, to ensure it achieves maximum reliability and performance.

As a best management practice (BMP) system, it removes the most challenging target pollutants – including fine solids, soluble heavy metals, oils and total nutrients (including soluble) – by using a variety of media to achieve site-specific pollutant removal objectives.

StormFilter[®] overview



1.1 Description

StormFilter is a passive, flow-through stormwater filtration system consisting of vaults that house rechargeable cartridges filled with a variety of filter media, and is installed in-line with storm drains. The StormFilter works by passing stormwater through media-filled cartridges, which trap particulates and adsorb materials such as dissolved metals and hydrocarbons. After being filtered through the media, the treated stormwater flows into a collection pipe or discharges into an open channel drainage way. StormFilter is offered in three different configurations: cast-in-place, precast and linear. The precast and linear models utilise pre-manufactured vaults. The cast-in-place units are customised for larger flows and may be either covered or uncovered underground units.

1.2 Operation

1.2.1 Purpose

The StormFilter is a passive stormwater filtration system designed to improve the quality of stormwater runoff from the urban environment before it enters receiving waterways.

Through independent third party studies, it has been demonstrated that the StormFilter is highly effective for treatment of first flush flows, and fast-paced flows, during the latter part of a storm. In general, StormFilter's efficiency is highest when pollutant concentrations are highest. The primary target pollutants for removal are: sediments (TSS), soluble metals, soluble phosphorus, nitrates, and oil and grease.

1.2.2 Sizing

The StormFilter is typically sized to meet design water quality objectives, which are subject to legislation regulated by local government authorities and other relevant environmental bodies. MUSIC modelling software is used to determine pollutant loads from a site, influenced by a number of factors such as site area, imperviousness and land use. Pollutant load reduction capabilities, based on third party testing, allows the number of StormFilter cartridges required to achieve the relevant objectives to be established. Cartridges are designed to treat a peak flow between 0.7 and 1.6 litres/second, depending on the cartridge size used. For example, 10 standard sized cartridges (460mm) are able to treat 11 L/s, as each filter can treat 1.1 L/s.

Because of the highly porous nature of the granular filter media, the flow through a newly installed cartridge is restricted to 1 L/s (average 460mm), using a restrictor disc, to ensure adequate pollutant-media contact time.



Photo 27 Filter cartridge

1.2.3 Basic function

The StormFilter is designed to siphon stormwater runoff through a filter cartridge containing media. The variety of media available can be designed to act as a mechanical filter to remove sediments, as an ion exchanger to remove dissolved heavy metals, and as an absorber to remove oils and greases.

1.2.4 Priming system function

The treated stormwater collects in the centre tube of the cartridge, which is equipped with a self-priming siphon system. (Figure 1 illustrates this system.) The key component of the system is the plastic float, consisting of a ball located at the base leading up to a larger portion, which provides increased buoyancy. Initially the ball rests in a seat, effectively closing off the port to the drainage manifold.

As a result, the filter fills the centre drainage tube until the water level has risen high enough to purge the air from the filter cartridges and displaces the float. At a water depth of 22 inches the float pulls loose and allows the filtered water to drain out through the manifold. This effectively “primes” a siphon within the drainage tube and greatly increases the potential across the filter. The priming system increases StormFilter’s ability to be loaded with sediment. A related feature is the cartridge “hood”. This hood maintains the siphon effect by preventing air from being drawn into the cartridge until the external water level drops below the bottom of the hood.

Cartridges are connected to the manifold with a plastic connector. These can be either quarter turn connectors or in the older systems, threaded connectors.

StormFilter is also equipped with flow spreaders that trap floating debris and surface films, even during overflow conditions. Depending on individual site characteristics, some systems are equipped with high and/or low flow bypasses. High flow bypasses are installed when the calculated peak storm event generates a flow that overcomes the overflow capacity of the system. This is especially important for precast systems. Low flow bypasses are sometimes installed to bypass continuous inflows caused by ground water seepage, which usually do not require treatment. All StormFilter units are designed with an overflow. The overflow operates when the inflow rate is greater than the infiltration capacity of the filter media.

1.2.5 Maintenance overview

The primary purpose of the StormFilter is to filter out and prevent pollutants from entering our waterways. Like any effective filtration system, these pollutants must be removed periodically to restore the StormFilter to its full efficiency and effectiveness. Maintenance requirements and frequency are dependent on the pollutant load characteristics of each site. To assist the owner with maintenance issues, Stormwater360 provides detailed Operation and Maintenance Guidelines with each unit.

Stormwater360 can provide maintenance services completely, or in part. Available services include tracking of installed systems, advising the system’s owner of maintenance needs, and notification of the regulatory agency once the system has been maintained.

Maintenance is usually performed in the dryer periods to rejuvenate the filter media and prepare the system for the next rainy period. Maintenance activities can also be required in the event of a chemical spill or excessive sediment loading due to site erosion or extreme storms. It is good practice to inspect the system after severe storm events.

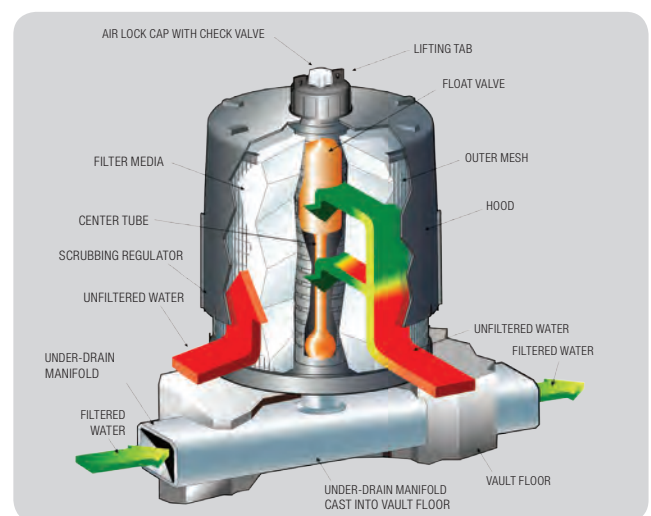


Figure 1 Filter cartridge

StormFilter[®] maintenance and performance expectations



To ensure the optimal and ongoing performance of the StormFilter, the system requires systematic inspection, cleaning and maintenance. This maintenance regime falls into two categories – ongoing minor inspection and maintenance, and major cleaning and maintenance. The maintenance frequency is largely determined by the conditions of each site, and the amount of sedimentation in the stormwater runoff that flows through the system. Unexpected events such as chemical spills, erosion or extreme storm activity require immediate inspection of the system, together with removal of debris or contaminated sediment, and where appropriate, replacement of the media cartridges.

While some maintenance activities can be completed by hand, others require specialised equipment such as an inductor truck with a vacuum hose. In all cases, it is important that maintenance staff are properly trained in the functioning of the StormFilter system and have a good knowledge of the correct procedures for disposing contaminated sediment as well as the methods for removing and installing StormFilter media cartridges.

At all times, appropriate safety equipment must be used, and Occupational Health And Safety (OH&S) guidelines adhered to.

2.1 Types of maintenance

Presently, procedures have been developed for two levels of maintenance:

- Inspection and/or minor maintenance
- Major maintenance.

Inspection/minor maintenance activities are combined since the minor maintenance does not require special equipment and typically little or no materials are in need of disposal.

Inspection/minor maintenance typically involves opening the flow restricting valves (to pre-set levels) and cleaning up vegetation and debris. Major maintenance typically includes cartridge recharging. Major maintenance may involve disposal of materials that require consideration of regulatory guidelines. Depending on the particular unit configuration and equipment used, major maintenance may require an understanding of OSHA rules. **Table 1** summarises the primary activities associated with StormFilter maintenance.

Table 1: StormFilter

Facility component requiring maintenance	Maintenance activity	When maintenance activity is required	Expected facility performance after maintaining
StormFilter cartridges and containment structure	Litter and debris removal	Floatable objects or other litter is present in the filter. Remove to avoid hindrance of filtration and eliminate unsightly debris and litter.	Permanent removal from storm system.
StormFilter cartridges and containment structure	Cartridge replacement and sediment removal	Media has been contaminated by high levels of pollutants, such as after a spill.	New media is able to effectively treat stormwater.
Drainage system piping	Flushing with water	Drainage system is obstructed by debris or sediment.	Outflow is not restricted.

2.2 Maintenance activities

2.2.1 Maintenance activity timing

Two scheduled inspections/maintenance activities should take place during the year. During the minor maintenance activities (routine inspection, debris removal), the type of major maintenance required is determined and, if required for disposal, samples of the sediments and media are obtained.

The next scheduled date is to perform major maintenance activities (replacement of the filter cartridges and associated sediment removal). In addition to the scheduled activities, it is important to check the condition of the filter after major storms to check for damage caused by high flows and to check for high sediment accumulation, which may be caused by localised erosion in the drainage area. It may be necessary to adjust maintenance activity scheduling depending on the actual operating conditions encountered by the system.

2.2.2 Maintenance activity frequency

The primary factor controlling timing of maintenance for the StormFilter is sedimentation. A properly functioning system will remove solids from water by trapping these particulates within the porous structure of the media. The flow through the system will naturally decrease as more and more solids are trapped. Eventually the flow through a system will be low enough to require replacement of the cartridges. Sediment should be removed from upstream trapping devices on an as-needed basis to prevent material from being re-suspended and discharged to the system.

Site conditions greatly influence maintenance requirements. StormFilter units located in areas with erosion or active construction should be inspected and maintained more often than those in fully established areas. The maintenance frequency may be adjusted as additional monitoring information becomes available during the inspection program. Areas that develop known problems should be inspected more frequently than areas that demonstrate no problems, particularly after large storms. Ultimately, inspection and maintenance activities should be scheduled based on the historic records and characteristics of an individual filter.

2.3 Maintenance crew requirements

Table 2 lists the anticipated crew requirements for maintenance operations. Removal of water and sediments during major maintenance activities can be accomplished using either a pump and water truck or a vacuum truck. All

applicable occupational health and safety (OH&S) and disposal regulations should be followed. A general description of the maintenance activities follows.

Table 2 Anticipated Crew Requirements

	Inspection/Minor Maintenance	Major Maintenance: Sediment Removal	Major Maintenance: Cartridge Replacement
Labourer	1		1
Skilled Worker	1	1	1
Vacuum/Water Truck Operator		1	0/1
Total	2*	2*	2/3*
Special Requirements	Knowledge of Proper StormFilter Function	Knowledge of Disposal Requirements	Knowledge of Cartridge Removal and Installation Procedures

* May require OH&S trained person if/when vault entry occurs.

2.4 Maintenance methods

2.4.1 Minor maintenance/inspection (twice a year)

Minor maintenance typically will involve the steps below, however if it appears that a spill of some type has occurred, the local hazard control agency and Stormwater360 should be notified immediately.

Steps for Minor Maintenance/Inspection

- 1 Maintenance to be performed by a skilled worker familiar with StormFilter units.
- 2 If applicable, set up safety equipment to protect pedestrians from fall hazards presented by open access covers. Also set up appropriate safety equipment for work near roadways.
- 3 Inspect the external condition of the unit and take notes concerning defects/problems.
- 4 Open the access covers to the vault and allow the system to air out for 5-10 minutes.
- 5 **Without entering the vault**, inspect the inside of the unit, including components.
- 6 Take notes about the external and internal condition. This includes inspecting pit penetrations, walls, lids, ladders and grates etc.
- 7 Give particular attention to recording the level of sediment build-up on the floor of the vault and on top of the internal components. If flow is occurring, note the level of water and estimate the flow rate per drainage pipe. Record all observations.
- 8 Remove large loose debris and litter using a pole with a grapple or net on the end.
- 9 Close and fasten the access cover, and remove safety equipment.
- 10 Finally, make notes about the local drainage area relative to ongoing construction, erosion problems, or high loadings of other materials to the system.

* In the case of a spill, workers should abort maintenance activities until the proper guidance has been obtained.

2.4.2 Major maintenance inspection (once a year)

The primary goal of the major maintenance inspection is to assess the condition of the cartridges relative to the level of sediment loading. It may be desirable to conduct this inspection during a storm to observe the relative flow through the filter cartridges. If the submerged cartridges are severely plugged, large amounts of sediments should be present and very little flow will be discharging from the drainage pipes. It is likely that the cartridges need to be replaced. Major maintenance inspection will typically involve the steps below. However, if it appears that a spill of some type has occurred, the local hazard control agency and Stormwater360 should be notified immediately. **In the case of a spill, the worker should abort maintenance activities until the proper guidance has been obtained.**

Steps for Pre-Major Maintenance Inspection

- 1 Maintenance to be performed by a skilled worker familiar with StormFilter units.
- 2 If applicable, set up safety equipment to protect pedestrians from fall hazards presented by open doors. Also, set up appropriate safety equipment for work near roadways.
- 3 Inspect the external condition of the unit and take notes concerning defects/problems.
- 4 Open the access covers to the vault and allow the vault to air out for 5-10 minutes.
- 5 Without entering the vault, give the inside of the unit, including components, a general condition inspection.
- 6 Take notes about the external and internal condition.
- 7 Give particular attention to recording the level of sediment build-up on the floor of the vault, and on top of the internal components.
- 8 Remove large loose debris and litter using a pole with a grapple or net on the end.
- 9 If the visit is during a storm, make the flow observations discussed above.
- 10 Close and fasten the access cover, and remove safety equipment.
- 11 Make notes about the local drainage area relative to ongoing construction, erosion problems, or high loading of other materials to the system.
- 12 Review the condition reports from the previous minor and major maintenance visits and schedule for cartridge replacement if needed.

2.4.3 Major maintenance: sediment removal and cartridge replacement (and emergency)

Major maintenance/filter cartridge replacement typically involves the steps below. However, if it appears that a spill of some type has occurred, the local hazard control agency and Stormwater360 should be notified immediately. **In the case of a spill, the worker should abort maintenance activities until the proper guidance has been obtained.**

Depending on the configuration of the particular system, a worker may be required to enter the vault to perform some tasks. If vault entry is required, OH&S rules for general confined space entry must be strictly adhered to. Filter cartridge replacement should occur during dry weather and it may be necessary to plug the filter inlet pipe if base flows exist. Standing water present in the vault should be regarded as polluted and contained during this operation by temporarily capping the manifold connectors.

*** Please note:** Confined space entry may be required on StormFilter systems. In this case, please ensure that appropriate Confined Space entry training and subsequent certification has been undertaken and is valid, and work procedures are strictly adhered to. If you are unsure, do not enter the vault and contact Stormwater360 immediately.

Steps For Cartridge Replacement Maintenance

- 1 Depending on the particular unit, one or two utility workers and a hauling truck operator will deliver the replacement cartridges to the site. Information concerning how to obtain the replacement cartridges is available from Stormwater360.
- 2 If applicable, set up safety equipment to protect pedestrians from fall hazards presented by open doors. Also, set up appropriate safety equipment for work near roadways.
- 3 Inspect the external condition of the unit and take notes concerning defects/problems.
- 4 Open the doors to the vault and allow the system to air out for 5-10 minutes.
- 5 Without entering the vault, give the inside of the unit, including components, a general condition inspection.
- 6 Make notes about the external and internal condition.
- 7 Give particular attention to recording the level of sediment build-up on the floor of the vault and on top of the internal components.
- 8 Ensuring safe working procedures are met, off load the replacement cartridges (16-39kgs each) and set aside.
- 9 Remove the top cap (threaded), upper seal and float from the cartridge. Repeat procedure for every cartridge within StormFilter vault. Place items in a large plastic container to be lifted from the vault.
- 10 Using a cordless drill and 8mm hex head, remove the three screws located around the top perimeter of the cartridge hood. Place screws in the large plastic container and, once full or completed, remove plastic container from vault.
- 11 Move the vacuum truck near the StormFilter vault on the down-wind side. Be sure that the truck is not too close to the vault so that fumes will not enter the vault. Make sure that the last 500mm of the nozzle is approximately 100-125mm in outside diameter.
- 12 Feed vacuum nozzle into cartridge bay and start vacuum truck. Remove cartridge hood and place nozzle directly onto filter media. Completely remove media from each cartridge and repeat process for every cartridge in vault.
- 13 Once completed disconnect cartridges from vault floor and place hood back on cartridges
- 14 Using the appropriate lifting cap, attach the cable and remove the cartridge (up to 10kgs. each) from the vault. It is strictly prohibited to have personnel standing under suspended cartridges. Care must also be used to avoid damaging the cartridges during removal and installation. The cost of repairing components damaged during maintenance will be the responsibility of the owner unless Stormwater360 is performing maintenance activities and damage is not related to discharges to the system.
- 15 Set the used cartridge aside or load onto the hauling truck.
- 16 Repeat steps 14 to 15 until all cartridges have been removed.
- 17 Remove deposited sediment from the floor of the vault. This can be accomplished by using the vacuum truck
- 18 Once the sediments are removed, it is necessary to assess the condition of the vault, particularly the manifold and the connectors. These are short sections of 2-inch schedule 50 PVC, or threaded schedule 80 PVC that should protrude above the floor of the vault. If required, apply a light coating of FDA approved silicon grease to the outside of the exposed portion of the connectors. This ensures a watertight connection between the cartridge and the drainage pipe. Replace any damaged connectors.
- 19 Using the boom, crane, or tripod, lower and install the new cartridges (typically 30kg for standard 460 cartridges). Once again, take care not to damage connectors.
- 20 Close and fasten the access cover, and remove safety equipment.
- 21 Make notes about the local drainage area relative to ongoing construction, erosion problems, or high loadings of other materials to the system.
- 22 Finally, dispose of the residual materials in accordance with applicable regulations. Make arrangements to return the used cartridges to Stormwater360.

2.4.4 Related maintenance activities (performed on an as-needed basis)

StormFilter units are often just one of many components in a more comprehensive stormwater drainage and treatment system. The entire system may include catch basins, detention vaults, sedimentation vaults and manholes, detention/retention ponds, swales, artificial wetlands, and other miscellaneous components. In order for maintenance of the StormFilter to be successful, it is imperative that all other

components be properly maintained. The maintenance/repair of upstream facilities should be carried out prior to StormFilter maintenance activities. In addition to considering upstream facilities, it is also important to correct any problems identified in the drainage area. Drainage area concerns may include: erosion problems, heavy oil and grease loading, and discharges of inappropriate materials.

2.5 Typical equipment required for maintenance activities

Typical equipment required for conducting maintenance is shown in Table 3. Some of the materials listed are suggestions rather than requirements. It should be noted that there is more than one way to accomplish some tasks. Owners

with available labour and equipment resources may desire to use alternative methods. However, it is advisable that guidance from Stormwater360 be obtained prior to using alternative techniques.

Table 3 Maintenance Equipment Requirements

Maintenance equipment required		
Minor maintenance	Pre-major maintenance inspection	Major maintenance cartridge replacement
- Safety equipment*: First aid, cones, barricades, flagging, flares, tape, vests, hard hats - Work clothes: Rubber boots, overalls, and gloves - Door bolt, wrench, proprietary lifters (e.g. Gatic) and miscellaneous Tools - Tape measure - Flashlight - Grapple or net pole - Record keeping forms - Litter/debris container	- Safety equipment*: First aid, cones, barricades, flagging, flares, tape, vests, hard hats - Work clothes: Rubber boots, overalls, and gloves - Door bolt, wrench, proprietary lifters (e.g. Gatic) and miscellaneous Tools - Tape measure - Flashlight - Grapple or net pole - Record keeping forms - Litter/debris container	- Safety equipment*: First aid, cones, barricades, flagging, flares, tape, vests, hard hats - Work clothes: Rubber boots, overalls, and gloves - Door bolt, wrench, Pentasocket and miscellaneous Tools - Tape measure - Flashlight - Grapple or net pole - Record keeping forms - Vacuum truck - Replacement cartridges - Cartridge hauling truck - Crane, tripod and hoist, or other lifting device (150kg minimum capacity) - Shovels - Extra 50mm PVC cartridge connectors - Spare flow restrictor discs - Litter/debris container - Vault inlet pipe plug - Dolly - PVC Pipe cutter - Ladder - Cartridge installation and removal sling

*Confined space equipment may be required for vault entry. This equipment must be used by personnel with the appropriate OH&S training. This equipment typically includes: Atmospheric testing devices, atmospheric purging and ventilating devices, and entry, exit, and rescue assisting devices.

2.6 Material Disposal

The accumulated sediment found in stormwater treatment and conveyance systems must be handled and disposed of in a manner that will not allow the material to affect surface or ground water. It is possible for sediments to contain measurable concentrations of heavy metals and organic chemicals (such as pesticides and petroleum products). Areas with the greatest potential for high pollutant loading include industrial areas and heavily travelled roads. Sediments and water must be disposed of in accordance with all applicable waste disposal regulations.

It is not appropriate to discharge these materials back to the stormwater drainage system. Part of arranging for maintenance to occur should include coordination of disposal of solids (landfill coordination) and liquids (municipal vacuum truck decant facility, local wastewater treatment plant, on-site treatment and discharge). Owners should contact the local public works department and inquire about how the department disposes of their street waste residuals. Stormwater360 will determine disposal methods or reuse of the media contained in the cartridges. If the material has been contaminated with any unusual substance, the cost of special handling and disposal will be the responsibility of the owner.



SFEP StormFilter & EnviroPod Maintenance Data Sheet



Date:	Location:	GPS COORD:
System size:	Type: ☐ Cast-in-place ☐ Precast ☐ Linear	
Number of Cartridges:	Type of Cartridge: ☒ 460mm ☐ 690mm ☐ 310mm	
Filter Media: ☐ ZPG ☐ Perlite		
Type of EnviroPods:		Number of EnviroPods:
Personnel:		

STORMFILTER SYSTEM OBSERVATIONS

Last service:	
Sediment Depth on Vault Floor:	
Structural Damage:	
Cartridges submerged: ☐ Yes ☐ No	How deep:
Comments:	

ENVIROPOD SYSTEM OBSERVATIONS

Last service:
Amount of Sediment in Basket:
Structural Damage:
Comments:

DRAINAGE AREA REPORT

Excessive Oil and Grease Loading	☐ Yes ☐ No	Source:
Sediment Accumulation on Pavement	☐ Yes ☐ No	Source:
Erosion of Landscaped Areas	☐ Yes ☐ No	Source:
Comments:		

STORMFILTER CARTRIDGE MAINTENANCE ACTIVITIES

Remove Litter and Debris	☐ Yes ☐ No	Details:
Sediment Removed from Vault Floor	☐ Yes ☐ No	Details:
Quantity of Sediment Removed (estimate?):		
Replace Cartridges	☐ Yes ☐ No	Details:
Minor Structural Repairs	☐ Yes ☐ No	Details:
Residuals (debris, sediment) Disposal Methods:		
Notes/Problems:		

ENVIROPOD MAINTENANCE ACTIVITIES

Number of Bags Replaced:	Clogged EnviroPods/Bags: ☐ Yes ☐ No
Comments:	

SFEP Treatment Train Inspection Data Sheet



It may be desirable to conduct this inspection during a storm to observe the relative flow through the filter cartridges. If the submerged cartridges are severely plugged, large amounts of sediments should be present, very little flow will be discharging from the drainage pipes, and it is likely that the cartridges need to be replaced during major maintenance.

Date:	Location:	GPS COORD:
System size:	Type: ☐ Cast-in-place ☐ Precast ☐ Linear	
Number of Cartridges:	Type of Cartridge: ☐ 460mm ☐ 690mm ☐ 310mm	
Filter Media: ☐ ZPG ☐ Perlite		
Type of EnviroPods:		Number of EnviroPods:
Personnel Attending Inspection:		

STORMFILTER SYSTEM OBSERVATIONS

Last service:	
Sediment Depth on Vault Floor:	
Structural Damage:	
Cartridges submerged: ☐ Yes ☐ No	How deep:
Comments:	

ENVIROPOD SYSTEM OBSERVATIONS

Last service:	
Amount of Sediment in Basket:	
Structural Damage:	
Comments:	

DRAINAGE AREA REPORT

Excessive Oil and Grease Loading	☐ Yes ☐ No	Source:
Sediment Accumulation on Pavement	☐ Yes ☐ No	Source:
Erosion of Landscaped Areas	☐ Yes ☐ No	Source:
Comments:		

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Stormwater360 supplies and maintains
a complete range of filtration,
hydrodynamic separation, screening and
oil/water separation technologies.

Call 1300 354 722

www.stormwater360.com.au



Appendix K

MUSIC Model Data

MUSIC Model Information

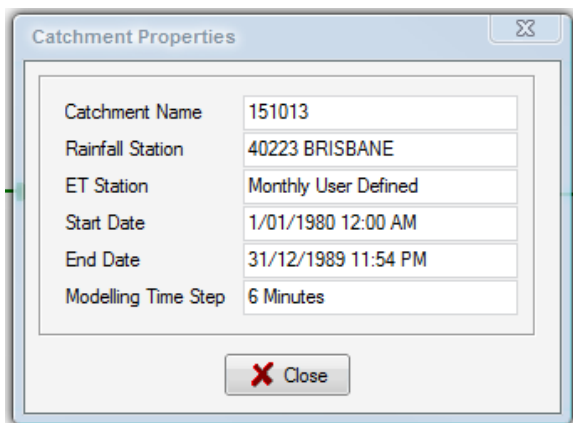
Introduction:

The quality of stormwater runoff and the impact of the proposed stormwater quality improvement measures were analysed using MUSIC Version 6.0 according to the MUSIC Modelling Guidelines Version 1.0, Water by Design 2010.

Meteorological Data:

The MUSIC model was carried out using the following parameters:

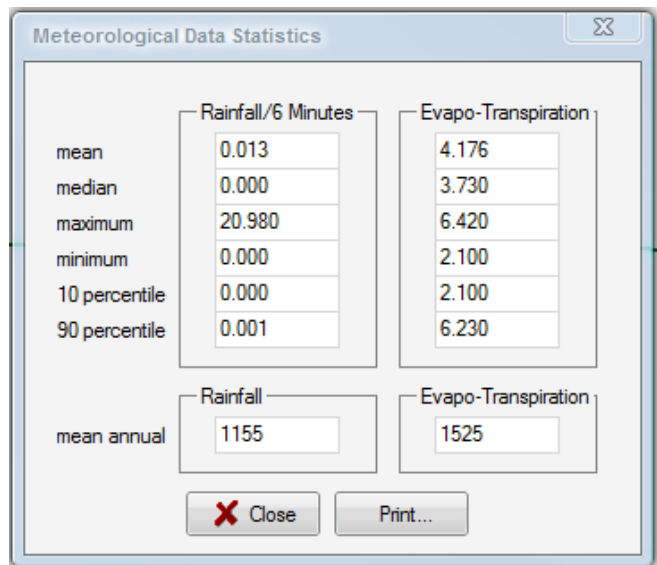
- The modelling period should be 10 years with a time step of 6 minutes.
- The nearest available 6 minute time step rainfall series to the subject site is Dayboro Post Office.



Catchment Properties

Catchment Name	151013
Rainfall Station	40223 BRISBANE
ET Station	Monthly User Defined
Start Date	1/01/1980 12:00 AM
End Date	31/12/1989 11:54 PM
Modelling Time Step	6 Minutes

X Close



Meteorological Data Statistics

	Rainfall/6 Minutes	Evapo-Transpiration
mean	0.013	4.176
median	0.000	3.730
maximum	20.980	6.420
minimum	0.000	2.100
10 percentile	0.000	2.100
90 percentile	0.001	6.230

	Rainfall	Evapo-Transpiration
mean annual	1155	1525

X Close **Print...**

Source Nodes – Pollutant Exports:

Pollutant export parameters were assigned as per Table 3.8 of the MUSIC Modelling Guidelines.

The pollutant exports parameters adopted in the MUSIC model are summarized in the table below.

Table 3.8 Pollutant export parameters for split catchment land use (log₁₀ values)

FLOW TYPE	SURFACE TYPE	TSS log ¹⁰ values		TP log ¹⁰ values		TN log ¹⁰ values	
		Mean	St. dev.	Mean	St. dev.	Mean	St. dev.
Urban residential							
Baseflow parameters	Roof	N/A	N/A	N/A	N/A	N/A	N/A
	Roads	1.00	0.34	-0.97	0.31	0.20	0.20
	Ground level	1.00	0.34	-0.97	0.31	0.20	0.20
Stormflow parameters	Roof	1.30	0.39	-0.89	0.31	0.26	0.23
	Roads	2.43	0.39	-0.30	0.31	0.26	0.23
	Ground level	2.18	0.39	-0.47	0.31	0.26	0.23
Industrial							
Baseflow parameters	Roof	N/A	N/A	N/A	N/A	N/A	N/A
	Roads	0.78	0.45	-1.11	0.48	0.14	0.20
	Ground level	0.78	0.45	-1.11	0.48	0.14	0.20
Stormflow parameters	Roof	1.30	0.44	-0.89	0.36	0.25	0.32
	Roads	2.43	0.44	-0.30	0.36	0.25	0.32
	Ground level	1.92	0.44	-0.59	0.36	0.25	0.32
Commercial							
Baseflow parameters	Roof	N/A	N/A	N/A	N/A	N/A	N/A
	Roads	0.78	0.39	-0.60	0.50	0.32	0.30
	Ground level	0.78	0.39	-0.60	0.50	0.32	0.30
Stormflow parameters	Roof	1.30	0.38	-0.89	0.34	0.37	0.34
	Roads	2.43	0.38	-0.30	0.34	0.37	0.34
	Ground level	2.16	0.38	-0.39	0.34	0.37	0.34

Appendix L

DBYD Data

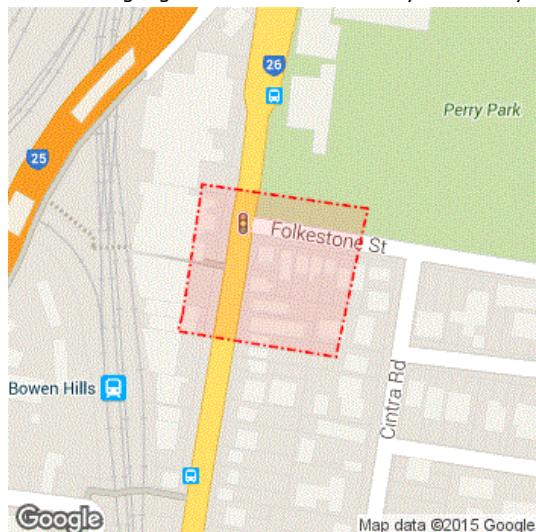
Caller Details

Contact: Mr Sam Warner
Company: ADG Engineers (Aust.) PTY LTD
Address: PO Box 208 1 short Street
Southport QLD 4215

Caller Id: 1535596
Mobile: Not Supplied
Email: swarner@adgce.com
Phone: 1300 657 402
Fax: Not Supplied

Dig Site and Enquiry Details

WARNING: The map below only displays the location of the proposed dig site and does not display any asset owners' pipe or cables. The area highlighted has been used only to identify the participating asset owners, who will send information to you directly.



User Reference: Not Supplied
Working on Behalf of: Private
Enquiry Date: 25/09/2015
Start Date: 30/09/2015
End Date: 30/09/2015

Address: Abbotsford Road
Bowen Hills QLD 4006
Job Purpose: Excavation
Onsite Activity: Mechanical Excavation
Location of Workplace: Both
Location in Road: CarriageWay, Footpath, Nature Strip

- Check that the location of the dig site is correct. If not you must submit a new enquiry.
- Should the scope of works change, or plan validity dates expire, you must submit a new enquiry.
- Do NOT dig without plans. Safe excavation is your responsibility. If you do not understand the plans or how to proceed safely, please contact the relevant asset owners.

Notes/Description of Works:
Not Supplied

Your Responsibilities and Duty of Care

- If plans are not received within 2 working days, contact the asset owners directly & quote their Sequence No.
- ALWAYS perform an onsite inspection for the presence of assets. Should you require an onsite location, contact the asset owners directly. Please remember, plans do not detail the exact location of assets.
- Pothole to establish the exact location of all underground assets using a hand shovel, before using heavy machinery.
- Ensure you adhere to any State legislative requirements regarding Duty of Care and safe digging requirements.
- If you damage an underground asset you MUST advise the asset owner immediately.
- By using this service, you agree to Privacy Policy and the terms and disclaimers set out at www.1100.com.au
- For more information on safe excavation practices, visit www.1100.com.au

Asset Owner Details

The assets owners listed below have been requested to contact you with information about their asset locations within 2 working days. Additional time should be allowed for information issued by post. It is **your responsibility** to identify the presence of any underground assets in and around your proposed dig site. Please be aware, that not all asset owners are registered with the Dial Before You Dig service, so it is **your responsibility** to identify and contact any asset owners not listed here directly.

** Asset owners highlighted by asterisks ** require that you visit their offices to collect plans.

Asset owners highlighted with a hash require that you call them to discuss your enquiry or to obtain plans.

Seq. No.	Authority Name	Phone	Status
48143727	APA Group Networks, Brisbane	0881591644	NOTIFIED
48143723	Brisbane City	0734038888	NOTIFIED
48143724	Energex, Electricity (Qld)	0736645400	NOTIFIED
48143728	NBN Co, Qld	1800626762	NOTIFIED
48143726	Optus and/or Uecomm, Qld	1800505777	NOTIFIED
48143721	PIPE Networks, Qld	1800201100	NOTIFIED
48143729	Queensland Urban Utilities	132364	NOTIFIED
48143722	Reef Networks	1800336886	NOTIFIED
48143725	Telstra QLD, South East	1800653935	NOTIFIED

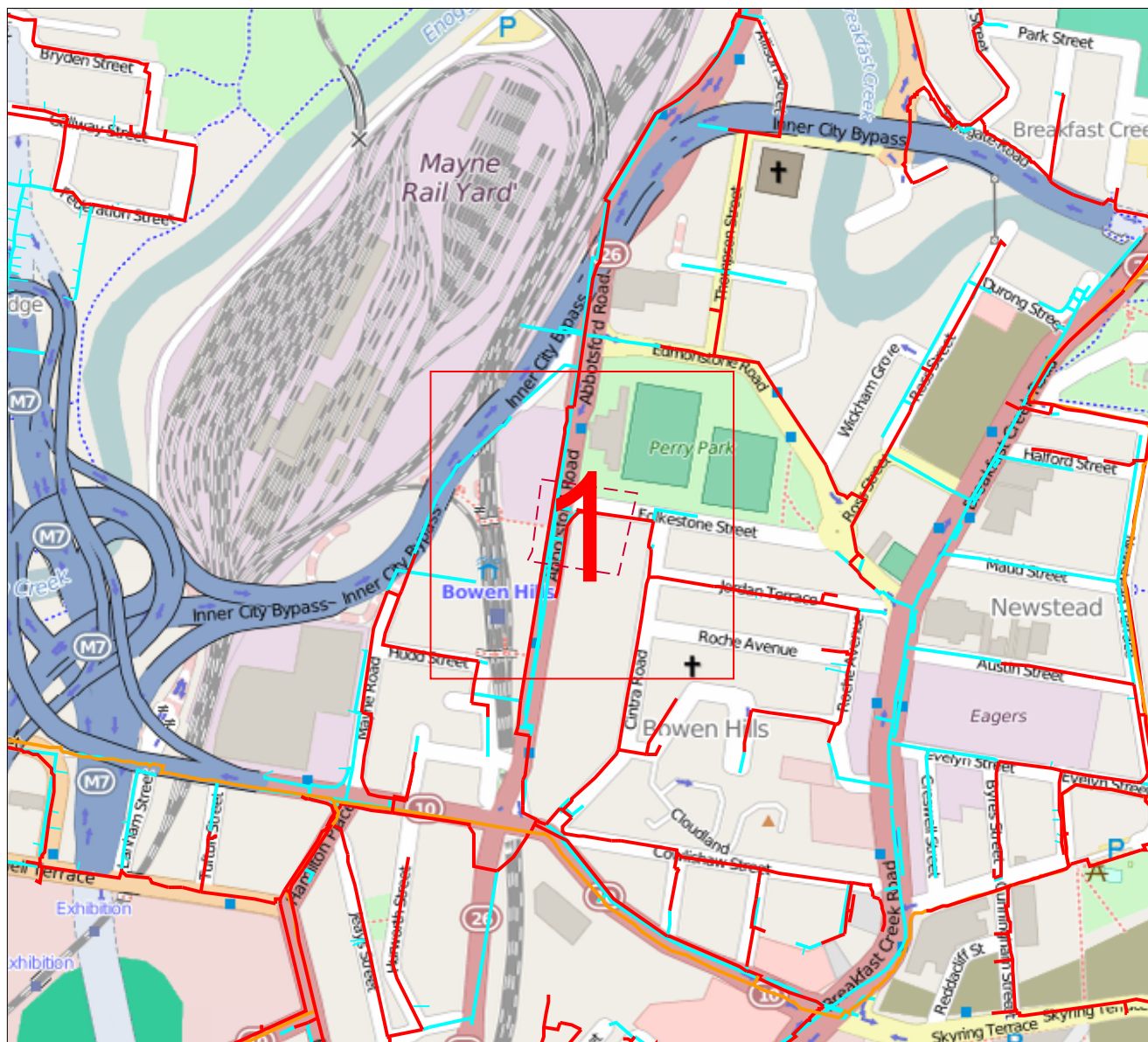
END OF UTILITIES LIST

25 09 2015

SCALE: DO NOT SCALE

REF NO: 48143727

As work on APA underground plant is ongoing any drawing with an issue date of more than one month previous can no longer be considered valid. All persons planning civil works on any site are advised to contact APA to confirm location. All underground gas pipelines are the property of APA & are not to be accessed by unauthorised persons. All care is taken with preparation of the drawings & no responsibility is accepted for errors or omissions.



48143727

Papersize: A4 Scale: 1: 6000

0 0.08



Data Source

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Property Parcels Copyright QLD Government, UBD Imagery -
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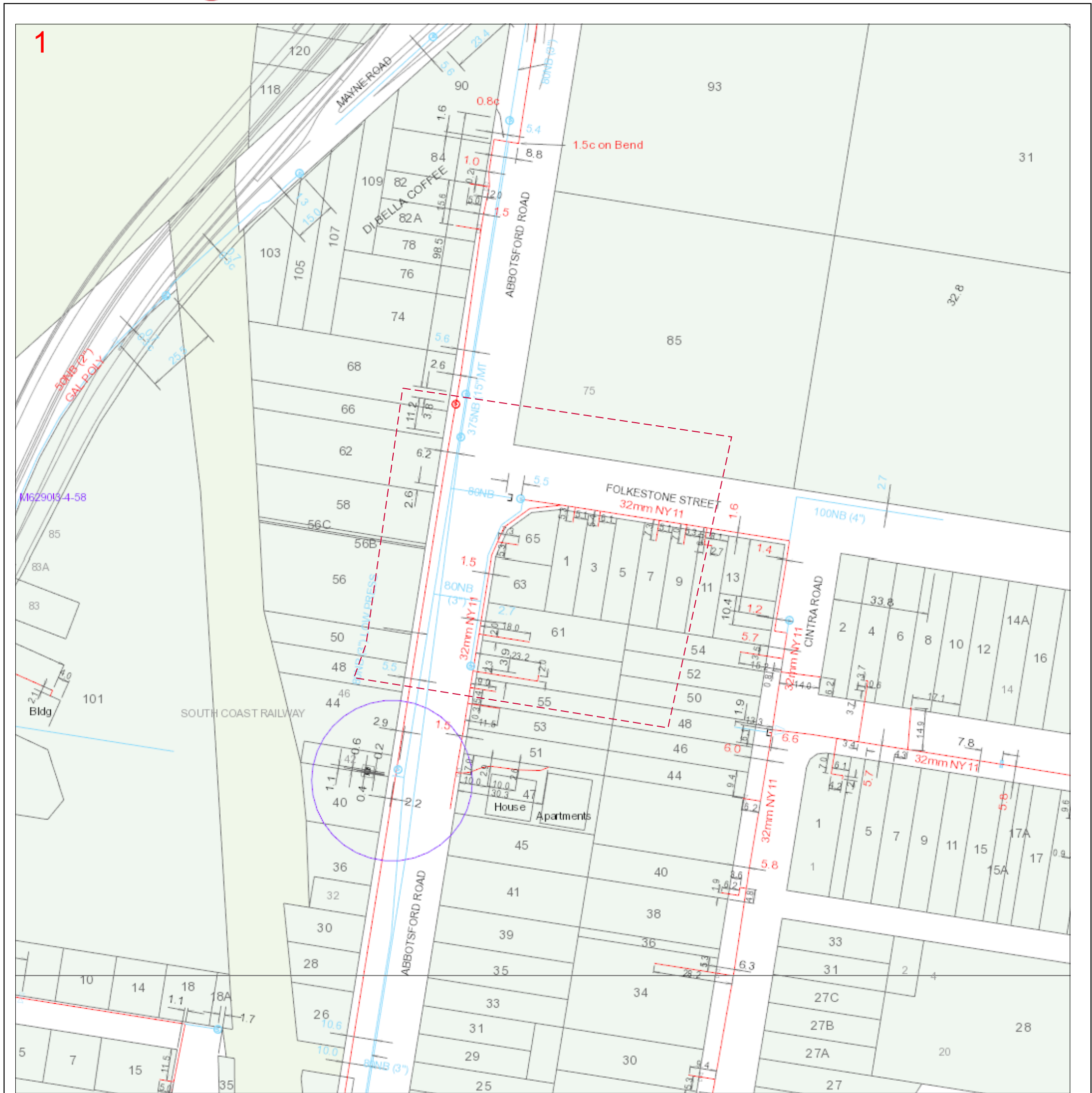
APA Group

Legend

	Distribution Transmission - Live		Gate Station		Sleeve
	Distribution High - Live		Pipe Connector		End Cap
	Distribution Medium - Live		Emergency Valve		Valve
	Distribution Low - Live		Cathodic TP		Reducer
	Distribution LPG - Live		Purge Point		Syphon
	Distribution TLP Medium - Live		GPS Symbol		Baghole
	Distribution Main - Planned		Power Pole		Regulator
	Distribution Main - Idle		Pipeline Marker		Test Point

- - - Line / Polygon Request

This maps is created in colour and shall be printed in colour



48143727 Map Sheet: 1

Papersize: A3 Scale: 1: 1000

0 0.01



Map Key:

1

Legend

— Distribution Transmission - Live	▲ Gate Station	— Sleeve
— Distribution High - Live	= Pipe Connector	┐ End Cap
— Distribution Medium - Live	⚡ Emergency Valve	⋈ Valve
— Distribution Low - Live	Ⓢ Cathodic TP	▽ Reducer
— Distribution LPG - Live	φ Purge Point	Ⓢ Syphon
— Distribution TLP Medium - Live	Ⓢ GPS Symbol	Ⓢ Baghole
--- Distribution Main - Planned	Ⓢ Power Pole	R Regulator
--- Distribution Main - Idle	Ⓢ Pipeline Marker	T Test Point

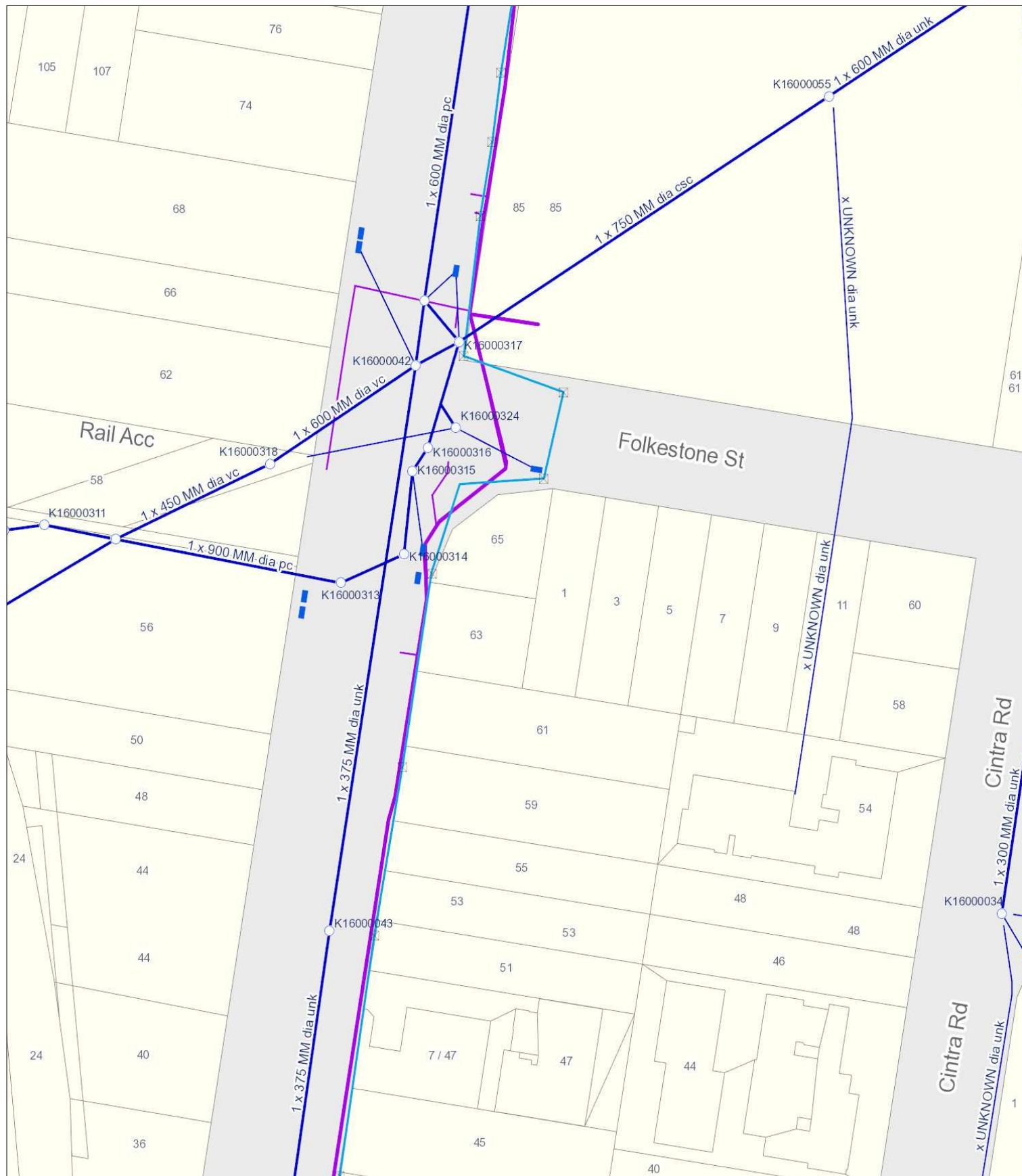
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APA Group

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BCC Stormwater and Cable Networks

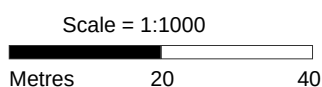
Sequence Number: 48143723

Disclaimer:

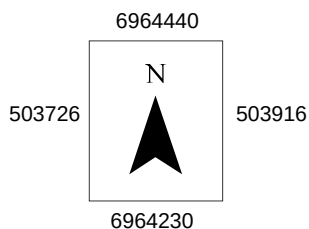
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Caution: This map may contain the locations of abandoned underground asbestos pipes. Council gives no warranty to the completeness or accuracy of these records. Appropriate care needs to be taken in all cases.



Location:



Copyright BCC, 2015

Date: Sep 25, 2015

All underground cables shall be treated as being energised. Where a cable is located that is not represented on the ENERGEX EnerGISE DBYD map, then ENERGEX shall be contacted immediately.

For Emergency Situations
Please call 13 19 62

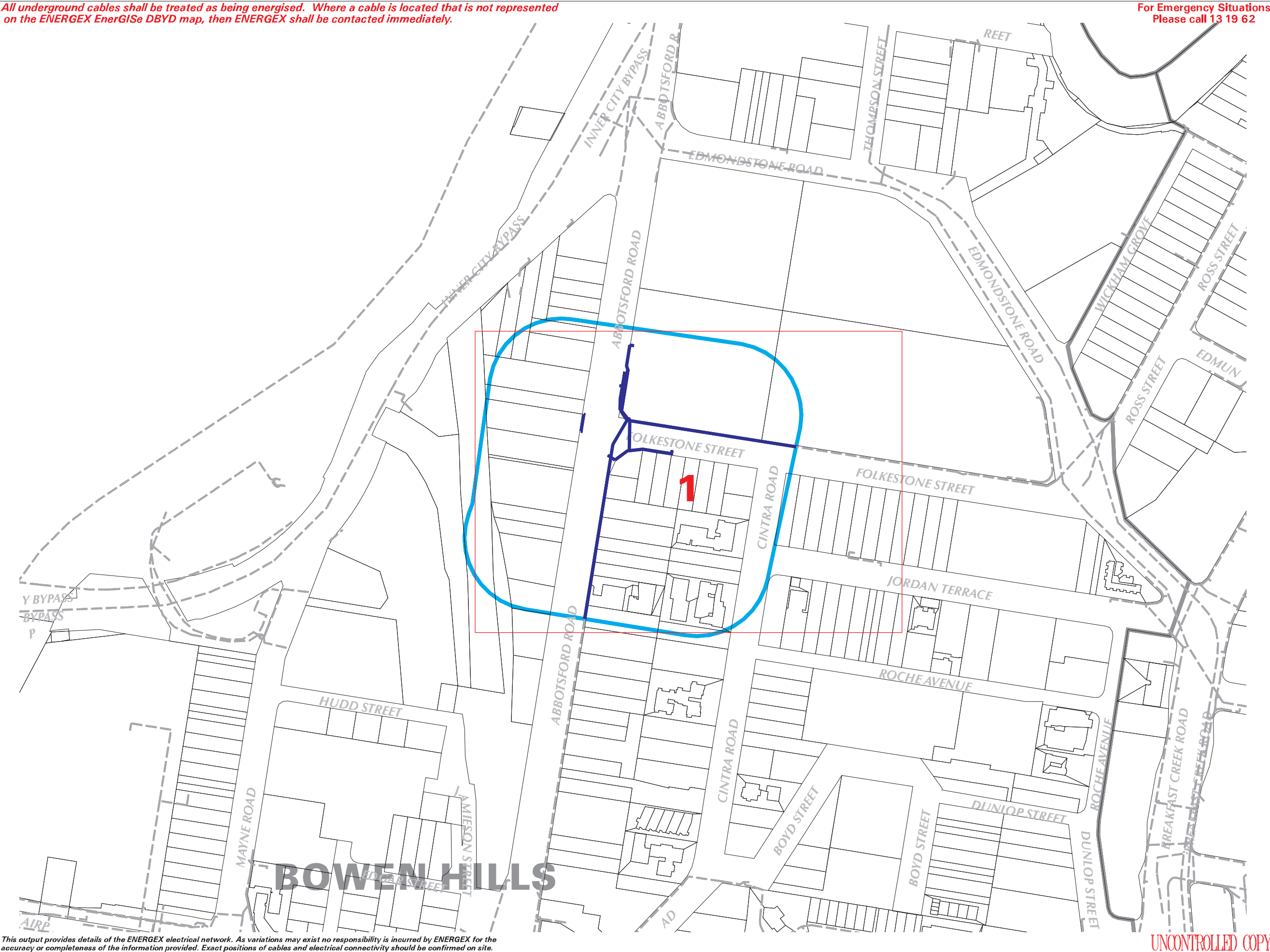


Date: 25 Sep 15 Time: 13.53.21
Requested By: DBYD

NOT TO SCALE
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Enquiry No: 48143724
KEY MAP

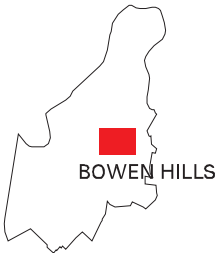
Enquiry Area



This output provides details of the ENERGEX electrical network. As variations may exist no responsibility is incurred by ENERGEX for the accuracy or completeness of the information provided. Exact positions of cables and electrical connectivity should be confirmed on site.

UNCONTROLLED COPY

LOCALITY DIAGRAM



All underground cables shall be treated as being energised. Where a cable is located that is not represented on the ENERGEX EnerGISE DBYD map, then ENERGEX shall be contacted immediately.

For Emergency Situations
Please call 13 19 62



Date: 25 Sep 15 Time: 13.53.32
Requested By: DBYD

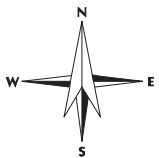
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Enquiry No: 48143724

STRIP No: 1

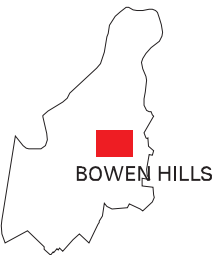
- | | | | |
|--|---------------------|--|------------------------------|
| | Ground Transformer | | Cable Voltage Less Than 33kV |
| | Cubicle Transformer | | Cable Voltage 33kV or Higher |
| | Ring Main Unit | | Direct-Lay Cable |
| | Metering Unit | | Conduit |
| | Link Pillar | | Multi-Section Duct |
| | Service Pillar | | Trench |
| | Junction Pillar | | Cable Tray |
| | Pit | | Tunnel |
| | Cable Joint | | |
| | Cable Termination | | |
| | Cable Marker | | |
| | Street Light Pole | | |
| | Earth | | |
| | Works Order Polygon | | |



INDEX TO SHEETS

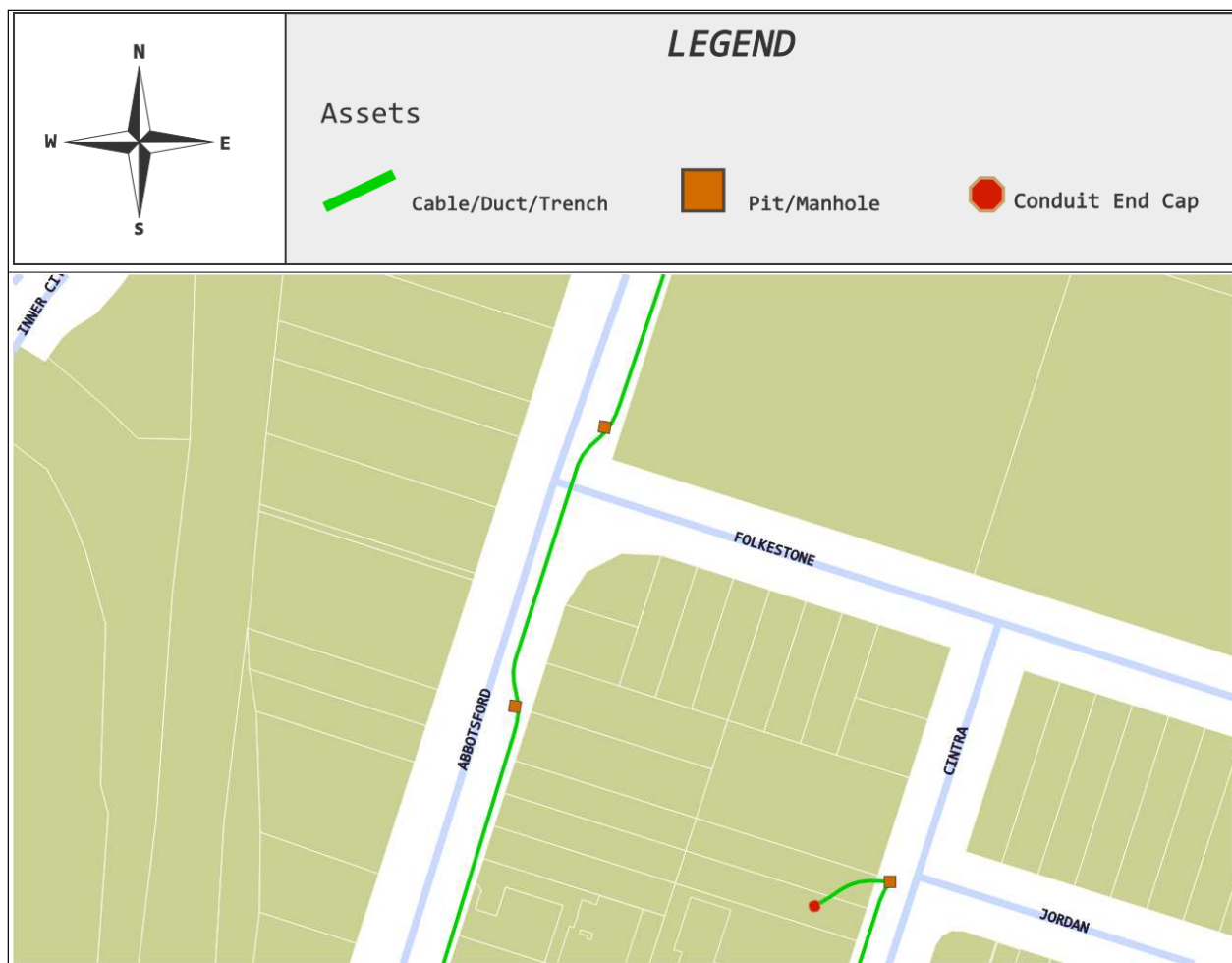


LOCALITY DIAGRAM



This output provides details of the ENERGEX electrical network. As variations may exist no responsibility is incurred by ENERGEX for the accuracy or completeness of the information provided. Exact positions of cables and electrical connectivity should be confirmed on site.

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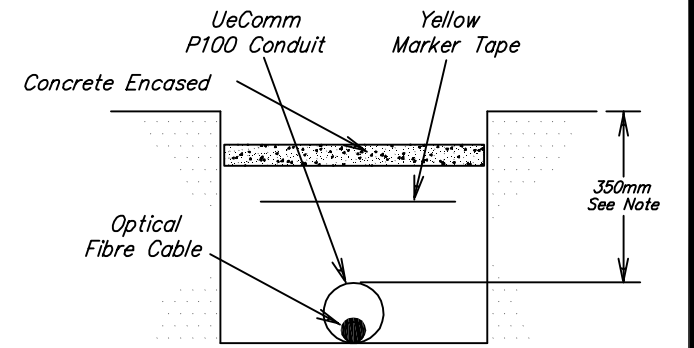
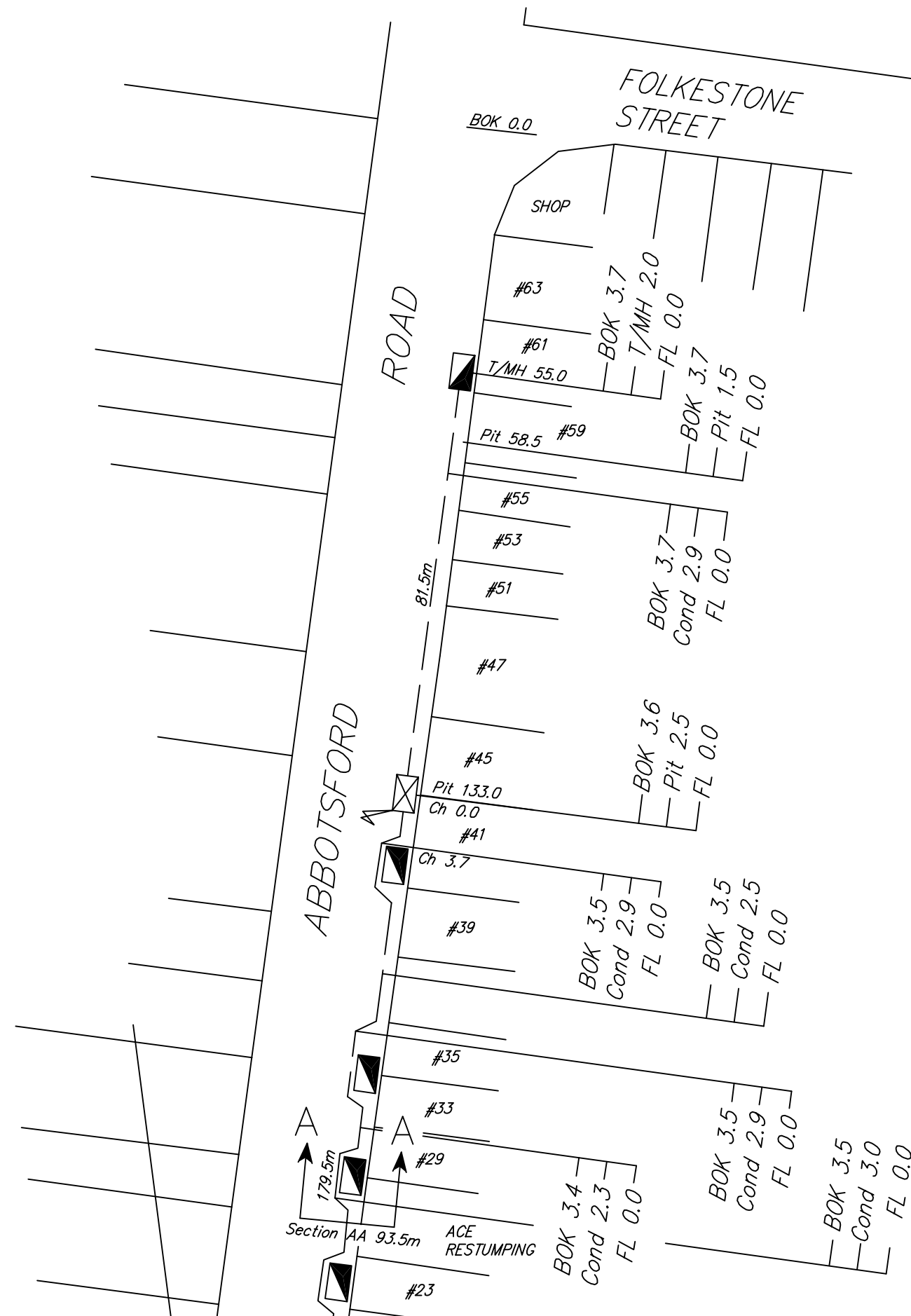
Conditions

The following are conditions on which NBN Co provides you with the Indicative Plans. By accepting the plans, you are agreeing to these conditions. These conditions are in addition (and not in replacement of) any duties and obligations you have under applicable law.

1. NBN Co does not accept any responsibility for any inaccuracies of its plans. You are expected to make your own inquiries and perform your own investigations (including engaging appropriately qualified plant locators at your cost to locate NBN Co telecommunications facilities during any activities you carry out on site).
2. You should not assume that fibre optic cables follow straight lines or are installed at uniform depths along their lengths, even if they are indicated on plans provided to you. Careful onsite investigations are essential to locate the exact position of cables.
3. In carrying out any works in the vicinity of NBN Co facilities, you must maintain the following minimum clearances:

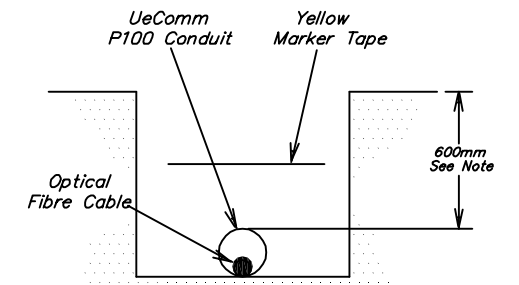
LEGEND

○	ELECTRICITY POLE
- - - -	BORE TUNNELLING
- - - -	TRENCHING
⊗	UE P8 PIT
⊠	UE P6 PIT
FL	FENCE LINE
BOK	BACK OF KERB
Cond	CONDUIT
▴	TELSTRA PIT
MRD	MAIN ROADS DEPARTMENT PIT



SECTION AA

Note:
Conduit depths quoted are approximate only and may change due to unforeseen circumstances.
Excavate by hand until conduit depth is determined.



TYPICAL SECTION

Note:
Conduit depths quoted are approximate only and may change due to unforeseen circumstances.
Excavate by hand until conduit depth is determined.

SHEET 1 OF 5

K.J. BLAIN SURVEYS

Land Development, Planning
& Surveying Consultants

Suite 35, 10-14 Masthead Drive, Cleveland, Qld 4163
PH: (07) 3821 2016 FAX: (07) 3821 2253



UeComm Pty Ltd
Comalco Place
Level 13, 12 Creek Street
Brisbane, QLD 4000

Phone: (07) 3815 9097
Facsimile: (07) 3211 8960



SERVICES PTY LTD
Ph. (07) 3286 7311 Fx. (07) 3286 7322

G	
F	
E	
D	
C	
B	
A	TBM
	MOVE PIT 24.11.04
	REVISIONS

APPROVED

T. Sultana

31.07.01

DETAILS:

ABBOTSFORD ROAD
TO LONGLAND STREET
BOWEN HILLS - 4006

UBD.

MAP 140 C20

SCALE 1: 1000

SURVEYED

DRAWN: PDR

CHECKED: AJS

FILE REF: 7069

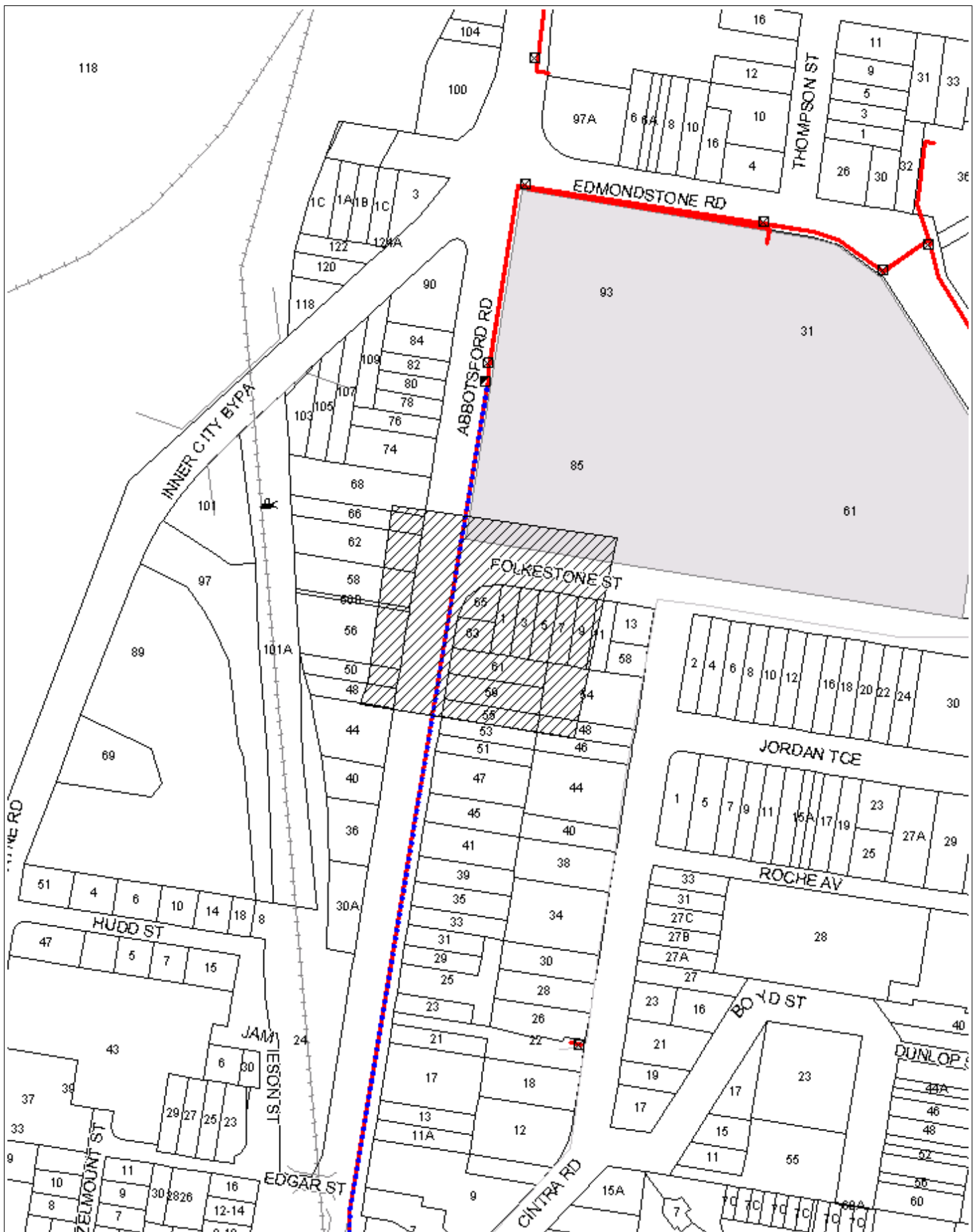
DATE

DATE: 22/12/00

DATE: 22/12/00

F.B.

OFN5/BNE/4132/1



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Sequence Number: 48143726

Date Generated: 25/09/2015



For all Optus DBYD plan enquiries –
Email: Fibre.Locations@optus.net.au
For urgent onsite assistance contact 1800 505 777
Optus Limited ACN 052 833 208





Job Location

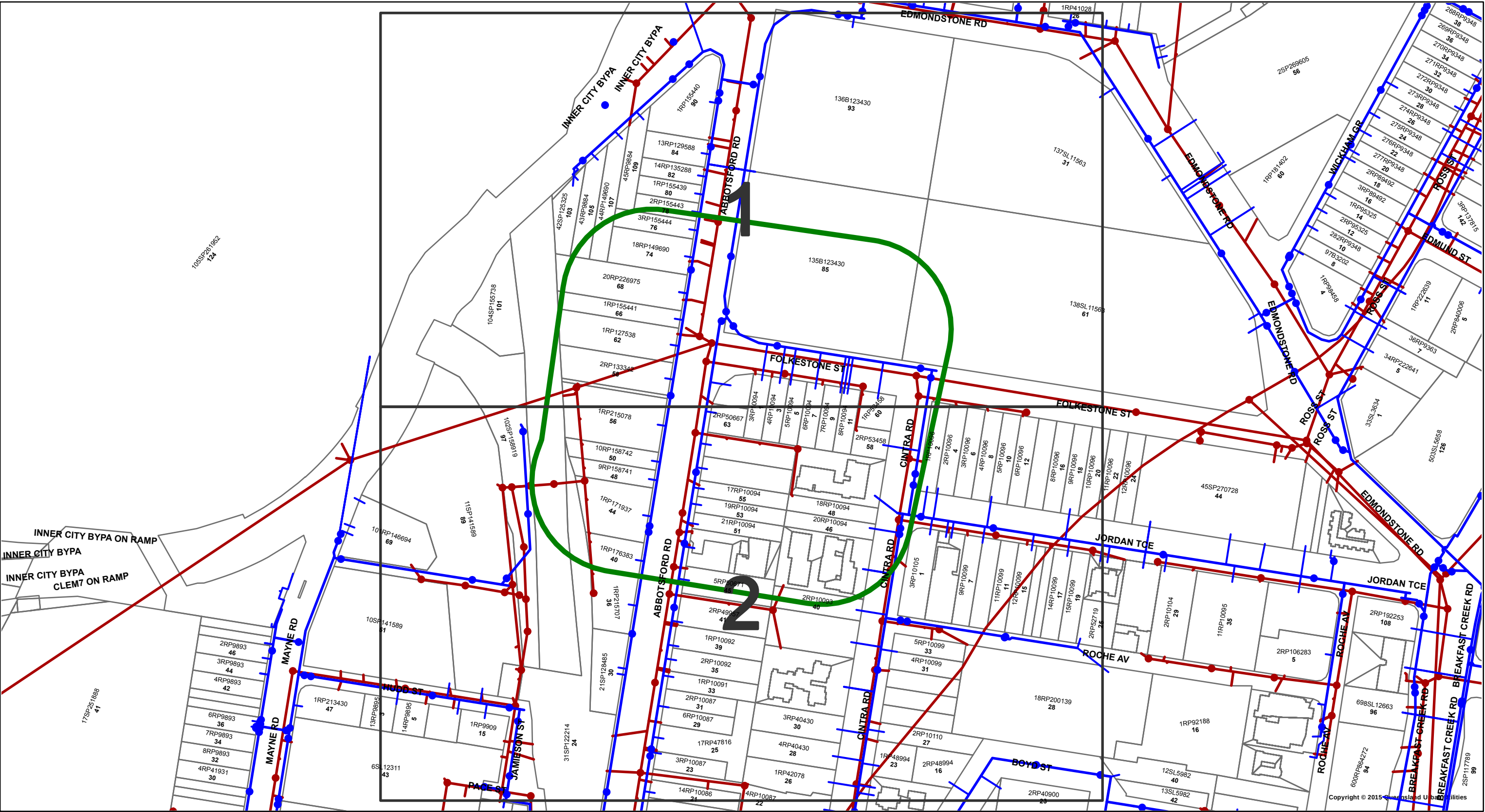


Underground Asset



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QUEENSLAND
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DBYD - Queensland Urban Utilities
Water & Sewer Infrastructure

DBYD Reference No: 48143729

B R R 25 09 2015 1 50 00 P
B B 30 09 2015 12 00 00
B P 25 09 2015

30 P B



Sewer

● ◆
— — P
— — R P
▨ S S

Water

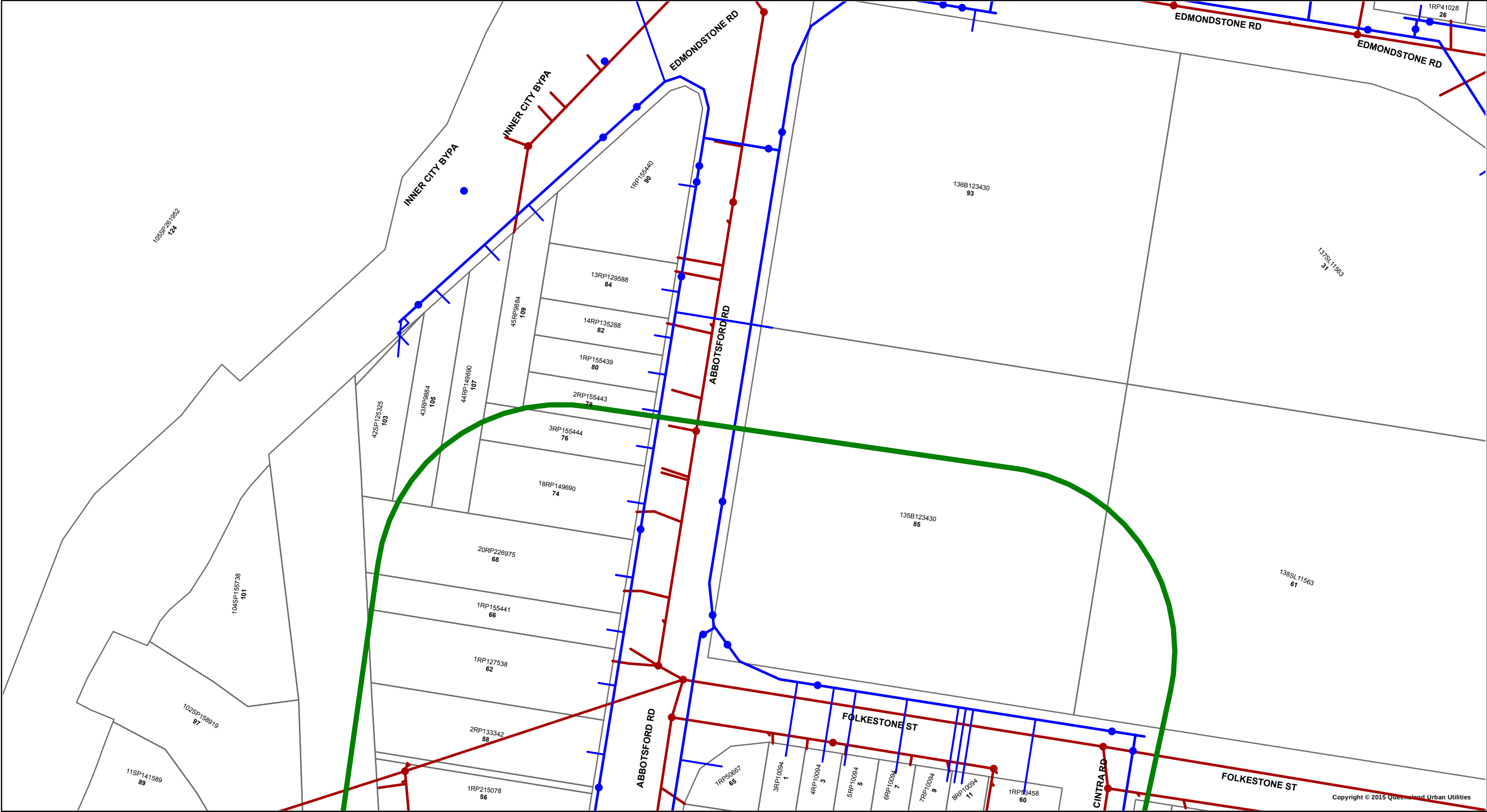
● ◆
— — P
▨ S



N
Map Scale
1 2050

B 2012 S S R S
2012 S R
13 23 64 24 7 13 26 57 7 7
B 86 673 835 011

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Water & Sewer Infrastructure

DBYD Reference No: 48143729

B	R	R	25 09 2015 1 50 00 P
B			30 09 2015 12 00 00
B		P	25 09 2015

P B



Sewer



P

1

S

Water



P

S



Map Scale

1 1000



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2015



DBYD - Queensland Urban Utilities
Water & Sewer Infrastructure

DBYD Reference No: 48143729

[illegible]

Sewer



P

— R

S

Water



P

S

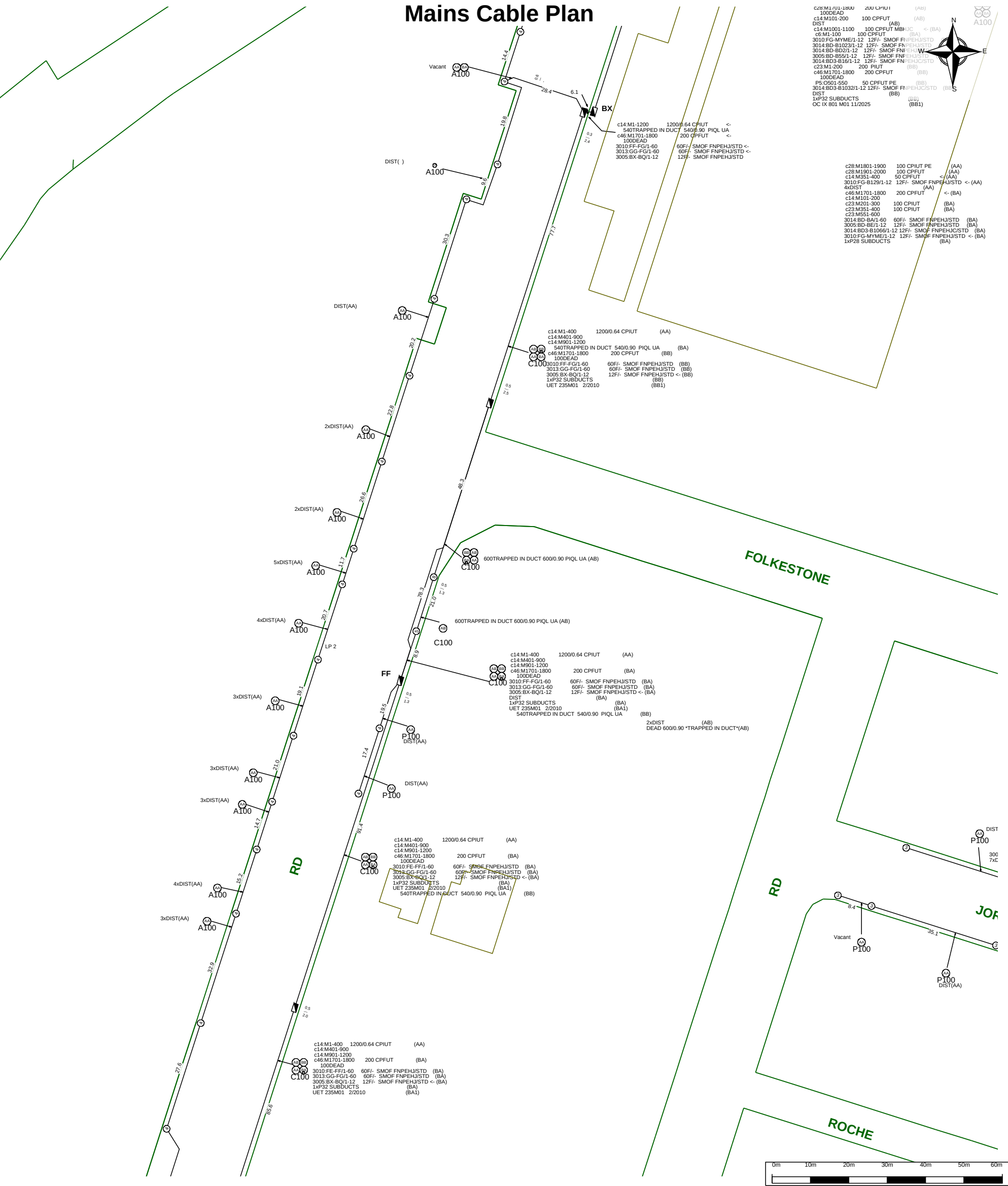


Map Scale

1 1000



Mains Cable Plan



For all Telstra DBYD plan enquiries -
email - Telstra.Plans@team.telstra.com
For urgent onsite contact only - ph 1800 653 935 (bus hrs)

TELSTRA CORPORATION LIMITED A.C.N. 051 775 556

Generated On 25/09/2015 13:53:07

Sequence Number: 48143725

CAUTION: Fibre optic and/ or major network present in plot area. Please read the Duty of Care and contact Telstra Plan Services should you require any assistance.

WARNING - Due to the nature of Telstra underground plant and the age of some cables and records, it is impossible to ascertain the precise location of all Telstra plant from Telstra's plans. The accuracy and/or completeness of the information supplied can not be guaranteed as property boundaries, depths and other natural landscape features may change over time, and accordingly the plans are indicative only. Telstra does not warrant or hold out that its plans are accurate and accepts no responsibility for any inaccuracy shown on the plans.

It is your responsibility to locate Telstra's underground plant by careful hand pot-holing prior to any excavation in the vicinity and to exercise due care during that excavation.

Please read and understand the information supplied in the duty of care statement attached with the Telstra plans. TELSTRA WILL SEEK COMPENSATION FOR LOSS CAUSED BY DAMAGE TO ITS PLANT.

Telstra plans and information supplied are valid for 60 days from the date of issue. If this timeframe has elapsed, please reapply for plans.

Brisbane

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PO Box 1492
Toowong BC, QLD 4066
Phone: +61 07 3300 8800
Fax: +61 07 3871 2266
Email: bris@adgce.com

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Darwin, NT 0801
Phone: +61 08 8944 6300
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Email: info@adgce.com

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Maroochydore BC, QLD 4558
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Fax: +61 07 5444 0536
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Southport, QLD 4215
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Fax: +61 07 5528 4723
Email: info@adgce.com

