New Berrima Brickworks Facility
416-524 Berrima Rd, Moss Vale
Soil and Water Management Plan & Civil Servicing Report

CLIENT/ BRICKWORKS LTD
DATE/ MARCH 2020
CODE/ REP001-02-19-681

Commercial in Confidence

Document Registration

Document Title	Berrima Brickworks Soil and Water Management Plan & Civil Servicing Report
Document File Name	REP001-02-19-681-Soil, Water & Servicing Report
Section	Civil Engineering
Document Author	Simon Haycock

Issue	Description	Date	Author	Checked	Approved
001	Draft Issued for Review	31/03/20	Simon Haycock	☒	☒
002	Issued for Approval	28/04/20	Simon Haycock	☒	☒
				☐	☐
				☐	☐
				☐	☐

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1. Introduction

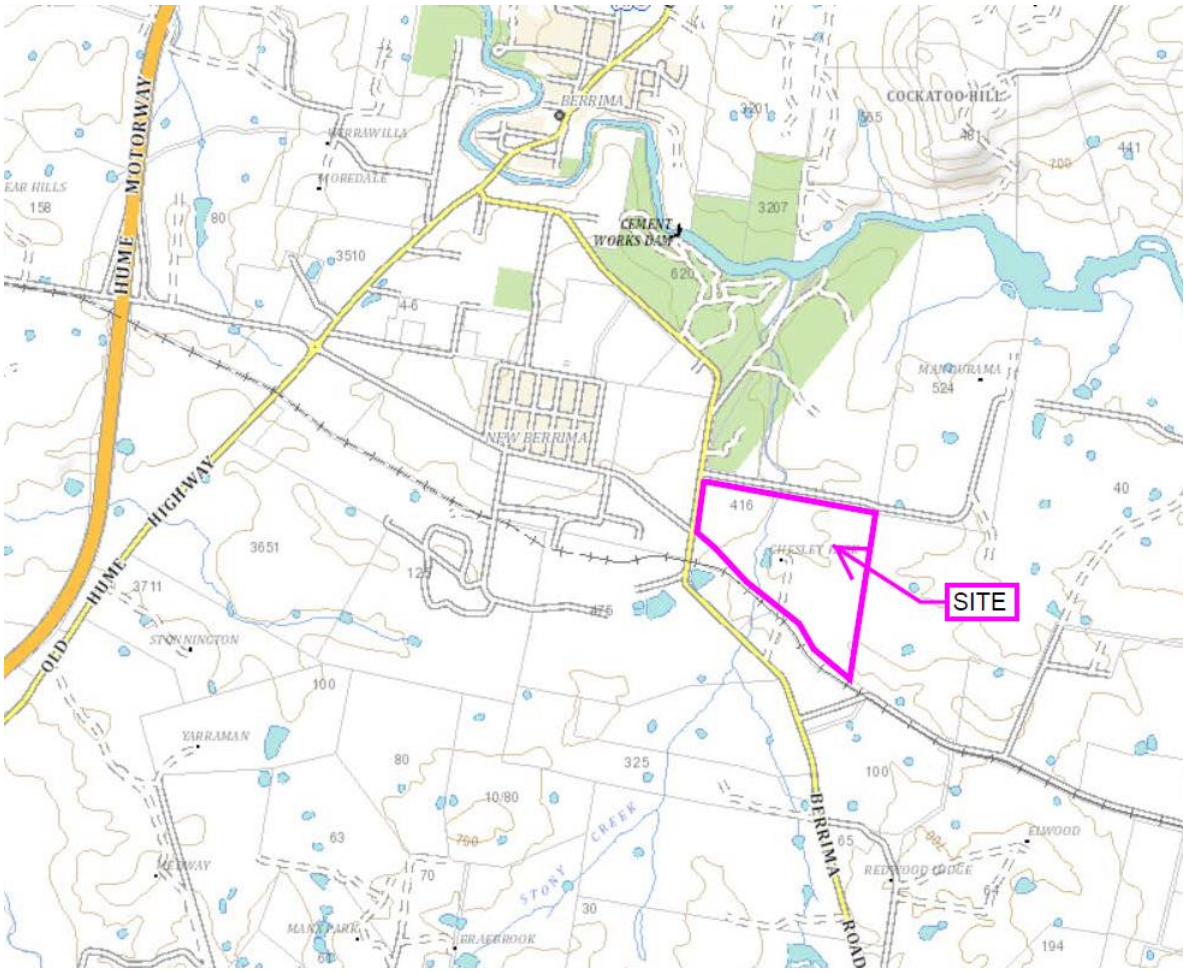
1.1. Background

AT&L was commissioned by The Austral Brick Company Pty Ltd to prepare a Soil, Water and Servicing Report in support of an Environmental Impact Statement associated with a State Significant Development Application (SSD-10422) for a proposed industrial development on their property at 416-524 Berrima Road, Moss Vale.

The site is situated within the Wingecarribee Shire Council local government area and is immediately adjacent to the proposed Austral masonry manufacturing facility approved by Council in September 2019 (Ref. 18/0576).

This report has been prepared based on the NSW Planning Secretary's Environmental Assessment Requirements as issued 11 February 2020.

Figure 1.1 - Subject Site Locality (SIX Maps)



2. Existing Site

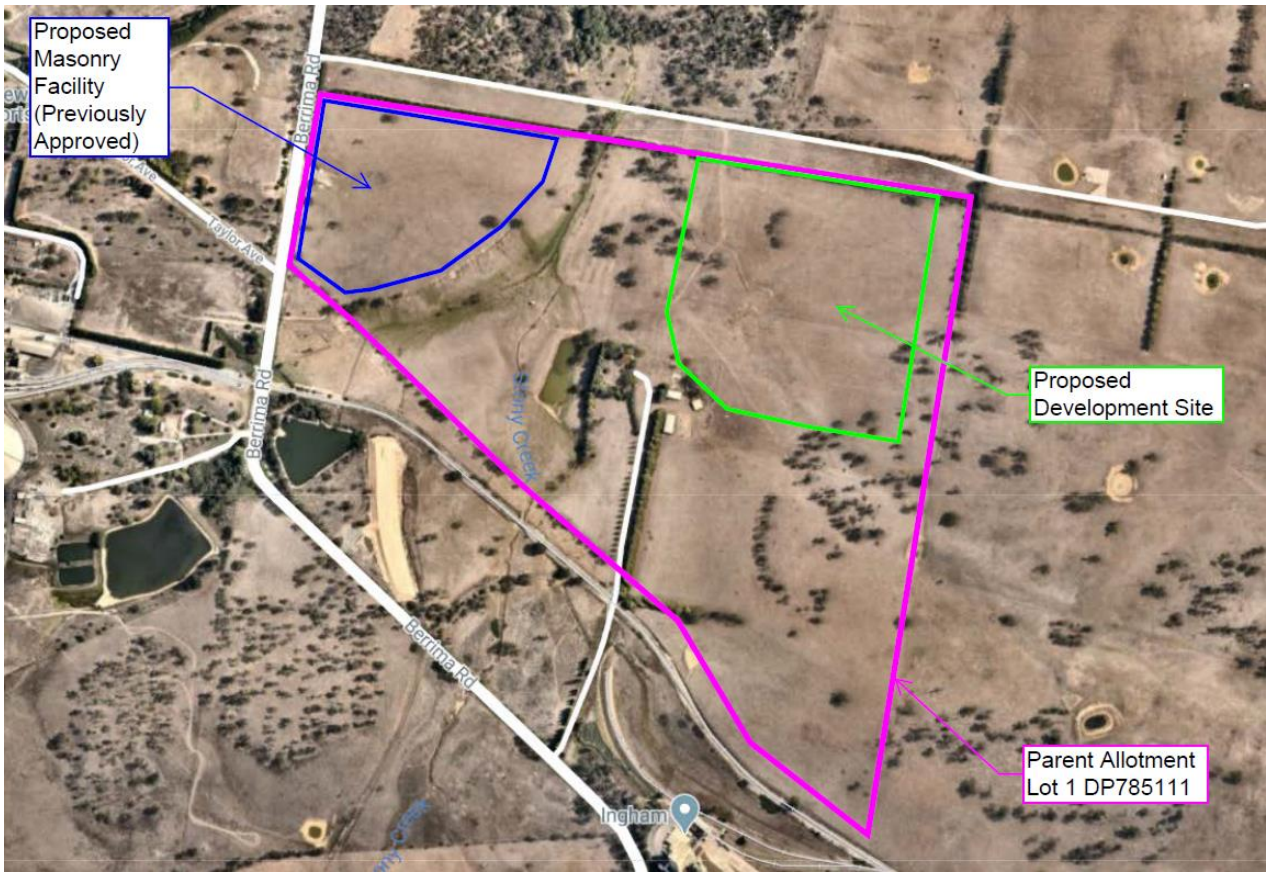
2.1. Existing Site Location & Topography

The larger parent allotment (Lot 1 DP785111) on which the proposed development is located covers an area of approximately 51 hectares in Moss Vale. It is approximately 700m east of New Berrima and 2.2km southeast of Berrima town centre. The site is bounded by Berrima Road to the west, private rural property to the north and east and a private railway line to the south (servicing the nearby Boral cement works).

The site is currently vacant and used for grazing livestock. It is primarily covered in grass with some scattered trees. Several existing farm buildings are located centrally within the parent site, with a driveway leading south onto Berrima Rd.

The topography of the proposed development site generally falls from the eastern boundary (approx. RL 676m) towards the Stony Creek riparian corridor (approx. RL 658m) in the centre of the parent allotment. Average existing gradient through this area is approximately 5% but there are some localised areas where it exceeds 10%, particularly on the ridgelines near the eastern side of the site.

Figure 2.1 Site Aerial Photo (Nearmap, Jan 2020)



2.2. Existing Creek

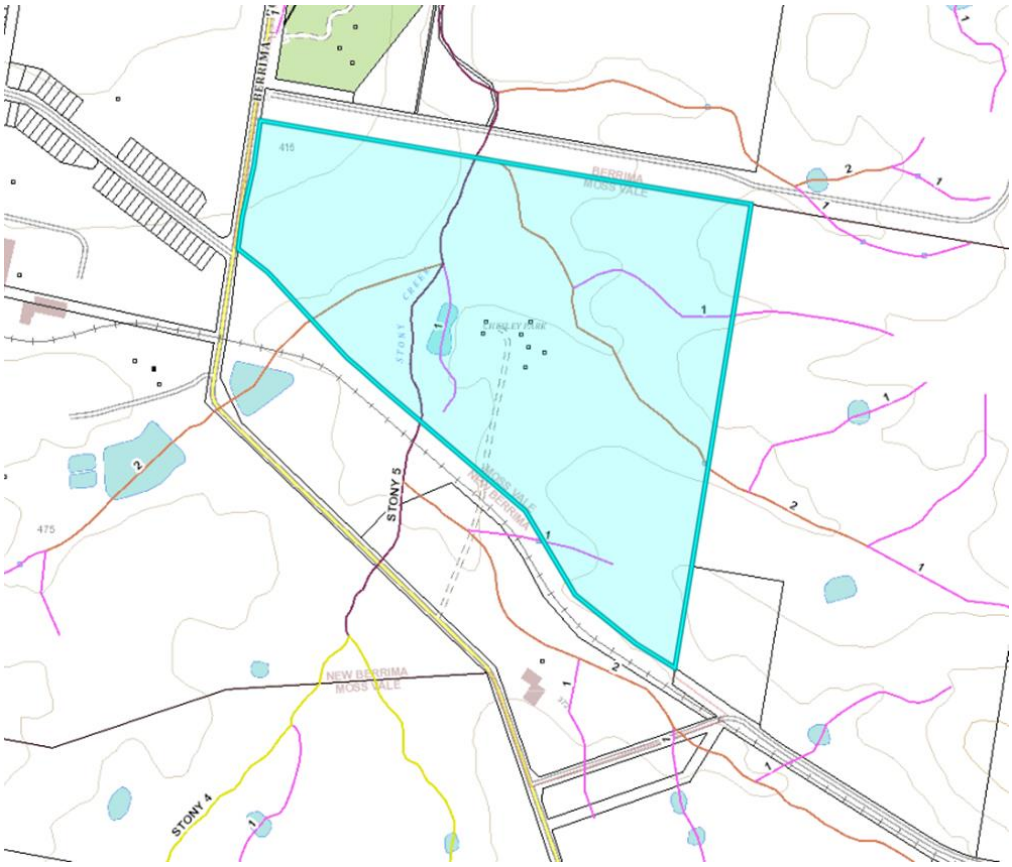
A watercourse known as Stony Creek runs through the centre of the parent site falling south to north within a sparsely vegetated riparian corridor. The creek is classified as follows:

- Category 2 riparian land (aquatic and terrestrial habitat) under the Wingecarribee Local Environmental Plan 2010 (refer Appendix D) which requires a minimum 30m riparian corridor setback;
- A 5th Order watercourse in accordance with the stream order classification methodology described in the NSW Office of Water's Guidelines for Riparian Corridors on Waterfront Land (the Strahler System). This has been confirmed by the NSW Department of Industry Lands & Water Division. This classification requires a minimum 40m riparian corridor setback i.e. total corridor width of 80m plus creek width.

The various smaller tributaries running through the site and connecting into Stony Creek are classified as Category 3 riparian land (Bank Stability and Water Quality) per Council's LEP and 1st and 2nd order streams per NSW Office of Water. They are therefore all subject to minimum 10m top of bank setbacks and minimum 20m setbacks for the 2nd order streams.

It is noted that the two existing tributaries within the area of the proposed development do not appear to have any defined channels and consist only of wide, open farm gullies/depressions.

Figure 2.2 - NSW Office of Water Stream Mapping

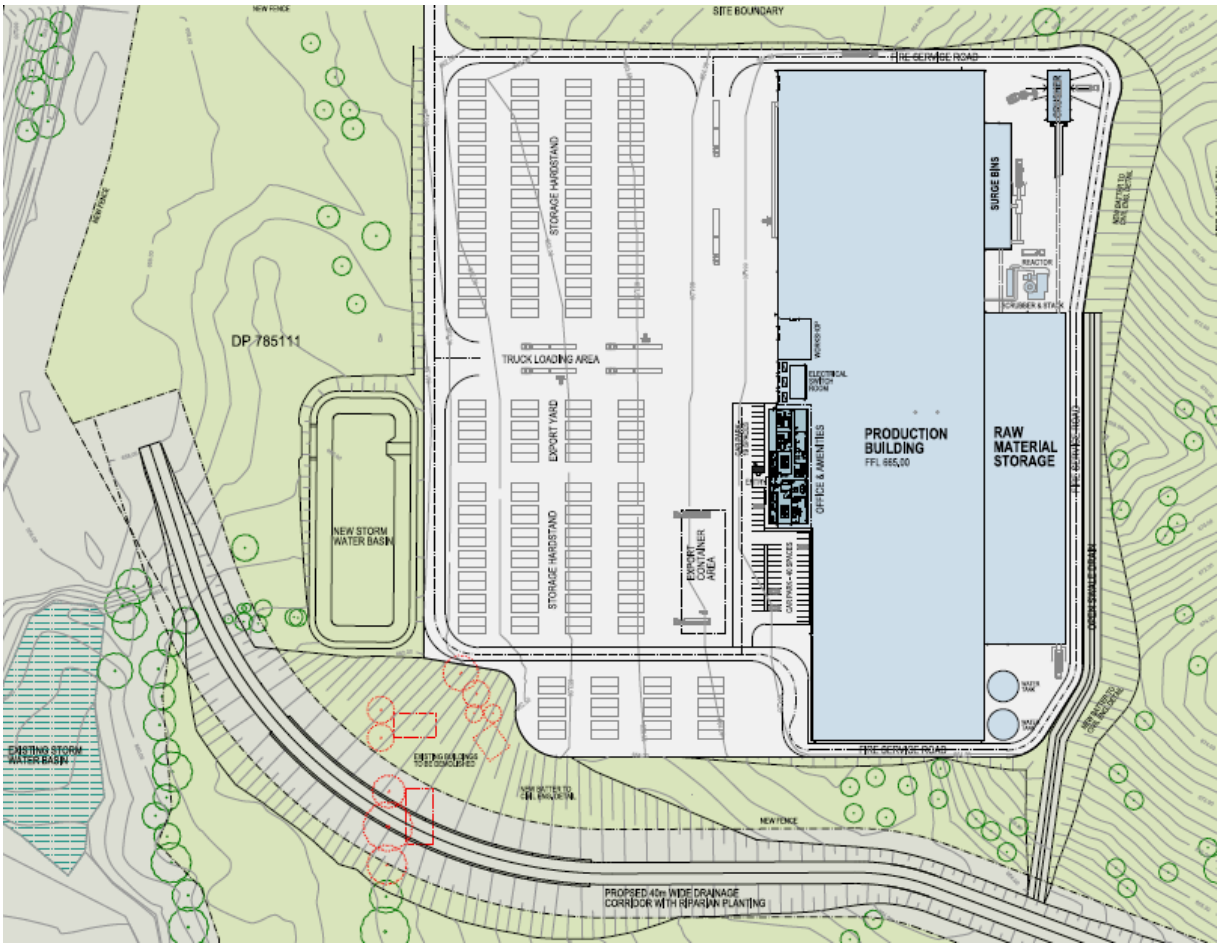


3. Proposed Development

The proposed development involves the construction of brick manufacturing plant on a site covering approximately 11 hectares. The new plant will include a main production building (approx. 26,000m^2) with an attached office, crusher, raw material storage and surge bins taking the total GFA to approximately 33,500m^2. These buildings will be surrounded by associated access roads, conveyors, loading docks, storage hardstands and car parking areas. The plant is expected to have a production capacity of 50 million tonnes per annum.

To allow for the proposed development footprint the realignment of two existing drainage corridors is required.

Figure 3.1 - Proposed Development Site Plan (SBA Architects)



4. Soil

4.1. Existing Geology

The subject site is located near the southern end of the Sydney Basin where one of the main geological units is the Wianamatta Group. Subsoil strata on the site are expected to comprise:

- Topsoil (thickness may be up to 1m due to long-term rural use); over
- Variable thicknesses of clays and weathered shales; over
- Ashfield Shale; over
- Hawkesbury sandstone

A geotechnical engineer will be commissioned to undertake a geotechnical investigation on the subject site. Once the geotechnical report is available its findings will be reviewed against the bulk earthworks design.

4.2. Proposed Bulk Earthworks

In order to create suitable levels for the various structures, pavements and associated components of the development a significant quantity of bulk earthworks will be required to the existing landform.

The earthworks design has been undertaken with the aim of balancing cut and fill, which has been achieved in this case. The small surplus volume shown is considered to be within the margin of error for this exercise. This is advantageous as it means material does not need to be imported or exported from the site (with traffic, cost and program implications).

The required total cut to fill volume is estimated to be approximately 140,000m^3 across the site as shown in Table 4.1 below. Refer also to the bulk earthworks drawing included under Appendix A for further information.

Table 4.1 - Proposed Bulk Earthworks Volumes

	Net Cut (m^3)	**Net Fill (m^3)**	**Balance (m^3)**
Main Pad	-92,632	+140,250	+47,618
Drainage Channel	-48,574	+114	-48,460
Total	**-141,206**	**+140,364**	**-842 (Surplus)**

The cut is primarily generated from excavation into the ridges at the eastern end of the site for use in filling around the western and central portions of the proposed pad area. Some cut is also generated out of the

proposed watercourse realignment along the southern edge of the site and from the stormwater detention basin in the southwest corner.

All structural filling for the development will be controlled filling undertaken with Level 1 supervision and certification by a geotechnical engineer to ensure proper compaction standards are achieved.

Topsoil on the site will be stripped at the commencement of bulk earthworks and depending on the quantity, some will be blended with clay subsoils for use as general fill (subject to geotechnical advice) whilst some will be stockpiled for later respreading on landscaping areas. It should be noted that earthworks quantities quoted currently make no allowance for topsoil, pending confirmation of topsoil depth on the site by geotechnical investigation. Once topsoil depth and blending methodology is confirmed the bulk earthworks quantities can be refined accordingly.

The maximum permanent batter slope is assumed to be 1V:2H, subject to stabilisation measures being implemented to exposed surfaces. This will be confirmed by further geotechnical investigation and assessment.

Appropriate erosion and sediment control measures will be installed and maintained for the duration of construction to ensure that sediment-laden runoff does not enter the Stony Creek riparian zone untreated. Refer to Section 5 for further detail.

4.3. Stony Creek Riparian Zone

All proposed bulk earthworks will take place outside of the defined 40m riparian setback zone from the top bank of Stony Creek.

Robust erosion and sediment controls will be installed upstream of the riparian zone to ensure that there are no adverse effects on the water quality, flora and fauna of the creek environment.

4.4. Groundwater

Groundwater investigation/monitoring has not been undertaken for the site since the proposal does not involve any interaction between the development and the underlying water table.

5. Sedimentation and Erosion Control

5.1. Planning Requirements

The Secretary's Environmental Assessment Requirements for the Development Application state that the Soil and Water Report must include:

- *Description of the construction erosion and sediment controls.*

5.2. Sediment and Erosion Control

Suitable erosion and sediment controls shall be provided and maintained throughout all stages of works, including at completion of the bulk earthworks. Design, documentation, installation and maintenance of sediment and erosion controls will be in accordance with the requirements of the *Protection of the Environment Operations Act, Wingecarribee Shire Council's specifications* and the *Office of Environment and Heritage's 'Managing Urban Stormwater: Soils and Construction. Landcom, (4th Edition) (The "Blue Book") Volume 1 and Volume 2*.

A preliminary erosion and sediment control plan for the site is included within Appendix A. It is important to note that the measures identified on this plan are a conceptual approach to construction phase stormwater quality management. Erosion and sediment control is highly dependent on local site conditions and staging of the proposed earth disturbing activities. Therefore, further details of the erosion and sediment control systems and procedures will be provided at the detailed design stage when more information is available regarding in-situ soils and development staging.

5.3. Sources of Pollution

The activities and aspects of the works that have potential to lead to erosion, sediment transport, siltation and contamination of natural waters include:

- Earthworks undertaken immediately prior to rainfall periods
- Work areas that have not been stabilised
- Extraction of construction water from waterways during low rainfall periods
- Clearing of vegetation and the methods adopted, particularly in advance of construction works
- Stripping of topsoil, particularly in advance of construction works
- Bulk earthworks and construction of pavements
- Works within drainage paths, including depressions and waterways
- Stockpiling of excavated materials
- Storage and transfer of oils, fuels, fertilisers and chemicals
- Maintenance of plant and equipment
- Ineffective implementation of erosion and sediment control measures

- Inadequate maintenance of environmental control measures
- Time taken for the rehabilitation / revegetation of disturbed areas

5.4. Potential Impacts

The major potential impacts on the riparian environment relate to erosion of distributed areas or stockpiles and sediment transportation. Potential adverse impacts from erosion and sediment transportation can include:

- Loss of topsoil
- Increased water turbidity
- Decreased levels of dissolved oxygen
- Changed salinity levels
- Changed pH levels
- Smothering of stream beds and aquatic vegetation
- Reduction in aquatic habitat diversity
- Increased maintenance costs
- Decrease in waterway capacity leading to increased flood levels and durations

5.5. Construction Methodology

5.5.1. Pre-Construction

The following erosion control measures will be implemented prior to commencement of construction to minimise disturbance and ensure the performance criteria for water quality are met:

- The civil contractor will prepare a traffic management plan for the site which ensures efficient vehicle movement whilst minimising potential for sediment generation. This is to include designation and marking of transport routes across undisturbed portions of the site to ensure minimal vegetation disturbance;

- Transport routes will be provided with stabilised construction entry/exits (i.e. Blue Book detail SD6-14) at the designated access points, including traffic rumble grids and wash-down areas, to prevent vehicles carrying soils beyond the site;

- Installation of a temporary sediment basin will occur before bulk earthworks across the site begin so that sediment-laden runoff from the works can be captured and treated. This will logically be located in the same position as the future stormwater detention basin. All temporary sediment basins (including overflow weirs) shall be located clear of the 1 in 100 year ARI flood event from the Stony Creek riparian corridor;

- Diversion of “clean” water from upstream catchments away from proposed areas of disturbance and discharge via suitable scour protection;

- All site personnel are to complete an environmental induction covering the operation and maintenance of the erosion and sediment controls;

5.5.2. During Construction

Measures to mitigate water quality impacts during the construction phase will include:

- Sediment fences (i.e. Blue Book detail SD6-8) to be erected to filter and retain sediments at source. In particular around the base of all soil stockpiles and at the base of the perimeter batter to prevent sediment-laden stormwater from flowing into the Stony Creek riparian zone;

- Regular dust suppression on exposed areas by water truck or use of chemical dust suppressant;

- Rapid stabilisation of disturbed and exposed ground surfaces with hydro seeding in areas where imminent construction and building works are not proposed;

- Diversion of sediment-laden water into temporary sediment control basins (to be sized in accordance with the Blue Book) for settling and flocculation, including provision of catch drains which may need to be moved/altered numerous times to suit construction sequencing;

- Regular inspections as soon as practicable after storm events to check and maintain controls;

- Sediment to be removed from fences when controls are 40% full and at the completion of construction. All material to be re-used or stored on-site in a controlled manner or taken off-site for re-use or disposal at a licensed waste disposal facility;

- Filter rolls or geotextile inlet filters (e.g. Blue Book SD6-11&6-12) to be installed around all new stormwater inlet gullies; and

- Monitoring of water quality to determine the effectiveness of the sediment and erosion control management practices;

- The sediment basin shall not be converted into its ultimate detention basin form until such time as all building and construction works have been completed and 90% of the site is stabilised.

Erosion and sediment control measures will remain in place for the duration of construction works and following completion until the site is fully stabilised.

5.6. Site Inspection and Maintenance

The inspection and maintenance requirements outlined in this section will need to be carried out as long as either earthworks or quarrying are being conducted and all areas re-established.

The Contractor's site Superintendent will inspect the site after every rainfall event and at least weekly, and will:

- Inspect and assess the effectiveness of the SWMP and identify any inadequacies that may arise during normal work activities or from a revised construction methodology. Construct additional erosion and sediment control works as necessary to ensure the desired protection is given to downstream lands and waterways;
- Ensure that drains operate properly and to effect any repairs;
- Remove spilled sand or other materials from hazard areas, including lands closer than 5 metres from areas of likely concentrated or high velocity flows especially waterways and paved areas;
- Remove trapped sediment whenever less than design capacity remains within the structure;
- Ensure rehabilitated lands have affectively reduced the erosion hazard and to initiate upgrading or repair as appropriate;
- Maintain erosion and sediment control measures in a fully functioning condition until all construction activity is completed and the site has been rehabilitated;
- Remove temporary soil conservation structures as the last activity in the rehabilitation.

6. Stormwater Management

6.1. Planning Requirements

The Secretary's Environmental Assessment Requirements for the Development Application state that the Soil and Water Report must include:

- *a description of the catchment and proximity of the site to waterways;*
- *an assessment of potential surface water impacts associated with the development.*
- *an assessment of potential impacts on the quality and quantity of surface and groundwater resources;*
- *details of the proposed stormwater and wastewater management systems (including sewage), water monitoring program and other measures to mitigate surface and groundwater impacts;*
- *a water cycle management study in accordance with the relevant Water NSW guidelines;*
- *details of the proposed stormwater and wastewater management systems (including sewage), water monitoring program and other measures to mitigate surface and groundwater impacts;*
- *an explanation of how a neutral or beneficial effect on water quality would be achieved throughout the construction and operation of the proposed development;*
- *an assessment of potential impacts on water quality and aquatic habitats of Stony Creek and the Wingecarribee River, in accordance with the relevant DPI guidelines;*

6.2. Hydrology

6.2.1. Existing Catchments

The site covers an area of 14.5 hectares and comprises rural pastoral land, covered in long grass and sparsely populated with trees. As such it is classified as a "greenfield", fully pervious site.

Runoff flows via overland sheet flow from the elevated eastern portions of the site into and through two wide natural gullies running west and northwest through the centre of the site, joining into one and discharging into Stony Creek.

There is no existing stormwater drainage infrastructure located on the development site.

6.2.2. External Catchments

An external catchment flows through the existing site via the two existing drainage gullies. The majority of this catchment is located in the privately-owned rural property to the immediate east but there is also a 30-50m wide buffer strip between the eastern edge of the development site and the property boundary which contributes additional catchment area.

The larger of the two gullies has a catchment of approximately 34.5 hectares, while the smaller northern gully captures approximately 5.3 hectares. Both catchments are 100% pervious with grass cover and sparse clumps of trees.

Figure 6.1: External Stormwater Catchments

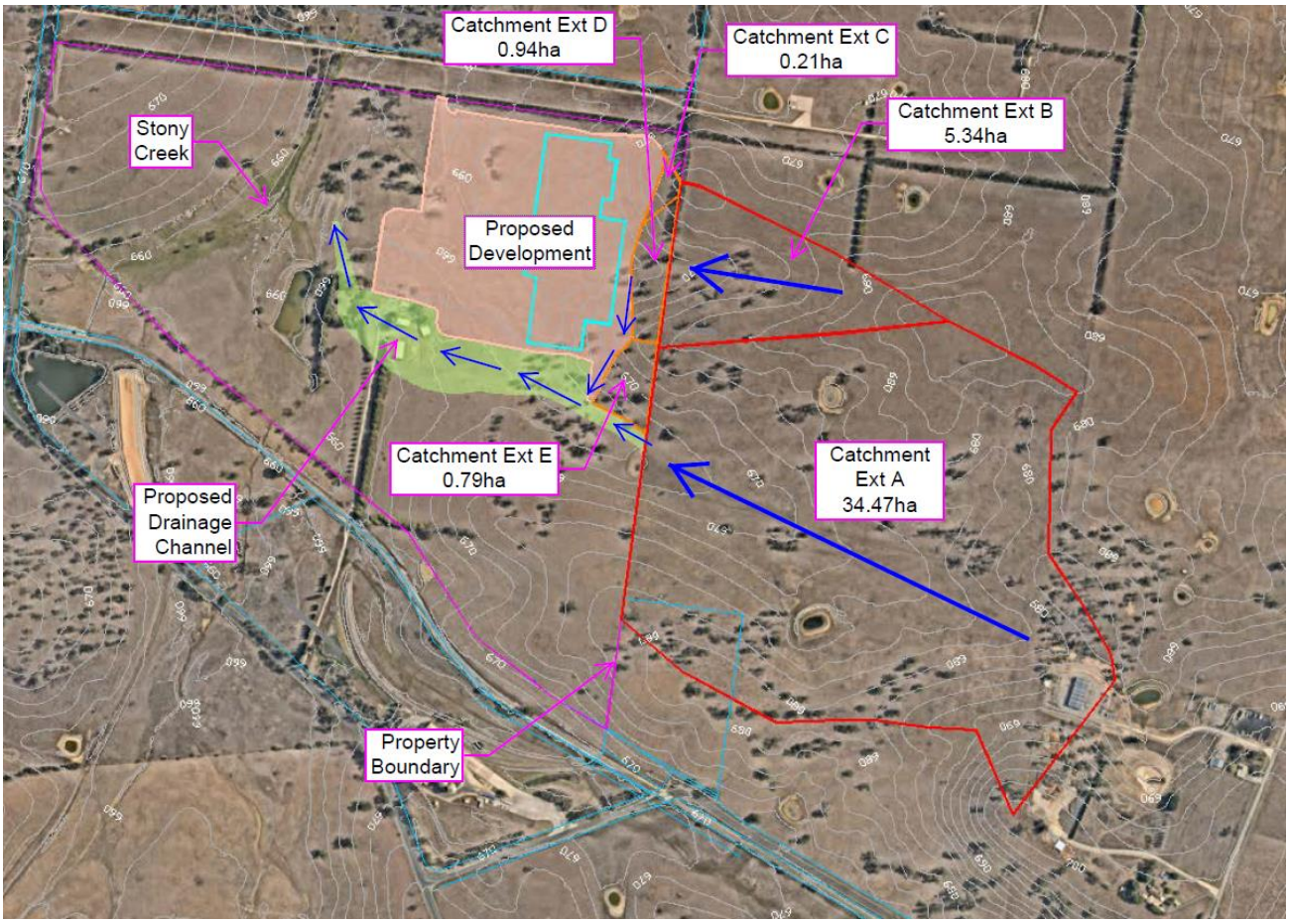


Table 6.1 – External Catchment Summary

Catchment	Area	Comment
Ext A	34.47	Collected by main drainage channel DC01
Ext B	5.34	Collected by cutoff drain which flows into main drainage channel DC01
Ext C	0.21	Collected by site drainage infrastructure
Ext D	0.94	Collected by cutoff drain DC02 which flows into main drainage channel
Ext E	0.79	Collected by main drainage channel DC01
TOTAL	**41.75 ha**	

6.2.3. Stony Creek

Stony Creek conveys runoff from the predominantly rural catchment located to the south of the parent site (northwest of Moss Vale). The watercourse flows northwards through the centre of the site, surrounded by a sparsely vegetated riparian corridor.

Due to Stony Creek's close proximity to the development site, a flood modelling investigation was undertaken in order to understand any impacts and effects from the development on this watercourse and vice versa. It was particularly important to confirm that there are no adverse effects on upstream or downstream properties. Refer to Section 7 below for flood analysis and results.

6.2.4. Proposed Catchments

The proposed development has been divided up into its key constituent catchments in the table below.

Table 6.2 - Proposed Catchment Composition Summary

Catchment	Surface	Total Area	% Impervious	Discharge
1	Roof	3.38 ha	100%	Directed to OSD basin for attenuation of peak flows
	Pavements	6.05 ha	100%	
	Landscaping	0.61 ha	0%	
	Stormwater Basin	0.55 ha	0%	
	Sub-Total	**10.59 ha**	**89%**	
2	Riparian Corridor	3.42 ha	0%	Sheet flow off batters into channel, diverted around site to Stony Creek
	Eastern Batter	0.50 ha	0%	
	Sub-Total	**3.92 ha**	**0%**	
	TOTAL	**14.51 ha**	**65%**	

Figure 6.2: Proposed Site Catchment Areas

6.2.4.1. Catchment 1 – Proposed Factory Pad

This catchment covers an area of 10.6 hectares and comprises the main factory building and surrounding impervious surfaces including access road, carpark and loading/storage hardstand areas. It also includes some batter slopes around the perimeter of the site which will be landscaped with suitable vegetation and the on-site detention/sediment basin at the southwest corner of the pad.

A minor and major stormwater drainage system has been designed for this catchment to ensure that all runoff is captured, treated and attenuated in accordance with relevant Council and State standards. Refer to Sections 6.3-6.5 below for further information.

Please refer to the more detailed stormwater catchment plan included in Appendix A for information on internal drainage catchments to individual stormwater gully pits.

6.2.4.2. Catchment 2 – Riparian Corridor & Eastern Batter

This catchment covers an area of approximately 3.9 hectares and comprises the new alignment of the drainage channel along the southern edge of the factory pad as well as the cut batter along the eastern edge of the development.

The batter slopes in both these areas will be fully planted with suitable vegetation. Due to the relatively

steep slope of the batter it will be planted with low-maintenance shrubs, ground covers and trees to assist with bank stability and reduce erosion. Refer to the landscape architect's documentation for further information.

No downstream treatment or attenuation is required for this catchment as it will match the pre-development runoff regime i.e. fully pervious.

6.3. Proposed Stormwater Drainage

6.3.1. Proposed Drainage

Wingecarribee Council's standards specify that the minor system design for site drainage in commercial and industrial areas shall be the 1 in 10 year ARI (10% AEP) event.

Runoff from the external hardstands and carparks will be intercepted and collected by a combination of kerb inlet gully pits and field inlet gully pits located strategically around the site. These pits will discharge flows into the underground piped network, which will fall south to the proposed treatment devices and outlet into the stormwater detention basin.

Discharge from the basin will be controlled via a rock lined swale that will intersect the existing creek system. The discharge swale will be designed to meet the NSW Office of Water Guidelines for outlet structures on waterfront land.

Refer to attached Civil Drawings included under Appendix A.

6.3.2. Proposed Design Stormwater Flows

The following indicative design flows have been calculated as an indication of the scale of the stormwater generated by the proposed development footprint.

Table 6.3: Indicative Post-Development Peak Stormwater Flows for Various ARI events (unmitigated)

	63% AEP/ 2 year ARI (m^3/s)	10% AEP/ 10 year ARI (m^3/s)	5% AEP 20 year ARI (m^3/s)	1% AEP 100 year ARI (m^3/s)
Catchment 1	2.43	4.27	5.11	6.41
Catchment 2	0.24	0.68	0.87	1.34
Sub-Total	**2.67**	**4.95**	**5.98**	**7.75**

6.3.3. Proposed Drainage Channels

6.3.3.1. Channel DC01

The upstream external catchments A and E draining towards the site from the east will be diverted into a new drainage channel to be constructed around the southern edge of the development. This channel will be approximately 600m long and flows from east to west, discharging into the Stony Creek riparian zone.

To replicate a 2nd Order watercourse a minimum 40m-wide riparian corridor has been adopted – this typically takes the form of a central 10m-wide channel with batters either side (varying in slope between 1V:3H to 1V:20H) to be planted with appropriate riparian species as advised by the ecologist/landscape architect. Channel DC01 is intended to provide some improved ecological amenity to the site.

Within the 10m central channel, a 2.0m wide, 0.5m deep low-flow channel will be formed – this could either be in a central location or meander from side to side along the length of the channel. Frequent flows will be contained within this low-flow channel, whilst larger storm events/flooding will spread into the wider channel.

Hydraulic modelling has confirmed that the proposed channel has sufficient capacity to convey upstream catchment flows including for all storm events up to the 0.2% AEP (1 in 500 year ARI).

Due to the relatively high velocities anticipated in larger storm events (up to 3m/s), it is proposed that the invert of the channel be lined with dumped rock in high-risk areas to prevent scour, for example where longitudinal grades exceed 2% and at the intersection with Channel DC02.

Based on the recommendations of the fluvial geomorphology report, a rock pad flow spreading structure will also be provided at the outlet of the channel into the Stony Creek floodplain to make flows exiting the channel wider and shallower and avoid any concentration of flows into the downstream flood chutes.

6.3.3.2. Channel DC02

A smaller channel will be installed along the rear (eastern edge) of the main factory pad to collect runoff from the other external catchments B and D, as well as the landscaped perimeter batter. This channel is proposed to have a total width of 8.0m, with a 2.0m-wide base width and 1V:3H side slopes. It will fall to the south and discharge into the main drainage channel DC01.

Refer to the civil drawings in Appendix A for further details.

6.4. Stormwater Quantity

The increase in impervious area on the site associated with the proposed development will result in an increase in peak stormwater runoff flows being generated on the site. To protect the downstream receiving environment from increased flood levels and erosion, peak stormwater flows from the development must be attenuated on the site.

It is proposed that the necessary detention capacity will be provided by the construction of a single detention basin at the southwest edge of the proposed development. The design of the site ensures that

both the minor stormwater system (i.e. piped drainage) and the major stormwater system (overland flow) is directed to the basin for collection and attenuation.

Refer to the civil drawings enclosed under Appendix A.

6.4.1. Design Standards

Wingecarribee Shire Council's engineering standards (Development Design Specification D5 Stormwater Design) require that peak flows are mitigated to pre-development levels for all storm events up to and including the 1% AEP/1 in 100 year ARI.

6.4.2. Basin Modelling

Runoff routing analysis has been undertaken using DRAINS hydraulic modelling software. This software utilises the ILSAX method for comparing inflow and outflow hydrographs for multiple storm events. The methodology used was based on the principles of Australian Rainfall and Runoff (ARR) 2019.

Since the basin also functions as a sediment basin to capture coarse particles from runoff, the permanent pool volume associated with this part of the basin was not considered in the detention calculations.

For the existing pre-development model case (for comparison purposes), a time of concentration of 16 minutes was calculated from the Bransby-Williams equation for a fully pervious rural catchment. For the post-development model case the stormwater network was modelled with a standard 5 minute inlet time for impervious catchments and 10 minutes for pervious catchments.

The volume and surface area of the proposed detention basin were iteratively configured to optimise its size while ensuring peak flows for all storm events between the 1 in 1 year ARI (63% AEP) and 1 in 100 year ARI (1% AEP) are mitigated to less than pre-development levels.

6.4.3. Results

The modelling results for flow rate comparisons in various storm events are shown in the table below.

Table 6.4 - Pre-Development vs Post-Development Peak Flow Comparison (Catchment 1)

Storm Event (AEP)	Storm Event (ARI)	Pre-Development Flow (m^3/s) (m^3/s)	Post-Development Flow Unmitigated (m^3/s)	Post-Development Flow with Basin (m^3/s)	Difference (m^3/s)	Peak Flow Reduction? Y/N
63%	1	0.243	1.340	0.132	-0.111	Y
39%	2	0.438	1.650	0.225	-0.213	Y
20%	4.5	0.845	2.070	0.412	-0.433	Y
10%	10	1.320	3.370	0.424	-0.896	Y
5%	20	1.760	3.980	0.448	-1.312	Y

2%	50	2.440	4.850	1.103	-1.337	Y
1%	100	2.970	5.530	1.512	-1.458	Y

Note that Catchment 2 (drainage channel and eastern landscaped batter) bypasses the basin and is not included in the pre and post development flow rates given above. This will be remain a fully pervious catchment post-development and therefore flows are not expected to increase.

6.4.4. Proposed Basin Configuration

Table 6.5 – Proposed Detention Basin Sizing

	Total Volume (to spillway crest)	Surface Area at Base (RL659.35)	Surface Area at Crest (RL661.15)
Total Basin	5,167 m^3	2,658 m^2	4,655 m^2
Detention Basin (minus sediment basin component)	2,658 m^3	1,147 m^2	4,655 m^2

Table 6.6 – Proposed Detention Basin Outlet Configuration

Low-Level Outlets	**High-Level Outlet**
• 250mm dia orifice @ IL659.45 • 1200 x 1200mm grated inlet pit @ RL660.50 with 375mm dia RCP outlet pipe	• 20m-wide spillway with weir @ RL660.85 (activated in a 5% AEP/20yr ARI and above)

The low-level outlet pipe will discharge via the proposed SPEL filter treatment vault (refer Section 6.5 below) and then continue west to an outlet into the drainage channel. Appropriate scour protection (e.g. dumped rock over geotextile liner) will be provided around the outlet to prevent scour.

The weir and spillway chute will be lined with reno mattress and/or dumped rock for scour protection of the bank and downstream surface during overflows.

Refer to AT&L Drawing C500 contained in Appendix A for the proposed basin layout. The basin outlet structure and spillway will be documented in full at detailed design stage. It is noted that there may be scope to reduce the size of the basin slightly at detailed design stage, once the development's stormwater drainage layout is refined and confirmed.

6.5. Stormwater Quality

6.5.1. Planning Requirements

As the site is located within the Sydney drinking water catchment any development must comply with the *Drinking Water Catchments Regional Environmental Plan No 1* (the 'REP'). The objectives of this standard are:

- To ensure water catchments deliver high quality water while sustaining diverse and prosperous communities;
- To improve water quality in degraded areas where quality is not suitable for the relevant environmental values; and
- To maintain or improve water quality where it is currently suitable for the relevant environmental values.

As described by Council's Industrial Land DCP, Council must be satisfied that the development will have a neutral or beneficial effect on water quality in order to grant development consent. In assessing whether a proposed development has a neutral or beneficial effect on water quality, Council must be satisfied that:

- the development has no identifiable potential impact on water quality; or
- will contain any such impact on the site of the development and prevent it from reaching any watercourse, waterbody or drainage depression on the site; or
- will transfer any such impact outside the site by treatment in a facility to the required standard and disposal approved by the consent authority; and
- the development incorporates the Water NSW's current recommended practices (or equivalent standards and practices) which represent best industry or development practice in terms of maintaining water quality.

This report is intended to satisfy the above requirements by identifying proposed water quality treatment measures, their proposed location on the site and confirming that they achieve a neutral or beneficial effect on water quality in accordance with Water NSW's *NorBE Assessment Guidelines*. This is supported by MUSIC stormwater quality modelling (refer Section 6.5.5 below), identification of site-specific pollutants (see Table 6.8) and soil and water management planning (refer also Sections 4 and 5 above) as required for a Module 5 development.

In addition to a neutral or beneficial effect on water quality, any new development should also ensure that the following water quality pollutant reduction targets are also achieved.

Table 6.7 – Pollutant Reduction Targets

Pollutant	Target Reduction
Total Suspended Solids	80%
Total Nitrogen	45%
Total Phosphorus	60%
Gross Pollutants >5mm	90%

6.5.2. Pollutant Types

It is anticipated that the following pollutants (common to urban stormwater runoff) are likely to be generated by the development.

Table 6.8 – Potential Pollutant Types

Pollutant	Potential Causes	Treatment Type
Gross pollutants	• pedestrians and vehicles • waste collection systems • leaf-fall from trees • spills and accidents	Primary
Sediment	• land surface erosion • pavement and vehicle wear • truck washing • organic matter • spillages, illegal discharges • weathering of buildings • atmospheric deposition • building/construction	Primary
Hydrocarbons	• leakage from vehicles • truck washing • organic matter • spillage, illegal discharges • asphalt pavements	Secondary
Nutrients	• atmospheric deposition • spillages, illegal discharges • detergents (truck washing) • organic matter	Tertiary
Heavy metals	• atmospheric deposition • vehicle wear • weathering of buildings • spillages, illegal discharges	Tertiary
pH	• erosion of stored concrete masonry products • erosion of roofing material • organic matter • atmospheric deposition • spillages, illegal discharges	Tertiary

6.5.3. Existing Treatment

There are no existing water quality treatment measures on the site.

6.5.4. Proposed Treatment

In order to achieve the required pollutant load reductions, a treatment train approach will be implemented.

6.5.4.1. Primary Treatment

It is proposed to install a proprietary primary treatment device on the pipe network draining the impervious areas of the site into the stormwater basin. This unit will focus on the capture of gross pollutants but will also provide some capture of sediment, hydrocarbons, oil, fuel, grease, total suspended solids (TSS) and nutrients.

A SPEL Ecoceptor 8000 Series Class 3 unit has been used for the purposes of MUSIC modelling and specified on the civil engineering drawings. This could potentially be substituted with an equivalent alternative product, subject to rechecking of the MUSIC model.

6.5.4.2. Secondary Treatment

It is proposed that the southern portion of the proposed stormwater basin (located at the southwest corner of the site) will act as a sediment basin. This area will capture coarse sediment particles which will settle to the basin floor. An internal concrete weir of 1.0m height constructed across the centre of the basin will divide the sediment basin component from the on-site detention component. Low flows from the development's pipe network will be directed from the GPT unit into the sediment basin area, whilst high flows will bypass directly into the detention basin area (avoiding scour and re-suspension of sediment particles). Refer to AT&L Drawing C500 for the proposed basin general arrangement.

6.5.4.3. Tertiary Treatment

Tertiary treatment involves removal of dissolved nutrients such as nitrogen, phosphorous and suspended solids. It is proposed to provide tertiary treatment with a proprietary filter media cartridge system installed in an underground vault. This unit will be installed on the proposed basin outlet pipe prior to discharge into the creek. A SPEL Filter unit (with 27 cartridges housed in a 10m x 6m vault) has been used for the purposes of MUSIC modelling and specified on the civil engineering drawings.This could potentially be substituted with an equivalent alternative product, subject to rechecking of the MUSIC model.

6.5.4.4. Internal Factory Pollutant Control

The area inside the factory is underneath the roof and therefore not subject to rainfall and direct stormwater runoff. However a filter press unit is proposed to be installed inside the factory to capture, treat and recycle all liquid runoff from the factory floor (generated by plant and processes) which is then made available for re-use within the factory. This ensures that pollutants from the factory are not discharged externally into the development's proposed stormwater drainage network.

6.5.5. Water Quality Modelling

The Model for Urban Stormwater Improvement Conceptualisation (MUSIC, Version 6.3.0) was used to evaluate pollutant loads from the site for both pre-development and post-development conditions. MUSIC is water quality modelling software which offers the ability to simulate both quantity and quality of runoff from catchments. Modelling input parameters were based on the Sydney Catchment Authority document *Using MUSIC in Sydney's Drinking Water Catchment*.

According to the standard, to demonstrate that NorBE is achieved, the pollutant loads and concentrations from the post-development scenario must be equal to or less than the pre-development scenario. However, given the uncertainty of MUSIC model outcomes, Water NSW requires a modelled improvement of 10% for total suspended solids, total phosphorus and total nitrogen loads to ensure NorBE is achieved. Also nutrient concentrations for the post-development case must be equal to or less than the predevelopment case.

For accuracy of the model separate catchment nodes were created to simulate the roofed area, paved area and landscaped areas for each lot. The eastern perimeter landscaped batter and southern riparian corridor were modelled as bypassing the treatment train but included in the model to ensure that pollutant reduction targets were achieved for the overall site.

6.5.5.1. MUSIC Model Setup

6.5.5.1.1. Rainfall Data

Water NSW provides meteorological templates that include the rainfall and potential evapotranspiration data for various sub-catchment areas within the Sydney drinking water catchment to assist with the accuracy of hydrologic analysis. The subject site is located within the Climate Zone 3 sub-catchment and therefore the relevant files for this zone were downloaded from Water NSW's website and imported into the MUSIC model. The rainfall file uses 6-minute timestep data.

6.5.5.1.2. Catchment Source Nodes

Different MUSIC source nodes have been used to model various catchment characteristics i.e. roof, sealed pavements and pervious landscaped/revegetated areas. All catchments are directed through the treatment train, with the exception of the revegetated riparian corridor catchment which drain directly to Stony Creek and bypasses the treatment train. Individual catchment areas used in the model coincide with those given in Table 6.1 above.

MUSIC model input parameters for these catchments including rainfall-runoff, base flow concentration and stormflow concentration parameters were selected as per those specified in *Using MUSIC in Sydney's Drinking Water Catchment*. The parameters used for the various catchment areas can be seen in the tables below.

Table 6.8 – Rainfall-Runoff Parameters

Parameter	Unit	Figure
Rainfall Threshold Value - Roofs	mm	0.3
Rainfall Threshold Value – Sealed Roads/Carparks/Paving	mm	1.5
Soil Storage Capacity	mm	94
Field Capacity	mm	70
Initial Soil Storage	% of capacity	30
Field Capacity	mm	70
Infiltration Capacity Coefficient	a	135
Infiltration Capacity Coefficient	b	4.0
Initial Depth (Ground Water)	mm	10
Daily Recharge Rate	%	10
Daily Baseflow Rate	%	10
Daily Seepage Rate	%	0

Note that a root soil zone depth of 0.5m was assumed per the guidelines and a soil type of medium clay was assumed in the absence of detailed site-specific geotechnical information.

Table 6.9 – Base Flow Pollutant Concentration Parameters

Concentration (log mg/L)	Total Suspended Solids (TSS)		Total Phosphorous (TP)		Total Nitrogen (TN)	
Surface Type	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Roofs	-	-	-	-	-	-
Sealed Roads	1.20	0.17	-0.85	0.19	0.11	0.12
Revegetated Land	1.15	0.17	-1.22	0.19	-0.05	0.12

Table 6.10 – Storm Flow Pollutant Concentration Parameters

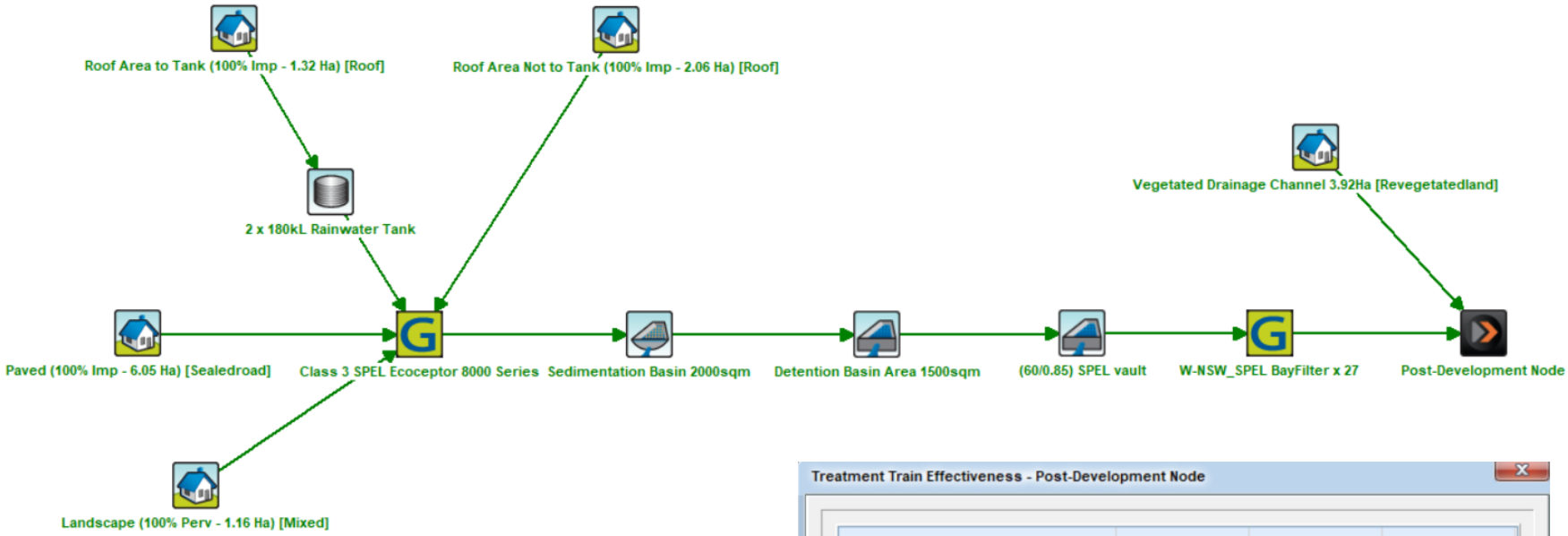
Concentration (log mg/L)	Total Suspended Solids (TSS)		Total Phosphorous (TP)		Total Nitrogen (TN)	
Surface Type	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Roofs	1.30	0.32	-0.89	0.25	0.30	0.19
Sealed Roads	2.43	0.32	-0.30	0.25	0.34	0.19
Revegetated Land	1.95	0.32	-0.66	0.25	0.30	0.19

6.5.5.1.3. Treatment Nodes

MUSIC treatment nodes for the proprietary stormwater quality improvement devices were supplied by SPEL. Sediment basin, detention basin and rainwater tank nodes have been created based on the proposed design for each of these features. All treatment nodes have been configured based on WaterNSW's MUSIC modelling requirements.

The treatment train has been developed on an iterative basis to find the optimal solution which meets the stormwater quality treatment requirements. A conceptual view of the MUSIC model used in this report is shown in Figure 6.13 below.

Figure 6.3: MUSIC Model Treatment Train Configuration



Treatment Train Effectiveness - Post-Development Node

	Sources	Residual Load	% Reduction
Flow (ML/yr)	84.2	77.1	8.4
Total Suspended Solids (kg/yr)	17300	1720	90
Total Phosphorus (kg/yr)	33.2	8.75	73.7
Total Nitrogen (kg/yr)	196	105	46.4
Gross Pollutants (kg/yr)	1870	0	100

☐ Include Pre-Development

6.5.5.2. Water Quality Modelling Results

6.5.5.2.1. Annual Pollutant Load Reductions

MUSIC modelling results presented as mean annual pollutant loads of suspended solids, total phosphorous, total nitrogen and gross pollutants at the receiving node indicate that the adopted target reductions are achieved, as shown in the table below. These compare post-development unmitigated ("Sources") versus mitigated ("Residual") conditions.

Table 6.12: MUSIC Model Treatment Train Effectiveness Results

Pollutant	Annual Pollutant Loads (kg/yr)		Reduction (%)	Target Reduction (%)
	Sources	Residual		
Total Suspended Soils	17300	1720	90.0	80
Total Phosphorous	33.2	8.75	73.7	45
Total Nitrogen	196	105	46.4	60
Gross Pollutants	1870	0	100.0	90

6.5.5.2.2. NorBE Comparison

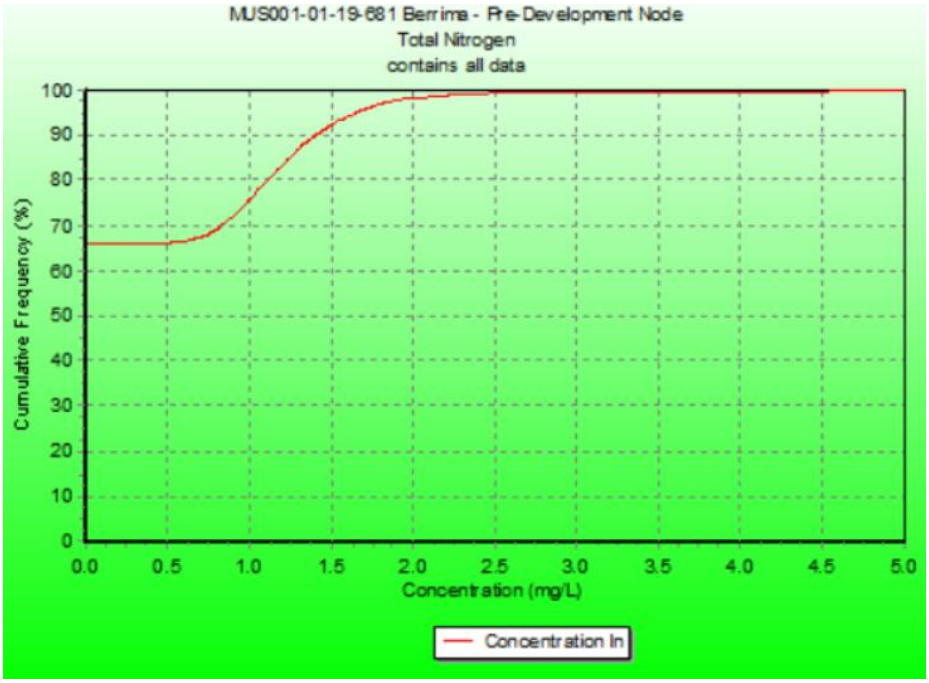
According to WaterNSW's NorbE criteria the mean annual pollutant loads for the post-development case (including mitigation measures) must be 10% less than the pre-development case for total suspended solids (TSS), total phosphorus (TP) and total nitrogen (TN). For gross pollutants, the post-development load only needs to be equal to or less than pre-development load. The results listed in the table below confirms that this is achieved for the proposed development.

Table 6.13 – NorBE Comparison of Pre-Development and Post-Development Pollutant Loads

	Annual Pollutant Loading (kg/year)			
Scenario/Catchment	**TSS**	**TP**	**TN**	**GP**
Pre-Development	8420	20.0	142	0
Post-Development (with treatment)	1720	8.75	105	0
Difference (Pre-Post)	6700	11.25	37	0
% Improvement	79.6%	56.3%	26%	N/A
Neutral or Beneficial Effect? Y/N	**Y**	**Y**	**Y**	**Y**

An additional WaterNSW NorBe criteria is that pollutant concentrations for TP and TN for the post-development case (including mitigation measures) must be equal to or better compared to the pre-development case for between the 50th and 98th percentiles over the five-year modelling period when runoff occurs. To demonstrate this, comparative cumulative frequency graphs, which use the Flow-Based Sub-Sample Threshold for both the pre-development and post-development cases, are provided under Appendix E. These graphs show a higher frequency of "compliance" in the post-development scenario for a given TP or TN concentration.

Figure 6.4: TN Cumulative Frequency Pre-Development and Post-Development Comparison



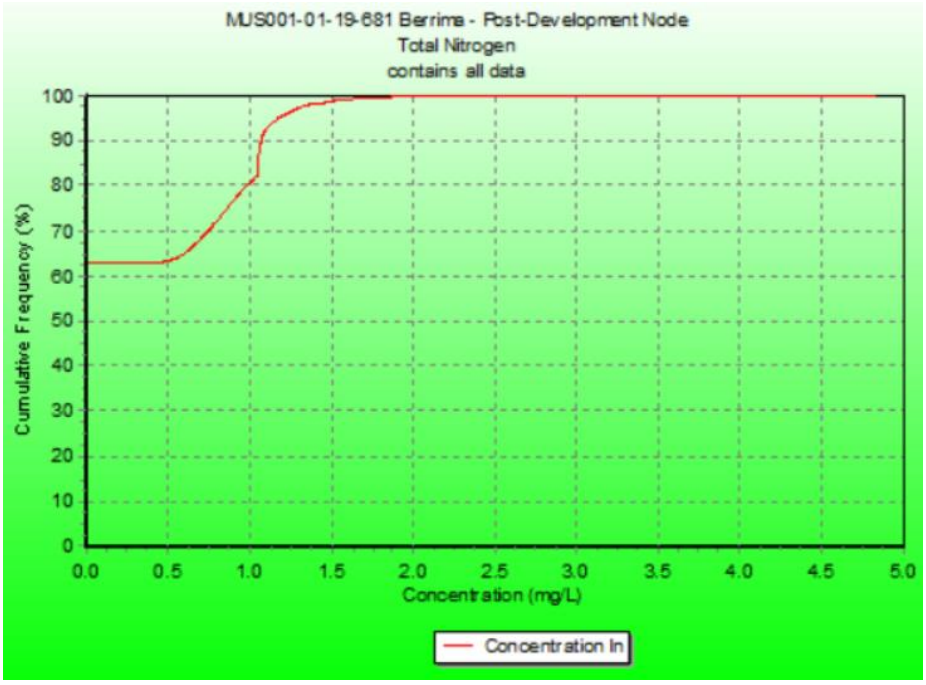
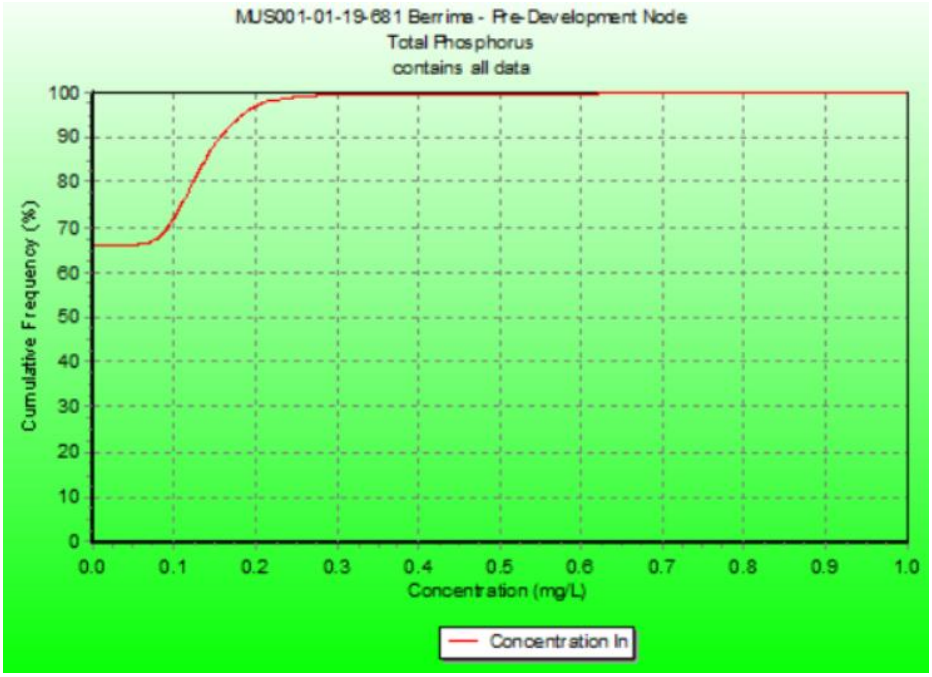
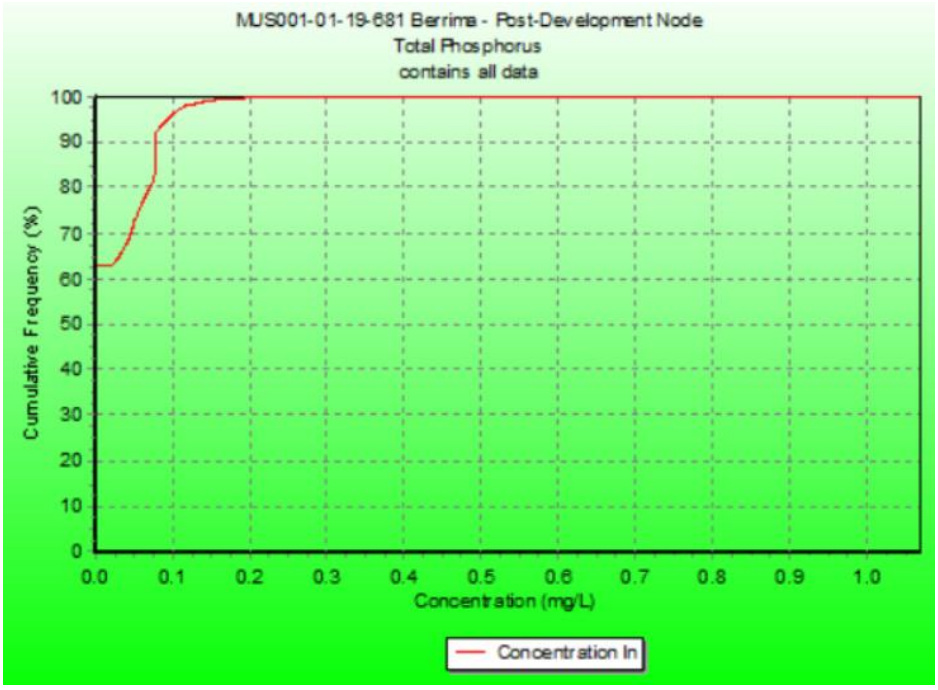


Figure 6.5: TP Cumulative Frequency Pre-Development and Post-Development Comparison





6.6. Spillages

The proposed masonry manufacturing facility will operate a process in which there is little risk of contaminants being released into the stormwater system. However should a spill occur the proposed stormwater basin will detain the contaminated material at the low-point of the site until it can be removed via suction pumps or other equipment. It would be necessary to temporarily cap off the basin outlet pipes in this scenario.

6.7. Operation & Maintenance

Following installation of stormwater management devices during the civil construction phase, the site owner will be responsible for the regular maintenance of these during the operational phase of the development. Since the basin is fully contained within an industrial site, it is proposed to remain in private ownership by Brickworks Ltd.

Maintenance access to the basin must be provided to allow for mowing and cleaning of the basin floor and side batters. A 3.0m-wide berm has been provided around the top perimeter of the basin to allow maintenance vehicles to circulate. A maintenance ramp constructed from concrete (maximum grade of 1V:6H) shall be provided at both ends of the basin to allow direct access from the adjacent hardstand pavement onto the floor of the basin.

Routine basin maintenance inspections will be undertaken on a 3 monthly-basis and also following significant storm events (over 30mm rainfall in a 24 hour period). A basin maintenance checklist shall be prepared, which will include the following:

- Litter and debris accumulation;
- Sediment accumulation;
- Condition of structures including inlet pipe outlet pit and pipe, spillway, ramps, weir. Check for debris blockage and sediment accumulation;
- Condition of vegetation – plant health, weed growth, density etc.;
- Condition of creek outlet including rock pad scour protection;
- Erosion or settlement of batters;
- Standing/stagnant water;
- Pest and mosquito control; and
- Damage or vandalism.

It is anticipated that sediment removal from the floor of the basin will occur on a once-yearly basis. This will involve an excavator entering the basin via the access ramp and loading out sediment. Any excavated sediment must be disposed of in an environmentally-sensitive manner so as not to cause contamination or downstream pollution.

The proprietary stormwater quality treatment units (gross pollutant trap and cartridge filter unit) located at either end of the basin will need to be serviced regularly in accordance with the manufacturer's

recommendations. Usually this will involve 6-monthly maintenance inspections. Ocean Protect will provide a Maintenance Manual for the specific devices once supplied.

6.8. Safety

The basin is of sufficient depth (1.8m) to be considered a potential public safety risk. However as the basin will be located on a secure fenced industrial site, to which any visitors will need to be WH&S inducted, specific safety fencing should not be required. Installation of warning signage and a water depth marker in the basin is recommended. There are two access ramps proposed at either end of the basin which will be installed at a maximum gradient of 1V:6H, allowing easy pedestrian egress.

7. Flooding

7.1. Planning Requirements

The Secretary's Environmental Assessment Requirements for the Development Application state that the Soil and Water Report must include:

- *Consideration of potential local and mainstream flooding impacts*

Whilst Council's flood planning is generally based around the 1% AEP (1 in 100 year ARI) storm event, as requested by NSW Department of Planning, Industry and Environment the 0.2% AEP event (1 in 500 year ARI) has also been considered to cater for the potential effects of climate change including increased rainfall intensity. The Probable Maximum Flood (PMF) event was also assessed.

7.2. Wingecarribee River Flood Study

A flood study for the Wingecarribee River catchment was undertaken by SMEC in 2014 and subsequently adopted by Council. The plans identify 1% AEP (100 year ARI) flood depths and hydraulic hazard areas within the wider catchment, including the Stony Creek tributary.

The plans appear to show a low-intermediate hydraulic hazard and flood depths of up to 2.5m in the centre of the site (the Stony Creek riparian corridor) in the 1% AEP event, although it is difficult to confirm this due to the lack of detail available.

7.3. Development Flood Modelling Investigation

Due to their background experience with preparation of the Wingecarribee River catchment model, SMEC were engaged to undertake further flood modelling for the proposed development.

7.3.1. Pre-Development Scenario

To form the existing conditions model, detailed site topographical survey data was combined with LIDAR survey data available for the wider catchment. For results of this modelling, please refer to the SMEC report included under Appendix B.

7.3.2. Post-Development Scenario

A 3-dimensional model of the proposed finished surface levels was prepared by AT&L and provided to SMEC for incorporation into their flood model as the proposed post-development scenario. Flood modelling was undertaken in Tuflow software for various design storm events including the 10% AEP, 1% AEP, 0.2% AEP and PMF. A range of storm durations were modelled, with the 2 hour event being critical in most cases for this site.

7.4. Flood Modelling Results

The flood modelling showed that there are **no significant** flood level impacts (afflux) on the upstream or downstream properties as a result of the proposed development. In the 1% AEP storm event (1 in 100 year ARI) the afflux at the points on the boundary of the site is less than 10mm and in the 0.2% AEP event (1 in 500 year ARI) less than 15mm.

The proposed building pad (FFL 665.0) and all other areas of the proposed development have been designed to ensure they have significant freeboard (in excess of 2.0m) to the adjacent 1% AEP flood levels in Stony Creek (approx. RL659.7). It is noted that the building will also have plenty of freeboard to the PMF level (approx. 662.4).

Flood hazard was shown to be low in all areas that are accessible to staff and visitors, including all of the main factory pad area. A high flood hazard is anticipated within the constructed drainage channel located along the southern edge of the site due to higher flow velocities there approaching 3.0m/s, which is a similar scenario to Stony Creek. Appropriate scour protection will be provided to the invert of this channel.

For detailed modelling results and discussion please refer to the SMEC report included under Appendix B.

8. Water Balance

8.1. Planning Requirements

The Secretary's Environmental Assessment Requirements for the Development Application state that the Soil and Water Report must include:

- *A description of water balance including a description of the water demands and breakdown of water supplies, including any water licensing requirements; and*

- *Description of the measures to minimise water use.*

Wingecarribee Shire Council's Industrial Land DCP also targets the following as part of their Water Sensitive Urban Design (WSUD) objectives:

- a minimum of 50% of the roof area to be connected to a rainwater storage device and the installation of a tank of suitable capacity (minimum 8,000L) water tank; and

- the re-use of stormwater collection for non-potable uses such as landscape irrigation and flushing toilets.

8.2. Water Balance Overview

Potable water supplies in the Sydney area are in recognised short supply with projected population increases, potential climate change, periods of extended drought and development in water sources of the Sydney region accentuating the growing demand. As a result, authorities have encouraged sustainable development by the implementation of an integrated approach to water cycle management (potable water, sewage, stormwater and rainwater) to offset demands of potable water supplies.

Whilst opportunities for water reuse include such initiatives as regional stormwater harvesting, black water recycling and recycled water, this development is limited to rainwater collection and reuse. We have used MUSIC modelling to establish an estimated rainwater tank size and demonstrated the volume of water reuse possible in order to provide a more sustainable servicing solution.

8.3. Overall Site Runoff Volumes

On a site of this scale a large quantity of surface runoff is expected throughout the year. Whilst storage has been provided to capture and detain some of this water (for detention and treatment requirements described above in Section 6), only a fraction of it will realistically be used to meet the development's water demand and the vast majority of the water will ultimately leave the site via the Stony Creek watercourse per existing conditions.

Post-development site catchments are summarised in the following table along with their respective volumetric runoff coefficients. The volumetric runoff coefficient given in the table makes allowance for water loss through evaporation and infiltration from the respective surfaces.

Table 8.1 – Total Site Water Re-Use Demand

Catchment Type	Catchment Area	Volumetric Runoff Coefficient
Building Roofs	33,800	0.95
Paved Areas	60,500	0.85
Landscaping/Pervious	50,800	0.64

Potential runoff generated is therefore summarised in the following table, broken into dry, medium and wet years based on available climate statistics from the nearby Moss Vale BOM station:

Table 8.2 – Total Site Runoff Quantities

	Potential Runoff (ML/year)		
	Dry (605mm)	Medium (944mm)	Wet (1391mm)
Building Roofs	19.43	30.31	44.67
Paved Areas	31.11	48.54	71.53
Landscaping	19.67	30.69	45.22
Total	**70.21**	**109.54**	**161.42**

8.4. Potential Non-Potable Water End Uses

We have identified the following potential water demand end uses which may be required across the development:

- toilet and urinal flushing, hand basin washing – approx. 20L/person/day;
- kitchen (food preparation, washing), drinking;
- air conditioning cooling;
- internal cleaning;
- truck wash;
- external cleaning;
- plant watering; and
- use in the brick manufacturing process.

8.5. Total Site Water Demands

In the absence of development-specific water demand information (e.g. proposed number of toilets), the following provide a reasonable approximation for an industrial site per Water NSW's current MUSIC guidelines:

1) **For Internal Use -** 0.1kL/day/1000m^2 of roof area

2) **For External Use -** 20kL/year/1000m^2 of external landscape area

In addition to these standard requirements, it is likely that the brick manufacturing process will require a significant quantity of water for cooling and washing etc. In the absence of detailed information about process requirements a generic allowance has been made in the table below.

Table 8.3 – Total Site Water Re-Use Demand

	Area (m^2)	L/day
Total Roof Area	33,800	3.38 kL/day
Total External Landscape Area	43,600	2.39 kL/day
Process Use (for Manufacturing)		10.0 kL/day*
	TOTAL	**15.77 kL/day**

*Note: This is an assumption for the purposes of rainwater tank modelling.

8.6. Rainwater Reuse

The use of rainwater collected in rainwater tanks from roof runoff provides a valuable alternative to potable water for a variety of non-potable end uses. We have assumed for this development that irrigation and toilet flushing will be plumbed to the rainwater tanks. Other uses such as truck/forklift washdown facilities may be considered at the detailed design stage.

A rainwater tank model was constructed to simulate the rainwater tank operations and select the optimal rainwater tank size.

8.7. Rainwater Tank Modelling

8.7.1. Assumptions

The assumptions built into the rainwater tank modelling scenarios include the following:

1) An allowance for 20% loss in rainwater tank size volume to allow for anaerobic sludge zones, mains water top up levels and overflow levels;
2) Up to approx. 39% of the total roof area (i.e. 13,200m^2) can be drained into the rainwater harvest tanks, subject to detailed roofwater design;
3) External re-use is modelled as an annual demand scaled by potential evapotranspiration (PET) whilst internal use is modelled as an average daily demand;

4) It is assumed that the initial 2mm of rainfall that falls on the roof is considered 'wetting', that is, potential rainfall runoff that is not captured by the rainwater tank, but is rather 'lost runoff' as evaporation or other;

5) The overflow pipe from individual tanks is modelled as a typical 200 mm diameter pipe;

6) To prevent sediment and other pollutants entering the rainwater tank, a portion of the initial runoff from the roof is transferred to stormwater, this is known as the 'first flush'. The portion of water diverted as part of the first flush differs for each facility depending on the amount of pollution each roof is susceptible to;

7) As the development is located in a predominantly light industrial area, where there may be potential for some roof pollution, a standard first flush volume of 1mm of runoff from across the roof area has been adopted; and

8) Any roof runoff that exceeds the rainwater tank capacity is 'overflow' and is directed to the stormwater drainage system.

8.7.2. Results

Modelling results suggest that the 2 x 180kL rainwater harvest tanks proposed will be sufficient for providing over 80% of the development's re-use needs. These tanks could either be installed in an above-ground or below-ground installation with suitable plumbing, as long as they receive flows from gutters/downpipes draining a minimum of 13,200m^2 of roof area.

Figure 8.1 – MUSIC Rainwater Tank Water Balance Results

Node Water Balance - 2 x 180kL Rainwater Tank

	Flow (ML/yr)	TSS (kg/yr)	TP (kg/yr)	TN (kg/yr)	GP (kg/yr)
Flow In	11.05	283.22	1.69	24.03	294.01
ET Loss	0.00	0.00	0.00	0.00	0.00
Infiltration Loss	0.00	0.00	0.00	0.00	0.00
Low Flow Bypass Out	0.00	0.00	0.00	0.00	0.00
High Flow Bypass Out	0.00	0.00	0.00	0.00	0.00
Pipe Out	6.14	129.63	0.89	12.78	0.00
Weir Out	0.21	3.83	0.03	0.40	0.00
Transfer Function Out	0.00	0.00	0.00	0.00	0.00
Reuse Supplied	4.73	62.43	0.63	8.55	0.00
Reuse Requested	5.76	0.00	0.00	0.00	0.00
% Reuse Demand Met	82.17	0.00	0.00	0.00	0.00
% Load Reduction	42.49	52.88	45.33	45.14	100.00

Decimal Places 2

9. Servicing

There are no existing utility services available at the proposed development site. Supply for the development will generally need to be brought along the entry road from Berrima Road and in some cases farther afield.

9.1. Water

9.1.1. Existing

There is no existing water supply to the development site. The nearest water infrastructure is a DN100 AC main located at the Berrima Rd/Taylor Avenue intersection. This is fed by the Hill Road reservoir in Moss Vale.

9.1.2. Proposed

The water connection point for the development will be in the verge of Berrima Road opposite the proposed entry road. This will require construction of a lead-in main from the existing main in Taylor Rd, an approximate length of 400m. According to Council records, the existing water main in this location is a 100mm diameter AC pipe.

A hydraulic modelling exercise is currently being undertaken by Urban Water Systems in order to confirm the available capacity of the public water infrastructure network, proposed connection size and location. It is anticipated that some external trunk upgrade works will be required.

Previous Council advice has indicated that there are future plans to upgrade the water main along Berrima Road from DN100 to DN200 but these upgrades are contingent on other major projects.

9.2. Sewerage

9.2.1. Existing

There is no existing sewerage connection to the development site. The nearest sewerage infrastructure is the Council pumping station (SPS-BE6) located on Adelaide St, New Berrima. This station pumps to gravity sewerage in Howard St which falls to another pump station in Odessa Street where sewage is pumped to the Berrima Wastewater Treatment Plant.

9.2.2. Proposed

A new pressurised sewer rising main will be installed to connect the site to the existing public sewer pump station in Adelaide Street. The alignment will run from the site, along the private entry road and then south along Berrima Road and west along Taylor Avenue over a length of approximately 950m. The rising main will be installed in the road verge at a standard cover. Sewerage from the development will be pumped

along the new main by a proprietary package pump station (e.g. Aquatec OGP Duplex 1500L) to be installed on the site, collecting flows from the internal building sanitary drainage.

This system will be part of the same network as the proposed pressure sewer system required to service the adjacent approved masonry development, both discharging into the rising main along Berrima Rd.

A hydraulic modelling exercise is currently being undertaken by Urban Water Systems in order to confirm the available capacity of the public sewerage infrastructure network, proposed connection size and location. It is anticipated that upgrades to the pump station or the downstream network are unlikely to be required due to the low wastewater flows generated by the development (i.e. PWWF of less than 5L/s).

9.3. Electricity

9.3.1. Existing

There is no existing electricity connection to the development site.

9.3.2. Proposed

As described in a previous Letter of Offer from Endeavour Energy for the neighbouring proposed masonry development, a new 11kV feeder will be required from the existing Berrima Junction zone substation located on Douglas Road, approximately 2km southeast of the subject site. This connection is likely to involve a combination of underground ducts and overhead lines across various lengths.

It is recommended that an ASP Level 3 electrical engineer is engaged to prepare a design for this supply in due course.

9.4. Telecommunications

9.4.1. Existing

There is no existing telecommunications connection to the development site. The nearest Telstra and NBN infrastructure is located in the western verge of Berrima Road, opposite the entry road.

9.4.2. Proposed

It is anticipated that the development will connect into the existing Telstra and/or NBN infrastructure located in Berrima Road. A new joint pit is likely to be required. Further discussions will be carried out with Telstra and NBN to confirm the exact connection point during the detailed design stage.

Other telecommunications networks may be available farther afield from the site. Should a connection be required the feasibility of providing a lead-in service would need to be investigated with the relevant authorities.

9.5. Gas

9.5.1. Existing

There is no existing gas connection to the development site. The nearest Jemena infrastructure is located at the Berrima Rd/Taylor Avenue intersection, with a 90mm PE main running west along Taylor Avenue and south down Berrima Rd.

9.5.2. Proposed

It is anticipated that the development will be serviced with gas via a new medium pressure connection into the existing Jemena gas infrastructure described above. This will require approx. 300m length of new PE main along the Berrima Rd verge to the entry road.

Further discussions will be carried out with Jemena to confirm the details of the network extension.

9.6. Access

9.6.1. Existing

Existing access to the site is located off Berrima Road via a driveway located at the crest of the hill, approximately 300m north of the Taylor Ave intersection. This driveway also provides quarry access into the Brickworks-owned property to the immediate north of the development site and will be shared with the proposed adjacent masonry development.

9.6.2. Proposed

It is anticipated that the proposed development will be accessed via the existing access point off Berrima Road. The vehicle crossing and entry road will be upgraded to cater for the increased traffic. Refer to the Traffic Impact Assessment report by Ason for further information.

10. Conclusions

This Soil, Water & Servicing Report has been completed for the proposed brick manufacturing facility at 416-524 Berrima Rd, Moss Vale. Key findings of AT&L's assessment and analysis are listed below:

1) The proposed development involves conversion of an existing rural site into a new brick manufacturing facility. This project requires robust soil and water management measures in order to protect the environment;

2) Significant bulk earthworks including approximately 140,000m^3 cut and fill are proposed as described in Section 4 in order to provide suitable ground levels and gradients for the proposed development;

3) Robust erosion and sediment control measures, as described in Section 5, must be installed on the site prior to construction commencing and will be updated and maintained during all stages of construction until full stabilisation of the site occurs;

4) A stormwater detention basin will be constructed on the site as described in Section 6.4 to ensure that there is no increase in peak runoff flows compared with pre-development conditions for all storm events up to the 1% AEP/1 in 100 year ARI;

5) Stormwater quality treatment measures including primary, secondary and tertiary devices will be installed on the site in a treatment train configuration as described in Section 6.5 to ensure that water released from the site meets the requirements of Council and Water NSW. Of particular importance, our analysis concludes that the development will have a neutral or beneficial effect on water quality within the Sydney drinking water catchment;

6) As described in Section 7, a flood impact assessment has been undertaken by SMEC who have confirmed that the proposed earthworks for the development, including the diverted drainage channel, have no adverse effect on flood levels on surrounding properties and that the proposed development will have sufficient flood immunity;

7) A water balance analysis has been undertaken for the proposed development as described in Section 8. The proposed two 180kL rainwater tanks to be installed beside the warehouse are sufficient to meet re-use demands such as toilet flushing, irrigation and also a component of the anticipated manufacturing process supply;

8) The development site will also need to be provided with important services including sewerage, water supply, electricity, telecommunications, gas and road access as described in Section 9. These services will generally be provided via new reticulation and connections to be installed along Berrima Road.

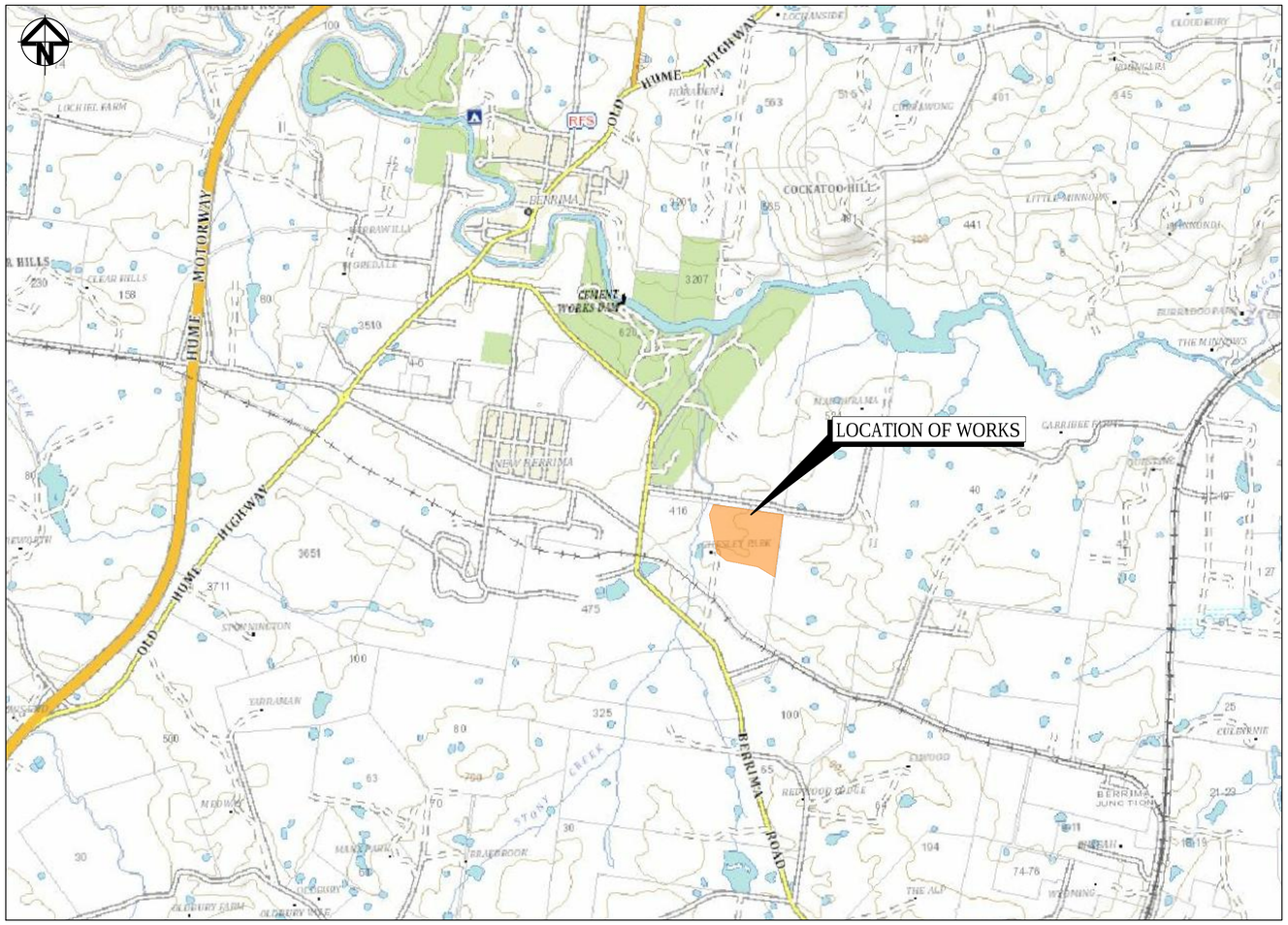
Appendix A

Concept Civil Engineering Drawings

PROPOSED BRICKWORKS FACTORY
416-524 BERRIMA ROAD, MOSS VALE

CIVIL WORKS DA PACKAGE

DRAWING LIST	
DRAWING LIST	DRAWING NUMBER
C000	COVER SHEET DRAWING LIST AND LOCATION PLAN
C010	GENERAL NOTES AND LEGENDS
C020	GENERAL ARRANGEMENT PLAN
C030	TYPICAL CROSS SECTIONS - SHEET 1
C031	TYPICAL CROSS SECTIONS - SHEET 2
C032	TYPICAL CROSS SECTIONS - SHEET 3
C100	SITEWORKS AND STORMWATER DRAINAGE PLAN SHEET 1
C101	SITEWORKS AND STORMWATER DRAINAGE PLAN SHEET 2
C102	SITEWORKS AND STORMWATER DRAINAGE PLAN SHEET 3
C103	SITEWORKS AND STORMWATER DRAINAGE PLAN SHEET 4
C104	SITEWORKS AND STORMWATER DRAINAGE PLAN SHEET 5
C150	EXTERNAL ROAD FUNCTIONAL LAYOUT PLAN SHEET 1
C151	EXTERNAL ROAD FUNCTIONAL LAYOUT PLAN SHEET 2
C152	EXTERNAL ROAD FUNCTIONAL LAYOUT PLAN SHEET 3
C190	ROADWORKS LONGITUDINAL SECTION
C200	BULK EARTHWORKS CUT/FILL PLAN
C400	PAVEMENT PLAN
C500	STORMWATER BASIN LAYOUT PLAN
C510	STORMWATER BASIN SECTIONS
C580	STORMWATER DRAINAGE CATCHMENTS PLAN
C590	STORMWATER CHANNEL LONGITUDINAL SECTIONS
C600	EROSION AND SEDIMENT CONTROL PLAN
C650	EROSION AND SEDIMENT CONTROL DETAILS
C800	CONCEPT SERVICES AND UTILITIES PLAN SHEET 1
C801	CONCEPT SERVICES AND UTILITIES PLAN SHEET 2



LOCALITY PLAN

N.T.S

Issue	Description	Date
B	ISSUED FOR APPROVAL	28-04-20
A	ISSUED FOR REVIEW	31-03-20

Bar Scales

100mm on Original

Client: BRICKWORKS LIMITED

Scales: NIL

Grid

Height Datum: AHD

Drawn	ALS
Designed	ALS
Checked	OJ
Approved	SH

Project: PROPOSED BRICKWORKS FACTORY
416-524 BERRIMA ROAD
MOSS VALE

Title: COVER SHEET
DRAWING LIST AND
LOCATION PLAN

Civil Engineers and Project Managers
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www.atl.net.au
info atl.net.au

Status: FOR APPROVAL
NOT FOR CONSTRUCTION

A1

Drawing No.	Project No.	Issue
C000	19-681	B

F:\19-681 Brickworks Berrima 2\6.0 Drgs\Civil\Final\C000.dwg

CONCRETE NOTES

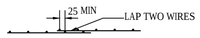
1. ALL WORKMANSHIP AND MATERIALS SHALL BE IN ACCORDANCE WITH AS 3600 CURRENT EDITION WITH AMENDMENTS, EXCEPT WHERE VARIED BY THE CONTRACT DOCUMENTS.
2. CONCRETE QUALITY
   ALL REQUIREMENTS OF THE CURRENT ACSE CONCRETE SPECIFICATION DOCUMENT 1 SHALL APPLY TO THE FORMWORK, REINFORCEMENT AND CONCRETE UNLESS NOTED OTHERWISE.

ELEMENT	AS 3600 F'c MPa AT 28 DAYS	SPECIFIED SLUMP	NOMINAL AGG. SIZE
VEHICULAR BASE	32	60	20
KERBS, PATHS, AND PITS	25	80	20

   - CEMENT TYPE SHALL BE (ACSE SPECIFICATION) TYPE SL
   - PROJECT CONTROL TESTING SHALL BE CARRIED OUT IN ACCORDANCE WITH AS 1379.
3. NO ADMIXTURES SHALL BE USED IN CONCRETE UNLESS APPROVED IN WRITING BY AT & L.
4. CLEAR CONCRETE COVER TO ALL REINFORCEMENT FOR DURABILITY SHALL BE 40mm TOP AND 70mm FOR EXTERNAL EDGES UNLESS NOTED OTHERWISE.
5. ALL REINFORCEMENT SHALL BE FIRMLY SUPPORTED ON MILD STEEL PLASTIC TIPPED CHAIRS, PLASTIC CHAIRS OR CONCRETE CHAIRS AT NOT GREATER THAN 1m CENTRES BOTH WAYS. BARS SHALL BE TIED AT ALTERNATE INTERSECTIONS.
6. THE FINISHED CONCRETE SHALL BE A DENSE HOMOGENEOUS MASS, COMPLETELY FILLING THE FORMWORK, THOROUGHLY EMBEDDING THE REINFORCEMENT AND FREE OF STONE POCKETS. ALL CONCRETE INCLUDING SLABS ON GROUND AND FOOTINGS SHALL BE COMPACTED AND CURED IN ACCORDANCE WITH R.T.A. SPECIFICATION R83.
7. REINFORCEMENT SYMBOLS:
   N DENOTES GRADE 450 N BARS TO AS 1302 GRADE N
   R DENOTES 230 R HOT ROLLED PLAIN BARS TO AS 1302
   SL DENOTES HARD-DRAWN WIRE REINFORCING FABRIC TO AS 1304

   NUMBER OF BARS IN GROUP ┐ ┌ BAR GRADE AND TYPE
   17 N 20 250
   NOMINAL BAR SIZE IN mm ┘ └ SPACING IN mm

   THE FIGURE FOLLOWING THE FABRIC SYMBOL SL IS THE REFERANCE NUMBER FOR FABRIC TO AS 1304.
8. FABRIC SHALL BE LAPPED IN ACCORDANCE WITH THE FOLLOWING DETAIL:



STORMWATER DRAINAGE NOTES

1. FOR STORMWATER DESIGN CRITERIA REFER AT&L SOIL AND WATER MANAGEMENT PLAN REP-001-02-19-681.
2. PIPES 300 DIA. AND LARGER TO BE REINFORCED CONCRETE CLASS '3' APPROVED SPIGOT AND SOCKET WITH RUBBER RING JOINTS. U.N.O.
3. PIPES UP TO 300 DIA SHALL BE SEWER GRADE uPVC WITH SOLVENT WELDED JOINTS.
4. EQUIVALENT STRENGTH FRC PIPES MAY BE USED.
5. ALL STORMWATER DRAINAGE LINES UNDER PROPOSED BUILDING SLABS TO BE uPVC PRESSURE PIPE GRADE 6. ENSURE ALL VERTICALS AND DOWNPIPES ARE uPVC PRESSURE PIPE, GRADE 6 FOR A MIN OF 3.0m IN HEIGHT.
6. PIPES TO BE INSTALLED TO TYPE HS1 SUPPORT IN ACCORDANCE WITH AS 3725 (2007) IN ALL CASES BACKFILL TRENCH WITH SAND TO 300mm ABOVE PIPE. WHERE PIPE IS UNDER PAVEMENTS BACKFILL REMAINDER OF TRENCH TO UNDERSIDE OF PAVEMENT WITH SAND OR APPROVED GRANULAR MATERIAL COMPACTED IN 150mm LAYERS TO MINIMUM 98% STANDARD MAXIMUM DRY DENSITY IN ACCORDANCE WITH AS 1289 5.2.1. (OR A DENSITY INDEX OF NOT LESS THAN 75)
7. ALL INTERNAL WORKS WITHIN PROPERTY BOUNDARIES ARE TO COMPLY WITH THE REQUIREMENTS OF AS 3500 3.1 (1998) AND AS/NZS 3500 3.2 (1998).
8. PRECAST PITS MAY BE USED EXTERNAL TO THE BUILDING SUBJECT TO APPROVAL BY AT & L.
9. ENLARGERS, CONNECTIONS AND JUNCTIONS TO BE PREFABRICATED FITTINGS WHERE PIPES ARE LESS THAN 300 DIA.
10. WHERE SUBSOIL DRAINS PASS UNDER FLOOR SLABS AND VEHICULAR PAVEMENTS, UNSLOTTED uPVC SEWER GRADE PIPE IS TO BE USED.
11. CARE IS TO BE TAKEN WITH LEVELS OF STORMWATER LINES. GRADES SHOWN ARE NOT TO BE REDUCED WITHOUT APPROVAL.
12. GRATES AND COVERS SHALL CONFORM TO AS 3996.
13. ALL INTERNAL PIT DIMENSIONS TO CONFORM TO AS3500.3 TABLE 8.2.
14. AT ALL TIMES DURING CONSTRUCTION OF STORMWATER PITS, ADEQUATE SAFETY PROCEDURES SHALL BE TAKEN TO ENSURE AGAINST THE POSSIBILITY OF PERSONNEL FALLING DOWN PITS.
15. ALL EXISTING STORMWATER DRAINAGE LINES AND PITS THAT ARE TO REMAIN ARE TO BE INSPECTED AND CLEANED. DURING THIS PROCESS ANY PART OF THE STORMWATER DRAINAGE SYSTEM THAT WARRANTS REPAIR SHALL BE REPORTED TO THE SUPERINTENDENT/ENGINEER FOR FURTHER DIRECTIONS.

SITEWORKS NOTES

1. ORIGIN OF LEVELS:- REFER SURVEY NOTES.
2. CONTRACTOR MUST VERIFY ALL DIMENSIONS AND EXISTING LEVELS ON SITE PRIOR TO COMMENCEMENT OF WORK. ANY DISCREPANCIES TO BE REPORTED TO AT & L.
3. MAKE SMOOTH CONNECTION WITH EXISTING WORKS.
4. ALL TRENCH BACKFILL MATERIAL SHALL BE COMPACTED TO THE SAME DENSITY AS THE ADJACENT MATERIAL.
5. ALL SERVICE TRENCHES UNDER VEHICULAR PAVEMENTS SHALL BE BACKFILLED WITH SAND TO 300mm ABOVE PIPE. WHERE PIPE IS UNDER PAVEMENTS BACKFILL REMAINDER OF TRENCH TO UNDERSIDE OF PAVEMENT WITH SAND OR APPROVED GRANULAR MATERIAL COMPACTED IN 150mm LAYERS TO MINIMUM 98% MODIFIED MAXIMUM DRY DENSITY IN ACCORDANCE WITH AS 1289 5.2.1. (OR A DENSITY INDEX OF NOT LESS THAN 75)
6. PROVIDE 10mm WIDE EXPANSION JOINTS BETWEEN BUILDINGS AND ALL CONCRETE OR UNIT PAVEMENTS.
7. ASPHALTIC CONCRETE SHALL CONFORM TO RMS. SPECIFICATION R116.
8. ALL BASECOURSE MATERIAL SHALL BE IGNEOUS ROCK QUARRIED MATERIAL TO COMPLY WITH RMS. FORM 3051 (UNBOUND), RMS. FORM 3052 (BOUND) COMPACTED TO MINIMUM 98% MODIFIED DENSITY IN ACCORDANCE WITH AS 1289 5.2.1
   FREQUENCY OF COMPACTION TESTING SHALL NOT BE LESS THAN 1 TEST PER 50m OF BASECOURSE MATERIAL PLACED.
9. ALL SUB-BASE COURSE MATERIAL SHALL BE IGNEOUS ROCK QUARRIED MATERIAL TO COMPLY WITH RMS. FORM 3051, 3051.1 AND COMPACTED TO MINIMUM 98% MODIFIED DENSITY IN ACCORDANCE WITH A.S 1289 5.2.1
   FREQUENCY OF COMPACTION TESTING SHALL NOT BE LESS THAN 1 TEST PER 50m OF SUB-BASE COURSE MATERIAL PLACED.
10. AS AN ALTERNATIVE TO THE USE OF IGNEOUS ROCK AS A SUB-BASE MATERIAL IN (9) A CERTIFIED RECYCLED CONCRETE MATERIAL COMPLYING WITH RMS. FORM 3051 AND 3051.1 WILL BE CONSIDERED. SUBJECT TO MATERIAL SAMPLES AND APPROPRIATE CERTIFICATIONS BEING PROVIDED TO THE SATISFACTION OF AT & L.
11. SHOULD THE CONTRACTOR WISH TO USE A RECYCLED PRODUCT THIS SHALL BE CLEARLY INDICATED IN THEIR TENDER AND THE PRICE DIFFERENCE BETWEEN AN IGNEOUS PRODUCT AND A RECYCLED PRODUCT SHALL BE CLEARLY INDICATED.
12. WHERE NOTED ON THE DRAWINGS THAT WORKS ARE TO BE CARRIED BY OTHERS, (eg. ADJUSTMENT OF SERVICES), THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE CO-ORDINATION OF THESE WORKS.

KERBING NOTES

1. ALL CONCRETE TO HAVE A MINIMUM COMPRESSIVE STRENGTH OF 25MPa U.N.O IN REINFORCED CONCRETE NOTES.
2. ALL KERBS, GUTTERS, DISH DRAINS AND CROSSINGS TO BE CONSTRUCTED ON 100mm GRANULAR BASECOURSE COMPACTED TO MINIMUM 98% MODIFIED DRY DENSITY (AS 1289 5.2.1).
3. EXPANSION JOINTS (E.J) TO BE FORMED FROM 10mm COMPRESSIBLE CORK FILLER BOARD FOR THE FULL DEPTH OF THE SECTION AND CUT TO PROFILE. EXPANSION JOINTS TO BE LOCATED AT DRAINAGE PITS, ON TANGENT POINTS OF CURVES AND ELSEWHERE AT MAX 12m CENTRES EXCEPT FOR INTEGRAL KERBS WHERE THE EXPANSION JOINTS ARE TO MATCH THE JOINT LOCATIONS IN THE SLABS.
4. WEAKENED PLANE JOINTS TO BE MIN 3mm WIDE AND LOCATED AT 3m CENTRES EXCEPT FOR INTEGRAL KERBS WHERE THE WEAKENED PLANE JOINTS ARE TO MATCH THE JOINT LOCATIONS IN THE SLABS.
5. BROOMED FINISH TO ALL RAMPED AND VEHICULAR CROSSINGS. ALL OTHER KERBING OR DISH DRAINS TO BE STEEL FLOAT FINISHED.
6. IN THE REPLACEMENT OF KERB AND GUTTER :-
   EXISTING ROAD PAVEMENT IS TO BE SAWCUT 900mm U.N.O FROM THE LIP OF GUTTER. UPON COMPLETION OF THE NEW KERB AND GUTTER NEW BASECOURSE AND SURFACE TO BE LAID 600mm WIDE U.N.O.

   EXISTING ALLOTMENT DRAINAGE PIPES ARE TO BE BUILT INTO THE NEW KERB AND GUTTER WITH 100mm DIA HOLE.

   EXISTING KERB AND GUTTER IS TO BE COMPLETELY REMOVED WHERE NEW KERB AND GUTTER IS SHOWN.

SURVEY NOTES

THE EXISTING SITE CONDITIONS SHOWN ON THE FOLLOWING DRAWINGS HAVE BEEN INVESTIGATED BY CARDNO, BEING REGISTERED SURVEYORS. THE INFORMATION IS SHOWN TO PROVIDE A BASIS FOR DESIGN. AT & L DOES NOT GUARANTEE THE ACCURACY OR COMPLETENESS OF THE SURVEY BASE OR ITS SUITABILITY AS A BASIS FOR CONSTRUCTION DRAWINGS.

SHOULD DISCREPANCIES BE ENCOUNTERED DURING CONSTRUCTION BETWEEN THE SURVEY DATA AND ACTUAL FIELD DATA, CONTACT AT & L.

THE FOLLOWING NOTES HAVE BEEN TAKEN DIRECTLY FROM THE ORIGINAL SURVEY DOCUMENTS.

1. LIMITED SURVEY OF THE ROAD PAVEMENT HAS BEEN UNDERTAKEN SHOULD ANY DESIGN WORKS BE UNDERTAKEN AFFECTING THE ROADS HEREON THEN ADDITIONAL SURVEY MAY BE REQUIRED.
2. HEIGHT OF FENCES WHERE SHOWN ARE APPROXIMATE ONLY.
3. THE INFORMATION SHOWN IN GREYSCALE IS THE DRAWING PROVIDED TO CARDNO (130604-DETAIL.DWG)
4. THE BLUE ARE BOUNDARIES WITHIN LAYER "APPROX BDYS-DCDB" COLOURED BLUE) ARE APPROXIMATE ONLY AND ARE NOT BE RELIED UPON FOR ANY DESIGN OR CONSTRUCTION.

EROSION & SEDIMENT CONTROL NOTES

GENERAL INSTRUCTIONS

1. THE SITE SUPERINTENDENT/ENGINEER WILL ENSURE THAT ALL SOIL AND WATER MANAGEMENT WORKS ARE LOCATED AS DOCUMENTED.
2. ALL WORK SHALL BE GENERALLY CARRIED OUT IN ACCORDANCE WITH
   a. LOCAL AUTHORITY REQUIREMENTS
   b. EPA REQUIREMENTS
   c. NSW DEPARTMENT OF HOUSING MANUAL "MANAGING URBAN STORMWATER, SOILS AND CONSTRUCTION", 4th EDITION, MARCH 2004.
3. MAINTAIN THE EROSION CONTROL DEVICES TO THE SATISFACTION OF THE SUPERINTENDENT AND THE LOCAL AUTHORITY.
4. WHEN STORMWATER PITS ARE CONSTRUCTED, PREVENT SITE RUNOFF ENTERING UNLESS SEDIMENT FENCES ARE ERECTED AROUND PITS.
5. CONTRACTOR IS TO ENSURE ALL EROSION & SEDIMENT CONTROL DEVICES ARE MAINTAINED IN GOOD WORKING ORDER AND OPERATE EFFECTIVELY. REPAIRS AND OR MAINTENANCE SHALL BE UNDERTAKEN AS REQUIRED, PARTICULARLY FOLLOWING STORM EVENTS.

LAND DISTURBANCE

6. WHERE PRACTICAL, THE SOIL EROSION HAZARD ON THE SITE WILL BE KEPT AS LOW AS POSSIBLE. TO THIS END, WORKS SHOULD BE UNDERTAKEN IN THE FOLLOWING SEQUENCE:
   (A) INSTALL A SEDIMENT FENCE ALONG THE BOUNDARIES AS SHOWN ON PLAN. REFER DETAIL.
   (B) CONSTRUCT STABILISED CONSTRUCTION ENTRANCE TO LOCATION AS DETERMINED BY SUPERINTENDENT/ENGINEER. REFER DETAIL.
   (C) INSTALL SEDIMENT TRAPS AS SHOWN ON PLAN.
   (D) UNDERTAKE SITE DEVELOPMENT WORKS IN ACCORDANCE WITH THE ENGINEERING PLANS. WHERE POSSIBLE, PHASE DEVELOPMENT SO THAT LAND DISTURBANCE IS CONFINED TO AREAS OF WORKABLE SIZE.

EROSION CONTROL

7. DURING WINDY WEATHER, LARGE, UNPROTECTED AREAS WILL BE KEPT MOIST (NOT WET) BY SPRINKLING WITH WATER TO KEEP DUST UNDER CONTROL.
8. FINAL SITE LANDSCAPING WILL BE UNDERTAKEN AS SOON AS POSSIBLE AND WITHIN 20 WORKING DAYS FROM COMPLETION OF CONSTRUCTION ACTIVITIES.

SEDIMENT CONTROL

9. STOCKPILES WILL NOT BE LOCATED WITHIN 2 METRES OF HAZARD AREAS, INCLUDING LIKELY AREAS OF CONCENTRATED OR HIGH VELOCITY FLOWS SUCH AS WATERWAYS. WHERE THEY ARE BETWEEN 2 AND 5 METRES FROM SUCH AREAS, SPECIAL SEDIMENT CONTROL MEASURES SHOULD BE TAKEN TO MINIMISE POSSIBLE POLLUTION TO DOWNSLOPE WATERS, E.G. THROUGH INSTALLATION OF SEDIMENT FENCING.
10. ANY SAND USED IN THE CONCRETE CURING PROCESS (SPREAD OVER THE SURFACE) WILL BE REMOVED AS SOON AS POSSIBLE AND WITHIN 10 WORKING DAYS FROM PLACEMENT.
11. WATER WILL BE PREVENTED FROM ENTERING THE PERMANENT DRAINAGE SYSTEM UNLESS IT IS RELATIVELY SEDIMENT FREE, I.E. THE CATCHMENT AREA HAS BEEN PERMANENTLY LANDSCAPED AND/OR ANY LIKELY SEDIMENT HAS BEEN FILTERED THROUGH AN APPROVED STRUCTURE.
12. TEMPORARY SOIL AND WATER MANAGEMENT STRUCTURES WILL BE REMOVED ONLY AFTER THE LANDS THEY ARE PROTECTING ARE REHABILITATED.

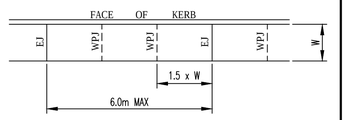
OTHER MATTERS

13. ACCEPTABLE RECEPTORS WILL BE PROVIDED FOR CONCRETE AND MORTAR SLURRIES, PAINTS, ACID WASHINGS, LIGHT-WEIGHT WASTE MATERIALS AND LITTER.
14. ANY EXISTING TREES WHICH FORM PART OF THE FINAL LANDSCAPING PLAN WILL BE PROTECTED FROM CONSTRUCTION ACTIVITIES BY:
   (A) PROTECTING THEM WITH BARRIER FENCING OR SIMILAR MATERIALS INSTALLED OUTSIDE THE DRIP LINE
   (B) ENSURING THAT NOTHING IS NAILED TO THEM
   (C) PROHIBITING PAVING, GRADING, SEDIMENT WASH OR PLACING OF STOCKPILES WITHIN THE DRIP LINE EXCEPT UNDER THE FOLLOWING CONDITIONS.
      (I) ENCROACHMENT ONLY OCCURS ON ONE SIDE AND NO CLOSER TO THE TRUNK THAN EITHER 1.5 METRES OR HALF THE DISTANCE BETWEEN THE OUTER EDGE OF THE DRIP LINE AND THE TRUNK, WHICH EVER IS THE GREATER
      (II) A DRAINAGE SYSTEM THAT ALLOWS AIR AND WATER TO CIRCULATE THROUGH THE ROOT ZONE (E.G. A GRAVEL BED) IS PLACED UNDER ALL FILL LAYERS OF MORE THAN 300 MILLIMETRES DEPTH
      (III) CARE IS TAKEN NOT TO CUT ROOTS UNNECESSARILY NOR TO COMPACT THE SOIL AROUND THEM.

JOINTING NOTES

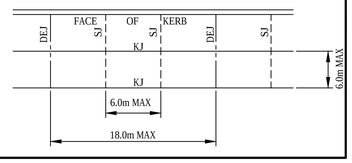
PEDESTRIAN PAVEMENT JOINTS

1. ALL PEDESTRIAN PAVEMENTS ARE TO BE JOINTED AS FOLLOWS. (U.N.O)
2. EXPANSION JOINTS ARE TO BE LOCATED WHERE POSSIBLE AT TANGENT POINTS OF CURVES AND ELSEWHERE AT MAX. 6.0m CENTRES.
3. WEAKENED PLANE JOINTS ARE TO BE LOCATED AT A MAX. SPACING OF 1.5 x WIDTH OF THE PAVEMENT.
4. WHERE POSSIBLE JOINTS SHOULD BE LOCATED TO MATCH KERBING AND OR ADJACENT PAVEMENT JOINTS.
5. PEDESTRIAN PAVEMENT JOINT DETAIL.



VEHICULAR PAVEMENT JOINTS

6. ALL VEHICULAR PAVEMENTS TO BE JOINTED AS FOLLOWS. (U.N.O)
7. KEYED CONSTRUCTION JOINTS SHOULD GENERALLY BE LOCATED AT A MAX OF 6.0m CENTRES
8. SAWN JOINTS SHOULD GENERALLY BE LOCATED AT A MAX OF 6.0m CENTRES WITH DOWELED EXPANSION JOINTS AT MAX 18.0m CENTRES
9. VEHICULAR PAVEMENT JOINT DETAIL.



EXISTING UNDERGROUND SERVICES NOTES

THE LOCATIONS OF UNDERGROUND SERVICES SHOWN IN THIS SET OF DRAWINGS HAVE BEEN PLOTTED FROM SURVEY INFORMATION AND SERVICE AUTHORITY INFORMATION. THE SERVICE INFORMATION HAS BEEN PREPARED ONLY TO SHOW THE APPROXIMATE POSITIONS OF ANY KNOWN SERVICES AND MAY NOT BE AS CONSTRUCTED OR ACCURATE.
AT & L CAN NOT GUARANTEE THAT THE SERVICES INFORMATION SHOWN ON THESE DRAWINGS ACCURATELY INDICATES THE PRESENCE OR ABSENCE OF SERVICES OR THEIR LOCATION AND WILL ACCEPT NO LIABILITY FOR INACCURACIES IN THE SERVICES INFORMATION SHOWN FROM ANY CAUSE WHATSOEVER.

CONTRACTORS SHALL TAKE DUE CARE WHEN EXCAVATING ONSITE INCLUDING HAND EXCAVATION WHERE NECESSARY.

CONTRACTORS ARE TO CONTACT THE RELEVANT SERVICE AUTHORITY PRIOR TO COMMENCEMENT OF EXCAVATION WORKS.

CONTRACTORS ARE TO UNDERTAKE A SERVICES SEARCH, PRIOR TO COMMENCEMENT OF WORKS ON SITE. SEARCH RESULTS ARE TO BE KEPT ON SITE AT ALL TIMES.

Issue	Description	Date
B	ISSUED FOR APPROVAL	28-04-20
A	ISSUED FOR REVIEW	31-03-20

Bar Scales

Client: BRICKWORKS LIMITED

Scales: NIL
Grid:
Height Datum: AHD

Drawn: ALS
Designed: ALS
Checked: OJ
Approved: SH

Project: PROPOSED BRICKWORKS FACTORY
416-524 BERRIMA ROAD
MOSS VALE

Title: GENERAL NOTES AND LEGENDS

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info atl.net.au

Status: FOR APPROVAL
NOT FOR CONSTRUCTION

A1

Drawing No.	Project No.	Issue
C010	19-681	B

100mm on Original

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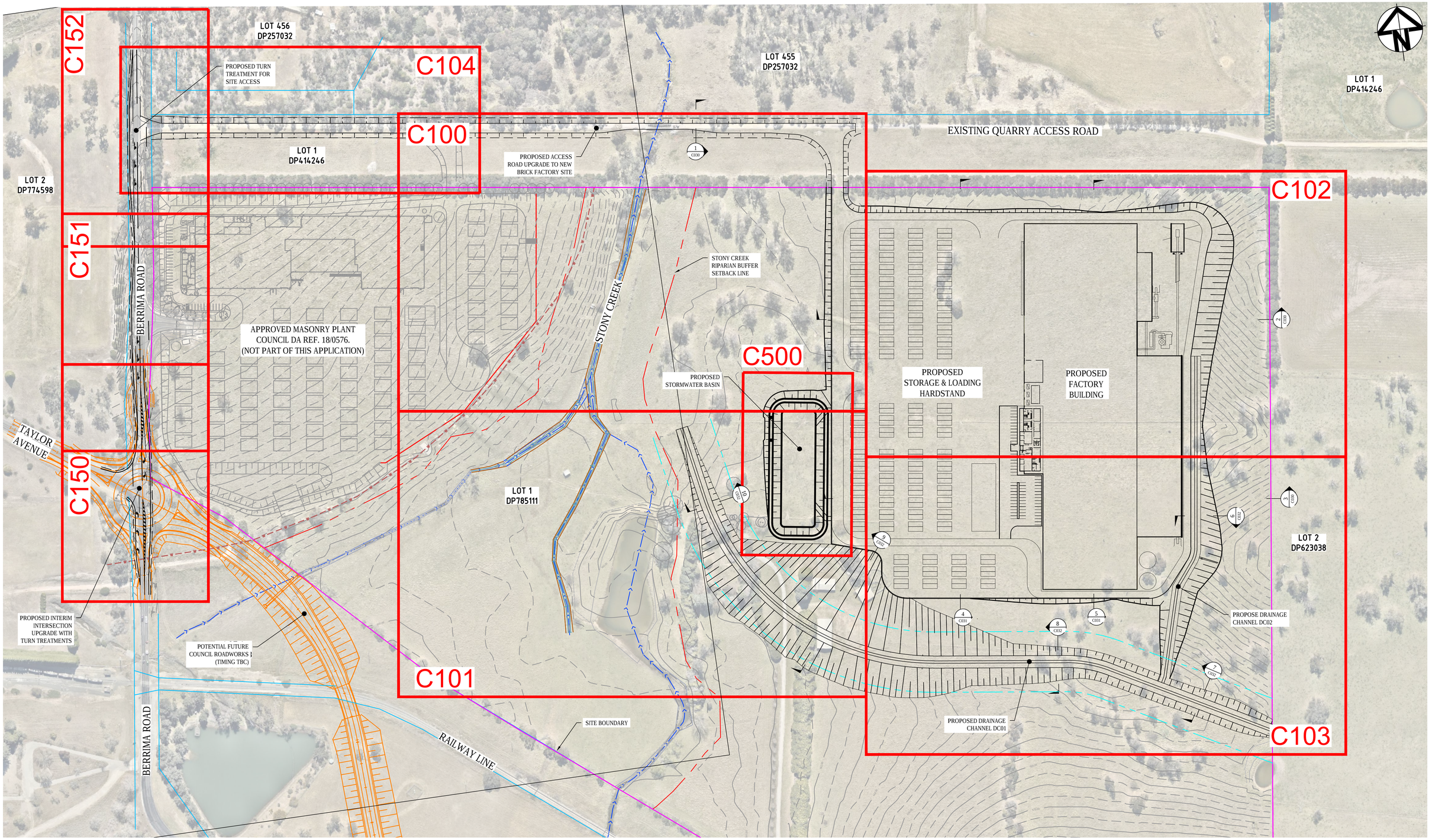

Issue	Description	Date
B	ISSUED FOR APPROVAL	28-04-20
A	ISSUED FOR REVIEW	31-03-20

Bar Scales

0 30 60 90 120 150m

1 : 1500 @ A1

100mm on Original

Client: BRICKWORKS LIMITED

Scales: 1:1500

Grid:

Height Datum: AHD

Drawn	ALS
Designed	ALS
Checked	OJ
Approved	SH

Project: PROPOSED BRICKWORKS FACTORY
416-524 BERRIMA ROAD
MOSS VALE

Title: GENERAL ARRANGEMENT PLAN

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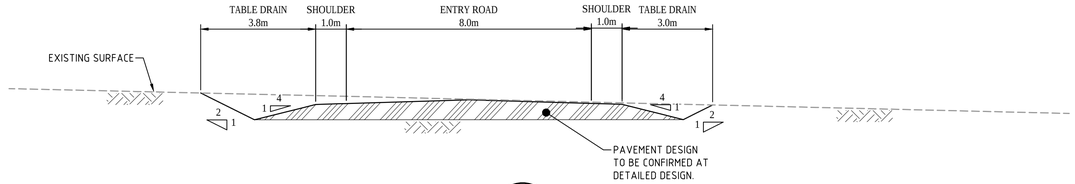
Status: FOR APPROVAL
NOT FOR CONSTRUCTION

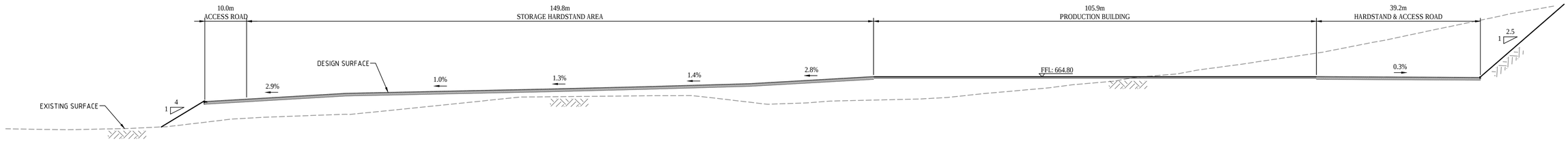
A1

Drawing No.	Project No.	Issue
C020	19-681	B

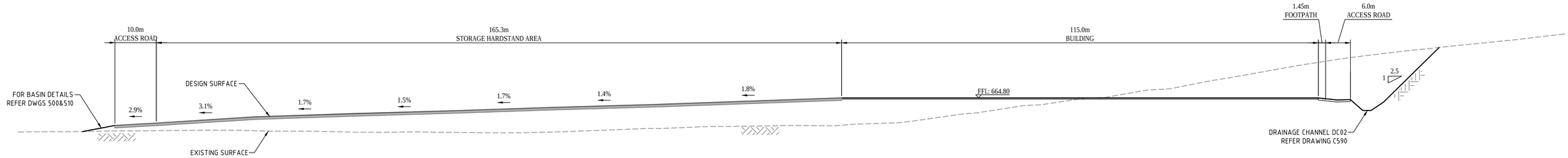
F:\19-681 Brickworks Berrima 2\6.0 Drgs\Civil\Final\C020.dwg



SECTION 1 (C020)
1 : 100



SECTION 2 (C020)
1 : 500



SECTION 3 (C020)
1 : 500

Issue	Description	Date
B	ISSUED FOR APPROVAL	28-04-20
A	ISSUED FOR REVIEW	31-03-20

100mm on Original

Bar Scales

0 2 4 6 8 10m
1 : 100 @ A1 1 : 200 @ A3

0 10 20 30 40 50m
1 : 500 @ A1 1 : 1000 @ A3

Client: BRICKWORKS LIMITED

Scales	AS SHOWN
Grid	
Height Datum	AHD
Drawn	ALS
Designed	ALS
Checked	OJ
Approved	SH

Project: PROPOSED BRICKWORKS FACTORY
416-524 BERRIMA ROAD
MOSS VALE

Title: TYPICAL CROSS SECTIONS - SHEET 1

Civil Engineers and Project Managers
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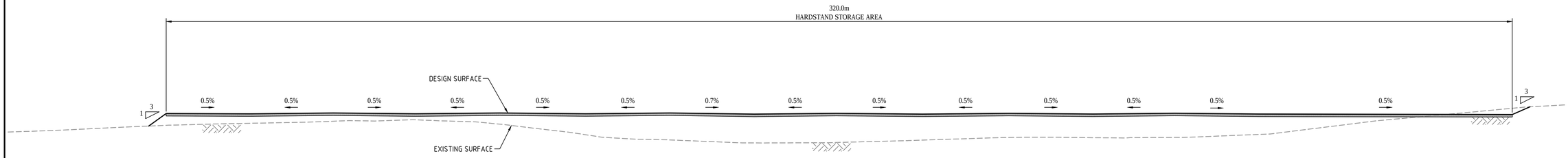
info atl.net.au

Status: FOR APPROVAL
NOT FOR CONSTRUCTION

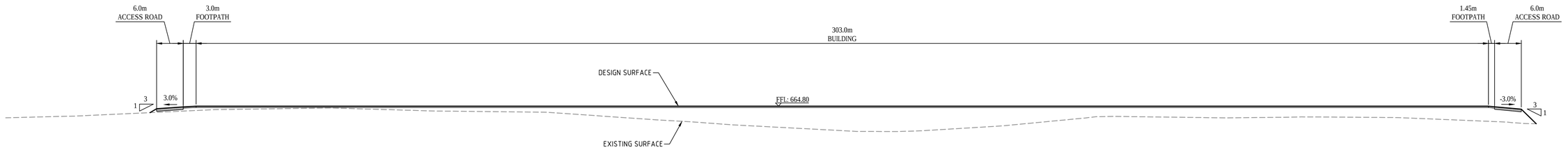
A1

Drawing No.	Project No.	Issue
C030	19-681	B

F:\19-681 Brickworks Berrima 2\6.0 Drgs\Civil\Final\C030.dwg



SECTION 4
1 : 500
C020



SECTION 5
1 : 500
C020

Issue	Description	Date
B	ISSUED FOR APPROVAL	28-04-20
A	ISSUED FOR REVIEW	31-03-20

100mm on Original

Bar Scales

0 2 4 6 8 10m
1 : 100 @ A1 1 : 200 @ A3

0 10 20 30 40 50m
1 : 500 @ A1 1 : 1000 @ A3

Client: BRICKWORKS LIMITED

Scales: AS SHOWN
Grid:
Height Datum: AHD

Drawn	ALS
Designed	ALS
Checked	OJ
Approved	SH

Project: PROPOSED BRICKWORKS FACTORY
416-524 BERRIMA ROAD
MOSS VALE

Title: TYPICAL CROSS SECTIONS - SHEET 2

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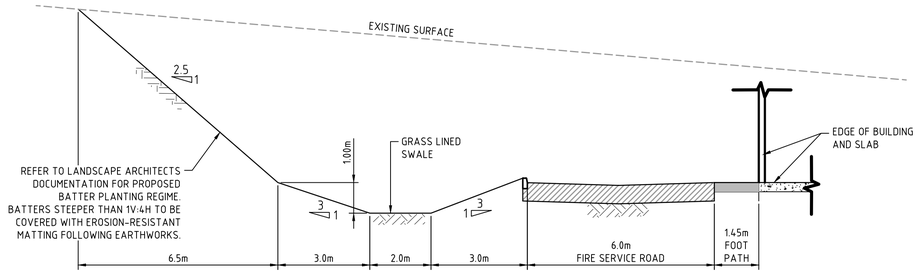
Status: FOR APPROVAL
NOT FOR CONSTRUCTION

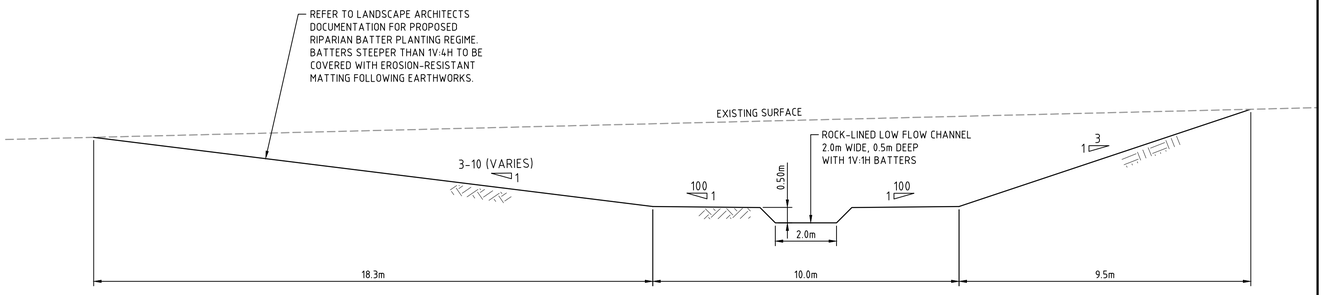
A1

Drawing No.	Project No.	Issue
C031	19-681	B

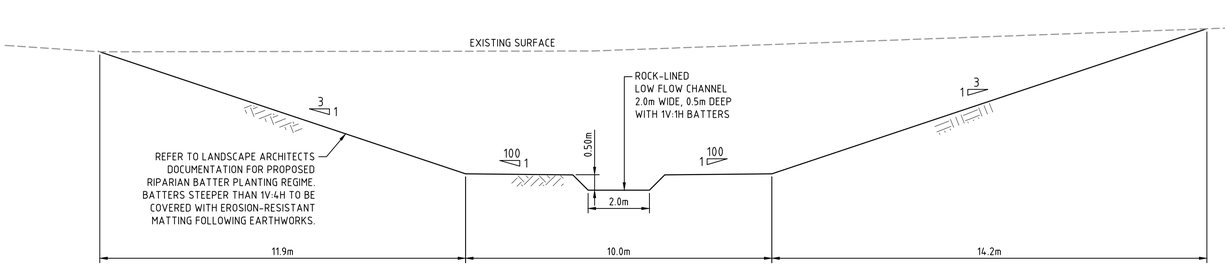
F:\19-681 Brickworks Berrima 2\6.0 Drgs\Civil\Final\C031.dwg



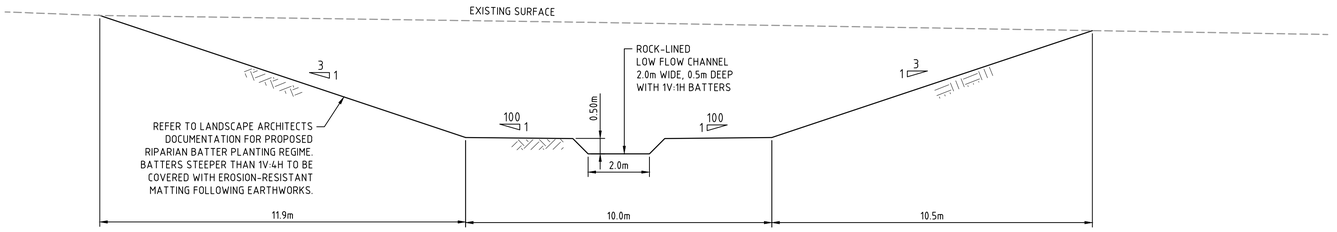
SECTION 6
1 : 100 C020



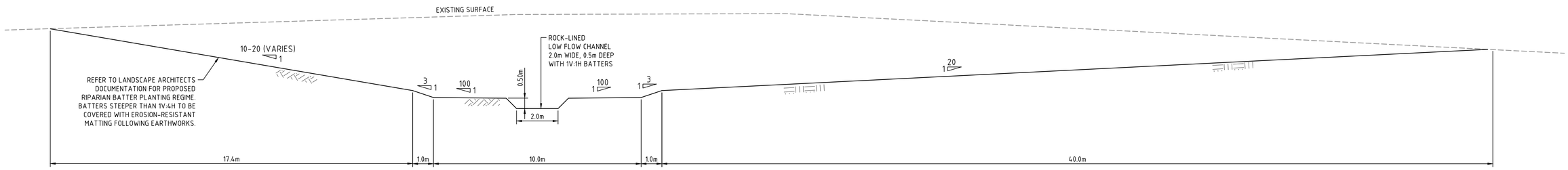
SECTION 10
1 : 100 CH460-600 C020



SECTION 7
1 : 100 CH0-65 C020



SECTION 8
1 : 100 CH65-300 C020



SECTION 9
1 : 100 CH300-460 C020

Issue	Description	Date
B	ISSUED FOR APPROVAL	28-04-20
A	ISSUED FOR REVIEW	31-03-20

100mm on Original

Bar Scales

0 2 4 6 8 10m

1 : 100 @ A1 1 : 200 @ A3

Client: BRICKWORKS LIMITED

Scales	1:100	Drawn	ALS
		Designed	ALS
Grid		Checked	OJ
Height Datum	AHD	Approved	SH

Project: PROPOSED BRICKWORKS FACTORY
416-524 BERRIMA ROAD
MOSS VALE

Title: TYPICAL CROSS SECTIONS - SHEET 3

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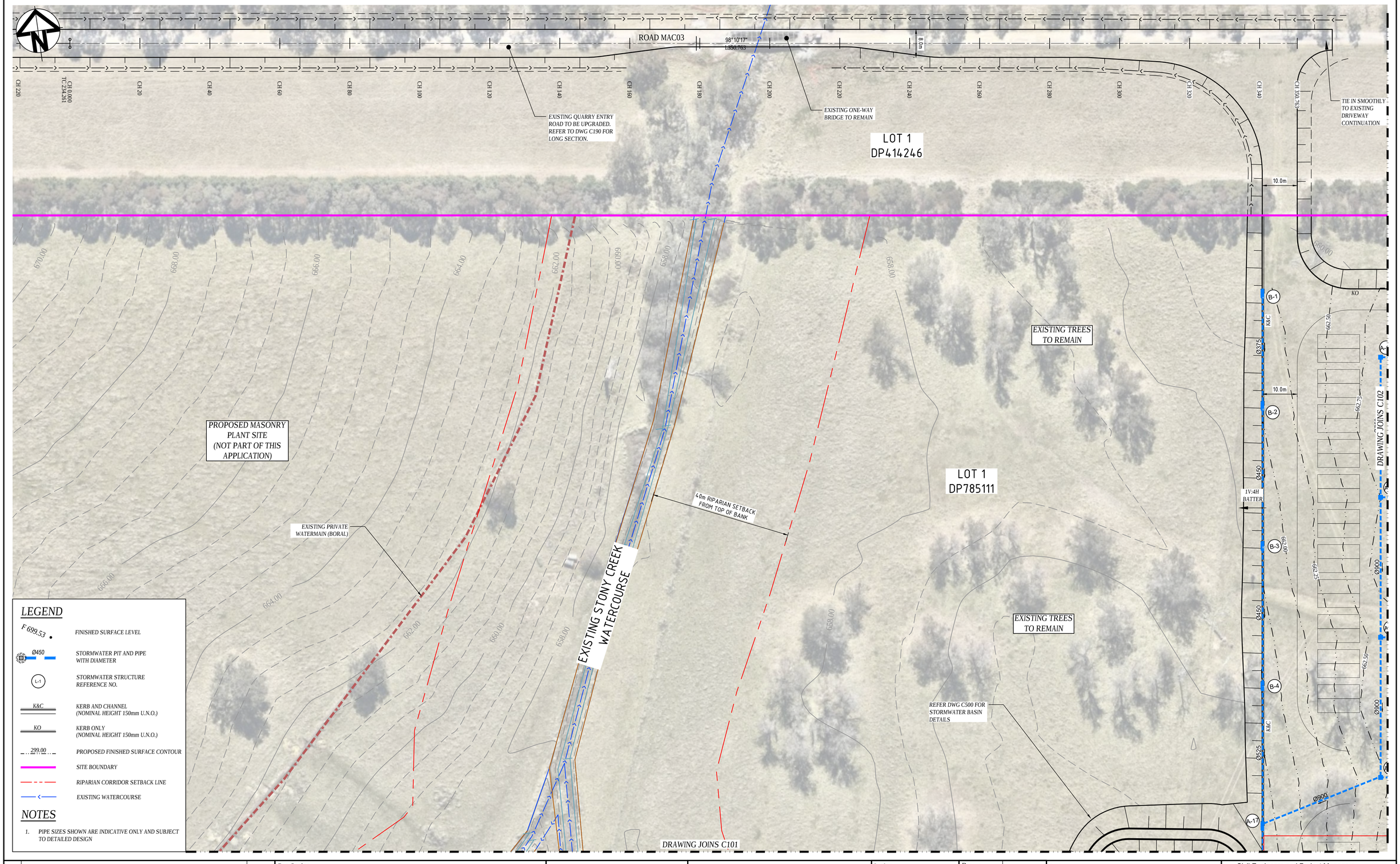
Status: FOR APPROVAL
NOT FOR CONSTRUCTION

A1

Drawing No.	Project No.	Issue
C032	19-681	B

F:\19-681 Brickworks Berrima 2\6.0 Drgs\Civil\Final\C032.dwg



LEGEND

- F 699.53 — FINISHED SURFACE LEVEL
- Ø450 — STORMWATER PIT AND PIPE WITH DIAMETER
- L-1 — STORMWATER STRUCTURE REFERENCE NO.
- K&C — KERB AND CHANNEL (NOMINAL HEIGHT 150mm U.N.O.)
- KO — KERB ONLY (NOMINAL HEIGHT 150mm U.N.O.)
- 299.00 — PROPOSED FINISHED SURFACE CONTOUR
- SITE BOUNDARY
- RIPARIAN CORRIDOR SETBACK LINE
- EXISTING WATERCOURSE

NOTES

1. PIPE SIZES SHOWN ARE INDICATIVE ONLY AND SUBJECT TO DETAILED DESIGN

Issue	Description	Date
B	ISSUED FOR APPROVAL	28-04-20
A	ISSUED FOR REVIEW	31-03-20

Bar Scales

0 10 20 30 40 50m

1 : 500 @ A1 1 : 1000 @ A3

Client: BRICKWORKS LIMITED

Scales	1:500
Grid	
Height Datum	AHD
Drawn	ALS
Designed	ALS
Checked	OJ
Approved	SH

Project: PROPOSED BRICKWORKS FACTORY
416-524 BERRIMA ROAD
MOSS VALE

Title: SITEWORKS AND STORMWATER DRAINAGE PLAN SHEET 1

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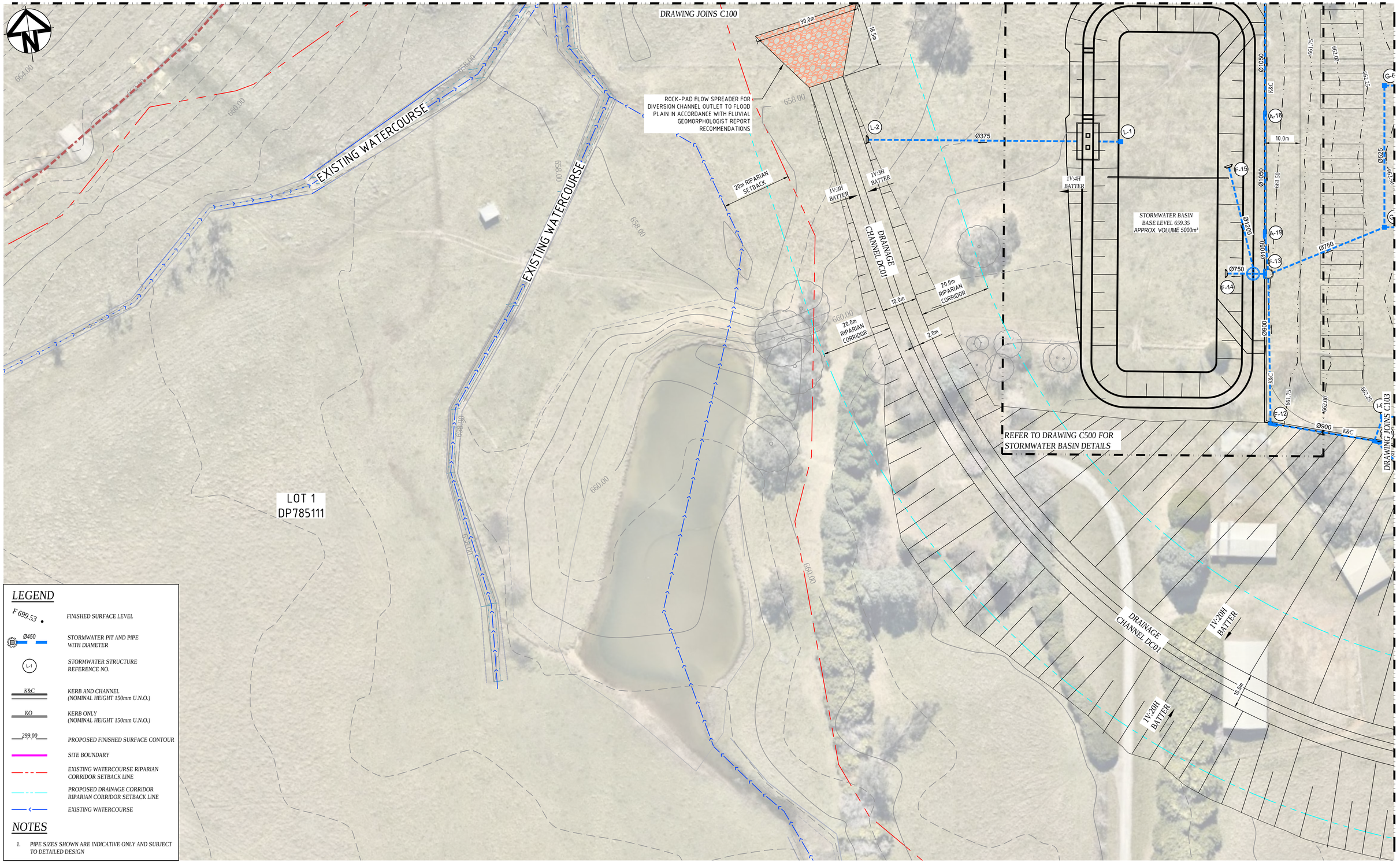
Status: FOR APPROVAL
NOT FOR CONSTRUCTION

A1

Drawing No.	Project No.	Issue
C100	19-681	B

100mm on Original

F:\19-681 Brickworks Berrima 2\6.0 Drgs\Civil\Final\C100.dwg



LEGEND

- F 699.53 — FINISHED SURFACE LEVEL
- Ø450 — STORMWATER PIT AND PIPE WITH DIAMETER
- L-1 — STORMWATER STRUCTURE REFERENCE NO.
- K&C — KERB AND CHANNEL (NOMINAL HEIGHT 150mm U.N.O.)
- KO — KERB ONLY (NOMINAL HEIGHT 150mm U.N.O.)
- 299.00 — PROPOSED FINISHED SURFACE CONTOUR
- SITE BOUNDARY
- EXISTING WATERCOURSE RIPARIAN CORRIDOR SETBACK LINE
- PROPOSED DRAINAGE CORRIDOR RIPARIAN CORRIDOR SETBACK LINE
- EXISTING WATERCOURSE

NOTES

1. PIPE SIZES SHOWN ARE INDICATIVE ONLY AND SUBJECT TO DETAILED DESIGN

Issue	Description	Date
B	ISSUED FOR APPROVAL	28-04-20
A	ISSUED FOR REVIEW	31-03-20

Bar Scales

0 10 20 30 40 50m

1 : 500 @ A1 1 : 1000 @ A3

Client: BRICKWORKS LIMITED

Scales	1:500
Grid	
Height Datum	AHD
Drawn	ALS
Designed	ALS
Checked	OJ
Approved	SH

Project: PROPOSED BRICKWORKS FACTORY
416-524 BERRIMA ROAD
MOSS VALE

Title: SITEWORKS AND STORMWATER DRAINAGE PLAN SHEET 2

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info atl.net.au

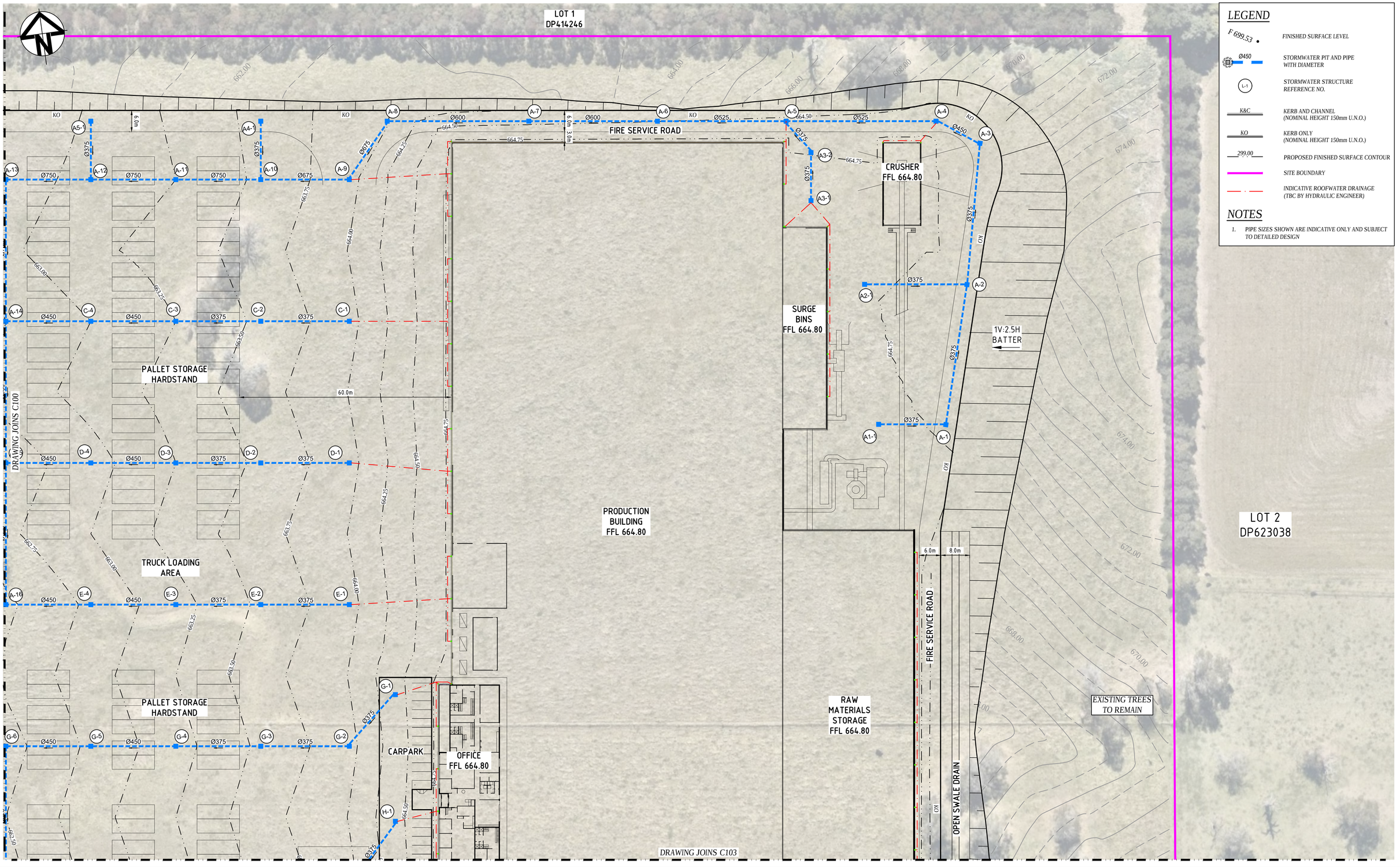
Status: FOR APPROVAL
NOT FOR CONSTRUCTION

A1

Drawing No.	Project No.	Issue
C101	19-681	B

100mm on Original

F:\19-681 Brickworks Berrima 2\6.0 Drgs\Civil\Final\C101.dwg



LEGEND

- F 699.53 — FINISHED SURFACE LEVEL
- Ø450 — STORMWATER PIT AND PIPE WITH DIAMETER
- L-1 — STORMWATER STRUCTURE REFERENCE NO.
- K&C — KERB AND CHANNEL (NOMINAL HEIGHT 150mm U.N.O.)
- KO — KERB ONLY (NOMINAL HEIGHT 150mm U.N.O.)
- 299.00 — PROPOSED FINISHED SURFACE CONTOUR
- SITE BOUNDARY
- INDICATIVE ROOFWATER DRAINAGE (TBC BY HYDRAULIC ENGINEER)

NOTES

1. PIPE SIZES SHOWN ARE INDICATIVE ONLY AND SUBJECT TO DETAILED DESIGN

Issue	Description	Date
B	ISSUED FOR APPROVAL	28-04-20
A	ISSUED FOR REVIEW	31-03-20

100mm on Original

Bar Scales

0 10 20 30 40 50m

1 : 500 @ A1 1 : 1000 @ A3

Client: BRICKWORKS LIMITED

Scales	1:500	Drawn	ALS
		Designed	ALS
Grid		Checked	OJ
Height Datum	AHD	Approved	SH

Project: PROPOSED BRICKWORKS FACTORY
416-524 BERRIMA ROAD
MOSS VALE

Title: SITEWORKS AND STORMWATER DRAINAGE PLAN SHEET 3

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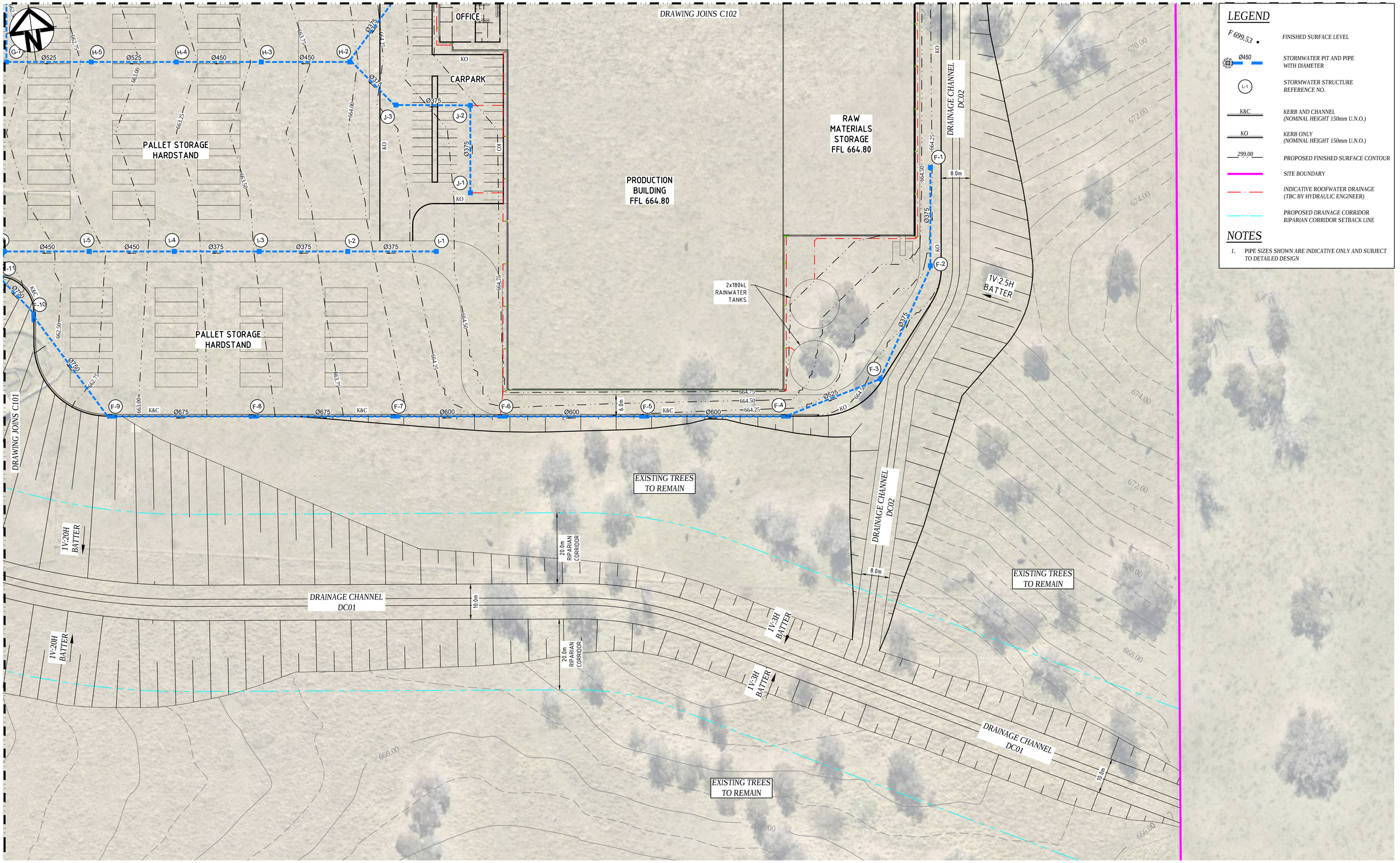
info@atl.net.au

Status: FOR APPROVAL
NOT FOR CONSTRUCTION

A1

Drawing No.	Project No.	Issue
C102	19-681	B

F:\19-681 Brickworks Berrima 2\6.0 Drgs\Civil\Final\C102.dwg



LEGEND

- F 699.53 — FINISHED SURFACE LEVEL
- Ø450 — STORMWATER PIT AND PIPE WITH DIAMETER
- L-1 — STORMWATER STRUCTURE REFERENCE NO.
- K&C — KERB AND CHANNEL (NOMINAL HEIGHT 150mm U.N.O.)
- KO — KERB ONLY (NOMINAL HEIGHT 150mm U.N.O.)
- 299.00 — PROPOSED FINISHED SURFACE CONTOUR
- SITE BOUNDARY
- INDICATIVE ROOFWATER DRAINAGE (TBC BY HYDRAULIC ENGINEER)
- PROPOSED DRAINAGE CORRIDOR RIPARIAN CORRIDOR SETBACK LINE

NOTES

1. PIPE SIZES SHOWN ARE INDICATIVE ONLY AND SUBJECT TO DETAILED DESIGN

Issue	Description	Date
B	ISSUED FOR APPROVAL	28-04-20
A	ISSUED FOR REVIEW	31-03-20

Bar Scales

0 10 20 30 40 50m

1 : 500 @ A1 1 : 1000 @ A3

Client: BRICKWORKS LIMITED

Scales	1:500
Grid	
Height Datum	AHD
Drawn	ALS
Designed	ALS
Checked	OJ
Approved	SH

Project: PROPOSED BRICKWORKS FACTORY
416-524 BERRIMA ROAD
MOSS VALE

Title: SITEWORKS AND STORMWATER DRAINAGE PLAN SHEET 4

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info@atl.net.au

Status: FOR APPROVAL
NOT FOR CONSTRUCTION

A1

Drawing No.	Project No.	Issue
C103	19-681	B

100mm on Original

F:\19-681 Brickworks Berrima 2\6.0 Drgs\Civil\Final\C103.dwg

Issue	Description	Date
B	ISSUED FOR APPROVAL	28-04-20
A	ISSUED FOR REVIEW	31-03-20

Bar Scales

0 10 20 30 40 50m

1 : 500 @ A1 1 : 1000 @ A3

Client: BRICKWORKS LIMITED

Scales	1:500
Grid	
Height Datum	AHD
Drawn	ALS
Designed	ALS
Checked	OJ
Approved	SH

Project: PROPOSED BRICKWORKS FACTORY
416-524 BERRIMA ROAD
MOSS VALE

Title: SITEWORKS AND STORMWATER DRAINAGE PLAN SHEET 5

Civil Engineers and Project Managers
at&l
Level 7, 153 Walker Street
North Sydney NSW 2060
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Fax: 02 9423 1055
www.atl.net.au
info@atl.net.au

Status: FOR APPROVAL
NOT FOR CONSTRUCTION

A1

Drawing No.	Project No.	Issue
C104	19-681	B

100mm on Original

F:\19-681 Brickworks Berrima 2\6.0 Drgs\Civil\Final\C104.dwg

FUNCTIONAL LAYOUT LEGEND

EXISTING

- EXISTING BOUNDARY
- EXISTING FENCE
- EDGE OF BITUMEN
- EXISTING TOE OF BATTER
- EXISTING ROAD SIGN
- EXISTING VEGETATION

PROPOSED

- PROPOSED EDGE OF PAVEMENT
- PROPOSED EDGE OF SHOULDER

KEY PLAN
N.T.S

Issue	Description	Date
B	ISSUED FOR APPROVAL	28-04-20
A	ISSUED FOR REVIEW	31-03-20

Bar Scales

0 5 10 15 20 25m

1 : 250 @ A1 1 : 500 @ A3

100mm on Original

Client: BRICKWORKS LIMITED

Scales	1:250
Grid	
Height Datum	AHD
Drawn	OJ
Designed	OJ
Checked	OJ
Approved	SH

Project: PROPOSED BRICKWORKS FACTORY
416-524 BERRIMA ROAD
MOSS VALE

Title: EXTERNAL ROAD FUNCTIONAL LAYOUT PLAN
SHEET 1

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Status: FOR APPROVAL
NOT FOR CONSTRUCTION

A1

Drawing No.	Project No.	Issue
C150	19-681	B

F:\19-681 Brickworks Berrima 2\6.0 Drgs\Civil\Final\C150.dwg

FUNCTIONAL LAYOUT LEGEND

EXISTING

- EXISTING BOUNDARY
- EXISTING FENCE
- EDGE OF BITUMEN
- EXISTING TOE OF BATTER
- EXISTING ROAD SIGN
- EXISTING VEGETATION

PROPOSED

- PROPOSED EDGE OF PAVEMENT
- PROPOSED EDGE OF SHOULDER

DRAWING JOIN C126

DRAWING JOIN C128

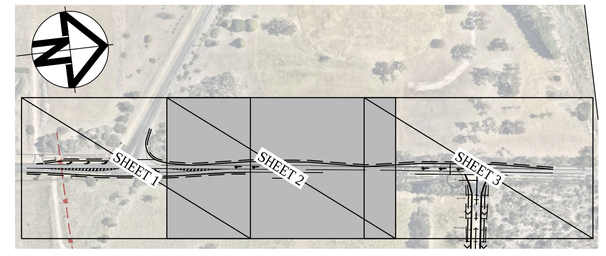
3.0

3.5

2.8

BERRIMA ROAD

PROPOSED INTERNAL MASONRY PLANT LIGHT VEHICLE ACCESS (NOT PART OF THIS APPLICATION)



KEY PLAN
N.T.S

Issue	Description	Date
B	ISSUED FOR APPROVAL	28-04-20
A	ISSUED FOR REVIEW	31-03-20

Bar Scales

0 5 10 15 20 25m

1 : 250 @ A1 1 : 500 @ A3

Client: BRICKWORKS LIMITED

Scales	1:250
Grid	
Height Datum	AHD
Drawn	OJ
Designed	OJ
Checked	OJ
Approved	SH

Project: PROPOSED BRICKWORKS FACTORY
416-524 BERRIMA ROAD
MOSS VALE

Title: EXTERNAL ROAD FUNCTIONAL LAYOUT PLAN
SHEET 2

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info atl.net.au

Status: FOR APPROVAL
NOT FOR CONSTRUCTION

A1

Drawing No.	Project No.	Issue
C151	19-681	B

100mm on Original

F:\19-681 Brickworks Berrima 2\6.0 Drgs\Civil\Final\C151.dwg

FUNCTIONAL LAYOUT LEGEND

EXISTING

- EXISTING BOUNDARY
- EXISTING FENCE
- EDGE OF BITUMEN
- EXISTING TOE OF BATTER
- EXISTING ROAD SIGN
- EXISTING VEGETATION

PROPOSED

- PROPOSED EDGE OF PAVEMENT
- PROPOSED EDGE OF SHOULDER

DRAWING JOIN C128

3.0
3.5
2.8

CH 0.000

BERRIMA ROAD

PROPOSED SITE ACCESS ROAD

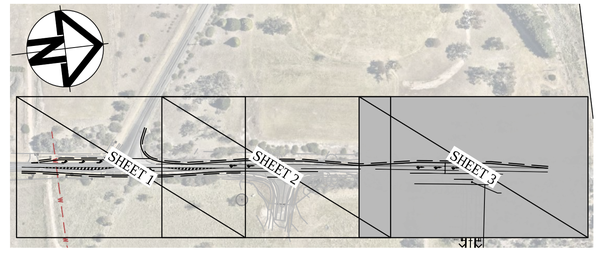
CH 20

SAG 23.339

CH 40

CREST 49.305

EXISTING CROSOVER TO BE UPGRADED IN ACCORDANCE WITH WINGECARRIBEE SHIRE COUNCIL STANDARDS. REFER SD108 FOR DETAILS.



KEY PLAN
N.T.S

Issue	Description	Date
B	ISSUED FOR APPROVAL	28-04-20
A	ISSUED FOR REVIEW	31-03-20

Bar Scales

0 5 10 15 20 25m

1 : 250 @ A1 1 : 500 @ A3

Client: BRICKWORKS LIMITED

Scales	1:250	Drawn	OJ
		Designed	OJ
Grid		Checked	OJ
Height Datum	AHD	Approved	SH

Project: PROPOSED BRICKWORKS FACTORY
416-524 BERRIMA ROAD
MOSS VALE

Title: EXTERNAL ROAD FUNCTIONAL LAYOUT PLAN
SHEET 3

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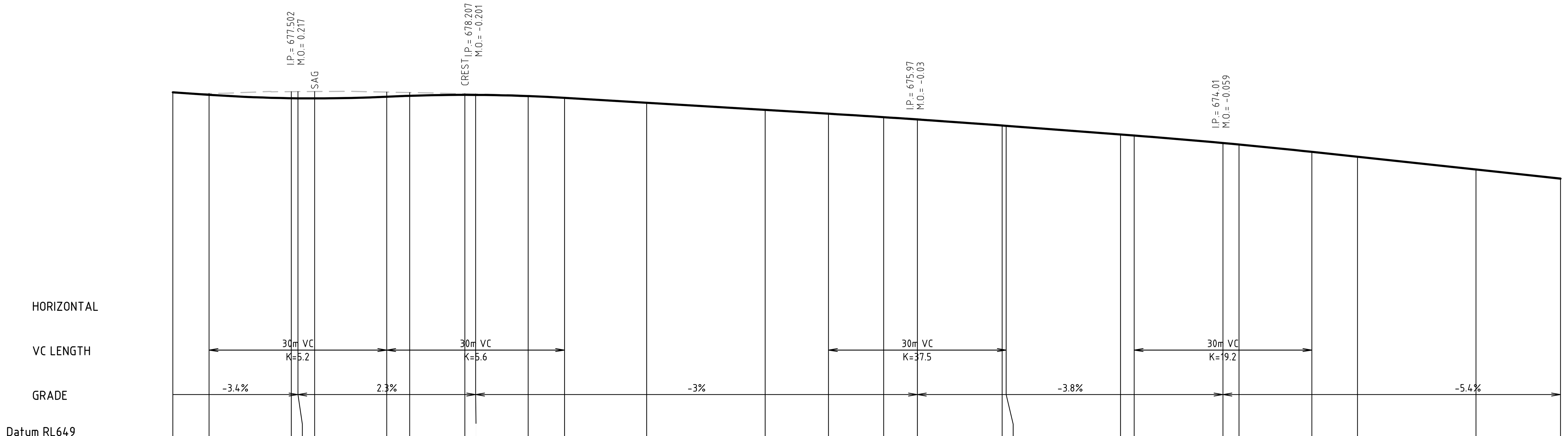
Status: FOR APPROVAL
NOT FOR CONSTRUCTION

A1

Drawing No.	Project No.	Issue
C152	19-681	B

100mm on Original

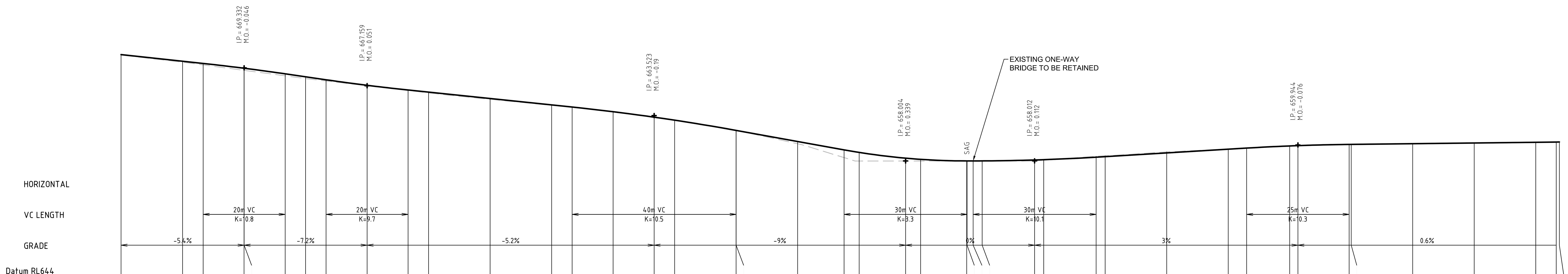
F:\19-681 Brickworks Berrima 2\6.0 Drgs\Civil\Final\C152.dwg



CHAINAGE	PROPOSED SURFACE LEVEL	EXISTING SURFACE LEVEL
0.000	678.228	678.228
6.124	678.018	678.124
20.000	677.726	678.280
21.124	677.719	678.283
23.939	677.712	678.292
36.124	677.855	678.244
40.000	677.932	678.207
49.305	678.010	678.104
51.129	678.007	678.083
60.000	677.908	677.948
66.135	677.757	677.774
80.000	677.341	677.363
100.000	676.741	676.761
110.697	676.420	676.441
120.000	676.130	676.168
125.697	675.940	676.000
140.000	675.427	675.472
140.697	675.400	675.446
160.000	674.667	674.702
162.292	674.580	674.610
177.292	673.951	674.000
180.000	673.825	673.861
192.292	673.205	673.223
200.000	672.791	672.810
220.000	671.718	671.712
234.261	670.953	670.893

ROAD MCA01 LONGITUDINAL SECTION

SCALE 1:500 HORI.
1:250 VERT.



CHAINAGE	PROPOSED SURFACE LEVEL	EXISTING SURFACE LEVEL
0.000	670.95	670.89
15.000	670.14	670.02
20.016	669.87	669.69
30.000	669.29	669.03
30.016	669.29	669.03
40.016	668.61	668.37
45.000	668.25	668.03
50.000	667.88	667.74
60.000	667.21	667.16
70.000	666.64	666.58
75.000	666.38	666.29
90.000	665.60	665.51
105.000	664.82	664.77
109.998	664.56	664.53
120.000	663.99	664.04
129.998	663.33	663.31
135.000	662.97	662.94
149.998	661.72	661.74
150.000	661.72	661.74
165.000	660.37	660.10
176.325	659.35	658.41
180.000	659.04	658.00
191.325	658.34	658.00
195.000	658.20	658.00
206.231	658.01	658.00
206.325	658.01	658.00
207.791	658.01	658.00
210.000	658.01	658.00
222.791	658.12	658.01
225.000	658.16	658.09
237.791	658.46	658.57
240.000	658.53	658.63
255.000	658.98	659.10
270.000	659.43	659.46
274.500	659.57	659.58
285.000	659.83	659.84
287.000	659.87	659.89
299.500	660.02	660.04
300.000	660.02	660.04
315.000	660.11	660.11
330.000	660.19	660.19
345.000	660.28	660.28
350.000	660.31	660.31
350.763	660.31	660.31

ROAD MCA02 LONGITUDINAL SECTION

SCALE 1:500 HORI.
1:250 VERT.

Issue	Description	Date
B	ISSUED FOR APPROVAL	28-04-20
A	ISSUED FOR REVIEW	31-03-20

Bar Scales

0 5 10 15 20 25m
1 : 250 @ A1 1 : 500 @ A3

0 10 20 30 40 50m
1 : 500 @ A1 1 : 1000 @ A3

100mm on Original

Client: BRICKWORKS LIMITED

Scales	AS SHOWN	Drawn	ALS
		Designed	ALS
Grid		Checked	OJ
Height Datum	AHD	Approved	SH

Project: PROPOSED BRICKWORKS FACTORY 416-524 BERRIMA ROAD MOSS VALE

Title: ROADWORKS LONGITUDINAL SECTIONS

Civil Engineers and Project Managers
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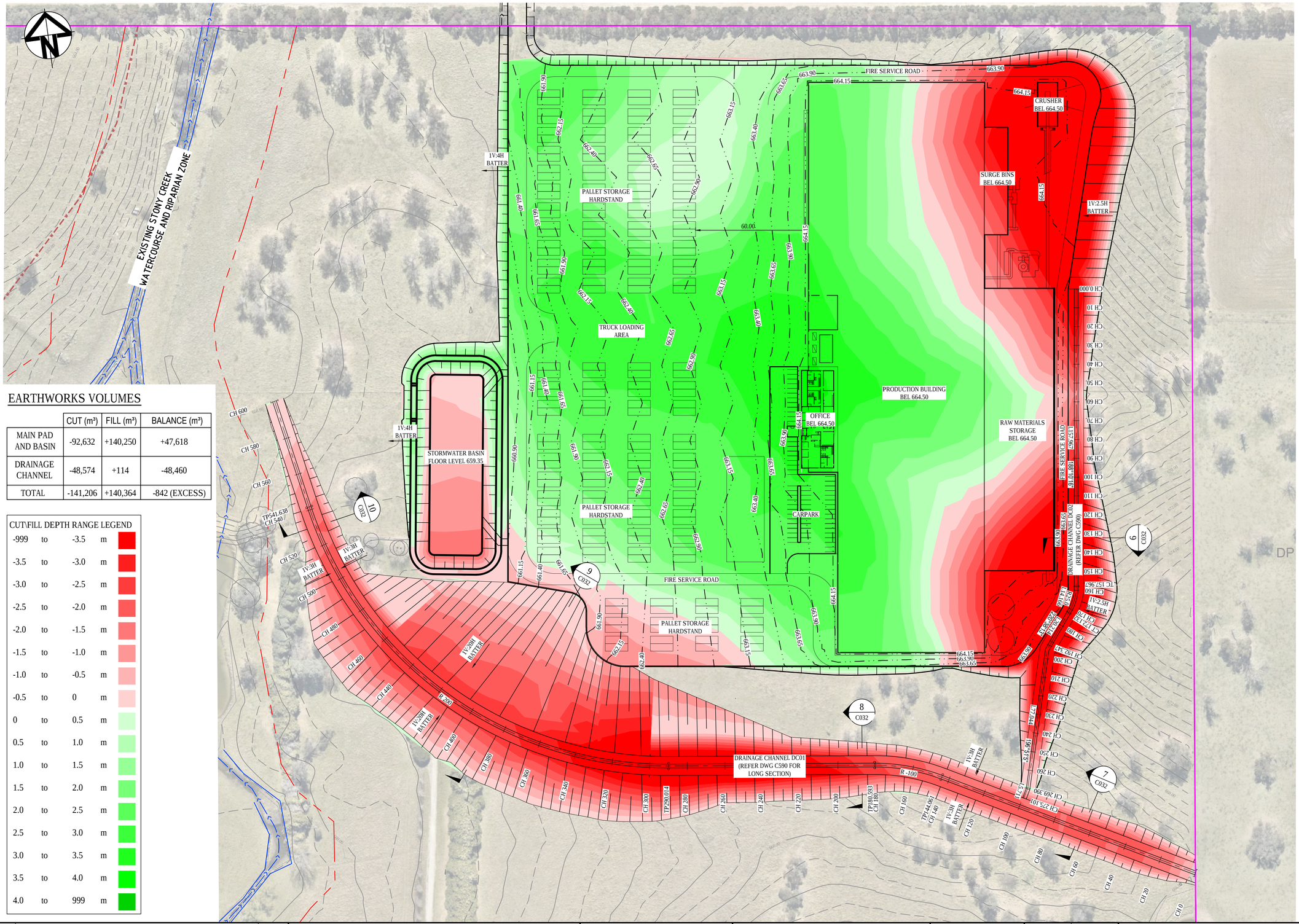
Status: FOR APPROVAL
NOT FOR CONSTRUCTION
A1

Drawing No.	Project No.	Issue
C190	19-681	B

F:\19-681 Brickworks Berrima 2\6.0 Drgs\Civil\Final\C190.dwg



EARTHWORKS VOLUMES

	CUT (m³)	FILL (m³)	BALANCE (m³)
MAIN PAD AND BASIN	-92,632	+140,250	+47,618
DRAINAGE CHANNEL	-48,574	+114	-48,460
TOTAL	-141,206	+140,364	-842 (EXCESS)

CUT\FILL DEPTH RANGE LEGEND

-999	to	-3.5	m	
-3.5	to	-3.0	m	
-3.0	to	-2.5	m	
-2.5	to	-2.0	m	
-2.0	to	-1.5	m	
-1.5	to	-1.0	m	
-1.0	to	-0.5	m	
-0.5	to	0	m	
0	to	0.5	m	
0.5	to	1.0	m	
1.0	to	1.5	m	
1.5	to	2.0	m	
2.0	to	2.5	m	
2.5	to	3.0	m	
3.0	to	3.5	m	
3.5	to	4.0	m	
4.0	to	999	m	

NOTES

1. VOLUMES SHOWN ARE APPROXIMATE ONLY AND HAVE BEEN CALCULATED BETWEEN THE PROPOSED BULK EARTHWORKS SURFACE LEVEL AND THE EXISTING SURFACE LEVEL. THE VOLUMES DO NOT TAKE INTO ACCOUNT THE FOLLOWING :-
   - TOPSOIL STRIPPING
   - BULKING FACTORS OF REMOVED CUT
   - REMOVAL AND\OR REMEDIATION OF ANY EXISTING UNCONTROLLED FILL
   - PROPOSED LANDSCAPING
   - STORMWATER AND UTILITIES TRENCHING
2. A PAVEMENT DEPTH OF 600mm HAS BEEN ASSUMED ACROSS ALL EXTERNAL HARDSTANDS & ACCESS ROADS AND 300mm UNDER BUILDING FOOTPRINTS. THIS WILL BE REFINED AT DETAILED DESIGN STAGE.

Issue	Description	Date
B	ISSUED FOR APPROVAL	28-04-20
A	ISSUED FOR REVIEW	31-03-20

Bar Scales

0 20 40 60 80 100m

1 : 1000 @ A1 1 : 2000 @ A3

Client: BRICKWORKS LIMITED

Scales	1:1000
Grid	
Height Datum	AHD
Drawn	ALS
Designed	ALS
Checked	OJ
Approved	SH

Project: PROPOSED BRICKWORKS FACTORY
416-524 BERRIMA ROAD
MOSS VALE

Title: BULK EARTHWORKS CUT/FILL PLAN

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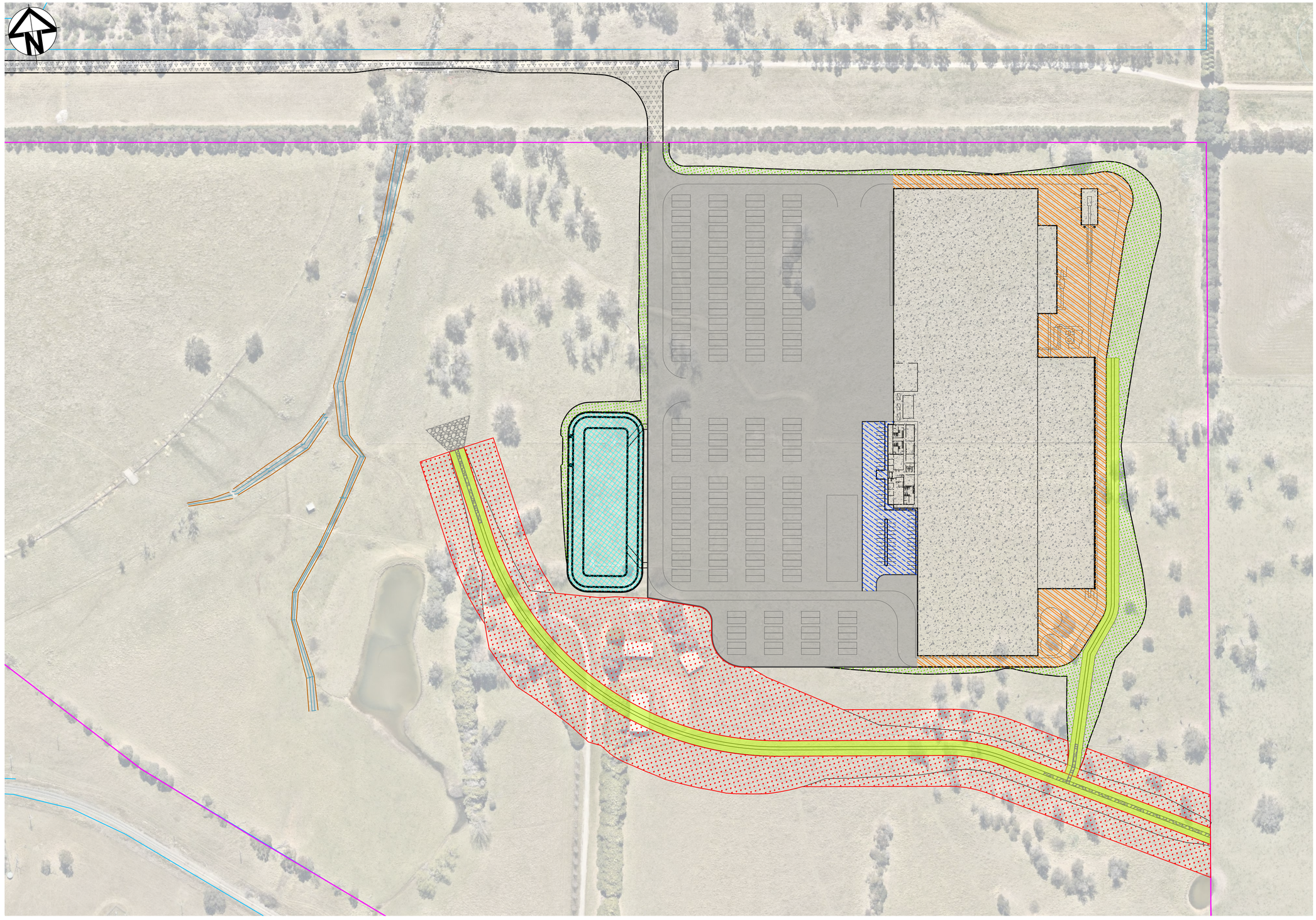
Status		
FOR APPROVAL NOT FOR CONSTRUCTION		A1
Drawing No.	Project No.	Issue
C200	19-681	B

100mm on Original

F:\19-681 Brickworks Berrima 2\6.0 Drgs\Civil\Final\C200.dwg



PAVEMENT LEGEND

- HEAVY DUTY HARDSTAND PAVEMENT
  (INTERLOCKING CONCRETE BLOCKS)
  48,284m²
- BUILDING SLAB
  (REFER STRUCTURAL ENGINEERING DOCUMENTATION)
  33,770m²
- REAR ACCESS ROAD PAVEMENT
  9,621m²
- LIGHT DUTY CARPARK PAVEMENT
  2,587m²
- HEAVY DUTY ENTRY ROAD PAVEMENT
  5,403m²
- PERIMETER LANDSCAPING
  (REFER LANDSCAPE ARCHITECT'S DOCUMENTATION)
  8,273m²
- BASIN LANDSCAPING
  (REFER LANDSCAPE ARCHITECT'S DOCUMENTATION)
  5,494m²
- RIPARIAN LANDSCAPING
  (REFER LANDSCAPE ARCHITECT'S DOCUMENTATION)
  30,673m²
- DRAINAGE CHANNEL LANDSCAPING
  (REFER LANDSCAPE ARCHITECT'S DOCUMENTATION)
  8,238m²
- ROCK-LINING
  DUMPED ROCK OVER GEOFABRIC
  748m²

Issue	Description	Date
B	ISSUED FOR APPROVAL	28-04-20
A	ISSUED FOR REVIEW	31-03-20

Bar Scales

0 25 50 75 100 125m

1 : 1250 @ A1 1 : 2500 @ A3

Client: BRICKWORKS LIMITED

Scales: 1:1000

Grid:

Height Datum: AHD

Drawn	ALS
Designed	ALS
Checked	OJ
Approved	SH

Project: PROPOSED BRICKWORKS FACTORY
416-524 BERRIMA ROAD
MOSS VALE

Title: PAVEMENT PLAN

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Status: FOR APPROVAL
NOT FOR CONSTRUCTION

A1

Drawing No.	Project No.	Issue
C400	19-681	B

100mm on Original

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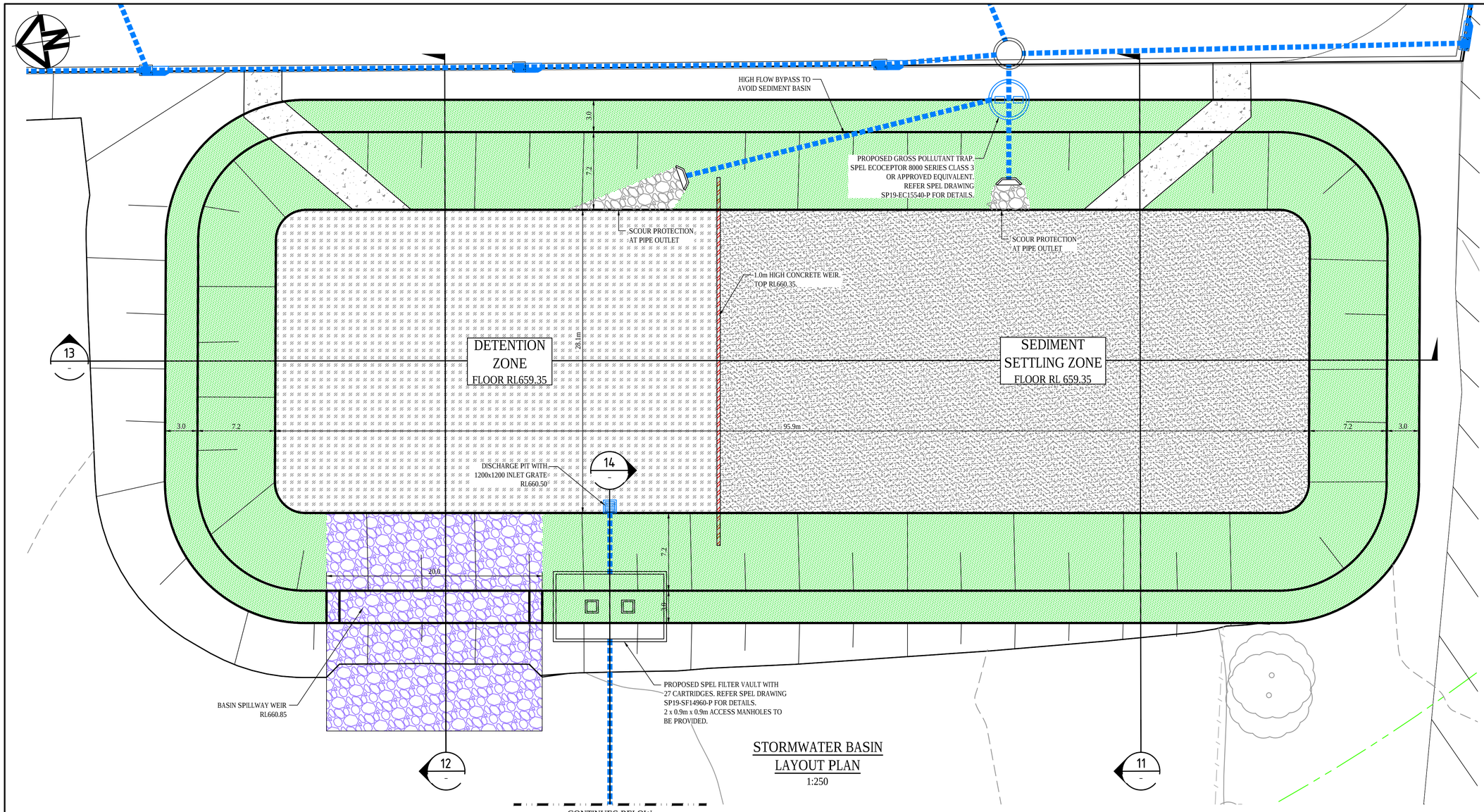
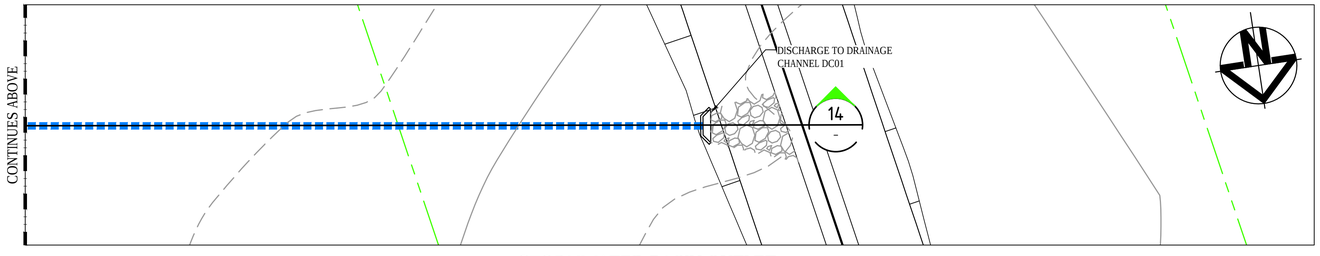


STORMWATER BASIN LAYOUT PLAN

1:250

LEGEND

- DETENTION BASIN ZONE
- SEDIMENT SETTLING & STORAGE BASIN ZONE
- STORMWATER PIPE OUTLET SCOUR PROTECTION
- SPILLWAY SCOUR PROTECTION
- CONCRETE MAINTENANCE ACCESS RAMP
- LANDSCAPED BATTER (REFER LANDSCAPE ARCHITECT'S DOCUMENTATION)



STORMWATER BASIN OUTLET DISCHARGE PLAN

1:250

Issue	Description	Date
B	ISSUED FOR APPROVAL	28-04-20
A	ISSUED FOR REVIEW	31-03-20

Bar Scales

0 5 10 15 20 25m

1 : 250 @ A1 1 : 500 @ A3

Client: BRICKWORKS LIMITED

Scales	1:250	Drawn	ALS
		Designed	ALS
Grid		Checked	OJ
Height Datum	AHD	Approved	SH

Project: PROPOSED BRICKWORKS FACTORY
416-524 BERRIMA ROAD
MOSS VALE

Title: STORMWATER BASIN LAYOUT PLAN

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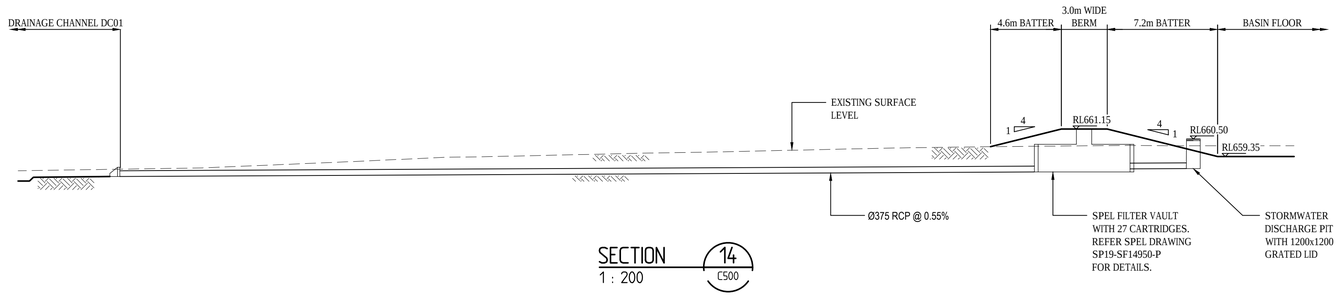
Status: FOR APPROVAL
NOT FOR CONSTRUCTION

A1

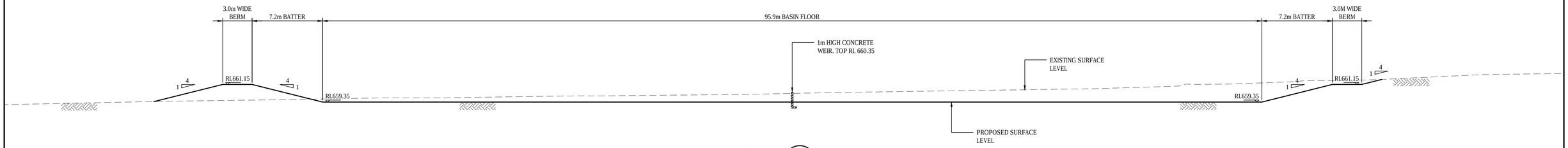
Drawing No.	Project No.	Issue
C500	19-681	B

100mm on Original

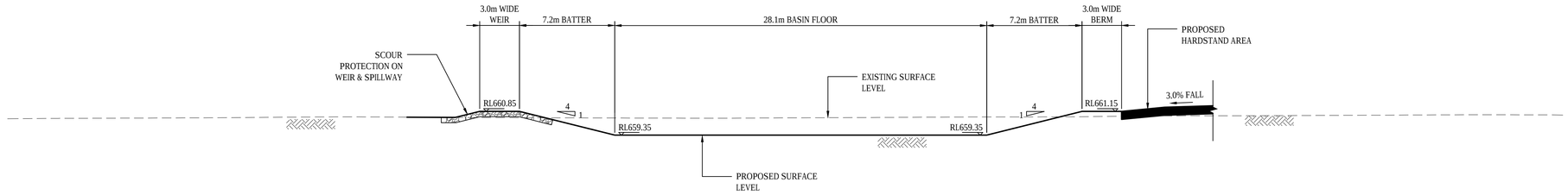
F:\19-681 Brickworks Berrima 2\6.0 Drgs\Civil\Final\C500.dwg



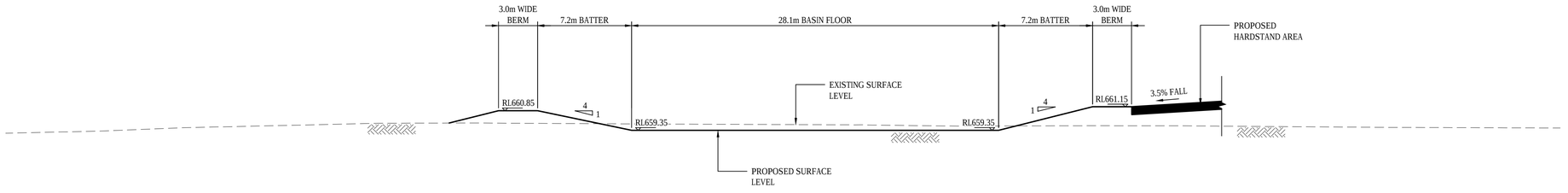
SECTION 14
1 : 200 C500



SECTION 13
1 : 200 C500



SECTION 12
1 : 200 C500



SECTION 11
1 : 200 C500

Issue	Description	Date
B	ISSUED FOR APPROVAL	28-04-20
A	ISSUED FOR REVIEW	31-03-20

Bar Scales

0 5 10 15 20m

1 : 200 @ A1 1 : 400 @ A3

Client: BRICKWORKS LIMITED

Scales: AS SHOWN
Grid:
Height Datum: AHD

Drawn	ALS
Designed	ALS
Checked	OJ
Approved	SH

Project: PROPOSED BRICKWORKS FACTORY
416-524 BERRIMA ROAD
MOSS VALE

Title: STORMWATER BASIN SECTIONS

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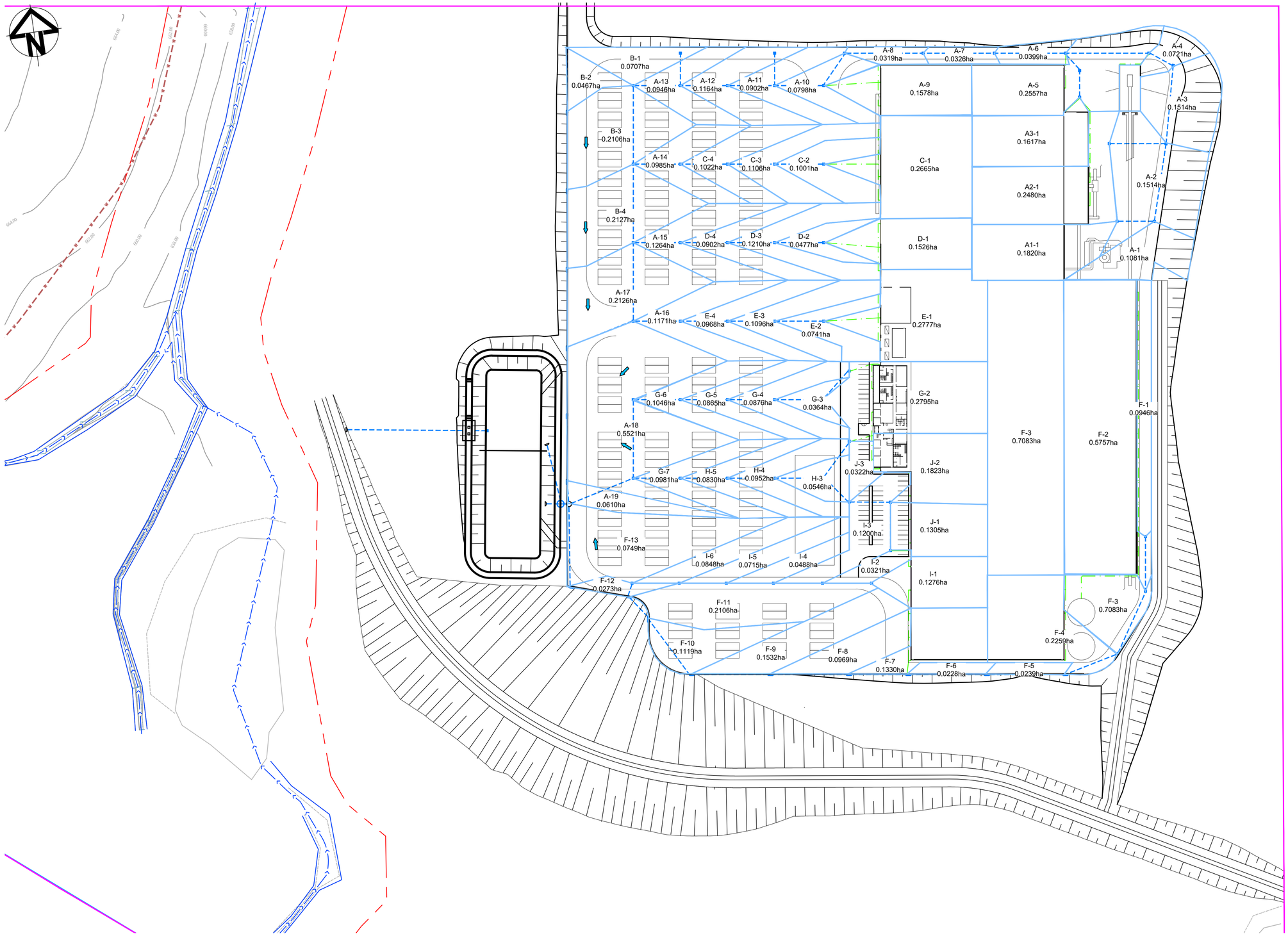
Status: FOR APPROVAL
NOT FOR CONSTRUCTION

A1

Drawing No.	Project No.	Issue
C510	19-681	B

100mm on Original

F:\19-681 Brickworks Berrima 2\6.0 Drgs\Civil\Final\C510.dwg



Issue	Description	Date
B	ISSUED FOR APPROVAL	28-04-20
A	ISSUED FOR REVIEW	31-03-20

Bar Scales

0 20 40 60 80 100m

1 : 1000 @ A1 1 : 2000 @ A3

Client

BRICKWORKS LIMITED

Scales	1:1000
Grid	
Height Datum	AHD

Drawn	ALS
Designed	ALS
Checked	OJ
Approved	SH

Project

PROPOSED BRICKWORKS FACTORY
416-524 BERRIMA ROAD
MOSS VALE

Title

STORMWATER DRAINAGE CATCHMENTS PLAN

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Status		Issue
FOR APPROVAL NOT FOR CONSTRUCTION		A1
Drawing No.	Project No.	Issue
C580	19-681	B

100mm on Original

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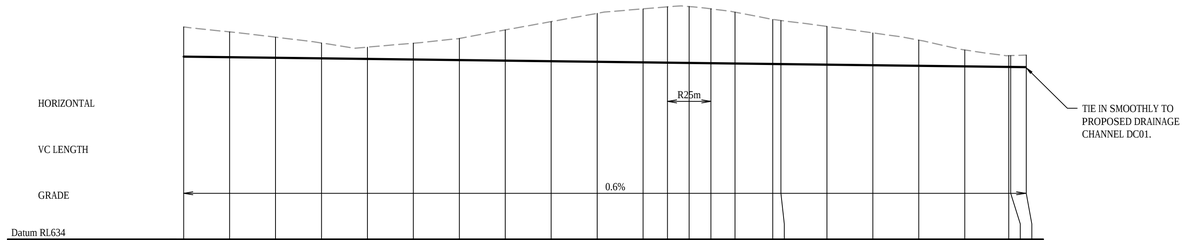


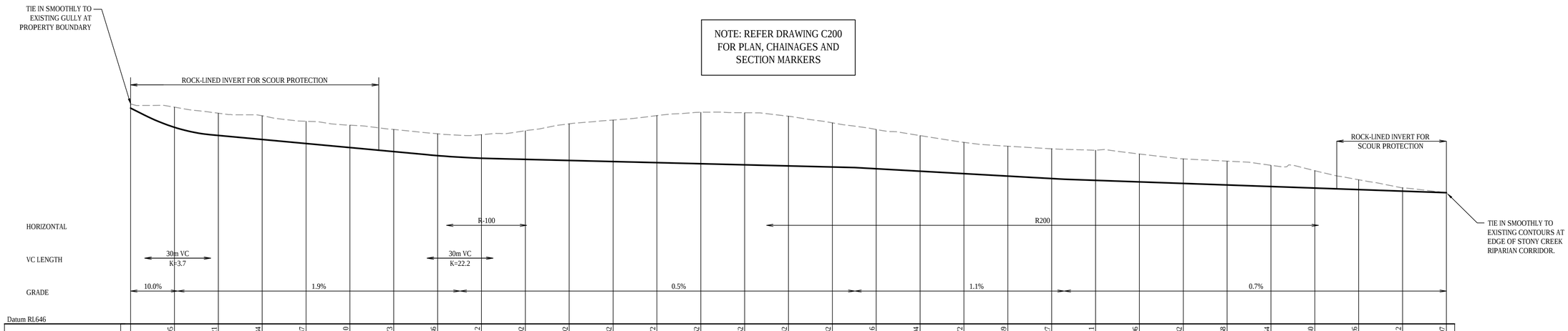
Datum RL634

PROPOSED SURFACE LEVEL	663.80	663.71	663.61	663.52	663.42	663.33	663.24	663.14	663.05	662.96	662.86	662.81	662.77	662.72	662.67	662.60	662.58	662.49	662.39	662.30	662.20	662.11	662.11			
EXISTING SURFACE LEVEL	668.64	667.84	666.98	666.03	665.35	665.99	666.76	668.16	669.52	670.86	671.60	671.93	671.98	671.60	671.06	669.87	669.69	668.72	667.68	666.49	664.89	663.97	663.98	664.06		
CHAINAGE	0.000	15.000	30.000	45.000	60.000	75.000	90.000	105.000	120.000	135.000	150.000	157.967	165.000	172.132	180.000	192.347	195.000	210.000	225.000	240.000	255.000	269.390	270.000	275.101		

DRAINAGE CHANNEL DC02 LONGITUDINAL SECTION

SCALE 1:1000 HORI.
1:200 VERT.

NOTE: REFER DRAWING C200 FOR PLAN, CHAINAGES AND SECTION MARKERS



Datum RL646

PROPOSED SURFACE LEVEL		663.95	663.21	662.84	662.47	662.10	661.73	661.36	661.12	661.02	660.92	660.82	660.72	660.62	660.52	660.42	660.32	660.16	659.94	659.72	659.49	659.27	659.11	658.96	658.82	658.68	658.54	658.40	658.26	658.12	657.97
EXISTING SURFACE LEVEL	666.08	665.79	665.23	665.00	664.50	664.14	663.75	663.36	663.28	663.64	664.27	664.61	665.02	665.32	665.28	664.96	664.36	663.75	663.19	662.57	662.22	661.99	661.85	661.51	661.07	660.86	660.48	659.99	659.16	658.44	657.99
CHAINAGE	0.00	20.00	40.00	60.00	80.00	100.00	120.00	140.00	160.00	180.00	200.00	220.00	240.00	260.00	280.00	300.00	320.00	340.00	360.00	380.00	400.00	420.00	440.00	460.00	480.00	500.00	520.00	540.00	560.00	580.00	600.00

DRAINAGE CHANNEL DC01 LONGITUDINAL SECTION

SCALE 1:1000 HORI.
1:200 VERT.

Issue	Description	Date
B	ISSUED FOR APPROVAL	28-04-20
A	ISSUED FOR REVIEW	31-03-20

Bar Scales

0 5 10 15 20m
1 : 200 @ A1 1 : 400 @ A3

0 20 40 60 80 100m
1 : 1000 @ A1 1 : 2000 @ A3

100mm on Original

Client: BRICKWORKS LIMITED

Scales	AS SHOWN	Drawn	ALS
		Designed	ALS
Grid		Checked	OJ
Height Datum	AHD	Approved	SH

Project: PROPOSED BRICKWORKS FACTORY
416-524 BERRIMA ROAD
MOSS VALE

Title: DRAINAGE CHANNEL LONGITUDINAL SECTIONS

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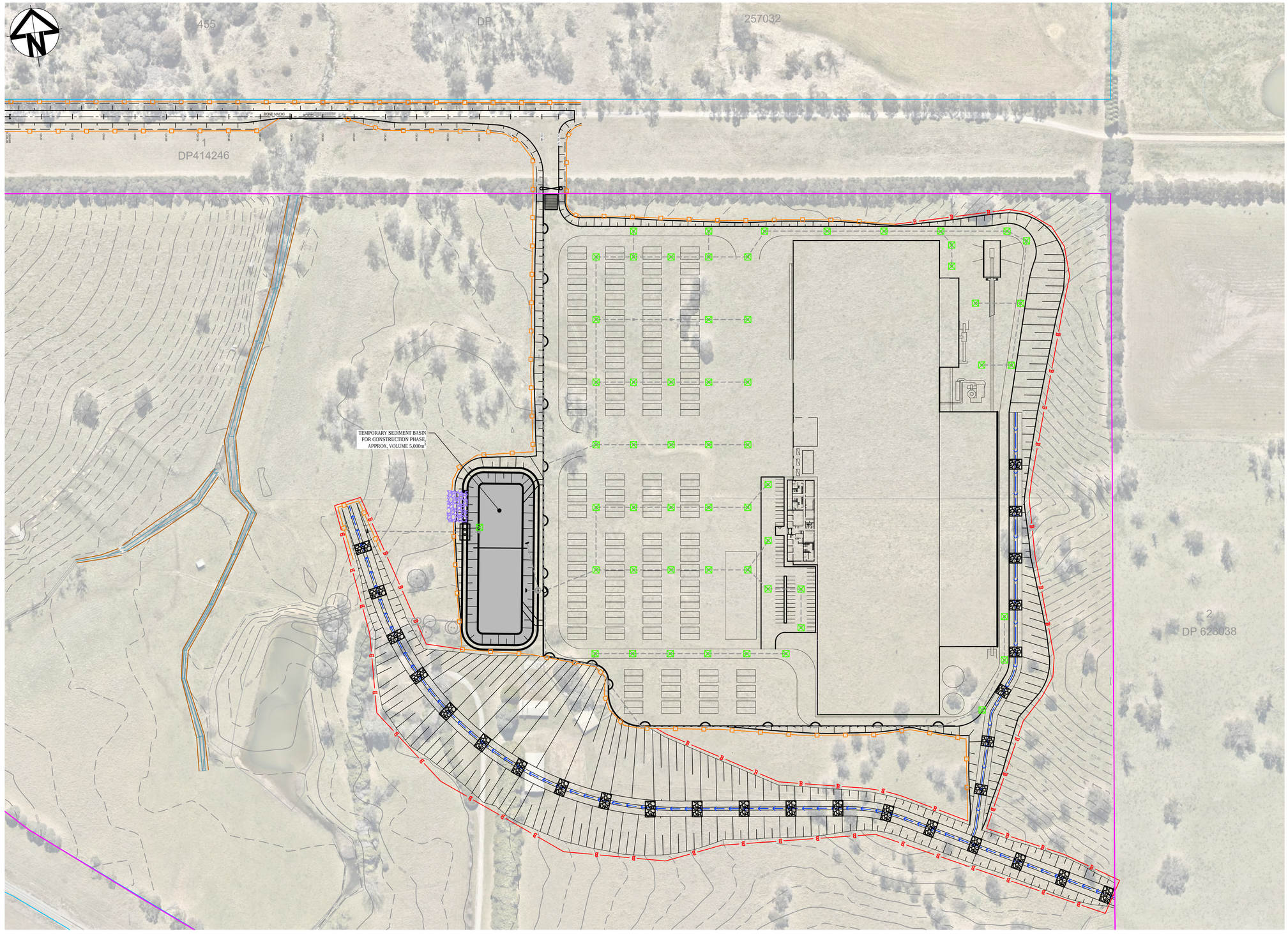
Status: FOR APPROVAL
NOT FOR CONSTRUCTION

A1

Drawing No.	Project No.	Issue
C590	19-681	B

F:\19-681 Brickworks Berrima 2\6.0 Drgs\Civil\Final\C590.dwg



LEGEND

- SEDIMENT FENCE (SD 6-8)
- CATCH DRAIN
- BARRIER FENCE
- STRAW BALE FILTER (SD 6-7)
- MESH AND GRAVEL INLET FILTER (SD 6-11)
- GEOTEXTILE INLET (SD 6-12)
- CHECK DAM (30m SPACINGS)
- STABILISED SITE ACCESS AND TRUCK WASH DOWN AREA (SD 6-14)
- PROPOSED SITE ACCESS GATE

NOTE

1. FOR SEDIMENT AND EROSION DETAILS REFER TO C650
2. FOR GENERAL NOTES REFER TO C010

Issue	Description	Date
B	ISSUED FOR APPROVAL	28-04-20
A	ISSUED FOR REVIEW	31-03-20

Bar Scales

0 20 40 60 80 100m

1 : 1000 @ A1 1 : 2000 @ A3

Client: BRICKWORKS LIMITED

Scales	1:1000	Drawn	ALS
		Designed	ALS
Grid		Checked	OJ
Height Datum	AHD	Approved	SH

Project: PROPOSED BRICKWORKS FACTORY
416-524 BERRIMA ROAD
MOSS VALE

Title: EROSION AND SEDIMENT CONTROL PLAN

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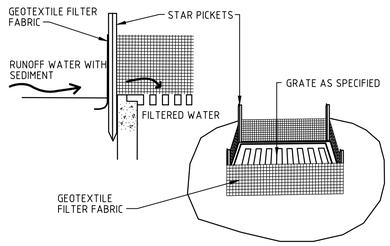
Status: FOR APPROVAL
NOT FOR CONSTRUCTION

A1

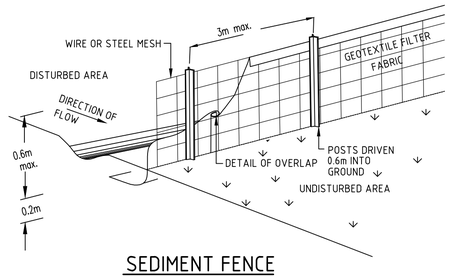
Drawing No.	Project No.	Issue
C600	19-681	B

100mm on Original

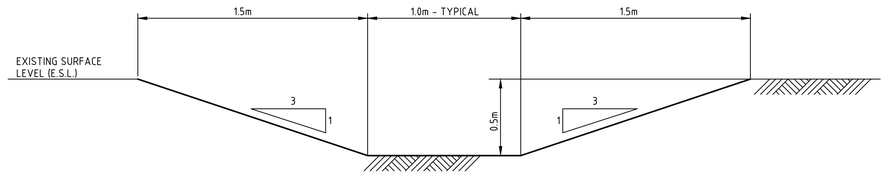
F:\19-681 Brickworks Berrima 2\6.0 Drgs\Civil\Final\C600.dwg



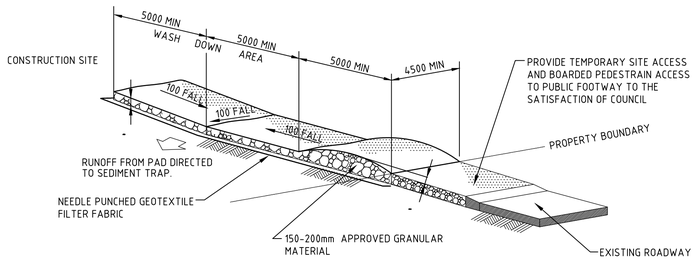
GEOTEXTILE FILTER PIT SURROUND
NTS



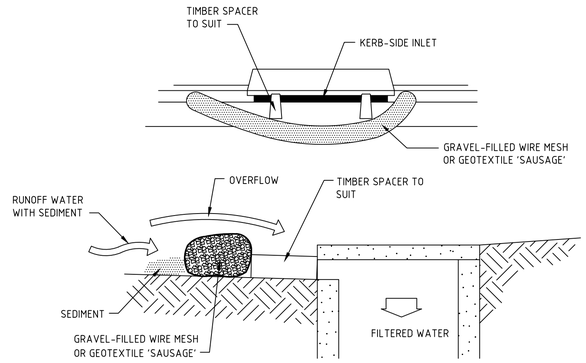
SEDIMENT FENCE
NTS



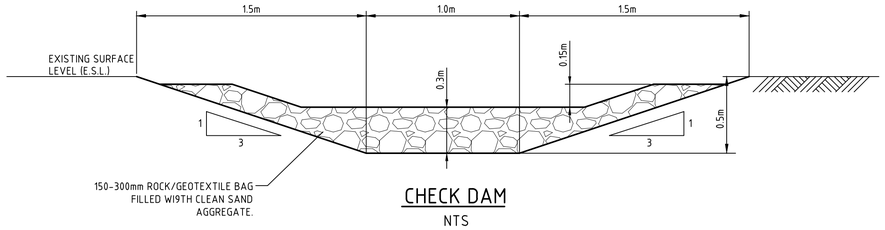
TEMPORARY CATCH DRAIN
(MIN FALL 0.5%)
NTS



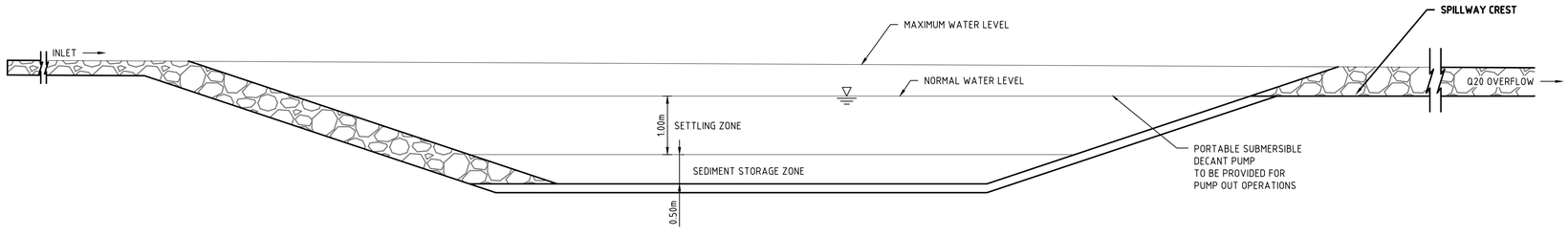
STABILISED SITE ACCESS AND TRUCK WASH DOWN AREA
NTS



MESH AND GRAVEL INLET FILTER
NTS



CHECK DAM
NTS



TEMPORARY SEDIMENT BASIN (TYPE F/D)
NTS

Issue	Description	Date
B	ISSUED FOR APPROVAL	28-04-20
A	ISSUED FOR REVIEW	31-03-20

Bar Scales

Client: BRICKWORKS LIMITED

Scales	NA	Drawn	ALS
		Designed	ALS
Grid		Checked	OJ
Height Datum	AHD	Approved	SH

Project: PROPOSED BRICKWORKS FACTORY
416-524 BERRIMA ROAD
MOSS VALE

Title: EROSION AND SEDIMENT CONTROL DETAILS

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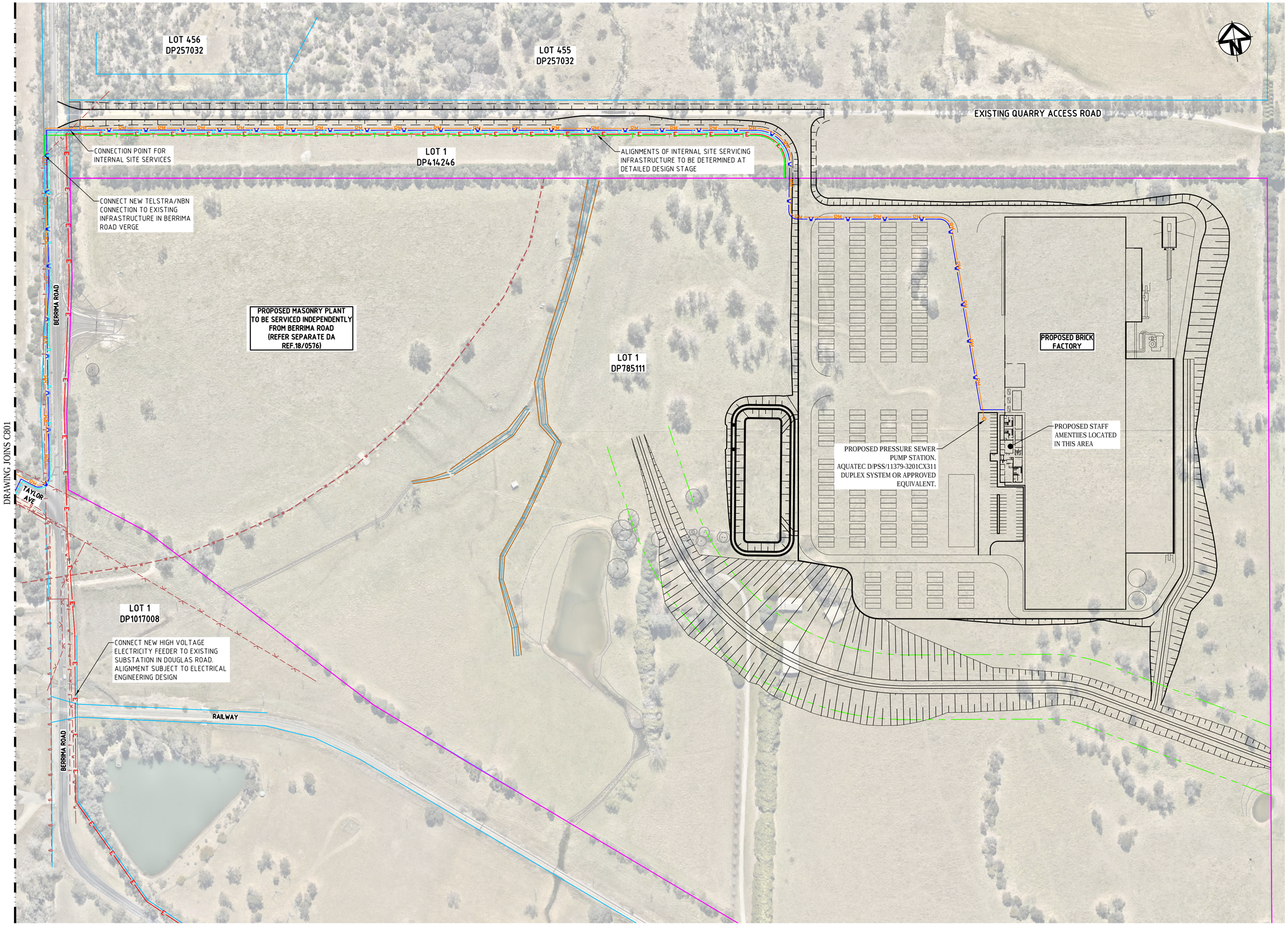
Status: FOR APPROVAL
NOT FOR CONSTRUCTION

A1

Drawing No.	Project No.	Issue
C650	19-681	B

100mm on Original

F:\19-681 Brickworks Berrima 2\6.0 Drgs\Civil\Final\C650.dwg



LEGEND

- EXISTING TELSTRA
- EXISTING ELECTRICITY OVERHEAD
- EXISTING WATER
- EXISTING GAS
- EXISTING SEWER
- PROPOSED ELECTRICAL
- PROPOSED COMMUNICATIONS
- PROPOSED GAS MAIN
- PROPOSED MATER MAIN
- PROPOSED SEWER RISING MAIN
- PROPOSED PRIVATE PRESSURE SEWER PUMP UNIT

Issue	Description	Date
B	ISSUED FOR APPROVAL	28-04-20
A	ISSUED FOR REVIEW	31-03-20

Bar Scales

0 30 60 90 120 150m

1 : 1500

Client: BRICKWORKS LIMITED

Scales	1:1500
Grid	
Height Datum	AHD
Drawn	ALS
Designed	ALS
Checked	OJ
Approved	SH

Project: PROPOSED BRICKWORKS FACTORY
416-524 BERRIMA ROAD
MOSS VALE

Title: CONCEPT SERVICES AND UTILITIES PLAN SHEET 1

Civil Engineers and Project Managers
at&l
Level 7, 153 Walker Street
North Sydney NSW 2060
ABN 96 130 882 405
Tel: 02 9439 1777
Fax: 02 9423 1055
www.atl.net.au
info atl.net.au

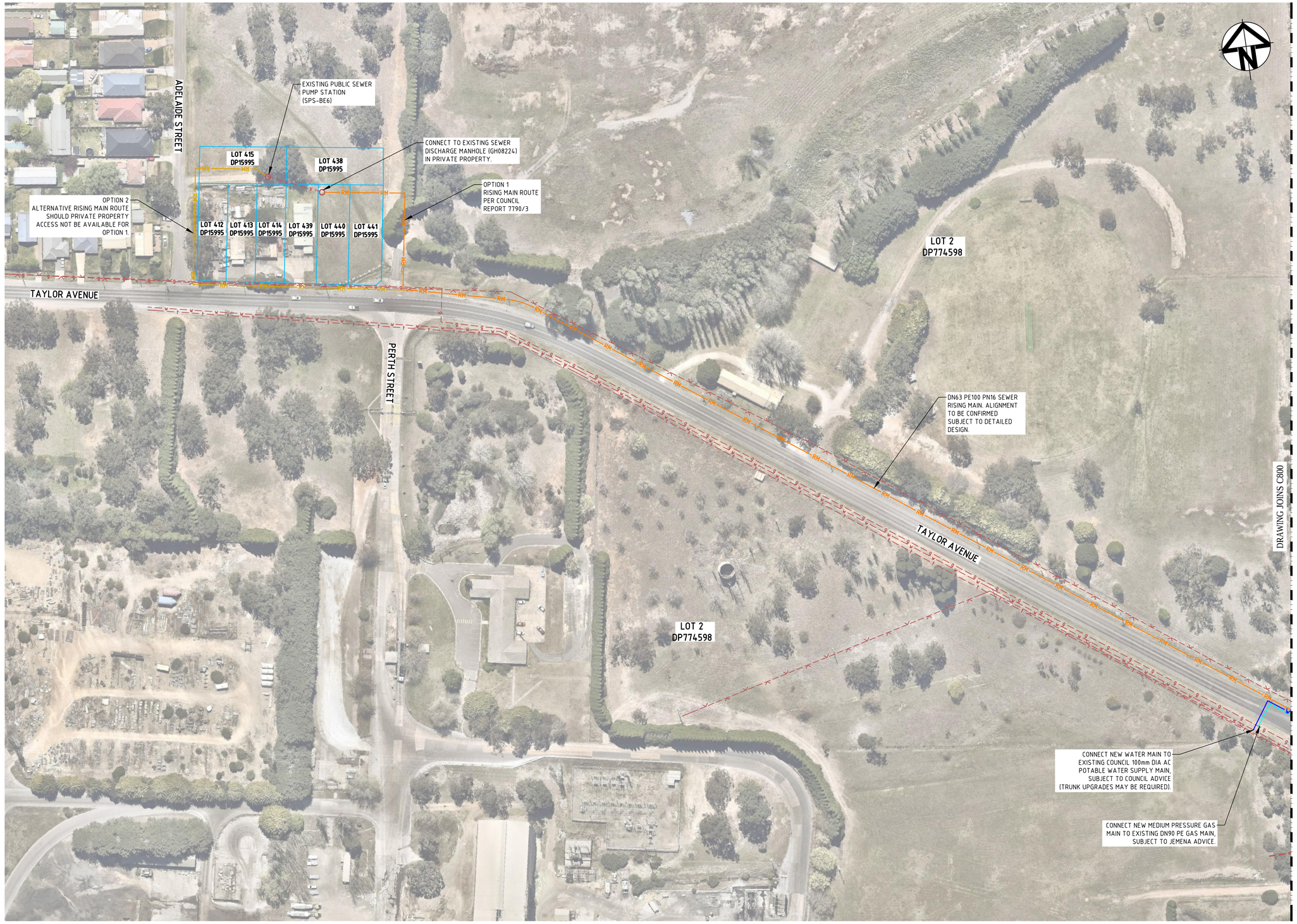
Status: FOR APPROVAL
NOT FOR CONSTRUCTION

A1

Drawing No.	Project No.	Issue
C800	19-681	B

100mm on Original

F:\19-681 Brickworks Berrima 2\6.0 Drgs\Civil\Final\C800.dwg



LEGEND

- EXISTING TELSTRA
- EXISTING ELECTRICITY OVERHEAD
- EXISTING WATER
- EXISTING GAS
- EXISTING SEWER
- PROPOSED ELECTRICAL
- PROPOSED COMMUNICATIONS
- PROPOSED GAS MAIN
- PROPOSED MATER MAIN
- PROPOSED SEWER RISING MAIN
- PROPOSED PRIVATE PRESSURE SEWER PUMP UNIT

Issue	Description	Date
B	ISSUED FOR APPROVAL	28-04-20
A	ISSUED FOR REVIEW	31-03-20

100mm on Original

Bar Scales

0 25 50 75 100 125m

1 : 1250 @ A1 1 : 2500 @ A3

Client: BRICKWORKS LIMITED

Scales	1:1000	Drawn	ALS
		Designed	ALS
Grid		Checked	OJ
Height Datum	AHD	Approved	SH

Project: PROPOSED BRICKWORKS FACTORY
416-524 BERRIMA ROAD
MOSS VALE

Title: CONCEPT SERVICES AND UTILITIES PLAN SHEET 2

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Status: FOR APPROVAL
NOT FOR CONSTRUCTION

A1

Drawing No.	Project No.	Issue
C801	19-681	B

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Appendix B

SMEC Flood Study Report

SMEC
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local people
global experience

Flood Impact Assessment

New Berrima Brickworks Facility
416-524 Berrima Rd, Moss Vale

Reference No. 30012599
Prepared for: AT&L Associates
9 March 2020

SMEC INTERNAL REF. 30012599

Document Control

Document:	Flood Impact Assessment
File Location:	I:\projects\30012599 – WR Small Jobs - Sydney\700 - Berrima\04 Documents\02 Working\01 Reports
Project Name:	New Berrima Brickworks Facility 416-524 Berrima Rd, Moss Vale
Project Number:	30012599
Revision Number:	1

Revision History

REVISION NO.	DATE	PREPARED BY	REVIEWED BY	APPROVED FOR ISSUE BY
1 (DRAFT)	19 November 2019	Joseph Shen	Ian Rowbottom	Donnie Carroll
1	9 March 2020	Donnie Carroll	Gus Naghib	Donnie Carroll

Issue Register

DISTRIBUTION LIST	DATE ISSUED	NUMBER OF COPIES
AT&L Associates	9 March 2020	1

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Email:	Donald.Carroll@smec.com	Website:	www.smec.com

Important Notice

This report is confidential and is provided solely for the purposes of providing AT&L Associates with a Flood Impact Assessment for the proposed development at 416 Berrima Road. This report is provided pursuant to a Consultancy Agreement between SMEC Australia Pty Limited ("SMEC") and AT&L Associates under which SMEC undertook to perform a specific and limited task for AT&L Associates. This report is strictly limited to the matters stated in it and subject to the various assumptions, qualifications and limitations in it and does not apply by implication to other matters. SMEC makes no representation that the scope, assumptions, qualifications and exclusions set out in this report will be suitable or sufficient for other purposes nor that the content of the report covers all matters which you may regard as material for your purposes.

This report must be read as a whole. The executive summary is not a substitute for this. Any subsequent report must be read in conjunction with this report.

The report supersedes all previous draft or interim reports, whether written or presented orally, before the date of this report. This report has not and will not be updated for events or transactions occurring after the date of the report or any other matters which might have a material effect on its contents or which come to light after the date of the report. SMEC is not obliged to inform you of any such event, transaction or matter nor to update the report for anything that occurs, or of which SMEC becomes aware, after the date of this report.

Unless expressly agreed otherwise in writing, SMEC does not accept a duty of care or any other legal responsibility whatsoever in relation to this report, or any related enquiries, advice or other work, nor does SMEC make any representation in connection with this report, to any person other than AT&L Associates. Any other person who receives a draft or a copy of this report (or any part of it) or discusses it (or any part of it) or any related matter with SMEC, does so on the basis that he or she acknowledges and accepts that he or she may not rely on this report nor on any related information or advice given by SMEC for any purpose whatsoever.

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Abbreviations and Acronyms

ABBREVIATION/ ACRONYM	DESCRIPTION
AEP	Annual Exceedance Probability
AHD	Australian Height Datum
ARR	Australian Rainfall and Runoff
WSC	Wingecarribee Shire Council

1 Introduction

1.1 Site Information

AT&L Associates are developing a civil engineering design for a proposed industrial development on the 52-hectare site at 416 Berrima Road, New Berrima. A masterplan is currently being developed for the entire site. The site is located within Wingecarribee Shire Council's (WSC) local government area. The development proposal is to create two building pads, as shown in Figure 1.1, which will be raised above the 1% AEP flood level.

SMEC Australia Pty Ltd (SMEC) have been engaged by AT&L Associates to assess the potential impact of the proposed development on flooding. The subject site is affected by flooding in the 1% AEP storm event from Stony Creek, which is a tributary of the Wingecarribee River. Hydraulic modelling has been undertaken to ensure no worsening of flood levels upstream and downstream of the subject site. SMEC previously prepared a Flood Study and model for the Wingecarribee River (January 2014), which will be utilised for this studies' hydraulic modelling.

SMEC previously submitted a technical note (see Appendix A) outlining the findings of the flood impact assessment for the proposed development in April 2018. This report is a follow on to the technical note, which suggested modifications to pad 2 to ensure no adverse impact on flood levels based on discussions with WSC and the Office of Environment and Heritage (OEH). Pad 1 has been approved by Council (18/0576) whilst this DA refers to the revised pad 2 design. For the purposes of flood modelling the Pad 1 design is incorporated into the design although its suitability is not being assessed as this design has already been approved.

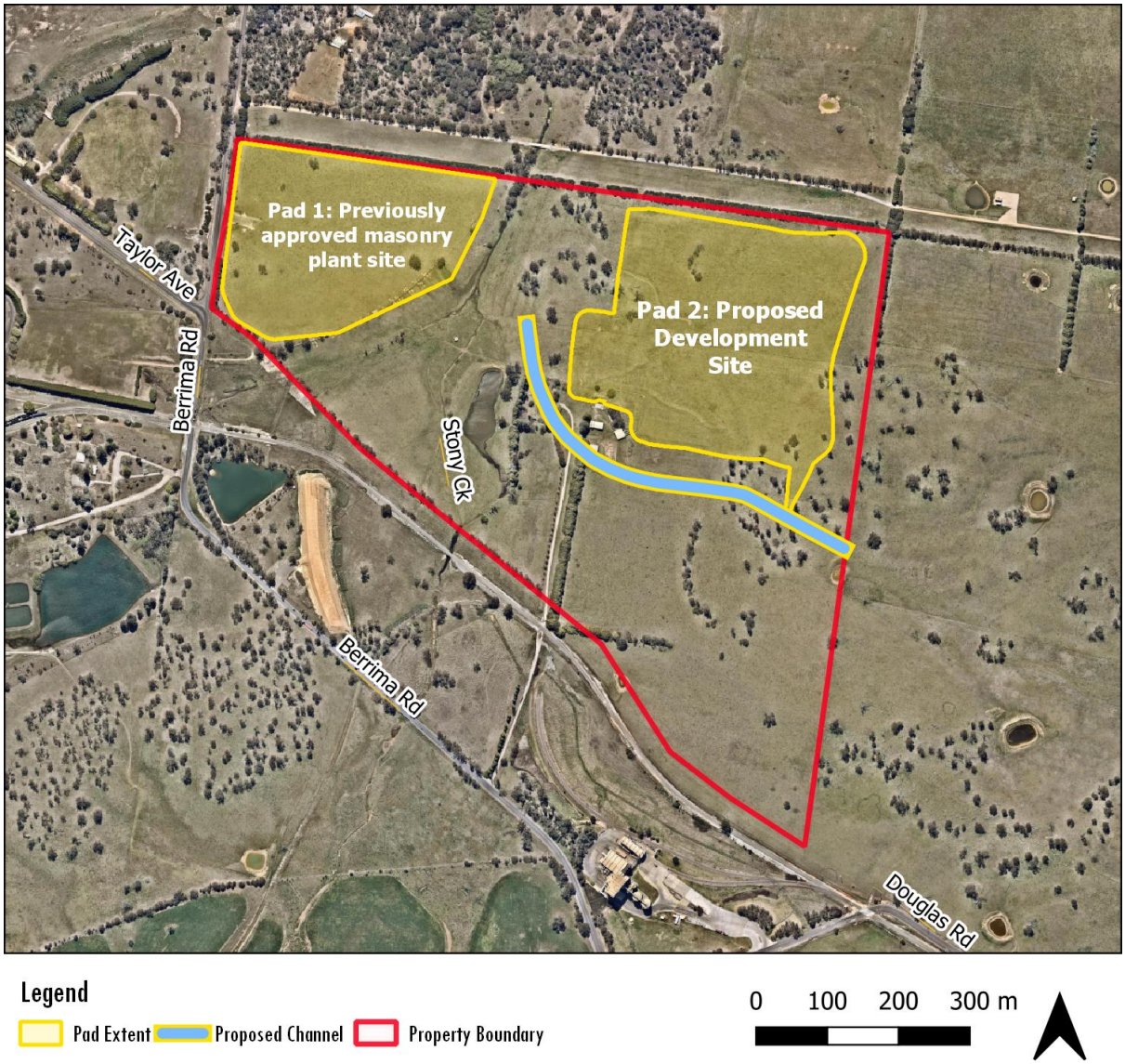

Figure 1.1: Site Layout

1.2 Summary of Initial Flood Impact Assessment

In SMEC's previous technical note (dated April 2018), a flood impact assessment for the proposed development was conducted. The regional flood model that was originally developed for the 2014 Wingecarribee River Flood Study was modified as noted in Section 2.1 and was used to determine the flooding performance of the proposed development.

It was noted that off-site impacts from the development should be less than 50 mm (within modelling accuracy), as per discussions with WSC and the OEH. However, while the north-western pad was outside of the floodplain and caused no increase in flood levels, the modelling indicated that pad 2 resulted in increased flood levels greater than 50 mm outside of the property boundary. This was mainly caused by the loss of flood storage due to the filling for the north-eastern pad.

In response, the design was revised to minimise the impact on flood storage with pad 2 modified. This final design had no adverse impacts on flood levels, with the peak water level increases being below 50 mm outside of the property boundary during the 1% AEP event.

2 Flood Impact Assessment

2.1 TUFLOW Model Modifications

The model used in this assessment used the 2014 Wingecarribee River Flood Study as the base case model. The following changes were made to the regional flood model:

- The model domain was reduced in size to decrease model simulation times.
- The model was upgraded to the latest TUFLOW version.
- The 10 m grid size was reduced to 5 m to improve modelling accuracy and better reflect the smaller area of the subject site compared to the regional model. The previous assessment (April 2018) utilised a 10 m grid. However, to model the new proposed channel accurately, the grid size was decreased to 5 m in this assessment.
- The entire upstream catchment was modelled as rain on grid, whereas in the regional model a small proportion was modelled through an input WBNM hydrograph.
- The form loss coefficients for some structures were reduced to a more reasonable number.
- Areal Reduction Factors (ARF's) have not been considered due to the small size of the upstream catchment. For the regional model, an ARF for the entire Wingecarribee River catchment was applied.
- Soil initial and continual losses were reduced for the PMF storm event.
- Several other storm durations have now been considered with the 2 hour and 6 hour storms being critical at the Site. The regional model was only simulated for the 12 hour storm duration.

This model was then applied to the altered development pads provided as TINs by AT&L.

Since SMEC's previous technical note, the proposed channel to the south of the north-eastern (pad 2) has been widened. This was achieved by reducing the size of pad 2. A low maintenance, naturalised, landscaped channel is recommended (and has been assumed in the modelling), with hard engineering structures avoided where possible in favour of more natural grassed surfaces and riprap.

2.2 Base Case Results

The modified TUFLOW model was run for the 10% AEP, 1% AEP, 0.2% AEP and PMF design storm events. The 1% AEP design event was noted as Councils flood planning level for the Site. The 2-hour storm was found to be critical for the 10%, 1% and 0.2% AEP events whilst the 5 hour storm was critical for the PMF. Figure 2.1 shows the Existing Case 1% AEP flood depths and the proposed development configuration. The following is noted from Figure 2.1:

- A diversion channel is required to convey the flows from the east below Pad 2.
- A diversion channel is required to convey the flows from Pad 2's upstream catchment to the east (approximately 6.5 Ha).
- The western sections of pad 2 encroaches on the Stoney Creek flood storage area.

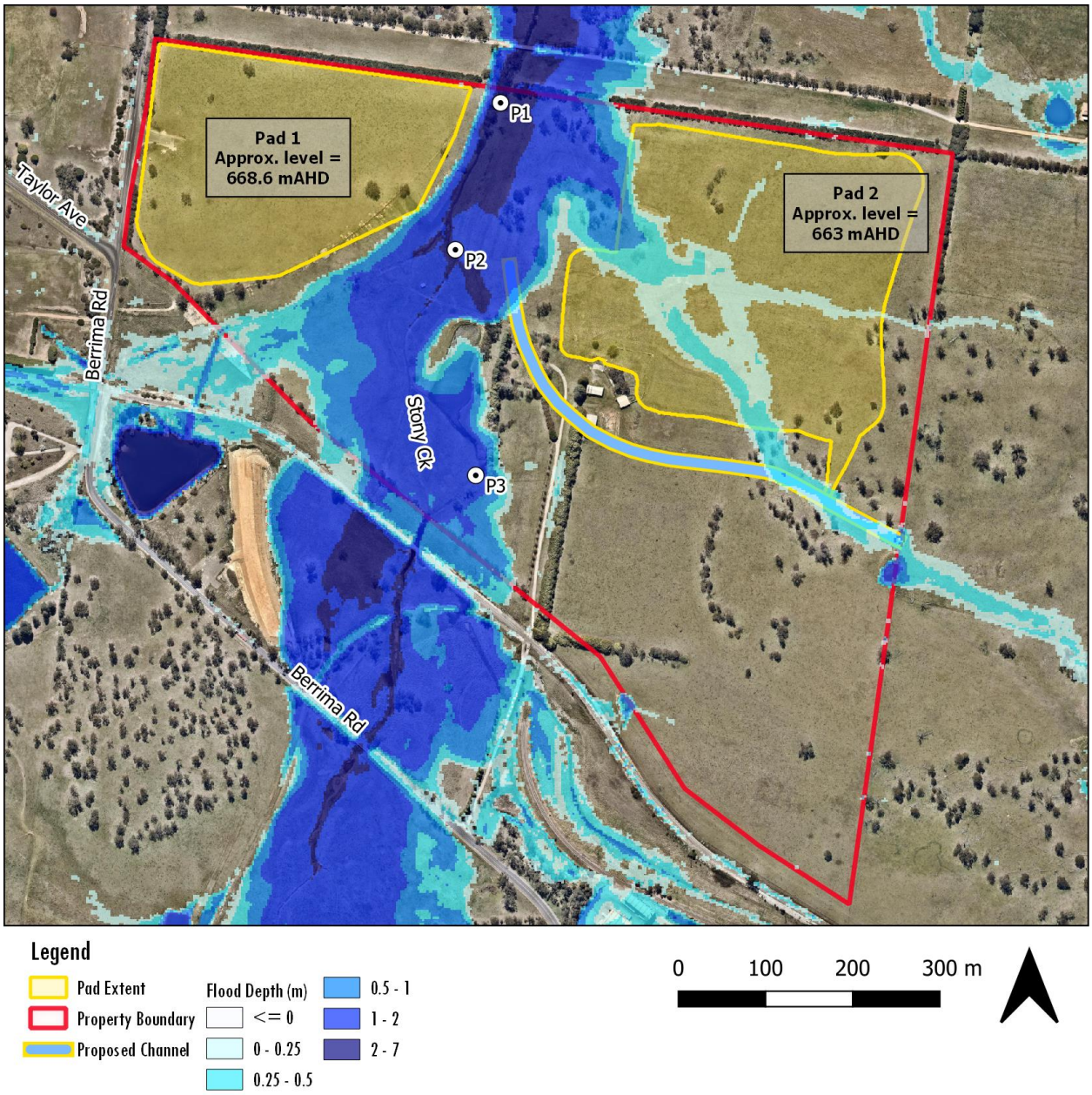

Figure 2.1: 1% AEP Peak Flood Depth Existing Case (2-hour event)

2.2.1 Existing Hydraulic Categorisation

The proposed development pads are situated within 1% AEP flood storage areas of the floodplain rather than the floodway of Stony Creek with minimal conveyance through the proposed development site. Figure 2.2 below shows the 1% AEP flood event hazard classification with the development overlayed.

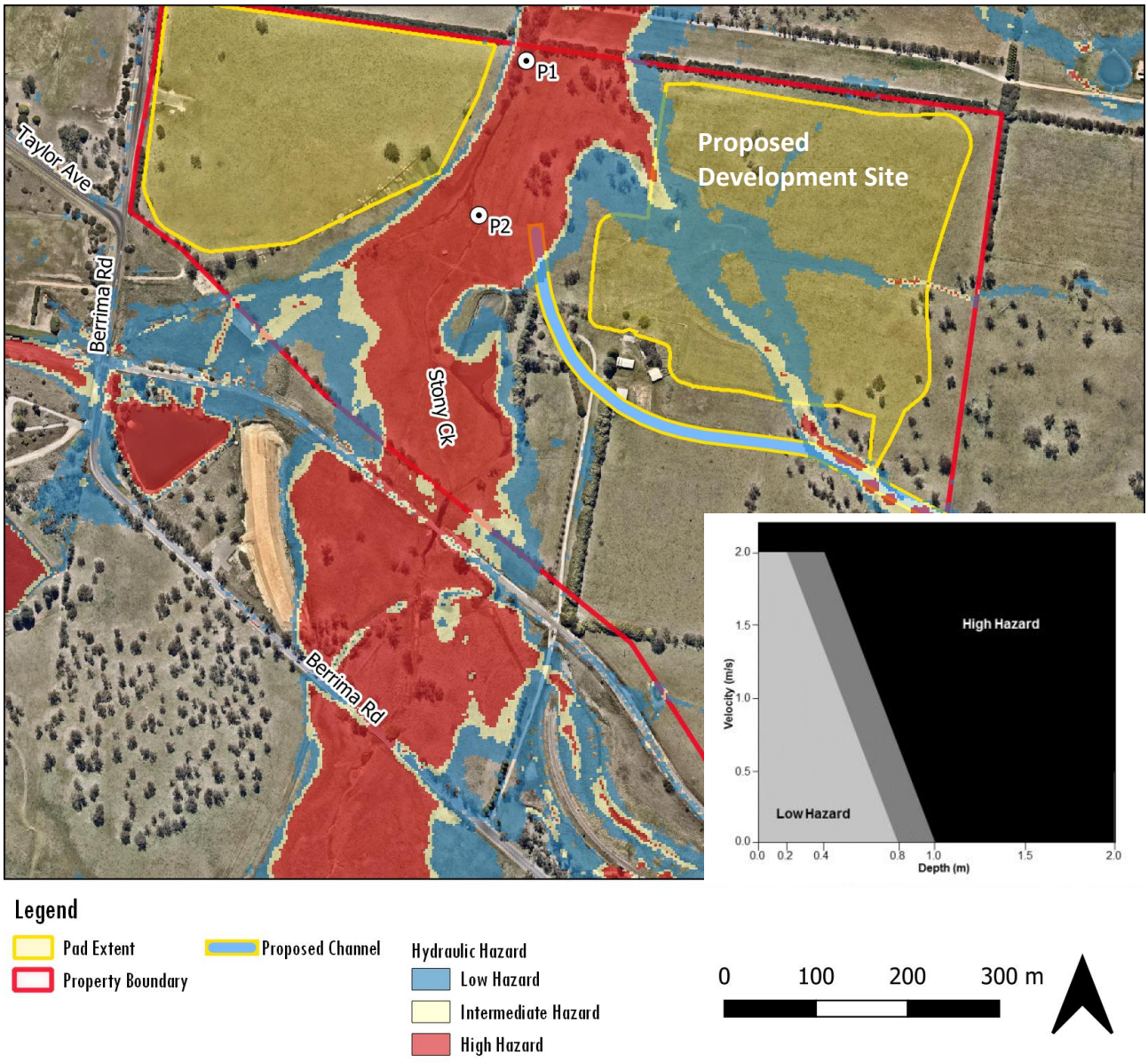

Figure 2.2: 1% AEP Peak Flood Hazard Existing Case (2-hour event)

2.3 Developed Case Results

The proposed pad design was utilised to create a developed case model. The Developed Case model included earthworks of the two pads, two diversion channels and modification of manning's 'n' roughness coefficients. Flood simulations for the 10%, 1%, 0.2% AEP and PMF storm events were assessed for the Developed Case scenario. Figures 2.3 to 2.6 show the respective peak flood depths for each flood event.

Based on the modelled results, the proposed site will not be inundated in any flood event up to the PMF in Stony Creek. Furthermore, the proposed channel to the south of pad 2 effectively conveys the 1% AEP flow and 0.2% AEP flow without any breakout. The 1% AEP flood velocity within this proposed open channel is 3 m/s and therefore will require suitable scour protection to ensure protection of the channel.

Two points of interest were selected along Stony Creek with their peak water level results presented in Table 2.1. Based on these results, there is significant freeboard (over 2 metres) from the 1% AEP and 0.2% AEP peak flood level to the proposed development pad levels.

Table 2.1: TUFLOW Result Summary

ID	PEAK WATER ELEVATION (M AHD)			
	10% AEP	1% AEP	0.2% AEP	PMF
P1	658.90	659.73	660.03	662.37
P2	658.93	659.75	660.04	662.40

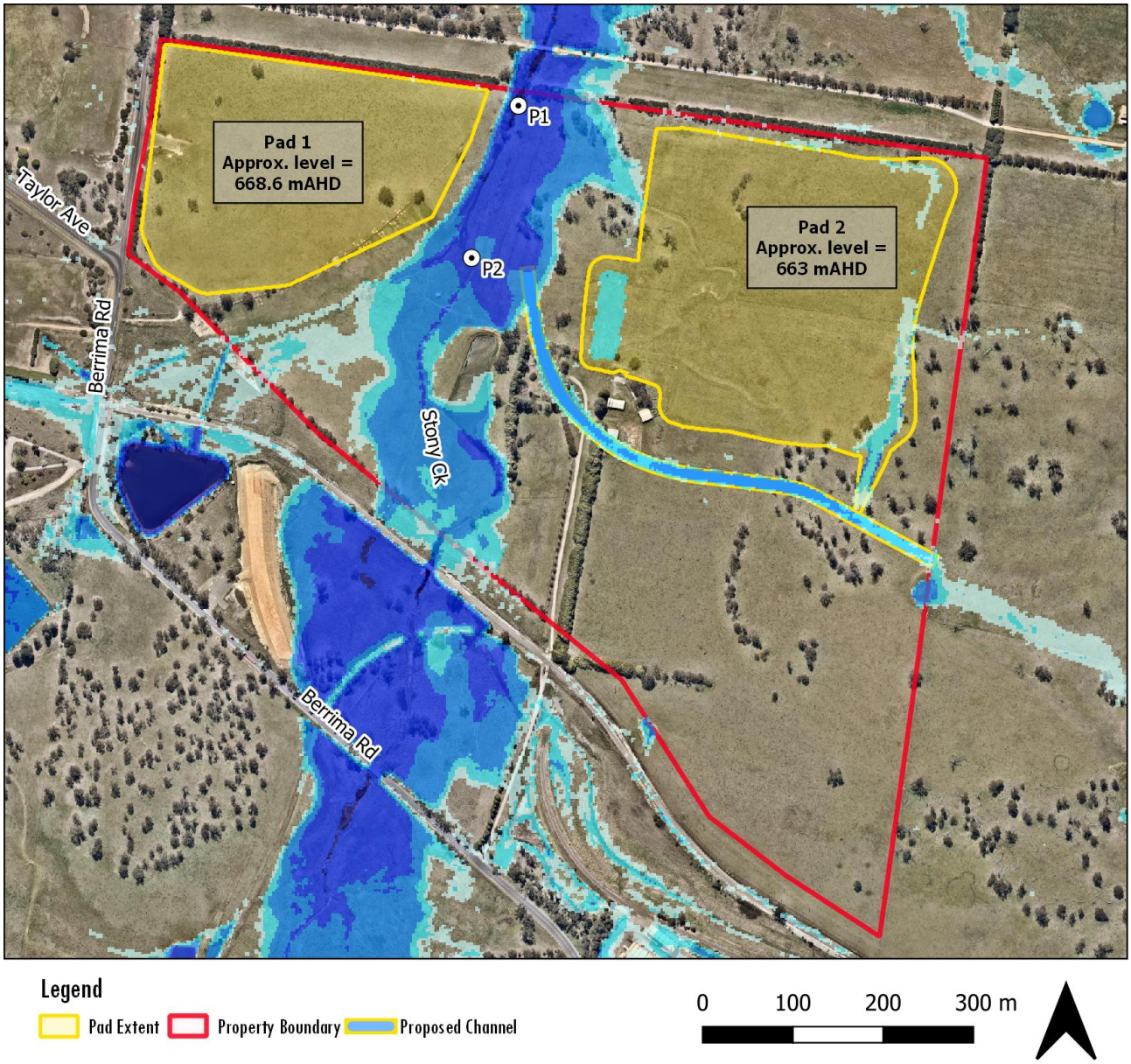

Figure 2.3: 10% AEP Peak Flood Depth (2-hour event)

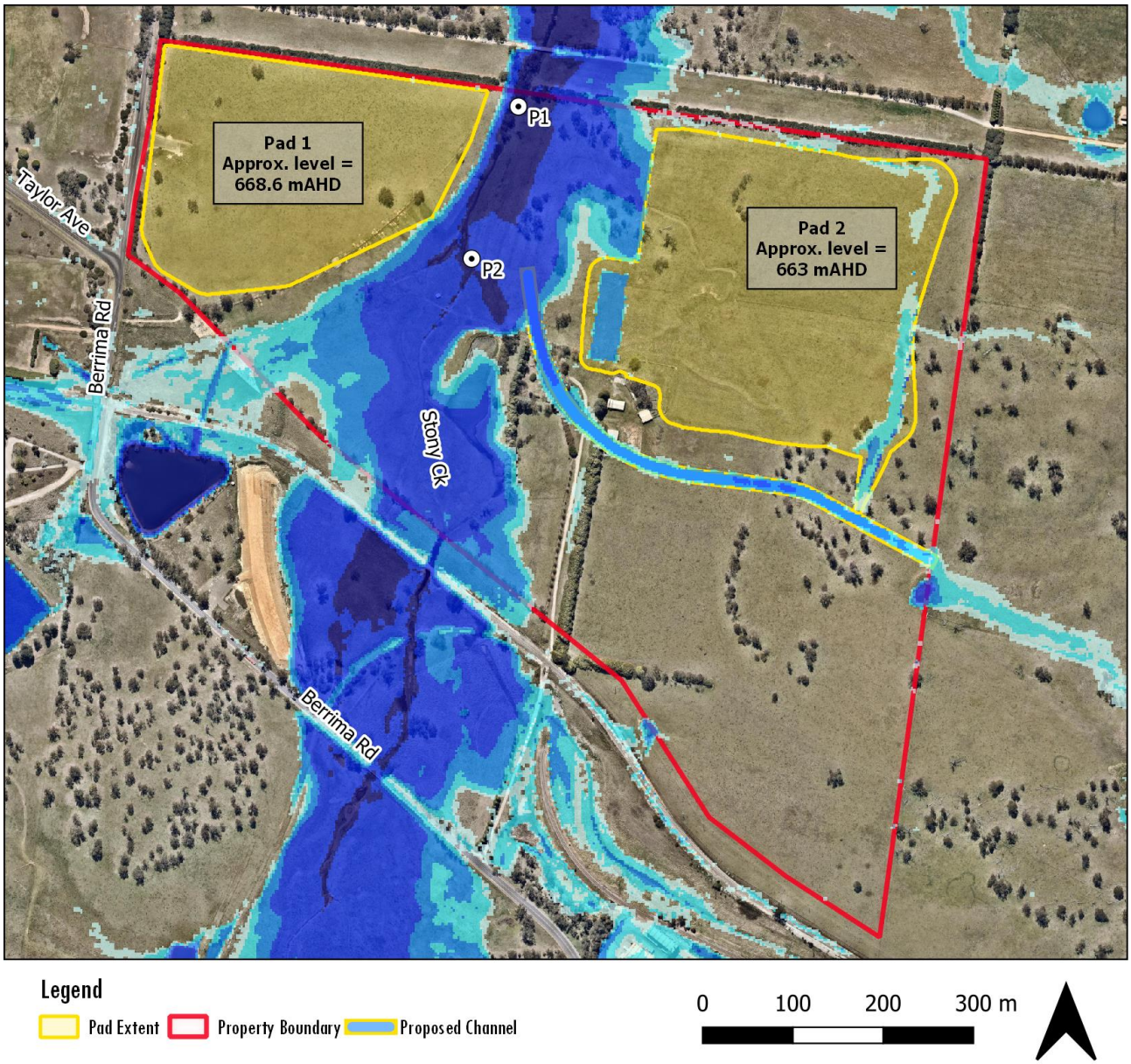

Figure 2.4: 1% AEP Peak Flood Depth (2-hour event)

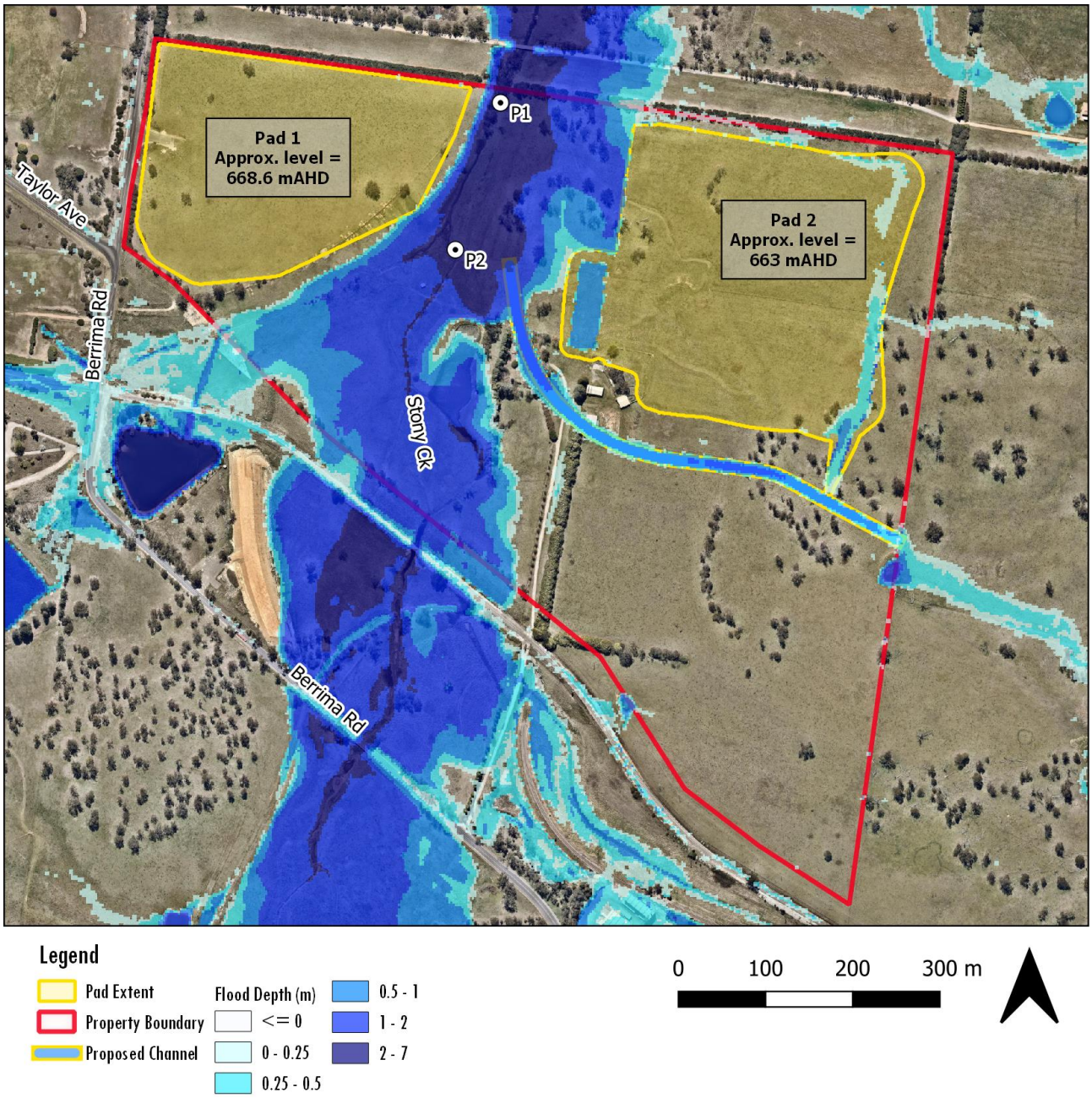

Figure 2.5: 0.2% AEP Peak Flood Depth (2-hour event)

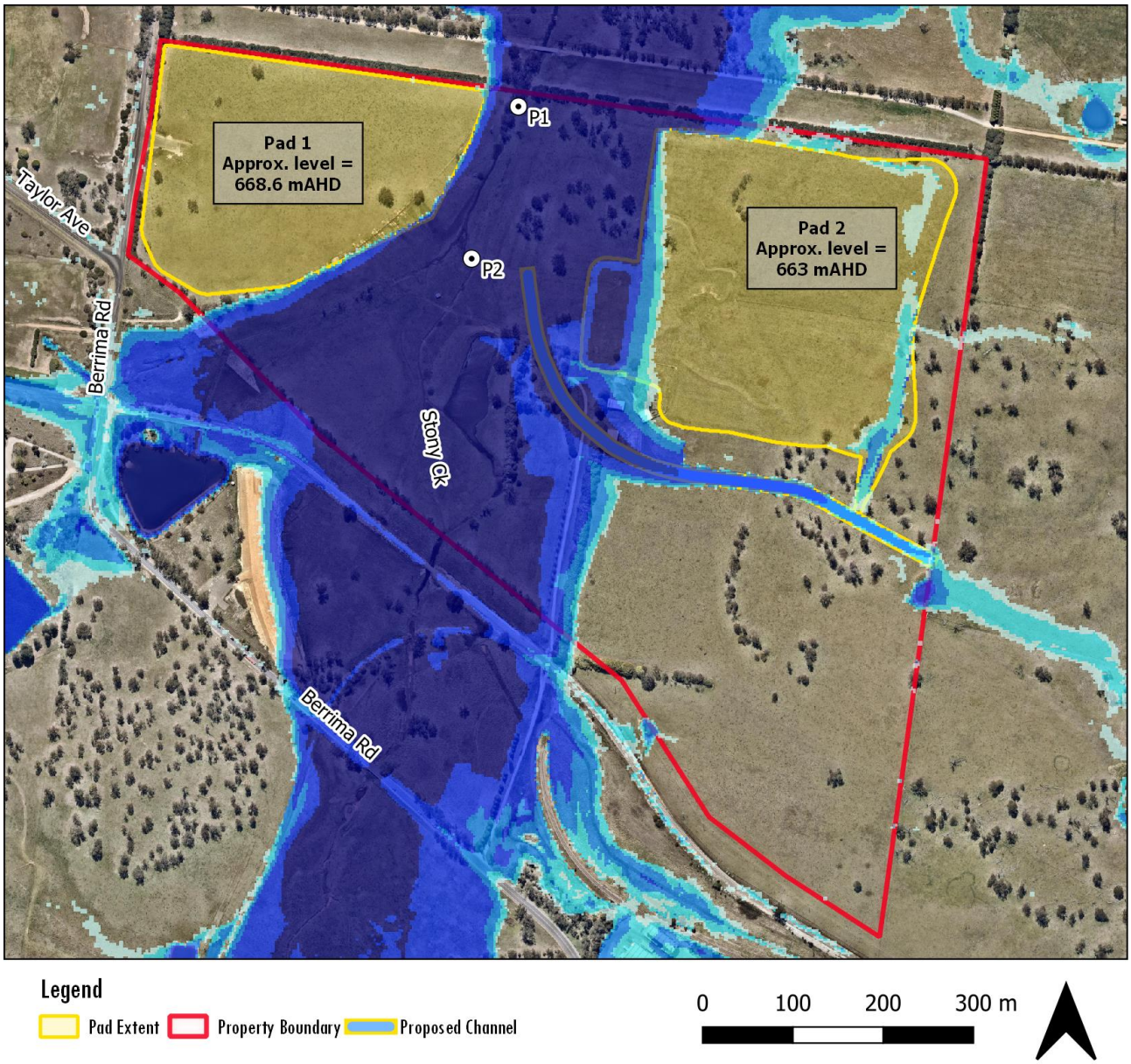

Figure 2.6: PMF Peak Flood Depth (5-hour event)

2.3.1 Afflux

A comparison of the Existing Case peak flood levels and the Developed Case peak flood levels was undertaken for the 1% AEP and the 0.2% AEP event to ensure there were no offsite impacts due to loss in floodplain storage (see 2.7 and Figure 2.8). The 0.2% AEP event has been considered to allow for potential future increases in rainfall intensity associated with Climate Change.

Despite the proposed development footprint reducing flood storage slightly the afflux is minimal (less than 10 mm) outside the property boundary in the 1%. As expected in the 0.2% AEP events the flood impacts are slightly larger as the development encroaches more into the flood storage. Despite this the impacts off site are minimal being less than 15 mm. This lower than the 50 mm limit on offsite flood impacts which was determined through discussions with WSC and OEH. The 10% AEP afflux has not been modelled as the development pads do not encroach into the estimated flood extent and therefore would not impact on flood levels.

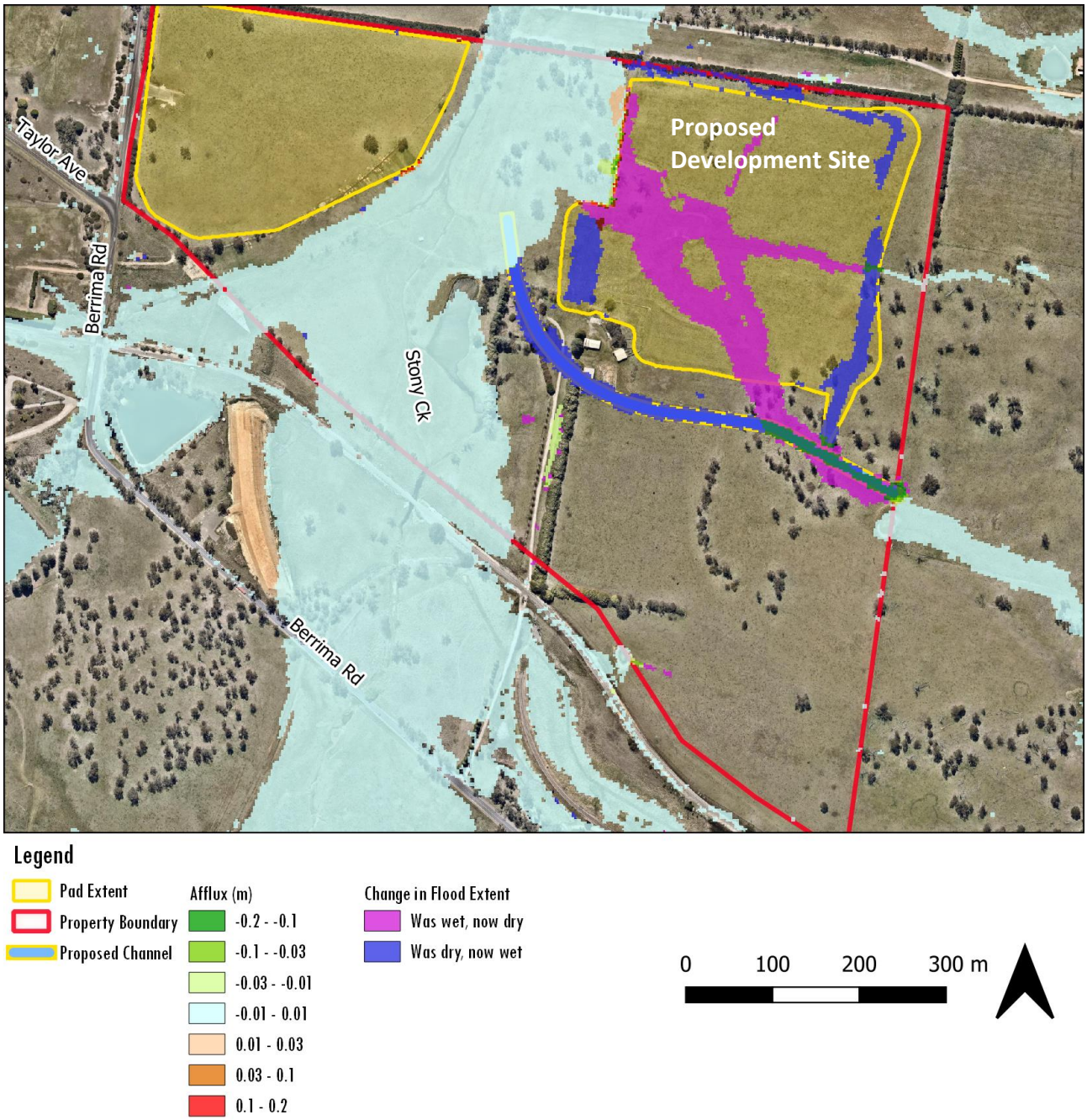

Figure 2.7: 1% AEP Afflux (2-hour event)

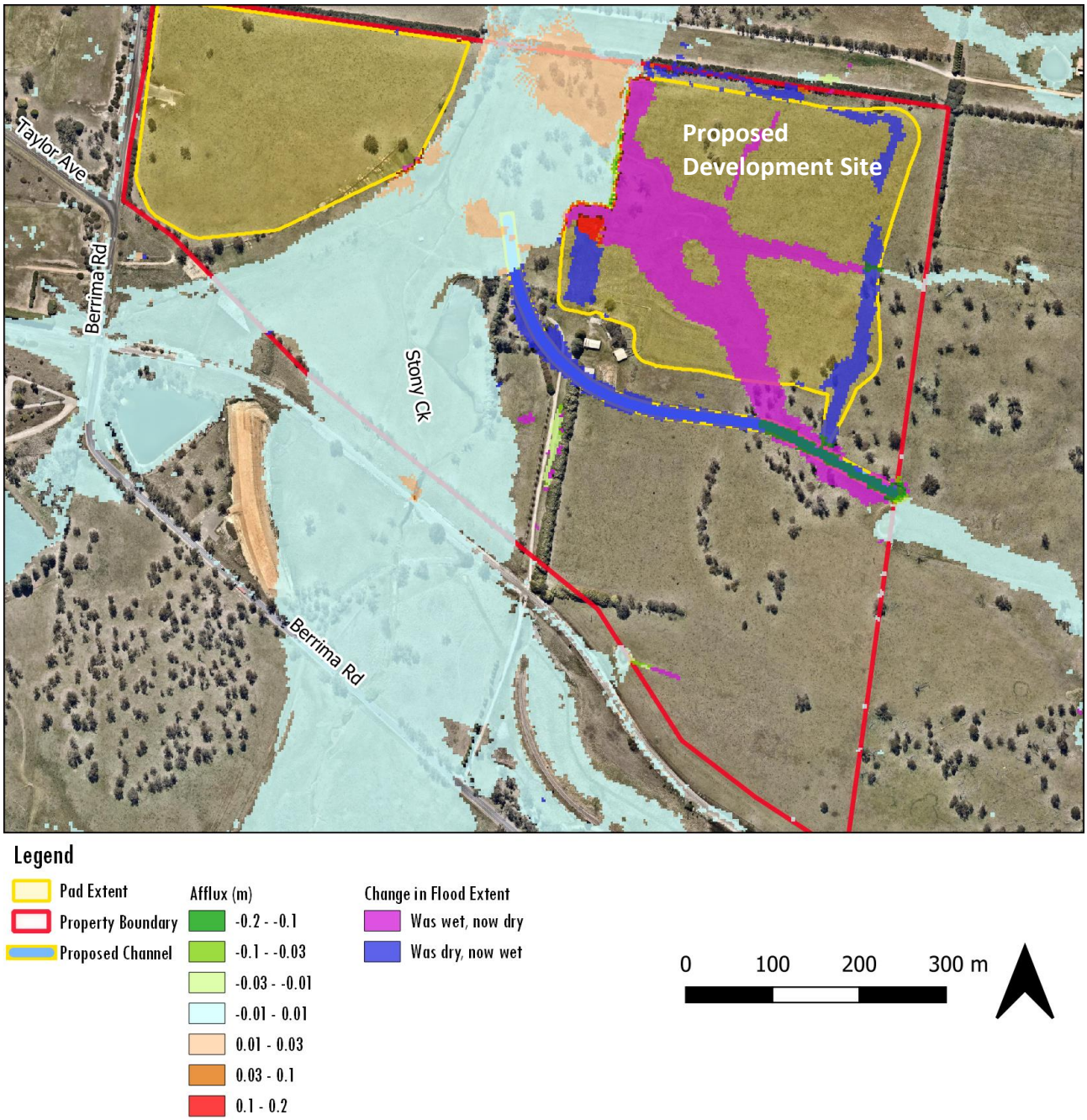

Figure 2.8: 0.2% AEP Afflux (2-hour event)

2.3.2 Flood Hazard

Figure 2.9 below shows the 1% AEP flood event hazard classification with the proposed development modelled noting the flood hazard has not changed within Stony Creek. Furthermore, the development has not increased any flood hazard to any major infrastructure surrounding the site. For the proposed channel to the east the high hazard is contained within the proposed channel extents. As discussed previously the channel will require suitable scour protection for design velocities up to 3 m/s.

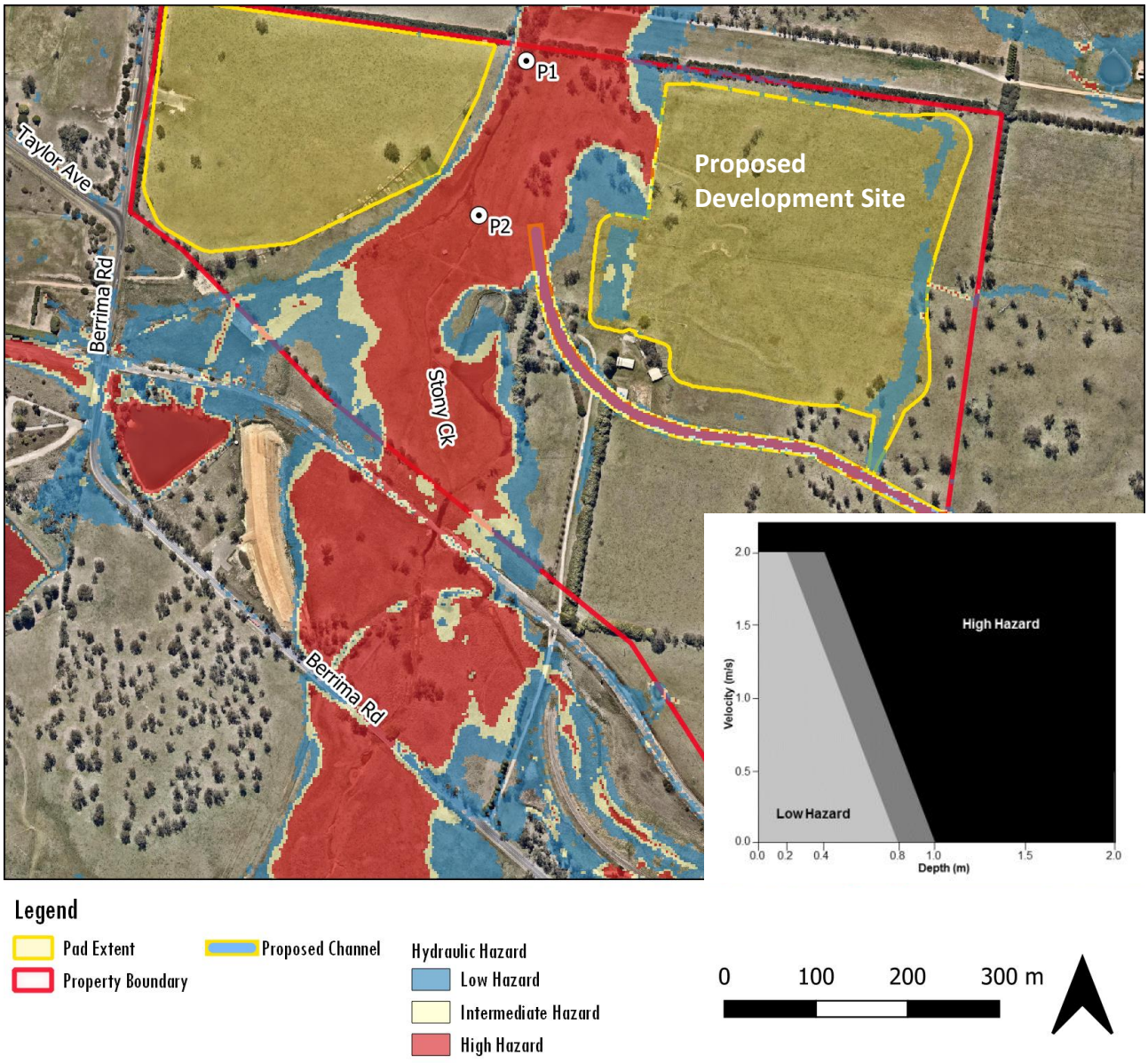

Figure 2.9: 1% AEP Peak Flood Hazard Developed Case (2-hour event)

2.3.2.1 PMF Flood Hazard and Evacuation Strategy

Based on the estimated PMF flood extent the development is immune from main creek flooding in a PMF event. For this reason, a shelter in place evacuation strategy should be suitable for the development and should not require any evacuation.

3 Conclusion

A flood impact assessment was conducted by SMEC for the proposed industrial development site at 416 Berrima Road, New Berrima, for AT&L Associates. This follows from SMEC's previous technical note dated April 2018, which assessed an initial design. This assessment examined subsequent design changes to the north-eastern pad and found that flood levels or flood hazards outside of the property boundary were not adversely affected. Furthermore, the development pads experienced minimal flood impact under a range of flood events up to PMF conditions.

Appendix A Previous Flood Assessment Technical Memo

Member of the Surbana Jurong Group

local people
global experience

02/04/2018
Mr Simon Haycock
AT&L Associates
Level 7, 153 Walker Street
North Sydney NSW 2060
Simon@atl.net.au

Dear Simon,

RE: 416 Berrima Road, New Berrima: Flood assessment

AT&L Associates are developing a civil engineering design for a proposed industrial development on the 52-hectare site at 416 Berrima Road, New Berrima. A masterplan is currently being developed by the entire site. However, the subject of the initial Development Application (DA) is the proposed development in the north-western corner of the site.

SMEC Australia Pty Ltd (SMEC) were engaged by AT&L Associates to assess the potential impact of the proposed development on flooding; specifically, the potential impact on flood levels upstream and downstream of the proposed development. SMEC previously prepared a Flood Study for the Wingecarribee River (January 2014), which included the subject land.

The subject site is affected by flooding from Stony Creek, which is a tributary of the Wingecarribee River, and an unnamed smaller water course, as shown in Figure 1. The development proposal is to create three building pads, which will be raised above the 1% AEP flood level. As the subject land is impacted by the 1% AEP flood event, it is likely that any proposed filling will require compensatory excavation to replace lost flood storage.

This letter outlines the findings of the flood impact assessment for the proposed development (i.e. the impact of proposed filling and excavation within the floodplain). It is noted that the current DA is specifically related to the north-western fill pad. However, the flood impact assessment has been done for the entire site and includes the three building areas. This will assess the impact of cumulative development within the subject site.

To assess the impacts of the proposed development, the following changes were made to the regional flood model that was originally developed for the 2014 Wingecarribee River Flood Study (this forms the Base Case model):

- The model domain was reduced in size to decrease model simulation times and the latest TUFLOW version was utilised.
- The 10m grid size was retained, which was deemed suitable due to the wide floodplain nature of the flows during the 1% AEP event.
- The entire upstream catchment was modelled as rain on grid, whereas in the regional model a small proportion was modelled through an input WBNM hydrograph.
- The form loss coefficients for some structures were reduced to a more reasonable number.

- Areal Reduction Factors (ARF's) have not been considered due to the small size of the upstream catchment. For the regional model, an ARF for the entire Wingecarribee River catchment was applied.
- Several other storm durations have now been considered with the 2 hour and 6 hour storms being critical at the Site. The regional model was only simulated for the 12 hour storm duration.

Figure 1 shows the updated Base Case 1% AEP flood extent, with the final proposed building pads overlayed. The existing 1% AEP flood levels are also shown on Figure 1.

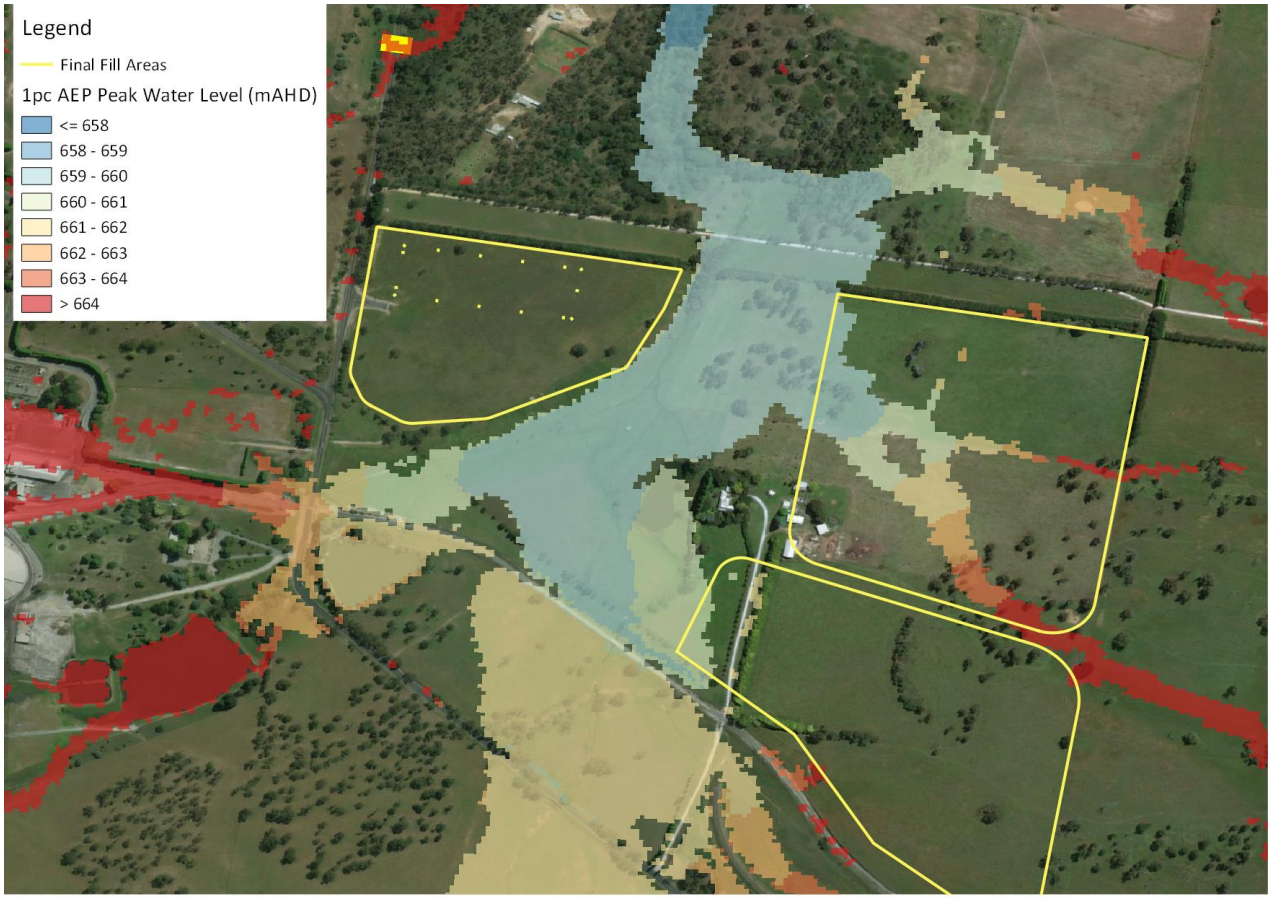

Figure 1 - 1% AEP Base Case flood extent, with provided fill pads overlayed

Figure 1 shows the final building pad extents, which were optimised following an assessment of a preliminary site layout that was provided on 14-03-2018. The preliminary site layout is shown in Figure 2.

Figure 2 shows the afflux (i.e. change in flood levels) that will result from the preliminary site layout during the 1% AEP flood event. This is based on the TUFLOW model results. However, it should be noted that the design TINs only included the fill pads (i.e. no earthworks for channels).

Based on discussions with Wingecarribee Shire Council and the Office of Environment and Heritage (OEH), the off-site impacts from the development should be less than 50mm, which is considered to be the order of accuracy of the modelling. Based on this criterion, the preliminary development layout had an adverse impact on flood levels.

It should be noted that the north-western pad is out of the floodplain and causes no increase in flood levels. However, the other eastern pads result in increased flood levels greater than 50mm outside of the property boundary. This is mainly caused by the loss of flood storage, as a result of filling for the north-eastern pad.

Based on discussions with AT&L Associates, the design was revised to minimise the impact on the flood storage (i.e. the north-eastern pad and south-eastern pad were altered with the north-western pad remaining unchanged).

Figure 3 shows the afflux based on the revised (final) design. The final design had no adverse impacts on flood levels, with the peak water level increases being below 50mm outside of the property boundary during the 1% AEP event.

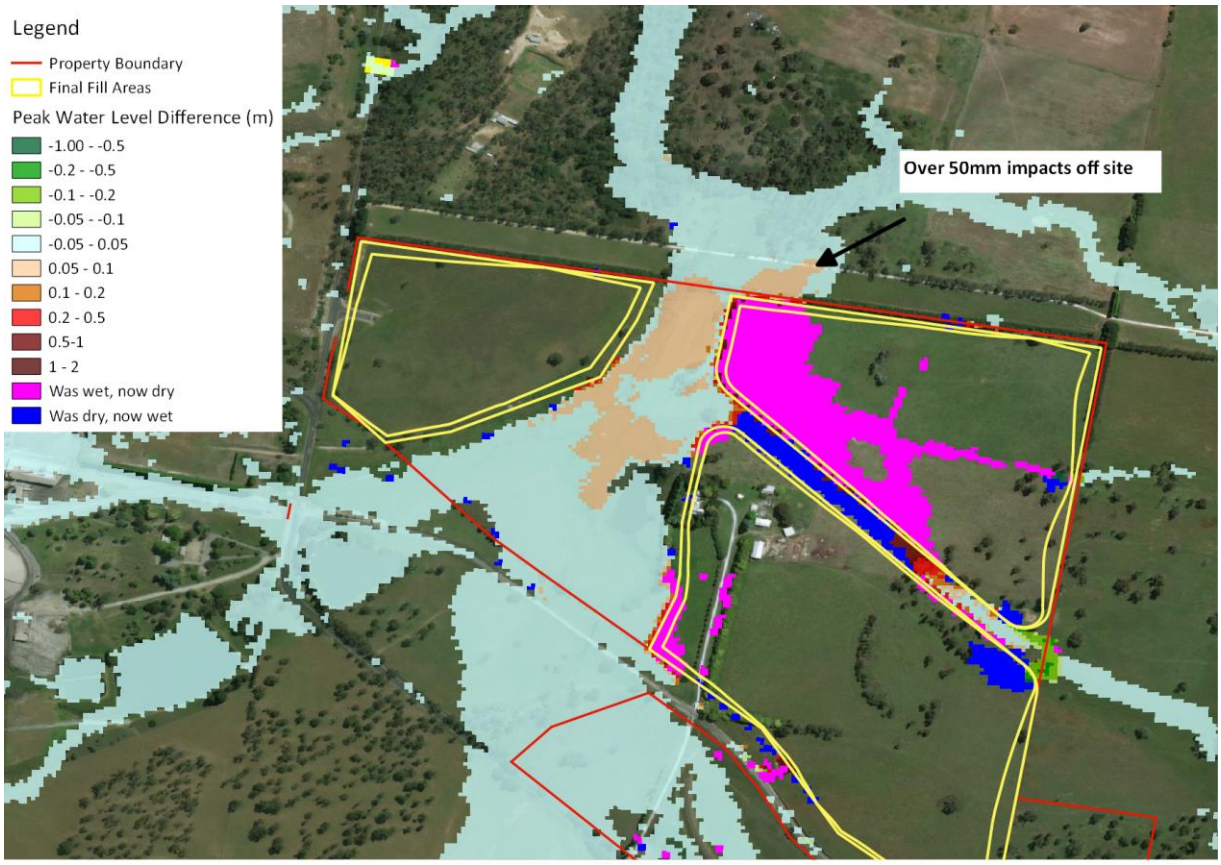

Figure 2 - 1% AEP afflux for preliminary site layout

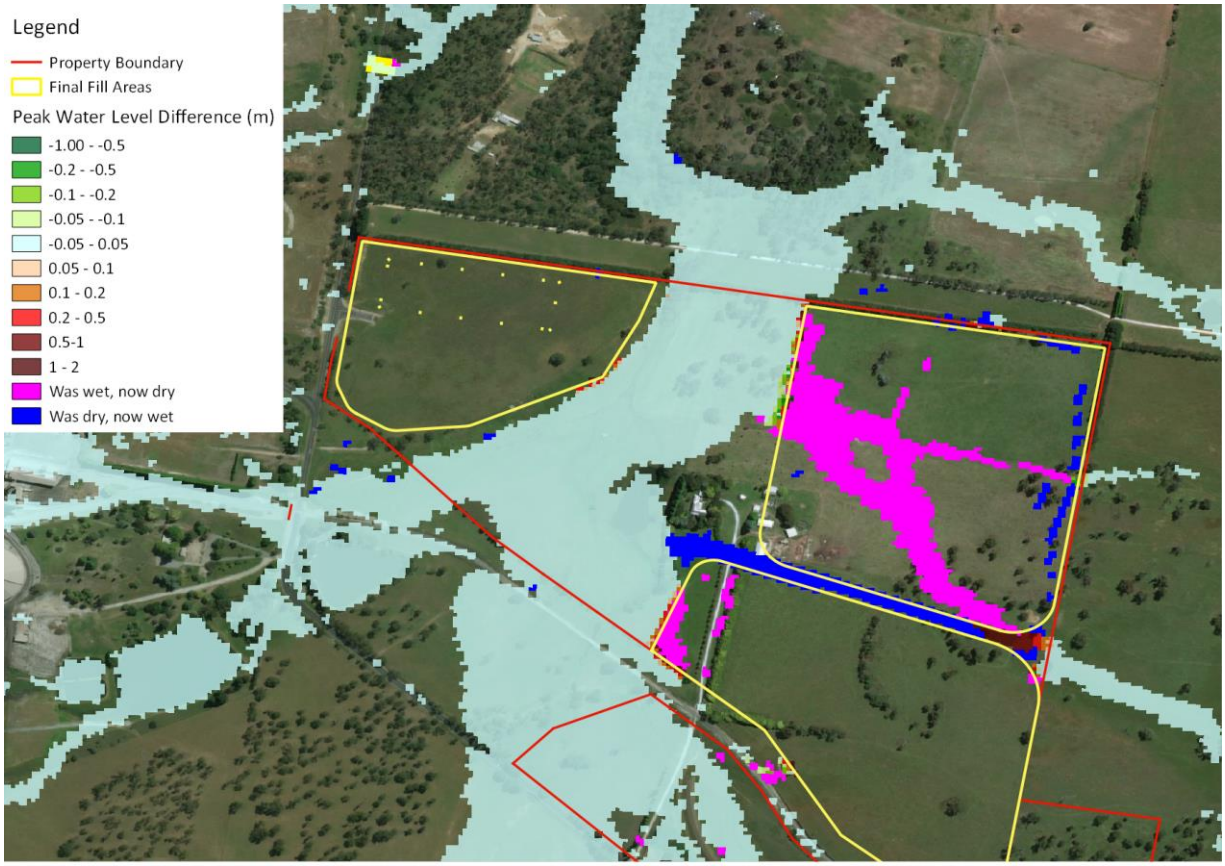

Figure 3 - 1% AEP Afflux for Final Design

Please call me on my mobile (0400 914 598) if you have any questions.

Yours sincerely,

Ian Rowbottom
Principal Engineer - Water

local people
global experience

SMEC is recognised for providing technical excellence and consultancy expertise in urban, infrastructure and management advisory. From concept to completion, our core service offering covers the life-cycle of a project and maximises value to our clients and communities. We align global expertise with local knowledge and state-of-the-art processes and systems to deliver innovative solutions to a range of industry sectors.

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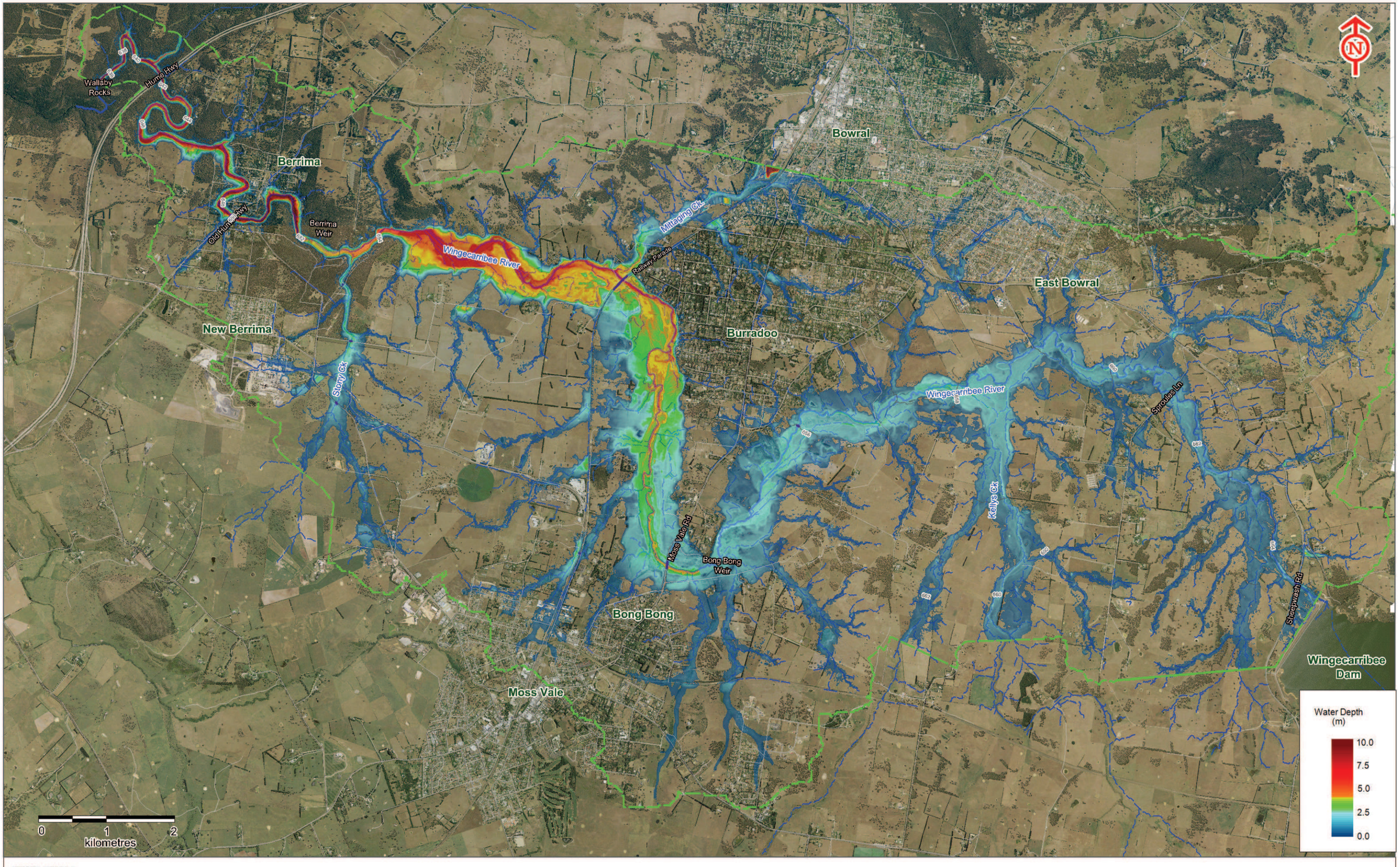
Appendix C

Wingecarribee River Flood Study Maps



DISCLAIMER

The accuracy of flood extents and hydraulic parameters shown on this map is limited to the level of accuracy of the survey data and modelling software available for flood modelling. Despite the effort to provide a high resolution survey of the floodplain and 2D hydraulic modelling, the flood extents and hydraulic parameters on the map are only indications of potential flooding conditions throughout the catchment for modelled design storm events and may vary from real flooding conditions.
The background image shows aerial photography dated 2009

Bridge Crossing
Road
Waterway
Hydraulic Model Extents

SMEC

Wingecarribee Shire Council
Wingecarribee River Flood Study

Figure D1E
1% AEP Flood Depths

Appendix D

Wingecarribee LEP 2010

Natural Resources Sensitivity Map NRS007

Wingecarribee Local Environmental Plan 2010

Natural Resources
Sensitivity Map - Sheet NRS_007

Riparian Land

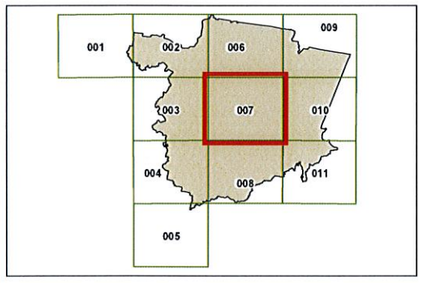
- Category 1 - Environmental Corridor
  (within 50 metres from the top of stream bank on each side)
- Category 2 - Aquatic & Terrestrial Habitat
  (within 30 metres from the top of stream bank on each side)
- Category 3 - Bank Stability & Water Quality
  (within 10 metres from the top of stream bank on each side)

Natural Waterbodies

Regional Wildlife Habitat Corridor

Cadastre

Cadastre 04/11/11 © Land and Property Information (LPI)



N
W E
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0 750 1,500 2,250 3,000
Metres

Projection: MGA
(GDA94) Zone 56

Scale 1:80,000 @ A3

Map identification number:
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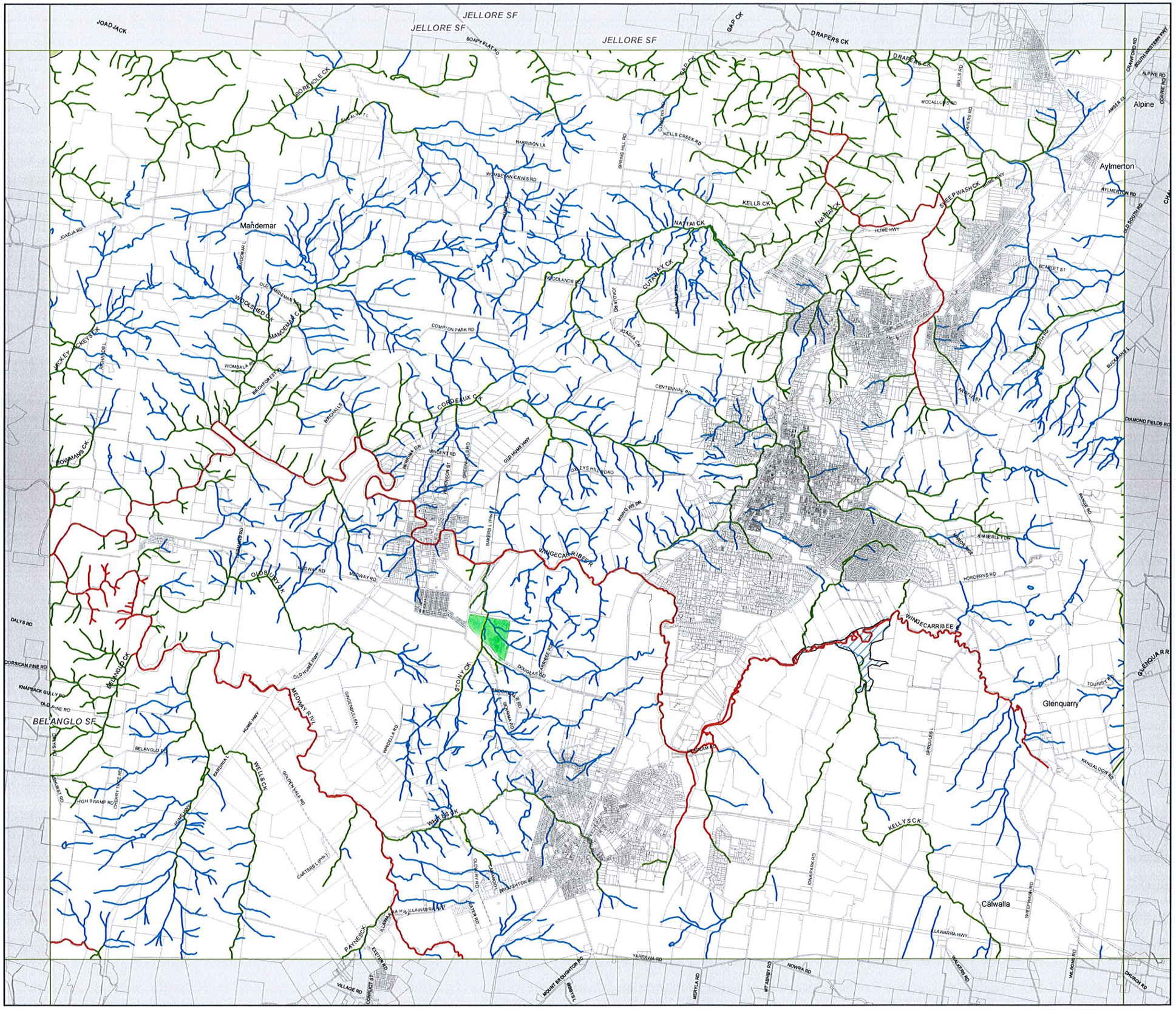


Appendix E

Dial Before You Dig Search Records

Job No 19187307

Phone: 1100
www.1100.com.au

Caller Details

Contact:	Mr Simon Haycock	**Caller Id:**	1295787	**Phone:**	0294391777
Company:	ATL	**Mobile:**	0479160270	**Fax:**	Not Supplied
Address:	Suite 702, 154 Pacific Highway St Leonards NSW 2065	**Email:**	simon@atl.net.au		

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:	Start Date:	End Date:
11/03/2020	13/03/2020	14/03/2020

Address:
416 Berrima Road
Moss Vale NSW 2577

Job Purpose:	Onsite Activity:
Excavation	Manual Excavation
Location of Workplace:	**Location in Road:**
Both	CarriageWay,Footpath,Nature Strip

- Check the location of the dig site is correct. If not submit a new enquiry.
- If the scope of works change, or plan validity dates expire, resubmit your 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:

Your Responsibilities and Duty of Care

- The lodgement of an enquiry does not authorise the project to commence. You must obtain all necessary information from any and all likely impacted asset owners prior to excavation.
- 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
95675548	Endeavour Energy	0298534161	NOTIFIED
95675551	Jemena Gas Country	1300880906	NOTIFIED
95675553	NBN Co, NswAct	1800626329	NOTIFIED
95675549	Telstra NSW, Central	1800653935	NOTIFIED
95675547	Wingecarribee Shire Council	0248680888	NOTIFIED

END OF UTILITIES LIST

LEGEND

IT'S HOW WE CONNECT

For more info contact a Telstra Accredited Locater or Telstra Plan Services 1800 653 935

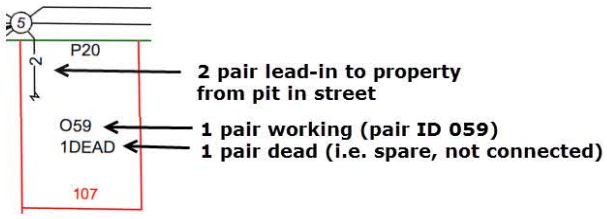
Exchange
(major cable present)

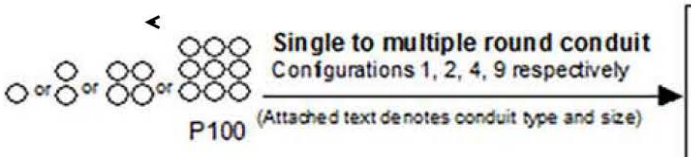
Footway access chamber
(can vary from 1-lid to 12-lid)

or **Pillar/cabinet**
(above the ground / free standing)

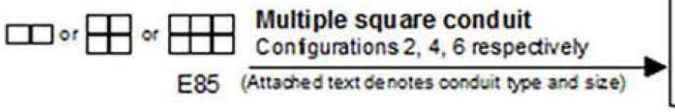
Above ground complex equipment housing (eg RIM)
Please Note: This equipment is powered by 240V electricity.

OC **other carrier**





Single to multiple round conduit
Configurations 1, 2, 4, 9 respectively
(Attached text denotes conduit type and size)



Multiple square conduit
Configurations 2, 4, 6 respectively
(Attached text denotes conduit type and size)

Some examples of conduit type and size:
A - Asbestos cement, P - PVC / plastic, C - Concrete, GI - Galvanised iron, E - Earthenware.
Conduit sizes *nominally* range from 20mm to 100mm.

P50	50mm PVC conduit
P100	100mm PVC conduit
A100	100mm asbestos cement conduit
E 85	85mm square earthenware conduit

Cable jointing pit
(number indicating pit type)

Elevated cable joint
(above ground joint on buried cable)

Telstra Plant in shared utility trench

Aerial Cable
(above ground)

Aerial Cable
(attached to joint use pole e.g. power)

Direct buried cable

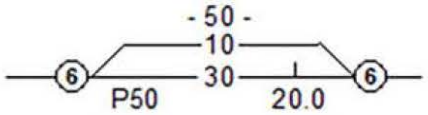
M **Marker post installed**

TR **Buried transponder**

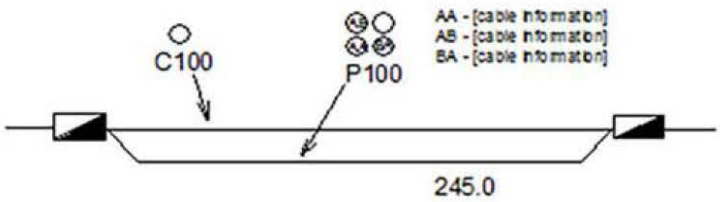
MT **Marker, transponder**

SMOF **Optical fibre cable direct buried**

Some examples of how to read Telstra plans:



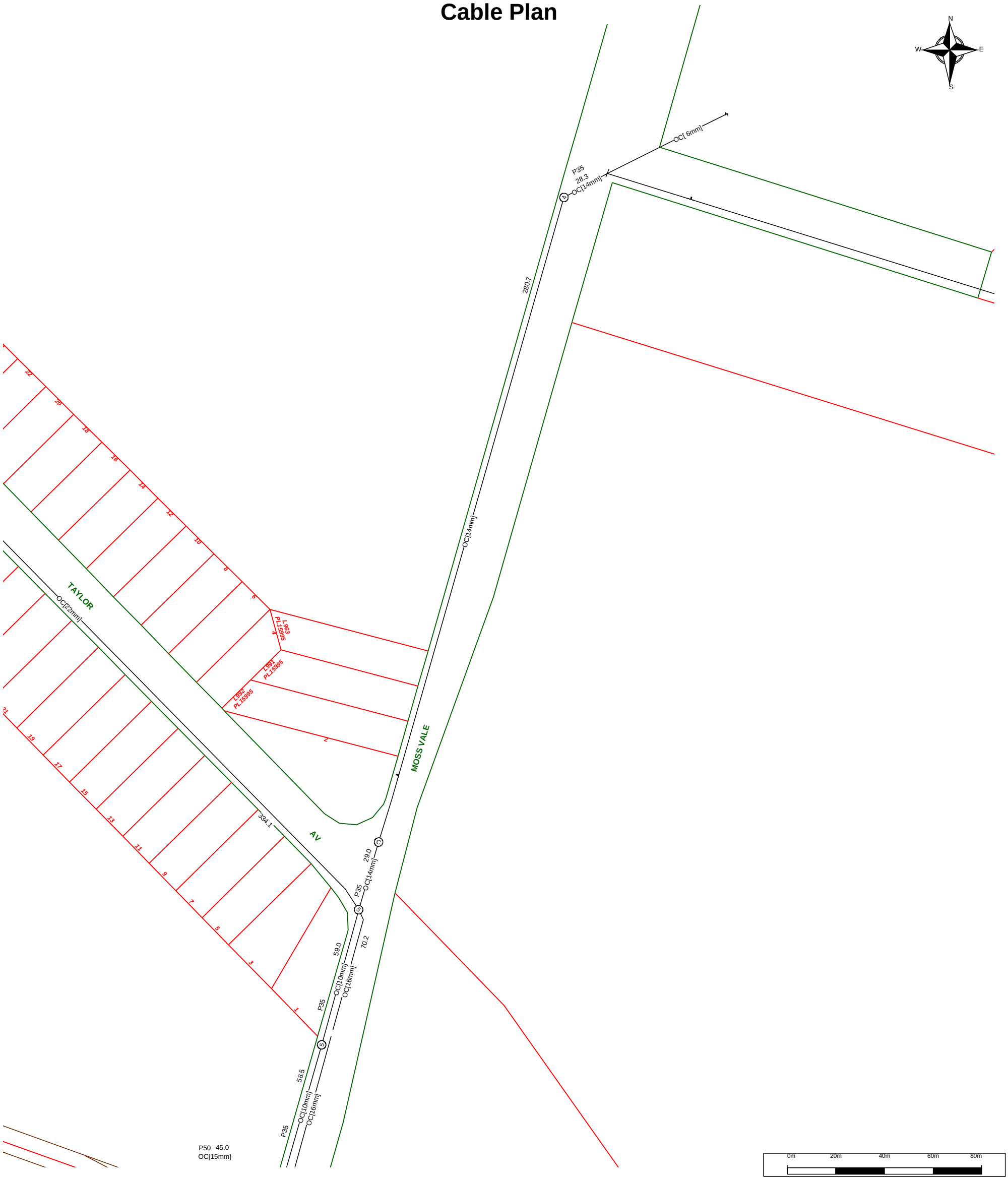
One 50mm PVC conduit (P50) containing a 50-pair and a 10-pair cable between two 6-pits, 20.0m apart, with a direct buried 30-pair cable along the same route.



Two separate conduit runs between two footway access chambers (manholes) 245m apart. A nest of four 100mm PVC conduits (P100) containing assorted cables in three ducts (one being empty) and one empty 100mm concrete duct (C100) along the same route.

WARNING: Telstra plans and location information conform to Quality Level 'D' of the Australian Standard AS 5488 - Classification of Subsurface Utility Information. As such, Telstra supplied location information is indicative only. Spatial accuracy is not applicable to Quality Level D. Refer to AS 5488 for further details. Telstra does not warrant or hold out that its plans are accurate and accepts no responsibility for any inaccuracy shown on the plans. FURTHER ON SITE INVESTIGATION IS REQUIRED TO VALIDATE THE EXACT LOCATION OF TELSTRA PLANT PRIOR TO COMMENCING CONSTRUCTION WORK. A plant location service is an essential part of the process to validate the exact location of Telstra assets and to ensure the asset is protected during construction works. The exact position of Telstra assets can only be validated by physically exposing it. Telstra will seek compensation for damages caused to its property and losses caused to Telstra and its customers.

Cable Plan



Telstra For all Telstra DBYD plan enquiries - email - Telstra.Plans@team.telstra.com For urgent onsite contact only - ph 1800 653 935 (bus hrs)	Sequence Number: 95675549
TELSTRA CORPORATION LIMITED A.C.N. 051 775 556	Please read Duty of Care prior to any excavating
Generated On 11/03/2020 11:48:27	

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.

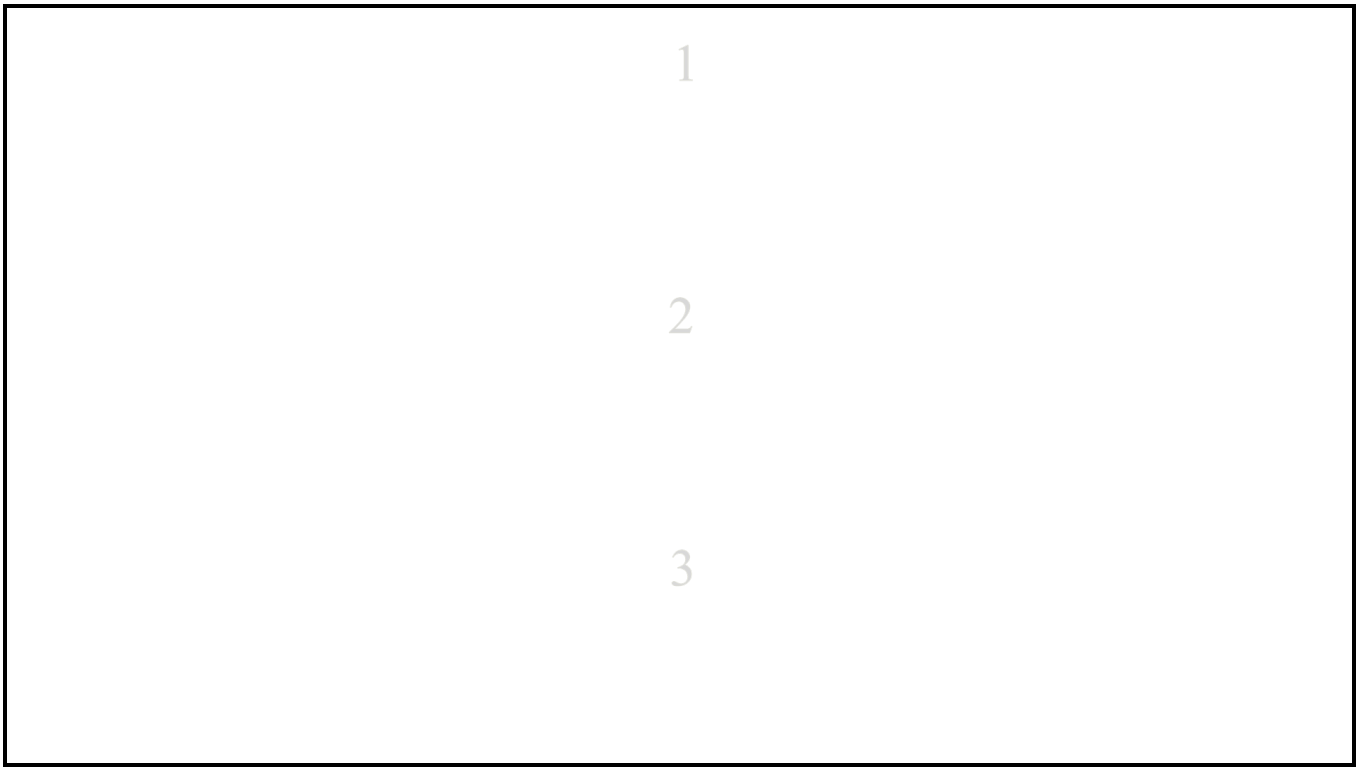
It is your responsibility to locate Telstra's underground plant by careful hand pot-holing prior to any excavation in the vicinity and to exercise due care during that excavation.

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.

Indicative Plans

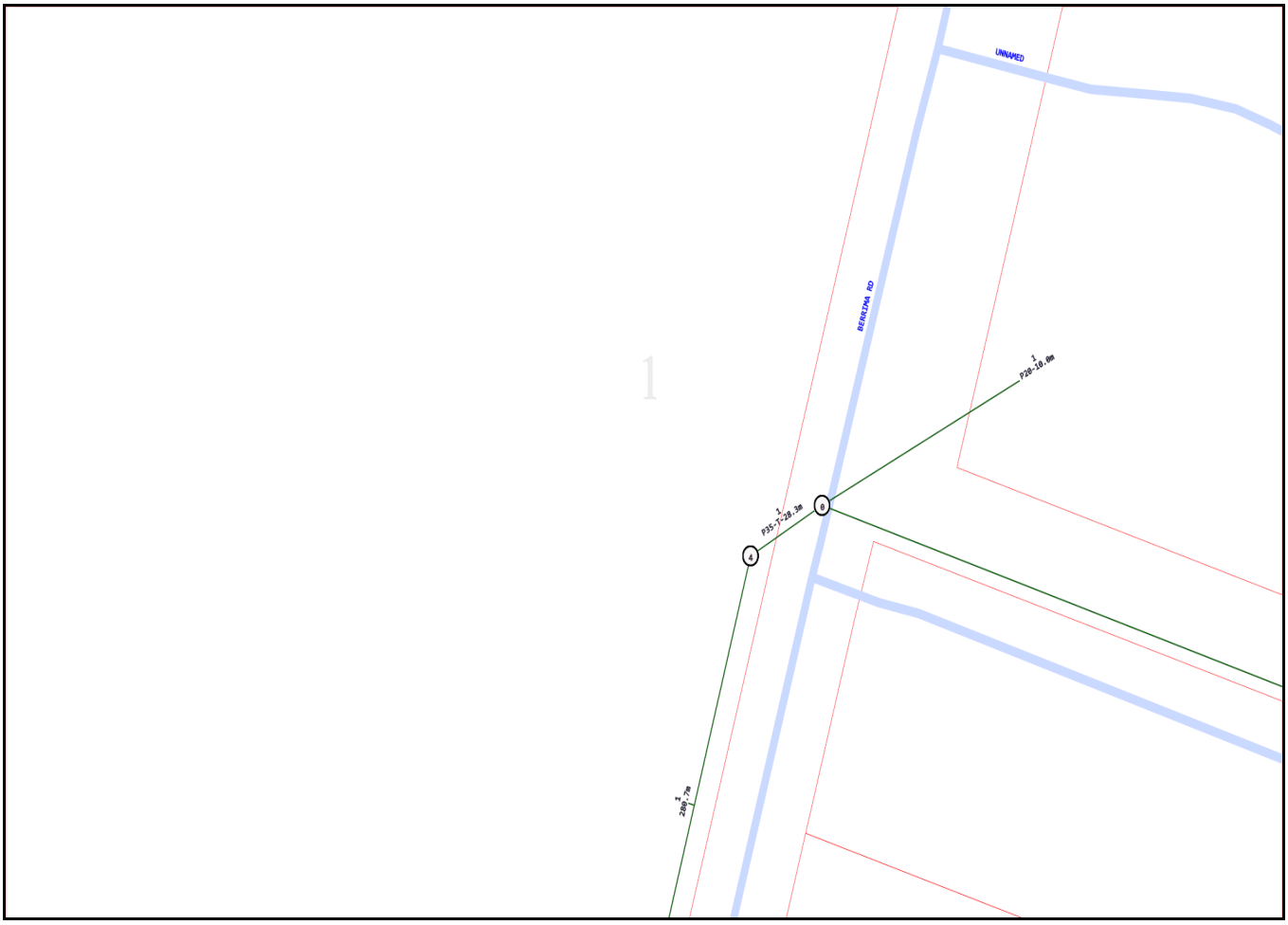
Issue Date:	11/03/2020
Location:	416 Berrima Road , Moss Vale , NSW , 2577



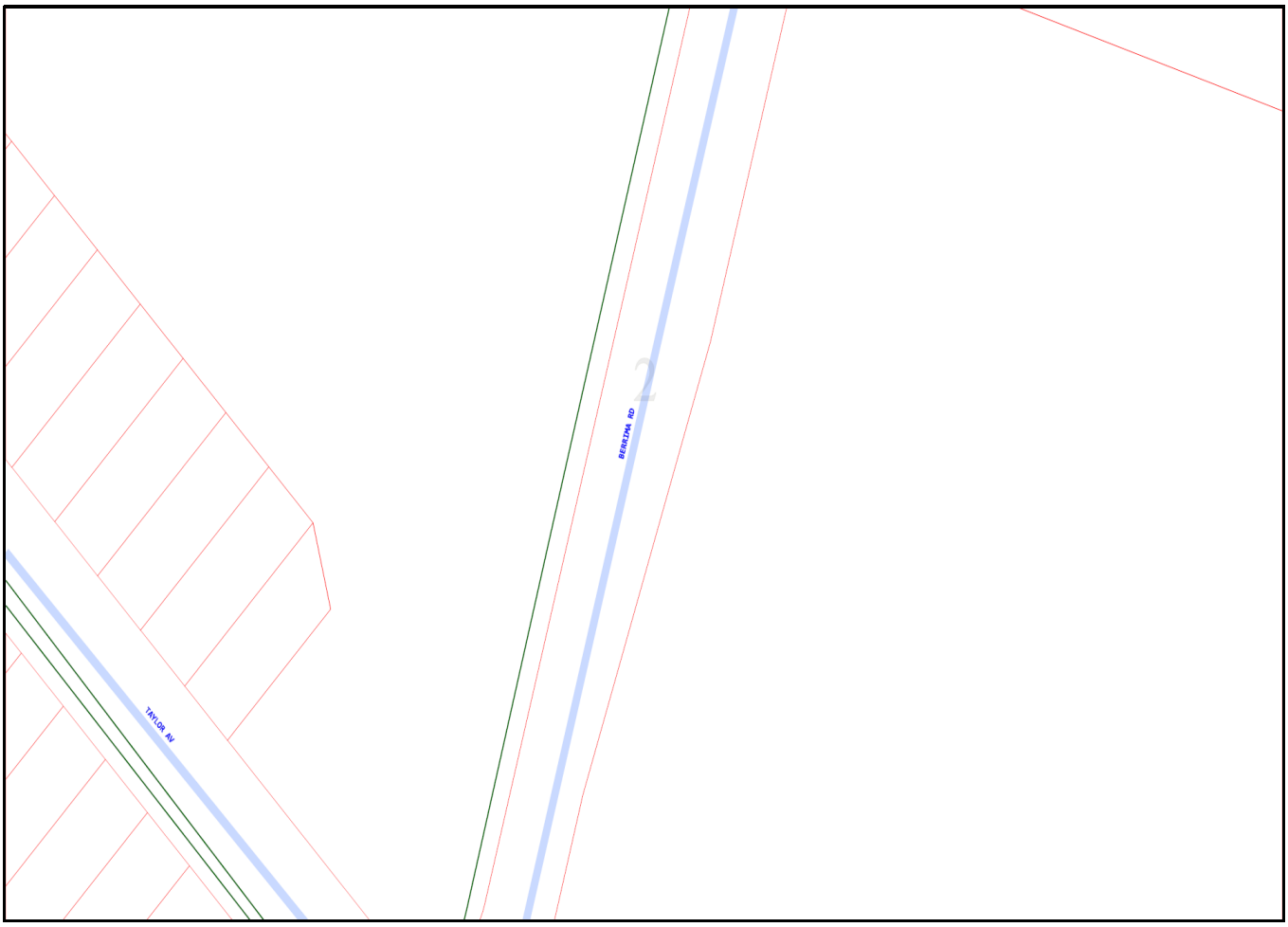
LEGEND

34	Parcel and the location
5	Pit with size "5"
2E	Power Pit with size "2E". Valid PIT Size: e.g. 2E, 5E, 6E, 8E, 9E, E, null.
	Manhole
	Pillar
2 PO – T- 25.0m P40 – 20.0m 5 9	Cable count of trench is 2. One "Other size" PVC conduit (PO) owned by Telstra (-T-), between pits of sizes, "5" and "9" are 25.0m apart. One 40mm PVC conduit (P40) owned by NBN, between pits of sizes, "5" and "9" are 20.0m apart.
2 10.0m 5 9	2 Direct buried cables between pits of sizes ,"5" and "9" are 10.0m apart.
5 9	Trench containing any INSERVICE/CONSTRUCTED (Copper/RF/Fibre) cables.
5 9	Trench containing only DESIGNED/PLANNED (Copper/RF/Fibre/Power) cables.
5 9	Trench containing any INSERVICE/CONSTRUCTED (Power) cables.
BROADWAY ST	Road and the street name "Broadway ST"
Scale	0 20 40 60 Meters 1:2000 1 cm equals 20 m

Email info@nbn.com.au Web nbn.com.au

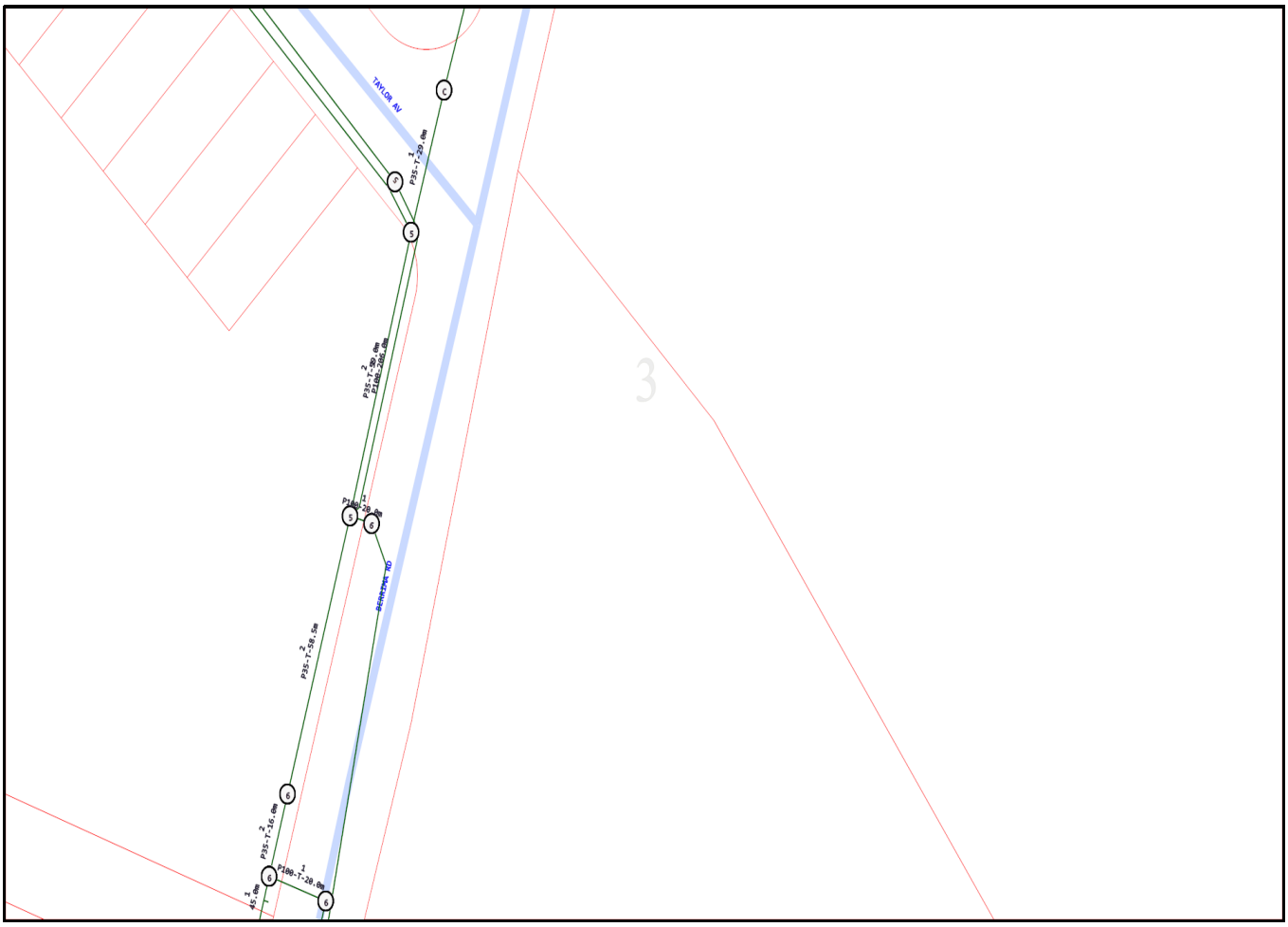


Email info@nbn.com.au Web nbn.com.au



Level 11, 100 Arthur Street, North Sydney NSW 2060

Email info@nbn.com.au Web nbn.com.au



Emergency Contacts

You must immediately report any damage to **nbn™** network that you are/become aware of. Notification may be by telephone - 1800 626 329.

Response Cover Letter

Wingecarribee Shire Council

PO Box 141

Moss Vale NSW 2577

www.wsc.nsw.gov.au

Date: 11/03/2020

To:
Mr Simon Haycock
ATL
Suite 702, 154 Pacific Highway
St Leonards NSW 2065

According to our records your enquiry with the following details impacts our infrastructure. Please review other documents included with this response for additional details:

Sequence No: 95675547

Job No: 19187307

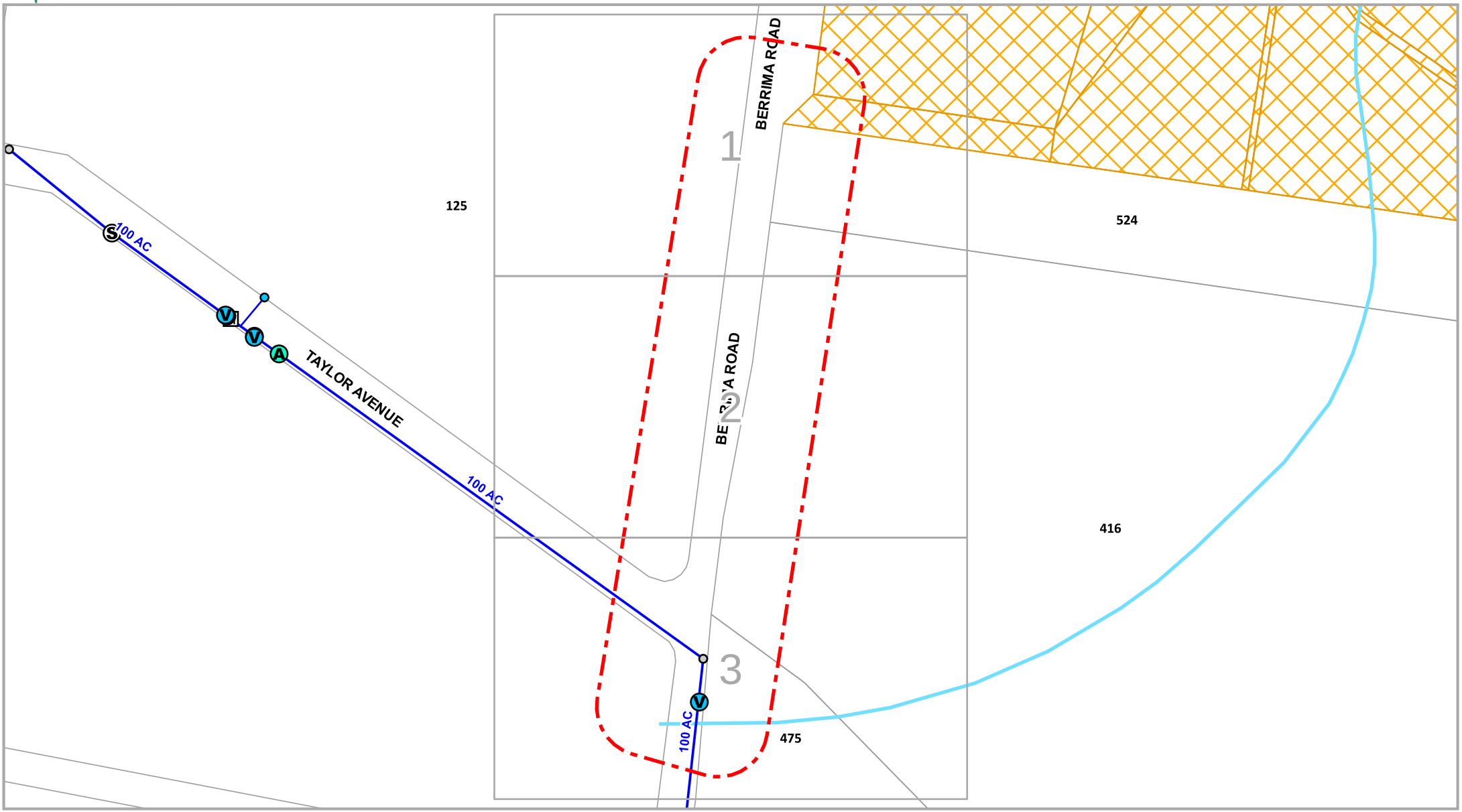
Location: 416 Berrima Road
Moss Vale NSW 2577

If you require further information, please contact the Wingecarribee Shire Council on 02 4868 0888 or dialbeforeyoudig@wsc.nsw.gov.au

Important Notice: This enquiry response, including any associated documentation, has been assessed and compiled from the information detailed within the DBYD enquiry outlined above. Please ensure that the DBYD enquiry details and this response accurately reflect your proposed works.

This response is intended for use only by the addressee. If you have received the enquiry response in error, please let us know by telephone and delete all copies; you are advised that copying, distributing, disclosing or otherwise acting in reliance on the response is expressly prohibited.

Sequence No: 95675547
Job No: 19187307
Location: 416 Berrima Road, Moss Vale, NSW 2577



Legend | Scale: 1:3075 | Overview

N

Please refer to attached Water & Sewer Asset Guide

WINGECARRIBEE SHIRE COUNCIL

Sequence No: 95675547
Job No: 19187307
Location: 416 Berrima Road, Moss Vale, NSW 2577

DIAL BEFORE YOU DIG www.1100.com.au
The Essential First Step.

Legend | Scale: 1:1000 | Tile No: 1

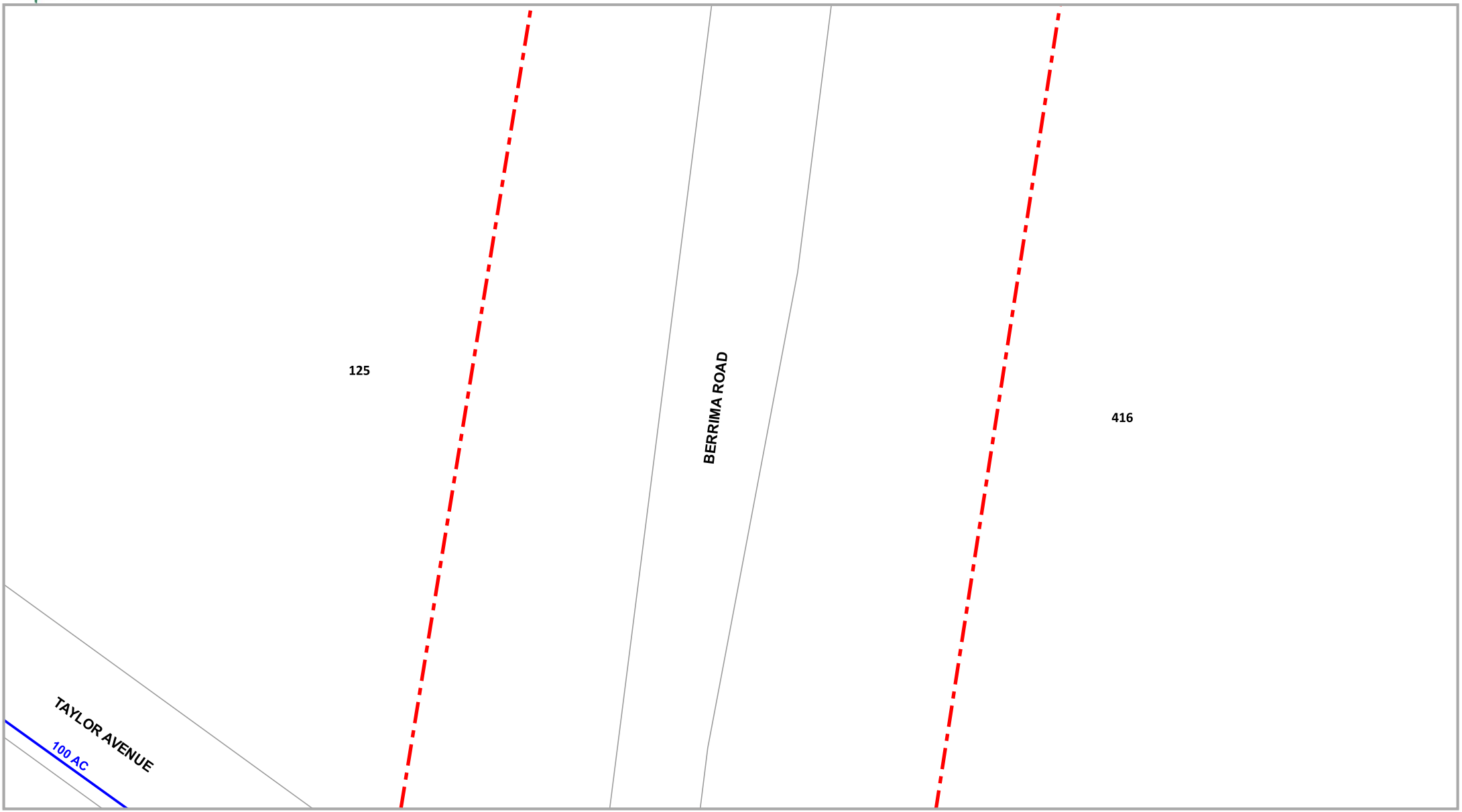
N

Please refer to attached Water & Sewer Asset Guide

WINGECARRIBEE SHIRE COUNCIL

Sequence No: 95675547
Job No: 19187307
Location: 416 Berrima Road, Moss Vale, NSW 2577

DIAL BEFORE YOU DIG www.1100.com.au
The Essential First Step.



Legend | Scale: 1:1000 | Tile No: 2

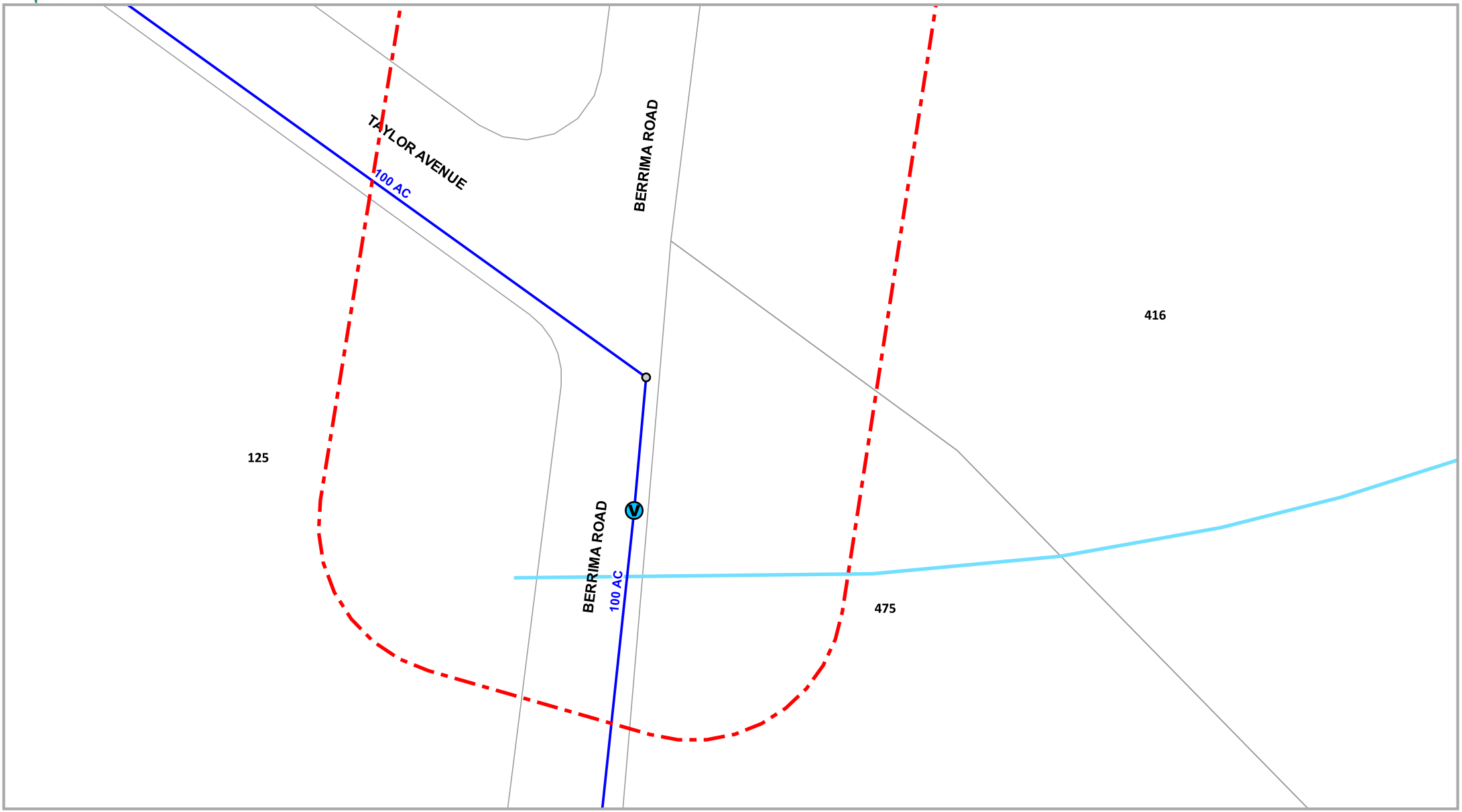
N

Please refer to attached Water & Sewer Asset Guide

WINGECARRIBEE SHIRE COUNCIL

Sequence No: 95675547
Job No: 19187307
Location: 416 Berrima Road, Moss Vale, NSW 2577

DIAL BEFORE YOU DIG www.1100.com.au
The Essential First Step.



Legend | Scale: 1:1000 | Tile No: 3

N

Please refer to attached Water & Sewer Asset Guide

If further clarification is required, please contact:
Endeavour Energy
Phone: (02) 9853 4161 (8:00am-4:30pm Mon-Fri)
Emergency Phone Number: 131 003

DBYD Underground Search Report

Date: 11/03/2020

DBYD Sequence No: 95675548 **DBYD Job No:** 19187307

ENDEAVOUR ENERGY ASSETS NOT AFFECTED

To:	Mr Simon Haycock		Company:	ATL	
Address:	Suite 702, 154 Pacific Highway, St Leonards, NSW 2065				
Cust. ID:	1295787	Email:	simon@atl.net.au		
Phone:	0294391777	Mobile:	0479160270	Fax:	Not Supplied
Enquiry Location:	416 Berrima Road, Moss Vale, NSW 2577				

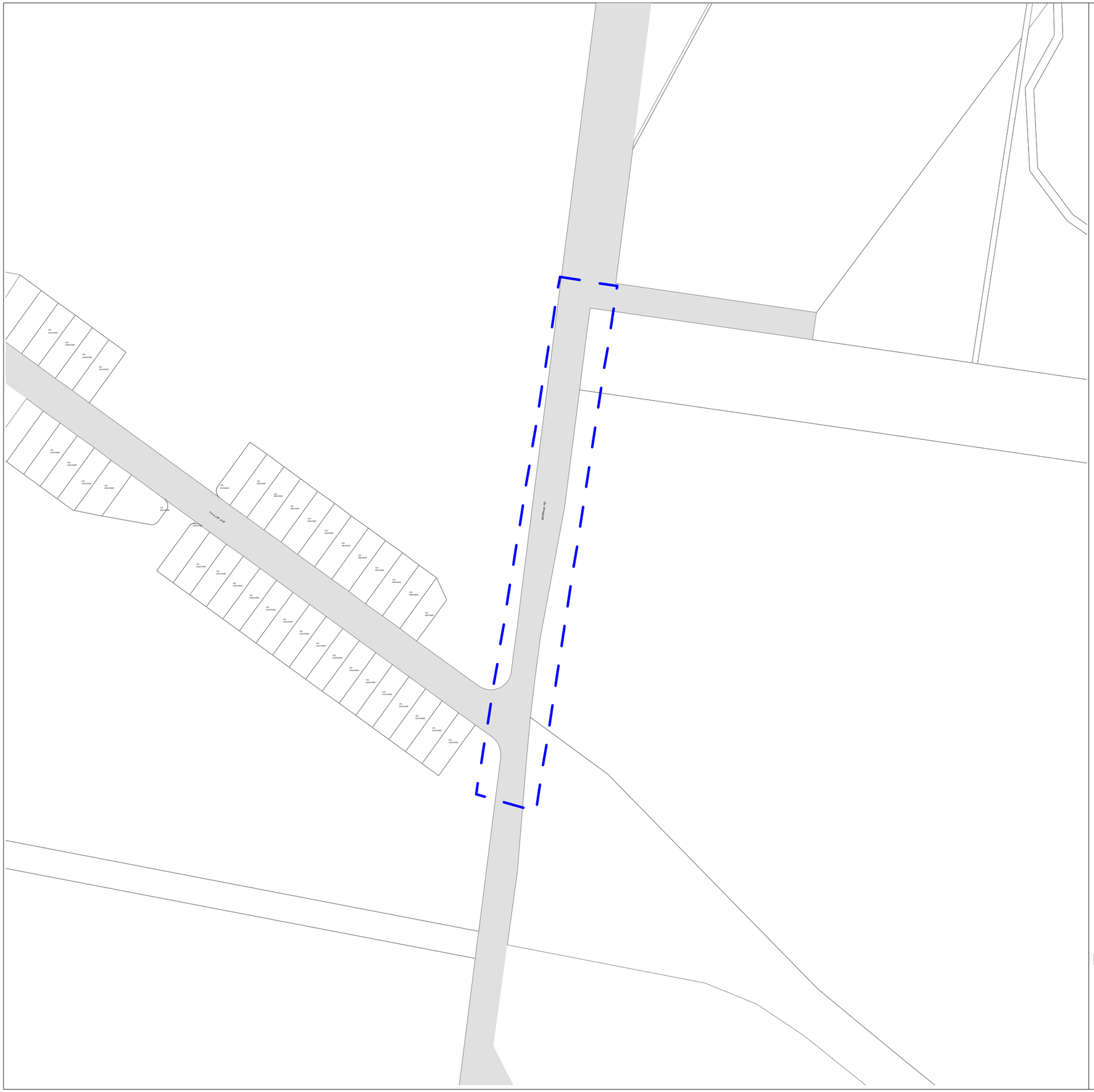
Our Search has shown that **NO UNDERGROUND ASSETS ARE PRESENT** on our plans within the nominated enquiry location. However all persons planning excavation shall read and understand the warnings below. This search is based on the graphical position of the excavation site as denoted in the DBYD customer confirmation sheet.

WARNING

- **All electrical apparatus shall be regarded as live until proved de-energised.** Contact with live electrical apparatus will cause severe injury or death.
- In accordance with the *Electricity Supply Act 1995*, you are obliged to report any damage to Endeavour Energy Assets immediately by calling **131 003**.
- The customer must obtain a new set of plans from Endeavour Energy if work has not been started or completed within twenty **(20)** working days of the original plan issue date.
- The customer must contact Endeavour Energy if any of the plans provided have blank pages, as some underground asset information may be incomplete.
- Endeavour Energy underground earth grids may exist and their location **may not** be shown on plans. Persons excavating are expected to exercise all due care, especially in the vicinity of padmount substations, pole mounted substations, pole mounted switches, transmission poles and towers.
- Endeavour Energy plans **do not** show any underground customer service mains or information relating to service mains within private property.
- Asbestos or asbestos-containing material may be present on or near Endeavour Energy's underground assets.
- Organo-Chloride Pesticides (OCP) may be present in some sub-transmission trenches.
- All plans must be printed and made available at the worksite where excavation is to be undertaken. Plans must be reviewed and understood by the crew on site prior to commencing excavation.

SUPPLEMENTARY MATERIAL

Material	Purpose	Location
DBYD Cover Letter	Endeavour Energy DBYD response Cover Letter	Attached
DBYD Important Information & Disclaimer	Endeavour Energy disclaimer, responsibilities and information on understanding plans	Attached
DBYD Response Plans	Endeavour Energy DBYD plans	Attached
Work Cover NSW *"Work near underground assets: Guide"*	Guideline for anyone involved in construction work near underground assets	Contact Work Cover NSW for a copy
Work Cover NSW *"Excavation work: Code of practice"*	Practical guidance on managing health and safety risks associated with excavation	URL [Click Here]
Safe Work Australia *"Working in the vicinity of overhead and underground electric lines guidance material"*	Provides information on how to manage risks when working in the vicinity of overhead and underground electric lines at a workplace	URL [Click Here]
Endeavour Energy Safety Brochures & Guides	To raise awareness of dangers of working on or near Endeavour Energy's assets	URL [Click Here]



Endeavour Energy

WARNING

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- Endeavour Energy underground earth grids may exist and their location **may not** be shown on plans. Persons excavating are expected to exercise all due care, especially in the vicinity of padmount substations, pole mounted substations, pole mounted switches, transmission poles and towers.
- Endeavour Energy plans **do not** show any underground customer service mains or information relating to service mains within private property.
- Asbestos or asbestos-containing material may be present on or near Endeavour Energy's underground assets.
- Organo-Chloride Pesticides (OCP) may be present in some sub-transmission trenches.
- All plans must be printed and made available at the worksite where excavation is to be undertaken. Plans must be reviewed and understood by the crew on site prior to commencing excavation.

INFORMATION PROVIDED BY ENDEAVOUR ENERGY

- Any plans provided pursuant to this service are intended to show the approximate location of underground assets relative to road boundaries, property fences and other structures at the time of installation.
- Depth of underground assets may vary significantly from information provided on plans as a result of changes to road, footpath or surface levels subsequent to installation.
- Such plans have been prepared solely for use by Endeavour Energy staff for design, construction and maintenance purposes.
- All enquiry details and results are kept in a register.

DISCLAIMER

Whilst Endeavour Energy has taken all reasonable steps to ensure that the information contained in the plans is as accurate as possible it will accept no liability for inaccuracies in the information shown on such plans.

LEGEND

- or — Street light column
- Padmount substation
- or — Overground pillar (O.G.Box)
- Underground pit
- Duct run
- Cable run
- Typical duct section
- Asbestos warning

N

NOT TO SCALE

DBYD Sequence No.:	95675548
Issued Date:	11/03/2020

Network Protection

Assets Affected

In reply to your enquiry, there are gas mains at the location of your intended work as per the attached map. For an explanation of the map, please see the key below. The following excavation guidelines apply.

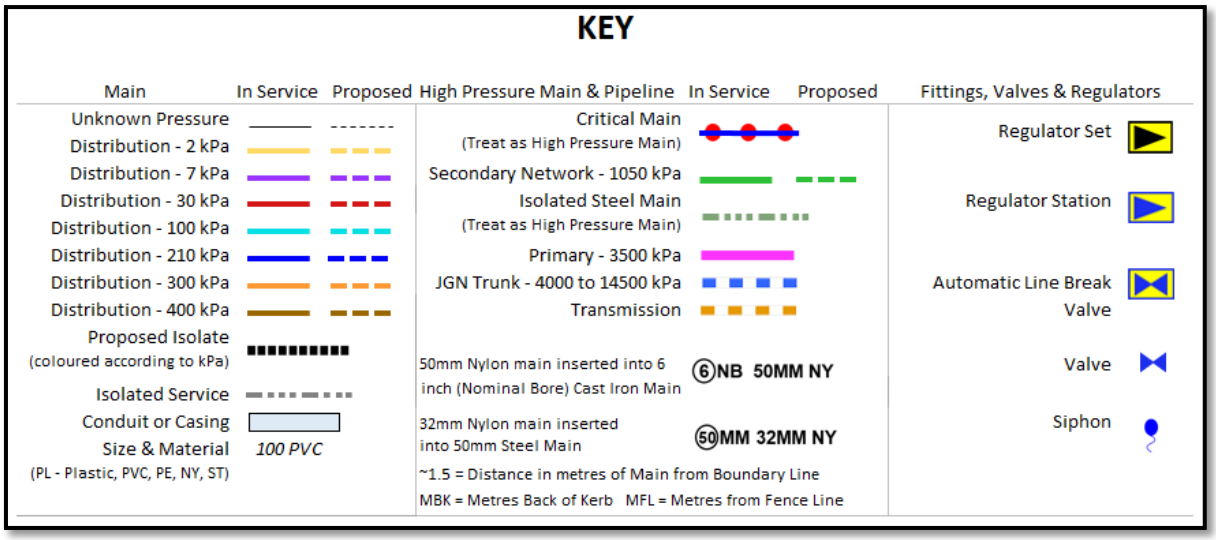
Excavation Guidelines:

It is essential the location of gas pipe/s are confirmed by carefully pot-holing by hand excavation prior to proceeding with mechanical excavation in the vicinity of gas pipes. If you cannot locate the gas main, contact the local depot.

In accordance with clause 34(5) of the Gas Supply (Safety and Network Management) Regulation 2013 (NSW), you should be informed that all excavation, (including pot-holing by hand to confirm the location of pipes) should be performed in accordance with "***Work Near Underground Assets Guideline"*** *published in 2007 by the Work Cover Authority.*

A copy of this Guideline is available at: www.workcover.nsw.gov.au

DBYD Administration 1300 880 906



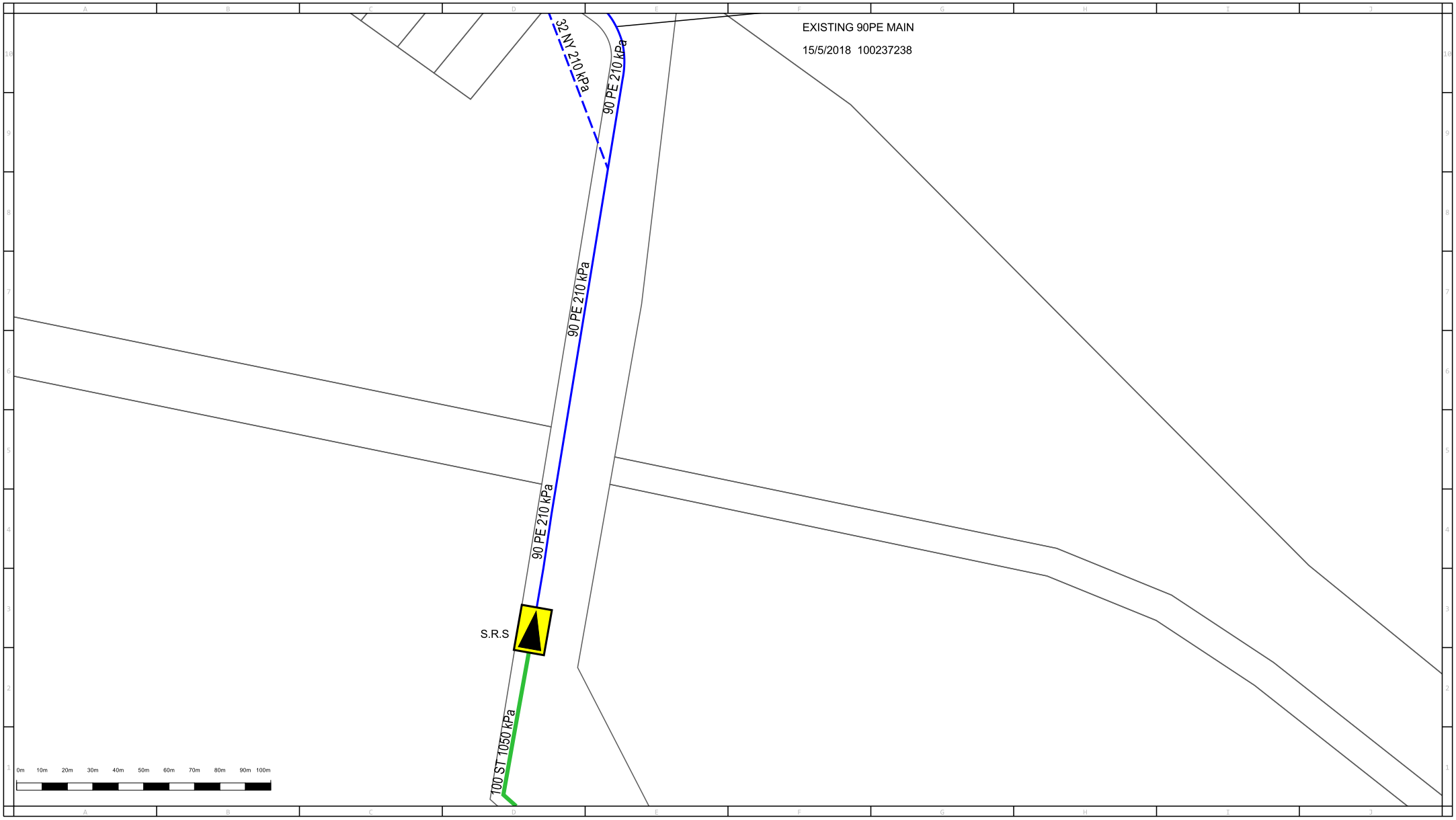
Warning: The enclosed plans show the position of Jemena Gas Networks (NSW) Ltd's underground gas mains and installations in public gazetted roads only. **Individual customers' services and services belonging to other third parties are not included** on these plans. These plans have been prepared solely for the use of Jemena Gas Networks (NSW) Ltd and Jemena Asset Management Pty Ltd (together "**Jemena**") and any reliance placed on these plans by you is entirely at your own risk. The plans may show the position of underground mains and installations relative to fences, buildings etc., as they existed at the time the mains etc were installed. The plans may not have been updated to take account of any subsequent change in the location or style of those features since the time at which the plans were initially prepared. Jemena makes no warranty as to the accuracy or completeness of the enclosed plans and does not assume any duty of care to you nor any responsibility for the accuracy, adequacy, suitability or completeness of the plans or for any error, omission, lack of detail, transmission failure or corruption in the information provided. Jemena does not accept any responsibility for any loss that you or anyone else may suffer in connection with the provision of these plans, however that loss may arise (including whether or not arising from the negligence of Jemena, its employees, agents, officers or contractors). The recipient of these plans must use their own care and diligence in carrying out their works and must carry out further surveys to locate services at their work site. Persons excavating or carrying out other earthworks will be held responsible for any damage caused to Jemena's underground mains and equipment. In accordance with the Work Near Underground Assets Guideline published in 2007 by Work Cover Authority, Jemena recommends that you carry out potholing by hand to accurately confirm the location of gas mains and installation prior to commencing excavations.

In case of Emergency Phone 131 909 (24 hours)

Admin
1300 880 906

DBYD Authority: Jemena Gas Networks (NSW)

DBYD Location: 416 Berrima Road Moss Vale NSW, 2577



Jemena
ABN 87 003 004 322

Main	In Service	Proposed
Unknown Pressure		
Distribution - 2 kPa		
Distribution - 7 kPa		
Distribution - 30 kPa		
Distribution - 100 kPa		
Distribution - 210 kPa		
Distribution - 300 kPa		
Distribution - 400 kPa		

Main	
Proposed Isolate (coloured according to kPa)	
Isolated Service	
Conduit or Casing	
Size & Material (PL - Plastic, PVC, PE, NY, ST)	*100 PVC*

High Pressure Main & Pipeline	In Service	Proposed
Critical Main (Treat as High Pressure Main)		
Secondary Network - 1050 kPa		
Isolated Steel Main (Treat as High Pressure Main)		
Primary - 3500 kPa		
JGN Trunk - 7000 kPa		
Transmission		

Fittings, Valves & Regulators		
Siphon	Distance in metres of Main from Boundary Line	~1.5
Valve	MBK = Metres Back of Kerb	
Regulator Set	MFL = Metres from Fence Line	
Regulator Station	50mm Nylon main inserted in 6 inch (Nominal Bore) Cast Iron Main	⑥NB 50MM NY
Automatic Line Break Valve	32mm Nylon main inserted into 50mm Steel Main	50MM 32MM NY

N W E S

Scale: 1:2000

Issue Date: 11/03/2020

DBYD Seq No: 95675551

DBYD Job No: 19187307

WARNING: This is a representation of Jemena Gas Networks underground assets only and may not indicate all assets in the area. It must not be used for the purpose of exact asset location in order to undertake any type of excavation. This plan is diagramatic only, and distances scaled from this plan may not be accurate. Please read all conditions and information on the attached information sheet. This extract is subject to those conditions. The information contained on this plan is only valid for 28 days from the date of issue.

DBYD Authority: Jemena Gas Networks (NSW)

DBYD Location: 416 Berrima Road Moss Vale NSW, 2577

Jemena
ABN 87 003 004 322

Main	In Service	Proposed
Unknown Pressure		
Distribution - 2 kPa		
Distribution - 7 kPa		
Distribution - 30 kPa		
Distribution - 100 kPa		
Distribution - 210 kPa		
Distribution - 300 kPa		
Distribution - 400 kPa		

Main	
Proposed Isolate (coloured according to kPa)	
Isolated Service	
Conduit or Casing	
Size & Material (PL - Plastic, PVC, PE, NY, ST)	*100 PVC*

High Pressure Main & Pipeline	In Service	Proposed
Critical Main (Treat as High Pressure Main)		
Secondary Network - 1050 kPa		
Isolated Steel Main (Treat as High Pressure Main)		
Primary - 3500 kPa		
JGN Trunk - 7000 kPa		
Transmission		

Fittings, Valves & Regulators		
Siphon	Distance in metres of Main from Boundary Line	~1.5
Valve	MBK = Metres Back of Kerb	
Regulator Set	MFL = Metres from Fence Line	
Regulator Station	50mm Nylon main inserted in 6 inch (Nominal Bore) Cast Iron Main	⑥NB 50MM NY
Automatic Line Break Valve	32mm Nylon main inserted into 50mm Steel Main	50MM 32MM NY

N W E S

Scale: 1:2000

Issue Date: 11/03/2020

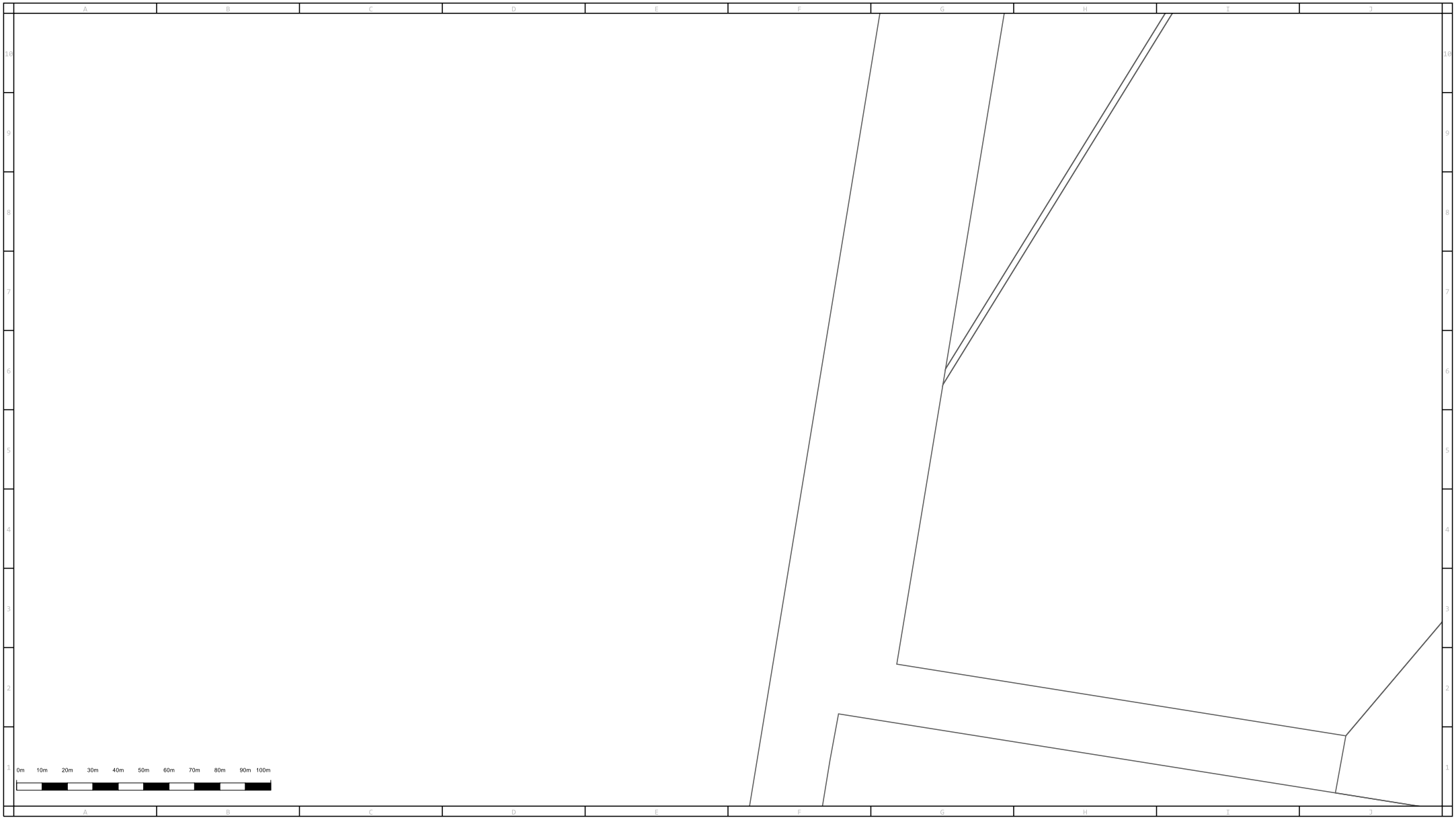
DBYD Seq No: 95675551

DBYD Job No: 19187307

WARNING: This is a representation of Jemena Gas Networks underground assets only and may not indicate all assets in the area. It must not be used for the purpose of exact asset location in order to undertake any type of excavation. This plan is diagramatic only, and distances scaled from this plan may not be accurate. Please read all conditions and information on the attached information sheet. This extract is subject to those conditions. The information contained on this plan is only valid for 28 days from the date of issue.

DBYD Authority: Jemena Gas Networks (NSW)

DBYD Location: 416 Berrima Road Moss Vale NSW, 2577



Jemena
ABN 87 003 004 322

Main	In Service	Proposed
Unknown Pressure		
Distribution - 2 kPa		
Distribution - 7 kPa		
Distribution - 30 kPa		
Distribution - 100 kPa		
Distribution - 210 kPa		
Distribution - 300 kPa		
Distribution - 400 kPa		

Main	
Proposed Isolate (coloured according to kPa)	
Isolated Service	
Conduit or Casing	
Size & Material (PL - Plastic, PVC, PE, NY, ST)	*100 PVC*

High Pressure Main & Pipeline	In Service	Proposed
Critical Main (Treat as High Pressure Main)		
Secondary Network - 1050 kPa		
Isolated Steel Main (Treat as High Pressure Main)		
Primary - 3500 kPa		
JGN Trunk - 7000 kPa		
Transmission		

Fittings, Valves & Regulators		
Siphon	Distance in metres of Main from Boundary Line	~1.5
Valve	MBK = Metres Back of Kerb	
Regulator Set	MFL = Metres from Fence Line	
Regulator Station	50mm Nylon main inserted in 6 inch (Nominal Bore) Cast Iron Main	6NB 50MM NY
Automatic Line Break Valve	32mm Nylon main inserted into 50mm Steel Main	50MM 32MM NY

N W E S

Scale: 1:2000

Issue Date: 11/03/2020

DBYD Seq No: 95675551

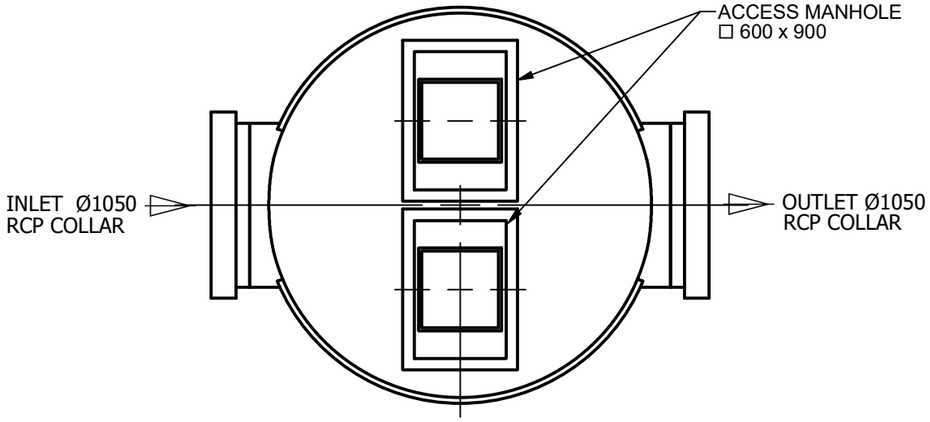
DBYD Job No: 19187307

WARNING: This is a representation of Jemena Gas Networks underground assets only and may not indicate all assets in the area. It must not be used for the purpose of exact asset location in order to undertake any type of excavation. This plan is diagramatic only, and distances scaled from this plan may not be accurate. Please read all conditions and information on the attached information sheet. This extract is subject to those conditions. The information contained on this plan is only valid for 28 days from the date of issue.

Appendix F

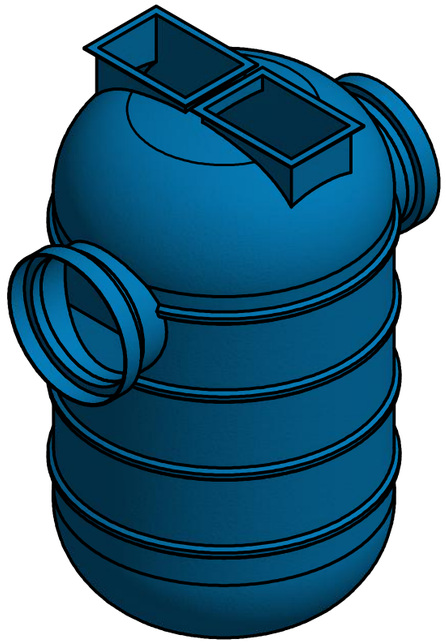
SPEL Stormwater Quality Treatment Device Drawings

REVISION HISTORY				
REV	DESCRIPTION	DESIGNER	CREATION DATE	CHECKED BY
1	INITIAL RELEASE	M.MAKIN	20/11/2019	

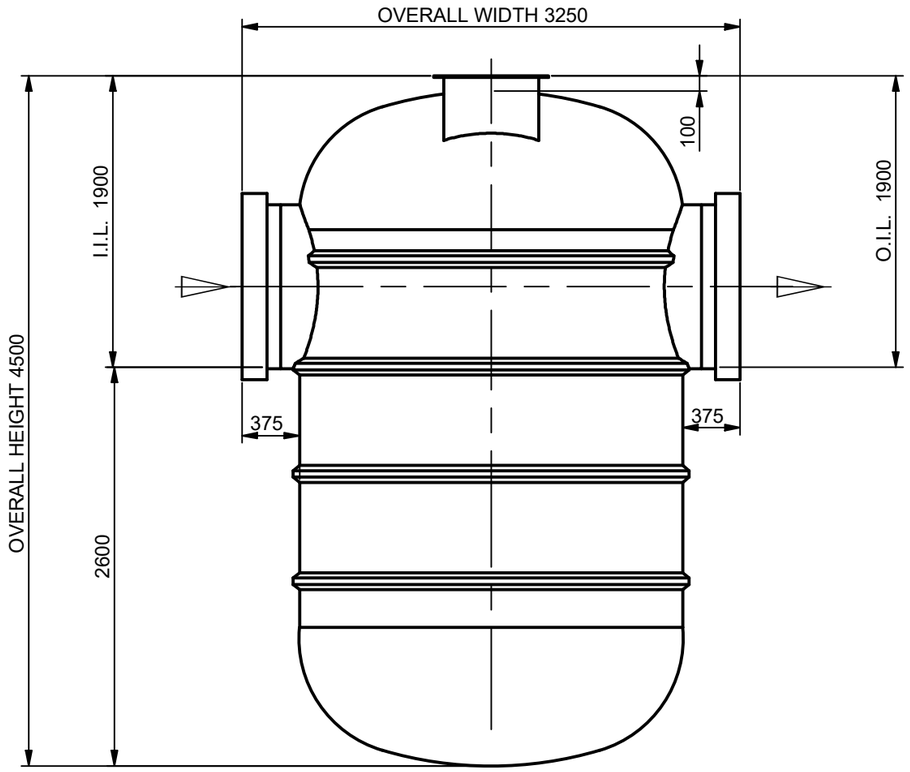


PLAN VIEW

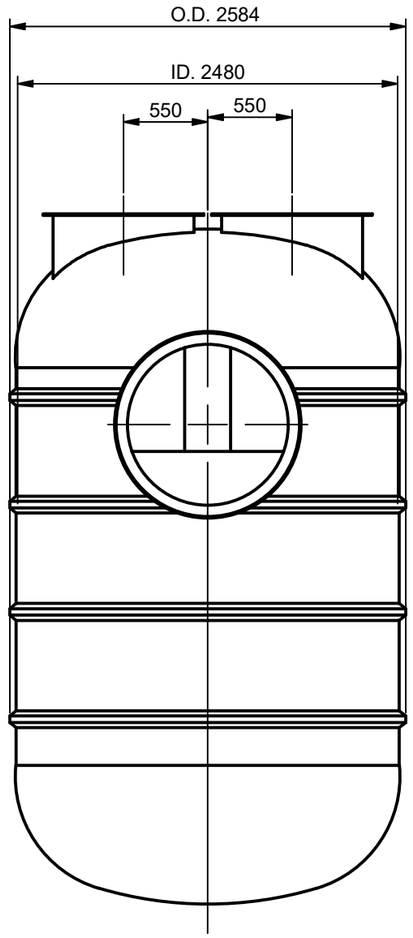
Site Level Confirmation	
Finished Surface Level (FSL)	RL:
Access Cover Thickness	mm
Inlet Invert Level	RL:
Outlet Invert Level	RL:
Company:	
Name:	
Date:	



ISOMETRIC VIEW



ELEVATION VIEW



SIDE VIEW

APPROVED.....

NAME.....

SIGNED.....

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

ISSUE FOR APPROVAL
NOT FOR CONSTRUCTION

E:\Vault Working Folder\Designs\SPEL\PRODUCTS\ECOCEPTOR\CLASS 3\E.1800-80105105\PROJECT\416 BERRIMA RD, MOSS VALE\SP19-EC15540-P.idw

TOLERANCE: ALL DIMENSIONS TO NEAREST 10mm ☐/- 30mm UNLESS OTHERWISE STATED.

CLIENT:

DISTRIBUTOR :

Drawn	M.MAKIN	Date 20/11/2019
Check		Date
Verified		Date
Approved		Date
Request No.		

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

PROJECT : 416 BERRIMA RD, MOSS VALE

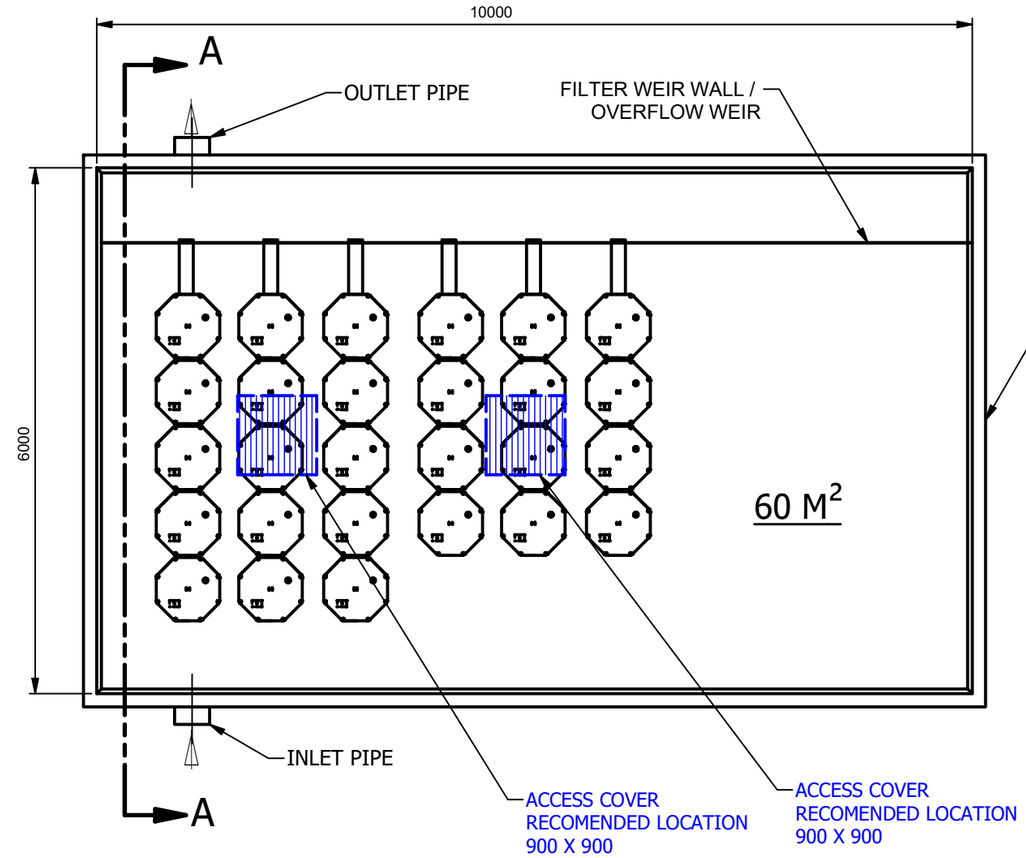
TITLE: ECOCEPTOR - 8,000 SERIES CLASS 3
E.1800/80105105.C3.RCP
GENERAL ARRANGEMENT

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

CUSTOMER CODE :

DWG No. SP19-EC15540-P

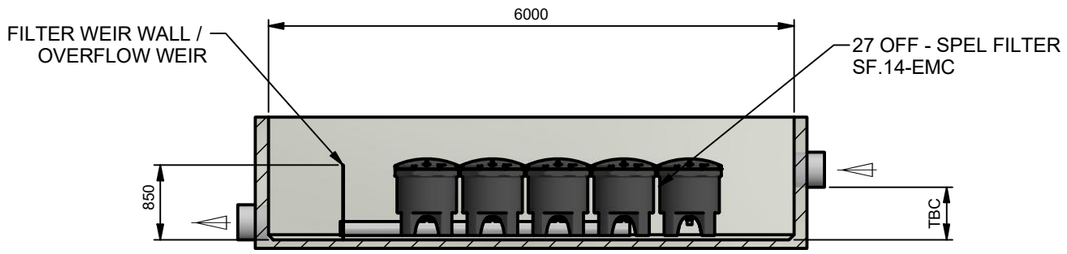
REVISION HISTORY				
REV	DESCRIPTION	DESIGNER	CREATION DATE	CHECKED BY
1	INITIAL RELEASE	M.MAKIN	20/11/2019	



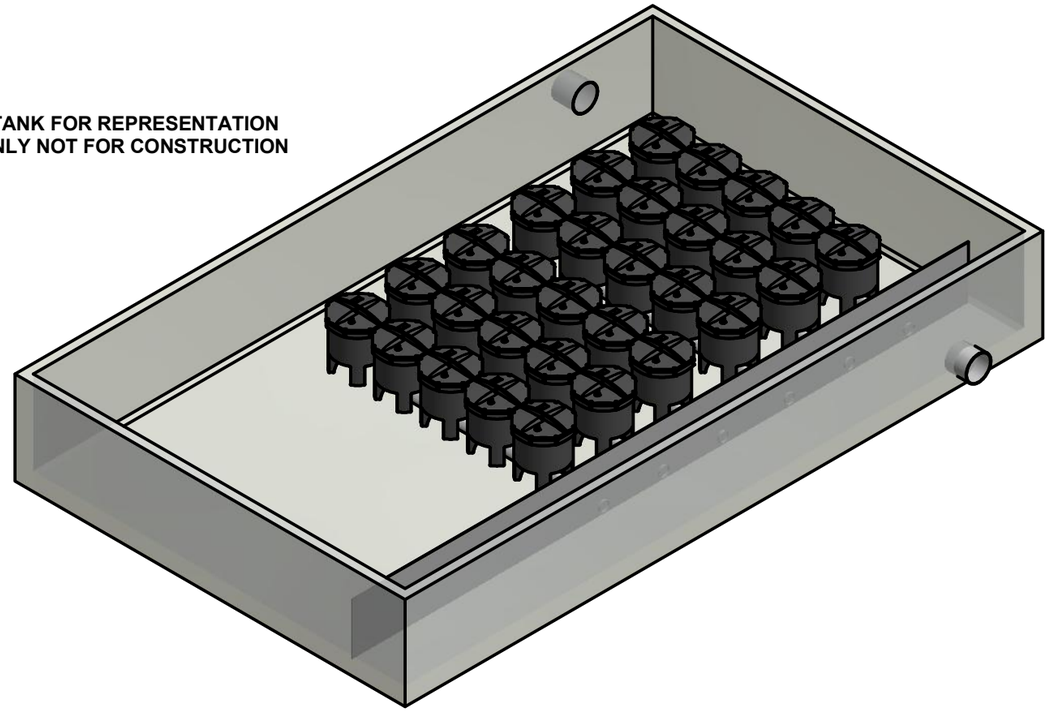
CONCRETE TANK FOR REPRESENTATION PURPOSE ONLY NOT FOR CONSTRUCTION

PLAN VIEW

COVER & LID REMOVED FOR CLARITY



SECTION A-A



ISOMETRIC VIEW

NOTE:
- LIFTING WEIGHTS MAY VARY DEPENDING ON CUSTOM DESIGN
- ALL PIPES AND CORE HOLES BY OTHERS
- WALLS AND FLOORS TO STRUCTURAL ENGINEER'S REQUIREMENTS
- MINIMUM 850MM HEAD REQUIRED TO ACHIEVE TREATMENT FLOW RATE

APPROVED..... ☐

NAME.....

SIGNED.....

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

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

ISSUE FOR APPROVAL
NOT FOR CONSTRUCTION

TOLERANCE: ALL DIMENSIONS 10mm UNLESS OTHERWISE STATED.

CLIENT:

DISTRIBUTOR :

Drawn	M.MAKIN	Date 20/11/2019
Check		Date
Verified		Date
Approved		Date
Request No.	RN2358	

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

PROJECT : 416 BERRIMA RD, MOSS VALE

TITLE SPEL TREATMENT TRAIN
SF.1060-27.29.CON.
27 SPEL FILTER VAULT

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

CUSTOMER CODE :

DWG No. SP19-SF14950-P

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at&l

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