Section 4
SPECIALIST REPORTS

Zone Planning Group

Section 4 - SPECIALIST REPORTS

Bushfire Management Plan
Prepared by Wollemi-Eco

zone Planning Group

Wollemi Eco-Logical

Environmental Project Management | Bushfire Assessment | Vegetation Management

Bushfire Management Plan

79-99 Courtney Drive, Upper Coomera

Lots 188-192 on RP173728

Gold Coast City Council, Qld

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It should be noted that the recommendations within this BMP have been formulated based on site conditions at the time of writing and utilising current best-practise hazard and impact assessment methodologies, and have been developed to reduce the potential severity of impacts on the proposed development in the event of a bushfire emergency rather than prevent impacts altogether. No guarantee is provided or assumed that the area will not be affected by bushfire at some time.

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1.0 INTRODUCTION

Wollemi Eco-Logical has been commissioned to undertake a Site Specific Bushfire Hazard Assessment and to prepare a Bushfire Management Plan for a proposed development on the subject site (**Figure 1**).

This report aims to assess the Bushfire Hazard and risk to the proposed development with regard to the *Queensland State Government Single State Planning Policy - Part E* (SPP 2017), and the *Gold Coast City Council, Bushfire Hazard Overlay Code (8.2.3),* and the *Australian Standard – Construction in Bushfire Prone Areas (AS3959-2009).* These documents detail both the State and Council interest in Bushfire Hazard with regard to determining suitability of development applications.

Subsequently, this report references currently available best-practice Bushfire Hazard Assessment and Risk Mitigation Methodologies, from the following sources: Vegetation Hazard Classification & Potential Fire-line Intensity for Queensland sourced from 'A new methodology for state-wide mapping of bushfire prone areas in Queensland'. CSIRO, Australia. (2014); Bushfire Attack Level (BAL), Building setback requirements and Construction Standards as per the Australian Standard AS 3959- 2009 - *Construction of buildings in bushfire prone areas*. These methodologies are used in conjunction with GCCC Planning Scheme requirements to ensure appropriate assessment and mitigation of potential bushfire hazard is undertaken.

Vegetation composition and extent, slope and industry standard Fuel Load calculations will be used to determine the Potential Bushfire Hazard acting on the proposed development. Once determined, Bushfire Risk Mitigation Measures are detailed in order to demonstrate compliance with Councils Planning Scheme performance outcome to ensure the safety of people and property in the event of a bushfire emergency.

This BMP has been prepared by a suitably qualified Bushfire Consultant with over 20 years relevant experience in Environmental Management & Bushfire Planning and Design experience specific to South East Queensland.

1.1 Subject Site

Address: 79-99 Courtney Drive, Upper Coomera

Titles: Lots 188-192 on RP173728

Local Government: Gold Coast City Council

Total Area: 18,849ha

Zoning: Rural Residential

Topography: The site is undulating, generally falling toward Courtney Drive from the south and eastern property boundaries at up to 4 degrees. The Southeast extent also falls to the southeast at <5 degrees.

Current Use: Rural residential land uses.

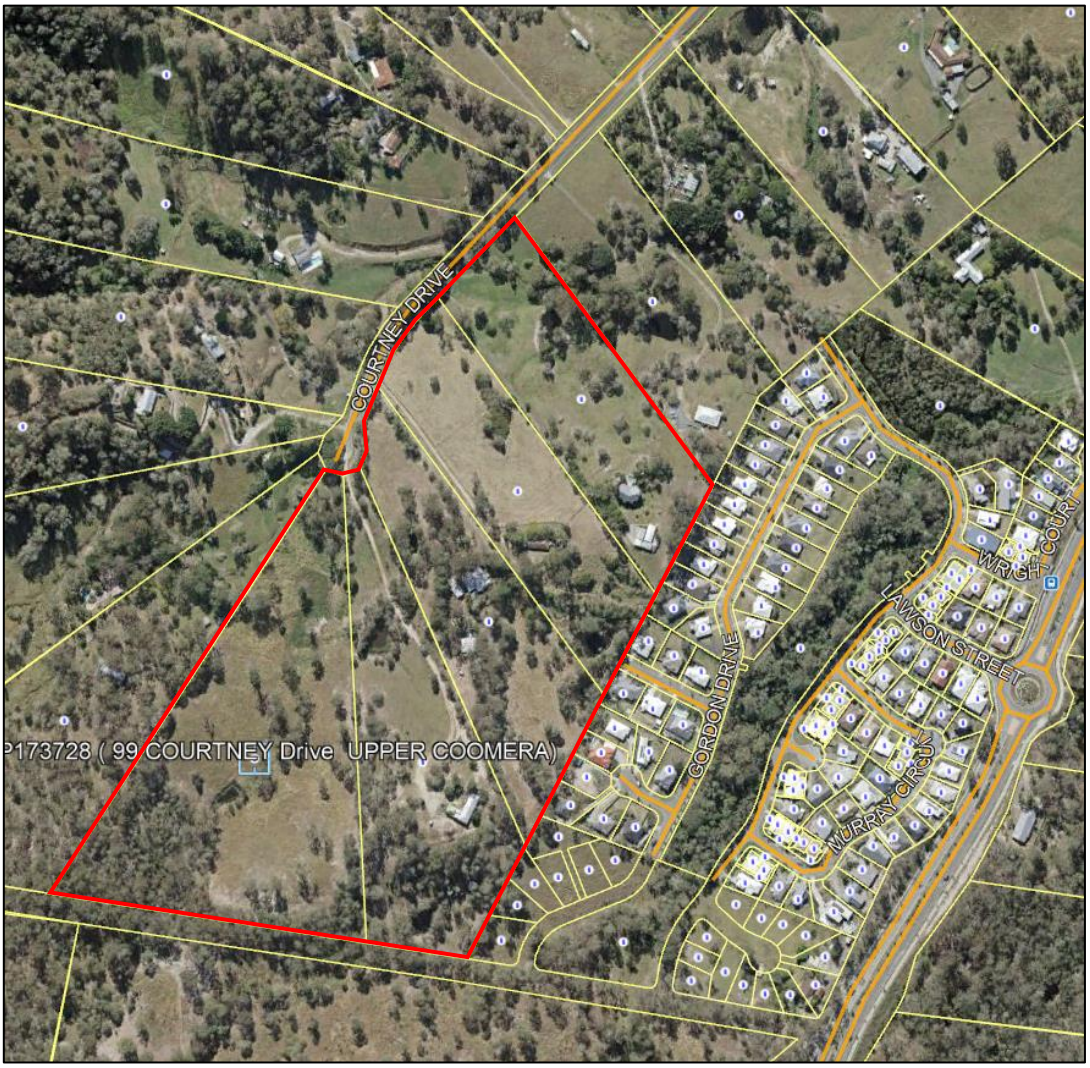

Figure 1: Subject Site

1.2 Proposed Development

It is understood a new 237 Lot, residential subdivision is proposed to be constructed on the subject site. The proposed development layout is represented in **Figure 2**.

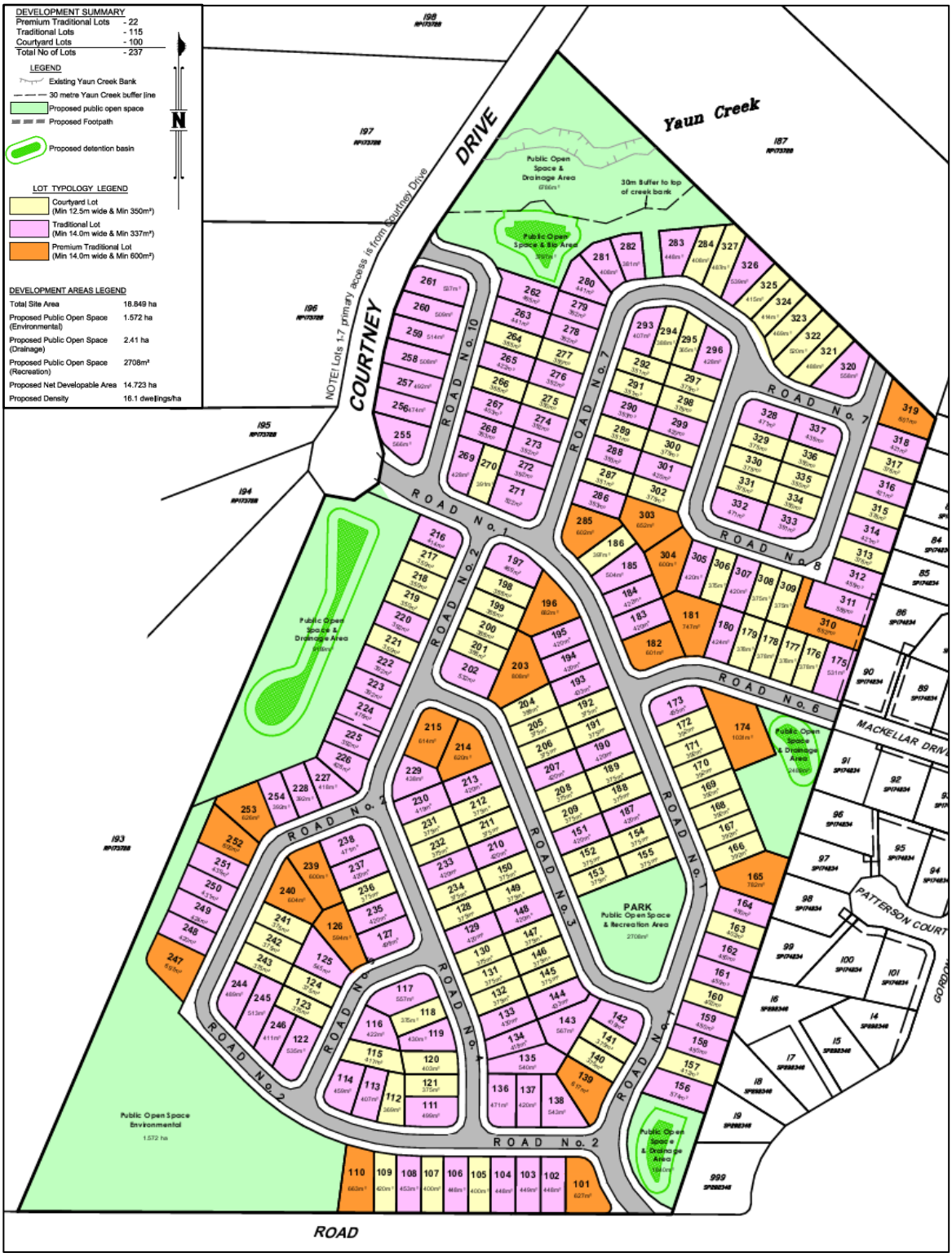

Figure 2: Proposed Development Layout

2.0 Bushfire Hazard Assessment

The prevalence of Bushfire in the landscape is dependent on vegetation type and fuel load available to sustain a bushfire. Bushfire intensity and rate of spread are influenced by fuel load, (including type and extent of vegetation), topography and to a lesser extent aspect. Land uses surrounding potentially hazardous vegetation, and consequently the connectivity of vegetation communities, all influence the potential for a bushfire to develop and be sustained.

2.1 Current Bushfire Hazard Mapping

On review of Gold Coast City Council (GCCC) Bushfire Hazard Overlay Mapping, the site is mapped as containing patches of High and Medium Potential Bushfire Hazard, and Potential Bushfire Impact Buffer areas (**Figure 3**).

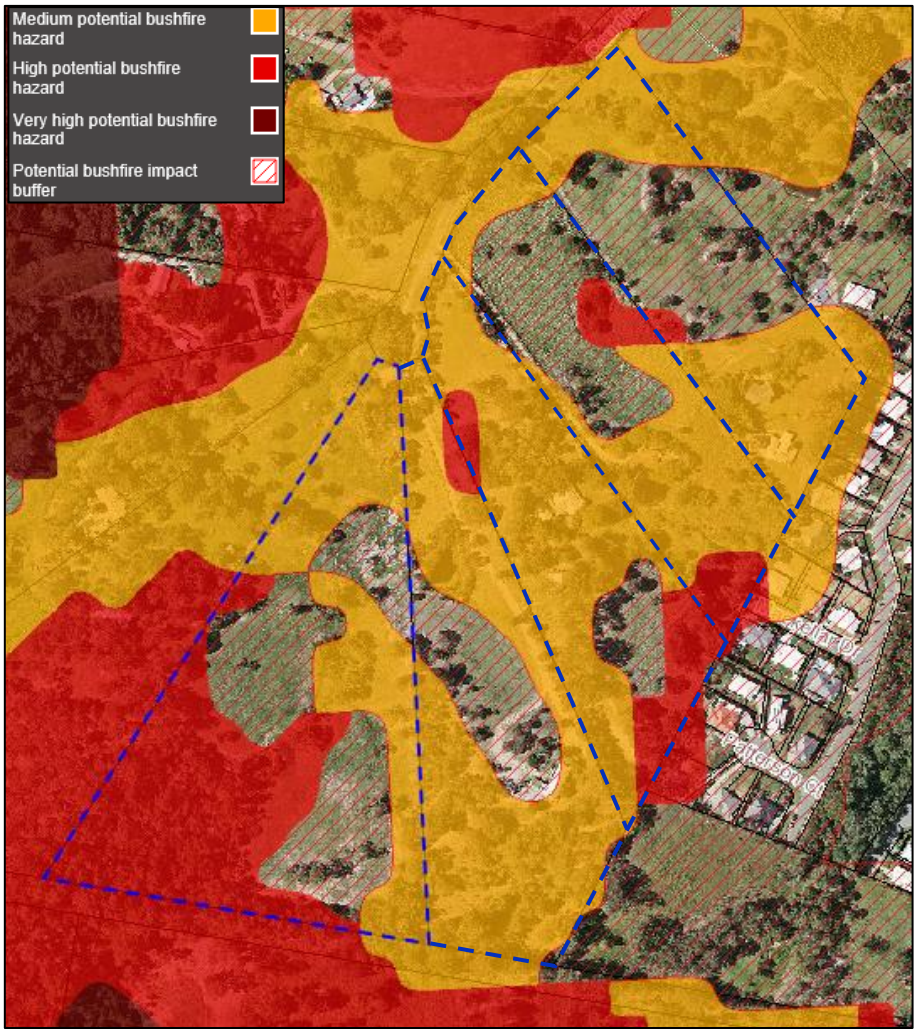

Figure 3: GCCC Bushfire Hazard Overlay Mapping

It should be noted that current SPP Interactive Mapping, as maintained by the Department of Infrastructure, Local Government & Planning (DILGP), maps the majority of the site as

containing a lesser Potential Bushfire Hazard than the above Council mapping (refer **Figure 4**).

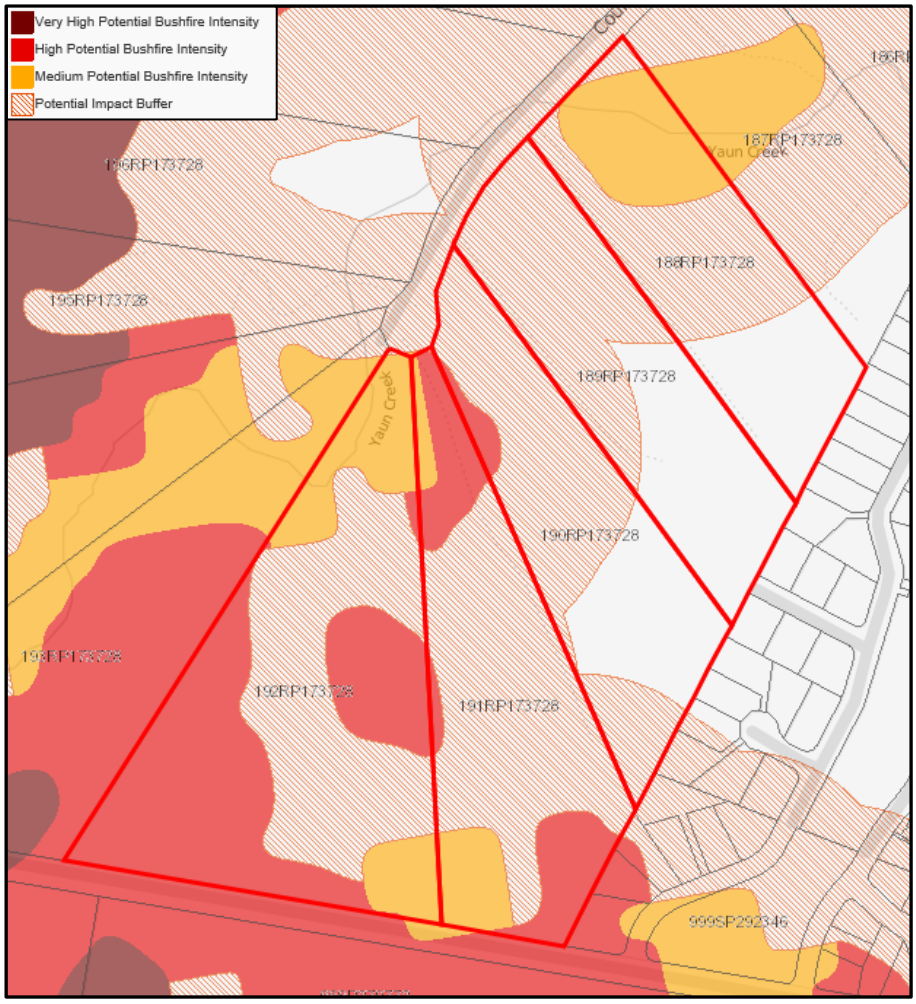

Figure 4: State Bushfire Hazard Overlay Mapping

To verify the Bushfire Hazard mapping, a Site-Specific Bushfire Hazard Assessment is triggered, and is addressed below.

2.2 On-Site Hazard Assessment

This Site Specific Bushfire Hazard Assessment references: Vegetation Hazard Classification & Potential Fire-line Intensity for Queensland sourced from *A new methodology for state-wide mapping of bushfire prone areas in Queensland*. CSIRO, Australia. (2014)[1]; Bushfire Attack Level (BAL), Building setback requirements and Construction Standards as per the Australian

[1] This methodology updates the calculations apparent in the Australian Standard AS3959: 2009 based on current fire weather modelling and includes 43 detailed Vegetation Hazard Classes, in addition to the 20 broad Hazard categories used to update State-wide Mapping.

Standard AS 3959- 2009 - *Construction of buildings in bushfire prone areas*[2]; and Bushfire Risk Mitigation Measures in compliance with current industry best-practice assessment methodologies. Vegetation composition and extent, slope and industry standard Fuel Load calculations will be used to determine the Potential Bushfire Hazard acting on the proposed development. Additionally, this BMP will address the requirements of the proposed development against *Gold Coast City Council, Bushfire Hazard Overlay Code (8.2.3)* with regard to the proposed development.

Two key features of the landscape strongly contribute towards the behaviour of bushfires:

1. Vegetation community structure/composition
   The structure and composition of vegetation communities determine the rate at which dry fuel accumulates. Some vegetation communities protect fuel from drying out in all but extreme bushfire seasons, making the vegetation susceptible to very destructive bushfires, whilst other vegetation communities may expose fuels to drying and therefore be frequently available for burning.
2. Slope
   As a general rule, bushfire intensity and the rate of spread of bushfires rises in proportion to slope, with bushfires burning faster uphill and slower downhill. Studies have shown that the speed and intensity of fires moving up slopes generally doubles every 10 degrees of slope. Steeper slopes also increase the difficulty of constructing ring roads and firebreaks and limit the access for emergency crews.

Several investigative tools were utilised to determine the site specific bushfire hazard risk including:

- A review of local aerial photography;
- A review of site and local topography;
- Review of site development plan;
- A review of DERM Regional Ecosystem Mapping; and
- An inspection of the site.

The risk assessment comprised an analysis of the site and the surrounding lands (i.e. within 100m) to determine characteristic bushfire risk based on Vegetation Hazard Classifications for vegetation within 100m of the site.

[2] The Australian Standard AS3959: 2009 defines Fire Danger Index as the chance of a fire starting, its rate of spread, its intensity and the difficulty of its suppression, according to various combinations of air temperature, relative humidity, wind speed and both the long and short term drought effects.

2.2.1 Site Inspection & Findings

A site inspection was completed on the 31st August 2017 to verify the bushfire hazard mapping over the site and surrounds. All vegetated areas of the site and within 100m of the proposed development site were assessed during the site investigations.

A summary of the findings of the site inspection is provided:

1. Site access is via Courtney Drive, a formed public bitumen road bordering the northwest of the majority of the site. Courtney Drive is accessed from the east via Reserve Road, a major arterial road, linking the pacific Motorway in the east.
2. The site is located in a Rural Residential setting, with established dwellings and rural land uses on site and to the west, south and north. Extensive emerging residential development is located immediately to the east of the site, and further afield to the northeast.
3. Site topography is undulating with the lots 188 – 192 generally sloping upslope from Courtney Drive to the southern and eastern extents of the property boundaries (respectively). Lot 188 contains an overland flow path through the north-western portions of the lots and subsequently slopes downhill from Courtney drive to the northeast in this locality. Adjacent properties to the south of Lots 191 and 192 slope upslope to the south. Adjacent properties to the east slope downslope at approximately 7 degrees, and properties on the western side of Courtney Drive slope up to the southwest through west to northwest respectively.
4. Regulated Vegetation as maintained by Qld Department of Natural Resources & Mines (DNRM), maps a small area adjacent the southwestern boundary of Lot 192 as containing Regional Ecosystem (RE) 12.11.5, described as '*Corymbia citriodora subsp. variegata, Eucalyptus siderophloia, E. major open forest on metamorphics ± interbedded volcanics*' (Refer **Figure 5**).

   Site assessment generally confirmed the vegetation present in this locality (southwest) to be reflective of the described RE, all-be-it fragmented. The remainder of site vegetation consisted of: small patches of fragmented native vegetation, consisting of limited dominant species (i.e. mature Eucalypt sp.) and relatively high percentage of acacia; scattered trees and shrubs (predominantly Eucalypt and acacia); dominant, predominantly maintained grazing land throughout; ornamentals and exotics associated with existing residences, and exotic species, predominantly lantana, and introduced grasses.
5. Adjacent vegetation to the north consists predominantly of managed grazing land, with scattered trees, and ornamentals as associated with an established residential dwelling and rural residential land use.
6. Adjacent vegetation to the east is limited to scattered trees, ornamentals and maintained grass as associated with established, and under construction, residential dwellings.

7. Adjacent vegetation to the south consists of a narrow (east/west) strip of Eucalypt species in the road reserve, with patches of native and regenerating vegetation and predominantly unmanaged grazing land further south.
8. Adjacent vegetation to the west within 100m is consistent with site vegetation, being scattered trees and shrubs over maintained grazing land, and ornamental associated with residential land uses.

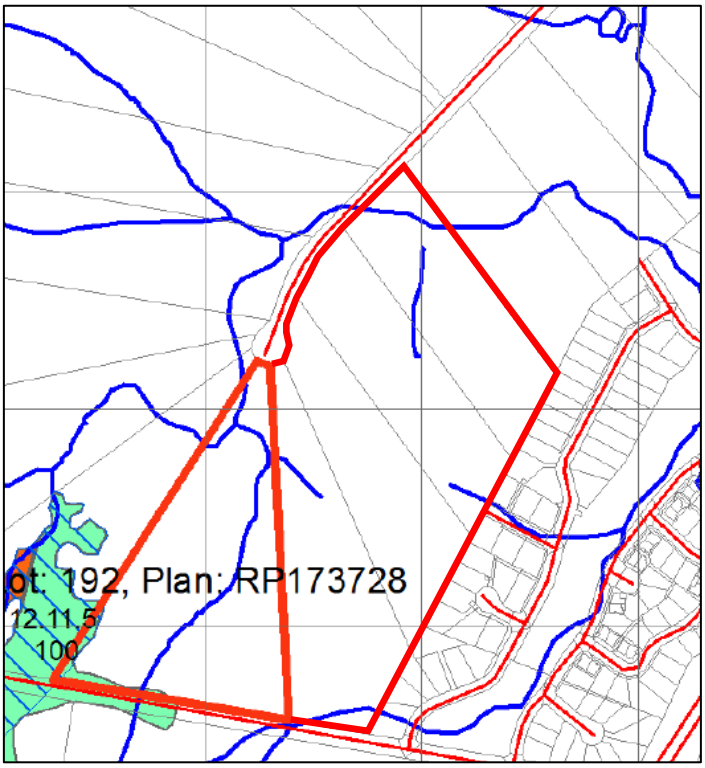

Figure 5: Regional Ecosystem Mapping

2.2.2 Vegetation Classification

The structure and composition of vegetation communities determine the rate at which dry fuel accumulates. Some vegetation communities protect fuel from drying out in all but extreme bushfire seasons, making the vegetation susceptible to very destructive bushfires, whilst other vegetation communities may expose fuels to drying and therefore be frequently available for burning.

Vegetation communities surrounding the proposed development were referenced against mapped RE's in the general vicinity, and Vegetation Hazard Classifications and Potential Fire-line Intensity calculations as detailed in the CSIRO (2014) report. Potential Fuel Load calculations were undertaken on site to validate vegetation classifications and subsequently potential bushfire hazard to the proposed development.

Vegetation ecotones result in varying fuel load availability. Subsequently, vegetation communities have been referenced against predominant vegetation with highest fuel loads.

Observed vegetation communities are described in **Table 1**. It is understood that the majority of site vegetation within the proposed development footprint and associated site infrastructure will be removed for the purpose of the development. Note: Retention of individual trees and small patches of vegetation within the development site as per the proposed site layout is considered in the following determinations.

Table 1 Vegetation Hazard Classifications

Direction of Bushfire Hazard	Vegetation Description (Sub-Unit – if relevant)	DNRM Regional Ecosystem (ref. RE)	Vegetation Hazard Class (CSIRO, 2014)	Potential Fuel Load (t/ha)	Potential Fire-line Intensity (kw/m)	Potential Bushfire Hazard
North: Current Lot 187SP173728	Grazing land, small patch of vegetation, scattered trees (SU1)	NA	Class 12: Mixture of Rural Classes – Mainly Grassland	8t/ha (calculated)	1,984	LOW
East: All proposed Lots	Managed vegetation associated with established residential development (SU2)	NA	Class 16: Mixture of Urban Classes	5t/ha (5 deg.)	1,094	LOW
South to Southeast: Current Lots 191 & 192 on SP173728)	Narrow strip of Eucalypt species with patches of native vegetation and predominantly unmanaged grazing land. (SU3)	NA	Class 12: Mixture of Rural Classes – Mainly Grassland	10t/ha (calculated)	3,100	LOW
Southwest: Current Lot Lot 192 SP173728	Eucalypt Forest (SU4)	12.11.5	Class 13.1: moist to dry eucalypt open forests on undulating metamorphics and granite	24.1t/ha (calculated)	18,005	Medium
West: Current Lot 192 SP173728	Fragmented Eucalypt Forest (SU5)	12.11.5	Class 13.1: Dry to moist Eucalypt forest on undulating metamorphics	21.7t/ha	14,597	Medium
West: Current Lots 188 &191SP17372 & northwest of Lot 192 SP17372	Managed Grazing land, scattered trees, rural residential land uses (SU6)	NA	Class 12: Mixture of Rural Classes – Mainly Grassland	5t/ha	830	LOW

Vegetation Hazard classification as described in **Table 1**, are visually represented in **Figure 6**.

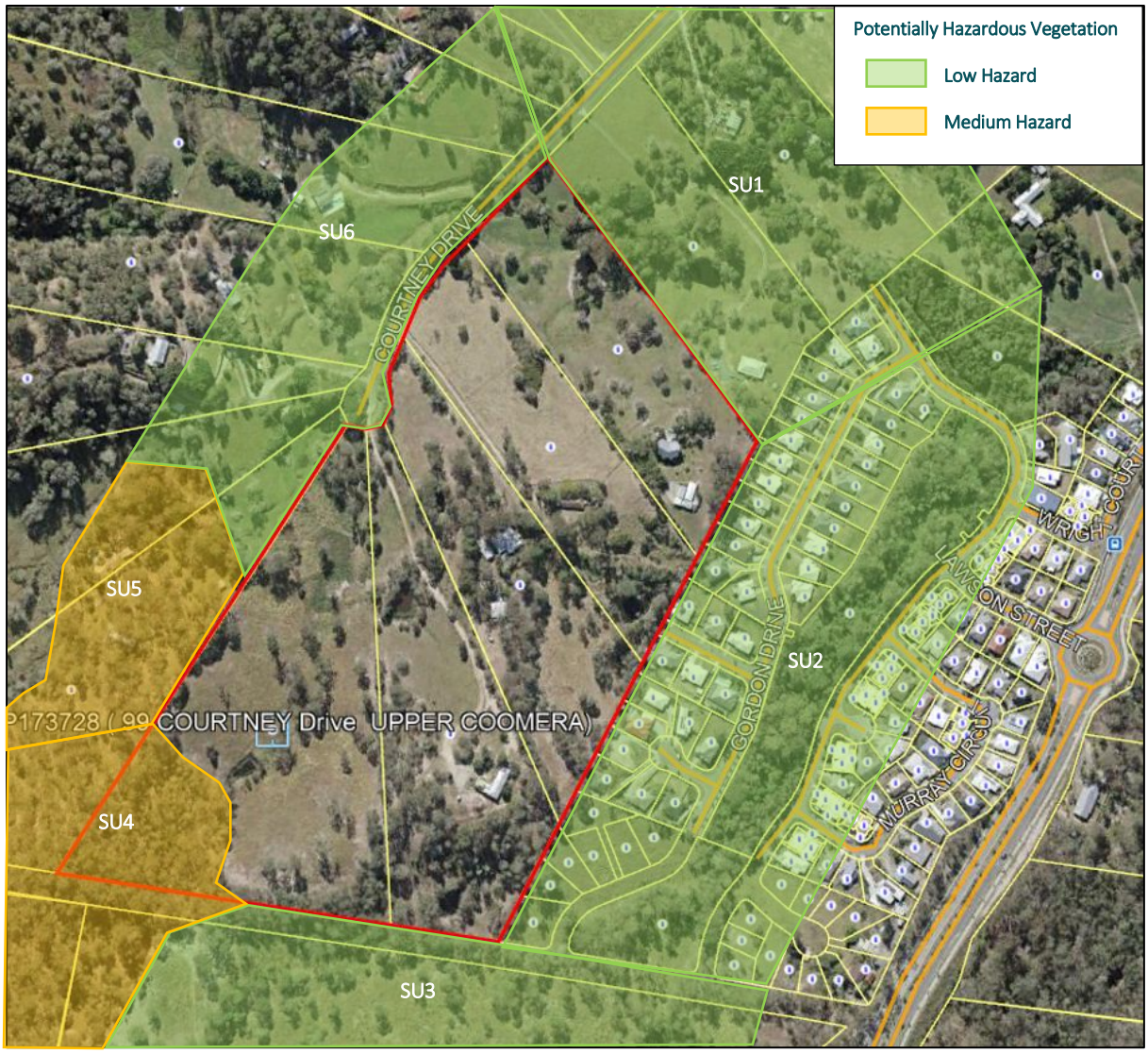

Figure 6: Vegetation Hazard Classification

2.2.3 Potentially Hazardous Vegetation

Based on the above assessment, vegetation posing a Medium Potential Bushfire Hazard to the proposed development is present to the Southwest to West of current Lot 192SP173728. These vegetation communities have the potential to carry moderate fuel loads and subsequently present a potential Bushfire Hazard to the proposed development.

Vegetation in the immediate vicinity of the proposed development and in all other directions has been classified as having a Low Potential Bushfire Hazard to the proposed development. However, it is noted that determined low threat vegetation within 100m of designated bushfire hazard area, will require assessment against the Australian Standard for *Construction of buildings in bushfire prone area (AS3959-2009)* to ensure compliance. This is particularly relevant for vegetation adjacent proposed Lots 193-202 due to their proximity to potentially hazardous vegetation to the south.

The following section details Bushfire Risk Mitigation measures to be implemented on the site to address the Bushfire Hazard and compliance requirements acting on the proposed development.

3.0 Bushfire Risk Mitigation Measures

The following section describes Bushfire Risk Mitigation measures, recommended to be utilised at the subject site to reduce the risk of Bushfire impacting on people and property.

The scope of proposed Bushfire Risk Mitigation Measures have been drawn from the following sources:

- the *Queensland State Government Single State Planning Policy* - Part E (SPP 2017);
- the *Gold Coast City Council, Bushfire Hazard Overlay Code (8.2.3)*; and
- the Australian Standard (AS 3959- 2009) - *Construction of buildings in bushfire prone areas*.

The intent of the above legislation is to protect people and premises in the event of a bushfire emergency, through achieving acceptable Performance Outcomes for the development given the identified bushfire hazard. Performance Outcomes are generally achieved by appropriate separation of a development from bushfire hazard, appropriate access for fire-fighting vehicles, and appropriate construction standards of buildings. Additional factors are detailed where considered appropriate.

3.1 Asset Protection Zones

Asset protection zones (APZ's) provide a defensive tool to assist in the reduction of potential bushfire impact to people and property situated in bushfire prone areas. APZ's are the most strategically valuable defence against radiant heat and flame, and to a lesser extent, embers.

Whilst APZ's should prevent buildings from being subjected to direct contact from flames, and reduced levels of radiant heat in the event of a bushfire, building construction standards will also be key to ensuring the performance of buildings subjected to ember attack. Bushfire Attack Level for the proposed development is determined in **Section 3.2**.

Based on the above Bushfire Hazard Assessment, APZ's may be required adjacent the proposed development. These are detailed in the following section.

3.1.1 Performance Outcomes

APZ and setback distances have not been prescribed in the SPP 2017. The SPP refers to provision of appropriate defendable space between dwellings and medium or above Bushfire Hazard. The *Gold Coast City Council, Bushfire Hazard Overlay Code* does not prescribe separation distances from potentially hazardous vegetation, aside from fire trail provisions for development adjacent bushfire hazard areas (refer **Section 3.5** below). Consequently, the

required setbacks (APZ's) detailed in the AS3959-2009, with regard to building construction standards are considered appropriate to mitigate the identified bushfire hazard to the proposed development and consequently meeting the performance outcome intent of the GCCC Planning Scheme and the SPP as a result.

Subsequently, the **Table 2** details the requirements for setbacks for the proposed development, in order to comply with the performance outcomes of the Australian Standard (AS3939-2009) and specified Building Construction Standards, with regard to the Medium Potential Bushfire Hazard acting on the site from the west to southwest of the site.

N.B. Where '*Exclusions for Low Threat Vegetation*' criteria as per the AS3959-2009 are applicable, relevant vegetation will be classified as Low Threat for the purpose of BAL determination. This is particularly relevant for vegetation to the south of proposed Lots 116-123, due to relative connectivity of this vegetation to potentially hazardous vegetation to the southwest.

APZ's have been determined for individual proposed lots, potentially exposed to Bushfire Hazard, with regard to minimum known setbacks to individual Lots, and Building Setback Provisions within proposed Lots.

It should be noted that planning provisions in Queensland specify BAL-29 construction standards are considered the maximum acceptable requirement for new residential subdivision developments. Consequently, this will be used to inform the following APZ's and BAL determinations for the proposed development.

Table 2: Australian Standard Asset Protection Zones

Direction of Bushfire Hazard	Classification of Vegetation AS3959-2009	Effective Slope (deg.)	Setback to Hazard	Required Setback to achieve (≤ BAL-40)	Required Setback to achieve (≤ BAL-29)	Required Setback to achieve (≤ BAL-19)	Required Setback to achieve (≤ BAL-12.5)
North of proposed Lots 261, 262, 280-284 & 319-327	Low Threat	NA	NA	NA	NA	NA	NA
South of proposed Lots 101 to 110	Woodland	0	>13m	≥6m	≥9m	≥13m	≥19m
South of proposed Lot 247	Forest	0	>13m	≥10m	≥13m	≥20m	≥28m
Southwest of Proposed Lots 113, 114, 122, 244-246	Forest	0	>16m	≥10m	≥13m	≥20m	≥28m
Southwest of proposed Lots 123-126, 239-243.	Forest	0	>40m	≥10m	≥13m	≥20m	≥28m
South of Lots 111-112, 115-121, 134-143, 156-158.	Woodland	0	>40m	≥6m	≥9m	≥13m	≥19m

East of Proposed Lots 175, 310-319, & 156-165	Low Threat	NA	NA	NA	NA	NA	NA
West of Proposed Lots 247-253	Woodland	0	>16m	>6m	≥9m	≥13m	≥19m
West of Proposed Lots 216-228, 253 & 254	Woodland	0	>20m	>6m	≥9m	≥13m	≥19m
West of proposed Lot 110	Forest	Up Slope	>13m (TBC)	>10m	≥13m	≥20m	≥28m
West of proposed Lots 255-261	Low Threat	NA	NA	NA	NA	NA	NA

Based on the above assessment, and achievement of the specified setbacks to assessable vegetation for individual buildings, the proposed development is considered appropriately positioned to achieve maximum BAL ratings of BAL-29. These recommended setback requirements, in compliance with the Australian Standard (AS3959-2009), are considered appropriate to inform APZ requirements for the proposed development, and no additional setbacks required.

N.B. acceptable treatment of vegetation within the APZ's is detailed in ***Section 3.3 –*** *Landscaping & Vegetation Management*.

3.2 Bushfire Attack Level - Construction Standards

The Building Code of Australia (BCA) requires all Class 1 buildings to be constructed in accordance with the Australian Standard 3959 (2009) - *Construction of buildings in bushfire-prone areas* (AS 3959-2009). This Standard provides minimum construction standards for new dwellings in designated Bushfire Prone Areas.

The construction standards are intended to improve the performance of buildings subjected to burning debris, radiant heat or flame contact. The AS3959- 2009 methodology prescribes Bushfire Attack Levels (BAL's) to the facades of proposed buildings to which corresponding construction safety standards are applied. AS3959-2009 defines Bushfire Attack Levels as:

> *'A means of measuring the severity of a building's potential exposure to ember attack, radiant heat and direct flame contact, using increments of radiant heat expressed in kilowatts per metre squared, which is the basis for establishing the requirements for construction to improve protection of building elements from attack by bushfire.'*

3.2.1 Bushfire Attack Level Determination

In accordance with the Australian Standard – *Construction of Buildings in Bushfire-prone Areas* (AS 3959, 2009), an assessment of the required construction standards for the proposed development of has been undertaken (**Table 2**). Subsequently, the required BAL's for construction within individual Lots of the proposed development are represented in **Figure 7**.

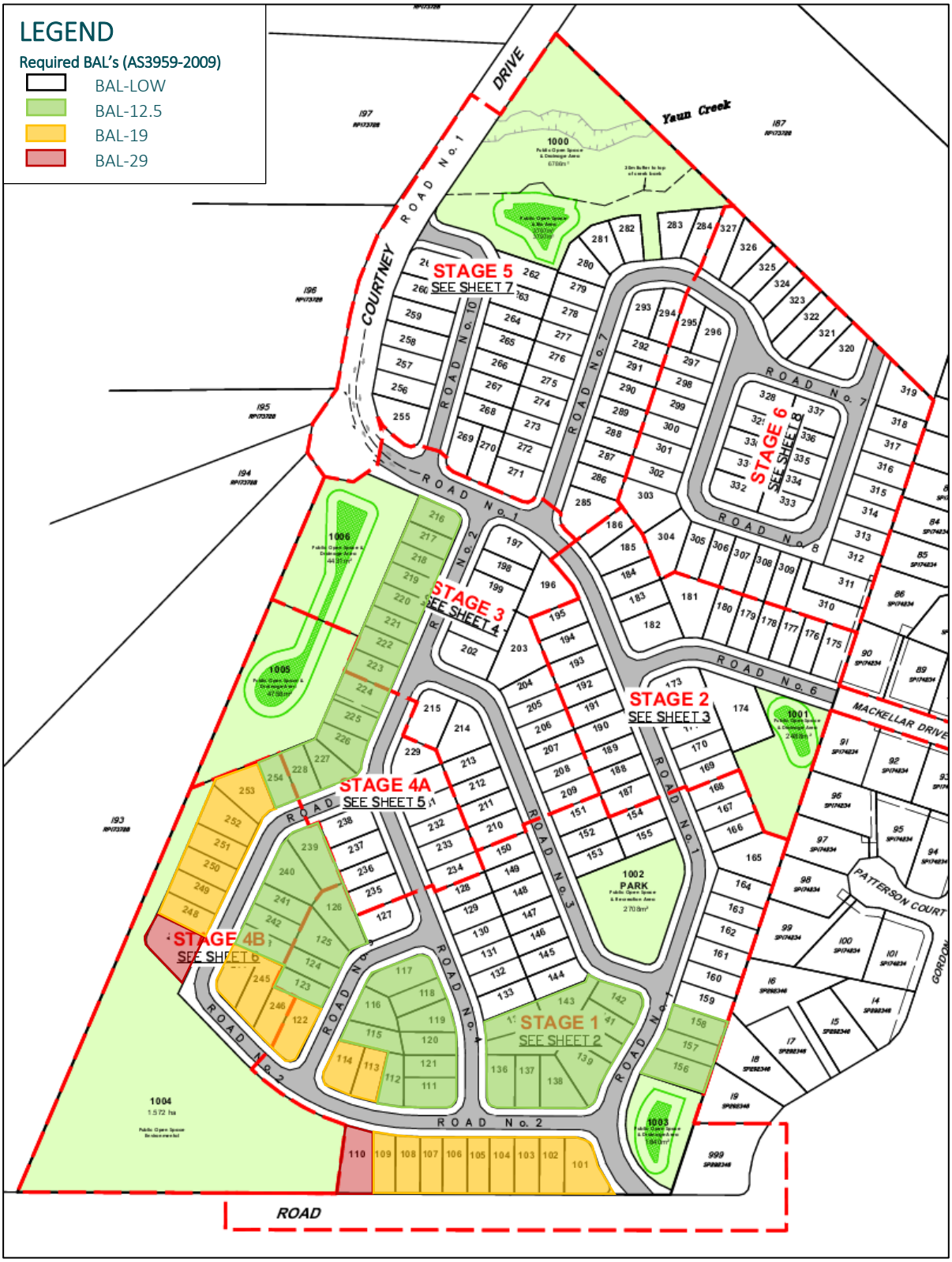

Figure 7: Bushfire Attack Level Requirements

Based on this assessment, the following Bushfire Attack Levels for individual Lots are applicable:

- **BAL-29**: Lots 110 & 247 (refer Sections 3 & 7 in the AS3959-2009);
- **BAL-19**: Lots 101-109, 113-114, 122, 244-246, 248-253 (refer Sections 3 & 6 in the AS3959-2009);
- **BAL-12.5:** 111-112, 115-121, 123-126, 134-143, 156-158, 216-228, 239-243, 254 (refer Sections 3 & 5 in the in the AS3959-2009);
- **BAL-LOW**: Lots 127-133, 144-155, 159-215, 229-238, 255-327 (no specific construction requirements – refer Section 4 in the in the AS3959-2009);

Relevant Building Construction Standards, as detailed in the Australian Standard – Construction of Buildings in Bushfire-prone Areas (AS 3959, 2009), should be applied. The nominated construction standards should be reviewed by an experienced consultant/designer at the time of detailed building design. Should the proposed site layout or vegetation setbacks change, this may alter the determination of the required BAL.

3.3 Landscaping and Vegetation Management

The landscaping and ongoing management of vegetation in areas susceptible to Bushfire Hazard is an important tool to mitigate bushfire risk. Previously detailed APZ's/setback requirements should prevent buildings from being subjected to direct contact from flames, and reduced levels of radiant heat in the event of a bushfire. Please Note: Final Building footprint locations, and vegetation setbacks able to be achieved, will dictate final BAL ratings for individual dwellings of the proposed development.

The proposed development layout has considered potential bushfire hazard from the southwest to west and has revised preliminary designs to minimise vegetation clearing of the subject site where practical. Previously detailed bushfire hazard and setback recommendations have been made, particularly with regard to the establishment of appropriate setbacks to hazardous vegetation.

Landscaping and vegetation retention adjacent proposed buildings should consider the following guidelines:

- Immediately adjacent proposed buildings should either be fully cleared and regularly maintained (i.e. lawn) or retain trees as clumps or islands and provide a tree canopy cover of less than 15% and tree canopies should be located greater than 2 metres from any part of the roofline of a building. Any trees should have lower limbs removed up to a height of 2 metres above the ground.
- Any landscaping performed on site shall maintain the APZ effectively free of available fuel. Landscaping plants may be used in this area so long as they are selected for their low combustibility, by virtue of high moisture content, low volatile oil content, high leaf mineral levels, large fleshy leaves, and absence of shedding bark. They should be placed so as to not provide either vertical or horizontal connectedness of plant material, and avoid overhanging rooflines or contact with flammable parts of

buildings. Any planted trees should be of species which grow to over 2m, to maintain separation between lower canopy and the ground.

- Turf is to be maintained regularly to reduce the potential for long grass to fuel an advancing fire toward buildings.
- Revegetation activities in covenant areas particularly to the north and east of the site should utilise low volatility, locally endemic rainforest species where appropriate to ensure future fuel load potential is minimised.

3.4 Emergency Access & Egress

New developments in bushfire prone areas should be serviced by safe access/exit points for both residents and emergency services personnel in the event of an emergency. Development should avoid entrapment potential, provide safe and effective access for emergency services vehicles and safe evacuation routes for occupants.

The *GCCC Bushfire Hazard* Overlay Code (PO6) prescribes '*vehicular access is designed to mitigate against bushfire hazard by ensuring adequate access for* (a fire-fighting and other emergency vehicles, and (b) the evacuation of residents and emergency personnel, during a bushfire event.'

The proposed development layout contains perimeter roads separating the majority of the proposed lots from potential sources of bushfire hazard, aside from lots to the immediate south (i.e. Lots 116-123). However, these lots are adjacent a gazetted road easement to the south and potentially hazardous vegetation in this locality is limited to small patches, scattered trees and grassland to the south. Importantly, multiple access and egress routes are provided internally into designated Low Hazard areas, with direct access to Courtney Drive in the north. Consequently, it is considered that current access and egress is appropriate, given achievement of suitable setbacks, particularly for Lot 123 as previously detailed.

3.5 Fire Trails

The *GCCC Bushfire Hazard* Overlay Code (PO9) prescribes '*in a bushfire hazard area, fire trails must be provided to: enable access for fire fighters, residents and equipment; contribute to bushfire radiation zones; mitigate against bushfire hazard; and to allow access for hazard reduction management programs*'.

The proposed development has been designed where practical, with setbacks from potentially hazardous vegetation aligning with roadways or public open space. Where not practical, and deemed appropriate, the provision of a Fire Trail to the west of proposed Lots 247-253, and south of proposed Lot 247 and connecting to 'Road No.2', has been incorporated. Adjacent vegetation to the southwest of these Lots, has been classified as medium potential bushfire hazard, and due to limited setbacks, a fire trail is considered an appropriate outcome to demonstrate compliance with PO9 of the GCCC Bushfire Code. Additionally, it is also recommended that immediately adjacent the west of proposed Lot 110,

be maintained as a fire trail in order to facilitate bushfire risk mitigation measures to this lot, posed by vegetation to the west. No further fire trail provisions are considered necessary, including to the south of proposed Lots 101-110 for the proposed development due to the identified bushfire hazard as detailed in this report.

The fire trail located to the to the west of Lots 247-253, and to the south of Lot 247, is represented as green space (**Figure 7**), and has been designed with connections to Proposed Road 1 in the north, and Proposed Road 2 in the south. Thereby providing through access to public roads. The specifications of this trail are understood to comply with the AO9.1-AO 9.6 by meeting the following minimum standards:

- Fire trail to be located on public land to facilitate access for fire brigades;
- Achieve a minimum cleared width of 6m; minimum 4.8m vertical clearance; a cross fall of no greater than 10 degrees; a minimum formed width of 4m; and a maximum gradient of 12.5%';
- Provision of vehicular links provided to existing roads.

N.B. primary need for the Fire trail is adjacent Lots 247-243, equating to an approximate 150m length. The southern end of this trail is connected to a proposed public road, and the northern end is within a designated low potential bushfire hazard area, with connections to a public road further north. Consequently, additional links at 200m intervals are not considered necessary, and turning areas are able to be provided by the proposed public road network at either end of the fire trail.

Consequently, given the implementation of the fire trails as detailed above, the proposed development is considered to be in compliance with the Performance Outcomes and Acceptable Outcomes of the GCCC *Bushfire Hazard* Overlay Code PO9.

3.6 Water Availability for Fire-Fighting Purposes

All development within bushfire hazard areas require adequate water supply for fire-fighting purposes in the event of a bushfire emergency. The *GCCC Bushfire Hazard* Overlay Code (PO10) prescribes 'a reliable reticulated water supply that has sufficient flow and pressure characteristics for fire-fighting purposes at all times' be achieved.

It is understood the proposed development site will be on a reticulated water supply and it is subsequently understood the indicated pressure and flow of 10L/Sec at 200 kPa (as per AO10.2) will be achieved on site. Verification of this via the utility provider is recommended.

3.7 Open Space Management

The *GCCC Bushfire Hazard* Overlay Code (PO8) prescribes '*for areas to be dedicated to Council as open space, management strategies to mitigate bushfire risk must be identified*.'

It is understood the 5 areas of Public Open Space (and drainage areas) are proposed and will be dedicated to Council as part of the proposed development. Open Space areas with potential to contain potentially hazardous vegetation are limited to the southwest and southeast extents of the subject site, with the southwest containing forest vegetation.

Due to the extent and nature of the vegetation, specific bushfire management strategies are limited to the following:

- Maintaining a foliar separation to proposed development to ensure the above determined BAL ratings and APZ setbacks remain relevant into the future. In essence, ensuring separation distances used to determine BAL ratings are maintained free of potentially hazardous vegetation and fuel load accumulation.
- Management of ground-based fuel load accumulation, by way of manual removal within 20m of proposed Lots. Importantly, prescribed burning is not recommended due to implications of declining ecosystem values and increasing volatile fuel loads by way of exotic grass invasion, loss of soil carbon, and detrimental soil condition impacts such as to soil macro-invertebrates.
- Revegetation of edges of retained vegetation, with suitable low volatile species, to mitigate edge effects, and to act as bushfire buffer with low fuel availability in the event of a bushfire emergency.

3.8 Advice to New Residents

The *GCCC Bushfire Hazard* Overlay Code (PO16) prescribes *'…new residents/occupants of a development in a bushfire hazard area are informed about: (a) the potential bushfire hazard on their site; (b) their responsibilities for fire management*; *(c) the measures required for ongoing fire mitigation; and (d) emergency procedures during a bushfire or on bad weather days*.'

Consequently, it is recommended that a copy of this Bushfire Management Plan, complete with a Queensland Fire and Emergency Services (QFES) cover sheet be provided to each resident/occupant of Lots where BAL ratings of **BAL-12.5** and above have been determined (refer Section 3.2.1).

Residents and occupants should be made aware of QFES website (www.ruralfire.qld.gov.au) for further information on bushfire preparation.

4.0 Recommendations and Conclusions

This report details the assessment of Bushfire Hazard and risk mitigation measures acting on the proposed development, with consideration to the requirements of: the *Queensland State Government Single State Planning Policy - Part E* (SPP 2017); the *GCCC Bushfire Hazard* Overlay Code; and the Australian Standard (AS 3959- 2009) - *Construction of buildings in bushfire prone areas*.

This assessment has confirmed that vegetation posing a Medium Potential Bushfire Hazard to the proposed development is present to the Southwest to West of current Lot 192SP173728. These vegetation communities have the potential to carry moderate fuel loads and subsequently present a potential Bushfire Hazard to the proposed development.

Vegetation in the immediate vicinity of the proposed development and in all other directions has been classified as having a Low Potential Bushfire Hazard to the proposed development. However, it is noted that determined low threat vegetation within 100m of designated bushfire hazard area, will require assessment against the Australian Standard for *Construction of buildings in bushfire prone area (AS3959-2009)* to ensure compliance. This is particularly relevant for vegetation adjacent proposed Lots 116-123 due to their proximity to potentially hazardous vegetation.

The following Bushfire Risk Mitigation Measures, as detailed above, are considered appropriate to substantially mitigate the Bushfire Hazard acting on the proposed development:

- Asset Protection Zone (APZ) / setbacks widths have been determined for areas of the proposed development (refer Section 3.1). With the achievement of setbacks consistent with applicable BAL ratings, no additional setbacks are considered required
- BAL determination and Construction Standard requirements have been determined for the proposed development, with a maximum BAL-29 considered achievable. BAL ratings for individual Lots have been detailed (refer Section 3.2).
- Vegetation management within the site, including within setbacks and APZ's have been detailed to ensure low fuel availability and reduced connectivity to buildings. It is further recommended that revegetation activities within 20m of proposed Lots, be undertaken utilising low volatility species where appropriate (refer Section 3.3).
- Emergency Access & Egress of the proposed development has been detailed and is considered appropriate for the Bushfire Hazard acting on the site (refer Section 3.4).
- Fire Trail provisions within the development footprint have been detailed in order to comply with the *GCCC Bushfire Hazard* Overlay Code (PO9). This includes a Fire Trail adjacent Lots 247-253, and to the west of Lot 110, in order to enable access for fire fighters, residents and equipment in the event of a bushfire emergency (refer Section 3.5).
- Water Availability for Fire-fighting Purposes as per Councils Planning Scheme has been detailed (refer Section 3.6).

- Open Space Management recommendations have been made to assist Council to manage the potential bushfire hazard posed to the proposed development by Open Space land dedicated to Council (refer Section 3.7). and

- Advice to new residents/occupants by way of a copy of this Bushfire Management Plan, complete with a Queensland Fire and Emergency Services (QFES) cover sheet be provided to each resident/occupant for their information. This is applicable to Lots where BAL ratings of **BAL-12.5** and above have been determined (refer Section 3.2.1).

  Residents and occupants should also be made aware of QFES website (www.ruralfire.qld.gov.au) for further information on bushfire preparation (refer Section 3.8)

With the achievement of the Bushfire Risk Mitigation Measures as detailed in this report, the proposed development is considered to be compliant with the specifications and intent of the *Queensland State Government Single State Planning Policy - Part E* (SPP 2017), and the *Gold Coast City Council, Bushfire Hazard Overlay Code (8.2.3),* and the *Australian Standard – Construction in Bushfire Prone Areas (AS3959-2009).*

This assessment has been undertaken based on vegetative condition and bushfire hazards identified on and adjacent the subject site in September 2018.

It should be noted that the recommendations within this BMP have been formulated based on site conditions at the time of writing and utilising current best-practise hazard and impact assessment methodologies, and have been developed to reduce the potential severity of impacts on the proposed development in the event of a bushfire emergency rather than prevent impacts altogether. No guarantee is provided or assumed that the area will not be affected by bushfire at some time.

Site occupants should seek advice from the local fire authority every 5 years (as a minimum) to ensure the subject recommendations remain appropriate as site conditions and hazard assessment methodologies may change over time.

Bushfires are an intrinsic part of Australia's environment, are often unpredictable, and have potentially extremely serious consequences. All Queenslanders should be familiar with the official Bushfire Warnings system and have a completed Bushfire Survival Plan. Print ready guides for preparing a Bushfire Survival Plan and to assist in the interpretation of the official Bushfire Warnings system are available for download from the Rural Fire Service Queensland website – https://ruralfire.qld.gov.au/bushfires/.

There are three formal Bushfire Warning levels:

Advice

Monitor conditions and review your bushfire survival plan.

Watch and act

Conditions are changing. Start taking action and follow your bushfire survival plan.

Emergency Warnings

You are in danger. Act on your bushfire survival plan now.

Section 4 - SPECIALIST REPORTS

Ecological Assessment
Prepared by Biome Consulting

Zone Planning Group

Ecological Assessment

79-99 Courtney Drive, Upper Coomera

Gallery Homes

March 2019

BC-16090

BIOME
WATER AND ENVIRONMENTAL CONSULTING

Document Control

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79-99 Courtney Drive, Upper Coomera

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Abbreviations and Definitions

Term	Meaning
BoM	Bureau of Meteorology
CAMBA	China Australia Migratory Bird Agreement
CoGC	City of Gold Coast
DNRM	Department of Natural Resources and Mines
DoE	Department of the Environment
EHP	Department of Environmental and Heritage Protection
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
Endemic species	Species unique to a geographical location
EVNT	Endangered, Vulnerable or Near Threatened
Exotic Species	Refers to all species of both flora and fauna that are introduced to Australia
Fauna	Refers to all animal species
Flora	Refers to all plant species
IDAS	Integrated Development Assessment System
JAMBA	Japan Australia Migratory Bird Agreement
KSAT	Koala Spot Assessment Technique – used to determine the level of use of an area by Koala
MLES	Matters of Local Environmental Significance
MNES	Matters of National Environmental Significance
MSES	Matters of State Environmental Significance
NCA	*Nature Conservation Act 1992*
Planning Scheme	City of Gold Coast Planning Scheme, *City Plan 2018 Version 5*
PMST	Protected Matters Search Tool
QPWS	Queensland National Parks and Wildlife Services
RE	Regional Ecosystem. Defined as a vegetation community that is consistently associated with a particular combination of geology, landform and soil
RL	Reduced level - this is the height or elevation above the point adopted as the site datum for the purpose of establishing levels
RoKAMBA	Republic of Korea Australia Migratory Bird Agreement
RoL	Reconfiguration of a lot
SDAP	State Development Assessment Provisions
SL	Special Least Concern species are listed under the NCA for species on migratory bird agreements, the platypus and echidna
SPP	State Planning Policy
SPRP	State Regulatory Planning Provisions
Threatened species	Species listed under the NCA or EPBC Act as having a conservation status of near threatened, vulnerable, endangered or critically endangered.
VMA	*Vegetation Management Act 1999*

Executive Summary

This report has been prepared to identify the environmental values and constraints of the subject site, located at 79-99 Courtney Drive, Upper Coomera and to accompany a development application for a Reconfiguration of a Lot.

The subject site has been assessed for its development potential and constraints in the Investigation Area Program – Courtney Drive, Upper Coomera Draft Concept Plan, prepared by GHD (2017). The Draft Concept Plan ranked the site as having high marketability and development potential. The plan recommends the amalgamation of allotments to maximise development yields, habitat connectivity and bushfire management.

This ecological assessment investigated the environmental constraints of the subject site. The assessment of the ecological values on the site focused on the vulnerable Koala, which is known to occur in the Upper Coomera area.

Investigations were made to determine the habitat use of the site by Koala using a randomised grid-based spot assessment technique. Koala were determined to be using the site at Low Use levels (as defined by Phillips and Callaghan, 2011). Areas of Koala habitat have been included in the proposed open space areas of the development. No other threatened species were identified on the site during the survey period.

The site is mapped as containing a small area of regulated vegetation and essential habitat for state regulated species. The regulated vegetation area is reflective of least concern Regional Ecosystem 12.11.5 (Spotted Gum/Ironbark open forest). This area has been included within designated open space to ensure vegetation is protected and rehabilitated to improve its existing ecological condition.

Four vegetation associations were identified on the site:

- *Acacia* low open forest;
- Spotted Gum/Grey Ironbark open forest;
- *Acacia* low open woodland/mosaic in association with infrastructure; and
- Pasturelands.

No threatened flora species were identified in any of the vegetation communities. Several restricted invasive species were recorded. These species must be controlled by the landholder under the provisions of the *Biosecurity Act 2014.*

Recommendations have been made to rehabilitate and buffer Yaun Creek where it traverses the site in the northern corner, the Koala habitat area within the south-western corner of the site and the drainage channel in the south-eastern corner of the site.

To assist with the on-going management of the site and as stipulated in the City of Gold Coast planning provisions, it is recommended that the following reports be prepared:

- Flora and Fauna Management Plan;
- Stormwater Management Plan and Sediment and Erosion Control Plan;
- Open Space Management Plan; and
- Rehabilitation Management Plan.

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1 Introduction

Gallery Homes is proposing a new residential sub-division to be located within the rapidly developing northern Gold Coast region. Gallery Homes has commissioned Biome Consulting to undertake an assessment of the ecological constraints related to the proposal. This Ecological Assessment report accompanies a planning application to be assessed by the City of Gold Coast (CoGC) for a development permit for Reconfiguration of Lots (RoL) to accommodate the sub-division components.

The location of the sub-division is described as Lots 188-192 on RP173728, at 79-99 Courtney Drive, Upper Coomera (hereafter referred to as 'the site').

The intent of this assessment is to detail the ecological features and functions of the subject site and identify any potential impacts to these values as a result of the proposed development. The report includes a desktop assessment and field investigation.

1.1 Scope and Objectives

This Ecological Assessment aims to provide the following information:

- Desk top review of existing databases and local, state and federal environmental policy documents;
- Flora survey to identify:
  - terrestrial and aquatic flora species;
  - the presence of any significant flora species;
  - dominant vegetation associations and their level of integrity;
  - the presence of any Regional Ecosystems; and
  - areas of weed infestation and disturbance.
- Scaled map of vegetation communities and significant species;
- Targeted fauna survey to identify:
  - terrestrial and aquatic fauna species;
  - the presence of any significant fauna species; and
  - the presence of any significant fauna habitat.
- A scaled map which identifies any important habitat trees i.e. active den and nest sites, the presence of tree hollows or obvious nests;
- An assessment of the ecological features identified, their function and significance;
- An assessment of impacts upon any matters of environmental significance; and
- Recommendations to mitigate environmental impacts.

2 Site Specifics

The following sections describe the site and current conditions.

2.1 Site Location

The subject site is located at 79-99 Courtney Drive, Upper Coomera on Lots 188-192 on RP173728 and is located within the City of Gold Coast Local Government Area. The site comprises of five allotments with a total land area of 18.849 ha (Table 2.1).

Table 2.1 Allotment Details

Street Number	Lot Plan Number	Lot Size (ha)
79	188 RP173728	3.079
89	189 RP173728	3.034
91	190 RP173728	3.095
97	191 RP173728	3.739
99	192 RP173728	5.902

Figure 2.1 Site Location (Google Earth, image date 2016)

2.2 Current Land Use

The site is used for residential/rural purposes. Residential dwellings and associated out buildings are present on the site and it is grazed by livestock. Several dams are present on the site. Yaun Creek and/or its tributaries pass through Lots 188, 191 and 192.

The immediate surrounding land use pattern is characterised by rural residential allotments to the immediate west, south and north. These allotments range in size from 3 – 157 ha. Small lot residential developments are present to the east.

The site is accessed via Courtney Drive. The unformed Reserve Road runs along the southern site boundary.

2.2.1 Land Use Zones

Under the City of Gold Coast Planning Scheme *City Plan 2018 Version 6*, the site is designated as Rural and Rural Residential (Figure 2.2). Some areas of the site are designated Rural Landscape and Environment Precinct.

The site falls within an Investigation Area for Future Development. The Draft Concept Plan (GHD, 2017) identifies much of the the site as *Suburban Neighbouhood.*

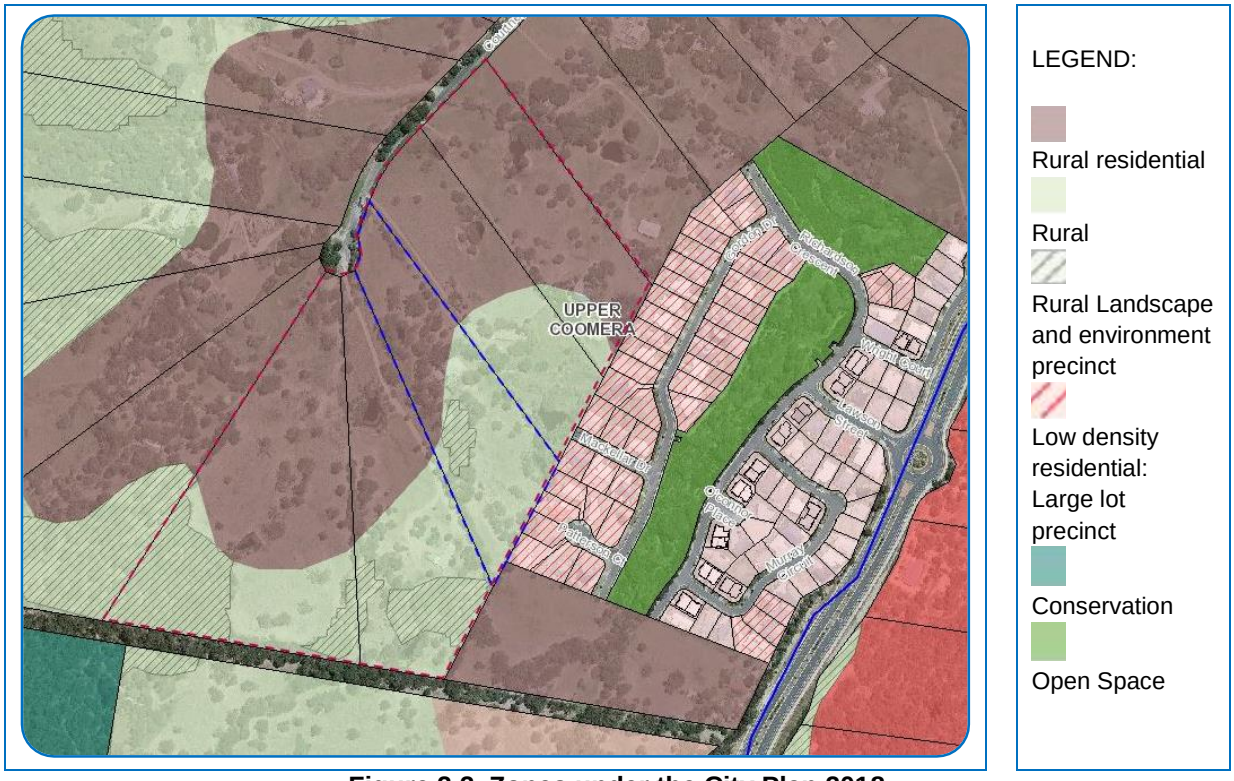

Figure 2.2 Zones under the City Plan 2018

2.3 Draft Concept Plan

Under the City Plan, 13 non-urban areas within the urban footprint of the *South East Queensland Regional Plan 2009-2031*, were identified for investigation into land use opportunities and constraints. Courtney Drive was given the highest ranking in terms of marketability and development suitability (GHD, 2017).

The subject site falls within the Courtney South East and Courtney West Precincts of the investigation area (Figure 2.3). Three potential land use categories have been identified on the subject site – suburban neighbourhood, suburban neighbourhood (constrained) and green space. Constrained suburban neighbourhood areas require special design considerations as the land is above Reduced Level (RL) 60.

The draft concept plan recommends the amalgamation of allotments to maximise the development potential, connectivity and bushfire management.

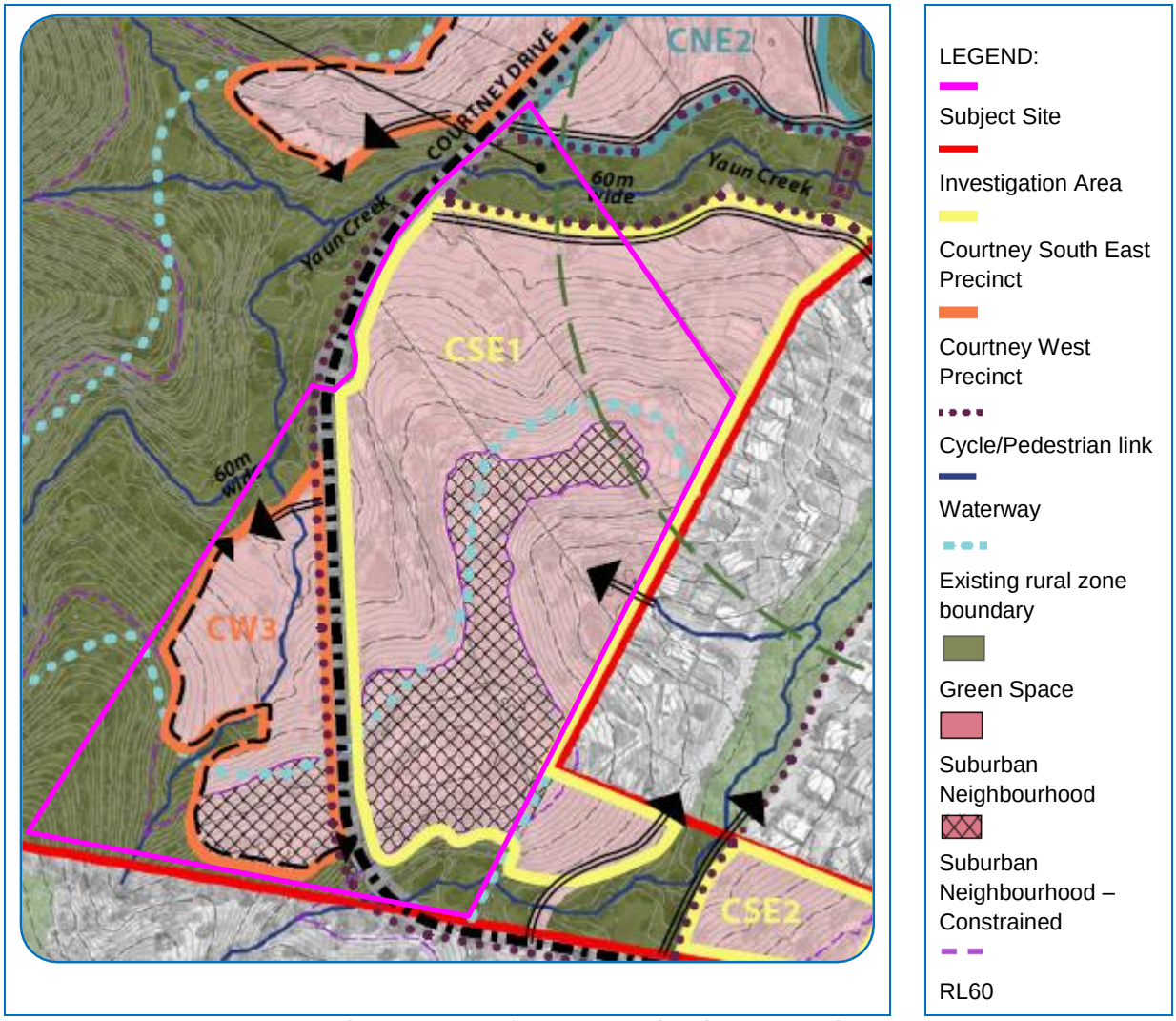

Figure 2.3 Draft Concept Plan (GHD, 2017)

2.3.1 Courtney South East Precinct

The Courtney South East Precinct includes the extension of Courtney Drive to connect with Reserve Road and the Yaun Creek Corridor at its northern edge.

GHD concluded that based primarily on slope, lot sizes similar to the adjoining residential area are the most appropriate response for the majority of housing in this precinct. Where properties can be amalgamated, increased density may be suitable. A density estimate of future dwellings for this precinct was determined to be 9.7-13.3 (GHD, 2017).

A large area of this precinct is greater than RL 60. These areas are considered suitable for significant earthworks to reduce the amount of land above RL 60 and achieve an extension of Courtney Drive that improves the development potential and connectivity.

Yaun Creek is considered a key character element.

2.3.2 Courtney West Precinct

The Courtney West Precinct is characterised by its proximity to conservation open space, its higher elevation and several overland flow paths. The extent of development in this precinct relies on the amalgamation of the site to address bushfire management.

The density estimate of future dwellings was determined to be 8.4-10.9 (GHD, 2017).

2.3.3 Green Space

Green Space areas have been proposed in the concept plan. Green Space is land suitable for a conservation or open space.

This land is considered not suitable for development based on the following constraints (GHD, 2017):

- High Value and Medium Value ecological constraints;
- Extreme slopes 1:3 (33.33 %) or steeper;
- Land above RL 60 (where servicing issues, bushfire risk/ fire-fighting capabilities and scenic amenity values are anticipated to affect development potential); or
- Within 30 m from the outer bank of watercourse.

2.4 Climate

Weather and climate information is collected by the Bureau of Meteorology (BoM). The nearest weather station to the site is Southport Ridgeway Avenue (station number 040190). The average annual rainfall is 1451.7mm and average temperature range is 15.3-25.0º C (Table 2.2).

Table 2.2 Climate Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Mean minimum temperature (°C)	28.5	28.3	27.6	25.9	23.3	21.2	20.6	21.4	23.3	25.2	26.7	28.1
Mean minimum temperature (°C)	20.3	20.5	19.2	16.5	13.4	10.6	9.1	9.8	12.1	15.0	17.4	19.2
Mean Rainfall (mm)	181.2	190.2	198.9	136.4	128.9	96.3	72.8	56.9	57.5	96.8	105.8	136.2

3 Legislation and Planning Considerations

Several legislative acts, policies and guidelines apply to the assessment, planning and management of biodiversity values within the study site. The following provides an overview of their relevance to this report and identifies the stages when applicable. Table 3.1 provides a summary of this information.

Table 3.1 Summary of Legislative Considerations

Legislation	Applicable to Development
Environment Protection and Biodiversity Conservation Act 1999	Referral under the EPBC Act only required if impacts to a threatened species is deemed to be significant. No referral is considered necessary for this development.
Nature Conservation Act 1992	The entire site falls within the Protected Plants trigger area. A survey for threatened flora will need to be conducted prior to any vegetation clearing. Essential habitat is mapped on the site and is excluded from the building envelopes.
Vegetation Management Act 1999	Regulated vegetation present on the site: • Least Concern RE 12.11.5; • Regulated vegetation intersecting a watercourse; and • Essential habitat.
Water Act 2000	A riverine protection permit is required for excavating or filling a watercourse mapped under the Water Act.
Biosecurity Act 2014	Restricted and invasive weeds must be controlled on the site.
Environmental Offsets Act 2014	No significant residual impacts to matters of state environmental significance will result due to the development. Therefore, the provisions of the Environmental Offsets Act do not apply.
City of Gold Coast Planning Scheme *City Plan 2018, Version 5*	The following are required under the planning scheme provisions: • Basic Ecological Assessment; • Compliance with the Environmental Significance Overlay Code.

3.1 Federal Legislation

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is federal legislation that provides a framework for the protection and management of nationally and internationally important flora, fauna, ecological communities and heritage places, which are defined in the Act as Matters of National Environmental Significance (MNES).

There are eight MNES identified under the EPBC Act including:

- World Heritage Properties;
- National Heritage Places;
- Wetlands of National Importance (listed under the Ramsar Convention);
- Listed Threatened Species and Ecological Communities;
- Migratory Species (protected under international agreements);
- Commonwealth Marine Areas;
- The Great Barrier Reef Marine Park; and

- Nuclear Actions (including uranium mines).

Under the EPBC Act, actions that are likely to have a significant impact on either Commonwealth land or MNES are deemed 'controlled actions'. A controlled action is also any action which is likely to have a significant impact on the environment.

A significant impact is an impact which is important, notable, or of consequence, having regard to its context or intensity. Whether an action is likely to have a significant impact depends upon the sensitivity, value, and quality of the environment which is impacted, and upon the intensity, duration, magnitude and geographic extent of the impacts.

If a proposed action is likely to have a significant impact on a MNES, it must be referred to the Australian Government Minister for the Environment for assessment against the EPBC Act.

To identify the MNES that are known or likely to occur on site, a review of EPBC Act Protected Matters database was undertaken. Results of this investigation are discussed in Section 4.

3.2 State of Queensland Legislation

State ordinances applicable to the study area are discussed below.

3.2.1 Planning Act 2016

The *Planning Act 2016* (Planning Act) and the underlying *State Planning Policy July 2017* (SPP) form Queensland's primary planning and development assessment legislation. The Planning Act seeks to achieve sustainable planning outcomes through managing the development process; managing the effects or impacts of development on the environment; and coordinating development assessment at local, regional and state planning level through the Integrated Development Assessment System (IDAS).

The SPP is supported by two interactive mapping systems the State Planning Interactive Mapping System (SP IMS) and the Development Assessment Mapping System (DAMS). These mapping systems provide links to registers or external mapping systems maintained by relevant state or federal agencies and are used to identify matters of state or national interest when assessing development applications.

A review of the SP IMS mapping indicates that the site is constrained by the following state environmental interests:

- Biodiversity:
  - Matters of State Environmental Significance (MSES) – Wildlife habitat;
  - MSES – Regulated vegetation (essential habitat); and
  - MSES – Regulated vegetation (intersecting a watercourse).

A review of the DAMS indicates that the site is constrained by:

- SEQ Regional Plan Triggers:
  - SEQ Regional Plan land use categories (Urban Footprint);
- Native Vegetation Clearing:
  - Regulated vegetation (category A and B extract);

The implications of the environmental constraints listed above are discussed in the following sections.

3.2.2 Nature Conservation Act 1992

The *Nature Conservation Act 1992* (NCA) protects areas that have been dedicated for conservation as well as individual specimens of native plants and animals that are prescribed as extinct, endangered, vulnerable, near threatened, special least concern and least concern under the schedules of the Act's Regulation, the *Nature Conservation (Wildlife) Regulation 2006*.

The NCA endeavours to ensure that protected plants are not illegally removed from the wild or illegally traded. Some areas fall within a high-risk area for protected plants. For properties in a high-risk area, a flora survey must be undertaken. A clearing permit may be required for clearing endangered, vulnerable and near threatened plants (EVNT plants) and their supporting habitat. If a flora survey identifies that EVNT plants are not present or can be avoided by 100 m, the clearing activity may be exempt from a permit. An exempt clearing notification form is required. In an area, other than a high-risk area, a clearing permit is only required where EVNT plants are present.

Clearing of least concern plants is exempt from requiring a clearing permit within a low risk area.

The protected plants map shows areas where provisions of the NCA apply to the clearing of protected plants. The site falls inside a high-risk area; therefore, a protected plants flora survey is required before clearing in this area to identify the presence of EVNT flora on the site.

The Wildlife Online Database was queried to identify any threatened species recorded within a 2 km radius of the site. The results of this database search informed the targeted searches for threatened species during the field assessment. This report identifies threatened species and their habitat on the subject site to advise the development planning as to potential constraints. Results of this database search are discussed in Section 4.

3.2.3 Vegetation Management Act 1999

The *Vegetation Management Act 1999* (VMA) regulates the clearing of remnant vegetation, high value regrowth vegetation, and high value vegetation near regrowth watercourses across Queensland. The purpose of the VMA is mainly achieved through the classification of vegetation units and defining permissible clearing for each unit in accordance with its level of significance.

The VMA regulates the clearing of vegetation in a way that:

- Conserves remnant vegetation that is:
    - An endangered Regional Ecosystem; or
    - An of concern Regional Ecosystem; or
    - A least concern Regional Ecosystem.
- Conserves vegetation in declared areas;
- Ensures the clearing does not cause land degradation;
- Prevents the loss of biodiversity;
- Maintains ecological processes;
- Manages the environmental effects of the clearing; and
- Reduces greenhouse gas emissions.

The VMA defines Regional Ecosystems (RE) as a vegetation community in a bioregion that is consistently associated with a particular combination of geology, landform and soil. All Queensland Regional Ecosystems and their designated VM Class are described and listed in

the *Vegetation Management Regulation 2000* (VM Reg). The VMA and VM Reg are administered by the Department of Environment and Science (DES) through the Planning Act.

Vegetation mapping indicates the subject area is constrained by:

- Least concern regional ecosystems;
- Essential habitat; and
- Regulated vegetation intersecting a watercourse.

Results of the vegetation mapping are discussed in Section 4.

The clearing of least concern regional ecosystems is governed by the VMA and as such, development is required to address the provisions of *State Code 16 – Native Vegetation Clearing* of the SDAP should this area not be avoidable.

The purpose of this code is to regulate the clearing of native vegetation within Queensland to conserve remnant vegetation, prevent the loss of biodiversity and maintain ecological processes.

In planning the proposed development, consideration should be given to the preservation of essential habitat and regulated vegetation.

3.2.4 Water Act 2000

The *Water Act 2000* seeks the sustainable management of Queensland's water resources. Amongst other regulatory provisions, the *Water Act 2000* protects vegetation within watercourses, whereby a permit is required for destroying vegetation, excavating or placing fill in a watercourse, lake or spring.

The waterways on the site are unmapped under the Water Act. Therefore, the provisions of the Water Act are not applicable to the development.

3.2.5 Biosecurity Act 2014

The *Biosecurity Act 2014* ensures a consistent, risk-based approach to biosecurity in Queensland. The Act provides comprehensive biosecurity measures to safeguard our economy, agricultural and tourism industries, environment and way of life, from:

- Pests (e.g. Wild dogs and weeds);
- Diseases (e.g. Foot-and-mouth disease); and
- Contaminants (e.g. lead on grazing land).

Every landholder has a general biosecurity obligation. This means activities on the land do not spread a pest, disease or contaminant.

Under the Biosecurity Act, weeds are categorised into prohibited, restricted, and other invasive plants. Prohibited weeds are not found in Queensland and must be reported immediately if found. Action should be taken to limit restricted plants impact by reducing, controlling or containing them.

Several restricted weed species were recorded on the site. The landholder is responsible for the control and containment of these species.

3.2.6 Environmental Offsets Act 2014

Under the *Environmental Offsets Act 2014* (EOA), there is a requirement in the first instance, of avoiding impacts on prescribed environmental matters and if avoidance cannot be achieved, demonstrating that impacts have been carefully managed and minimized. If after avoidance and mitigation, there is still a significant residual impact on prescribed environmental matters, an offset may be required.

The requirement to provide environmental offsets does not mean that development with unacceptable impacts will be approved. Offsets simply provide an additional tool that can be used in the application and assessment process.

Prescribed environmental matters include development in or impacting on:

- Regulated vegetation;
- Connectivity areas;
- Wetlands and watercourses;
- Protected wildlife habitat; and
- Koala habitat in south-east Queensland.

A significant residual impact for prescribed environmental matters is described in the following:

3.2.6.1 Regulated Vegetation

Regulated vegetation is a 'prescribed Regional Ecosystem' that:

- Is an endangered or of concern regional ecosystem, as defined under the VMA; or
- Intersects with an area shown on the vegetation management wetlands map, as defined under the VMA, to remove doubt this refers to that component of a regional ecosystem that lies within a mapped wetland; or
- Is located within the defined distance from the defining banks of a watercourse identified on the vegetation management watercourse map, as defined under the VMA.

Clearing in regulated vegetation is restricted by size and/or distance from the watercourse or wetland. For example, buffers of at least 10 m along minor watercourses are required to avoid triggering the EOA.

The provisions of the EOA are not triggered in this instance as no regulated vegetation is mapped outside of the south-western corner of the site.

3.2.6.2 Connectivity Areas

Development that will cause a change in core remnant ecosystem extent at the local scale or result in loss or fragmentation of core remnant ecosystem at the site scale is subject to offset.

A development impact on connectivity areas is determined to be significant if either of the following are true:

1. The change in the core remnant ecosystem extent at the local scale (post impact) is greater than a threshold determined by the level of fragmentation at the regional scale; or
2. Any core area that is greater than or equal to 1 hectare is lost or reduced to patch fragments (core to noncore).

The proposed development will not change the extent of core remnant ecosystems at a local scale.

3.2.6.3 Wetlands and Watercourses

An offset may be required for the following wetlands:

- Wetland in a wetland protection area;
- Wetlands of high ecological significance; and
- Wetland or watercourse in a high ecological value waters.

An action is likely to have a significant residual impact on prescribed wetlands or watercourses if it is likely that the action will result in environmental values being affected in any of the following ways:

- Areas of the wetland or watercourse being destroyed or artificially modified;
- A measurable change in water quality of the wetland or watercourse—for example a change in the level of the physical and/or chemical characteristics of the water, including salinity, pollutants, or nutrients in the wetland or watercourse, to a level that exceeds the water quality guidelines for the waters; or
- The habitat or lifecycle of native species, including invertebrate fauna and fish species, dependent upon the wetland being seriously affected; or
- A substantial and measurable change in the hydrological regime or recharge zones of the wetland, e.g. A substantial change to the volume, timing, duration and frequency of ground and surface water flows to and within the wetland; or
- An invasive species that is harmful to the environmental values of the wetland being established (or an existing invasive species being spread) in the wetland.

No wetlands have been identified on the site. While there are mapped watercourses on the site, they are not defined as high value ecological waters identified under Schedule 2 of the *Environmental Protection (Water) Policy 2009*.

3.2.6.4 Protected Wildlife Habitat

Protected wildlife habitat applies to endangered and vulnerable and special least concern species habitat.

Protected wildlife habitat also includes non-juvenile Koala habitat trees located in an area shown as bushland habitat, high value rehabilitation habitat or medium value rehabilitation habitat on the 'Map of Assessable Development Area Koala Habitat Values' that applies under the repealed *South East Queensland Koala Conservation State Planning Regulatory Provisions*.

A non-juvenile Koala habitat tree is a Matter of State Environmental Significance (MSES) if it is in:

a) A bushland habitat area under the *Planning Regulation 2017*; or
b) A high value rehabilitation habitat area under the *Planning Regulation 2017*; or
c) A medium value rehabilitation habitat area under the *Planning Regulation 2017*.

Koala habitat tree means:

- A food tree of the *Corymbia, Melaleuca,* or *Lophostemon* or *Eucalyptus* genera; or
- A preferred shelter species such as *Angophora*.

Non-juvenile Koala habitat tree means a Koala habitat tree that:

- Is more than 4 m high; or
- Has a trunk with a circumference of more than 31.5 cm at 1.3 m above the ground.

Habitat areas under the *Planning Regulations 2017* are those that fall within the Koala Assessable Development Areas.

Offsets apply when an action is considered likely to have a significant residual impact. Significant residual impacts are those that are likely to:

- Lead to a long-term decrease in the size of a local population; or
- Reduce the extent of occurrence of the species; or
- Fragment an existing population; or
- Result in genetically distinct populations forming as a result of habitat isolation; or
- Result in invasive species that are harmful to an endangered or vulnerable species becoming established in the endangered or vulnerable species' habitat; or
- Introduce disease that may cause the population to decline, or
- Interfere with the recovery of the species; or
- Cause disruption to ecologically significant locations (breeding, feeding, nesting, migration or resting sites) of a species.

The Koala offset policy objective is that development which must impact on important Koala habitat requires a net benefit large enough to ensure that is contributes significantly to the recovery of Koalas in SEQ Region. The policy objective can be met by requiring an offset to contribute the equivalent of five new Koala habitat trees for every non-juvenile Koala habitat tree removed. This is a net benefit ratio of 5:1.

The site is not within a Koala Assessable Development Area under the *Planning Regulations 2017*. In addition, while Koalas have been identified as using the site, it is considered, based on assessment of the species' ecology and habitat requirements and the proposed development design, that no residual significant impact to this species will occur.

The provisions of the EOA therefore, do not apply.

3.3 City of Gold Coast Planning Scheme

In accordance with the CoGC *Guidelines for Ecological Site Assessments* (Schedule 6.7), ecological assessments submitted as part of a development application must be undertaken to either a 'Basic' or 'Detailed' level.

The level of assessment required is determined by the estimated area of impact on areas of mapped vegetation and buffers to wetlands and watercourse.

As the area of impact was estimated to be less than <2,000m^2 a *Basic Ecological Site Assessment* is required.

The development must show how it complies with the provisions of the Environmental Significance Overlay Code. Code responses are included at Appendix D.

4 Desktop Assessment

A desk top assessment was conducted to inform the flora and fauna values within and proximal to the site. The outcomes of this investigation are presented in the following sections.

4.1 Aerial Photography

Aerial photographs indicate the site is mostly cleared of vegetation except for a small area within the site's south-western corner. This vegetation is directly connected to vegetation located within allotments to the south and a council reserve located further west of the site (refer to Figure 1.1).

Given the extent of connectivity to surrounding bushland, vegetation on-site may provide ecological resources for a variety of native species, especially those adapted to disturbed environments.

4.2 Database Searches

To identify the threatened species and ecosystems present on or near to the site, database searches were undertaken.

4.2.1 Protected Matters Database Search

The EPBC Act protected matters search tool enables searches for MNES in a specified area (Appendix A). Results of this database search (using a 1 km buffer to a central coordinate: Latitude -27.869688; Longitude 153.278631) identified the site to be within 10 km of a Ramsar wetland (Moreton Bay).

A total of 19 threated species or species' habitat, *known* or considered *likely to occur*, are recorded within 1 km of the site (Table 4.1).

Table 4.1 Protected Matters Search Results

Scientific Name	Common Name	Status
Flora		
Baloghia marmorata	Marbled Balogia	V
Bosistoa transversa	Three-leaved Bosistoa	V
Corchorus cunninghamii	Native Jute	E
Endiandra floydii	Floyd's Walnut	E
Macadamia integrifolia	Macadamia Nut	V
Samadera bidwillii	Quassia	V
Thesium australe	Austral Toadflax	V
Fauna		
Anthochaera phrygia	Regent Honeyeater	CE
Botaurus poiciloptilus	Australasian Bittern	E
Erythrotriorchis radiatus	Red Goshawk	V
Limosa lapponica baueri	Western Alaskan Bar-tailed Godwit	V

Scientific Name	Common Name	Status
Turnix melanogaster	Black-breasted Button-quail	V
Chalinolobus dwyeri	Large-eared Pied Bat	V
Dasyurus maculatus maculatus	Spotted-tailed Quoll	E
Petauroides Volans	Greater Glider	V
Phascolarctos cinereus	Koala	V
Potorus tridactylus tridatylus	Long Nosed Potaroo	V
Pseudomys novaehollandiae	New Holland Mouse	V
Pteropus poliocephalus	Grey-headed Flying-fox	V

Status

Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*: CE= Critically Endangered, E= Endangered, V= Vulnerable, CD= Conservation Dependent, I = Introduced Species.

4.2.2 Wildlife Online

A search of the Queensland Government Wildlife Online database was undertaken to identify flora and fauna recorded in the local area and consequently species that may occur on-site that are listed as threatened under the Queensland *Nature Conservation (Wildlife) Regulation 2006* (Appendix B). A 2 km buffer was applied to a central coordinate in the site (Latitude -27.8697; Longitude 153.2786) to obtain a representative indication of potential species occurrences.

Seven species recorded in the search area are listed as threatened under State or Commonwealth legislation (Table 4.2). A further six species are listed under the NCA as special least concern. Special least concern species are defined under the NCA as those species listed on a migratory bird agreement (such as JAMBA, CAMBA or RoKAMBA), the Echidna and Platypus.

Table 4.2 Conservation Significant Species Potentially Occurring On-Site

Scientific Name	Common Name	Status*
Fauna		
Calyptorhynchus lathami lathami	Glossy Black-cockatoo (Eastern)	V
Numenius madagascariensis	Eastern Curlew	V, CE[#]
Limosa lapponica baueri	Western Alaskan Bar-tailed Godwit	SL, V[#]
Phascolarctos cinereus	Koala	V, V[#]
Flora		
Eucalyptus curtisii	Plunkett Mallee	NT
Cupaniopsis newmanii	Long-leaved Tuckeroo	NT
Endiandra floydii	Floyd's Walnut	E, E[#]

*Status

Queensland *Nature Conservation (Wildlife) Regulation 2006* (*Nature Conservation Act 1992*): E = Endangered, V = Vulnerable, NT = Near Threatened, SL = Special Least Concern.

Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*: CE[#]= Critically Endangered, E[#]= Endangered, V[#]= Vulnerable, CD[#]= Conservation Dependent, I[#] = Introduced Species.

4.3 Vegetation Mapping

Several State government maps were analysed as part of the desktop survey to identify vegetation constraints present on-site, including:

- Queensland Government Regulated Vegetation Map;
- Vegetation Management Regional Ecosystem and Remnant Map;
- Watercourses and Drainage Features; and
- Essential Habitat Map.

The results are discussed in the following sections.

4.3.1 Regulated Vegetation

The management and clearing of native vegetation in Queensland is regulated by the *Vegetation Management Act 1999* (VMA) and the *Planning Act 2016* in conjunction with associated regulations, policies and codes. The requirements for a permit depend on the type of vegetation, the land tenure, the location, and the extent and purpose of the proposed clearing. In urban areas, vegetation may be regulated by local government provisions even if it is not regulated vegetation under the VMA.

The regulated vegetation management map shows vegetation categories to determine clearing requirements. A small area within the south-western corner of the site is mapped as containing regulated vegetation (blue area in Figure 4.1). The balance of the site is mapped as Category X which is not regulated under the VMA.

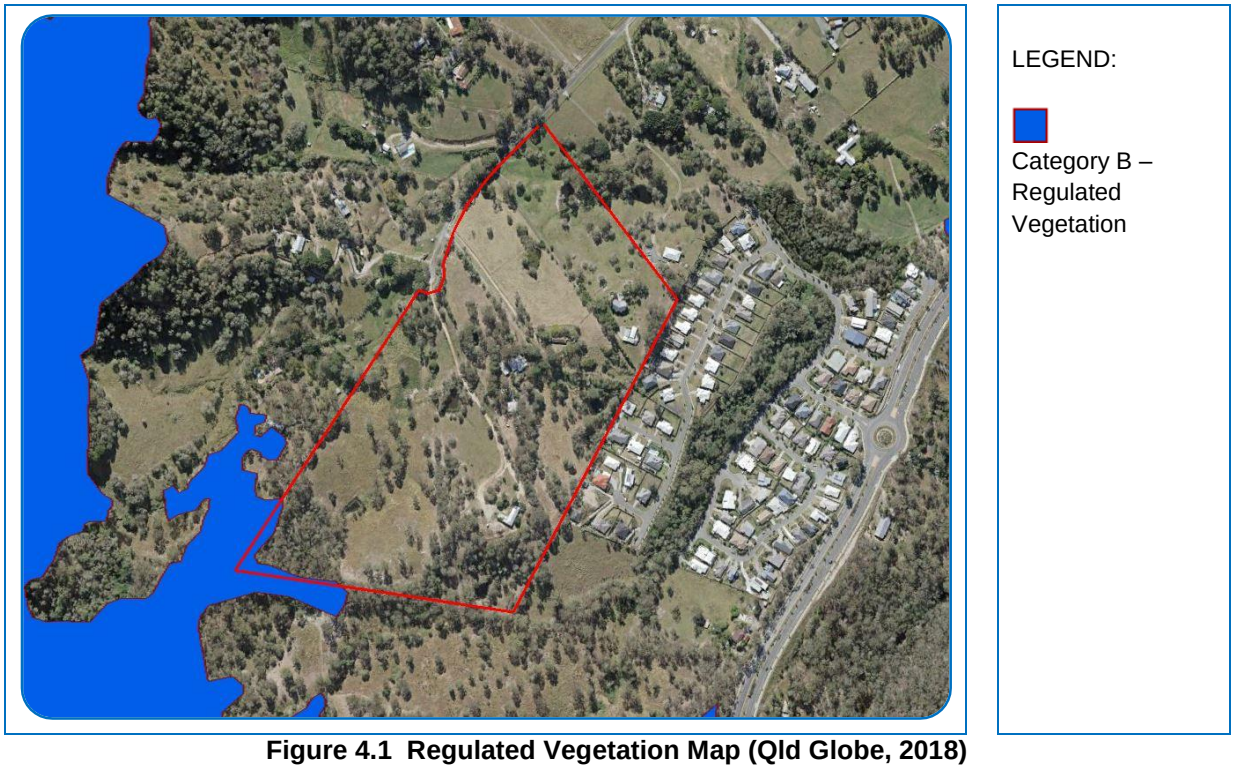

Figure 4.1 Regulated Vegetation Map (Qld Globe, 2018)

4.3.2 Vegetation Management Regional Ecosystem and Remnant Map

The vegetation management supporting maps provide information on Regional Ecosystems, wetlands, watercourses and essential habitat. The regulated vegetation shown in Figure 4.1 is mapped as a Least Concern Regional Ecosystem 12.11.5e/12.11.5a. Under the most recent

version (Version 10) of the RE mapping, this ecosystem type has been reclassified as 12.11.5 - *Corymbia citriodora subsp. variegata, Eucalyptus siderophloia, E. major* open forest on metamorphics +/- interbedded volcanics. (Figure 4.2). A full description of RE 12.11.5 is provided in Table 4.3.

Figure 4.2 Vegetation Management Support Map (Qld Globe, 2018)

Table 4.3 Description of Regional Ecosystems Mapped On-site

Regional Ecosystem	Characteristics	VMA Status
RE12.11.5 *Corymbia citriodora* subsp. *variegata*, *Eucalyptus siderophloia*, *E. major* open forest on metamorphics +/- interbedded volcanics	*Corymbia citriodora* subsp. *variegata* open forest to woodland, usually including *Eucalyptus siderophloia*/*E. crebra* (sub coastal ranges), *E. propinqua* and *E. acmenoides* or *E. carnea*. Other species that may be present and abundant locally include *Corymbia intermedia*, *C. trachyphloia* subsp. *trachyphloia*, *Eucalyptus tereticornis*, *E. microcorys*, *E. portuensis*, *E. helidonica*, *E. major*, *E. longirostrata*, *E. biturbinata*, *E. moluccana* and *Angophora leiocarpa*. *Lophostemon confertus* often present in gullies and as a sub-canopy or understorey tree. Mixed understorey of grasses, shrubs and ferns. Occurs on hills and ranges of Palaeozoic and older moderately to strongly deformed and metamorphosed sediments and interbedded volcanics.	Least Concern

4.3.3 Watercourses and Drainage Features

Several watercourses are mapped on the site (Figure 4.3). Vegetation along a mapped watercourse is regulated under the VMA. If the ecological values of the waterway and riparian vegetation are found to be high, then appropriate buffers should be incorporated into the development design.

Filling or excavating a waterway mapped under the *Water Act 2000* is regulated and requires a Riverine Protection Permit.

Figure 4.3 Watercourses and Drainage Features (Qld Globe, 2018)

4.3.4 Essential Habitat Map

Potential presence of significant fauna habitat is indicated by 'Essential Habitat' mapping. Essential Habitat mapping identifies areas of potential habitat for species listed as near threatened, vulnerable or endangered under the *Nature Conservation Act 1992*.

Essential habitat for Koala has been mapped over a very small area along the south-western boundary of the site (area shown in red in Figure 4.4). As evidence of Koala was identified on-site, habitat should be conserved where possible and appropriate clearing measures undertaken if clearing is required.

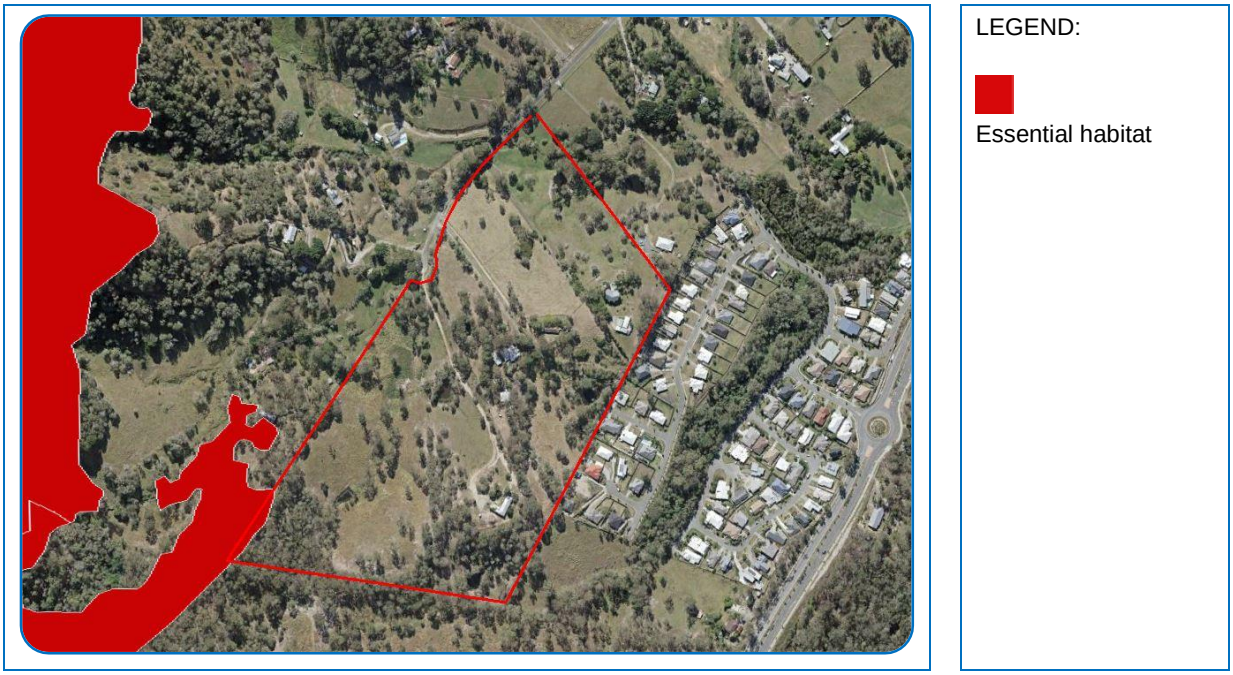

Figure 4.4 Essential Habitat Mapping (Qld Globe, 2018)

4.4 Planning Scheme Overlays

The proposed development will be assessed under the CoGC Planning Scheme *City Plan 2018 Version 6*. Several Environmental Significance overlay codes have been identified as being applicable to the site. The purpose of the Environmental Significance Overlay Code and associated mapping is to identify and protect matters of environmental significance and ensure that development is consistent with, and contributes to, the achievement of the objectives of the *Gold Coast Nature Conservation Strategy 2009-2019*.

4.4.1 Environmental Significance – Priority Species

The Environmental Significance Priority Species code seeks to protect significant species and ensure their habitat is enhanced and maintained. Under this overlay code, assessable Koala feed and shelter trees are protected when they are located in Koala habitat areas.

The south-western corner of the site is mapped as containing Koala habitat area and state significant species (Figure 4.5). The overlay code does not identify which species are significant. It is assumed, based on essential habitat mapping, the species is Koala.

Therefore, development is to avoid or minimise impacts on assessable Koala feed and shelter trees to the greatest extent possible. Development design should incorporate safe Koala movement opportunities by incorporating measures to maintain connectivity between areas of Koala habitat on and adjacent to the site.

Where development impacts on state and local significant species and their habitat, it is a requirement that flora species are propagated and used in rehabilitation and landscaping on site and fauna species are safely relocated by a qualified fauna spotter catcher.

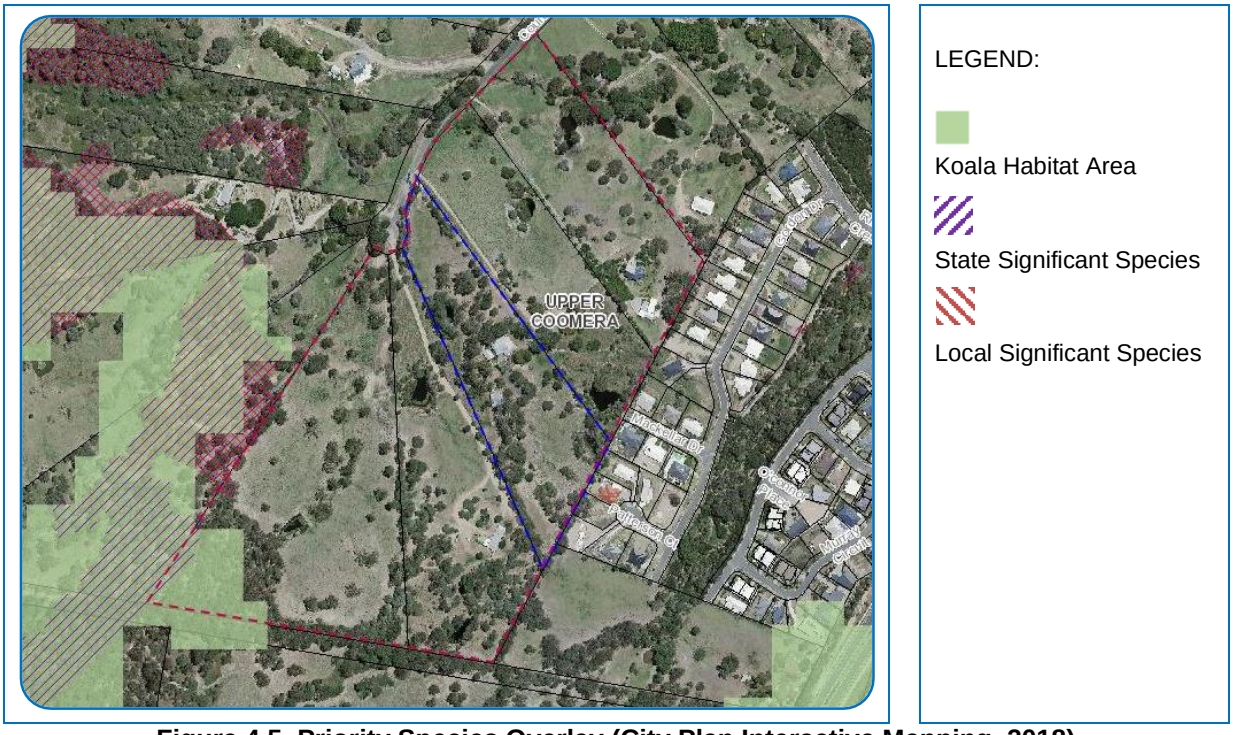

Figure 4.5 Priority Species Overlay (City Plan Interactive Mapping, 2018)

4.4.2 Environmental Significance – Vegetation Management

The purpose of the Vegetation Management code is to ensure that development does not impact on high, medium or general priority vegetation. Overlay code mapping indicates that medium and general priority vegetation is present on the site (Figure 4.6).

Damage to medium priority vegetation should be avoided or if damage is unavoidable, offset under the provisions of the *Environmental Offsets Act 2014* at an area ratio of 3:1 .in accordance with SC6.8 City Plan policy – Environmental offsets. Damage to general priority vegetation should be minimised.

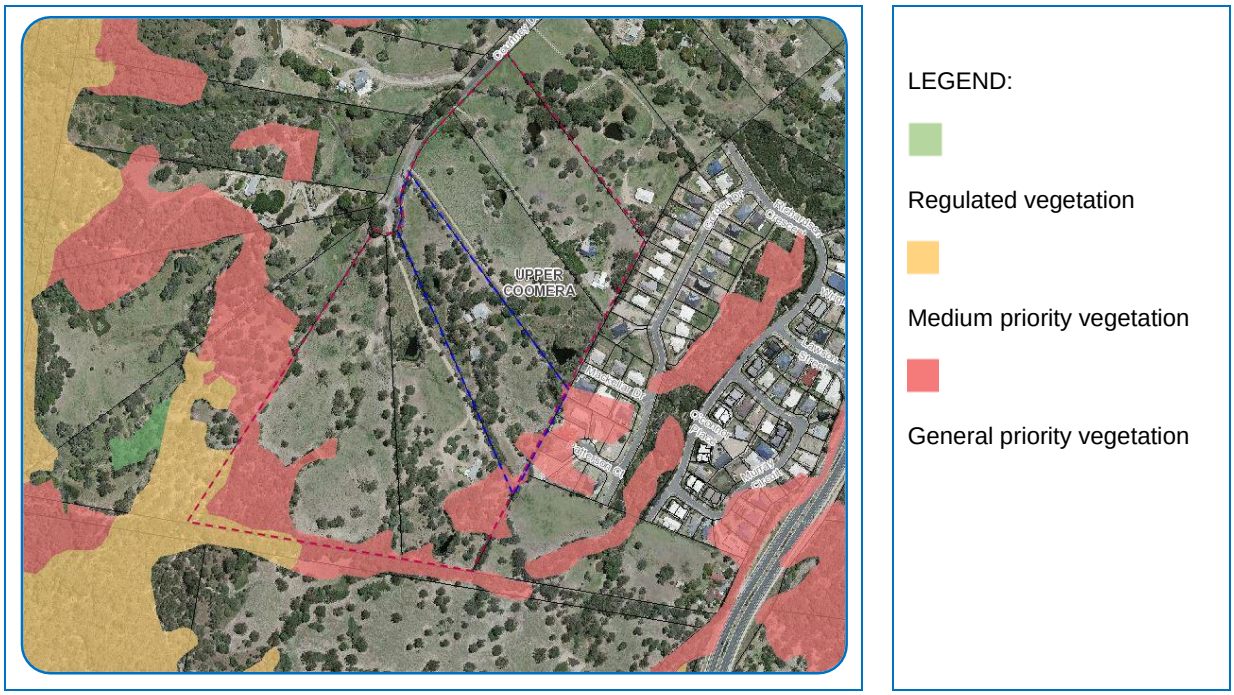

Figure 4.6 Vegetation Management Overlay (City Plan Interactive Mapping, 2018)

4.4.3 Environmental Significance – Wetlands and Watercourses

The purpose of this overlay is to ensure that wetlands and watercourses are protected and enhanced. Mapping indicates that there are locally significant minor watercourses on the site (Figure 4.7).

In accordance with the Planning Scheme, buffers of at least 30 m are to be provided from the outer bank of the minor watercourse.

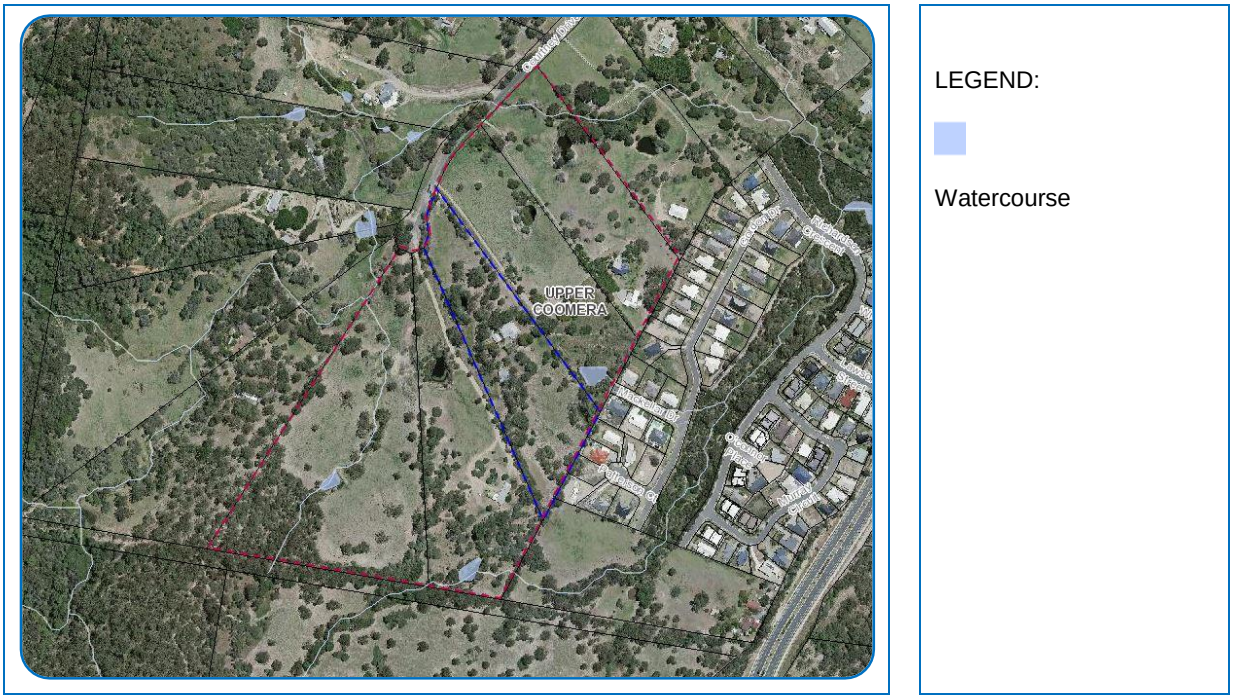

Figure 4.7 Wetlands and Watercourses Overlay (City Plan Interactive Mapping, 2018)

4.5 Likelihood of Occurrence

Table 4.4 identifies the threatened fauna returned from the EPBC Act and Wildlife Online database searches (as described in Section 4.2) together with a likelihood of occurrence for each species.

Each species' likely occurrence was based on a desktop assessment, habitat availability based on site investigations, knowledge of the species' ecology and professional judgement.

Four terms for the likelihood of occurrence of species are used in this report. The terms for likelihood of occurrence are defined below:

- Known or Recorded = the species has been observed on the site.
- Potential = suitable habitat for a species occurs on the site.
- Unlikely = a very low to low probability that a species uses the site.
- No = habitat on site and in the vicinity, is unsuitable for the species.

Table 4.4 Threatened Fauna – Assessment of Likelihood of Occurrence

Scientific Name	Common Name	Status*	Ecology	Likelihood of Occurrence
Anthochaera phrygia	Regent Honeyeater	E, CE[#]	The Regent Honeyeater is endemic to south-east Australia, where it is widespread but with an extremely patchy distribution (Garnett *et al*. 2011). Its range extends from south-east Queensland to central Victoria. In Queensland, the regent honeyeater has been recorded from 15 sites, primarily south of a line between Chinchilla and the Sunshine Coast (Environment Australia, 2016). Regent Honeyeaters mostly occur in dry box-ironbark eucalypt woodland and dry sclerophyll forest associations in areas of low to moderate relief, especially along creek flats, or in broad river valleys and foothills (Environment Australia, 2016). Regent Honeyeaters usually nest in the canopy of forests or woodlands. The diet of this species consists mainly of nectar, supplemented with some invertebrates (mostly insects) and their exudates (e.g. lerp, honeydew). Nectar is taken mainly from a variety of eucalypt species (Environment Australia, 2016).	**UNLIKELY** Marginal habitat for this species exists on the site, but were not observed. Known breeding sites for this species are restricted to west of Warwick.
Calyptorhynchus lathami lathami	Glossy Black-cockatoo (Eastern)	V	Glossy Black-cockatoos inhabit open forest and woodlands of the coast and the Great Dividing Range where stands of She-oak occur. They feed almost exclusively on the seeds of several species of She-oak (*Casuarina* and *Allocasuarina* species). They are dependent on large hollow-bearing eucalypts for breeding (Office of Environment & Heritage, 2015).	**UNLIKELY** While a She-oak stand is present on the subject site, no evidence of feeding by this species was recorded during the survey period.

Scientific Name	Common Name	Status*	Ecology	Likelihood of Occurrence
Botaurus poiciloptilus	Australasian Bittern	E	The Australasian Bittern occurs from south-east Queensland to south-east South Australia, Tasmania and the south-west of Western Australia (Marchant & Higgins 1990). The species is rarely recorded in Queensland, and possibly survives only in protected areas such as the Cooloola and Fraser regions (DE, 2016). The Australasian bittern occurs in terrestrial freshwater wetlands and, rarely, estuarine habitats. It favours wetlands with tall, dense vegetation, where it forages in still, shallow water up to 0.3 m deep, often at the edges of pools or waterways, or from platforms or mats of vegetation over deep water (Marchant & Higgins 1990). The Australasian Bittern has been recorded feeding on freshwater crayfish, fish (including goldfish), beetles, snakes, leaves and fruit (Marchant & Higgins 1990).	**NO** Suitable habitat for this species does not occur on the subject site
Erythrotriorchis radiatus	Red Goshawk	E, V#	The Red Goshawk is endemic to Australia. It is very sparsely dispersed coastal and sub-coastal Australia, from the western Kimberley Division (north of 19°S) to north-eastern NSW (north of 33°) (Marchant & Higgins, 1993). The Red Goshawk occurs in coastal and sub-coastal areas in wooded and forested lands (Marchant & Higgins, 1993). Riverine forests are also used frequently (Debus, 1991, 1993). Such habitats typically support high bird numbers and biodiversity, especially medium to large bird species which the goshawk requires for prey. The Red Goshawk nests in large trees within one km of permanent water (Debus & Czechura, 1988b).	**UNLIKELY** The low diversity of suitable prey for this species make the subject site an area unlikely to support Red Goshawk.

Scientific Name	Common Name	Status*	Ecology	Likelihood of Occurrence
Turnix melanogaster	Black-breasted Button-quail	V	The present-day known distribution in Queensland extends from near Byfield in the north, south to the New South Wales border and westwards to Palm Grove National Park and Barakula State Forest (Marchant & Higgins, 1993). The most significant populations appear to be in the Yarraman-Nanango, Jimna-Conondale and Great Sandy regions. The Black-breasted Button-quail is restricted to rainforests and forests, mostly in areas with 770-1200 mm rainfall per annum (Marchant & Higgins, 1993). They prefer drier low closed forests, particularly semi-evergreen vine thicket, low microphyll vine forest, araucarian microphyll vine forest and araucarian notophyll vine forest (Marchant & Higgins, 1993). They may also be found in low, dense acacia thickets and, in littoral area, in vegetation behind sand dunes (Smith & Mathieson, 2004).	**NO** No suitable habitat exists on the site for this species.
Chalinolobus dwyeri	Large-eared Pied Bat	V	This species prefers roosting habitat of sandstone cliffs and fertile woodland valley. Records from south-east Queensland suggest rainforest and moist eucalypt forest habitats on other geological substrates at high elevation are of importance to the species. Species distribution is poorly known (DE, 2016).	**NO** No suitable habitat exists on the site.
Dasyurus maculatus maculatus	Spotted-tailed Quoll	E	The Spotted-tailed Quoll prefers mature wet forest habitat. Unlogged forest or forest that has been less disturbed by timber harvesting is also preferable. This predominantly nocturnal species rests during the day in dens. Habitat requirements include suitable den sites such as hollow logs, tree hollows, rock outcrops or caves (DE, 2016). Individuals require an abundance of food such as birds and small mammals, and large areas of relatively intact vegetation through which to forage (DE, 2016).	**NO** Suitable habitat in the form of intact mature wet forest was not observed on the subject site. While some hollows were recorded on-site, they were in low abundance, and no rocky outcrops or caves were recorded.

Scientific Name	Common Name	Status*	Ecology	Likelihood of Occurrence
Petauroides volans	Greater Glider	V[#]	The Greater Glider is an arboreal marsupial, largely restricted to eucalypt forests and woodlands. It is primarily folivorous, with a diet mostly comprising eucalypt leaves, and occasionally flowers (Kehl & Borsboom, 1984; Kavanagh & Lambert, 1990; van der Ree *et al*., 2004). The Greater Glider is restricted to eastern Australia, from the Windsor Tableland in north Queensland to central Victoria, with an elevational range from sea level to 1200m ASL (Vanderduys *et al*., 2012). It is found in highest abundance typically in taller, montane, moist eucalypt forests, with relatively old trees and abundant hollows (van der Ree et al., 2004; Vanderduys *et al*., 2012). The distribution may be patchy even in suitable habitat. The greater glider favours forests with a diversity of eucalypt species, due to seasonal variation in its preferred tree species (Kavanagh, 1984). During the day, it shelters in tree hollows, with a preference for large hollows in large, old trees (Kehl & Borsboom, 1984; Smith *et al*., 2007). In southern Queensland, greater gliders require at least 2-4 live den trees for every 2 ha of suitable forest habitat (Eyre, 2002). Home ranges vary from 1-4 ha in high productivity forests (Kavanagh & Wheeler, 2004) to 16 ha in open woodlands (Eyre, 2002; Smith *et al*., 2007).	**NO** Suitable habitat and denning sites were not observed on the site.
Phascolarctos cinereus	Koala	V, V[#]	Koalas inhabit dry open sclerophyll forests and woodlands occurring on fertile soils (Van Dyck, 1995; Menkhorst and Knight, 2001; Environmental Protection Agency, 2006). Communities containing denser vegetation and larger trees are generally preferred; however Koalas can also inhabit less optimal habitat such as young forests, highly fragmented vegetation communities, and small remnants (Environmental Protection Agency, 2006). They mainly feed on *Eucalyptus* species, along with some *Corymbia*, *Angophora*, *Lophostemon*, *Melaleuca*, and *Leptospermum* species (Environmental Protection Agency, 2006).	**KNOWN** This species was not directly recorded during surveys. Indirect evidence (scratch marks and scats) were found of Koala during the KSAT survey.

Scientific Name	Common Name	Status*	Ecology	Likelihood of Occurrence
Pteropus poliocephalus	Grey-headed Flying-fox	V#	The Grey-headed Flying-fox occurs in the coastal belt from Rockhampton to Melbourne. The Grey-headed Flying-fox requires foraging resources and roosting sites. It is a canopy-feeding frugivore and nectarivore, which utilises vegetation communities including rainforests, open forests, closed and open woodlands, *Melaleuca* swamps and *Banksia* woodlands (Eby, 1998). None of the vegetation communities used by the Grey-headed Flying-fox produce continuous foraging resources throughout the year, so the species selectively forages where food is available. Consequently, patterns of occurrence and relative abundance within its distribution vary widely between seasons and between years. At a local scale, the species is generally present intermittently and irregularly (Eby & Lunney, 2002). The Grey-headed Flying-fox roosts in aggregations of various sizes on exposed branches. They most frequently travel around 15 km from a roost site to feed (Tidemann, 1998), although can travel up to 50 km as food resources change (Eby, 1991).	**POTENTIAL** The site would provide seasonal foraging resources. No flying-fox camps are present on the site.
Pseudomys novaehollandiae	New Holland Mouse	V	The New Holland mouse is patchily distributed in coastal areas of south eastern Australia from southern Queensland in the north, to Flinders Island and Tasmania in the south, extending inland to around 100 km in NE NSW (Australian Museum, 2016). The species is now largely restricted to the coast of central and northern NSW (DE, 2016).	**NO** Suitable heath habitat does not exist on the subject site.
Potorus tridactylus tridatylus	Long Nosed Potaroo	V	This species generally prefers rainforest and adjacent to wet sclerophyll forest, coastal heathlands and similar habitats with a dense understorey. Like all Potoroos, fungi are the major component of the diet and is also known to feed on invertebrates (DE, 2016).	**NO** Suitable habitat for this species does not occur on the subject site.

5 Development Proposal

The development involves reconfiguring the existing site into 237 lots (Figure 5.1). The development will include:

- An internal road network with pedestrian footpath;
- Conservation area (Environmental Reserve public open space) to protect existing ecologically significant areas; and
- Rehabilitated waterways incorporated into public open space areas.

Figure 5.1 Proposed Development Layout (Bennett and Bennett, 2019)

6 Vegetation Field Survey

A flora survey to ground truth the floristic characteristics of the sites vegetation communities was undertaken on 5 June 2017. The results of this investigation are presented in the following sections.

6.1 Methodology

The field assessment involved an initial walkover of the survey area to ground-truth desktop investigations and identify the presence and extent of vegetation community types. Random meanders were undertaken throughout the survey area generally in accordance with Cropper (1993). This survey technique enabled the identification of a comprehensive flora species list for the survey area.

An assessment of disturbance was undertaken at an association-wide scale.

Data associated with structural formations (i.e. growth form, stratum intervals, crown cover and height) and floristic associations (i.e. species diversity) for each broad vegetation type was collected (Table 6.1).

The vegetation surrounding the site's infrastructure was found to be too modified to represent natural vegetation associations or communities and was excluded from the quantitative assessment.

Table 6.1 Structural Formation Classes for Woody Plant Communities

Vegetation cover equivalents	Foliage Projective Cover	70-100%	30-70%	10-30%	<10%
	Crown Separation	Closed or dense	Mid-dense	Sparse	Very sparse
	Field Criteria	Crowns touching to overlapping	Crowns touching to slightly separated	Crowns clearly separated	Crowns well separated
	CROWNCOVER %	100-81%	81-52%	52-20%	20-0.2%

	GROWTH FORM	Structural Formation Classes			
Growth form and height	Trees >30 m tall	Tall closed-forest	Tall Open-forest	Tall woodland	Tall Open-woodland
	Trees 10-30 m tall	Closed-forest	Open-forest	Woodland	Open-woodland
	Trees <10 m tall	Low closed-forest	Low open-forest	Low woodland	Low Open-woodland
	Shrubs 2– 8 m tall	Closed-scrub	Open-scrub	Tall shrubland	Tall Open-shrubland
	Shrubs 1-2 m tall	Closed-heath	Open-heath	Shrubland	Open-shrubland
	Shrubs <1 m tall	-	-	Dwarf shrubland	Dwarf Open-shrubland

Source: DNRW Application Kit for a Property Map of Assessable Vegetation 2004.

6.2 Flora Survey Results

Based on past aerial photography, it appears that much of the site has been historically cleared for rural residential purposes while retaining a small area of bushland on a steep slope in the south-western corner and isolated copses throughout. Cultivated gardens around the existing dwellings are present.

A total of 106 species of flora were identified within the site, comprising 51 endemic species and 55 non-endemic species (Appendix C).

6.3 Vegetation Communities

The vegetation encountered on-site was broadly classified into four associations:

1. *Acacia* low open forest;
2. Spotted Gum / Grey Ironbark Open Forest (RE 12.11.5);
3. *Acacia* low open woodland/mosaic +/- landscaping around dwellings; and
4. Pasturelands +/- copses of native/exotic trees

These vegetation communities are illustrated in Figure 6.1 and are described in greater detail in the following sections.

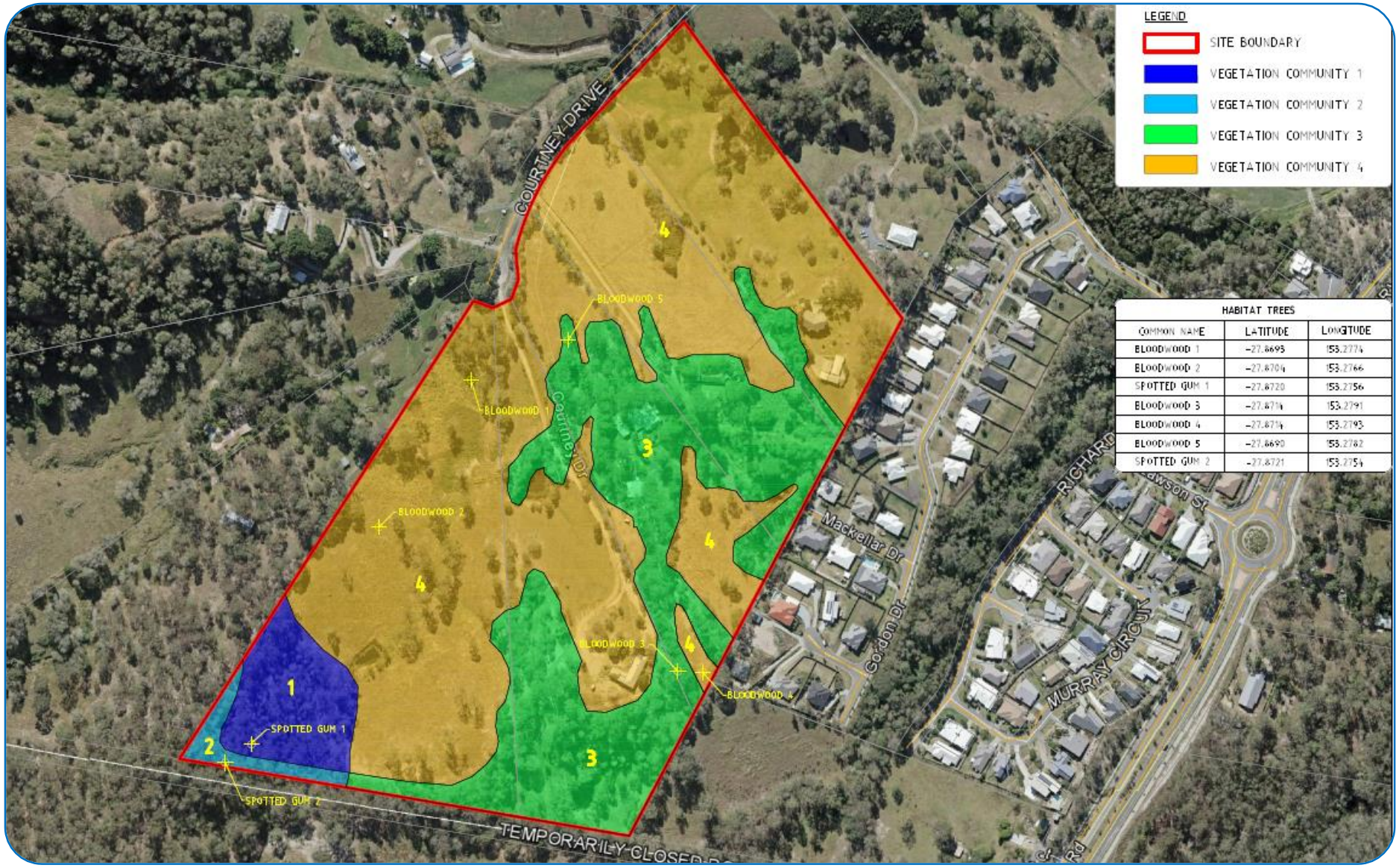

Figure 6.1 Vegetation Communities

6.3.1 Vegetation Community 1 – Acacia low open forest

Vegetation Unit 1 is comprised of mature *Acacia disparrima* regrowth with occasional emergent *Corymbia citriodora, Eucalyptus siderophloia, E. propinqua, and E. tereticornis*. Other common species in the mid stratum include *Lophostemon suaveolens* and *Allocasuarina littoralis*.

The notable disturbance within this vegetation community is the incursion of weeds, with Lantana dominating the shrub layer. Low level livestock grazing is presently occurring.

Figure 6.2 Vegetation Community 1

Table 6.2 Vegetation Community 1 Quantitative Assessments

Stratum	Growth Form	Crown separation	Stratum Height (m)
Upper	Tall tree	Very Sparse	15 - 20
Mid	Small tree	Mid-dense	3 - 15
Lower	Shrub	Mid-dense	0.5 - 3
Ground	Forb	Sparse	<0.5

Tables 6.3 summarises the floristic characteristics of Vegetation Community 1 within each stratum.

Table 6.3 Floristic Association – Community 1

Growth Form	Stratum	Scientific Name	Common Name
Woodland	Upper	*Corymbia citriodora*	Spotted Gum
		Eucalyptus propinqua	Small-fruiting Grey Gum
		Eucalyptus siderophloia	Grey Ironbark
		Eucalyptus tereticornis	Queensland Blue Gum

Growth Form	Stratum	Scientific Name	Common Name
		Lophostemon confertus	Brush Box
Low open-forest	Mid	*Acacia disparrima*	Hickory Wattle
		Allocasuarina littoralis	Black She-oak
		Eucalyptus siderophloia	Grey Ironbark
		Lophostemon confertus	Brush Box
		Lophostemon suaveolens	Swamp Box
-	Lower	*Acacia disparrima*	Hickory Wattle
		Lantana camara	Lantana
-	Ground	*Cymbopogon refractus*	Barbed-wire Grass
		Entolasia stricta	Wiry Panic
		Imperata cylindrica	Blady Grass
		Lomandra multiflora	Many-flowered Mat Rush
		Themeda triandra	Kangaroo Grass

6.3.2 Vegetation Community 2 – Spotted Gum/Grey Ironbark Open Forest (RE 12.11.5)

Vegetation Community 2 comprises a small area of the total subject site in the south-west corner and is an extension of a larger area of the same vegetation type beyond the site boundary. The composition of canopy trees is generally representative of RE 12.11.5. Low level livestock grazing is presently occurring with negligible weed incursion.

Figure 6.3 Vegetation Community 2

Table 6.4 Vegetation Community 2 Quantitative Assessments

Stratum	Growth Form	Crown separation	Stratum Height (m)

Upper	Tall tree	Sparse	15 - 20
Mid	Small tree	Mid-dense	3 - 15
Lower	Shrub	Very Sparse	0.5 - 3
Ground	Forb	Sparse	<0.5

Tables 6.5 summarises the floristic characteristics of Vegetation Community 2 within each stratum.

Table 6.5 Floristic Association – Community 2

Growth Form	Stratum	Scientific Name	Common Name
Open-forest	Upper	*Corymbia citriodora*	Spotted Gum
		Eucalyptus siderophloia	Grey Ironbark
Low open-forest	Mid	*Corymbia citriodora*	Spotted Gum
		Corymbia intermedia	Pink Bloodwood
		Eucalyptus carnea	Broad-leaved White Mahogany
		Lophostemon confertus	Brush Box
-	Lower	*Acacia disparrima*	Hickory Wattle
		Corymbia citriodora	Spotted Gum
-	Ground	*Cymbopogon refractus*	Barbed-wire Grass
		Entolasia stricta	Wiry Panic
		Imperata cylindrica	Blady Grass
		Lomandra confertifolia	A Mat Rush
		Lomandra longifolia	Spikey-headed Mat Rush
		Themeda triandra	Kangaroo Grass

6.3.3 Vegetation Community 3 - Acacia low open woodland/mosaic +/- landscaping around dwellings

Vegetation Community 3 is primarily mature *Acacia* regrowth proximate to dwellings and outbuildings on the subject site. There are occasional larger eucalypts and small isolated thickets of lantana and vine weeds are common. Low level grazing is presently occurring throughout most of this community. Prevalent flora species for this community are provided below.

Upper Stratum:
Acacia disparrima, Eucalyptus siderophloia, Eucalyptus tereticornis, Lophostemon confertus.

Mid stratum:
Acacia disparrima, Lantana camara, Eucalyptus spp.

Ground Stratum (*exotic species)**:**
*Cynodon dactylon var. dactylon, *Setaria sphacelata, *Panicum megathyrsus.*

Figure 6.4 Vegetation Unit 3

6.3.4 Vegetation Community 4 - Pasturelands +/- copses of native/exotic trees

Vegetation Community 4 covers most of the site comprising introduced pasture species, copses of endemic tree species and trees associated with landscaping. Some of the largest eucalypt trees on site occur as isolated trees or within the copses.

Figure 6.5 Vegetation Community 4

6.4 Conservation Significant Flora

As the site falls within a high-risk area for protected flora species, surveys noted any threatened species listed under state or Commonwealth legislation.

For the purposes of this report, a significant flora species has been defined as a species that is:

- Scheduled as critically endangered, endangered, vulnerable or conservation dependent under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act); and/or
- Scheduled as endangered, vulnerable, or near threatened under the Queensland *Nature Conservation Act 1992* (NCA).

No conservation significant species were recorded on site during surveys.

6.5 Weed Incursions

In its broadest definition, a weed is “a plant out of place”. The State government has applied a hierarchical system of classification to invasive plants according to their estimated economic and environmental impacts. Each level of classification prescribes legal obligations designed to control the spread of declared invasive plants. Other plants that are simply exotic or non-endemic to a particular area may be considered less invasive or non-invasive but are nonetheless “out of place” depending on the given context or land use purpose.

In the context of this ecological assessment, a weed is a plant that is not endemic to any given natural area or ecological unit being assessed.

A total of 55 non-endemic species were identified on the subject site, 15 of which are Invasive Plants under the Queensland *Biosecurity Act 2014* (Table 6.6).

Table 6.6 Weeds Observed On-site

Scientific Name	Common Name	Status
Ageratum houstonianum	Blue Billygoat Weed	
Amaranthus spinosus	Red Amaranth	
Ambrosia artemisiifolia	Ragweed	RIP
Anagallis arvensis	Scarlet Pimpernel	
Asclepias curassavica	Tropical Milkweed	
Asparagus aethiopicus cv. Sprengeri	Ground Asparagus	RIP
Bidens pilosa	Cobbler's Pegs	
Cinnamomum camphora	Camphor Laurel	RIP
Cirsium vulgare	Scotch Thistle	
Conyza canariensis	Canadian Fleabane	
Conyza sumatrensis	Tall Fleabane	
Corymbia torelliana	Cadaghi	
Crassocephalum crepidioides	Thickhead	
Crotalaria incana	Woolly Rattlepod	

Scientific Name	Common Name	Status
Crotalaria lanceolata	Lance-leaved Rattlepod	
Cupressus sempervirens	Pencil Pine	
Cyperus papyrus	Papyrus	
Emelia sonchifolia	Emelia	
Gomphocarpus sp.	Cotton Bush	
Hypochaeris radicata	Flatweed	
Jacaranda mimosifolia	Jacaranda	
Lantana camara	Lantana	RIP
Macrotyloma axillare	Horse Gram	
Megathyrsus maximus	Guinea Grass	
Melinis minutiflora	Molasses Grass	OIP
Murraya paniculata	Mock Orange	OIP
Neonotonia wightii	White Glycine	
Nymphaea capensis	Cape Waterlily	
Oxalis corniculata	Yellow Wood Sorrel	
Oxalis debilis var. corymbosa	Soursob	
Paspalum dilatatum	Paspalum	
Passiflora edulis	Passionfruit	
Passiflora foetida	Stinking Passion Flower	OIP
Passiflora suberosa	Corky Passionfruit	OIP
Passiflora subpeltata	White Passionflower	OIP
Polygala paniculata	Polygala	
Phytolacca octandra	Inkweed	
Psidium guajava	Yellow Guava	
Ravenala madagascariensis	Traveller’s Palm	
Richardia brasiliensis	White Eye	
Schefflera actinophylla	Umbrella Tree	OIP
Senecio madagascariensis	Fireweed	RIP
Senna pendula var. glabrata	Easter Senna	OIP
Setaria sphacelata	Setaria	
Sida cordifolia	Flannel Weed	
Sida rhombifolia	Paddy Lucerne	
Solanum chrysotrichum	Giant Devil's Fig	
Solanum mauritianum	Wild Tobacco	OIP
Solanum capsicoides	Devil’s Apple	
Sphagneticola trilobata	Singapore Daisy	RIP

Scientific Name	Common Name	Status
Sporobolus africanus	Paramatta Grass	
Syagrus romanzoffiana	Cocos Palm	OIP
Tagetes minuta	Stinking Roger	
Urena lobata	Urena Burr	
Verbena bonariensis	Purple Top	

*Species listed under the Queensland *Biosecurity Act 2014*, where:

PIP = Prohibited invasive plants must not be kept, moved, given away or sold without a permit. The Biosecurity Act requires that all sightings to be reported to Biosecurity Queensland within 24 hours. By law, everyone has a general biosecurity obligation to take all reasonable and practical steps to minimise the risk of spreading prohibited invasive plants until they receive advice from an authorised officer.

RIP = Restricted invasive plants must not be given away, sold or released into the environment without a permit. The Biosecurity Act requires everyone to take all reasonable and practical steps to minimise the risks associated with invasive plants under their control. At a local level, each local government must have a biosecurity plan that covers invasive plants and animals in its area. This plan may include actions to be taken on certain species. Some of these actions may be required under local laws.

OIP = Other invasive plants are not prohibited or restricted, however, by law, everyone has a general biosecurity obligation to take reasonable and practical steps to minimise the risks associated with invasive plants under their control. Local governments must have a biosecurity plan that covers invasive plants and animals in their area. This plan may include actions to be taken on certain species. Some of these actions may be required under local laws.

6.6 Habitat Trees

Habitat trees are defined under Schedule 6.7 of the City Plan as having hollows, nests or being a significant food source. The locations of trees that meet this definition are provided in Table 6.7 and shown in Figure 6.1.

Table 6.7 Habitat Tree Locations

Common Name	Latitude	Longitude
Bloodwood	-27.869329	153.277390
Bloodwood	-27.870399	153.276640
Spotted Gum	-27.871978	153.275604
Bloodwood	-27.871441	153.279087
Bloodwood	-27.871448	153.279290
Bloodwood	-27.869035	153.278187
Spotted Gum	-27.872113	153.275391

6.7 Waterways and Riparian Vegetation

As noted in Section 4, minor waterways (including dams) are mapped as present on the site. Under the *Water Act 2000* these waterways are yet to be mapped.

Field investigations identified these waterways to be degraded and primarily consist of eroded or heavily weed infested ephemeral overland flow paths discharging to dams.

To assist with the description and identification of the site's waterways and associated vegetation, they are discussed with regard to the Lot number on which they occur.

6.7.1 Waterways Definition

Under the *City Plan 2018 Version 6*, a waterway is defined as that which is:

a) Identified on the Environmental Significance – wetlands and waterways overlay map; or
b) Identified within an ecological site assessment; or
c) As defined under the *Water Act 2000*.

6.7.2 Lot 192

An ephemeral waterway flows through the centre of this allotment (Figure 6.7). The headwater of this waterway arises from the southern site boundary and is characterised by steeply sloping embankments, especially the western slope. The gully is vegetated south of the dam (vegetation community 1) and has notable weed infestations, especially lantana.

Figure 6.6 Waterway Lot 192 (City Plan mapping)

The dam is relatively small and is accessed by livestock (Figure 6.7). Surrounding vegetation is dominated by pasture grasses and regrowth vegetation. There is some evidence of erosion on the dam embankments where ground cover vegetation has been grazed to bare earth. There is very little native vegetation north of the dam (Figure 6.8).

The lack of native vegetation and permanent or temporary water limits the ecological values of the waterway north of the dam. The Draft Concept Plan (GHD, 2017) did not identify any ecological benefits in incorporating this flow path in future development.

Figure 6.7 Dam on Lot 192

Figure 6.8 Waterway Lot 192 (north of dam)

6.7.3 Lot 191

City Plan mapping shows a waterway is present on Lot 191 along the southern boundary (Figure 6.9). The waterway flows from the south of the site and to a large dam (Figure 6.10). The dam overflow is a narrow gully which flows to neighbouring properties to the east, connecting with a stormwater conveyance channel in the residential development.

As with the dam on Lot 192, grazing pressures have resulted in areas of exposed earth along the embankments. The vegetation surrounding the dam is dominated by *Acacia* and lantana.

Downstream flow paths are currently influenced by the dam and are likely to convey water only after the dam has exceeded capacity.

The Draft Concept Plan (GHD, 2017) proposed that the southern waterway be included into the green space network. It has connectivity through an adjacent rural property with the residential development located to the east of the site (refer to Figure 2.3).

Figure 6.9 Waterway Lot 191 (City Plan mapping)

Figure 6.10 Dam on Lot 191

6.7.4 Lot 189

The waterway on Lot 189 is dominated by a large dam. The overflow of this dam discharges to a residential development located to the east (Figure 6.11). Downstream flow paths are likely to convey water only after the dam has exceeded capacity.

The downstream flow paths have been significantly modified through the establishment of a residential community. Inflows to the dam are via a small gully arising from near the dwelling.

Vegetation around the dam is dominated by pasture grass (Figure 6.12) and is accessed by livestock.

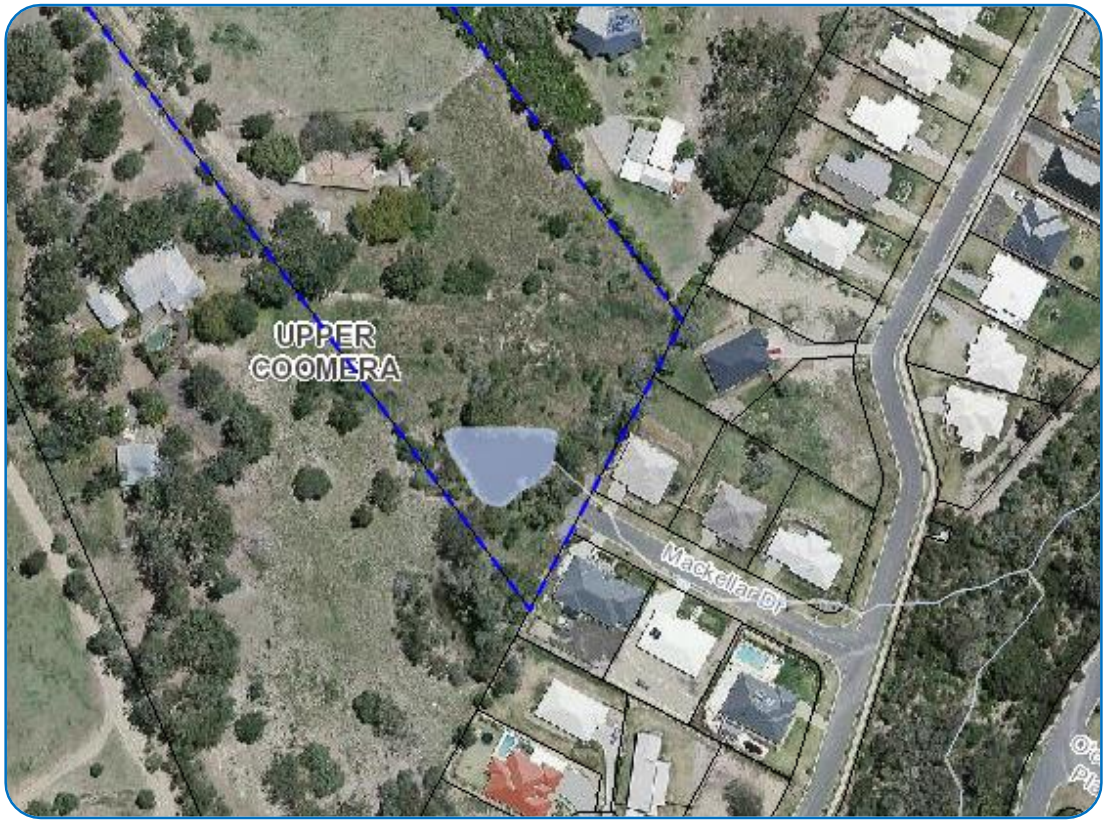

Figure 6.11 Waterway Lot 189 (City Plan mapping)

Figure 6.12 Dam on Lot 189

6.7.5 Lot 188

Yaun Creek runs through the northern corner of Lot 188. It arises from neighbouring properties to the west and passes under Courtney Drive via a culvert before flowing through the allotment (Figures 6.13).

Figure 6.13 Waterway Lot 188 (City Plan mapping)

The waterway has eroded and steep embankments. Very little riparian vegetation is present, and horses have direct access (Figure 6.14). The waterway discharges to neighbouring properties to the east. With the exceptions of the dams on all the allotments, this was the only waterway where standing water was present. The waterway is characterised in this reach by a series of shallow pools of still water.

Rehabilitation of this waterway was recommended in the Draft Concept Plan (GHD, 2017).

Figure 6.14 Waterway on Lot 188

7 Fauna Field Survey

With consideration given to the information obtained within the desktop assessment, fauna field surveys were undertaken on 5 June 2017.

Where relevant, observations regarding fauna habitat values on adjacent sites were also recorded, although limited to those that were discernible from within the subject site and/or from publicly accessible land.

The survey methodology incorporated the following survey techniques:

- Diurnal bird surveys;
- Targeted searches for conservation significant species; and
- Opportunistic records and observations of inferential evidence.

7.1.1 Diurnal bird surveys

Diurnal bird surveys were undertaken over all the site. Bird species were identified through direct observations (i.e. visual sighting) and/or vocalisations. The bird survey involved the observer walking slowly and quietly through the site, looking and listening for birds.

7.1.2 Targeted Searches for Conservation Significant Species

This section provides an overview of the specific techniques employed for surveys for specific threatened species. The targeted threatened species were identified in the database review as potentially occurring on the site. The survey methodologies described below differ from standard survey techniques.

7.1.2.1 Koala Searches

An assessment of habitat utilisation of Koala was made using the Randomised Grid-based Koala Spot Assessment Technique to identify Koala activity levels across the site. This technique involves a search of Koala scats to determine the relative activity level of Koalas in the area.

Finding and identifying traces such as faecal pellets and scratch marks allows for the presence of Koalas to be confirmed (Woosnam-Merchez *et al.,* 2012) and allows for past as well as present habitat occupancy to be evaluated. Both scats and scratch marks are relatively identifiable and persist for a reasonable period post-departure of the animal (Woosnam-Merchez *et al.*, 2012). Scratch marks are however, only detectable on smooth barked trees.

Spot assessment locations were located randomly using a 100 m x 100 m grid overlay of the site. Within each of these grid cells, a Koala Spot Assessment Technique (KSAT) was performed where an adequate number of trees were present. Concurrent with each KSAT, all trees were visually searched for Koala. The methodology employed for the KSAT followed Phillips and Callaghan (2011). A total of two KSAT were conducted within Vegetation Communities 1 and 2 in the south-west corner of the site.

In accordance with Phillips and Callaghan (2011), a centre tree within a 40 m x 40 m (1,600 m^2) plot was selected. Within the plot, the 29 closest trees (of any species) to the central tree were selected. Searches for faecal pellets were made within a radial distance of up to 1 m from the

base of the trees. For each tree, the survey effort dedicated to the faecal pellet search was two-person minutes, or until a Koala faecal pellet was found – whichever occurred first.

In refining the KSAT site selection, the center tree was selected on the basis of being:

- A tree beneath which one or more Koala faecal pellets were observed; or
- A preferred Koala food tree.

Tree species were selected for assessment based on the following:

- The tree was a Koala Habitat Tree, as defined by the *Nature Conservation (Koala) Conservation Plan 2006* (i.e. a tree from a genus that is *Angophora, Corymbia, Eucalyptus, Lophostemon* or *Melaleuca*); and
- The tree had a diameter at breast height (DBH) of greater than 100 mm.

7.1.2.2 Glossy Black-cockatoo Searches

Glossy Black-cockatoos inhabit open forest and woodlands of the coast and the Great Dividing Range where stands of She-oak occur. They feed almost exclusively on the seeds of several species of She-oak (*Casuarina* and *Allocasuarina* species) (NSW Environment and Heritage, 2014). As the birds feed, they drop the remnants of the She-oak cones after stripping the cone of seeds. These distinctive 'orts' are used to determine if Glossy Black-cockatoos have been feeding in the area. Within the subject site, searches were made for She-oaks.

A stand of She-oaks was located at Latitude -27.872105, Longitude 153.275550. The ground underneath these trees was searched for orts.

As with other cockatoo species, the Glossy Black-cockatoo is dependent on large hollow-bearing eucalypts for nest sites. Searches were made for suitable nesting trees within the subject site.

7.1.3 Opportunistic Records and Observations of Inferential Evidence

Observations of inferential evidence and opportunistic fauna encounters were recorded. Inferential evidence included observation of scratches, scats, tracks, shed skins and nests.

7.1.4 Survey Limitations

The fauna survey that was undertaken provides an overview of the species present and detectable on the subject site at the time of the survey. Weather and time constraints impact on the detectability of some species. Failure to detect a species during a single survey does not mean it is absent from the site. It cannot be confidently claimed a target species is absent from a site without repeated seasonal surveys.

It is recognised that the full inventory of fauna species utilising the site will not have been recorded. Although assessments of habitat and species ecology do provide an additional measure to predict the presence of species, there are no methodologies that can be used to predict, with absolute certainty, the absence of a species from potential habitat. There may be species that utilise habitats within the region like those on-site but have not been detected due to their occasional usage of the habitat types, rarity or cryptic nature.

Despite the limitations, and given the disturbed nature of the site, the survey effort conducted provides a level of fauna assessment that is consistent with the requirements associated with the preparation of a Basic Ecological Assessment as per the planning scheme guidelines.

7.2 Results

The following section provides the results of the fauna field assessments. A total of 54 fauna species were recorded during this survey, including one amphibian, 47 birds, and six mammals (Table 7.1). The survey results did not include domesticated livestock (sheep, goats, alpaca and horses), pets (dogs, cats) and caged birds (Red-tailed Black-cockatoo, Major Mitchell Cockatoo and Cockatiel) that were also present on the site.

Table 7.1 Fauna Observed On-Site

Scientific Name	Common Name	Status*	Method**	Comment
Amphibians				
Litoria fallax	Eastern Sedgefrog	LC	H	
Birds				
Sphecotheres vieilloti	Australasian Figbird	LC	S	
Cracticus tibicen	Australian Magpie	LC	S	
Pelecanus conspicillatus	Australian Pelican	LC	S	F/O
Threskiornis molucca	Australian White Ibis	LC	S	O/S
Chenonetta jubata	Australian Wood Duck	LC	S	
Geopelia humeralis	Bar-shouldered Dove	LC	S	
Coracina novaehollandiae	Black-faced Cuckoo-shrike	LC	S	
Bubulcus ibis	Cattle Egret	LC	S	
Phaps chalcoptera	Common Bronzewing	LC	S	
Psophodes olivaceus	Eastern Whipbird	LC	H	
Petrochelidon ariel	Fairy Martin	LC	S	
Cacomantis flabelliformis	Fan-Tailed Cuckoo	LC	S	
Pachycephala pectoralis youngi	Golden Whistler (South-Eastern Australia)	LC	S	
Cracticus torquatus	Grey Butcherbird	LC	S	
Rhipidura albiscapa	Grey Fantail	LC	S	
Sericornis magnirostra	Large-Billed Scrubwren	LC	S	
Dacelo novaeguineae	Laughing Kookaburra	LC	S	
Meliphaga lewinii	Lewin's Honeyeater	LC	S	
Philemon citreogularis	Little Friarbird	LC	S	
Parvipsitta pusilla	Little Lorikeet	LC	H	
Anseranas semipalmata	Magpie Goose	LC	S	O/S
Grallina cyanoleuca	Magpie-lark	LC	S	
Vanellus miles novaehollandiae	Masked Lapwing (Southern Subspecies)	LC	H	
Philemon corniculatus	Noisy Friarbird	LC	S	

Scientific Name	Common Name	Status*	Method**	Comment
Manorina melanocephala	Noisy Miner	LC	S	
Oriolus sagittatus	Olive-backed Oriole	LC	S	
Anas superciliosa	Pacific Black Duck	LC	S	
Platycercus adscitus palliceps	Pale-headed Rosella (Southern Form)	LC	S	
Geopelia striata	Peaceful Dove	LC	S	
Strepera graculina graculina	Pied Currawong (Eastern Australia)	LC	H	
Porphyrio melanotus	Purple Swamphen	LC	S	O/S
Merops ornatus	Rainbow Bee-eater	LC	H	
Trichoglossus haematodus moluccanus	Rainbow Lorikeet	LC	S	
Malurus melanocephalus	Red-backed Fairy-wren	LC	S	
Trichoglossus chlorolepidotus	Scaly-breasted Lorikeet	LC	S	
Myzomela sanguinolenta	Scarlet Honeyeater	LC	H	
Zosterops lateralis cornwalli	Silvereye (Eastern)	LC	H	
Dicrurus bracteatus bracteatus	Spangled Drongo (Eastern Australia)	LC	S	
Streptopelia chinensis	Spotted Dove	I	S	
Pardalotus punctatus	Spotted Pardalote	LC	H	
Pardalotus striatus	Striated Pardalote	LC	H	
Plectorhyncha lanceolata	Striped Honeyeater	LC	S	
Cacatua galerita	Sulphur-crested Cockatoo	LC	H	
Corvus orru	Torresian Crow	LC	S	
Malurus lamberti	Variegated Fairy-wren	LC	S	
Hirundo neoxena	Welcome Swallow	LC	S	
Rhipidura leucophrys leucophrys	Willie Wagtail (Southern)	LC	S	
Mammals				
Trichosurus vulpecula	Common Brushtail Possum	LC	S	
Macropus giganteus	Eastern Grey Kangaroo	LC	S	
Lepus europaeus	European Brown Hare	I	S	
Phascolarctos cinereus	Koala	V, V#	S	
Isoodon macrourus	Northern Brown Bandicoot	LC	S	
Wallabia bicolor	Swamp Wallaby	LC	V	

*Status:

As listed within the Queensland *Nature Conservation (Wildlife) Regulation 2006* (*Nature Conservation Act 1992*): E = Endangered, V = Vulnerable, RV = Regionally Vulnerable, NT = Near Threatened, SL = Special Least Concern, LC = Least Concern.

As listed within the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*: CE#= Critically Endangered, E#= Endangered, V#= Vulnerable, CD#= Conservation Dependent, I# = Introduced Species.

**Primary method of identification: C = hand caught, H = heard, V = visually observed, S = other signs of presence (e.g. scats, traces etc.).

Comment: F/O = Flying overhead; O/S = Off site

7.2.1 Amphibians

One species of amphibian was recorded during the field survey, the Eastern Sedgefrog (*Litoria fallax*). This species is the most commonly recorded frog in the greater Brisbane area and is frequently found in suburban gardens (Qld Museum, 1995). It is likely that the site is habitat to more disturbance tolerant amphibian species that can complete their breeding cycle in still water.

7.2.2 Birds

All 47 bird species identified during the field survey are tolerant of disturbed environments. Given the site's connectivity to a much larger remnant bushland unit to the south, it is possible that the subject site may provide occasional foraging opportunities for predatory nocturnal species with large home ranges.

Despite the presence of stands of She-oak on the site, there was no indication that these were used for foraging by Glossy Black-cockatoos.

7.2.3 Mammals

Scats and/or sign of six mammalian species were observed during the survey.

Indirect evidence of Koala presence was detected based on the results of targeted KSAT, in the form of faecal pellets and scratch marks on smooth-barked trees. Koala scats are distinctive in their shape and persist long after the Koala has departed (McAlpine *et al*., 2007; Woosnam *et al.*, 2012). The presence of the distinctive faecal pellets of Koalas, located around the base of trees, is routinely used as an indicator of use (Phillips and Callaghan, 2000). However, scat deposition under trees cannot reliably be interpreted as an indication of forage tree preference (cited in Woosnam-Merchez *et al.*, 2012), although it does provide an indication of which trees are being used on the subject site. Koalas demonstrate marked preferences for a relatively small number of the eucalypt species (McAlpine *et al.,* 2007).

The results of the KSAT are provided in Table 6.2. Activity level for each of the KSAT sites is expressed as a percentage of trees under which Koala faecal pellets were found.

Phillips and Callaghan (2011) defined activity levels for three general areas: east coast low, east coast medium-high and western slopes and plains. Koala densities in the east coast low areas were arbitrarily defined at ≤0.1 Koala/ha (Phillips and Callaghan, 2011).

Studies in the Coomera-Pimpama area have identified Koala density to be in the order of 0.23 – 0.37 Koala/ha (Biolink Ecological Consulting 2007; City of Gold Coast, 2014). Based on this density determination, Koala habitat use was compared to the east coast high area defined in Phillips and Callaghan (2011). Within the east coast high areas Phillips and Callaghan (2011) define Low Use is <22.52%, Med ≥22.52% but ≤32.84%, and High >32.84%. Results of the KSAT surveys indicated that the site has a low usage by Koala.

Table 7.2 KSAT Results

KSAT Location	Activity Level (%)	Use Classification
-27.871817, 153.275265	6.67	Low
-27.871524, 153.276303	3.33	Low
Average	**5**	**Low**

7.2.4 Significant Fauna Species

Evidence of one conservation significant species, Koala, was observed on the subject site. Assessment of likelihood of occurrence of those conservation significant species determined from the desktop assessment is presented in Table 4.4.

8 Ecological Functions

The ecological functions of the site were assessed during the field survey and are described in the sections below.

8.1 Core Habitat

For the purposes of this report, a core habitat area is defined as follows:

Areas that, due to features such as their size, composition, diversity etc., provide important habitat for the conservation of particular plant or animal species, or of a range of plant and animal species.

The Low Use activity levels recorded in the KSAT indicate that the vegetated area in the south-western corner of the site is currently being used by Koala, at least on a transient basis. It is considered that the site forms part of a larger home range for at least one Koala.

The site does not provide core habitat for any other flora and fauna species recorded during field surveys as most of these species are common and widespread.

8.2 Ecological Corridors

For the purposes of this report, an ecological corridor is defined as:

An area of land or water, including areas above and below ground, that is capable of providing fauna habitat in its own right, and/or has the potential to do so, while allowing fauna to move to and between other habitats.

The site is situated on the edge of an ecological corridor as it directly connects to large areas of existing bushland to the south. Under the *City Plan 2018*, much of this bushland is zoned for conservation.

The proposed development facilitates a 60 m wide linkage along Yaun Creek. The rehabilitation of Yaun Creek would provide a valuable movement corridor for fauna. The rehabilitation of a secondary waterway located in the south-east of the site will provide a major connection to the waterway within the residential community to the east, which is primarily used for storm water conveyance.

8.3 Waterways and Wetlands

There is limited native riparian vegetation along the site's waterways and this, together with livestock access, has resulted in stream bank erosion. Weed incursion in the riparian zone has further degraded the waterways.

Despite being mapped as a waterway under the *City Plan 2018*, they perhaps can better de described as drainage channels given they have short duration flows following rain and no native riparian vegetation. They have been substantially modified through the creation of dams and are degraded through weed incursion and unrestricted livestock access.

Recommendations for the rehabilitation of Yaun Creek and waterways proposed to be retained have been made and are presented in Section 11 of this report.

9 Ecologically Significant Areas

This section provides a review and analysis of the results presented in the previous sections in the context of Matters of Environmental Significance at the Local, State and National levels.

Under the *City Plan 2018*, matters of environmental significance include:

a) Matters of national environmental significance under the *Environmental Protection and Biodiversity Conservation Act 1999*, chapter 2, part 3, being:

- World heritage properties;
- National heritage places;
- Wetlands of international importance (listed under the Ramsar Convention);
- Listed threatened species and ecological communities;
- Migratory species protected under international agreements; and
- Commonwealth marine areas.

b) Matters of state environmental significance under the *State Planning Policy July 2017*, being:

- Protected areas (including all classes of protected area except coordinated conservation areas) under the *Nature Conservation Act 1992*;
- Marine parks and land within a 'marine national park', 'conservation park', 'scientific research', 'preservation' or 'buffer' zone under the *Marine Parks Act 2004*;
- Areas within declared fish habitat areas that are management A areas or management B areas under the *Fisheries Regulation 2008*;
- Threatened wildlife under the *Nature Conservation Act 1992* and Special Least Concern animal under the *Nature Conservation (Wildlife) Regulation 2006*.
- Regulated vegetation under the *Vegetation Management Act 1999* that is:
- Category B areas on the regulated vegetation management map, that are 'endangered' or 'of concern' regional ecosystems;
- Category C areas on the regulated vegetation management map that are 'endangered' or 'of concern' regional ecosystems;
- Category R areas on the regulated vegetation management map;
- Areas of essential habitat on the essential habitat map for wildlife prescribed as 'endangered wildlife' or 'vulnerable wildlife' under the *Nature Conservation Act 1992*;
- Regional ecosystems that intersect with watercourses identified on the vegetation management watercourse map;
- Regional ecosystems that intersect with wetlands identified on the vegetation management wetlands map;
- High preservation areas of wild river areas under the *Wild Rivers Act 2005*;
- Wetlands in a wetland protection area or wetlands of high ecological significance shown on the Map of Referable Wetlands under the *Environmental Protection Regulation 2008*;
- Wetlands and watercourses in high ecological value waters as defined in the *Environmental Protection (Water) Policy 2009*, schedule 2; and
- Legally secured offset areas.

c) Matters of local environmental significance, being:

- Biodiversity areas, including primary and secondary vegetation;
- Koala and their habitat;
- Natural watercourses and wetlands and associated buffers;
- Conservation estate, being areas owned or managed by the Council for nature conservation purposes (including Conservation Area, Environmental Reserve, Bushland Reserve and General Reserve) areas subject to a Voluntary Conservation Agreement with the Council or registered voluntary covenant (for ecological purposes);
- Areas subject to a Vegetation Protection Order;
- Environmental corridors required to link matters of environmental significance;
- Areas that contain environmental offsets provided in accordance with Queensland Government offset policies; and
- Areas that are subject to a statutory covenant (for ecological purposes).

Table 8.1 provides a summary of the identified ecological values in relation to the criteria that defines matter of environmental significances as listed above.

Table 9.1 Summary of Environmentally Significant Areas

Schedule of Environmentally Significant Areas	Present on Site
Matters of National Environmental Significance under the *Environmental Protection and Biodiversity Conservation Act 1999*, chapter 2, part 3	One MNES determined to occur on the site – Koala (listed as vulnerable under the EPBC Act)
Matters of State Environmental Significance under the *State Planning Policy July 2017*	MSES determined to occur on the site: • Koala (listed as vulnerable under the NCA); and • Regional ecosystems that intersect with watercourses.
Matters of Local Environmental Significance under the *City Plan 2018 (Version 5)*	The site is constrained by: • Medium priority vegetation; • Natural watercourses; and • Koala habitat.

An appraisal of the site and desktop analysis against the criteria for defining environmentally significant areas was conducted. It has been concluded that the environmentally significant values associated with the site are:

1. Habitat for nationally, state and locally significant wildlife (Koala); and
2. Waterways.

10 Impact Assessment

The potential impacts of the proposed development are discussed in the following sections.

10.1 Loss of Native Vegetation

The proposed development will necessitate the removal of some vegetation. Where it is not deemed safe for habitat trees to be retained in the development, their loss will be offset within open space areas.

Vegetation Community 2 is mapped as state regulated vegetation and is reflective of least concern regional ecosystem 12.11.5. This vegetation community and the surrounding *Acacia* low open forest (Vegetation Community 1), are of ecological significance given their use by a threatened fauna species (Koala).

These ecologically significant vegetation communities will be retained within the public open space network and managed for conservation. This will enable habitat of Koala to be preserved and connectivity with extensive bushland located to the south be maintained.

Section 11 contains recommendations to mitigate the impacts of vegetation clearing and ensure the retention of those areas of the site not directly cleared will retain their environmental values to the greatest possible extent.

10.2 Loss of Fauna Habitat

The fauna survey targeted threatened species to ensure that the potential impacts of the proposed development could be accurately identified and evaluated.

The protection of the site's existing patch of remnant vegetation in the south-western corner, will ensure the impacts to fauna habitat are limited.

It is however recognised that some isolated Koala habitat tree species are located within the proposed development footprint and it is likely that these trees will be removed as part of future building works. Non-juvenile Koala habitat trees should be cleared only where there is no reasonable alternative.

It is therefore possible that the removal of vegetation could potential impact fauna during construction works. Section 11 contains recommendations to mitigate the impacts of construction of fauna and fauna habitat during construction.

10.2.1 Habitat Fragmentation

Given the proposed development footprint is located within predominately cleared areas and vegetation within the mapped Koala habitat areas is to be retained, no habitat fragmentation is expected to occur.

10.3 Waterway Modification

The site's waterways are currently in relatively poor condition, given the lack of riparian vegetation, dominance of weed species, livestock access and bank erosion.

The waterway in Lots 191 and 192 consist of unvegetated depressions with poorly defined banks and have been modified to include dams for livestock watering.

As recommended in the Draft Concept Plan (GHD, 2017), Yaun Creek (Lot 188) and the waterway in the south-east corner of the site (Lot 191) will be rehabilitated. These waterways provide valuable fauna movement corridors and have connectivity to waterways external to the site. The development design facilitates a 60 m wide linkage along the length of Yaun Creek within the site. To ensure the rehabilitated waterways are managed appropriately into the future, these waterways will be incorporated into open space areas. An Open Space Management Plan will be prepared to guide the management of these areas.

The waterway on lot 192 (north of the dam) and the dam on lot 189 are intended to be filled to accommodate the proposed residential development. Their removal will not impact on any existing fauna movement corridors or valuable riparian vegetation communities. They currently provide limited habitat function given their level of degradation. The loss of these waterways is not considered ecologically significant given the opportunities for other connections to be enhanced in the local area. It is noted that the waterways to the east have been significantly modified and runoff from the subject site captured and piped through a residential development.

The dams associated with retained waterways will be modified to accommodate additional drainage features.

Section 11 discusses mitigation measures which are to be employed to improve the water quality and ecological function of the waterway within and external to the site.

10.4 Sedimentation and Erosion

Earthworks required to facilitate construction of any proposed buildings will heighten the risk of soil and sediment mobilisation occurring through erosion and surface runoff during storm events. Unless appropriately managed, this has the potential to impact on the water quality of downstream receiving environments, causing increases in turbidity and nutrient loads. Such impacts are may lead to decreased water quality in downstream aquatic ecosystems and result in adverse impacts on aquatic flora and fauna.

Section 11 contains recommendations to mitigate the impacts to the downstream environment.

11 Impact Mitigation Measures

Given the proposal has sited much of the development footprint within predominately cleared areas and committed to retaining areas of regulated vegetation on the site, environmental impacts area not expected to be significant.

It is acknowledged however that any land use that involves vegetation clearing and landform modification many impact flora and fauna. The following sections outline recommendations and management measures to minimise impacts and assist in mitigating these impacts.

11.1 Waterway Buffers

Restoration and rehabilitation of waterway buffers are to focus on existing linkages along the riparian corridor of Yaun Creek and the mapped waterway in the south-eastern corner of the site. These areas are to be incorporated into the open space network.

To reduce sedimentation and erosion and maintain the waterway function of Yaun Creek, buffers of at least 30 m from the waterway in the northern corner of the site are incorporated into the development layout. The buffers will allow for the retention of any existing native vegetation adjacent to the waterway and restoration of the riparian and wetland zones.

The waterway and associated dam in the south-east of the site will be incorporated into public open space and rehabilitated to the extent of the Q100 flood line. The buffer width ranges from approximately 10-40 m. This buffer will enhance connectivity with the flow path to the east of the site.

The proposed buffer widths are considered to be of sufficient width to mitigate impacts from the development to water quality (Castelle et al., 1994).

11.2 Rehabilitation

To mitigate some of the impacts to flora and fauna resulting from the proposed development, it is recommended that three areas of the site be rehabilitated to improve the existing environmental condition. These areas are to be retained in the public open space network and include:

- Vegetation Communities 1 and 2 in the south-west corner of the site;
- The waterway in the south-eastern corner of the site (Lot 191); and
- The Yaun Creek riparian corridor in the northern corner of the site (Lot 188).

Rehabilitation of Vegetation Communities 1 and 2 in the south-western corner of site will enhance established connections with existing bushland external to the site.

The waterway in the south-eastern corner of the site (Lot 191) has connectivity to a flow path to the east. Rehabilitating the waterway to the Q100 flood line will enhance the environmental condition of the channel and establish riparian linkages.

Restoration of the waterway through Lot 188 (Yaun Creek) will provide ecological linkages along the waterway and provide connectivity to retained riparian vegetation in the residential communities to the east of the site. It is recommended that the area comprising a 30 m buffer to the waterway be rehabilitated at a minimum.

A rehabilitation plan is to be prepared to guide the rehabilitation and restoration of the open space areas generally in accordance with the regeneration principles and procedures set out within the *South-East Queensland Ecological Restoration Framework*.

The aim of the plan will be to outline practical restoration techniques to improve the ecological values of the bushland area and to rehabilitate a waterway to convey flows through the site.

The document should also specify maintenance procedures required to ensure that the rehabilitated areas continue to function efficiently and effectively during the operational phase of the development based on regular maintenance to be undertaken future landowners.

11.3 Fauna Management

Vegetation clearing will have the potential to cause injury and/or death to fauna within the site at the time of clearing. At a minimum, an experienced Koala spotter-catcher should be present on-site during all clearing works. Any clearing should not commence until approval has been granted in writing from the spotter-catcher. This approval is valid only for the day it is given. Where more than one machine is used during clearing operations, it is recommended that there is a minimum of one spotter-catcher per machine.

Construction is to be carried out such that Koalas can safely move between any retained Koala habitat. Dispersing wildlife should be guided towards retained vegetation or patches of vegetation off-site through the installation of fauna fencing.

Should a Koala be observed on the site during vegetation clearing, all operations will temporarily cease within a range of 25 m from any tree occupied by a Koala. Construction can recommence after the Koala has moved from the tree of its own volition.

It is recommended that a Flora and Fauna Management Plan be developed to guide vegetation clearing and minimise impacts on retained vegetation and fauna.

11.4 Sediment and Erosion Control

To minimise erosion and sediment runoff from the site, it is essential that appropriate sediment and erosion control practices be adhered to during the construction phase of the development.

These practices should be guided by an approved Sediment and Erosion Control Plan, that has been prepared in accordance with Institute of Engineers Australia Erosion and Sediment Control Guidelines. At a minimum, the Sediment and Erosion Control Plan should include provisions for the following:

- Installation of sediment fences to intercept stormwater flows and collect suspended solid loads;
- Construction of diversion drains to direct stormwater away from disturbed areas; and
- Provision of sediment ponds for the retention of stormwater allowing for sedimentation.

12 Conclusions

This report has been prepared in accordance with the guidelines for preparing an ecological assessment provided in the planning scheme. The report includes the results of desk top assessments and a field survey.

Ecologically significant areas on the site were identified as:

1. An existing waterway; and
2. Habitat for one nationally, state and locally significant wildlife species - Koala.

All the waterways were degraded due to lack of riparian vegetation, dominance of weed species, livestock access, modification (for dams) and bank erosion.

The waterways on lot 192 north of the dam and the dam on lot 189 are intended to the filled to accommodate the proposed residential development. The filling of these waterbodies will not impact on any existing fauna movement corridors or valuable riparian vegetation communities. They currently provide limited habitat function given their level of degradation.

The remaining mapped waterway/drainage channels are proposed to be retained, buffered and be incorporated into the open space network. They will be subject to rehabilitation to improve their habitat function and ecological value. The development layout facilitates a 60 m wide linkage along Yaun Creek. This will establish a valuable fauna movement corridor and improve downstream water quality.

Habitat for Koalas was identified within two of the vegetation communities present on the subject site Vegetation Community 1 – low *Acacia* forest and Vegetation Community 2 - Spotted Gum/Grey Ironbark open forest. Vegetation Community 2 is mapped as state regulated vegetation and is reflective of Least Concern Regional Ecosystem 12.11.5. These communities have been retained as Environmental Reserve public open space within the proposed development. This will ensure vegetation is protected and habitat connectivity to adjacent bushland is maintained. It will be rehabilitated to improve its existing ecological condition.

Direct impacts to Koalas as a result of the proposed development are expected to be minimal. However, indirect impacts to Koala due to disturbance from human activities, such as vehicle traffic, increased noise and increased risk of injuries from domestic animals may occur.

Clearing of isolated Koala food tree species will be necessary to facilitate the construction of new dwellings. The clearing of these trees and any habitat trees that cannot be retained, will be offset in the areas of the site to be rehabilitated.

Vegetation clearing should be guided by a Flora and Fauna Management Plan.

It is recommended that a Rehabilitation Management Plan be prepared to improve the existing ecological condition of the vegetation included within the proposed conservation reserve and to guide the restoration and rehabilitation of waterways. To this end, a Statement of Rehabilitation Intent has been prepared by Biome to accompany the development application.

Areas of the development that are designated public open space will need to be managed in accordance with an Open Space Management Plan. Consequently, an Open Space Management Statement has been prepared to guide the design, management, construction and operational principles of the open space.

A Stormwater Management Plan and Sediment and Erosion Control Plan should also be prepared for the site to minimise impacts to downstream environments.

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Appendix A

Protected Matters Search Results

Australian Government
Department of the Environment and Energy

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

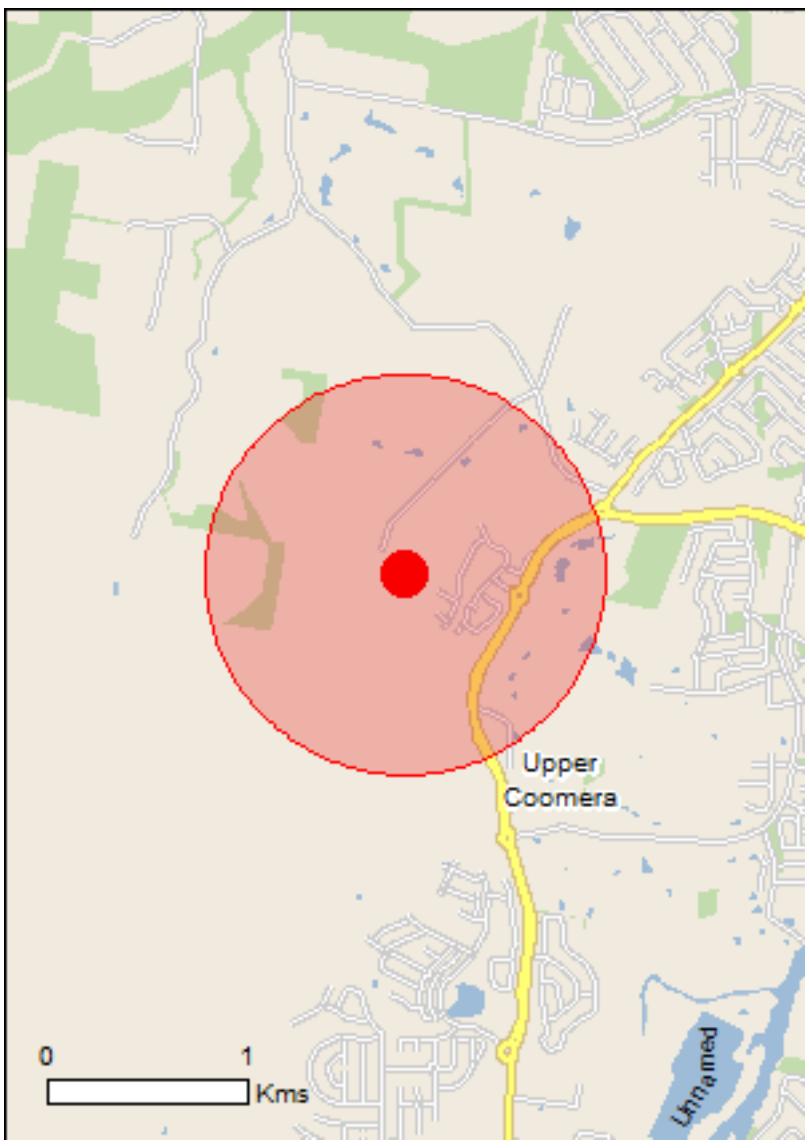
Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 02/06/17 13:29:06

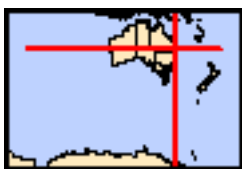
Summary
Details
- Matters of NES
- Other Matters Protected by the EPBC Act
- Extra Information

Caveat
Acknowledgements



This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2010

Coordinates
Buffer: 1.0Km



Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	1
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	1
Listed Threatened Species:	36
Listed Migratory Species:	16

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	23
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Commonwealth Reserves Marine:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	38
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar) [Resource Information]

Name	Proximity
Moreton bay	Within 10km of Ramsar

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Name	Status	Type of Presence
Lowland Rainforest of Subtropical Australia	Critically Endangered	Community may occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Foraging, feeding or related behaviour likely to occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Dasyornis brachypterus Eastern Bristlebird [533]	Endangered	Species or species habitat may occur within area
Erythrotriorchis radiatus Red Goshawk [942]	Vulnerable	Species or species habitat likely to occur within area
Geophaps scripta scripta Squatter Pigeon (southern) [64440]	Vulnerable	Species or species habitat may occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat may occur within area
Limosa lapponica baueri Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat likely to occur within area
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Bar-tailed Godwit (menzbieri) [86432]	Critically Endangered	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area

Name	Status	Type of Presence
Poephila cincta cincta		
Southern Black-throated Finch [64447]	Endangered	Species or species habitat may occur within area
Rostratula australis		
Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
Turnix melanogaster		
Black-breasted Button-quail [923]	Vulnerable	Species or species habitat likely to occur within area
Mammals		
Chalinolobus dwyeri		
Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat likely to occur within area
Dasyurus maculatus maculatus (SE mainland population)		
Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat likely to occur within area
Petauroides volans		
Greater Glider [254]	Vulnerable	Species or species habitat likely to occur within area
Petrogale penicillata		
Brush-tailed Rock-wallaby [225]	Vulnerable	Species or species habitat may occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)		
Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat known to occur within area
Potorous tridactylus tridactylus		
Long-nosed Potoroo (SE mainland) [66645]	Vulnerable	Species or species habitat likely to occur within area
Pseudomys novaehollandiae		
New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat likely to occur within area
Pteropus poliocephalus		
Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Plants		
Arthraxon hispidus		
Hairy-joint Grass [9338]	Vulnerable	Species or species habitat may occur within area
Baloghia marmorata		
Marbled Balogia, Jointed Baloghia [8463]	Vulnerable	Species or species habitat likely to occur within area
Bosistoa transversa		
Three-leaved Bosistoa, Yellow Satinheart [16091]	Vulnerable	Species or species habitat likely to occur within area
Corchorus cunninghamii		
Native Jute [14659]	Endangered	Species or species habitat likely to occur within area
Cryptocarya foetida		
Stinking Cryptocarya, Stinking Laurel [11976]	Vulnerable	Species or species habitat may occur within area
Endiandra floydii		
Floyd's Walnut [52955]	Endangered	Species or species habitat likely to occur within area
Lepidium peregrinum		
Wandering Pepper-cress [14035]	Endangered	Species or species habitat may occur within

Name	Status	Type of Presence
		area
Macadamia integrifolia Macadamia Nut, Queensland Nut Tree, Smooth-shelled Macadamia, Bush Nut, Nut Oak [7326]	Vulnerable	Species or species habitat likely to occur within area
Macadamia tetraphylla Rough-shelled Bush Nut, Macadamia Nut, Rough-shelled Macadamia, Rough-leaved Queensland Nut [6581]	Vulnerable	Species or species habitat may occur within area
Phaius australis Lesser Swamp-orchid [5872]	Endangered	Species or species habitat may occur within area
Samadera bidwillii Quassia [29708]	Vulnerable	Species or species habitat likely to occur within area
Sophora fraseri [8836]	Vulnerable	Species or species habitat may occur within area
Thesium australe Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat likely to occur within area
Reptiles		
Delma torquata Adorned Delma, Collared Delma [1656]	Vulnerable	Species or species habitat may occur within area
Saiphos reticulatus Three-toed Snake-tooth Skink [88328]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Cuculus optatus Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat known to occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat likely to occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat likely to occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat likely to occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within

Name	Threatened	Type of Presence
		area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat likely to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat may occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Anseranas semipalmata Magpie Goose [978]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat likely to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area

Name	Threatened	Type of Presence
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Cuculus saturatus Oriental Cuckoo, Himalayan Cuckoo [710]		Species or species habitat known to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat likely to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat may occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat likely to occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat likely to occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat may occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat likely to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat may occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

Extra Information

Invasive Species [Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Lonchura punctulata Nutmeg Mannikin [399]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Frogs		
Rhinella marina Cane Toad [83218]		Species or species habitat likely to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus norvegicus Brown Rat, Norway Rat [83]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Alternanthera philoxeroides Alligator Weed [11620]		Species or species habitat likely to occur within area
Anredera cordifolia Madeira Vine, Jalap, Lamb's-tail, Mignonette Vine, Anredera, Gulf Madeiravine, Heartleaf Madeiravine, Potato Vine [2643]		Species or species habitat likely to occur within area
Asparagus plumosus Climbing Asparagus-fern [48993]		Species or species habitat likely to occur within area
Cabomba caroliniana Cabomba, Fanwort, Carolina Watershield, Fish Grass, Washington Grass, Watershield, Carolina Fanwort, Common Cabomba [5171]		Species or species habitat likely to occur within area
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species habitat may occur within area
Chrysanthemoides monilifera subsp. rotundata Bitou Bush [16332]		Species or species habitat likely to occur within area
Cryptostegia grandiflora Rubber Vine, Rubbervine, India Rubber Vine, India Rubbervine, Palay Rubbervine, Purple Allamanda [18913]		Species or species habitat likely to occur within area
Genista monspessulana Montpellier Broom, Cape Broom, Canary Broom, Common Broom, French Broom, Soft Broom [20126]		Species or species habitat likely to occur within area
Hymenachne amplexicaulis Hymenachne, Olive Hymenachne, Water Stargrass, West Indian Grass, West Indian Marsh Grass [31754]		Species or species habitat likely to occur within area
Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		Species or species habitat likely to occur within area
Opuntia spp. Prickly Pears [82753]		Species or species habitat likely to occur within area
Parthenium hysterophorus Parthenium Weed, Bitter Weed, Carrot Grass, False Ragweed [19566]		Species or species habitat likely to occur

Name	Status	Type of Presence
		within area
Protasparagus plumosus Climbing Asparagus-fern, Ferny Asparagus [11747]		Species or species habitat likely to occur within area
Sagittaria platyphylla Delta Arrowhead, Arrowhead, Slender Arrowhead [68483]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Salvinia molesta Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur within area
Senecio madagascariensis Fireweed, Madagascar Ragwort, Madagascar Groundsel [2624]		Species or species habitat likely to occur within area
Reptiles		
Hemidactylus frenatus Asian House Gecko [1708]		Species or species habitat likely to occur within area

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-27.86969 153.27863

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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Appendix B

Wildlife Online Database Search Results

Queensland Government

Wildlife Online Extract

Search Criteria: Species List for a Specified Point
Species: All
Type: All
Status: All
Records: All
Date: All
Latitude: -27.8697
Longitude: 153.2786
Distance: 2
Email: Nadya.Lees01@gmail.com
Date submitted: Friday 02 Jun 2017 10:43:34
Date extracted: Friday 02 Jun 2017 10:50:03

The number of records retrieved = 140

Disclaimer

As the DSITIA is still in a process of collating and vetting data, it is possible the information given is not complete. The information provided should only be used for the project for which it was requested and it should be appropriately acknowledged as being derived from Wildlife Online when it is used.

The State of Queensland does not invite reliance upon, nor accept responsibility for this information. Persons should satisfy themselves through independent means as to the accuracy and completeness of this information.

No statements, representations or warranties are made about the accuracy or completeness of this information. The State of Queensland disclaims all responsibility for this information and all liability (including without limitation, liability in negligence) for all expenses, losses, damages and costs you may incur as a result of the information being inaccurate or incomplete in any way for any reason.

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	amphibians	Bufonidae	*Rhinella marina*	cane toad	Y			1
animals	amphibians	Hylidae	*Litoria fallax*	eastern sedgefrog		C		1
animals	amphibians	Hylidae	*Litoria latopalmata*	broad palmed rocketfrog		C		1
animals	amphibians	Myobatrachidae	*Pseudophryne raveni*	copper backed broodfrog		C		1
animals	birds	Acanthizidae	*Acanthiza pusilla*	brown thornbill		C		2
animals	birds	Acanthizidae	*Gerygone olivacea*	white-throated gerygone		C		2
animals	birds	Acanthizidae	*Sericornis frontalis*	white-browed scrubwren		C		1
animals	birds	Accipitridae	*Aquila audax*	wedge-tailed eagle		C		1
animals	birds	Accipitridae	*Haliastur sphenurus*	whistling kite		C		1
animals	birds	Anatidae	*Anas superciliosa*	Pacific black duck		C		3
animals	birds	Anatidae	*Chenonetta jubata*	Australian wood duck		C		3
animals	birds	Anatidae	*Dendrocygna eytoni*	plumed whistling-duck		C		1
animals	birds	Ardeidae	*Bubulcus ibis*	cattle egret		C		3
animals	birds	Ardeidae	*Butorides striata*	striated heron		C		1
animals	birds	Ardeidae	*Egretta novaehollandiae*	white-faced heron		C		2
animals	birds	Artamidae	*Cracticus torquatus*	grey butcherbird		C		3
animals	birds	Artamidae	*Cracticus nigrogularis*	pied butcherbird		C		4
animals	birds	Artamidae	*Cracticus tibicen*	Australian magpie		C		4
animals	birds	Artamidae	*Strepera graculina*	pied currawong		C		1
animals	birds	Cacatuidae	*Cacatua galerita*	sulphur-crested cockatoo		C		1
animals	birds	Cacatuidae	*Calyptorhynchus lathami lathami*	glossy black-cockatoo (eastern)		V		2
animals	birds	Campephagidae	*Coracina novaehollandiae*	black-faced cuckoo-shrike		C		3
animals	birds	Campephagidae	*Coracina papuensis*	white-bellied cuckoo-shrike		C		1
animals	birds	Campephagidae	*Coracina tenuirostris*	cicadabird		C		1
animals	birds	Charadriidae	*Charadrius ruficapillus*	red-capped plover		C		1
animals	birds	Charadriidae	*Vanellus miles novaehollandiae*	masked lapwing (southern subspecies)		C		1
animals	birds	Cisticolidae	*Cisticola exilis*	golden-headed cisticola		C		1
animals	birds	Climacteridae	*Cormobates leucophaea metastasis*	white-throated treecreeper (southern)		C		3
animals	birds	Columbidae	*Geopelia humeralis*	bar-shouldered dove		C		1
animals	birds	Columbidae	*Ocyphaps lophotes*	crested pigeon		C		4
animals	birds	Columbidae	*Geopelia striata*	peaceful dove		C		3
animals	birds	Columbidae	*Streptopelia chinensis*	spotted dove	Y			1
animals	birds	Corvidae	*Corvus orru*	Torresian crow		C		2
animals	birds	Cuculidae	*Cacomantis flabelliformis*	fan-tailed cuckoo		C		1
animals	birds	Estrildidae	*Neochmia temporalis*	red-browed finch		C		1
animals	birds	Estrildidae	*Lonchura castaneothorax*	chestnut-breasted mannikin		C		1
animals	birds	Falconidae	*Falco cenchroides*	nankeen kestrel		C		1
animals	birds	Halcyonidae	*Dacelo novaeguineae*	laughing kookaburra		C		5
animals	birds	Halcyonidae	*Todiramphus sanctus*	sacred kingfisher		C		1
animals	birds	Halcyonidae	*Todiramphus macleayii*	forest kingfisher		C		1
animals	birds	Hirundinidae	*Petrochelidon ariel*	fairy martin		C		2
animals	birds	Hirundinidae	*Hirundo neoxena*	welcome swallow		C		3
animals	birds	Hirundinidae	*Petrochelidon nigricans*	tree martin		C		1
animals	birds	Jacanidae	*Irediparra gallinacea*	comb-crested jacana		C		1
animals	birds	Laridae	*Chroicocephalus novaehollandiae*	silver gull		C		1
animals	birds	Laridae	*Hydroprogne caspia*	Caspian tern		SL		1

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	birds	Maluridae	*Malurus melanocephalus*	red-backed fairy-wren		C		2
animals	birds	Maluridae	*Malurus lamberti*	variegated fairy-wren		C		2
animals	birds	Maluridae	*Malurus cyaneus*	superb fairy-wren		C		1
animals	birds	Meliphagidae	*Plectorhyncha lanceolata*	striped honeyeater		C		2
animals	birds	Meliphagidae	*Acanthorhynchus tenuirostris*	eastern spinebill		C		3
animals	birds	Meliphagidae	*Meliphaga lewinii*	Lewin's honeyeater		C		4
animals	birds	Meliphagidae	*Caligavis chrysops*	yellow-faced honeyeater		C		5
animals	birds	Meliphagidae	*Lichmera indistincta*	brown honeyeater		C		5
animals	birds	Meliphagidae	*Melithreptus lunatus*	white-naped honeyeater		C		1
animals	birds	Meliphagidae	*Philemon corniculatus*	noisy friarbird		C		2
animals	birds	Meliphagidae	*Manorina melanocephala*	noisy miner		C		3
animals	birds	Meliphagidae	*Myzomela sanguinolenta*	scarlet honeyeater		C		2
animals	birds	Meliphagidae	*Anthochaera chrysoptera*	little wattlebird		C		1
animals	birds	Meliphagidae	*Gavicalis fasciogularis*	mangrove honeyeater		C		1
animals	birds	Meliphagidae	*Melithreptus albogularis*	white-throated honeyeater		C		4
animals	birds	Meropidae	*Merops ornatus*	rainbow bee-eater		C		3
animals	birds	Monarchidae	*Grallina cyanoleuca*	magpie-lark		C		4
animals	birds	Monarchidae	*Symposiachrus trivirgatus*	spectacled monarch		SL		1
animals	birds	Nectariniidae	*Dicaeum hirundinaceum*	mistletoebird		C		1
animals	birds	Neosittidae	*Daphoenositta chrysoptera*	varied sittella		C		4
animals	birds	Oriolidae	*Sphecotheres vieilloti*	Australasian figbird		C		2
animals	birds	Oriolidae	*Oriolus sagittatus*	olive-backed oriole		C		2
animals	birds	Pachycephalidae	*Colluricincla megarhyncha*	little shrike-thrush		C		1
animals	birds	Pachycephalidae	*Pachycephala rufiventris*	rufous whistler		C		5
animals	birds	Pachycephalidae	*Colluricincla harmonica*	grey shrike-thrush		C		3
animals	birds	Pachycephalidae	*Pachycephala pectoralis*	golden whistler		C		5
animals	birds	Pardalotidae	*Pardalotus striatus*	striated pardalote		C		5
animals	birds	Pardalotidae	*Pardalotus punctatus*	spotted pardalote		C		4
animals	birds	Passeridae	*Passer domesticus*	house sparrow	Y			1
animals	birds	Pelecanidae	*Pelecanus conspicillatus*	Australian pelican		C		1
animals	birds	Petroicidae	*Petroica rosea*	rose robin		C		5
animals	birds	Petroicidae	*Microeca fascinans*	jacky winter		C		1
animals	birds	Petroicidae	*Eopsaltria australis*	eastern yellow robin		C		4
animals	birds	Phalacrocoracidae	*Microcarbo melanoleucos*	little pied cormorant		C		1
animals	birds	Phasianidae	*Coturnix ypsilophora*	brown quail		C		1
animals	birds	Podargidae	*Podargus strigoides*	tawny frogmouth		C		1
animals	birds	Podicipedidae	*Tachybaptus novaehollandiae*	Australasian grebe		C		1
animals	birds	Psittacidae	*Platycercus eximius*	eastern rosella		C		2
animals	birds	Psittacidae	*Alisterus scapularis*	Australian king-parrot		C		1
animals	birds	Psittacidae	*Platycercus adscitus*	pale-headed rosella		C		2
animals	birds	Psittacidae	*Trichoglossus haematodus moluccanus*	rainbow lorikeet		C		3
animals	birds	Psophodidae	*Psophodes olivaceus*	eastern whipbird		C		2
animals	birds	Rallidae	*Gallirallus philippensis*	buff-banded rail		C		1
animals	birds	Rallidae	*Porphyrio melanotus*	purple swamphen		C		3
animals	birds	Rhipiduridae	*Rhipidura albiscapa*	grey fantail		C		7
animals	birds	Rhipiduridae	*Rhipidura leucophrys*	willie wagtail		C		5

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	birds	Scolopacidae	*Xenus cinereus*	terek sandpiper		SL		1
animals	birds	Scolopacidae	*Numenius minutus*	little curlew		SL		1
animals	birds	Scolopacidae	*Actitis hypoleucos*	common sandpiper		SL		1
animals	birds	Scolopacidae	*Calidris ruficollis*	red-necked stint		SL		1
animals	birds	Scolopacidae	*Limosa lapponica baueri*	Western Alaskan bar-tailed godwit		V	V	1
animals	birds	Scolopacidae	*Numenius madagascariensis*	eastern curlew		E	CE	1
animals	birds	Sturnidae	*Sturnus vulgaris*	common starling	Y			1
animals	birds	Threskiornithidae	*Threskiornis spinicollis*	straw-necked ibis		C		2
animals	birds	Threskiornithidae	*Threskiornis molucca*	Australian white ibis		C		2
animals	birds	Timaliidae	*Zosterops lateralis*	silvereye		C		2
animals	mammals	Dasyuridae	*Antechinus flavipes flavipes*	yellow-footed antechinus (south-east Queensland)		C		1
animals	mammals	Macropodidae	*Macropus rufogriseus*	red-necked wallaby		C		1
animals	mammals	Miniopteridae	*Miniopterus australis*	little bent-wing bat		C		1
animals	mammals	Muridae	*Melomys cervinipes*	fawn-footed melomys		C		1
animals	mammals	Muridae	*Rattus lutreolus*	swamp rat		C		1
animals	mammals	Peramelidae	*Isoodon macrourus*	northern brown bandicoot		C		1
animals	mammals	Phalangeridae	*Trichosurus vulpecula*	common brushtail possum		C		1
animals	mammals	Phascolarctidae	*Phascolarctos cinereus*	koala		V	V	3
animals	mammals	Vespertilionidae	*Scotorepens orion*	south-eastern broad-nosed bat		C		1
animals	reptiles	Boidae	*Morelia spilota*	carpet python		C		1
animals	reptiles	Diplodactylidae	*Nebulifera robusta*	robust velvet gecko		C		1
animals	reptiles	Elapidae	*Cryptophis nigrescens*	eastern small-eyed snake		C		1
animals	reptiles	Elapidae	*Pseudechis porphyriacus*	red-bellied black snake		C		1
animals	reptiles	Scincidae	*Cryptoblepharus pulcher pulcher*	elegant snake-eyed skink		C		1
animals	reptiles	Scincidae	*Lampropholis delicata*	dark-flecked garden sunskink		C		1
animals	reptiles	Scincidae	*Concinnia tenuis*	bar-sided skink		C		1
fungi	club fungi	Basidiomycota	*Leucoagaricus fimetarius*			C		1/1
fungi	club fungi	Basidiomycota	*Stropharia*			C		1/1
plants	higher dicots	Apocynaceae	*Parsonsia straminea*	monkey rope		C		1/1
plants	higher dicots	Fabaceae	*Tephrosia brachyodon var. longipes*			C		1/1
plants	higher dicots	Malvaceae	*Modiola caroliniana*	red-flowered mallow	Y			1/1
plants	higher dicots	Mimosaceae	*Mimosa pudica var. hispida*		Y			1/1
plants	higher dicots	Myrsinaceae	*Ardisia crenata*		Y			1/1
plants	higher dicots	Myrtaceae	*Eugenia uniflora*	Brazilian cherry tree	Y			1/1
plants	higher dicots	Myrtaceae	*Sannantha similis*			C		1/1
plants	higher dicots	Myrtaceae	*Eucalyptus curtisii*	Plunkett mallee		NT		1/1
plants	higher dicots	Myrtaceae	*Backhousia leptopetala*			C		1/1
plants	higher dicots	Passifloraceae	*Passiflora suberosa subsp. litoralis*		Y			1/1
plants	higher dicots	Passifloraceae	*Passiflora edulis*		Y			1/1
plants	higher dicots	Phyllanthaceae	*Glochidion sumatranum*	umbrella cheese tree		C		1/1
plants	higher dicots	Rosaceae	*Rubus ellipticus*	yellow raspberry	Y			1/1
plants	higher dicots	Rubiaceae	*Opercularia diphylla*			C		1/1
plants	higher dicots	Rutaceae	*Murraya paniculata cv. Exotica*		Y			1/1
plants	higher dicots	Sapindaceae	*Cupaniopsis newmanii*	long-leaved tuckeroo		NT		1/1
plants	lower dicots	Lauraceae	*Endiandra floydii*			E	E	1/1

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
plants	lower dicots	Lauraceae	*Endiandra muelleri subsp. bracteata*			C		2/2
plants	lower dicots	Lauraceae	*Endiandra pubens*	hairy walnut		C		1/1
plants	monocots	Asparagaceae	*Asparagus falcatus*		Y			1/1

CODES

I - Y indicates that the taxon is introduced to Queensland and has naturalised.

Q - Indicates the Queensland conservation status of each taxon under the *Nature Conservation Act 1992.* The codes are Extinct in the Wild (PE), Endangered (E), Vulnerable (V), Near Threatened (NT), Least Concern (C) or Not Protected ( ).

A - Indicates the Australian conservation status of each taxon under the *Environment Protection and Biodiversity Conservation Act 1999.* The values of EPBC are Conservation Dependent (CD), Critically Endangered (CE), Endangered (E), Extinct (EX), Extinct in the Wild (XW) and Vulnerable (V).

Records – The first number indicates the total number of records of the taxon for the record option selected (i.e. All, Confirmed or Specimens).
This number is output as 99999 if it equals or exceeds this value. The second number located after the / indicates the number of specimen records for the taxon.
This number is output as 999 if it equals or exceeds this value.

Appendix C

Flora Recorded

Flora Recorded Onsite

Scientific Name	Common Name	Status
Acacia disparrima	Hickory Wattle	
**Ageratum houstonianum*	Blue Billygoat Weed	
Allocasuarina littoralis	Black She-oak	
Alphitonia excelsa	Red Ash	
**Amaranthus spinosus*	Red Amaranth	
**Ambrosia artemisiifolia*	Ragweed	RIP
**Anagallis arvensis*	Scarlet Pimpernel	
Aristida calycina	Dark Wire Grass	
**Asclepias curassavica*	Tropical Milkweed	
**Asparagus aethiopicus cv. Sprengeri*	Ground Asparagus	RIP
**Bidens pilosa*	Cobbler's Pegs	
Bothriochloa decipiens	Red Grass	
Breynia oblongifolia	Breynia	
Capillipedium spicigerum	Scented-top Grass	
Centella asiatica	Pennywort	
Chrysocephalum apiculatum	Yellow Buttons	
**Cinnamomum camphora*	Camphor Laurel	RIP
**Cirsium vulgare*	Scotch Thistle	
Clematicissus opaca	Small-leaved Water Vine	
**Conyza canadensis*	Canadian Fleabane	
**Conyza sumatrensis*	Tall Fleabane	
Corymbia citriodora	Spotted Gum	
Corymbia intermedia	Pink Bloodwood	
**Corymbia torelliana*	Cadaghi	
**Crassocephalum crepidioides*	Thickhead	
**Crotalaria incana*	Woolly Rattlepod	
**Crotalaria lanceolata*	Lance-leaved Rattlepod	
**Cupressus sempervirens*	Pencil Pine	
Cyanthillium cinereum	Cyanthillium	
Cymbopogon refractus	Barbed-wire Grass	
Cynodon dactylon var. dactylon	Common Couch	
Cyperus gracilis	Slender Flat Sedge	
**Cyperus papyrus*	Papyrus	
Digitaria divaricatissima	Umbrella Grass	

Scientific Name	Common Name	Status
Eleocharis dulcis	Water Chestnut	
**Emelia sonchifolia*	Emelia	
Entolasia stricta	Wiry Panic	
Eragrostis brownii	Brown's Lovegrass	
Eucalyptus carnea	Large-leaved White Mahogany	
Eucalyptus propinqua	Small-fruited Grey Gum	
Eucalyptus siderophloia	Grey Ironbark	
Eucalyptus tereticornis	Forest Red Gum	
Eustrephus latifolius	Wombat Berry	
Glycine clandestina	Twining Glycine	
Glochidion ferdinandi	Cheese Tree	
Glochidion sumatranum	Umbrella Cheese Tree	
**Gomphocarpus sp.*	Cotton Bush	
Goodenia rotundifolia	Goodenia	
Hovea acutifolia	Purple Pea Bush	
Hypericum gramineum	St. John's Wort	
**Hypochaeris radicata*	Flatweed	
Imperata cylindrica	Blady Grass	
**Jacaranda mimosifolia*	Jacaranda	
Jagera pseudorhus	Foambark Tree	
**Lantana camara*	Lantana	RIP
Lobelia purpurascens	White Root	
Lomandra confertifolia	A Mat Rush	
Lomandra longifolia	Spiny-headed Mat Rush	
Lomandra multiflora	Many-flowered Mat Rush	
Lophostemon confertus	Brush Box	
Lophostemon suaveolens	Swamp Box	
**Macrotyloma axillare*	Horse Gram	
Mallotus philippensis	Red Kamala	
**Megathyrsus maximus*	Guinea Grass	
Melaleuca quinquenervia	Broad-leaved Paperbark	
**Melinis minutiflora*	Molasses Grass	OIP
**Murraya paniculata*	Mock Orange	OIP
**Neonotonia wightii*	White Glycine	
**Nymphaea capensis*	Cape Waterlily	
**Oxalis corniculata*	Yellow Wood Sorrel	

Scientific Name	Common Name	Status
**Oxalis debilis var. corymbosa*	Soursob	
Panicum effusum	Hairy Panic	
Panicum pygmaeum	Pygmy Panic Grass	
Panicum simile	Two-coloured Panic	
Parsonsia straminea	Monkey Rope Vine	
**Paspalum dilatatum*	Paspalum	
Paspalum orbiculare	Ditch Millet	
**Passiflora edulis*	Passionfruit	
**Passiflora foetida*	Stinking Passion Flower	OIP
**Passiflora suberosa*	Corky Passionfruit	OIP
**Passiflora subpeltata*	White Passionflower	OIP
**Polygala paniculata*	Polygala	
**Phytolacca octandra*	Inkweed	
**Psidium guajava*	Yellow Guava	
Pteridium esculentum	Bracken Fern	
**Ravenala madagascariensis*	Traveller's Palm	
**Richardia brasiliensis*	White Eye	
Rubus moluccanus	Molucca Bramble	
Rumex brownii	Swamp Dock	
**Schefflera actinophylla*	Umbrella Tree	OIP
**Senecio madagascariensis*	Fireweed	RIP
**Senna pendula var. glabrata*	Easter Senna	OIP
**Setaria sphacelata*	Setaria	
**Sida cordifolia*	Flannel Weed	
**Sida rhombifolia*	Paddy Lucerne	
**Solanum chrysotrichum*	Giant Devil's Fig	
**Solanum mauritianum*	Wild Tobacco	OIP
**Solanum capsicoides*	Devil's Apple	
**Sphagneticola trilobata*	Singapore Daisy	RIP
**Sporobolus africanus*	Paramatta Grass	
Stephania japonica	Snake Vine	
**Syagrus romanzoffiana*	Cocos Palm	OIP
**Tagetes minuta*	Stinking Roger	
Typha orientalis	Bull Rush	
**Urena lobata*	Urena Burr	
**Verbena bonariensis*	Purple Top	

Scientific Name	Common Name	Status
Wikstroemia indica	Bootlace Shrub	

Key (as per Qld *Biosecurity Act 2014*): **PIP**=Prohibited Invasive Plant; **RIP**=Restricted Invasive Plant; **OIP**=Other Invasive Plant

*=Non-endemic

Appendix D

Code Responses

City Plan code template

This code template supports the preparation of a development application against either the acceptable outcome(s) or performance outcome(s) contained in the code. Development assessment rules are outlined in **Section 5.3.3** of the City Plan.

Please note:

For assessment against the overall outcomes, refer to the appropriate code.

Impact assessable development requires assessment against the strategic framework prior to using this template.

8.2.6 Environmental significance overlay code

8.2.6.1 Application

This code applies to assessing all material change of use, reconfiguration of a lot and operational works (vegetation clearing, changes to ground level, infrastructure) for development on land identified in **Part 5.10 Levels of assessment** and containing the following mapped areas**:**

Overlay map	Mapped area
Environmental significance – Biodiversity areas	**Matters of State Environmental Significance** • Protected Areas **Matters of Local Environmental Significance** • Hinterland core habitat system; • Coastal wetlands and islands core habitat system; • Substantial remnants; • Hinterland to coast critical corridors.
Environmental significance – Priority species	**Matters of State Environmental Significance** • Koala habitat areas; and • State significant species. **Matters of Local Environmental Significance** • Local significant species.
Environmental significance – Vegetation management	**Matters of State Environmental Significance** • Regulated Vegetation. **Matters of Local Environmental Significance**

Overlay map	Mapped area
	• High priority vegetation; • Medium priority vegetation; and • General priority vegetation.

And for all land containing, sharing a property boundary with or within a defined buffer distance of, the following mapped areas:

Overlay map	Mapped area
Environmental significance – Wetlands and watercourses	**Matters of State Environmental Significance** • State significant aquatic systems • State significant wetlands **Matters of Local Environmental Significance** • Major watercourse; • Watercourse; • Local significant wetlands.

When using this code, reference should be made to **Section 5.3.2** and, where applicable, **Section 5.3.3,** in **Part 5**.

Note: Buffers are taken as the maximum distance applicable for the site and are not cumulative.

8.2.6.2 Purpose

(1) The purpose of the Environmental significance overlay code is to identify and protect matters of environmental significance and ensure that development is consistent with, and contributes to, the achievement of the objectives of the Nature Conservation Strategy.

(2) The purpose of the code will be achieved through the following overall outcomes:

(a) Matters of environmental significance are identified, protected in situ and enhanced to maintain flora and fauna diversity within:

(i) Hinterland core habitat systems;

(ii) Coastal wetlands and islands core habitat systems;

(iii) Substantial remnants; and

(iv) Hinterland to coast critical corridors.

(b) Degraded matters of environmental significance are protected and rehabilitated.

(c) High priority vegetation is protected in situ.

(d) Outside of Biodiversity Areas:

(i) Regulated, medium and general priority vegetation is maintained and disturbance is minimised.

(ii) Significant species and their habitat are identified, protected, enhanced and maintained.

(e) Wetlands, watercourses and their associated buffers (as prescribed in SO2) are protected and enhanced.

(f) Buffers are provided between matters of environmental significance and any proposed impacts.

(g) Appropriate tenure and management arrangements are provided for matters of environmental significance and their associated buffers.

(h) Where offsets are required, these are consistent with the *Environmental Offsets Act 2014*.

Editor's Note – in addition to the requirements of this planning scheme, obligations for the protection of matters of environmental significance are established by the Commonwealth and Queensland Government. Additional approvals or referrals may be required.

8.2.6.3 Criteria for assessment

Table 8.2.6-2: Environmental significance overlay code – for assessable development

Performance outcomes	Acceptable outcomes	Does the proposal meet the acceptable outcome? If not, justify how the proposal meets either the performance outcome or overall outcome	Internal use
Ecological site assessment			
PO1 All matters of environmental significance on and adjacent to the development site are identified and protected. **Note - An Ecological Site Assessment prepared in accordance with SC6.7 City Plan policy – Ecological site assessments, is Council's preferred method for addressing this performance outcome**.	**AO1** Proposed works do not impact on: (a) areas identified on **Environmental significance – vegetation management overlay map**; (b) buffers to wetlands and watercourses being: (i) 100m from the mapped boundary of a State significant aquatic area, as identified on **Environmental significance – wetlands and watercourse overlay map**; (ii) 100m from the outer landward boundary of a State significant wetland, as identified on Environmental significance – wetlands and watercourse overlay map; (iii) 100m from the outer landward boundary of a Local significant wetland, as identified on Environmental significance **– wetlands and watercourse overlay map**; (iv) 60m from the outer bank of a Major Watercourse identified on Environmental significance – wetlands and watercourse overlay map; or (v) 30m from the outer bank of a Watercourse identified on Environmental significance –	**COMPLIES WITH PO1** An ecological site assessment has been prepared for the site (this report). **COMPLIES WITH AO1 (a)** The proposed works do not impact on areas of environmental significance identified on the vegetation management overlay map. **COMPLIES WITH AO1 (b)(v)** A minimum 30 m buffer to Yaun Creek in the northern corner of the site will be achieved. This buffer will be revegetated and rehabilitated. The drainage channel in the south-eastern corner of the site will be revegetated to the Q100 flood line. This will provide a buffer width of approximately 10-40 m. This area will be incorporated into the public open space network. No recommendations for the buffer width of the drainage channel traversing Lot 192 have been made given its degraded nature, lack of existing native vegetation and lack of fauna connectivity. It is proposed that this drainage channel be filled to accommodate the residential development as is recommended in the Draft Concept Plan (GHD, 2017). **COMPLIES WITH AO1 (c)** All trees within the areas mapped on the priority species overlay will be retained. This area will be rehabilitated to improve its ecological function.	

Performance outcomes	Acceptable outcomes	Does the proposal meet the acceptable outcome? **If not, justify how the proposal meets <u>either</u> the performance outcome or overall outcome**	Internal use
	wetlands and watercourse overlay map; and (c) individual trees within areas mapped on the **Environmental significance – priority species overlay map.**		
Biodiversity areas			
PO2 Development does not impact on Protected Areas as identified on the **Environmental significance– biodiversity areas overlay map.**	**AO2.1** No acceptable outcome provided.	**PO2 NOT APPLICABLE** No protected areas are mapped within the subject site.	
PO3 Development within the Hinterland to Coast Critical Corridors as identified on the **Environmental significance – biodiversity areas overlay map** is located and designed to: (a) provide corridors of sufficient dimensions and characteristics that will enable adequate movement of fauna through the site; (b) protect in situ matters of environmental significance and associated buffers; (c) protect in situ, vegetation identified on the **Environmental significance – vegetation management overlay map** and habitat for native flora and fauna; (d) link matters of environmental significance, existing corridors and/or conservation estate/reserves on adjacent properties; (e) maintain and improve upon the regional connectivity of the Hinterland to Coast Critical Corridors;	**AO3.1** No acceptable outcome provided.	**PO3 NOT APPLICABLE** The site does not fall within the Hinterland to Coast Critical Corridor.	

Performance outcomes	Acceptable outcomes	Does the proposal meet the acceptable outcome? **If not, justify how the proposal meets <u>either</u> the performance outcome or overall outcome**	Internal use
and (f) allow for the rehabilitation of disturbed, cleared or modified areas that form part of the Hinterland to Coast Critical Corridors. **Note : Recommendations provided in an ecological site assessment (prepared in accordance with SC6.7 City Plan policy – Ecological site assessments) are Council's preferred method for determining corridor dimensions.**			
PO4 Development within Hinterland Core Habitat Systems, Coastal Wetlands and Islands Core Habitat Systems and Substantial Remnant Areas as identified on the **Environmental significance – biodiversity areas overlay map** is located and designed to: (a) protect in situ matters of environmental significance and associated buffers; (b) protect in situ vegetation identified on the **Environmental significance – vegetation management overlay map** and habitat for native flora and fauna; and (c) allow for the rehabilitation of disturbed, cleared or modified areas.	**AO4** No acceptable outcome provided.	**PO4 NOT APPLICABLE** The site does not fall within the Hinterland Core Habitat Systems, Coastal Wetlands and Islands Core Habitat Systems and Substantial Remnant Areas.	
Wetland and watercourse			
PO5 Buffers are provided to wetlands and watercourses identified on the **Environmental significance – wetlands and watercourse overlay map** to ensure the:	**AO5.1** Buffers at least 100m wide are provided between the development and the mapped boundary of a State significant aquatic area, as identified on **Environmental significance – wetlands and watercourse overlay**	**AO5.1 NOT APPLICABLE** No State significant aquatic areas are mapped on the site.	

Performance outcomes	Acceptable outcomes	Does the proposal meet the acceptable outcome? **If not, justify how the proposal meets <u>either</u> the performance outcome or overall outcome**	Internal use
(a) protection of matters of environmental significance mapped onsite or identified through an ecological site assessment; (b) unimpeded movement of fauna along the watercourse; (c) water quality is maintained; (d) bank stability; and (e) protection of property and infrastructure. **Note: The buffer width for wetlands is measured from the outer, landward boundary of the mapped wetland, as shown on Environmental significance – wetland and watercourse overlay map.** **Note: Recommendations provided in an ecological site assessment (prepared in accordance with SC6.7 City Plan policy – Ecological site assessments) is Council's preferred method for determining alternative buffer widths.** **Note Artificial watercourses are to be addressed through the Coastal erosion hazard overlay code and map. Where a waterbody contains both natural and artificial banks, the natural banks are to be assessed in accordance with this performance outcome.**	**map**.		
	AO5.2 Buffers at least 100m wide are provided between the development and the outer landward boundary of a State significant wetland, as identified on **Environmental significance – wetlands and watercourse overlay map.**	**AO5.2 NOT APPLICABLE** No State significant wetlands are mapped on the site.	
	AO5.3 Buffers at least 100m wide are provided between the development and the outer landward boundary of a Local significant wetland as identified on the **Environmental significance – wetlands and watercourse overlay map.**	**AO5.3 NOT APPLICABLE** No local significant wetlands are mapped on the site.	
	AO5.4 Buffers at least 60m wide are provided between the development and the outer bank of a Major Watercourse as identified on the **Environmental significance – wetlands and watercourse overlay map**.	**AO5.4 NOT APPLICABLE** No major waterways are identified on the site.	
	AO5.5 Buffers at least 30m wide are provided between the development and the outer bank of a watercourse as identified on the **Environmental significance – wetlands and watercourse overlay map**.	**COMPLIES WITH AO5.5** A 30 m buffer to Yaun Creek in the north of the site will be achieved. The buffer will be revegetated and rehabilitated. The drainage channel in the south-eastern corner of the site will be buffered to the width of the Q100 flood line. The buffer width will be approximately 10-40 m. This will enhance riparian connectivity to the east. The drainage channel emanating from the south-western corner of the site will be modified. In its current state, it does not provide any fauna linkages for species that are not highly mobile, the vegetation along its length is	

Performance outcomes	Acceptable outcomes	Does the proposal meet the acceptable outcome? **If not, justify how the proposal meets <u>either</u> the performance outcome or overall outcome**	Internal use
		dominated by pasture grasses and there is evidence of bank erosion. Buffers to the waterway/drainage channels are to focus on areas of the site where there are existing habitat linkages. It is proposed that the drainage channel north of and including the dam in Lot 192 be filled to accommodate the residential development, as is recommended in the Draft Concept Plan (GHD, 2017).	
Vegetation management			
PO6 Regulated vegetation is protected in situ when it is: (a) identified on the **Environmental significance – vegetation management overlay map**; and (b) within biodiversity areas as identified on the **Environmental significance – biodiversity areas overlay map.**	**AO6** Development does not impact on regulated vegetation.	**PO6 NOT APPLICABLE** No biodiversity areas are mapped on the site	
PO7 Development is designed to maintain regulated vegetation and minimise disturbance when it is: (a) identified on the **Environmental significance – vegetation management overlay map**; and (b) outside of biodiversity areas as identified on the **Environmental significance – biodiversity areas overlay map.**	**AO7** Development avoids impacts on regulated vegetation.	**COMPLIES WITH AO7** No state regulated vegetation will be impacted by the development. The regulated vegetation will be conserved and rehabilitated.	
PO8 High priority vegetation as identified on the **Environmental significance – vegetation management overlay map** is protected in situ.	**AO8** No acceptable outcome provided.	**PO8 NOT APPLICABLE** No high priority vegetation is mapped on the subject site.	
PO9	**AO9**	**PO9 NOT APPLICABLE**	

Performance outcomes	Acceptable outcomes	Does the proposal meet the acceptable outcome? **If not, justify how the proposal meets <u>either</u> the performance outcome or overall outcome**	Internal use
Medium and general priority vegetation as identified on the **Environmental significance – vegetation management overlay map** within biodiversity areas as identified on the **Environmental significance –biodiversity areas overlay map** is protected in situ.	No acceptable outcome provided.	No biodiversity areas, as identified on the Environmental Significance – biodiversity areas overlay map are present on the subject site.	
PO10 Vegetation is protected when it is: (a) identified as medium priority vegetation on the **Environmental significance – vegetation management overlay map**; and (b) located outside the biodiversity areas identified on the **Environmental significance – biodiversity areas overlay map.**	**AO10** Vegetation is not damaged when it is: (a) identified as medium priority vegetation on the **Environmental significance – vegetation management overlay map**; and (b) located outside the **Environmental significance – biodiversity areas overlay map.** OR Where all attempts have been made to avoid and minimise damage to vegetation as stated above, any significant residual impact is offset consistent with the *Environmental Offsets Act 2014*, at a ratio of 3:1 (area) in accordance with **SC6.8 City Plan policy – Environmental offsets**. OR Damage to medium priority vegetation identified on the **Environmental significance – vegetation management overlay map** and located outside the biodiversity areas identified on the **Environmental significance – biodiversity areas overlay map** is for committed development.	**COMPLIES WITH P10 AND AO10** Medium priority vegetation is excluded from development and will be rehabilitated. This area will be included within the open space network on the site.	
PO11 Disturbance to vegetation is minimised	**AO11** Development avoids impacts on	**COMPLIES WITH PO11 AND AO11** Where possible, general priority vegetation is excluded	

Performance outcomes	Acceptable outcomes	Does the proposal meet the acceptable outcome? **If not, justify how the proposal meets <u>either</u> the performance outcome or overall outcome**	Internal use
when it is: (a) identified as General priority vegetation on the **Environmental significance – vegetation management overlay map**; and (b) located outside the **Environmental significance – biodiversity areas overlay map**.	general priority vegetation. Any damage is minimised to the greatest extent possible.	from development. It will be rehabilitated where is occurs within the designated conservation reserve (environmental reserve) of the development or along waterways.	
PO12 Buffers are provided that protect the long term viability of high priority and regulated vegetation located on or adjacent to the site.	**AO12** Buffers at least 30m wide are provided between the development and any retained vegetation identified as high priority or regulated vegetation on the **Environmental significance – vegetation management overlay map** on or adjacent to the site.	**AO12 NOT APPLICABLE** No regulated or high priority vegetation is present on the site.	
Priority species			
PO13 Assessable koala feed and shelter trees are protected in situ when they are located: (a) in koala habitat areas as identified on the **Environmental significance – priority species overlay map**; and (b) within biodiversity areas as identified on the **Environmental significance – biodiversity areas overlay map**.	**AO13** Development does not impact on assessable koala feed and shelter trees.	**PO13 NOT APPLICABLE** No biodiversity areas are mapped on the subject site.	
PO14 Assessable koala feed and shelter trees are protected when they are: (a) in koala habitat areas as identified on the **Environmental significance – priority species overlay map**; and (b) outside biodiversity areas as identified on the **Environmental significance – biodiversity areas**	**AO14** Development avoids impacts on assessable koala feed and shelter trees. Any damage is minimised to the greatest extent possible.	**COMPLIES WITH PO14 AND AO14** Mapped koala habitat areas will be wholly within the environmental open space of the proposed development. Where isolated koala food trees exist outside of this area and where they cannot be retained, these trees will be offset in the rehabilitation areas.	

Performance outcomes	Acceptable outcomes	Does the proposal meet the acceptable outcome? **If not, justify how the proposal meets <u>either</u> the performance outcome or overall outcome**	Internal use
overlay map.			
PO15 Site design provides safe koala movement opportunities by incorporating measures to maintain connectivity between areas of koala habitat on and adjacent to the site. **Note :** *DEHP's Koala-Sensitive Design Guideline* **should be consulted for suitable measures to provide for safe koala movement.**	**AO15** No acceptable outcome provided.	**COMPLIES WITH PO15** The development has been designed so that connectivity with adjacent bushland areas is maintained. The rehabilitation of waterways on the site will increase connectivity to bushland to the north.	
PO16 During the clearing and construction phases, measures are incorporated to protect koalas from death or injury.	**AO16** Threats to koalas as a result of clearing and construction activities are mitigated by: (a) ensuring no tree in which a koala is present or a tree with a crown overlapping a tree containing a koala is cleared; (b) undertaking clearing of vegetation in stages, and ensuring: (i) no more than 1 ha is cleared per day for sites less than 6 ha in size; (ii) no more than 2 ha is cleared per day for sites greater than 6 ha in size; (iii) that between each stage there is at least 12 hours where no	**COMPLIES WITH PO16 AND AO16** No clearing will occur without a registered and experienced koala spotter catcher being present on the site. Best practice industry guidelines will be followed to ensure the impacts to all wildlife are minimised. Clearing and construction works will adhere to the conditions of AO16.	

Performance outcomes	Acceptable outcomes	Does the proposal meet the acceptable outcome? **If not, justify how the proposal meets <u>either</u> the performance outcome or overall outcome**	Internal use
	clearing occurs; and (iv) koala habitat is always linked to allow koalas to move out of the site; (c) use of qualified koala spotters; (d) prohibition of domestic dogs and security dogs on site; and (e) use of koala safety fencing.		
PO17 State significant species, and their habitat, are protected in situ when it is: (a) identified on the **Environmental significance – priority species overlay map,** or through an ecological site assessment; and (b) within biodiversity areas as identified on the **Environmental significance – biodiversity areas overlay map.**	**AO17** Development does not impact on State significant species, and their habitat.	**PO17 NOT APPLICABLE** No biodiversity areas are mapped on the subject site.	
PO18 Development protects state significant species, and their habitat or is designed to minimise and mitigate impacts on habitat values when it is: (a) identified on the **Environmental significance – priority species overlay map**; and (b) outside of biodiversity areas as identified on the **Environmental significance – biodiversity areas overlay map.**	**AO18.1** Development avoids impacts on state significant species, and their habitat.	**COMPLIES WITH PO18 AND AO18.1** Mapped koala habitat areas will be wholly within the conservation reserve (environmental reserve) of the proposed development. Where isolated koala food trees exist outside of this area and where they cannot be retained, these trees will be offset in the rehabilitation areas.	
	AO18.2 Where development impacts on state significant species and their habitat, the following occurs: (a) flora species are propagated and used in rehabilitation and landscaping onsite; and (b) fauna species are safely relocated by a qualified fauna spotter catcher.	**COMPLIES WITH PO18 AND AO18.2 (b)** All vegetation clearing will be conducted under the guidance of a registered fauna spotter catcher. **AO18.2 (a) NOT APPLICABLE** No threatened flora species have been identified on the site.	

Performance outcomes	Acceptable outcomes	Does the proposal meet the acceptable outcome? **If not, justify how the proposal meets <u>either</u> the performance outcome or overall outcome**	Internal use
PO19 Local significant species, and their habitat, are protected in situ when it is: (a) identified on the **Environmental significance – priority species overlay map,** or through an ecological site assessment; and (b) within biodiversity areas as identified on the **Environmental significance – biodiversity areas overlay map.**	**AO19** Development does not impact on local significant species, and their habitat.	**PO19 NOT APPLICABLE** No biodiversity areas are mapped on the subject site.	
PO20 Development protects local significant species, and their habitat or is designed to minimise and mitigate impacts on habitat values when it is: (a) identified on the **Environmental significance – priority species overlay map**; and (b) outside of biodiversity areas as identified on the **Environmental significance – biodiversity areas overlay map.**	**AO20.1** Development avoids impacts on local significant species, and their habitat.	**COMPLIES WITH PO20 AND AO20.1** Mapped habitat of locally significant species is excluded from the development footprint.	
	AO20.2 Where development impacts on local significant species and their habitat, the following occurs: (a) flora species are propagated and used in rehabilitation and landscaping onsite; and (b) fauna species are safely relocated by a qualified fauna spotter catcher.	**AO20.2 (a) NOT APPLICABLE** No locally significant flora species have been identified on the site. **COMPLIES WITH AO20.2 (b)** All vegetation clearing will be conducted under the guidance of a registered fauna spotter catcher.	
Fauna management			
PO21 Development design and location provides for the safe movement of native fauna through the site.	**AO21** Where infrastructure crosses native fauna movement paths, the design of new development incorporates fauna friendly movement solutions. **Note: Fauna friendly movement solutions developed in accordance with the** *Queensland Government Fauna Sensitive Road Design Manual Volume 2: Preferred Practices; and the QLD Government Koala-Sensitive Design Guidelines* **is Council's preferred method for**	**COMPLIES WITH PO21 AND AO21** The development design incorporates rehabilitated riparian areas that will facilitate the safe movement of wildlife through the site and to neighbouring habitat. Reduced speed limits and traffic calming devices will be installed where necessary to limit wildlife vehicle strike.	

Performance outcomes	Acceptable outcomes	Does the proposal meet the acceptable outcome? **If not, justify how the proposal meets <u>either</u> the performance outcome or overall outcome**	Internal use
	addressing this outcome.		
PO22 Where fauna habitat is proposed to be damaged, management strategies must be implemented to ensure: (a) the native fauna is safely relocated to an area of similar habitat; (b) the sequence of habitat disturbance ensures that fauna is not isolated from adjoining areas of habitat; (c) fauna relocation occurs immediately prior to habitat disturbance; (d) accredited and experienced spotter catchers, licensed by the Queensland Parks and Wildlife Service, are to be present on the site to direct and undertake the removal and relocation of fauna; and (e) where possible, damaged habitat and nesting sites are rehabilitated outside of development areas. **Note: A Fauna Management Plan prepared by a suitably qualified person is Council's preferred method for addressing this outcome.**	**AO22** No acceptable outcome provided.	**COMPLIES WITH PO22** No clearing will occur without a registered and experienced koala spotter catcher being present on the site. Best practice industry guidelines will be followed to ensure the impacts to all wildlife are minimised. Clearing and construction works will adhere to the conditions of PO22. A fauna and flora management plan will be prepared for the site to guide vegetation clearing and mitigate impacts to flora and fauna on site and in adjacent areas.	
Tenure, ownership and management arrangements			
PO23 Matters of environmental significance and associated buffers, mapped areas as identified on the **Environmental significance – vegetation management overlay map** proposed for retention and areas requiring rehabilitation are suitably protected in perpetuity and will: (a) enable necessary fire management in accordance with an approved fire	**AO23** Matters of environmental significance and associated buffers, mapped areas as identified on the **Environmental significance – vegetation management overlay map** proposed for retention and areas requiring rehabilitation are transferred to Council ownership as Public Open Space. OR	**COMPLIES WITH PO23** Areas of environmental significance (koala habitat and medium priority vegetation areas) are to be retained within the conservation reserve (environmental reserve) open space of the proposed development. Public open space areas will be transferred to Council ownership.	

Performance outcomes	Acceptable outcomes	Does the proposal meet the acceptable outcome? **If not, justify how the proposal meets <u>either</u> the performance outcome or overall outcome**	Internal use
management plan and any adopted bushfire management plan; (b) allow unimpeded movement of native fauna through matters of environmental significance and associated buffers; (c) enable maintenance access and regular management; (d) enable auditing and reporting of maintenance and management activities; (e) provide for public access along major watercourses, where such access is consistent with the ecological functions; (f) allow for linkages and buffers to adjacent areas of ecological significance; and (g) allow for a coordinated approach to the management of adjacent areas of conservation estate.	Where not required for public access, matters of environmental significance and associated buffers, and mapped areas as identified on the **Environmental significance – vegetation management overlay map** proposed for retention and areas requiring rehabilitation are retained in private ownership and protected under a statutory covenant (under the *Land Title Act 1994*). **Note: Where the area is adjacent to existing public open space, or is a buffer to a major waterway, Council's preference is for the land to be dedicated as Public Open Space.**		
PO24 An Open Space Management Plan prepared in accordance with **SC6.10 City Plan policy – Landscape work** is prepared for areas to be dedicated to Council as Public Open Space.	**AO24** No acceptable outcome provided.	**WILL COMPLY WITH PO24 VIA CONDITIONS** An Open Space Management Plan will be prepared for the site for areas designation public open space.	
PO25 A Covenant Management Plan is prepared for areas to be protected under a statutory covenant. The management plan must include the following details: (a) rehabilitation area and strategy of works; (b) weed eradication and control requirements;	**AO25** No acceptable outcome provided.	**PO25 NOT APPLICABLE** No areas of the proposed development will be protected under a statutory covenant. Public open space will be transferred to Council ownership.	

Performance outcomes	Acceptable outcomes	Does the proposal meet the acceptable outcome? **If not, justify how the proposal meets <u>either</u> the performance outcome or overall outcome**	Internal use
(c) how the covenant area will be maintained and managed in perpetuity; (d) feral and domestic animal exclusion requirements; and (e) required maintenance access.			
Rehabilitation			
PO26 Disturbed, cleared or modified areas are rehabilitated where they form part of: (a) an ecological corridor; or (b) matters of environmental significance and associated buffers; or (c) areas identified within an Ecological Site Assessment as requiring rehabilitation. **Note : A Rehabilitation Management Plan prepared in accordance with the** *South East Queensland Ecological Restoration Framework* **is Council's preferred method for addressing this outcome.**	**AO26** No acceptable outcome provided.	**WILL COMPLY WITH PO26 VIA CONDITIONS** Environmentally significant areas on the site will be rehabilitated, as will riparian zones along the waterway and drainage channel where connectivity external to the site persists. To guide the rehabilitation procedures, a Rehabilitation Management Plan will be prepared.	

Section 4 - SPECIALIST REPORTS

Engineering Services Report
Prepared by Mortons Urban Solutions

Zone Planning Group

MORTONS urbansolutions

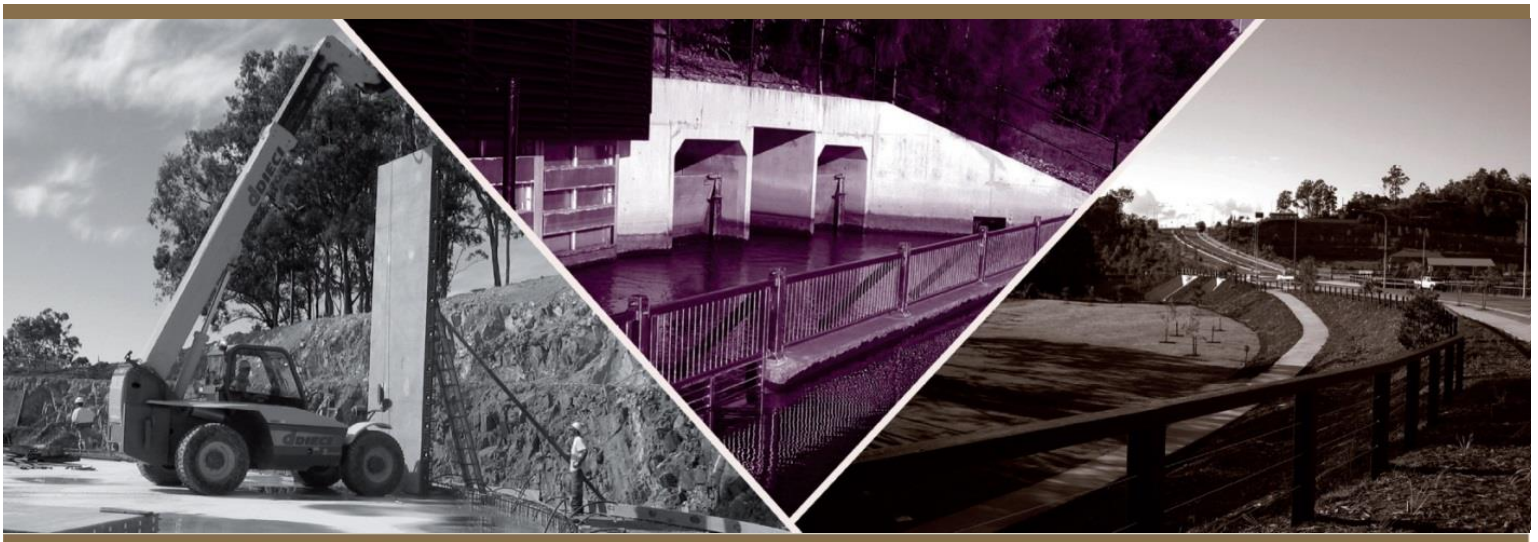
Innovative Solutions. Sustainable Outcomes.

Courtney Drive Upper Coomera

PRELIMINARY ENGINEERING REPORT

Address:	79 to 99 Courtney Drive, Upper Coomera
Lot & RP Description:	Lot 188 to 192 on RP173728
Local Government:	Gold Coast City Council
Prepared for:	GALLERY THE ART OF LIVING
Prepared by:	**Mortons – Urban Solutions** Level 2, 19 Short Street (PO Box 2484) Southport Qld 4215 Ph: (07) 5571 1099 Fax: (07) 5571 1088 Email: mortons@urbansolutions.net.au

DATE: 17th April 2019



CIVIL ENGINEERING TOWN PLANNING PROJECT COORDINATION

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GALLERY
THE ART OF LIVING

Property Address:
79 to 99 Courtney Dr,
Upper Coomera

Real Property Description/s:
Lot 188 to 192
RP173728

DOCUMENT CONTROL

Report Summary					
Document Details					
Project Reference:	36001-ALL [ID 731018]				
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List of Appendices

Appendix A **Plan of Proposed Staged Subdivision**
(Plan No. 171100_005_PRO, Revision J, Dated 25.03.2019)
Prepared by Bennett and Bennett

Appendix B **Council Discussions**
(Emails dated 28.02.2019 and 27.03.2019)
Prepared by Mortons-Urban Solutions

Appendix C **Preliminary Earthworks Drawings**
(Drawing No.: 36001-PE-000 to 460, Issued 04.04.2019)
Prepared by Mortons-Urban Solutions

Appendix D **Preliminary Engineering Drawings**
(Drawing No.: 36001-PRE-000 to 705, Issued 17.04.2019)
Prepared by Mortons-Urban Solutions

1.0 INTRODUCTION

This Engineering Services Report has been prepared on behalf of **Gallery Homes** and is supporting information to the combined Reconfiguration of a Lot and Material Change of Use application for 79 to 99 Courtney Drive, Upper Coomera. The application proposes the creation of 237 residential lots, open space, associated public road and stormwater drainage reserve. The development is proposed to be constructed in 7 stages.

The proposed development is located within the Upper Coomera Investigation Area identified as an area that may be appropriate to be converted from rural to urban purposes to assist in the provision of the City's urban land supply and cater for the city's future population growth.

The investigations within this report are based on the Bennett and Bennett's Plan of Proposed Staged Subdivision Plan No. 171100_005_PRO Rev J dated 25th March 2019 (**Appendix A**).

The location of the proposed development site is shown in Figures 1.1 and 1.2 below.

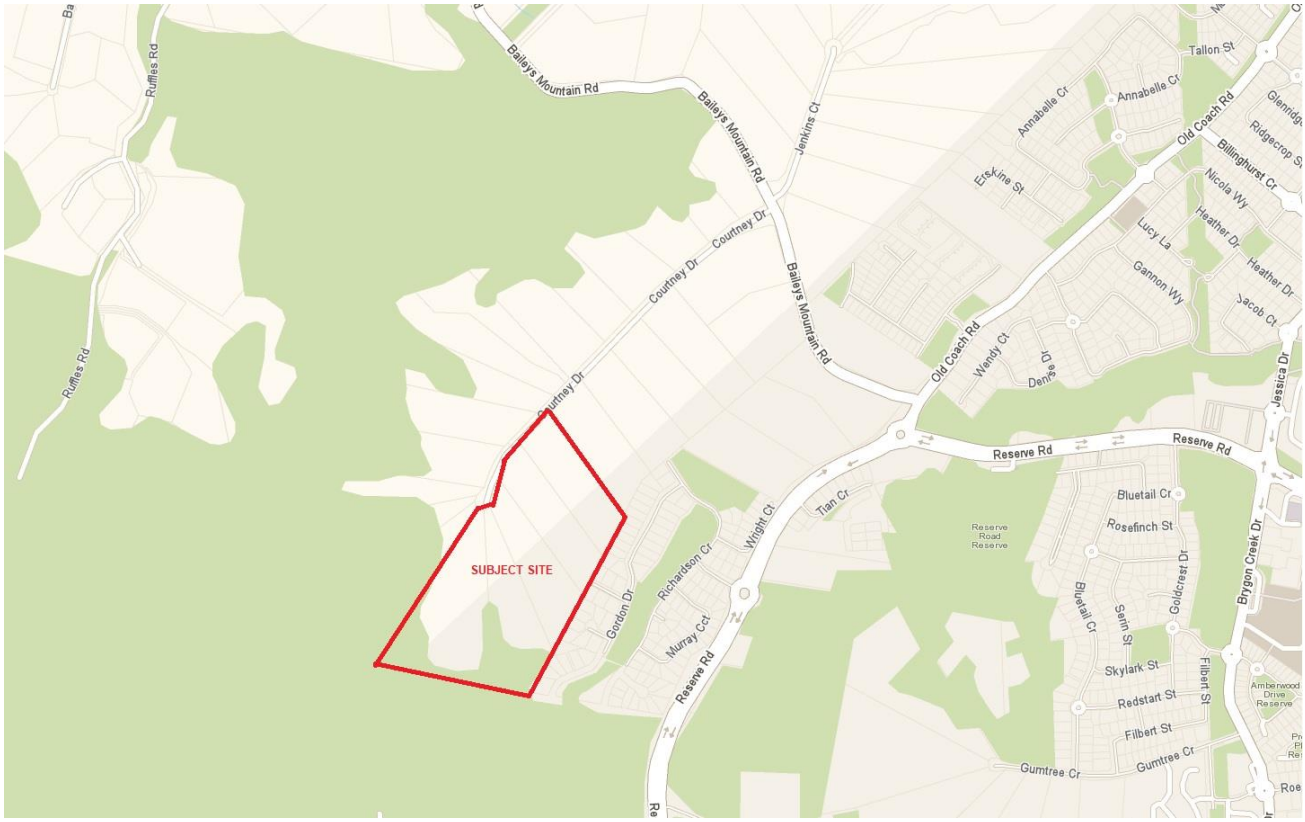

Figure 1.1 – Location of Proposed Development Site *Source: www.whereis.com*

Figure 1.2 – Aerial Photo of Proposed Development Site

The proposed servicing strategy for Stages 1 and 2 was discussed with Council in February and March 2019 and the strategies noted in this report are consistent with these discussions. A copy of the notes from these discussions is included within **Appendix B**.

2.0 PRELIMINARY EARTHWORKS DESIGN

A preliminary earthworks design has been prepared over the site to establish the extent of earthworks, retaining walls & batters. The preliminary design incorporates the required stormwater management infrastructure (including basins) for the site proposed by BIOME Consulting (refer details in **Section 3.0** below). The preliminary earthworks and retaining wall design are shown on MUS Drawings No. 36001-PE-000 to 460 (refer **Appendix C**).

For Council's information, bulk earthworks cross-sections through the proposed development have been prepared and are shown on Drawings No. 36001-PE-050 to 050. Cut to Fill drawings are also provided and are shown on MUS Drawings No. 36001-PE-040 to 045. These drawings are included within **Appendix C**.

The preliminary earthworks model incorporates the following:

- An approximate earthworks balance of 330,000m3 cut to fill;
- Batter slopes generally acceptable to Council and Geotechnic Engineers;
- Stormwater strategy in accordance with BIOME Consulting's conceptual management plan.
- Ties into the surrounding properties;
- Retaining walls as noted in **Section 2.1** below;
- The reconstruction of Courtney Drive where required to facilitate access to the proposed development, with the existing driveways adjusted to suit;
- The potential for a fire trail/access track within the road reserve that adjoins the southern boundary of the site, extending from the Gordon Drive entry road (ie Road 1);
- Interface along the southern boundary with Stockland's Highland Reserve as noted in **Section 6.1** below;
- Stormwater and sewer catchments generally in accordance with the Subconsultant reports.

2.1 Retaining Walls

Concrete sleeper retaining walls are proposed to be used within the development with a maximum height of 2m for a single tier wall and 3m for two tiers with a bench. Typical details are shown on MUS Drawing 36001-PE-460 (refer **Appendix C**). The proposed concrete sleeper retaining wall is a proprietary product and it is noted that the proposed wall heights have been accepted on other recent developments within the City of Gold Coast.

All retaining walls will be subject to site specific RPEQ structural engineer design prior to construction.

Anticipated retaining wall heights and site pad levels are shown on MUS Drawings No. 36001-PE-450 to 455 (refer **Appendix C**).

3.0 CONCEPTUAL STORMWATER MANAGEMENT

BIOME Consulting have prepared a Stormwater Management and Hydraulic Assessment report (dated March 2019) that provides a conceptual stormwater management plan (CSMP) for the proposed development. The CSMP presents a comprehensive review of available Stormwater Quality Improvement Devices (SQID) and stormwater Best Management Practices (BMP) to ensure that the proposed development adequately addresses the management of stormwater quantity and quality during both the construction and operational phases of the development.

An excerpt from BIOME's proposed operational control plan is below showing the proposed infrastructure to mitigate the development's potential stormwater impacts if left uncontrolled.

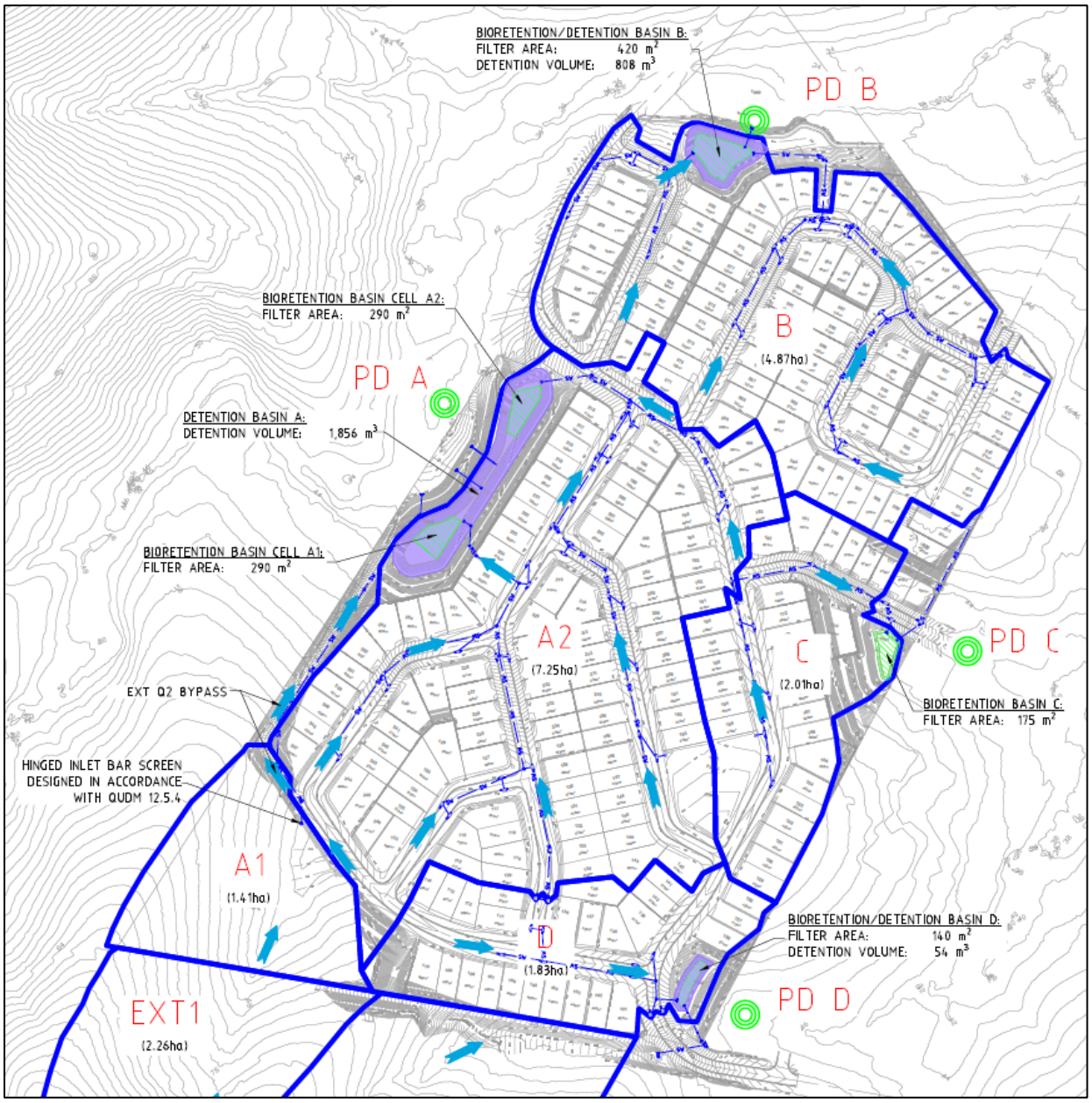

Figure 3.1 – BIOME Consulting's Operational Control Plan (refer Drawing DWG-300 Rev A)

BIOME's CSMP incorporates and confirms the following:

- A total of four (4) stormwater treatment basins are proposed:
  - Basins A, B and D will be combined bioretention/detention basin for quality and quantity management.
  - Basin C will only be required for treatment of pollutant loads, as catchment reductions in the post-development case have resulted in a reduction of peak discharge.
- The results of xpstorm modelling indicate that the inclusion of the three (3) proposed detention basins will mitigate the expected increases in peak discharge at PD-A, PD-B, and PD-D during all modelled AEP events.
- Utilising a 1D-2D flood model TUFLOW, the resulting spatial analysis of the peak pre- and post-development flooding indicates that the proposed earthworks required to create the subdivision will not cause any flood increase or nuisance to neighbouring properties.
- All internal catchments will be directed to bioretention measure for quality treatment. MUSIC v6 modelling indicates that reduction target for TSS, TP, TN and gross pollutants of 80%, 60%, 45% and 90% respectively can be achieved for the rainfall data set simulated.

A future Detailed Stormwater Management Plan containing the detailed engineering designs will be prepared in the future to finalise the stormwater concepts presented in their report.

Following the implementation of the BIOME's proposed strategies, the CSMP confirms that:

- There should be no worsening in peak discharge as a result of the proposed development;
- Stormwater pollutant load reductions in accordance with best practice should be achieved.

For further discussion on the stormwater mitigation strategies regarding this development refer to BIOME Consulting's report supporting the development.

4.0 PRELIMINARY CIVIL ENGINEERING DESIGN

A preliminary civil engineering design has been prepared over the site to establish preliminary catchments and alignments of the required stormwater culverts, water and sewer mains to service the proposed development. The preliminary design also provides long-sections and indicative cross-sections of the proposed roads.

The water and sewer layouts prepared in the preliminary civil design have formed the base for the water and sewer modelling discussed in **Section 5.0** below.

The preliminary civil design is shown on MUS Drawings No. 36001-PRE-000 to 705 (refer **Appendix D**).

5.0 WATER & SEWER SERVICING

H2One have prepared a Water Supply and Sewerage Network Hydraulic Analysis report (dated 17th April 2019) summarising the proposed infrastructure to service the proposed development with potable water and sewer. Adopting the water and sewerage layouts noted in **Section 4.0** above, H2One have prepared the following:

- A hydraulic model assessing the proposed internal networks and prepared reticulation schematic plans, to ensure adequate service will be achieved throughout the subdivision.
- A network capacity assessment to determine if the proposed development's additional loading will impact CoGC's existing systems and trigger the need for infrastructure upgrades.

The desired standards of service identified within the SEQ Water Supply and Sewerage Design and Construction Code were adopted for H2One's study.

The hydraulic analysis identified the following outcomes:

- The proposed internal pipe layouts and service strategies generally achieved Council's design standards for both water and sewer.
- Council's existing water supply network has sufficient capacity to incorporate the proposed development and infrastructure upgrades are not required. The following connection points to service the development are proposed:
    - Stage 1 connection to existing watermain in Gordon Drive located approximately 50m from the south-east corner of the proposed development.
    - Stage 2 connection to existing watermain in MacKellar Drive located near the proposed development property boundary.
    - Connection to existing watermain within Courtney Drive which requires the construction of approximately 600m of 200mm watermain and 970m of 300mm watermain.
- Council's existing sewer network has sufficient capacity to incorporate the proposed development up to the 2036 planning horizon. The 2066 planning horizon required the following infrastructure upgrades to service the site's additional loading:
    - Construction of 210m of DN300 parallel gravity mains (refer Appendix 9 for layout plan).
    - Construction of 30.5 kL of emergency storage. Note the subject site is estimated to have contributed 75% towards this upgrade, with the remaining component attributed to the approved development at 155 Baileys Mountain Road, Upper Coomera.

Refer to H2One's report to review their sensitivity analysis results for their water modelling due to the elevation of the proposed development plus the identified minimum pressure failures within existing development not triggered nor exacerbated by the proposed development.

For further discussion on the water and sewer strategies regarding this development refer to H2One's report supporting the development.

6.0 TRAFFIC CONSIDERATIONS

SLR Consulting have prepared a Traffic Report summarising the traffic impacts and infrastructure required to support the proposed development. Initially it is proposed that access will be provided via the new road currently being constructed by others between Reserve Road and Gordon Dr. Further discussion on this access is in **Section 6.1** below.

Future links will also be provided via Mackellar Dr on the eastern boundary of the site and Courtney Drive along the north-west boundary.

For further discussion on the traffic considerations regarding this development refer to SLR Consulting's report supporting the development.

6.1 Access via Gordon Drive

Stockland's Highland Reserve development to the south is currently under construction and as part of their approved works, they are providing a road link connection between Gordon Drive and Reserve Road. A fire trail is also proposed beyond Gordon Drive to the west.

The preliminary earthworks model has replicated the approved PDF design and extended it to provide access into the proposed Courtney Drive development. If the road link between Reserve Rd and Gordon Drive is constructed (by others) in accordance with the approved design, it is likely the extension into the proposed development will require a retaining wall within the road reserve to facilitate the entry road construction.

This was discussed with Council in February 2019 and the emails are included within **Appendix B** confirming that a retaining wall would be accepted as long as its minimised as much as possible. The preliminary earthworks drawings (refer **Appendix C**) provide details of the expected cross-section in this area due to the approved design.

7.0 ELECTRICAL & TELCOMMUNICATION SERVICES

The Development will include the provision of electricity and telecommunications services to each residential lot. Given the extent of similar residential development to the south and east of the subject site, it is expected sufficient infrastructure is available to service the proposed development. The existing service provider networks will be extended into the subject site via underground networks.

Future detailed advice regarding the provision of these services will be commissioned and appropriate designs and upgrades will be provided in the future to facilitate this development.

8.0 CONCLUSION

Based on preliminary reporting from the associated consultants, the preliminary earthworks model and the preliminary civil engineering design drawings prepared to date, servicing of the proposed 237 lot residential development is proposed as follows:

- The preliminary earthworks design demonstrates that suitable house sites exist on each lot through a combination of batters and retaining walls to Council's standards.
- There is sufficient capacity to service via connections to Council's existing sewer and water infrastructure located in the vicinity of the development.
- Access to the site can be provided via extension of existing roads into the development and proposes the reconstruction of the Courtney Dr for the development's frontage.
- Existing electrical and telecommunication services exist close to the development and are anticipated to supply the site as required.

It is therefore concluded that the subject site can be developed in accordance with the City of Gold Coast's Planning Scheme requirements and development codes and that no significant constraints exist to stop the development of this property as proposed.

APPENDIX A

Plan of Proposed Staged Subdivision

(Plan no. 171100_005_PRO, Revision J, dated 25.03.2019)
Prepared by Bennett and Bennett

Scale 1:2500

0m 50 100 150 200 250 300 350 400

DEVELOPMENT SUMMARY

Stage 1	- 68
Stage 2	- 27
Stage 3	- 28
Stage 4A	- 15
Stage 4B	- 16
Stage 5	- 40
Stage 6	- 43
TOTAL	237 Lots

LEGEND

Stage boundary

DEVELOPMENT AREAS LEGEND

Total Site Area	18.849 ha
Proposed Public Open Space (Environmental)	1.572 ha
Proposed Public Open Space (Drainage)	2.41 ha
Proposed Public Open Space (Recreation)	2708m²
Proposed Net Developable Area	14.597 ha
Proposed Density	16.1 dwellings/ha
Length of New Road	2541m
Area of New Road	4.163 ha

NOTES:
1. Drawn to scale on an A3 sheet.
2. All dimensions and areas are subject to final survey and approval by G.C.C.C.
3. Dimensions shown are to the nearest decimeter.

Issue	Revision	Int	Date
J	Staging Amended	SDS	25/03/2019
I	Staging Amended	DJL	12/02/2019
H	Staging amended	SDS	1/02/2019
G	Staging Amended	SDS	11/12/2018
F	Staging amended	SDS	26/11/2018
E	Detention Basins Amended	JEW	20/09/2018
D	Lot 1004 + 157 - 163	JEW	18/09/2018
C	Layout Updated	SDS	27/08/2018
B	Layout Updated	JKC	12/06/2018
A	Original Issue		

Title:

Plan of Proposed Staged Subdivision of Lots 1-237

Cancelling Lots 188-192 on RP173728

Client:	**GALLERY HOMES**		
Locality:	UPPER COOMERA		
Local Gov:	GCCC	Prepared By:	SDS
Surveyed By:		Approved:	GWS
Date Created:	15/5/2018	Scale:	1:2500
Comp File:			
Plan No:	**171101_005_PRO**		

A3

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Surveying, Town Planning & Spatial Services
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APPENDIX B

Council Discussions

(Emails dated 28th February 2019 and 27th March 2019)
Prepared by Mortons-Urban Solutions

Matthew McLaren

From: Matthew McLaren
Sent: Wednesday, 27 March 2019 5:10 PM
To: 'JOHNSON Mark'
Cc: 'Ashley Nankervis'
Subject: RE: Tuesday Meeting Notes - Courtney Dr - 13th March 2019
Attachments: Location Plan.JPG; Sewer conn l-sect.pdf; Sewer conn plan.pdf; IMG_0552.jpeg; IMG_0557.jpeg

Hi Mark

I've just noticed I haven't forwarded you my notes from our meeting. Sorry for the delay.

I appreciate you organising everyone to come along to give direct advice on the way forward. Definitely helps the process.

Attendees:
Council – Mark Johnson, Anton Adina, Ivan Mircev, Subra Subramaniam & Uttam Saha
Gallery Homes - Ashley Nankervis
Mortons - Matt McLaren

Water connection

- MM discussed proposed servicing of initial stages via connection to existing mains in Gordon Dr for Stage 1 and Mackellar Drive for Stage 2. Another connection is likely along Courtney Drive & Baileys Mountain Rd.
- Uttam noted no objections to proposed servicing of initial stages via eastern development as long as sufficient capacity. Capacity to be proven via modelling.
- MM noted H2One have prepared a water model report that confirms there is capacity. The report identifies the works external to the site to ensure the development can be serviced. This report will be updated to suit the current layout plan and lodged in support of the application to Council in due course.

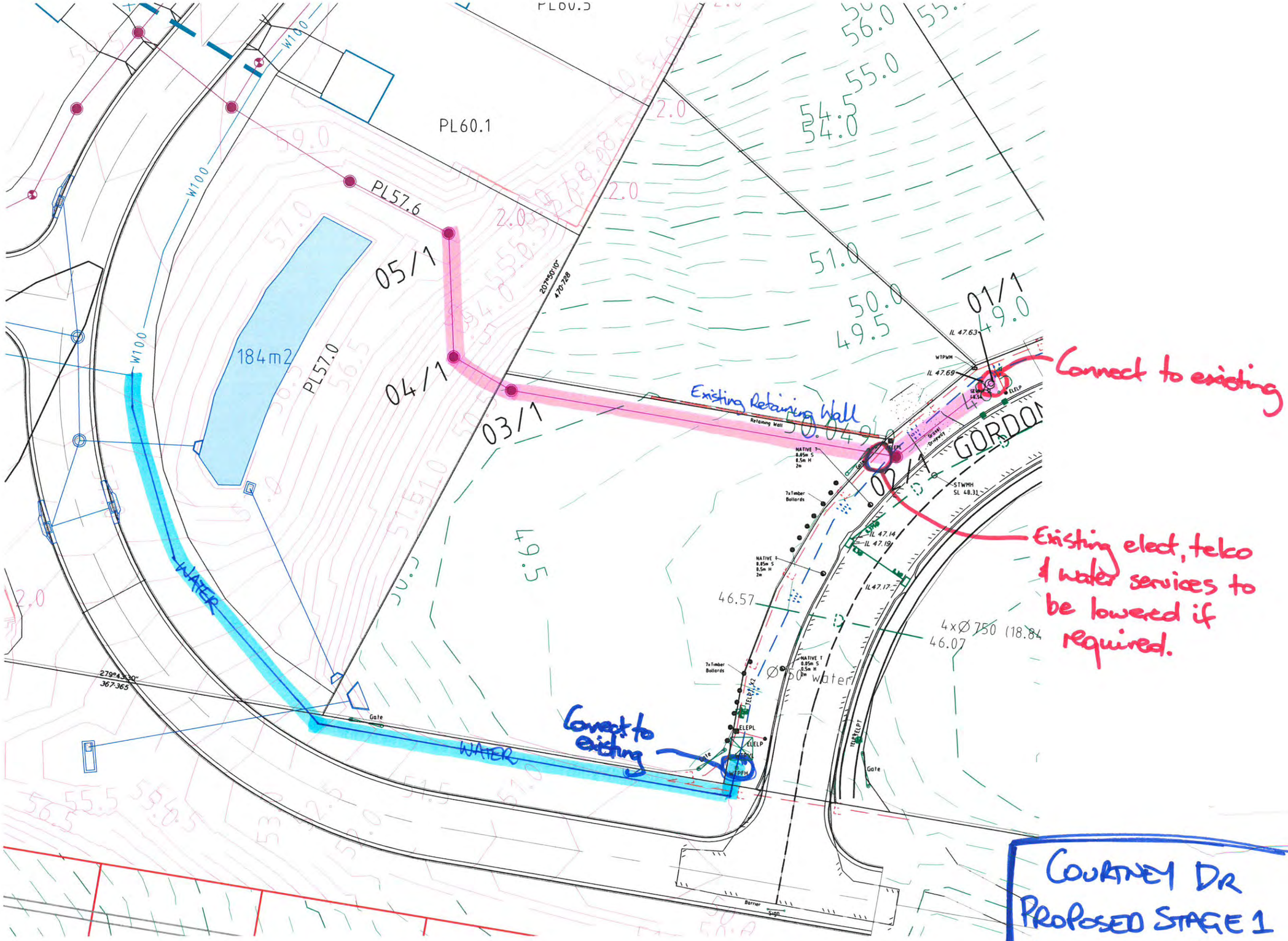
Sewer connection

- MM discussed proposed servicing of Stage 1 via existing sewer in Gordon Dr and for Stage 2 via existing sewer in Mackellar Drive. Stage 3 to trigger external works to the north of the site with specific connection location to be confirmed via modelling.
- Similar to the water, Council had no objections to servicing Stage 1 and Stage 2 of the development via the existing development to the east assuming capacity exists. Council's sewer modeller didn't think there would be a problem with capacity.
- MM noted a Sewer report prepared by H2One will be lodged in support of the application to Council confirming the works required to service the development.
- Mark noted there is no house on the lot the proposed sewer passes in front of yet (Lot 19 SP292346). Therefore the design needs to consider that this lot may dig out the verge to construct their driveway. Mortons to consider as part of future detailed design.
- Concrete encasement for the reduced depth is not Council's preferred treatment. Council suggested DICL may be a better alternative. Mortons to consider as part of future detailed design.

Post meeting note – I drove past the lot and took a few photos (see attached). You can see that the lot in question is above the road and very unlikely to require digging out to access the site. You can see the sewer manhole we would connect to next to the light pole in the photos.

Thanks again and please give me a call if you have any comments on the above.

Regards Matt



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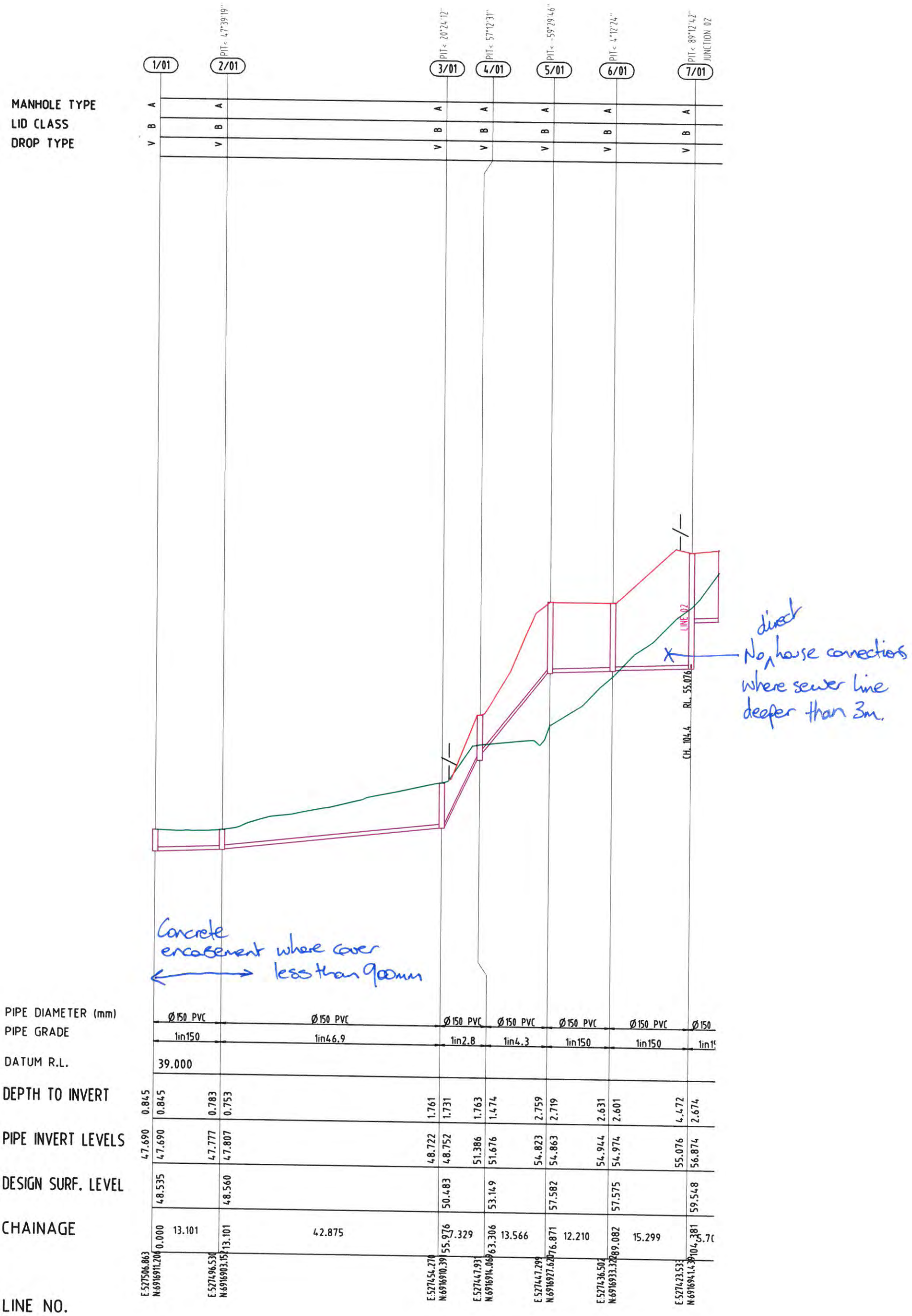

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SHEET 2/2

27/2/19

Matthew McLaren

From: KOCSMAR Antony <AKOCSMAR@goldcoast.qld.gov.au>
Sent: Thursday, 28 February 2019 5:08 PM
To: Matthew McLaren
Cc: John Harrison; 'Ashley Nankervis'
Subject: RE: Courtney Dr Entry - 79, 89, 91, 97, 99 Courtney Drive, Upper Coomera (Lots 188-192 on RP173728)

Hi Matt,

As discussed, verge widths in the MCU/ROL are conditioned by the subdivision engineer (Steve Mcbean) so it would not be appropriate for me to commit to outcomes that he may not agree with.

I have however, had a chat with Steve and agree that exploring a reduced verge would be a more preferable outcome to prevent the need for a retaining wall.

Issues to consider include:
- Despite being a cut batter we would prefer that appropriate clear zones are maintained i.e. usually 3m min.
- The 3m clearzone will steepen the batter on section B and we may consider a small retaining wall to flatten the batter to manageable grades i.e. flatter than 1/2.
- You would need to demonstrate that services can be contained within the set verge widths.

For more definitive advice an official prelodgement would need to be arranged with Steve, City Assets & myself.

Antony Kocsmar
Supervisor Operational Works
For the Chief Executive Officer

City Development

CITY OF **GOLDCOAST.**
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Fax: 5582 8248
PO Box 5042 Gold Coast Mail Centre Qld 9726

From: Matthew McLaren [mailto:mattmc@urbansolutions.net.au]
Sent: Thursday, 28 February 2019 10:57 AM
To: KOCSMAR Antony
Cc: John Harrison; Ashley Nankervis
Subject: Courtney Dr Entry - 79, 89, 91, 97, 99 Courtney Drive, Upper Coomera (Lots 188-192 on RP173728)

Hi Antony

I left you a message earlier to discuss.

Our Client was hoping to meet and discuss a potential entry road arrangement for their proposed development on Courtney Drive. The Stage 1 entry road adjoins Stockland's Highland Reserve and their recently approved OPW impacts on access into this development. Please see attached location plan of the subject site for your information.

As some background, the subject area is located in the Upper Coomera Investigation Area as identified by City of Gold Coast as an area that may be appropriate to be converted from rural to urban purposes (subject to undertaking relevant studies) to assist in the provision of the City's urban land supply and cater to the city's future population growth. No application has been lodged as yet but when it is, its likely it will be a combined MCU/ROL to create approximately 240 lots subject to detailed investigations.

The Developer has engaged us to investigate entry road options into their proposed development via the existing road reserve in the south-east corner of their site. Stockland's Highland Reserve design impacts on access via this existing road reserve (they have designed this area as a narrow fire trail) and based on our investigations, results in retaining walls within road reserve to allow the construction of a entry road to our Client's site. We've attached a plan and sections for your review but it would be much easier to discuss in a meeting.

We were hoping to meet to discuss as soon as possible as the Developer is waiting on this advice to continue with their detailed planning.

Given the size of the attachments – please confirm receipt.

Thanks Matt

Regards

Matt McLaren
Senior Engineer & Project Coordinator
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email: mattmc@urbansolutions.net.au

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APPENDIX C

Preliminary Earthworks Drawings

(Drawing No.: 36001-PE-000 to 460, Issued 4th April 2019)
Prepared by Mortons-Urban Solutions

DATA TRANSMITTAL

MORTONS urbansolutions
Urban & Regional Planning
Civil Engineering
Project Coordination
ABN: 39 116 375 065 Tel: (07) 55711099

PROJECT NAME: COURTNEY DRIVE, UPPER COOMERA
JOB NO: 36001-PE

DAY	11	04													
MONTH	09	04													
YEAR	18	19													

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PROJECT TEAM	0/0/1	0/0/1													

FILE NO.	**DESCRIPTION**	**AMENDMENT**													
	GENERAL														
36001-PE-000	COVER SHEET	A	B												
	EARTHWORKS: EXISTING FEATURES & DEMOLITION														
36001-PE-020	PLAN SHEET 01	A	B												
36001-PE-021	PLAN SHEET 02	A	B												
	EARTHWORKS: BULK EARTHWORKS CUT FILL														
36001-PE-040	PLAN SHEET 01	A	B												
36001-PE-041	PLAN SHEET 02	A	B												
36001-PE-042	PLAN SHEET 03	A	B												
36001-PE-043	PLAN SHEET 04	A	B												
36001-PE-044	PLAN SHEET 05	A	B												
36001-PE-045	PLAN SHEET 06	A	B												
	EARTHWORKS: BULK EARTHWORK SECTIONS														
36001-PE-050	SECTIONS KEY PLAN	A	B												
36001-PE-051	SECTIONS-SHEET 01	A	B												
36001-PE-052	SECTIONS-SHEET 02	A	A												
36001-PE-053	SECTIONS-SHEET 03	A	A												
36001-PE-054	SECTIONS-SHEET 04	A	B												
36001-PE-055	SECTIONS-SHEET 05	A	A												
	EARTHWORKS: FINAL SURFACE & SEDIMENT AND EROSION CONTRO														
36001-PE-070	PLAN SHEET 01	A	B												
36001-PE-071	PLAN SHEET 02	A	B												
36001-PE-072	PLAN SHEET 03	A	B												
36001-PE-073	PLAN SHEET 04	A	B												
36001-PE-074	PLAN SHEET 05	A	B												
36001-PE-075	PLAN SHEET 06	A	B												
	RETAINING WALL & DETAIL GRADING														
36001-PE-450	PLAN-SHEET 01	A	B												
36001-PE-451	PLAN-SHEET 02	A	B												
36001-PE-452	PLAN-SHEET 03	A	B												
36001-PE-453	PLAN-SHEET 04	A	B												
36001-PE-454	PLAN-SHEET 05	A	B												
36001-PE-455	PLAN-SHEET 06	A	B												
36001-PE-460	DETAILS SHEET 01	A	A												

TYPE: C - CIVILCAD A - AUTOCAD P - PLOT H - PHOTOCOPY OF APPROVED DWG D - Pdfs	D	D													

REASON: Z - COUNCIL R - REVISION A - APPROVAL C - CONSTRUCTION S - AS REQUESTED T - TENDER P - PRELIMINARY X - INFORMATION	ZA	ZA													

PLEASE CHECK THAT YOU HAVE RECEIVED ALL DOCUMENTS AS LISTED ABOVE.

I hereby acknowledge receipt of the documents as detailed above.
Signed: _____ Date: / /
Company: _____

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COURTNEY DR, UPPER COOMERA

PRELIMINARY EARTHWORKS

OVERALL

No. 36001-PE

SCHEDULE OF DRAWINGS		
NUMBER	REV. NO.	TITLE
GENERAL		
36001-PE-000	B	COVER SHEET
EARTHWORKS: EXISTING FEATURES & DEMOLITION		
36001-PE-020	B	PLAN SHEET 01
36001-PE-021	B	PLAN SHEET 02
EARTHWORKS: BULK EARTHWORKS CUT FILL		
36001-PE-040	B	PLAN SHEET 01
36001-PE-041	B	PLAN SHEET 02
36001-PE-042	B	PLAN SHEET 03
36001-PE-043	B	PLAN SHEET 04
36001-PE-044	B	PLAN SHEET 05
36001-PE-045	B	PLAN SHEET 06
EARTHWORKS: BULK EARTHWORK SECTIONS		
36001-PE-050	B	SECTIONS KEY PLAN
36001-PE-051	B	SECTIONS-SHEET 01
36001-PE-052	A	SECTIONS-SHEET 02
36001-PE-053	A	SECTIONS-SHEET 03
36001-PE-054	B	SECTIONS-SHEET 04
36001-PE-055	A	SECTIONS-SHEET 05
EARTHWORKS: FINAL SURFACE & SEDIMENT AND EROSION CONTROL		
36001-PE-070	B	PLAN SHEET 01
36001-PE-071	B	PLAN SHEET 02
36001-PE-072	B	PLAN SHEET 03
36001-PE-073	B	PLAN SHEET 04
36001-PE-074	B	PLAN SHEET 05
36001-PE-075	B	PLAN SHEET 06
RETAINING WALL & DETAIL GRADING		
36001-PE-450	B	PLAN-SHEET 01
36001-PE-451	B	PLAN-SHEET 02
36001-PE-452	B	PLAN-SHEET 03
36001-PE-453	B	PLAN-SHEET 04
36001-PE-454	B	PLAN-SHEET 05
36001-PE-455	B	PLAN-SHEET 06
36001-PE-460	A	DETAILS SHEET 01

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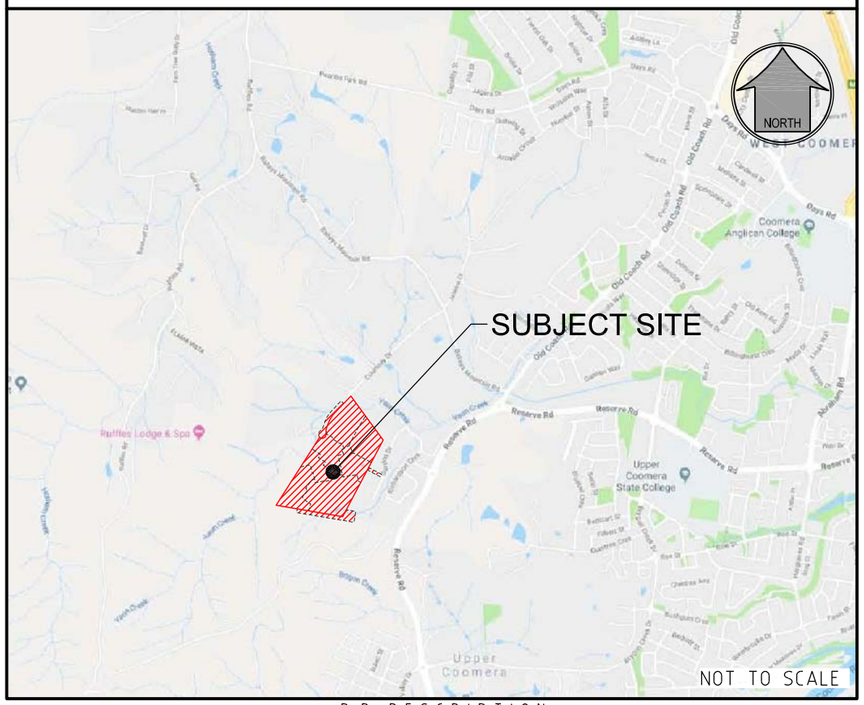
LOCALITY PLAN



R. P. DESCRIPTION
LOT 188, 189, 190, 191 & 192 ON RP173728
COURTNEY DRIVE
LOCALITY OF UPPER COOMERA
LOCAL AUTHORITY - GOLD COAST CITY COUNCIL

DRAWING NUMBER	AMEND.
36001-PE-000	B

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GENERAL

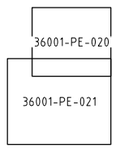
1. EXISTING SERVICES - External Works
   THE LOCATIONS OF ALL EXISTING SERVICES WITHIN THE WORK AREA SHALL BE CONFIRMED BY THE CONTRACTOR PRIOR TO CONSTRUCTION COMMENCING. IT IS THE CONTRACTOR'S RESPONSIBILITY TO CONTACT THE RELEVANT AUTHORITIES AND TO ENSURE THAT THE EXISTING SERVICES ARE NOT DAMAGED OR DISTURBED IN ANY WAY.
2. EXISTING STRUCTURES -
   ALL EXISTING STRUCTURES AND ASSOCIATED INFRASTRUCTURE TO BE REMOVED AND DISPOSED OF OFF SITE.
3. EXISTING DAMS -
   EXISTING DAMS TO BE DEWATERED. ALL SILT AND DEBRIS ARE TO BE REMOVED AND AND LAWFULLY DISPOSED OF. REPLACEMENT FILL IS TO BE LOCATED AND COMPACTED IN ACCORDANCE WITH LOCAL COUNCIL'S SPECIFICATIONS.

NOTE:
CONTRACTOR TO MAKE ALL NECESSARY ALLOWANCES FOR EXISTING SERVICES DURING BULK EARTHWORKS EXCAVATION.

LEGEND

- EXISTING PROPERTY LINE
- EXISTING FENCE
- EXISTING KERB
- EXISTING EDGE OF BITUMEN
- CONTROL LINE / CENTER OF ROAD
- EXISTING FOOTPATH
- EXISTING EDGE OF VEGETATION
- EXISTING RISING MAIN
- EXISTING SEWER
- EXISTING STORMWATER
- EXISTING WATER
- EXISTING GAS
- EXISTING UNDERGROUND ELECTRICITY
- EXISTING OVERHEAD ELECTRICITY
- EXISTING TELSTRA
- EXISTING COMMUNICATIONS
- EXISTING CONTOURS MAJOR
- EXISTING CONTOURS MINOR
- DEMOLISH RISING MAIN
- DEMOLISH SEWER
- DEMOLISH STORMWATER
- DEMOLISH WATER
- DEMOLISH GAS
- DEMOLISH UNDERGROUND ELECTRICITY
- DEMOLISH OVERHEAD ELECTRICITY
- DEMOLISH TELSTRA
- DEMOLISH COMMUNICATIONS
- SITE BOUNDARY
- STAGE BOUNDARY
- TREE PROTECTION FENCE
- TREES TO BE RETAINED
- TREES TO BE REMOVED

SHEET LAYOUT



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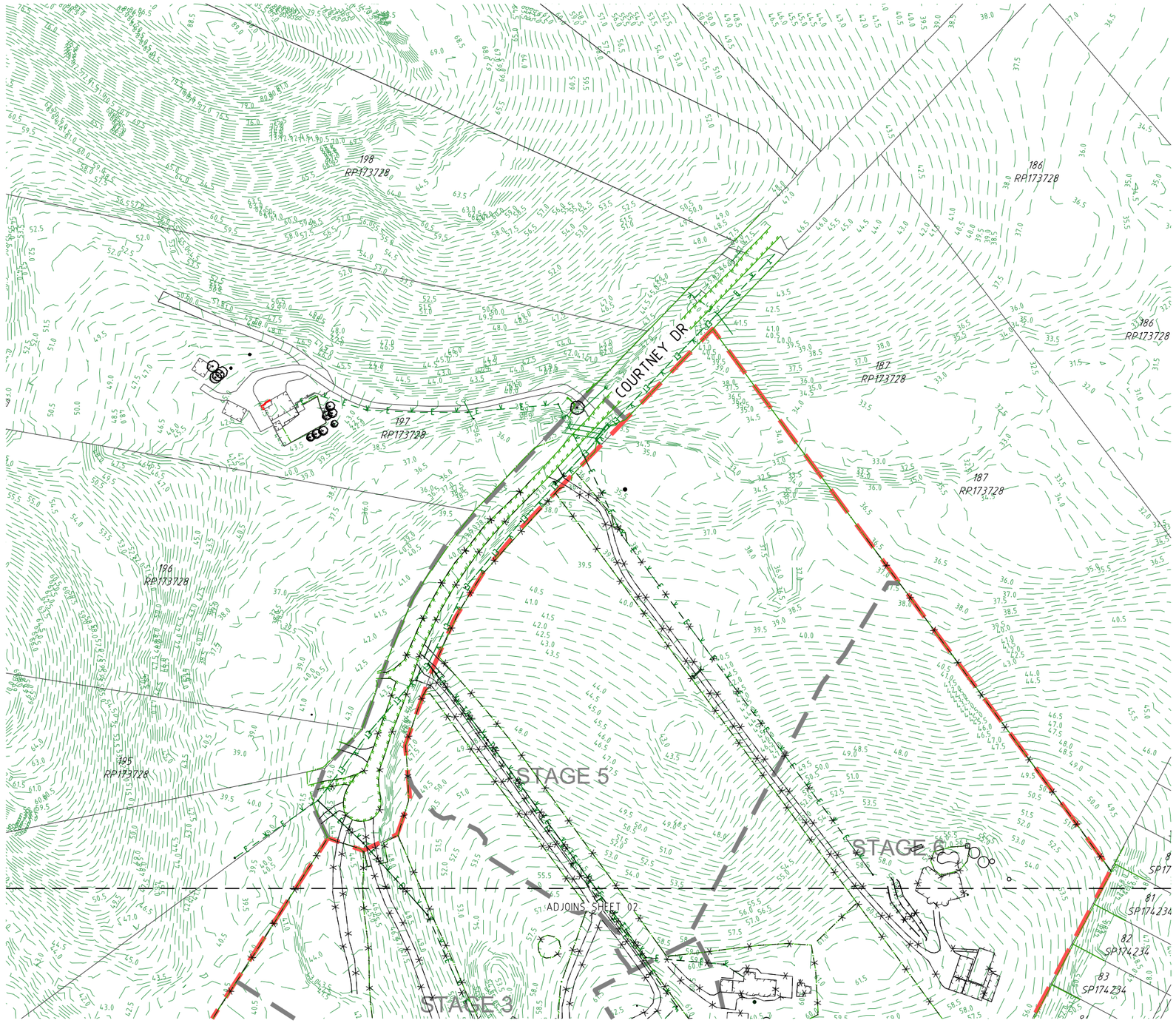

PROJECT NAME

COURTNEY DR UPPER COOMERA

PRELIMINARY EARTHWORKS

RP DESCRIPTION
LOT 188, 189, 190, 191 & 192 ON RP173728
COURTNEY DRIVE
LOCALITY OF UPPER COOMERA
LOCAL AUTHORITY - GOLD COAST CITY COUNCIL

CLIENT

GALLERY
THE ART OF LIVING

NORTH

0 10 20 30 40 50m
Scale 1:1000 - A1 (1:2000 - A3)

ISSUES	DATE	
TENDER		
COUNCIL	11-09-18	
CONSTRUCTION		

PRE	DATE	AMENDMENT
B	27-03-19	EXISTING FEATURES & STAGES AMENDED
A	11-09-18	COUNCIL ISSUE

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DRAWING TITLE

EXISTING FEATURES AND DEMOLITION PLAN SHEET 01

MORTONS urbansolutions
Urban & Regional Planning
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DESIGNED	RB	DRAWN	EP
APPROVED	RPEQ 4706	DATE	09-08-18

DRAWING NUMBER	AMEND.
36001-PE-020	B

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PROJECT NAME

COURTNEY DR UPPER COOMERA

PRELIMINARY EARTHWORKS

RP DESCRIPTION
LOT 188, 189, 190, 191 & 192 ON RP173728
COURTNEY DRIVE
LOCALITY OF UPPER COOMERA
LOCAL AUTHORITY - GOLD COAST CITY COUNCIL

CLIENT

GALLERY
THE ART OF LIVING

NORTH

0 10 20 30 40 50m
Scale 1:1000 - A1 (1:2000 - A3)

ISSUES	DATE	
TENDER		
COUNCIL	11-09-18	
CONSTRUCTION		

PRE	DATE	AMENDMENT
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A	11-09-18	COUNCIL ISSUE

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AND DEMOLITION
PLAN
SHEET 02

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urbansolutions
Urban & Regional Planning
Civil Engineering
Project Coordination

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DESIGNED	RB	DRAWN	EP
APPROVED		RPEQ 4706	DATE 09-08-18

DRAWING NUMBER	AMEND.
36001-PE-021	B

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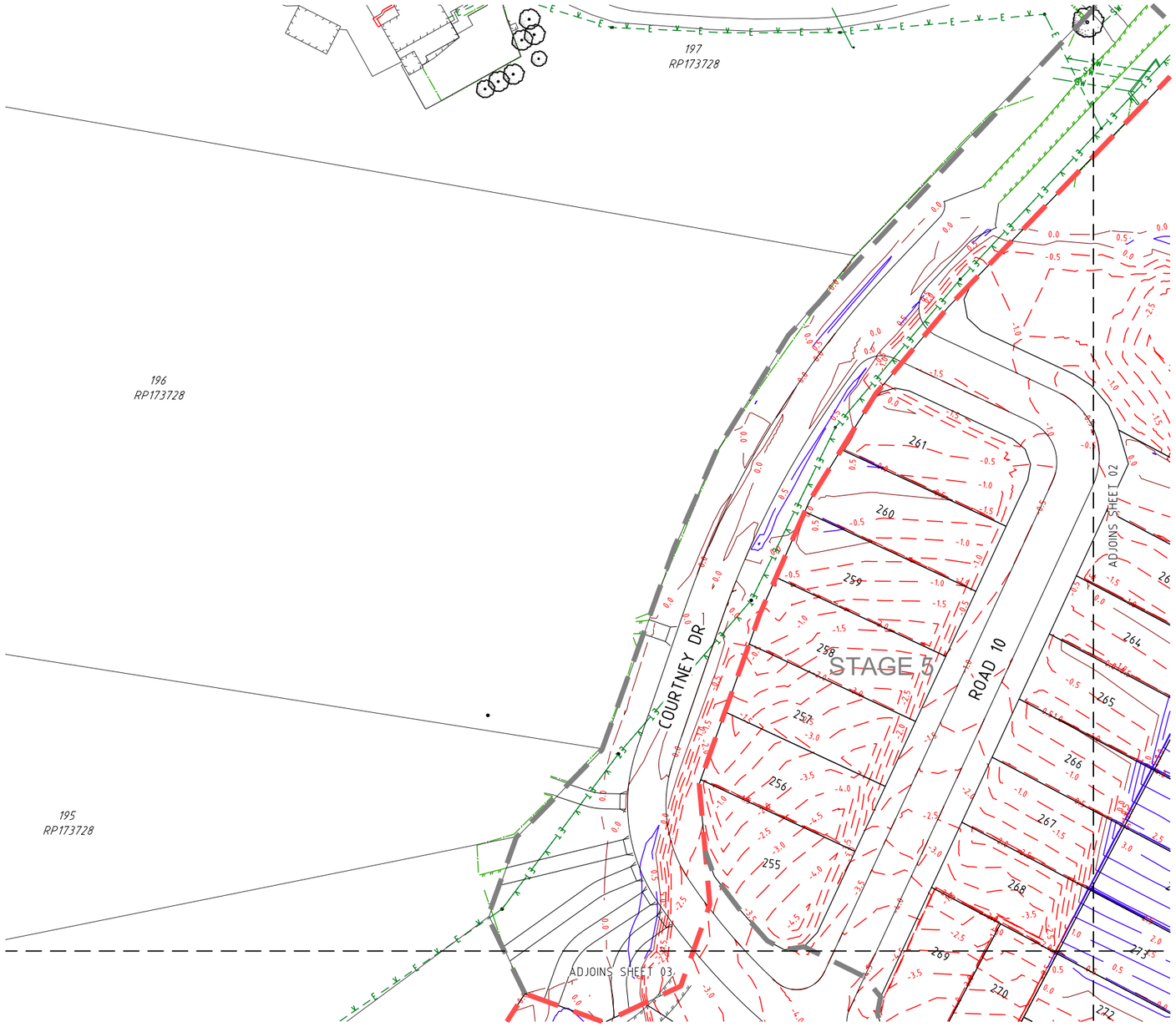
EARTHWORKS

1. TOPSOIL STRIPPING
   TOPSOIL SHALL BE STRIPPED ACROSS THE ENTIRE LIMIT OF THE EARTHWORKS CUT AND FILL AREAS AND SHALL BE STOCKPILED IN A LOCATION APPROVED BY THE SUPERINTENDENT. THE EXISTING STRATA IS TO BE TREATED IN ACCORDANCE WITH THE SPECIFICATION PRIOR TO PLACING ANY FILL.
2. EARTHWORKS LEVELS
   EARTHWORKS LEVELS SHOWN ON DRAWINGS ARE TO FINISHED SURFACE LEVELS AND INCLUDE 100mm OF TOPSOIL.
3. COMPACTION STANDARD
   SITE FILLING AND TRENCH BACKFILL SHALL BE COMPACTED TO THE STANDARDS OUTLINED IN THE LOCAL AUTHORITY'S SPECIFICATIONS.
4. PAVEMENT DEPTHS
   THE DESIGN PAVEMENT DEPTHS ALLOWED IN EARTHWORKS CALCULATIONS ARE BASED ON THE DEPTHS SHOWN IN THE SCHEDULE OF PAVEMENT DEPTHS. THE PAVEMENT DEPTHS GIVEN ARE DESIGN DEPTHS ONLY AND MAY BE VARIED AFTER SUB GRADE TESTS ARE TAKEN AND AUTHORITY APPROVAL.
5. TESTING AND CERTIFICATION
   ALL COMPACTION TESTING SHALL BE CARRIED OUT BY AN APPROVED N.A.T.A. TESTING AUTHORITY. ALL SITE FILLING SHALL BE TESTED AT LEVEL 1 REQUIREMENTS. THE CONTRACTOR IS TO PROVIDE ALL REQUIRED EARTHWORKS CERTIFICATIONS IN ACCORDANCE WITH THE APPROVAL CONDITIONS.
6. TOPSOIL REPLACEMENT
   ALL FOOTPATHS, BATTERS AND ALLOTMENT CUT & FILL AREAS SHALL BE TOPSOILED WITH TOPSOIL FROM ONSITE STOCKPILES.
7. GRASSING
   ALL CUT/FILL AREAS, DISTURBED AREAS AND TRENCHED AREAS SHALL BE GRASSED TO THE SATISFACTION OF THE SUPERINTENDENT AND AUTHORITY.
8. ROCK
   THE CONTRACTOR IS TO INCLUDE ROCK EXCAVATION AS PART OF THEIR EARTHWORKS RATE.
9. EARTHWORKS ZONE
   THE FOLLOWING ACTIVITIES ARE PROHIBITED OUTSIDE THE EARTHWORKS ZONE - STORAGE AND MIXING OF MATERIALS, VEHICLE PARKING, LIQUID DISPOSAL, MACHINERY REPAIRS/REFUELING, PLACEMENT OF SITE OFFICES OR SHEDS, COMBUSTION OF ANY MATERIAL, STOCKPILING OF SOIL, RUBBLE OR DEBRIS, ANY FILLING OR EXCAVATION INCLUDING TRENCHES, TOPSOIL, SKIMMING AND/OR SURFACE EXCAVATION UNLESS OTHERWISE APPROVED BY THE RELEVANT AUTHORITY.
10. CONSTRUCTION - STOCKPILING
    TEMPORARY SILT FENCE TO BE ERECTED 5m FROM TOE OF BATTER ON LOW SIDE OF STOCKPILING. STOCKPILE SITE TO BE CLEAR OF ADJACENT PROPERTY BOUNDARIES SO AS NOT TO CAUSE A NUISANCE TO ADJOINING PROPERTIES. NO STOCKPILES ARE TO BE LOCATED WITHIN THE TREE PROTECTION ZONE, REFER VEGETATION MANAGEMENT PLAN FOR MORE DETAILS. THE CONTRACTOR SHALL NOT CREATE STOCKPILES OF SURPLUS MATERIALS UNLESS DIRECTED BY THE SUPERINTENDENT. ALL MATERIALS ARISING FROM THE WORKS SHALL BE COMPACTED TO FUTURE FILL AREAS AS NOMINATED.
11. TOPSOIL SCREENING
    TOPSOIL SHALL BE SCREENED BY THE CONTRACTOR WHEN DIRECTED BY THE SUPERINTENDENT. ALL UNSUITABLE MATERIAL SCREENED FROM THE TOPSOIL WILL BE TAKEN TO AN OFFSITE TIP BY THE CONTRACTOR AT THE CONTRACTORS EXPENSE.

NOTE:
CONTRACTOR TO MAKE ALL NECESSARY ALLOWANCES FOR EXISTING SERVICES DURING ALL WORKS.

LEGEND

- EXISTING PROPERTY LINE
- EXISTING KERB (INVERT)
- FUTURE KERB (INVERT)
- FUTURE PROPERTY LINE
- SITE BOUNDARY
- STAGE BOUNDARY
- PROPOSED PROPERTY LINE
- PROPOSED KERB (INVERT)
- 0.5 BULK EARTHWORKS FILL CONTOUR
- 0.0 BULK EARTHWORKS INTERFACE CONTOUR
- -0.5 BULK EARTHWORKS CUT CONTOUR



STRUCTURAL EARTHWORKS VOLUMES	
CUT	-336,119m³
FILL	305,315m³

NOTES:
1. EARTHWORKS VOLUMES ARE APPROXIMATE ONLY, CONTRACTOR TO VERIFY.
2. VOLUMES INDICATE THE STRUCTURAL QUANTITY OF EARTHWORKS, IE BETWEEN THE EXISTING SURFACE STRIP SURFACE AND THE UNDERSIDE OF THE MINIMUM BOX AND UNDERSIDE OF THE TOPSOIL, AS PRESCRIBED IN THE CONTRACT DOCUMENTATION.
3. NO ALLOWANCE FOR COMPACTION OR BULKING FACTOR IS INCLUDED.
4. THE CONTRACTOR IS TO VERIFY EXISTING SURFACE AND TOPSOIL DISTRIBUTION PRIOR TO SIGNING THE CONTRACT.
5. THE CONTRACTOR IS REQUIRED TO EXPORT / IMPORT AS NEEDED TO ACHIEVE THE FINAL SURFACE LEVELS.

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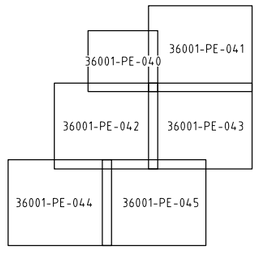
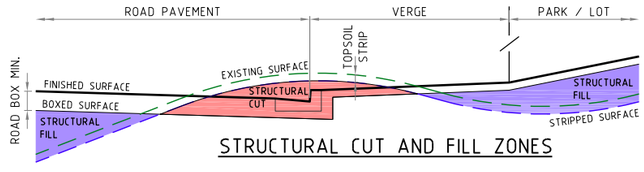
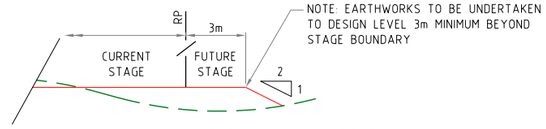
SHEET LAYOUT





STRUCTURAL CUT AND FILL ZONES



TEMPORARY BATTER BEYOND STAGE WORKS

PROJECT NAME

COURTNEY DR UPPER COOMERA

PRELIMINARY
EARTHWORKS

RP DESCRIPTION
LOT 188, 189, 190, 191 & 192 ON RP173728
COURTNEY DRIVE
LOCALITY OF UPPER COOMERA
LOCAL AUTHORITY - GOLD COAST CITY COUNCIL

CLIENT

GALLERY
THE ART OF LIVING

NORTH

0 5 10 15 20 25m
Scale 1:500 - A1 (1:1000 - A3)

ISSUES	DATE	
TENDER		
COUNCIL	11-09-18	
CONSTRUCTION		

PRE	DATE	AMENDMENT
B	27-03-19	LOT NO'S & STAGES AMENDED
A	11-09-18	COUNCIL ISSUE

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BIOME WATER AND ENVIRONMENTAL CONSULTING

zone Planning Group

DRAWING TITLE

EARTHWORKS
CUT TO FILL
PLAN
SHEET 01

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Project Coordination

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DESIGNED	RB	DRAWN	EP
APPROVED	RPEQ 4706	DATE	09-08-18

DRAWING NUMBER: 36001-PE-040
AMEND.: B

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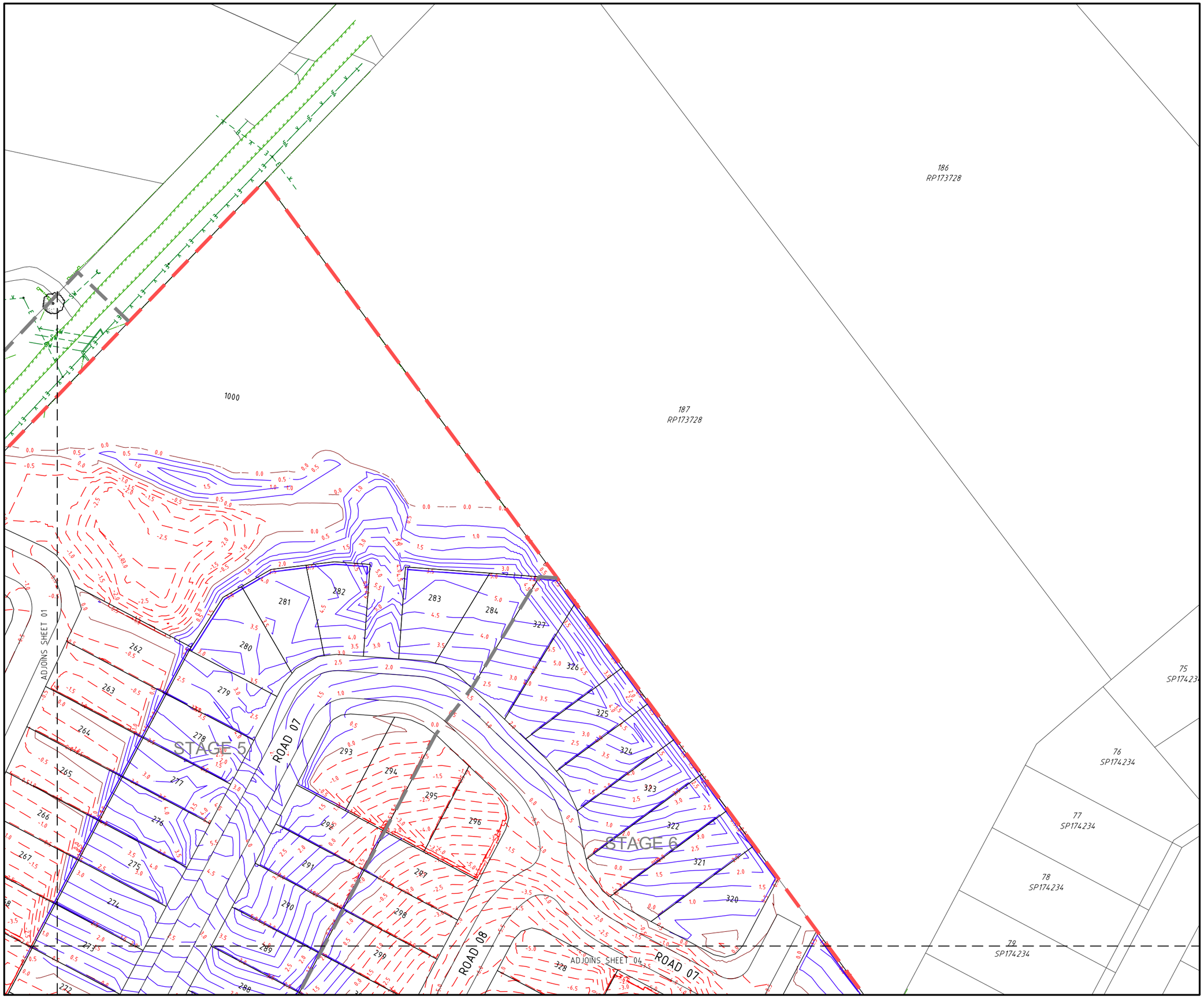

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PROJECT NAME

COURTNEY DR UPPER COOMERA

PRELIMINARY EARTHWORKS

RP DESCRIPTION
LOT 188, 189, 190, 191 & 192 ON RP173728
COURTNEY DRIVE
LOCALITY OF UPPER COOMERA
LOCAL AUTHORITY - GOLD COAST CITY COUNCIL

CLIENT

GALLERY
THE ART OF LIVING

NORTH

0 5 10 15 20 25m
Scale 1:500 - A1 (1:1000 - A3)

ISSUES	DATE	
TENDER		
COUNCIL	11-09-18	
CONSTRUCTION		

PRE	DATE	AMENDMENT
B	27-03-19	LOT NO'S & STAGES AMENDED
A	11-09-18	COUNCIL ISSUE

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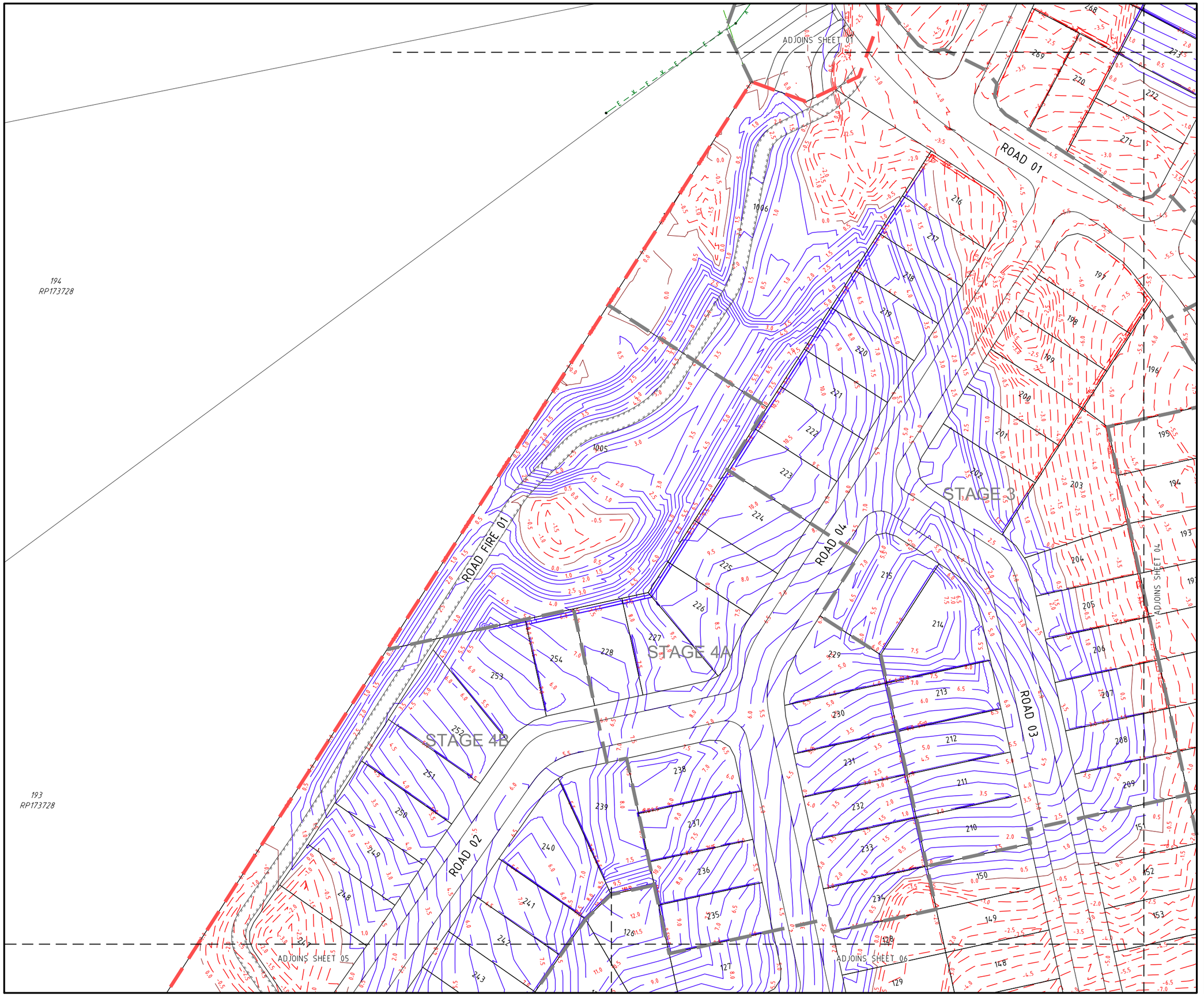
36001-PE-041	B



PROJECT NAME

COURTNEY DR UPPER COOMERA

PRELIMINARY EARTHWORKS

RP DESCRIPTION
LOT 188, 189, 190, 191 & 192 ON RP173728
COURTNEY DRIVE
LOCALITY OF UPPER COOMERA
LOCAL AUTHORITY - GOLD COAST CITY COUNCIL

CLIENT

GALLERY
THE ART OF LIVING

NORTH

0 5 10 15 20 25m
Scale 1:500 - A1 (1:1000 - A3)

ISSUES	DATE	
TENDER		
COUNCIL	11-09-18	
CONSTRUCTION		

PRE	DATE	AMENDMENT
A	27-03-19	LOTS, LOT NO'S & STAGES AMENDED
A	11-09-18	COUNCIL ISSUE

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DRAWING TITLE

EARTHWORKS
CUT TO FILL
PLAN
SHEET 03

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APPROVED	RPEQ 4706	DATE	09-08-18

DRAWING NUMBER	AMEND.
36001-PE-042	B

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ADJOINS SHEET 02

ADJOINS SHEET 03

ADJOINS SHEET 06

ROAD 07

ROAD 08

ROAD 06

ROAD 01

MACKELLAR DR

GORDON DR

STAGE 5

STAGE 6

STAGE 2

STAGE 1

PARK

79 SP174234

80 SP174234

81 SP174234

82 SP174234

83 SP174234

84 SP174234

85 SP174234

86 SP174234

87 SP174234

88 SP174234

89 SP174234

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91 SP174234

92 SP174234

93 SP174234

95 SP174234

96 SP174234

97 SP174234

PROJECT NAME

COURTNEY DR UPPER COOMERA

PRELIMINARY EARTHWORKS

RP DESCRIPTION
LOT 188, 189, 190, 191 & 192 ON RP173728
COURTNEY DRIVE
LOCALITY OF UPPER COOMERA
LOCAL AUTHORITY - GOLD COAST CITY COUNCIL

CLIENT

GALLERY
THE ART OF LIVING

NORTH

0 5 10 15 20 25m
Scale 1:500 - A1 (1:1000 - A3)

ISSUES	DATE	
TENDER		
COUNCIL	11-09-18	
CONSTRUCTION		

B	27-03-19	LOT NO'S & STAGES AMENDED
A	11-09-18	COUNCIL ISSUE
PRE	DATE	AMENDMENT

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APPROVED		RPEQ 4706	DATE 09-08-18

DRAWING NUMBER	AMEND.
36001-PE-043	B

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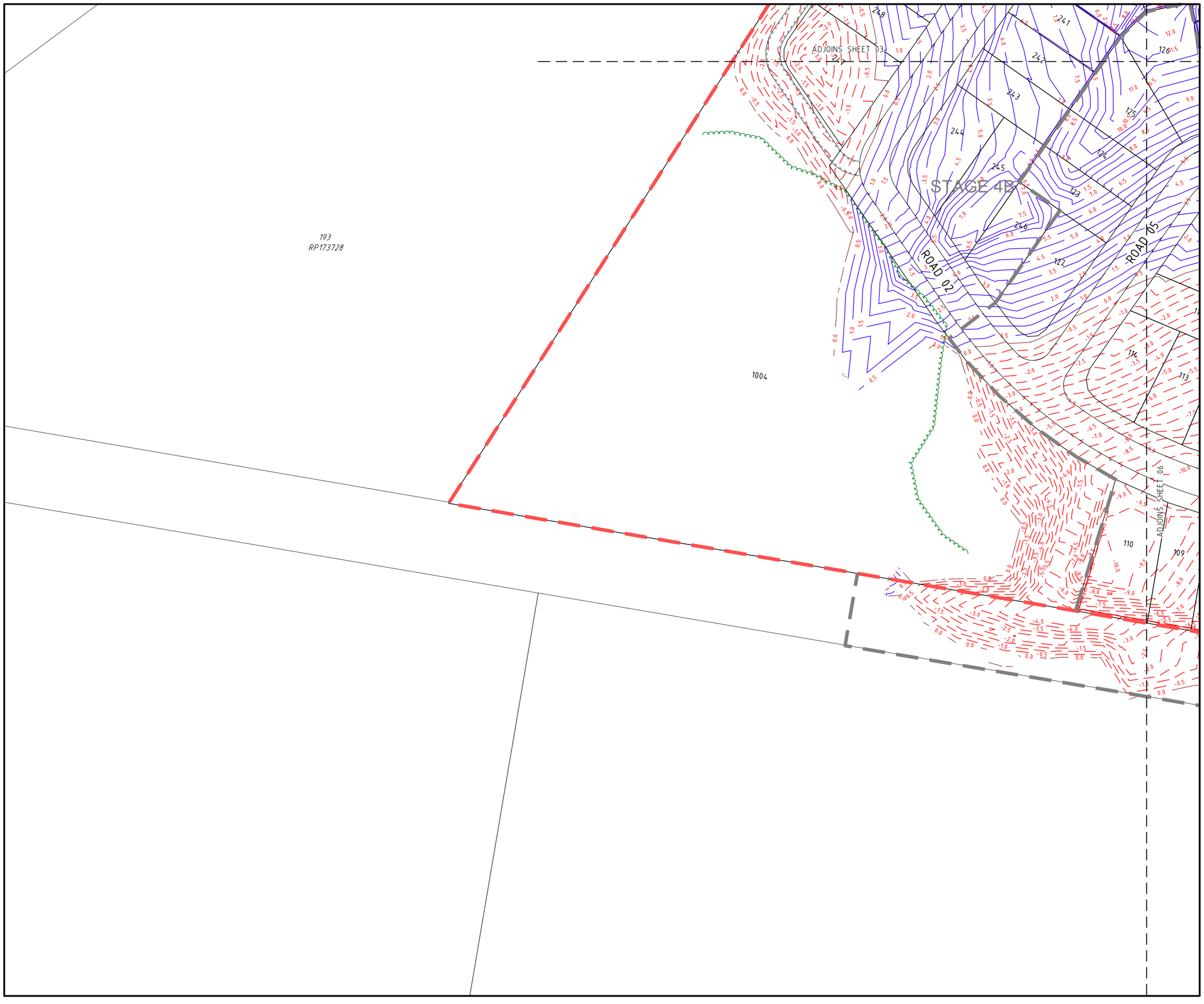

PROJECT NAME

COURTNEY DR UPPER COOMERA

PRELIMINARY EARTHWORKS

RP DESCRIPTION
LOT 188, 189, 190, 191 & 192 ON RP173728
COURTNEY DRIVE
LOCALITY OF UPPER COOMERA
LOCAL AUTHORITY - GOLD COAST CITY COUNCIL

CLIENT

GALLERY
THE ART OF LIVING

NORTH

0 5 10 15 20 25m
Scale 1:500 - A1 (1:1000 - A3)

ISSUES	DATE	
TENDER		
COUNCIL	11-09-18	
CONSTRUCTION		

B	27-03-19	LOTS, LOT NO'S & STAGES AMENDED
A	11-09-18	COUNCIL ISSUE
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SHEET 05

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36001-PE-044	B

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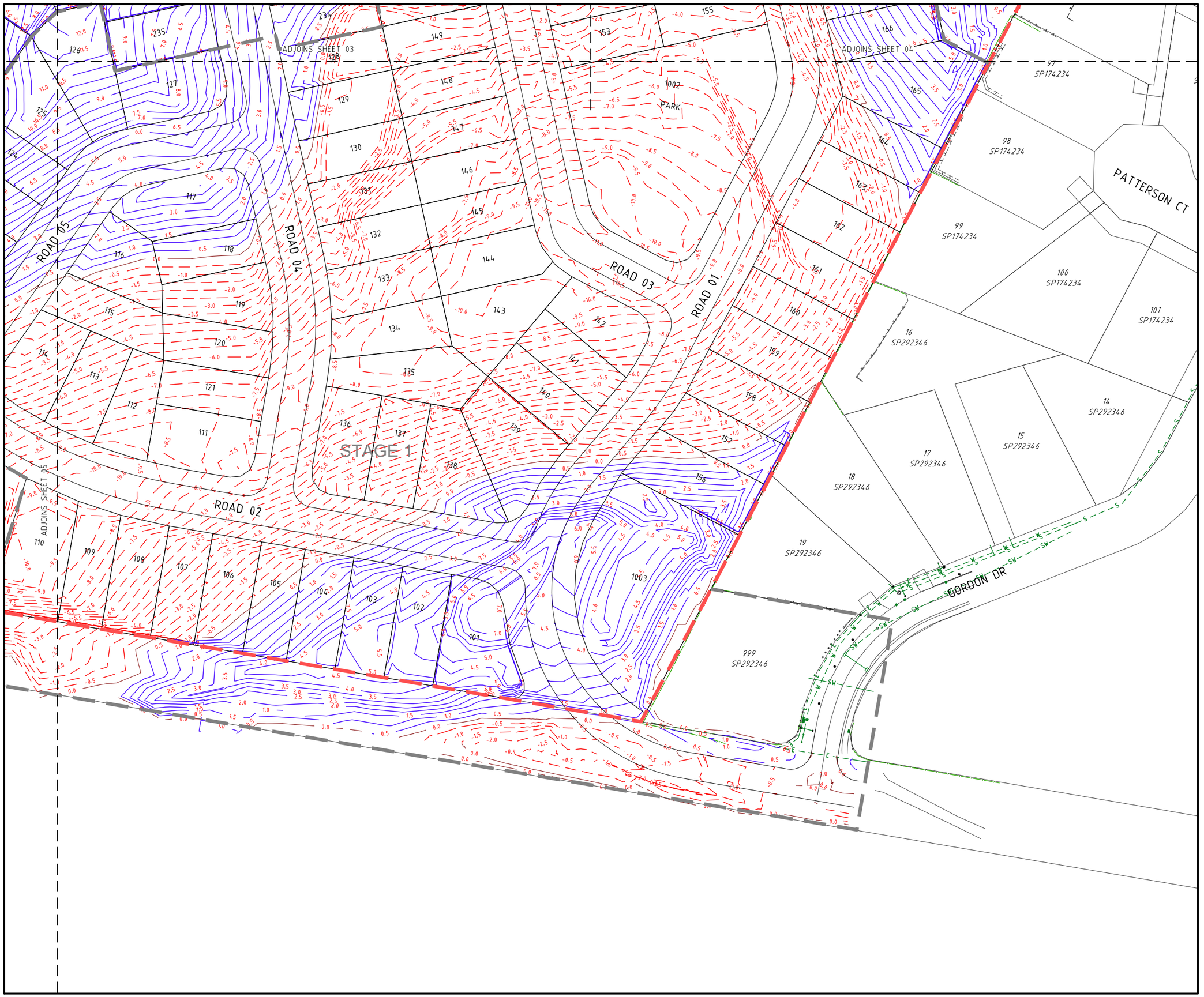

PROJECT NAME

COURTNEY DR UPPER COOMERA

PRELIMINARY EARTHWORKS

RP DESCRIPTION
LOT 188, 189, 190, 191 & 192 ON RP173728
COURTNEY DRIVE
LOCALITY OF UPPER COOMERA
LOCAL AUTHORITY - GOLD COAST CITY COUNCIL

CLIENT

GALLERY
THE ART OF LIVING

NORTH

0 5 10 15 20 25m
Scale 1:500 - A1 (1:1000 - A3)

ISSUES	DATE	
TENDER		
COUNCIL	11-09-18	
CONSTRUCTION		

PRE	DATE	AMENDMENT
B	27-03-19	LOT NO'S, STAGES & CONTOURS AMENDED
A	11-09-18	COUNCIL ISSUE

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DRAWING TITLE

EARTHWORKS
CUT TO FILL
PLAN
SHEET 06

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APPROVED	RPEQ 4706	DATE 09-08-18

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36001-PE-045	B

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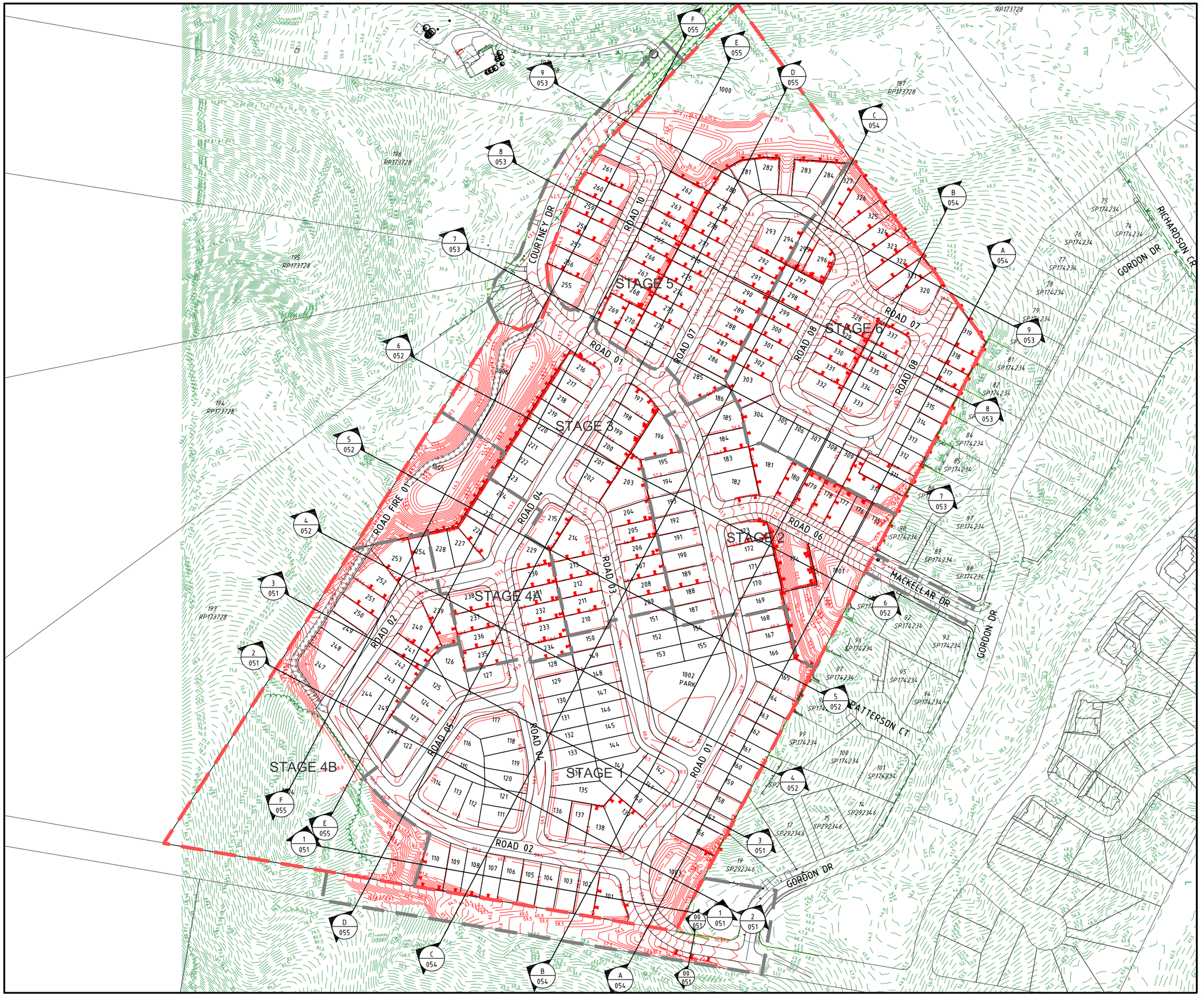

PROJECT NAME

COURTNEY DR UPPER COOMERA

PRELIMINARY EARTHWORKS

RP DESCRIPTION
LOT 188, 189, 190, 191 & 192 ON RP173728
COURTNEY DRIVE
LOCALITY OF UPPER COOMERA
LOCAL AUTHORITY - GOLD COAST CITY COUNCIL

CLIENT

GALLERY
THE ART OF LIVING

NORTH

0 12.5 25 37.5 50 62.5m
Scale 1:1250 - A1 (1:2500 - A3)

ISSUES	DATE	
TENDER		
COUNCIL	11-09-18	
CONSTRUCTION		

PRE	DATE	AMENDMENT
B	27-03-19	LOTS, LOT NO'S, STAGES, CONTOURS, SECTIONS AMENDED
A	11-09-18	COUNCIL ISSUE

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DRAWING TITLE

BULK EARTHWORKS
SECTIONS
KEY PLAN

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DRAWING NUMBER 36001-PE-050 | AMEND. B

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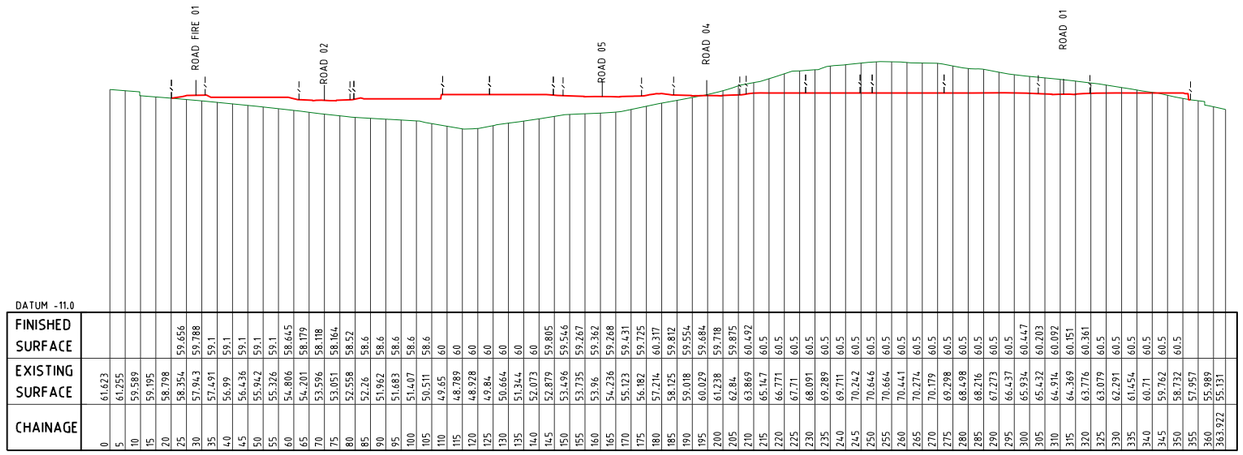
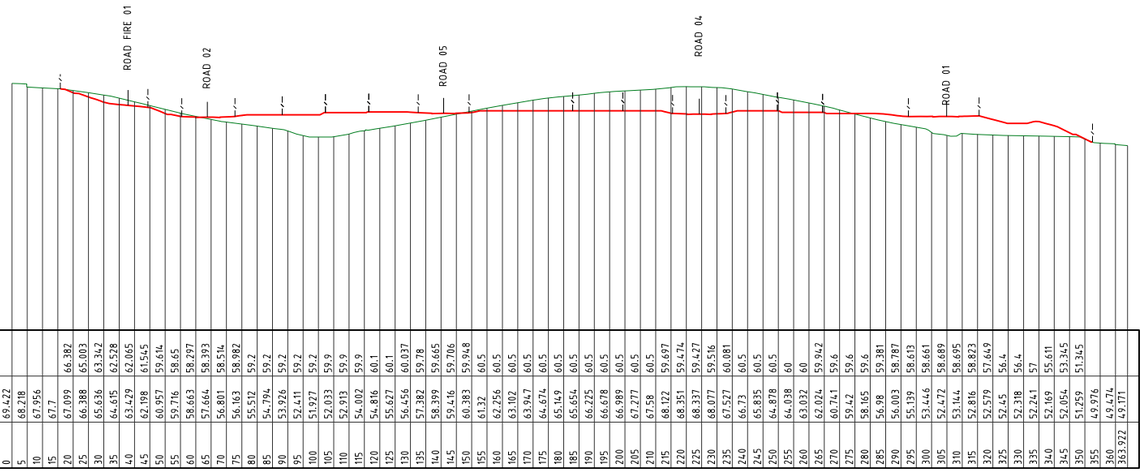


DATUM -11.0

CHAINAGE	FINISHED SURFACE	EXISTING SURFACE
0		61.623
5		61.255
10		59.589
15		59.195
20		58.798
25	59.656	58.354
30	59.788	57.943
35	59.1	57.491
40	59.1	56.99
45	59.1	56.436
50	59.1	55.942
55	59.1	55.326
60	58.645	54.806
65	58.179	54.201
70	58.118	53.596
75	58.164	53.051
80	58.52	52.558
85	58.6	52.26
90	58.6	51.962
95	58.6	51.683
100	58.6	51.407
105	58.6	50.511
110	60	49.65
115	60	48.789
120	60	48.928
125	60	49.84
130	60	50.664
135	60	51.344
140	60	52.073
145	59.805	52.879
150	59.546	53.496
155	59.287	53.735
160	59.362	53.96
165	59.268	54.236
170	59.431	55.123
175	59.725	56.182
180	60.317	57.214
185	59.812	58.125
190	59.554	59.018
195	59.684	60.029
200	59.718	61.238
205	59.875	62.84
210	60.492	63.869
215	60.5	65.147
220	60.5	66.771
225	60.5	67.71
230	60.5	68.091
235	60.5	69.289
240	60.5	69.711
245	60.5	70.242
250	60.5	70.646
255	60.5	70.664
260	60.5	70.441
265	60.5	70.274
270	60.5	70.179
275	60.5	69.298
280	60.5	68.498
285	60.5	68.216
290	60.5	67.273
295	60.5	66.437
300	60.447	65.934
305	60.203	65.432
310	60.092	64.914
315	60.151	64.369
320	60.361	63.776
325	60.5	63.079
330	60.5	62.291
335	60.5	61.454
340	60.5	60.71
345	60.5	59.762
350	60.5	58.732
355	60.5	57.957
360		55.989
363.922		55.131

SECTION 3 (050)
SCALE 1:1000
1:1000



DATUM -11.0

CHAINAGE	FINISHED SURFACE	EXISTING SURFACE
0		69.422
5		68.218
10		67.956
15		67.7
20	66.382	67.099
25	65.003	66.388
30	63.342	65.636
35	62.528	64.615
40	62.065	63.429
45	61.545	62.198
50	59.614	60.957
55	58.65	59.716
60	58.297	58.663
65	58.393	57.664
70	58.514	56.801
75	58.982	56.163
80	59.2	55.512
85	59.2	54.794
90	59.2	53.926
95	59.2	52.411
100	59.2	51.927
105	59.9	52.033
110	59.9	52.913
115	59.9	54.002
120	60.1	54.816
125	60.1	55.627
130	60.037	56.456
135	59.78	57.382
140	59.665	58.399
145	59.706	59.416
150	59.948	60.383
155	60.5	61.32
160	60.5	62.256
165	60.5	63.102
170	60.5	63.947
175	60.5	64.674
180	60.5	65.149
185	60.5	65.654
190	60.5	66.225
195	60.5	66.678
200	60.5	66.989
205	60.5	67.277
210	60.5	67.58
215	59.697	68.122
220	59.474	68.351
225	59.427	68.337
230	59.516	68.077
235	60.081	67.527
240	60.5	66.73
245	60.5	65.835
250	60.5	64.878
255	60	64.038
260	60	63.032
265	59.942	62.024
270	59.6	60.741
275	59.6	59.42
280	59.6	58.165
285	59.381	56.98
290	58.787	56.003
295	58.613	55.139
300	58.661	53.446
305	58.689	52.472
310	58.695	53.144
315	58.823	52.816
320	57.649	52.579
325	56.4	52.45
330	56.4	52.318
335	57	52.241
340	55.611	52.169
345	53.345	52.054
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355		49.976
360		49.474
363.922		49.171

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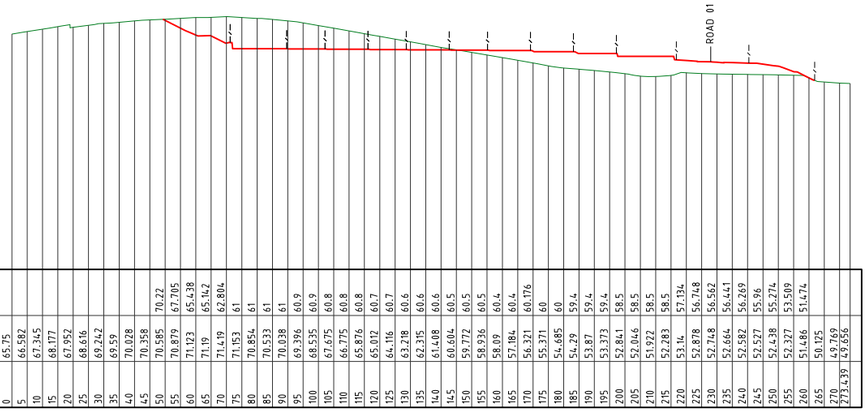

DATUM -11.0

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15		68.177
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25		68.616
30		69.242
35		69.59
40		70.028
45		70.358
50	70.22	70.585
55	67.705	70.879
60	65.438	71.123
65	65.142	71.19
70	62.804	71.419
75	61	71.153
80	61	70.854
85	61	70.533
90	61	70.038
95	60.9	69.396
100	60.9	68.535
105	60.8	67.675
110	60.8	66.775
115	60.8	65.876
120	60.7	65.012
125	60.7	64.116
130	60.6	63.218
135	60.6	62.315
140	60.6	61.408
145	60.5	60.604
150	60.5	59.772
155	60.5	58.936
160	60.4	58.09
165	60.4	57.184
170	60.176	56.321
175	60	55.371
180	60	54.685
185	59.4	54.29
190	59.4	53.87
195	59.4	53.373
200	58.5	52.841
205	58.5	52.046
210	58.5	51.922
215	58.5	52.283
220	57.134	53.14
225	56.748	52.748
230	56.562	52.664
235	56.441	52.582
240	56.269	52.527
245	55.96	52.438
250	55.274	52.327
255	53.509	51.486
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270		49.856
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SCALE 1:1000
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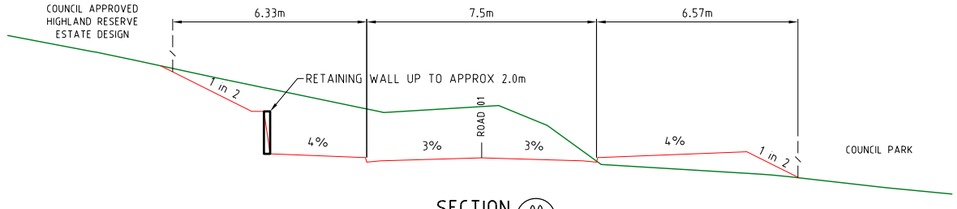

SECTION 00 (050)
SCALE 1:100
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PROJECT NAME

COURTNEY DR UPPER COOMERA

PRELIMINARY EARTHWORKS

RP DESCRIPTION
LOT 188, 189, 190, 191 & 192 ON RP173728
COURTNEY DRIVE
LOCALITY OF UPPER COOMERA
LOCAL AUTHORITY - GOLD COAST CITY COUNCIL

CLIENT

GALLERY
THE ART OF LIVING

0 10 20 30 40 50m
Scale 1:1000 - A1 (1:2000 - A3)

ISSUES	DATE	
TENDER		
COUNCIL	11-09-18	
CONSTRUCTION		

PRE	DATE	AMENDMENT
B	27-03-19	SECTION ADDED
A	11-09-18	COUNCIL ISSUE

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ASSOCIATED CONSULTANTS

BIOME WATER AND ENVIRONMENTAL CONSULTING

zone Planning Group

DRAWING TITLE

BULK EARTHWORKS
SECTIONS
SHEET 01

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Urban & Regional Planning
Civil Engineering
Project Coordination
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Southport QLD 4215

DESIGNED	RB	DRAWN	EP
APPROVED		RPEQ 4706	DATE 09-08-18

DRAWING NUMBER 36001-PE-051
AMEND. B

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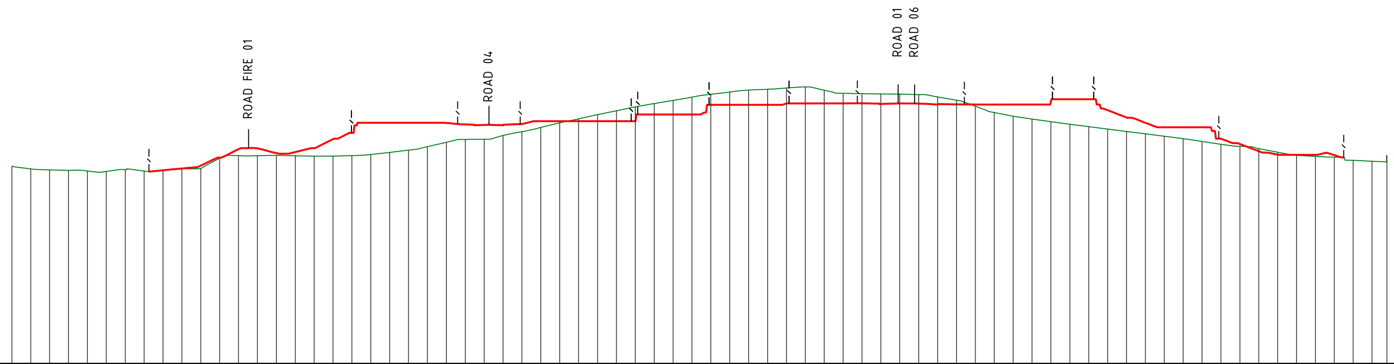

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35		39.928
40	40.138	40.103
45	40.605	40.503
50	41.37	40.552
55	43.5	43.299
60	45.692	43.98
65	45.925	43.969
70	44.69	44.066
75	44.942	43.986
80	46	43.878
85	48.367	43.917
90	50	44.019
95	52.7	44.295
100	52.7	44.86
105	52.7	45.441
110	52.7	46.357
115	52.643	47.536
120	52.265	48.297
125	52.12	48.345
130	52.018	49.351
135	52.369	50.345
140	53.1	51.43
145	53.1	52.677
150	53.1	53.718
155	53.1	54.822
160	53.1	55.863
165	53.1	56.898
170	54.9	57.759
175	54.9	58.6
180	54.9	59.467
185	57.4	60.223
190	57.4	60.82
195	57.4	61.33
200	57.4	61.539
205	57.778	61.863
210	57.8	62.152
215	57.8	61.285
220	57.8	60.476
225	57.82	60.377
230	57.636	60.295
235	57.815	60.248
240	57.756	60.143
245	57.497	59.503
250	57.563	58.635
255	57.5	57.041
260	57.5	55.396
265	57.5	54.434
270	57.5	53.697
275	58.396	52.988
280	58.9	52.26
285	58.9	51.704
290	56.003	51.042
295	54.093	50.361
300	52.682	49.77
305	51.5	49.127
310	51.5	48.478
315	51.5	47.743
320	48.489	47.018
325	47.078	46.454
330	45.167	45.85
335	44.278	44.904
340	44.2	44.101
345	44.2	43.798
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SECTION 6/050
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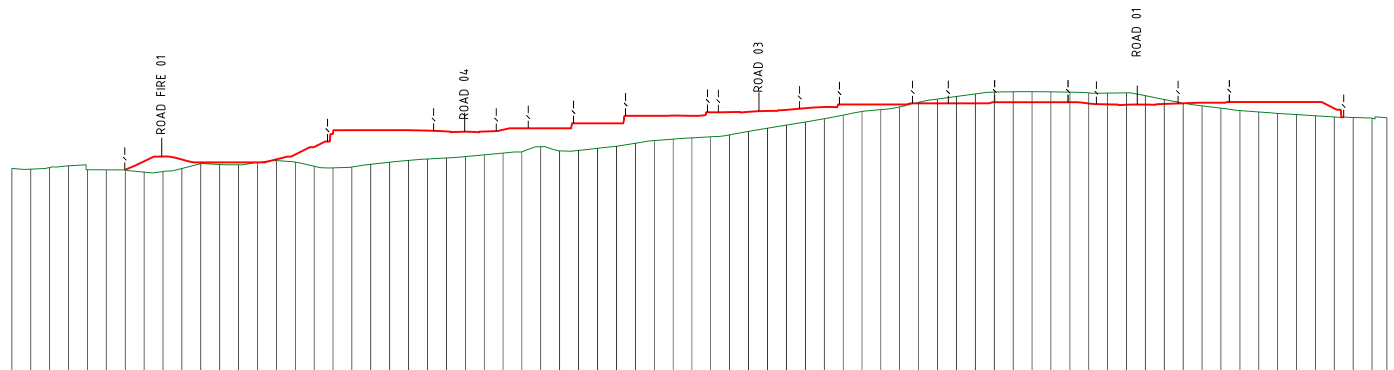

DATUM -11.0

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30	42.568	42.469
35	44.77	41.907
40	46	42.086
45	45.236	42.883
50	44.5	44.155
55	44.5	43.924
60	44.5	43.862
65	44.5	44.454
70	45.289	44.941
75	46.569	44.578
80	48.56	43.465
85	52.369	43.057
90	53	43.266
95	53	43.98
100	53	44.551
105	53	45.033
110	52.887	45.396
115	52.662	45.66
120	52.606	45.999
125	52.665	46.473
130	53.121	46.956
135	53.5	47.287
140	53.5	48.643
145	53.5	47.544
150	54.8	47.647
155	54.8	48.223
160	54.8	48.752
165	56.8	49.552
170	56.8	50.252
175	56.8	50.638
180	56.8	50.978
185	57.743	51.253
190	57.782	51.776
195	57.86	52.71
200	58.088	53.558
205	58.419	54.345
210	58.819	55.152
215	59.1	56.101
220	59.8	57.055
225	59.8	57.968
230	59.8	58.451
235	59.8	59.183
240	60.1	60.389
245	60.1	61.246
250	60.1	61.923
255	60.1	62.599
260	60.4	63.122
265	60.4	63.22
270	60.4	63.17
275	60.4	63.171
280	60.4	63.082
285	60.087	62.868
290	59.84	62.824
295	59.724	62.892
300	59.78	62.126
305	59.942	61.142
310	60.131	60.196
315	60.295	59.469
320	60.3	58.857
325	60.45	58.179
330	60.45	57.825
335	60.45	57.441
340	60.45	57.126
345	60.45	56.811
350	58.77	56.495
355		56.386
360		56.166
363.922		56.298

SECTION 5/050
SCALE: 1:1000
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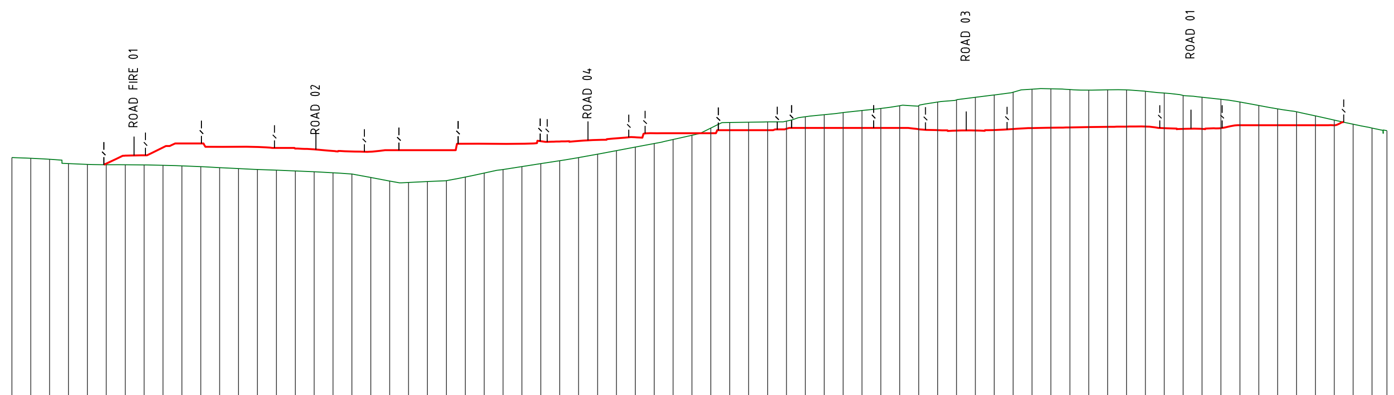

DATUM -11.0

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25	51.061	50.738
30	53.156	50.721
35	53.255	50.703
40	55.334	50.633
45	56.4	50.442
50	56.4	50.242
55	55.5	49.999
60	55.5	49.744
65	55.497	49.508
70	55.215	49.319
75	55.031	49.124
80	54.825	48.902
85	54.397	48.64
90	54.275	48.325
95	54.217	47.406
100	54.6	46.455
105	54.6	46.063
110	54.6	46.295
115	54.6	46.545
120	56.3	47.494
125	56.3	48.544
130	56.3	49.51
135	56.3	50.269
140	56.976	51.057
145	56.911	51.829
150	57.048	52.656
155	57.326	53.539
160	57.745	54.474
165	58.044	55.422
170	59.1	56.371
175	59.1	57.444
180	59.1	58.565
185	59.1	60.463
190	59.9	61.925
195	59.9	62.011
200	59.9	62.087
205	60.262	62.283
210	60.5	63.458
215	60.5	63.989
220	60.5	64.532
225	60.5	65.108
230	60.5	65.646
235	60.5	66.388
240	60.162	66.391
245	59.913	67.359
250	59.786	67.919
255	59.809	68.597
260	59.966	69.223
265	60.186	69.957
270	60.469	70.759
275	60.548	70.867
280	60.63	70.645
285	60.715	70.494
290	60.799	70.565
295	60.857	70.547
300	60.897	70.209
305	60.448	69.73
310	60.248	69.082
315	60.222	68.626
320	60.482	68.071
325	61.2	67.343
330	61.2	66.444
335	61.2	65.548
340	61.2	64.754
345	61.2	63.661
350	61.2	62.56
355		61.51
360		60.469
363.922		59.773

SECTION 4/050
SCALE: 1:1000
1:1000

PROJECT NAME

COURTNEY DR UPPER COOMERA

PRELIMINARY EARTHWORKS

RP DESCRIPTION
LOT 188, 189, 190, 191 & 192 ON RP173728
COURTNEY DRIVE
LOCALITY OF UPPER COOMERA
LOCAL AUTHORITY - GOLD COAST CITY COUNCIL

CLIENT
GALLERY
THE ART OF LIVING

0 10 20 30 40 50m
Scale 1:1000 - A1 (1:2000 - A3)

ISSUES	DATE	
TENDER		
COUNCIL	11-09-18	
CONSTRUCTION		

PRE	DATE	AMENDMENT
A	11-09-18	COUNCIL ISSUE

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ASSOCIATED CONSULTANTS
BIOME WATER AND ENVIRONMENTAL CONSULTING
zone Planning Group

DRAWING TITLE

BULK EARTHWORKS SECTIONS SHEET 02

MORTONS urbansolutions
Urban & Regional Planning
Civil Engineering
Project Coordination
MUS Pty Ltd T/As:
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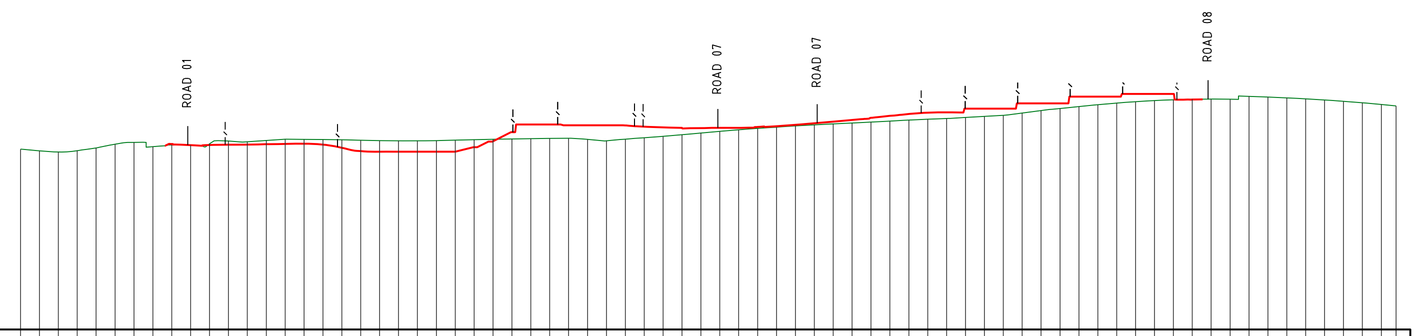
Southport QLD 4215

DESIGNED RB | DRAWN EP
APPROVED | RPEQ 4706 | DATE 09-08-18

DRAWING NUMBER 36001-PE-052 | AMEND. A



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25		37.992
30		38.483
35		37.358
40	38.057	37.807
45	37.742	37.769
50	37.77	38.087
55	37.888	38.857
60	37.887	38.64
65	37.995	38.971
70	38.046	39.303
75	38.08	39.285
80	37.847	39.229
85	37.033	39.172
90	36.175	39.067
95	36	38.938
100	36	38.927
105	36	38.857
110	36	38.944
115	36.002	39.064
120	37.2	39.183
125	38.788	39.29
130	41.2	39.385
135	43.2	39.476
140	43.2	39.513
145	43	39.558
150	43	39.273
155	43	38.902
160	42.958	39.335
165	42.614	39.709
170	42.446	40.088
175	42.323	40.488
180	42.257	40.965
185	42.33	41.43
190	42.324	41.789
195	42.568	42.147
200	42.763	42.505
205	43.114	42.828
210	43.538	43.125
215	43.964	43.389
220	44.404	43.591
225	44.972	43.855
230	45.497	44.118
235	45.958	44.382
240	46.389	44.591
245	46.4	44.815
250	47.4	45.079
255	47.4	45.355
260	47.4	45.637
265	48.8	46.23
270	48.8	46.89
275	48.8	47.445
280	50.6	47.952
285	50.6	48.437
290	50.6	48.867
295	51.3	49.248
300	51.3	49.536
305	51.3	49.771
310	49.796	49.871
315		49.953
320		49.885
325		50.665
330		50.485
335		50.285
340		49.97
345		49.661
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SECTION 9/050
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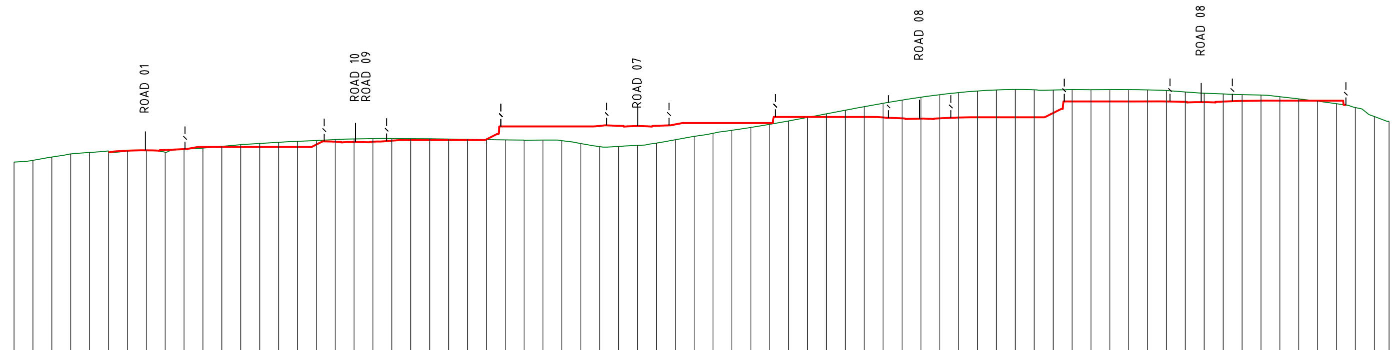

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30	41.959	41.884
35	42.097	42.069
40	42.177	41.597
45	42.385	42.385
50	43	42.706
55	43	43.154
60	43	43.6
65	43	43.898
70	43	44.199
75	43	44.467
80	43.621	44.695
85	44.356	44.922
90	44.302	45.083
95	44.378	45.165
100	44.64	45.195
105	44.8	45.176
110	44.8	45.147
115	44.8	45.065
120	44.8	44.996
125	44.976	44.926
130	48.4	44.854
135	48.4	44.776
140	48.4	44.784
145	48.4	44.615
150	48.4	43.876
155	48.549	43.058
160	48.557	43.119
165	48.495	43.38
170	48.549	44.009
175	48.957	44.888
180	49.3	45.773
185	49.3	46.6
190	49.3	47.419
195	49.3	48.168
200	49.3	49.009
205	50.9	49.899
210	50.9	50.789
215	50.9	51.686
220	50.9	52.667
225	50.9	53.647
230	50.75	54.525
235	50.521	55.348
240	50.469	56.114
245	50.546	56.79
250	50.742	57.378
255	50.8	57.773
260	50.8	58.011
265	50.8	58.158
270	50.8	58.104
275	51.934	58.034
280	55	58.143
285	55	58.106
290	55	58.125
295	55	58.123
300	55	58.034
305	55.047	57.875
310	54.877	57.501
315	54.83	57.173
320	54.942	56.979
325	55.164	56.803
330	55.2	56.683
335	55.2	56.241
340	55.2	55.663
345	55.2	55.085
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SECTION 8/050
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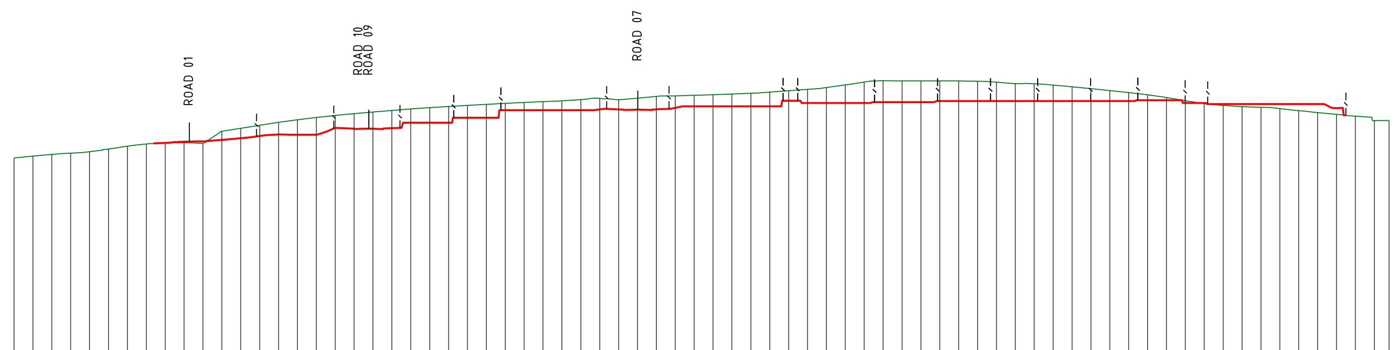

DATUM -11.0

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45	44.662	44.354
50	44.728	44.202
55	45.148	47.453
60	45.582	48.216
65	46.161	49.01
70	46.575	49.796
75	46.5	50.429
80	46.5	51.013
85	48.283	51.589
90	48.134	52.092
95	48.097	52.49
100	48.237	52.914
105	49.7	53.334
110	49.7	53.673
115	49.7	54.004
120	51	54.258
125	51	54.503
130	53	54.772
135	53	55.068
140	53	55.288
145	53	55.462
150	53	55.8
155	53.192	56.111
160	53.215	55.749
165	53.153	56.165
170	53.207	56.647
175	53.619	56.769
180	54	56.928
185	54	57.088
190	54	57.27
195	54	57.451
200	54	57.773
205	55.5	58.138
210	54.9	58.504
215	54.9	58.965
220	54.9	59.667
225	54.9	60.441
230	55.1	60.76
235	55.1	60.75
240	55.1	60.75
245	55.4	60.75
250	55.4	60.734
255	55.4	60.628
260	55.4	60.382
265	55.4	60.02
270	55.4	59.964
275	55.4	59.618
280	55.4	59.161
285	55.4	58.671
290	55.4	58.151
295	55.4	57.599
300	55.6	57.047
305	55.6	56.272
310	54.893	55.507
315	54.893	54.778
320	54.6	54.258
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345	54.6	52.356
350	53.54	51.904
355		51.402
360		50.242
363.922		50.277

SECTION 7/050
SCALE: 1:1000
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PROJECT NAME

COURTNEY DR
UPPER COOMERA

PRELIMINARY
EARTHWORKS

RP DESCRIPTION
LOT 188, 189, 190, 191 & 192 ON RP173728
COURTNEY DRIVE
LOCALITY OF UPPER COOMERA
LOCAL AUTHORITY - GOLD COAST CITY COUNCIL

CLIENT

GALLERY
THE ART OF LIVING

0 10 20 30 40 50m
Scale 1:1000 - A1 (1:2000 - A3)

ISSUES	DATE	
TENDER		
COUNCIL	11-09-18	
CONSTRUCTION		

PRE	DATE	AMENDMENT
A	11-09-18	COUNCIL ISSUE

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ASSOCIATED CONSULTANTS

BIOME WATER AND ENVIRONMENTAL CONSULTING

zone Planning Group

DRAWING TITLE

BULK EARTHWORKS
SECTIONS
SHEET 03

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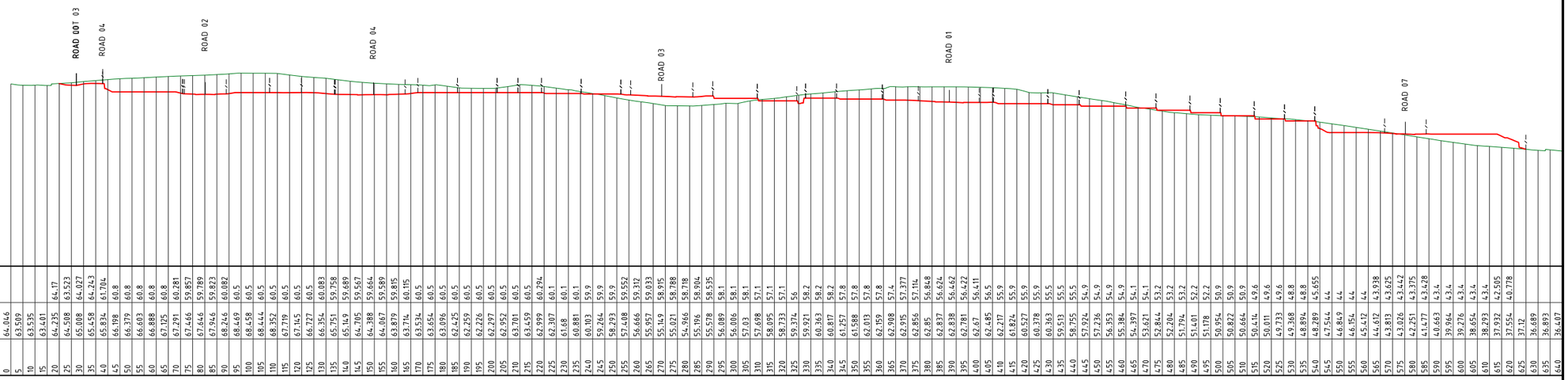
DESIGNED RB		DRAWN EP	
APPROVED (signature)		RPEQ 4706	DATE 09-08-18
DRAWING NUMBER 36001-PE-053			AMEND. A



DATUM -11.0

CHAINAGE	FINISHED SURFACE	EXISTING SURFACE
0		64.046
5		63.509
10		63.535
15		63.401
20	64.235	64.508
25	64.027	65.008
30	64.243	65.458
35	61.704	65.834
40	60.8	66.198
45	60.8	66.379
50	60.8	66.603
55	60.8	66.888
60	60.8	67.195
65	60.8	67.291
70	60.281	67.466
75	59.957	67.646
80	59.789	67.946
85	59.823	68.246
90	60.082	68.469
95	60.5	68.458
100	60.5	68.444
105	60.5	68.352
110	60.5	67.779
115	60.5	67.145
120	60.5	66.727
125	60.5	66.354
130	60.083	65.751
135	59.758	65.149
140	59.689	64.705
145	59.567	64.388
150	59.664	64.067
155	59.589	63.879
160	59.815	63.774
165	60.115	63.534
170	60.5	63.654
175	60.5	63.096
180	60.5	62.425
185	60.5	62.259
190	60.5	62.226
195	60.5	62.297
200	60.5	62.952
205	60.5	63.701
210	60.5	63.459
215	60.5	62.999
220	60.294	62.307
225	60.1	61.68
230	60.1	60.881
235	60.1	60.103
240	59.9	59.264
245	59.9	58.293
250	59.9	57.408
255	59.552	56.666
260	59.312	55.957
265	59.033	55.149
270	58.915	55.021
275	58.788	54.966
280	58.718	55.196
285	58.704	56.089
290	58.535	55.578
295	58.1	56.006
300	58.1	57.03
305	58.1	57.698
310	57.1	58.095
315	57.1	58.733
320	57.1	59.374
325	56	59.921
330	58.2	60.363
335	58.2	60.817
340	58.2	61.257
345	57.8	61.588
350	57.8	62.013
355	57.8	62.159
360	57.8	62.908
365	57.4	62.915
370	57.377	62.856
375	57.114	62.885
380	56.848	62.837
385	56.624	62.838
390	56.462	62.781
395	56.422	62.67
400	56.411	62.485
405	56.5	62.217
410	55.9	61.824
415	55.9	60.527
420	55.9	60.378
425	55.9	60.363
430	55.5	59.519
435	55.5	58.755
440	55.5	57.924
445	54.9	57.236
450	54.9	56.353
455	54.9	55.384
460	54.9	54.397
465	54.1	53.621
470	54.1	52.844
475	53.2	52.204
480	53.2	51.794
485	53.2	51.401
490	52.2	51.178
495	52.2	50.954
500	50.9	50.822
505	50.9	50.664
510	50.9	50.414
515	49.6	50.011
520	49.6	49.733
525	49.6	49.368
530	48.8	48.894
535	48.8	48.289
540	45.855	47.544
545	44	46.849
550	44	46.154
555	44	45.412
560	44	44.612
565	43.938	43.813
570	43.625	43.026
575	43.442	42.251
580	43.375	41.477
585	43.428	40.663
590	43.4	39.964
595	43.4	39.276
600	43.4	38.654
605	43.4	38.293
610	43.4	37.932
615	42.595	37.554
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625		36.689
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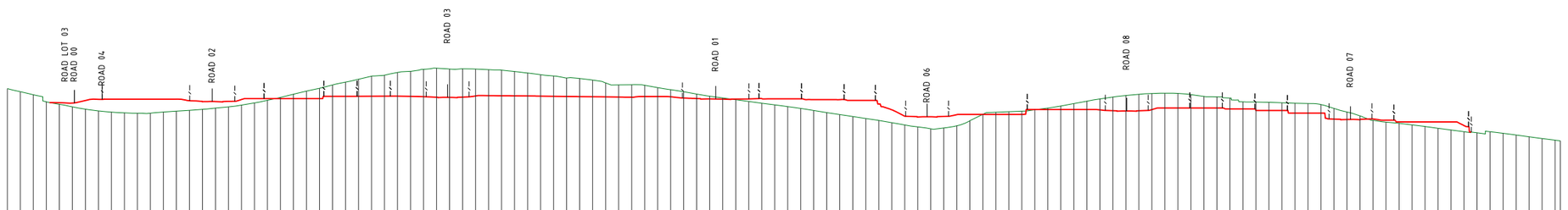
635		36.407
640		

SECTION C
SCALE 1:1000
1:1000
050



DATUM -11.0

CHAINAGE	FINISHED SURFACE	EXISTING SURFACE
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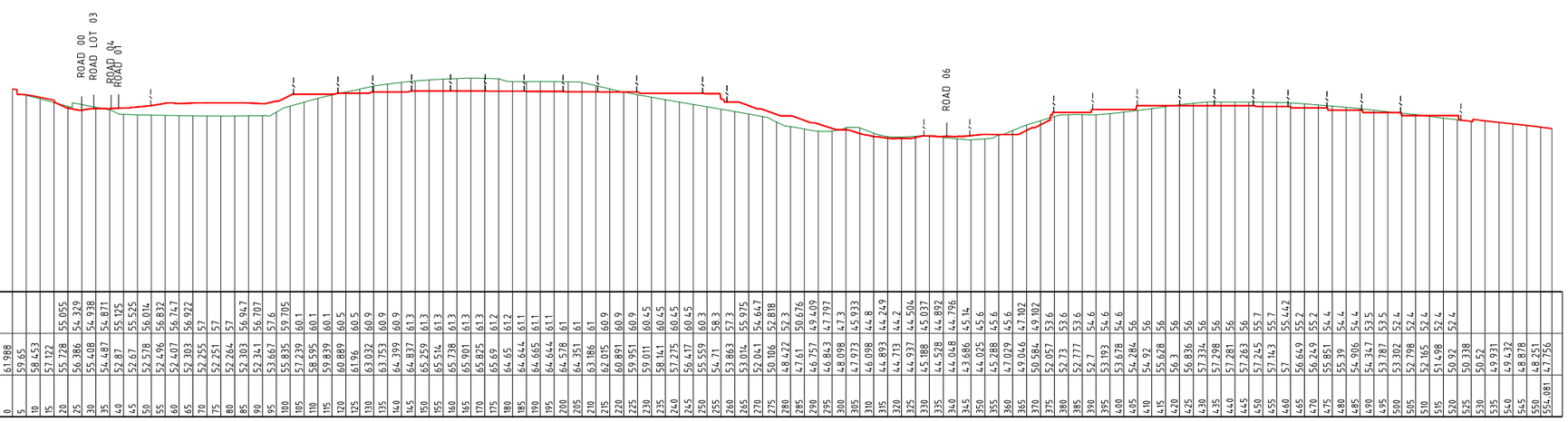
25	54.329	56.386
30	54.938	55.408
35	54.871	54.487
40	55.125	52.87
45	55.525	52.67
50	56.014	52.578
55	56.832	52.496
60	56.747	52.407
65	56.922	52.303
70	57	52.255
75	57	52.251
80	57	52.264
85	56.947	52.303
90	56.707	52.341
95	57.6	53.667
100	59.705	55.835
105	60.1	57.239
110	60.1	58.595
115	60.1	59.839
120	60.5	60.889
125	60.5	61.96
130	60.9	63.032
135	60.9	63.753
140	60.9	64.399
145	61.3	64.837
150	61.3	65.259
155	61.3	65.514
160	61.3	65.738
165	61.3	65.901
170	61.3	65.825
175	61.2	65.69
180	61.2	64.65
185	61.1	64.644
190	61.1	64.665
195	61.1	64.644
200	61	64.578
205	61	64.351
210	61	63.186
215	60.9	62.015
220	60.9	60.891
225	60.9	59.951
230	60.45	59.011
235	60.45	58.141
240	60.45	57.275
245	60.45	56.417
250	60.3	55.559
255	58.3	54.71
260	57.3	53.863
265	55.975	53.014
270	54.647	52.041
275	52.818	50.106
280	52.3	48.422
285	50.676	47.61
290	49.409	46.757
295	47.797	46.843
300	47.3	48.098
305	45.933	47.973
310	44.8	46.098
315	44.249	44.893
320	44.2	44.713
325	44.504	44.937
330	45.037	45.188
335	44.892	44.528
340	44.796	44.048
345	45.14	43.686
350	45.6	44.025
355	45.6	45.288
360	45.6	47.029
365	47.102	49.046
370	49.102	50.584
375	53.6	52.057
380	53.6	52.23
385	53.6	52.177
390	54.6	52.7
395	54.6	53.193
400	54.6	53.678
405	56	54.284
410	56	54.92
415	56	55.628
420	56	56.3
425	56	56.836
430	56	57.334
435	56	57.298
440	56	57.281
445	56	57.263
450	55.7	57.245
455	55.7	57.143
460	55.442	57
465	55.2	56.849
470	55.2	56.249
475	54.4	55.851
480	54.4	55.39
485	54.4	54.906
490	53.5	54.347
495	53.5	53.787
500	52.4	53.302
505	52.4	52.798
510	52.4	52.165
515	52.4	51.498
520	52.4	50.92
525		50.338
530		50.52
535		49.931
540		49.432
545		48.878
550		48.251
554.081		47.756

SECTION B
SCALE 1:1000
1:1000
050



DATUM -11.0

CHAINAGE	FINISHED SURFACE	EXISTING SURFACE
0		63.427
5		62.226
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15		58.355
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25	57.919	56.422
30	58.862	55.543
35	59.332	54.841
40	59.4	54.409
45	59.4	54.073
50	59.4	53.998
55	59.4	53.996
60	59.4	54.431
65	59.4	54.746
70	58.793	55.097
75	58.438	55.555
80	58.452	55.944
85	58.518	56.429
90	59.236	57.087
95	59.6	57.943
100	59.6	58.949
105	59.6	60.065
110	59.6	61.275
115	59.6	62.494
120	59.6	63.584
125	60.5	64.855
130	60.5	65.934
135	60.5	67.038
140	60.5	68.231
145	60.5	68.623
150	60.5	69.651
155	60.5	70.084
160	60.341	70.864
165	60.125	71.308
170	60.078	70.986
175	60.185	71.052
180	60.619	70.971
185	60.742	70.741
190	60.703	70.541
195	60.664	70.033
200	60.621	69.447
205	60.56	68.808
210	60.487	68.299
215	60.414	67.542
220	60.367	67.354
225	60.332	66.731
230	60.259	65.656
235	60.186	64.897
240	60.123	64.947
245	60.4	64.718
250	60.4	63.844
255	60.307	63.058
260	59.812	62.226
265	59.621	61.347
270	59.465	60.504
275	59.388	59.833
280	59.419	59.161
285	59.47	58.533
290	59.576	57.806
295	59.5	57.175
300	59.5	56.514
305	59.5	55.806
310	59.2	55.014
315	59.2	54.229
320	59.2	53.463
325	58.9	52.698
330	58.9	51.948
335	57.5	51.191
340	55.292	50.327
345	52.83	49.482
350	52.507	48.697
355	52.589	47.962
360	52.743	48.278
365	53.472	49.182
370	53.5	51.069
375	53.5	53.545
380	53.5	54.343
385	53.5	54.551
390	53.5	54.759
395	55.4	55.285
400	55.4	55.932
405	55.4	56.741
410	55.4	57.676
415	55.4	58.619
420	55.254	59.469
425	54.94	60.208
430	54.861	60.783
435	54.913	61.239
440	55.376	61.543
445	56	61.668
450	56	61.568
455	56	61.12
460	56	60.438
465	55.6	60.276
470	55.6	59.809
475	55.6	58.336
480	55	58.264
485	55	58.132
490	55	58.002
495	54	57.829
500	54	57.695
505	54	57.32
510	51.718	55.826
515	51.569	54.431
520	51.478	52.951
525	51.808	51.196
530	50.6	50.546
535	50.6	50.106
540	50.6	49.548
545	50.6	48.853
550	50.6	48.182
555	50.6	47.511
560	49.278	46.84
565		46.416
570		46.841
575		46.246
580		45.581
585		44.913
590		44.218
597.051		43.302

SECTION A
SCALE 1:1000
1:1000
050

PROJECT NAME

COURTNEY DR UPPER COOMERA

PRELIMINARY EARTHWORKS

RP DESCRIPTION
LOT 188, 189, 190, 191 & 192 ON RP173728
COURTNEY DRIVE
LOCALITY OF UPPER COOMERA
LOCAL AUTHORITY - GOLD COAST CITY COUNCIL

CLIENT

GALLERY
THE ART OF LIVING

0 10 20 30 40 50m
Scale 1:1000 - A1 (1:2000 - A3)

ISSUES	DATE	
TENDER		
COUNCIL	11-09-18	
CONSTRUCTION		

PRE	DATE	AMENDMENT
B	27-03-19	SECTION A AMENDED
A	11-09-18	COUNCIL ISSUE

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ASSOCIATED CONSULTANTS

BIOME WATER AND ENVIRONMENTAL CONSULTING

zone Planning Group

DRAWING TITLE

BULK EARTHWORKS
SECTIONS
SHEET 04

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Urban & Regional Planning
Civil Engineering
Project Coordination

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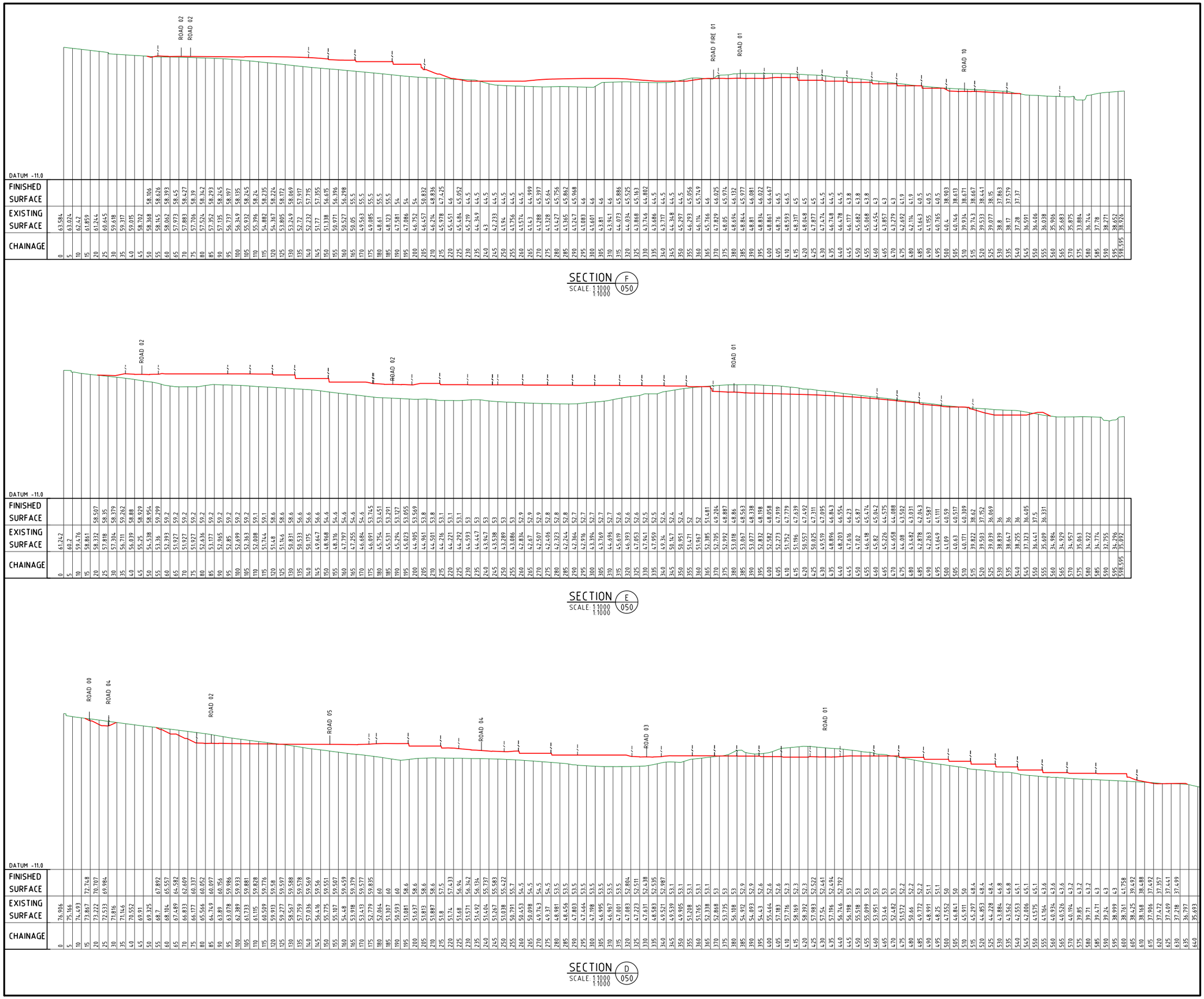
DESIGNED	RB	DRAWN	EP
APPROVED		RPEQ 4706	DATE 09-08-18

DRAWING NUMBER 36001-PE-054
AMEND. B

t:\autocad client\3600 - gallery homes\01 - courtney drive\Overall\engineering drawings\preliminary earthworks\Current\36001-PE-050.dwg, SECTIONS-SHEET 04, 4/04/2019 3:10:48 PM, 1:2



PROJECT NAME

COURTNEY DR UPPER COOMERA

PRELIMINARY EARTHWORKS

RP DESCRIPTION
LOT 188, 189, 190, 191 & 192 ON RP173728
COURTNEY DRIVE
LOCALITY OF UPPER COOMERA
LOCAL AUTHORITY - GOLD COAST CITY COUNCIL

CLIENT

GALLERY
THE ART OF LIVING

0 10 20 30 40 50m
Scale 1:1000 - A1 (1:2000 - A3)

ISSUES	DATE	
TENDER		
COUNCIL	11-09-18	
CONSTRUCTION		

PRE	DATE	AMENDMENT
A	11-09-18	COUNCIL ISSUE

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ASSOCIATED CONSULTANTS

BIOME WATER AND ENVIRONMENTAL CONSULTING

zone Planning Group

DRAWING TITLE

BULK EARTHWORKS
SECTIONS
SHEET 05

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DESIGNED	RB	DRAWN	EP
APPROVED		RPEQ 4706	DATE 09-08-18

DRAWING NUMBER 36001-PE-055
AMEND. A

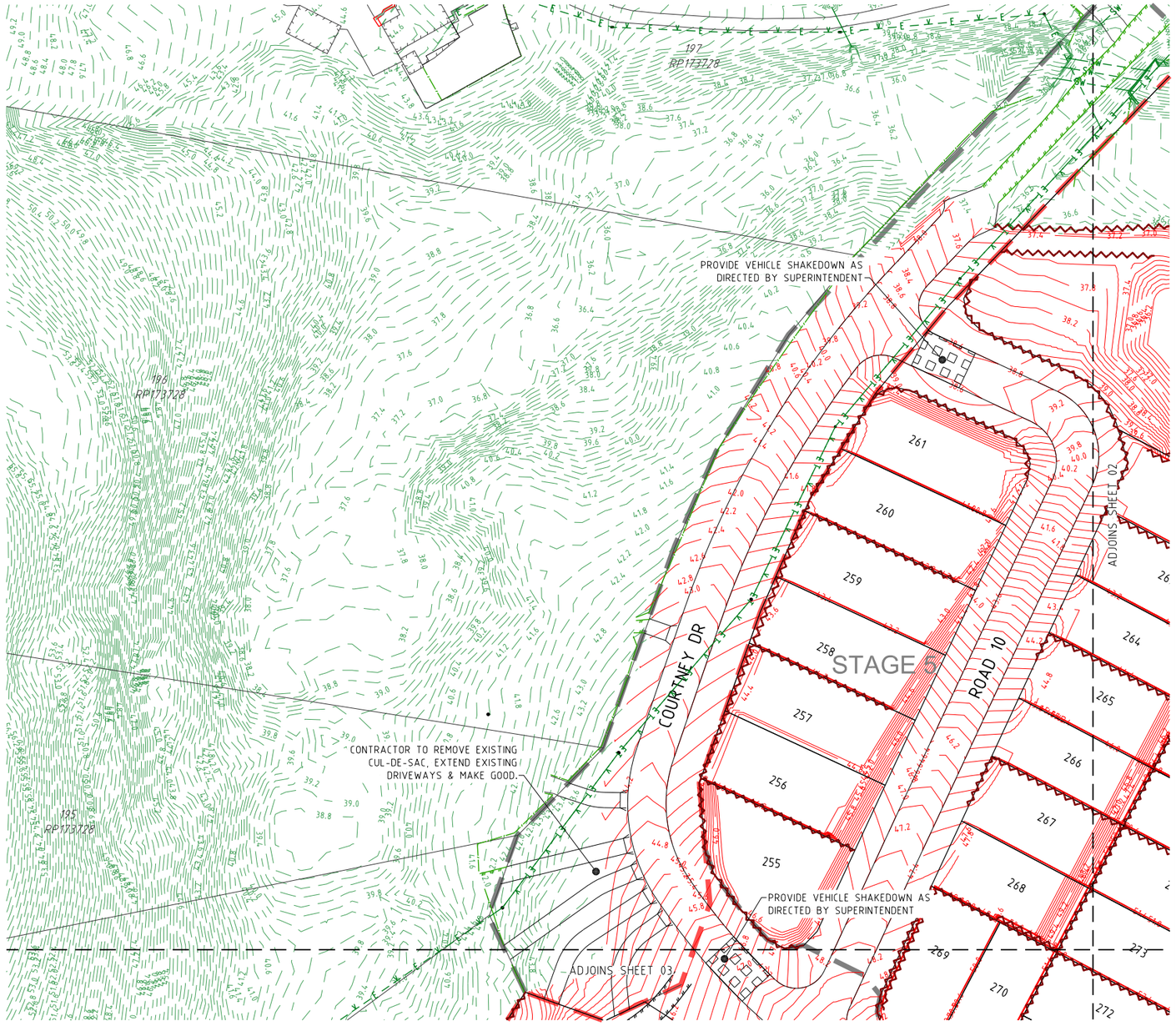
t:\autocad c&en\360 - gallery homes\01 - courtney drive\Overall\engineering drawings\preliminary earthworks\Current\36001-PE-050.dwg, SECTIONS-SHEET 05, 4/04/2019 3:21:53 PM, 1:2

SEDIMENT AND EROSION

1. THE EROSION AND SEDIMENT CONTROL DEVICES SHOWN ON THESE DRAWINGS ARE INDICATIVE AND PROVIDED FOR SUBMISSION TO LOCAL AUTHORITY ONLY. NOTWITHSTANDING THE EROSION AND CONTROL DEVICES SHOW ON THESE DRAWINGS, THE CONTRACTOR MUST PREPARE AND FOLLOW AN EROSION AND SEDIMENT CONTROL PLAN TO MEET ALL LOCAL AND STATE GOVERNMENT LEGISLATION INCLUDING BUT NOT LIMITED TO:
   a. ENVIRONMENTAL PROTECTION ACT WITH SPECIFIC REFERENCE TO PARTS S440G AND S319
   b. STATE PLANNING POLICY

   PRESCRIBED WATER CONTAMINANTS (AS DEFINED IN THE ENVIRONMENTAL PROTECTION ACT 1994) MUST NOT BE RELEASED FROM THE SITE OR TO WATERS WITHIN THE SITE, OR BE LIKELY TO BE RELEASED SHOULD RAINFALL OCCUR, UNLESS ALL REASONABLE AND PRACTICABLE MEASURES ARE TAKEN TO PREVENT OR MINIMISE THE RELEASE AND CONCENTRATION OF CONTAMINATION. THE ESC PLAN MUST BE DESIGNED, IMPLEMENTED AND MAINTAINED IN ACCORDANCE WITH "BEST PRACTICE EROSION AND SEDIMENT CONTROL" PUBLISHED BY THE INTERNATIONAL EROSION CONTROL ASSOCIATION (AUSTRALASIAN CHAPTER) (IECA, 2008).
2. TO COMPLY WITH THE REQUIREMENTS OF THE EP ACT AND BEST PRACTICE DESIGN, THE SEDIMENT BASINS ON THE SITE MUST BE DESIGNED AND IMPLEMENTED TO ACHIEVE THE FOLLOWING:
   SEDIMENT BASINS ARE TO BE DESIGNED, IMPLEMENTED AND MAINTAINED TO A STANDARD WHICH WOULD ACHIEVE AT LEAST 80% OF THE AVERAGE ANNUAL RUNOFF VOLUME OF THE CONTRIBUTING CATCHMENT TREATED (I.E. 80% HYDROLOGIC EFFECTIVENESS) TO 50MG/L TSS OR LESS AND PH IN THE RANGE 6.5-8.5

   THIS WILL REQUIRE THE INSTALLATION AND OPERATION OF A HIGH-EFFICIENCY SEDIMENT BASIN(S) DESIGNED IN ACCORDANCE WITH THE SPECIFICATIONS CONTAINED IN THE "BEST PRACTICE EROSION AND SEDIMENT CONTROL – APPENDIX B SEDIMENT BASIN DESIGN AND OPERATION" PUBLISHED BY THE INTERNATIONAL EROSION CONTROL ASSOCIATION (AUSTRALASIAN CHAPTER) (IECA, 2016, DRAFT)
3. THE EROSION AND SEDIMENT CONTROL PLAN MUST BE PREPARED AND CERTIFIED BY A CERTIFIED PROFESSIONAL IN EROSION AND SEDIMENT CONTROL AND FOLLOW THE REQUIREMENTS OUTLINED IN IECA'S BEST PRACTICE EROSION AND SEDIMENT CONTROL DOCUMENT AND THE QUEENSLAND URBAN DRAINAGE MANUAL.
4. PRIOR TO THE COMMENCEMENT OF WORKS ONSITE THE CONTRACTOR MUST MAKE THEMSELVES AWARE OF ALL PREVIOUS GEOTECHNICAL REPORTS AND DETERMINE THE DISPERSIVE CHARACTERISTICS OF THE SOIL (INCLUDING PERFORMING ANY SOIL TESTS IF REQUIRED). THE RESULTS OF THIS REVIEW AND ANY TESTS MUST BE INCLUDED IN THE CONTRACTOR'S EROSION AND SEDIMENT CONTROL PLAN. A COPY OF ALL TEST RESULTS MUST BE PROVIDED TO THE SUPERINTENDENT.
5. THE CONTRACTOR SHALL TAKE ALL NECESSARY PRECAUTIONS TO CONTROL EROSION AND DOWNSTREAM SEDIMENTATION DURING ALL STAGES OF CONSTRUCTION (INCLUDING THE MAINTENANCE PERIOD). NOTWITHSTANDING THE CONTROL MEASURES OR FINISHED EARTHWORKS DESIGN SHOWN ON THESE DRAWINGS, THE CONTRACTOR IS RESPONSIBLE FOR IMPLEMENTING ADDITIONAL OR ALTERNATIVE EROSION & SEDIMENT CONTROL MEASURES TO MINIMISE SEDIMENT ACROSS OR LEAVING THE SITE.
6. AT ALL TIMES THE CONTRACTOR SHALL MONITOR THE PREVAILING WEATHER CONDITIONS (INCLUDING WEEKENDS AND PUBLIC HOLIDAYS) AND AT ALL TIMES REMAINS RESPONSIBLE TO:
   a) CLEAN AND REPAIR CONTROL DEVICES WHENEVER THE ACCUMULATED SEDIMENT REDUCES THEIR CAPACITY BY 50%.
   b) MAINTAIN POSITIVE GRADES OF ALL PERIMETER BANKS AND SWALES TO AN OUTLET.
   c) PROTECT ANY DOWNSTREAM CONSTRUCTION.
   d) CONTROLLING DUST.
   e) MEASURES HAVE BEEN INSTALLED IN ACCORDANCE WITH DETAILS OUTLINED IN THEIR EROSION AND SEDIMENT CONTROL PLAN AND AS DIRECTED BY THE SUPERINTENDENT.
7. THE CONTRACTOR'S PLAN SHALL ALLOW FOR SUITABLE ACCESS TO ALLOW MAINTENANCE OF ALL SEDIMENT CONTROL DEVICES. NO ADDITIONAL VEGETATION CLEARING IS PERMITTED FOR GAINING ACCESS UNLESS APPROVED BY THE SUPERINTENDENT.
8. THE CONTRACTOR MAY REQUEST APPROVAL FROM THE SUPERINTENDENT TO REUSE THE STOCKPILED MULCH FOR STABILISING BATTERS ONLY IN LOCATIONS WHERE THE APPROVED LANDSCAPE OPW DESIGN REQUIRES MULCH ULTIMATELY.
9. CONSTRUCTION STOCKPILING
   a) TOPSOIL SHALL BE STRIPPED AND STOCKPILED IN LOCATIONS NOMINATED ON THE CONSTRUCTION DRAWINGS OR IN LOCATIONS AGREED WITH THE SUPERINTENDENT.
   b) ADDITIONAL VEGETATION CLEARING IS NOT PERMITTED TO FACILITATE THE STOCKPILING OF MATERIALS UNLESS SHOWN ON THE APPROVED VEGETATION MANAGEMENT PLAN.
   c) ANY STOCKPILE SITE MUST BE CLEAR OF ADJACENT PROPERTY BOUNDARIES SO AS NOT TO CAUSE A NUISANCE TO ADJOINING PROPERTIES.
   d) NO STOCKPILES ARE TO BE LOCATED WITHIN THE TREE PROTECTION ZONE OF VEGETATION.
   e) A TEMPORARY SILT FENCE IS TO BE ERECTED APPROXIMATELY 5m FROM TOE OF BATTER ON LOW SIDE OF STOCKPILING.
10. NOTWITHSTANDING THE DETAILS SHOWN IN THE CONTRACTOR'S EROSION AND SEDIMENT CONTROL PLAN, DURING CONSTRUCTION THE CONTRACTOR MUST:
    a) SIZE ALL TEMPORARY SEDIMENT BASINS APPROPRIATELY TO TREAT THE UPSTREAM CATCHMENT. NOTE THAT THE PERMANENT BIO BASINS SHOWN ON THESE DRAWINGS ARE SIZED FOR THE ULTIMATE CATCHMENT NOT FOR THE CONSTRUCTION PHASE.
    b) PLACE A ROCK BUND AROUND ALL HEADWALLS DURING CONSTRUCTION.
    c) PROVIDE KERB INLET PROTECTION TO ALL GULLIES.
    c) PLACE A MINIMUM 1.0m WIDE TURF STRIP BEHIND ALL KERBS AND IN A HERRINGBONE LAYOUT WITHIN THE ROAD VERGE.
    d) MAINTENANCE (INCLUDING FLOCCULATION IF REQUIRED AND PUMP OUT) OF ALL CONSTRUCTION SEDIMENT BASINS (WHETHER EXISTING OR NEW).
    e) CLEAN OUT OF ALL GROSS POLLUTANT TRAPS, SEDIMENT FOREBAYS AND ALL OTHER PERMANENT SEDIMENT CONTROL DEVICES AT BOTH ON AND OFF MAINTENANCE.
11. CONTRACTOR TO CONFIRM THE EXTENTS OF REQUIRED GRASSING TREATMENTS WITH THE SUPERINTENDENT ATLEAST 7 DAYS PRIOR TO FINAL TRIMMING.
12. THE CONTRACTOR IS RESPONSIBLE FOR ENSURING THAT GRASSING STRIKE RATES ARE ACHIEVED AT THE ON AND OFF MAINTENANCE INSPECTIONS IN ACCORDANCE WITH COUNCIL REQUIREMENTS. THIS INCLUDES THE SUPPLY AND INSTALLATION OF ANY REQUIRED CHEMICAL/FERTILIZER AMELIORATION TO ACHIEVE THE SPECIFIED GRASS STRIKE RATES.
13. GEOFABRIC LINING OF CHANNELS AND CHECK DAMS MAY BE REQUIRED SUBJECT TO THE SITE CONDITIONS.
14. BATTERS WITHIN PUBLIC OPEN SPACE TO BE VEGETATED IN ACCORDANCE WITH APPROVED OPEN SPACE MANAGEMENT PLAN AND LANDSCAPING OPW. CONTRACT DOCUMENTATION WILL SPECIFY WHETHER THIS IS THE CIVIL CONTRACTOR OR THE LANDSCAPE CONTRACTOR'S RESPONSIBILITY TO SUPPLY AND INSTALL. THE CIVIL CONTRACTOR IS RESPONSIBLE FOR PROVIDING SUITABLE ACCESS FOR THE LANDSCAPE CONTRACTOR TO PERFORM THEIR WORKS.
15. MAINTENANCE PERIOD (PRE TO POST CONSTRUCTION)
    a) ALL PROTECTION MEASURES ARE TO BE INSPECTED AND MAINTAINED REGULARLY
    b) REPAIRS ARE TO BE EFFECTED IMMEDIATELY.
    c) SILT AFTER RAIN IS TO BE CLEANED FROM STREETS AND ALLOTMENTS IMMEDIATELY AND CORRECTIVE ACTION TAKEN TO AVOID A RE-OCCURRENCE.
    d) AT OFF-MAINTENANCE AND ONLY WHEN DIRECTED BY COUNCIL, REMOVE AND DISPOSE OFFSITE ALL TEMPORARY EROSION AND SEDIMENT CONTROL DEVICES.



NOTE:
SEDIMENT AND EROSION CONTROL MEASURES SHOWN RELATES TO THE FINISHED SURFACE ONLY.
THE CONTRACTOR IS TO PREPARE A CONSTRUCTION PHASE SEDIMENT AND EROSION CONTROL PLAN.

LEGEND

- EXISTING PROPERTY LINE
- EXISTING KERB (INVERT)
- EXISTING STORMWATER (SW)
- EXISTING CONTOURS (1.0)
- FUTURE PROPERTY LINE
- FUTURE KERB (INVERT)
- FUTURE STORMWATER (SW)
- FUTURE CONTOURS (1.0)
- SITE BOUNDARY
- STAGE BOUNDARY
- PROPOSED PROPERTY LINE
- PROPOSED KERB (INVERT)
- PROPOSED STORMWATER (SW)
- DESIGN CONTOURS (1.0)
- SEDIMENT FENCE
- MANHOLE
- KERB INLET (ON GRADE) PIT
- KERB INLET (SAG) PIT
- HEADWALL
- SCOUR PROTECTION
- TEMPORARY SEDIMENT BASIN
- STORMWATER INLET FILTER
- ROCK CHECK DAM
- VEHICLE SHAKEDOWN
- TREES

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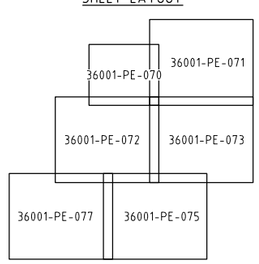
SHEET LAYOUT



PROJECT NAME

COURTNEY DR UPPER COOMERA

PRELIMINARY EARTHWORKS

RP DESCRIPTION
LOT 188, 189, 190, 191 & 192 ON RP173728
COURTNEY DRIVE
LOCALITY OF UPPER COOMERA
LOCAL AUTHORITY - GOLD COAST CITY COUNCIL

CLIENT

GALLERY
THE ART OF LIVING

NORTH

0 5 10 15 20 25m
Scale 1:500 - A1 (1:1000 - A3)

ISSUES	DATE	
TENDER		
COUNCIL	11-09-18	
CONSTRUCTION		

B	27-03-19	LOT NO'S & STAGES AMENDED
A	11-09-18	COUNCIL ISSUE
PRE	DATE	AMENDMENT

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ASSOCIATED CONSULTANTS

BIOME WATER AND ENVIRONMENTAL CONSULTING

zone Planning Group

DRAWING TITLE

FINAL SURFACE AND SEDIMENT AND EROSION PLAN
SHEET 01

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Civil Engineering
Project Coordination
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DESIGNED	RB	DRAWN	EP
APPROVED		RPEQ 4706	DATE 09-08-18

DRAWING NUMBER	AMEND.
36001-PE-070	B

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PROJECT NAME

COURTNEY DR UPPER COOMERA

PRELIMINARY EARTHWORKS

RP DESCRIPTION
LOT 188, 189, 190, 191 & 192 ON RP173728
COURTNEY DRIVE
LOCALITY OF UPPER COOMERA
LOCAL AUTHORITY - GOLD COAST CITY COUNCIL

CLIENT

GALLERY
THE ART OF LIVING

NORTH

0 5 10 15 20 25m
Scale 1:500 - A1 (1:1000 - A3)

ISSUES	DATE	
TENDER		
COUNCIL	11-09-18	
CONSTRUCTION		

PRE	DATE	AMENDMENT
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DRAWING TITLE

FINAL SURFACE AND SEDIMENT AND EROSION PLAN SHEET 02

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DESIGNED	RB	DRAWN	EP
APPROVED	RPEQ 4706	DATE	09-08-18

DRAWING NUMBER	AMEND.
36001-PE-071	B

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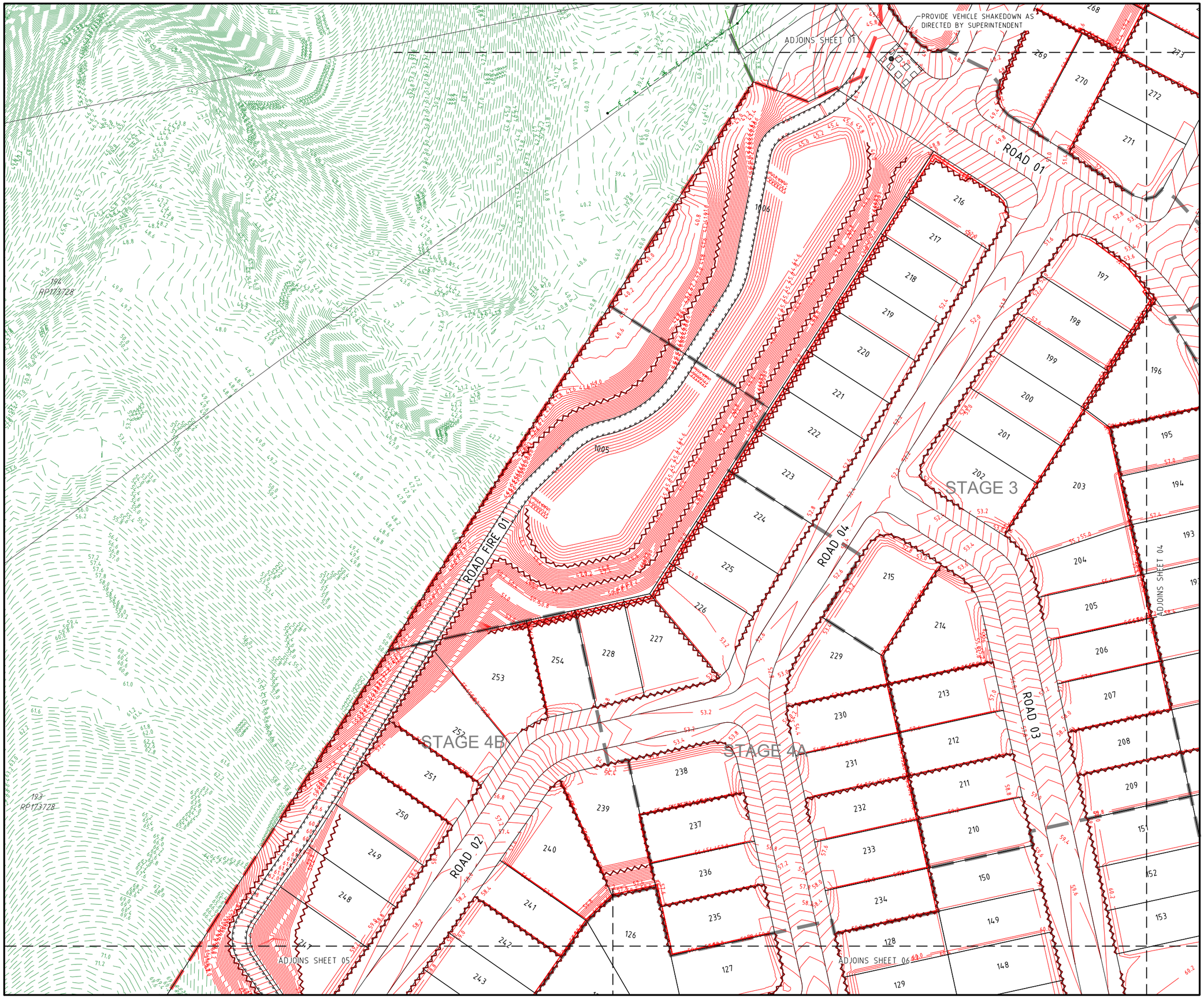

PROJECT NAME

COURTNEY DR UPPER COOMERA

PRELIMINARY EARTHWORKS

RP DESCRIPTION
LOT 188, 189, 190, 191 & 192 ON RP173728
COURTNEY DRIVE
LOCALITY OF UPPER COOMERA
LOCAL AUTHORITY - GOLD COAST CITY COUNCIL

CLIENT

GALLERY
THE ART OF LIVING

NORTH

0 5 10 15 20 25m
Scale 1:500 - A1 (1:1000 - A3)

ISSUES	DATE
TENDER	
COUNCIL	11-09-18
CONSTRUCTION	

PRE	DATE	AMENDMENT
B	27-03-19	LOTS, LOT NO'S & STAGES AMENDED
A	11-09-18	COUNCIL ISSUE

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DRAWING TITLE

FINAL SURFACE AND SEDIMENT AND EROSION PLAN
SHEET 03

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APPROVED	RPEQ 4706	DATE 09-08-18

DRAWING NUMBER	AMEND.
36001-PE-072	B

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PROJECT NAME

COURTNEY DR UPPER COOMERA

PRELIMINARY EARTHWORKS

RP DESCRIPTION
LOT 188, 189, 190, 191 & 192 ON RP173728
COURTNEY DRIVE
LOCALITY OF UPPER COOMERA
LOCAL AUTHORITY - GOLD COAST CITY COUNCIL

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THE ART OF LIVING

NORTH

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Scale 1:500 - A1 (1:1000 - A3)

ISSUES	DATE	
TENDER		
COUNCIL	11-09-18	
CONSTRUCTION		

B	27-03-19	LOT NO'S & STAGES AMENDED
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PRE	DATE	AMENDMENT

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FINAL SURFACE AND SEDIMENT AND EROSION PLAN
SHEET 04

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APPROVED		RPEQ 4706	DATE 09-08-18

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36001-PE-073	B

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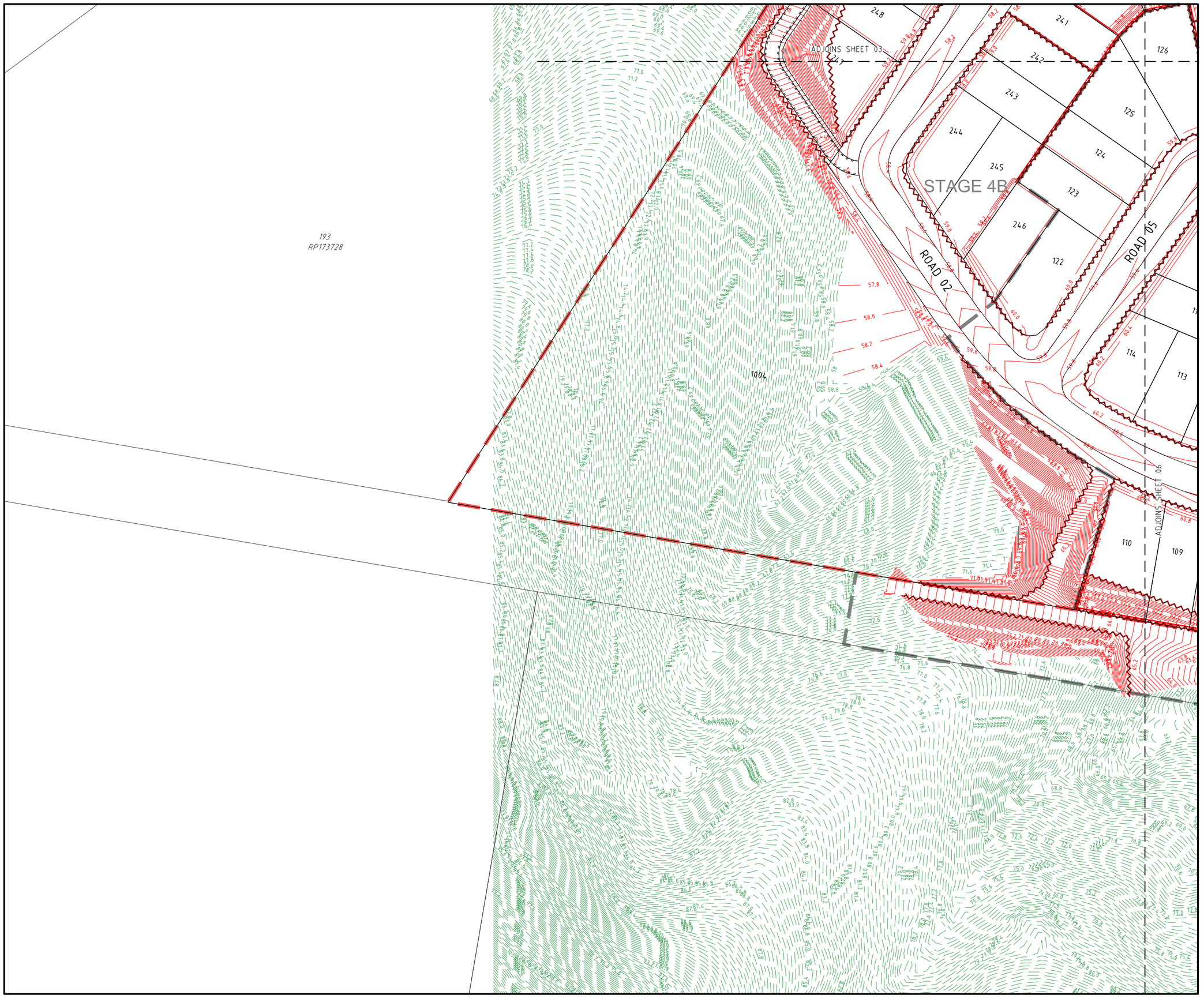

PROJECT NAME

COURTNEY DR UPPER COOMERA

PRELIMINARY EARTHWORKS

RP DESCRIPTION
LOT 188, 189, 190, 191 & 192 ON RP173728
COURTNEY DRIVE
LOCALITY OF UPPER COOMERA
LOCAL AUTHORITY - GOLD COAST CITY COUNCIL

CLIENT

GALLERY
THE ART OF LIVING

NORTH

0 5 10 15 20 25m
Scale 1:500 - A1 (1:1000 - A3)

ISSUES	DATE	
TENDER		
COUNCIL	11-09-18	
CONSTRUCTION		

B	27-03-19	LOT NO'S & STAGES AMENDED
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PRE	DATE	AMENDMENT

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FINAL SURFACE AND SEDIMENT AND EROSION PLAN
SHEET 05

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DRAWING NUMBER	AMEND.
36001-PE-074	B

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PROJECT NAME

COURTNEY DR UPPER COOMERA

PRELIMINARY EARTHWORKS

RP DESCRIPTION
LOT 188, 189, 190, 191 & 192 ON RP173728
COURTNEY DRIVE
LOCALITY OF UPPER COOMERA
LOCAL AUTHORITY - GOLD COAST CITY COUNCIL

CLIENT

GALLERY
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NORTH

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Scale 1:500 - A1 (1:1000 - A3)

ISSUES	DATE	
TENDER		
COUNCIL	11-09-18	
CONSTRUCTION		

PRE	DATE	AMENDMENT
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A	11-09-18	COUNCIL ISSUE

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FINAL SURFACE AND SEDIMENT AND EROSION PLAN
SHEET 06

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APPROVED		RPEQ 4706	DATE 09-08-18

DRAWING NUMBER	AMEND.
36001-PE-075	B

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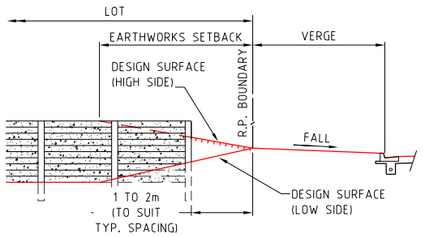
GENERAL

1. CONTRACT SPECIFICATIONS
   ALL DRAWINGS ARE TO BE READ IN CONJUNCTION WITH THE CONTRACT SPECIFICATION.
2. SETOUT
   SURVEY SETOUT INFORMATION HAS BEEN ESTABLISHED ON SITE BY THE PRINCIPAL'S SURVEYOR TO ENABLE THE CONTRACTOR TO ACCURATELY SETOUT THE WORKS TO THE CO-ORDINATES SHOWN. SETOUT INFORMATION SHALL NOT BE OBTAINED BY SCALING FROM THESE DRAWINGS.
3. DATUM
   LEVELS SHOWN ARE TO A.H.D.
4. EXISTING SERVICES - EXTERNAL WORKS
   THE LOCATIONS OF ALL EXISTING SERVICES WITHIN THE WORK AREA SHALL BE CONFIRMED BY THE CONTRACTOR PRIOR TO CONSTRUCTION COMMENCING. IT IS THE CONTRACTOR'S RESPONSIBILITY TO CONTACT THE RELEVANT AUTHORITIES AND TO ENSURE THAT THE EXISTING SERVICES ARE NOT DAMAGED OR DISTURBED IN ANY WAY.
5. ALL MATERIALS ARISING FROM RETAINING WALL CONSTRUCTION ARE TO BE COMPACTED TO FUTURE STAGES, TO LEVEL 1 OR IF DIRECTED BY THE SUPERINTENDENT SHALL BE TRUCKED TO A LICENSED TIP.

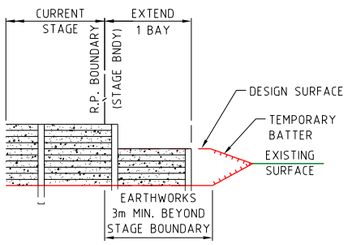
LEGEND

- EXISTING KERB (INVERT)
- EXISTING PROPERTY LINE
- 1.0 EXISTING CONTOURS
- EXISTING RETAINING WALL
- FUTURE KERB (INVERT)
- FUTURE PROPERTY LINE
- 1.0 FUTURE CONTOURS
- FUTURE RETAINING WALL
- PROPOSED KERB (INVERT)
- PROPOSED PROPERTY LINE
- 1.0 DESIGN CONTOURS
- PROPOSED RETAINING WALL
- PL50.4 NOMINAL LOT PAD LEVEL
- **RH1.0** INDICATIVE WALL HEIGHT



TYPICAL SIDE BOUNDARY CONSTRUCTION

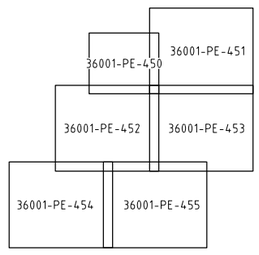
SCALE 1:100 - A1 (1:200 - A3)

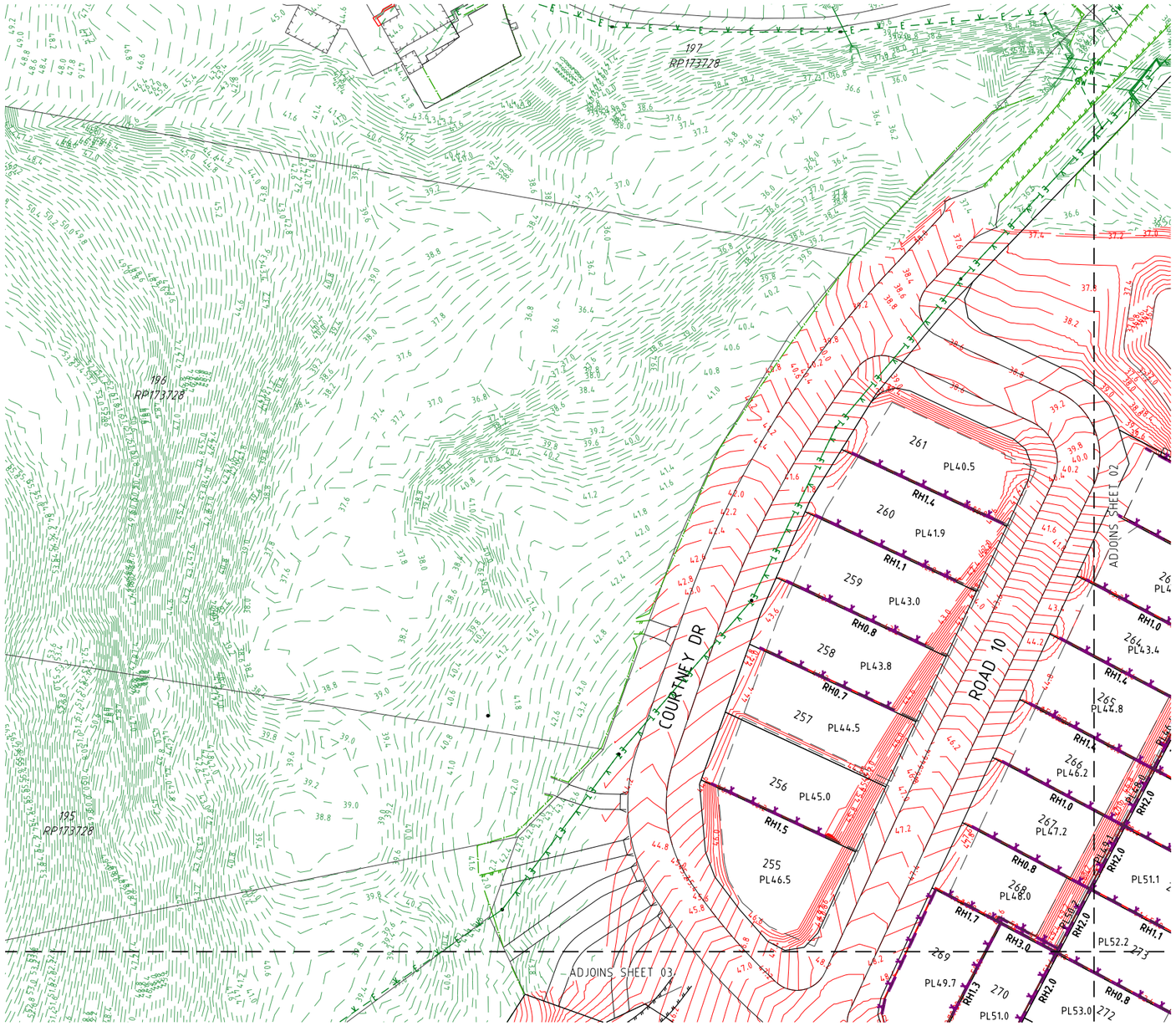


TYPICAL STAGE BOUNDARY CONSTRUCTION

SCALE 1:100 - A1 (1:200 - A3)

SHEET LAYOUT





PROJECT NAME

COURTNEY DR UPPER COOMERA

PRELIMINARY EARTHWORKS

RP DESCRIPTION
LOT 188, 189, 190, 191 & 192 ON RP173728
COURTNEY DRIVE
LOCALITY OF UPPER COOMERA
LOCAL AUTHORITY - GOLD COAST CITY COUNCIL

CLIENT

GALLERY
THE ART OF LIVING

NORTH

0 5 10 15 20 25m
Scale 1:500 - A1 (1:1000 - A3)

ISSUES	DATE	
TENDER		
COUNCIL	11-09-18	
CONSTRUCTION		

B	27-03-19	LOT NO'S & STAGES AMENDED
A	11-09-18	COUNCIL ISSUE
PRE	DATE	AMENDMENT

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BIOME WATER AND ENVIRONMENTAL CONSULTING

zone Planning Group

DRAWING TITLE

RETAINING WALL AND DETAIL GRADING PLAN SHEET 01

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Urban & Regional Planning
Civil Engineering
Project Coordination

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36001-PE-450	B

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PROJECT NAME

COURTNEY DR UPPER COOMERA

PRELIMINARY EARTHWORKS

RP DESCRIPTION
LOT 188, 189, 190, 191 & 192 ON RP173728
COURTNEY DRIVE
LOCALITY OF UPPER COOMERA
LOCAL AUTHORITY - GOLD COAST CITY COUNCIL

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ISSUES	DATE	
TENDER		
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CONSTRUCTION		

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DRAWING TITLE

RETAINING WALL
AND DETAIL GRADING PLAN
SHEET 02

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Civil Engineering
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DRAWING NUMBER	AMEND.
36001-PE-451	B

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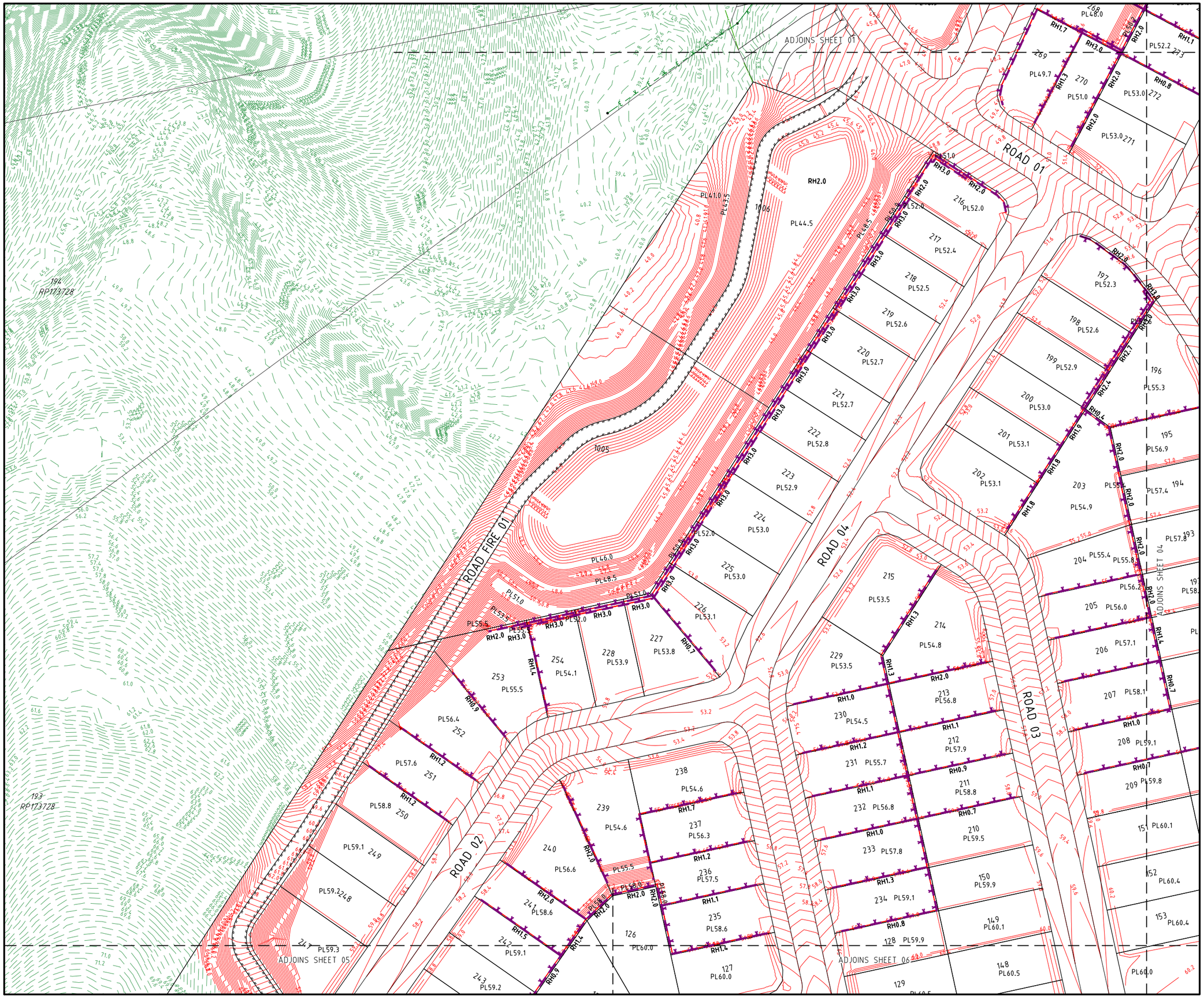

PROJECT NAME

COURTNEY DR UPPER COOMERA

PRELIMINARY EARTHWORKS

RP DESCRIPTION
LOT 188, 189, 190, 191 & 192 ON RP173728
COURTNEY DRIVE
LOCALITY OF UPPER COOMERA
LOCAL AUTHORITY - GOLD COAST CITY COUNCIL

CLIENT

GALLERY
THE ART OF LIVING

NORTH

0 5 10 15 20 25m
Scale 1:500 - A1 (1:1000 - A3)

ISSUES	DATE
TENDER	
COUNCIL	11-09-18
CONSTRUCTION	

PRE	DATE	AMENDMENT
B	27-03-19	LOTS, LOT NO'S & STAGES AMENDED
A	11-09-18	COUNCIL ISSUE

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RETAINING WALL
AND DETAIL GRADING PLAN
SHEET 03

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DRAWING NUMBER	AMEND.
36001-PE-452	B

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PROJECT NAME

COURTNEY DR UPPER COOMERA

PRELIMINARY
EARTHWORKS

RP DESCRIPTION
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COURTNEY DRIVE
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ISSUES	DATE	
TENDER		
COUNCIL	11-09-18	
CONSTRUCTION		

PRE	DATE	AMENDMENT
B	27-03-19	LOT NO'S & STAGES AMENDED
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RETAINING WALL
AND DETAIL GRADING PLAN
SHEET 04

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urbansolutions
Urban & Regional Planning
Civil Engineering
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Southport QLD 4215

DESIGNED	RB	DRAWN	EP
APPROVED		RPEQ 4706	DATE 09-08-18

DRAWING NUMBER	AMEND.
36001-PE-453	B

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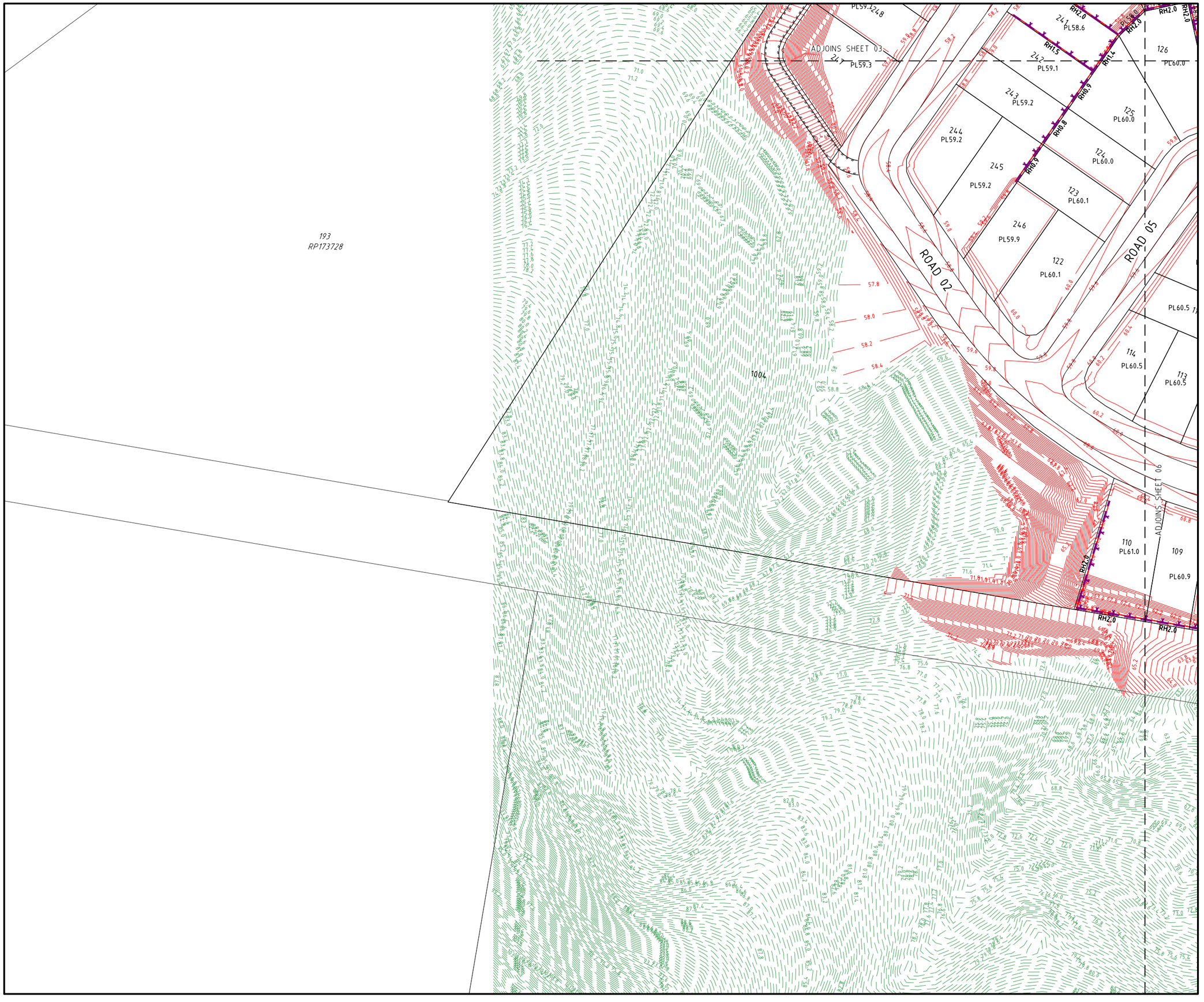

PROJECT NAME

COURTNEY DR UPPER COOMERA

PRELIMINARY EARTHWORKS

RP DESCRIPTION
LOT 188, 189, 190, 191 & 192 ON RP173728
COURTNEY DRIVE
LOCALITY OF UPPER COOMERA
LOCAL AUTHORITY - GOLD COAST CITY COUNCIL

CLIENT

GALLERY
THE ART OF LIVING

NORTH

0 5 10 15 20 25m
Scale 1:500 - A1 (1:1000 - A3)

ISSUES	DATE	
TENDER		
COUNCIL	11-09-18	
CONSTRUCTION		

B	27-03-19	LOTS, LOT NO'S & STAGES AMENDED
A	11-09-18	COUNCIL ISSUE
PRE	DATE	AMENDMENT

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ASSOCIATED CONSULTANTS

BIOME WATER AND ENVIRONMENTAL CONSULTING

zone Planning Group

DRAWING TITLE

RETAINING WALL
AND DETAIL GRADING PLAN
SHEET 05

MORTONS urbansolutions
Urban & Regional Planning
Civil Engineering
Project Coordination

MUS Pty Ltd T/As
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Southport QLD 4215

DESIGNED	RB	DRAWN	EP
APPROVED		RPEQ 4706	DATE 09-08-18

DRAWING NUMBER	AMEND.
36001-PE-454	B

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PROJECT NAME

COURTNEY DR UPPER COOMERA

PRELIMINARY EARTHWORKS

RP DESCRIPTION
LOT 188, 189, 190, 191 & 192 ON RP173728
COURTNEY DRIVE
LOCALITY OF UPPER COOMERA
LOCAL AUTHORITY - GOLD COAST CITY COUNCIL

CLIENT

GALLERY
THE ART OF LIVING

NORTH

0 5 10 15 20 25m
Scale 1:500 - A1 (1:1000 - A3)

ISSUES	DATE	
TENDER		
COUNCIL	11-09-18	
CONSTRUCTION		

B	27-03-19	R.WALL ADDED,CONTOURS,LOT NO'S & STAGES AMENDED
A	11-09-18	COUNCIL ISSUE
PRE	DATE	AMENDMENT

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Planning Group

DRAWING TITLE

RETAINING WALL
AND DETAIL GRADING PLAN
SHEET 06

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urbansolutions
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Civil Engineering
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Southport QLD 4215

DESIGNED RB	DRAWN EP	
APPROVED	RPEQ 4706	DATE 09-08-18

DRAWING NUMBER	AMEND.
36001-PE-455	B

RETAINING HEIGHT & LOCATION IS INDICATIVE ONLY & SUBJECT TO FUTURE DETAILED SURVEY FOLLOWING CONSTRUCTION OF ADJACENT DEVELOPMENT TO THE SOUTH. THE HEIGHT OF THIS WALL IS ESTIMATED BASED ON A PDF COPY OF THE ADJACENT DESIGN. REFER SECTION 00 ON DWG 36001-PE-051 FOR TYPICAL SECTION IN THIS AREA.

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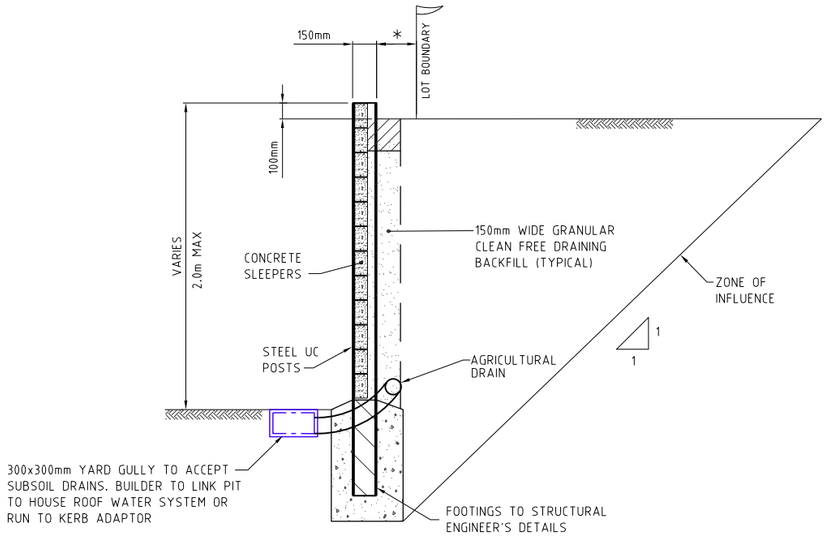
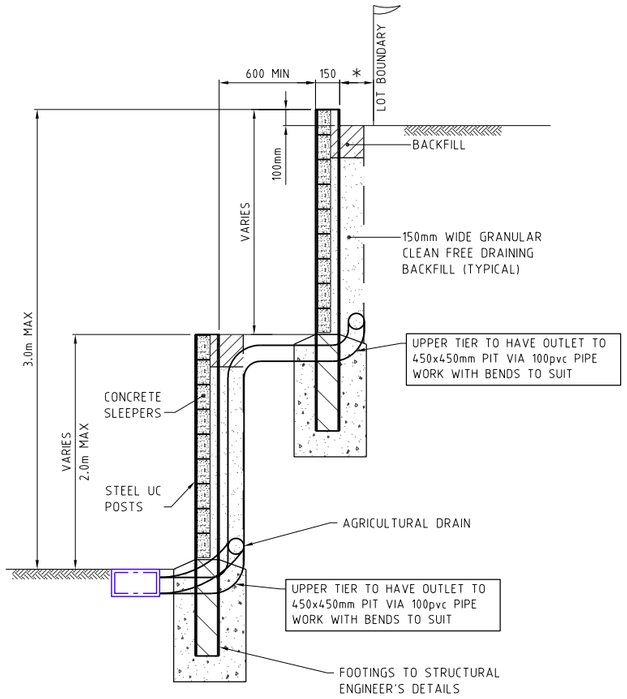


CROSS SECTION OF CONCRETE RETAINING WALL

SCALE 1:20 - A1 (1:40 - A3)



CROSS SECTION OF SPLIT CONCRETE RETAINING WALL

SCALE 1:20 - A1 (1:40 - A3)

NOTES:

1. RETAINING WALL DETAILS ARE INDICATIVE ONLY.
2. CONTRACTOR TO ARRANGE FOR DESIGN AND CONSTRUCTION OF WALLS BY RPEQ STRUCTURAL ENGINEER. CONTRACTOR TO PROVIDE STRUCTURAL CERTIFICATION OF DESIGN AND FINAL CONSTRUCTION.
3. ALLOW FOR 5KPa LOADING TO WALLS EXCEPT ADJACENT TO ROADS WHICH REQUIRE A 10kPa LOADING.
4. CONTRACTOR TO CONFIRM LOCATION OF LOT BOUNDARY PRIOR TO COMMENCING WALL CONSTRUCTION.
5. THE BUILDING ON THE HIGHER SIDE OF THE RETAINING WALL MUST MAINTAIN AN OFFSET OR APPROPRIATE FOUNDATION STRUCTURES (EG; PIERS) IN ORDER TO ENSURE THE ENTIRE DEPTH OF THE RETAINING WALL IS FREE FROM THE ZONE OF INFLUENCE OF THE BUILDING/OVERBURDEN LOAD UNLESS OTHERWISE SPECIFIED BY STRUCTURAL ENGINEER.
6. STRUCTURAL ENGINEER TO DESIGN SLAB AND PIER.
7. AGRICULTURAL DRAIN TO DISCHARGE TO 300x300mm STORMWATER PIT. HOUSE BUILDER TO CONNECT 300x300mm STORMWATER PIT TO ROOFWATER SYSTEM.
8. RETAINING WALL DESIGN TO ALLOW FOR ALL SERVICES (ADJACENT OR BELOW) AND HAVE NO IMPACT.

* LOT - LOT = 0.2m
LOT - ROAD RESERVE = 0.4m

PROJECT NAME

COURTNEY DR UPPER COOMERA

PRELIMINARY EARTHWORKS

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LOT 188, 189, 190, 191 & 192 ON RP173728
COURTNEY DRIVE
LOCALITY OF UPPER COOMERA
LOCAL AUTHORITY - GOLD COAST CITY COUNCIL

CLIENT

GALLERY
THE ART OF LIVING

NORTH

0 0.2 0.4 0.6 0.8 1.0m
Scale 1:20 - A1 (1:40 - A3)

ISSUES	DATE	
TENDER		
COUNCIL	11-09-18	
CONSTRUCTION		

PRE	DATE	AMENDMENT
A	11-09-18	COUNCIL ISSUE

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BIOME WATER AND ENVIRONMENTAL CONSULTING

zone Planning Group

DRAWING TITLE

RETAINING WALL DETAILS SHEET 01

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Urban & Regional Planning
Civil Engineering
Project Coordination

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DESIGNED	RB	DRAWN	EP
APPROVED	RPEQ 4706	DATE	09-08-18

DRAWING NUMBER	AMEND.
36001-PE-460	A

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APPENDIX D

Preliminary Engineering Drawings

(Drawing No.: 36001-PRE-000 to 705, Issued 17th April 2019)
Prepared by Mortons-Urban Solutions

DATA TRANSMITTAL

MORTONS urbansolutions
Urban & Regional Planning
Civil Engineering
Project Coordination
ABN: 39 116 375 065 Tel: (07) 55711099

PROJECT NAME: COURTNEY DRIVE, UPPER COMERA PRELIMINARY ENGINEERING
JOB NO: 36001-PRE

DAY	11	04	17											
MONTH	09	04	04											
YEAR	18	19	19											

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PROJECT TEAM	1/0/0	0/0/1	0/0/1											

FILE NO.	DESCRIPTION	AMENDMENT												
	GENERAL													
36001-PRE-000	COVER SHEET	A	B	C										
36001-PRE-005	ROAD HIERARCHY & STAGING PLAN	A	B	B										
	EARTHWORKS: COMBINED SERVICES													
36001-PRE-090	PLAN SHEET 01	A	B	B										
36001-PRE-091	PLAN SHEET 02	A	B	B										
36001-PRE-092	PLAN SHEET 03	A	B	C										
36001-PRE-093	PLAN SHEET 04	A	B	C										
36001-PRE-094	PLAN SHEET 05	A	B	C										
36001-PRE-095	PLAN SHEET 06	A	B	B										
~~36001-PRE-096~~	~~PLAN SHEET 07~~	~~A~~												
	ROADS: ROADWORKS													
36001-PRE-100	PLAN SHEET 01	A	B	B										
36001-PRE-101	PLAN SHEET 02	A	B	B										
36001-PRE-102	PLAN SHEET 03	A	B	B										
36001-PRE-103	PLAN SHEET 04	A	B	B										
36001-PRE-104	PLAN SHEET 05	A	B	B										
36001-PRE-105	PLAN SHEET 06	A	B	B										
36001-PRE-120	DETAILS SHEET 01	A	A	A										
	ROADS: LONGITUDINAL SECTIONS													
36001-PRE-200	ROAD 01	A	B	B										
36001-PRE-201	ROAD 01 (Cont.)	A	A	A										
36001-PRE-202	ROAD 02	A	A	A										
36001-PRE-203	ROAD 03 & ROAD 05	A	A	A										
36001-PRE-204	ROAD 04	A	A	A										
36001-PRE-205	ROAD 06 & ROAD 07	A	A	A										
36001-PRE-206	ROAD 08 & ROAD 10	A	A	A										
	SEWER: SEWER RETICULATION													
36001-PRE-500	PLAN SHEET 01	A	B	B										
36001-PRE-501	PLAN SHEET 02	A	B	B										
36001-PRE-502	PLAN SHEET 03	A	B	B										
36001-PRE-503	PLAN SHEET 04	A	B	B										
36001-PRE-504	PLAN SHEET 05	A	B	B										
36001-PRE-505	PLAN SHEET 06	A	B	B										
~~36001-PRE-506~~	~~PLAN SHEET 07~~	~~A~~												
	DRAINAGE: STORMWATER													
36001-PRE-600	PLAN SHEET 01	A	B	C										
36001-PRE-601	PLAN SHEET 02	A	B	C										
36001-PRE-602	PLAN SHEET 03	A	B	C										
36001-PRE-603	PLAN SHEET 04	A	B	C										
36001-PRE-604	PLAN SHEET 05	A	B	C										
36001-PRE-605	PLAN SHEET 06	A	B	C										
	WATER: WATER RETICULATION													
36001-PRE-700	PLAN SHEET 01	A	B	C										
36001-PRE-701	PLAN SHEET 02	A	B	C										
36001-PRE-702	PLAN SHEET 03	A	B	C										
36001-PRE-703	PLAN SHEET 04	A	B	C										
36001-PRE-704	PLAN SHEET 05	A	B	C										
36001-PRE-705	PLAN SHEET 06	A	B	C										

TYPE: **C** - CIVILCAD **A** - AUTOCAD **P** - PLOT **H** - PHOTOCOPY OF APPROVED DWG **D** - Pdfs	D	D	D											

REASON: **Z** - COUNCIL **R** - REVISION **A** - APPROVAL **C** - CONSTRUCTION **S** - AS REQUESTED **T** - TENDER **P** - PRELIMINARY **X** - INFORMATION	ZA	ZA	ZA											

PLEASE CHECK THAT YOU HAVE RECEIVED ALL DOCUMENTS AS LISTED ABOVE.

I hereby acknowledge receipt of the documents as detailed above.
Signed: _____ Date: / /
Company: _____

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COURTNEY DR, UPPER COOMERA

PRELIMINARY ENGINEERING

OVERALL

No. 36001-PRE

SCHEDULE OF DRAWINGS		
NUMBER	REV. NO.	TITLE
GENERAL		
36001-PRE-000	C	COVER SHEET
36001-PRE-005	B	ROAD HIERARCHY & STAGING PLAN
EARTHWORKS. COMBINED SERVICES		
36001-PRE-090	B	PLAN SHEET 01
36001-PRE-091	B	PLAN SHEET 02
36001-PRE-092	C	PLAN SHEET 03
36001-PRE-093	C	PLAN SHEET 04
36001-PRE-094	C	PLAN SHEET 05
36001-PRE-095	B	PLAN SHEET 06
ROADS. ROADWORKS		
36001-PRE-100	B	PLAN SHEET 01
36001-PRE-101	B	PLAN SHEET 02
36001-PRE-102	B	PLAN SHEET 03
36001-PRE-103	B	PLAN SHEET 04
36001-PRE-104	B	PLAN SHEET 05
36001-PRE-105	B	PLAN SHEET 06
36001-PRE-120	A	DETAILS SHEET 01
ROADS. LONGITUDINAL SECTIONS		
36001-PRE-200	B	ROAD 01
36001-PRE-201	A	ROAD 01 (Cont.)
36001-PRE-202	A	ROAD 02
36001-PRE-203	A	ROAD 03 & ROAD 05
36001-PRE-204	A	ROAD 04
36001-PRE-205	A	ROAD 06 & ROAD 07
36001-PRE-206	A	ROAD 08 & ROAD 10
SEWER. SEWER RETICULATION		
36001-PRE-500	B	PLAN SHEET 01
36001-PRE-501	B	PLAN SHEET 02
36001-PRE-502	C	PLAN SHEET 03
36001-PRE-503	C	PLAN SHEET 04
36001-PRE-504	C	PLAN SHEET 05
36001-PRE-505	B	PLAN SHEET 06
DRAINAGE. STORMWATER		
36001-PRE-600	C	PLAN SHEET 01
36001-PRE-601	C	PLAN SHEET 02
36001-PRE-602	C	PLAN SHEET 03
36001-PRE-603	C	PLAN SHEET 04
36001-PRE-604	C	PLAN SHEET 05
36001-PRE-605	C	PLAN SHEET 06
WATER. WATER RETICULATION		
36001-PRE-700	C	PLAN SHEET 01
36001-PRE-701	C	PLAN SHEET 02
36001-PRE-702	C	PLAN SHEET 03
36001-PRE-703	C	PLAN SHEET 04
36001-PRE-704	C	PLAN SHEET 05
36001-PRE-705	C	PLAN SHEET 06

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SUB-CONSULTANTS

BIOME WATER AND ENVIRONMENTAL CONSULTING

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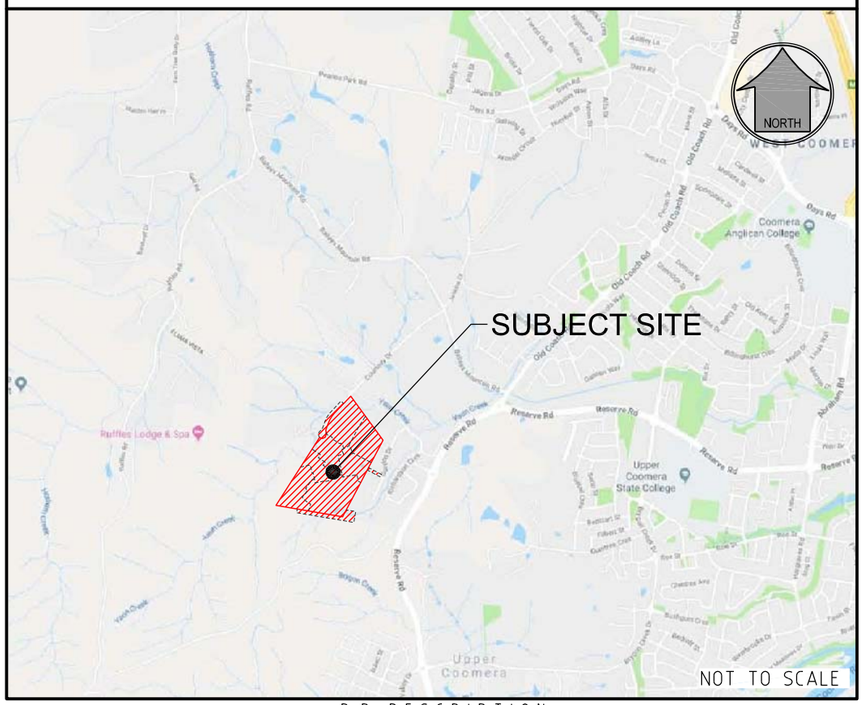
LOCALITY PLAN



R. P. DESCRIPTION
LOT 188, 189, 190, 191 & 192 ON RP173728
COURTNEY DRIVE
LOCALITY OF UPPER COOMERA
LOCAL AUTHORITY - GOLD COAST CITY COUNCIL

DRAWING NUMBER 36001-PRE-000 | AMEND. C

E:\autocad client\360 - gallery homes\01 - courtney drive\Overall\engineering drawings\pre\liminary engineering\Current\36001-PRE-000.dwg, COVER SHEET, 17/04/2019 8:33:17 AM, 1:2

GENERAL

1. CONTRACT SPECIFICATIONS
   ALL DRAWINGS ARE TO BE READ IN CONJUNCTION WITH THE CONTRACT SPECIFICATION.
2. SETOUT
   SURVEY SETOUT INFORMATION HAS BEEN ESTABLISHED ON SITE BY THE PRINCIPAL'S SURVEYOR TO ENABLE THE CONTRACTOR TO ACCURATELY SETOUT THE WORKS TO THE CO-ORDINATES SHOWN. SETOUT INFORMATION SHALL NOT BE OBTAINED BY SCALING FROM THESE DRAWINGS.
3. DATUM
   LEVELS SHOWN ARE TO A.H.D.
4. TRENCH SPOIL
   ALL MATERIALS ARISING FROM ROADS AND SERVICES ARE TO BE COMPACTED TO FUTURE STAGES, TO LEVEL 1 OR IF DIRECTED BY THE SUPERINTENDENT SHALL BE TRUCKED TO A LICENSED TIP AT THE CONTRACTOR'S EXPENSE.
5. CHECK ELECTRONIC SETOUT
   CONTRACTOR IS RESPONSIBLE TO ENSURE ANY ELECTRONIC DATA FILES MATCH THE DRAWINGS.
6. PRE START
   a. ERECT SITE SIGNAGE, CONSTRUCT ENTRY AND EXIT POINT AS INDICATED.
   b. CONSTRUCT VEHICLE WASHDOWN AREA AND ASSOCIATED SILT MANAGEMENT DEVICES.
   c. CONSTRUCT SITE OFFICE AND STORAGE COMPOUND AREA.
   d. INSTALL EROSION AND SEDIMENT CONTROL DEVICES AS PER THE CONTRACTOR'S EROSION AND SEDIMENT CONTROL PLAN.
   e. ERECT TEMPORARY TREE PROTECTION FENCING IN ACCORDANCE WITH THE APPROVED VEGETATION MANAGEMENT PLAN AND AUTHORITIES APPROVAL CONDITIONS (IF REQUIRED).
7. HEALTH AND SAFETY
   ALL WORKS UNDERTAKEN BY THE CONTRACTOR SHALL COMPLY WITH ALL APPLICABLE WORKPLACE HEALTH AND SAFETY LEGISLATION.

PROJECT SPECIFIC REPORTS

THE CONTRACTOR MUST FOLLOW THE RECOMMENDATIONS AND PROCEDURES OUTLINED IN THE FOLLOWING REPORTS AT ALL TIMES.

a) GEOTECHNICAL INVESTIGATION REPORTS (INCLUDING ANY ACID SULPHATE OR DISPERSIVE SOIL REPORTING)
b) VEGETATION & FAUNA MANAGEMENT PLANS
c) OTHER MANAGEMENT PLANS NOMINATED IN THE CONTRACT, AUTHORITIES APPROVAL CONDITIONS OR BY THE SUPERINTENDENT.

LEGEND

7.5m ROAD — REFER 120 DRAWING SERIES FOR TYPICAL SECTIONS

- EXISTING PROPERTY LINE
- EXISTING KERB (INVERT)
- EXISTING EDGE OF BITUMEN
- FUTURE PROPERTY LINE
- FUTURE KERB (INVERT)
- PROPOSED PROPERTY LINE
- PROPOSED KERB (INVERT)
- PROPOSED EDGE OF BITUMEN
- SITE BOUNDARY
- STAGE BOUNDARY
- LIMIT OF WORKS BOUNDARY

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PROJECT NAME

COURTNEY DR UPPER COOMERA

PRELIMINARY ENGINEERING

RP DESCRIPTION
LOT 188, 189, 190, 191 & 192 ON RP173728
COURTNEY DRIVE
LOCALITY OF UPPER COOMERA
LOCAL AUTHORITY - GOLD COAST CITY COUNCIL

CLIENT

GALLERY
THE ART OF LIVING

NORTH

0 12.5 25 37.5 50 62.5m
Scale 1:1250 - A1 (1:2500 - A3)

ISSUES	DATE	
TENDER		
COUNCIL	11-09-18	
CONSTRUCTION		

B	28-03-19	LOT NO'S, STAGES & LIMIT OF WORKS AMENDED
A	11-09-18	COUNCIL ISSUE
PRE	DATE	AMENDMENT

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zone Planning Group

DRAWING TITLE

ROAD HIERARCHY
AND
STAGING PLAN
SHEET 01

MORTONS urbansolutions
Urban & Regional Planning
Civil Engineering
Project Coordination

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DESIGNED	RB	DRAWN	EP
APPROVED		RPEQ 4706	DATE 14-08-18

DRAWING NUMBER 36001-PRE-005 | AMEND. B

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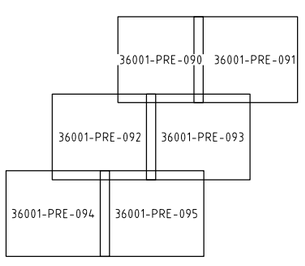
CONSTRUCTION SERVICES

1. CONSTRUCTION OF SEWER/ROOFWATER/STORMWATER/SERVICES
   EXCAVATED MATERIAL TO BE PLACED ON HIGH SIDE OF TRENCH AND TO PROTECT PIPE WORK AND DIRECT SURFACE MATERIAL AWAY FROM EXCAVATIONS.
   TOPSOIL AND GRASS SEED AREAS IN ALLOTMENTS IMMEDIATELY AFTER COMPLETING THE SEWER AND ROOFWATER DRAINAGE CONSTRUCTION.
   DEPRESS GROUND AROUND TEMPORARY FIELD INLETS TO CREATE SILT POND.
2. TRIP HAZARD
   MANHOLES OR STRUCTURES INSTALLED IN THE ROAD, FOOTPATH OR VERGE MUST MATCH NEATLY WITH NO TRIP HAZARD.
3. EXISTING SERVICES - EXTERNAL WORKS
   THE LOCATIONS OF ALL EXISTING SERVICES WITHIN THE WORK AREA SHALL BE CONFIRMED BY THE CONTRACTOR PRIOR TO CONSTRUCTION COMMENCING. IT IS THE CONTRACTOR'S RESPONSIBILITY TO CONTACT THE RELEVANT AUTHORITIES AND TO ENSURE THAT THE EXISTING SERVICES ARE NOT DAMAGED OR DISTURBED IN ANY WAY.

LEGEND

- EXISTING PROPERTY LINE
- EXISTING KERB (INVERT)
- EXISTING EDGE OF BITUMEN
- EXISTING FOOTPATH
- RM EXISTING RISING MAIN
- S EXISTING SEWER
- SW EXISTING STORMWATER
- RW EXISTING ROOFWATER
- SS EXISTING SUBSOIL
- W100 EXISTING WATER
- W150 EXISTING WATER
- W200 EXISTING WATER
- W225 EXISTING WATER
- W250 EXISTING WATER
- W300 EXISTING WATER
- EXISTING WATER CONDUIT
- PROPOSED PROPERTY LINE
- PROPOSED KERB (INVERT)
- PROPOSED EDGE OF BITUMEN
- PROPOSED FOOTPATH
- RM PROPOSED RISING MAIN
- S PROPOSED SEWER
- SW PROPOSED STORMWATER
- RW PROPOSED ROOFWATER
- SS PROPOSED SUBSOIL
- W PROPOSED WATER
- PROPOSED WATER CONDUIT
- FUTURE PROPERTY LINE
- FUTURE KERB (INVERT)
- FUTURE FOOTPATH
- RM FUTURE RISING MAIN
- S FUTURE SEWER
- SW FUTURE STORMWATER
- RW FUTURE ROOFWATER
- SS FUTURE SUBSOIL
- W100 FUTURE WATER
- W150 FUTURE WATER
- W200 FUTURE WATER
- W225 FUTURE WATER
- W250 FUTURE WATER
- W300 FUTURE WATER
- FUTURE WATER CONDUIT
- SITE BOUNDARY
- STAGE BOUNDARY

SHEET LAYOUT



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198 RP173728

197 RP173728

187 RP173728

1000

COURTNEY DR

ROAD 10

ROAD 07

STAGE 5

STAGE 6

261 260 259 258 257 256 255 262 263 264 265 266 267 268 269 270 272 273 274 275 276 277 278 279 280 281 282 283 284 327 326 325 324 323 293 294 295 296 292 291 297 290 298 289 299 288 328

PROJECT NAME

COURTNEY DR UPPER COOMERA

PRELIMINARY ENGINEERING

RP DESCRIPTION
LOT 188, 189, 190, 191 & 192 ON RP173728
COURTNEY DRIVE
LOCALITY OF UPPER COOMERA
LOCAL AUTHORITY - GOLD COAST CITY COUNCIL

CLIENT

GALLERY
THE ART OF LIVING

NORTH

0 5 10 15 20 25m
Scale 1:500 - A1 (1:1000 - A3)

ISSUES	DATE	
TENDER		
COUNCIL	11-09-18	
CONSTRUCTION		

B	28-03-19	SHEET LAYOUT, LOT NO'S & STAGES AMENDED
A	11-09-18	COUNCIL ISSUE
PRE	DATE	AMENDMENT

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BIOME WATER AND ENVIRONMENTAL CONSULTING

zone Planning Group

DRAWING TITLE

COMBINED SERVICES PLAN
SHEET 01

MORTONS urbansolutions
Urban & Regional Planning
Civil Engineering
Project Coordination

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185
RP173727

186
RP173728

187
RP173728

75
SP174234

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SP174234

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SP174234

77
SP174234

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SP174234

79
SP174234

900
SP205578

326
325
324
323
322
321
320
328

STAGE 6

ROAD 07

RICHARDSON CR

GORDON DR

PROJECT NAME

COURTNEY DR UPPER COOMERA

PRELIMINARY ENGINEERING

RP DESCRIPTION
LOT 188, 189, 190, 191 & 192 ON RP173728
COURTNEY DRIVE
LOCALITY OF UPPER COOMERA
LOCAL AUTHORITY - GOLD COAST CITY COUNCIL

CLIENT

GALLERY
THE ART OF LIVING

NORTH

0 5 10 15 20 25m
Scale 1:500 - A1 (1:1000 - A3)

ISSUES	DATE	
TENDER		
COUNCIL	11-09-18	
CONSTRUCTION		

PRE	DATE	AMENDMENT
B	28-03-19	LOT NO'S, STAGES & SHEET LAYOUT AMENDED
A	11-09-18	COUNCIL ISSUE

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PLAN
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36001-PRE-091	B

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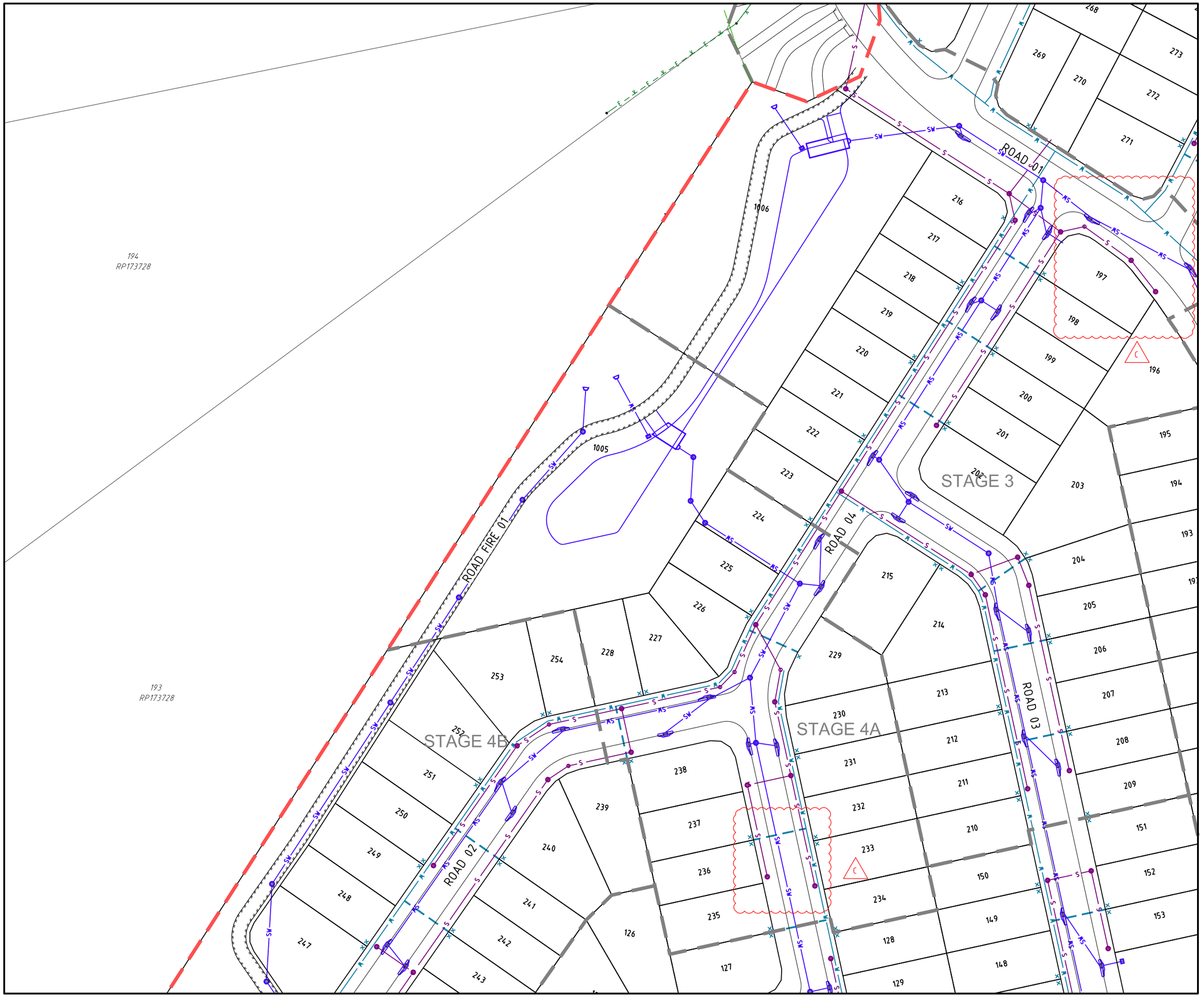

PROJECT NAME

COURTNEY DR UPPER COOMERA

PRELIMINARY ENGINEERING

RP DESCRIPTION
LOT 188, 189, 190, 191 & 192 ON RP173728
COURTNEY DRIVE
LOCALITY OF UPPER COOMERA
LOCAL AUTHORITY - GOLD COAST CITY COUNCIL

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ISSUES	DATE	
TENDER		
COUNCIL	11-09-18	
CONSTRUCTION		

PRE	DATE	AMENDMENT
C	16-04-19	SEWER AMENDED
B	28-03-19	LOTS, LOT NO'S, STAGES & SHEET LAYOUT AMENDED
A	11-09-18	COUNCIL ISSUE

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DRAWING NUMBER	AMEND.
36001-PRE-092	C

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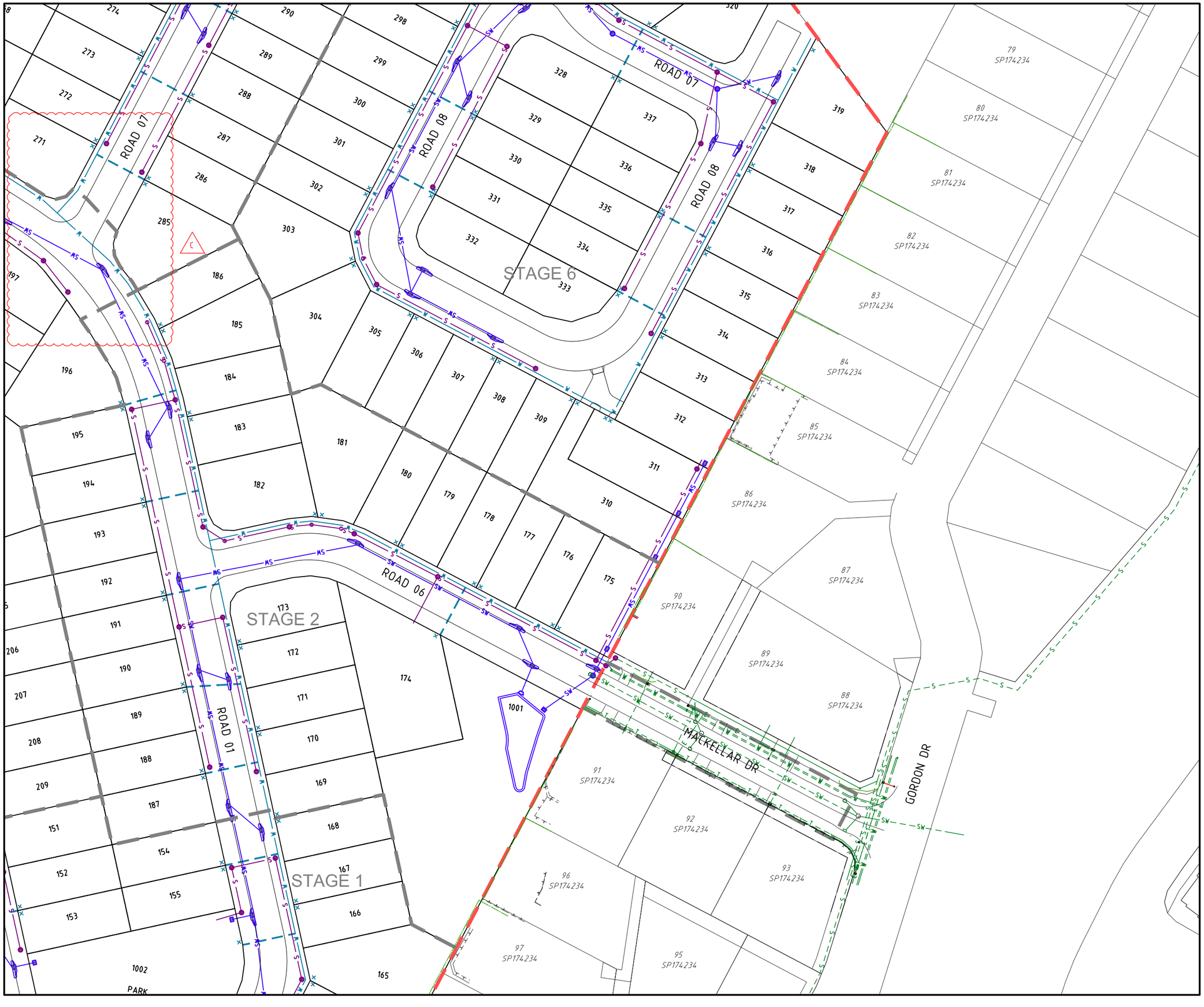

PROJECT NAME

COURTNEY DR UPPER COOMERA

PRELIMINARY ENGINEERING

RP DESCRIPTION
LOT 188, 189, 190, 191 & 192 ON RP173728
COURTNEY DRIVE
LOCALITY OF UPPER COOMERA
LOCAL AUTHORITY - GOLD COAST CITY COUNCIL

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ISSUES	DATE	
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PRE	DATE	AMENDMENT

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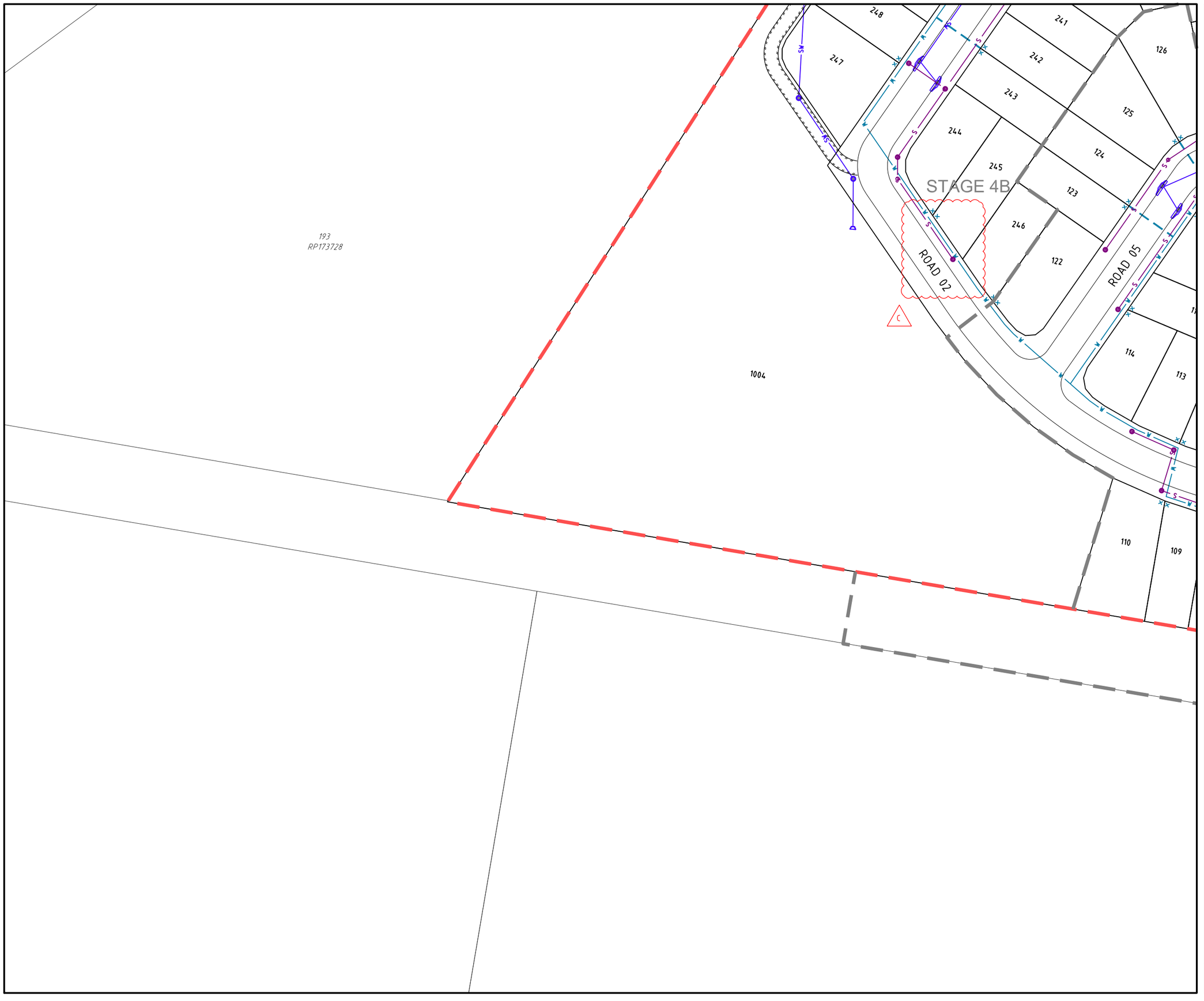

PROJECT NAME

COURTNEY DR UPPER COOMERA

PRELIMINARY ENGINEERING

RP DESCRIPTION
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CONSTRUCTION		

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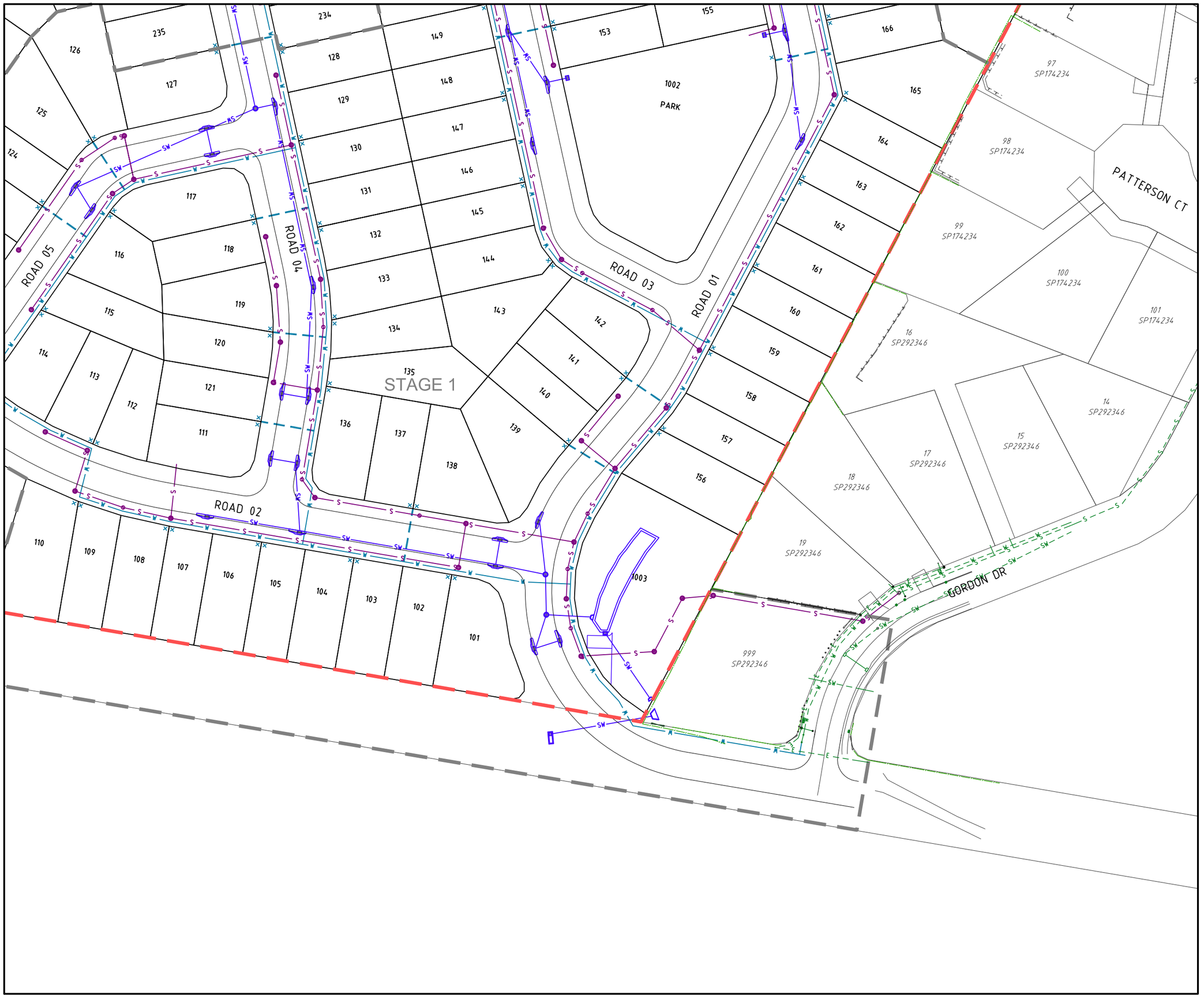

PROJECT NAME

COURTNEY DR UPPER COOMERA

PRELIMINARY ENGINEERING

RP DESCRIPTION
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COURTNEY DRIVE
LOCALITY OF UPPER COOMERA
LOCAL AUTHORITY - GOLD COAST CITY COUNCIL

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TENDER		
COUNCIL	11-09-18	
CONSTRUCTION		

PRE	DATE	AMENDMENT
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COMBINED SERVICES PLAN
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ROADWORKS

1. PAVEMENT DEPTHS
   a) THE DESIGN PAVEMENT DEPTHS ALLOWED IN EARTHWORKS CALCULATIONS ARE BASED ON THE DEPTHS SHOWN IN THE SCHEDULE OF PAVEMENT DEPTHS ON DRAWING 120.
   b) THE PAVEMENT DEPTHS GIVEN ARE DESIGN DEPTHS ONLY AND MAY BE VARIED AFTER SUB-GRADE TESTS ARE TAKEN. THE CONTRACTOR IS TO PROVIDE THE SUPERINTENDENT A SUBGRADE C.B.R. REPORT PREPARED BY A SUITABLY QUALIFIED GEOTECHNICAL ENGINEER.
   THE SUPERINTENDENT WILL COORDINATE THE AUTHORITIES APPROVAL OF THE PAVEMENT DESIGN.
   c) REFER TO DWG. 120 FOR TYPICAL ROAD SECTIONS.
2. TESTING
   ALL COMPACTION TESTING SHALL BE CARRIED OUT BY AN APPROVED N.A.T.A. TESTING AUTHORITY. ALL SITE FILLING SHALL BE TESTED AT LEVEL 1 REQUIREMENTS.
3. SUBSOIL DRAINS
   SUBSOIL DRAINS ARE TO BE CONSTRUCTED IN ACCORDANCE WITH THE LOCAL AUTHORITY'S SPECIFICATIONS. SUBSOIL DRAINS SHALL BE PLACED UNDER ALL KERB STRUCTURES AND ARE TO BE CONSTRUCTED TO A DEPTH GREATER THAN THAT OF THE INVERT OF THE DEEPEST SERVICE CROSSING.
4. MITRE DRAINS
   MITRE DRAINS ARE TO BE CONSTRUCTED ALONG THE CUT/FILL INTERFACE AND SAG/LOW POINTS OF ALL ROADS. CONTRACTOR TO REQUEST DIRECTION FROM SUPERINTENDENT WHETHER TO INSTALL MITRE DRAIN AT ROCK ENCOUNTERED IN SUBGRADE. ALL MITRE DRAINS MUST BE FREE DRAINING AND TIE INTO THE ADJACENT SUBSOIL DRAINS.
5. ROCK
   THE CONTRACTOR IS TO INCLUDE ROCK EXCAVATION AS PART OF THEIR RATES.
6. TURF
   1.0m TURF STRIP TO BE INSTALLED BEHIND THE BACK OF ALL KERBS. A PERPENDICULAR TURF STRIP AT MAXIMUM 10m INCREMENTS MUST BE INSTALLED TO FULL VERGE WIDTH FOR SEDIMENT AND EROSION CONTROL PURPOSES.
7. KERBS
   ALL KERBS TO BE CONSTRUCTED IN ACCORDANCE WITH AUTHORITY STANDARDS
8. PAVEMENT TIE-IN
   PAVEMENT TIE-IN TO BE IN ACCORDANCE WITH DWG. 120

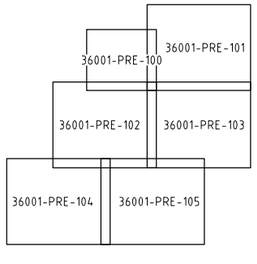
LEGEND

- EXISTING KERB (INVERT)
- EXISTING KERB (LIP & BACK)
- EXISTING FOOTPATH
- EXISTING EDGE OF BITUMEN
- EXISTING PROPERTY LINE
- EXISTING CONTOURS
- FUTURE KERB
- FUTURE FOOTPATH
- FUTURE PROPERTY LINE
- FUTURE CONTOURS
- CONTROL LINE / CENTER OF ROAD
- PROPOSED KERB (INVERT)
- PROPOSED KERB (LIP & BACK)
- PROPOSED EDGE OF BITUMEN
- PROPOSED FOOTPATH
- PROPOSED PROPERTY LINE
- SITE BOUNDARY
- STAGE BOUNDARY
- DESIGN CONTOURS
- PROPOSED CONCRETE
- 41.065 CENTRELINE CHAINAGE

KERB TYPE NOTE:

1. FOR KERB TYPES REFER TO DWG. 120

SHEET LAYOUT



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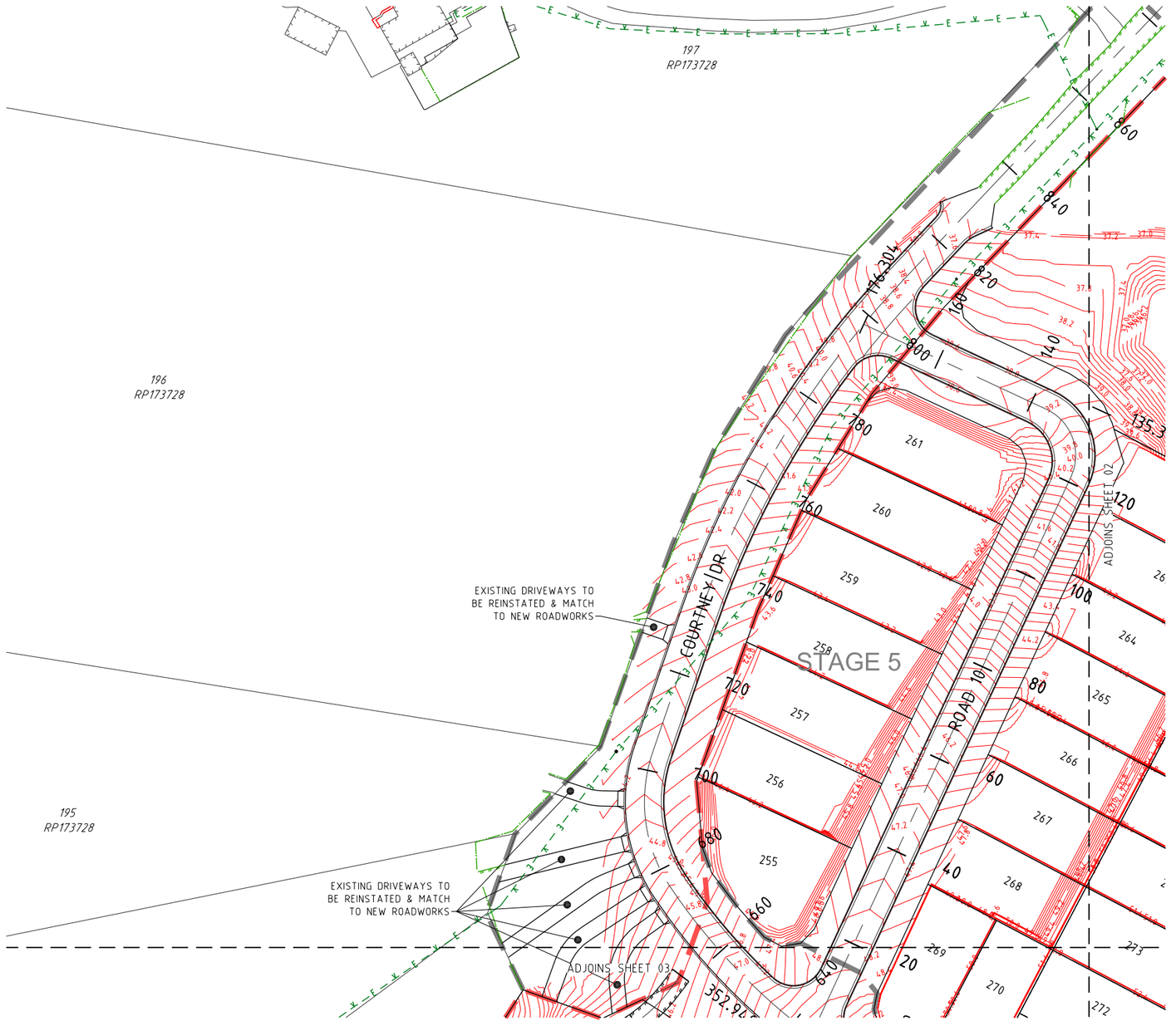

PROJECT NAME

COURTNEY DR UPPER COOMERA

PRELIMINARY ENGINEERING

RP DESCRIPTION
LOT 188, 189, 190, 191 & 192 ON RP173728
COURTNEY DRIVE
LOCALITY OF UPPER COOMERA
LOCAL AUTHORITY - GOLD COAST CITY COUNCIL

CLIENT

GALLERY
THE ART OF LIVING

NORTH

0 5 10 15 20 25m
Scale 1:500 - A1 (1:1000 - A3)

ISSUES	DATE	
TENDER		
COUNCIL	11-09-18	
CONSTRUCTION		

PRE	DATE	AMENDMENT
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DRAWING TITLE

ROADWORKS
PLAN
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PROJECT NAME

COURTNEY DR UPPER COOMERA

PRELIMINARY ENGINEERING

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EXISTING DRIVEWAYS TO BE REINSTATED & MATCH TO NEW ROADWORKS

ADJOINS SHEET 01

194
RP173728

193
RP173728

ROAD 01

ROAD FIRE 01

ROAD 02

ROAD 03

ROAD 04

STAGE 3

STAGE 4A

STAGE 4B

ADJOINS SHEET 04

ADJOINS SHEET 05

ADJOINS SHEET 06

PROJECT NAME

COURTNEY DR UPPER COOMERA

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ROADWORKS
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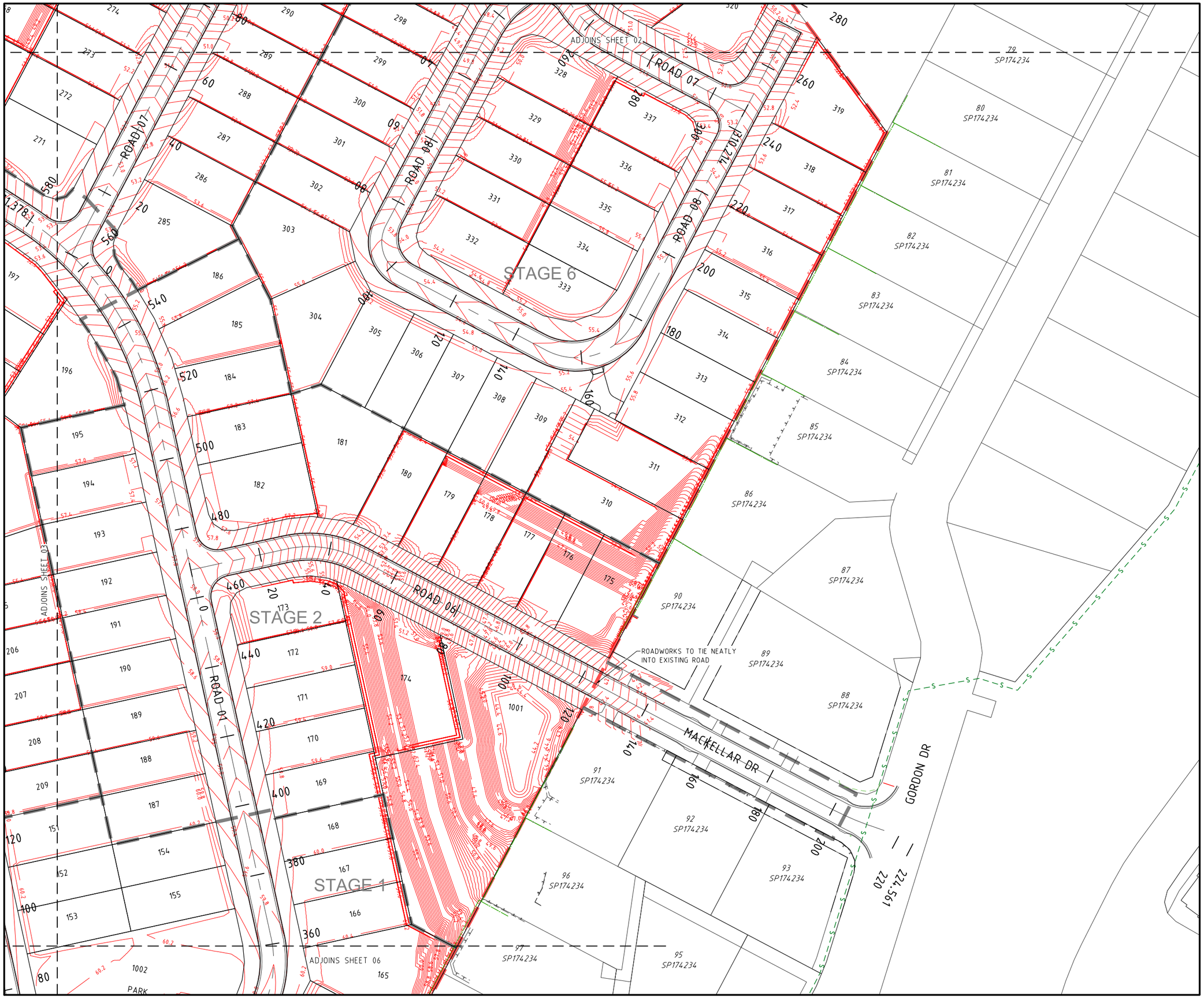

PROJECT NAME

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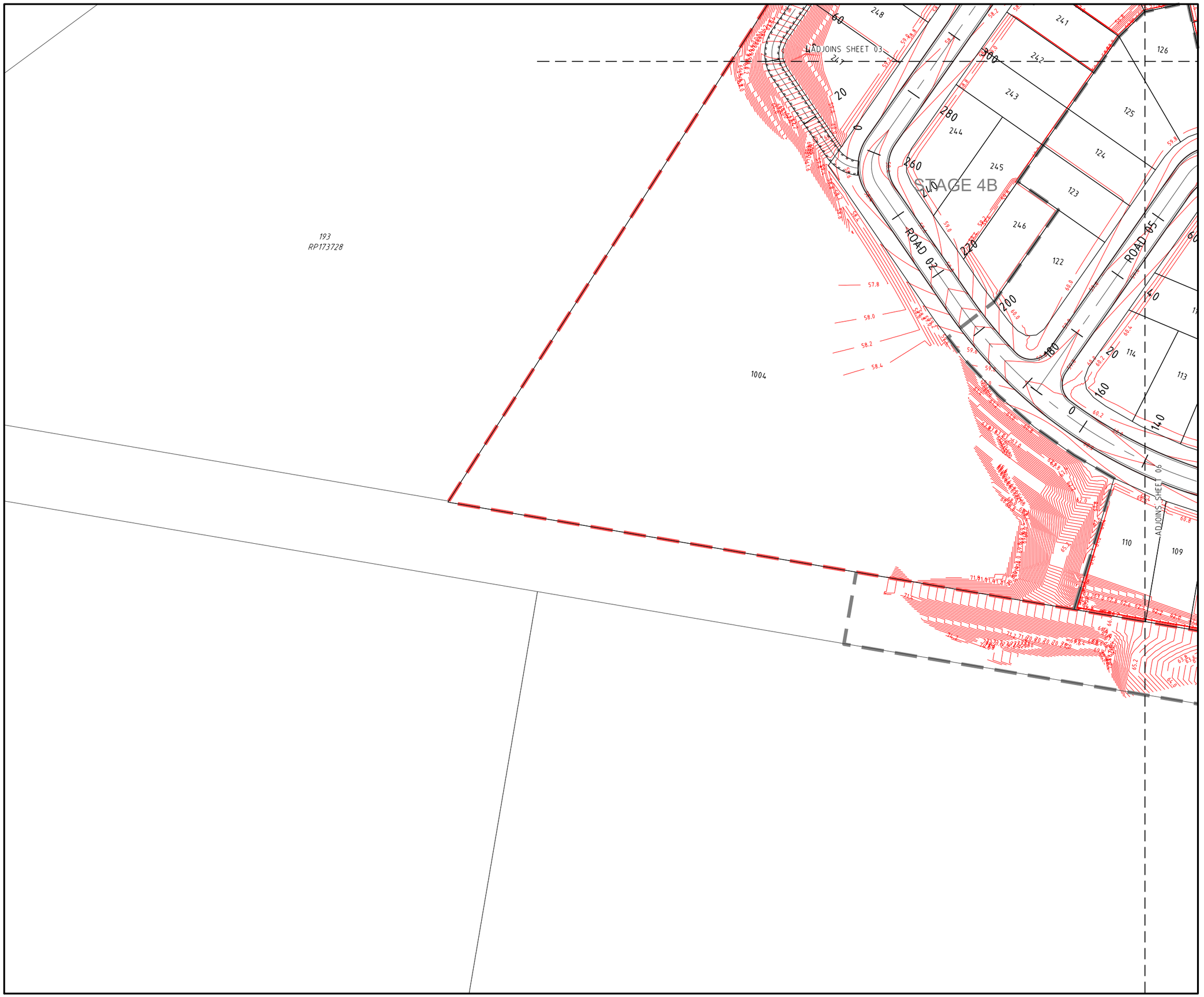

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THE ART OF LIVING

NORTH

0 5 10 15 20 25m
Scale 1:500 - A1 (1:1000 - A3)

ISSUES	DATE	
TENDER		
COUNCIL	11-09-18	
CONSTRUCTION		

PRE	DATE	AMENDMENT
B	28-03-19	LOTS, LOT NO'S & STAGES AMENDED
A	11-09-18	COUNCIL ISSUE

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zone Planning Group

DRAWING TITLE

ROADWORKS
PLAN
SHEET 05

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APPROVED		RPEQ 4706	DATE 14-08-18

DRAWING NUMBER	AMEND.
36001-PRE-104	B

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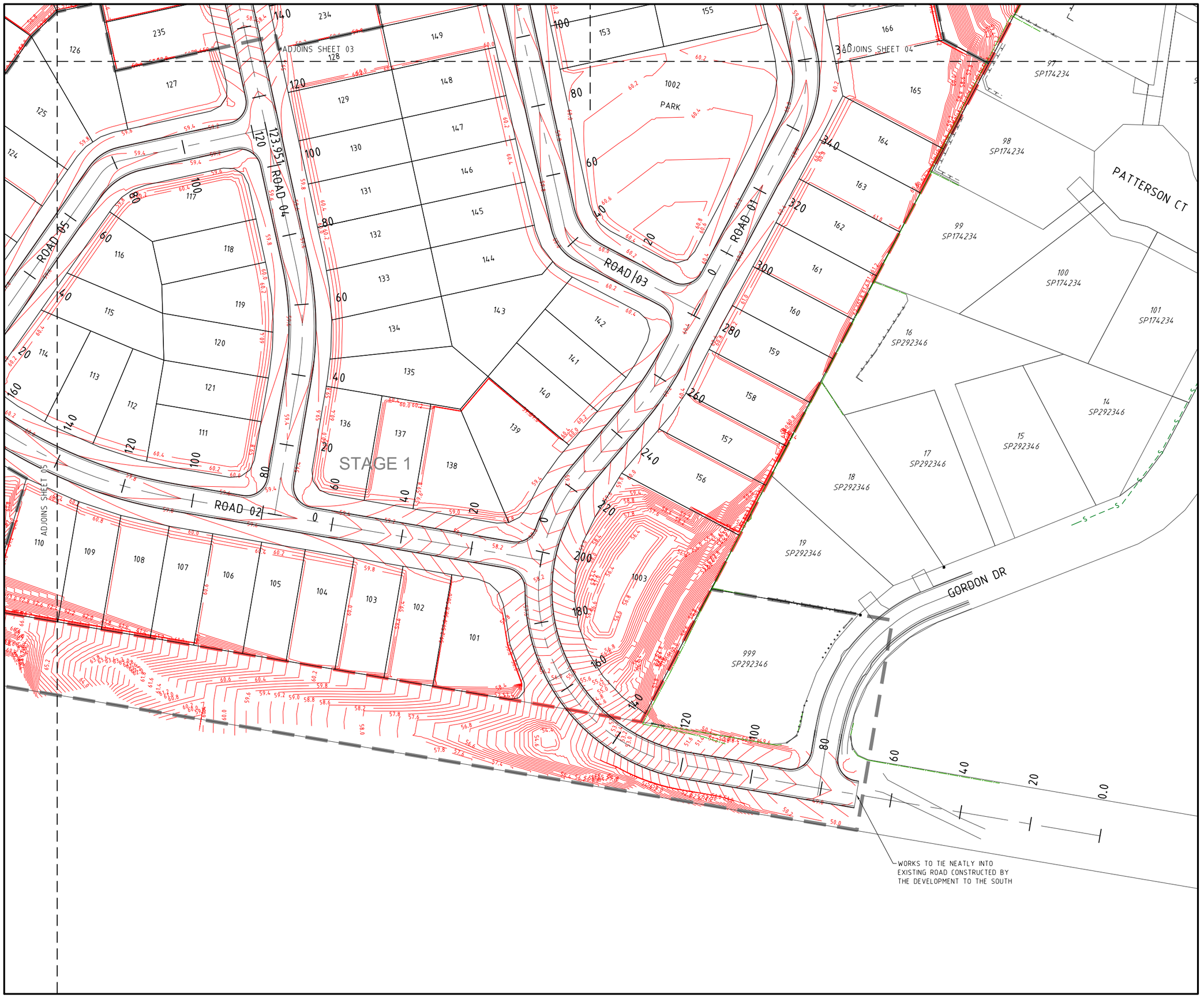

PROJECT NAME

COURTNEY DR UPPER COOMERA

PRELIMINARY ENGINEERING

RP DESCRIPTION
LOT 188, 189, 190, 191 & 192 ON RP173728
COURTNEY DRIVE
LOCALITY OF UPPER COOMERA
LOCAL AUTHORITY - GOLD COAST CITY COUNCIL

CLIENT

GALLERY
THE ART OF LIVING

NORTH

0 5 10 15 20 25m
Scale 1:500 - A1 (1:1000 - A3)

ISSUES	DATE	
TENDER		
COUNCIL	11-09-18	
CONSTRUCTION		

PRE	DATE	AMENDMENT
B	28-03-19	LOT NO'S, STAGES & CONTOURS AMENDED, NOTE ADDED
A	11-09-18	COUNCIL ISSUE

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zone Planning Group

DRAWING TITLE

ROADWORKS
PLAN
SHEET 06

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DRAWING NUMBER	AMEND.
36001-PRE-105	B

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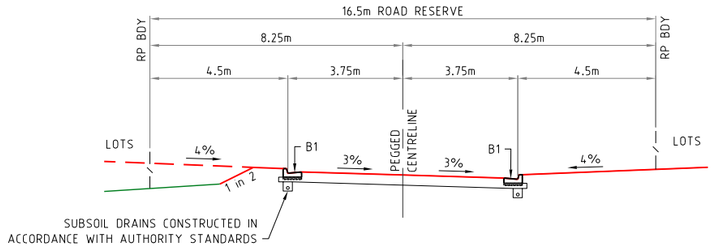
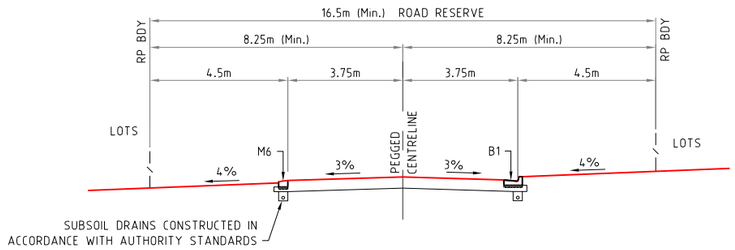


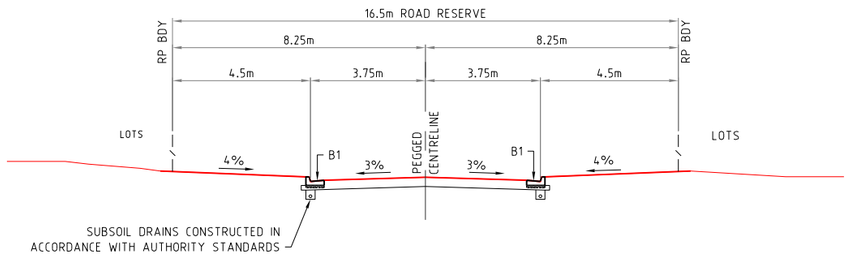
TYPICAL SECTION - ONE WAY CROSSFALL
7.5m ROAD-16.5m ROAD RESERVE

SCALE 1:100 - A1 (1:200 - A3)



TYPICAL SECTION - EDGE RESTRAINT TO BASIN
7.5m ROAD-16.5m (Min.) ROAD RESERVE

SCALE 1:100 - A1 (1:200 - A3)



TYPICAL SECTION - TWO WAY CROSSFALL
7.5m ROAD-16.5m ROAD RESERVE

SCALE 1:100 - A1 (1:200 - A3)

PROJECT NAME

COURTNEY DR UPPER COOMERA

PRELIMINARY ENGINEERING

RP DESCRIPTION
LOT 188, 189, 190, 191 & 192 ON RP173728
COURTNEY DRIVE
LOCALITY OF UPPER COOMERA
LOCAL AUTHORITY - GOLD COAST CITY COUNCIL

CLIENT

GALLERY
THE ART OF LIVING

0 1 2 3 4 5m
Scale 1:100 - A1 (1:200 - A3)

ISSUES	DATE	
TENDER		
COUNCIL	11-09-18	
CONSTRUCTION		

PRE	DATE	AMENDMENT
A	11-09-18	COUNCIL ISSUE

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DRAWING TITLE

ROADWORKS
DETAILS
SHEET 01

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APPROVED		RPEQ 4706	DATE 14-08-18

DRAWING NUMBER	AMEND.
36001-PRE-120	A

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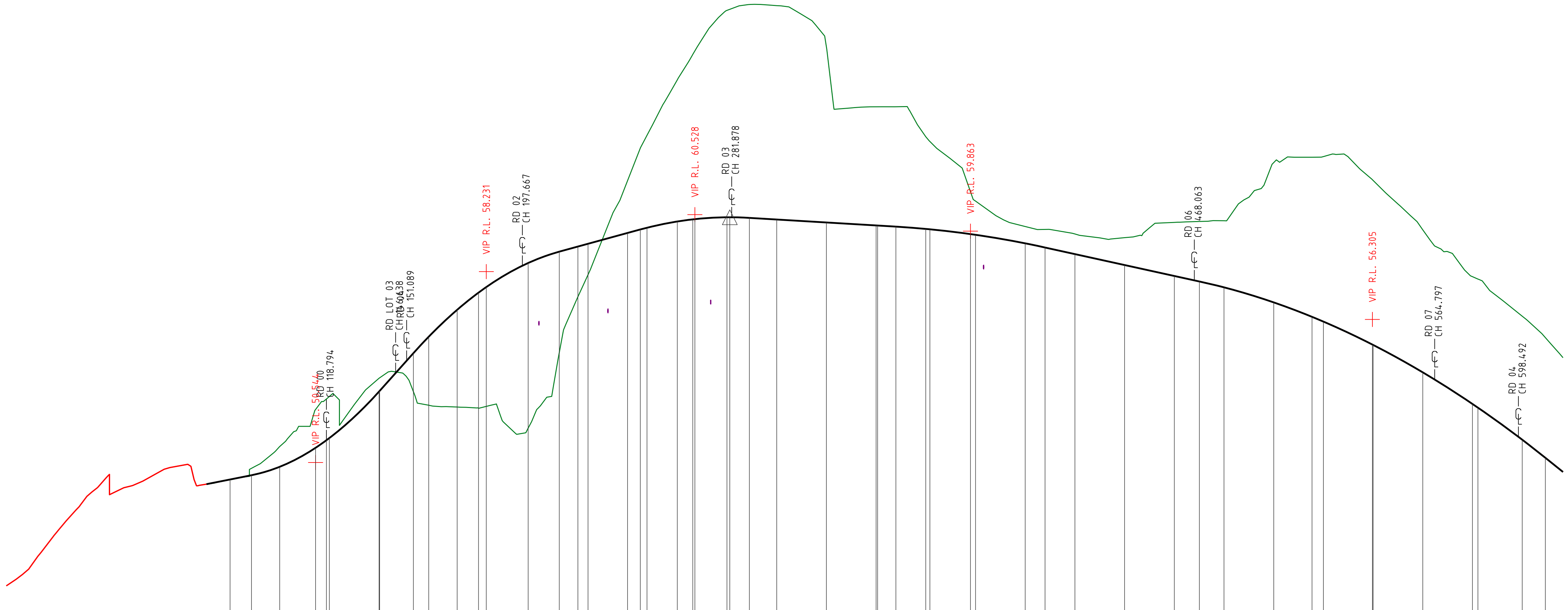

DESIGN GRADELINE: 1.985% | 11.186% | 2.738% | -0.600% | -2.200% | -8.000

VERTICAL GEOMETRY: 51.52m R560m | 58.71m R695m | 43.90m R1315m | 60.00m R3750m | 139.20m R2400m

HORIZONTAL GEOMETRY: 50 | 50 | -85 | -30 | -85

DATUM 30.0

CHAINAGE	CONTROL LINE LEVELS	EXISTING SURFACE	DEPTH
0		46.393	
20		48.861	
40		49.598	
60		50.417	
80	49.86	49.85	-0.01
88.671	50.032	50.311	0.278
100	50.372	51.187	0.815
114.432	51.136	52.68	1.544
118.794	51.441	53.101	1.66
120	51.531	53.202	1.671
140	53.404	53.939	0.535
140.194	53.425	53.954	0.529
153.796	54.947	53.419	-1.528
160	55.613	52.852	-2.761
171.424	56.695	52.778	-3.917
180	57.384	52.734	-4.65
183.151	57.611	52.807	-4.803
200	58.579	51.93	-6.649
212.506	59.034	54.995	-4.039
220	59.24	57.219	-2.021
224.055	59.351	58.106	-1.244
240	59.787	61.892	2.105
245.119	59.927	63.199	3.271
247.822	59.999	63.723	3.724
260	60.251	65.952	5.702
266.243	60.336	66.978	6.642
267.067	60.345	67.12	6.775
280	60.42	68.751	8.331
281.125	60.42	68.793	8.373
289.015	60.397	68.986	8.589
300	60.331	68.941	8.611
320	60.211	67.293	7.082
340	60.091	64.868	4.777
340.62	60.087	64.868	4.781
347.972	60.043	64.872	4.83
360	59.951	63.664	3.713
361.645	59.936	63.472	3.536
377.972	59.743	61.455	1.713
380	59.714	61.073	1.359
400	59.37	60.049	0.679
407.972	59.203	59.932	0.729
420	58.938	59.746	0.808
440	58.498	59.598	1.099
460	58.058	60.214	2.156
470.107	57.836	60.25	2.414
480	57.598	60.279	2.682
500	56.992	62.622	5.63
515.421	56.411	62.838	6.427
520	56.22	62.864	6.645
539.707	55.295	61.931	6.636
540	55.28	61.902	6.621
560	54.175	59.912	5.737
580	52.902	58.027	5.124
582.18	52.754	57.933	5.179
600	51.463	56.438	4.975
609.307	50.737	55.575	4.838

LONGITUDINAL SECTION ROAD 01

PROJECT NAME

COURTNEY DR UPPER COOMERA

PRELIMINARY ENGINEERING

RP DESCRIPTION
LOT 188, 189, 190, 191 & 192 ON RP173728
COURTNEY DRIVE
LOCALITY OF UPPER COOMERA
LOCAL AUTHORITY - GOLD COAST CITY COUNCIL

CLIENT

GALLERY
THE ART OF LIVING

0 5 10 15 20 25m
Horiz. Scale 1:500 - A1 (1:1000 - A3)
0 1 2 3 4 5m
Vert. Scale 1:100 - A1 (1:200 - A3)

ISSUES	DATE	
TENDER		
COUNCIL	11-09-18	
CONSTRUCTION		

PRE	DATE	AMENDMENT
B	28-03-19	ROAD 01 LONG SECTION AMENDED
A	11-09-18	COUNCIL ISSUE

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zone Planning Group

DRAWING TITLE

LONGITUDINAL SECTIONS
ROAD 01

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DESIGNED RB | DRAWN EP
APPROVED [signature] | RPEQ 4706 | DATE 14-08-18

DRAWING NUMBER 36001-PRE-200 | AMEND. B

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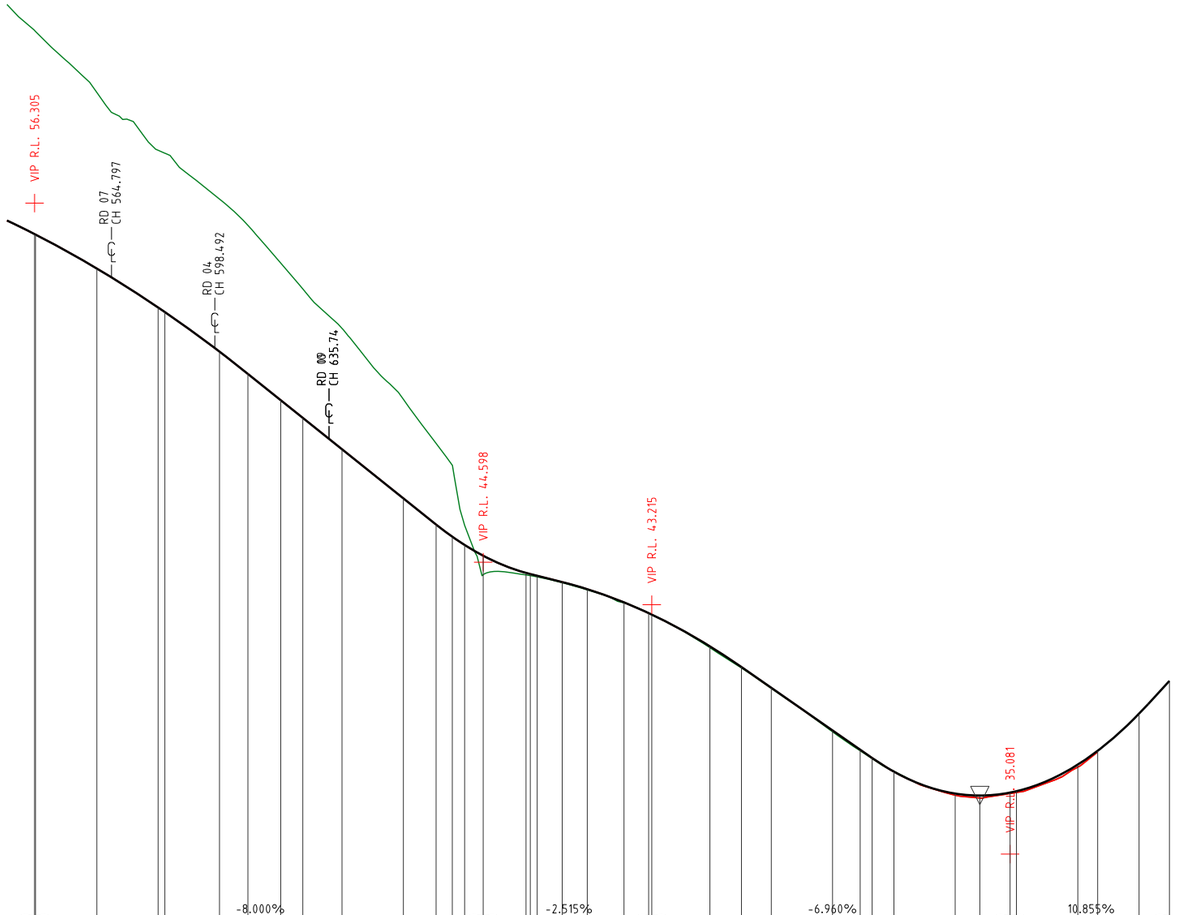

CONTROL LINE LEVELS	55.295	55.28	54.175	52.902	52.754	51.463	50.737	49.881	49.305	48.281	46.681	45.827	45.43	45.159	44.809	44.249	44.212	44.155	43.95	43.718	43.288	42.939	42.89	41.855	41.181	40.503	39.111	38.483	38.213	37.769	37.054	36.99	37.086	37.131	38	38.451	39.66	40.727
EXISTING SURFACE	61.931	61.902	59.912	58.027	57.933	56.438	55.575	54.351	53.507	52.219	49.91	48.474	47.761	45.797	44.192	44.183	44.162	44.119	43.925	43.696	43.272	42.935	42.889	41.811	41.149	40.484	39.07	38.449	38.194	37.783	37.004	36.91	37.056	37.09	37.916	38.413		
DEPTH	6.636	6.621	5.737	5.124	5.179	4.975	4.838	4.469	4.202	3.938	3.229	2.647	2.33	0.639	-0.617	-0.066	-0.05	-0.036	-0.025	-0.022	-0.016	-0.003	-0.001	-0.044	-0.031	-0.019	-0.041	-0.034	-0.02	0.014	-0.05	-0.08	-0.029	-0.041	-0.084	-0.039		
CHAINAGE	539.707	540	560	580	582.18	600	609.307	620	627.198	640	660	670.681	675.947	680	686.038	700	701.395	703.668	711.815	720	731.985	740	741.037	760	770.26	780	800	809.021	812.897	820	840	848.057	857.897	860	880	886.484	900	909.901

LONGITUDINAL SECTION ROAD 01 (Cont.)

PROJECT NAME

COURTNEY DR UPPER COOMERA

PRELIMINARY ENGINEERING

RP DESCRIPTION
LOT 188, 189, 190, 191 & 192 ON RP173728
COURTNEY DRIVE
LOCALITY OF UPPER COOMERA
LOCAL AUTHORITY - GOLD COAST CITY COUNCIL

CLIENT

GALLERY
THE ART OF LIVING

0 5 10 15 20 25m
Horiz. Scale 1:500 - A1 (1:1000 - A3)

0 1 2 3 4 5m
Vert. Scale 1:100 - A1 (1:200 - A3)

ISSUES	DATE	
TENDER		
COUNCIL	11-09-18	
CONSTRUCTION		

PRE	DATE	AMENDMENT
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DRAWING TITLE

LONGITUDINAL SECTIONS
ROAD 01 (Cont.)

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Urban & Regional Planning
Civil Engineering
Project Coordination

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APPROVED	RPEQ 4706	DATE	14-08-18

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36001-PRE-201

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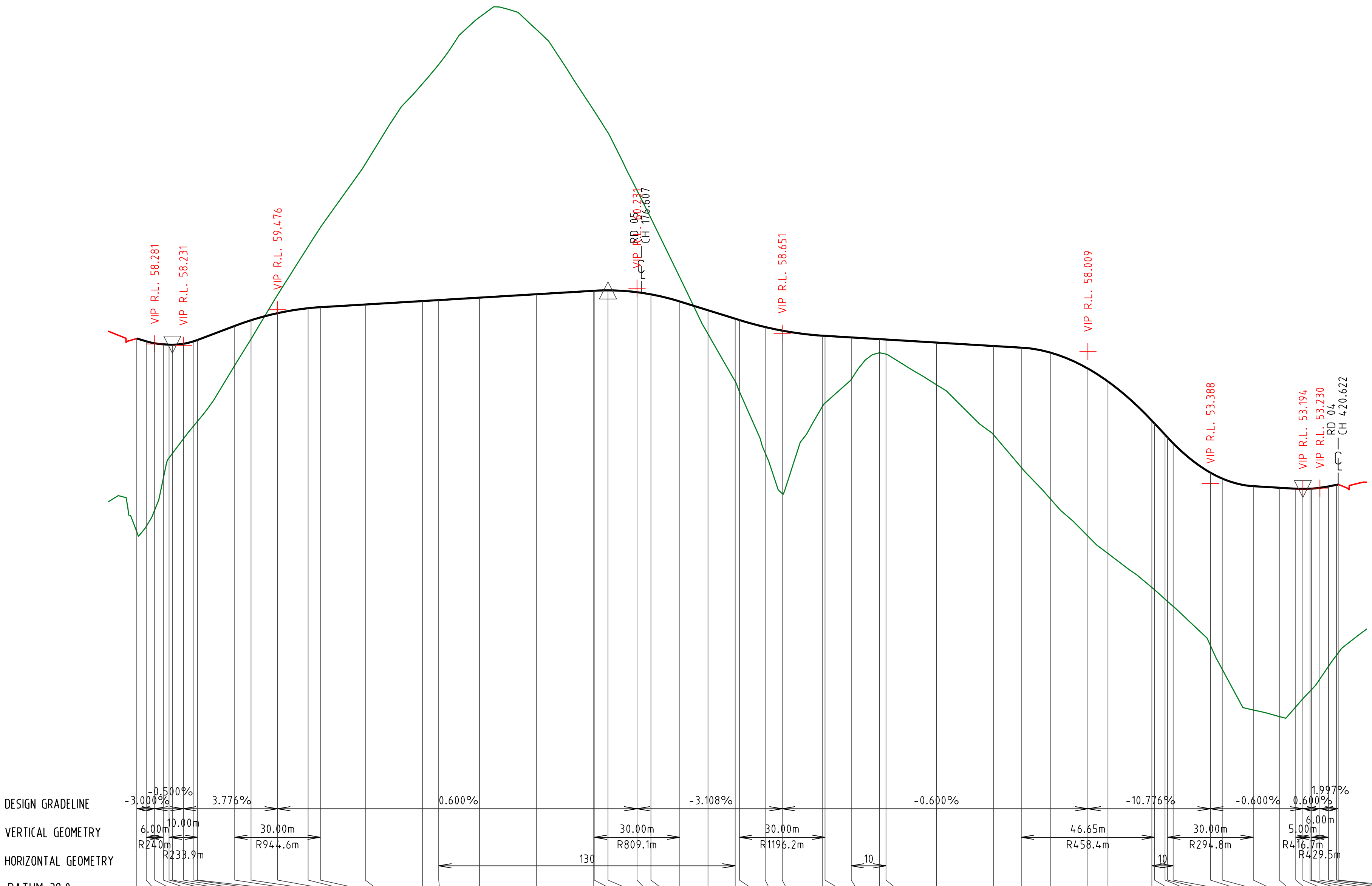

CHAINAGE	CONTROL LINE LEVELS	EXISTING SURFACE	DEPTH
0	58.47	51.702	-6.768
3.3	58.371	51.884	-6.486
6.3	58.299	52.467	-5.833
9.3	58.266	53.571	-4.694
11.3	58.256	54.286	-3.969
12.469	58.253	54.441	-3.811
16.3	58.284	54.95	-3.334
20	58.374	55.416	-2.958
21.3	58.419	55.573	-2.847
34.287	58.91	57.526	-1.384
40	59.108	58.449	-0.66
49.287	59.357	59.994	0.637
60	59.531	61.69	2.16
64.287	59.566	62.356	2.79
80	59.66	64.581	4.921
100	59.78	67.39	7.61
105.715	59.814	68.074	8.26
120	59.9	69.72	9.819
140	60.02	69.285	9.265
160	60.14	66.465	6.325
160.135	60.141	66.444	6.303
164.988	60.155	65.688	5.533
175.135	60.092	63.664	3.572
180	60.016	62.687	2.671
190.135	59.765	60.613	0.848
200	59.458	58.631	-0.828
209.524	59.162	56.972	-2.19
210.969	59.117	56.615	-2.502
220	58.871	54.46	-4.411
225.969	58.745	53.039	-5.706
240	58.567	56.081	-2.486
240.969	58.561	56.211	-2.35
250.157	58.506	57.036	-1.47
260	58.447	57.97	-0.476
262.283	58.433	57.925	-0.508
280	58.327	56.849	-1.477
300	58.207	55.09	-3.117
309.679	58.149	53.953	-4.196
320	57.971	52.836	-5.134
333.003	57.415	51.544	-5.871
340	56.964	50.94	-6.024
355.369	55.597	49.751	-5.847
356.327	55.495	49.669	-5.826
360	55.099	49.34	-5.76
360.879	55.005	49.261	-5.744
362.827	54.801	49.09	-5.711
375.879	53.77	47.713	-6.057
380	53.564	46.884	-6.68
390.879	53.298	45.46	-7.838
400	53.244	45.229	-8.014
405.759	53.209	45.566	-7.643
408.259	53.202	45.853	-7.349
410.759	53.209	46.118	-7.091
411.206	53.212	46.165	-7.047
414.206	53.24	46.547	-6.694
417.206	53.29	46.988	-6.302
420	53.345	47.376	-5.97
420.622	53.358	47.459	-5.899

LONGITUDINAL SECTION ROAD 02

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PROJECT NAME

COURTNEY DR
UPPER COOMERA

PRELIMINARY
ENGINEERING

RP DESCRIPTION
LOT 188, 189, 190, 191 & 192 ON RP173728
COURTNEY DRIVE
LOCALITY OF UPPER COOMERA
LOCAL AUTHORITY - GOLD COAST CITY COUNCIL

CLIENT

GALLERY
THE ART OF LIVING

0 5 10 15 20 25m
Horiz. Scale 1:500 - A1 (1:1000 - A3)
0 1 2 3 4 5m
Vert. Scale 1:100 - A1 (1:200 - A3)

ISSUES	DATE	
TENDER		
COUNCIL	11-09-18	
CONSTRUCTION		

PRE	DATE	AMENDMENT
A	11-09-18	COUNCIL ISSUE

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DRAWING TITLE

LONGITUDINAL SECTIONS
ROAD 02

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APPROVED (signature) | RPEQ 4706 | DATE 14-08-18

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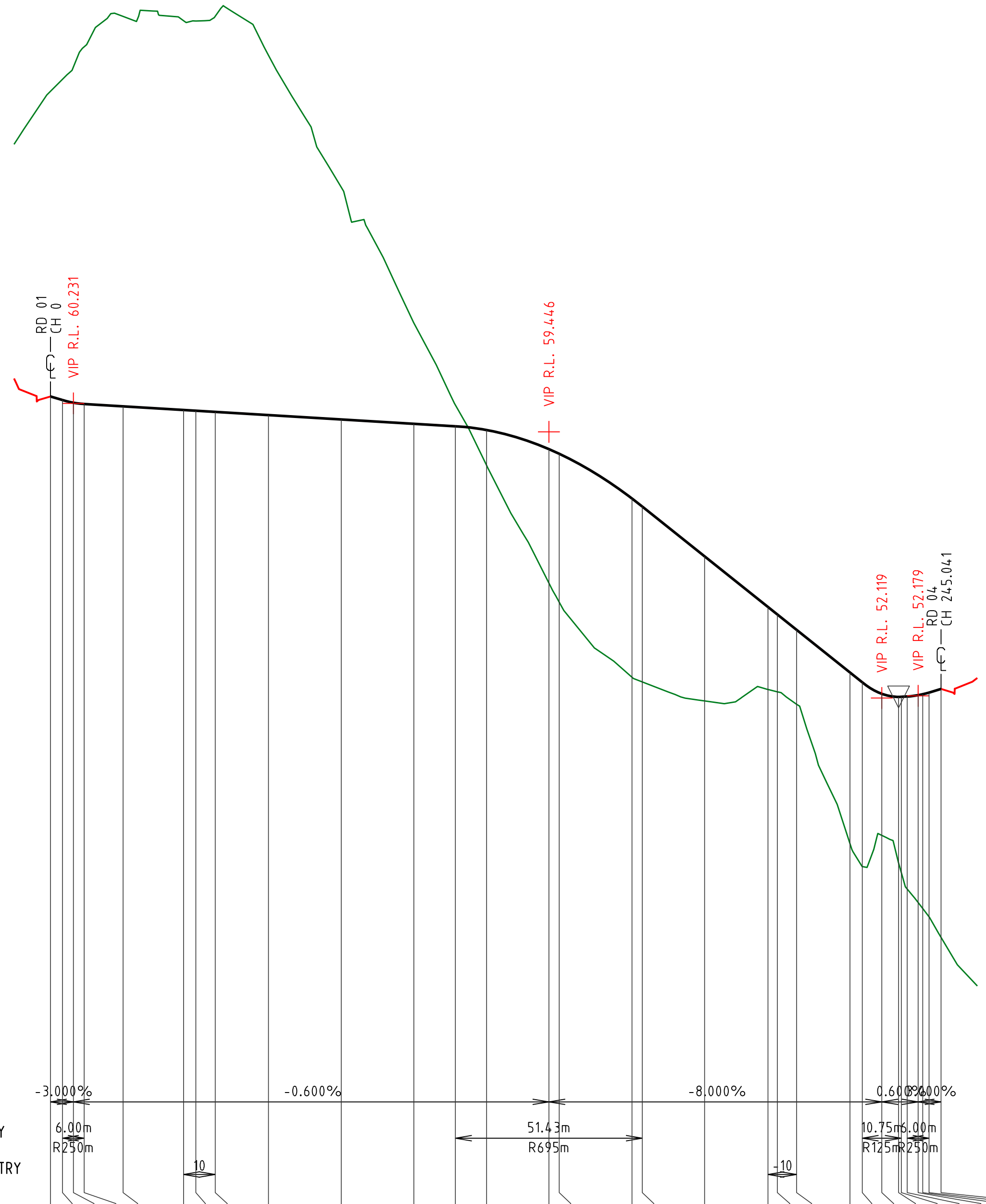
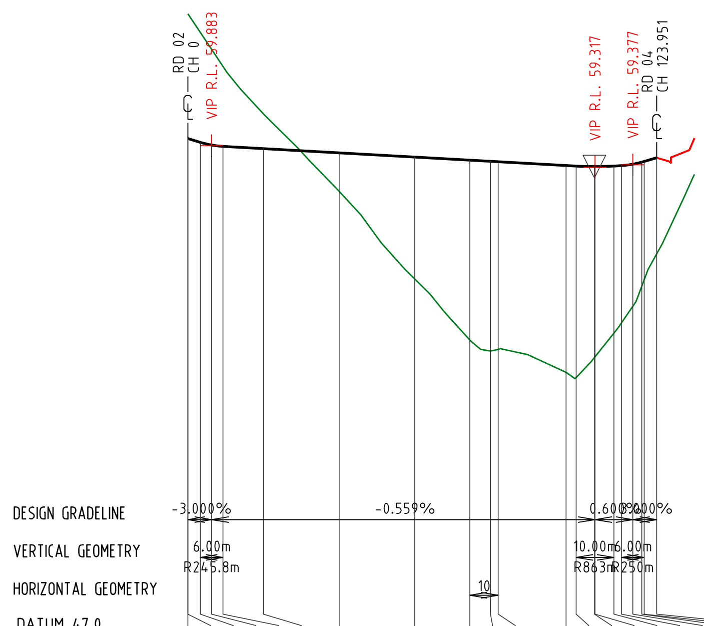


CHAINAGE	CONTROL LINE LEVELS	EXISTING SURFACE	DEPTH
0	60.42	68.821	8.401
3.3	60.321	69.153	8.832
6.3	60.249	69.489	9.24
9.3	60.213	70.049	9.836
20	60.149	70.882	10.734
36.631	60.049	70.766	10.717
40	60.029	70.759	10.73
45.33	59.997	70.89	10.893
60	59.909	69.814	9.905
80	59.789	66.181	6.392
100	59.669	62.445	2.776
111.434	59.6	60.182	0.582
120	59.496	58.524	-0.972
137.149	58.97	55.284	-3.686
140	58.842	54.756	-4.086
160	57.612	52.69	-4.922
162.864	57.389	52.56	-4.829
180	56.018	52.039	-3.979
197.435	54.623	52.353	-2.27
200	54.418	52.286	-2.131
205.289	53.995	51.947	-2.047
220	52.818	48.11	-4.708
223.366	52.549	47.479	-5.069
228.741	52.234	48.336	-3.898
233.366	52.149	47.575	-4.573
234.116	52.151	47.314	-4.837
235.741	52.161	46.861	-5.299
238.741	52.197	46.487	-5.709
240	52.222	46.322	-5.9
241.741	52.269	46.094	-6.174
245.041	52.368	45.53	-6.838

LONGITUDINAL SECTION ROAD 03



CHAINAGE	CONTROL LINE LEVELS	EXISTING SURFACE	DEPTH
-0	60.072		
0	60.072	63.371	3.299
3.3	59.973	62.876	2.903
6.3	59.901	62.427	2.526
9.3	59.866	61.977	2.111
20	59.806	60.726	0.919
40	59.695	58.676	-1.018
60	59.583	56.359	-3.224
74.575	59.502	54.747	-4.754
80	59.471	54.454	-5.017
82.033	59.46	54.497	-4.963
100	59.359	53.893	-5.467
102.651	59.345	53.755	-5.589
107.474	59.331	54.278	-5.053
107.651	59.331	54.301	-5.031
112.651	59.347	54.927	-4.42
114.651	59.359	55.2	-4.159
117.651	59.395	55.642	-3.752
120	59.448	56.169	-3.279
120.651	59.467	56.342	-3.125
123.951	59.566	57.021	-2.545

LONGITUDINAL SECTION ROAD 05

PROJECT NAME

COURTNEY DR UPPER COOMERA

PRELIMINARY ENGINEERING

RP DESCRIPTION
LOT 188, 189, 190, 191 & 192 ON RP173728
COURTNEY DRIVE
LOCALITY OF UPPER COOMERA
LOCAL AUTHORITY - GOLD COAST CITY COUNCIL

CLIENT

GALLERY
THE ART OF LIVING

0 5 10 15 20 25m
Horiz. Scale 1:500 - A1 (1:1000 - A3)
0 1 2 3 4 5m
Vert. Scale 1:100 - A1 (1:200 - A3)

ISSUES	DATE	
TENDER		
COUNCIL	11-09-18	
CONSTRUCTION		

PRE	DATE	AMENDMENT
A	11-09-18	COUNCIL ISSUE

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ASSOCIATED CONSULTANTS

BIOME WATER AND ENVIRONMENTAL CONSULTING

zone Planning Group

DRAWING TITLE

LONGITUDINAL SECTIONS
ROAD 03
&
ROAD 05

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Urban & Regional Planning
Civil Engineering
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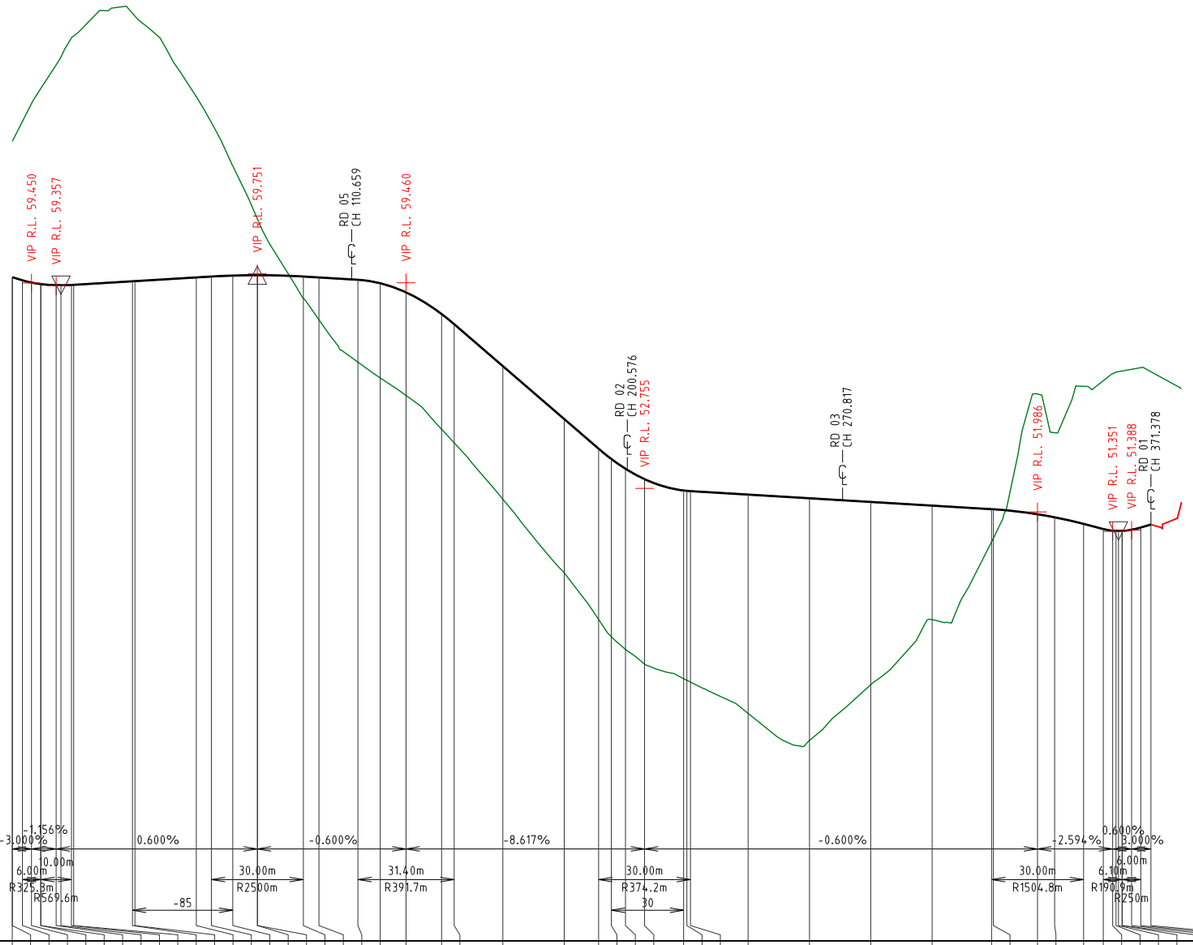
Suite 9, 19 Short St
Southport QLD 4215

DESIGNED RB | DRAWN EP
APPROVED [signature] | RPEQ 4706 | DATE 14-08-18
DRAWING NUMBER 36001-PRE-203 | AMEND. A



CHAINAGE	DEPTH	EXISTING SURFACE	CONTROL LINE LEVELS
-0.035			59.639
0	4.43	64.068	59.638
3.265	5.173	64.713	59.54
6.265	5.843	65.307	59.464
9.265	6.377	65.792	59.415
9.288	6.381	65.796	59.415
14.288	7.186	66.565	59.379
15.871	7.451	66.828	59.377
19.288	8.056	67.443	59.387
20	8.115	67.507	59.391
39.18	8.741	68.248	59.507
40	8.644	68.156	59.511
60	5.891	65.523	59.631
64.909	5.026	64.686	59.661
71.884	3.574	63.267	59.693
79.909	1.838	61.544	59.706
80	1.817	61.523	59.706
94.909	-0.705	58.956	59.661
100	-1.378	58.253	59.63
112.701	-2.681	56.873	59.554
120	-3.085	56.358	59.442
128.403	-3.362	55.783	59.145
140	-3.757	54.682	58.439
144.106	-3.868	54.239	58.107
160	-4.333	52.404	56.737
180	-5.013	50.001	55.014
191.21	-5.565	48.483	54.048
195.389	-5.794	47.917	53.711
200	-5.89	47.503	53.394
206.21	-6.037	47.019	53.056
218.951	-6.136	46.549	52.686
220	-6.177	46.497	52.674
221.21	-6.227	46.438	52.665
240	-7.136	45.417	52.552
260	-7.893	44.54	52.432
280	-5.96	46.352	52.312
300	-3.718	48.474	52.192
319.411	-1.069	51.007	52.076
320	-0.946	51.126	52.072
334.411	3.921	55.832	51.911
340	2.759	54.571	51.812
349.411	4.485	56.082	51.597
355.835	4.832	56.263	51.43
358.884	5.117	56.493	51.376
360	5.179	56.546	51.368
360.787	5.194	56.561	51.366
361.932	5.212	56.581	51.37
362.078	5.213	56.584	51.37
365.078	5.231	56.638	51.406
368.078	5.213	56.692	51.478
371.378	4.982	56.559	51.577

LONGITUDINAL SECTION ROAD 04

PROJECT NAME

COURTNEY DR UPPER COOMERA

PRELIMINARY ENGINEERING

RP DESCRIPTION
LOT 188, 189, 190, 191 & 192 ON RP173728
COURTNEY DRIVE
LOCALITY OF UPPER COOMERA
LOCAL AUTHORITY - GOLD COAST CITY COUNCIL

CLIENT

GALLERY
THE ART OF LIVING

0 5 10 15 20 25m
Horiz. Scale 1:500 - A1 (1:1000 - A3)

0 1 2 3 4 5m
Vert. Scale 1:100 - A1 (1:200 - A3)

ISSUES	DATE	
TENDER		
COUNCIL	11-09-18	
CONSTRUCTION		

PRE	DATE	AMENDMENT
A	11-09-18	COUNCIL ISSUE

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ASSOCIATED CONSULTANTS

BIOME WATER AND ENVIRONMENTAL CONSULTING

zone Planning Group

DRAWING TITLE

LONGITUDINAL SECTIONS
ROAD 04

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APPROVED		RPEQ 4706	DATE 14-08-18

DRAWING NUMBER 36001-PRE-204

AMEND. A

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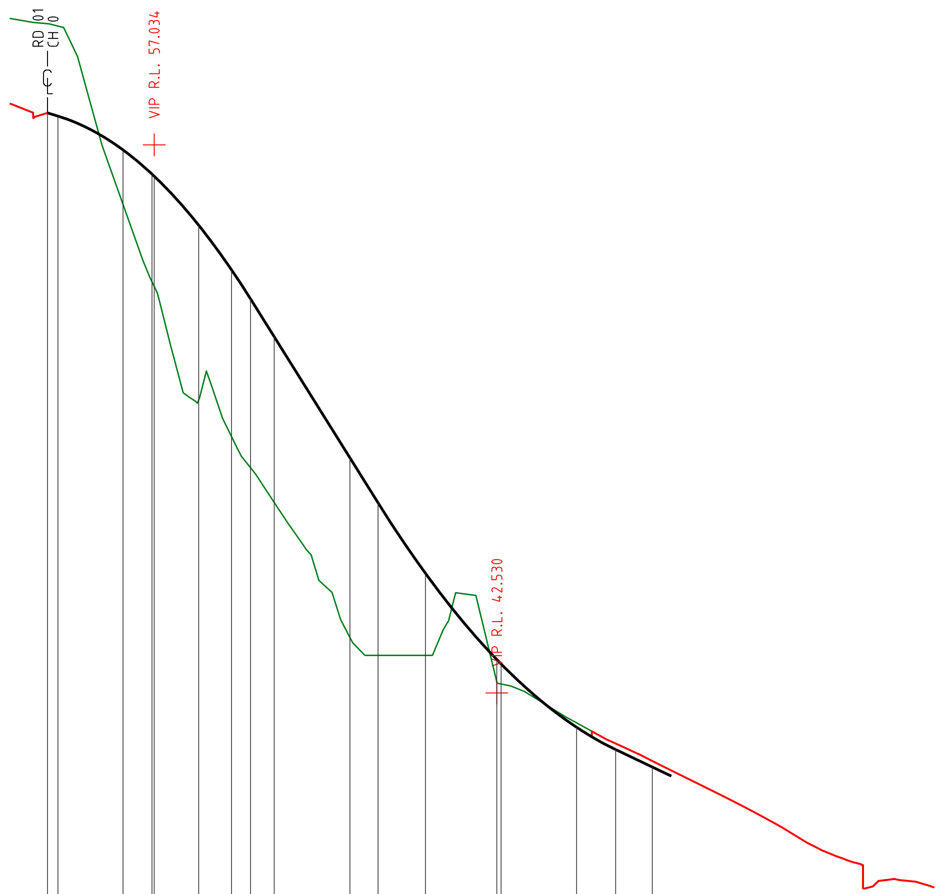


DESIGN GRADELINE: -3.000% | -16.000% | -4.773%

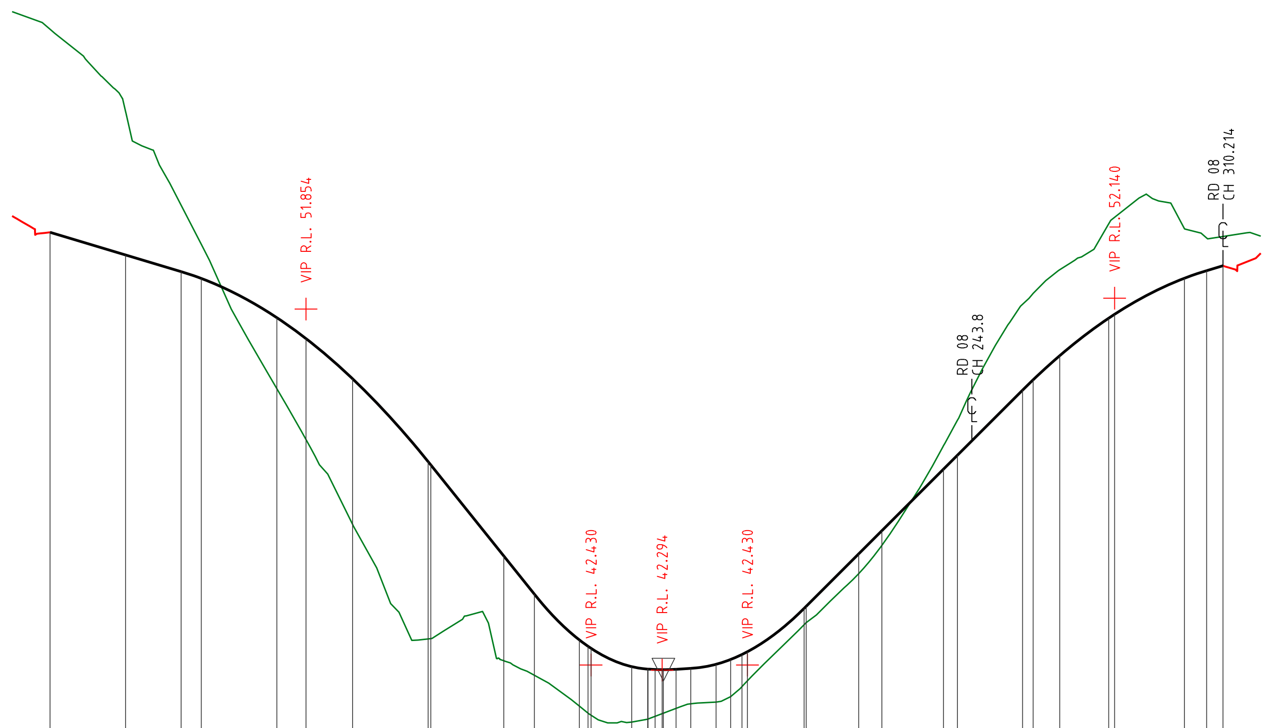
VERTICAL GEOMETRY: 50.96m R392m | 62.87m R560m

HORIZONTAL GEOMETRY: 30

DATUM 31.0

CHAINAGE	CONTROL LINE LEVELS	EXISTING SURFACE	DEPTH
0	57.881	60.243	2.362
2.753	57.798	60.181	2.383
20	56.901	55.462	-1.44
27.659	56.26	53.412	-2.848
28.233	56.206	53.29	-2.916
40	54.911	50.282	-4.63
48.684	53.729	49.313	-4.417
53.714	52.957	48.491	-4.466
60	51.951	47.571	-4.38
80	48.751	43.998	-4.753
87.446	47.56	43.523	-4.037
100	45.692	43.523	-2.169
118.881	43.412	42.812	-0.6
120	43.297	42.765	-0.532
140	41.617	41.736	0.119
150.316	41.029	41.189	0.159
160	40.567	40.731	0.164
180		39.729	
200		38.623	
220		37.555	
224.561		37.593	

LONGITUDINAL SECTION ROAD 06



DESIGN GRADELINE: -3.000% | -12.500% | -0.722% | 0.600% | 10.000% | 3.000%

VERTICAL GEOMETRY: 66.02m R695m | 30.00m R254.7m | 7.40m R560m | 30.00m R319.1m | 48.65m R695m

HORIZONTAL GEOMETRY: 10 | 10 | 30 | -30

DATUM 34.0

CHAINAGE	CONTROL LINE LEVELS	EXISTING SURFACE	DEPTH
0	53.885	59.262	5.377
20	53.285	57.081	3.797
34.677	52.844	54.602	1.758
40	52.664	53.568	0.903
60	51.623	49.748	-1.876
67.689	51.07	48.387	-2.683
80	50.007	46.157	-3.85
100	47.815	43.122	-4.693
100.702	47.727	43.13	-4.598
120	45.315	42.543	-2.772
128.083	44.305	42.159	-2.145
140	43.094	41.342	-1.752
142.281	42.926	41.157	-1.769
143.083	42.871	41.095	-1.776
153.861	42.387	40.918	-1.469
158.083	42.321	40.999	-1.323
158.172	42.321	41.002	-1.319
160	42.311	41.071	-1.239
161.873	42.306	41.142	-1.165
162.214	42.306	41.155	-1.152
165.574	42.316	41.281	-1.035
169.442	42.34	41.402	-0.937
176.129	42.45	41.448	-1.002
180	42.578	41.59	-0.987
183.006	42.709	41.857	-0.852
184.442	42.782	42.013	-0.769
199.442	43.93	43.506	-0.423
200	43.985	43.553	-0.432
213.851	45.37	44.85	-0.52
220	45.985	45.597	-0.388
236.316	47.617	48.236	0.619
240	47.985	48.913	0.927
257.221	49.707	51.987	2.279
260	49.98	52.27	2.29
267.029	50.619	52.892	2.273
280	51.612	54.11	2.498
281.546	51.714	54.282	2.568
300	52.669	53.98	1.311
305.871	52.87	53.734	0.864
310.214	53	53.773	0.773

LONGITUDINAL SECTION ROAD 07

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PROJECT NAME

COURTNEY DR UPPER COOMERA

PRELIMINARY ENGINEERING

RP DESCRIPTION
LOT 188, 189, 190, 191 & 192 ON RP173728
COURTNEY DRIVE
LOCALITY OF UPPER COOMERA
LOCAL AUTHORITY - GOLD COAST CITY COUNCIL

CLIENT

GALLERY THE ART OF LIVING

Horiz. Scale 1:500 - A1 (1:1000 - A3)

Vert. Scale 1:100 - A1 (1:200 - A3)

ISSUES	DATE	
TENDER		
COUNCIL	11-09-18	
CONSTRUCTION		

PRE	DATE	AMENDMENT
A	11-09-18	COUNCIL ISSUE

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ASSOCIATED CONSULTANTS

BIOME WATER AND ENVIRONMENTAL CONSULTING

zone Planning Group

DRAWING TITLE

LONGITUDINAL SECTIONS
ROAD 06
&
ROAD 07

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Urban & Regional Planning
Civil Engineering
Project Coordination
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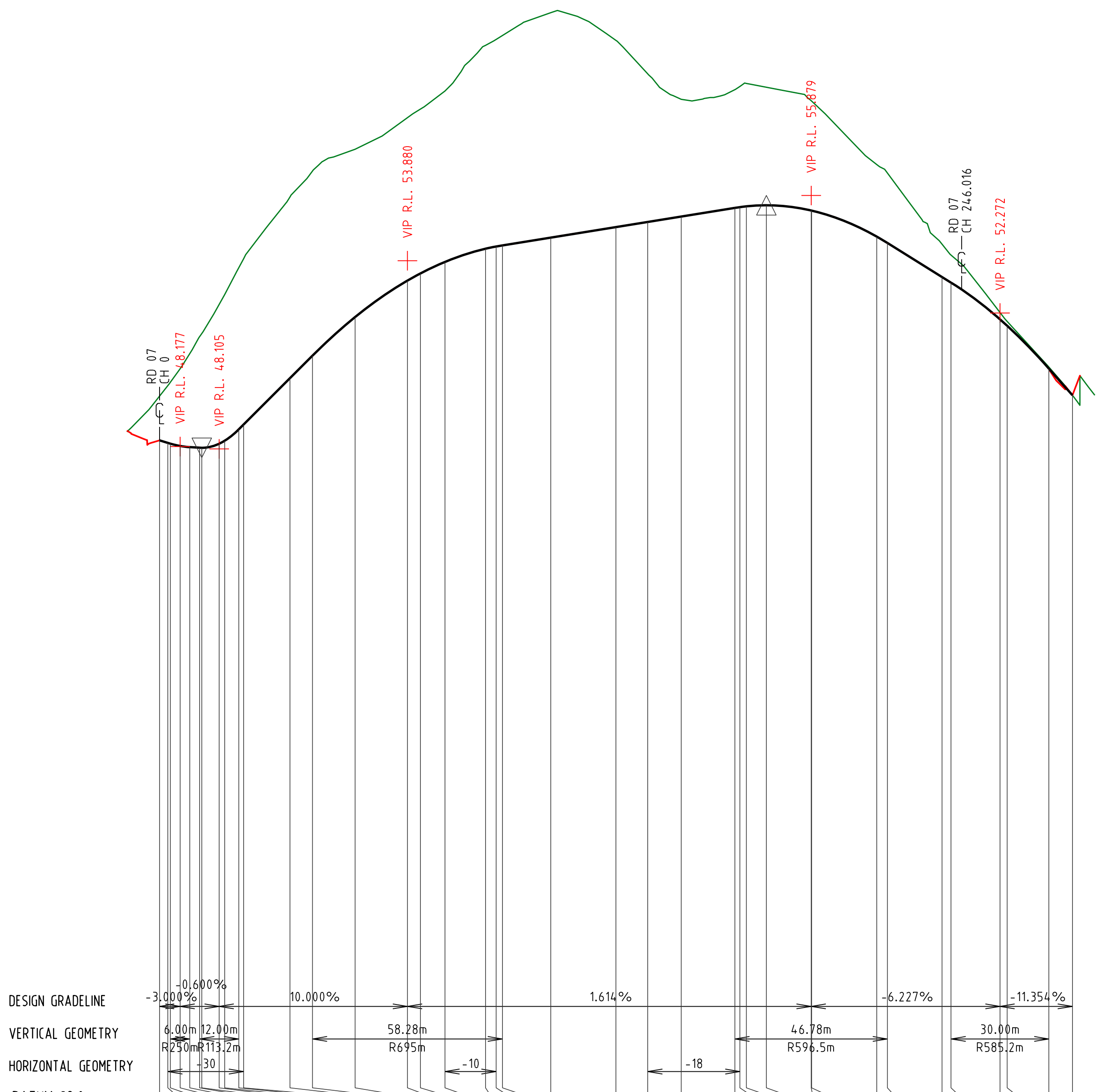
DESIGNED RB | DRAWN EP

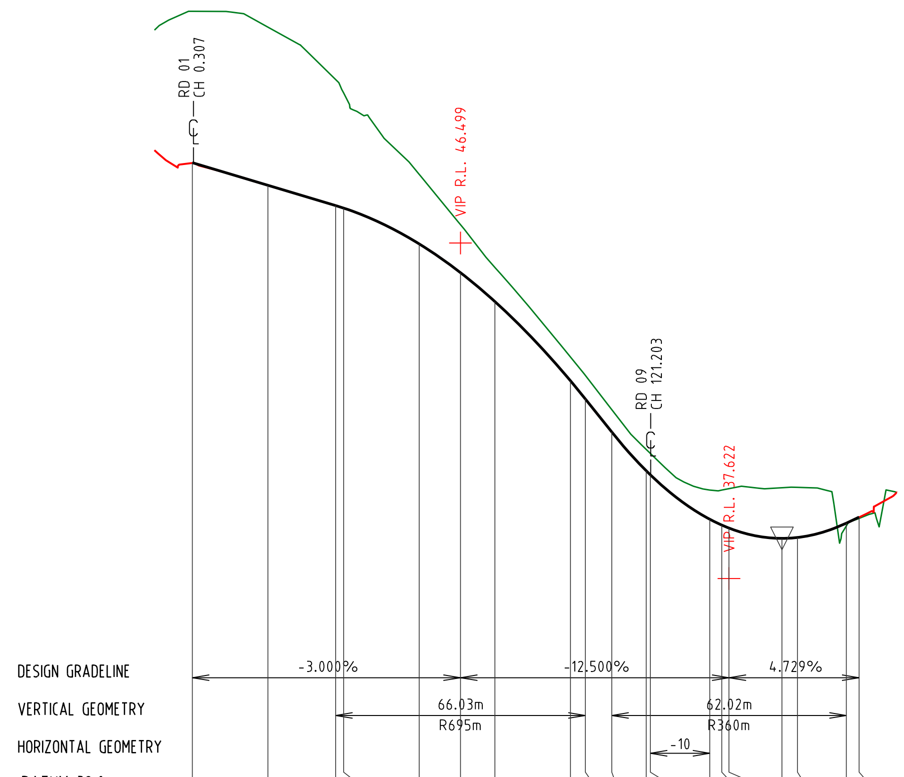
APPROVED | RPEQ 4706 | DATE 14-08-18

DRAWING NUMBER 36001-PRE-205 | AMEND. A



CHAINAGE	CONTROL LINE LEVELS	EXISTING SURFACE	DEPTH
-0	48.366		
2.554	48.289	50.048	1.759
3.3	48.267	50.143	1.876
6.3	48.195	50.554	2.36
9.3	48.159	51.025	2.866
12.3	48.141	51.541	3.401
12.979	48.138	51.644	3.506
18.3	48.264	52.529	4.266
20	48.356	52.839	4.483
24.3	48.705	53.659	4.955
25.783	48.853	53.938	5.085
40	50.275	55.833	5.559
46.911	50.966	56.626	5.661
60	52.151	57.3	5.149
76.051	53.269	58.27	5.001
80	53.487	58.53	5.043
87.533	53.841	59.085	5.244
100	54.247	60.484	6.237
103.241	54.316	60.668	6.352
105.191	54.35	60.788	6.438
120	54.589	61.49	6.901
140	54.912	60.637	5.725
149.741	55.069	59.614	4.545
160	55.235	58.83	3.595
176.488	55.501	59.127	3.625
178.016	55.524	59.226	3.703
180	55.547	59.319	3.771
186.119	55.579	59.202	3.623
199.877	55.42	58.789	3.369
200	55.417	58.777	3.36
220	54.617	56.83	2.213
223.266	54.422	56.571	2.148
240	53.38	54.385	1.005
242.788	53.207	54.051	0.844
257.788	52.08	52.291	0.21
260	51.882	52.017	0.136
272.788	50.569	50.614	0.044
280	49.751	49.751	0

LONGITUDINAL SECTION ROAD 08



CHAINAGE	CONTROL LINE LEVELS	EXISTING SURFACE	DEPTH
0	48.626	52.627	4.001
20	48.026	52.212	4.186
37.885	47.489	50.825	3.335
40	47.423	50.469	3.047
60	46.474	48.317	1.843
70.898	45.715	46.988	1.273
80	44.95	45.852	0.902
100	42.85	43.483	0.632
103.911	42.372	43.003	0.63
110.901	41.499	42.096	0.598
120	40.476	41.04	0.564
121.106	40.368	40.934	0.566
136.815	39.192	39.965	0.773
140	39.037	39.963	0.926
141.914	38.958	40	1.042
155.901	38.686	40.026	1.34
160	38.709	40.035	1.326
172.926	39.089	39.012	-0.077
176.304	39.248	39.214	-0.035

LONGITUDINAL SECTION ROAD 10

PROJECT NAME

COURTNEY DR
UPPER COOMERA

PRELIMINARY
ENGINEERING

RP DESCRIPTION
LOT 188, 189, 190, 191 & 192 ON RP173728
COURTNEY DRIVE
LOCALITY OF UPPER COOMERA
LOCAL AUTHORITY - GOLD COAST CITY COUNCIL

CLIENT

GALLERY
THE ART OF LIVING

0 5 10 15 20 25m
Horiz. Scale 1:500 - A1 (1:1000 - A3)
0 1 2 3 4 5m
Vert. Scale 1:100 - A1 (1:200 - A3)

ISSUES	DATE	
TENDER		
COUNCIL	11-09-18	
CONSTRUCTION		

PRE	DATE	AMENDMENT
A	11-09-18	COUNCIL ISSUE

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ASSOCIATED CONSULTANTS

BIOME
WATER AND ENVIRONMENTAL CONSULTING

zone
Planning Group

DRAWING TITLE

LONGITUDINAL SECTIONS
ROAD 08
&
ROAD 10

MORTONS
urbansolutions
Urban & Regional Planning
Civil Engineering
Project Coordination
MUS Pty Ltd T/As:
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Gold Coast Office
Suite 9, 19 Short St
Southport QLD 4215

DESIGNED RB	DRAWN EP	
APPROVED	RPEQ 4706	DATE 14-08-18

DRAWING NUMBER 36001-PRE-206
AMEND. A

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SEQ CODE SEWER NOTES

SEQ CODE NOTES COPIED DIRECTLY FROM DRAWING SEQ-SEW-1101-3.

ALL ENVIRONMENT PROTECTION MEASURES SHALL BE IMPLEMENTED PRIOR TO ANY CONSTRUCTION WORK, INCLUDING CLEARING, COMMENCING.

VEGETATION PROTECTION

A. TREES LOCATED ALONG THE FOOTPATH SHALL BE, TRANSPLANTED PRIOR TO CONSTRUCTION, OR REPLACED IF DESTROYED.
B. WHEN WORKING WITHIN 4m OF TREES, RUBBER OR HARDWOOD GIRDLES SHALL BE CONSTRUCTED WITH 1.8 m BATTENS CLOSELY SPACED AND ARRANGED VERTICALLY FROM GROUND LEVEL. GIRDLES SHALL BE STRAPPED TO TREES PRIOR TO CONSTRUCTION AND REMAIN UNTIL COMPLETION.
C. TREE ROOTS SHALL BE TUNNELLED UNDER, RATHER THAN SEVERED. IF ROOTS ARE SEVERED THE DAMAGED AREA SHALL BE TREATED WITH A SUITABLE FUNGICIDE. CONTACT RELEVANT COUNCIL ARBORIST FOR FURTHER ADVICE.
D. ANY TREE LOPPING REQUIRED SHOULD BE UNDERTAKEN BY AN APPROVED ARBORIST.

SOIL

A. TOPSOIL AND SUBSOIL SHALL BE STOCKPILED SEPARATELY.
B. CARE SHALL BE TAKEN TO PREVENT SEDIMENT FROM ENTERING THE STORMWATER SYSTEM. THIS MAY INVOLVE PLACING APPROPRIATE SEDIMENT CONTROLS AROUND STOCKPILES.
C. IF ACID SULPHATE SOILS EXIST IN THE WORKS AREA. THE CONTRACTOR MUST PREPARE A RISK ASSESSMENT BASED ON THE QUEENSLAND ACID SULPHATE SOIL TECHNICAL MANUAL AND MANAGE THE ACID SULPHATE SOILS AS PER THE MANUAL.

CREEK CROSSINGS

A. SILTATION CONTROL MEASURES SHALL BE PLACED DOWNSTREAM OF ANY EXCAVATION WORK.
B. APPROPRIATE SEDIMENT CONTROLS SHALL BE USED TO PREVENT SEDIMENT FROM ENTERING THE CREEK.
C. NO SOIL SHALL BE STOCKPILED WITHIN 5 m OF THE CREEK.

REHABILITATION

A. PREDISTURBANCE SOIL PROFILES AND COMPACTION LEVELS SHALL BE REINSTATED.
B. PREDISTURBANCE VEGETATION PATTERNS SHALL BE RESTORED.

SAFETY

A. THE DESIGN AND CONSTRUCTION OF THE WORKS SHALL COMPLY WITH ALL QUEENSLAND LEGISLATION.

GENERAL

1. ALL WORK AND MATERIALS SHALL BE IN ACCORDANCE WITH CURRENT SOUTH EAST QUEENSLAND SEWERAGE CODE SPECIFICATIONS AND STANDARDS.
2. UNLESS SPECIFIED OTHERWISE ALL MATERIALS AND WORK SHALL COMPLY WITH THE RELEVANT AUSTRALIAN STANDARDS.
3. THE CONSTRUCTION OF THE SEWERAGE WORK SHOWN ON THIS DRAWING SHALL BE SUPERVISED BY AN ENGINEER WHO HAS RPEQ REGISTRATION. SEWERAGE WORKS NOT COMPLYING WITH THIS REQUIREMENT WILL NOT BE PERMITTED TO CONNECT INTO THE SEQ SERVICE PROVIDER SEWERAGE SYSTEM.
4. ALL WORK ASSOCIATED WITH LIVE SEWERS OR MAINTENANCE HOLES SHALL BE CARRIED OUT BY DEVELOPER'S APPROVED CONTRACTOR UNDER THE SUPERVISION OF SEQ'S AGENT AT THE DEVELOPER'S COST.
5. ALL PIPES AND MATERIALS SHALL COMPLY WITH THE REQUIREMENTS OF THE "ACCEPTED PRODUCTS AND MATERIALS" LIST.
6. EACH ALLOTMENT SHALL BE SERVED BY A DN100 PVC PROPERTY CONNECTION. FOR ALLOTMENTS OTHER THAN SINGLE RESIDENTIAL, A DN160 PE (OR DN150 PVC) PROPERTY CONNECTION SHALL BE PROVIDED.
7. PROPERTY CONNECTIONS SHALL BE LOCATED WITHIN THE PROPERTY AS SHOWN IN THE DRAWINGS.
8. PROPERTY CONNECTION BRANCHES SHALL EXTEND INTO THE PROPERTY A MINIMUM OF 300 mm AND A MAXIMUM OF 750 mm. UNITYWATER REQUIRES MINIMUM EXTENSION OF 500 mm INTO PROPERTY.
9. WHERE PIPES ARE LAID IN FILL, THE FILLING SHALL BE CARRIED OUT IN LAYERS NOT EXCEEDING 300 mm (LOOSE) IN DEPTH AND SHALL BE COMPACTED UNTIL THE COMPACTION IS NOT LESS THAN 95% OF THE MATERIALS MAXIMUM COMPACTION WHEN TESTED IN ACCORDANCE WITH A.S. 1289 (MODIFIED COMPACTION). TESTING SHALL BE CARRIED OUT AFTER EACH ALTERNATE LAYER. IN ALL SUCH CASES APPROVAL OF CONSTRUCTED SEWERS WILL NOT BE ISSUED BY THE SEQ SERVICE PROVIDER UNLESS CERTIFICATES ARE PRODUCED CERTIFYING THAT THE REQUIRED COMPACTION HAS BEEN ACHIEVED.
10. WHERE SEWERS HAVE A GRADE OF 1 IN 20 OR STEEPER,BULKHEADS SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE SEQ SEWER CODE.
11. THE CONTRACTOR SHALL VERIFY THE LOCATION AND DEPTH OF EXISTING SERVICES WITH RELEVANT AUTHORITIES BEFORE COMMENCING WORKS.
12. SEWERS SHALL BE DISUSED /ABANDONED IN ACCORDANCE WITH PROCEDURES SET OUT IN THE SEQ SEWER CODE.
13. BENCH MARK AND LEVELS TO AHD.
14. THE EXISTING DWELLING ON LOT 3, REFER SEQ-SEW-1100, SERVED BY A SEPTIC SYSTEM, SHALL BE CONNECTED TO THE NEW SEWER BY A LICENCED PLUMBER IN ACCORDANCE WITH THE RELEVANT STATUTORY AND COUNCIL REQUIREMENTS. THE SEPTIC SYSTEM, INCLUDING TRENCHES,SHALL BE REMOVED AT THE DEVELOPER'S COST. ALL FIXTURES SHALL BE UPGRADED IF REQUIRED BY PLUMBING CODE.
15. EXISTING ALLOTMENTS REQUIRING A PROPERTY CONNECTION FROM EXISTING SEWERS SHALL BE PROVIDED BY THE SEQ SERVICE PROVIDER AT THE DEVELOPERS COST.

PROJECT SPECIFIC SEWER NOTES

a. ALL SEWER MAINS TO BE AS PER SEWER PIPE SPECIFICATIONS TABLE.
b. NOTWITHSTANDING THE STANDARD SEQ NOTES ABOVE, ALL MATERIALS AND WORKS MUST BE IN ACCORDANCE WITH THE SERVICE PROVIDER'S APPROVAL CONDITIONS AND THE SEQ WS&S D&C CODE.
c. THE CONTRACTOR IS TO INCLUDE ROCK EXCAVATION AS PART OF THEIR SEWER RATES UNLESS SCHEDULED OTHERWISE WITHIN THE CONTRACT.
d. THE CONTRACTOR TO PROVIDE CALCAREOUS CONCRETE WHERE SPECIFIED IN THE SEQ CODE BY THE RELEVANT AUTHORITY.
e. WATER AND ELECTRICAL CROSSING LOCATIONS ARE INDICATIVE ONLY. REFER TO PLANS TO DETERMINE PRECISE CROSSING LOCATIONS. WHERE SERVICE INDICATES CLASH WITH SEWER, SEWER TO TAKE PRECEDENCE, SERVICE TO BE CONSTRUCTED OVER OR UNDER SEWER ACCORDING TO SUPERINTENDENTS INSTRUCTION
f. ALL BENDS TO BE LONG RADIUS BEND, 3m RADIUS U.N.O.
g. CONTRACTOR TO VERIFY DOWNSTREAM EXISTING PIPE LEVELS PRIOR TO COMMENCEMENT OF WORKS ON-SITE.
h. PROPERTY CONNECTIONS HAVE BEEN DESIGNED TO CONTROL THE REQUIRED SERVICE AREA OF EACH LOT AT A GRADE OF 1:60 AND A MAXIMUM DEPTH OF PROPERTY CONNECTION AT 1.5m. UNLESS OTHERWISE STATED.
REFER SEQ STD. DWGS SEQ-SEW-1106-01 TO SEQ-SEW-1106-7 FOR JUNCTION DETAILS.
i. CONTRACTOR TO PAY ALL FEES AND CHARGES ASSOCIATED WITH CONNECTIONS

LEGEND

- EXISTING SEWER
- EXISTING RISING MAIN
- EXISTING KERB (INVERT)
- EXISTING EDGE OF BITUMEN
- EXISTING PROPERTY LINE
- EXISTING RETAINING WALL
- EXISTING CONTOURS
- FUTURE SEWER
- FUTURE RISING MAIN
- FUTURE KERB (INVERT)
- FUTURE PROPERTY LINE
- FUTURE RETAINING WALL
- FUTURE CONTOURS
- SITE BOUNDARY
- STAGE BOUNDARY
- PROPOSED KERB (INVERT)
- PROPOSED EDGE OF BITUMEN
- PROPOSED PROPERTY LINE
- PROPOSED RETAINING WALL
- DESIGN CONTOURS
- PROPOSED SEWER
- PROPOSED RISING MAIN
- SEWER MANHOLE
- SEWER RODDING END
- SEWER BEND
- SEWER MAINTENANCE SHAFT
- SEWER END CAP
- SEWER PUMP STATION

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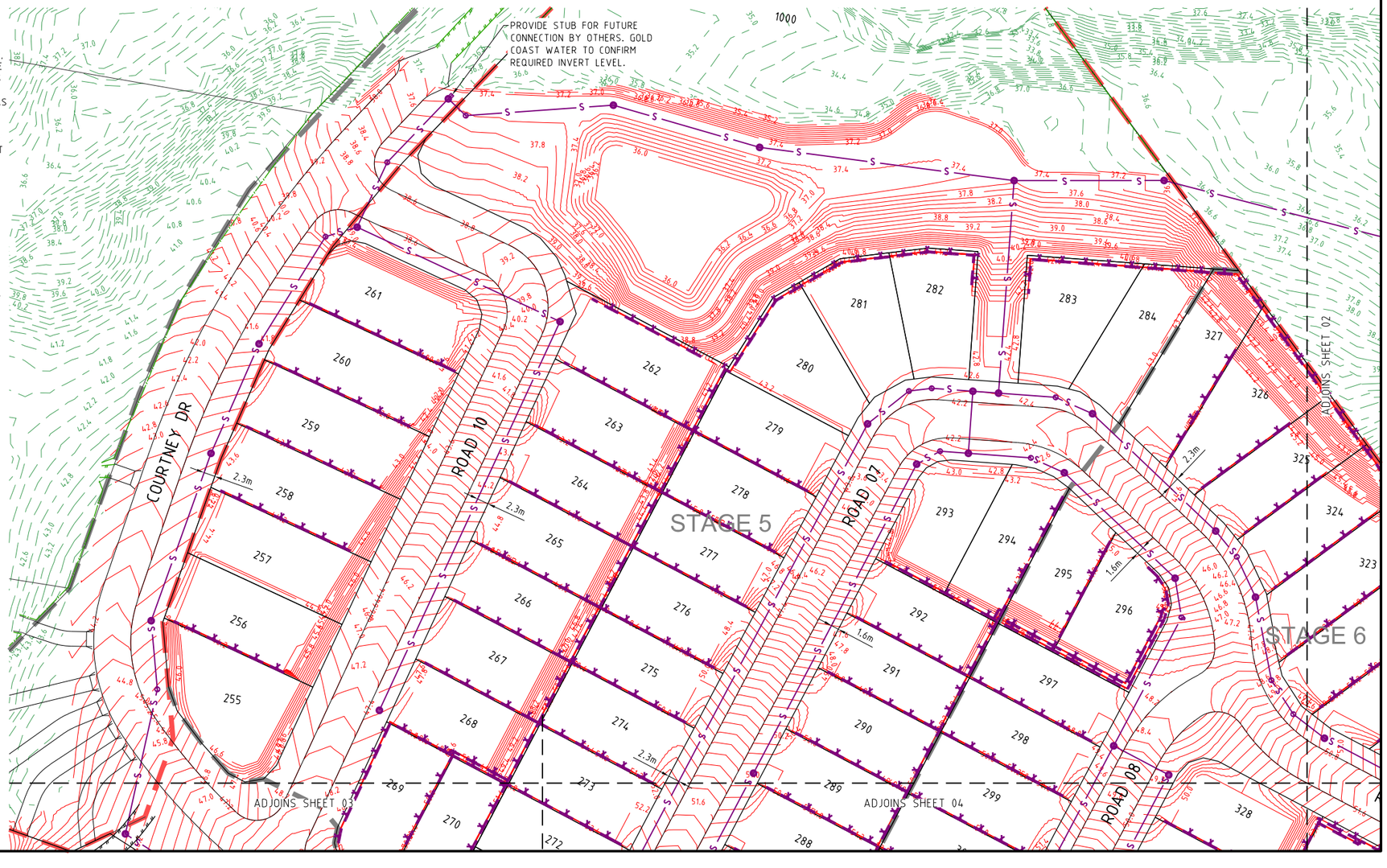
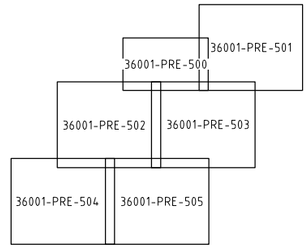


SHEET LAYOUT



PROJECT NAME

COURTNEY DR UPPER COOMERA

PRELIMINARY ENGINEERING

RP DESCRIPTION
LOT 188, 189, 190, 191 & 192 ON RP173728
COURTNEY DRIVE
LOCALITY OF UPPER COOMERA
LOCAL AUTHORITY - GOLD COAST CITY COUNCIL

CLIENT

GALLERY THE ART OF LIVING

NORTH

0 5 10 15 20 25m
Scale 1:500 - A1 (1:1000 - A3)

ISSUES	DATE	
TENDER		
COUNCIL	11-09-18	
CONSTRUCTION		

B	28-03-19	SEWER, SHEET LAYOUT, LOT NO'S & STAGES AMENDED
A	11-09-18	COUNCIL ISSUE
PRE	DATE	AMENDMENT

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ASSOCIATED CONSULTANTS

BIOME WATER AND ENVIRONMENTAL CONSULTING

zone Planning Group

DRAWING TITLE

SEWER RETICULATION PLAN AND NOTES SHEET 01

MORTONS urbansolutions
Urban & Regional Planning
Civil Engineering
Project Coordination

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DESIGNED	RB	DRAWN	EP
APPROVED		RPEQ 4706	DATE 14-08-18

DRAWING NUMBER	AMEND.
36001-PRE-500	B

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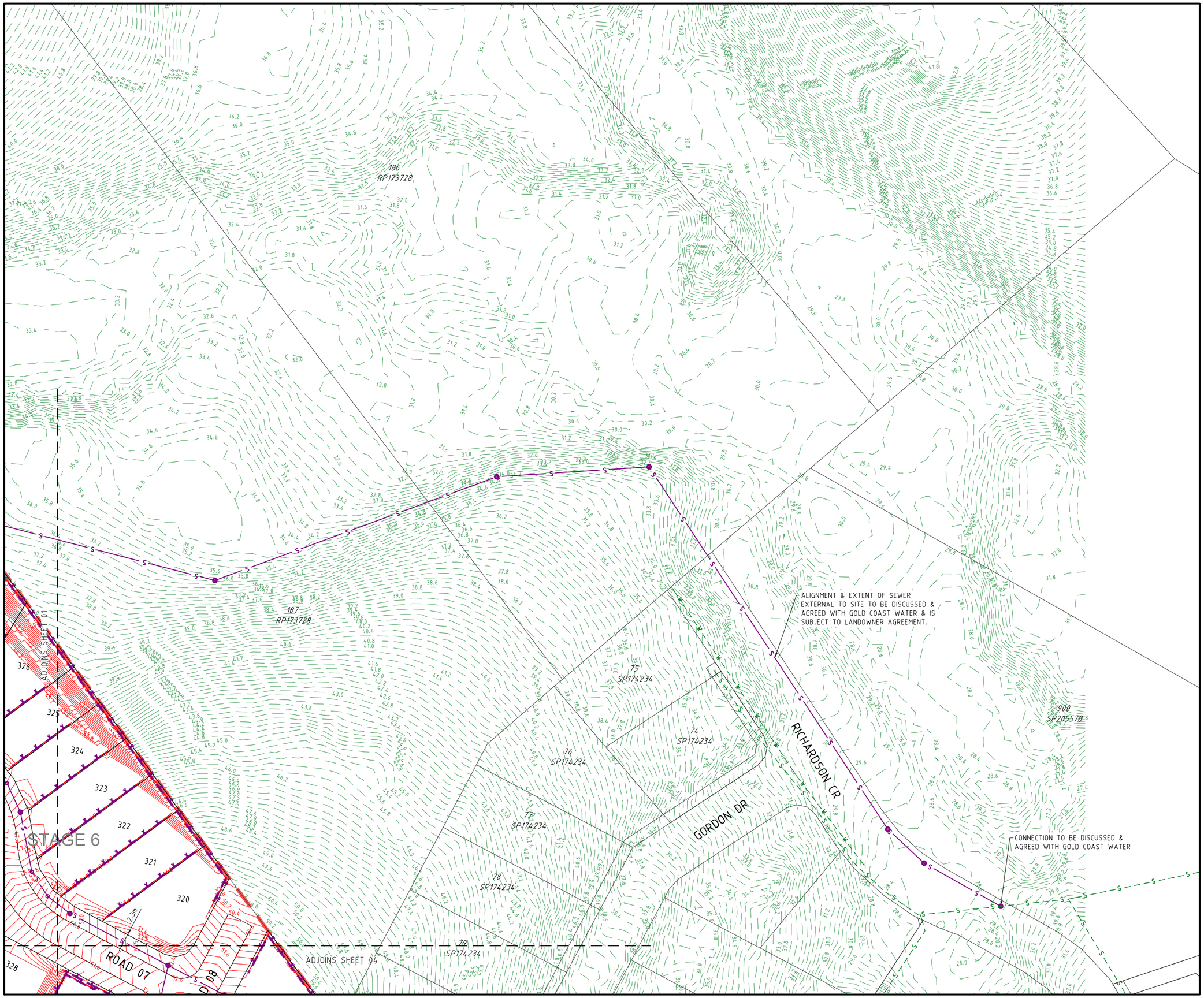

PROJECT NAME

COURTNEY DR UPPER COOMERA

PRELIMINARY ENGINEERING

RP DESCRIPTION
LOT 188, 189, 190, 191 & 192 ON RP173728
COURTNEY DRIVE
LOCALITY OF UPPER COOMERA
LOCAL AUTHORITY - GOLD COAST CITY COUNCIL

CLIENT

GALLERY
THE ART OF LIVING

NORTH

0 5 10 15 20 25m
Scale 1:500 - A1 (1:1000 - A3)

ISSUES	DATE	
TENDER		
COUNCIL	11-09-18	
CONSTRUCTION		

PRE	DATE	AMENDMENT
B	28-03-19	SHEET LAYOUT, LOT NO'S, NOTES & STAGES AMENDED
A	11-09-18	COUNCIL ISSUE

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SEWER RETICULATION
PLAN AND NOTES
SHEET 02

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APPROVED		RPEQ 4706	DATE 14-08-18

DRAWING NUMBER	AMEND.
36001-PRE-501	B

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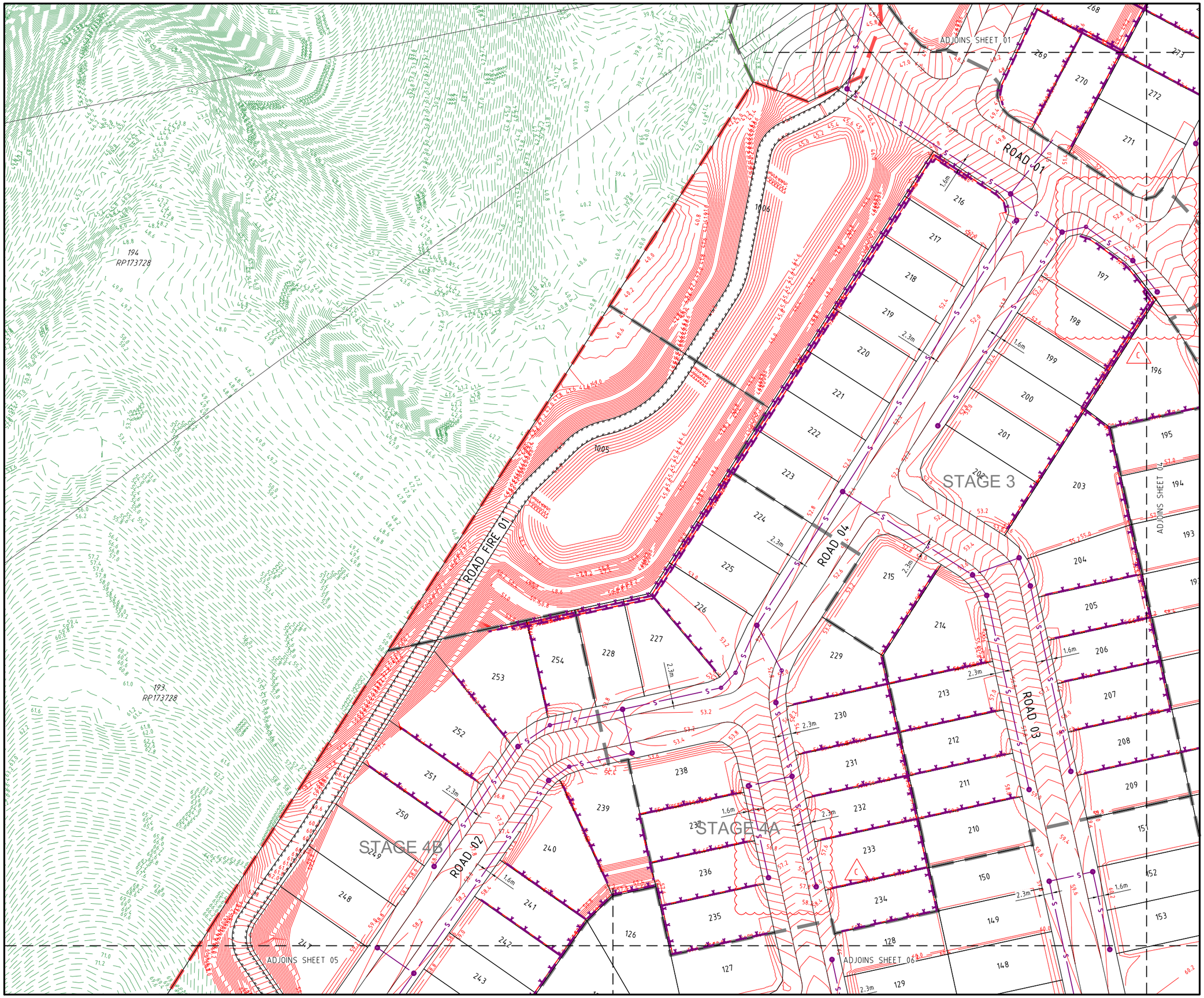

PROJECT NAME

COURTNEY DR UPPER COOMERA

PRELIMINARY ENGINEERING

RP DESCRIPTION
LOT 188, 189, 190, 191 & 192 ON RP173728
COURTNEY DRIVE
LOCALITY OF UPPER COOMERA
LOCAL AUTHORITY - GOLD COAST CITY COUNCIL

CLIENT

GALLERY
THE ART OF LIVING

NORTH

0 5 10 15 20 25m
Scale 1:500 - A1 (1:1000 - A3)

ISSUES	DATE
TENDER	
COUNCIL	11-09-18
CONSTRUCTION	

PRE	DATE	AMENDMENT
C	16-04-19	SEWER AMENDED
B	28-03-19	LOTS, SHEET LAYOUT, LOT NO'S & STAGES AMENDED
A	11-09-18	COUNCIL ISSUE

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SEWER RETICULATION PLAN AND NOTES SHEET 03

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APPROVED	RPEQ 4706	DATE 14-08-18

DRAWING NUMBER	AMEND.
36001-PRE-502	C

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PROJECT NAME

COURTNEY DR UPPER COOMERA

PRELIMINARY ENGINEERING

RP DESCRIPTION
LOT 188, 189, 190, 191 & 192 ON RP173728
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LOCAL AUTHORITY - GOLD COAST CITY COUNCIL

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THE ART OF LIVING

NORTH

0 5 10 15 20 25m
Scale 1:500 - A1 (1:1000 - A3)

ISSUES	DATE	
TENDER		
COUNCIL	11-09-18	
CONSTRUCTION		

C	16-04-19	SEWER AMENDED
B	28-03-19	SHEET LAYOUT, LOT NO'S & STAGES AMENDED
A	11-09-18	COUNCIL ISSUE
PRE	DATE	AMENDMENT

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DRAWING TITLE

SEWER RETICULATION
PLAN AND NOTES
SHEET 04

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APPROVED		RPEQ 4706	DATE 14-08-18

DRAWING NUMBER	AMEND.
36001-PRE-503	C

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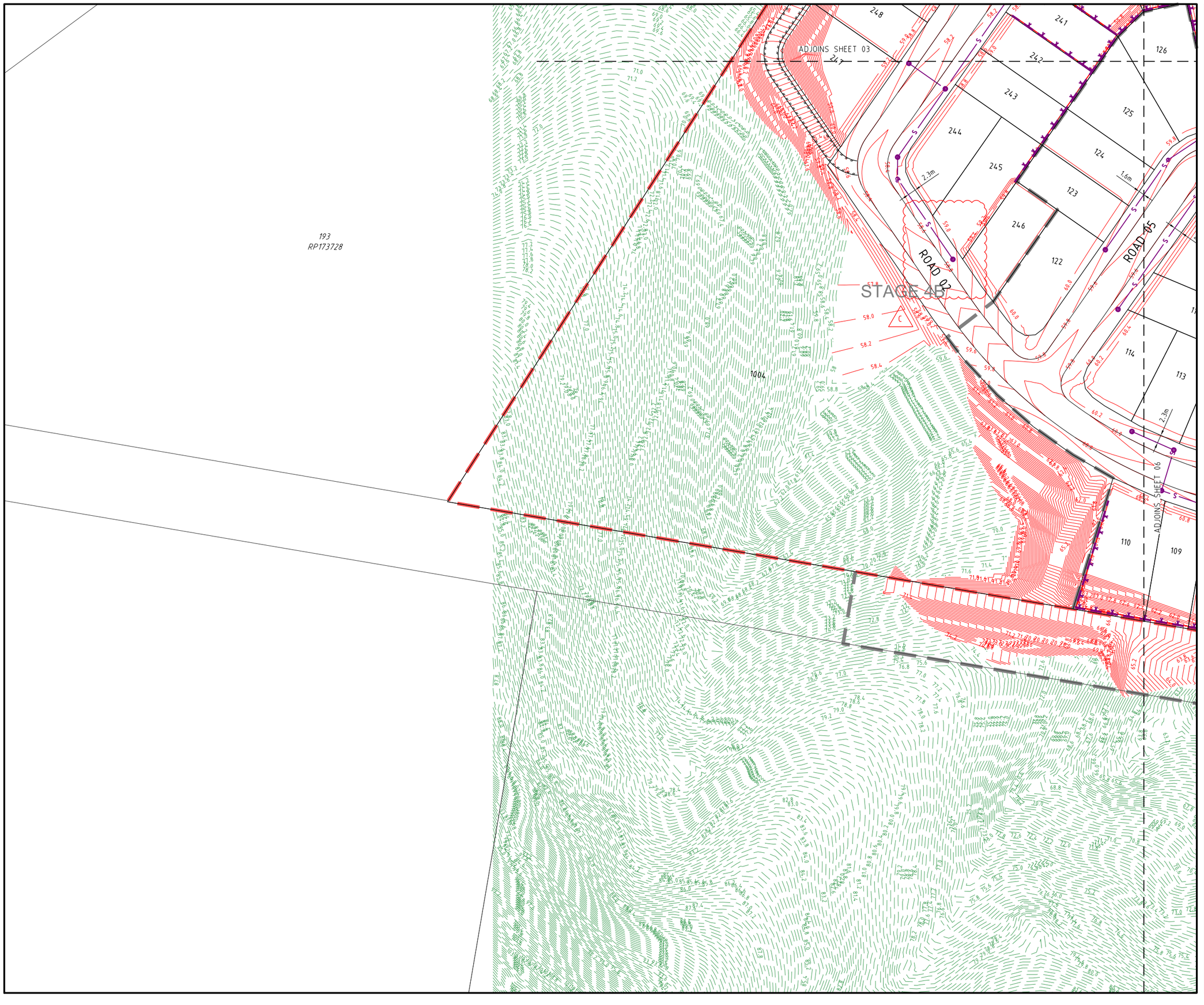

PROJECT NAME

COURTNEY DR UPPER COOMERA

PRELIMINARY ENGINEERING

RP DESCRIPTION
LOT 188, 189, 190, 191 & 192 ON RP173728
COURTNEY DRIVE
LOCALITY OF UPPER COOMERA
LOCAL AUTHORITY - GOLD COAST CITY COUNCIL

CLIENT

GALLERY
THE ART OF LIVING

NORTH

0 5 10 15 20 25m
Scale 1:500 - A1 (1:1000 - A3)

ISSUES	DATE	
TENDER		
COUNCIL	11-09-18	
CONSTRUCTION		

C	16-04-19	SEWER AMENDED
B	28-03-19	LOTS, SHEET LAYOUT, LOT NO'S & STAGES AMENDED
A	11-09-18	COUNCIL ISSUE
PRE	DATE	AMENDMENT

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DRAWING TITLE

SEWER RETICULATION
PLAN AND NOTES
SHEET 05

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APPROVED	RPEQ 4706	DATE	14-08-18

DRAWING NUMBER	AMEND.
36001-PRE-504	C

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ADJOINS SHEET 03

ADJOINS SHEET 04

ADJOINS SHEET 05

ROAD 05

ROAD 04

ROAD 03

ROAD 01

ROAD 02

PARK

PATTERSON CT

GORDON DR

STAGE 1

CONNECT TO EXISTING

THIS LENGTH OF SEWER IS EXPECTED TO HAVE REDUCED COVER DUE TO EXISTING INVERT LEVELS. CONCRETE PROTECTION OR ALTERNATIVE MAIN MATERIAL (ie. DICL) WILL BE PROPOSED DURING THE DETAILED DESIGN PHASE

PROJECT NAME

COURTNEY DR UPPER COOMERA

PRELIMINARY ENGINEERING

RP DESCRIPTION
LOT 188, 189, 190, 191 & 192 ON RP173728
COURTNEY DRIVE
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CLIENT

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NORTH

0 5 10 15 20 25m
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ISSUES	DATE	
TENDER		
COUNCIL	11-09-18	
CONSTRUCTION		

PRE	DATE	AMENDMENT
B	28-03-19	SHEET LAYOUT,LOT NO'S,STAGES AMENDED,NOTES ADDED
A	11-09-18	COUNCIL ISSUE

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SEWER RETICULATION
PLAN AND NOTES
SHEET 06

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36001-PRE-505	B

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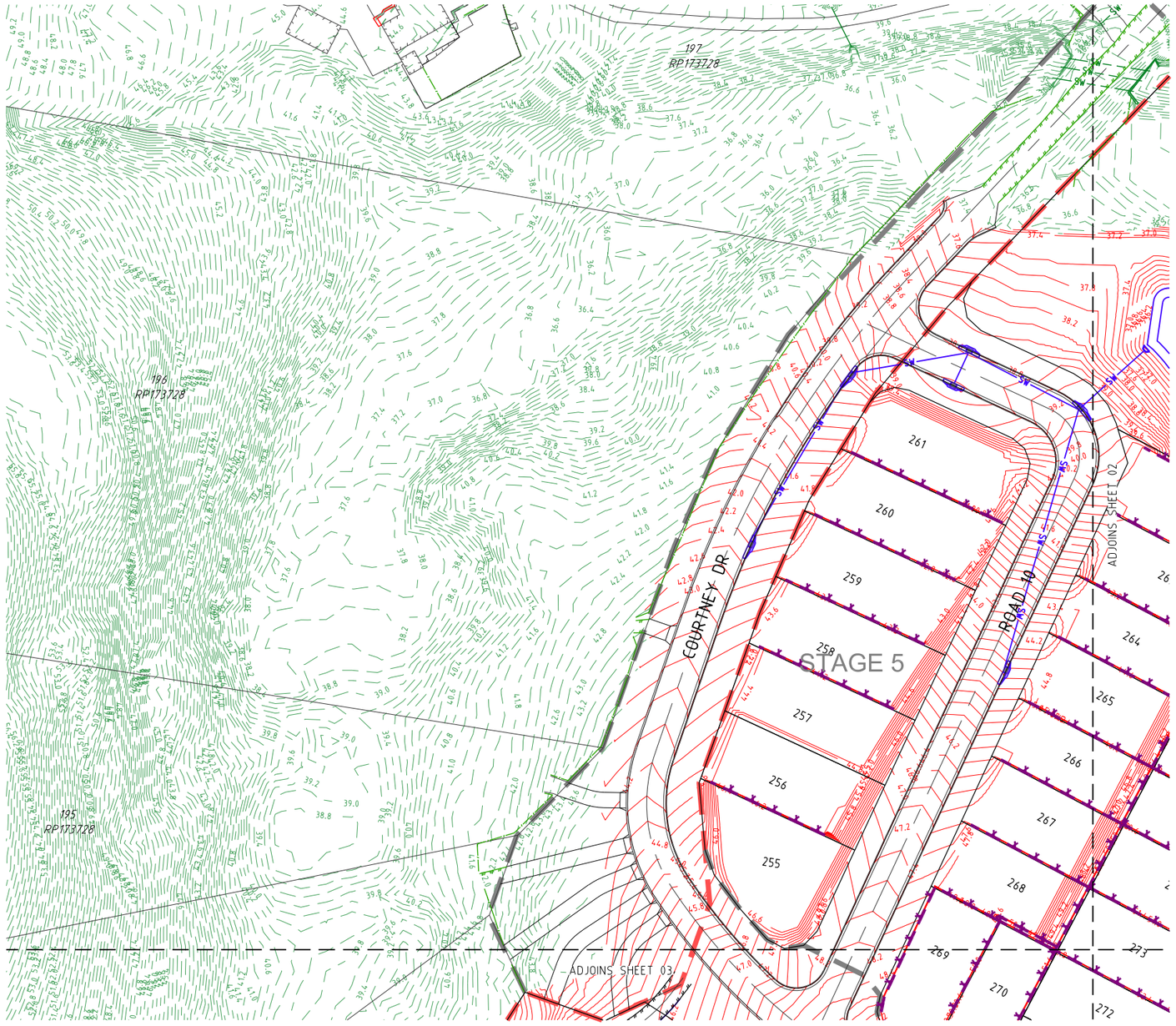
STORMWATER

1. ALL FIELD GULLIES SHALL CONTAIN A 150mm DIA STUB 600mm BELOW GRADE LEVEL FOR FUTURE ROOFWATER DRAINAGE.
2. MANHOLES TO BE IN ACCORDANCE WITH IPWEAQ STANDARD DRAWING No DS-010, DS-015, DS-018, DS-019, DS-020, DS-021 OR STRUCTURAL DRAWINGS (STRUCTURAL DRAWINGS TAKE PRECEDENCE).
3. OUTLET HEADWALLS TO BE IN ACCORDANCE WITH LOCAL COUNCIL STANDARD DRAWINGS.
4. ALL HEADWALLS WITH A FALL GREATER THAN 900mm HIGH REQUIRE INSTALLATION OF PEDESTRIAN SAFETY FENCES.
5. ALL PIPES 600mm DIA OR LESS TO BE SOCKETED CONCRETE PIPES WITH RUBBER RING JOINTS. PIPED GREATER THAN 600mm DIA SHALL BE BUTT OR FLUSH JOINTED.
6. ALL ALLOTMENTS TO BE GRADED SUCH THAT FUTURE ROOFWATER DRAINAGE DISCHARGES TO KERB OR TO PIPED DRAINAGE SYSTEM.
7. ALL PIPE 300mm DIA AND GREATER SHALL BE CONSTRUCTED USING SRC OR FRC PIPES. CONTRACTOR MAY ELECT TO USE PVC PIPES WITHIN ALLOTMENTS FOR PIPES SMALLER THAN 300mm DIA.
8. FOR SETOUT DETAILS REFER TO 640 SERIES DRAWINGS (PROFILES AND PIT DETAILS).
9. GULLY PITS TO BE IN ACCORDANCE WITH IPWEAQ STANDARD DRAWING No DS-060, DS-061, DS-062, DS-063. WHERE PITS ARE CONSTRUCTED AS DRAINWAY PITS, TO BE IN ACCORDANCE WITH IPWEAQ STANDARD DRAWINGS No 05-068.
10. LOTS WHICH CAN DRAIN OVERLAND FLOW TO THE STREET SWALE / DRAINAGE WITHOUT FLOWING THROUGH ADJOINING PROPERTIES NEED TO PROVIDE FOR Q100 OVERLAND FLOW TO THE ROAD
11. LOT EARTHWORKS DURING BUILDING CONSTRUCTION MUST NOT CHANGE FLOW PATH DIRECTION UNLESS IT IS REPLACED WITH ANOTHER FLOW PATH DRAINING TO THE ROAD SWALE / DRAINAGE.
12. THE CONTRACTOR IS TO INCLUDE ROCK EXCAVATION AS PART OF THEIR STORMWATER RATE.
13. PIPE CLASS - PIPE CLASSES/TRENCH BEDDING SHOWN ON THE DRAWINGS ARE SUBJECT TO THE CONTRACTORS PREFERRED INSTALLATION METHOD. THE CONTRACTOR IS RESPONSIBLE FOR INSTALLING THE APPROPRIATE PIPE CLASSES AND BEDDING.
14. KERB ADAPTORS ARE TO BE INSTALLED TO AUTHORITIES REQUIREMENTS.
15. ALL RCBC BASE SLABS ARE TO BE CAST INSITU.
16. DRIVEWAY LOCATIONS ARE INDICATIVE ONLY TO SHOW STORMWATER DESIGN IS SUITABLE FOR PROPOSED LOT LAYOUT.

LEGEND

- EXISTING KERB (INVERT)
- EXISTING KERB (LIP & BACK)
- EXISTING EDGE OF BITUMEN
- EXISTING PROPERTY LINE
- EXISTING RETAINING WALL
- SW EXISTING STORMWATER
- RW EXISTING ROOFWATER
- SS EXISTING SUBSOIL
- EXISTING CONTOURS
- FUTURE KERB
- FUTURE PROPERTY LINE
- FUTURE RETAINING WALL
- SW FUTURE STORMWATER
- RW FUTURE ROOFWATER
- SS FUTURE SUBSOIL
- SITE BOUNDARY
- STAGE BOUNDARY
- CONTROL LINE / CENTER OF ROAD
- PROPOSED KERB (INVERT)
- PROPOSED KERB (LIP & BACK)
- PROPOSED EDGE OF BITUMEN
- PROPOSED PROPERTY LINE
- PROPOSED RETAINING WALL
- 1.0 DESIGN CONTOURS
- SW PROPOSED STORMWATER
- RW PROPOSED ROOFWATER
- SS PROPOSED SUBSOIL
- MANHOLE
- FIELD INLET
- KERB INLET (ON GRADE) PIT
- KERB INLET (SAG) PIT
- HEADWALL
- SCOUR PROTECTION
- (10/001) DRAINAGE PIT & LINE NO.

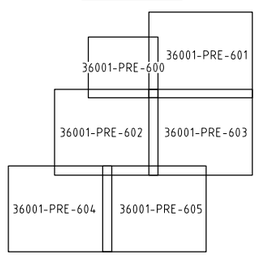


REFERENCE POINT LOCATION FOR DRAINAGE STRUCTURES

STRUCTURE TYPE	HORIZONTAL CONTROL (Reference Point Location)	VERTICAL CONTROL (Reference Level)
MANHOLE	CENTRE OF MANHOLE	FINISHED SURFACE LEVEL
GULLY PIT	LIP AT CENTRE OF PIT	FINISHED SURFACE LEVEL (LIP OF CHANNEL)
HEADWALL	INTERSECTION OF HEADWALL FACE & PIPE CENTRELINE	INVERT LEVEL

REFER TO DWG SERIES 640 FOR ALL DRAINAGE STRUCTURE SETOUT AND/OR CUSTOM DETAILS.

SHEET LAYOUT



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PROJECT NAME

COURTNEY DR UPPER COOMERA

PRELIMINARY ENGINEERING

RP DESCRIPTION
LOT 188, 189, 190, 191 & 192 ON RP173728
COURTNEY DRIVE
LOCALITY OF UPPER COOMERA
LOCAL AUTHORITY - GOLD COAST CITY COUNCIL

CLIENT

GALLERY
THE ART OF LIVING

NORTH

0 5 10 15 20 25m
Scale 1:500 - A1 (1:1000 - A3)

ISSUES	DATE	
TENDER		
COUNCIL	11-09-18	
CONSTRUCTION		

C	16-04-19	DRIVEWAYS REMOVED
B	28-03-19	NOTES, LOT NO'S & STAGES AMENDED
A	11-09-18	COUNCIL ISSUE
PRE	DATE	AMENDMENT

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DRAWING TITLE

STORMWATER DRAINAGE PLAN SHEET 01

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Urban & Regional Planning
Civil Engineering
Project Coordination

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DESIGNED RB	DRAWN EP
APPROVED	RPEQ 4706 DATE 14-08-18

DRAWING NUMBER 36001-PRE-600 AMEND. C

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WEIR
LENGTH 12m
I.L. 37.0
Q100 FLOW DEPTH 0.17m

BASIN B
BIO. 420m2
STORAGE: 808m3
I.L. 36.00
Q100 37.17
Q100 DEPTH 1.17
BUND 37.5

STAGE 5

STAGE 6

ROAD 07

ADJOINS SHEET 01

ADJOINS SHEET 04

186
RP173728

187
RP173728

75
SP174234

76
SP174234

77
SP174234

78
SP174234

79
SP174234

PROJECT NAME

COURTNEY DR UPPER COOMERA

PRELIMINARY ENGINEERING

RP DESCRIPTION
LOT 188, 189, 190, 191 & 192 ON RP173728
COURTNEY DRIVE
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ISSUES	DATE	
TENDER		
COUNCIL	11-09-18	
CONSTRUCTION		

C	16-04-19	DRIVEWAYS REMOVED
B	28-03-19	LOT NO'S & STAGES AMENDED
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DRAWING TITLE

STORMWATER
DRAINAGE
PLAN
SHEET 02

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DESIGNED	RB	DRAWN	EP
APPROVED	RPEQ 4706	DATE	14-08-18

DRAWING NUMBER	AMEND.
36001-PRE-601	C

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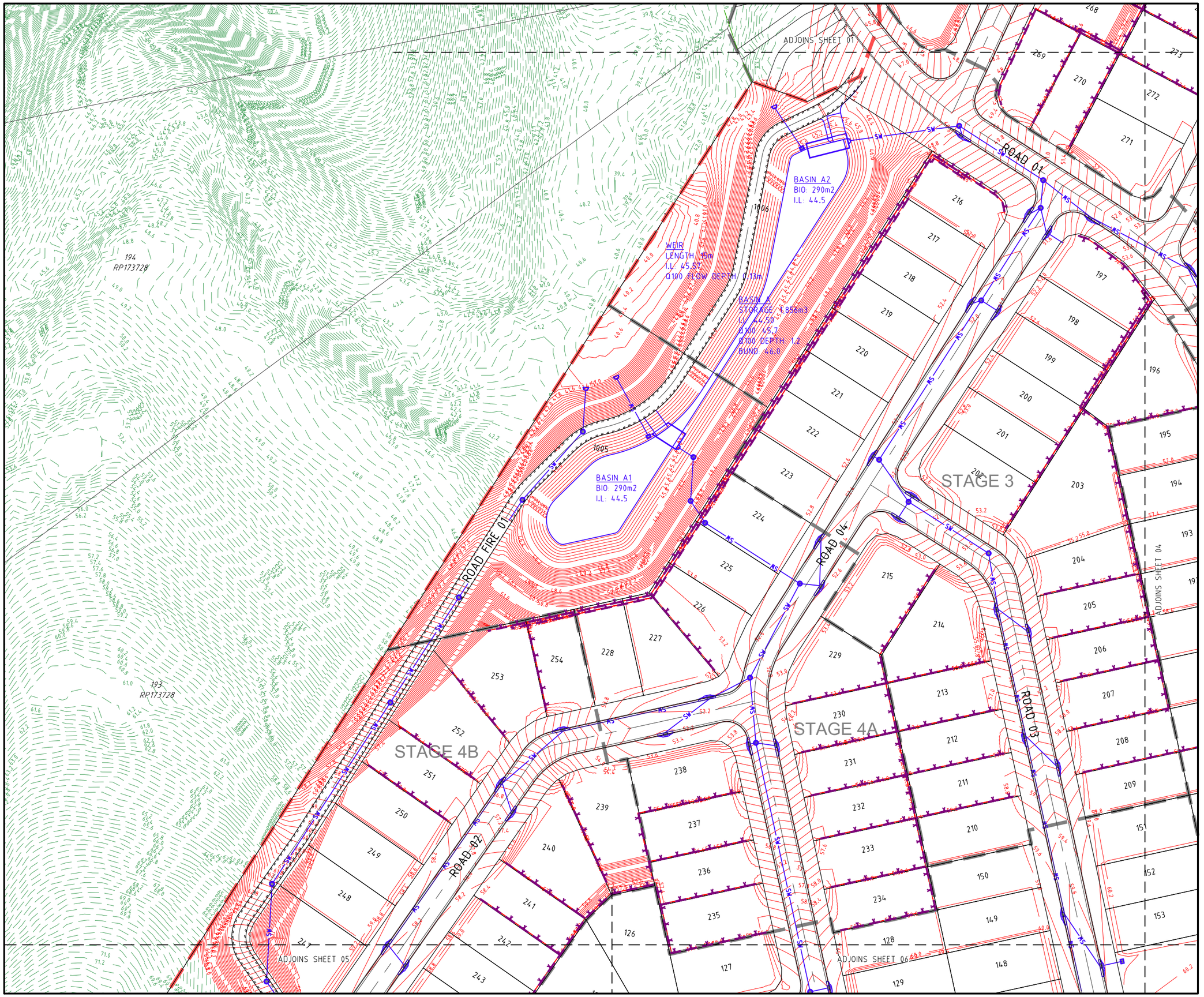

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C	16-04-19	DRIVEWAYS REMOVED
B	28-03-19	LOTS, LOT NO'S & STAGES AMENDED
A	11-09-18	COUNCIL ISSUE
PRE	DATE	AMENDMENT

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BIOME WATER AND ENVIRONMENTAL CONSULTING

zone Planning Group

DRAWING TITLE

STORMWATER
DRAINAGE
PLAN
SHEET 03

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Urban & Regional Planning
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APPROVED	RPEQ 4706 DATE 14-08-18

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36001-PRE-602	C

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PROJECT NAME

COURTNEY DR UPPER COOMERA

PRELIMINARY ENGINEERING

RP DESCRIPTION
LOT 188, 189, 190, 191 & 192 ON RP173728
COURTNEY DRIVE
LOCALITY OF UPPER COOMERA
LOCAL AUTHORITY - GOLD COAST CITY COUNCIL

CLIENT

GALLERY
THE ART OF LIVING

NORTH

0 5 10 15 20 25m
Scale 1:500 - A1 (1:1000 - A3)

ISSUES	DATE	
TENDER		
COUNCIL	11-09-18	
CONSTRUCTION		

PRE	DATE	AMENDMENT
C	16-04-19	DRIVEWAYS REMOVED
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DRAWING NUMBER	AMEND.
36001-PRE-603	C

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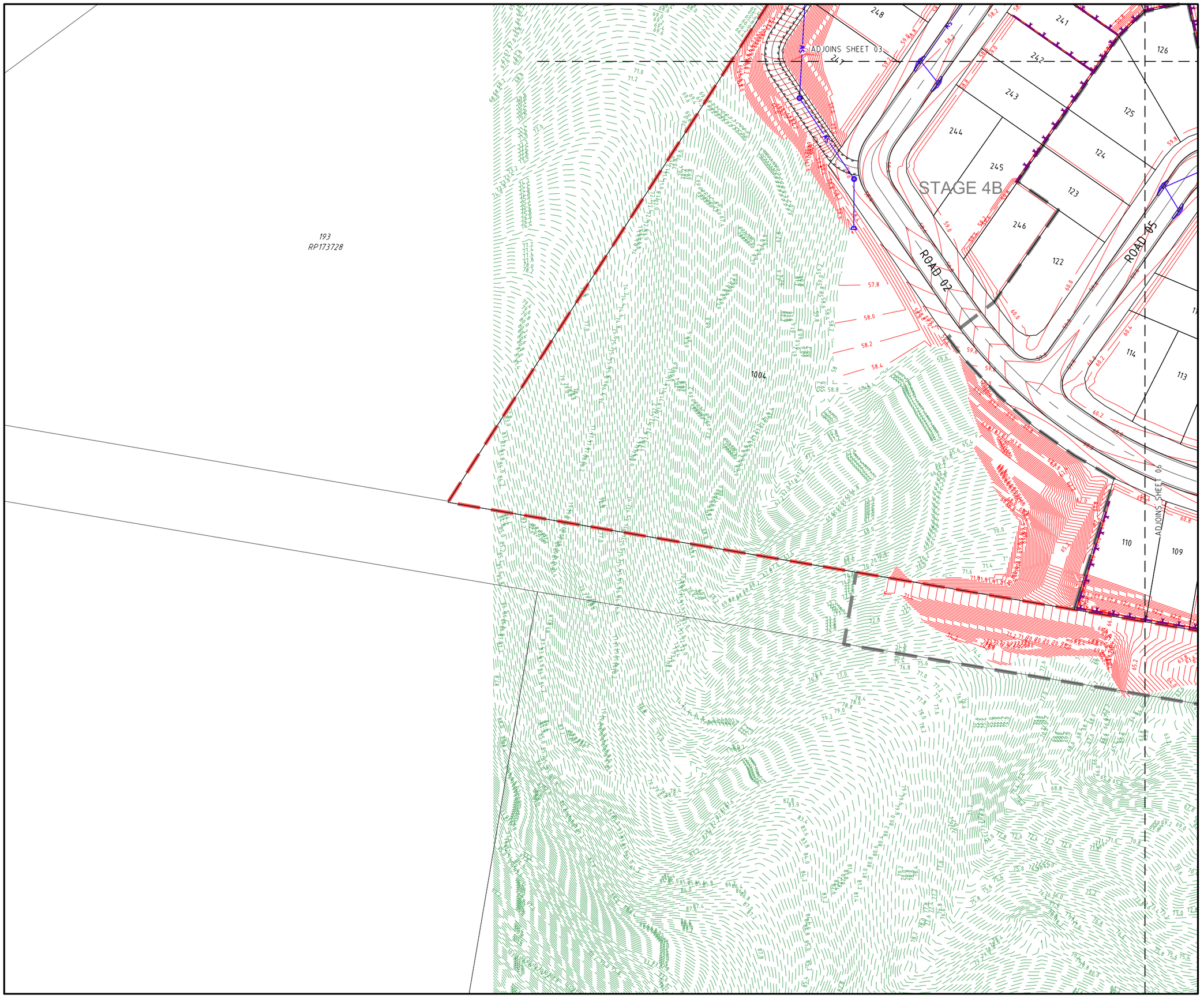

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DRAWING TITLE

STORMWATER
DRAINAGE
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SHEET 05

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DRAWING NUMBER	AMEND.
36001-PRE-604	C

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PROJECT NAME

COURTNEY DR UPPER COOMERA

PRELIMINARY ENGINEERING

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NORTH

0 5 10 15 20 25m
Scale 1:500 - A1 (1:1000 - A3)

ISSUES	DATE	
TENDER		
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CONSTRUCTION		

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DRAINAGE
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SEQ CODE WATER NOTES

SEQ CODE NOTES COPIED DIRECTLY FROM DRAWING SEQ-WAT-1101-3.

VEGETATION PROTECTION

A. TREES LOCATED ALONG THE FOOTPATH SHALL BE, TRANSPLANTED PRIOR TO CONSTRUCTION, OR REPLACED IF DESTROYED.
B. WHEN WORKING WITHIN 4m OF TREES, RUBBER OR HARDWOOD GIRDLES SHALL BE CONSTRUCTED WITH 1.8m BATTENS CLOSELY SPACED AND ARRANGED VERTICALLY FROM GROUND LEVEL. GIRDLES SHALL BE STRAPPED TO TREES PRIOR TO CONSTRUCTION AND REMAIN UNTIL COMPLETION.
C. TREE ROOTS SHALL BE TUNNELLED UNDER, RATHER THAN SEVERED. IF ROOTS ARE SEVERED THE DAMAGED AREA SHALL BE TREATED WITH A SUITABLE FUNGICIDE. CONTACT RELEVANT COUNCIL ARBORIST FOR FURTHER ADVICE.
D. ANY TREE LOPPING REQUIRED SHOULD BE UNDERTAKEN BY AN APPROVED ARBORIST.

SOIL

A. TOPSOIL AND SUBSOIL SHALL BE STOCKPILED SEPARATELY.
B. CARE SHALL BE TAKEN TO PREVENT SEDIMENT FROM ENTERING THE STORMWATER SYSTEM. THIS MAY INVOLVE PLACING APPROPRIATE SEDIMENT CONTROLS AROUND STOCKPILES.
C. IF ACID SULPHATE SOILS EXIST IN THE WORKS AREA. THE CONTRACTOR MUST PREPARE A RISK ASSESSMENT BASED ON THE QUEENSLAND ACID SULPHATE SOIL TECHNICAL MANUAL AND MANAGE THE ACID SULPHATE SOILS AS PER THE MANUAL.

CREEK CROSSINGS

A. SILTATION CONTROL MEASURES SHALL BE PLACED DOWNSTREAM OF ANY EXCAVATION WORK.
B. APPROPRIATE SEDIMENT CONTROLS SHALL BE USED TO PREVENT SEDIMENT FROM ENTERING THE CREEK.
C. NO SOIL SHALL BE STOCKPILED WITHIN 5m OF THE CREEK.

REHABILITATION

A. PREDISTURBANCE SOIL PROFILES AND COMPACTION LEVELS SHALL BE REINSTATED.
B. PREDISTURBANCE VEGETATION PATTERNS SHALL BE RESTORED.

GENERAL NOTES

1. ALL WORK AND MATERIALS SHALL BE IN ACCORDANCE WITH CURRENT SOUTH EAST QUEENSLAND WATER SUPPLY CODE SPECIFICATIONS AND STANDARDS.
2. UNLESS SPECIFIED OTHERWISE ALL MATERIALS AND WORK SHALL COMPLY WITH THE RELEVANT AUSTRALIAN STANDARDS.
3. ADOPT LIP OF KERB OR SHOULDER OF ROAD AS PERMANENT LEVEL.
4. COVER ON MAINS FROM PERMANENT LEVEL TO BE AS SHOWN IN SEQ-WAT-1200-2.
5. CONDUITS TO BE INSTALLED IN ACCORDANCE WITH THE STANDARD DRAWINGS.
6. A WATER METER SUPPLIED AT THE DEVELOPER'S COST, IS TO BE INSTALLED AT THE SERVICE POINT OF EACH LOT IN ACCORDANCE WITH THE STANDARD DRAWING FOR THE SEQ-SP.
7. ALL MATERIALS USED IN THE WORKS SHALL COMPLY WITH THE SEQ-SP's ACCEPTED PRODUCTS AND MATERIALS LIST OR BE APPROPRIATELY SHOWN, LISTED AND DEFINED IN THE ENGINEERING SUBMISSION SO THAT THE ALTERNATIVE PRODUCT OR MATERIAL CAN BE ASSESSED AND IF APPROPRIATE, APPROVED BY THE SEQ-SP.
8. ALL CONCRETE FOOTPATHS TO BE CLEAR OF WATER MAINS.
9. TEST/CHLORINATION POINTS TO BE INSTALLED IN ACCORDANCE WITH STANDARD DRAWING NO.SEQ-WAT-1410-1.
10. THE CONSTRUCTION OF THE WATER RETICULATION WORK SHOWN ON THIS DRAWING MUST BE SUPERVISED BY AN ENGINEER WHO HAS RPEQ REGISTRATION. WORKS NOT COMPLYING WITH THIS REQUIREMENT WILL NOT BE PERMITTED TO CONNECT TO THE RETICULATION SYSTEM.

ALL ENVIRONMENT PROTECTION MEASURES SHALL BE IMPLEMENTED PRIOR TO ANY CONSTRUCTION WORK, INCLUDING CLEARING, COMMENCING.

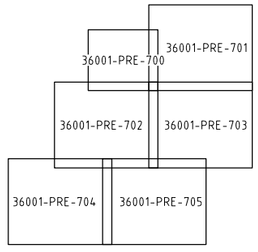
PROJECT SPECIFIC WATER NOTES

a. ALL PROPERTY CONNECTION ROAD CROSSINGS TO BE SLEEVED WITH DN100 mPVC CONDUIT.
b. ALL MATERIALS ARE TO BE SUPPLIED AND CONSTRUCTED IN ACCORDANCE WITH SEQ CODE.
c. WATER METERS ARE TO BE SUPPLIED AND INSTALLED AT ALL WATER SERVICE / CONNECTION POINTS IN ACCORDANCE WITH SEQ-WAT-1106 TO SEQ-WAT-1110-2.
d. THRUST BLOCKS, TRENCH STOPS AND BULK HEADS TO BE LOCATED AND INSTALLED BY CONTRACTOR IN ACCORDANCE WITH SEQ CODE.
e. TRENCH STOPS TO BE IN ACCORDANCE WITH SEQ-WAT-1201-1.
f. THE CONTRACTOR IS TO INCLUDE ROCK EXCAVATION AS PART OF THEIR WATER RATES UNLESS SCHEDULED OTHERWISE WITHIN THE CONTRACT.
g. FOOTPATHS SHOWN FOR INFORMATION PURPOSES ONLY.
h. ALL WATER CONSTRUCTION WORK UNDERTAKEN BY THE CONTRACTOR SHALL COMPLY WITH ALL APPLICABLE WORKPLACE HEALTH AND SAFETY LEGISLATION.
i. MINIMUM WATERMAIN COVER TO BE IN ACCORDANCE WITH SECTION 7.4.2 TABLE 7.2 OF THE SEQ AMENDMENT TO WATER SUPPLY CODE OF AUSTRALIA.
j. CONTRACTOR TO PAY ALL FEES AND CHARGES ASSOCIATED WITH CONNECTIONS.
k. END OF LINE ARRANGEMENTS (EG. CUL-DE-SAC HEADS) TO BE CONSTRUCTED IN ACCORDANCE WITH SEQ-WAT-1104-1.
l. TEMPORARY CONSTRUCTION HYDRANTS TO BE PROVIDED IN ACCORDANCE WITH SEQ-WAT-1303-1 AND SEQ-WAT-1303-2 AT ALL CONNECTIONS.
m. ALL LIVE CONNECTIONS ARE TO BE ORGANISED BY THE CIVIL CONTRACTOR AND UNDERTAKEN BY COUNCIL AT THE DEVELOPERS EXPENSE.

LEGEND

- W100 EXISTING 100Ø WATER MAIN
- W150 EXISTING 150Ø WATER MAIN
- W200 EXISTING 200Ø WATER MAIN
- W225 EXISTING 225Ø WATER MAIN
- W250 EXISTING 250Ø WATER MAIN
- W300 EXISTING 300Ø WATER MAIN
- EXISTING KERB (INVERT)
- EXISTING PROPERTY LINE
- EXISTING EDGE OF BITUMEN
- W100 FUTURE 100Ø WATER MAIN
- W150 FUTURE 150Ø WATER MAIN
- W200 FUTURE 200Ø WATER MAIN
- W225 FUTURE 225Ø WATER MAIN
- W250 FUTURE 250Ø WATER MAIN
- W300 FUTURE 300Ø WATER MAIN
- FUTURE KERB (INVERT)
- FUTURE PROPERTY LINE
- PROPOSED KERB (INVERT)
- PROPOSED EDGE OF BITUMEN
- PROPOSED PROPERTY LINE
- SITE BOUNDARY
- STAGE BOUNDARY
- W PROPOSED 100Ø WATER MAIN
- METER LOCATION
- SERVICE CONDUIT

SHEET LAYOUT



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PROJECT NAME

COURTNEY DR UPPER COOMERA

PRELIMINARY ENGINEERING

RP DESCRIPTION
LOT 188, 189, 190, 191 & 192 ON RP173728
COURTNEY DRIVE
LOCALITY OF UPPER COOMERA
LOCAL AUTHORITY - GOLD COAST CITY COUNCIL

CLIENT

GALLERY
THE ART OF LIVING

NORTH

0 5 10 15 20 25m
Scale 1:500 - A1 (1:1000 - A3)

ISSUES	DATE	
TENDER		
COUNCIL	11-09-18	
CONSTRUCTION		

C	16-04-19	DRIVEWAYS REMOVED
B	28-03-19	WATER, LOT NO'S & STAGES AMENDED
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BIOME WATER AND ENVIRONMENTAL CONSULTING

zone Planning Group

DRAWING TITLE

WATER RETICULATION PLAN SHEET 01

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EXTENT & ALIGNMENT OF WATER
EXTERNAL TO SITE TO BE DISCUSSED
& AGREED WITH GOLD COAST WATER

186
RP173728

187
RP173728

1000

ADJOINS SHEET 01

ROAD 07

STAGE 5

STAGE 6

ADJOINS SHEET 04

187
RP173728

75
SP174234

76
SP174234

77
SP174234

78
SP174234

79
SP174234

1.3m

PROJECT NAME

COURTNEY DR UPPER COOMERA

PRELIMINARY ENGINEERING

RP DESCRIPTION
LOT 188, 189, 190, 191 & 192 ON RP173728
COURTNEY DRIVE
LOCALITY OF UPPER COOMERA
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DRAWING TITLE

WATER
RETICULATION
PLAN
SHEET 02

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36001-PRE-701	C

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ADJOINS SHEET 01

ADJOINS SHEET 04

ADJOINS SHEET 05

ADJOINS SHEET 06

194
RP173728

193
RP173728

ROAD 01

ROAD 02

ROAD 03

ROAD 04

ROAD FIRE 01

1005

1006

1.3m

STAGE 3

STAGE 4A

STAGE 4B

126 127 128 129 147 148 149 150 151 152 153 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 247 248 249 250 251 252 253 254 268 269 270 271 272 273

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36001-PRE-702	C

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WATER RETICULATION PLAN SHEET 04

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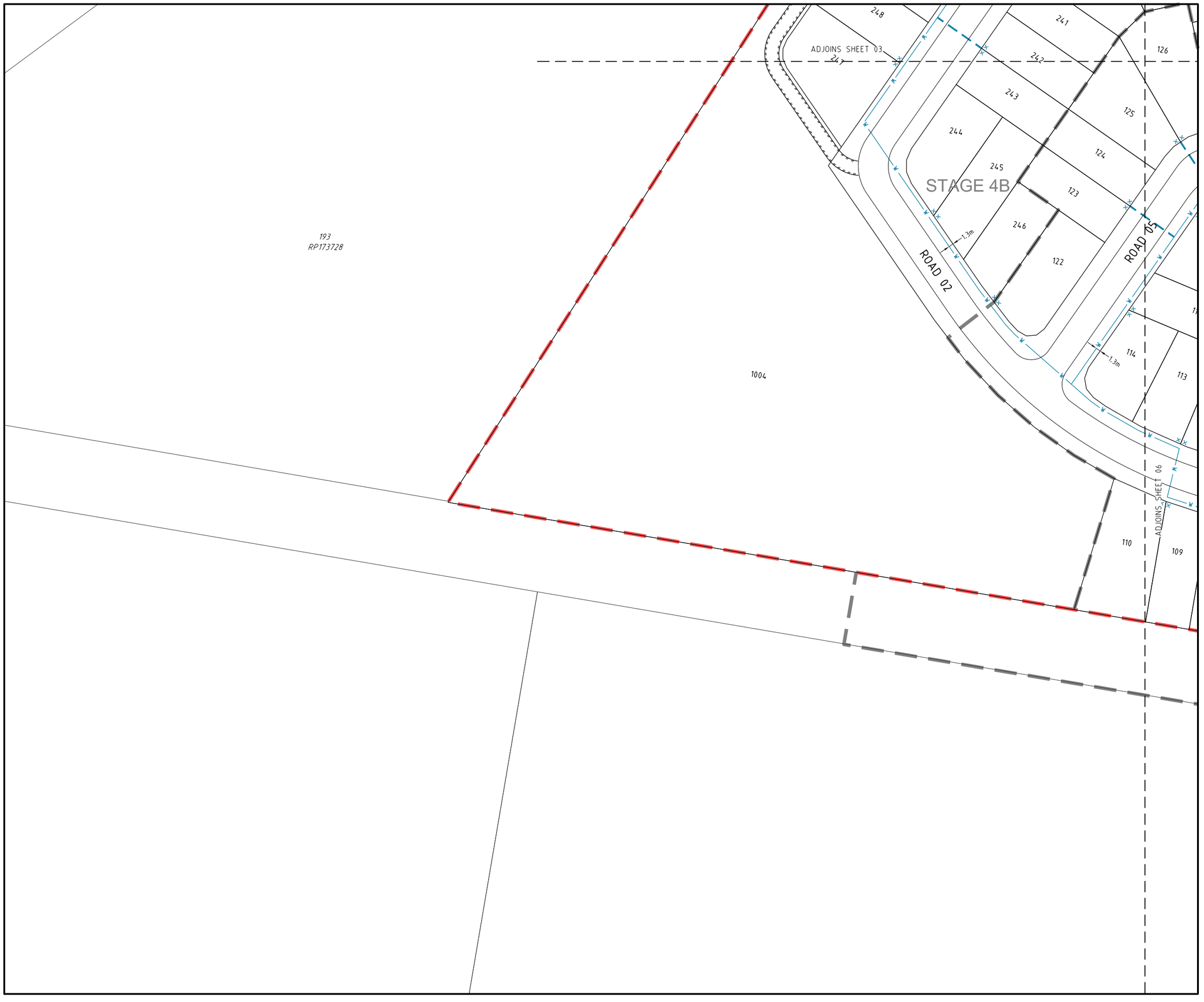
36001-PRE-703	C



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WATER
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PLAN
SHEET 05

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ADJOINS SHEET 03

ADJOINS SHEET 04

ADJOINS SHEET 05

ROAD 01

ROAD 02

ROAD 03

ROAD 04

ROAD 05

STAGE 1

1002
PARK

1003

PATTERSON CT

GORDON DR

CONNECT TO EXISTING

1.3m

1.5m

97
SP174234

98
SP174234

99
SP174234

100
SP174234

101
SP174234

16
SP292346

14
SP292346

15
SP292346

17
SP292346

18
SP292346

19
SP292346

999
SP292346

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LOT 188, 189, 190, 191 & 192 ON RP173728
COURTNEY DRIVE
LOCALITY OF UPPER COOMERA
LOCAL AUTHORITY - GOLD COAST CITY COUNCIL

CLIENT

GALLERY
THE ART OF LIVING

NORTH

0 5 10 15 20 25m
Scale 1:500 - A1 (1:1000 - A3)

ISSUES	DATE	
TENDER		
COUNCIL	11-09-18	
CONSTRUCTION		

PRE	DATE	AMENDMENT
C	16-04-19	DRIVEWAYS REMOVED
A	28-03-19	WATER, LOT NO'S & STAGES AMENDED
A	11-09-18	COUNCIL ISSUE

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ASSOCIATED CONSULTANTS

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WATER AND ENVIRONMENTAL CONSULTING

zone
Planning Group

DRAWING TITLE

WATER
RETICULATION
PLAN
SHEET 06

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APPROVED		RPEQ 4706	DATE 14-08-18

DRAWING NUMBER	AMEND.
36001-PRE-705	C

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Section 4 - SPECIALIST REPORTS

Landscape Concept Plan
Prepared by Group GSA

Zone Planning Group

Architecture
Interior Design
Landscape Architecture
Urban Design
Graphic Design

79-99 COURTNEY DRIVE, UPPER COOMERA

LANDSCAPE DESIGN REPORT

For: GALLERY HOMES

Date: APRIL 2019

GROUPGSA

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Issue	Title	Date	Prepared	Checked
1	DESIGN REPORT	MAY 2018	GD	SS
2	DESIGN REPORT	AUGUST 2018	GD	SS
3	DESIGN REPORT	SEPTEMBER 2018	GD	SS
4	DESIGN REPORT	APRIL 2019	GD	SS

DESIGN STATEMENT

SITE INFORMATION:

The subject site consists of five (5) lots totalling approximately 188,490m2 of land within Division 1 of the City of Gold Coast comprising:

+ Lot 188 on RP173728 (79 Courtney Drive, 30,790m2)
+ Lot 189 on RP173728 (89 Courtney Drive, 30,340m2)
+ Lot 190 on RP173728 (91 Courtney Drive, 30,950m2)
+ Lot 191 on RP173728 (97 Courtney Drive, 37,390m2)
+ Lot 192 on RP173728 (99 Courtney Drive, 59,020m2)

The land is currently zoned as the following:

+ Rural
+ Rural residential
+ Rural landscape and environmental precinct

The following City of Gold Coast City Plan Overlay Maps impact the site:

+ Bushfire Hazard
+ Dwelling House
+ Environmental significance – vegetation management
    Vegetation management
+ Environmental Significance – wetlands and watercourse
    Natural watercourse line
    Watercourse 30m buffer area
+ Landslide Hazard

DESIGN INTENT:

The landscape concept for the proposed residential development is based on the surrounding context, response to the proposed urban and civil layout, and the desired outcomes of the City of Gold Coast City Plan.

The design intent is to contribute positively to the image, identity and character of Upper Coomera by providing a contemporary, sensitive and appropriate landscape environment.

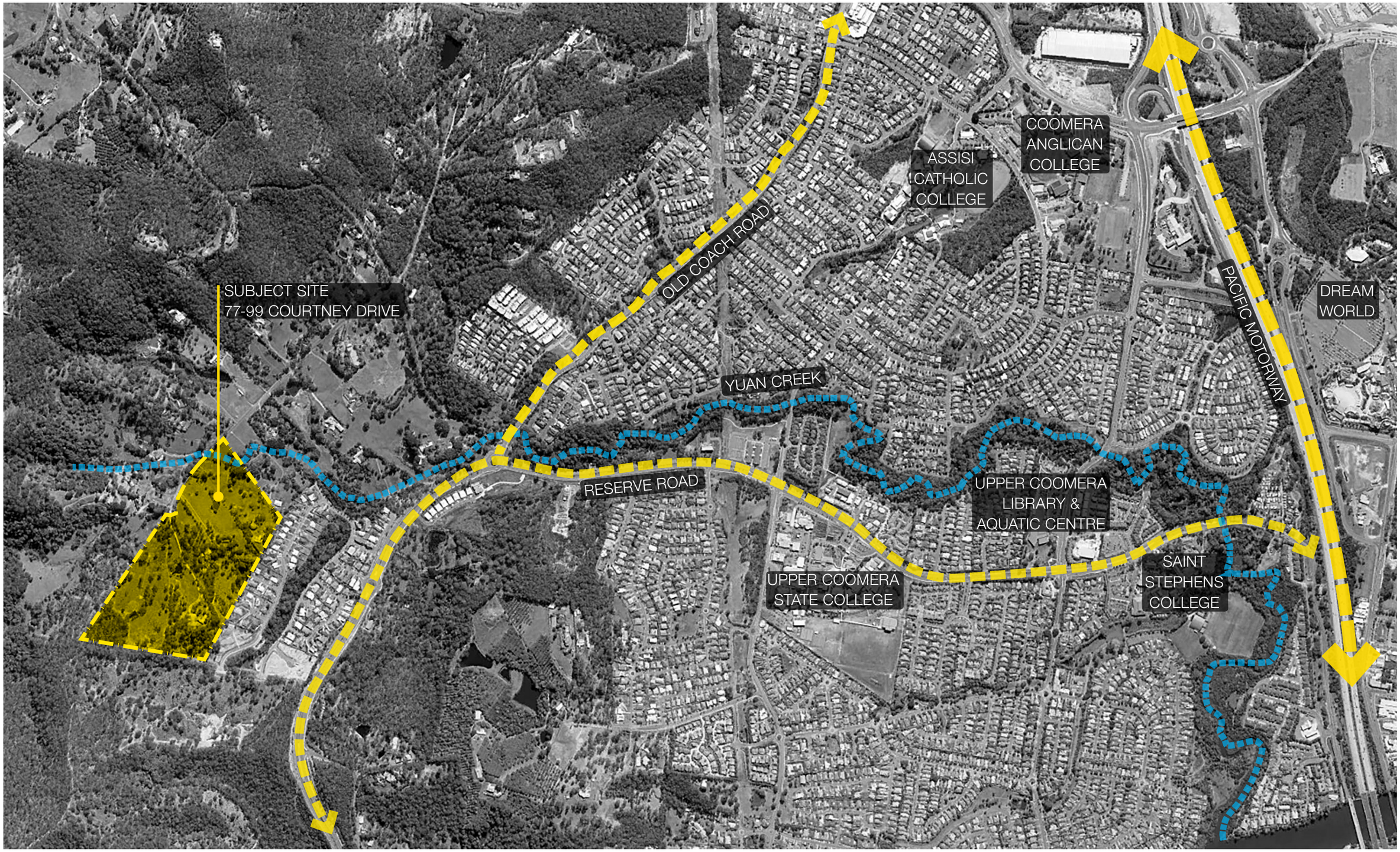
The key landscape elements comprise:

+ Provide leafy streets
+ Connect and link open space typologies to create an interconnected and diverse open space character
+ High quality recreation open space interconnected with environmental open space corridors
+ Shaded playground and recreation pathways within green open space
+ Assisted Natural Regeneration of environmental open spaces areas
+ A contemporary textually appropriate softscape planting palette which includes a variety of native plant species.
+ Creating a safe and accessible space, characterised by open sight lines.
+ Integration of water sensitive urban design elements into the residential layout.

To be read in conjunction with the Open Space Management Report prepared by Biome Consulting.

SUBJECT SITE LOCATION PLAN

North



OVERALL SITE LANDSCAPE MASTER PLAN

North

LEGEND:

01	Proposed Recreation Open Space
02	Proposed Environmental Open Space 30m Yaun Creek buffer Assisted Natural Regeneration Refer to Environmental Management Report
03	Proposed Environmental Open Space comprising existing mapper & vegetation Assisted Natural Regeneration Refer to Environmental Management Report
04	Proposed Bio Basin & Passive Open Space Refer to Stormwater Management Report
05	Adjacent neighbouring property
06	Site Boundary
07	Bushfire management buffer zone

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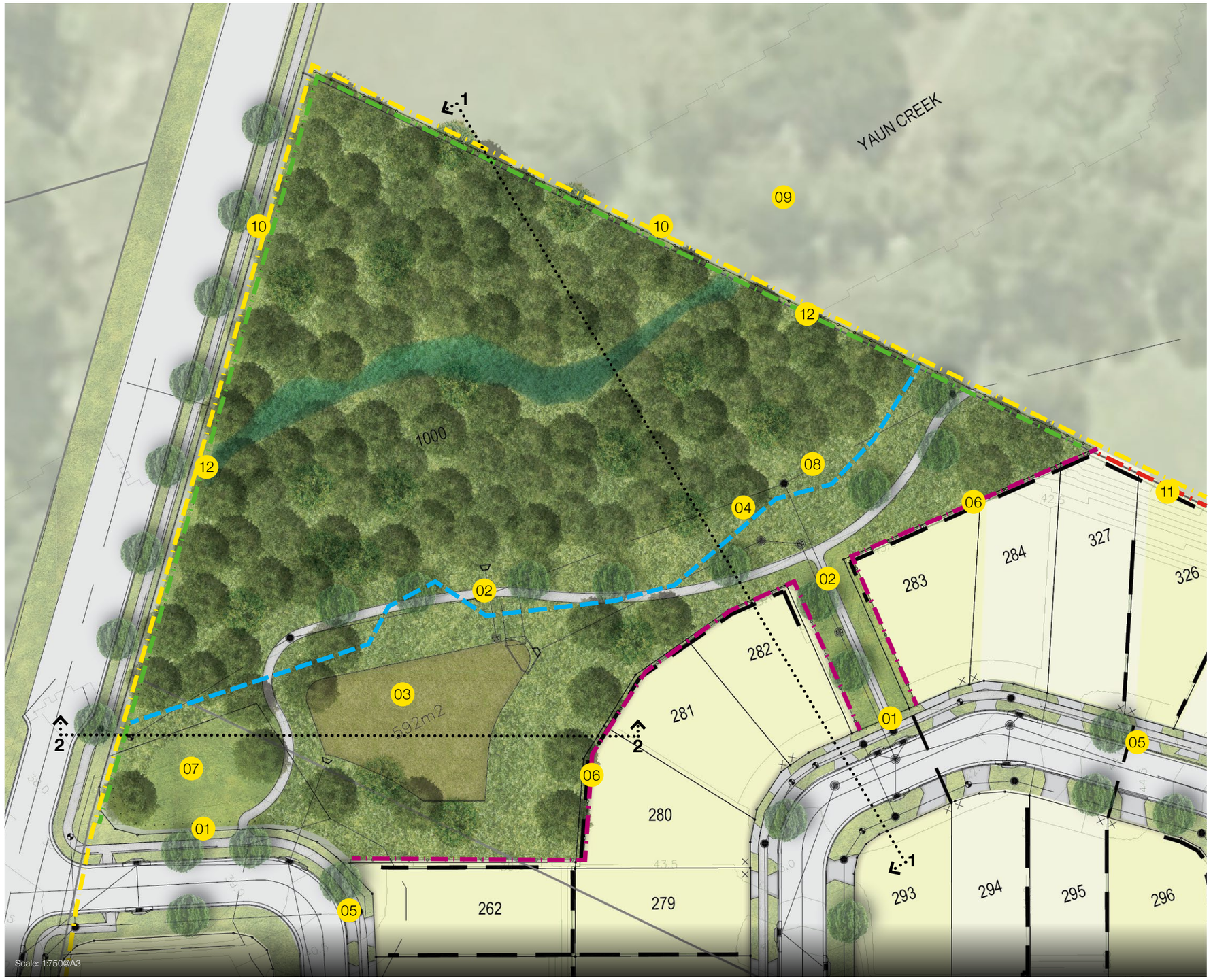
YAUN CREEK ENVIRONMENTAL OPEN SPACE LANDSCAPE CONCEPT PLAN

North

0 10 20 30 40 50m
Scale 1:750@A3

LEGEND:

01	Street front access control comprising timber bollards and park gate maintenance access
02	1.5m wide concrete footpath Refer to Engineers details
03	Proposed Bio Basin Refer to Stormwater Management Report
04	30m Yaun Creek buffer Assisted Natural Regeneration Refer to Environmental Management Report
05	Street Tree Planting Refer to Planting Palette
06	Proposed park interface boundary fence 1.2m high standard pool fence (selected finish)
07	Recreational open space
08	Existing dam to be filled and grassed/ turfed
09	Adjacent neighbouring property
10	Site Boundary
11	1.8m High Timber Good Neighbour Fence
12	1.0m High Post & Wire Fence



RECREATION OPEN SPACE LANDSCAPE CONCEPT PLAN

North

0 10 20 30 40 50m
Scale 1:750@A3

LEGEND:

01	Proposed shaded playground comprising large feature climber structure, swing and carousel, mulch softfall and bench seating
02	Proposed shaded picnic setting
03	Proposed 1.5m wide concrete informal recreation path connection
04	Informal kick about recreation open space
05	Street front access control comprising timber bollards and park gate maintenance access
06	Street Tree Planting Refer to Planting Palette
07	Proposed park interface boundary fence 1.2m high standard pool fence (selected finish)
08	Adjacent neighbouring property
09	Site Boundary
10	Existing Fence To be retained

GROUPGSA

ENVIRONMENTAL OPEN SPACE LANDSCAPE CONCEPT PLAN

North

0 10 20 30 40 50m
Scale 1:750@A3

LEGEND:

01	Proposed Environmental Open Space comprising existing mapped vegetation Assisted Natural Regeneration Refer to Environmental Management Report
02	Street Tree Planting Refer to Planting Palette
03	Street front access control comprising timber bollards and park gate maintenance access
04	Proposed park interface boundary fence 1.2m high standard pool fence (selected finish)
05	Adjacent neighbouring property
06	Site Boundary
07	1.0m High Post & Wire Nature Fence

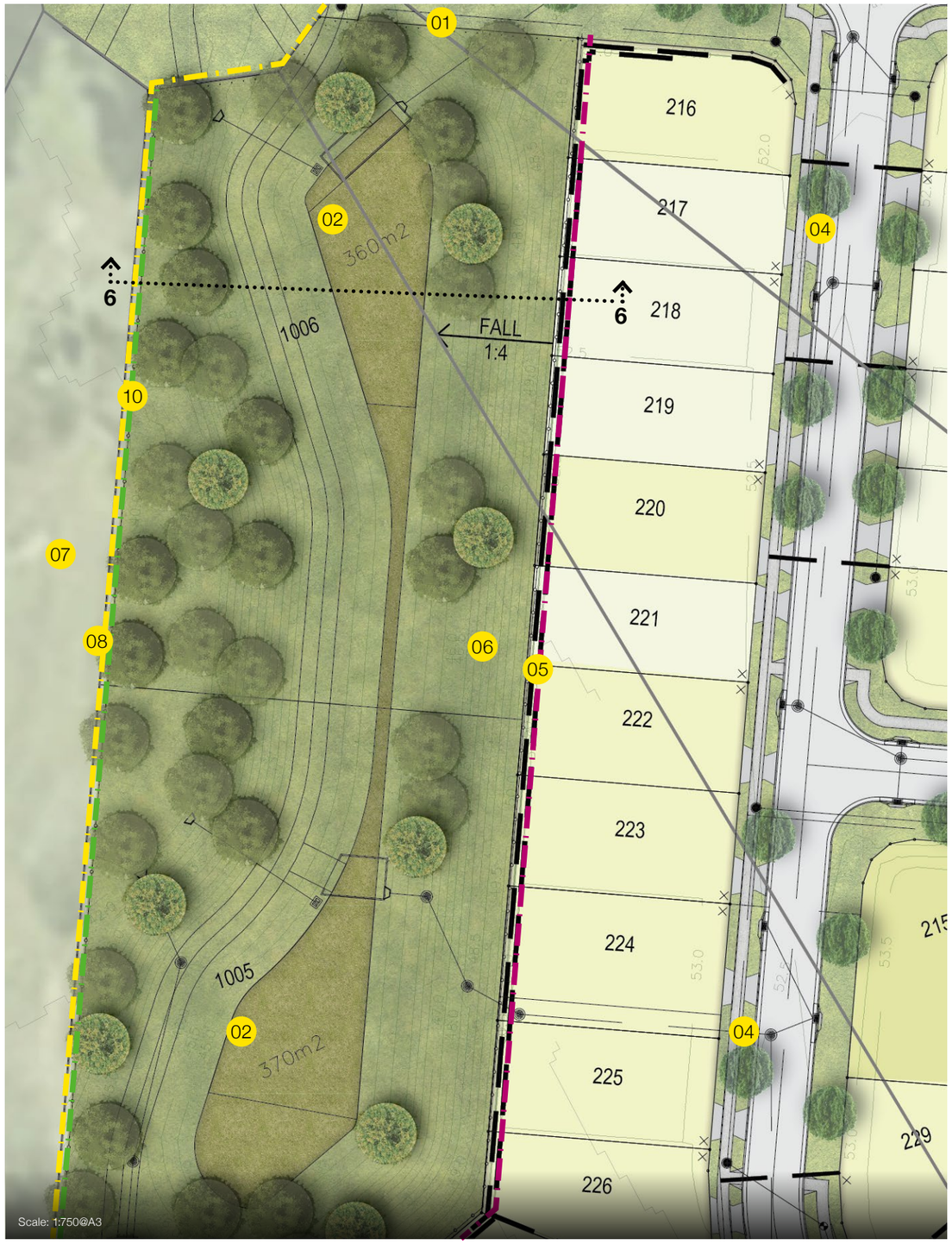
BIO BASIN LANDSCAPE CONCEPT PLAN 01

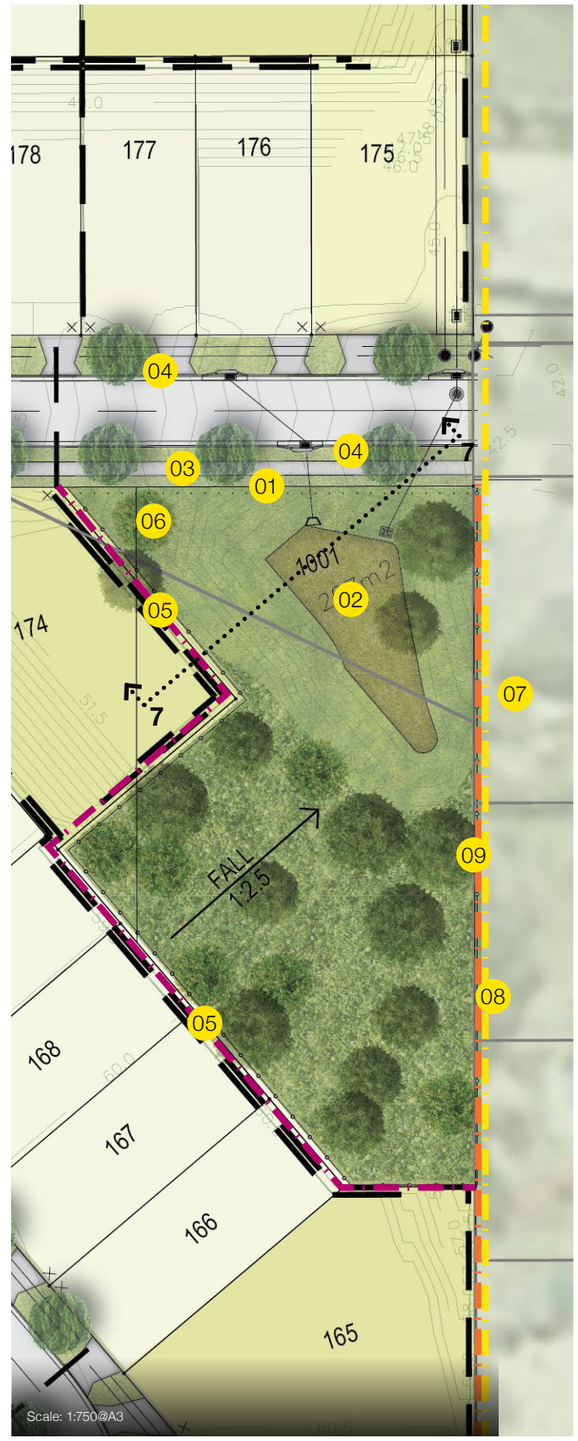
North

0 10 20 30 40 50m
Scale 1:750@A3

LEGEND:

01	Street front access control comprising timber bollards and park gate maintenance access
02	Proposed Bio Basin Refer to Stormwater Management Report
03	Proposed footpath connection Refer to Engineers details
04	Street Tree Planting Refer to Planting Palette
05	Proposed park interface boundary fence 1.2m high standard pool fence (selected finish)
06	Green Open Space
07	Adjacent neighbouring property
08	Site Boundary
09	Existing Fence To be retained
10	1.0m High Post & Wire Nature Fence





GROUPGSA

BIO BASIN LANDSCAPE CONCEPT PLAN 02

LEGEND:

01	Street front access control comprising timber bollards and park gate maintenance access
02	Proposed Bio Basin Refer to Stormwater Management Report
03	Proposed footpath connection Refer to Engineers details
04	Street Tree Planting Refer to Planting Palette
05	Proposed park interface boundary fence 1.2m high standard pool fence (selected finish)
06	Adjacent neighbouring property
07	Site Boundary
08	Existing Public Open Space Passive Recreation & Bio Basin
09	Existing Fence To be retained

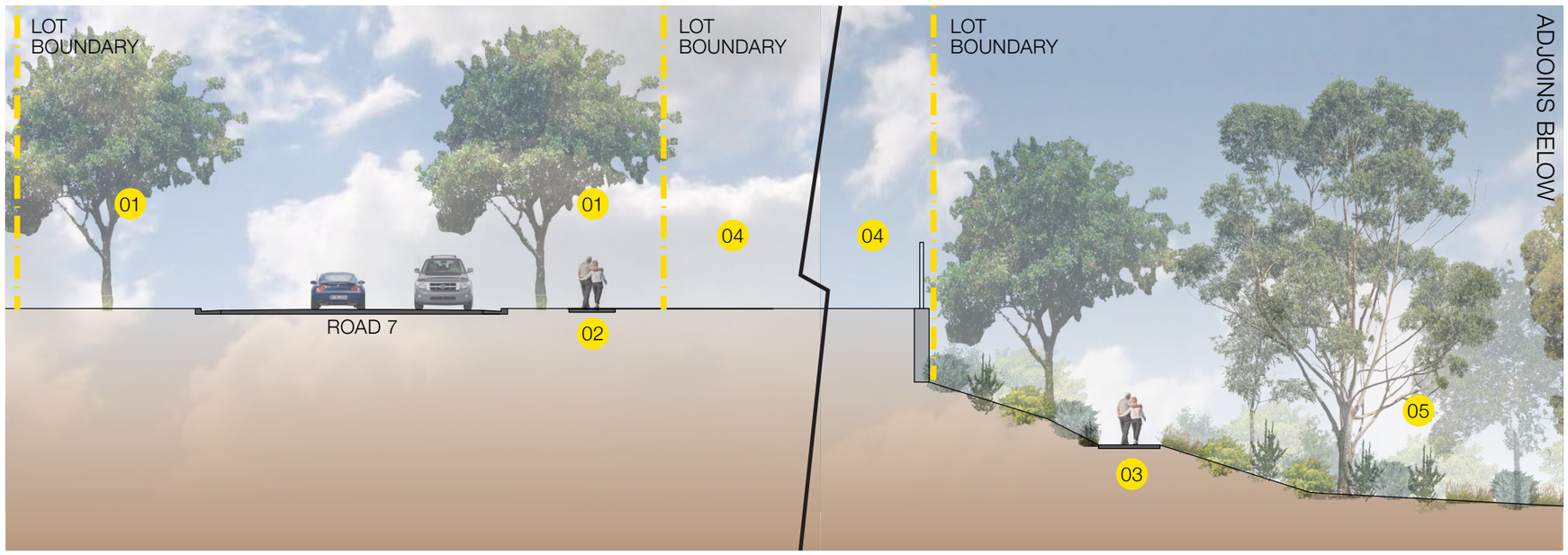
North

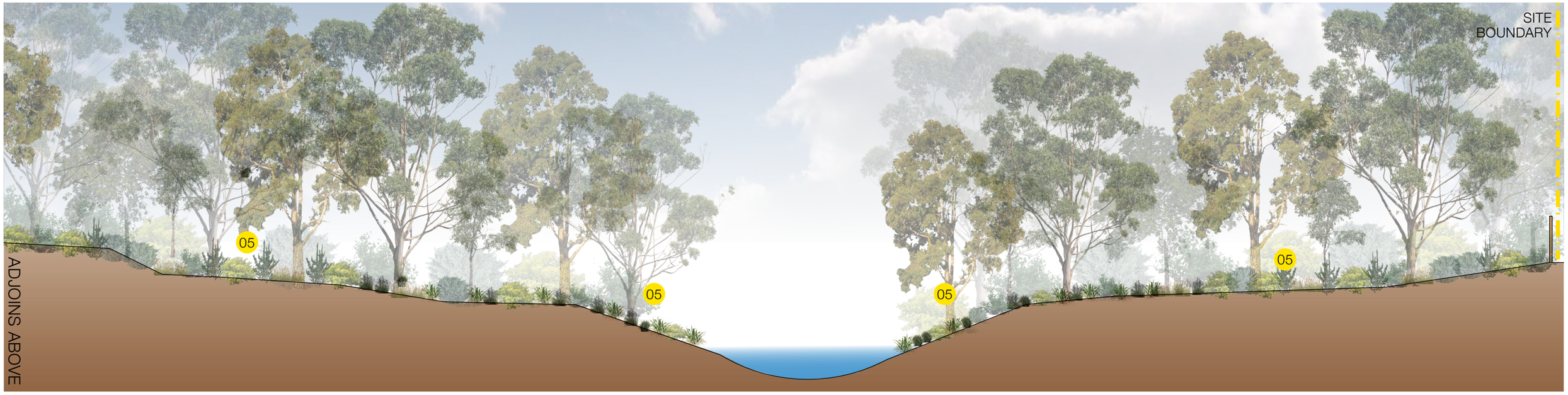
0 10 20 30 40 50m

Scale 1:750@A3

TYPICAL LANDSCAPE CROSS SECTIONS

SCALE - 1:150





SECTION 1 - Yuan Creek Environmental Open Space & Road 7 Section

LEGEND

01	Street Tree Planting Refer to Planting Palette
02	Proposed footpath connection Refer to Engineers details
03	Proposed 1.5m wide concrete informal recreation path connection
04	Lot 282
05	30m Yaun Creek buffer Assisted Natural Regeneration Refer to Environmental Management Report

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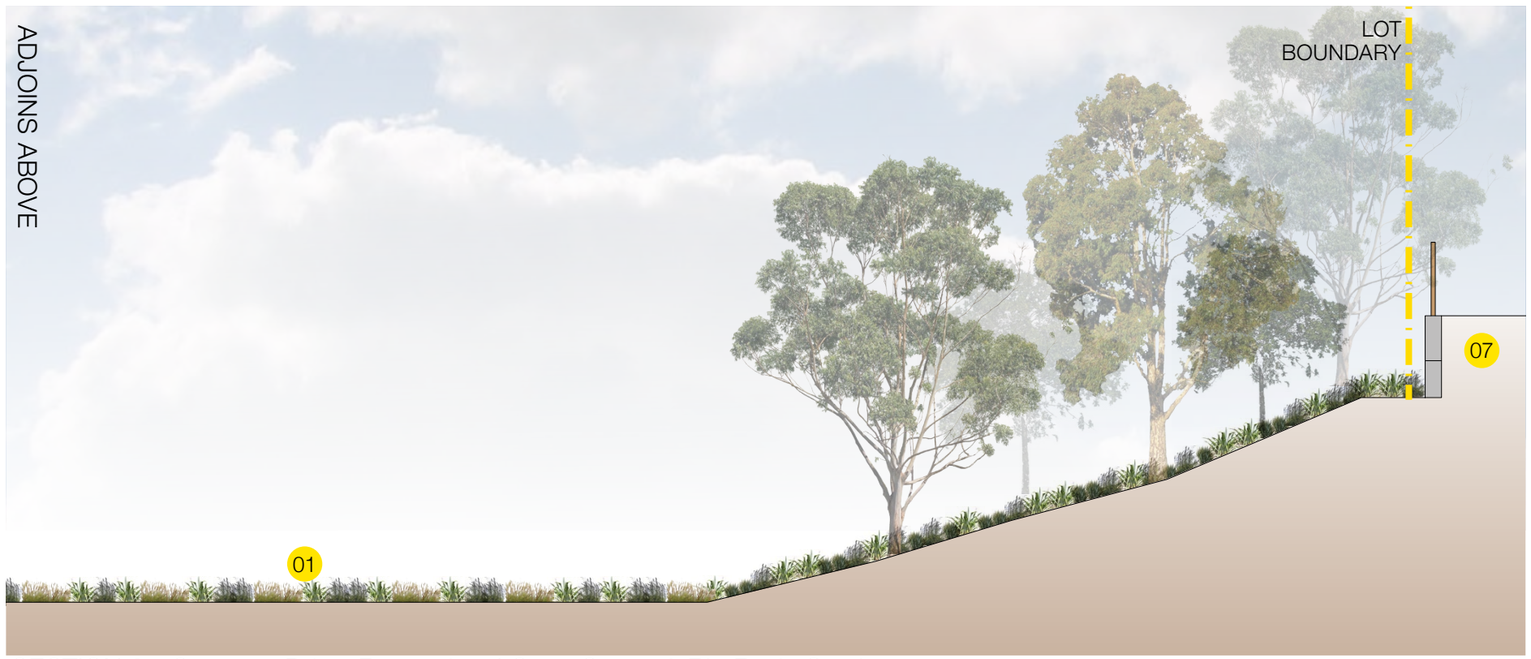
TYPICAL LANDSCAPE CROSS SECTIONS

SCALE - 1:150



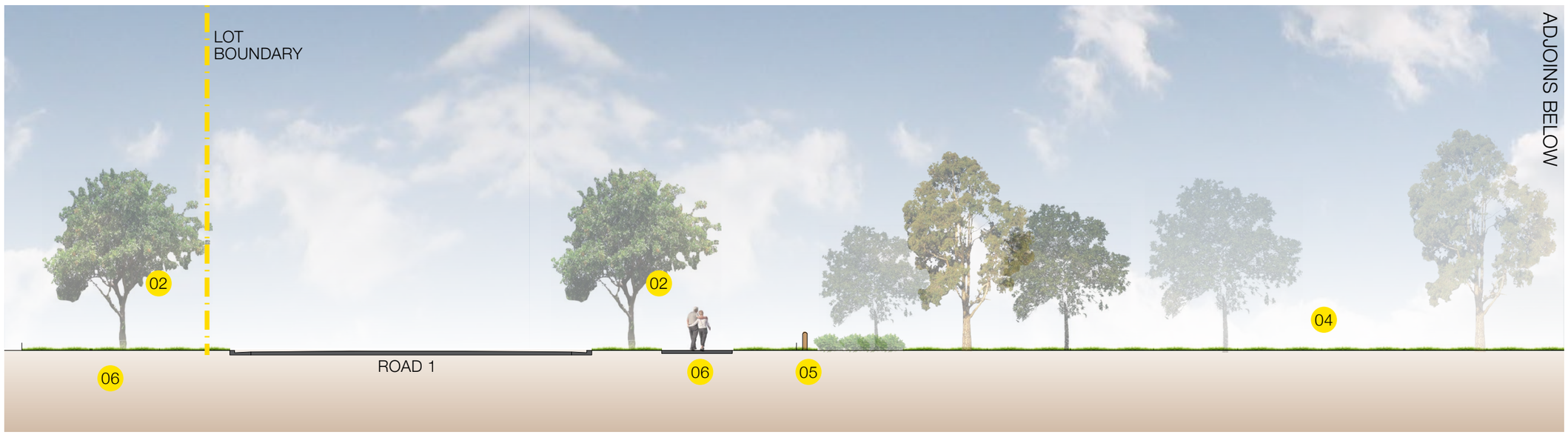
SECTION 2 - Courtney Drive, Recreational Open Space & Bio Basin Section

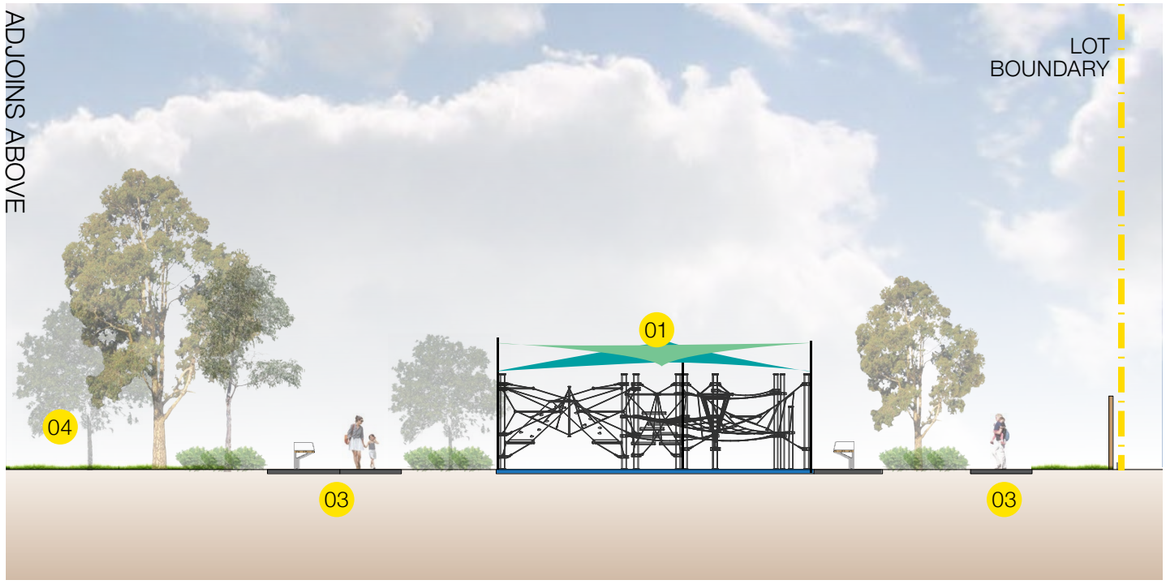
LEGEND:

01	Proposed Bio Basin Refer to Stormwater Management Report
02	Street Tree Planting. Refer to Planting Palette
03	Proposed 1.5m wide concrete informal recreation path connection
04	Informal kick about recreation open space
05	Street front access control comprising timber bollards and park gate maintenance access
06	Proposed footpath connection Refer to Engineers details
07	Retaining wall max 2.0m High Refer to Engineers Details

TYPICAL LANDSCAPE CROSS SECTIONS

SCALE - 1:150





SECTION 3 - Recreation Open Space & Road 1 Section

LEGEND:

01	Proposed shade playground comprising large feature climber structure, swing and carousel, mulch softfall and bench seating
02	Street Tree Planting Refer to Planting Palette
03	Proposed informal recreation path connection
04	Informal kick about recreation open space
05	Street front access control comprising timber bollards and park gate maintenance access
06	Proposed footpath connection Refer to Engineers details

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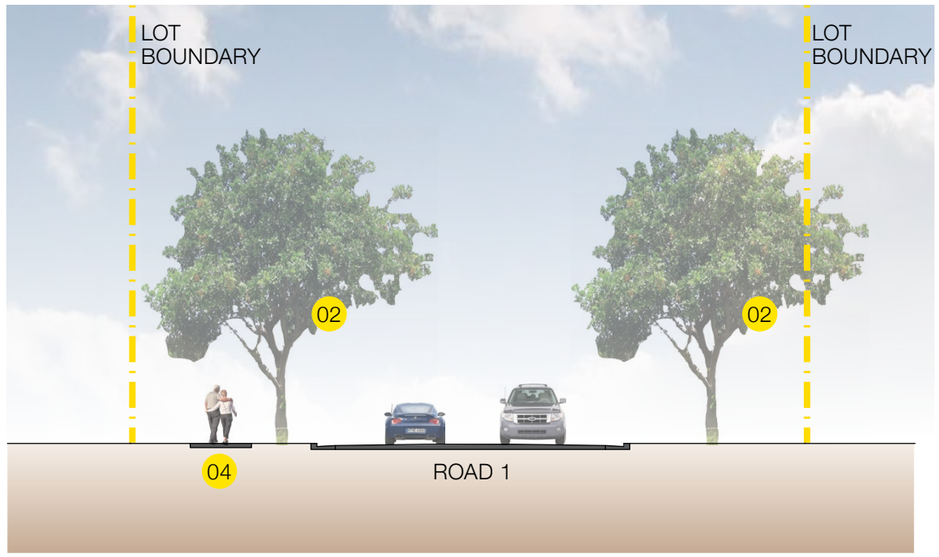
TYPICAL LANDSCAPE CROSS SECTIONS

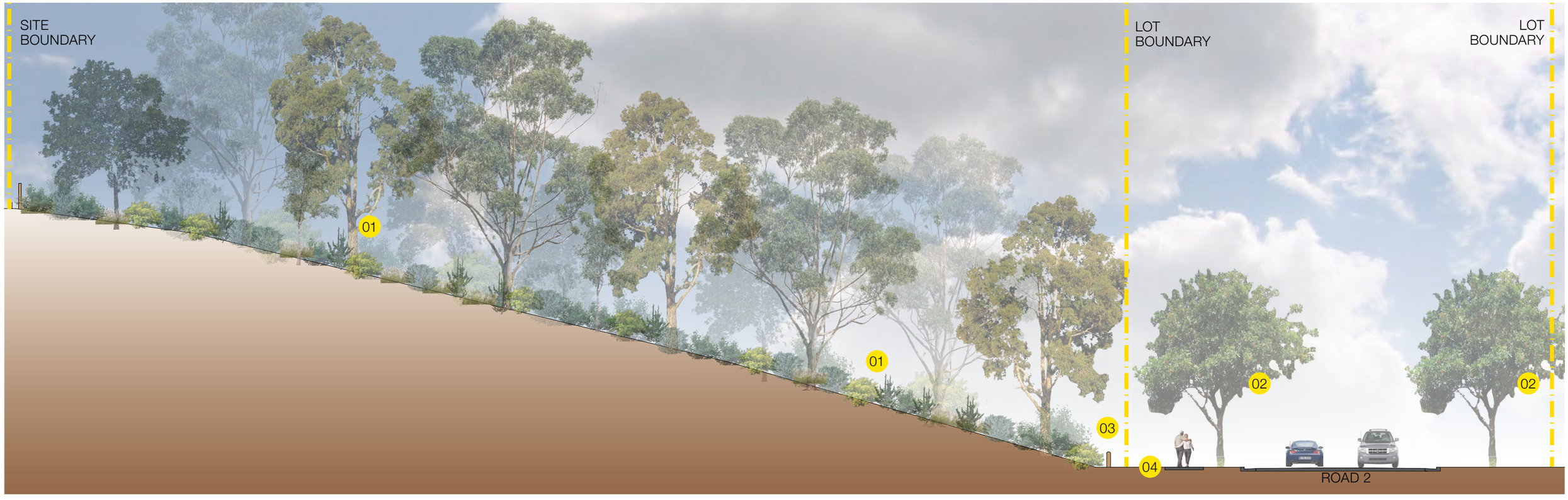
SCALE - 1:150



SECTION 4 - Typical Road 1 Section

LEGEND:

01	Green Open Space comprising existing mapped vegetation. Assisted Natural Regeneration Refer to Environmental Management Report
02	Street Tree Planting Refer to Planting Palette
03	Street front access control comprising timber bollards and park gate maintenance access
04	Proposed footpath connection Refer to Engineers details



SECTION 5 - Environmental Open Space & Road 2 Section

TYPICAL LANDSCAPE CROSS SECTIONS

SCALE - 1:150

SECTION 6 - Bio Basin & Retaining Section

SECTION 7 - Bio Basin Section

LEGEND:

01	Green Open Space
02	Proposed Bio Basin Refer to Stormwater Management Report
03	Retaining wall max 3.0m High Refer to Engineers Details
04	Adjacent neighbouring property
05	Street front access control comprising timber bollards and park gate maintenance access

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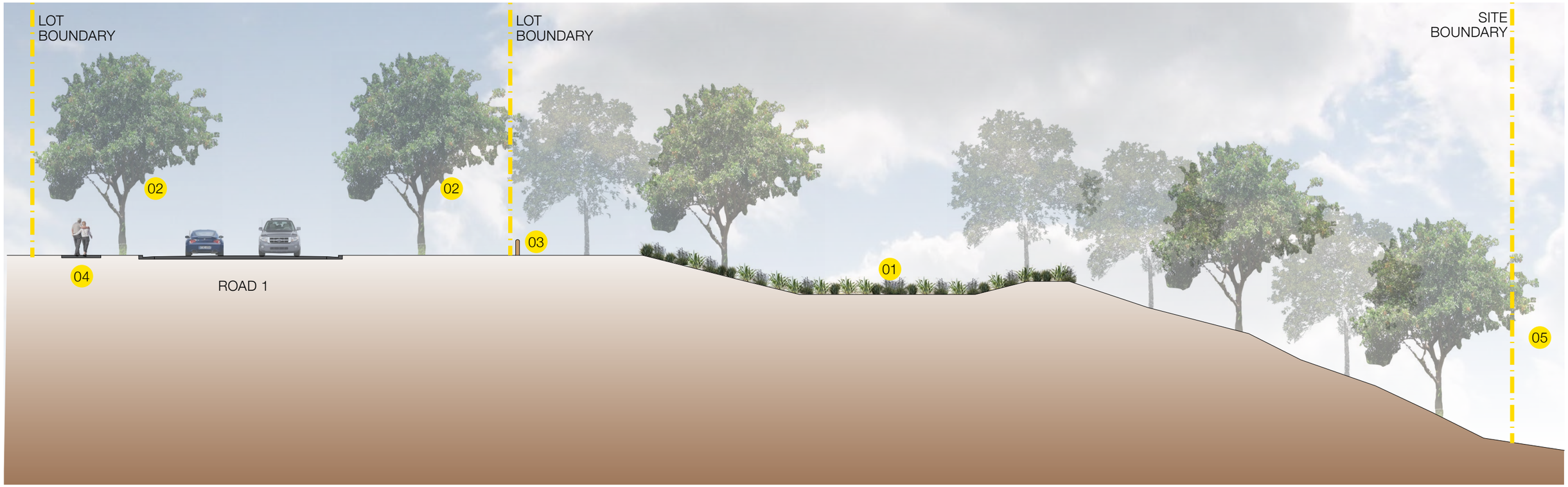
TYPICAL LANDSCAPE CROSS SECTIONS

SCALE - 1:150



SECTION 8 - Bio Basin & Road 1 Section

LEGEND:

01	Proposed Bio Basin Refer to Stormwater Management Report
02	Street Tree Planting Refer to Planting Palette
03	Street front access control comprising timber bollards and park gate maintenance access
04	Proposed footpath connection Refer to Engineers details
05	Adjacent Existing Green Open Space

STREET TREE PLANTING MASTER PLAN

LEGEND:

Primary Street Tree
Melaleuca linariifolia (Flyleaf Paperbark)

Secondary Street Tree
Tristaniopsis laurina (Water Gum)

Tertiary Street Tree
Cupaniopsis anacardioides (Tuckeroo)

Site boundary

Primary:

Melaleuca linariifolia

Secondary:

Tristaniopsis laurina

Tertiary:

Cupaniopsis anacardioides

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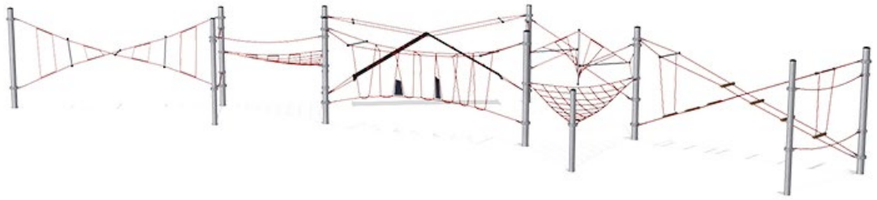
MATERIALS PALETTE

PLAY ELEMENTS



Kompan Corocord Climbing Ropes

Kompan Swing with Bird's Nest Seat

Kompan Multispinner Carousel

SHADE SAIL

Shade Sail

FURNITURE ELEMENTS

GCCC Urban Setting Picnic Table

Street & Garden Shelter

Street & Garden Drinking Fountain

GCCC Urban Bin

GCCC Urban Bench

SURFACE FINISHES

Standard Gray Concrete

Mulch Woodchip Softfall

GCCC Standard Timber Bollards

FENCING

1.2m Aluminium Pool Fence

1.8m Good Neighbour Fence

PLANTING PALETTE

Callistemon viminalis

Elaeocarpus grandis

Lophostemon confertus

Carex appressa

Cordyline ‘Rubra’

Crinum pedunculatum

Dianella caerulea

Hardenbergia violacea

Juncus kraussii

Liriope ‘Evergreen Giant’

Lomandra longifolia

Myoporum ellipticum

Pandorea pandorana

Rhagodia spinescens

Syzygium sp.

Westringia ‘Grey Box’

Species	Common Name
STREET TREES	
Cupaniopsis anacardioides	Tuckeroo
Melaleuca linarifolia	Flyleaf Paperbark
Tristaniopsis laurina	Water Gum
OPEN SPACE TREES	
Callistemon viminalis	Bottlebrush
Casuarina equisetifolia	Coastal She-Oak
Corymbia maculata	Spotted Gum
Elaeocarpus grandis	Blue Quandong
Grevillea robusta	Water Gum
Lophostemon confertus	QLD Brush Box
Melaleuca linarifolia	Flyleaf Paperbark
SHRUBS & STRAP LEAF PLANTS	
Callistemon ‘Little John’	Little John Bottlebrush
Cordyline ‘Rubra’	Red Palm Lily
Crinum pedunculatum	River Lily
Dianella caerulea	Flax Lily
Liriope ‘Evergreen Giant’	Giant Liriope
Rhagodia spinenscens	Aussie Flat Bush
Syzygium sp.	Lilly Pilly
Westringia ‘Grey Box’	Coastal Rosemary
SEDGES & RUSHES	
Carex appressa	Tall Sedge
Cyperus polystachyos	Bunchy Sedge
Gahnia aspera	Saw Sedge
Lomandra longifolia	Matt Rush
Juncus kraussii	Sea Rush
GROUNDCOVERS & CLIMBERS	
Hardenbergia violacea	Native Sarsparilla
Myoporum ellipticum	Coastal Boobialla
Pandorea pandorana	Wonga Wonga Vine
Themeda triandra	Kangaroo Grass
Trachelospermum jasminoides	Star Jasmine

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Section 4 - SPECIALIST REPORTS

Open Space Management Plan
Prepared by Biome Consulting

Zone Planning Group

Open Space Management Statement

79-99 Courtney Drive, Upper Coomera

Gallery Homes

March 2019

BC-16090

BIOME

WATER AND ENVIRONMENTAL CONSULTING

Document Control

Report Title: Open Space Management Statement
79-99 Courtney Drive, Upper Coomera

Prepared By: Nadya Lees
BSc (Hons)

Reviewed By: Kristina Entwistle
MSc, BAppSc

Approved By: Brad Comley
CEnvP MEIANZ, MIEAust, MSc, BAppSc

Dated: March 2019

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	Revision	Digital .PDF
Version 1	ROL Application	1 x Gallery Homes 1 x BIOME Consulting

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Abbreviations and Definitions

Term	Meaning
ACH Act	*Aboriginal Cultural Heritage Act 2003*
Biome	Biome Consulting Pty Ltd
CoGC	City of Gold Coast
City Plan	City of Gold Coast Planning Scheme *City Plan 2018, Version 5*
CPTED	Crime Prevention through Environmental Design
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
EVNT	Endangered, Vulnerable or Near Threatened
Fauna	Refers to all animal species
Flora	Refers to all plant species
LAP	Local Area Plan
MLES	Matters of Local Environmental Significance
MNES	Matters of National Environmental Significance
MSES	Matters of State Environmental Significance
NCA	*Nature Conservation Act 1992*
Non-trunk infrastructure	Refers to development infrastructure that is either internal to a development or connects development to trunk infrastructure. It is the responsibility of the developer to provide non-trunk infrastructure.
OSMS	Open Space Management Statement
Planning Scheme	City of Gold Coast Planning Scheme *City Plan 2018, Version 5*
PMST	Protected Matters Search Tool
RE	Regional Ecosystems. Defined as a vegetation community that is consistently associated with a particular combination of geology, landform and soil
RoL	Reconfiguration of a lot
SDAP	State Development Assessment Provisions
SPP	State Planning Policy
SPRP	State Regulatory Planning Provisions
SRI	Statement of Rehabilitation Intent
Threatened species	Species listed under the NCA or EPBC Act as having a conservation status of near threatened, vulnerable, endangered or critically endangered.
Trunk infrastructure	Refers to development infrastructure that is planned for and commonly provided by local governments. Trunk infrastructure is shared between developments.
VMA	*Vegetation Management Act 1999*

Executive Summary

This report has been prepared for Gallery Homes to guide the design, management, construction and operational principles of the open space within the proposed development, located at 79-99 Courtney Drive, Upper Coomera. The open space within the subject site provides an opportunity to enhance the liveability of the proposed residential development by providing an outdoor environment where people can recreate and socialise, while still maintaining habitat for wildlife.

This report has been prepared in accordance with the City of Gold Coast *Open Space Management Guideline. Guideline for the Preparation of Reports and Plans Associated with the Dedication of Public Open Space. Version 1 November 2007* and *Park Design Guideline. Safe, Responsive and Sustainable Parks for Our City. January 2016 – Version 1.0*.

The total area of open space proposed is 41,258 m^2. Three categories of open space have been proposed. These include:

- Utility Reserves (Drainage and Natural Drainage Reserves);
- Open Space Parks (Recreation); and
- Conservation Estate (Environmental Reserve).

The open space areas provide community meeting places and allow for pedestrian connectivity to community infrastructure (such as schools and convenience stores) in the local area. An area of 37,065 m^2 of non-trunk infrastructure public open space areas and 4,193 m^2 of trunk infrastructure is provided within the proposed development. All open space areas are linked by footpaths.

The conservation estate totals 14,450 m^2 and will enable connectivity to bushland external to the site to be maintained. The conservation estate (environmental reserve) will enable the preservation of environmentally significant areas in perpetuity.

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1 Introduction

Gallery Homes is proposing a new residential sub-development in the rapidly developing northern Gold Coast region. Biome Consulting Pty Ltd (Biome) has been commissioned to prepare an Open Space Management Statement (OSMS). This report accompanies a planning application submitted to the City of Gold Coast (CoGC) for a development permit for Reconfiguration of Lots (RoL) to accommodate the sub-division components.

The location of the sub-division is described as Lots 188-192 on RP173728, at 79-99 Courtney Drive, Upper Coomera (hereafter referred to as 'the subject site').

This report has been prepared in accordance with the City Gold Coast *Open Space Management Guideline. Guideline for the Preparation of Reports and Plans Associated with the Dedication of Public Open Space. Version 1 November 2007* and *Park Design Guideline. Safe, Responsive and Sustainable Parks for Our City. January 2016 – Version 1.0*.

The intent of this OSMS is to guide the design, management, construction and operational principles of the open space within the proposed development.

1.1 Report Scope

This OSMS has been prepared in accordance with relevant documentation guidelines and policies. Specifically, the OSMS will:

- Provide a summary of the physical and statutory constraints identified from the technical studies which have informed the location and function of open space areas;
- Define the parameters for the open space context and function; and
- Address relevant codes and development compliance.

1.2 Vision and Goals

1.2.1 Vision statement

The proposed master planned community provides an opportunity to conserve bushland, Koala habitat connectivity and riparian vegetation in perpetuity. The proposed open space networks offer an opportunity to enhance the liveability of the residential development by providing an outdoor environment where people can recreate and socialise, while also preserving habitat for wildlife.

1.2.2 Goals

The following goals for the proposed open space network provides a philosophical foundation on which to base the implementation of this Management Statement. These broad goals provide the basis for management actions related to specific resources.

1. Vegetation – protect the functional values and enhance the quality, diversity and health of retained native vegetation communities;
2. Wildlife – protect and enhance the wildlife habitat on the site while maintaining connectivity to adjacent bushland areas;
3. Parkland – provide an outdoor passive recreation area where people can socialise; and
4. Walking paths and infrastructure – manage access to provide a recreational experience within the urban environment while minimising impacts to ecosystems.

2 Site Specifics

The following sections describe the site and its current environmental condition.

2.1 Site Location

The subject site is located at 79-99 Courtney Drive, Upper Coomera on Lots 188-192 on RP173728 and is located within the City of Gold Coast Local Government Area. The site comprises of five allotments with a total land area of 18.849 ha (Table 2.1).

Table 2.1 Allotment Details

Street Number	Lot Plan Number	Lot Size (ha)
79	188 RP173728	3.079
89	189 RP173728	3.034
91	190 RP173728	3.095
97	191 RP173728	3.739
99	192 RP173728	5.902

Figure 2.1 Site Location (Google Earth, image date 2016)

2.2 Climate

The Bureau of Meteorology collect weather and climate information. The nearest weather station to the site is Southport Ridgeway Avenue (station number 040190). The average annual rainfall is 1451.7mm and average temperature range is 15.3-25.0º C (Table 2.2).

Table 2.2 Climate Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Mean minimum temperature (°C)	28.5	28.3	27.6	25.9	23.3	21.2	20.6	21.4	23.3	25.2	26.7	28.1
Mean minimum temperature (°C)	20.3	20.5	19.2	16.5	13.4	10.6	9.1	9.8	12.1	15.0	17.4	19.2
Mean Rainfall (mm)	181.2	190.2	198.9	136.4	128.9	96.3	72.8	56.9	57.5	96.8	105.8	136.2

2.3 Current and Surrounding Land Use

The site is used for rural purposes. Residential dwellings and associated out buildings are present on the site. The site is grazed by livestock. Several dams are present on the site. Yaun Creek and/or its tributaries passes through Lots 188, 191 and 192.

The immediate surrounding land use pattern is characterised by rural residential allotments to the immediate west, south and north. These allotments range in size from 3 – 157 ha. Smaller lot residential developments are present to the immediate east of the site.

2.4 Current Land Use Zoning

Under the CoGC Planning Scheme *City Plan 2018* (Version 5) (City Plan), the site is designated as Rural and Rural Residential (Figure 2.2). Some areas of the site are designated Rural Landscape and Environment Precinct (hatched areas in Figure 2.2).

The site falls within an Investigation Area for Future Development. The Draft Concept Plan (GHD, 2017) identifies the site as *Suburban Neighbouhood.*

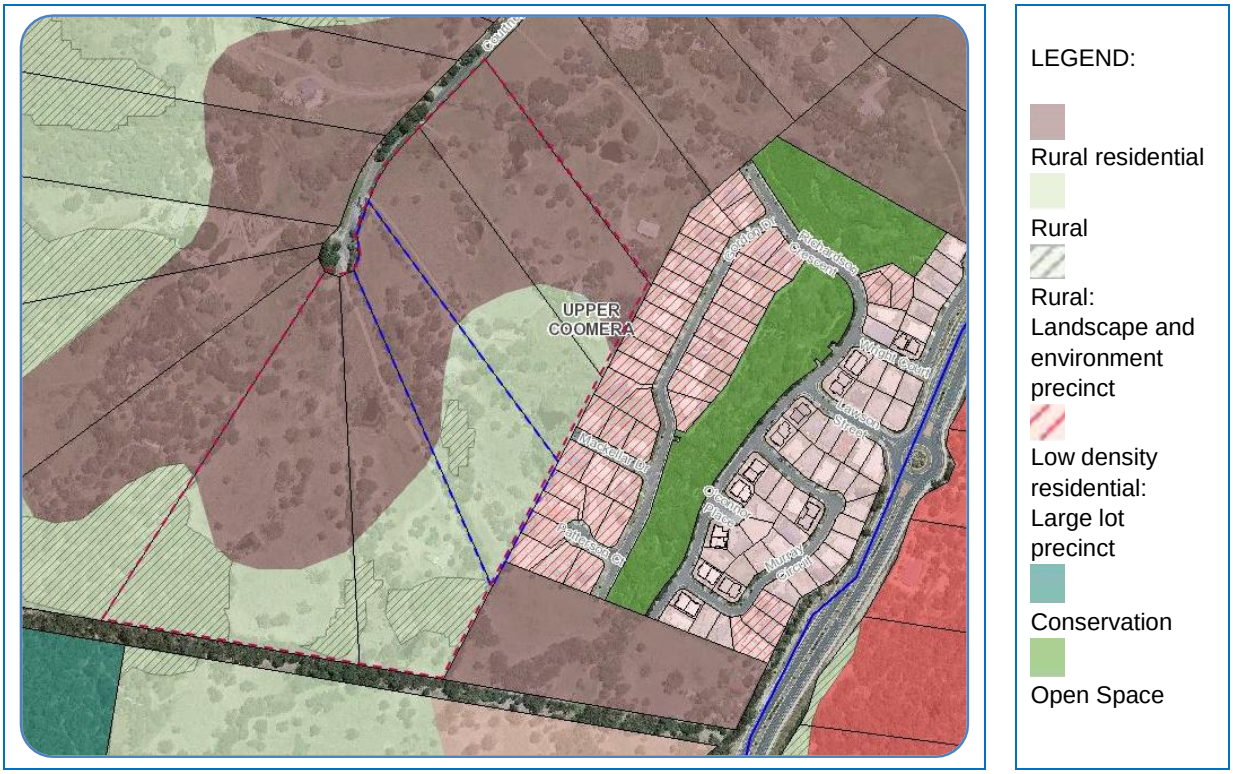


Figure 2.2 Zones under the City Plan 2018

2.5 Draft Concept Plan

Under the City Plan, 13 non-urban areas within the urban footprint of the *South East Queensland Regional Plan 2009-2031*, were identified for investigation into land use opportunities and constraints. Courtney Drive was given the highest ranking in terms of marketability and development suitability (GHD, 2017).

The subject site falls within the Courtney South East and Courtney West Precincts of the investigation area (Figure 2.3). Three potential land use categories have been identified on the subject site – suburban neighbourhood, suburban neighbourhood (constrained) and green space. Constrained suburban neighbourhood areas require special design considerations as the land is above Reduced Level (RL) 60.

The draft concept plan recommends the amalgamation of allotments to maximise the development potential, connectivity and bushfire management.

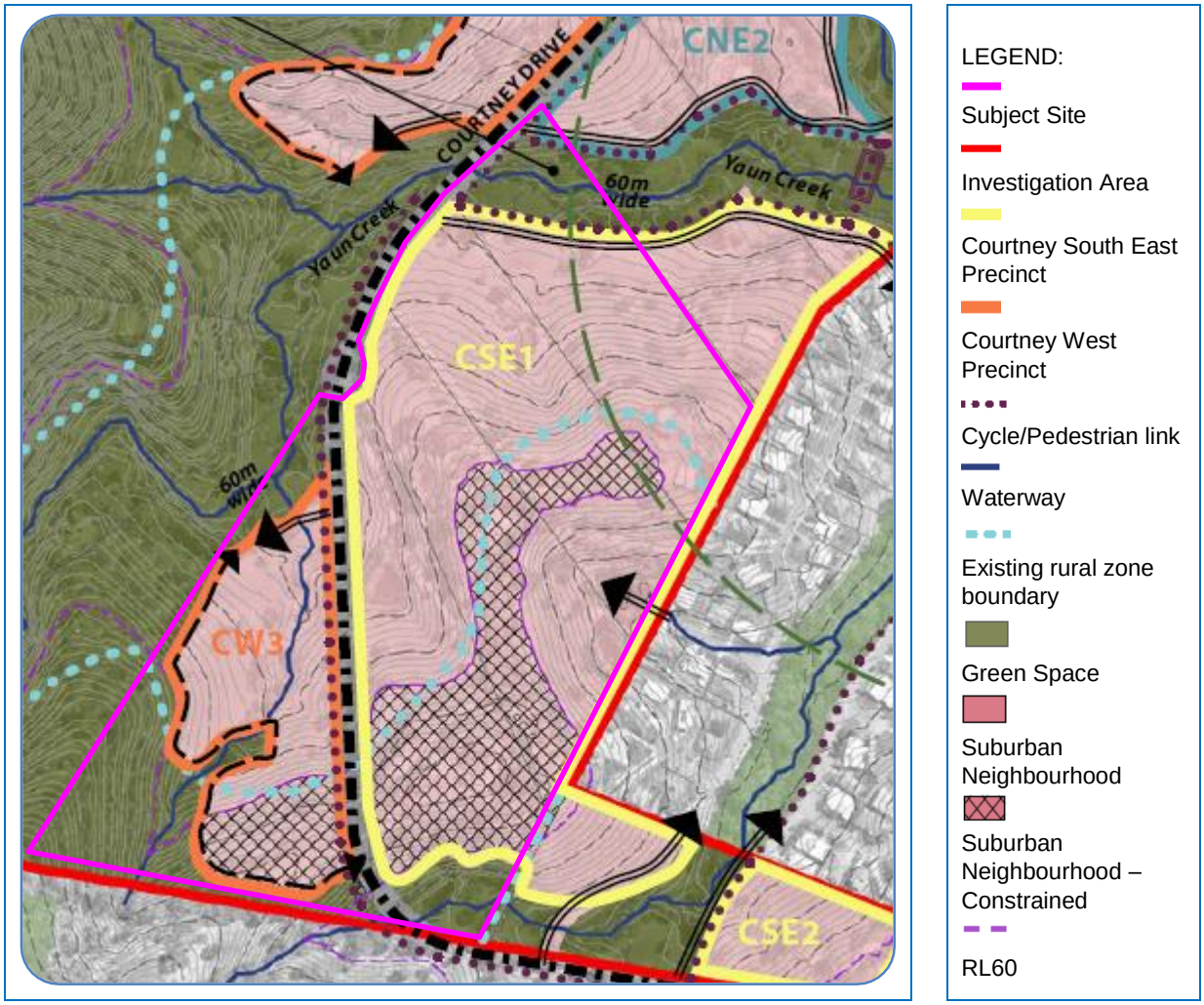


Figure 2.3 Draft Concept Plan (GHD, 2017)

2.5.1 Courtney South East Precinct

The Courtney South East Precinct includes the extension of Courtney Drive to connect with Reserve Road and the Yaun Creek Corridor at its northern edge.

GHD concluded that based primarily on slope, lot sizes similar to the adjoining residential area are the most appropriate response for the majority of housing in this precinct. Where properties can be amalgamated, increased density may be suitable. A density estimate of future dwellings for this precinct was determined to be 9.7-13.3 (GHD, 2017).

A large area of this precinct is greater than RL 60. These areas are considered suitable for significant earthworks to reduce the amount of land above RL 60 and achieve an extension of Courtney Drive that improves the development potential and connectivity.

Yaun Creek is considered a key character element.

2.5.2 Courtney West Precinct

The Courtney West Precinct is characterised by its proximity to Conservation open space, its higher elevation and several overland flow paths. The extent of development in this precinct relies on the amalgamation of the site to address bushfire management.

The density estimate of future dwellings was determined to be 8.4-10.9 (GHD, 2017).

2.5.3 Green Space

Green Space areas have been proposed in the concept plan. Green Space is land suitable for a conservation or open space.

This land is considered not suitable for development based on the following constraints (GHD, 2017):

- High Value and Medium Value ecological constraints;
- Extreme slopes 1:3 (33.33 %) or steeper;
- Land above RL 60 (where servicing issues, bushfire risk/ fire-fighting capabilities and scenic amenity values are anticipated to affect development potential); or
- Within 30 m from the outer bank of watercourse.

3 Development Proposal

The development involves reconfiguring the existing site into 237 lots (Figure 3.1). The development will include:

- An internal road network with pedestrian footpath;
- Three categories of public open space:
  - Conservation Estate (Environmental Reserve) to protect existing ecologically significant areas;
  - Utility Reserve (Drainage and Natural Drainage Reserve); and
  - Open Space Parks.

Figure 3.1 Proposed Development Layout (Bennett and Bennett, 2019)

3.1 Development Footprint

The development footprint has an estimated area of 14.723 ha. It has been situated to avoid impacts to medium priority vegetation mapped under the City Plan and regulated vegetation mapped under the *Vegetation Management Act 1999*. General priority vegetation has been avoided and incorporated into the open space network where possible. Conservation of identified Koala habitat and the establishment of regional riparian fauna linkages are incorporated into the development design.

3.2 Open Space Areas

The three open space categories proposed to be provided as part of the development are summarised below. Please note detailed descriptions of each category including design descriptions are included in Section 6.

3.2.1 Conservation Estate (Environmental Reserve)

The conservation estate of the proposed development totals an area of 1.572 ha and is in the south-western corner of the site. Management of this area aims to conserve and enhance regulated vegetation and Koala habitat areas. Connectivity to bushland external to the site is maintained through this open space area.

3.2.2 Utility Reserves

Utility Reserves include drainage reserves containing stormwater treatment devices. A natural drainage reserve is also planned along Yaun Creek. This will be rehabilitated and upon completion, incorporated into the conservation estate. Utility Reserves occupy a total area of 2.41 ha of the proposed development.

3.2.3 Open Space Park (Recreation)

The recreation parks will provide an informal setting for community residents to socialise and play.

Two (2) recreation parks have been included in the development layout and will occupy a total area of 4,193 m^2. One is located centrally, and the other is adjacent to the natural drainage reserve along Yaun Creek in the north of the site.

4 Development Constraints Overview

This section provides a synopsis of the site's development constraints, in relation to the open space areas, together with physical and management constraints on site. This information has been acquired from relevant planning scheme provisions and the ecological assessment prepared for the site (Biome, 2018).

Table 4.1 provides a summary of the legislative considerations under relevant federal, state and local legislation.

Table 4.1 Summary of Legislative Considerations

Legislation	Applicable to Development
Commonwealth Legislation	
Environment Protection and Biodiversity Conservation Act 1999	Referral under the EPBC Act is only required if impacts to Koala (or other threatened species or ecological communities) deemed to be significant. No referral is required for this development.
State of Queensland Legislation	
Nature Conservation Act 1992	Protected Plants Survey required for the site prior to vegetation clearing. Results of this survey are included in the Ecological Assessment for the site. Essential habitat is mapped on the site and is excluded from development.
Vegetation Management Act 1999	Regulated vegetation present on the site: • Least Concern RE 12.11.5; • Regulated vegetation intersecting a watercourse; and • Essential habitat. Regulated vegetation intersecting a watercourse is retained and appropriately buffered where the waterway occurs within regulated vegetation.
Water Act 2000	Riverine protection permit required for excavating or filling a watercourse.
Biosecurity Act 2014	Restricted and invasive weeds must be controlled on the site.
Environmental Offsets Act 2014	Removal of regulated vegetation intersecting a watercourse will need to be offset if clearing is unavoidable where the vegetation is controlled under the VMA (that is, Least Concern, Of Concern or Endangered Regional Ecosystems). The watercourse intersecting regulated vegetation on the site will be appropriately buffered and conserved within an open space area.
South-east Queensland Regional Plan 2009-2031	The site falls within the Urban footprint
Local Government	
City Plan 2018	Development and constraint codes applicable to the design and designation of open space have been addressed in Section 9 of this report.

Table 4.2 provides a summary of the management constraints, including those under the *City Plan 2018*. These constraints are discussed in greater detail in Section 5 of this report.

Table 4.2 Management Constraints

Constraint	Present	Absent	Comment
Easements and/or restrictions on title		x	
Zoning provisions	x		Rural and rural residential zoned land
Waterways and Wetlands	x		Mapping for wetlands and watercourses identifies minor waterways on the site. Buffer widths defined in the Ecological Assessment must be incorporated into the development design.
Nature Conservation	x		Areas of the site are mapped under the Environmental Significance Overlay code as containing Medium and General Priority Vegetation, State signficant species and Koala habitat areas. Habitat of State Significant species and medium priority vegetation are conserved within public open space network and are excluded from the development.
Bushfire Risk	x		State development planning mapping indicates that the site falls within a bushfire prone area. CoGC mapping indicates the site falls within an area of medium to high potential bushfire hazard.
Nature Conservation Areas		x	No nature conservation areas are present on the site.
Airport Environs		x	
Aboriginal cultural heritage		x	No known aboriginal cultural heritage sites are present on the subject site.
European cultural heritage		x	
Acid sulphate soils - risk		x	
Flood hazard		x	
Erosion prone	x		CoGC mapping indicates areas of the site have moderate landslide risks.
Tree Preservation Order		x	
Mapped Vegetation	x		A small area of the site in the south-western corner is mapped as Category B regulated vegetation, which is further defined as Least Concern RE 12.11.5. This area is excluded from the development footprint and will be managed for conservation within the open space network.
Mapped Essential Habitat	x		Essential Habitat for Koala is mapped on the site. Habitat for Koala will be conserved within the open space network.
Wildlife Online – threatened species	x		Seven threatened species have been recorded within 2 km of the site. Assessment of the habitat requirements of these species concluded that two species would potentially occur on the site.
Observed threatened species	x		One threatened species – Koala, observed on-site during site assessments.
SPRP Koala Assessable Development Area		x	The site is not within a SPRP Koala assessable development area.

5 Site Analysis

This section details the existing natural features and functions of the site in the context of its surrounds.

5.1 Topography

The site slopes from an elevation of approximately 82 m in the south-western corner of the site, to a low point of approximately 42 m near the tributary of Yaun Creek in the north (Figure 5.1).

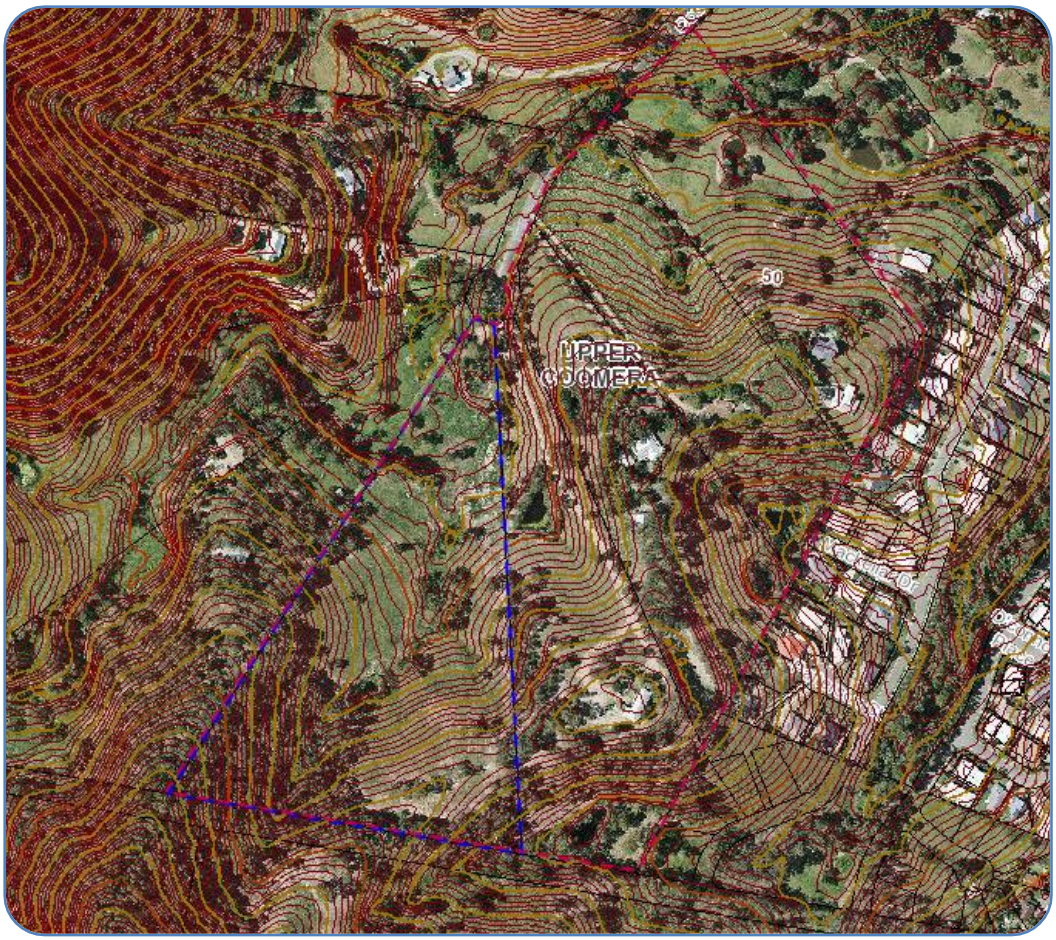


Figure 5.1 Contours (Source: City Plan 2018)

5.2 Flooding

City Plan mapping indicates that no area of the site is subject to flooding. Biome has assessed local flooding and conveyance. Figure 3.1 shows the anticipated Q100 flood lines (shown as blue lines in Figure 3.1).

5.3 Landslide Hazards

Areas of the site are mapped as having moderate landslide hazards (Figure 5.2).

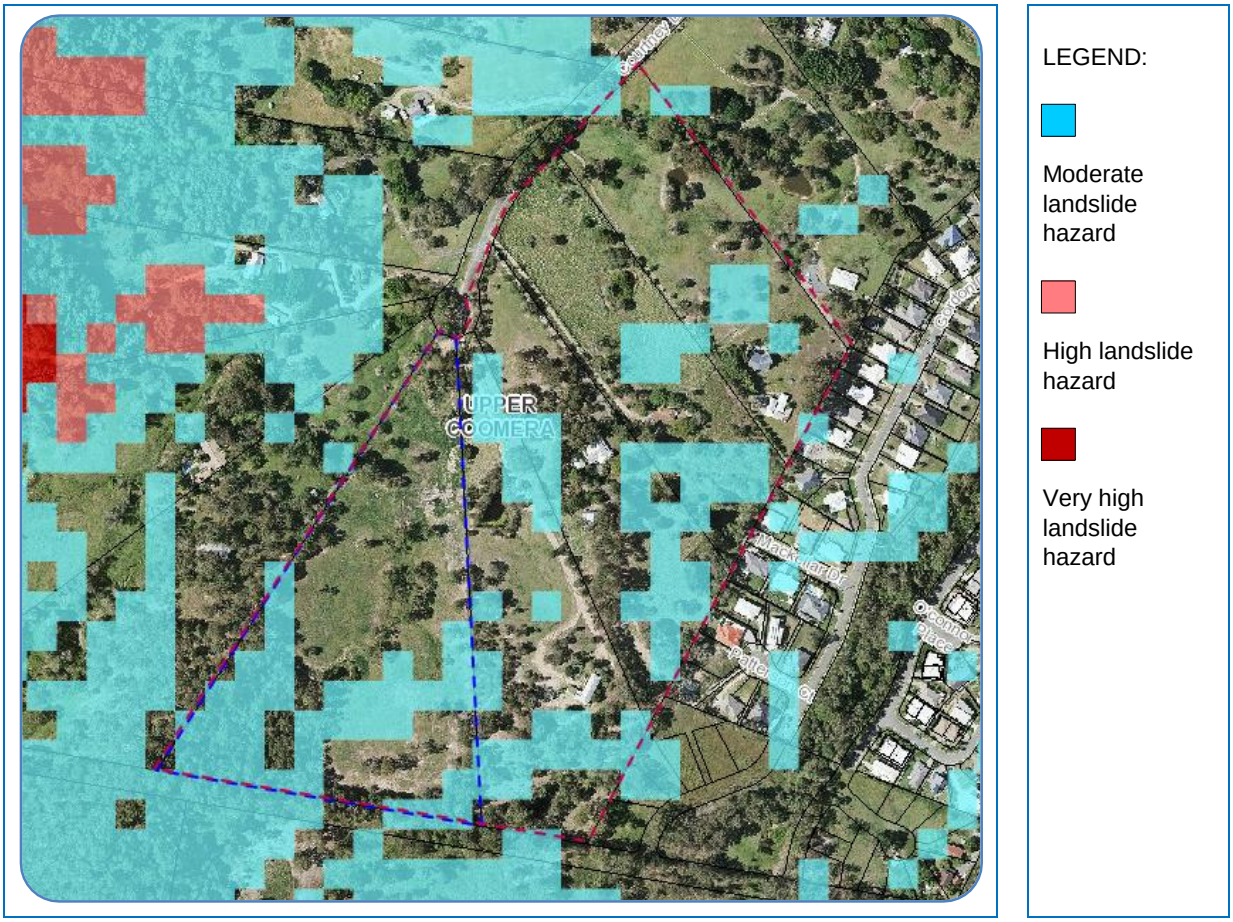


Figure 5.2 Landslide Hazard (City Plan 2018)

5.4 Native Vegetation Communities

One native vegetation community has been identified as occurring on the site, Regional Ecosystem (RE) 12.11.5.

Table 5.1 provides a description of this RE. Figure 5.3 shows the Vegetation Management Supporting Map indicating the locations of the vegetation communities within the development site.

Table 5.1 Description of Regional Ecosystems Mapped On-site

Regional Ecosystem	Characteristics	VMA Status
RE 12.11.5 *Corymbia citriodora* subsp. *variegata*, *Eucalyptus siderophloia*, *E. major* open forest on metamorphics +/- interbedded volcanics	*Corymbia citriodora* subsp. *variegata* open forest to woodland, usually including *Eucalyptus siderophloia*/*E. crebra* (sub coastal ranges), *E. propinqua* and *E. acmenoides* or *E. carnea*. Other species that may be present and abundant locally include *Corymbia intermedia*, *C. trachyphloia* subsp. *trachyphloia*, *Eucalyptus tereticornis*, *E. microcorys*, *E. portuensis*, *E. helidonica*, *E. major*, *E. longirostrata*, *E. biturbinata*, *E. moluccana* and *Angophora leiocarpa*. *Lophostemon confertus* often present in gullies and as a sub-canopy or understorey tree. Mixed understorey of grasses, shrubs and ferns. Occurs on hills and ranges of Palaeozoic and older moderately to strongly deformed and metamorphosed sediments and interbedded volcanics.	Least Concern

Figure 5.3 Vegetation Management Support Map (Qld Globe, 2018)

On-site field assessment identified four broad vegetation communities:

1. *Acacia* low open forest;
2. Spotted Gum / Grey Ironbark Open Forest (RE 12.11.5);
3. *Acacia* low open woodland/mosaic +/- landscaping around dwellings; and
4. Pasturelands +/- copses of native/exotic trees.

These vegetation communities are described in the following sections and are summarised from the Ecological Assessment (Biome, 2018). Figure 5.4 shows the locations of the vegetation communities.

Vegetation Communities 1 and 2 will be incorporated into the Conservation Estate (Environmental Reserve).

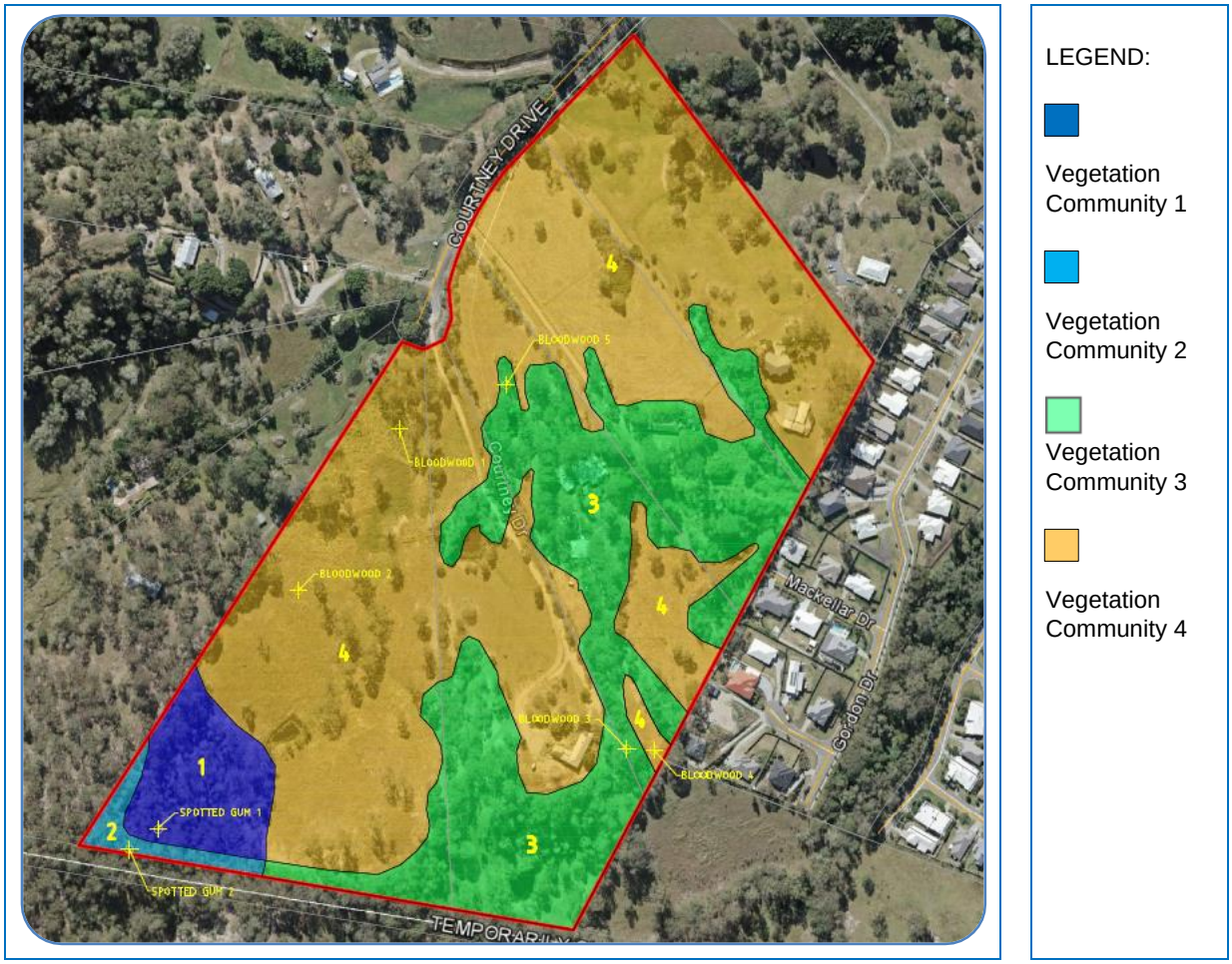


Figure 5.4 Vegetation Communities

5.4.1 Vegetation Community 1 – Acacia low open forest

Vegetation Unit 1 is comprised of mature *Acacia disparrima* regrowth with occasional emergent *Corymbia citriodora, Eucalyptus siderophloia, E. propinqua, and E. tereticornis*. Other common species in the mid stratum include *Lophostemon suaveolens* and *Allocasuarina littoralis*. Lantana (*Lantana camara*) dominates the shrub layer. Low level livestock grazing is presently occurring.

Figure 5.5 Vegetation Community 1

5.4.2 Vegetation Community 2 – Spotted Gum/Grey Ironbark Open Forest (RE 12.11.5)

Vegetation Community 2 comprises a small area of the total subject site in the south-west corner and is an extension of a larger area of the same vegetation type beyond the site boundary. The composition of canopy trees is generally representative of RE 12.11.5. Low level grazing is presently occurring with negligible weed incursion.

Figure 5.6 Vegetation Community 2

5.4.3 Vegetation Community 3 - Acacia low open woodland/mosaic +/- landscaping around dwellings

Vegetation Community 3 is primarily mature *Acacia* regrowth proximate to dwellings and outbuildings on the subject site. There are occasional larger eucalypts and small isolated thickets of lantana and vine weeds are common. Low level grazing is presently active throughout most of this community.

Figure 5.7 Vegetation Unit 3

5.4.4 Vegetation Community 4 - Pasturelands +/- copses of native/exotic trees

Vegetation Community 4 covers much of the site comprising introduced pasture species, copses of endemic tree species and trees associated with landscaping. Some of the largest eucalypt trees on site occur as isolated trees or within the copses of this community.

Figure 5.8 Vegetation Community 4

5.4.5 Threatened plant species and communities

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) protected matters search tool enables searches for Matters of National Environmental Significance (MNES) in a specified area. MNES include threatened species and ecological communities. Results of this database search (using a 1 km buffer to a central coordinate: Latitude -27.856753; Longitude 153.324814) identified a total of seven threated flora species, *known* or considered *likely to occur*, are recorded within a 1 km radius of the site (Table 5.2).

In addition to the protected matters search, a search of the Queensland Government Wildlife Online database was also undertaken. One threatened flora species; Floyd's Walnut (*Endiandra floydii*) was identified in this database as occurring within 2 km of the site.

Table 5.2 Protected Matters Search Results

Scientific Name	Common Name	Status
Baloghia marmorata	Marbled Baloghia	V
Bosistoa transversa	Three-leaved Bosistoa	V
Corchorus cunninghamii	Native Jute	E
Endiandra floydii	Floyd's Walnut	E
Macadamia integrifolia	Macadamia Nut	V
Samadera bidwillii	Quassia	V
Thesium australe	Austral Toadflax	V

Status: E = Endangered, V = Vulnerable

No threatened species were identified during the ecological site assessment.

5.5 Invasive weeds

A total of 55 non-endemic species were identified on the subject site, 15 of which are Invasive Plants under the Queensland *Biosecurity Act 2014* (Table 5.3).

Table 5.3 Weeds Observed On-site

Scientific Name	Common Name	Status
Ageratum houstonianum	Blue Billygoat Weed	
Amaranthus spinosus	Red Amaranth	
Ambrosia artemisiifolia	Ragweed	RIP
Anagallis arvensis	Scarlet Pimpernel	
Asclepias curassavica	Tropical Milkweed	
Asparagus aethiopicus cv. Sprengeri	Ground Asparagus	RIP
Bidens pilosa	Cobbler's Pegs	
Cinnamomum camphora	Camphor Laurel	RIP
Cirsium vulgare	Scotch Thistle	
Conyza canariensis	Canadian Fleabane	
Conyza sumatrensis	Tall Fleabane	
Corymbia torelliana	Cadaghi	
Crassocephalum crepidioides	Thickhead	
Crotalaria incana	Woolly Rattlepod	
Crotalaria lanceolata	Lance-leaved Rattlepod	
Cupressus sempervirens	Pencil Pine	
Cyperus papyrus	Papyrus	
Emelia sonchifolia	Emelia	
Gomphocarpus sp.	Cotton Bush	
Hypochaeris radicata	Flatweed	
Jacaranda mimosifolia	Jacaranda	
Lantana camara	Lantana	RIP
Macrotyloma axillare	Horse Gram	
Megathyrsus maximus	Guinea Grass	
Melinis minutiflora	Molasses Grass	OIP
Murraya paniculata	Mock Orange	OIP
Neonotonia wightii	White Glycine	
Nymphaea capensis	Cape Waterlily	
Oxalis corniculata	Yellow Wood Sorrel	
Oxalis debilis var. corymbosa	Soursob	
Paspalum dilatatum	Paspalum	
Passiflora edulis	Passionfruit	
Passiflora foetida	Stinking Passion Flower	OIP
Passiflora suberosa	Corky Passionfruit	OIP
Passiflora subpeltata	White Passionflower	OIP

Scientific Name	Common Name	Status
Polygala paniculata	Polygala	
Phytolacca octandra	Inkweed	
Psidium guajava	Yellow Guava	
Ravenala madagascariensis	Traveller's Palm	
Richardia brasiliensis	White Eye	
Schefflera actinophylla	Umbrella Tree	OIP
Senecio madagascariensis	Fireweed	RIP
Senna pendula var. glabrata	Easter Senna	OIP
Setaria sphacelata	Setaria	
Sida cordifolia	Flannel Weed	
Sida rhombifolia	Paddy Lucerne	
Solanum chrysotrichum	Giant Devil's Fig	
Solanum mauritianum	Wild Tobacco	OIP
Solanum capsicoides	Devil's Apple	
Sphagneticola trilobata	Singapore Daisy	RIP
Sporobolus africanus	Paramatta Grass	
Syagrus romanzoffiana	Cocos Palm	OIP
Tagetes minuta	Stinking Roger	
Urena lobata	Urena Burr	
Verbena bonariensis	Purple Top	

*Species listed under the Queensland *Biosecurity Act 2014*, where:

PIP = Prohibited invasive plants must not be kept, moved, given away or sold without a permit. The Biosecurity Act requires that all sightings to be reported to Biosecurity Queensland within 24 hours. By law, everyone has a general biosecurity obligation to take all reasonable and practical steps to minimise the risk of spreading prohibited invasive plants until they receive advice from an authorised officer.

RIP = Restricted invasive plants must not be given away, sold or released into the environment without a permit. The Biosecurity Act requires everyone to take all reasonable and practical steps to minimise the risks associated with invasive plants under their control. At a local level, each local government must have a biosecurity plan that covers invasive plants and animals in its area. This plan may include actions to be taken on certain species. Some of these actions may be required under local laws.

OIP = Other invasive plants are not prohibited or restricted, however, by law, everyone has a general biosecurity obligation to take reasonable and practical steps to minimise the risks associated with invasive plants under their control. Local governments must have a biosecurity plan that covers invasive plants and animals in their area. This plan may include actions to be taken on certain species. Some of these actions may be required under local laws.

5.6 Waterways

Minor waterways are mapped on the site (Figure 5.9). Field investigations identified these waterways to be degraded; primarily consisting of eroded and/or heavily weed infested ephemeral overland flow paths which discharge to dams created as stock watering points. Under the definitions of the *Water Act 2000*, with the exception of Yaun Creek, these flow paths met the definition of drainage channel.

Yaun Creek (the waterway in the north of the site) will be rehabilitated and a 30 m buffer to the watercourse provided. This 60 m wide riparian linkage will facilitate fauna movement along Yuan Creek.

The drainage channel in the south-eastern corner of the site will be rehabilitated to provide a buffer width ranging from approximately 14 to 40 m (Biome, 2018). This will provide a major connection to the waterway within the residential community to the east, which is primarily used for storm water conveyance.

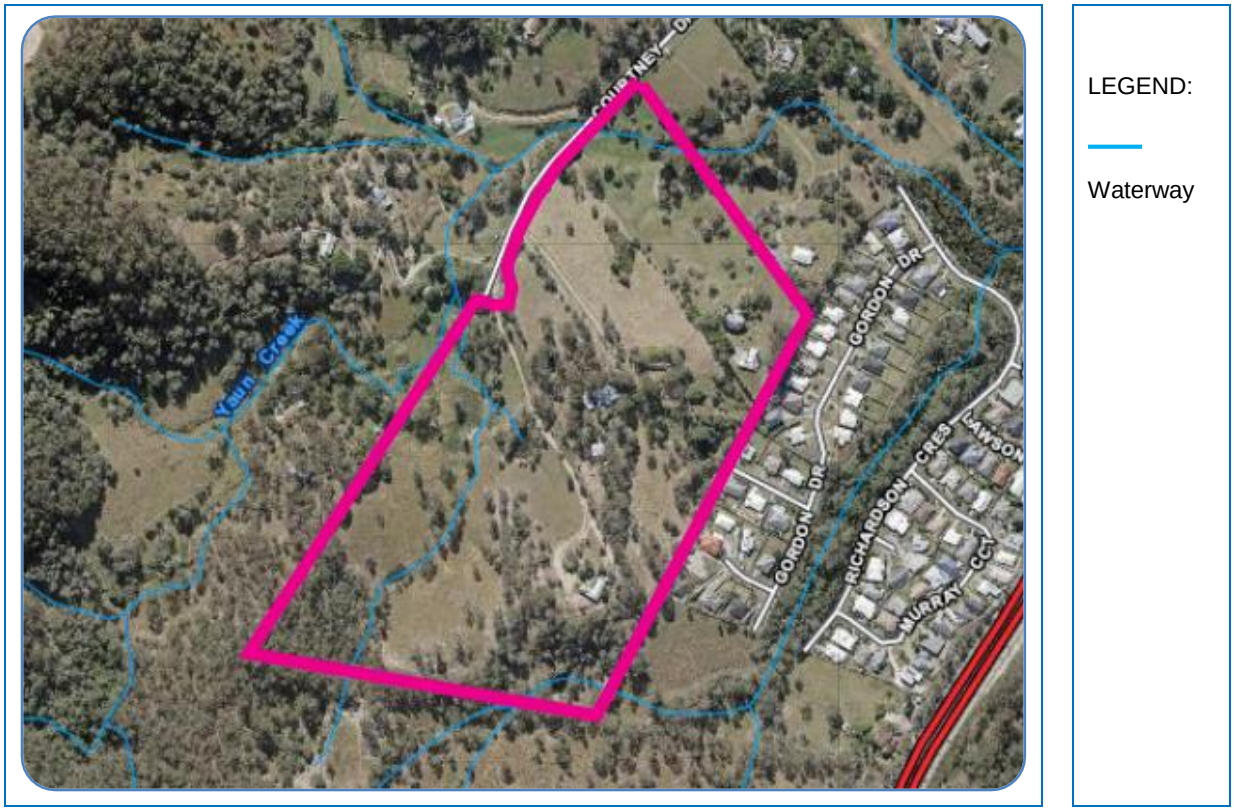


Figure 5.9 Waterways (Qld Globe, 2018)

The drainage channels on lot 192 (north of the dam) and the dam on lot 189 are intended to be filled to accommodate the proposed residential development. The filling of these channels will not impact on any existing fauna movement corridors or valuable riparian vegetation communities. They currently provide limited habitat function given their level of degradation and do not connect to larger or ecologically significant waterways on or external to the site. The dams associated with retained waterway/drainage channels will be modified to accommodate additional drainage features.

5.7 Fauna

Ecological site assessment identified 54 fauna species (Biome, 2018). One threatened species, Koala (*Phascolarctos cinereus*) was identified as occurring on the site.

5.7.1 Threatened species

Evidence of one conservation significant species - Koala, was observed on the subject site. The Koala is listed as Vulnerable under the Queensland *Nature Conservation Act 1994* (NCA) and Commonwealth EPBC Act.

Assessment of likelihood of occurrence of conservation significant species identified in database searches was also made. The database searches included the Protected Matters Search and Wildlife Online. Likelihood of occurrence assessment identified two species as having potential to occur on the site, at least on a transient basis (Table 5.4).

Habitat suitability and activity levels was determined for Koala and are presented in the Ecological Assessment for the site (Biome, 2018). The habitat has low Koala use (determined through spot analysis technique).

The protection of the sites' ecologically significant vegetation and known Koala habitat within the open space network will ensure the impacts to habitat for many fauna species is limited.

Table 5.4 Likelihood of Occurrence Assessment

Scientific Name	Common Name	Status	Ecology	Likelihood of Occurrence
Phascolarctos cinereus	Koala	V, V#	Koalas inhabit dry open sclerophyll forests and woodlands occurring on fertile soils (Van Dyck, 1995; Menkhorst and Knight, 2001; Environmental Protection Agency, 2006). Communities containing denser vegetation and larger trees are generally preferred; however Koalas can also inhabit less optimal habitat such as young forests, highly fragmented vegetation communities, and small remnants (Environmental Protection Agency, 2006). They mainly feed on *Eucalyptus* species, along with some *Corymbia*, *Angophora*, *Lophostemon*, *Melaleuca*, and *Leptospermum* species (Environmental Protection Agency, 2006).	**KNOWN TO OCCUR** This species was not directly recorded during surveys. However, scats of Koala were found during the KSAT surveys.
Pteropus poliocephalus	Grey-headed Flying-fox	V#	The Grey-headed Flying-fox occurs in the coastal belt from Rockhampton to Melbourne. The Grey-headed Flying-fox requires foraging resources and roosting sites. It is a canopy-feeding frugivore and nectarivore, which utilises vegetation communities including rainforests, open forests, closed and open woodlands, *Melaleuca* swamps and *Banksia* woodlands (Eby, 1998). None of the vegetation communities used by the Grey-headed Flying-fox produce continuous foraging resources throughout the year, so the species selectively forages where food is available. As a result, patterns of occurrence and relative abundance within its distribution vary widely between seasons and between years. At a local scale, the species is generally present intermittently and irregularly (Eby & Lunney, 2002). The Grey-headed Flying-fox roosts in aggregations of various sizes on exposed branches. They most frequently travel around 15 km from a roost site to feed (Tidemann, 1998), although can travel up to 50 km as food resources change (Eby, 1991).	**POTENTIAL TO OCCUR** The site would provide seasonal foraging resources. No flying-fox camps are present on the site.

Status: E = Endangered, V = Vulnerable, V# = Vulnerable under the EPBC Act

5.7.2 Habitat Trees

Habitat trees are defined under Schedule 6.7 of the City Plan as having hollows, nests or being a significant food source. The locations of the seven trees that met this definition are shown in Figure 5.4. The clearing of habitat trees that are not able to be retained, will be offset in the open space network.

5.8 Environmentally Significant Areas

Based on an appraisal of the site and desktop analysis against the criteria for defining environmentally significant areas, it has been concluded that the site contains habitat for nationally, state and locally significant wildlife (Koala) and natural waterways. The establishment of an open space network will enable Koala habitat on the site to be conserved in perpetuity.

Yaun Creek, where it traverses the site, will be rehabilitated to repair damage from grazing, erosion and to control invasive species.

5.9 Surrounding Environment

The surrounding environment influences the value of the proposed open space and its contribution to the amenity of the area.

5.9.1 Scenic Amenity

To the north, west and south of the site, the land use is currently rural residential. None of the existing dwellings on these allotments will directly overlook any of the proposed open space areas. A small residential development is located to the east of the site. A proposed drainage reserve is located behind some of the dwellings. The outlook of these dwellings will not be compromised by the construction of the drainage reserve and may be improved with the removal of weeds and sympathetic landscaping.

5.9.2 Pedestrian and Vehicle Access

An internal road and footpath network will be constructed. Current access to the site is via Courtney Drive. Vehicle access to the proposed residential community is planned from Courtney Drive in the west and Mackellar Drive to the east. Connectivity to the future developments to the north and south have been provided (refer to Figure 3.1).

The proposed development layout will incorporate a network of internal roadways and interconnecting pedestrian footpaths. The footpaths will allow for safe pedestrian movement to public open space recreation areas within and external to the development. The footpaths will connect to those external to the site and allow for pedestrian access to community such as schools and convenience stores.

5.9.3 Ecological Corridors

The proposed conservation estate open space serves to increase the conservation value of connecting bushland habitat in the south. The drainage open space areas in the north along Yaun Creek will function as a riparian linkage to open space located to the east and west (Figure 5.10). The rehabilitation of the drainage channel located in the south-east of the site will provide a major connection to the waterway within the residential community to the east, which is primarily used for storm water conveyance. The rehabilitation of these areas will create valuable linkages to facilitate fauna movement through the local area.

Ecological corridors are necessary to allow the movement of fauna between patches of habitat that are of insufficient size to support a population in isolation. They allow individuals to seek mates and alternate foraging resources. Ecological corridors are of importance to species with limited mobility.

Figure 5.10 Ecological connectivity in the local landscape

5.9.4 Open Space Linkages

An analysis of public open space in the surrounding locality has identified several public open space areas within a 1 km radius of the site (Figure 5.11). These open space areas include conservation parks and recreation parks. They cater for informal and formal recreation as well as habitat protection.

The level of pedestrian connectivity to open space areas and community facilities, in terms of dedicated footpaths and cycleways, is relatively high, particularly from the residential development located to the immediate east. These pathways extend to community facilities such as schools in the local area.

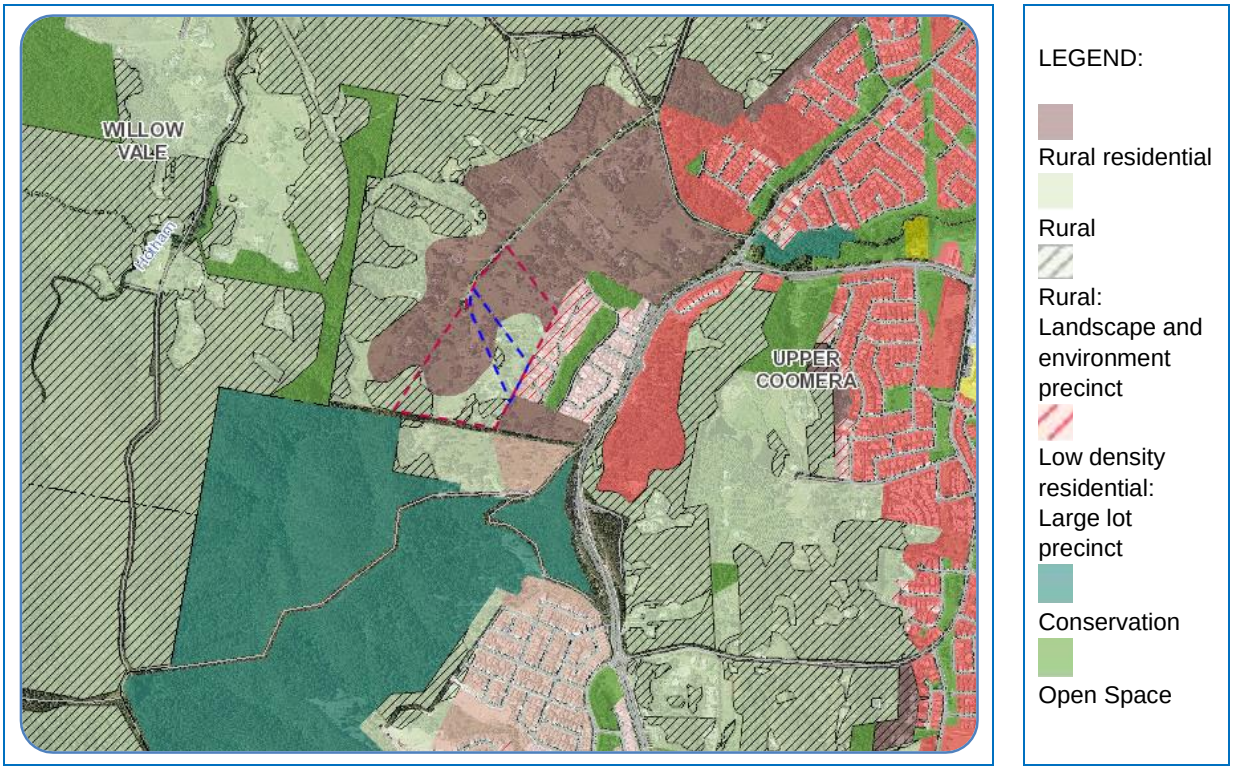


Figure 5.11 Open space areas in local area

5.10 Bushfire Hazard Areas

The Bushfire Hazard overlay identified areas within the site as having a bushfire hazard rating of medium and high (Figure 5.12). Confirmed medium or high bushfire hazard areas are considered as designated bushfire prone areas for the purposes of the *Building Code of Australia* and *AS3959-1999 Construction of Buildings in Bushfire-Prone Areas*, and all building work must be carried out in a manner consistent with this standard.

A Bushfire Risk Management Plan is to be prepared for the site to guide bushfire mitigation and management.

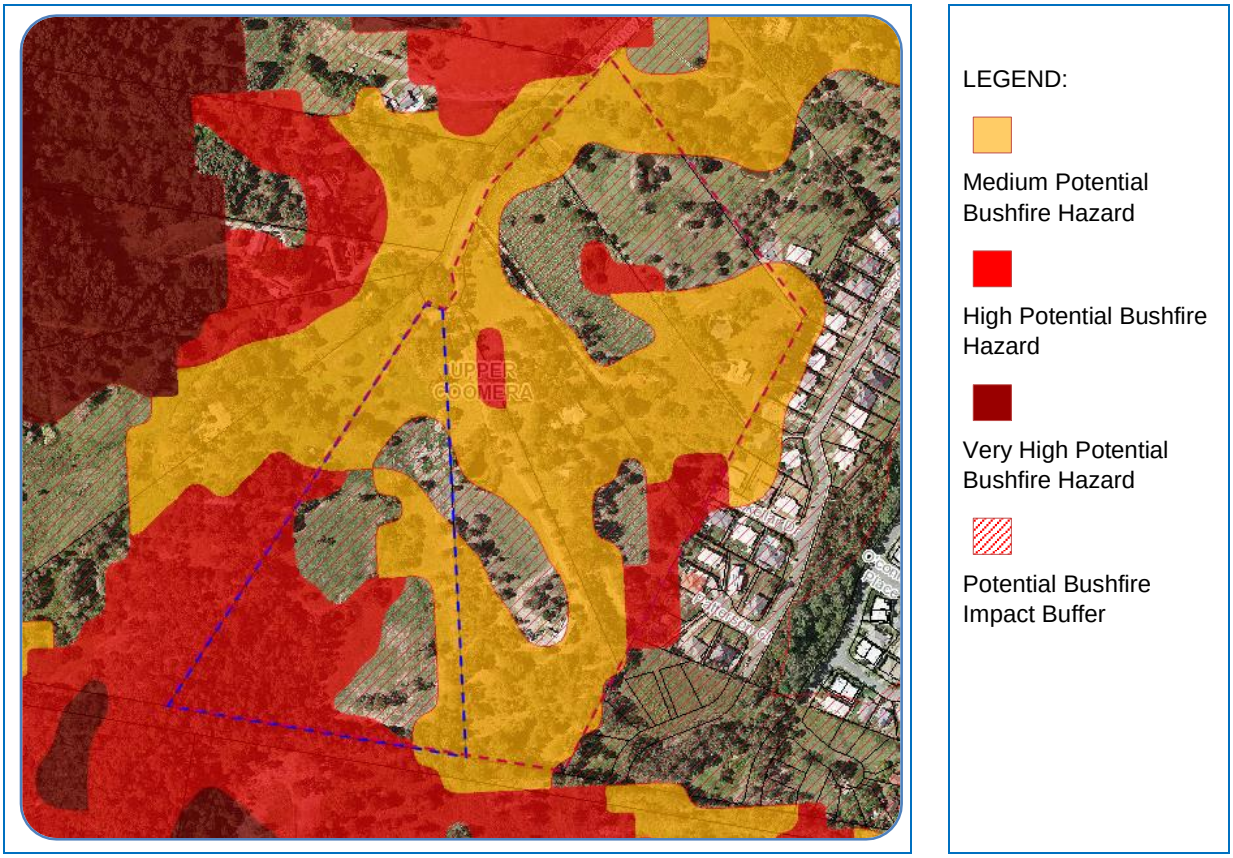


Figure 5.12 Bushfire Hazard

5.11 Cultural Heritage

The Aboriginal and Torres Strait Islander Cultural Heritage Register was consulted to determine if any known cultural heritage studies have been conducted over the site. The register contains information about cultural heritage studies recorded under Part 6 of the *Aboriginal Cultural Heritage Act 2003* (ACH Act), cultural heritage management plans registered under Part 7 of ACH Act, designated landscape area recorded under previous legislation, registered cultural heritage bodies, and details about statutory Aboriginal and Torres Strait Islander parties for an area.

No cultural heritage studies for the site were recorded on the register.

Should unrecorded cultural heritage sites or materials be discovered during construction, work at that location will cease until Traditional Owners are contacted to provide advice on the significance of the finds and discuss management and mitigation options.

5.12 Existing Infrastructure and Infrastructure Requirements

The following sections provide a summary of the infrastructure in the local area that potentially impact the proposed development or are required to facilitate the development. These sections have been prepared in reference to the draft Local Government Infrastructure Plan (LGIP). The LGIP is an overarching document that outlines where required trunk infrastructure will be delivered, when it will be delivered and how it will be delivered. Trunk infrastructure includes water supply, sewerage, public parks and land for community facilities and transport networks.

Constraints identified in the Draft Concept Plan (GHD, 2017) will be mitigated through bulk earthworks to reduce the RL to 60 m. This will enable sewer and water supply to be connected to the residences.

5.12.1 Stormwater Management

The construction phase of the development has the potential to impact on the water quality of downstream environments, especially within Yaun Creek. Water quality impacts are a result of disturbance and suspension of soils during periods of heavy rain, which are conveyed downstream causing turbidity and sedimentation. These impacts can be managed through the implementation of sediment erosion control measures that intercept stormwater and collect sediment loads prior to discharge. Uncontrolled erosion and sediment transportation off the site and into downstream environments has the potential to cause adverse ecological harm.

A Stormwater Management Plan has been prepared which will incorporate recommendations to be implemented during the construction and operational phases of the development. Four drainage bio-retention systems have been planned for the site to provide on-site detention, capture pollutants and treat stormwater prior to discharge.

No stormwater treatment will be undertaken in areas proposed for public open space managed for conservation or recreation.

5.12.2 Waste Water Management

The City of Gold Coast planning scheme identifies the location of current and future waste water networks within the city.

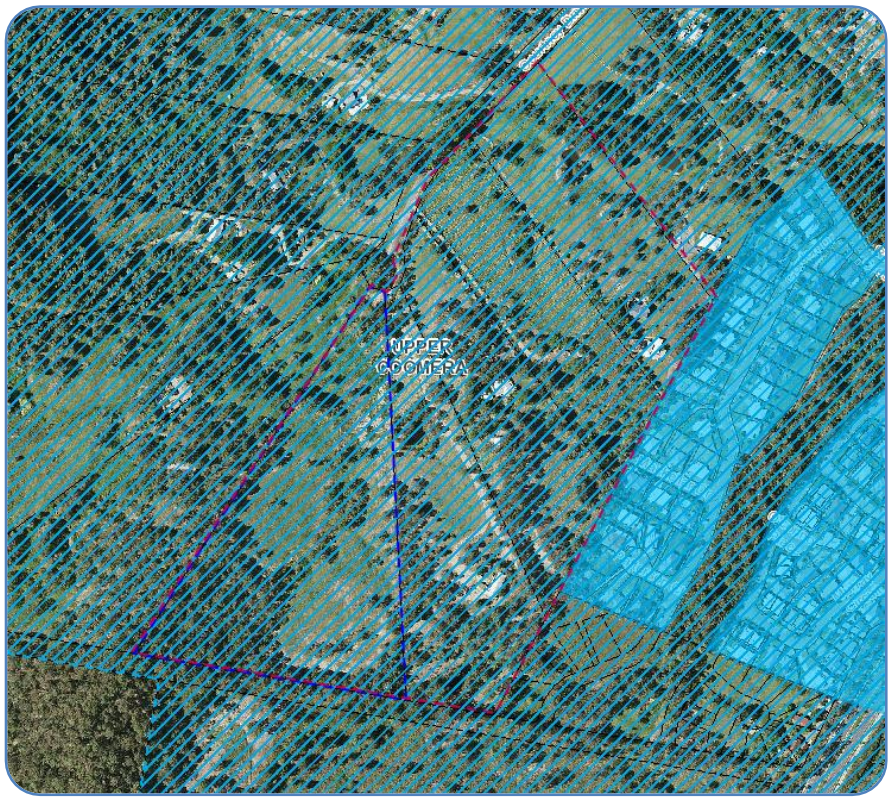
Figure 5.13 identifies the location of current and future sewerage connection areas in relation to the subject site. The site is not mapped as being within the ultimate or existing sewerage connection area. As described earlier, bulk earthworks to reduce the RL to 60 m will be undertaken to enable sewerage connection to the development.

Figure 5.13 Sewerage connection

5.12.3 Potable water connection

The City of Gold Coast planning scheme identifies the location of current and future potable water networks within the city.

Figure 5.14 identifies the location of current and future potable water connection areas in relation to the subject site. The site is not mapped as being within the ultimate potable water connection area. However, as described earlier, bulk earthworks to reduce the RL to 60 m will be undertaken to enable sewerage connection to the development.



LEGEND:

Ultimate potable water connection area

Existing potable water connection area

Figure 5.14 Potable Water Supply Network

6 Open Space Dedication and Design Description

The total open space proposed will have an area of approximately 41,258 m^2. Three categories of open space are proposed, each with differing functions and opportunities.

A summary of each of the open space categories that are applicable to the proposed development is provided below and discussed in further detail in the following sections.

6.1 Open Space Category 1 – Utility Reserve

Utility reserves are defined by the CoGC as parcels of land that do not provide any formalised terrestrial recreation function but may informally contribute to the city's parks network.

Within the classification of Utility Reserves are four categories:

1. Utility reserve;
2. Drainage reserve;
3. Natural drainage reserve; and
4. Access linkage.

Two classifications of Utility Reserve are proposed for the subject site; Drainage and Natural Drainage Reserve.

6.1.1 Drainage Reserve

A waterway/drainage reserve is defined as land associated with waterways, creeks, drainage lines and stormwater infrastructure. These types of parks are usually maintained as a natural area. They are part of the stormwater network where the primary purpose is water flow and drainage. Drainage Reserves may have footpath connections or other recreational embellishments but the development or potential of the park for recreational use is encumbered due to the presence of the drainage, the stormwater device or to the wetness of the area. Drainage reserves occupy an area of 15,829 m^2.

6.1.2 Natural Drainage Reserve

The primary purpose is natural drainage and may buffer waterways which serve to support water quality. These parks may contain recreational connections and may also provide some local scale wildlife corridor values and urban/suburban amenity.

The total area of natural drainage reserves within the proposed development is 6,786 m^2. Yaun Creek and associated buffers will form the natural drainage reserve. This area will be rehabilitated to provide regional riparian fauna linkages. Drainage reserves will contribute to the site's passive recreational opportunities and scenic amenity.

6.2 Open Space Category 2 – Open Space Parks

The CoGC defines recreation parks as open space areas that positively contribute to the Recreation Facilities Network.

Within the classification of Recreation Parks are five categories:

1. Local parks;
2. District parks;
3. City parks;

4. Open space linkage;
5. Amenity space; and
6. Water body.

Recreation areas of the open space network within the proposed development fall into the Local Park classification.

6.2.1 Local Recreation Parks

Local parks generally serve the needs of the immediate neighborhood (within 400 m or 5 minutes' walk) by providing limited recreational opportunities, and catering for short visits only. Most local parks will be used for informal social activities and informal sporting activities. Typical facilities include shaded seating areas, open space areas for 'kick and play' and shaded pathway connectivity throughout the park.

The total area of the recreation park in the proposed development is 4,193 m^2. The function of the recreation parks in the context of this development is to:

- Provide passive recreational opportunities for the community; and
- Provide an outdoor area to gather and socialize.

6.3 Open Space Category 3 – Conservation Estate (Environmental Reserve)

Conservation Estate is defined by the CoGC as 'areas of land, predominantly with native vegetation cover, managed principally for nature conservation purposes'. The Conservation Estate is broken down into four categories.

1. Conservation area;
2. Environmental reserve;
3. Bushland reserve; and
4. General reserve.

Areas of high ecological significance on the subject site fall into the Environmental Reserve classification and will be managed for conservation.

The total area of proposed environmental reserve is 15,720 m^2. The function of the environmental reserve is to:

- Provide a continued ecological conservation corridor;
- Provide nature observation and passive recreation opportunities;
- Retain vegetation and ecosystems of ecological significance, particularly, Koala habitat; and
- Provide a level of protection for existing natural value and habitat for flora and fauna.

7 Open Space Assessment

For each open space area, an assessment regarding its purpose and management has been made. A Statement of Landscape Intent has been prepared by Group GSA and presents the design concepts for each of the open space areas.

7.1 Open Space Category 1 – Utility Reserve (Drainage Reserve)

Four separate drainage reserves are proposed for the development. In total, they occupy an area of 19,330 m^2. They incorporate existing overland flow paths or drainage channels and associated dams created originally for livestock watering (refer to Figure 3.1).

7.1.1 Drainage Reserve 1

Size, Shape and Location

Drainage Reserve 1 is roughly triangular and is located at the southern end of the proposed development. The total area of the park is 1,840 m^2 (Figure 7.1). Provision has been provided for a future road to enable connection with future development to the south.

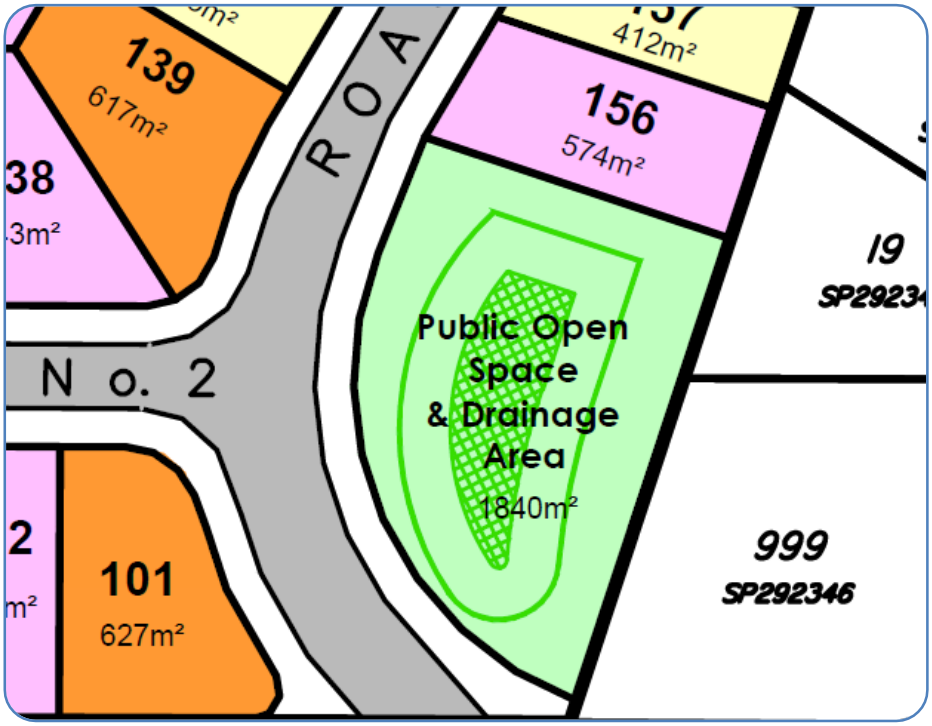


Figure 7.1 Drainage Reserve 1

Function and Connectivity

The drainage reserve will include a stormwater treatment and detention basin. This reserve will maintain connectivity to bushland and to the storm water conveyance waterway within the residential development located to the immediate east.

A Statement of Landscape Intent has been prepared by Group GSA.

Access

Pedestrian access to Drainage Reserve 1 will be from the internal road network and pedestrian walkway. Maintenance access will be via the road frontage.

7.1.2 Drainage Reserve 2

Size, Shape and Location

Drainage Reserve 2 is roughly triangular and is located at the south of the Mackellar Drive entrance on the eastern side of the proposed development. The total area of the park is 2,488 m^2 (Figure 7.2).

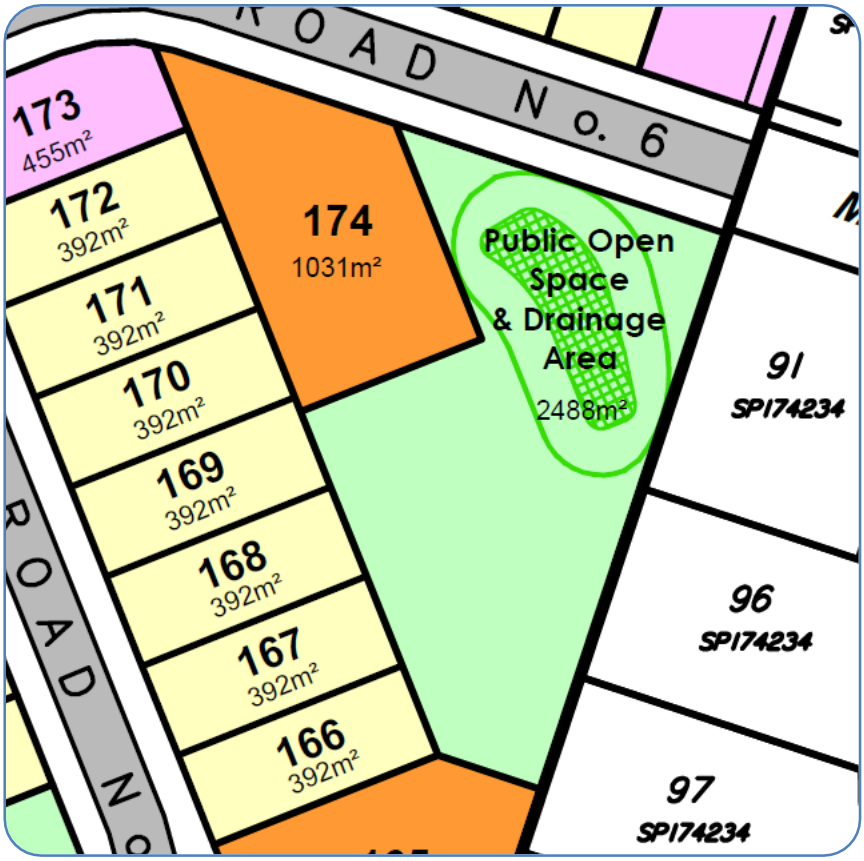


Figure 7.2 Drainage Reserve 2

Function and Connectivity

The primary function of Drainage Reserve 2 is stormwater treatment and detention. It will provide informal, passive recreation opportunities, although the space will be dominated by a bioretention basin.

This location will not have any habitat or drainage linkages to retained bushland given its location adjacent to an established development and planned residential housing.

A Statement of Landscape Intent has been prepared by Group GSA.

Access

Pedestrian access to Drainage Reserve 2 will be from the internal road network and footpath located to the north. Maintenance access will be via the road frontage.

7.1.3 Drainage Reserve 3

Size, Shape and Location

Drainage Reserve 3 is roughly rectangular and is located on the western side of the proposed development and adjoins the cul-de-sac of Courtney Drive. The total area of the park is 9,189 m^2 (Figure 7.3).

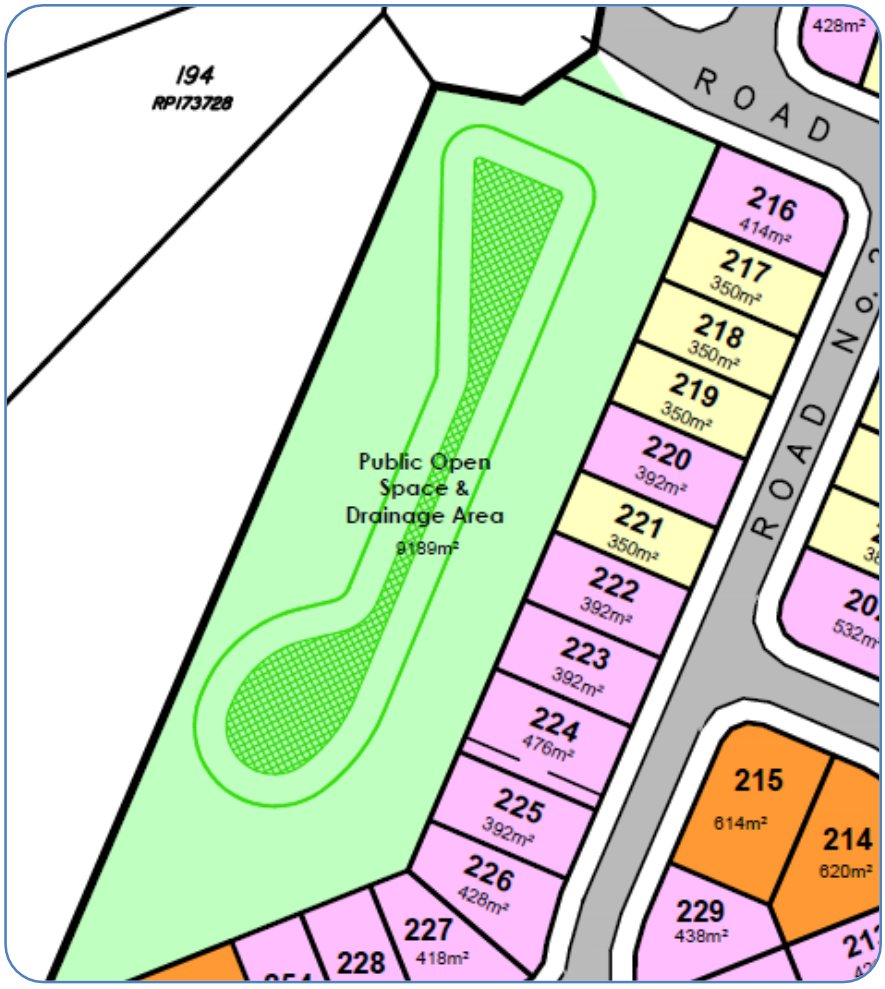


Figure 7.3 Drainage Reserve 3

Function and Connectivity

The primary function of Drainage Reserve 3 is for stormwater treatment and detention along with conveyance of upstream catchment flows. It will provide informal, passive recreation opportunities, although the space will be dominated by a detention basin.

This reserve will provide a welcoming area of green space to one of the major access points to the development. It will maintain connectivity to adjacent residential rural allotments.

A Statement of Landscape Intent has been prepared by Group GSA.

Access

Pedestrian access to Drainage Reserve 3 will be from the internal road network and footpath to the north. Residential blocks 216-253 back onto this reserve.

Maintenance access will be via the road frontage.

7.1.4 Drainage Reserve 4

Size, Shape and Location

Drainage Reserve 4 is roughly triangular in shape and is located in the north of the proposed development. It is directly connected to the Yaun Creek Natural Drainage Reserve and creek buffer and the passive recreation park. The total area of the drainage reserve and recreation park is 3,797 m^2. The bio-retention basin occupies an area of 2,312 m^2 (Figure 7.4).

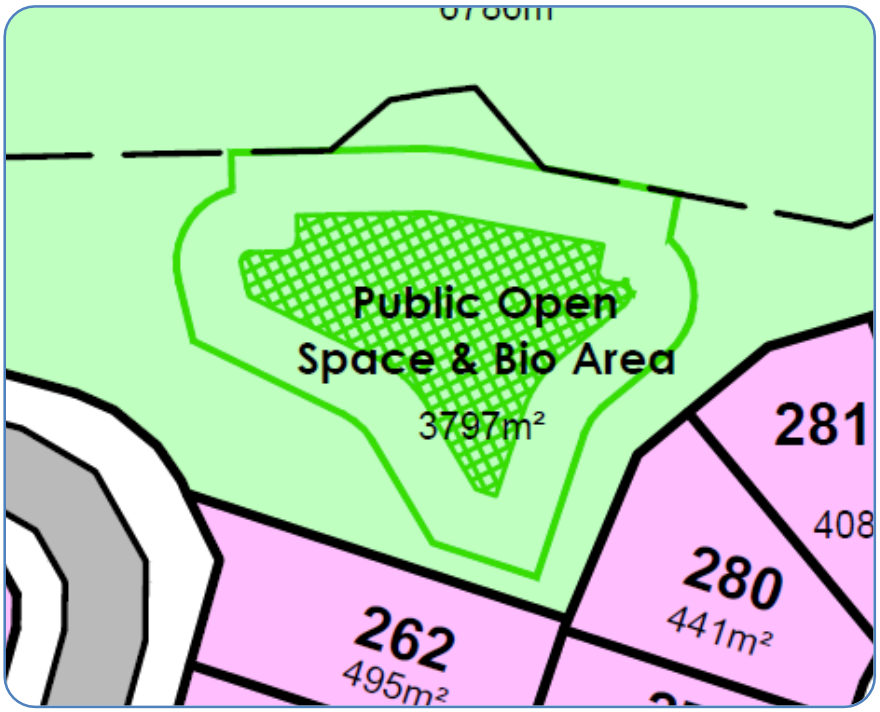


Figure 7.4 Drainage Reserve 4

Function and Connectivity

The primary function of Drainage Reserve 4 is stormwater treatment and detention. It will provide informal, passive recreation opportunities, although the space will be dominated by a bio-retention basin.

Drainage Reserve 4 will be directly connected to Natural Drainage Reserve to the immediate north and the recreation park to the east. The location of this drainage reserve will effectively increase the buffer to Yaun Creek. Batters are intended to be rehabilitated and planted with preferred Koala food trees.

A Statement of Landscape Intent has been prepared by Group GSA.

Access

Pedestrian access to Drainage Reserve 4 will be from the internal road network and an access point located between blocks 282 and 283.

Maintenance access will be via the road frontage.

7.1.5 Embellishments

Signage will be erected at the main access point to the drainage reserves. No picnic or play nodes are planned for any of the drainage reserves. A Statement of Landscape Intent has been prepared by Group GSA which provides details of the fencing and street front access control for each of the drainage reserves.

7.1.6 Landscape Design

The landscape design for the drainage reserves will incorporate native, endemic species suitable for drainage and detention areas. The planting palate will not obstruct the line of sight for park users and will increase the scenic amenity of the development. A Statement of Landscape Intent has been prepared by Group GSA and provides a suitable planting palette.

7.1.7 Safety

All drainage reserves will be planned and designed in accordance with Crime Prevention through Environmental Design (CPTED) principles. This will increase people's comfort levels as they will feel and be safer. CPTED principles include landscaping to provide clear sight lines across the open space and to potential hazards (such as standing water) to increase the capacity for passive and active surveillance.

7.1.8 Bushfire Hazard Management

Sections of the proposed development site have been identified as having a medium to high bushfire hazard rating. However, the clearing of the site to progress the development, will mitigate the risk of bushfires.

7.1.9 Environmental Impact and Protection

All the planned drainage reserves are located within areas where existing waterways or dams are present. The environmental impacts associated with creating drainage reserves is therefore considered negligible.

The rehabilitation of drainage reserves to remove weeds and establish plants to assist in storm water treatment will serve to enhance their ecological values.

7.1.10 Maintenance

In accordance with the Council's *Planning Scheme Policy: Land Development Guidelines* and notwithstanding normal cadastral survey requirements, 1.5 metre marker posts shall be located adjacent to each corner peg of dedicated Public Open Space areas. The purpose of these marker posts is to reduce fencing errors and to better define Council's maintenance responsibility.

The parks will be maintained regularly (e.g. mowing and weed management) and landscaped in accordance with the Statement of Landscape Intent. The drainage reserves will be maintained by the developers for a yet-to-be specified establishment and maintenance period. This will be further defined in the Open Space Management Plan (to be prepared in the operational phase of the development).

7.1.11 Ownership

Ownership will be transferred to Council upon the completion of the maintenance period.

7.2 Open Space Category 1 – Utility Reserve (Natural Drainage Reserve)

7.2.1 Size, Shape and Location

The total area of the Natural Drainage Reserve is 6,786 m^2. It is triangular in shape and located in the northern-most corner of the proposed development (Figure 7.4). The Natural Drainage Reserve incorporates a 30 m buffer to Yaun Creek.

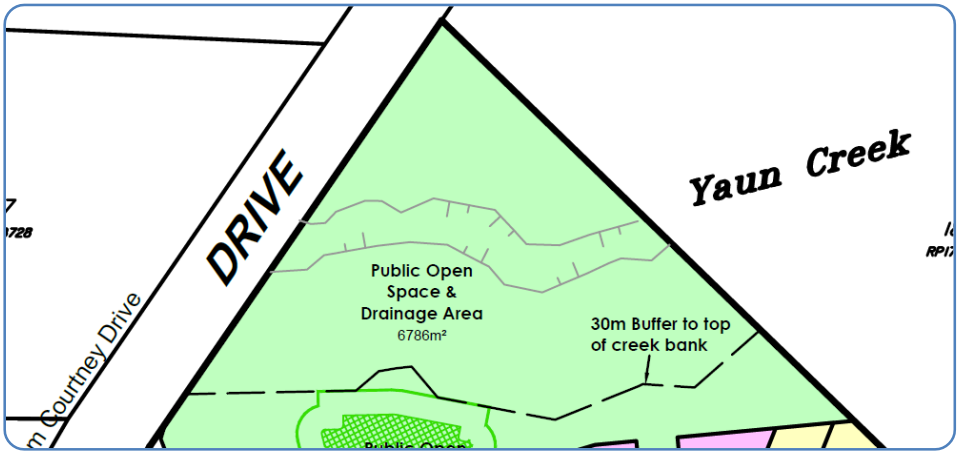


Figure 7.5 Natural Drainage Reserve

7.2.2 Function and Connectivity

The Natural Drainage Reserve serves as a buffer to Yaun Creek, which is currently in a degraded state due to bank erosion resulting from a lack of riparian vegetation and unrestricted livestock access. When rehabilitated, it will provide passive recreation and nature observation opportunities while enhancing its ecological function. The rehabilitation of this waterway will provide valuable linkages along Yaun Creek and facilitate fauna movement. A Statement of Rehabilitation Intent (SRI) has been prepared to support this development application and set out the rehabilitation approach. The rehabilitation of this reserve will increase riparian connectivity along Yaun Creek external to the development.

This reserve is directly connected to Drainage Reserve 4 and a recreation reserve, located to the south. As the drainage reserve and recreation park will be planted with trees, this will effectively provide a total corridor width of greater than 60 m to Yaun Creek.

A Statement of Landscape Intent has been prepared by Group GSA.

7.2.3 Access

Pedestrian and maintenance access is provided between blocks 282 and 283 and via Courtney Drive. Several blocks back onto the natural drainage reserve.

7.2.4 Embellishments

No embellishments for the natural drainage reserve are planned, as its primary intent is to buffer Yaun Creek.

7.2.5 Landscape Design

Landscaping will focus on recreating pre-clearing communities within the 30 m buffer of Yaun Creek. A Statement of Rehabilitation Intent (SRI) has been prepared which sets out the rehabilitation approach for the open space network. This has been provided as Appendix A of this report. A Rehabilitation Management Plan will be prepared to guide the detailed rehabilitation and on-going maintenance of this reserve.

7.2.6 Safety

Egress/access points have been incorporated into the design along Courtney Drive and the internal road network, to allow multiple escape routes if people are in a position of danger.

7.2.7 Bushfire Hazard Management

Sections of the proposed development site have been identified as having a medium to high bushfire hazard rating. However, the clearing of the site to facilitate the development, will minimise the risks of bushfires.

7.2.8 Maintenance

A maintenance regime, including weed management, will be specified within the Rehabilitation Management Plan (to be prepared during the operational phase of the development).

All drainage reserves will be maintained by the developers for a yet-to-be specified establishment and maintenance period. This will be further defined in the Rehabilitation Management Plan and the Open Space Management Plan (to be prepared in the operational phase of the development).

7.2.9 Environmental Impact and Protection

The natural drainage reserve is located along Yaun Creek. The environmental impacts associated with creating this drainage reserve is therefore considered negligible.

The rehabilitation of this reserve to reflect pre-clearing ecosystems will serve to enhance its ecological values. Rehabilitation is expected to decrease erosion by stabilizing stream banks and slow overland inflows.

7.2.10 Ownership

Ownership will be transferred to the CoGC at the end of the maintenance phase, as specified in the Rehabilitation Management Plan.

7.3 Open Space Category 2 – Open Space Parks (Local Recreation Park)

Two recreation parks are proposed for the development. The largest is located centrally and will be embellished with play structures and a picnic node.

7.3.1 Local Recreation Park 1

Size, Shape and Location

The total area of Recreation Park 1 is 2,708 m^2. It is located centrally in the site and is roughly triangular in shape (Figure 7.6). The site chosen for this park has a relatively flat contour and its location on a ridge, provides public access to panoramic views of the surrounding landscape.

Function and Connectivity

The Recreation Park 1 will cater for informal social and play activities. It is located within 400 m of approximately 75% of the proposed residences. The Recreation Park is linked to the residential dwellings by a pedestrian footpath network. A Statement of Landscape Intent has been prepared by Group GSA which shows the landscape intent for the recreation park.

Access

Pedestrian access is via footpaths along the western, southern and eastern boundaries. Maintenance access will be via the internal road network. Two blocks, 153 and 155 share a boundary with the recreation park.

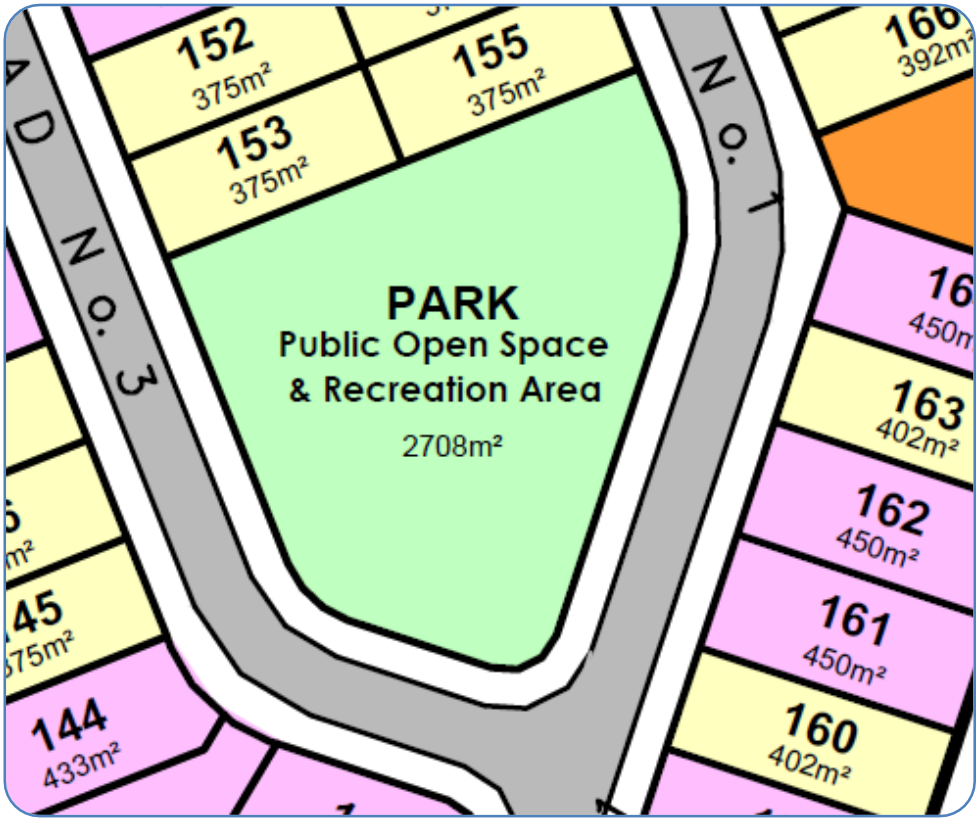


Figure 7.6 Recreation Park 1

7.3.2 Local Recreation Park 2

Size, Shape and Location

The total area of Recreation Park 2 is 1,485 m^2. This park has a rectangular shape and directly adjoins the Natural Drainage Reserve (located to the north) and Drainage Reserve 4 (located to the west) (Figure 7.7).

Function and Connectivity

Recreation Park 2 will be planted with preferred Koala food trees to act as shade under which people may relax and additional Koala habitat. This parks' direct connectivity with the Natural Drainage Reserve and Drainage Reserve 4 will effectively increase the buffer to Yaun Creek to greater than 60 m.

This recreation park is linked to residential dwellings by a network of footpaths and is accessed by an easement between blocks 282 and 283.

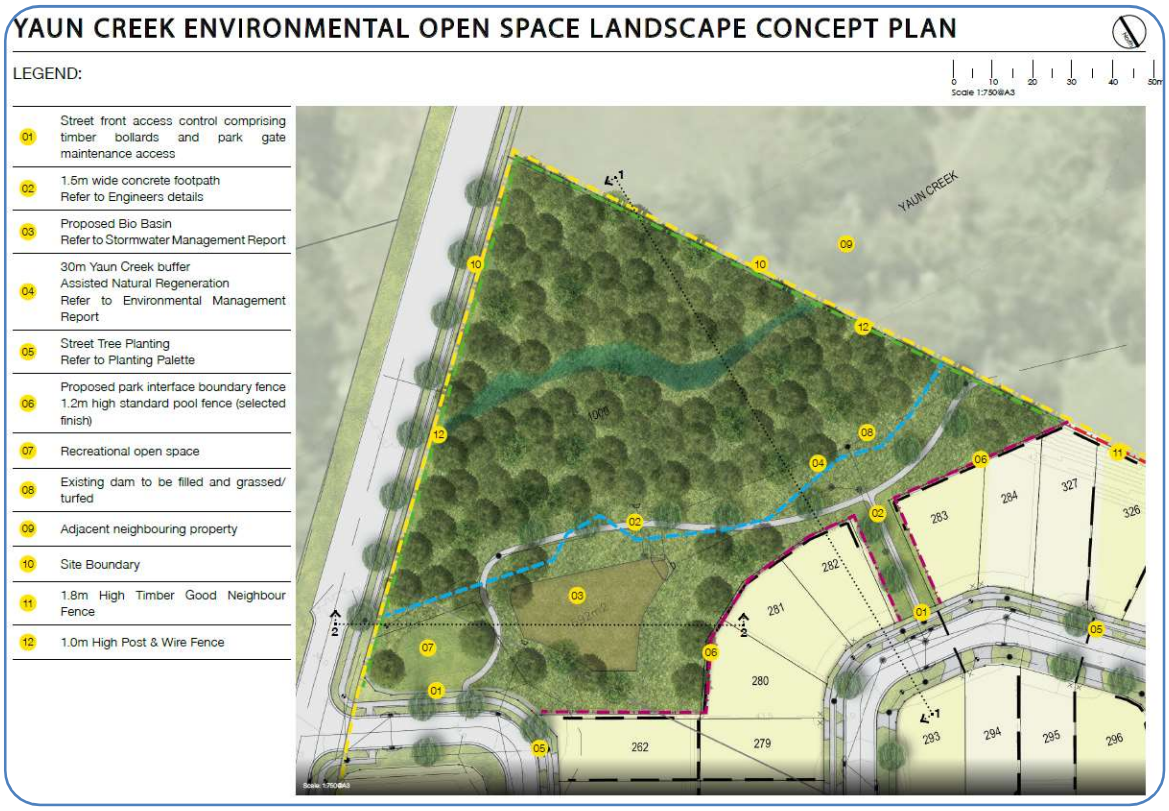


Figure 7.7 Recreation Park 2

7.3.3 Embellishments

Bollards along street frontages will be erected to prevent accidental or intentional vehicle access to the Recreation Parks. Within Recreation Park 1, a shaded playground and picnic node is planned. An informal kick about space will also be provided within this park.

Recreation Park 2 will have a walking path along its length. Preferred Koala food trees will be planted to provide both shade and additional Koala habitat. Recreation Park 2 has direct connectivity to other open space areas which will provide for passive recreation opportunities and nature observation.

7.3.4 Landscape Design

Landscaping will consist of endemic species that will enable unimpeded vision through the parks, while providing shaded spots. Ground cover will consist of maintained lawn. A Statement of Landscape Intent has been prepared by Group GSA. Shade trees in Recreation Park 2 will consist of preferred Koala food trees to increase the available Koala habitat within the development and further enhance the buffer to Yaun Creek.

7.3.5 Safety

The Recreation Parks will be planned and designed in accordance with Crime Prevention through Environmental Design (CPTED) principles. This will increase people's comfort levels as they will feel and be safer. CPTED principles include landscaping to provide clear sight lines across the open space and to potential hazards (such as roadways) to increase the capacity for passive and active surveillance.

7.3.6 Bushfire Hazard Management

Sections of the proposed development site have been identified as having a medium to high bushfire hazard rating. However, the clearing of the site to progress the development, will minimise the risks of bushfires.

7.3.7 Maintenance

Regular mowing and weed management will be conducted. A maintenance schedule will be formulated in the planned Open Space Management Plan (to be prepared during the operational phase of the development).

7.3.8 Environmental Impact and Protection

The Recreation Parks will be created within areas currently cleared of vegetation. The environmental impacts associated with creating these parks is therefore considered negligible. The rehabilitation of Recreation Park 2 will enhance the ecological values of the site by providing additional Koala habitat.

7.3.9 Ownership

The Recreation Park will be maintained by the developer until the end of the establishment period (to be defined in the Open Space Management Plan). Ownership will be transferred to the CoGC at the end of the establishment period.

7.4 Open Space Category 3 – Conservation Estate (Environmental Reserve)

7.4.1 Size, Shape and Location

The total area of the open space linkage is 15,720 m^2. It is roughly triangular in shape and protects areas of ecological significance identified in the Ecological Assessment. It is situated in the south-western corner of the proposed development (Figure 7.8).

7.4.2 Function and Connectivity

The primary function of the Environmental Reserve is to protect an area of ecological significance and associated fauna and flora habitat. This area is mapped as containing regulated vegetation and habitat of Koala. The Environmental Reserve will also provide passive recreational opportunities and nature observation, although no formal walking paths or facilities are planned.

The Environmental Reserve will enable connectivity with existing vegetation to the south to be maintained.

The landscaping concept for the public open space area is detailed in the Statement of Landscape Intent prepared by Group GSA.

Figure 7.8 Environmental Reserve

7.4.3 Access

Access to this area will not be encouraged by providing formal pathways, however, access will be via the internal road network or the road reserve located to the south.

7.4.4 Embellishments

No embellishments for this Environmental Reserve are planned.

7.4.5 Landscape Design

Landscaping will be minimal in this area and primarily consist of rehabilitation of degraded areas. A Rehabilitation Management Plan will be prepared to guide and inform the rehabilitation and restoration process. This Rehabilitation Management Plan will be informed by the Statement of Rehabilitation Intent, prepared to accompany the RoL development application (Appendix A). In areas where restoration is required, the planting palette will reflect the pre-clearing ecosystems.

7.4.6 Safety

To protect the natural features of the Environmental Reserve, no formal infrastructure will be created. The creation of this reserve provides an opportunity for promoting environmental awareness. Nonetheless, public safety and wellbeing is of paramount importance and where feasible, CPTED principles will be incorporated into the design of the Environmental Reserve.

7.4.7 Bushfire Hazard Management

Sections of the proposed development site have been identified as having a medium to high bushfire hazard rating. However, the clearing of the site to progress the development, will minimise the risks of bushfires.

7.4.8 Maintenance

On-going weed control will be necessary in the Environmental Reserve. Rehabilitation of the degraded areas will enhance the ecological values of this open space. A Rehabilitation Management Plan will be prepared to guide and inform the rehabilitation and restoration process during the operation phase of the development. Maintenance schedules and duration of establishment and maintenance periods will be defined in the Rehabilitation Management Plan.

7.4.9 Environmental Impact and Protection

The Environmental Reserve is in an area of ecological significance and is designed to conserve these features. The environmental impacts associated with creating this reserve is therefore considered negligible. The Environmental Reserve is designed so that its natural features will not be adversely impacted upon or damaged by visitors, thus destroying all or some of the fundamental features of the reserve.

The rehabilitation of this reserve to reflect pre-clearing ecosystems will serve to enhance its ecological values.

7.4.10 Ownership

The ownership of the conservation area will be transferred to the CoGC following the establishment period of the rehabilitated areas. During the establishment period, maintenance will be the responsibility of the developer. Once ownership has been transferred to the CoGC, the City will be responsible for on-going maintenance. The dedication of this area to the CoGC will allow it to be conserved in perpetuity.

8 Open Space Design

The design elements of public open space areas have been depicted within the Landscape Intent Statement prepared by Group GSA.

As described earlier, a Statement of Rehabilitation Intent has been prepared to define the areas that will fall within the rehabilitation areas of the development (Appendix A).

8.1 Breakdown of Open Space Areas

Table 8.1 summarises the areas of public open space planned in the proposed residential development.

Trunk infrastructure is defined by the Queensland Department of Infrastructure, Local Government and Planning as that shared between multiple developments. Non-trunk infrastructure is not shared between developments and is generally internal to a development site.

Table 8.1 Breakdown of Open Space Areas

Open Space Type	Area (m^2)	Local Government Infrastructure Plan Use
Drainage Reserves (including detention areas and flood affected areas)	15,829	Non-trunk infrastructure
Natural Drainage Reserve (including buffer areas)	6,786	Non-trunk infrastructure
Recreation Parks	4,193	Trunk infrastructure
Environmental Reserve	15,720	Non-trunk infrastructure

A total area of 38,335 m^2 of non-trunk infrastructure will be created within the proposed development. Trunk infrastructure will occupy an area of 4,193 m^2.

9 Code and Development Compliance

This section references the relevant Development and Constraint Codes contained within the City Plan and how each has been addressed within the development design.

Table 9.1 Compliance Table

Performance Outcomes	Acceptable Outcomes	Compliance with Code
DEVELOPMENT CODES		
9.4.6 Landscape Work Code		
Public Open Space Areas		
PO10 Landscape works in public open space areas (including open space dedicated as an open space contribution) must be designed to be appropriate to their function and location by: • utilising suitable land for its intended purpose; • incorporating, complementing and enhancing existing vegetation and ecological systems; • enhancing the visual amenity of local area and contributing to the amenity of the region; • providing an inclusive and sustainable community resource; and • reinforcing and enhancing hydraulic or drainage regimes on the site and within the adjacent surrounding areas.	**AO10** No acceptable outcome provided.	**Complies with PO10** A Statement of Landscape Intent has been prepared to support the development application. The Statement of Landscape Intent identifies the areas to the landscaped and includes a planting palette that will enhance existing vegetation communities and enhance visual amenity and drainage regimes.
PO11 Landscape works in public open space areas (including open space dedicated as an open space contribution) are appropriately managed during the construction and subsequent maintenance phases.	**AO11** An Open Space Management Plan prepared in accordance with SC6.10 City Plan policy – Landscape work is submitted where the site includes one or more of the following: 1. threatened flora or habitat for threatened fauna under the *Nature Conservation Act 1992*; 2. assessable vegetation; 3. includes retention of matters of environmental significance; 4. includes extensive areas of replanting and large rehabilitation areas; 5. includes wetlands, watercourses and other drainage corridors; 6. requires storage of materials on-site during construction;	**Will comply with AO11 via conditions** An Open Space Management Plan will be prepared to support the construction phase of the development and accompany an operational works application. It will be prepared in accordance with SC6.10. The site contains assessable vegetation, threatened fauna habitat and watercourse/drainage channels requiring rehabilitation.

Performance Outcomes	Acceptable Outcomes	Compliance with Code
	7. forms part of a wider open space system; 8. may be subject to sediment deposition or erosion; 9. includes fauna habitats that require protection or expansion, including habitat features; 10. includes areas of land subject to the Bushfire hazard overlay map; 11. incorporates significant public facilities or spaces likely to attract high visitation and use; or 12. incorporates treatment to the banks of wetlands, watercourses or edges of other water bodies and other drainage corridors. **Note: Where an Open Space Management Statement has been endorsed through an earlier approval, the Open Space Management Plan should be in accordance with that approval.**	
PO12 Landscape work is designed and constructed to achieve a reasonable and practicable response to all public risk – duty of care issues.	**AO12** The design and construction of Landscape work in public open space areas is consistent with all relevant Australian standards or other international landscape standards where a standard is not available in Australia or New Zealand for the specific work item or practice.	**Will comply with AO12 via conditions** All landscape work in public open space areas will be consistent with all relevant Australian standards and industry best practice.
9.4.8 Reconfiguring a Lot Code		
Open Space Provision		
PO20 A public open space network is provided which: 1. has a range of recreation settings and adequate facilities to meet the needs of the community; 2. offers opportunities for residents to conveniently participate in passive recreational activities; 3. delivers well distributed public open space that contributes to the legibility, accessibility, safety, and character of the development;	**AO20.1** Land intended for public open space is of a physical standard and condition in accordance with the SC6.9 City Plan policy – Land development guidelines. **AO20.2** **For trunk recreational open space** Recreation and sporting parklands and land for community facilities are designed and provided in accordance with the Local government infrastructure plan and approved Council master plans.	**Will comply with AO20.1 via conditions** All land intended for public open space will be rehabilitated to standards and conditions in accordance with SC6.9. **Complies with AO20.2** Recreational open space is designed in accordance with the Local government infrastructure plan. The designated recreation parks are within 400 m of all of the residential community within the proposed development. The network of footpaths enables the

Performance Outcomes	Acceptable Outcomes	Compliance with Code
4. creates safe and attractive settings and focal points; 5. facilitates casual surveillance from adjacent streets and land uses and provides for open space areas with public road frontages; 6. delivers for stormwater and flood management and care of valuable environmental resources; and 7. is cost effective to maintain.	**OR** Public open space is provided in accordance with an already approved open space strategy, relevant approved material change of use, adopted concept plan, master plan or structure plan. **AO20.3** **For non-trunk recreational open space** Residential subdivisions creating more than 100 lots provide a minimum of 20m^2 of land per dwelling, for open space that is: 1. within 400m walking distance of all residential lots; and 2. designed to adequately meet the recreational needs of users.	recreation park to be accessed within a 5-minute walk by all residences. Public open spaces that provide passive recreational opportunities are easily accessible to all within this residential community. **Alternative solution to AO20.3** The proposed development will create 237 blocks (one dwelling per block). A minimum of 4,740 m^2 of non-trunk recreational open space is therefore required. The development will create a total of 4,193 m^2 of non-trunk public open space. This is located within the centrally located recreation park and an additional recreation area located adjacent to the natural drainage reserve. All non-trunk open space is within 400 m walking distance of all residential lots. In addition, a pedestrian bushfire trail has been proposed that runs the length of the western site boundary and will connect the environmental reserve to the natural drainage reserve. This will further increase the size of the recreation areas within the development. The variety of public open space areas and the network of pedestrian footpaths will meet the recreational needs of all users within the residential community.
PO21 The design and location of open space results in high-quality parkland which: 1. enables the retention and protection of matters of environmental significance, their associated buffers, assessable vegetation, habitat features and natural cultural features; 2. contributes to the visual amenity of the area and facilitates casual surveillance; 3. can be easily accessed along road frontages;	**AO21.1** Open space is provided adjacent to waterway buffers with roads servicing linear parkland and lots located on the opposite side of the road. **AO21.2** Open space for conservation purposes is consolidated with other conservation areas to allow for a connected movement corridor. **AO21.3** Recreational open space areas less than 5000m^2 directly adjoin existing or proposed recreational open space areas to provide: 1. a consolidated useable area; and	**Complies with PO21** High quality parkland has been created that protects areas of environmental significance, provides a buffer to waterways, contributes to visual amenity and creates open space linkages. **Complies with AO21.1** All public open space has been designed to accommodate the waterway buffer along Yaun Creek. This area will be rehabilitated to enhance the ecological values of the creek and provide increased bank stability and reduce erosion. This area can be

Performance Outcomes	Acceptable Outcomes	Compliance with Code
4. directly adjoins existing or proposed open space areas; and 5. creates opportunities for linkages between open space areas.	2. connectivity between open spaces.	serviced via Courtney Drive and the internal road network. **Complies with AO21.2** The Environmental Reserve will conserve ecologically significant areas of the site and adjoin conservation estate located externally to the south-west. This will allow for fauna movement to and from the site. **Alternative solution to AO21.3** Site constraints such as steep slopes limit the amount of suitable recreational local park space. The largest recreation park is situated in a prominent location on a ridge that is relatively flat. The internal walkways join recreation areas and additional open space within the development, providing connectivity. The natural drainage area, a drainage reserve and a recreation park adjoin to consolidate the amount of open space. The landscape/rehabilitation intent of these areas will enhance their ecological value by providing additional Koala habitat and passive recreation opportunities.
Open Space Safety and Design		
PO22 Open space areas are designed and managed to promote user safety.	**AO22.1** Areas intended for use during times of darkness are lit in accordance with SC6.9 City Plan policy – Land development guidelines. **AO22.2** Casual surveillance is achieved by parks and open space being overlooked by housing, commercial or other development, as well as passing pedestrian and vehicle traffic. **AO22.3** Fencing greater than 1.2m in height adjoining a park is to be at least 50% transparent (i.e. swimming pool style or	**AO22.1 Not applicable** No areas are intended for use during the evening. **Complies with AO22.2** Residential housing overlooks all public open space areas. The positioning of the roadways and footpaths also allows for casual surveillance from passing vehicle and pedestrian traffic. **Will comply with AO22.3 via conditions**

Performance Outcomes	Acceptable Outcomes	Compliance with Code
	timber picket fencing) and any landscaping adjacent to the fence is to be designed to maximise the opportunity for casual surveillance.	Fencing and landscaping adjoin public open space areas will comply with that stipulated in AO22.3.
9.4.15 Works for Infrastructure Code		
Open space and recreational facilities design		
PO6 Open-space areas and recreational facilities are designed and constructed to an appropriate standard, having regard to their intended recreational use and environmental values.	**AO6** Open-space areas and recreation facilities are designed and constructed in accordance with the requirements of the relevant sections of SC6.9 City Plan policy – Land development guidelines	**Complies with AO6** All public open space areas are designed in accordance with SC6.9. **Will comply with AO6 via conditions** All public open space areas will be constructed in accordance with the requirements of SC6.9.
OVERLAY CODES		
8.2.3 Bushfire Hazard Overlay Code		
Open space management plan		
PO8 For areas to be dedicated to Council as open space, management strategies to mitigate bushfire risk must be identified.	**AO8** The Bushfire management plan contains a separate section detailing management strategies for areas to be dedicated to Council that can be included within the Open space management plan.	**Will comply with AO8 via conditions** A Bushfire Management Plan will be prepared for the site. Strategies to mitigate bushfire risk to public open space areas will be identified in this plan.
8.2.6 Environmental Significance Overlay Code		
Tenure, ownership and management arrangements		
PO23 Matters of environmental significance and associated buffers, mapped areas as identified on the Environmental significance – vegetation management overlay map proposed for retention and areas requiring rehabilitation are suitably protected in perpetuity and will: 1. enable necessary fire management in accordance with an approved fire management plan and any adopted bushfire management plan;	**AO23** Matters of environmental significance and associated buffers, mapped areas as identified on the Environmental significance – vegetation management overlay map proposed for retention and areas requiring rehabilitation are transferred to Council ownership as Public Open Space. **OR** Where not required for public access, matters of environmental significance and associated buffers, and mapped areas as identified on the Environmental	**Complies with AO23 via suggested conditions** It is the intent of the developers to transfer ownership of all public open space areas to Council upon completion of rehabilitation projects.

Performance Outcomes	Acceptable Outcomes	Compliance with Code
2. allow unimpeded movement of native fauna through matters of environmental significance and associated buffers; 3. enable maintenance access and regular management; 4. enable auditing and reporting of maintenance and management activities; 5. provide for public access along major watercourses, where such access is consistent with the ecological functions; 6. allow for linkages and buffers to adjacent areas of ecological significance; and 7. allow for a coordinated approach to the management of adjacent areas of conservation estate.	significance – vegetation management overlay map proposed for retention and areas requiring rehabilitation are retained in private ownership and protected under a statutory covenant (under the *Land Title Act 1994*). **Note: Where the area is adjacent to existing public open space, or is a buffer to a major waterway, Council's preference is for the land to be dedicated as Public Open Space.**	
PO24 An Open Space Management Plan prepared in accordance with SC6.10 City Plan policy – Landscape work is prepared for areas to be dedicated to Council as Public Open Space.	**AO24** No acceptable outcome provided.	**Will comply with PO24 via suggested conditions** An Open Space Management Plan will be prepared in accordance with SC6.10 and accompany an operational works application. This plan will incorporate all open space areas that are to be dedicated to Council upon completion of rehabilitation of these areas.

10 Conclusion

This report has been prepared in accordance with the Open Space Management Guideline for the preparation of reports and plan associated with the dedication of public open space (GCCC, 2007). The open space meets the requirements of the City of Gold Coast Park Design Guidelines by providing an open space design in harmony with the development, the surrounding environs and the environmental constraints.

The open space areas planned for the development will maintain connectivity to existing bushland, provide community meeting points, passive recreational opportunities and allow for pedestrian connectivity to community facilities in the local region. The open space network also includes drainage reserves, including a natural drainage reserve that will be rehabilitated to provide riparian linkages along Yaun Creek.

The open space network seeks to improve the environmental values of the site through retaining and rehabilitating an area of existing native vegetation of conservation significance.

Relevant development and constraint code responses to applicable Planning Scheme requirements have been provided.

11 References

Biome Consulting 2018. Environmental Assessment 79-99 Courtney Drive, Upper Coomera. Report to Gallery Homes.

Gold Coast City Council (GCCC) (2007). *Open Space Management Guideline. Guideline for the Preparation of Reports and Plans Associated with the Dedication of Public Open Space. Version 1 November 2007*

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Eby, P. (1991). Seasonal Movements of Grey-headed Flying-foxes, Pteropus poliocephalus (Chiroptera: Pteropodidae), from Two Maternity Camps in Northern New South Wales. Wildlife Research. 18:547-559.

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GHD (2017). *Investigation Areas Program – Courtney Drive, Upper Coomera. Draft Concept Plan May 2017 Version 1*.

Tidemann, C.R. (1998). Grey-headed Flying-fox, Pteropus poliocephalus, Temminck, 1824. In: Strahan, R., ed. The Mammals of Australia. French's Forest: New Holland Publishers Pty Ltd.

Appendix A

Statement of Rehabilitation Intent

VERSION: A
DATE : 29.03.19

STATEMENT OF REHABILITATION INTENT

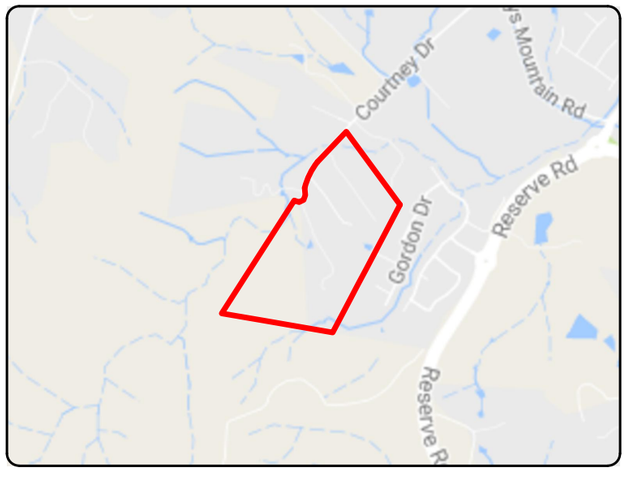
Lots 188-192 on RP173728, 79-99 Courtney Drive, Upper Coomera

for

Gallery Homes

Project No: BC-16090

March 2019



Site Location

SCHEDULE OF DRAWINGS	
Drawing No.	Drawing Title
SRI-00	LOCALITY AND DRAWING INDEX PLAN
SRI-01	EXISTING ECOLOGICAL FEATURES
SRI-02	REHABILITATION AREAS WITHIN PROPOSED DEVELOPMENT
SRI-03	WEED CONTROL
SRI-04	PLANTING SPECIFICATIONS
SRI-05	MAINTENANCE
SRI-06	REHABILITATION TIMELINE

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EXISTING ECOLOGICAL FEATURES

Vegetation
The vegetation on site has been broadly classified into four (4) vegetation communities:

- V1 - Acacia low open forest
- V2 - Spotted Gum / Grey Ironbark Open Forest (RE 12.11.5);
- V3 - Acacia low open woodland/mosaic +/- landscaping around dwellings
- V4 - Pasturelands +/- copses of native/exotic trees

Vegetation Community V1
V1 is a regrowth extension of Regional Ecosystem vegetation at the site's southwestern boundary corner. It comprises mature Acacia disparrima regrowth with occasional emergent Corymbia citriodora, Eucalyptus siderophloia, E. propinqua, and E. tereticornis. Other common species in the mid stratum include Lophostemon suaveolens and Allocasuarina littoralis. The notable disturbance within this vegetation community is the incursion of weeds with Lantana dominating the shrub layer.

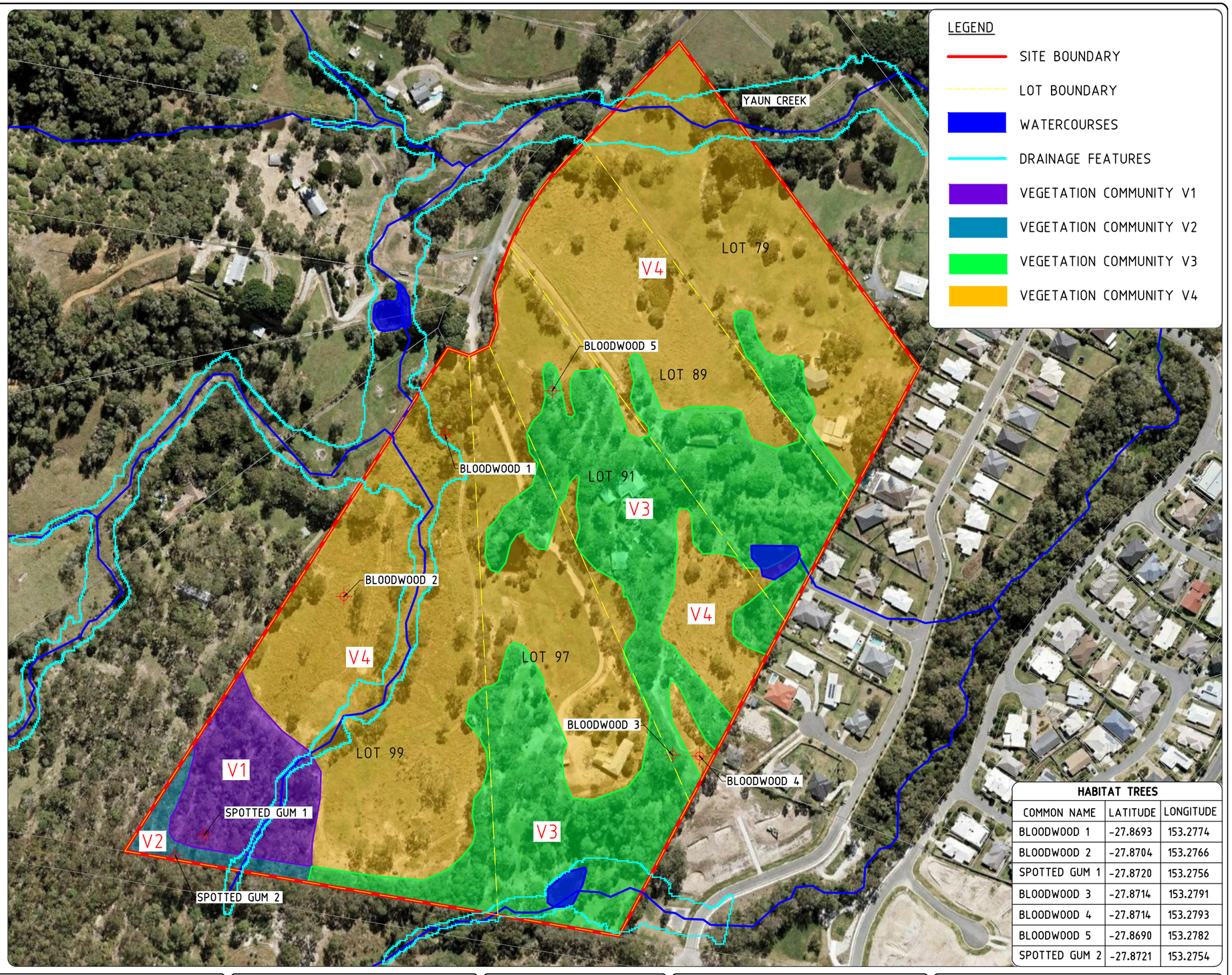
Vegetation Community V2
V2 comprises a small area of the total subject site in the south-west corner and is an extension of a larger area of the same vegetation type beyond the site boundary. The composition of the canopy is generally representative of RE 12.11.5, primarily Corymbia citriodora and Eucalyptus siderophloia. The understorey is a mixture of juvenile canopy species, endemic shrubs and endemic ground species with negligible weed incursion.

Vegetation Community V3
V3 primarily mature acacia regrowth proximate to dwellings and outbuildings on the subject site. There are occasional larger eucalypts and small isolated thickets of lantana and vine weeds are common. Low level grazing is presently active throughout most of this community. Prevalent endemic flora species for this community include Acacia disparrima, Eucalytpus siderophloia, E. tereticornis, Lophostemon confertus, Cynodon dactylon var. dactylon. Prevalent weed species include Lantana camara, Setaria sphacelata, and Panicum megathyrsus.

Vegetation Community V4
V4 covers the majority of the site and comprises introduced pasture species, copses of endemic tree species and trees associated with landscaping. Some of the largest eucalypt trees on site occur as isolated trees or within the copses.

Habitat Trees
Seven (7) habitat trees have been identified across the site as shown in the adjacent image.

Watercourses and Drainage Features
The site contains two main drainage lines. Yaun Creek is the primary drainage line which traverses the site's northern corner for approximately 100 m. An ephemeral drainage line, originating at the site's southern boundary, converges with Yaun Creek on the site's central western boundary.



HABITAT TREES

COMMON NAME	LATITUDE	LONGITUDE
BLOODWOOD 1	-27.8693	153.2774
BLOODWOOD 2	-27.8704	153.2766
SPOTTED GUM 1	-27.8720	153.2756
BLOODWOOD 3	-27.8714	153.2791
BLOODWOOD 4	-27.8714	153.2793
BLOODWOOD 5	-27.8690	153.2782
SPOTTED GUM 2	-27.8721	153.2754

DATE
29.03.19
PROJECT No. :
BC-16090
DRAWING No. :
SRI-01
REVISION No. :
A

PROJECT
STATEMENT OF REHABILITATION INTENT
DRAWING TITLE
EXISTING ECOLOGICAL FEATURES
CLIENT
GALLERY HOMES
ADDRESS:
LOTS 188-192 ON RP173728
79-99 COURTNEY DRIVE, UPPER COOMERA

DRAFTED BY :	DESIGNED BY :	CHECKED BY:	PAPER SIZE :	SCALE :
TP / LD	DC	BC	A3	1:3000

APPROVED FOR AND ON BEHALF OF BIOME CONSULTING PTY LTD
ACN 166 087 476
RPEQ No. :

VER.	DESCRIPTION	APPR.	DATE
A	ORIGINAL ISSUE		29.03.19

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ORIGINAL SCALE BEFORE REDUCTION
30 0 30 60 90 120 150
1 : 3000 (FULL SIZE) (metres)
CERTIFIED BY
N

REHABILITATION APPROACH

This Statement of Rehabilitation Intent (SRI) has been prepared to set out the rehabilitation approach for the open space network. This SRI forms part of the Reconfiguration of Lots (RoL) development application. This SRI will be used as the basis to prepare a detailed Rehabilitation Management Plan (RMP) accompanying an Operational Works (OPW) application. The proposed development includes a number of open space areas, two of which will include rehabilitation. The purpose of works to be conducted within these rehabilitation areas is to enhance their existing ecological values and contribute to ecological values within and beyond the site's boundaries. Specific outcomes include re-establishing vegetation reflective of pre-cleared Regional Ecosystems, enhancing koala habitat and contributing to ecological values associated with Yaun Creek. The rehabilitation approach is described in greater detail below.

REHABILITATION APPROACH

The Society for Ecological Restoration International (SERI), defines ecological restoration as:

> "...the process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed."

The key aspect of ecological restoration is that it returns the structure and function of an area which in turn results in the improvement of habitat values for fauna species. The return of structure and function is also important as once the area has developed to a self-sustaining state, ongoing maintenance effort is minimised. The ultimate goal is to restore natural processes and reduce the level of human-directed activity over time.

Further to the specific outcomes mentioned above, other objectives of rehabilitation include:

- Removing all Invasive Plants listed under the Biosecurity Act 2014;
- Controlling other non-invasive and environmental weeds;
- Encouraging the natural recruitment of endemic species;
- Providing fauna habitat opportunities to increase the presence of natural seed dispersal vectors;
- Restoring the structure and function of disturbed vegetation communities to that of the pre-disturbed vegetation type where required; and
- Maximising survival opportunities for areas of existing native vegetation and newly installed plantings.

The SEQ Restoration Framework Manual, presents four (4) ecological restoration approaches including:

- Natural Regeneration;
- Assisted Natural Regeneration;
- Reconstruction; and
- Fabrication.

Due to the varying conditions within the rehabilitation areas, a mix of approaches will be required over the life of the rehabilitation project.

Where the natural vegetation associations are relatively intact and weed-free and regeneration is capable of occurring without the need for human intervention, a **Natural Regeneration** approach will be employed.

Within areas of weed incursion beneath mature native canopy, a viable seed bank for germination is likely to be present and **Assisted Natural Regeneration** is considered most appropriate. These areas are expected to recover with limited intervention while focussing on improving conditions for existing endemic plants and encouraging the recruitment and establishment of new endemic plants. This will involve sensitive, targeted weed control and, where prescribed, minor amelioration of soil conditions. These areas are then to be clearly delineated to limit access to authorised personnel only and monitored to guide ongoing management. The control of any ongoing weed emergence is intended to further facilitate the re-establishment of endemic species via any in-situ seed bank that may be present or by other natural seed dispersal vectors. Where deemed appropriate, Assisted Regeneration is preferable to planting. Naturally recruited endemic plants tend to have high rates of survival due to natural selection, and the integrity of the local genetic material is better maintained.

In highly disturbed areas with little to no endemic vegetation a greater level of intervention is required, and restoration will take the form of **Reconstruction**. This will include controlling weeds to prepare areas for planting to re-establish the native vegetation communities.

Where significant re-profiling of the land's relief is undertaken, subsequent planting may be prescribed as a surface treatment to achieve the purpose/s of the modified area. This is referred to as **Fabrication**.

Off-target Plant Damage

Off-target damage to endemic species is to be minimised insofar as is practical in areas managed through Assisted Regeneration and during general maintenance activities in restoration areas. Many ground covers and seedlings can be mistaken for weeds. Care must be taken to avoid off-target damage to endemic species. Treatment of weeds through activities such as herbicide use should only be undertaken when the target plants have been conclusively identified. Endemic seedlings may provide the future canopy trees of the site and endemic ground covers provide significant resilience for the site against ongoing weed incursion.

Zone R1 Rehabilitation (Public Open Space Conservation Estate)

The majority of this zone is under canopy. Regional Ecosystem 12.11.5 occurs along the fringes of the southern and western boundary with negligible weed incursion. The balance of area under canopy comprises advanced regrowth dominated by Acacia disparrima and other species consistent with RE 12.11.5 with moderate weed incursion, such as Lantana camara which increases in density towards the drainage line. A clear area of degraded pasture constituting approximately 10% of the zone occurs in the eastern extent of this zone.

Areas under canopy will require **Assisted Regeneration**. Weeds found on site and techniques for their control are provided in Drawing RMP-03.

Generally, weed control will include:

- woody and vine weeds either manually removed or treated via cut/paint or drill /inject; and
- ground layer weeds sprayed with herbicide.

The cleared area will require **Reconstruction** as per Planting Schedule PS1, and Planting Module PM1 (Drawing RMP-04).

Zone R2 Rehabilitation (Public Open Space Drainage Reserve)

The majority of this zone is clear and highly disturbed and comprised mostly of pasture grasses and weeds. Yaun Creek runs centrally through this zone from west to east the majority of which flows in open paddock. Less than 20% of this zone occurs under canopy. A small copse of trees occurs centrally within the zone. A larger patch of trees occurs within the eastern corner.

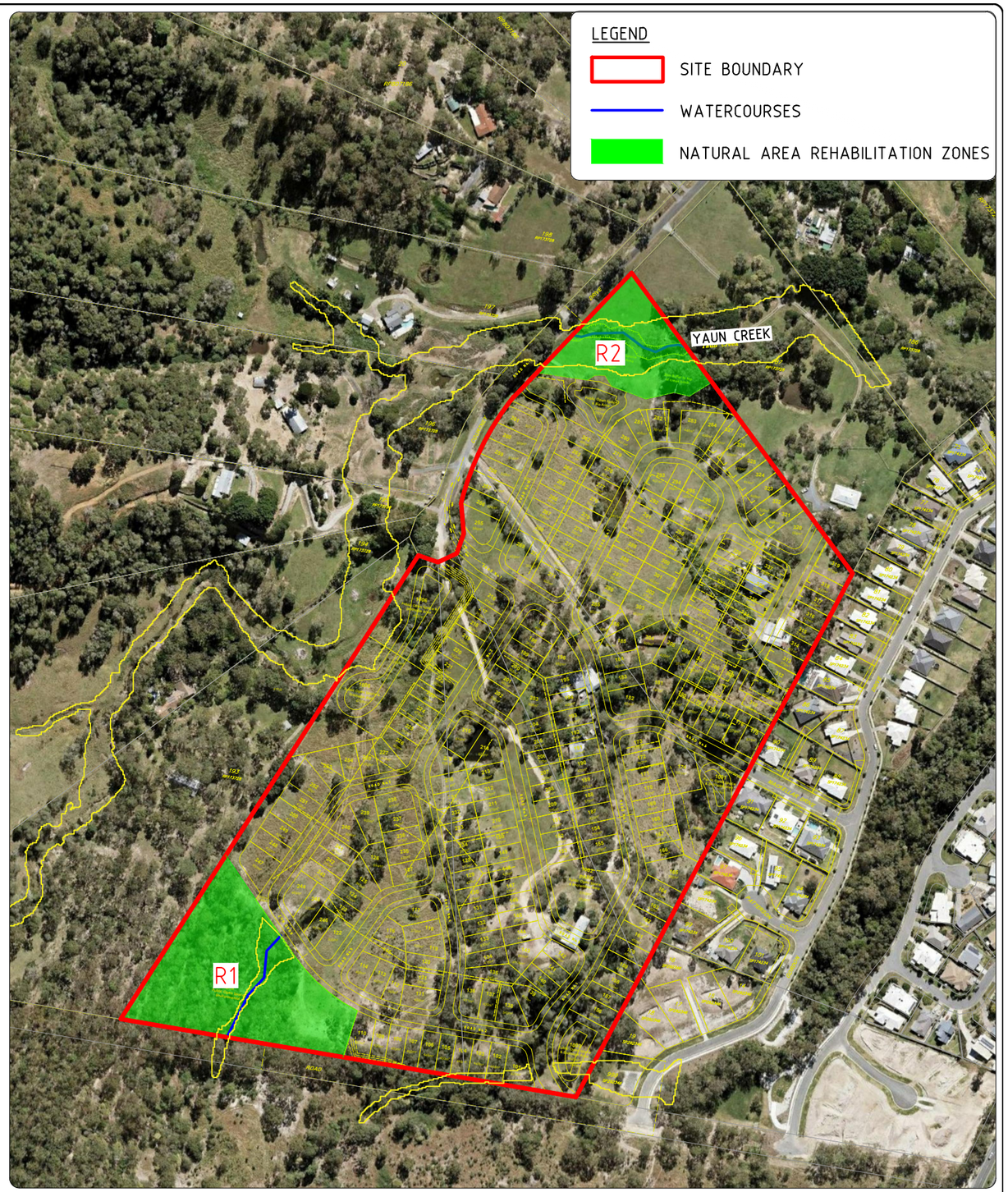
Areas under canopy will require **Assisted Regeneration**. Weeds found on site and techniques for their control are provided in Drawing RMP-03. Generally, weed control will include:

- woody and vine weeds either manually removed or treated via cut/paint or drill /inject; and
- ground layer weeds sprayed with herbicide.

The cleared area will require **Reconstruction** as per Planting Schedule PS2, and Planting Module - PM2 (Drawing RMP-04).

MAINTENANCE AND PERFORMANCE CRITERIA

Likely maintenance tasks and performance criteria are provided in Drawing RMP-05. A schedule for all rehabilitation works is provided in the Rehabilitation Timeline (Drawing RMP-06).



DATE
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PROJECT No. :
BC-16090

DRAWING No. :
SRI-02

REVISION No. :
A

PROJECT
STATEMENT OF REHABILITATION INTENT

DRAWING TITLE
REHABILITATION AREAS WITHIN PROPOSED DEVELOPMENT

CLIENT
GALLERY HOMES

ADDRESS:
LOTS 188-192 ON RP173728
79-99 COURTNEY DRIVE, UPPER COOMERA

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WEED CONTROL

The control of weed species is essential to the environmental restoration process. The removal of invasive species reduces competition with the germination and establishment of native species. In areas where Assisted Regeneration methods are to be used, weed control should be designed to reduce impacts to existing native vegetation, maintain juvenile native species and retain the existing in-situ seed bank within the soil profile.

The control of weed species within each zone is to be undertaken generally in accordance with the following phases:

- **Primary Weed Control**
  Involves initial weed control and rarely entails the removal of all weed species at once, but rather the selective and strategic removal of weeds.

- **Secondary Weed Control**
  Follows the completion of primary work and is a vital stage in the regeneration process. During this stage it is necessary to correctly manage the growth of not only weed species on-site, but also regenerating natives.

- **Maintenance and Follow-up Weed Control**
  In order to ensure primary and secondary work is successful, ongoing maintenance and follow-up weed control is essential. The frequency and duration of this process shall vary according to the resilience of native vegetation, viability of weed seed in the seed bank, the proximity of weed sources for reinfestation to the site and the skill level of workers.

All weed control works are to be either actively supervised or undertaken by personnel suitably qualified in botany and bush regeneration disciplines. Weed removal should be undertaken in accordance with the methodology outlined within the Southeast Queensland Ecological Restoration Framework: Manual. In the context of ecological restoration on this site, low impact weed control methods (hand removal and chemical treatment) have been recommended and shall be undertaken in accordance with this plan.

Specific to this site, the proposed weed control methods are provided within the Weed Control Table. The methods of weed control have been determined based on the extent of weed infestation and the desired long term outcomes sought for each area.

WEED CONTROL TABLE

Scientific Name	Common Name	Status*	Method^
Ageratum houstonianum	Blue Billygoat Weed		Hand pull; spray G1:100.
Amaranthus spinosus	Needle Burr		Hand pull; spray G1:100 or G1:100+MM or MM.
Ambrosia artemisiifolia	Ragweed		Hand pull; spray seedlings G1:100; G1:100 + MM or MM.
Bidens pilosa	Cobbler's Pegs		Hand pull; spray G1:100 or G1:100 + MM or MM.
Cinnamomum camphora	Camphor Laurel	RIP (Cat 3)	Seedlings: hand pull or spray G1:100+adj or G1:100+MM+adj. Saplings: CP G1:1.5 or G(neat);. Trees: Inject G1:1.5 or G(neat).
Conyza bonariensis	Flax Leaf Fleabane		Hand pull; spray G1:100 or G1:100 + MM or MM.
Corymbia torelliana	Cadaghi		Seedlings: Hand pull; spray G1:200. Saplings: CSP 1:1.5. Trees: SI G1:1.5.
Crassocephalum crepidioides	Thickhead		Hand pull; spray G1:100 or G1:100 + MM or MM.
Crotalaria lanceolata	Lance-leaved Rattlepod		Hand pull; spray G1:100; G1:100 + MM or MM.
Gomphocarpus sp.	Cotton Bush		Hand pull; spray seedlings G1:100; G1:100 + MM or MM.
Lantana camara	Lantana	RIP (Cat 3)	Hand pull; spray G1:100 or G1:100 + MM or MM.
Macroptyloma axillare	Horse Gram		Hand pull; spray G1:100 or G1:100 + MM or MM.
Megathyrsus maximus	Guinea Grass		Crown; spray G1:100.
Melinis repens	Molasses Grass		Spray G1:100.
Murraya paniculata	Mock Orange	OIP	Seedlings: hand pull, spray G1:100+adj or G1:100+MM or MM. Shrubs: spray G1:100+MM or MM, CSP G1:1.5; inject G1:1.5.
Neonotonia wightii	White Glycine		Seedlings: hand pull; spray G1:100 or G1:100+MM or MM. Vines CSP G1:1.5.
Paspalum dilatatum	Paspalum		Spray G1:100.
Passiflora edulis	Passionfruit		Hand pull; CSP G1:1.5; spray G1:100 or G1:100 + MM.
Passiflora foetida	Stinking Passionfruit	OIP	Hand pull; CSP G1:1.5; spray G1:100 or G1:100 + MM.
Passiflora suberosa	Corky Passionfruit	OIP	Hand pull; CSP G1:1.5; spray G1:100 or G1:100 + MM.
Passiflora subpeltata	White Passionfruit	OIP	Hand pull; CSP G1:1.5; spray G1:100 or G1:100 + MM.
Phytolacca octandra	Inkweed		Hand pull or crown; CP G1:1.5; spray G1:100.
Psidium guajava	Yellow Guava		Spray G1:200 or G1:200; CSP G1:1.5; SI G1:1.5.
Richardia brasiliensis	White Eye		Hand pull; spray G1:100.
Schefflera actinophylla	Umbrella Tree	OIP	Seedlings: hand pull or spray G1:100 + MM or MM. Saplings: CP G1:1.5 and stack trunks above the ground to dry. Trees: Inject G1:1.5.
Senecio madagascarensis	Fireweed	RIP (Cat 3)	Hand pull; spray G1:200 or G1:100 + MM or MM.
Senna pendula var. glabrata	Easter Cassia	OIP	Seedlings: hand pull or spray G1:200 or G1:200 + MM or MM. Shrubs: CSP G1:1.5 or SI 1:1.5.
Setaria sphacelata	Setaria		Crown; spray G1:100.
Sida cordifolia	Flannel Weed		Seedlings: hand pull; spray G1:100 or G1:100 + MM. Shrubs: CP G1:1.5.
Sida rhombifolia	Paddy Lucerne		Seedlings: hand pull; spray G1:100 or G1:100 + MM. Shrubs: CP G1:1.5.
Solanum chrysotrichum	Giant Devil's Fig		Seedlings: hand pull, spray G1:100+MM or MM. Saplings: spray G100+MM or MM, CP G1:1.5. Trees: inject G1:1.5.
Solanum mauritianum	Wild Tobacco	OIP	Seedlings: hand pull, spray G1:100+MM or MM. Saplings: spray G100+MM or MM, CP G1:1.5. Trees: inject G1:1.5.
Solanum capsicoides	Devil's Apple		Hand pull; spray G1:100+MM.
Sphagneticola trilobata	Singapore Daisy	RIP (Cat 3)	Manually remove when growing through endemic plants; Spray G1:100+MM or MM.
Sporobolus africanus	Parramatta grass		Crown; spray G1:100.
Tagetes minuta	Stinking Roger		Hand pull; spray G1:100 or G1:100+MM or MM; CP G1:1.5.
Urena lobata	Urena Burr		Seedlings and small plants: hand pull; spray G1:100 or G1:100 + MM. Shrubs: CSP G1:1.5.
Verbena bonariensis	Purple Top		Hand pull; spray G1:100 or G100+MM.

TABLE NOTES

*Status as per Queensland Biosecurity Act 2014, where:

- PIP = Prohibited invasive plants must not be kept, moved, given away or sold without a permit. The Biosecurity Act requires that all sightings to be reported to Biosecurity Queensland within 24 hours. By law, everyone has a general biosecurity obligation to take all reasonable and practical steps to minimise the risk of spreading prohibited invasive plants until they receive advice from an authorised officer.

- RIP = Restricted invasive plants must not be given away, sold or released into the environment without a permit. The Biosecurity Act requires everyone to take all reasonable and practical steps to minimise the risks associated with invasive plants under their control. At a local level, each local government must have a biosecurity plan that covers invasive plants and animals in its area. This plan may include actions to be taken on certain species. Some of these actions may be required under local laws. There are 4 categories assigned to restricted invasive plants that prescribe actions required if you come into contact with them. Category 2 restricted invasive plants: The Act requires that all sightings of category 2 restricted invasive plants be reported to Biosecurity Queensland within 24 hours of you becoming aware of its presence. Category 3 restricted invasive plants: You must not distribute this restricted invasive plant i.e. it must not be sold, given as a gift, traded or released into the environment, unless authorised in a regulation or under a permit. Category 4 restricted invasive plants: You must not move this restricted invasive plant to ensure that it is not spread into other areas of the state. Category 5 restricted invasive plants: You must not possess or keep this restricted invasive plant under your control due to the high risk of negative impacts to the environment.

- OIP = Other invasive plants are not prohibited or restricted, however, by law, everyone has a general biosecurity obligation to take reasonable and practical steps to minimise the risks associated with invasive plants under their control. Local governments must have a biosecurity plan that covers invasive plants and animals in their area. This plan may include actions to be taken on certain species. Some of these actions may be required under local laws.

^METHOD:
G = Glyphosate 360 g/L;
MM = Metsulfuron methyl;
G1:100 = 100mls glyphosate per 10L water;
G1:1.5 = 1 part Glyphosate to 1.5 parts water;
CSP = Cut, Scrape and Paint with: G(neat) or G1:1.5;
CP = Cut and Paint with: G(neat) OR G1:1.5;
SP = Scrape and Paint with: G(neat) or G1:1.5;
Adj = adjuvant as per manufacturer directions of use;
Spray = thorough wetting of the target foliage to the point of run-off;
Inject = Drill or Frill with: G(neat) or G1:1.5.

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PROJECT
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WEED CONTROL
CLIENT
GALLERY HOMES
ADDRESS:
LOTS 188-192 ON RP173728
79-99 COURTNEY DRIVE, UPPER COOMERA

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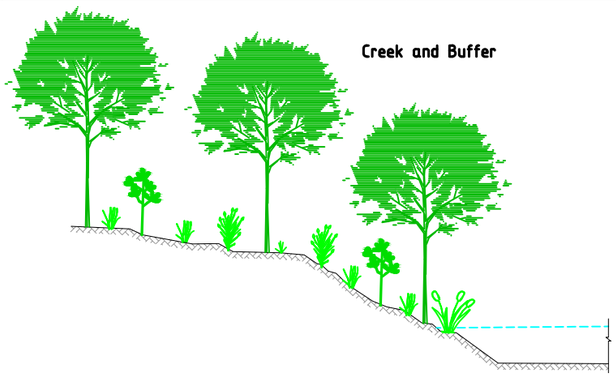
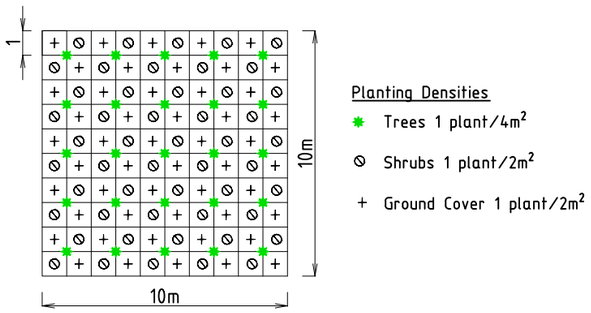
PLANTING SCHEDULE - PS1

Scientific Name	Common Name	Planting Density	Container Size
Trees			
Corymbia intermedia	Pink Bloodwood	1 plant / 4m²	Tube
Eucalyptus grandis	Flooded Gum		
Eucalyptus tereticornis	Queensland Blue Gum		
Ficus watkinsiana	Strangler Fig		
Grevillea robusta	Silky Oak		
Lophostemon confertus	Brushbox		
Melaleuca bracteata	River Tea Tree		
Tristaniopsis laurina	Water Gum		
Small Trees/Shrubs			
Acacia disparrima	Hickory Wattle	1 plant / 2m²	Tube
Alphitonia excelsa	Red Ash		
Allocasuarina littoralis	Black Sheoak		
Babingtonia similis	Twiggy Myrytle		
Ficus coronata	Creek Sandpaper Fig		
Glochidion ferdinandi	Cheese Tree		
Glochidion sumatranum	Umbrella Cheese Tree		
Lophostemon suaveolens	Swamp Box		
Melaleuca quinquenervia	Broad-leaved Paperbark		
Groundcovers			
Lomandra hystrix	Creek Mat Rush	1 plant / 2m² (along creek)	Tube
Lomandra longifolia	Spiny-headed Mat Rush	1 plant / 2m² (beyond creek)	

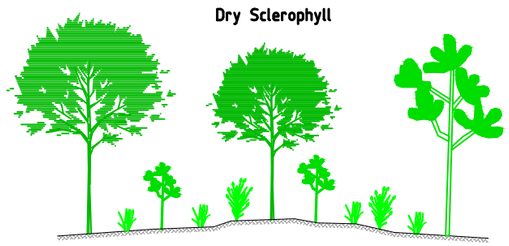
PLANTING SCHEDULE - PS2

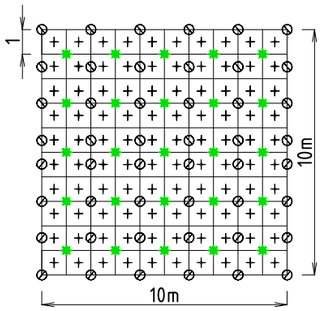
Scientific Name	Common Name	Planting Density	Container Size
Trees			
Corymbia citriodora	Spotted Gum	1 plant / 4m²	Tube
Corymbia intermedia	Pink Bloodwood		
Eucalyptus carnea	Broad-leaved White Mahogany		
Eucalyptus propinqua	Small-fruited Grey Gum		
Eucalyptus siderophloia	Grey Ironbark		
Eucalyptus tereticornis	Queensland Blue Gum		
Lophostemon confertus	Brushbox		
Small Trees/Shrubs			
Acacia disparrima	Hickory Wattle	1 plant / 2m²	Tube
Allocasuarina littoralis	Black Sheoak		
Lophostemon suaveolens	Swamp Box		
Melaleuca salignus	White Bottlebrush		
Groundcovers			
Cymbopogon refractus	Creek Mat Rush	1 plant / 1m²	Tube
Imperata cylindrica	Blady Grass		
Lomandra longifolia	Spiny-headed Mat Rush		
Themeda triandra	Kangaroo Grass		





Planting Densities
- Trees 1 plant/4m²
- Shrubs 1 plant/2m²
- \+ Ground Cover 1 plant/2m²





Planting Densities
- Trees 1 plant/4m²
- Shrubs 1 plant/2m²
- \+ Ground Cover 1 plant/2m²

PLANTING MODULE - PM1

PLANTING MODULE - PM2

PLANT INSTALLATION RECOMMENDATIONS

Planting is to be undertaken or directly supervised by an experienced and qualified landscape or restoration contractor. All works are to be in accordance with the provisions of this plan, relevant local government policies and Australian Standards.

Prior to plant installation weeds posing a risk to planting outcomes are to be removed as outlined within previous sections. Weeds or non-endemic plants may be retained where it can be argued by the restoration project supervisor that the interim retention of any weeds would contribute to the site's existing habitat value or inhibit incursion by more invasive weeds. Once endemic species have established, retained weeds are to be removed and where appropriate replaced with endemic species.

- Tubestock and/or 140 mm pots are to be used wherever possible. Use of larger plants is unlikely to result in more rapid establishment and may have lower success rates;
- Plants are to be vigorous, well established, hardened off, consistent with species or variety, free from disease and insect pests, with large root systems and no evidence of having been restricted or damaged;
- Plants are to be planted immediately after delivery to the site. If not possible, they should be stored in the shade and watered sufficient times during the day;
- Excavate planting medium to a depth suitable for the installation of tube or pot specimens. In areas where the planting substrate is deemed to be very poor (compacted, nutrient depauperate, hydrophobic etc.) and above areas of potential frequent inundation and water flow, topsoil may be used, or the ground mechanically ripped (in more than one direction) where access is feasible;
- Pre-water plant hole, if soil is dry, to decrease root stress upon planting and assess the infiltration or water through the soil;
- Incorporate into the planting substrate the appropriate quantity of prepared water crystals or other suitable hydrating product;
- Place plant into hole and backfill ensuring that the plant is upright, and the stem is covered in 10-20 mm of planting medium to protect surface roots;
- Plants are to be watered thoroughly immediately after planting (ensure deep irrigation) and thereafter as required to maintain soil moisture around the root ball. Creation of a concave hollow around the base of each plant will aid water infiltration to the plant roots during watering;
- A complete, slow release fertiliser is to be applied during planting as per manufacturer's recommendations;
- Unless otherwise specified or exempted, all planting surfaces must be covered in:
  - a 10cm layer of high quality weed-free composted chip mulch (Note: to avoid possible stem rot in some "drier" species ensure mulch is "dished" and not covering plant stem by more than 2 cm);
  - suitable individual anchored natural fibre weed mat; or
  - "fluffed" mulch bail material at a rate of six to eight plants per bail.
  - Mulch material will be sourced from cleared vegetation material if adequately seasoned.
- Regenerating seedling/saplings are to be encouraged and maintained throughout the establishment period;
- Monitoring and evaluation for the purpose of site maintenance (watering, weed control, stock replacement, fertilising, managing inappropriate site access by pedestrians or livestock) should occur monthly during higher growth periods and otherwise and bi-monthly during other periods;
- If a species is consistently doing poorly, it is recommended to replace with an alternate species.

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PROJECT
STATEMENT OF REHABILITATION INTENT

DRAWING TITLE
PLANTING SPECIFICATIONS

CLIENT
GALLERY HOMES

ADDRESS:
LOTS 188-192 ON RP173728
79-99 COURTNEY DRIVE, UPPER COOMERA

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MAINTENANCE

Varying types and levels of maintenance may be required within each of the two (2) rehabilitation zones. The likely maintenance activities for each zone are described below.

Zone M1
Weed control:
- woody and vine weeds either manually removed or treated via cut/paint or drill /inject; and
- ground layer weeds sprayed with herbicide.

Litter removal:
- Any litter deposited needs to be removed as soon as is practicable.

Zone M2
Weed control:
- woody and vine weeds either manually removed or treated via cut/paint or drill /inject; and
- ground layer weeds sprayed with herbicide.

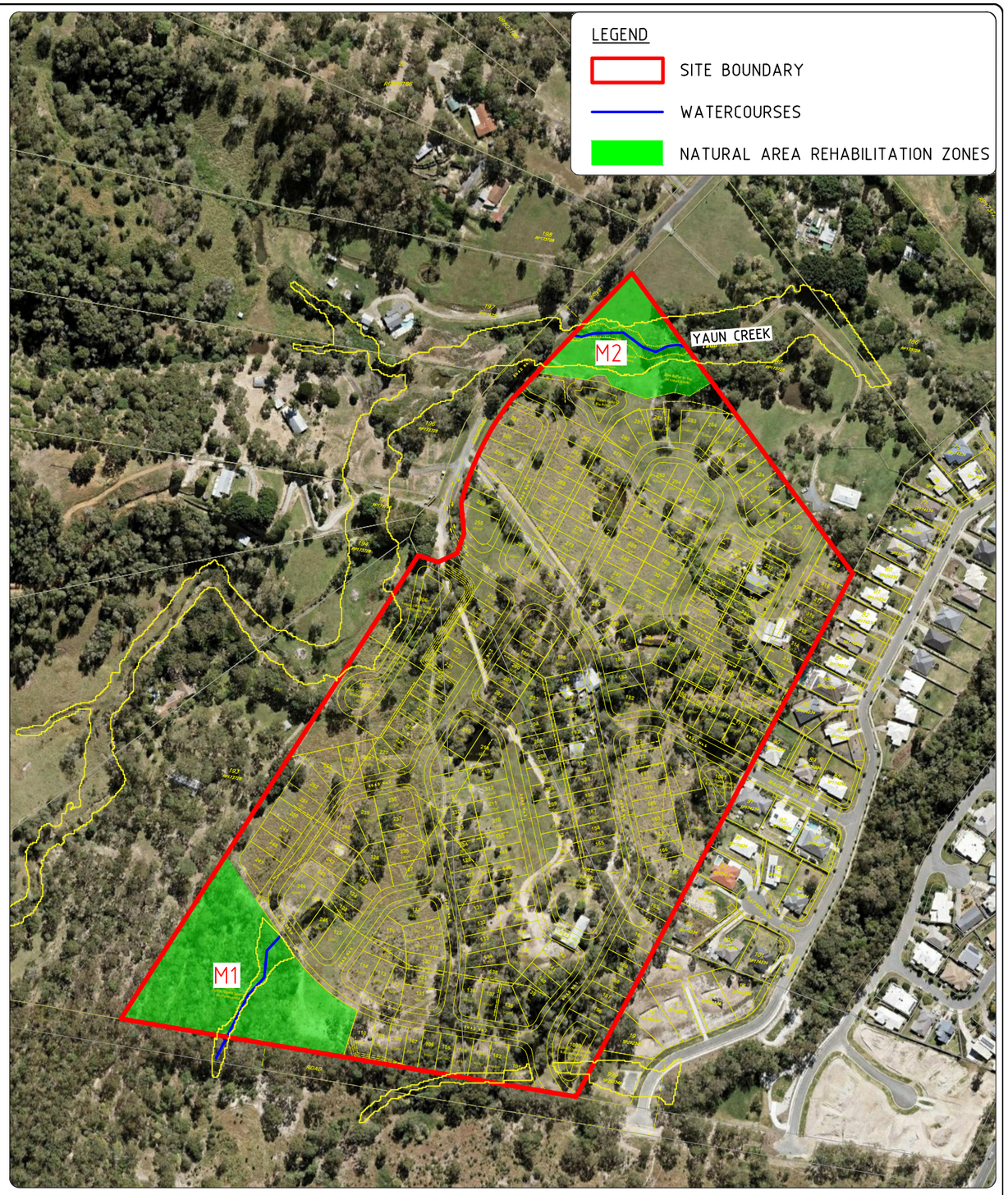
Litter removal:
- Any litter deposited needs to be removed as soon as is practicable.

Monitor for major erosion of creek banks.

PERFORMANCE CRITERIA
The following performance criteria shall be met by the end of the first six (6) months of weed control and Reconstruction (planting) works:
- No Declared Plants listed under the Biosecurity Act 2014;
- Removal of a minimum of 90% of non-invasive and Environmental Weeds;
- Reconstruction planting to achieve a minimum 90% success rate relative to prescribed quantities/densities; and
- No litter within rehabilitation areas.

The following performance criteria shall be met prior to the end of the twelve (12) month Reconstruction (planting) establishment period:
- No Declared Plants listed under the Biosecurity Act 2014;
- Removal of a minimum of 95% of non-invasive and Environmental Weeds;
- Reconstruction planting to achieve a minimum 95% success rate relative to prescribed quantities/densities;
- All planted stock to be healthy and actively growing;
- Any further replacement of under-performing plants will require an additional Six (6) month establishment period; and
- No litter within rehabilitation areas.

The following performance criteria shall be maintained beyond the completion of planting establishment criteria above:
- No Declared Plants listed under the Biosecurity Act 2014;
- Removal of a minimum of 95% of non-invasive and Environmental Weeds;
- Reconstruction planting to achieve a minimum 95% success rate;
- All planted stock to remain healthy and actively growing; and
- No litter within rehabilitation areas.



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CLIENT
GALLERY HOMES
ADDRESS:
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79-99 COURTNEY DRIVE, UPPER COOMERA

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REHABILITATION TIMELINE

Whole-of-site Weed Control
Planting
Planting Establishment
Replacement Planting Establishment
Maintenance
Litter Collection

Activity Description	Month 1		Month 2		Month 3		Month 4		Month 5		Month 6		Month 7		Month 8		Month 9		Month 10		Month 11		Month 12	
	Zone		Zone		Zone		Zone		Zone		Zone		Zone		Zone		Zone		Zone		Zone		Zone	
	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
VEGETATION MANAGEMENT																								
Weed Control																								
Planting																								
Planting Establishment																								
Replacement Planting Establishment																								
General Maintenance																								
CLEANING																								
Litter Collection																								

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PROJECT
STATEMENT OF REHABILITATION INTENT

DRAWING TITLE
REHABILITATION TIMELINE

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Section 4 - SPECIALIST REPORTS

Stormwater Quality Report
Prepared by Biome Consulting

Zone Planning Group

Stormwater Management & Hydraulic Impact Assessment

79-99 Courtney Drive, Upper Coomera

Gallery Homes

March 2019

BC-16090

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79-99 Courtney Drive, Upper Coomera

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Executive Summary

This conceptual stormwater management plan has been prepared so as to be considered as part of a Development Application for a Reconfiguration of Lot over Lots 188-192 on RP173728, at 79-99 Courtney Drive, Upper Coomera (hereafter referred to as 'the subject site').

The report has been prepared on behalf of Gallery Homes and presents a comprehensive review of available Stormwater Quality Improvement Devices (SQID) and stormwater Best Management Practices (BMP) to ensure that the proposed development adequately addresses the management of stormwater quantity and quality during both the construction and operational phases of the development.

In order to address the management of stormwater quantity and quality, a total of four (4) stormwater treatment basins have been proposed. Three (3) of these basins (Basins A, B and D) will be combined bioretention/detention basin for quality and quantity management. The remaining Basin C will only be required for treatment of pollutant loads, as catchment reductions in the post-development case have resulted a the reduction of peak discharge.

The results of xpstorm modelling indicate that the inclusion of the three (3) proposed detention basins will mitigate the expected increases in peak discharge at PD-A, PD-B, and PD-D during all modelled AEP events.

All internal catchment will be directed to bioretention measure for quality treatment. *MUSIC v6* modelling indicates that reduction target for TSS, TP, TN and gross pollutants of 80%, 60%, 45% and 90% respectively can be achieved for the rainfall data set simulated,

In order to simulate pre- and post-development flooding across the site the 1D - 2D hydrodynamic flood model TUFLOW has been utilised to route stormwater through the upper reaches of Yaun Creek and the other minor streams.

Spatial analysis of the peak pre and post-development flooding indicates that the proposed earthworks required to create the subdivision will not cause any flood increase or nuisance to neighbouring properties.

The level of detail provided within this report is suitable for development assessment only and should not be relied upon for construction purposes. A Detailed Stormwater Management Plan containing detailed engineering designs will be needed to finalise the stormwater concepts presented in this report. Detailed design documentation should be prepared in conjunction with civil operational works.

This report has been reviewed by a Registered Professional Engineer of Queensland (RPEQ), and certification has been provided that if the design parameters set out in this report are included within the development:

- there should be no worsening in peak discharge as a result of the proposed development; and
- stormwater pollutant load reductions in accordance with best practice should be achieved.

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1 Introduction

This conceptual stormwater management plan has been prepared so as to be considered as part of a Development Application for a Reconfiguration of Lot over Lots 188-192 on RP173728, at 79-99 Courtney Drive, Upper Coomera (hereafter referred to as 'the subject site').

The report has been prepared on behalf of Gallery Homes and presents a comprehensive review of available Stormwater Quality Improvement Devices (SQID) and stormwater Best Management Practices (BMP) to ensure that the proposed development adequately addresses the management of stormwater quantity and quality during both the construction and operational phases of the development.

The level of detail provided within this report is suitable for development assessment only and should not be relied upon for construction purposes. A Detailed Stormwater Management Plan containing detailed engineering designs will be needed to finalise the stormwater concepts presented in this report. Detailed design documentation should be prepared in conjunction with civil operational works.

1.1 Objectives

The objective of this report is to present practical conceptual stormwater designs which can be integrated into the development proposal so as to ensure that the development minimises potential impacts on downstream receiving environments during the operational phases of development. In addition, the report aims to address the requirements of the City of Gold Coast – Healthy Waters Code (Appendix A).

1.1.1 Operational Phase Objectives

The overarching objective for stormwater management during the operational phase of the development is to ensure that development does not cause an unacceptable impact or nuisance which could result in actionable damage to downstream properties and receiving environments. The following objectives are to be achieved.

Operational Phase Objective (Quantity)	Maintain a Lawful Point of Discharge (LPD) for all site catchments in accordance with the Queensland Urban Drainage Manual (2016).
Operational Phase Objective (Quality)	Stormwater discharged from the site achieves the specified load based reduction targets in accordance Queensland Water Quality Guidelines (2009). For the development site relevant targets are TSS 80%, TP 60%, and TN 45%.

2 Site Location

The subject site is located at 79-99 Courtney Drive, Upper Coomera on Lots 188-192 on RP173728 and is located within the City of Gold Coast Local Government Area. The site comprises of five allotments with a total land area of 18.849 ha. The size of each allotment is included within Table 2.1 with the location and extent of the site shown on Figure 2.1.

Table 2.1 Allotment Details

Street Number	Lot Plan Number	Lot Size (ha)
79	188 RP173728	3.079
89	189 RP173728	3.034
91	190 RP173728	3.095
97	191 RP173728	3.739
99	192 RP173728	5.902

Figure 2.1 Site Location (Google Earth, image date 2016)

3 Existing Case - Hydrological Assessment

xpstorm was utilised to assess the site's existing hydrology and generate hydrographs to represent the stormwater flows expected at the site's existing points of discharge (PD's). Modelling was based on existing catchment areas and surface characteristics. Peak discharge rates for nominated Annual Exceedance Probabilities (AEPs) were derived from the output hydrographs. The following sections detail the input parameters used in the *xpstorm* modelling. Catchments have been delineated on Drawing 201 – Appendix A.

3.1 Rainfall

The hydrologic analysis undertaken in this report will rely on Australian Rainfall and Runoff (ARR) temporal pattern and IFD data obtained for the site from the BOM (Table 3.1).

Table 3.1 Adopted Intensity Frequency Data (mm/hr)

Storm Duration	Annual Exceedance Probability (AEP)					
	0.393 (2 yr ARI)	0.181 (5 yr ARI)	0.095 (10 yr ARI)	0.049 (20 yr ARI)	0.02 (50 yr ARI)	0.01 (100 yr ARI)
5 minute	140.00	176.00	204.00	234.00	276.00	308.00
10 minute	115.00	143.00	164.00	188.00	218.00	240.00
15 minute	97.30	121.00	139.00	158.00	183.00	201.00
20 minute	84.60	105.00	121.00	138.00	160.00	176.00
25 minute	75.20	93.40	108.00	123.00	143.00	158.00
30 minute	67.80	84.40	97.40	112.00	130.00	144.00
45 minute	53.10	66.50	77.10	88.90	105.00	117.00
60 minute	44.20	55.70	64.90	75.20	89.40	100.00
90 minute	34.00	43.20	50.80	59.30	71.30	80.90
120 minute	28.20	36.10	42.70	50.10	60.70	69.30
180 minute	21.70	28.20	33.50	39.70	48.50	55.70

3.2 Existing Case - External Catchments

Two (2) upstream catchments direct flows onto the subject site.

- Ext 1 - discharges flows onto the south western corner of the site as channel flow via a small gully; and
- Ext 2 - directs flows onto the subject site via channel flow. Catchment flows are conveyed across the south eastern corner of the site and to the east.

  NOTE: The conveyance requirements for this catchment through the subject site have been analysis as part of a 2D assessment within Section 7 of this report. As such no further reference is made to this catchment within following 1D hydrological section.

Table 3.2 below presents a summary of the external catchment characteristics.

Table 3.2 Existing Case – External Catchment Characteristic

Catchment ID		Area (ha)	Cover (%)
External	Ext-1	2.26	100 - Dense Forest

3.3 Existing Case - Internal Catchments

The subject site has been divided into four (4) internal catchment areas:

- A – discharges flows primarily as channel flow into Yaun Creek on the western edge of the site;
- B – flows are directed to the north and into Yaun Creek at the site's northern boundary;
- C – discharges catchment flows into the Mackellar Drive road reserve; and
- D – directs flows into a tributary of Yaun Creek at the site south eastern corner.

The characteristic of the site's catchments are detailed in Table 3.3 below and have been delineated on Drawing 201 – Appendix A.

Table 3.3 Existing Case – Catchment Characteristic

Catchment ID		Area (ha)	Cover (%)	Discharge Condition	PD ID
Internal	A	8.6	10 – Dense Forest 90 – Cleared pasture	Channel - Sheet	PD-A
	B	4.4	100 – Cleared pasture with isolated corpses	Sheet	PD-B
	C	2.9	100 – Cleared pasture with isolated corpses	Channel	PD-C
	D	1.94	100 – Cleared pasture with isolated corpses	Sheet – Channel	PD-D

3.4 Existing Case - *xpstorm* Runoff

The "Laurenson" routing method was applied to *xpstorm* for hydrological calculation and hydrograph generation. The contributing catchment was split into pervious (with 0% impervious fraction) and impervious (with 100% impervious fraction) areas. Adopted parameters for the Laurenson routing method include a Manning's roughness coefficient (n) for impervious and pervious areas respectively. Infiltration uniform losses have been applied to the hydrologic model.

The tables below contain the modelling parameters relied upon and present the resulting peak discharges expected for each catchment.

Table 3.4 *xpstorm* Catchment Details – Existing Case

Catchment ID		Impervious Area		Pervious Area	
		Area (ha)	Slope (%)	Area (ha)	Slope (%)
External	Ext-A1	-	-	2.26	25
Internal	A	-	-	8.6	8.5
	B	-	-	4.4	11
	C	-	-	2.9	14
	D	-	-	1.94	16

Table 3.5 *xpstorm* Rainfall Multipliers Applied to Temporal Patterns (mm)

Storm Duration	Annual Exceedance Probability (AEP)					
	0.393 (2 yr ARI)	0.181 (5 yr ARI)	0.095 (10 yr ARI)	0.049 (20 yr ARI)	0.02 (50 yr ARI)	0.01 (100 yr ARI)
5 minute	11.67	14.67	17.00	19.50	23.00	25.67
10 minute	19.17	23.83	27.33	31.33	36.33	40.00
15 minute	24.33	30.25	34.75	39.50	45.75	50.25
20 minute	28.20	35.00	40.33	46.00	53.33	58.67
25 minute	31.33	38.92	45.00	51.25	59.58	65.83
30 minute	33.90	42.20	48.70	56.00	65.00	72.00
45 minute	39.83	49.88	57.83	66.68	78.75	87.75
60 minute	44.20	55.70	64.90	75.20	89.40	100.00
90 minute	51.00	64.80	76.20	88.95	106.95	121.35
120 minute	56.40	72.20	85.40	100.20	121.40	138.60
180 minute	65.10	84.60	100.50	119.10	145.50	167.10

Table 3.6 *xpstorm* Adopted Initial and Continuing Losses – Existing Case

Impervious Area			Pervious Area			
IL (mm)	CL (mm/hr)	Manning's (n)	AEP	CL (mm/hr)	IL (mm)	Manning's (n)
0	0	0.014	0.393-0.049	2	15	0.037
			0.020-0.010	2	5	

Table 3.7 *xpstorm* Peak Discharge (m^3/s) – Existing Case

Point of Discharge	Annual Exceedance Probability (AEP)					
	0.393 (2 yr ARI)	0.181 (5 yr ARI)	0.095 (10 yr ARI)	0.049 (20 yr ARI)	0.02 (50 yr ARI)	0.01 (100 yr ARI)
Ext-A	0.599	0.784	0.927	1.087	1.428	1.582
PD-A	1.701	2.551	3.357	4.099	4.527	5.053
PD-B	0.829	1.208	1.531	1.825	2.076	2.304
PD-C	0.645	0.898	1.082	1.276	1.558	1.752
PD-D	0.508*	0.698*	0.824*	1.012*	1.152*	1.506*

*Peak discharge from Catchment D to PD-D. Does not include flows from Ext-2.

3.5 Existing Case - Model Validation (Rational Method)

For validation purposes, peak discharge values obtained for nominated storm events using xpstorm were compared to those calculated using Rational Method and are shown in Table 3.8 below. Rational calculations were prepared in accordance with QUDM 2013 Section 4, and are detailed within Appendix C.

Table 3.8 Peak Flow Validation *xpstorm* vs Rational – Existing Case

Catchment & Point of Discharge ID			*xpstorm* (m^3/s)	Rational (m^3/s)	Difference (%)
External	PD-A	Ext-A	1.52	1.582	4.1
Internal		A	4.76	3.949	-17.0
	PD-B		2.62	2.304	-12.1
	PD-C		1.82	1.752	-3.5
	PD-D		1.27	1.506	15.3

The peak inflows generated using both hydrological methods are within 20% of each other for the 0.01 AEP. The modelling is therefore considered to be appropriately validated.

4 Proposed Development

The development involves reconfiguring the existing site into 237 residential allotments (Figure 4.1). The development will also include:

- An internal road network with pedestrian footpath;
- Conservation areas (Environmental Reserve public open space) to protect existing ecologically significant areas;
- Open space recreational areas;
- Four (4) stormwater treatment areas; and
- Rehabilitated waterways incorporated into public open space

Figure 4.1 Proposed Development Layout (Bennett and Bennett)

5 Developed Case - Hydrological Assessment

xpstorm was utilised to assess the site's developed hydrology and generate hydrographs and peak discharge rates at each point of discharge (PD). The following sections detail the input parameters used in the *xpstorm* modelling. Catchments have been delineated on Drawing - 201 - Appendix A.

5.1 Developed Case - External Catchments

In the developed case the external catchment will remain unchanged (refer to Section 3.1 above). NOTE: The conveyance requirements for Ext-2 have been analysis as part of a 2D assessment within Section 8 of this report.

5.2 Developed Case - Internal Catchments

In the developed case the site will undergo substantial earthworks to profile the development area. Underground piped drainage will be installed to collect minor stormwater flows, with major flows conveyed via an internal road network. Four (4) major post development catchments have been delineated based on the preliminary civil designs by Mortons Urban Solutions. Catchment A has been further subdivided to recognise an area of environmental reserve that will be maintained:

- A1 – discharges flows primarily as channel flow into Yaun Creek on the western edge of the site;
- A2 – discharges flows primarily as channel flow into Yaun Creek on the western edge of the site;
- B – flows are directed to the north and into Yaun Creek at the sites northern boundary;
- C – discharges catchment flows into the Mackellar Drive road reserve; and
- D – directs flows into a tributary of Yaun Creek at the site south eastern corner.

The characteristic of the site's catchments are detailed in Table 5.1 below and have been delineated on Drawing 201 – Appendix A.

Table 5.1 Developed Case – Catchment Characteristic

Catchment ID		Area (ha)	Cover (%)	Discharge Condition	PD ID
Internal	A1	1.41	100 – Dense Forest	Channel	Into A2
	A2	7.25	100 – Res Dev	Weir – Pipe	PD-A
	B	4.88	100 – Res Dev	Weir – Pipe	PD-B
	C	2.00	100 – Res Dev	Pipe – Road	PD-C
	D	1.83	100 – Res Dev	Channel	PD-D

5.3 Developed Case - *xpstorm* Runoff

The "Laurenson" routing method was applied to *xpstorm* for hydrological calculation and hydrograph generation. The contributing catchment was split into pervious (with 0% impervious fraction) and impervious (with 100% impervious fraction) areas. Adopted parameters for the Laurenson routing method include a Manning's roughness coefficient (n) for impervious and pervious areas respectively. Infiltration uniform losses have been applied to the hydrologic model.

The tables below contain the modelling parameters relied upon and present the resulting peak discharges expected for each catchment.

Table 5.2 *xpstorm* Catchment Details – Developed Case

Catchment ID		Impervious Area		Pervious Area	
		Area (ha)	Slope (%)	Area (ha)	Slope (%)
External	Ext-A1	-	-	2.257	25
Internal	A1	-	-	1.412	20
	A2	4.351	6	2.901	6
	B	2.926	6	1.950	6
	C	1.204	10	0.803	10
	D	1.100	7	0.733	7

Table 5.3 *xpstorm* Adopted Initial and Continuing Losses – Developed Case

Impervious Area			Pervious Area			
IL (mm)	CL (mm/hr)	Manning's (n)	AEP	CL (mm/hr)	IL (mm)	Manning's (n)
0	0	0.014	0.393-0.049	2	15	0.037
			0.020-0.010	2	5	

Table 5.4 *xpstorm* Peak Discharge (m^3/s)– Developed Case

Point of Discharge	Annual Exceedance Probability (AEP) – Peak Discharge					
	0.393 (2 yr ARI)	0.181 (5 yr ARI)	0.095 (10 yr ARI)	0.049 (20 yr ARI)	0.02 (50 yr ARI)	0.01 (100 yr ARI)
Ext-1	0.599	0.784	0.927	1.087	1.428	1.582
PD-A	2.785	3.735	4.520	5.336	6.476	7.203
PD-B	1.335	1.692	1.969	2.314	2.702	3.108
PD-C	0.564	0.732	0.861	1.003	1.261	1.395
PD-D	0.514	0.654	0.776	0.905	1.112	1.234

5.3.1 Validation of Flows

Table 5.5 illustrates that the peak discharges generated using both methods are within 10% of each other for the 0.01 AEP. The modelling is therefore considered to be appropriately calibrated.

Table 5.5 Peak Flow Validation *xpstorm* vs Rational – Developed Case

Catchment & Point of Discharge ID			*xpstorm* (m^3/s)	Rational (m^3/s)	Difference (%)
External	PD-A	Ext-A	1.52	1.582	4.1
Internal		A	4.575	4.572	-0.1
	PD-B		3.108	3.404	8.7
	PD-C		1.395	1.552	10.1
	PD-D		1.234	1.36	9.3

5.3.2 Peak Discharge Comparison - Existing- vs Developed (Unmitigated)

Table 5.6 presents a comparison of the peak discharges expected at each PD. Results indicate increases in peak discharge are expected a PD-A, PD-B, and PD-D. Decreases in peak discharge to PD-C is expected due to catchment area reductions.

Table 5.6 Peak Discharge Comparison (m^3/s) - Unmitigated

PD	Scenario	Contributing Catchment Area (ha)	Annual Exceedance Probability (AEP) – Peak Discharge					
			0.393 (2 yr ARI)	0.181 (5 yr ARI)	0.095 (10 yr ARI)	0.049 (20 yr ARI)	0.02 (50 yr ARI)	0.01 (100 yr ARI)
A	Existing	10.86	1.701	2.551	3.357	4.099	4.527	5.053
	Developed (Unmitigated)	11.47	2.785	3.735	4.520	5.336	6.476	7.203
	Difference		**+1.083**	**+1.184**	**+1.163**	**+1.237**	**+1.949**	**+2.150**
B	Existing	4.4	0.829	1.208	1.531	1.825	2.076	2.304
	Developed (Unmitigated)	4.88	1.335	1.692	1.969	2.314	2.702	3.108
	Difference		**+0.506**	**+0.484**	**+0.439**	**+0.489**	**+0.626**	**+0.804**
C	Existing	2.9	0.645	0.898	1.082	1.276	1.558	1.752
	Developed (Unmitigated)	2.01	0.564	0.732	0.861	1.003	1.261	1.395
	Difference		**-0.081**	**-0.166**	**-0.221**	**-0.273**	**-0.297**	**-0.357**
D	Existing	1.94	0.478*	0.636*	0.760*	0.892*	1.152*	1.285*
	Developed (Unmitigated)	1.83	0.514	0.654	0.776	0.905	1.112	1.234
	Difference		**+0.036**	**+0.018**	**+0.016**	**+0.013**	**-0.040**	**-0.051**

*Peak discharge from Catchment D to PD-D. Does not include flows from Ext-2.

6 Stormwater Management - Operational Phase

In order to ensure that the operational phase objectives outlined within Section 1.1 of this report can be achieved, a network of stormwater management measures are proposed for inclusion within the development.

To achieve these objectives, both external and internal flows will need to be adequately managed prior to discharge to the site's points of discharge.

6.1 Schematic Design Plan

With consideration given to the existing site characteristics, the proposed development configuration and the range of available stormwater management control measures, a set of conceptual design drawings have been prepared and are included as Appendix B. These drawings illustrate the layout and design requirements of each proposed mitigation measures.

6.1.1 External Drainage

- Ext-1 – Flows from this external catchment will continue to enter the subject site as per the pre-development case and into post-development Catchment A1. Low flows are proposed to be captured within an underground pipe network and conveyed around the residential allotments along the sites western boundary. These low flows will be discharged downstream of the detention basin. Highs flows from this catchment will combine within internal site flows and be conveyed within the internal road network.
- Ext 2 - The conveyance requirements for this catchment through the subject site have been analysis as part of a 2D assessment within Section 8 of this report.

6.1.2 Internal Drainage

The site's internal catchments will be developed for residential allotments which will be graded so as to allow minor stormwater flows to be collected within inter-allotment and road piped drainage systems with higher flows conveyed with road reserves.

Four (4) stormwater treatment basins have been proposed for the management of stormwater. Basins A, B, and D will be combined bioretention/detention basin for quality and quantity management. Basin C will only be required for treatment of pollutant loads, as catchment reductions in the post-development case have resulted a reduction in peak discharge at PD-C.

6.2 Quantity Control – Detention

In order to mitigate the increase in peak discharge expected at PD-A, PD-B and PD-D, detention is proposed within open detention basins. These basins will be located within open space to be dedicated to Council and will function to detain stormwater flows so as to ensure that there is no increase in discharge to downstream properties for all nominated AEP's.

NOTE: No detention is proposed within Catchment C as decreases in peak discharge are expected to PD-C as a result of catchment area reductions in the development case.

6.2.1 *xpstorm* Modelling Paramaters

xpstorm has been relied upon to size the required detention measures and develop appropriate outlet configurations.

xpstorm requires a depth area relationship to be defined when modelling an onsite detention (OSD). An initial depth of 0.3 m has been applied within the modelling to reflect the bioretention extended detention requirements.

A summary of the total depth-area relationship applied to the storage node of the *xpstorm* model in the post-development (mitigated) scenario is contained in Table 6.1. The dimensions and proposed levels of the outlet structures used to mitigate the developed case peak discharge and achieve the required detention volume/s are detailed in Table 6.2.

Table 6.1 Depth Area Relationship

Detention ID	RL (m AHD)	Depth (m)	Surface Area (m^2)
A	44.50	0.00	1479
	44.55	0.05	1542
	44.60	0.10	1605
	44.65	0.15	1668
	44.70	0.20	1731
	44.75	0.25	1794
	44.80	0.30	1858
	44.85	0.35	1922
	44.90	0.40	1987
	44.95	0.45	2051
	45.00	0.50	2116
	45.05	0.55	2181
	45.10	0.60	2247
	45.15	0.65	2313
	45.20	0.70	2379
	45.25	0.75	2445
	45.30	0.80	2511
	45.35	0.85	2578
	45.40	0.90	2645
	45.45	0.95	2713
	45.50	1.00	2780
	45.55	1.05	2848
	45.60	1.10	2916
	45.65	1.15	2985
	45.70	1.20	3472
B	36.00	0.00	721
	36.05	0.05	743
	36.10	0.10	766
	36.15	0.15	788
	36.20	0.20	812
	36.25	0.25	835
	36.30	0.30	859

	36.35	0.35	883
	36.40	0.40	907
	36.45	0.45	932
	36.50	0.50	957
	36.55	0.55	982
	36.60	0.60	1007
	36.65	0.65	1033
	36.70	0.70	1059
	36.75	0.75	1085
	36.80	0.80	1112
	36.85	0.85	1139
	36.90	0.90	1215
	36.95	0.95	1242
	37.00	1.00	1270
	37.05	1.05	1301
	37.10	1.10	1333
	37.15	1.15	1369
	37.20	1.20	1520
D	56.40	0.00	277
	56.45	0.05	294
	56.50	0.10	311
	56.60	0.20	345
	56.70	0.30	413

Table 6.2 Outlet Structures

Detention ID	Orifice	Outlet Riser & Pipe(s)	Weir
A	-	1 x 1200 x 900 mm inlet pit Crest @ RL 45.26 m AHD Outlet 1 x 750 mm dia RCP @ RL 43.4 m AHD 2 x 450 mm dia RCP @ RL 44.8 m AHD	1 x 15 m Wide weir Crest @ RL 45.57 m AHD
B	-	1 x 1200 x 900 mm inlet pit Crest @ RL 36.3 m AHD Outlet 1 x 750 mm dia RCP @ RL 34.9 m AHD	1 x 12 m Wide weir, crest @ RL 37.0 m AHD
D	-	1 x 900 x 900 mm inlet pit Crest @ RL 56.7 m AHD Outlet 1 x 525 mm dia RCP @ RL 55.3 m AHD	1 x 7 m Wide weir, crest @ RL 56.75 m AHD

6.2.2 Modelling Results

The results of xpstorm modelling indicate that the inclusion of the three (3) proposed detention basins will mitigate the expected increases in peak discharge at PD-A, PD-B, and PD-D during all modelled AEP events.

Table 6.3 presents a comparison between the expected peak discharge during nominated AEP events for the pre- and post-development mitigated cases. Figure 6.1, 6.2 and 6.3 illustrate a comparison of the outlet hydrographs at PD-A, PD-B and PD-D.

Table 6.3 Peak Discharge Comparison (m^3/s) – Mitigated

PD	Scenario	Contributing Catchment Area (ha)	Annual Exceedance Probability (AEP) – Peak Discharge					
			0.393 (2 yr ARI)	0.181 (5 yr ARI)	0.095 (10 yr ARI)	0.049 (20 yr ARI)	0.02 (50 yr ARI)	0.01 (100 yr ARI)
A	Existing	10.86	1.701	2.551	3.357	4.099	4.527	5.053
	Developed (Mitigated)	11.47	1.674	2.185	2.729	3.566	4.307	5.019
	Difference		**-0.028**	**-0.366**	**-0.628**	**-0.533**	**-0.220**	**-0.034**
B	Existing	4.40	0.829	1.208	1.531	1.825	2.076	2.304
	Developed (Mitigated)	4.88	0.759	0.813	0.854	1.381	1.818	2.284
	Difference		**-0.070**	**-0.395**	**-0.676**	**-0.444**	**-0.258**	**-0.020**
D	Existing	1.94	0.478*	0.636*	0.760*	0.892*	1.152*	1.285*
	Developed (Mitigated)	1.83	0.456	0.618	0.745	0.874	1.053	1.171
	Difference		**-0.022**	**-0.018**	**-0.015**	**-0.018**	**-0.099**	**-0.114**

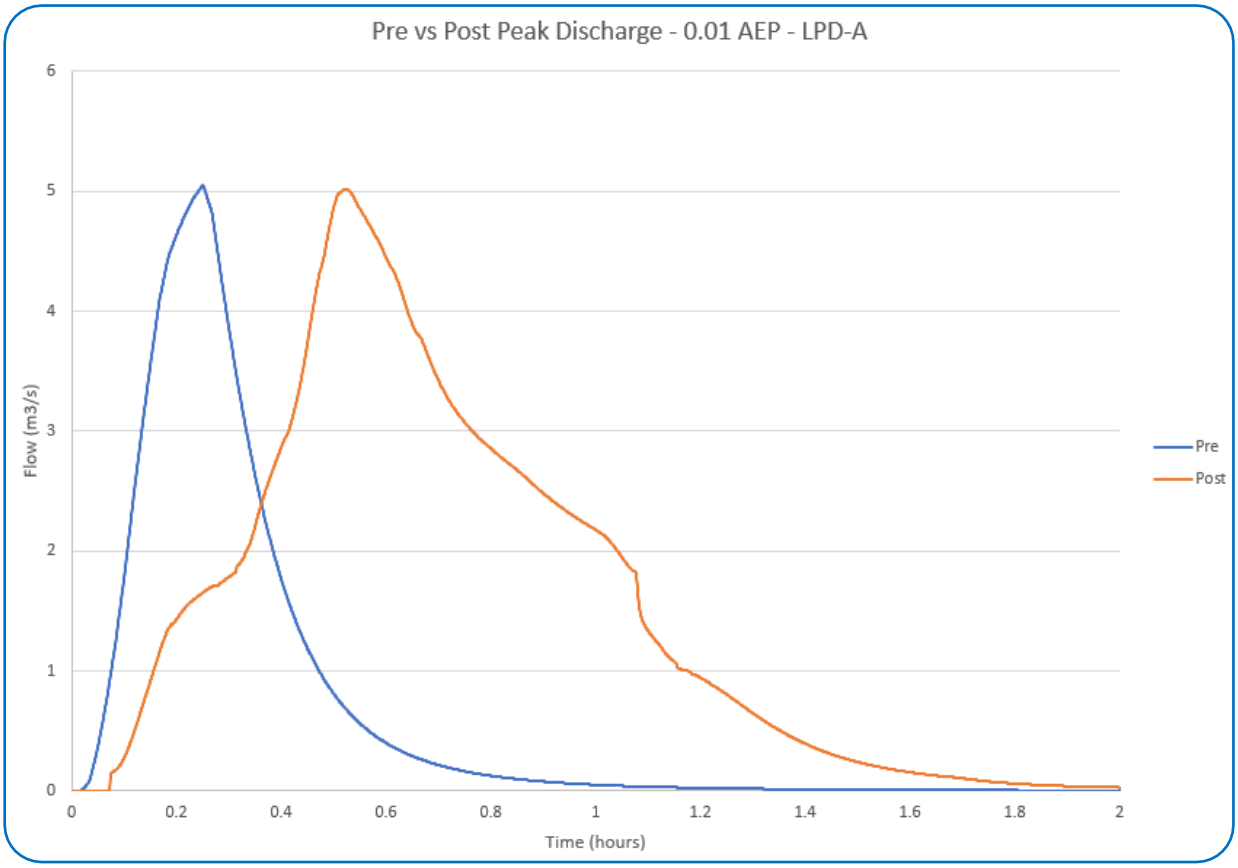

Figure 6.1 Comparison 0.01 AEP Hydrography PD-A

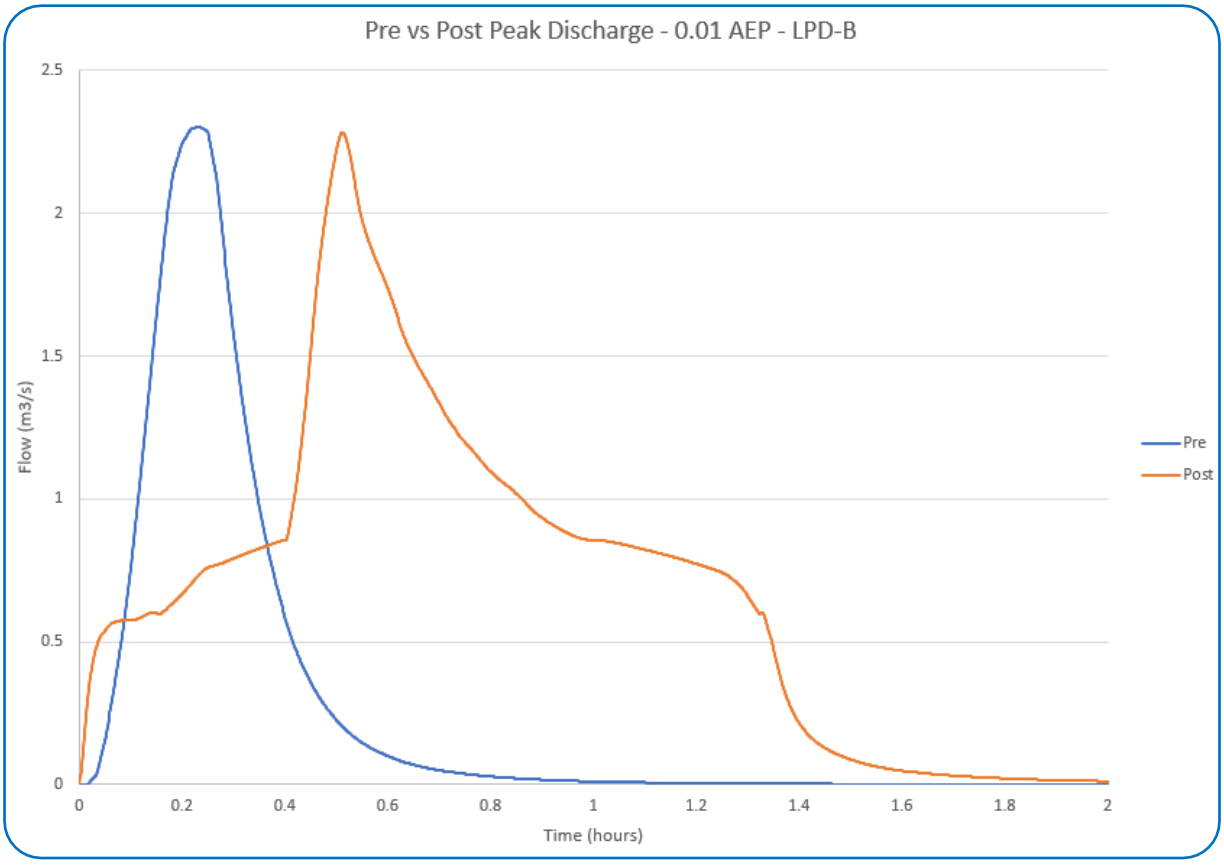

Figure 6.2 Comparison 0.01 AEP Hydrography PD-B

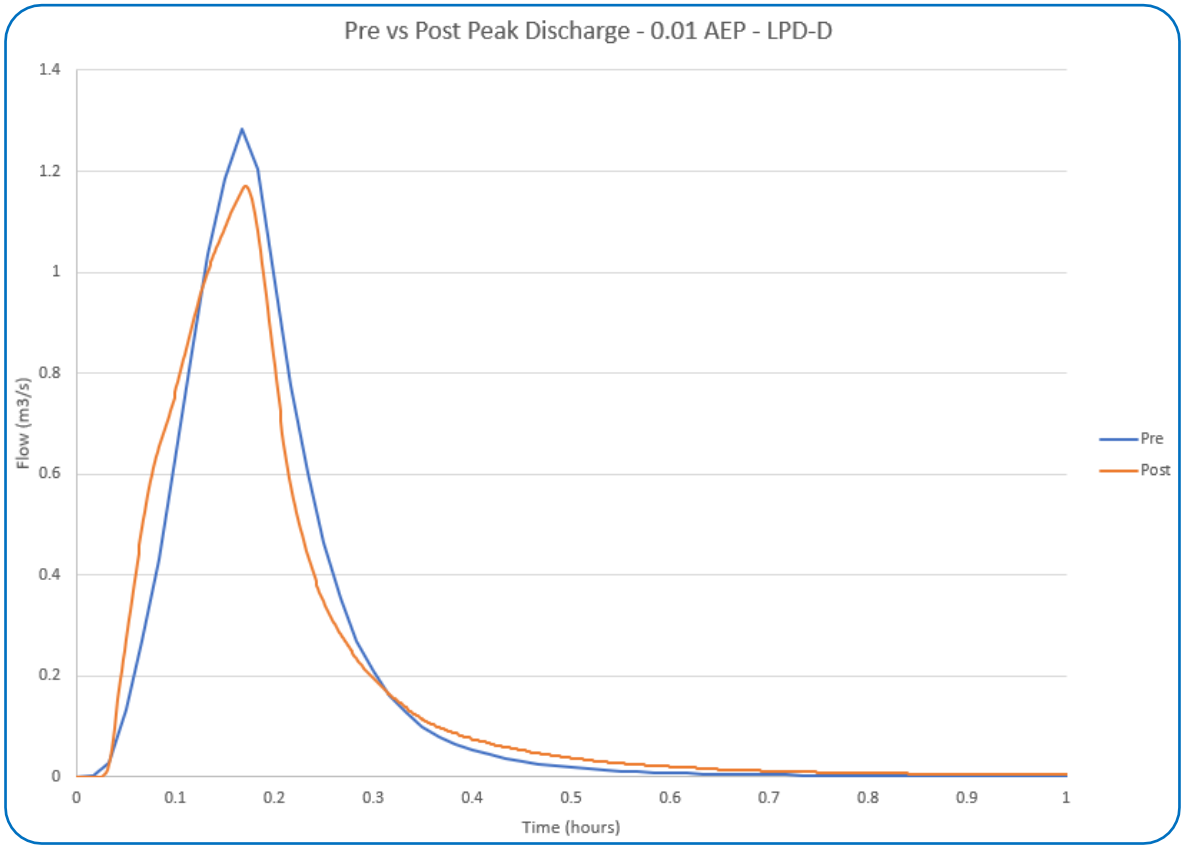

Figure 6.3 Comparison 0.01 AEP Hydrography PD-D

6.2.3 QUDM Minimum Design Safety Standards – Detention Depth

In accordance with the QUDM the depth of water in a detention basin is not to exceed 1.2 m during the 0.049 AEP and is to be limited to less than 1.5 m for the 0.01 AEP. A freeboard of 300 mm should also be achieved, along with a weir flow depth of no greater than 300 mm.

Table 6.4 presents the peak water levels, depths and volumes expected within the detention basins during both the 0.049 AEP and 0.01 AEP. Based on the *xpstorm* modelling of the proposed post-development scenario, the basin designs will not result in water depths outside the recommended design criteria with.

Table 6.4 Detention Storage Details, Depths and Volumes

	Basin A		Basin B		Basin D	
	0.049 (20 yr ARI)	0.01 (100 yr ARI)	0.049 (20 yr ARI)	0.01 (100 yr ARI)	0.049 (20 yr ARI)	0.01 (100 yr ARI)
Base Level (m AHD)	44.5	44.5	36.0	36.0	56.4	56.4
Top of Bund Level (m AHD)	46.0	46.0	37.5	37.5	57.0	57.0
Weir Level (m AHD)	45.57	45.57	37.0	37.0	56.75	56.75
Peak Water Surface (m AHD)	45.62	45.7	37.09	37.17	56.87	56.90
Peak Depth of Water (m)	1.12	1.2	1.09	1.17	0.47	0.50
Peak Volume (m^3)	1643	1856	714	808	51	54
Freeboard Achieved (m)	0.38	0.30	0.41	0.33	0.13	0.10
Depth of Weir Flow (m)	0.05	0.13	0.09	0.17	0.12	0.15

6.2.4 Sensitivity Analysis

In accordance with the requirements of QUDM Section 5.08.2, consideration has been given to the consequences of fully blocked outlets within each basin. Table 6.5 illustrates the expected peak water levels within each basin, should blockage occur. In this event, water levels would increase and flows would be discharged over the high flow weir structures.

Table 6.5 Sensitivity Analysis Results for 0.01 AEP Event

Basin ID	Peak Water Level (m AHD)	Top of Bund (m AHD)	Depth of Weir Flow (m)
Basin A	45.88	46.0	0.31
Basin B	37.26	37.5	0.26
Basin D	56.96	57.0	0.21

Based on the proposed basin and weir configurations, peak water levels would not be expected to exceed the Top of Bund during the 0.01 AEP event for all three (3) basins. The expected maximum depth of flow over the each weir has been modelled at less than 0.3 m.

6.2.5 QUDM Design Safety Standards – Inlet Grates

In accordance with Section 12.3 of the Queensland Urban Drainage Manual an initial safety risk assessment has been undertaken to determine the need for inlet safety screens for any of the proposed inlet headwalls. This risk assessment has identified that the proposed Q2 bypass pipe located on the downstream end of External Catchment EXT1 possess a potential safety risks. This pipe will have length greater than 60 m and an internal travel time of over 10 seconds.

Given the potential safety risk associated with this conduit an inlet screen, designed in accordance with Section 12.5 of QUDM, will be needed.

6.3 Lawful Point of Discharge

The criteria for determining a Lawful Point of Discharge (LPD) as specified within the Queensland Urban Drainage Manual (2016) is as follows:

(i) Will the proposed development alter the site's stormwater discharge characteristics in a manner that may substantially damage a third party property?

- If not, then no further steps are required to obtain tenure for a lawful point of discharge (assuming any previous circumstances and changes were lawful).
- If there is a reasonable risk of such damage then consider (ii) or (iii).

(ii) Is the location of the discharge from the development site under the lawful control of the local government or other statutory authority from whom permission to discharge has been received? This will include a park, watercourse, drainage or road reserve, stormwater registered drainage easement, or land held by local government (including freehold land).

- If so, then no further steps are required to obtain tenure for a lawful point of discharge
- If not, then consider issue (iii). A land owner or regulator may require that the developer obtain an authority to discharge as described in (iii) in order for the stormwater to ultimately flow to a location described in (ii).

(iii) An authority to discharge over affected properties will be necessary. In descending order of certainty, an authority may be in the form of:

- Dedication of a drainage reserve or park;
- A registered easement for stormwater discharge/works; or
- Written approval.

The locations of the proposed points of discharge for each stormwater outlet are shown on Drawing DWG-200 – Appendix B. All the points of discharge have been aligned and designed so as to not result in any impacts that would substantially damage a third party property.

6.4 Quality Control – Pollutant Reduction

In accordance with the State Planning Policy for Healthy Waters and the Queensland Water Quality Guidelines (2009), treatment measures have been included to achieve the minimum mean annual load based reductions of 80% for Suspended Sediment; 60% for Total Phosphorus, 45% for Total Nitrogen; and 90% for Gross Pollutants.
The Model for Urban Stormwater Improvement Conceptualisation (*MUSIC v6*) has been used to estimate the potential pollutant loads generated by the development and to size the proposed

treatment measures. The following sections outline the parameters relied upon within the *MUSIC v6* modelling.

6.4.1 Rainfall and Evapotranspiration Data

Rainfall and evapotranspiration data has been obtained from the Bureau of Meteorology (BOM) rainfall station and is included within Table 6.6 below.

Table 6.6 Meteorological and Rainfall Runoff Data Reporting

Station	40584 Hinze Dam
Period	1/01/1976 to 31/12/1985 (10 years)
Time step	6 minute
Mean annual rainfall (mm)	1371
Evapotranspiration	1539

6.4.2 Developed Case - Catchment Parameters

The developed site has been modelled as an Urban Residential Land use. Each internal catchment has been split into roof, road and ground level source nodes. Table 6.7 summarises the sub-catchment areas and Drawing DWG-210 – Appendix B presents the sub-catchment delineation. The pollutant export and runoff parameters for each sub catchment adopted is based on the data from the Water by Design *MUSIC v6* Modelling Guidelines (2010), as summarised in Table 6.8 and 6.9.

Table 6.7 *MUSIC v6* Sub-Catchment Areas

Catchment ID	Land Use	Area (ha)	Total Impervious (%)
Catchment A1	Urban Residential - Road	0.94	60
	Urban Residential - Roof	1.08	100
	Urban Residential - Ground Level	1.20	20
Catchment A2	Urban Residential - Road	0.91	60
	Urban Residential - Roof	1.05	100
	Urban Residential - Ground Level	1.26	20
Catchment B	Urban Residential - Road	1.40	60
	Urban Residential - Roof	1.72	100
	Urban Residential - Ground Level	1.56	20
Catchment C	Urban Residential - Road	0.45	60
	Urban Residential - Roof	0.60	100
	Urban Residential - Ground Level	0.78	20
Catchment D	Urban Residential - Road	0.48	60
	Urban Residential - Roof	0.54	100
	Urban Residential - Ground Level	0.70	20

Table 6.8 Rainfall Runoff Parameters

Parameter	All Nodes
Land use	Residential
Rainfall threshold (mm)	1
Soil storage capacity (mm)	500
Initial storage (% capacity)	10
Field capacity (mm)	200
Infiltration capacity coefficient a	211
Infiltration capacity exponent b	5.0
Initial depth (mm)	50
Daily recharge rate (%)	28
Daily baseflow rate (%)	27
Daily deep seepage rate (%)	0

Table 6.9 Pollutant Export Parameters

Flow Type	Surface Type	Total Suspended Solids (log mg/L)		Total Phosphorous (log mg/L)		Total Nitrogen (log mg/L)	
		Mean	Std Dev.	Mean	Std Dev.	Mean	Std Dev.
Urban Residential							
Base Flow	Roof	N/A	N/A	N/A	N/A	N/A	N/A
	Road	1.00	0.34	-0.97	0.31	0.20	0.20
	Ground	1.00	0.34	-0.97	0.31	0.20	0.20
Storm Flow	Roof	1.30	0.39	-0.89	0.31	0.26	0.23
	Road	2.43	0.39	-0.30	0.31	0.26	0.23
	Ground	2.18	0.39	-0.47	0.31	0.26	0.23

6.4.3 Treatment Measures

In order to determine the design requirements for the necessary stormwater treatment measures, key "Treatment Nodes" were added to the *MUSIC v6* model. The following sections outline the modelling parameters relied upon for each "Treatment Node".

Bioretention

It is proposed that bioretention measures be incorporated into the development layout to provide the necessary load based reductions. Bioretention systems operate by capturing and retaining water in an extended ponding area (no more than 400 mm deep for a maximum of four (4) days to prevent anaerobic conditions, plant death and insect breeding), before filtering through a soil media. The devices remove pollutants via the following physical processes:

- Sedimentation in the extended detention storage;
- Filtration by filter media;
- Nutrient uptake by biofilms;
- Nutrient adsorption and pollutant decomposition by soil bacteria; and
- Adsorption of metals and nutrients by filter particles (Somes & Crosby, 2007).

In accordance with Water by Design Guidelines, Table 6.10 summarises the treatment node parameters used in the *MUSIC v6* modelling whilst Figure 6.4 provides typical design parameters for the proposed bioretention devices.

Table 6.10 Bioretention Parameters

Parameter	Bioretention A	Bioretention B	Bioretention C	Bioretention D
Surface area (m^2)	2 x 320	470	205	165
Extended detention depth (m)	0.3	0.3	0.3	0.3
Filter area (m^2)	2 x 290	420	175	140
Unlined filter media perimeter (m)	0.01	0.01	0.01	0.01
Saturated hydraulic conductivity (mm/hr)	200	200	200	200
Filter depth (m)	0.7	0.7	0.5	0.5
TN content of filter media (mg/kg)	400*	400*	400*	400*
Proportion of organic material in filter (%)	< 5	< 5	< 5	< 5
Orthophosphate content of filter media (mg/kg)	30*	30*	30*	30*
Is the base lined?	Yes	Yes	Yes	Yes
Effectiveness of plant TN removal	Effective	Effective	Effective	Effective
Overflow weir width (m)	Surface Area/10	Surface Area/10	Surface Area/10	Surface Area/10
Exfiltration rate (mm/hr)	0.00	0.00	0.00	0.00
If an exfiltration rate has been used, have node water balance losses been used in calculation of treatment train effectiveness?	N/A	N/A	N/A	N/A
If exfiltration rate has been used, is the exfiltration rate justified?	N/A	N/A	N/A	N/A
Underdrain present?	Yes	Yes	Yes	Yes
Submerged zone with carbon present?	No	No	No	No
Depth of submerged zone (m)	N/A	N/A	N/A	N/A
Confirmation that K and C* remain default?	Yes	Yes	Yes	Yes
Sediment Forebay Required (>2.5 ha contributing catchment)	Yes	Yes	No	No

*As per Healthy Land and Water Recommendations for *MUSIC v6* modelling

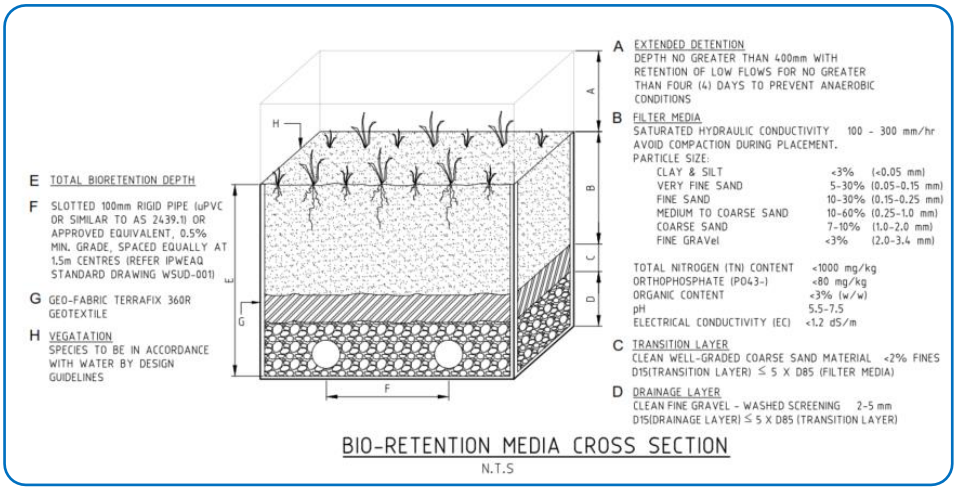

Figure 6.4 Bioretention specifications

Coarse Sediment Forebay

As the contributing catchment to bioretention basins A and B will greater than 2.5 ha a coarse sediment forebay will be installed at each piped discharge point into the bioretention basin. The forebay will limit sediment accumulation over the bioretention filter surface and reduce the potential for clogging. This will also help to reduce the frequency of maintenance required for the bioretention systems. Table 6.11 provides a summary of the sediment forebay calculations and requirements. The sediment forebays have been excluded from the *MUSIC v6* modelling. It is noted that basin A has two (2) inlet points.

Table 6.11 Sediment Forebay Parameters

Forebay ID	Contributing Catchment Area (ha)	Q_{3month} Inflow Rate (m^3/s)	Settling Velocity (m/s)	Area (m^2)	Depth (m)	Capture Efficiency (%)
A1	3.21	0.272	0.1	31	0.3	80
A2	3.22	0.273	0.1	31	0.3	80
B	4.68	0.445	0.1	51	0.3	80

6.4.4 Bioretention Basin Staged Construction and Establishment

In accordance with the Water by Design Construction and Establishment Guidelines: Swales Bioretention Systems and Wetlands (C & E Guidelines), inflow of sediment-laden runoff during the building stage is a major risk to the successful and long-term functioning of bioretention systems.

During the building phase of developments, sediment can seal the surface of the filter media, move into and clog the filter media and accumulate in the under-drainage. Within the C & E Guidelines, there are four (4) options recommended to overcome the challenges associated with delivering bioretention systems. These generally include the following options:

- Option 1: Surface Protection
- Option 2: Bypass flows and early establishment of vegetation;
- Option 3: Sediment basin and bioretention function; and
- Option 4: Leave as sediment basin.

It is recommended that Option 1 method for staged construction and establishment of the bioretention system be implemented for the proposed development. This method will generally include the following:

- Construction of the civil infrastructure, including under-drainage and media, for the bioretention system;
- Installation of a protective layer on the surface of the filter media, allowing it to operate as a shallow sediment basin during the building phase. It is recommended that filter cloth (geofab), topsoil and turf be installed for surface protection; and
- When 80-90% of building in the catchment is complete, remove the protective layers and establish vegetation in the bioretention system.

For details of the procedure and order of construction for Option 1 method please refer to Section 3.9 (Steps 1-40) of the C & E Guidelines. The relevant sign off forms have been included as Appendix C.

In accordance with the *Water by Design Construction and Establishment Guidelines: Swales Bioretention Systems and Wetlands (C& E Guidelines)*, inflow of sediment-laden runoff during the building stage is a major risk to the long-term functioning of bioretention systems.

It is proposed that the Option 4 method for staged construction and establishment be implemented for the proposed development. This method will generally include the following:

- Earthworks and bulking out of basin;
- Install the hydraulic structures;
- Allow system to operate as a sediment basin during the building phase; and
- When 80-90% of building in the catchment is complete, the bioretention system can be cleaned and profiled, the under-drainage and bioretention media installed, and the vegetation planted and established.

For details of the procedure and order of construction for Option 4 method please refer to Section 3.10 (Steps 1-41) of the C& E Guidelines.

6.4.5 Modelling Results

Results of the *MUSIC v6* modelling for the treatment train effectiveness are summarised in Table 6.12. The results indicate the 80%, 60%, 45% and 90% reduction target for TSS, TP, TN and gross pollutants respectively are achieved for the rainfall data set simulated at both assessment points. Screen captures of the *MUSIC v6* modelling results are included as Figures 6.4 and 6.5.

Table 6.12 Treatment Train Effectiveness

Catchment ID	Pollutant	Inflows (kg/yr)	Outflows (kg/yr)	Reduction (kg/yr)	Reduction Achieved (%)	Water Quality Objective (%)
Northern	TSS	17,000	3,240	13,800	**81.0**	80
	TP	34.9	9.56	25.3	**72.6**	70
	TN	206	103	103	**50.0**	45
Southern	TSS	5,220	967	4,250	**81.5**	80
	TP	10.8	2.83	7.97	**73.8**	70
	TN	64.6	31.4	33.2	**51.5**	45

NOTE: All simulations have been run with pollutant export estimation set to “stochastic generation”.

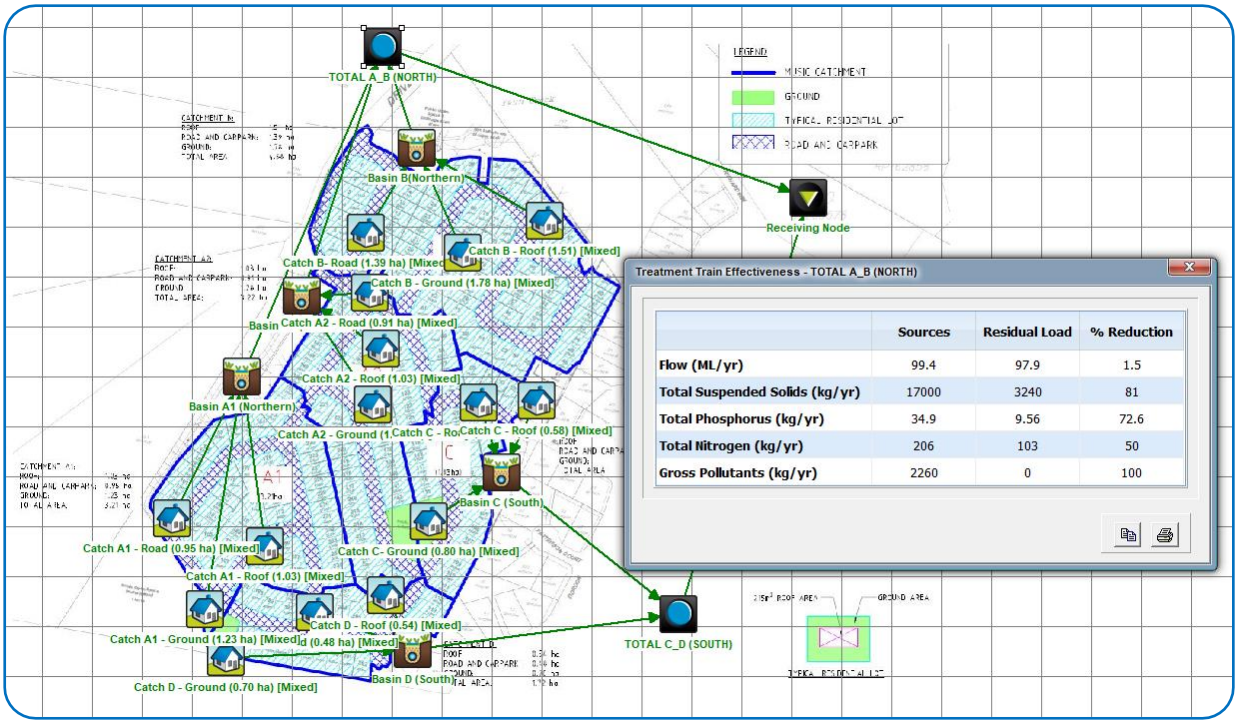

Figure 6.4 Screen Capture of MUSIC Modelling Results

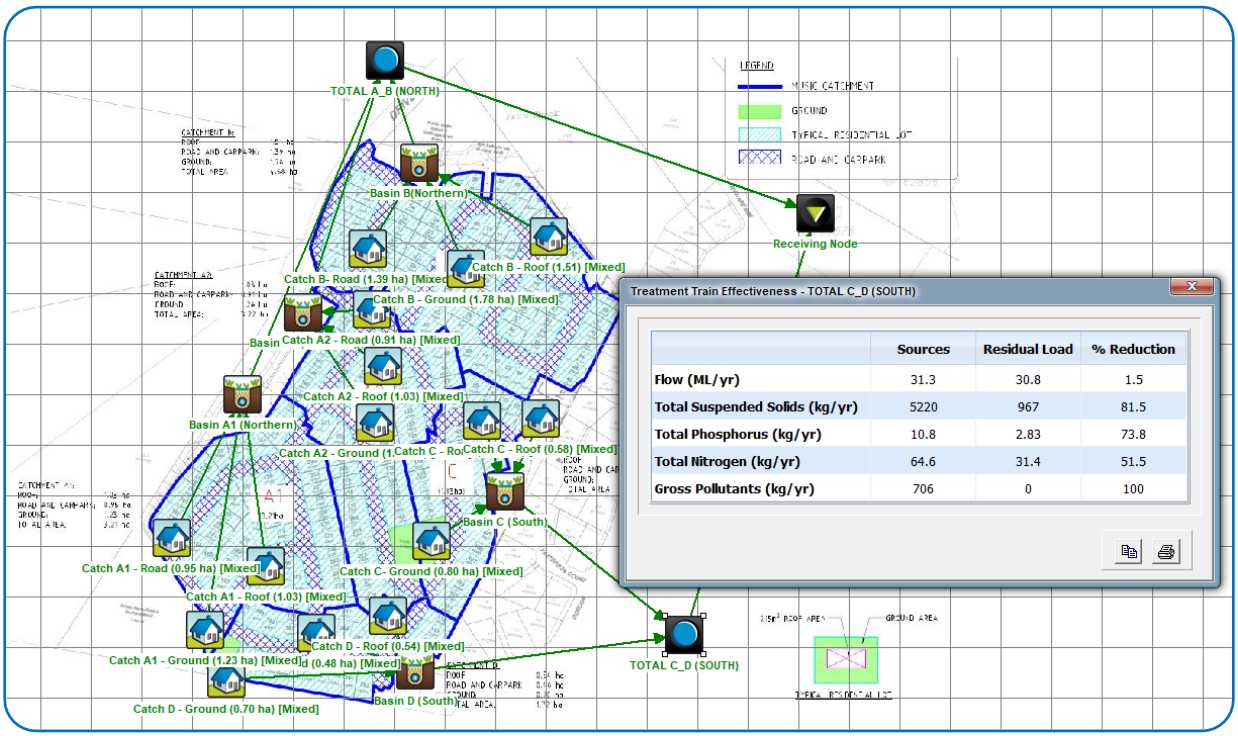

Figure 6.5 Screen Capture of MUSIC Modelling Results

6.5 Water Quality Monitoring and Maintenance

In order to ensure that the stormwater management measures detailed within this management plan function correctly in the long term and to ensure that impacts to downstream receiving environments are mitigated, appropriate operational phase water maintenance and monitoring is to be undertaken. The following sections detail the minimum requirements for each specific control device.

6.5.1 Operational Phase Water Quality Monitoring

Monitoring during the operational phase will be undertaken to determine the impact of activities on the receiving waters. Surface water quality monitoring is to be undertaken at discharge points from the site. Samples should be collected for total suspended solids (TSS), pH, dissolved oxygen (DO), TP, TN and hydrocarbons. Sampling is to be performed in accordance with procedures set out in the Environmental Protection Authority's Water Quality Sampling Manual. A NATA registered laboratory is to be used to analyse the collected samples.

Table 6.13 specifies the parameters and sampling frequencies required. Results of the monitoring program are to be compiled monthly into an ongoing Water Quality Monitoring Report. A copy of the report and monitoring data is to be maintained at all times.

Table 6.13 Operational Phase Water Quality Parameters and Sampling Frequencies

Sampling Parameter	Sampling Frequency
Total Suspended Solids (TSS)	Water quality monitoring will be completed following a rainfall event of 25 mm or greater in any 24 hour period monthly for a minimum period of 12 months, or as specified by the Local Authority conditions of approval for the development.
pH	
Dissolved Oxygen (DO)	
TN	
TP	
Hydrocarbons	

Table 6.14 sets the water quality criteria for discharge water realised from the development site.

Table 6.14 Operational Phase Water Quality Discharge Criteria

Water Quality Parameter	Discharge Criteria
Total Suspended Solids (TSS)	No net deterioration of the downstream receiving environment as a result of discharge from the development.
Turbidity (NTU)	
pH	
DO	
TN	
TP	
Hydrocarbons	

6.6 Operational Phase Device Maintenance

In order for each of the proposed stormwater treatment devices to achieve the necessary pollutant removal efficiencies regular maintenance is necessary. Poorly maintained devices will result in under performance and in some instances may cause leaching of pollutants to downstream receiving environments. Based on the proposed treatment train Table 6.15 details appropriate maintenance regimes for each treatment device.

Table 6.15 Operational Phase Device Maintenance Requirements

Treatment Device	Maintenance Action
Bioretention	Routine inspection to identify obvious increased sediment deposition. Remove sediment when flow within the bioretention is impeded or smothering of vegetation occurs.
	Routine inspection of inlet and outlet pit to identify any areas of scour, litter build up or blockages.
	Tilling of the bioretention surface if there is evidence of clogging.
	Regular watering of vegetation until plants are established.
	Removal and management of invasive weeds.
	Removal and replacement of dead and dying vegetation.
	Regular inspection and removal of litter and gross pollutants.
	Resetting (i.e. complete reconstruction) of the bioretention will be required if the flow within the bioretention system is reduced by 25% due to an accumulation of sediment.
Detention Basin Area	Routine inspection to identify obvious increased sediment deposition. Remove sediment if there is any sign of smothering of vegetation. If necessary reprofile base and revegetate.
	Routine inspection of inlet and outlet structures to identify any areas of scour, litter build up or blockages.
	Regular watering of vegetation until plants are established.
	Removal and management of invasive weeds.
	Removal and replacement of dead and dying vegetation.
	Regular inspection and removal of litter and gross pollutants.
Inlet Pond	Routine inspection to identify obvious increased sediment deposition. Remove sediment accumulation at inflow points. If sediment accumulation occurs within pond to a depth . 50% removal and reprofile base if necessary.
	Routine inspection of inlet and outlet structures to identify any areas of scour, litter build up or blockages.
	Regular watering of vegetation until plants are established.
	Removal and management of invasive weeds.
	Removal and replacement of dead and dying vegetation.
	Regular inspection and removal of litter and gross pollutants.

All material removed during maintenance, whether solid or liquid, is to be disposed of in a manner that does not cause ongoing soil erosion or environmental harm.

7 Hydraulic Assessment

The 1D - 2D hydrodynamic flood model TUFLOW has been utilised to route stormwater through the upper reaches of Yaun Creek and the other minor streams which cross the site. This modelling will confirm:

- The extent of flooding from Yaun Creek;
- The effect of the proposed earthworks on this flooding; and
- Sizes of infrastructure required to route flood flows through the site.

7.1.1 Modelling Procedure

To simulate the peak flow behaviour within the catchment and quantify peak flood depths, discharges, and flow velocities, hydraulic modelling using the 1D/2D hydrodynamic model *TUFLOW* was undertaken. This involved the insertion of inflow hydrographs into the model upstream of the site. The hydrographs have been calculated using *WBNM* software as described in the following sections. Pre-development and post-development scenarios have been modelled using LiDAR and proposed earthworks data respectively.

7.2 Hydrology – *WBNM*

WBNM hydrological software has been utilised to generate hydrographs to represent the contributing catchments. WBNM is a software package which calculates flood runoff from rainfall hyetographs, utilising sub-catchments and flow routings to estimate flood flows at various points within the catchment.

Hydrographs were generated for nominated Annual Exceedance Probability's (AEP)'s with peak discharges derived from the output hydrographs. The following sections detail the catchment parameters used in the *WBMN* modelling.

7.2.1 Design Rainfall

Rainfall data for this report has been based on site specific Intensity-Frequency-Duration (IFD) data acquired from the Bureau of Meteorology summarised in Figure 7.1.

Intensity-Frequency-Duration Table

Location: 27.875S 153.275E Issued: 21/6/2017

Rainfall intensity in mm/h for various durations and Average Recurrence Interval

	Average Recurrence Interval						
Duration	1 YEAR	2 YEARS	5 YEARS	10 YEARS	20 YEARS	50 YEARS	100 YEARS
5Mins	125	158	193	212	239	275	301
6Mins	117	148	181	199	225	258	284
10Mins	96.0	122	149	164	186	214	235
20Mins	70.4	89.3	110	122	138	159	175
30Mins	57.4	72.9	90.1	99.8	113	131	144
1Hr	38.9	49.5	61.7	68.6	78.1	90.6	100
2Hrs	25.2	32.2	40.5	45.3	51.8	60.3	66.8
3Hrs	19.2	24.7	31.2	35.0	40.2	46.9	52.1
6Hrs	12.1	15.6	20.0	22.5	26.0	30.5	34.0
12Hrs	7.78	10.1	13.0	14.8	17.1	20.3	22.7
24Hrs	5.19	6.73	8.80	10.1	11.7	13.9	15.6
48Hrs	3.48	4.53	5.98	6.87	8.04	9.59	10.8
72Hrs	2.65	3.46	4.61	5.30	6.23	7.45	8.42

(Raw data: 50.05, 10.04, 3.48, 89.57, 19.77, 7.33, skew=0.08, F2=4.41, F50=17.18)

© Australian Government, Bureau of Meteorology

Figure 7.1 Adopted Intensity Frequency Data (mm/hr)

7.2.2 Temporal Patterns

Temporal patterns applied to the rainfall data have been extracted from Australian Rainfall and Runoff (1987) for Zone 3. Storm durations of 25, 60, 90, 120, 180, 360, 540, 720, 1440, and 1800 minutes have been analysed for each AEP.

7.2.3 Design Storm Events

This report has analysed a range of storm events which simulate the rainfall from hypothetical storms based on an Average Exceedance Probability (AEP). Table 7.1 lists each modelled AEP storm event and the corresponding Average Occurrence Interval (ARI) and description.

Table 7.1 Design Storm Events

Annual Exceedance Probability (AEP)	Average Occurrence Interval (ARI)	Storm Description
0.632	1 year	Storm rainfall total has a 63.2% probability of being exceeded in any one year
0.393	2 years	Storm rainfall total has a 39.3% probability of being exceeded in any one year
0.181	5 years	Storm rainfall total has a 18.1% probability of being exceeded in any one year
0.095	10 years	Storm rainfall total has a 9.5% probability of being exceeded in any one year
0.049	20 years	Storm rainfall total has a 4.9% probability of being exceeded in any one year
0.02	50 years	Storm rainfall total has a 2% probability of being exceeded in any one year
0.01	100 years	Storm rainfall total has a 1% probability of being exceeded in any one year

7.2.4 Land Uses

The land uses within each sub-catchment have been used to determine the impervious fraction relied upon in hydrological modelling. The land use parameters for this study are based upon the City of Gold Coast planning scheme assuming fully developed catchments. Table 7.2 below summarises the percentage impervious adopted for each land use type.

Table 7.2 Fraction Impervious

Land Use Type	Fraction Impervious (%)
Open Space	0
Low Density Urban	40
Rural	20

7.2.5 Infiltration Losses

Infiltration parameters applied to catchments simulate the volume of runoff lost into the soil as initial and continuing values. For the upstream catchment, values of 5 mm initial and 2.5 mm/hr continuing have been applied globally. These values are consistent with recommendations in *Australian Rainfall and Runoff (1987).*

7.2.6 *WBNM* Parameters

The *WBNM* parameters chosen for the hydrological modelling have been chosen in accordance with the *WBNM* documentation with reference to the specific characteristics of the catchment. These values control the sub-catchment lag and routing within each sub-catchment of the model and are listed in Table 7.3 below.

Table 7.3 WBNM Parameters

Parameter	Value
Catchment Lag Parameter	1.6
Impervious Lag Factor	0.1
Stream Lag Factor	1

7.2.7 Catchment Delineation

The hydrological assessment analysed the total catchment of Yaun Creek and delineated catchments based on:

- LiDAR survey obtained from the Department of Natural Resources and Mines; and
- land uses based on Council mapping and aerial photography.

A total catchment area of approximately 150 ha was delineated based on 22 sub-catchments. The area of each sub-catchment is shown within Table 7.4. Figure 7.2 illustrates the catchment location and extent.

Table 7.4 Catchment Characteristics

Catchment ID	Catchment Area (ha)	Fraction Impervious (%)
A	7.843	10
B	4.07	10
C	6.507	5
D	6.354	10
E	6.843	5
F	5.654	10
G	1.983	10
H	4.481	5
I	6.978	5
J	8.565	0
K	4.221	0
L	9.895	0
M	7.573	0
N	8.199	0
O	11.068	0
P	6.273	0
Q	10.525	0
R	9.664	0
S	7.116	0
T	5.426	5
U	4.05	0
V	5.715	0

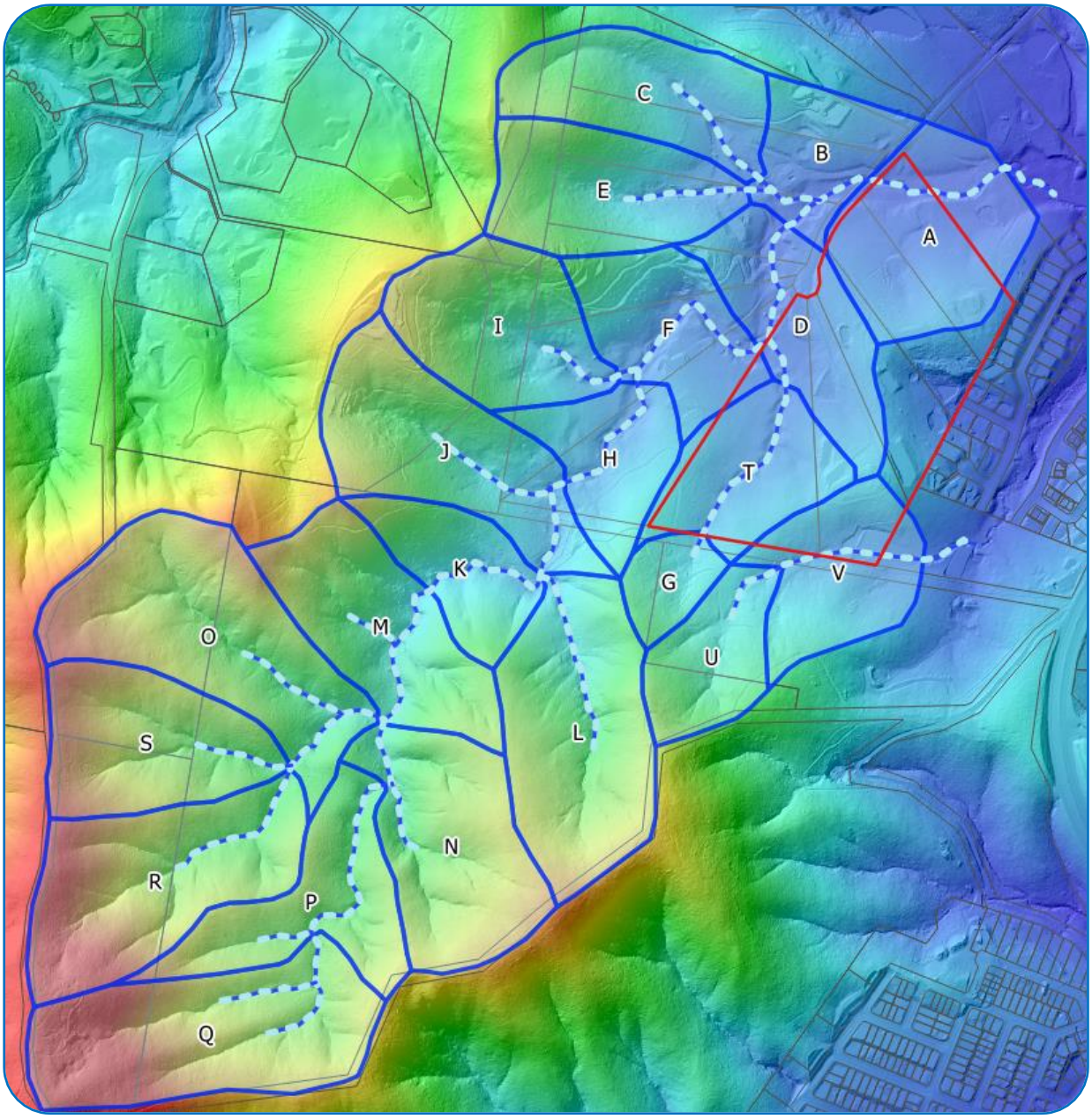

Figure 7.2 Catchment Plan

7.2.8 Critical Storm Duration

In order to determine the critical storm event for the Yaun Creek catchment, *WBNM* was relied upon to identify the storm duration that produced the highest peak flow immediately downstream of the site. Table 7.5 below presents the results of this assessment and concludes that the 90 minute duration storm is critical. Figure 7.3 presents the hydrographs for each duration.

Table 7.5 Critical Storm Durations

AEP	0.01 AEP Peak Flow (m^3/s)	Storm Duration (mins)
0.01	13.85	25
0.01	24.21	60
0.01	25.90	90
0.01	25.73	120
0.01	24.20	180
0.01	20.42	360
0.01	21.30	540
0.01	18.84	720
0.01	22.77	1440
0.01	17.85	1880

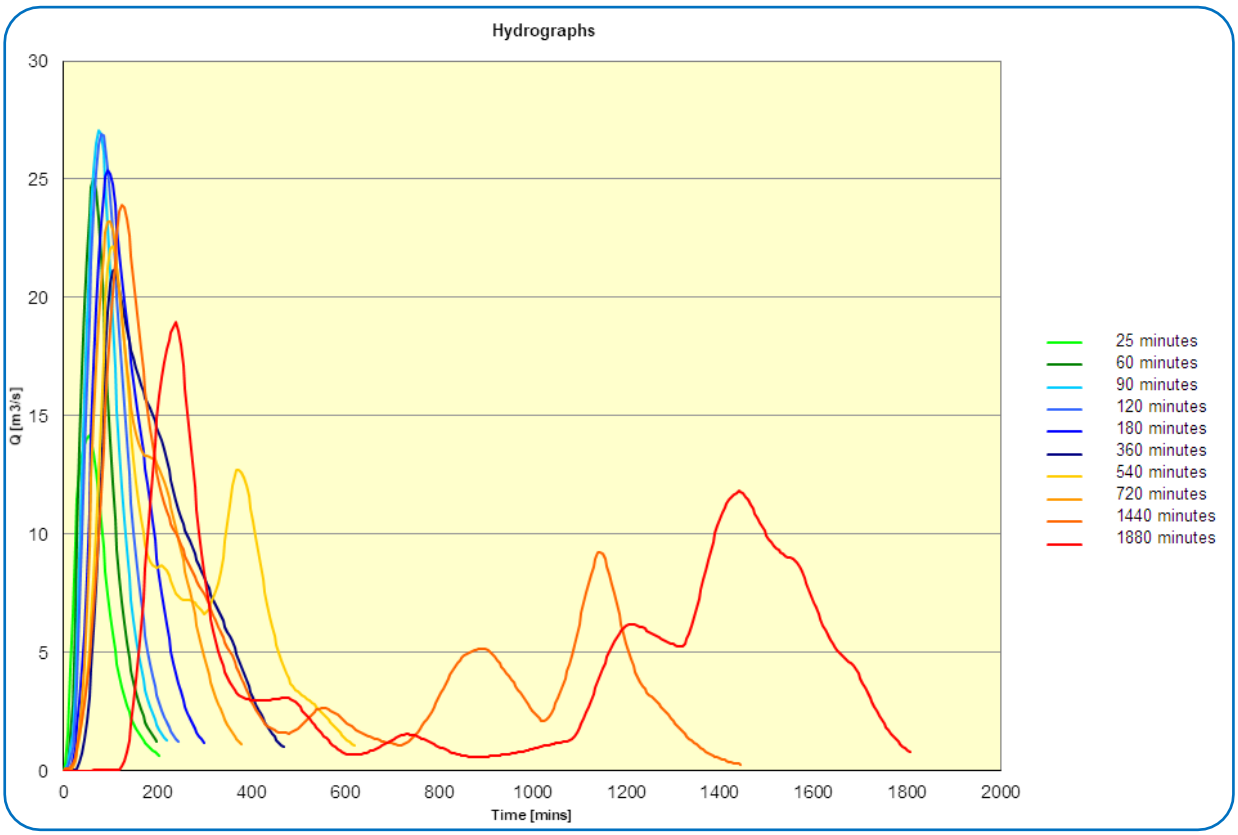

Figure 7.3 All Storm Duration Hydrographs – 0.01 AEP

7.2.9 Calculated Peak Flows

The expected inflow peak discharges generated for the critical storm event were extracted from the catchment hydrographs generated within *WBMN*. The peak result for each catchment are summarised within Table 7.6 below.

Table 7.6 *WBMN* Peak Catchment Discharge – 0.01 AEP

Catchment ID	Peak Flow (m^3/s)
A	2.819
B	1.586
C	2.316
D	2.351
E	2.419
F	2.123
G	0.83
H	1.67
I	2.461
J	2.799
K	1.529
L	3.154
M	2.526
N	2.7
O	3.457
P	2.153
Q	3.318
R	3.093
S	2.397
T	1.977
U	1.474
V	1.989

7.3 Hydraulics – *TUFLOW*

7.3.1 Digital Terrain Model (DTM)

The pre-development modelling scenario has relied upon LiDAR data of the site and contributing catchments. The post-development scenario utilises the preliminary civil design DTM provided by Cozens Regan Group. The proposed earthworks extends into the Yaun Creek inundation area on the western side of the site. The small catchment to the south of the site is to be routed through the site using a 0.393 AEP pipe, with the remainder flowing overland through the road reserve. The flowpath in the south-eastern corner of the site is to be piped under the proposed road.

7.3.2 Downstream Boundary Condition

The downstream boundaries of the model have been applied as free draining outlets. This arrangement is considered appropriate due to the relative steepness of the flowpaths and the absence of regional flooding in the vicinity.

7.3.3 Manning's Coefficient

Based on recommendations from; *Chow. V. T, (1959) Open Channel Hydraulics*, *Tweed Shire Council Development Design Specification D5 (V1.4),* the following Manning Coefficients were applied:

- Concrete/Road: 0.020
- Open water: 0.030
- Grassed areas: 0.050
- Light Vegetation : 0.060
- Dense Vegetation: 0.080

Figure 7.4 below presents the *TUFLOW* model layout.

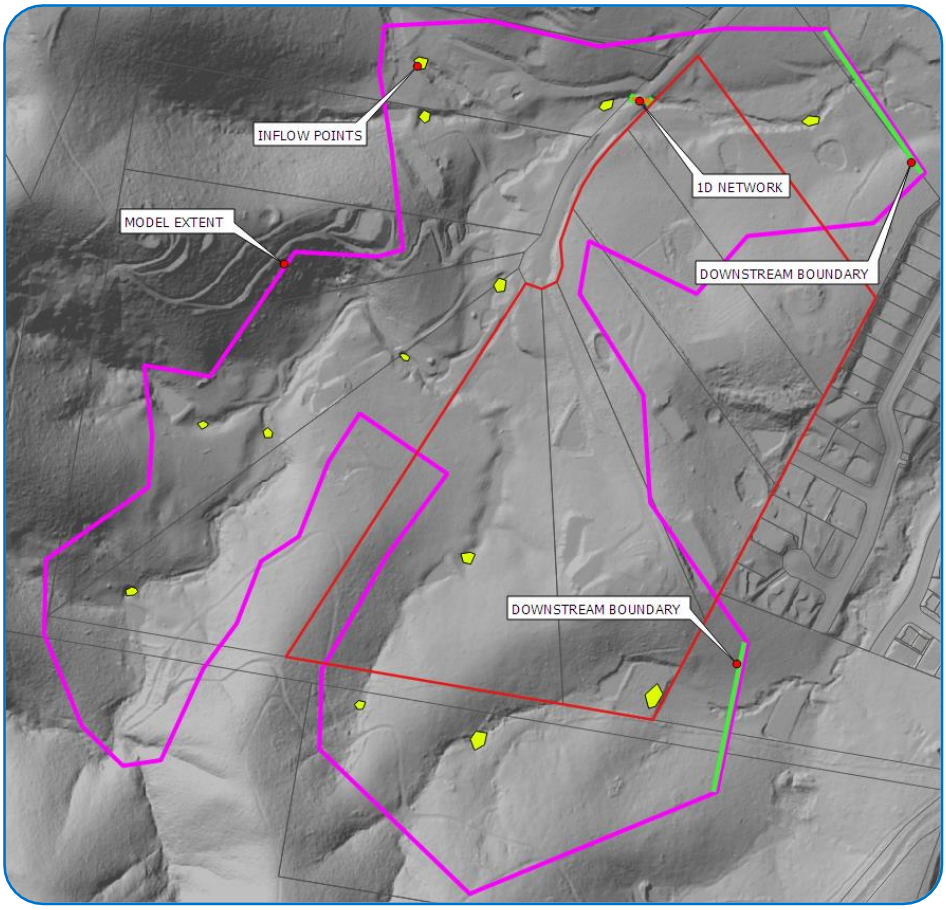

Figure 7.4 *TUFLOW* Model Layout

7.3.4 Hydraulic Model Simulation

Simulation of the adopted design storm events was undertaken based on:

- Applying the inflow hydrographs within the *TUFLOW* model; and
- Applying the appropriate downstream boundary condition to the hydraulic model.

Key model outputs describing flood behaviour include peak water levels, flows and velocities. Results of the hydraulic analysis have been presented in the following sections for the existing and design scenarios.

7.4 Modelling Results

The following sections provide a summary of the 2D modelling results for the pre and post-development scenarios.

7.4.1 Pre-Development Scenario

Pre-development flood depths and extents estimated by *TUFLOW* for the 0.01 AEP storm is presented in Figure 7.5 below. The existing flow regime can be described as follows:

- Yaun Creek briefly crosses the western edge of the site and then again in the northern corner downstream of Courtney Drive;
- Runoff from two external catchments to the south flow through the site; and
- Peak flood depths in Yaun Creek are approximately 3.6 m immediately upstream of Courtney Drive.

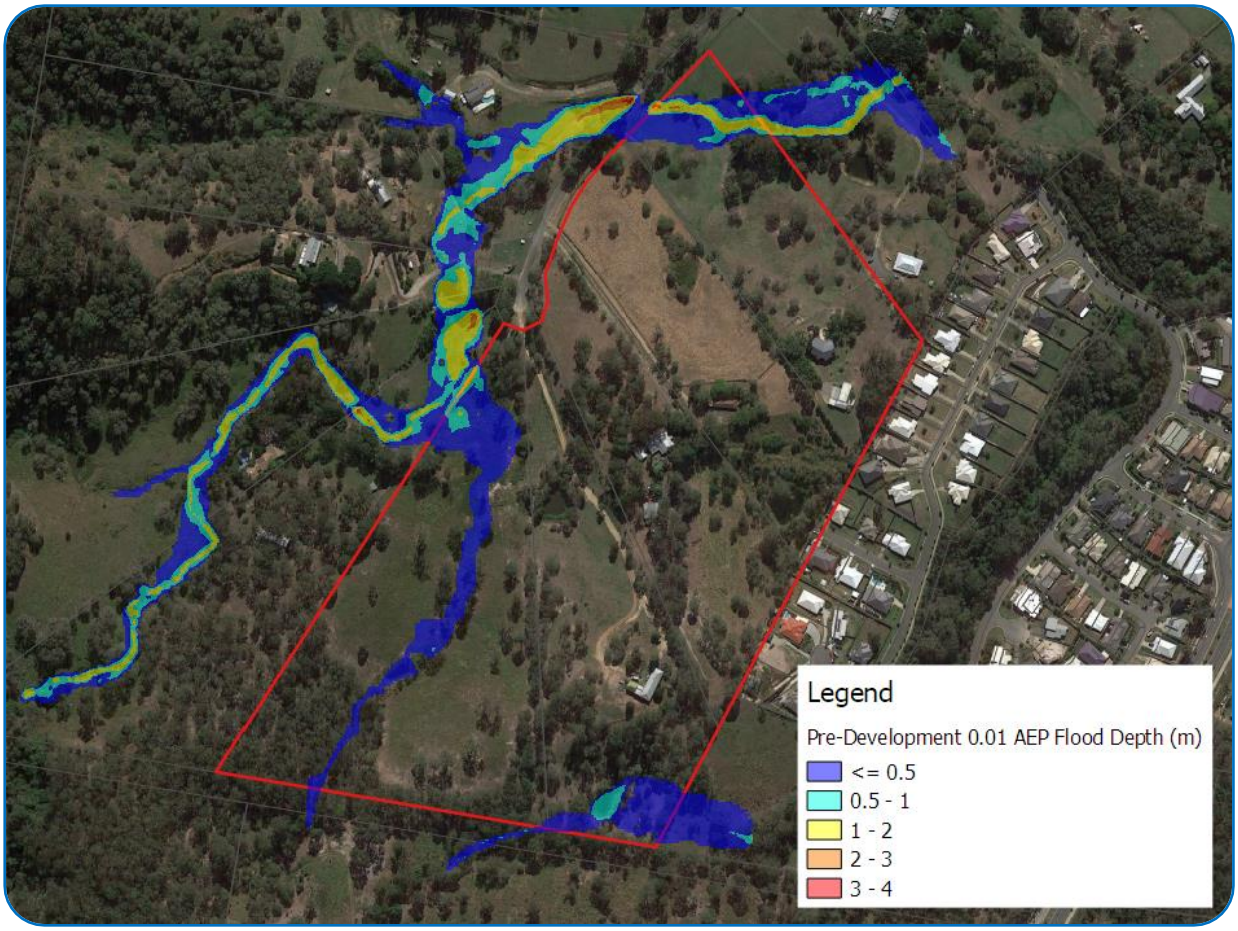

Figure 7.5 0.01 AEP Peak Flood Depth – Pre-Development

7.4.2 Post-Development Scenario

Post-development flood depths and extents estimated by *TUFLOW* for the 0.01 AEP storm are presented in Figure 7.6 below. Flow characterises in the post-development case can be summaries as follows:

- flow from Yaun Creek in unimpeded by the proposed site earthworks;
- The south-western external catchment is routed through the site using a 0.393 AEP pipe (600 mm diameter), with overland flow down the road reserve for larger events. The details of this overland flow are to be confirmed at the operational works design phase so as to ensure compliance with QUDM longitudinal flow requirements;
- The south eastern catchment is routed around the proposed development to the Council controlled park area; and
- Peak flood depths in Yaun Creek are approximately 3.6 m immediately upstream of Courtney Drive.

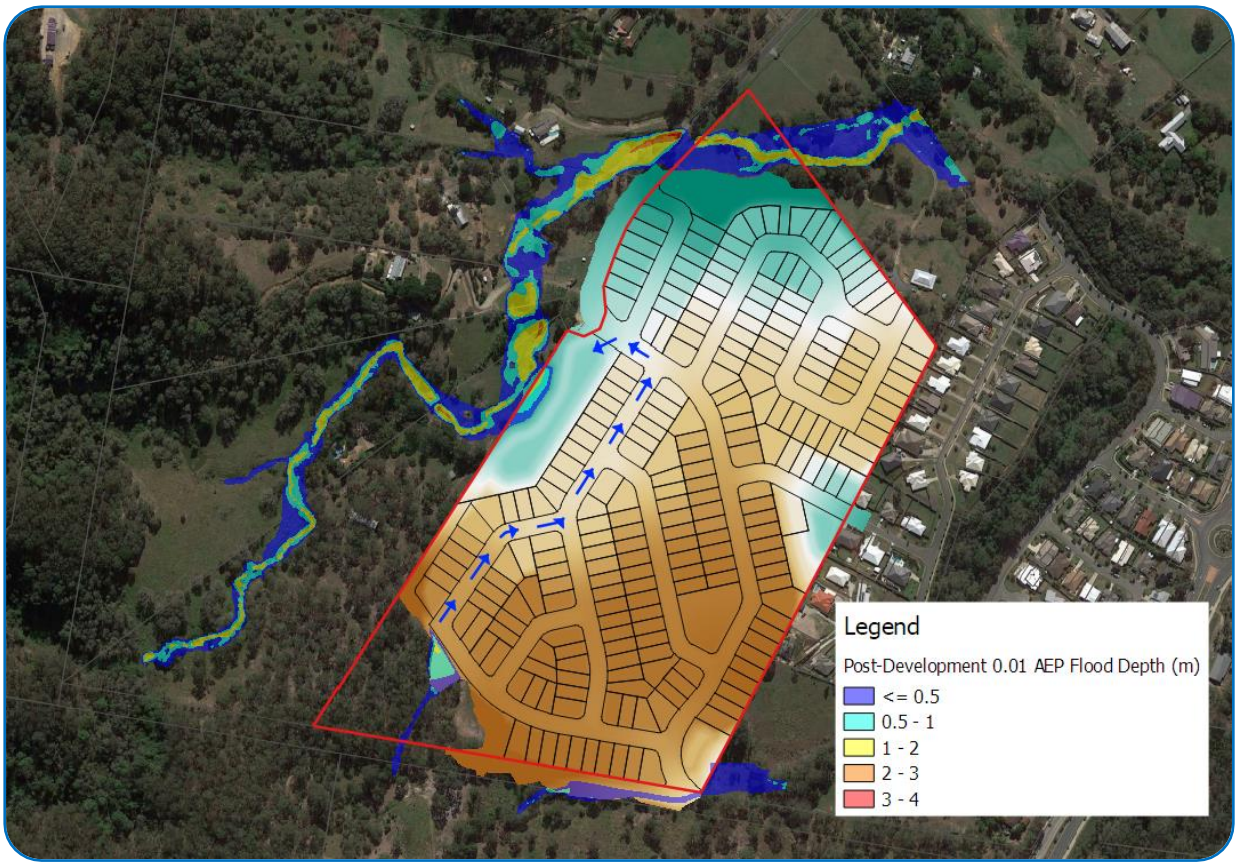

Figure 7.6 0.01 AEP Peak Flood Depth – Post-Development

7.5 Impact Assessment

In order to assess the impact of the proposed earthworks, a spatial analysis of the peak pre and post-development flood levels has been undertaken. The result of this analysis in presented in Figure 7.7 for 0.01 AEP storm event. These results indicate that the proposed earthworks will not cause any flood increase or nuisance to neighbouring properties.

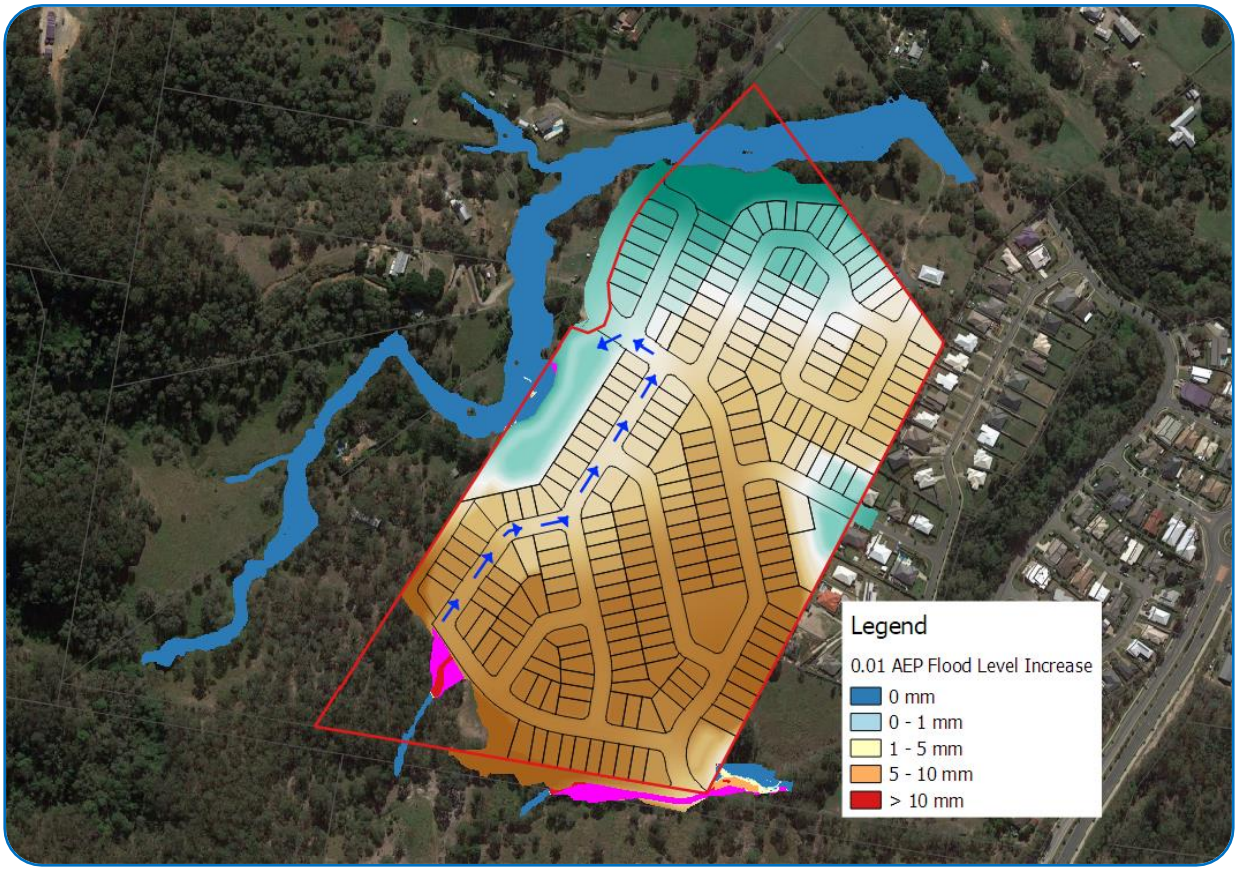

Figure 7.7 0.01 AEP Impact Plot

8 Conclusions

The report presents a comprehensive review of available Stormwater Quality Improvement Devices (SQID) and stormwater Best Management Practices (BMP) to ensure that the proposed development adequately addresses the management of stormwater quantity and quality during the operational phases of the development.

A total of four (4) stormwater treatment basins have been proposed. Three (3) of these basins (Basins A, B and D) will be combined bioretention/detention basin for quality and quantity management. The remaining Basin C, will only be required for treatment of pollutant loads, as catchment reductions in the post-development case have resulted a the reduction of peak discharge.

The results of xpstorm modelling indicate that the inclusion of the three (3) proposed detention basins will mitigate the expected increases in peak discharge at PD-A, PD-B, and PD-D during all modelled AEP events.

All internal catchment will be directed to bioretention measure for quality treatment. MUSIC v6 modelling indicates that reduction target for TSS, TP, TN and gross pollutants of 80%, 60%, 45% and 90% respectively can be achieved for the rainfall data set simulated,

In order to simulate pre- and post-development flooding across the site the 1D - 2D hydrodynamic flood model TUFLOW has been utilised to route stormwater through the upper reaches of Yaun Creek and the other minor streams.

Spatial analysis of the peak pre and post-development flooding indicates that the proposed earthworks required to create the subdivision will not cause any flood increase or nuisance to neighbouring properties.

The level of detail provided within this report is suitable for development assessment only and should not be relied upon for construction purposes. A Detailed Stormwater Management Plan containing detailed engineering designs will be needed to finalise the stormwater concepts presented in this report. Detailed design documentation should be prepared in conjunction with civil operational works.

This report has been reviewed by a Registered Professional Engineer of Queensland (RPEQ), and certification has been provided that if the design parameters set out in this report are included within the development:

- there should be no worsening in peak discharge as a result of the proposed development; and
- stormwater pollutant load reductions in accordance with best practice should be achieved.

9 RPEQ Certification

I am aware that Council may rely upon the contents and findings of this assessment for the purposes of development assessment. In my opinion, the Council can rely upon the information contained within the report and there are no reservations or qualifications in respect to the information other than set out in the report.

I confirm that if the design parameters set out in this report are included within the development:

- there should be no worsening in peak discharge, as a result of the proposed development that would result in actionable damage to downstream properties; and
- stormwater pollutant load reductions in accordance with best practice should be achieved.

16 April 2019

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Brad Comley **RPEQ 17706** **DATE**

10 References

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Appendix A

Healthy Waters Code

City Plan code template

This code template supports the preparation of a development application against either the acceptable outcome(s) or performance outcome(s) contained in the code. Development assessment rules are outlined in **Section 5.3.3** of the City Plan.

Please note:

For assessment against the overall outcomes, refer to the appropriate code.

Impact assessable development requires assessment against the strategic framework prior to using this template.

9.4.5 Healthy waters code

9.4.5.1 Application

This code applies to assessing material change of use or reconfiguring a lot for development where indicated within **Part 5 Tables of assessment** unless either of the following circumstances apply:

(1) No increase in impervious area is required onsite for the development.

(2) A stormwater quality and quantity management plan previously approved by the Council has been fully implemented within the existing development layout.

Note: Where a development proposal meets either (1) and (2) above, this code is not applicable.

When using this code, reference should be made to **Section 5.3.2** and, where applicable, **Section 5.3.3,** in **Part 5**.

9.4.5.2 Purpose

(1) The purpose of the Healthy waters code is to protect the quality of the city's waters from the impacts of development.

(2) The purpose of the code will be achieved through the following overall outcomes:

(a) Urban stormwater quality management, wastewater management, and management of waters are based on the following principles:

(i) Development and construction activities are conducted in accordance with design objectives to achieve the water quality objectives, as specified in the *Environmental Protection (Water) Policy 2009*.

(ii) The ongoing management of urban stormwater quality incorporates design objectives that reflect the regional climate and the site's landscape characteristics.

(iii) Development is undertaken in accordance with best practice environmental management.

(iv) Development avoids adverse impacts on the City of Gold Coast's waters or, where this is not feasible, adverse impacts are minimised.

(b) Water resource catchments are protected from contamination by chemicals.

(c) The drainage capacity of the Woongoolba Flood Mitigation Scheme Area for rainfall events up to 1 in 10 year 72 hours is maintained (contained within the Scheme drains within a 4 day period) and this capacity is not be eroded due to cumulative impact of development.

9.4.5.3 Criteria for assessment

Table 9.4.5-2: Healthy waters code – for assessable development

Performance outcomes	Acceptable outcomes	Does the proposal meet the acceptable outcome? If not, justify how the proposal meets either the performance outcome or overall outcome
Stormwater quality		
PO1 Development appropriately manages stormwater quality to: (a) protect natural ecosystems; (b) integrate stormwater treatment into the urban landscape; (c) protect water quality; (d) reduce runoff and peak flows; and (e) meet the water quality objectives and environmental values for Queensland waters. **Note: Water quality objectives and environmental values for Queensland waters are contained within *Schedule 1* of the *Environmental Protection (Water) Policy 2009*. Water quality objectives are locally specific and vary between and within river catchments.**	**AO1.1** Where development is: (a) for a dwelling house, dual occupancy or multiple dwelling on a lot less than 5000m²; or (b) light industry or business activity on a lot less than 2500m², it complies with the 'Deemed to comply' requirements detailed in the **Stormwater quality management guidelines** in **SC6.9 City Plan policy – Land development guidelines**.	**N/A**
	AO1.2 Where development is: (a) for a dwelling house, dual occupancy or multiple dwelling on a lot equal to or more than 5000m² but less than 1.25 ha; or (b) light industry or business activity on a lot equal to or more than 2500m² but less than 1.25 ha; (c) it complies with the 'Deemed to comply' requirements detailed in the **Stormwater quality management guidelines** in **SC6.9 City Plan policy – Land development guidelines**.	**N/A**

Performance outcomes	Acceptable outcomes	Does the proposal meet the acceptable outcome? **If not, justify how the proposal meets <u>either</u> the performance outcome or overall outcome**
	AO1.3 Where development is not listed in AO1 a Stormwater Quality Management Plan is prepared by a suitably-qualified person in accordance with the **Stormwater quality management guidelines** in **SC6.9 City Plan policy – Land development guidelines**.	**COMPLIES WITH AO1.3** This Stormwater Management Plan has been prepared by a suitably-qualified person and is in accordance with the Stormwater quality management guidelines in SC6.9 City Plan policy – Land development guidelines.
Stormwater quantity		
PO2 Stormwater quantity management outcomes demonstrate no adverse impact on stormwater flooding or the drainage of properties external to the subject site.	**AO2** A stormwater quantity management plan is prepared by a suitably qualified person and demonstrates: (a) achievable stormwater quantity control measures for discharge during both the construction and operational phases of development designed in accordance with the *Queensland Urban Drainage Manual (QUDM)* unless subject to specific requirements of **SC6.9 City Plan policy – Land development guidelines**; (b) on-site detention systems that are designed to restrict peak outflows for Q2, Q5, Q10, Q20 Q50 and Q100 to pre-development conditions.	**COMPLIES WITH AO2** This Stormwater Management Plan has been prepared by a suitably-qualified person in accordance with the QUDM and includes on-site detention systems designed to restrict peak outflows for Q2, Q5, Q10, Q20 Q50 and Q100 to pre-development conditions.
Woongoolba Flood Mitigation Scheme Catchment Area		
PO3	**AO3** No acceptable outcome provided.	**N/A**

Performance outcomes	Acceptable outcomes	Does the proposal meet the acceptable outcome? If not, justify how the proposal meets either the performance outcome or overall outcome
In the Woongoolba Flood Mitigation Scheme Catchment Area, shown on the **Water catchments and dual reticulation overlay map**, peak outflow and its timing for Q2, Q5 and Q10 for rainfall events up to 72 hours does not change as a result of development.		
Protection of natural flows (discharge)		
PO4 Construction and operational activities avoid or minimise adverse impacts of altered stormwater quality and quantity.	**AO4** Development achieves the Frequent Flow Management and Waterway Stability Management design objectives as stated within *Chapter 2 – Section 2.4.2 of the Urban Stormwater Quality Planning Guidelines 2010*. **Note: A site Stormwater Quality and Quantity Management Report prepared by a suitably qualified person is Council's preferred method required to be submitted to Council to address Acceptable outcome AO6.** **The intent in the above guidelines (*Urban Stormwater Quality Planning Guidelines 2010*) can be achieved by adopting Water Sensitive Urban Design (WSUD) concepts within the development.**	**COMPLIES WITH AO4** This Stormwater Management Plan has been prepared by a suitably-qualified person and adopts Water Sensitive Urban Design (WSUD) concepts within the development to manage stormwater quality and quantity.
Wastewater management		
PO5 Development does not discharge wastewater to receiving waters or areas external to the site unless demonstrated to be the best-practice environmental management for that site and takes into consideration:	**AO5** Where the development involves the discharge of wastewater, a Wastewater Management Plan (WWMP) is prepared, demonstrating compliance with the performance outcome, by a suitably qualified person	**N/A**

Performance outcomes	Acceptable outcomes	Does the proposal meet the acceptable outcome? **If not, justify how the proposal meets <u>either</u> the performance outcome or overall outcome**
(a) the applicable water quality objectives for the receiving waters; and (b) the potential adverse impact on ecosystem health of receiving waters.	and submitted to the Council, detailing all of the following: (a) wastewater type; (b) climatic conditions; (c) water quality objectives; (d) best-practice environmental management; (e) waste management hierarchy; and (f) the WWMP provides for the management of wastewater in accordance with a wastewater management hierarchy that: (i) avoids wastewater discharge to waterways; or (ii) if wastewater discharge to the environment cannot practicably be avoided wastewater discharge to waterways is minimised through re-use, recycling, recovery and treatment for disposal to sewer, surface water and groundwater.	

Performance outcomes	Acceptable outcomes	Does the proposal meet the acceptable outcome? If not, justify how the proposal meets either the performance outcome or overall outcome	
Erosion and sediment control (ESC)			
PO6 Development does not cause erosion or allow sediments to leave the site.	**AO6** An **Erosion hazard assessment** completed in accordance with the criteria in **Table 9.4.5-3** is undertaken to establish the level of risk for soil erosion and sediment pollution to the environment. **Where the Erosion hazard assessment has a risk score less than or equal to 10:** A deemed to comply report is prepared by a suitably qualified person for Council approval, including conceptual location and design drawings of each treatment measure in plan and section views, in accordance with the *Best Practice Erosion and Sediment Control: International Erosion Control Association, (IECA) 2008, Australasia Chapter 2008.* **Where the Erosion hazard assessment has a risk score greater than 10:** A conceptual erosion and sediment control plan (ESCP) is prepared by a suitably qualified person for Council approval in accordance with the *Best Practice Erosion and Sediment Control: International Erosion Control Association, (IECA) 2008, Australasia Chapter 2008*.	**COMPLIES VIA CONDITIONS** It is considered reasonable that conditions be placed on the development approval to ensure that am Erosion and Sediment Control plan is developed in conjunction with the OPW for Change to Ground Level.	

Appendix B

Stormwater Management Design Drawings

VERSION: A
DATE : 01.04.19

CONCEPTUAL STORMWATER MANAGEMENT DRAWING SET

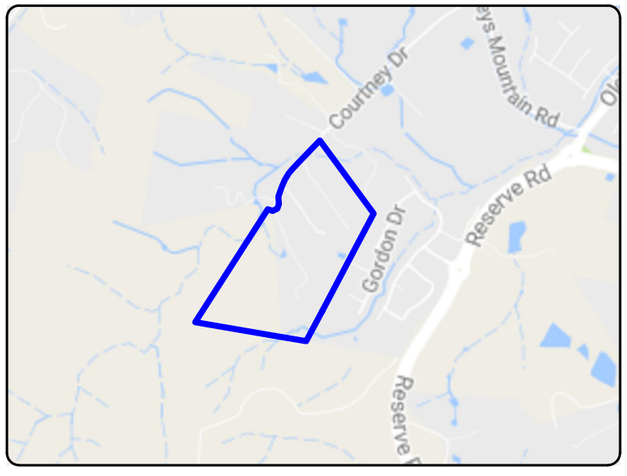
Courtney Drive

for

Gallery Homes Pty Ltd

Project No: BC-16090

April 2019



Site Location

SCHEDULE OF DRAWINGS	
Drawing No.	Drawing Title
DWG-100	LOCALITY AND DRAWING INDEX PLAN
DWG-200	EXISTING CATCHMENT PLAN
DWG-201	DEVELOPED CATCHMENT PLAN
DWG-210	MUSIC CATCHMENT PLAN
DWG-300	OPERATIONAL CONTROL PLAN
DWG-310	BASIN A LAYOUT AND CROSS SECTION
DWG-311	BASIN B LAYOUT AND CROSS SECTION
DWG-312	BASIN C LAYOUT AND CROSS SECTION
DWG-313	BASIN D LAYOUT AND CROSS SECTION
DWG-320	BASIN A - INLET AND OUTLET DETAILS
DWG-321	BASIN B - INLET AND OUTLET DETAILS
DWG-322	BASIN C - INLET AND OUTLET DETAILS
DWG-323	BASIN D - INLET AND OUTLET DETAILS
DWG-330	BIORETENTION A - FILTER MEDIUM AND UNDERDRAINAGE DETAILS
DWG-331	BIORETENTION B - FILTER MEDIUM AND UNDERDRAINAGE DETAILS
DWG-332	BIORETENTION C - FILTER MEDIUM AND UNDERDRAINAGE DETAILS
DWG-333	BIORETENTION D - FILTER MEDIUM AND UNDERDRAINAGE DETAILS

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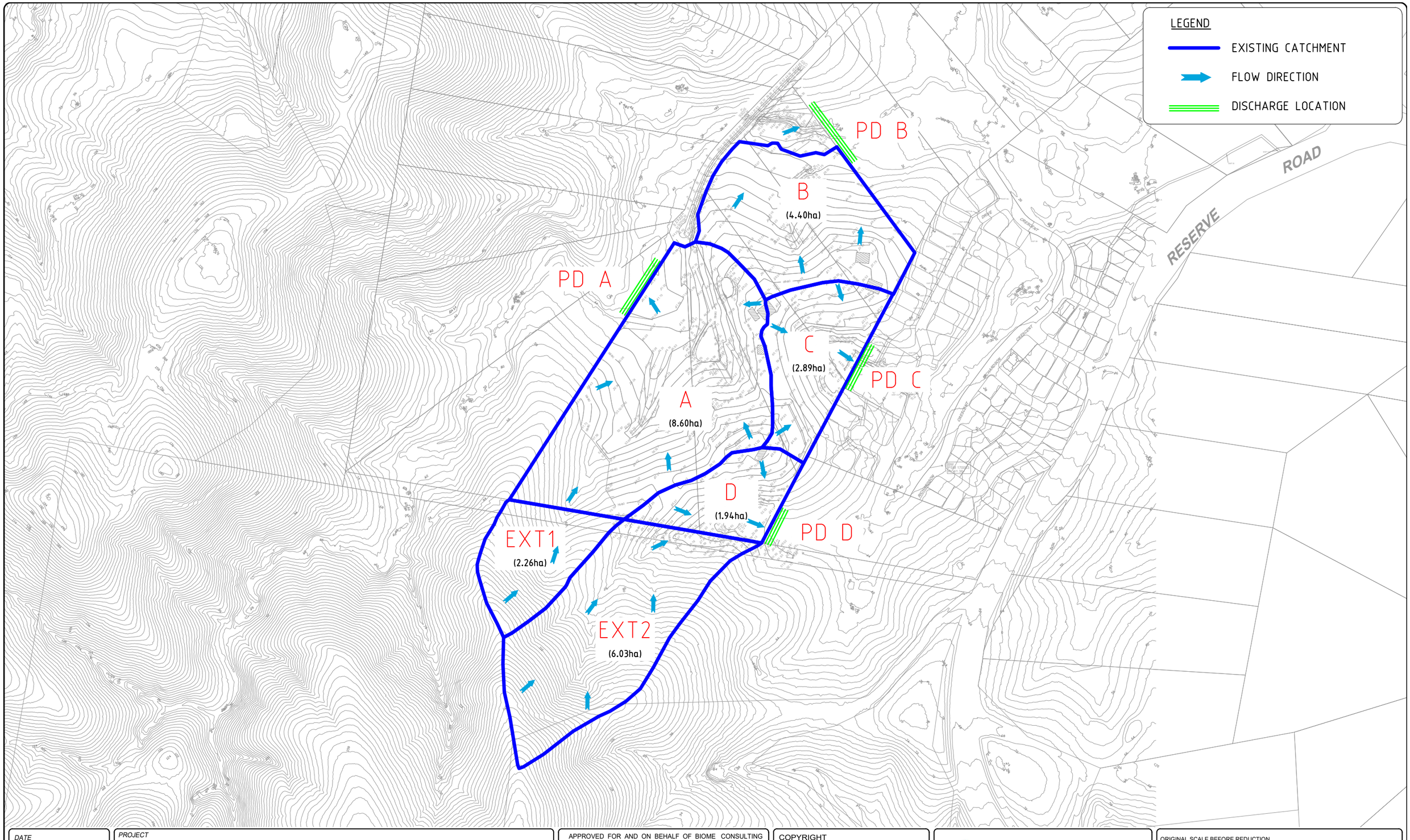

DATE
01.04.19

PROJECT No. :
BC-16090

DRAWING No. :
DWG-200

REVISION No. :
A

PROJECT
PROPOSED SUBDIVISION

DRAWING TITLE
EXISTING CATCHMENT PLAN

CLIENT
GALLERY HOMES PTY LTD

ADDRESS:
COURTNEY DRIVE, UPPER COOMERA, QLD

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RPEQ No. :

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A	ORIGINAL ISSUE		01.04.19

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ORIGINAL SCALE BEFORE REDUCTION
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1 : 5000 (FULL SIZE) (metres)
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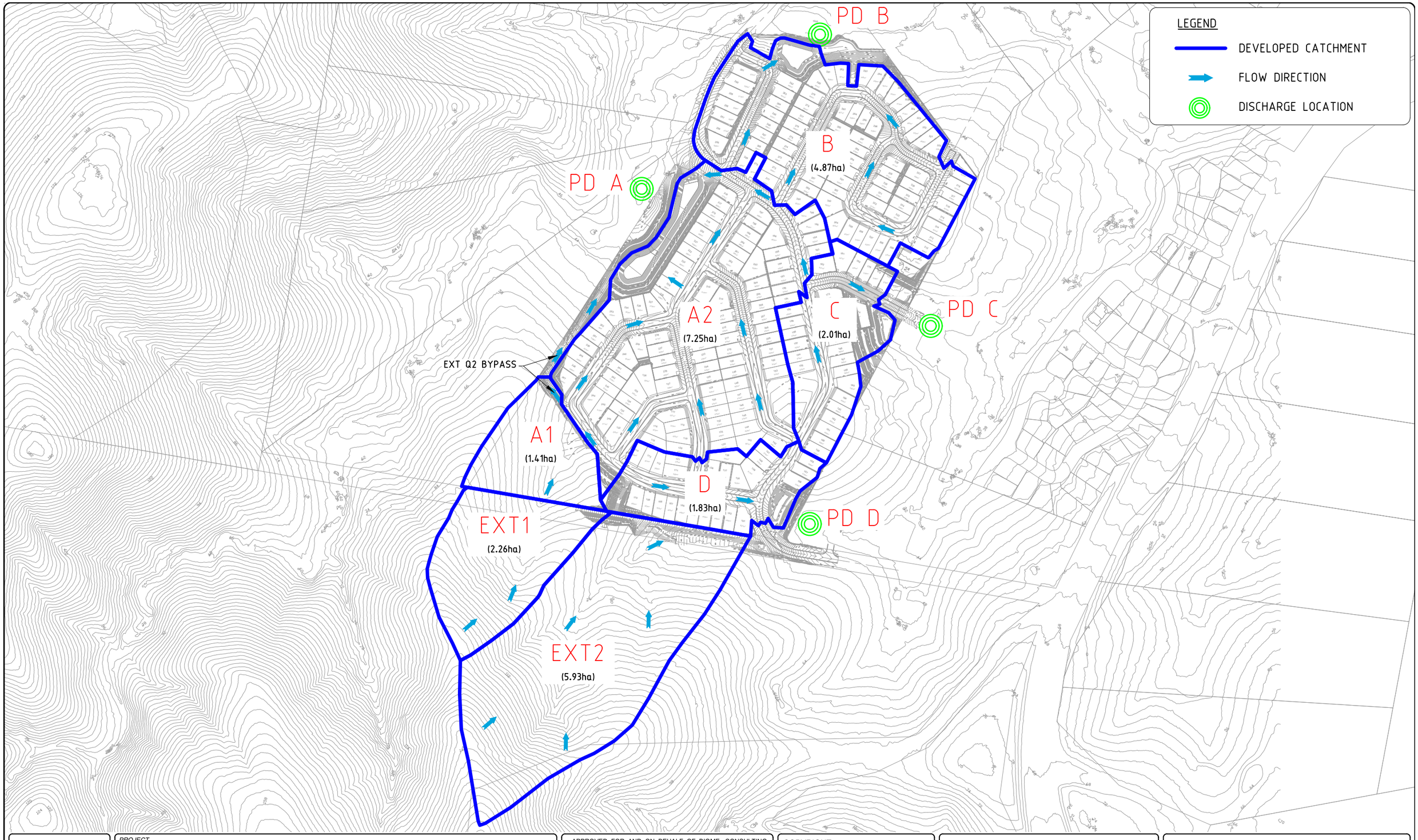

DATE
01.04.19

PROJECT No. :
BC-16090

DRAWING No. :
DWG-201

REVISION No. :
A

PROJECT
PROPOSED SUBDIVISION

DRAWING TITLE
DEVELOPED CATCHMENT PLAN

CLIENT
GALLERY HOMES PTY LTD

ADDRESS:
COURTNEY DRIVE, UPPER COOMERA, QLD

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ORIGINAL SCALE BEFORE REDUCTION
40 0 40 80 120 160 200
1 : 4000 (FULL SIZE) (metres)

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N

LEGEND

- MUSIC CATCHMENT
- GROUND
- TYPICAL RESIDENTIAL LOT
- ROAD AND CARPARK

CATCHMENT B:

ROOF:	1.72 ha
ROAD AND CARPARK:	1.40 ha
GROUND:	1.56 ha
TOTAL AREA:	4.68 ha

CATCHMENT A2:

ROOF:	1.05 ha
ROAD AND CARPARK:	0.91 ha
GROUND:	1.26 ha
TOTAL AREA:	3.22 ha

CATCHMENT A1:

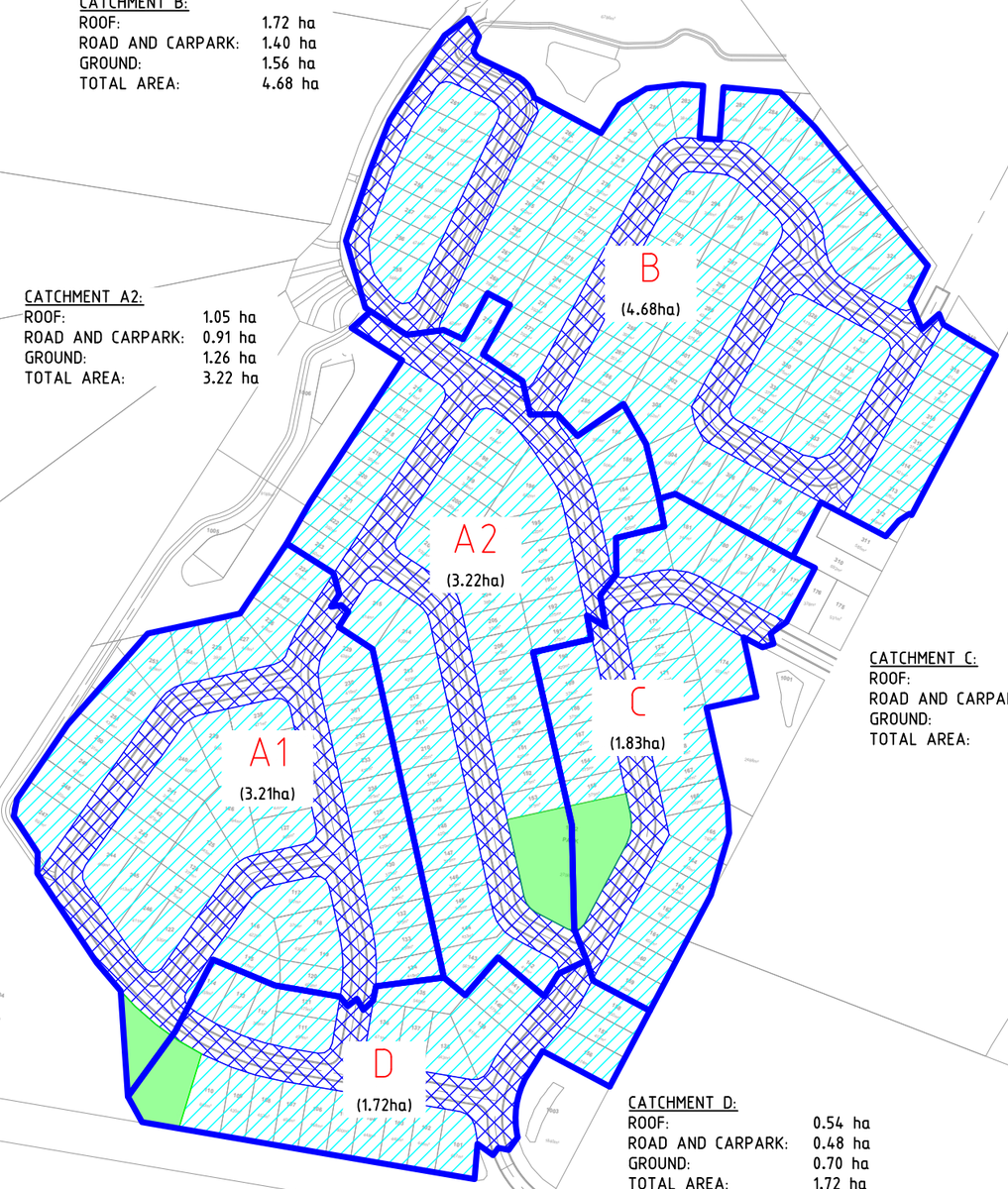
ROOF:	1.08 ha
ROAD AND CARPARK:	0.94 ha
GROUND:	1.20 ha
TOTAL AREA:	3.21 ha

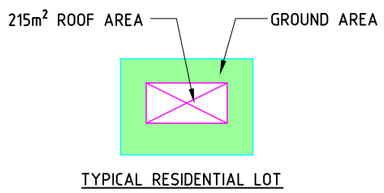
CATCHMENT C:

ROOF:	0.60 ha
ROAD AND CARPARK:	0.45 ha
GROUND:	0.78 ha
TOTAL AREA:	1.83 ha

CATCHMENT D:

ROOF:	0.54 ha
ROAD AND CARPARK:	0.48 ha
GROUND:	0.70 ha
TOTAL AREA:	1.72 ha





DATE
01.04.19

PROJECT No. :
BC-16090

DRAWING No. :
DWG-210

REVISION No. :
A

PROJECT
PROPOSED SUBDIVISION

DRAWING TITLE
MUSIC CATCHMENT PLAN

CLIENT
GALLERY HOMES PTY LTD

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ORIGINAL SCALE BEFORE REDUCTION

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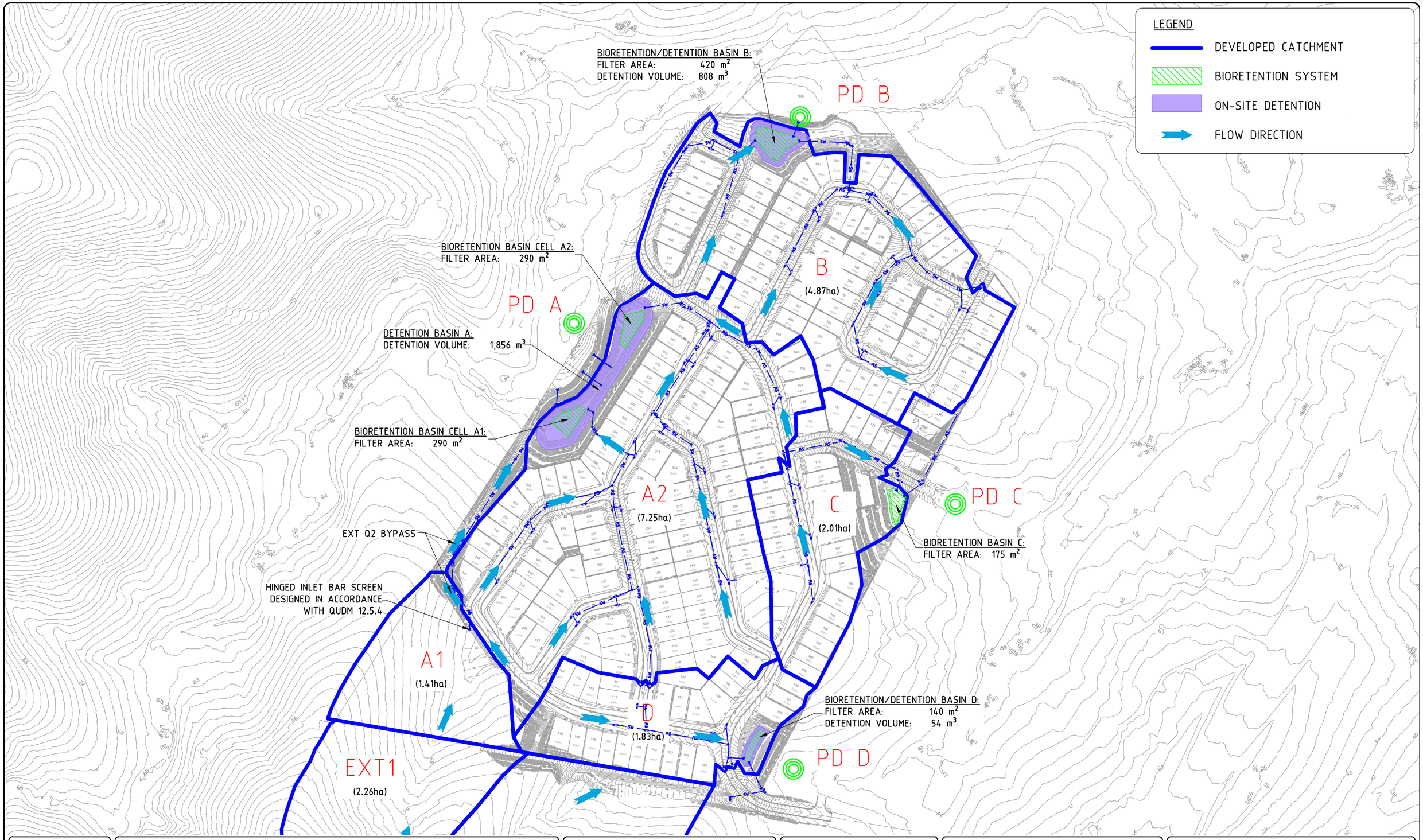

DATE
01.04.19

PROJECT No. :
BC-16090

DRAWING No. :
DWG-300

REVISION No. :
A

PROJECT
PROPOSED SUBDIVISION

DRAWING TITLE
OPERATIONAL CONTROL PLAN

CLIENT
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ORIGINAL SCALE BEFORE REDUCTION
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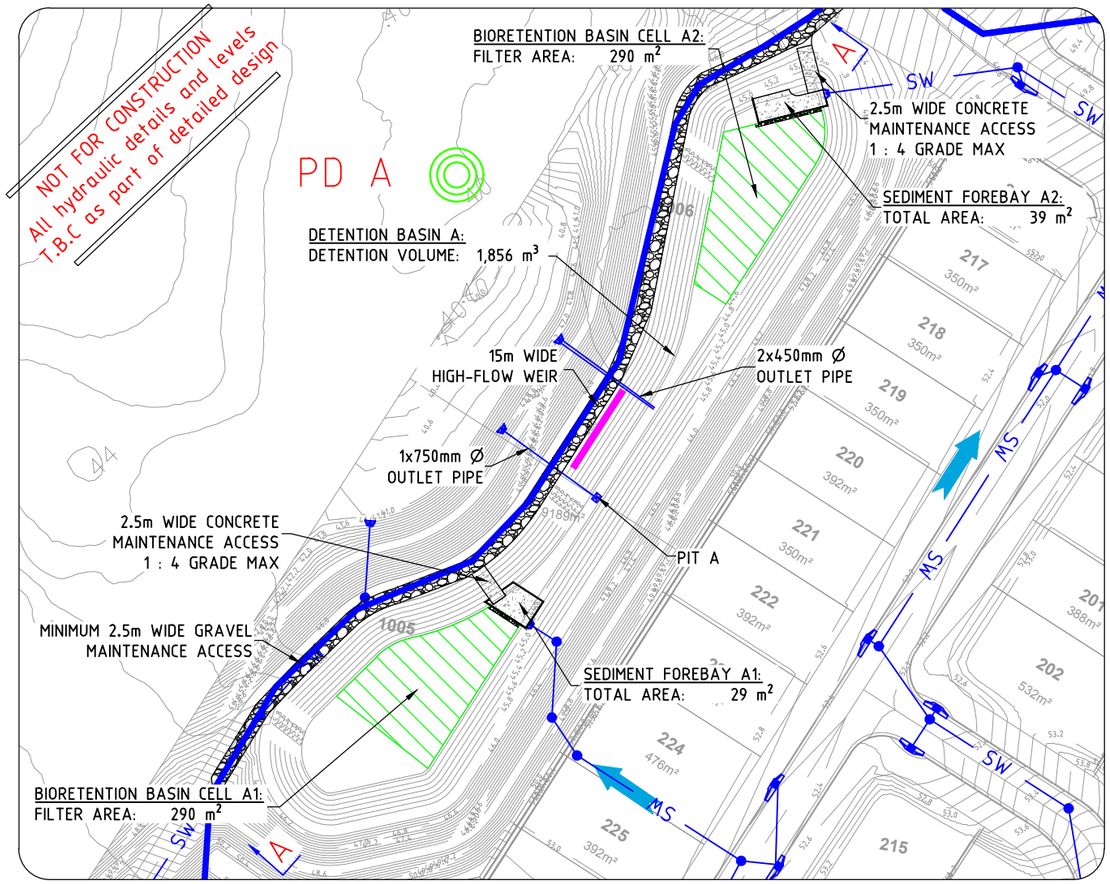
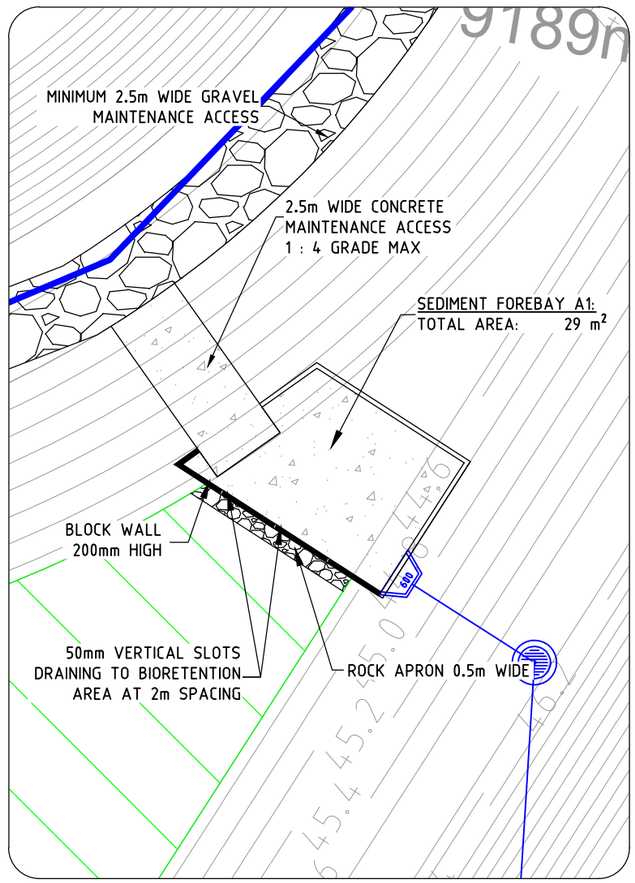
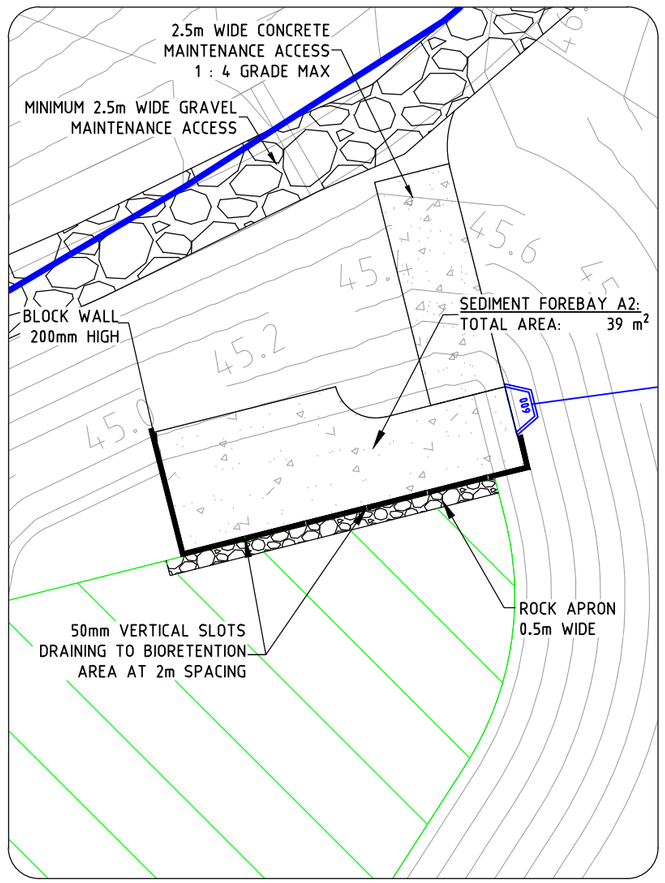
All hydraulic details and levels T.B.C as part of detailed design



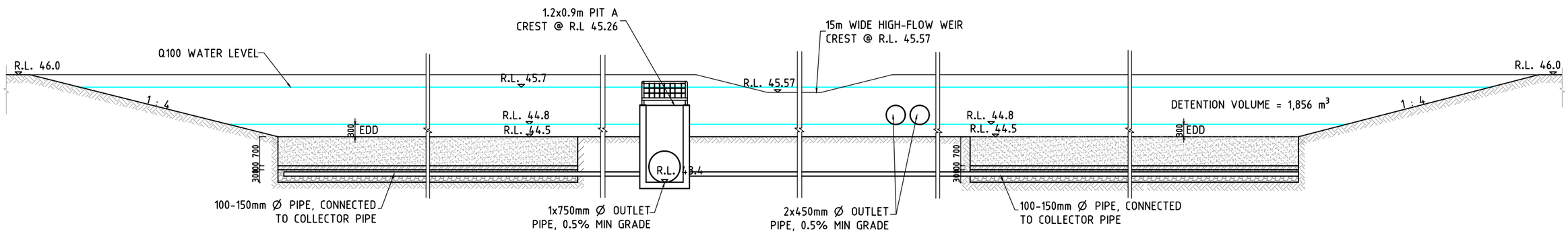
BASIN A PLAN VIEW
1:1000



SEDIMENT FOREBAY A1 PLAN VIEW
1:200



SEDIMENT FOREBAY A2 PLAN VIEW
1:200



BASIN A CROSS SECTION A - A
1 0 1 2 3 4 5
1 : 100 (FULL SIZE) (metres)

DATE
01.04.19

PROJECT No. :
BC-16090

DRAWING No. :
DWG-310

REVISION No. :
A

PROJECT
PROPOSED SUBDIVISION

DRAWING TITLE
BASIN A LAYOUT AND CROSS SECTION

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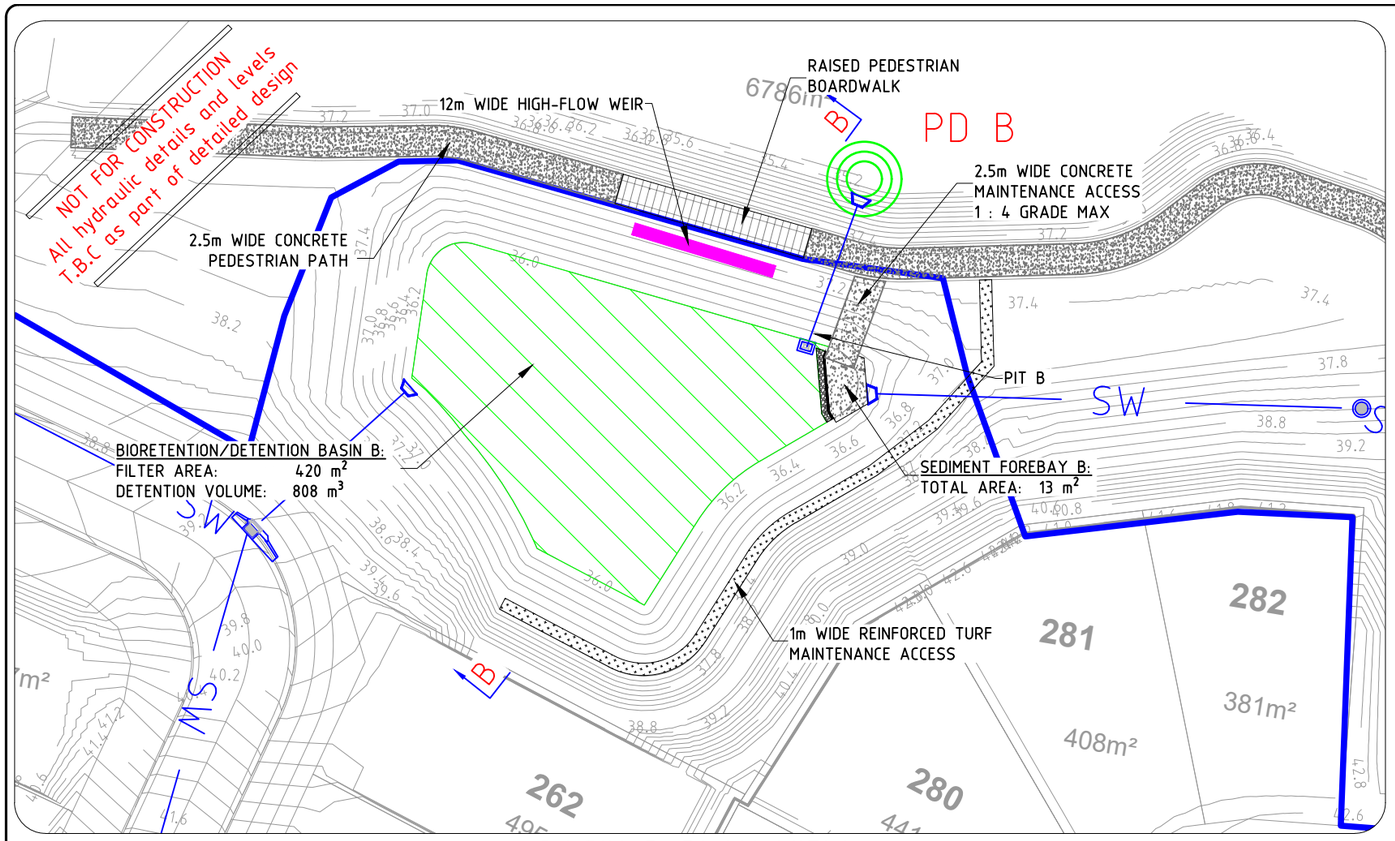
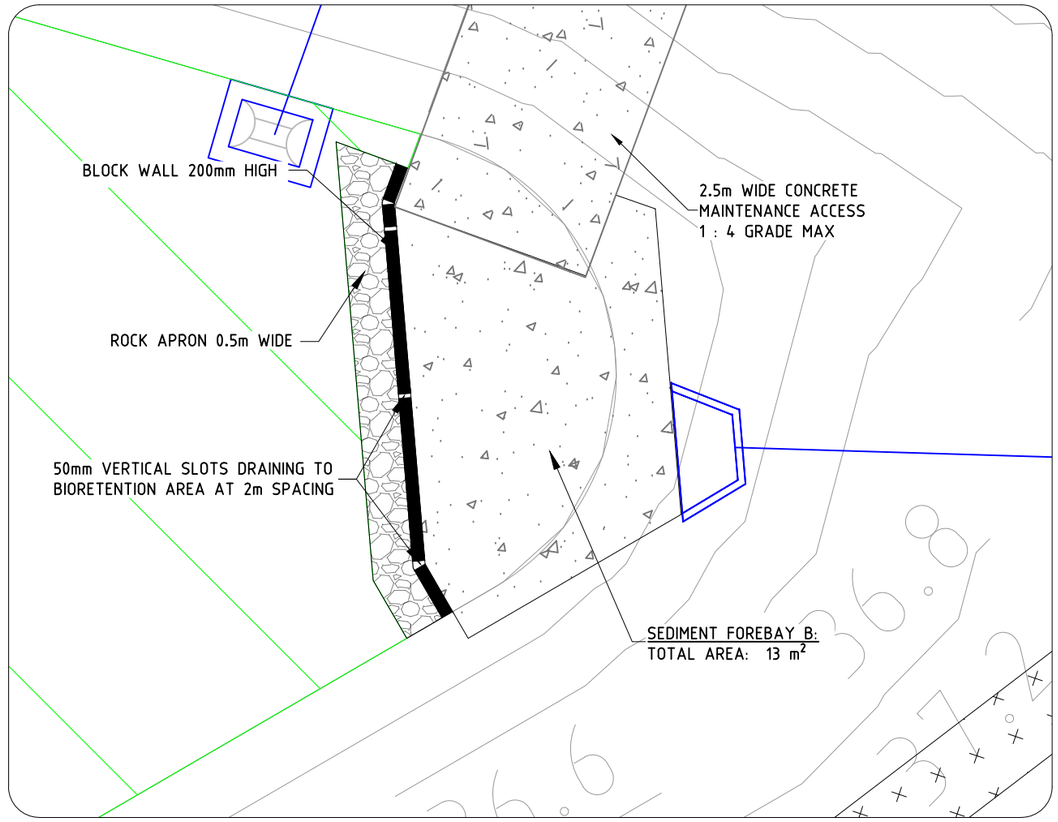


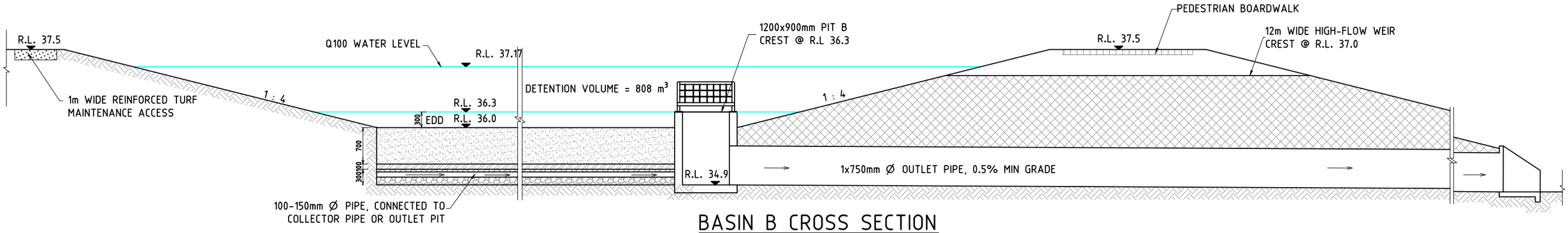
BASIN B PLAN VIEW

1:500



SEDIMENT FOREBAY B PLAN VIEW

1:750



BASIN B CROSS SECTION

1 0.5 0 0.5 1 1.5 2 2.5 3 3.5 4

1 : 75 (FULL SIZE) (metres)

DATE
01.04.19

PROJECT No. :
BC-16090

DRAWING No. :
DWG-311

REVISION No. :
A

PROJECT
PROPOSED SUBDIVISION

DRAWING TITLE
BASIN B LAYOUT AND CROSS SECTION

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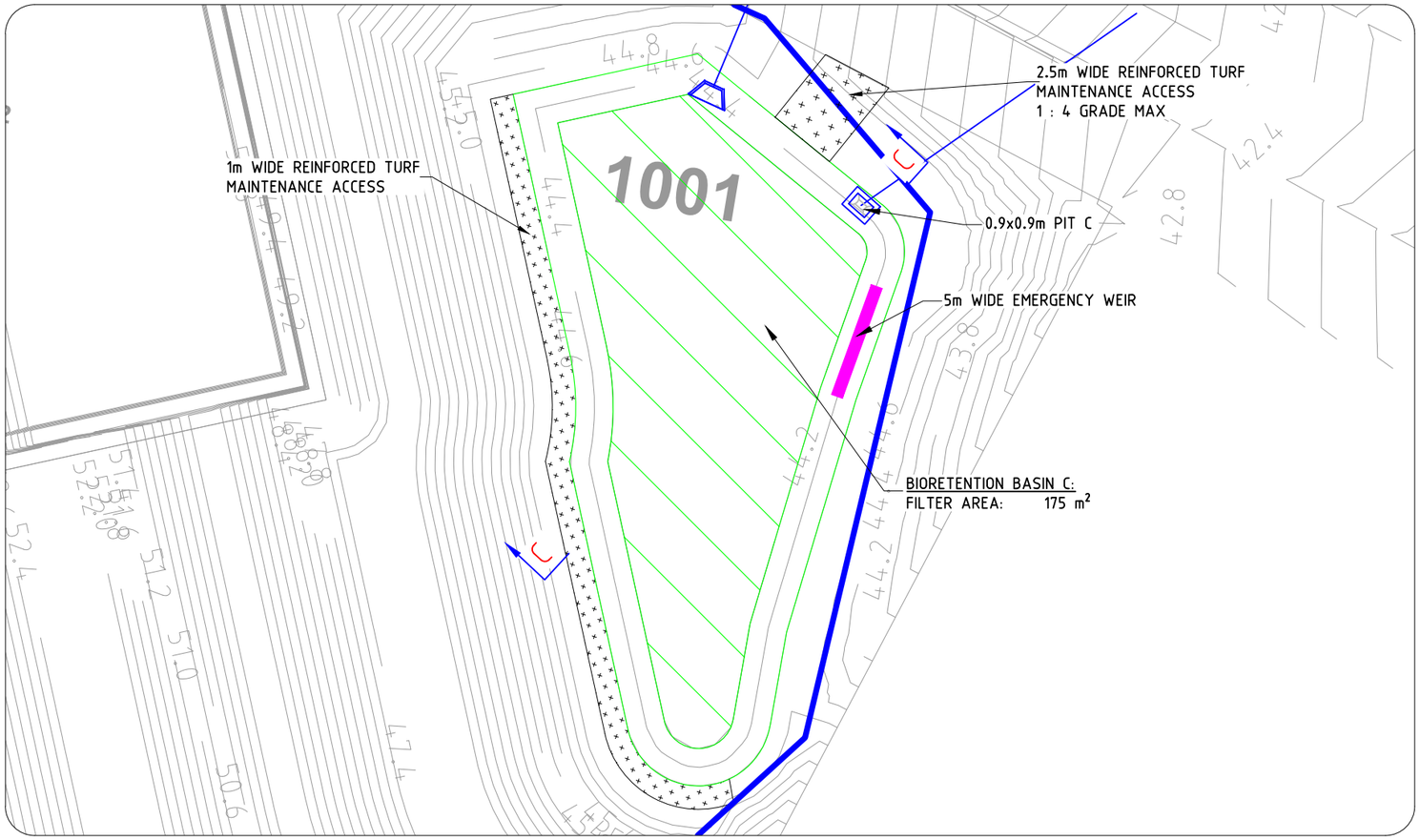
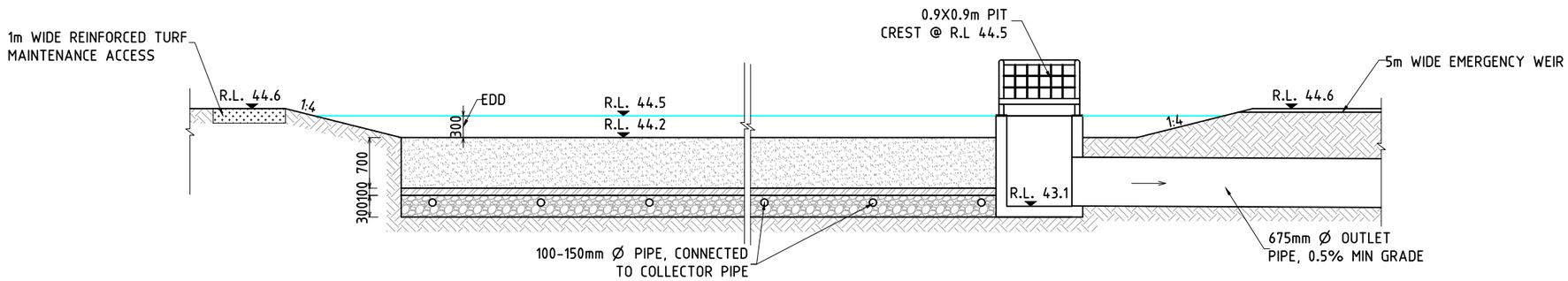


BASIN C PLAN VIEW

1:400



BASIN C CROSS SECTION C - C

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1 : 75 (FULL SIZE) (metres)

DATE
01.04.19

PROJECT No. :
BC-16090

DRAWING No. :
DWG-312

REVISION No. :
A

PROJECT
PROPOSED SUBDIVISION

DRAWING TITLE
BASIN C LAYOUT AND CROSS SECTION

CLIENT
GALLERY HOMES PTY LTD

ADDRESS:
COURTNEY DRIVE, UPPER COOMERA, QLD

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TP / KP	BC	BC	A3	1:75, 1:400

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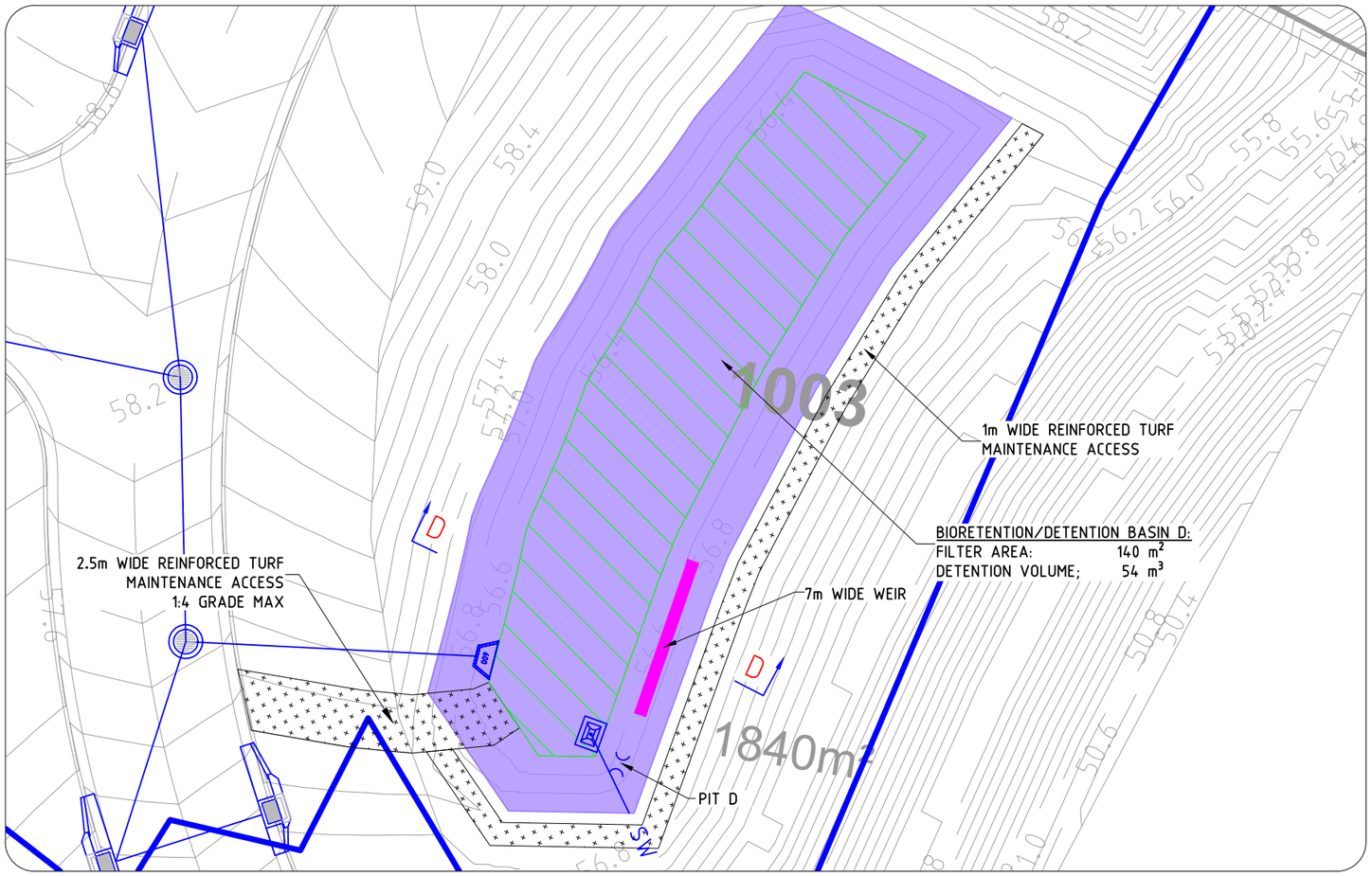
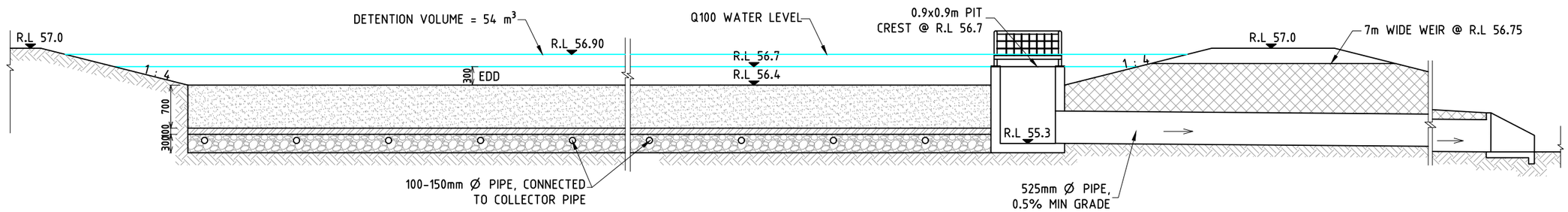
All hydraulic details and levels
T.B.C as part of detailed design



BASIN D PLAN VIEW

1:250



BASIN D CROSS SECTION

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1 : 75 (FULL SIZE) (metres)

DATE	01.04.19
PROJECT No. :	BC-16090
DRAWING No. :	DWG-313
REVISION No. :	A

PROJECT: PROPOSED SUBDIVISION

DRAWING TITLE: BASIN D - LAYOUT AND CROSS SECTION

CLIENT: GALLERY HOMES PTY LTD

ADDRESS: COURTNEY DRIVE, UPPER COOMERA, QLD

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TP / KP	BC	BC	A3	1:75, 1:250, 1:750

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ORIGINAL SCALE BEFORE REDUCTION

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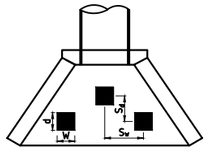
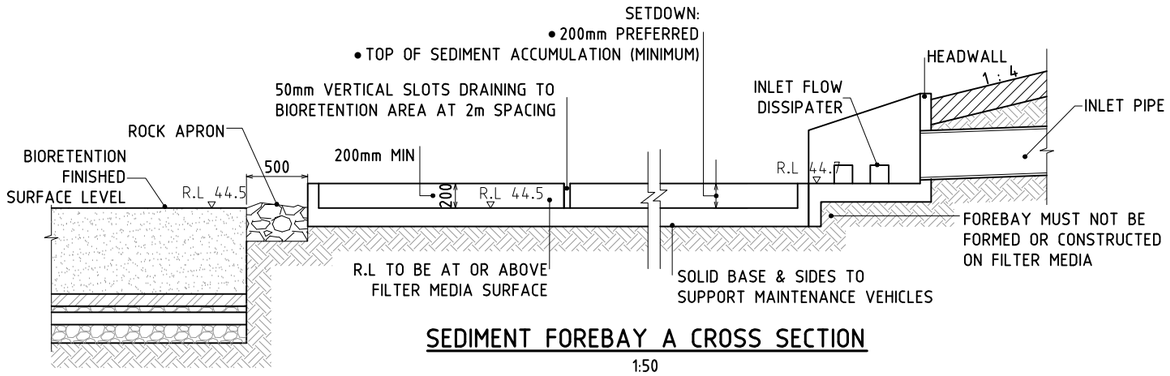
N

NOT FOR CONSTRUCTION
All hydraulic details and levels T.B.C as part of detailed design



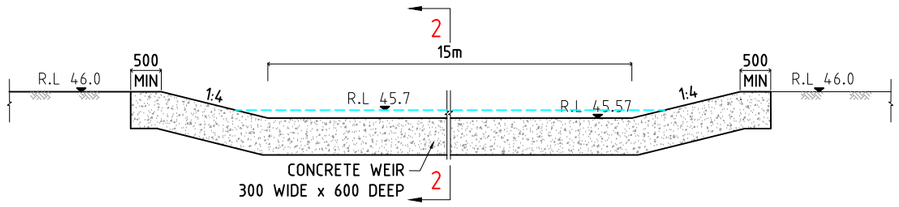
NOTE: ENERGY DISSIPATER LAYOUT TO BE DESIGNED AS PER BRISBANE CITY COUNCIL'S STORMWATER OUTLETS IN PARKS AND WATERWAYS

INLET SCOUR PROTECTION DETAILS
N.T.S

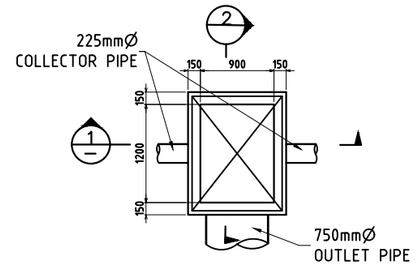


SEDIMENT FOREBAY A CROSS SECTION
1:50

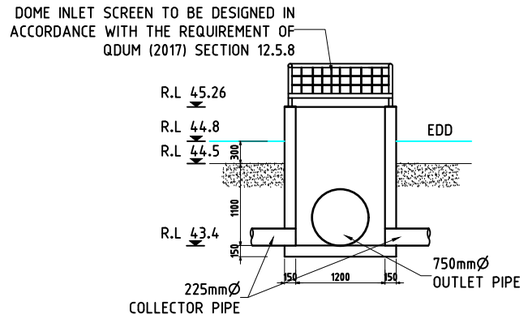
INLET DETAILS



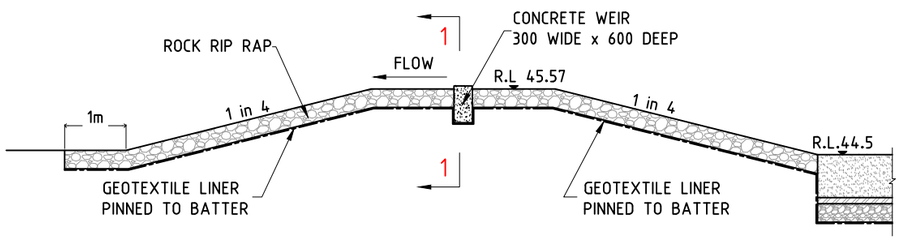
WEIR DETAIL SECTION 1-1
1:100



OVERFLOW STRUCTURE PLAN - PIT A
1:75



SECTION 1 - 1
1:75



WEIR CROSS SECTION 2-2
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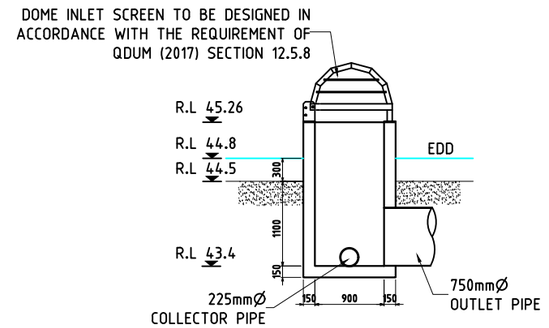

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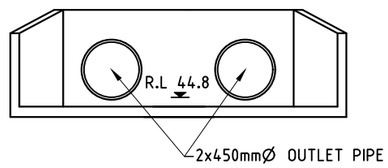

HEADWALL
(2x450mm OUTLET PIPE)
1:50

OUTLET DETAILS

DATE
01.04.19

PROJECT No. :
BC-16090

DRAWING No. :
DWG-320

REVISION No. :
A

PROJECT
PROPOSED SUBDIVISION

DRAWING TITLE
BASIN A - INLET AND OUTLET DETAILS

CLIENT
GALLERY HOMES PTY LTD

ADDRESS:
COURTNEY DRIVE, UPPER COOMERA, QLD

DRAFTED BY :	DESIGNED BY :	CHECKED BY:	PAPER SIZE :	SCALE :
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ACN 166 087 476
RPEQ No. :

VER.	DESCRIPTION	APPR.	DATE
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ABN 86 166 087 476

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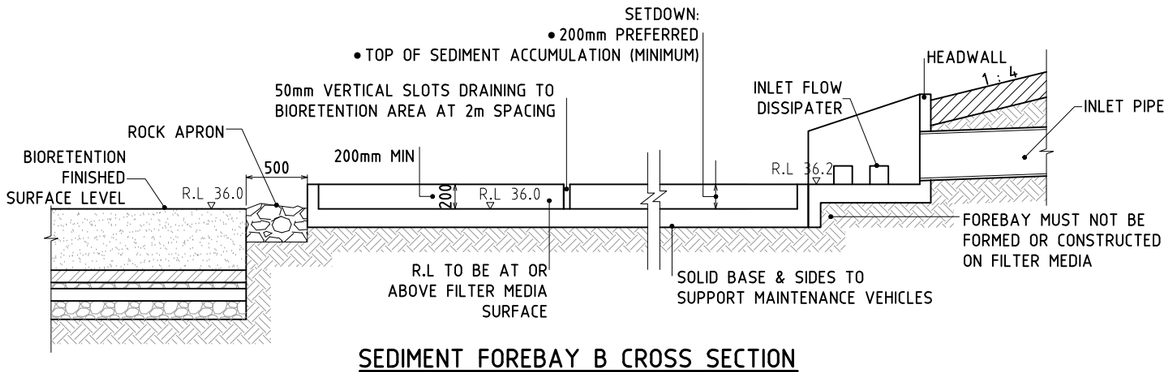
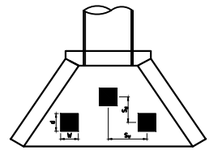


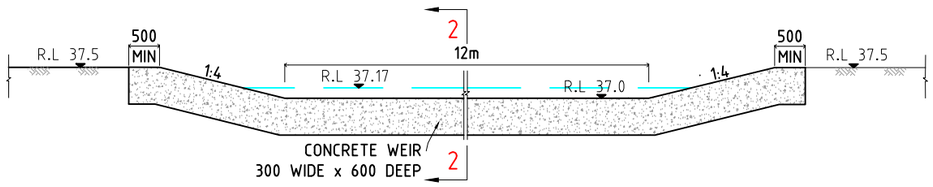
SEDIMENT FOREBAY B CROSS SECTION
1:50



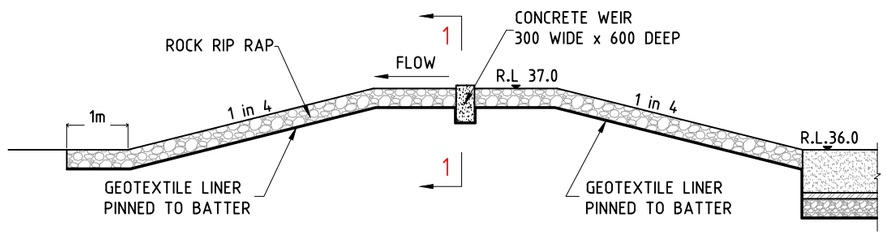
NOTE: ENERGY DISSIPATER LAYOUT TO BE DESIGNED AS PER BRISBANE CITY COUNCIL'S STORMWATER OUTLETS IN PARKS AND WATERWAYS

INLET SCOUR PROTECTION DETAILS
N.T.S

INLET DETAILS



WEIR DETAIL SECTION 1-1
1:100



WEIR CROSS SECTION 2-2
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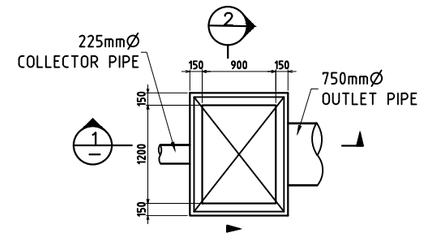
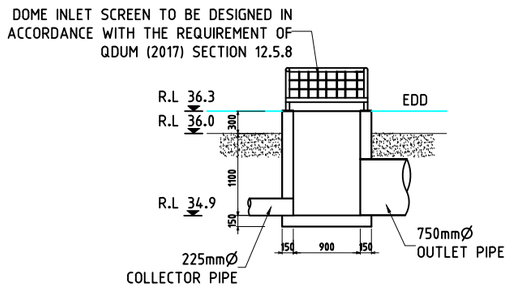


OVERFLOW STRUCTURE PLAN - PIT B
1:75



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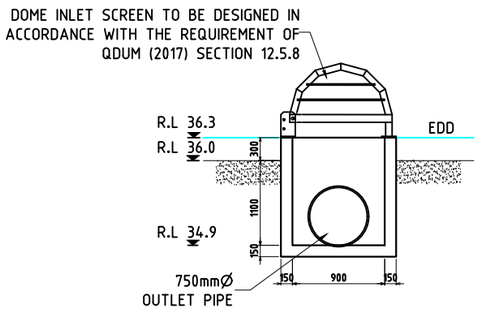

SECTION 2 - 2
1:75

OUTLET DETAILS

DATE
01.04.19

PROJECT No. :
BC-16090

DRAWING No. :
DWG-321

REVISION No. :
A

PROJECT
PROPOSED SUBDIVISION

DRAWING TITLE
BASIN B - INLET AND OUTLET DETAILS

CLIENT
GALLERY HOMES PTY LTD

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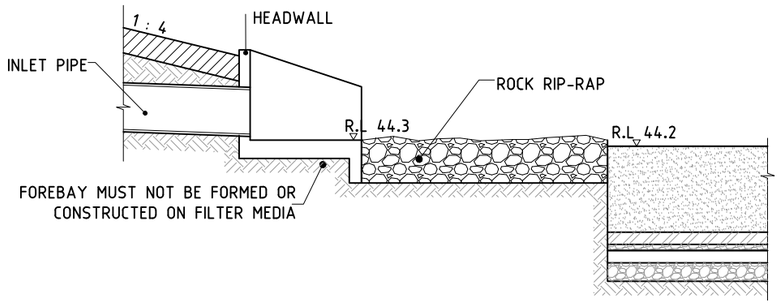
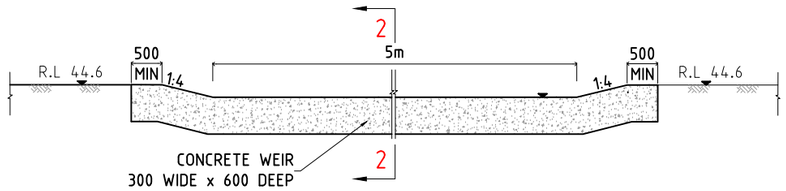


INLET SCOUR PROTECTION CROSS SECTION
1:50

INLET DETAILS



WEIR DETAIL SECTION 1-1
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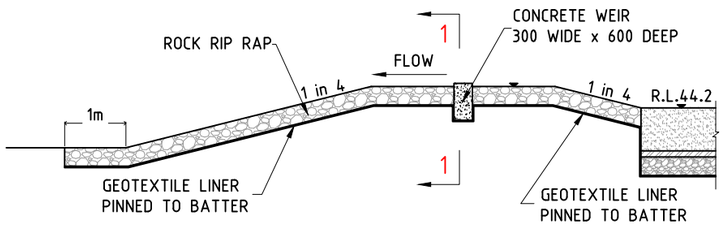
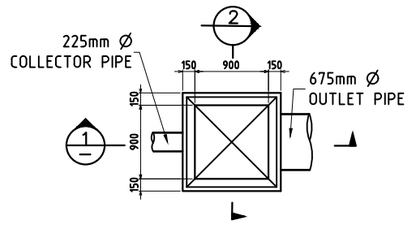
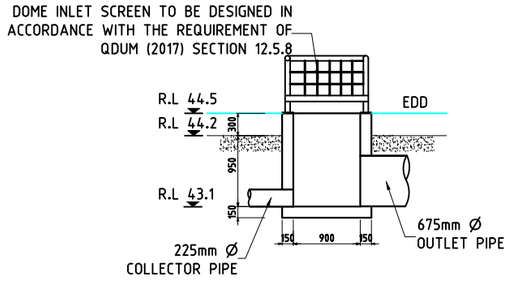


WEIR CROSS SECTION 2-2
1:100



OVERFLOW STRUCTURE PLAN - PIT C
1:75



SECTION 1 - 1
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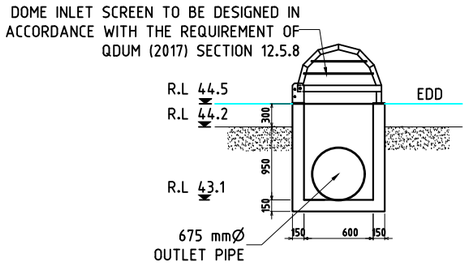

SECTION 2 - 2
1:75

OUTLET DETAILS

DATE
01.04.19
PROJECT No. :
BC-16090
DRAWING No. :
DWG-322
REVISION No. :
A

PROJECT
PROPOSED SUBDIVISION
DRAWING TITLE
BASIN C - INLET AND OUTLET DETAILS
CLIENT
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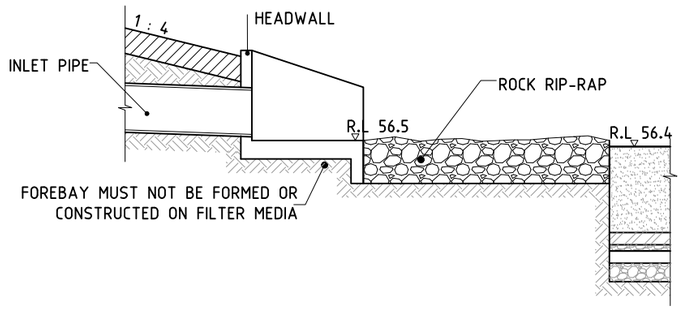
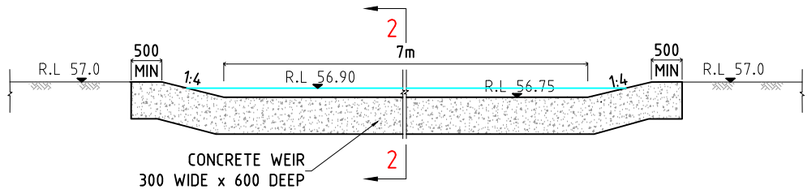
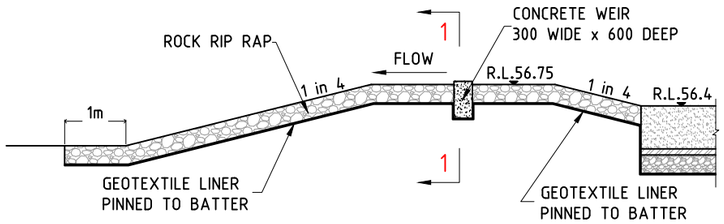


INLET SCOUR PROTECTION CROSS SECTION
1:50

INLET DETAILS



WEIR DETAIL SECTION 1-1
1:100



WEIR CROSS SECTION 2-2
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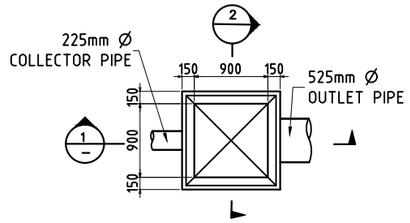
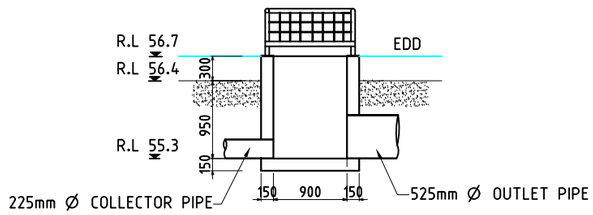


OVERFLOW STRUCTURE PLAN - PIT D
1:75



SECTION 1 - 1
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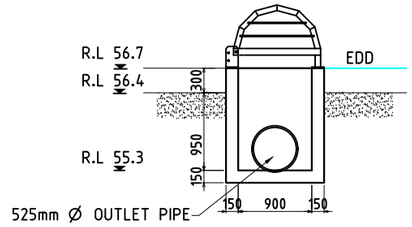

SECTION 2 - 2
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OUTLET DETAILS

DATE
01.04.19

PROJECT No. :
BC-16090

DRAWING No. :
DWG-323

REVISION No. :
A

PROJECT
PROPOSED SUBDIVISION

DRAWING TITLE
BASIN D - INLET SCOUR PROTECTION DETAILS

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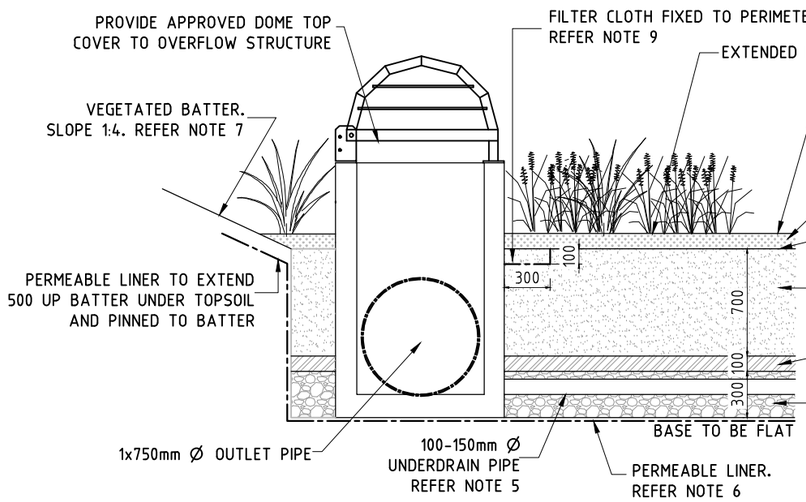
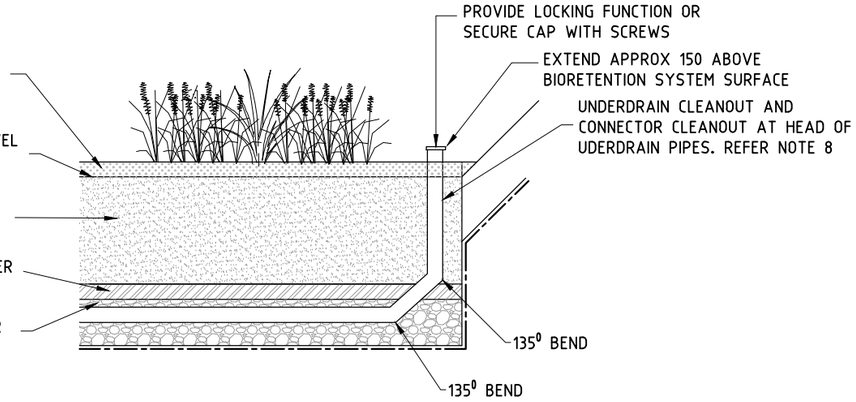


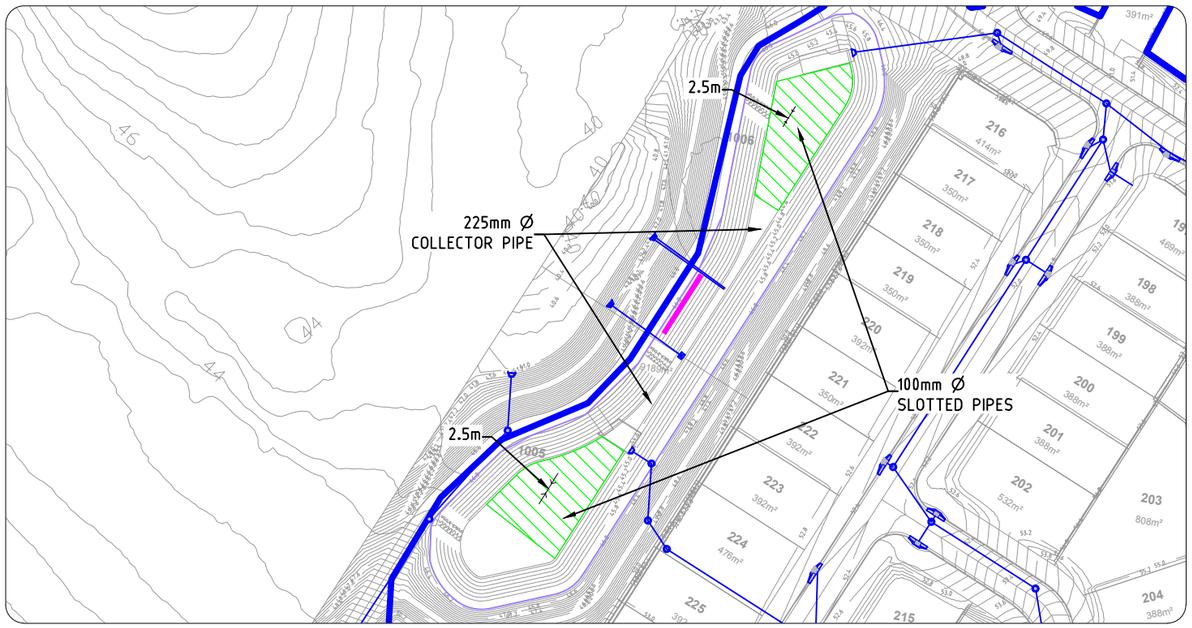
BIORETENTION MEDIA (TYPE 3-CONVENTIONAL) CROSS SECTION

N.T.S



BIORETENTION BASIN SUBSOIL DRAIN CLEANOUT (TYPE 3-CONVENTIONAL)

N.T.S



DRAINAGE LAYOUT PLAN VIEW

N.T.S

NOTES (IN ACCORDANCE WITH IPWEAQ STANDARD DRAWINGS DS-070 AND DS-073):

1. BIORETENTION SYSTEM SURFACE. SURFACE LEVEL IS TOP OF FILTER MEDIA. SURFACE TO BE MULCHED AND PLANTED AS PROJECT DRAWING AND THE 'BIORETENTION TECHNICAL DESIGN GUIDELINES' (WATER BY DESIGN).
2. FILTER MEDIA SPECIFICATION SHALL BE IN ACCORDANCE WITH THE 'ADOPTION GUIDELINES FOR STORMWATER BIOFILTRATION SYSTEMS (CRC FOR WATER SENSITIVE CITIES) AND THE BIORETENTION TECHNICAL DESIGN GUIDELINES (WATER BY DESIGN). BIORETENTION HYDRAULIC CONDUCTIVITY SHALL BE IN ACCORDANCE WITH PRACTICE NOTE 1: IN SITU MEASUREMENT OF HYDRAULIC CONDUCTIVITY' (FAWB). THE NUMBER OF SAMPLES TO BE TESTED SHALL BE IN ACCORDANCE WITH THE 'CONSTRUCTION AND ESTABLISHMENT GUIDELINES - SWALES, BIORETENTION SYSTEMS AND WETLANDS' (WATER BY DESIGN).
3. CONSTRUCTION TOLERANCES SHALL BE IN ACCORDANCE WITH THE 'CONSTRUCTION AND ESTABLISHMENT GUIDELINES -SWALES, BIORETENTION SYSTEMS AND WETLANDS' (WATER BY DESIGN)
4. TRANSITION LAYER AND DRAINAGE LAYER. DEPTHS AND SPECIFICATION TO BE IN ACCORDANCE WITH THE 'BIORETENTION TECHNICAL DESIGN GUIDELINES' (WATER BY DESIGN)
5. UNDERDRAIN. SLOTTED RIGID PIPE LAID FLAT. PIPE SHOULD NOT BE INSTALLED WITH A FILTER SOCK SURROUNDING PIPE. UNDERDRAIN PIPES SHALL BE SEALED INTO PITS USING GROUT OR OTHER APPROVED WATERTIGHT SEAL.
6. PERMEABLE LINER. NON-WOVEN GEOTEXTILE FILTER CLOTH TO BASE AND SIDES OF BIORETENTION SYSTEM. FILTER CLOTH NOT TO BE PLACED BETWEEN ANY FILTER LAYERS. PERMEABLE LINER AS PER 'BIORETENTION TECHNICAL DESIGN GUIDELINES' (WATER BY DESIGN)
7. VEGETATED BATTER. SLOPE AND PLANTING TO BE IN ACCORDANCE WITH 'BIORETENTION TECHNICAL DESIGN GUIDELINES' (WATER BY DESIGN).
8. INSPECTION/CLEANOUT POINT. VERTICAL SOLID PIPE SECTION ATTACHED TO THE END OF EACH UNDERDRAIN IN ACCORDANCE WITH THE 'BIORETENTION TECHNICAL DESIGN GUIDELINES'(WATER BY DESIGN)
9. FILTER CLOTH TO BE FIXED TO PERIMETER OF PIT TO AVOID RUNNELLING OF WATER BETWEEN PIT AND SOIL INTERFACE. BEGIN FILTER CLOTH 100 ABOVE SURFACE. EXTEND TO 100 BELOW SURFACE. CONTINUE 300 HORIZONTALLY INTO FILTER MEDIA.
10. FOR GENERAL DESIGN AND CONSTRUCTION NOTES REFER TO DS-078
11. ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE NOTED.

DATE
01.04.19

PROJECT No. :
BC-16090

DRAWING No. :
DWG-330

REVISION No. :
A

PROJECT
PROPOSED SUBDIVISION

DRAWING TITLE
BIORETENTION A – FILTER MEDIUM AND UNDERDRAINAGE DETAILS

CLIENT
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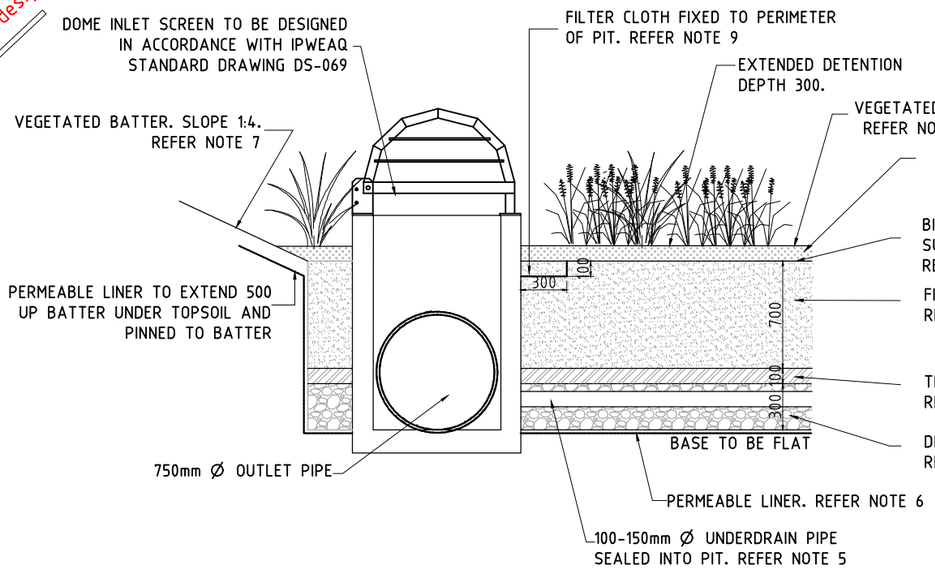
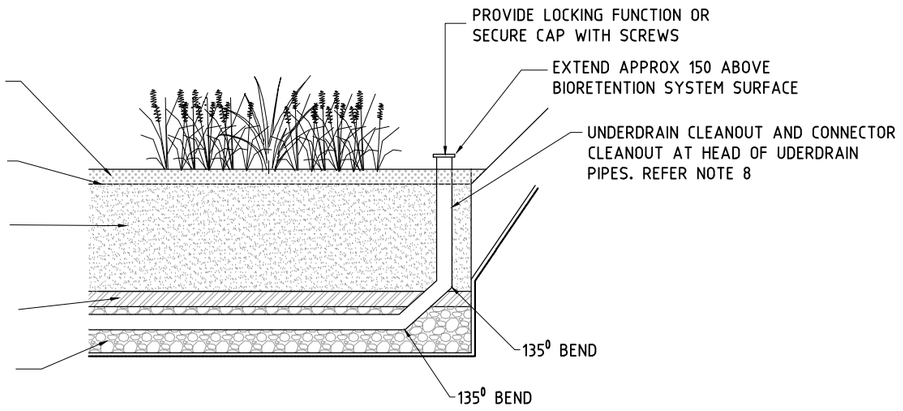


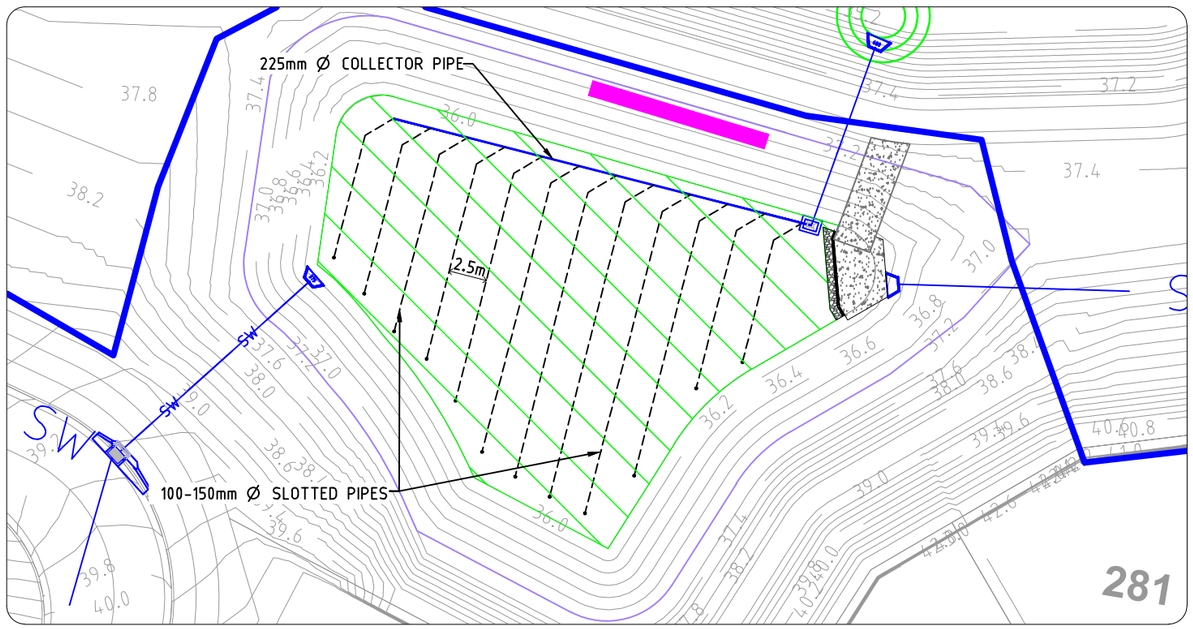
BIORETENTION MEDIA (TYPE 3-CONVENTIONAL) CROSS SECTION

N.T.S



BIORETENTION BASIN SUBSOIL DRAIN CLEANOUT (TYPE 3-CONVENTIONAL)

N.T.S



DRAINAGE LAYOUT PLAN VIEW

N.T.S

NOTES (IN ACCORDANCE WITH IPWEAQ STANDARD DRAWINGS DS-070 AND DS-073):

1. BIORETENTION SYSTEM SURFACE. SURFACE LEVEL IS TOP OF FILTER MEDIA. SURFACE TO BE MULCHED AND PLANTED AS PROJECT DRAWING AND THE 'BIORETENTION TECHNICAL DESIGN GUIDELINES' (WATER BY DESIGN).
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3. CONSTRUCTION TOLERANCES SHALL BE IN ACCORDANCE WITH THE 'CONSTRUCTION AND ESTABLISHMENT GUIDELINES -SWALES, BIORETENTION SYSTEMS AND WETLANDS' (WATER BY DESIGN)
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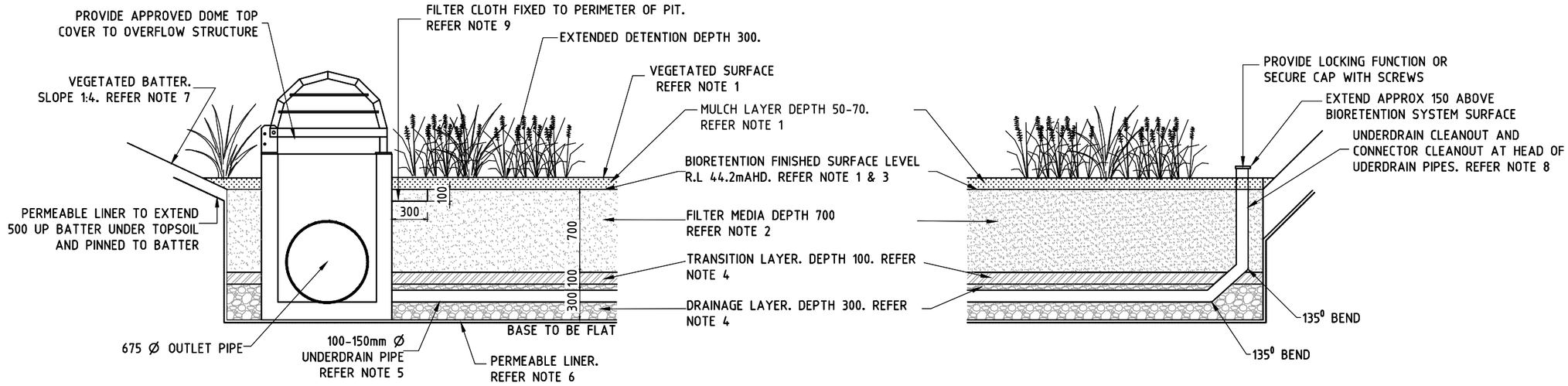

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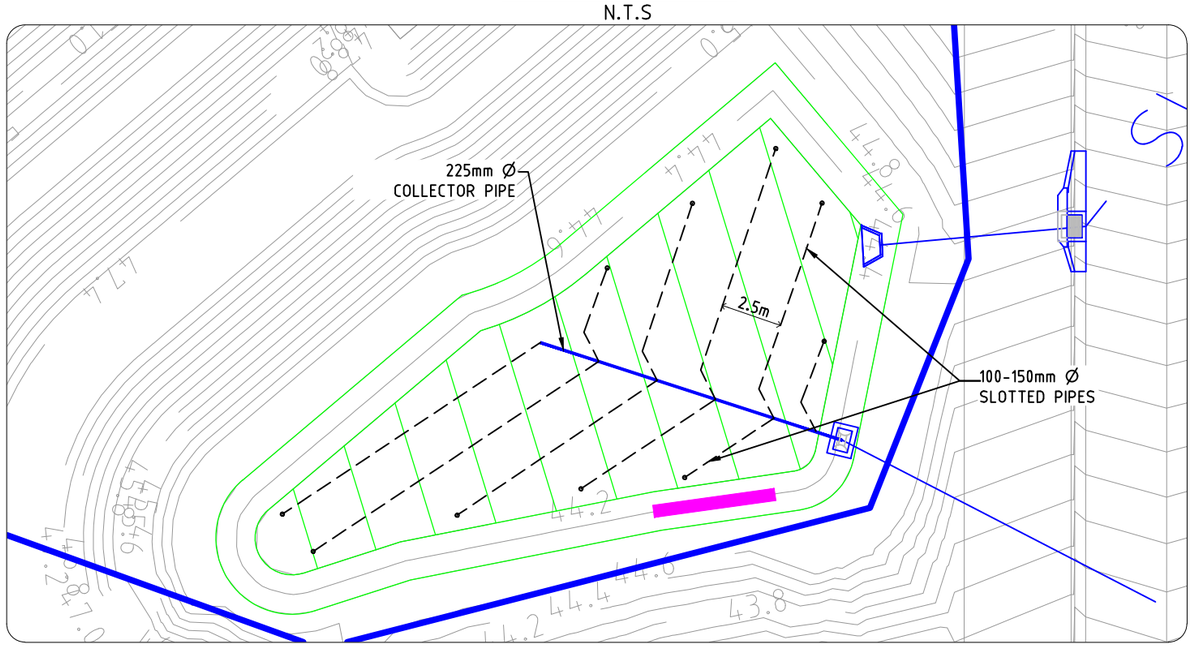

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BIORETENTION BASIN SUBSOIL DRAIN CLEANOUT (TYPE 3-CONVENTIONAL)

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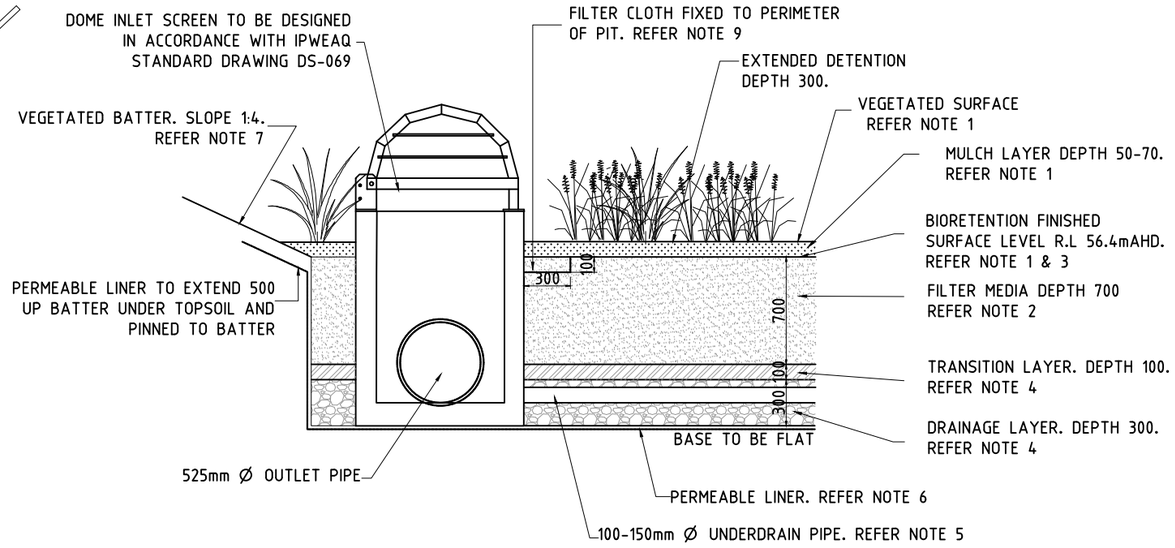

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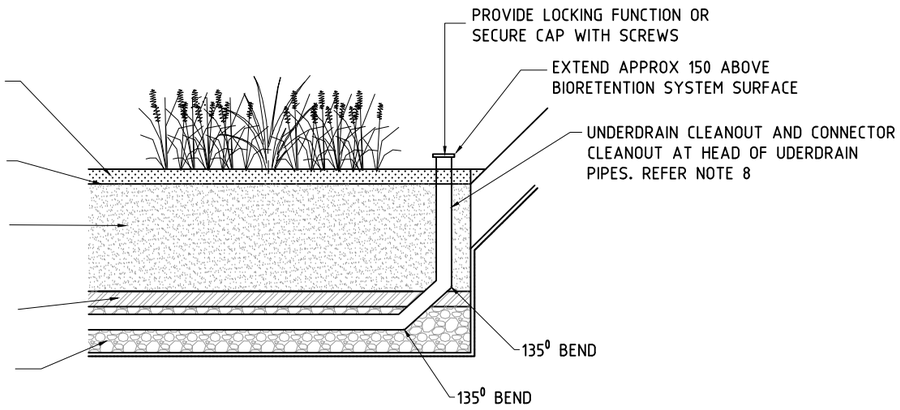

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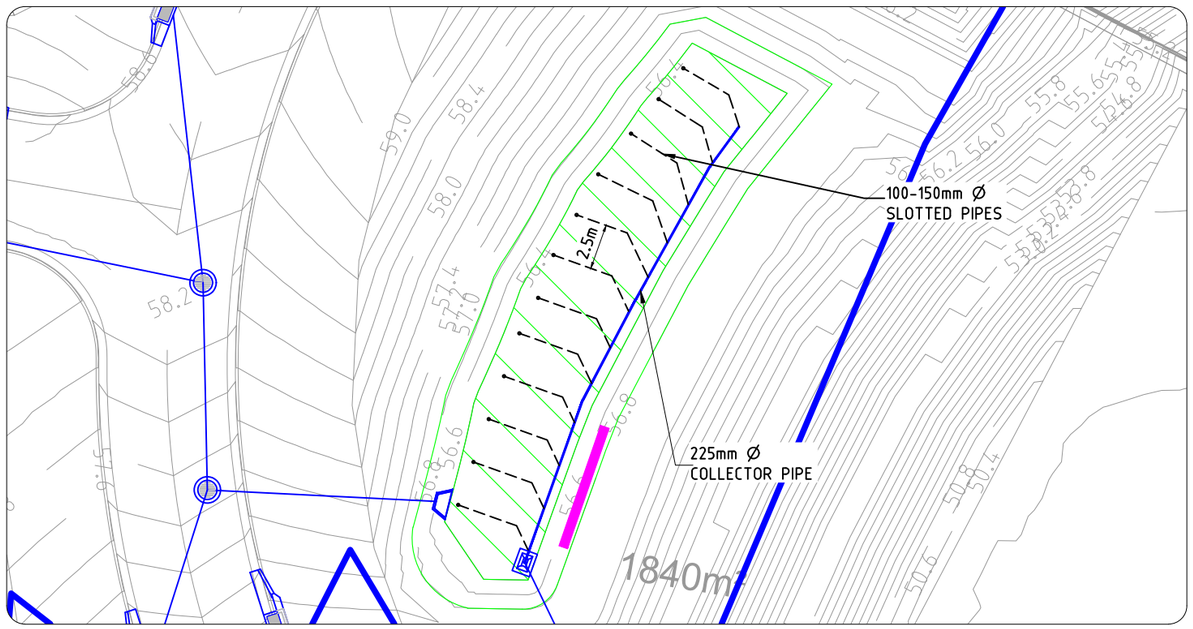

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Appendix C

Rational Method Model Validation

The Rational Method has been relied upon to validate the flows reported within *xpstorm* for both the pre and post development cases. In accordance with QUDM 2013 Section 4, the Rational Method provides a simple means of estimating peak discharge and is therefore considered suitable for validation purposes. Equation 4.2 from QUDM has been relied upon.

$$Q_y = (C_y \cdot {}^{t}I_y \cdot A)/360$$

where:

Q_y	=	peak flow rate (m^3/s) for annual exceedance probability (AEP) of 1 in '*y*' years
C_y	=	coefficient of discharge for AEP of 1 in '*y*' years
A	=	area of catchment (ha)
${}^{t}I_i$	=	average rainfall intensity (mm/h) for a design duration of '*t*' hours and an AEP of 1 in '*y*' years
t	=	the nominal design storm duration as defined by the time of concentration (t)

Coefficient of Discharge

Based on the infiltration characteristics of the internal and external catchments, the following discharge coefficients have been calculated using the method presented within Book 8 of Australian Rainfall and Runoff (1998) and based on Equation 4.4 from QUDM (2013).

$$C_y = F_y \cdot C_{10}$$

where:

C_y	=	coefficient of discharge for AEP of 1 in '*y*' years
F_y	=	frequency factor for AEP of 1 in '*y*' years
C_{10}	=	10 year discharge coefficient value for Tables 4.5.3 and 4.5.4 of QUDM

Based on Table SC6.9.2-7, Runoff Coefficient vs Development Category of the City Of Gold Coast Land Development Guidelines, C_{10} values have been determined for each catchment and the coefficient of discharge values for the nominated AEP's for the existing and developed catchment condition are shown in Tables C.1 and C.2, respectively.

Table C.1 Coefficient of Discharge – Existing Case

Catchment & Point of Discharge ID			C_2	C_5	C_{10}	C_{20}	C_{50}	C_{100}
External	PD-A	Ext-A	0.68	0.76	0.8	0.84	0.92	0.96
Internal		A	0.68	0.76	0.8	0.84	0.92	0.96
	PD-B		0.68	0.76	0.8	0.84	0.92	0.96
	PD-C		0.68	0.76	0.8	0.84	0.92	0.96
	PD-D		0.68	0.76	0.8	0.84	0.92	0.96

Table C.2 Coefficient of Discharge – Developed Case

Catchment & Point of Discharge ID			C_2	C_5	C_{10}	C_{20}	C_{50}	C_{100}
External	PD-A	Ext-A	0.68	0.76	0.8	0.84	0.92	0.96
Internal		A	0.77	0.86	0.90	0.95	1.00	1.00
	PD-B		0.77	0.86	0.90	0.95	1.00	1.00
	PD-C		0.77	0.86	0.90	0.95	1.00	1.00
	PD-D		0.77	0.86	0.90	0.95	1.00	1.00

Time of Concentration

The time of concentration (t_c) for each catchment was calculated in accordance with Section 4.6 of QUDM.

A standard inlet time of concentration of 5 min has been adopted within developed catchments from Table 4.6.2 of QUDM (2013).

The time of concentration (t_c) for the initial flow length within the undeveloped catchments was estimated using Friend's Equation for overland flow (QUDM Section 4.6.6).

$$t_c = (107nL^{0.333})/S^{0.2}$$

where:

t_c	=	Time of concentration (min)
n	=	Horton's roughness value
L	=	Overland sheetflow path length (m)
S	=	Slope (%)

For channel flows, times where estimated using approximate stream velocities as provided within QUDM Table 4.6.6 and based an average catchment surface slope.

Table C.3 and C.4 below present the parameters relied upon to calculate the time of concentration (t_c) to the discharge point of each catchment for the existing and developed case, respectively.

Table C.3 t_c Parameters Remaining Flow Length – Existing Case

Parameter	External	Internal			
	Ext-A	A	B	C	D
Standard Inlet Time					
t_c (min)	-	-	-	-	-
Sheet Flow					
Flow Length (m)	50	50	50	50	50
Horton's Roughness Value	0.04	0.04	0.04	0.04	0.04
Slope (%)	25	8	11	14	16
t_c (min)	8.3	10.4	9.7	9.3	9.0
Channel Flow					
Flow Length (m)	150	341	217	111	78
Velocity (m/s)	3	1.5	1.5	1.5	3
Slope (%)	25	8	11	14	16
t_c (min)	0.83	3.79	2.41	1.23	0.43
TOTAL t_c (min)	**9.11**	**14.18**	**12.16**	**10.52**	**9.48**

Table C.4 Time of Concentration - Developed Case

Parameter	External	Internal			
	Ext-A	A	B	C	D
Standard Inlet Time					
t_c (min)	-	5	5	5	5
Sheet Flow					
Flow Length (m)	50	-	-	-	-
Horton's Roughness Value	0.04	-	-	-	-
Slope (%)	25	-	-	-	-
t_c (min)	8.3	-	-	-	-
Channel Flow					
Flow Length (m)	150				
Velocity (m/s)	3				
Slope (%)	25				
t_c (min)	0.83				
Pipe Flow					
Flow Length (m)	-	400	250	130	180
Velocity (m/s)	-	1	1	1	1
Slope (%)	-	1	1	1	1
t_c (min)	-	6.67	4.17	2.17	3.00
TOTAL t_c (min)	**9.11**	**11.67**	**9.17**	**7.17**	**8.00**

Rainfall Intensity

Based on the calculated t_c for each catchment, Intensity-Frequency-Duration data (IFD) has been obtained from the Bureau of Meteorology for nominated AEP's and the existing and developed cases are presented in Tables C.5 and C.6, respectively.

Table C.5 Rainfall Intensity (mm/h) – Existing Case

Catchment & Point of Discharge ID			I_2	I_5	I_{10}	I_{20}	I_{50}	I_{100}
External	PD-A	Ext-A	119.45	148.87	171.12	196.19	228.32	252.10
Internal		A	100.20	124.61	143.10	162.92	188.74	207.40
	PD-B		107.35	133.50	153.20	175.04	202.88	223.15
	PD-C		113.16	140.71	161.40	184.88	214.36	235.94
	PD-D		117.60	14643	168.16	192.78	224.03	247.07

Table C.6 Rainfall Intensity (mm/h)– Developed Case

Catchment & Point of Discharge ID			I_2	I_5	I_{10}	I_{20}	I_{50}	I_{100}
External	PD-A	Ext-A	119.45	148.87	171.12	196.19	228.32	252.10
Internal		A	109.90	135.65	155.65	177.98	206.31	226.97
	PD-B		119.15	148.48	170.64	195.64	227.63	251.29
	PD-C		129.15	161.68	186.64	214.04	250.83	278.49
	PD-D		125.00	156.20	180.00	206.40	241.20	267.20

Peak Discharge

Based on the above parameters, estimates of the expected peak discharge generated at the site's existing discharge locations for nominated AEP's have been calculated, and are presented in Tables C.7 and C.8 below.

Table C.7 Peak Discharge (m^3/s) – Existing Case

Catchment & Point of Discharge ID			0.393 (2 yr ARI)	0.181 (5 yr ARI)	0.095 (10 yr ARI)	0.049 (20 yr ARI)	0.02 (50 yr ARI)	0.01 (100 yr ARI)
External	PD-A	Ext-A	0.509	0.709	0.858	1.033	1.317	1.517
Internal		A	1.628	2.263	2.735	3.270	4.149	4.757
	PD-B		0.893	1.241	1.499	1.798	2.283	2.620
	PD-C		0.617	0.857	1.035	1.245	1.581	1.816
	PD-D		0.430	0.598	0.723	0.870	1.108	1.275

Table C.8 Peak Discharge (m^3/s) – Developed Case

Catchment & Point of Discharge ID			0.393 (2 yr ARI)	0.181 (5 yr ARI)	0.095 (10 yr ARI)	0.049 (20 yr ARI)	0.02 (50 yr ARI)	0.01 (100 yr ARI)
External	PD-A	Ext-A	0.509	0.709	0.858	1.033	1.317	1.517
Internal		A	1.681	2.336	2.822	3.388	4.156	4.572
	PD-B		1.185	1.650	1.996	2.403	2.959	3.267
	PD-C		0.551	0.770	0.936	1.127	1.398	1.552
	PD-D		0.487	0.680	0.825	0.993	1.228	1.360

Section 4 - SPECIALIST REPORTS

Water & Sewer Capacity Assessment
Prepared by H2One

Zone Planning Group

H2ONE

79-99 Courtney Drive
Upper Coomera Qld 4209

Water Supply and Sewerage Network
Hydraulic Analysis

FINAL Report V4 - 17 April, 2019

H2One Pty Ltd

Water, Sewer and Stormwater Engineering Specialists

H2One Pty Ltd

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1 INTRODUCTION

1.1 Background

A residential sub-division on 79 to 99 Courtney Drive, Upper Coomera QLD 4209, lots 188-192 on RP173728, is currently in the planning phase of the Development Application (DA) process. The site has an estimated land area of 18.9 hectares and will comprise of 237 residential freehold allotments. The development is located within the Upper Coomera development area.

To support the DA, City of Gold Coast (CoGC) has requested the following works to be submitted, with respect to water supply and sewerage infrastructure.

- A hydraulic modelling assessment of the proposed internal networks and preparation of reticulation schematic plans, to ensure adequate service will be achieved throughout the sub-division.
- A network capacity assessment to determine if the site's additional loading will impact CoGC's existing systems and trigger the need for infrastructure upgrades. Note CoGC completed a sewer modelling study in May, 2017, identifying infrastructure upgrades to service the Upper Coomera development area along Courtney Drive (refer Appendix 1). This study formed the basis for any potential infrastructure upgrades triggered by the subject site.

Morton Urban Solutions Pty Ltd developed a water supply and sewerage reticulation layout plan and service strategy for the proposed development on 79 to 99 Courtney Drive, Upper Coomera (refer to Appendices to 2 and 3 for further details). With the adoption of these service plans, H2One Pty Ltd was engaged to undertake the above assessments requested by CoGC, in accordance with the *South East Queensland Water Supply and Sewerage Design and Construction Code* (SEQ WS&S D&C Code) (2013). The outcomes of the study are presented in this report.

1.2 Objectives

The main objectives of the project were as follows.

1. Estimate potable water supply and sewerage demands for the proposed development.
2. With the adoption of CoGC's Local Government Infrastructure Plan (LGIP) hydraulic models, introduce proposed water supply and sewerage infrastructure as per Morton Urban Solutions' service strategy and reticulation schematic plans (refer Appendices 2 and 3), and complete a hydraulic analysis to determine if the proposed networks will perform within CoGC's Design Standards.
3. Assess the capacity of CoGC's existing water supply and sewerage networks to determine infrastructure upgrades necessary to achieve the minimum Design Standards, where system performance failures have occurred due to the additional loading of the new development.
4. Issue an RPEQ certified hydraulic assessment report outlining outcomes of the assessment.

1.3 Sewer Catchment System

The development site is located within the SPS PA1 sewerage catchment, at the southern extremity of Courtney Drive. The proposed service strategy consists of constructing a DN225 trunk gravity sewer line along Courtney Drive, which will traverse east through neighbouring properties and connect into the existing DN300 along Richardson Crescent. Two additional connections are proposed on the existing DN150 gravity mains along Mackellar Drive and Gordon Drive.

The development's sewage outfall will be conveyed north-east via DN300, DN375 and DN450 gravity mains along Reserve Road and Clydesdale Drive, and discharge to SPS PA1, approximately 3.3 km east of the subject site. SPS PA1 boosts flow to a downstream catchment (PA9) where wastewater is eventually transferred to the Pimpama Sewage Treatment Plant (STP).

SPS PA1 currently services an estimated 12,000 EP, which is projected to increase to a maximum of 17,000 EP at the Ultimate planning horizon (2066).

Refer to Appendices 2, 3 and 4 for an overview of the development site and relevant service strategy.

1.4 Water Supply Zone

The development site is located within the Coomera/Pimpama Low Level Zone (LLZ), which is serviced by a Pressure Reducing Valve (PRV) with a fixed pressure setting of 70 m. The Coomera/Pimpama LLZ is supplied by the Pimpama tank (CP01), via a trunk system of DN750, DN300 and DN200 mains along Peanba Park Road, Days Road and Old Coach Road.

The proposed service strategy consists of constructing a DN300 main, along Baileys Mountain Road and Courtney Drive, and a DN200 main continuing south-west along Courtney Drive to the north-west entry of the development site. Two additional connection points are proposed; one on the existing DN100 in Mackellar Drive, located at the eastern boundary of the site, and the other on the existing DN150 in Gordon Drive, adjacent to the southeast property boundary of 33 Patterson Court, Upper Coomera. This arrangement will improve network connectivity and minimise water quality issues.

The Coomera/Pimpama LLZ tank (CP01) is located to the north-west of the site approximately 5.7 km along the pipe alignment, and is situated at an estimated RL of 86 m AHD. The Coomera/Pimpama tank currently services 85,000 EP, which is estimated to increase to a maximum of 200,000 EP at the ultimate planning horizon.

Refer to Appendices 2, 3 and 5 for an overview of the development site and relevant service strategy.

1.5 Demand Assessment

A demand assessment of the development was undertaken to determine the approximate potable water and sewage demands attributed to the proposed land use type and density. This was calculated using the CoGC's adopted Equivalent Tenement (ET) unit rates and average "per capita" demand for potable water and sewage (220 L/EP/day and 210 L/EP/day respectively).

Table 1 shows a summary of the development's demand estimation.

Table 1. Estimated demands for the proposed development

Site Land Use and Density	Demand Rate	ET	EP	Water (kL/day)	Sewage (kL/day)
237 x res. allotments	1 ET / Lot	237.0	647.1	142.3	135.8

Note: Based on 2.73 ET to EP conversion

Prior to the analysis, the demands presented in Table 2 below were introduced to the hydraulic models to account for planned development within the local networks. These figures were advised by CoGC and consider existing LGIP demands already present in the model.

Table 2. Development demands (EP) introduced to the hydraulic models

Address	Sewer Node ID	Water Node ID	2016 to 2066	Water Usage Pattern
155 Baileys Mountain Rd, Upper Coomera	S111-00177M	FCP1040	212.3	RSF_1

2 METHODOLOGY

2.1 Desired Standards of Service

The CoGC Design Standards from the *South East Queensland Water Supply and Sewerage Design and Construction Code* (2013) were adopted for the study. A summary of relevant provisions is presented in Table 3 below.

Table 3. SEQ WS&S D&C Code provisions relevant to the analysis

	Provision	Specification
Sewerage	ET to EP conversion factor	2.73
	Average Dry Weather Flow (ADWF)	210 L/EP/day
	Peak Wet Weather Flow (PWWF)	5 x ADWF
	Single pump capacity	C1 x ADWF (L/s) where; C1 = 3.5 to 5.0 C1 = 15 x (EP)$^{-0.1587}$
	Pump station operational storage (m^3)	0.9 x Q / N where; Q = Single pump capacity (L/s) N = Number of pump starts per hour, where N = 12 for duty pump motor < 100 kW N = 8 for duty pump motor 100 – 200 kW N = 5 for duty pump motor > 200 kW
	Pump station emergency storage (m^3)	4 hours ADWF
	Total pump station capacity (L/s)	PWWF
	Minimum gravity pipe grade	DN150 - 1:100 for first 10 allotments, 1:150 for following allotments DN225 - 1:300
	Minimum ground cover	0.6 m in allotment or pathway 0.9 m in roadway
	Maximum manhole spacing	90 m
	Maximum depth of gravity flow (proposed system)	75% pipe diameter
	Maximum depth of gravity flow (existing system)	1.0 m below manhole level
Water Supply	ET to EP conversion factor	2.73
	Average Day Demand	220 L/EP/day
	Maximum pipe velocity (m/s)	3.0 m/s
	Standard flow minimum network pressure and background demand	22m at the property boundary at PH demand
	Residential fire flow minimum network pressure and background demand	12m at 2/3 PH demand Positive pressure at PH demand Reservoir at Minimum Operating Level (15%)
	Fire flows	Residential - 15L/s
	Hazen Williams pipe friction co-efficient	<= 150 diameter, 100 151 to 300 diameter, 110

2.2 Sewer Hydraulic Assessment

The methodology adopted for the sewerage hydraulic modelling assessment is as follows.

2.2.1 Internal Reticulation Layout and Service Strategy

1. CoGC's H2OMap SWMM LGIP hydraulic model (*PI_LGIP_2014*) was adopted for the study.
2. The development's sewer pipe layout was introduced to the base model as a background layer and model elements drawn manually. The following data was subsequently introduced to the model.

a. Nominal pipe diameters and minimum pipe grades.

b. Manhole invert levels and minimum ground cover, based on ground contours from the proposed finished surface levels presented in Appendix 3.

c. Lot demands (EP) based on closest proximity to nodes.

3. A hydraulic analysis was undertaken on the development's internal pipe layout and service strategy, where pipe sizes and grades were systematically adjusted to achieve relevant design requirements.

2.2.2 CoGC Network Capacity Assessment

4. The pump capacity of SPS PA1 was assessed by comparing the PWWF required to service the catchment, pre- and post-development, to available pump capacities presented in CoGC's LGIP report.

   If the combined pump capacity was above the catchment's PWWF, relevant design standards were achieved. If it was below the PWWF, upgrades were investigated until compliance was attained.

5. The wet well operational storage of SPS PA1 was subsequently evaluated by comparing the required operational storage capacity, post-development, against wet well volumes between duty pump start/stop levels.

   If the wet well's operational storage volume was above the minimum requirement, compliance was achieved. If it was below the minimum requirement, upgrades were investigated until design standards were achieved.

6. The flow depth of gravity mains was assessed from the proposed connection points to SPS PA1, at post-development PWWF. To avoid surcharging from unrelated issues downstream, pumps were deactivated from the model and gravity mains discharged directly to a wet well outlet.

   If flow depths could not be maintained within CoGC specifications, pipe augmentations were investigated until design standards were achieved.

7. The emergency storage for the SPS PA1 catchment was assessed by determining the available ADWF network volume between 300 mm below the overflow level (RL 3.04 m - 300 mm) and pump duty start level (RL -2.13 m AHD). This was achieved by calculating the "empty" volume of the network and subtracting the post-development ADWF volume already present in the network.

   The available emergency storage was compared against the 4 hour ADWF requirement. If the available storage was above the minimum requirement, compliance was achieved. If it was below the minimum requirement, compliance was not achieved and storage augmentations were investigated.

8. Modelling results were verified and findings reported.

2.3 Water Supply Hydraulic Assessment

The methodology adopted for the water supply hydraulic modelling assessment is as follows.

2.3.1 Internal Reticulation Layout and Service Strategy

1. CoGC's InfoWater LGIP hydraulic model (*Northern Potable Multi-Use Updated v51*) was adopted for the study.

2. The development's water pipe layout was introduced to the base model as a background layer and model elements drawn manually. The following data was subsequently introduced to the model.
    a. Nominal pipe diameters and relevant Hazen Williams pipe roughness.
    b. Node/hydrant elevation based on ground contours from the proposed finished surface levels presented in Appendix 3.
    c. Lot demands (EP) and diurnal patterns based on closest proximity to nodes/hydrants.
    d. Residential (15 L/s) fire flow allocation applied to all hydrants.

    Note the *2066_MD_SEQ_D&C_LGIP* scenario was adopted for this component of the study, as it presented the lowest network pressures across all planning horizons.
3. A standard flow and fire flow hydraulic analysis was undertaken on the development's internal pipe layout and service strategy, where pipe sizes were systematically increased and/or alignments adjusted to achieve relevant design requirements.

2.3.2 CoGC Network Capacity Assessment

4. A detailed 3 x consecutive Maximum Day (MD) demand standard flow analysis was undertaken on the Coomera/Pimpama tank, property connection point/s and surrounding network, for both pre- and post-development scenarios. Any deficiencies in the network were investigated and appropriate solutions determined.
5. Residential (15 L/s) and commercial (30 L/s) fire flow allocation was applied to the surrounding network as per the COGC's Infowater allocation. Hydrants surrounding the site were allocated 15 L/s fire flow, due to the site's significant residential usage.
6. A detailed fire flow analysis was undertaken on the nearest hydrants directly servicing the site and all hydrants within the surrounding network. This was completed for both pre- and post-development scenarios, with a 1 x MD event and supply tanks at MOL (15%). Any deficiencies in the network were investigated and appropriate solutions determined.
7. Modelling results were verified and deliverables prepared.

3 RESULTS

3.1 Sewer Internal Reticulation and Service Strategy

As per the methodology described in Section 2.2 of this report, a hydraulic analysis was undertaken on the proposed service strategy and internal sewer pipe reticulation, as per the layout plan provided by Morton Urban Solutions Pty Ltd.

The proposed pipe infrastructure presented sufficient grade, capacity and ground cover to service the subject site. The sewer hydraulic model pipe layout and raw modelling results is presented in Appendices 6 and 7, respectively. A summary of the proposed pipe network is presented in Table 4.

Table 4. Summary of infrastructure for the proposed sewer service strategy

Description	Location	Diameter (DN)	Length (m)
Sewer reticulation pipe	Within the development site	150	3,480
Sewer trunk pipe	Courtney Drive	225	680

Based on the estimated pipe levels, the DN225 servicing the larger Courtney Drive catchment area has an estimated minimum spare capacity of 18.5 L/s (or 1,522 EP), based on full pipe flow. CoGC's modelling report (presented in Appendix 1) shows a total catchment demand of 1,850 EP for the Courtney Drive catchment. The subject site accounts for a large portion of the developable land area within this catchment (estimated at 25 %), indicating that the proposed DN225 trunk pipe will have sufficient capacity to incorporate sewage loading from development external to the subject site. It is recommended that pipe sizing of trunk infrastructure should be confirmed at the design phase.

3.2 Sewer Capacity Assessment

3.2.1 Pumps

A pump capacity assessment was undertaken on SPS PA1 as per the methodology described in Section 2.2 of this report. Refer to Table 5 below for a summary of results.

Table 5. Combined pump flow capacity results

Planning Horizon	Capacity Available (kL)	Capacity Required (kL)	Difference (kL)
2016	256.2	156.5	+99.7
2066	256.2	214.9	+41.3

The above results demonstrate that there is sufficient capacity at SPS PA1 to incorporate the site's additional loading across all planning horizons. A pump capacity upgrade is therefore not required.

3.2.2 Wet Well

An assessment on the operational storage capacity of the SPS PA1 wet well was undertaken with the inclusion of the development's estimated loading. Refer to Table 6 below for a summary of results and Appendix 8 for detailed calculations.

Table 6. Operational storage capacity results

Planning Horizon	Storage Available (kL)	Storage Required (kL)	Difference (kL)
2016	15.6	8.2	+7.4
2066	15.6	11.3	+4.3

Table 6 shows that the introduction of the site's demand did not adversely impact the operating volume of the SPS PA1 wet well. A storage capacity upgrade is therefore not required.

3.2.3 Gravity Mains

As per the methodology described in Section 2.0 of this report, gravity pipe flow depths were assessed against the CoGC's minimum requirement (1.0 m below manhole level), from the connection points to SPS PA1.

The analysis identified sufficient capacity to incorporate the site's additional loading up to the 2036 planning horizon. However, the 2066 planning horizon demonstrated insufficient pipe capacity at two locations downstream of the site. This necessitated approximately 210 m of DN300 parallel pipe augmentations to achieve the minimum Design Standards at the 2066 planning horizon (pipe ID's MS-PA1-19L1AUG, MS-PA1-20L1AUG, S111-02136ML1AUG, S111-02135ML1AUG and S111-02134ML1AUG). This augmentation was determined in conjunction with the overall pipe augmentation strategy from CoGC's Upper Coomera development area regional planning study (refer Appendix 1).

Refer to Appendix 8 for detailed results and Appendix 9 for the recommended gravity main upgrades.

3.2.4 Emergency Storage

An emergency storage capacity assessment was undertaken on the SPS PA1 catchment, with the inclusion of the additional ADWF from the proposed development (2.1 L/s). Refer to Table 7 below for a summary of results and Appendix 8 for detailed calculations.

Table 7. Emergency storage capacity results

Planning Horizon	Storage Available (kL)	Storage Required (kL)	Difference (kL)
2016	514.3	406.5	+107.8
2036	514.3	411.8	+102.5
2066	510.4	540.9	-30.5

Table 7 shows that the SPS PA1 catchment has sufficient emergency storage to incorporate the development's loading up to 2036 planning horizon. The 2066 planning horizon presented insufficient capacity and will therefore require a 30.5 kL storage upgrade to satisfy CoGC's Design Standards.

The subject site is estimated to have contributed 75% towards the storage upgrade, with the remaining component attributed to the approved development at 155 Baileys Mountain Road, Upper Coomera. For the development approval process, it is recommended that CoGC only considers the component of the augmentation attributed to the subject site.

3.3 Water Supply Internal Reticulation and Service Strategy

As per the methodology described in Section 2.3 of this report, a standard flow and fire flow hydraulic analysis was undertaken on the development's internal water supply network, as per the pipe layout provided by Morton Urban Solutions Pty Ltd.

The proposed pipe network presented a minimum pressure of 19.7 m for peak hour standard flow and 13.0 m for 2/3 peak hour fire flow, located at node *H21* and respectively. This achieved CoGC's minimum Design Standard for 2/3 peak hour fire flow, however marginally failed the required 22 m residual pressure for peak hour standard flow. This outcome was discussed with CoGC where it was agreed to undertake a sensitivity analysis at the 2066_MDMM_SEQ_D&C_LGIP scenario.

This scenario presented a minimum pressure of 27.0 m and 22.5 m for standard flow and 2/3 peak hour fire flow respectively, located at node *H21* and *H36* respectively. This achieved CoGC's minimum Design Standard of 22 m residual pressure for standard flow and 12 m for fire flow. Due to the rare

event of a peak hour, peak day demand scenario, it is recommended that CoGC approves the proposed service strategy under MDMM demand conditions.

Note the critical pressure point nodes with a surface level of RL 60.5 m were assumed at an elevation of RL 59.9 m for the hydraulic analysis. This was to account for CoGC's minimum ground cover requirement, 600 mm below ground level, and accurately represent residual pressures within the main, at peak hour.

The maximum service pressure was observed at 58.6 m at node J14, based on a ground level of RL 39.0 m. This marginally exceeded CoGC's "target maximum allowable" pressure of 55 m, however was below the "maximum pressure" requirement of 80 m. The existing Coomera/Pimpama LLZ network was also largely observed at pressures exceeding the 55 m target pressure. For these reasons, the resolution of excess pressure was not investigated.

The water supply hydraulic model pipe layout and raw modelling results is presented in Appendices 10 and 11, respectively. A summary of the proposed pipe infrastructure is presented in Table 8.

Table 8. Summary of infrastructure for the proposed water supply service strategy

Description	Location	Diameter (DN)	Length (m)
Water supply reticulation pipe	Within the development site	100	1,850
Water supply reticulation pipe	Within the development site	150	780
Water supply reticulation pipe	Gordon Dr	150	275
Water supply trunk pipe	Courtney Dr	200	600
Water supply trunk pipe	Courtney Dr / Baileys Mt Rd	300	970

3.4 Water Supply Capacity Assessment

3.4.1 Standard Flow and Fire Flow

As per the methodology described in Section 2.3 of this report, a post-development standard flow and fire flow network analysis was undertaken on all planning horizons. A summary of results is presented in Tables 9 and 10 below.

Table 9. Standard flow network modelling results

	Planning Horizon					
Provision	**2016**	**2021**	**2026**	**2031**	**2036**	**2066**
Connection point (*FCP1040*) min. pressure (m)	45.7	43.4	42.0	41.7	40.2	44.1
Connection point (*W18-03512H*) min. pressure (m)	42.2	39.7	38.3	38.0	36.5	40.4
Connection point (*W18-03522H*) min. pressure (m)	34.5	33.3	33.0	32.5	30.7	32.9
Network min. pressure (m)	28.7	26.6	25.1	24.8	23.4	17.2
Network min. pressure node ID	W18-02916H					W18-00888N
Network no. failures	0	0	0	0	0	8
Tank min. water level (%)	15%	16%	32%	27%	15%	15%
Max. pipe velocity (m/s)	1.8	1.8	1.8	2.4	1.8	2.3

The above results demonstrate that the network performed within CoGC's standard flow requirements, across all planning horizons, with exception to a small number of minimum pressure failures at the 2066 planning horizon.

A subsequent analysis revealed that the minimum pressure failures are an existing planning issue, due to high elevation in the south-west area of the network analysed. The lowest performing model node (W18-00888N) was located at 15 Kiamba Street, Upper Coomera. These deficiencies were not triggered nor significantly exacerbated by the subject site's demand loading.

Infrastructure upgrades related to standard flow are not required to service the development. Refer to Appendix 12 for the modelling results pre- and post-development.

Table 10. Fire flow network modelling results

		Planning Horizon					
Scenario		**2016**	**2021**	**2026**	**2031**	**2036**	**2051**
Peak Hour	Site hydrant *(FCP1040)* min. pressure (m)	43.3	39.1	37.6	37.3	35.8	29.4
	Site hydrant *(W18-03512H)* min. pressure (m)	35.1	30.8	29.2	28.9	27.5	21.1
	Site hydrant *(W18-03522H)* min. pressure (m)	32.2	30.0	28.5	28.1	26.7	20.3
	Network hydrants min. pressure (m)	12.7	10.4	9.1	8.9	7.6	-1.5
	Network hydrant min. pressure node ID	W18-03512H					
	Network hydrants no. failures	0	0	0	0	0	1
2/3 Peak Hour	Site hydrant *(FCP1040)* min. pressure (m)	44.2	43.1	42.9	42.9	42.2	38.7
	Site hydrant *(W18-03512H)* min. pressure (m)	36.1	34.9	34.7	34.7	34.1	30.6
	Site hydrant *(W18-03522H)* min. pressure (m)	33.9	33.8	33.6	33.5	32.9	29.5
	Network hydrants min. pressure (m)	13.3	13.2	12.8	12.8	12.1	1.7
	Network hydrant min. pressure node ID	W18-01475H					
	Network hydrants no. failures	0	0	0	0	0	3

Note: Results based on supply reservoirs operating at MOL (15%), peak hour at 6 pm and 2/3 peak hour at 12 noon

The above fire flow modelling results demonstrate a small number of peak hour and 2/3 peak hour failures occurred at the 2066 planning horizon. Further investigation revealed that these minimum pressure failures were existing planning issues due to under sized "dead-end" mains throughout the network analysed. These failures were not triggered nor significantly exacerbated by the introduction of the site's demand.

No water supply infrastructure upgrades are therefore required for standard flow and fire flow service. Refer to Appendix 12 for the modelling results pre- and post-development.

4 CONCLUSION

A residential sub-division on 79 to 99 Courtney Drive, Upper Coomera QLD is currently in the planning phase of the Development Application (DA) process. The site has an estimated land area of 18.9 hectares and will comprise of 237 residential freehold allotments. The development is located within the Upper Coomera development area.

To support the DA, City of Gold Coast (CoGC) has requested the following works to be submitted, with respect to water supply and sewerage infrastructure.

- A hydraulic modelling assessment of the proposed internal networks and preparation of reticulation schematic plans, to ensure adequate service will be achieved throughout the sub-division.
- A network capacity assessment to determine if the site's additional loading will impact CoGC's existing systems and trigger the need for infrastructure upgrades.

The hydraulic analysis completed by H2One identified the following outcomes.

- The proposed internal pipe layouts and proposed service strategies, generally achieved CoGC Design Standards, for both water and sewer.
- CoGC's water supply network has sufficient capacity to incorporate the proposed development and infrastructure upgrades are therefore not required.
- CoGC's sewer network has sufficient capacity to incorporate the proposed development up to the 2036 planning horizon. However, the 2066 planning horizon required the following infrastructure upgrades to service the site's additional loading.
  - 210 m of DN300 parallel gravity mains (refer Appendix 9 for layout plan).
  - 30.5 kL of emergency storage. Note the subject site is estimated to have contributed 75% towards this upgrade, with the remaining component attributed to the approved development at 155 Baileys Mountain Road, Upper Coomera.

It is therefore recommended that CoGC approves the recommended water supply and sewer service strategies presented in Appendix 3, with consideration to the infrastructure upgrades presented above.

Detailed modelling results and layout plans can be observed in Appendices 1 through 12.

5 REFERENCE LIST

CoGC. (2013). *SEQ Water Supply and Sewerage Design and Construction Code*. Gold Coast: City of Gold Coast

CoGC. (2014). *Water Supply and Sewerage Infrastructure Plan 2014, Pimpama Sewerage Catchment Hydraulic Modelling Report 2014*. Gold Coast: City of Gold Coast

CoGC. (2016). *Network Modifications, Extension and Connections Policy Procedure.* Gold Coast: City of Gold Coast

6 APPENDICES

Appendix 1. CoGC Upper Coomera development area hydraulic analysis

CITY OF GOLDCOAST.

Briefing notes

To: Kim Evans

Copy: Mark Hunting, Kanthavanam Subramaniam, Anton Adina

From: Swapan Sikder

Action by:

Subject: Upper Coomera Development Sewerage Network Capacity Assessment

Date: 27/03/2017

File no:

Doc #: 60875128

1. Introduction

The Upper Coomera development area is located in Upper Coomera on both sides of Courtney Drive and on the north-west side of Reserve Road as shown in Figure 1.1 and Figure 1.2. The development area falls within the sewerage pump station catchment (SPS) PA1 which is located within the Pimpama Sewerage Catchment.

Figure 1.1: Upper Coomera Development

Figure 1.2: Upper Coomera Development Area within PA1 Pump Station catchment

The IDM_2013 EPs for the development area was updated based on the increase in densities, which was then used for modelling analysis. Only 2066 planning horizon was modelled to identify required augmentations due to increasing EPs within the development area.

2. Objectives

The objectives of the study were to:

- Assess the capacity of the existing gravity mains, rising mains, pumps, operational volume and emergency storage for the SPS PA1.
- Determine infrastructure upgrades necessary to achieve Council's minimum design standards, where system performance failures have occurred due to the additional sewage loadings from the development area.
- Prepare a sewer network capacity assessment report.

3. Demand Assessment

The IDM_2013 EPs were verified in September 2015 as part of Detailed Planning investigation for PA1 emergency storage requirements. These EPs were used in all assessments in this report. The EPs within the development area and SPS PA1 catchment are shown in Table 3.1. In Tables 3.1 and 3.2, additional EPs from the proposed development were added to verified EPs within the SPS PA1 catchment from 2021 planning horizon.

Table 3.1: Total EPs within the development area and SPS PA1 catchment 'without' and 'with' the proposed development

	Without Proposed Development						With Proposed Development					
	2016	2021	2026	2031	2036	2066	2016	2021	2026	2031	2036	2066
Development lots	0	0	0	0	0	0	0	1,850	1,850	1,850	1,850	1,850
PA1	10,051	10,473	10,852	11,212	11,388	15,213	10,051	12,323	12,702	13,062	13,238	17,063

Table 3.2 shows the Peak Wet Weather Flow (PWWF) within the development area and SPS PA1 catchment.

Table 3.2: Peak Wet Weather Flow (L/s) to PA1

	Without Proposed Development						With Proposed Development					
	2016	2021	2026	2031	2036	2066	2016	2021	2026	2031	2036	2066
Development lots	0	0	0	0	0	0	0	22.5	22.5	22.5	22.5	22.5
PA1	122.1	127.3	131.9	136.3	138.4	184.9	122.1	149.8	154.4	158.7	160.9	207.4

4. Desired Standards of Service

The design standards of the "South East Queensland Water Supply and Sewerage Design and Construction Code" 2013 (SEQ Code) were utilised for the assessment. A summary of the most relevant requirements is provided in Table 4.1 below.

Table 4.1: SEQ Code provisions relevant to sewerage network analysis

Parameters	Specification
Average Dry Weather Flow (ADWF)	210 L/EP/day
Peak Wet Weather Flow (PWWF)	5 x ADWF
Single Pump Capacity (L/s)	C1 x ADWF where; C1 = 3.5 to 5.0, C1 = 15 x (EP) $^{-0.1587}$
Pump station operational storage (m^3)	0.9 x Q/N where; Q = Single pump (duty) capacity (L/s) N – Number of pump starts per hour, where N = 12 for duty pump motor < 100 kW N = 8 for duty pump motor 100 – 200 kW N = 5 for duty pump motor > 200 kW
Pump station emergency storage (m^3)	4 hours ADWF
Total pump station capacity (L/s)	PWWF
Maximum depth of gravity flow (proposed system)	75% pipe full
Maximum depth of gravity flow (existing system)	1.0 m below manhole lid level.
Maximum rising main flow velocity (m/s)	3.0
Minimum rising main flow velocity (m/s)	0.75

5. Sewerage Network Modelling

The methodology adopted for the sewerage network analysis is as follows:

- Gold Coast Water and Waste's (GCWW) latest Local Government Infrastructure Planning (LGIP) InfoSWMM Pimpama sewerage catchment network model (PI_LGIP_2014) was adopted for the analysis of 2066 planning horizon. The development area's updated demand was placed into the model at relevant manholes for 2066 planning horizon.

- An analysis was carried out for SPS PA1 upstream and further downstream network to identify pumps capacities.

- The new operational volume and emergency storage volume requirements were calculated using Table 4.1 loadings and compared with available volumes.

- Rising main capacity was assessed for existing and future pumps capacity requirements.

- The flow depth of gravity mains were assessed with Table 4.1 loadings within the SPS PA1 catchment. If the flow depths could not be maintained within the Council Specifications, augmentations were proposed to meet the requirements.

- Modelling results were then verified and findings reported.

6. Sewerage Network Capacity Assessment without the Proposed Development

6.1 Gravity Sewers

As per the methodology described in section 5, existing gravity sewer flow depths were assessed against the Council's minimum requirement (1.0 m below manhole lid level) from the development area to SPS PA1.

Modelling analysis results indicate that the existing gravity sewers from the proposed development connection manhole SAP ID: 000000009000149097 up to SPS PA1 would be adequate for 2066 PWWF demand without the proposed development load (Figure 6.1). It can be seen that five gravity sections between manholes 000000009000221749 and 000000009000225835, and two gravity sections between manholes 000000009000144477 and 000000009000024658 would have exceeded pipe capacity but not breach Council's maximum depth of gravity flow criteria (1m below manhole lid level).

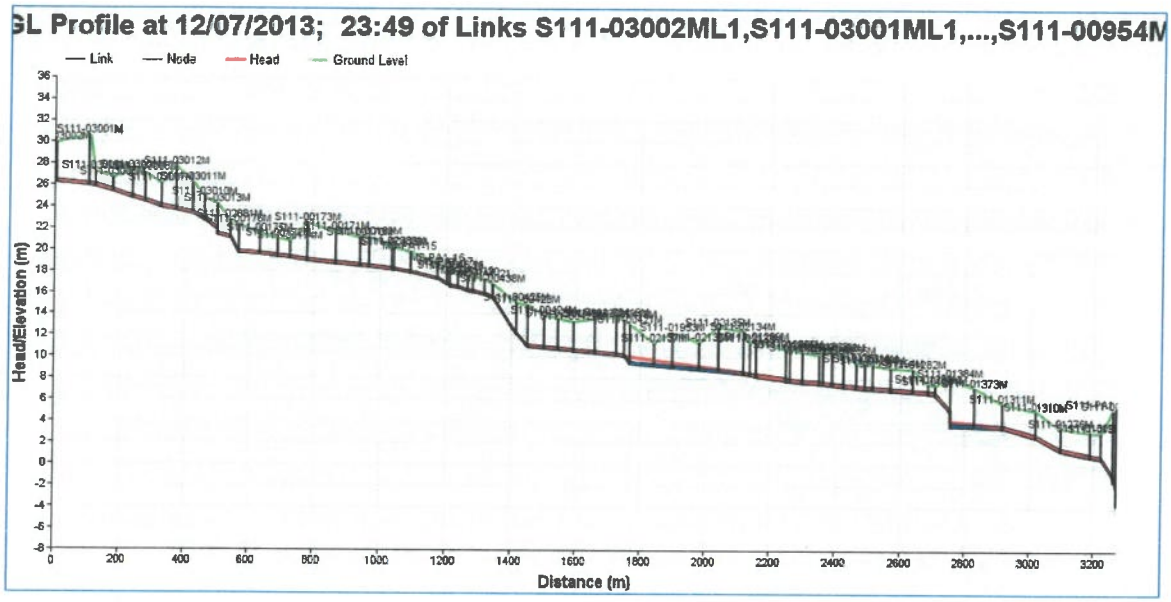

Figure 6.1: Longitudinal profile of existing gravity sewers from proposed development connection manhole 000000009000149097 up to SPS PA1 for 2066 planning horizon (without proposed development)

6.2 Pump Capacity

The single and dual pumps capacities of existing PA1 pumps are 180 L/s and 260 L/s, respectively. The 2066 PWWF inflow to PA1 is 185 L/s. There is no surcharge at immediate upstream gravity pipes of the station (Figure 6.1).

Hence existing PA1 pumps capacities are adequate until 2066.

6.3 Rising Main

SPS PA1 discharges through 375 mm diameter rising main. In 2066, the velocity in the rising main would be 1.6 m/s for single pump operation and 2.4 m/s for dual pumps operation, which would satisfy both maximum and minimum rising main velocity criteria in the SEQ Code.

Hence existing PA1 rising main would be adequate until 2066.

6.4 Operational Volume

The available operating wet well volume of PA1 is 13.2 m^3. The required operational volume for PA1 is 13.5 m^3 for existing pumps. Since PA1 pump capacity would not be required to be upgraded up to 2066, then the existing operational volume would not need to be changed.

Hence existing PA1 operational volume is sufficient until 2066.

6.5 Emergency Storage

Available current emergency storage volume of PA1 is 278 m^3, which is not adequate for any planning horizon. Additional emergency storage volume is proposed to be constructed in two stages:

Stage 1 – construction of additional 128 m^3 storage by 2017
Stage 2 – construction of additional 134 m^3 storage by 2032.

The spare capacity of emergency storage (after upgrade) at PA1 is shown in Table 6.1.

Table 6.1: Emergency storage requirements (kL) for SPS PA1

Parameter	Emergency Storage Volume (kL)					
	2016	2021	2026	2031	2036	2066
Available storage	278	406	406	406	540	536
Required storage	352	367	380	392	399	532
Spare Capacity	-74	39	26	14	141	4

Hence available PA1 emergency storage volume would be adequate up to 2066.

7. Sewerage Network Assessment with Proposed Development Demand

7.1 Gravity Sewers

The existing gravity sewers from the proposed development connection manhole 000000009000149097 up to SPS PA1 would not be adequate for 2066 PWWF demand with the proposed development load (Figure 7.1).

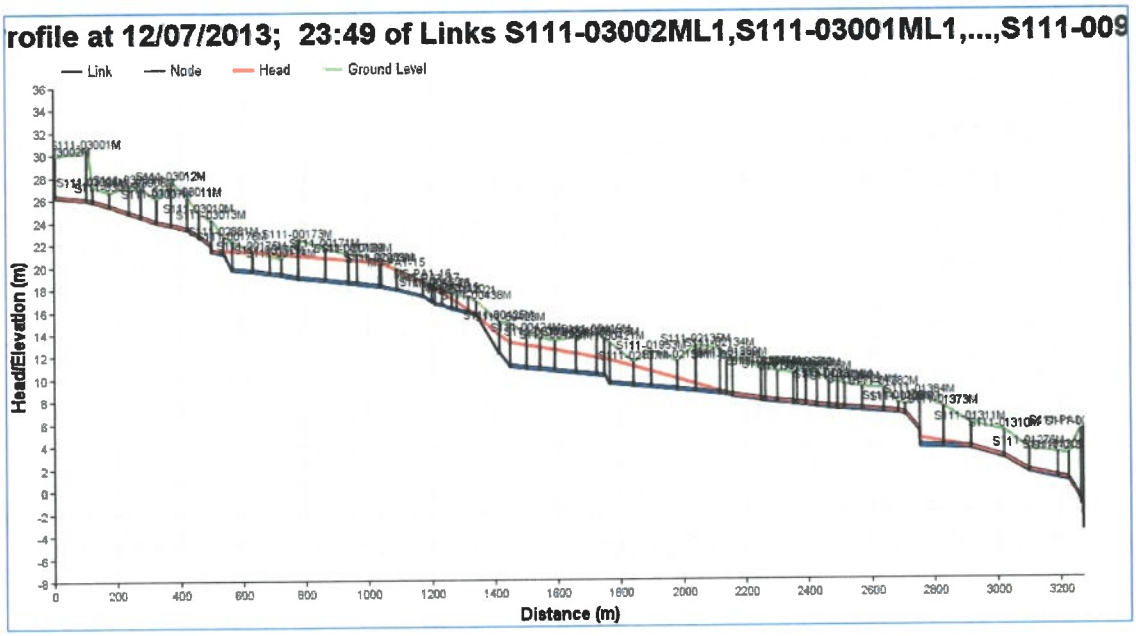

Figure 7.1: Longitudinal profile of existing gravity sewers from proposed development connection manhole 000000009000149097 up to SPS PA1 for 2066 planning horizon (with the proposed development)

As seen from above Figure 7.1, several gravity sewer sections do not have adequate capacity to deliver 2066 PWWF and spills would occur at 5 manholes.

Further modelling and analysis has identified that following gravity sections (Table 7.1 and Figure 7.2) will need to be augmented with additional 300 mm diameter pipes to satisfy SEQ design criteria of 75% depth of flow for new sewers.

Table 7.1: Existing Gravity Sections Requiring Augmentation to accommodate the Proposed Development

Pipe SAP ID	Length (m)	Existing Main Diameter (mm)	Required Additional Main Diameter (mm)
000000009000221835	85.5	225	300
000000009000140434	26.7	225	300
000000009000221864	6.9	225	300
000000009000221870	21.7	225	300
000000009000105682	29.2	225	300
000000009000140311	13.8	225	300
000000009000140318	35.4	225	300
000000009000105695	23.5	225	300
000000009000221746	78.0	300	300
000000009000146844	57.5	300	300
000000009000146291	85.9	300	300
000000009000146840	60.0	300	300
000000009000027992	79.9	300	300
000000009000225832	18.6	300	300
Total	**622.3**		

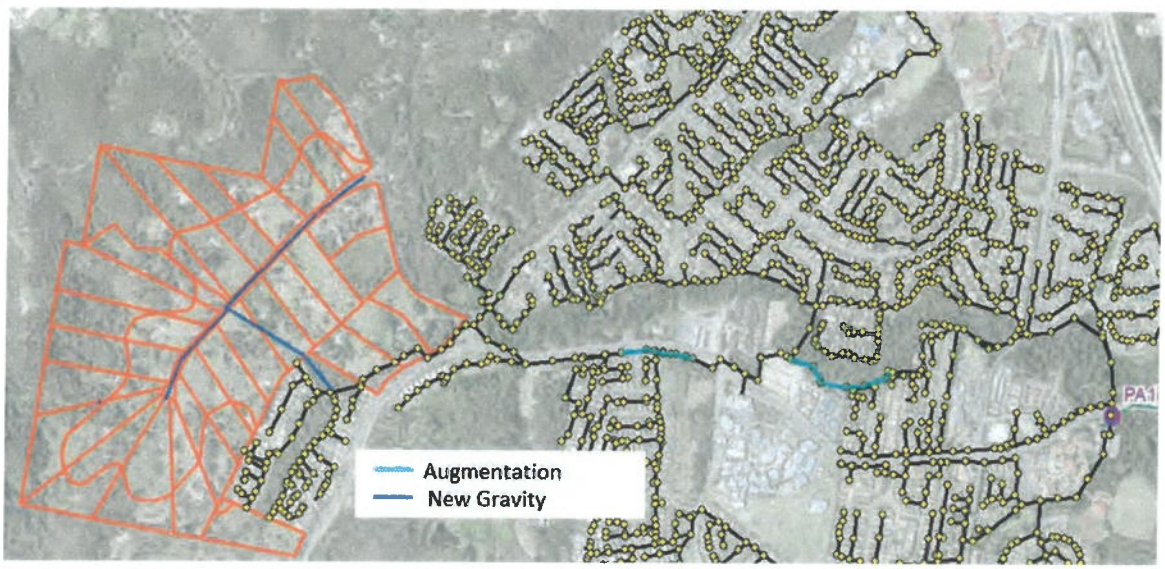

Figure 7.2: Required gravity sewers augmentation between development connection manhole 000000009000149097 and SPS PA1 (2066 Planning Horizon)

After augmenting the gravity sections as mentioned in Table 7.1 and Figure 7.2, the network to deliver 2066 PWWF including the development load would be adequate as shown in Fig 7.3.

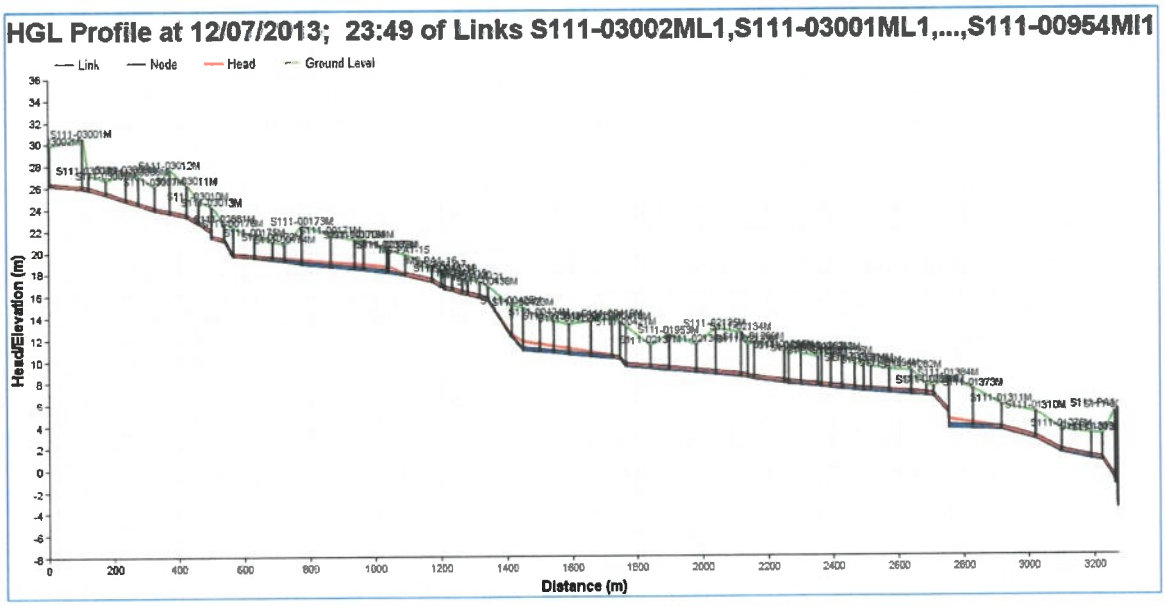

Figure 7.3: Longitudinal profile of gravity sewers from proposed development connection manhole 000000009000149097 up to SPS PA1 with augmentations and the proposed development (2066)

7.2 Pump Capacity

PWWF inflow to PA1 with additional demand from the proposed development would be 207.4 L/s in 2066. Since the dual pump capacity of existing PA1pumps is 260 L/s, the PA1 pump capacity would be adequate until 2066 including the proposed development.

Hence existing PA1 pumps would not be required to be upgraded to accommodate the proposed development.

7.3 Rising Main

Since PA1 pumps would not be required to be upgraded to cater for the proposed development, PA1 rising velocity would not change and be below 3 m/s as mentioned in section 6.3.

Hence the existing PA1 rising main would be adequate until 2066 with the proposed development.

7.4 Operational Volume

Since PA1 pumps would not be required to be upgraded to cater for the proposed development, the required operational volume would not change.

Hence existing PA1 operational volume is adequate until 2066 with the proposed development.

7.5 Emergency Storage

Since existing storage volume within PA1 catchment is not adequate for any planning horizon, additional storage volumes would be constructed to cater the demand from verified EPs. Table 6.2 shows the required emergency storage with proposed development.

Table 6.2: Emergency storage requirements (kL) for SPS PA1

Parameter	Emergency Storage Volume (kL)					
	2016	2021	2026	2031	2036	2066
Available storage	278	406	406	406	540	536
Required storage	352	431	445	457	463	597
Spare Capacity	-74	-25	-39	-51	+77	-61

The proposed development would require an additional emergency storage volume of 61 kL and available storage volume does not have adequate capacity to service this development.

Hence additional 61 kL of emergency storage would have to be constructed before development connection to service the proposed development up to 2066 planning horizon.

8. Summary of Augmentations

The following augmentations in Table 8.1 were identified to connect the proposed Upper Coomera developments to the Council's sewerage network. This is due to increase in densities in the proposed developments area.

Table 8.1: Required Augmentations within PA1 sewerage catchment

SPS Catchment	Infrastructure Augmentations	Infrastructure Size	Augmentation Year
PA1	Gravity Sewers	623 m length of DN300 – Existing gravity sewer augmentations 1370 m length of DN225 – New gravity sewers within Proposed Development 20 new manholes – Within Proposed Development	Before development connection
	Emergency Storage	61 m^3	Before development connection

9. Costing

Table 9.1 shows the total capital cost for the proposed augmentations. Cardno unit rates (2013) were used for the cost estimates. Adjustments were made for current year (2017). The overheads (20%) and contingencies (30%) were applied to base cost to calculate the total cost.

Table 9.1: Cost for Required Augmentations

SPS Catchment	Infrastructure Augmentations	Total Cost ($)
PA1	Gravity Sewer Main – Existing gravity sewer mains augmentation	[redacted]
	New gravity sewer mains in the development area	[redacted]
	New Manholes in the development area	
	Emergency Storage	[redacted]
Sub total		[redacted]
	Overheads @ 20%	[redacted]
Total		[redacted]
	Contingency @ 30%	[redacted]
Grand Total (2012 Dollars)		[redacted]
Grand Total (Adjusted to 2017 Dollars)		[redacted]

Note that pipe solution is adopted for emergency storage cost calculation.

10. Conclusions

The Upper Coomera development area would trigger the following augmentations requirements within PA1 sewerage catchment:

- Additional 243 m length of 300 mm gravity sewers from manhole 000000009000105826 to manhole 000000009000140368.
- Additional 380 m length of 300 mm gravity sewers from manhole 000000009000221749 to manhole 000000009000225830.
- New 1370 m length of 225 mm gravity sewers within the proposed development area.
- New 20 manholes within the proposed development area.
- Additional 61 kL of emergency storage at SPS PA1.
- Total capital cost of augmentations within PA1 catchment is [redacted].

Appendix 2. Proposed development layout

Scale 1:2500

0m 50 100 150 200 250 300 350 400

DEVELOPMENT SUMMARY

Stage 1	- 68
Stage 2	- 27
Stage 3	- 28
Stage 4A	- 15
Stage 4B	- 16
Stage 5	- 40
Stage 6	- 43
TOTAL	237 Lots

LEGEND

Stage boundary

DEVELOPMENT AREAS LEGEND

Total Site Area	18.849 ha
Proposed Public Open Space (Environmental)	1.572 ha
Proposed Public Open Space (Drainage)	2.41 ha
Proposed Public Open Space (Recreation)	2708m²
Proposed Net Developable Area	14.597 ha
Proposed Density	16.1 dwellings/ha
Length of New Road	2541m
Area of New Road	4.163 ha

NOTES:
1. Drawn to scale on an A3 sheet.
2. All dimensions and areas are subject to final survey and approval by G.C.C.C.
3. Dimensions shown are to the nearest decimeter.

Issue	Revision	Int	Date
J	Staging Amended	SDS	25/03/2019
I	Staging Amended	DJL	12/02/2019
H	Staging amended	SDS	1/02/2019
G	Staging Amended	SDS	11/12/2018
F	Staging amended	SDS	26/11/2018
E	Detention Basins Amended	JEW	20/09/2018
D	Lot 1004 + 157 - 163	JEW	18/09/2018
C	Layout Updated	SDS	27/08/2018
B	Layout Updated	JKC	12/06/2018
A	Original Issue		

Title:

Plan of Proposed Staged Subdivision of Lots 1-237

Cancelling Lots 188-192 on RP173728

Client:	**GALLERY HOMES**		
Locality:	UPPER COOMERA		
Local Gov:	GCCC	Prepared By:	SDS
Surveyed By:		Approved:	GWS
Date Created:	15/5/2018	Scale:	1:2500
Comp File:			
Plan No:	**171101_005_PRO**		

A3

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Appendix 3. Proposed water supply and sewerage reticulation layout plan

COURTNEY DR, UPPER COOMERA

PRELIMINARY ENGINEERING

OVERALL

No. 36001-PRE

SCHEDULE OF DRAWINGS		
NUMBER	REV. NO.	TITLE
GENERAL		
36001-PRE-000	C	COVER SHEET
36001-PRE-005	B	ROAD HIERARCHY & STAGING PLAN
EARTHWORKS. COMBINED SERVICES		
36001-PRE-090	B	PLAN SHEET 01
36001-PRE-091	B	PLAN SHEET 02
36001-PRE-092	C	PLAN SHEET 03
36001-PRE-093	C	PLAN SHEET 04
36001-PRE-094	C	PLAN SHEET 05
36001-PRE-095	B	PLAN SHEET 06
ROADS. ROADWORKS		
36001-PRE-100	B	PLAN SHEET 01
36001-PRE-101	B	PLAN SHEET 02
36001-PRE-102	B	PLAN SHEET 03
36001-PRE-103	B	PLAN SHEET 04
36001-PRE-104	B	PLAN SHEET 05
36001-PRE-105	B	PLAN SHEET 06
36001-PRE-120	A	DETAILS SHEET 01
ROADS. LONGITUDINAL SECTIONS		
36001-PRE-200	B	ROAD 01
36001-PRE-201	A	ROAD 01 (Cont.)
36001-PRE-202	A	ROAD 02
36001-PRE-203	A	ROAD 03 & ROAD 05
36001-PRE-204	A	ROAD 04
36001-PRE-205	A	ROAD 06 & ROAD 07
36001-PRE-206	A	ROAD 08 & ROAD 10
SEWER. SEWER RETICULATION		
36001-PRE-500	B	PLAN SHEET 01
36001-PRE-501	B	PLAN SHEET 02
36001-PRE-502	C	PLAN SHEET 03
36001-PRE-503	C	PLAN SHEET 04
36001-PRE-504	C	PLAN SHEET 05
36001-PRE-505	B	PLAN SHEET 06
DRAINAGE. STORMWATER		
36001-PRE-600	C	PLAN SHEET 01
36001-PRE-601	C	PLAN SHEET 02
36001-PRE-602	C	PLAN SHEET 03
36001-PRE-603	C	PLAN SHEET 04
36001-PRE-604	C	PLAN SHEET 05
36001-PRE-605	C	PLAN SHEET 06
WATER. WATER RETICULATION		
36001-PRE-700	C	PLAN SHEET 01
36001-PRE-701	C	PLAN SHEET 02
36001-PRE-702	C	PLAN SHEET 03
36001-PRE-703	C	PLAN SHEET 04
36001-PRE-704	C	PLAN SHEET 05
36001-PRE-705	C	PLAN SHEET 06

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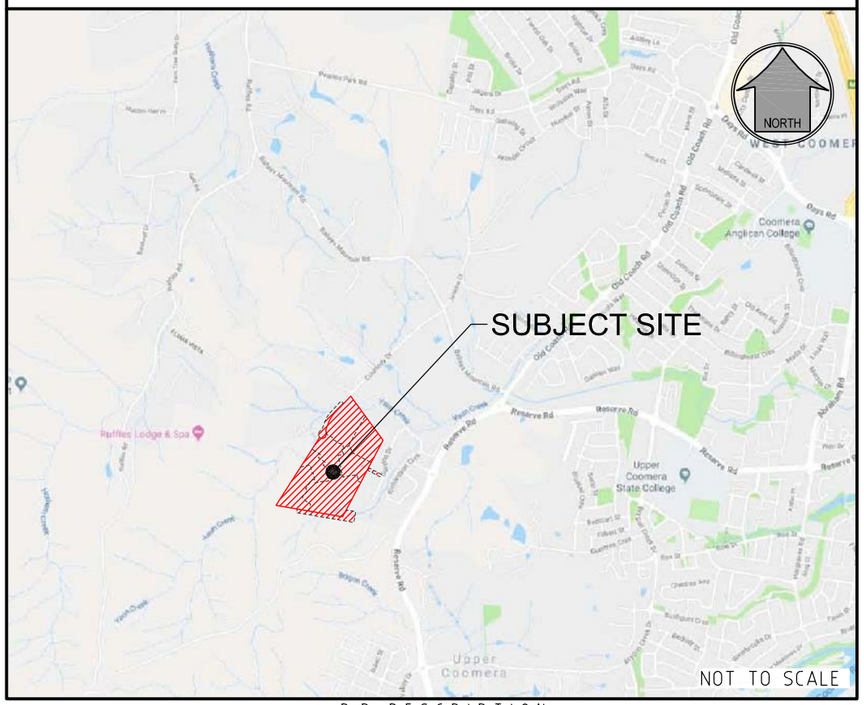
LOCALITY PLAN



R. P. DESCRIPTION
LOT 188, 189, 190, 191 & 192 ON RP173728
COURTNEY DRIVE
LOCALITY OF UPPER COOMERA
LOCAL AUTHORITY - GOLD COAST CITY COUNCIL

DRAWING NUMBER 36001-PRE-000 | AMEND. C

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GENERAL

1. CONTRACT SPECIFICATIONS
   ALL DRAWINGS ARE TO BE READ IN CONJUNCTION WITH THE CONTRACT SPECIFICATION.
2. SETOUT
   SURVEY SETOUT INFORMATION HAS BEEN ESTABLISHED ON SITE BY THE PRINCIPAL'S SURVEYOR TO ENABLE THE CONTRACTOR TO ACCURATELY SETOUT THE WORKS TO THE CO-ORDINATES SHOWN. SETOUT INFORMATION SHALL NOT BE OBTAINED BY SCALING FROM THESE DRAWINGS.
3. DATUM
   LEVELS SHOWN ARE TO A.H.D.
4. TRENCH SPOIL
   ALL MATERIALS ARISING FROM ROADS AND SERVICES ARE TO BE COMPACTED TO FUTURE STAGES, TO LEVEL 1 OR IF DIRECTED BY THE SUPERINTENDENT SHALL BE TRUCKED TO A LICENSED TIP AT THE CONTRACTOR'S EXPENSE.
5. CHECK ELECTRONIC SETOUT
   CONTRACTOR IS RESPONSIBLE TO ENSURE ANY ELECTRONIC DATA FILES MATCH THE DRAWINGS.
6. PRE START
   a. ERECT SITE SIGNAGE, CONSTRUCT ENTRY AND EXIT POINT AS INDICATED.
   b. CONSTRUCT VEHICLE WASHDOWN AREA AND ASSOCIATED SILT MANAGEMENT DEVICES.
   c. CONSTRUCT SITE OFFICE AND STORAGE COMPOUND AREA.
   d. INSTALL EROSION AND SEDIMENT CONTROL DEVICES AS PER THE CONTRACTOR'S EROSION AND SEDIMENT CONTROL PLAN.
   e. ERECT TEMPORARY TREE PROTECTION FENCING IN ACCORDANCE WITH THE APPROVED VEGETATION MANAGEMENT PLAN AND AUTHORITIES APPROVAL CONDITIONS (IF REQUIRED).
7. HEALTH AND SAFETY
   ALL WORKS UNDERTAKEN BY THE CONTRACTOR SHALL COMPLY WITH ALL APPLICABLE WORKPLACE HEALTH AND SAFETY LEGISLATION.

PROJECT SPECIFIC REPORTS

THE CONTRACTOR MUST FOLLOW THE RECOMMENDATIONS AND PROCEDURES OUTLINED IN THE FOLLOWING REPORTS AT ALL TIMES.

a) GEOTECHNICAL INVESTIGATION REPORTS (INCLUDING ANY ACID SULPHATE OR DISPERSIVE SOIL REPORTING)
b) VEGETATION & FAUNA MANAGEMENT PLANS
c) OTHER MANAGEMENT PLANS NOMINATED IN THE CONTRACT, AUTHORITIES APPROVAL CONDITIONS OR BY THE SUPERINTENDENT.

LEGEND

7.5m ROAD — REFER 120 DRAWING SERIES FOR TYPICAL SECTIONS

- EXISTING PROPERTY LINE
- EXISTING KERB (INVERT)
- EXISTING EDGE OF BITUMEN
- FUTURE PROPERTY LINE
- FUTURE KERB (INVERT)
- PROPOSED PROPERTY LINE
- PROPOSED KERB (INVERT)
- PROPOSED EDGE OF BITUMEN
- SITE BOUNDARY
- STAGE BOUNDARY
- LIMIT OF WORKS BOUNDARY

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PROJECT NAME

COURTNEY DR UPPER COOMERA

PRELIMINARY ENGINEERING

RP DESCRIPTION
LOT 188, 189, 190, 191 & 192 ON RP173728
COURTNEY DRIVE
LOCALITY OF UPPER COOMERA
LOCAL AUTHORITY - GOLD COAST CITY COUNCIL

CLIENT

GALLERY
THE ART OF LIVING

NORTH

0 12.5 25 37.5 50 62.5m
Scale 1:1250 - A1 (1:2500 - A3)

ISSUES	DATE	
TENDER		
COUNCIL	11-09-18	
CONSTRUCTION		

B	28-03-19	LOT NO'S, STAGES & LIMIT OF WORKS AMENDED
A	11-09-18	COUNCIL ISSUE
PRE	DATE	AMENDMENT

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DRAWING TITLE

ROAD HIERARCHY
AND
STAGING PLAN
SHEET 01

MORTONS urbansolutions
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DESIGNED	RB	DRAWN	EP
APPROVED		RPEQ 4706	DATE 14-08-18

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CONSTRUCTION SERVICES

1. CONSTRUCTION OF SEWER/ROOFWATER/STORMWATER/SERVICES
   EXCAVATED MATERIAL TO BE PLACED ON HIGH SIDE OF TRENCH AND TO PROTECT PIPE WORK AND DIRECT SURFACE MATERIAL AWAY FROM EXCAVATIONS.
   TOPSOIL AND GRASS SEED AREAS IN ALLOTMENTS IMMEDIATELY AFTER COMPLETING THE SEWER AND ROOFWATER DRAINAGE CONSTRUCTION.
   DEPRESS GROUND AROUND TEMPORARY FIELD INLETS TO CREATE SILT POND.
2. TRIP HAZARD
   MANHOLES OR STRUCTURES INSTALLED IN THE ROAD, FOOTPATH OR VERGE MUST MATCH NEATLY WITH NO TRIP HAZARD.
3. EXISTING SERVICES - EXTERNAL WORKS
   THE LOCATIONS OF ALL EXISTING SERVICES WITHIN THE WORK AREA SHALL BE CONFIRMED BY THE CONTRACTOR PRIOR TO CONSTRUCTION COMMENCING. IT IS THE CONTRACTOR'S RESPONSIBILITY TO CONTACT THE RELEVANT AUTHORITIES AND TO ENSURE THAT THE EXISTING SERVICES ARE NOT DAMAGED OR DISTURBED IN ANY WAY.

LEGEND

- EXISTING PROPERTY LINE
- EXISTING KERB (INVERT)
- EXISTING EDGE OF BITUMEN
- EXISTING FOOTPATH
- RM EXISTING RISING MAIN
- S EXISTING SEWER
- SW EXISTING STORMWATER
- RW EXISTING ROOFWATER
- SS EXISTING SUBSOIL
- W100 EXISTING WATER
- W150 EXISTING WATER
- W200 EXISTING WATER
- W225 EXISTING WATER
- W250 EXISTING WATER
- W300 EXISTING WATER
- EXISTING WATER CONDUIT
- PROPOSED PROPERTY LINE
- PROPOSED KERB (INVERT)
- PROPOSED EDGE OF BITUMEN
- PROPOSED FOOTPATH
- RM PROPOSED RISING MAIN
- S PROPOSED SEWER
- SW PROPOSED STORMWATER
- RW PROPOSED ROOFWATER
- SS PROPOSED SUBSOIL
- W PROPOSED WATER
- PROPOSED WATER CONDUIT
- FUTURE PROPERTY LINE
- FUTURE KERB (INVERT)
- FUTURE FOOTPATH
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- S FUTURE SEWER
- SW FUTURE STORMWATER
- RW FUTURE ROOFWATER
- SS FUTURE SUBSOIL
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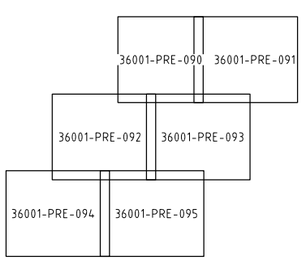
- W225 FUTURE WATER
- W250 FUTURE WATER
- W300 FUTURE WATER
- FUTURE WATER CONDUIT
- SITE BOUNDARY
- STAGE BOUNDARY

SHEET LAYOUT



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COURTNEY DR

ROAD 10

ROAD 07

STAGE 5

STAGE 6

261 260 259 258 257 256 255 262 263 264 265 266 267 268 269 270 272 273 274 275 276 277 278 279 280 281 282 283 284 327 326 325 324 323 293 294 295 296 292 291 297 290 298 289 299 288 328

PROJECT NAME

COURTNEY DR UPPER COOMERA

PRELIMINARY ENGINEERING

RP DESCRIPTION
LOT 188, 189, 190, 191 & 192 ON RP173728
COURTNEY DRIVE
LOCALITY OF UPPER COOMERA
LOCAL AUTHORITY - GOLD COAST CITY COUNCIL

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NORTH

0 5 10 15 20 25m
Scale 1:500 - A1 (1:1000 - A3)

ISSUES	DATE	
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COUNCIL	11-09-18	
CONSTRUCTION		

B	28-03-19	SHEET LAYOUT, LOT NO'S & STAGES AMENDED
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SHEET 01

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Project Coordination

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36001-PRE-090	B

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SP174234

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STAGE 6

ROAD 07

RICHARDSON CR

GORDON DR

PROJECT NAME

COURTNEY DR UPPER COOMERA

PRELIMINARY ENGINEERING

RP DESCRIPTION
LOT 188, 189, 190, 191 & 192 ON RP173728
COURTNEY DRIVE
LOCALITY OF UPPER COOMERA
LOCAL AUTHORITY - GOLD COAST CITY COUNCIL

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NORTH

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Scale 1:500 - A1 (1:1000 - A3)

ISSUES	DATE	
TENDER		
COUNCIL	11-09-18	
CONSTRUCTION		

PRE	DATE	AMENDMENT
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DESIGNED	RB	DRAWN	EP
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DRAWING NUMBER	AMEND.
36001-PRE-091	B

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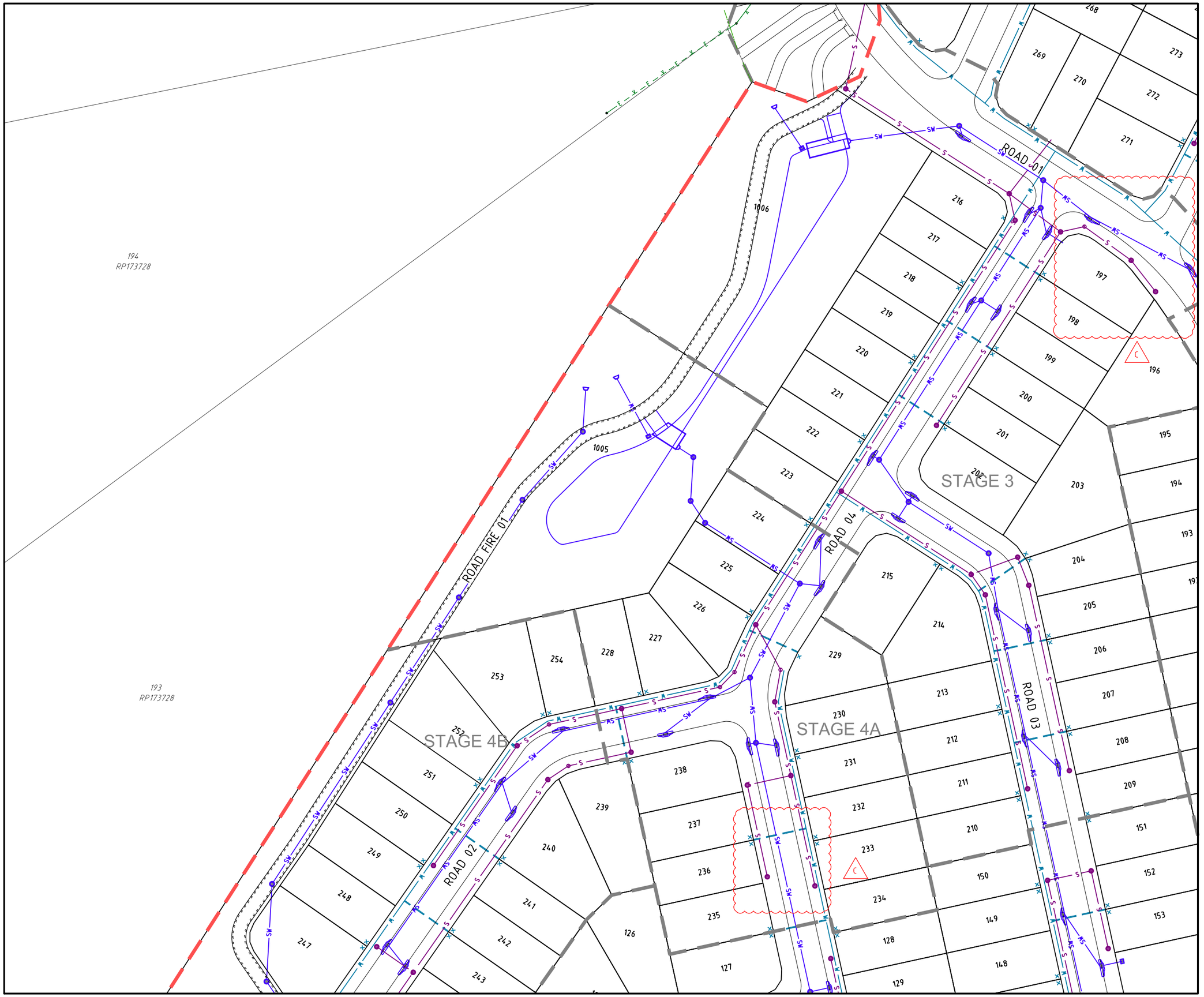

PROJECT NAME

COURTNEY DR UPPER COOMERA

PRELIMINARY ENGINEERING

RP DESCRIPTION
LOT 188, 189, 190, 191 & 192 ON RP173728
COURTNEY DRIVE
LOCALITY OF UPPER COOMERA
LOCAL AUTHORITY - GOLD COAST CITY COUNCIL

CLIENT

GALLERY
THE ART OF LIVING

NORTH

0 5 10 15 20 25m
Scale 1:500 - A1 (1:1000 - A3)

ISSUES	DATE	
TENDER		
COUNCIL	11-09-18	
CONSTRUCTION		

PRE	DATE	AMENDMENT
C	16-04-19	SEWER AMENDED
B	28-03-19	LOTS, LOT NO'S, STAGES & SHEET LAYOUT AMENDED
A	11-09-18	COUNCIL ISSUE

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zone Planning Group

DRAWING TITLE

COMBINED SERVICES
PLAN
SHEET 03

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Project Coordination

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APPROVED		RPEQ 4706	DATE 14-08-18

DRAWING NUMBER	AMEND.
36001-PRE-092	C

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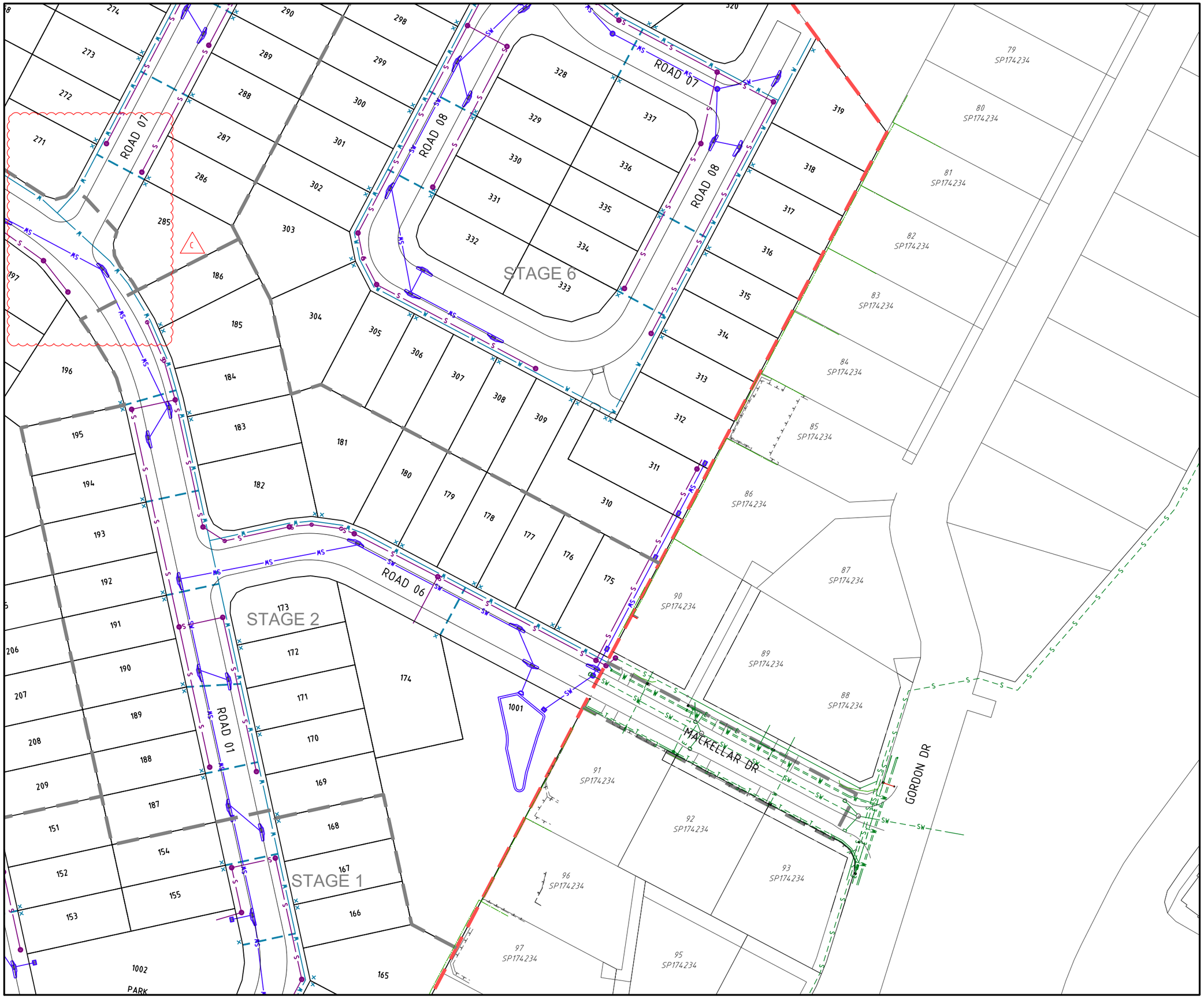

PROJECT NAME

COURTNEY DR UPPER COOMERA

PRELIMINARY ENGINEERING

RP DESCRIPTION
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ISSUES	DATE	
TENDER		
COUNCIL	11-09-18	
CONSTRUCTION		

C	16-04-19	SEWER AMENDED
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PRE	DATE	AMENDMENT

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36001-PRE-093	C

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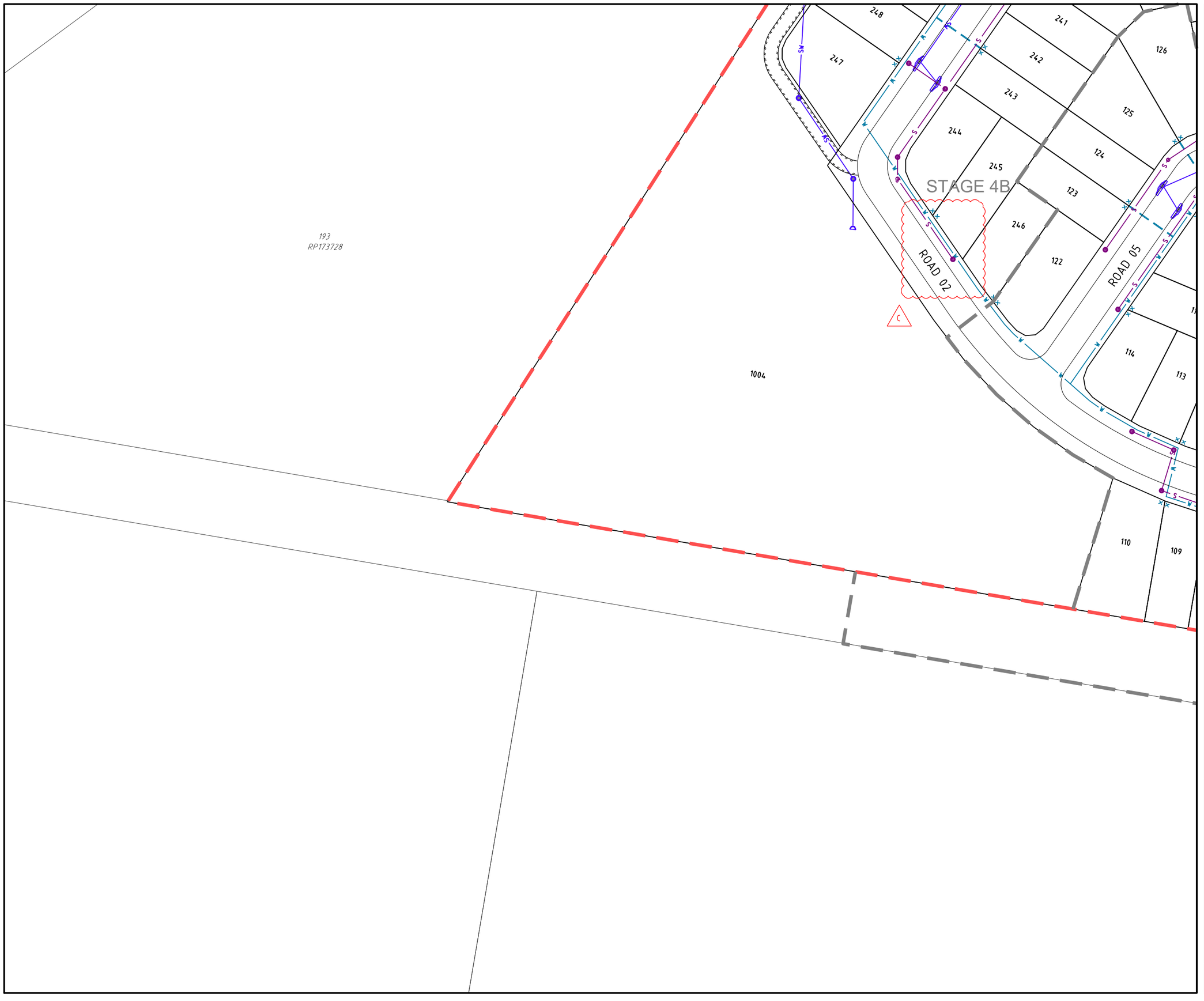

PROJECT NAME

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PRELIMINARY ENGINEERING

RP DESCRIPTION
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LOCALITY OF UPPER COOMERA
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CONSTRUCTION		

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DRAWING NUMBER	AMEND.
36001-PRE-094	C

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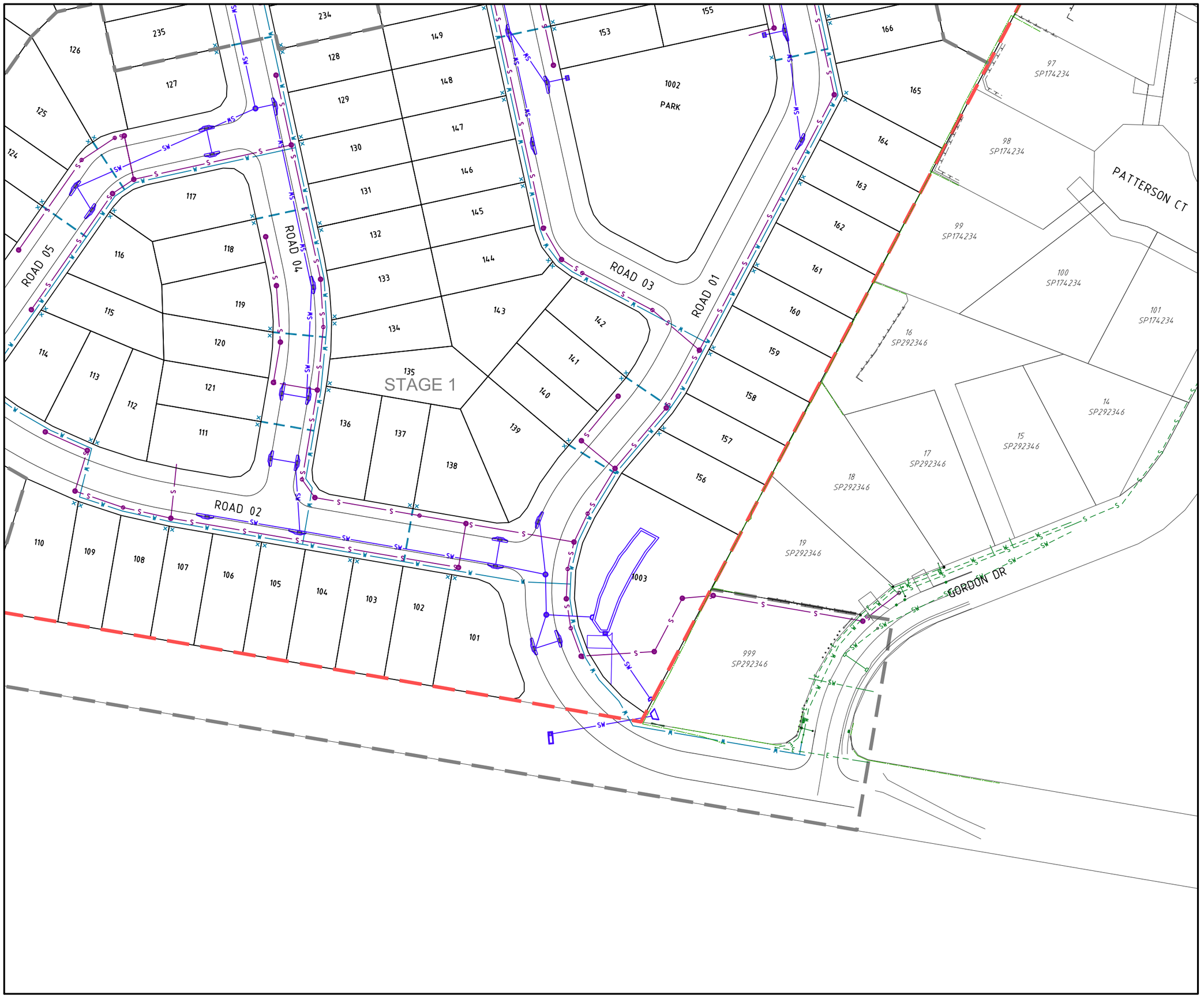

PROJECT NAME

COURTNEY DR UPPER COOMERA

PRELIMINARY ENGINEERING

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ISSUES	DATE	
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COUNCIL	11-09-18	
CONSTRUCTION		

PRE	DATE	AMENDMENT
B	28-03-19	SERVICES, LOT NO'S, STAGES & SHEET LAYOUT AMENDED
A	11-09-18	COUNCIL ISSUE

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APPROVED	RPEQ 4706	DATE 14-08-18

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36001-PRE-095	B

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ROADWORKS

1. PAVEMENT DEPTHS
   a) THE DESIGN PAVEMENT DEPTHS ALLOWED IN EARTHWORKS CALCULATIONS ARE BASED ON THE DEPTHS SHOWN IN THE SCHEDULE OF PAVEMENT DEPTHS ON DRAWING 120.
   b) THE PAVEMENT DEPTHS GIVEN ARE DESIGN DEPTHS ONLY AND MAY BE VARIED AFTER SUB-GRADE TESTS ARE TAKEN. THE CONTRACTOR IS TO PROVIDE THE SUPERINTENDENT A SUBGRADE C.B.R. REPORT PREPARED BY A SUITABLY QUALIFIED GEOTECHNICAL ENGINEER.
   THE SUPERINTENDENT WILL COORDINATE THE AUTHORITIES APPROVAL OF THE PAVEMENT DESIGN.
   c) REFER TO DWG. 120 FOR TYPICAL ROAD SECTIONS.
2. TESTING
   ALL COMPACTION TESTING SHALL BE CARRIED OUT BY AN APPROVED N.A.T.A. TESTING AUTHORITY. ALL SITE FILLING SHALL BE TESTED AT LEVEL 1 REQUIREMENTS.
3. SUBSOIL DRAINS
   SUBSOIL DRAINS ARE TO BE CONSTRUCTED IN ACCORDANCE WITH THE LOCAL AUTHORITY'S SPECIFICATIONS. SUBSOIL DRAINS SHALL BE PLACED UNDER ALL KERB STRUCTURES AND ARE TO BE CONSTRUCTED TO A DEPTH GREATER THAN THAT OF THE INVERT OF THE DEEPEST SERVICE CROSSING.
4. MITRE DRAINS
   MITRE DRAINS ARE TO BE CONSTRUCTED ALONG THE CUT/FILL INTERFACE AND SAG/LOW POINTS OF ALL ROADS. CONTRACTOR TO REQUEST DIRECTION FROM SUPERINTENDENT WHETHER TO INSTALL MITRE DRAIN AT ROCK ENCOUNTERED IN SUBGRADE. ALL MITRE DRAINS MUST BE FREE DRAINING AND TIE INTO THE ADJACENT SUBSOIL DRAINS.
5. ROCK
   THE CONTRACTOR IS TO INCLUDE ROCK EXCAVATION AS PART OF THEIR RATES.
6. TURF
   1.0m TURF STRIP TO BE INSTALLED BEHIND THE BACK OF ALL KERBS. A PERPENDICULAR TURF STRIP AT MAXIMUM 10m INCREMENTS MUST BE INSTALLED TO FULL VERGE WIDTH FOR SEDIMENT AND EROSION CONTROL PURPOSES.
7. KERBS
   ALL KERBS TO BE CONSTRUCTED IN ACCORDANCE WITH AUTHORITY STANDARDS
8. PAVEMENT TIE-IN
   PAVEMENT TIE-IN TO BE IN ACCORDANCE WITH DWG. 120

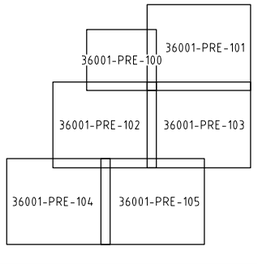
LEGEND

- EXISTING KERB (INVERT)
- EXISTING KERB (LIP & BACK)
- EXISTING FOOTPATH
- EXISTING EDGE OF BITUMEN
- EXISTING PROPERTY LINE
- EXISTING CONTOURS
- FUTURE KERB
- FUTURE FOOTPATH
- FUTURE PROPERTY LINE
- FUTURE CONTOURS
- CONTROL LINE / CENTER OF ROAD
- PROPOSED KERB (INVERT)
- PROPOSED KERB (LIP & BACK)
- PROPOSED EDGE OF BITUMEN
- PROPOSED FOOTPATH
- PROPOSED PROPERTY LINE
- SITE BOUNDARY
- STAGE BOUNDARY
- DESIGN CONTOURS
- PROPOSED CONCRETE
- 41.065 CENTRELINE CHAINAGE

KERB TYPE NOTE:

1. FOR KERB TYPES REFER TO DWG. 120

SHEET LAYOUT



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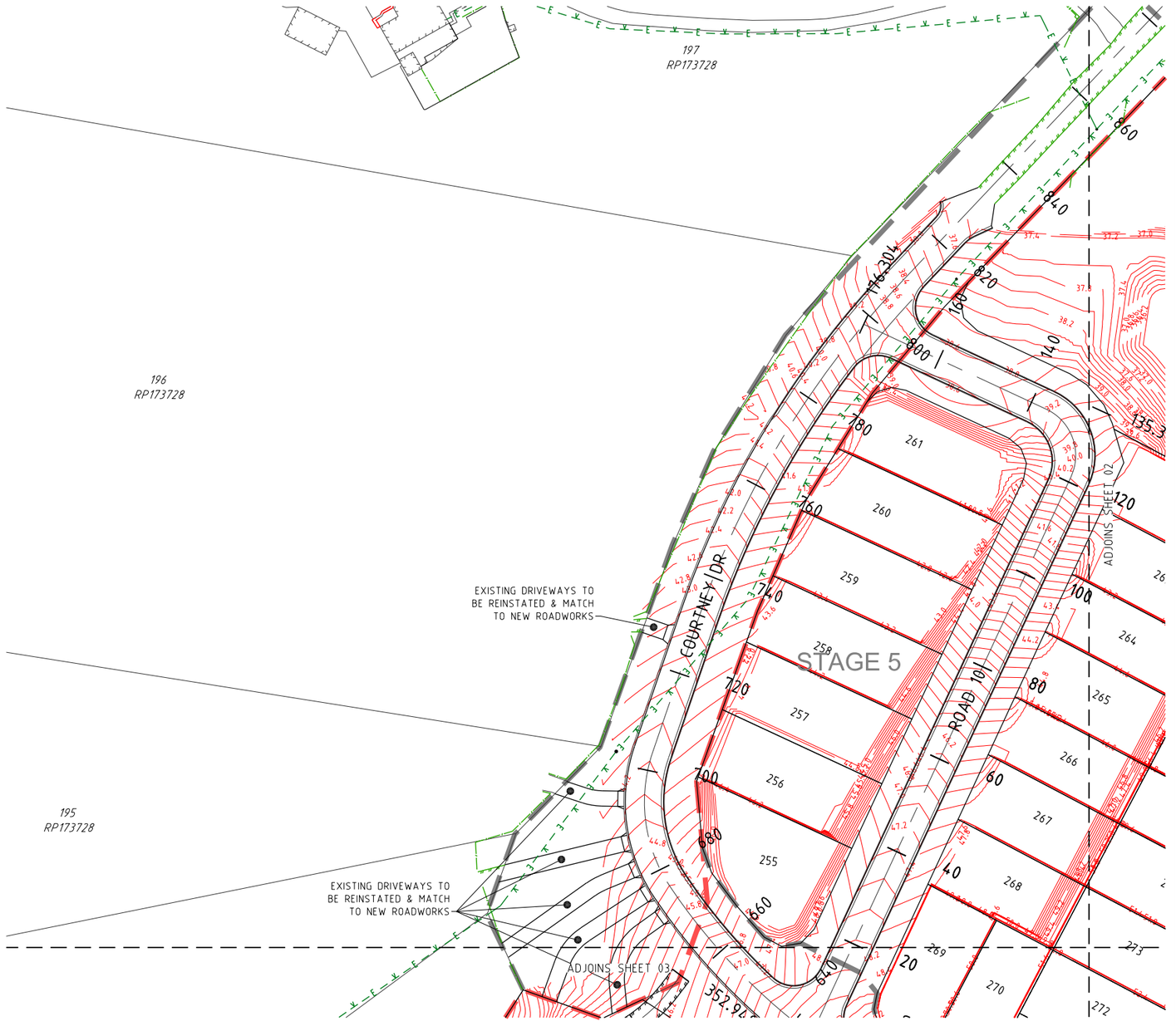

PROJECT NAME

COURTNEY DR UPPER COOMERA

PRELIMINARY ENGINEERING

RP DESCRIPTION
LOT 188, 189, 190, 191 & 192 ON RP173728
COURTNEY DRIVE
LOCALITY OF UPPER COOMERA
LOCAL AUTHORITY - GOLD COAST CITY COUNCIL

CLIENT

GALLERY
THE ART OF LIVING

NORTH

0 5 10 15 20 25m
Scale 1:500 - A1 (1:1000 - A3)

ISSUES	DATE	
TENDER		
COUNCIL	11-09-18	
CONSTRUCTION		

PRE	DATE	AMENDMENT
B	28-03-19	LOT NO'S & STAGES AMENDED, NOTES ADDED
A	11-09-18	COUNCIL ISSUE

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zone Planning Group

DRAWING TITLE

ROADWORKS
PLAN
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Urban & Regional Planning
Civil Engineering
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PROJECT NAME

COURTNEY DR UPPER COOMERA

PRELIMINARY ENGINEERING

RP DESCRIPTION
LOT 188, 189, 190, 191 & 192 ON RP173728
COURTNEY DRIVE
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ISSUES	DATE	
TENDER		
COUNCIL	11-09-18	
CONSTRUCTION		

B	28-03-19	LOT NO'S & STAGES AMENDED, NOTE ADDED
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PRE	DATE	AMENDMENT

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36001-PRE-101	B

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EXISTING DRIVEWAYS TO BE REINSTATED & MATCH TO NEW ROADWORKS

ADJOINS SHEET 01

194
RP173728

193
RP173728

ROAD 01

ROAD FIRE 01

ROAD 02

ROAD 03

ROAD 04

STAGE 3

STAGE 4A

STAGE 4B

ADJOINS SHEET 04

ADJOINS SHEET 05

ADJOINS SHEET 06

PROJECT NAME

COURTNEY DR UPPER COOMERA

PRELIMINARY ENGINEERING

RP DESCRIPTION
LOT 188, 189, 190, 191 & 192 ON RP173728
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ROADWORKS
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DRAWING NUMBER	AMEND.
36001-PRE-102	B

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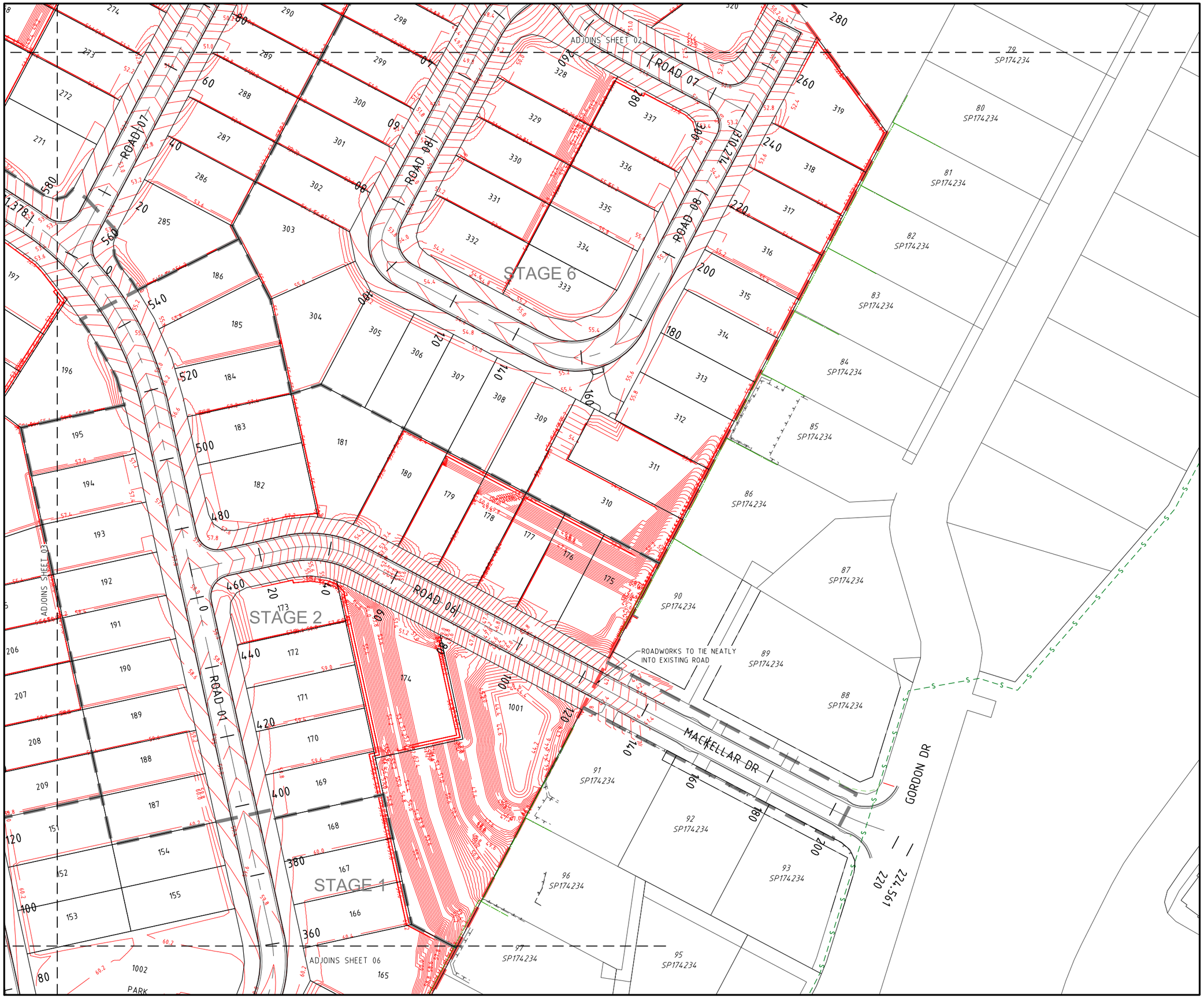

PROJECT NAME

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36001-PRE-103	B

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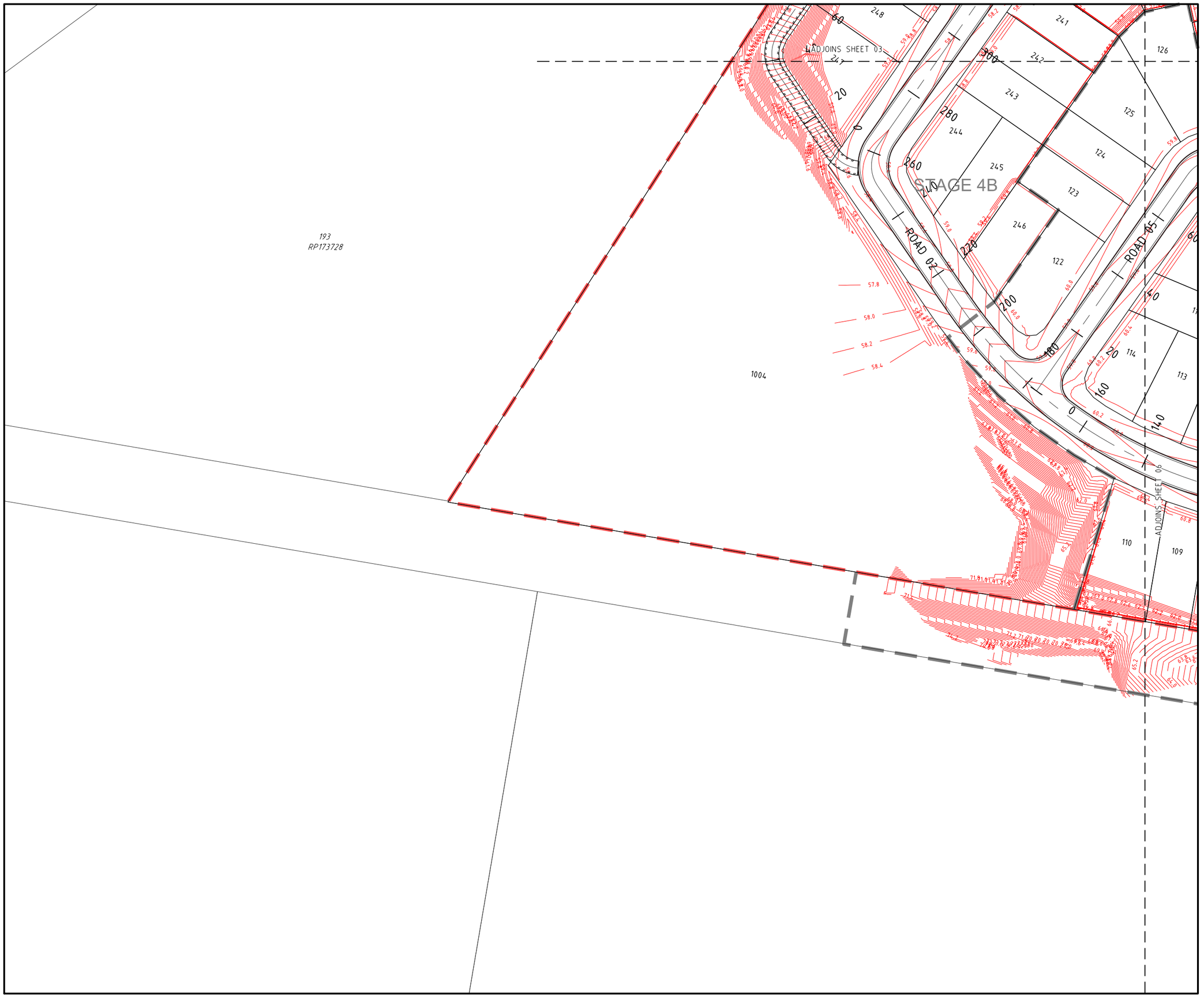

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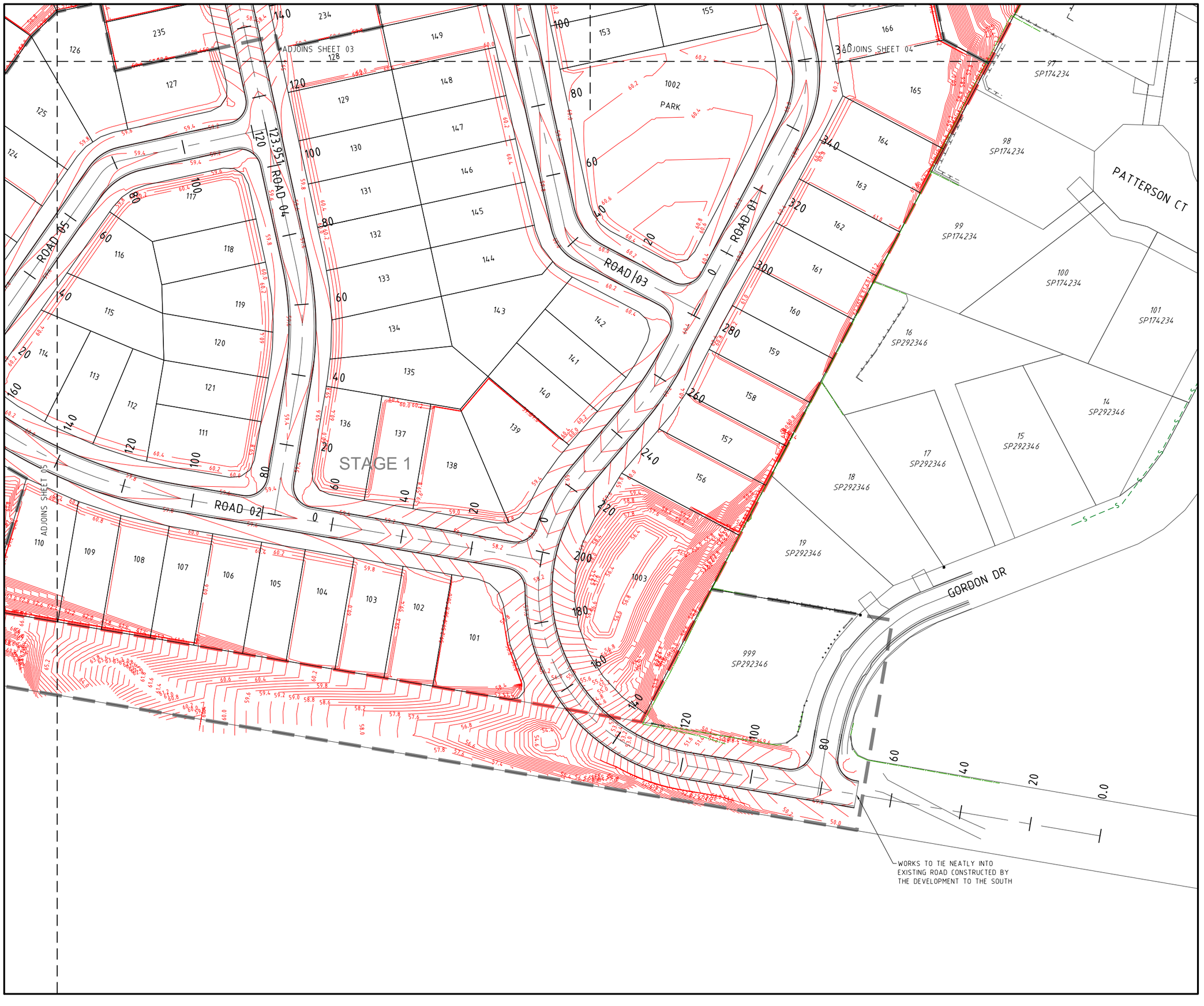

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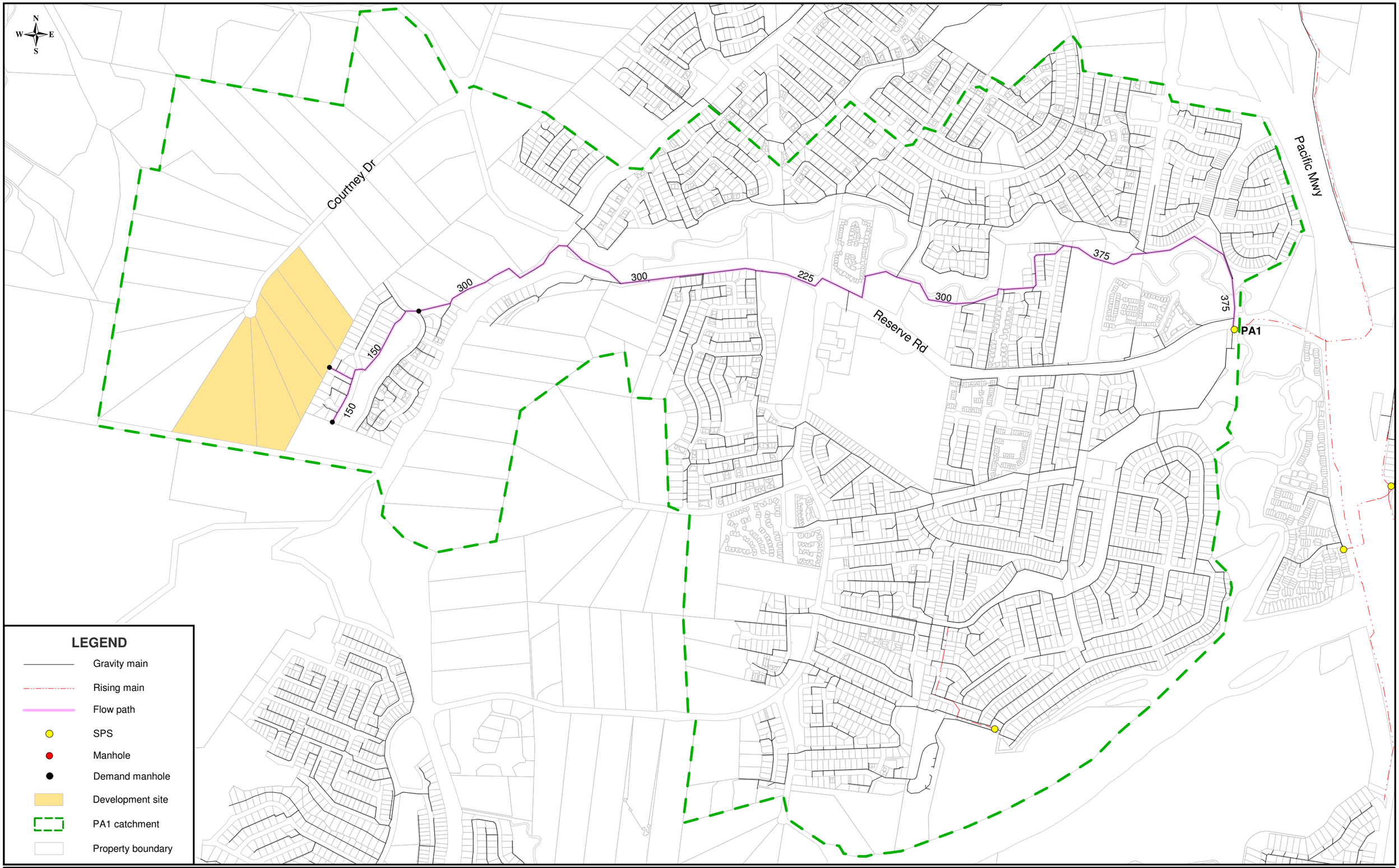
Southport QLD 4215

DESIGNED	RB	DRAWN	EP
APPROVED		RPEQ 4706	DATE 14-08-18

DRAWING NUMBER	AMEND.
36001-PRE-105	B

f:\autocad client\360 - gallery homes\01 - courtney drive\Overall\engineering drawings\preliminary engineering\Current\36001-PRE-100.dwg, PLAN SHEET 06, 17/04/2019 8:34:22 AM, 1:2

Appendix 4. Development site and SPS PA1 sewer catchment



LEGEND

- Gravity main
- Rising main
- Flow path
- SPS
- Manhole
- Demand manhole
- Development site
- PA1 catchment
- Property boundary

H2ONE

H2One Pty Ltd
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AUSTRALIA FAIR, SOUTHPORT QLD 4215

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No.	REVISION	APPROVED
C	REVISED ISSUE - 17 APR 2019	
B	REVISED ISSUE - 21 SEP 2018	
A	ORIGINAL ISSUE - 15 MAY 2018	

DATUM:
HORIZ: MGA94 (ZONE 56)
HEIGHT: AHD

SCALE:
0 200 400
Metres

SURVEYED BY / DATE:
SURVEY CHECKED:

H2ONE REFERENCES

PROJECT NO: 1804245

FILE REFERENCE:

CAD FILE:

CITY OF GOLDCOAST.

CITY OF GOLD COAST
PO BOX 5042, GCMC QLD 9729

79-99 Courtney Dr Upper Coomera QLD 4209 Water Supply and Sewerage Hydraulic Analysis

Appendix 4. Development site and SPS PA1 sewer catchment

ORIGINAL ISSUE DATE: MAY, 2018

DATE SCANNED:

DRG No:

REV:

Appendix 5. Development site and Coomera/Pimpama LLZ water supply system

LEGEND

- Trunk main
- Retic main
- DN300 service strategy
- Reservoir
- Hydrant
- Demand node
- PRV
- Area analysed
- DMAs
- Development site
- Property boundary

N
W E
S

CP01

750

750

300

PRV

300

300

300

200

Refer INSET 1

INSET 1

300

FCP1040

Courtney Dr

W18-03512H

150

100

200

Alexander Dr

W18-03522H

Reserve Rd

H2ONE

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B	REVISED ISSUE - 17 APR 2019	
A	ORIGINAL ISSUE - 15 MAY 2018	

DATUM:
HORIZ: MGA94 (ZONE 56)
HEIGHT: AHD

SCALE:
0 250 500
Metres

SURVEYED BY / DATE:
SURVEY CHECKED:

H2ONE REFERENCES
PROJECT NO: 1804245
FILE REFERENCE:
CAD FILE:

CITY OF GOLDCOAST.

CITY OF GOLD COAST
PO BOX 5042, GCMC QLD 9729

79-99 Courtney Dr Upper Coomera QLD 4209 Water Supply and Sewerage Hydraulic Analysis

Appendix 5. Development site and Coomera/Pimpama LLZ water supply system

ORIGINAL ISSUE DATE: MAY, 2018
DATE SCANNED:
DRG No:
REV:

Appendix 6. Sewer hydraulic model pipe layout

LEGEND

Existing

- Gravity main
- Pressure main
- SPS
- Manhole
- Demand manhole
- Property boundary

Proposed

- DN150 gravity main
- DN225 gravity main
- Manhole
- Property boundary

N W E S

Courtney Drive

Gordon Dr

Richardson Cres

Reserve Rd

150

150

S111-03002M

S111-03082M

S111-03071M

Gravity flow to SPS PA1

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CHECKED: J May
APPROVED: J May
CLIENT PM:
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No.	REVISION	APPROVED
D	REVISED ISSUE - 17 APR 2019	
C	REVISED ISSUE - 26 NOV 2018	
B	REVISED ISSUE - 21 SEP 2018	
A	ORIGINAL ISSUE - 15 MAY 2018	

DATUM:
HORIZ: MGA94 (ZONE 56)
HEIGHT: AHD

SCALE:
0 40 80
Metres

SURVEYED BY / DATE:
SURVEY CHECKED:

PROJECT NO: 1804245
FILE REF:
CAD FILE:

CITY OF GOLDCOAST.
CITY OF GOLD COAST
PO BOX 5042, GCMC QLD 9729

79-99 Courtney Dr Upper Coomera QLD 4209 Water Supply and Sewerage Hydraulic Analysis

Appendix 6. Sewer hydraulic model pipe layout

DATE SCANNED:
DRG No:
REV:

Appendix 7. Modelling results for sewer reticulation layout

Nodes

Node ID	IL (RL m)	SL (RL m)	Depth (m)	Demand (EP)
JCT-12	53.88	55.00	1.12	5.40
JCT-14	53.94	55.60	1.66	0.00
JCT-16	53.99	56.00	2.01	0.00
JCT-18	54.12	57.60	3.48	0.00
JCT-20	54.17	57.60	3.43	5.40
JCT-22	58.65	59.40	0.75	8.13
JCT-30	58.65	59.40	0.75	8.13
JCT-32	58.85	59.60	0.75	0.00
JCT-34	58.72	59.60	0.88	5.40
JCT-36	59.45	60.20	0.75	8.13
JCT-38	58.85	59.60	0.75	0.00
JCT-40	58.73	59.60	0.87	8.13
JCT-42	57.79	60.40	2.61	0.00
JCT-44	57.28	59.20	1.92	0.00
JCT-46	56.99	59.00	2.01	0.00
JCT-48	56.93	58.60	1.67	0.00
JCT-50	56.87	58.20	1.33	0.00
JCT-52	56.65	57.40	0.75	0.00
JCT-54	56.25	57.00	0.75	0.00
JCT-56	52.25	53.00	0.75	0.00
JCT-58	52.13	53.00	0.87	0.00
JCT-60	49.65	50.40	0.75	0.00
JCT-62	47.25	48.00	0.75	0.00
JCT-64	46.25	47.00	0.75	0.00
JCT-66	54.45	55.20	0.75	2.67
JCT-68	59.52	60.40	0.88	0.00
JCT-70	59.65	60.40	0.75	5.40
JCT-72	57.65	58.40	0.75	8.13
JCT-74	58.05	58.80	0.75	5.40
MH0	58.64	59.60	0.96	5.40
MH1	33.03	34.00	0.97	0.00
MH10	38.38	39.20	0.82	0.00
MH100	59.40	60.40	1.00	5.40
MH101	36.78	37.60	0.82	0.00
MH102	58.48	59.60	1.12	0.00
MH103	58.18	59.80	1.62	8.13
MH104	59.25	60.00	0.75	5.40
MH105	59.15	60.00	0.85	2.67
MH106	59.05	59.80	0.75	5.40
MH107	54.25	55.00	0.75	2.67
MH108	54.65	55.40	0.75	5.40
MH109	57.65	58.40	0.75	8.13
MH11	45.38	46.20	0.82	0.00
MH110	54.75	55.50	0.75	0.00
MH111	54.25	55.00	0.75	5.40
MH112	57.80	57.05	0.75	5.40
MH113	58.20	57.45	0.75	5.40
MH114	57.92	59.90	1.98	0.00
MH115	57.83	59.90	2.07	2.67
MH116	57.71	59.80	2.09	2.67
MH117	57.54	59.40	1.86	0.00
MH118	59.04	59.90	0.86	0.00
MH119	58.96	59.90	0.94	8.13
MH12	44.18	45.00	0.82	0.00

MH120	59.25	60.20	0.95	2.67
MH121	59.11	60.00	0.89	8.13
MH122	58.15	58.90	0.75	10.86
MH123	57.20	58.80	1.60	0.00
MH124	57.49	59.40	1.91	8.13
MH126	59.25	60.00	0.75	5.40
MH127	57.39	60.00	2.61	0.00
MH128	57.54	60.40	2.86	5.40
MH129	57.67	60.40	2.73	13.59
MH13	51.55	52.40	0.85	13.59
MH130	57.25	58.00	0.75	8.13
MH132	54.42	56.20	1.78	0.00
MH133	54.53	56.00	1.47	0.00
MH134	54.65	55.40	0.75	8.13
MH136	55.65	56.40	0.75	10.86
MH139	29.18	30.00	0.82	0.00
MH14	44.85	45.60	0.75	0.00
MH140	29.13	30.00	0.87	0.00
MH15	52.25	53.00	0.75	16.32
MH16	46.65	47.40	0.75	10.86
MH17	42.25	43.00	0.75	10.86
MH18	42.25	43.00	0.75	0.00
MH19	53.20	52.45	0.75	2.70
MH2	33.18	34.00	0.82	0.00
MH20	37.38	38.20	0.82	0.00
MH21	38.78	39.60	0.82	0.00
MH22	40.78	41.60	0.82	8.13
MH23	42.18	43.00	0.82	0.00
MH24	43.38	44.20	0.82	10.86
MH25	52.05	52.80	0.75	8.13
MH26	51.85	52.60	0.75	2.67
MH27	50.45	51.20	0.75	5.40
MH28	50.85	51.60	0.75	8.13
MH29	50.25	51.00	0.75	0.00
MH3	34.65	37.00	2.35	0.00
MH30	45.25	46.00	0.75	8.13
MH31	49.85	50.60	0.75	0.00
MH32	52.05	52.80	0.75	2.67
MH33	52.75	53.50	0.75	2.67
MH34	59.01	58.26	0.75	8.13
MH35	57.95	58.70	0.75	0.00
MH36	58.65	59.40	0.75	10.86
MH37	49.05	49.80	0.75	5.40
MH38	46.25	47.00	0.75	0.00
MH39	47.85	48.60	0.75	0.00
MH4	35.00	38.00	3.00	0.00
MH40	53.45	54.20	0.75	0.00
MH41	58.25	59.00	0.75	10.86
MH42	58.05	58.80	0.75	10.86
MH43	58.06	60.00	1.94	13.59
MH44	57.99	60.00	2.01	0.00
MH45	53.05	53.80	0.75	2.67
MH46	51.25	52.00	0.75	8.13
MH47	54.85	55.60	0.75	8.13
MH48	53.25	54.00	0.75	5.40
MH49	54.85	55.60	0.75	10.86
MH5	36.68	37.50	0.82	0.00
MH50	59.25	60.00	0.75	8.13

MH51	50.45	51.20	0.75	8.13
MH52	52.45	53.20	0.75	5.40
MH53	53.05	53.80	0.75	0.00
MH54	53.15	53.90	0.75	0.00
MH55	53.45	54.20	0.75	8.13
MH56	51.85	52.60	0.75	5.40
MH57	53.05	53.80	0.75	0.00
MH58	52.25	53.00	0.75	0.00
MH59	54.25	55.00	0.75	5.40
MH6	36.18	37.00	0.82	0.00
MH63	34.90	37.60	2.70	0.00
MH64	42.05	42.80	0.75	0.00
MH65	41.76	42.60	0.84	0.00
MH66	41.95	42.70	0.75	5.40
MH67	42.65	43.40	0.75	10.86
MH68	50.25	51.00	0.75	16.32
MH69	45.25	46.00	0.75	2.67
MH7	35.18	36.00	0.82	0.00
MH70	42.25	43.00	0.75	0.00
MH71	42.05	42.80	0.75	0.00
MH72	45.65	46.40	0.75	0.00
MH73	42.65	43.40	0.75	2.67
MH74	41.72	42.60	0.88	0.00
MH75	42.05	42.80	0.75	8.13
MH76	48.45	49.20	0.75	5.40
MH77	42.05	42.80	0.75	0.00
MH78	42.25	43.00	0.75	5.40
MH79	50.25	51.00	0.75	8.13
MH8	41.85	42.60	0.75	0.00
MH80	54.45	55.20	0.75	10.86
MH81	52.45	53.20	0.75	8.13
MH82	53.65	54.40	0.75	8.13
MH83	48.32	49.20	0.88	10.86
MH84	53.65	54.40	0.75	0.00
MH85	50.45	51.20	0.75	0.00
MH86	53.85	54.60	0.75	0.00
MH87	57.45	58.20	0.75	5.40
MH88	48.85	49.60	0.75	8.13
MH89	53.25	54.00	0.75	8.13
MH9	39.25	40.00	0.75	8.13
MH90	57.85	58.60	0.75	0.00
MH91	58.74	59.70	0.96	5.40
MH92	59.05	59.80	0.75	0.00
MH93	58.37	60.20	1.83	10.86
MH95	58.60	59.60	1.00	2.67
MH97	59.45	60.20	0.75	5.40
MH98	59.05	59.80	0.75	10.86
MH99	57.94	60.20	2.26	0.00
MH200	55.00	54.25	0.75	2.70

Pipes

Pipe ID	Diam. (mm)	Length (m)	Manning	US IL (RL m)	DS IL (RL m)	Grade (%)	PWWF (L/s)	d/D (%) @ PWWF
GM1	150	14.9	0.0130	59.40	59.25	1.01	0.13	6.9%
GM100	150	6.6	0.0130	42.25	41.85	6.04	0.30	12.9%
GM101	150	12.2	0.0130	42.05	41.85	1.64	0.76	16.4%
GM102	150	7.7	0.0130	42.25	42.05	2.60	0.66	12.3%
GM103	150	30.8	0.0130	45.25	42.25	9.80	0.66	9.7%
GM104	150	8.0	0.0130	45.65	45.25	5.03	0.63	9.0%

GM105	150	29.4	0.0130	48.32	45.65	9.12	0.63	9.0%
GM106	150	12.7	0.0130	48.45	48.32	1.03	0.16	7.7%
GM107	150	12.7	0.0130	41.85	41.76	0.71	1.05	23.0%
GM108	150	5.6	0.0130	41.76	41.72	0.72	1.45	19.8%
GM109	150	43.2	0.0130	41.72	35.00	15.75	2.17	27.7%
GM110	225	51.8	0.0130	35.18	35.00	0.34	2.34	24.3%
GM111	150	10.0	0.0130	42.25	42.05	2.00	0.33	8.6%
GM112	150	4.6	0.0130	42.05	41.95	2.18	0.33	9.4%
GM113	150	8.2	0.0130	41.95	41.84	1.35	0.40	10.4%
GM114	150	11.6	0.0130	42.05	41.84	1.81	0.72	12.9%
GM115	150	7.6	0.0130	42.65	42.05	7.87	0.72	11.0%
GM116	150	34.5	0.0130	44.85	42.65	6.40	0.59	8.8%
GM117	150	7.0	0.0130	45.25	44.85	5.75	0.59	8.8%
GM118	150	8.8	0.0130	46.25	45.25	11.39	0.49	8.0%
GM119	150	17.5	0.0130	47.85	46.25	9.17	0.49	7.1%
GM12	150	42.9	0.0130	57.49	57.20	0.68	0.95	20.4%
GM120	150	8.2	0.0130	49.05	47.85	14.75	0.49	6.9%
GM121	150	7.7	0.0130	49.85	49.05	10.44	0.43	6.6%
GM122	150	30.9	0.0130	51.85	49.85	6.49	0.43	7.1%
GM123	150	20.8	0.0130	53.25	51.85	6.76	0.16	6.1%
GM124	150	18.0	0.0130	52.05	51.85	1.11	0.23	8.1%
GM125	150	46.3	0.0130	54.85	53.25	3.45	0.10	4.5%
GM126	150	73.6	0.0130	54.85	52.05	3.81	0.13	6.7%
GM127	150	50.6	0.0130	54.45	53.85	1.19	0.13	5.9%
GM128	150	7.9	0.0130	53.85	53.65	2.53	0.13	5.5%
GM129	150	7.6	0.0130	53.65	53.25	5.30	0.23	6.1%
GM13	150	7.0	0.0130	57.54	57.49	0.71	0.85	18.1%
GM130	150	66.1	0.0130	53.25	48.45	7.28	0.33	6.4%
GM131	150	44.4	0.0130	52.45	48.45	9.05	0.10	5.3%
GM132	225	30.4	0.0130	35.00	34.90	0.33	4.51	29.6%
GM133	225	75.3	0.0130	34.90	34.65	0.33	4.51	24.8%
GM134	225	85.0	0.0130	34.65	33.18	1.74	4.51	24.9%
GM135	225	43.8	0.0130	33.18	33.03	0.33	4.51	23.6%
GM136	225	122.3	0.0130	33.03	29.18	3.15	4.51	22.5%
GM137	225	13.8	0.0130	29.18	29.13	0.33	4.51	29.5%
GM138	225	25.6	0.0130	29.13	29.05	0.33	4.51	27.1%
GM14	150	25.7	0.0130	57.71	57.54	0.66	0.85	17.7%
GM140	150	12.7	0.0130	55.65	54.42	9.72	0.49	11.0%
GM141	150	12.6	0.0130	59.05	58.85	1.59	0.11	5.4%
GM142	150	12.5	0.0130	58.85	58.72	1.04	0.10	6.5%
GM143	150	34.6	0.0130	58.72	58.37	1.01	0.16	9.1%
GM144	150	22.5	0.0130	59.45	58.85	2.67	0.11	5.2%
GM145	150	12.4	0.0130	58.85	58.73	0.96	0.10	6.9%
GM146	150	66.8	0.0130	58.73	58.06	1.00	0.20	9.8%
GM147	150	22.5	0.0130	57.94	57.79	0.67	0.36	11.7%
GM148	150	17.4	0.0130	57.79	57.67	0.69	0.36	14.4%
GM149	150	15.9	0.0130	57.39	57.28	0.69	1.02	19.1%
GM15	150	17.6	0.0130	57.83	57.71	0.68	0.62	16.6%
GM150	150	7.8	0.0130	56.99	56.93	0.76	2.37	30.3%
GM151	150	8.5	0.0130	56.93	56.87	0.71	2.37	26.9%
GM152	150	8.6	0.0130	56.87	56.65	2.57	2.37	21.1%
GM153	150	7.8	0.0130	56.65	56.25	5.14	2.37	16.5%
GM154	150	20.6	0.0130	56.25	52.25	19.76	2.37	24.2%
GM155	150	17.2	0.0130	52.25	52.13	0.70	2.37	23.6%
GM156	150	8.8	0.0130	52.13	49.65	29.41	2.37	14.7%
GM157	150	43.4	0.0130	49.65	47.25	5.54	2.37	16.9%
GM158	150	12.8	0.0130	47.25	46.25	7.81	2.37	20.3%
GM159	150	31.1	0.0130	57.20	56.99	0.67	1.35	25.4%

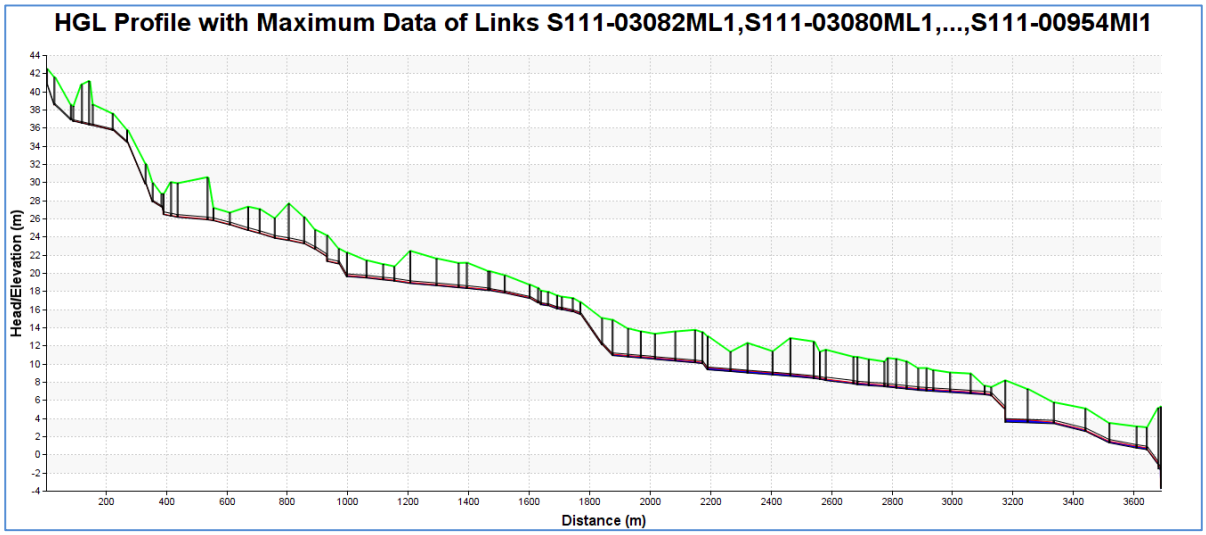
GM16	150	13.5	0.0130	57.92	57.83	0.67	0.59	15.0%
GM160	150	11.4	0.0130	59.04	58.96	0.70	0.10	7.6%
GM161	150	12.0	0.0130	58.60	58.48	1.00	0.23	10.1%
GM162	150	11.9	0.0130	54.45	54.25	1.68	0.10	5.5%
GM163	150	38.9	0.0130	58.18	57.92	0.67	0.59	14.9%
GM164	150	12.8	0.0130	59.65	59.52	1.01	0.07	4.7%
GM165	150	12.1	0.0130	59.52	59.40	0.99	0.07	5.6%
GM166	150	66.4	0.0130	57.65	54.75	4.37	0.26	6.2%
GM167	150	12.6	0.0130	58.05	57.65	3.19	0.07	5.1%
GM168	150	7.1	0.0130	54.17	54.12	0.71	0.66	15.7%
GM169	150	18.8	0.0130	54.12	53.99	0.69	0.66	15.3%
GM17	150	13.0	0.0130	58.96	58.87	0.69	0.20	8.5%
GM170	150	6.1	0.0130	53.99	53.94	0.82	0.66	15.7%
GM171	150	8.1	0.0130	53.94	53.88	0.74	0.66	13.7%
GM172	150	4.1	0.0130	53.88	53.65	5.57	0.72	9.4%
GM173	150	97.6	0.0130	46.25	44.68	1.61	2.37	22.3%
GM18	150	16.0	0.0130	59.15	59.04	0.69	0.10	6.3%
GM19	150	14.5	0.0130	59.25	59.15	0.69	0.07	5.8%
GM2	150	14.0	0.0130	59.25	59.11	1.00	0.16	8.0%
GM21	150	40.7	0.0130	59.05	58.64	1.01	0.07	5.7%
GM22	150	7.2	0.0130	58.64	58.57	0.98	0.13	6.5%
GM23	150	45.4	0.0130	58.48	58.18	0.66	0.36	13.3%
GM24	150	20.1	0.0130	58.65	58.45	0.99	0.13	6.5%
GM25	150	31.4	0.0130	59.05	58.74	0.99	0.13	7.3%
GM26	150	13.6	0.0130	58.74	58.60	1.03	0.20	8.2%
GM29	150	29.7	0.0130	57.05	54.45	8.75	0.07	4.0%
GM3	150	82.4	0.0130	59.11	58.15	1.17	0.26	10.2%
GM31	150	35.1	0.0130	57.45	54.25	9.12	0.07	4.3%
GM32	150	21.0	0.0130	54.25	53.05	5.72	0.23	5.3%
GM33	150	8.8	0.0130	53.05	52.05	11.40	0.23	6.6%
GM34	150	14.5	0.0130	52.05	51.85	1.38	0.26	13.6%
GM35	150	27.8	0.0130	52.75	52.45	1.08	0.56	11.9%
GM36	150	6.0	0.0130	52.45	52.25	3.31	0.62	10.6%
GM37	150	14.7	0.0130	52.25	51.85	2.71	0.62	14.8%
GM38	150	21.3	0.0130	54.25	52.75	7.06	0.20	9.2%
GM39	150	10.5	0.0130	54.65	54.25	3.82	0.16	5.2%
GM4	150	12.2	0.0130	58.15	58.05	0.82	0.39	11.6%
GM40	150	18.3	0.0130	54.25	53.05	6.59	0.33	7.4%
GM41	150	12.5	0.0130	53.05	52.75	2.40	0.33	10.9%
GM42	150	7.0	0.0130	54.75	54.25	7.12	0.26	6.1%
GM43	150	41.2	0.0130	57.65	54.65	7.31	0.10	4.5%
GM44	150	23.5	0.0130	57.85	57.65	0.85	0.10	6.3%
GM45	150	6.3	0.0130	57.95	57.85	1.58	0.11	5.6%
GM46	150	30.7	0.0130	58.26	57.95	1.01	0.10	5.9%
GM47	150	45.6	0.0130	51.85	51.55	0.66	0.95	19.5%
GM48	150	6.9	0.0130	57.99	57.94	0.72	0.36	11.7%
GM49	150	9.9	0.0130	58.06	57.99	0.71	0.36	11.6%
GM5	150	22.5	0.0130	57.54	57.39	0.67	0.89	18.8%
GM51	150	56.1	0.0130	58.25	53.45	8.58	0.14	4.2%
GM52	150	7.0	0.0130	53.45	53.05	5.68	0.13	6.4%
GM53	150	44.6	0.0130	53.05	51.65	3.14	0.40	8.5%
GM54	150	53.8	0.0130	58.05	53.45	8.58	0.13	5.2%
GM55	150	8.5	0.0130	53.45	53.15	3.51	0.23	7.9%
GM56	150	13.4	0.0130	53.15	53.05	0.75	0.23	8.9%
GM57	150	60.6	0.0130	51.25	50.85	0.66	0.10	6.3%
GM58	150	90.4	0.0130	51.55	50.45	1.22	1.51	20.5%
GM59	150	13.1	0.0130	50.85	50.45	3.07	0.20	13.5%
GM6	150	12.1	0.0130	59.25	59.15	0.83	0.13	6.7%

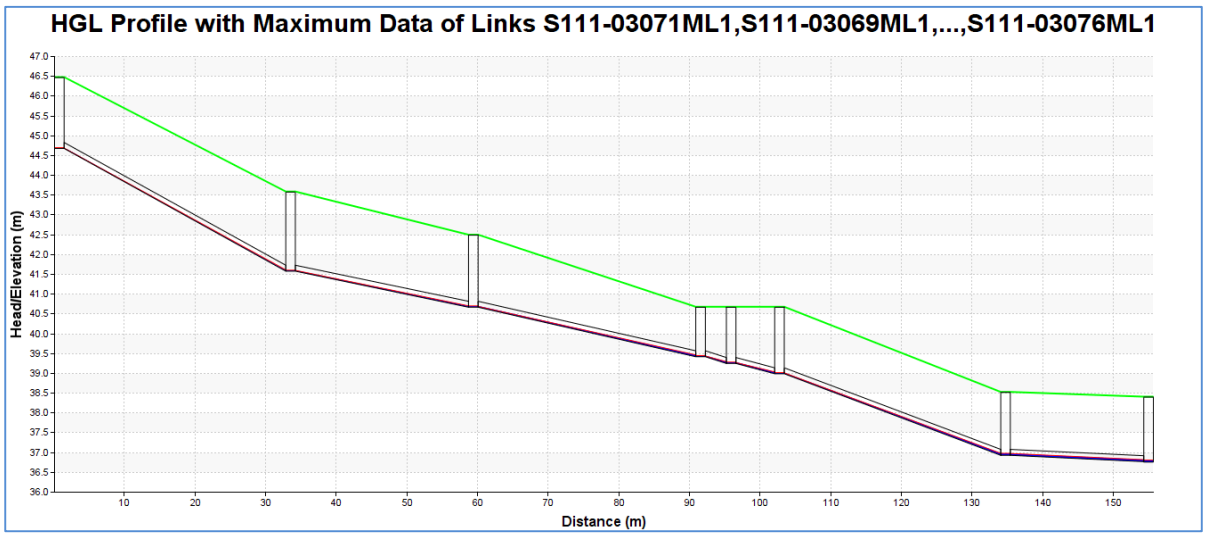
GM60	150	7.9	0.0130	50.45	50.25	2.52	1.81	17.3%
GM61	150	18.1	0.0130	50.45	50.25	1.11	0.07	9.2%
GM62	150	54.9	0.0130	50.25	45.38	8.92	1.87	14.6%
GM63	225	30.1	0.0130	45.38	44.18	3.99	1.87	9.7%
GM64	225	14.3	0.0130	44.18	43.38	5.62	1.87	10.1%
GM65	225	35.9	0.0130	43.38	42.18	3.34	2.01	10.4%
GM66	225	25.1	0.0130	42.18	40.78	5.59	2.01	9.3%
GM67	225	25.5	0.0130	40.78	38.78	7.85	2.10	9.3%
GM68	225	6.4	0.0130	38.78	38.38	6.21	2.10	9.7%
GM69	225	14.5	0.0130	38.38	37.38	6.90	2.34	11.2%
GM7	150	18.4	0.0130	57.67	57.54	0.71	0.82	17.7%
GM70	225	17.3	0.0130	37.38	36.78	3.47	2.37	12.1%
GM71	225	4.4	0.0130	36.78	36.68	2.28	2.34	13.5%
GM72	150	45.5	0.0130	39.25	38.38	1.92	0.23	11.0%
GM73	225	29.8	0.0130	36.68	36.18	1.68	2.34	13.0%
GM74	225	30.9	0.0130	36.18	35.18	3.24	2.34	15.9%
GM75	150	86.7	0.0130	46.65	39.25	8.57	0.13	5.7%
GM76	150	81.6	0.0130	58.37	57.83	0.66	0.30	10.4%
GM77	150	44.4	0.0130	58.65	57.45	2.70	0.10	5.5%
GM78	150	12.4	0.0130	57.45	57.25	1.61	0.16	7.7%
GM79	150	8.8	0.0130	59.25	59.05	2.28	0.11	5.1%
GM8	150	16.2	0.0130	59.45	59.25	1.24	0.07	5.7%
GM80	150	40.5	0.0130	58.65	57.25	3.46	0.10	6.6%
GM81	150	4.8	0.0130	42.05	42.01	0.84	0.99	18.3%
GM82	150	5.0	0.0130	42.25	42.05	3.99	0.99	15.5%
GM83	150	62.9	0.0130	57.25	55.65	2.54	0.36	8.0%
GM85	150	36.7	0.0130	54.42	54.17	0.68	0.59	15.2%
GM86	150	11.0	0.0130	54.53	54.42	1.00	0.10	10.3%
GM87	150	12.2	0.0130	54.65	54.53	0.99	0.10	5.8%
GM9	150	8.4	0.0130	57.28	57.21	0.83	1.02	18.5%
GM90	150	26.3	0.0130	53.65	50.25	13.02	0.72	8.1%
GM91	150	14.5	0.0130	50.45	50.25	1.38	0.00	4.1%
GM92	150	49.7	0.0130	50.25	42.25	16.31	0.82	10.2%
GM93	150	60.6	0.0130	48.85	42.25	10.95	0.10	7.8%
GM96	150	44.4	0.0130	52.45	50.25	4.95	0.07	4.3%
GM97	150	70.7	0.0130	50.25	42.65	10.80	0.26	5.6%
GM98	150	112.2	0.0130	52.25	42.25	8.95	0.20	6.7%
GM99	150	5.0	0.0130	42.65	42.25	8.05	0.30	6.1%
GM200	150	39.6	0.0130	54.25	53.85	1.01	0.03	1.0%

Appendix 8. Modelling results for sewer network capacity assessment

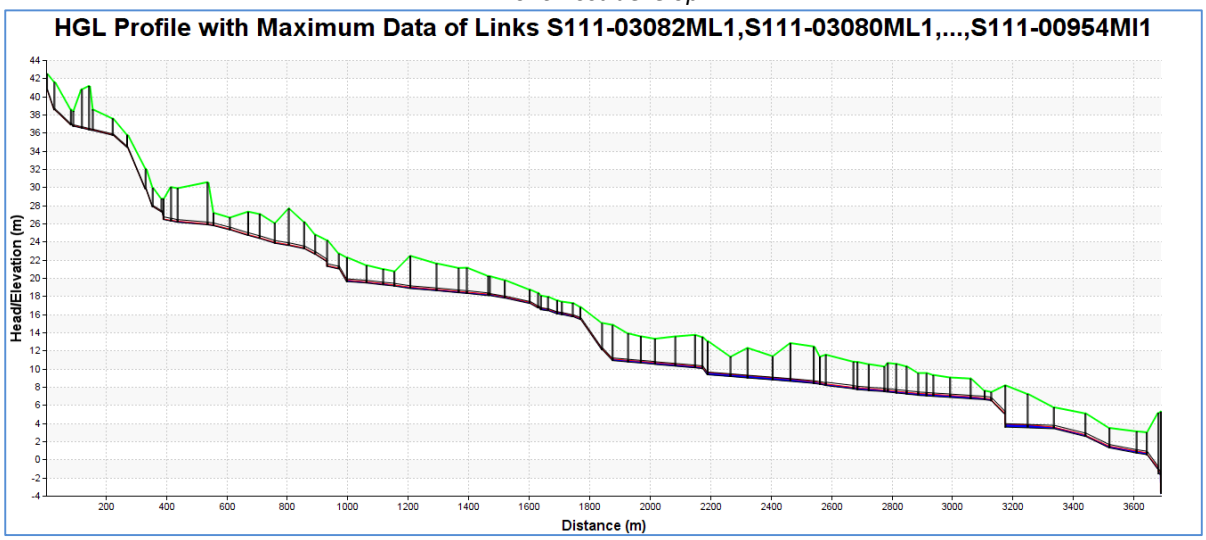
Gravity Mains

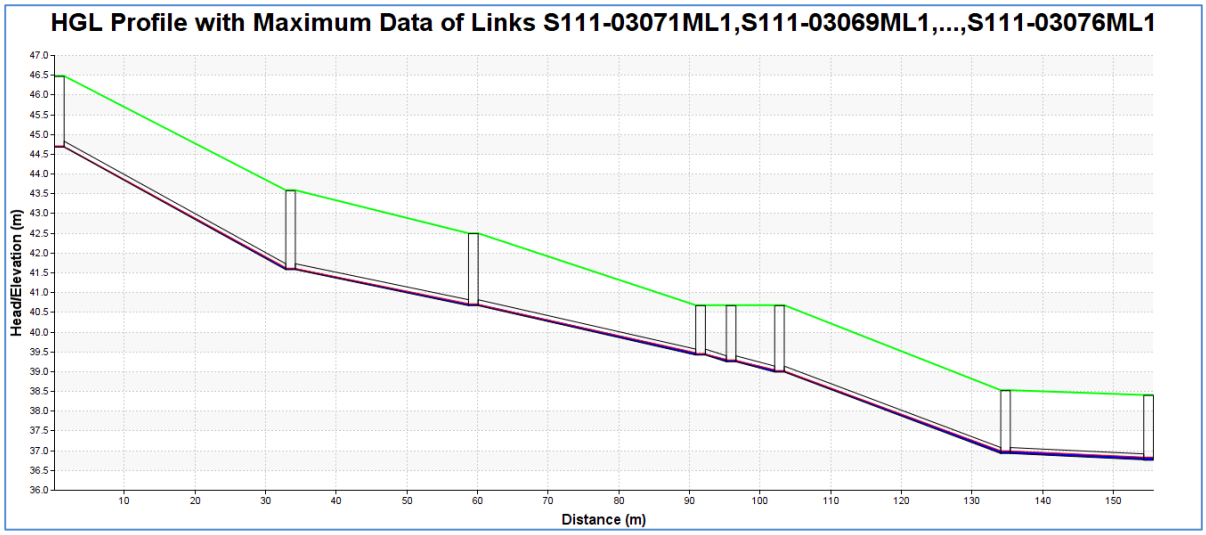
2016 Pre-develop.



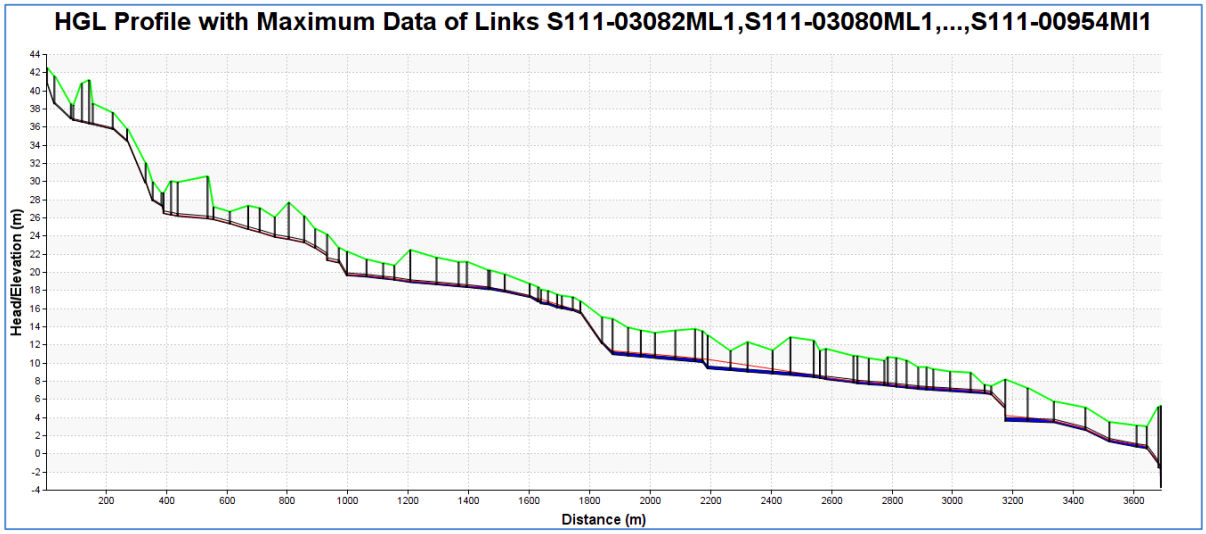


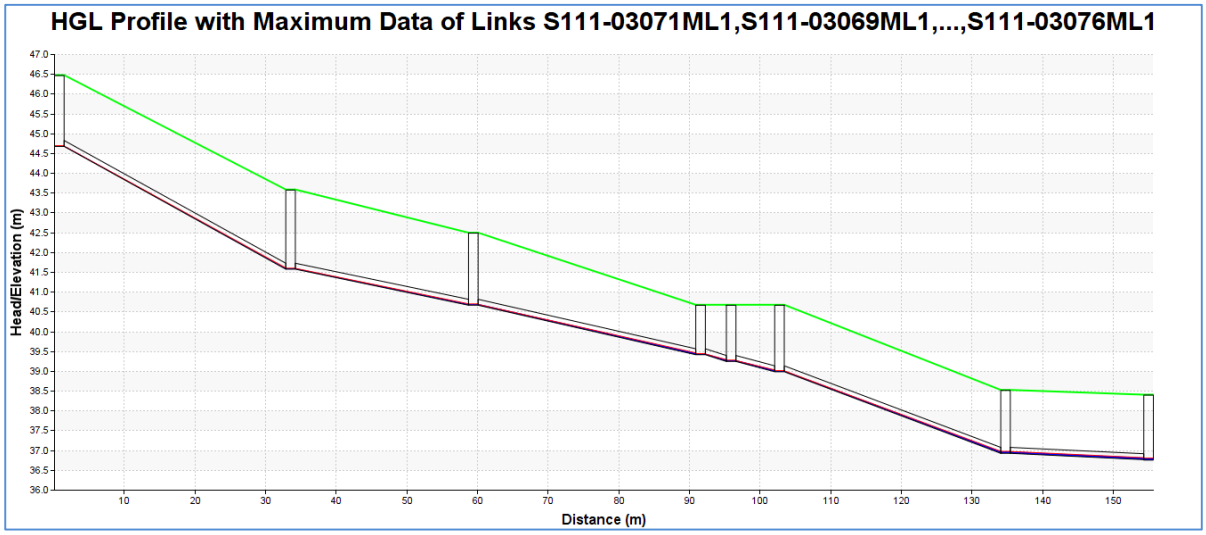
2016 Post-develop.



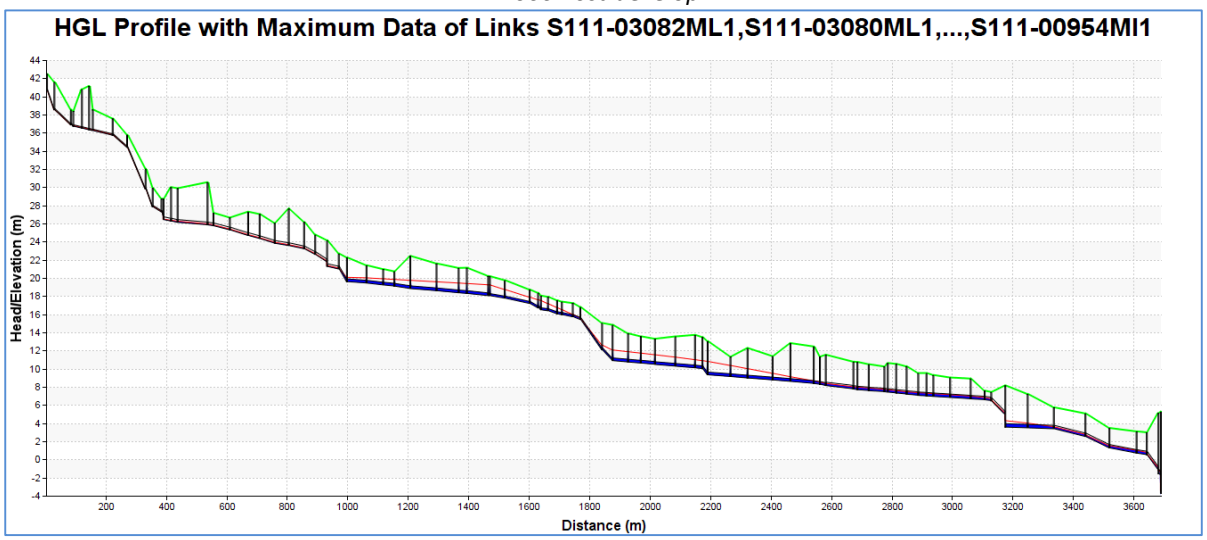


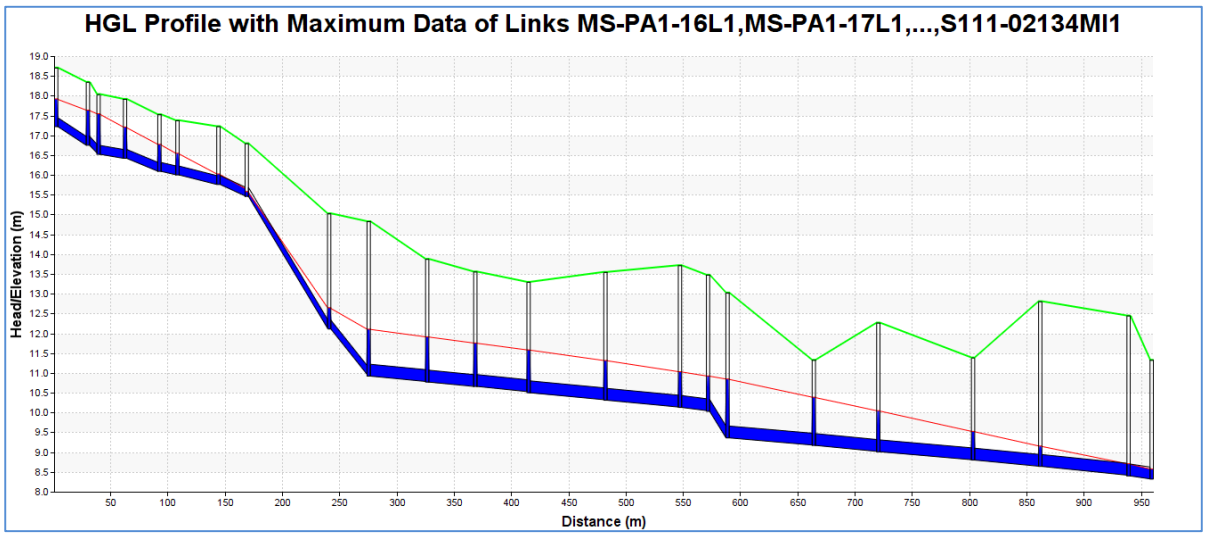
2066 Pre-develop.

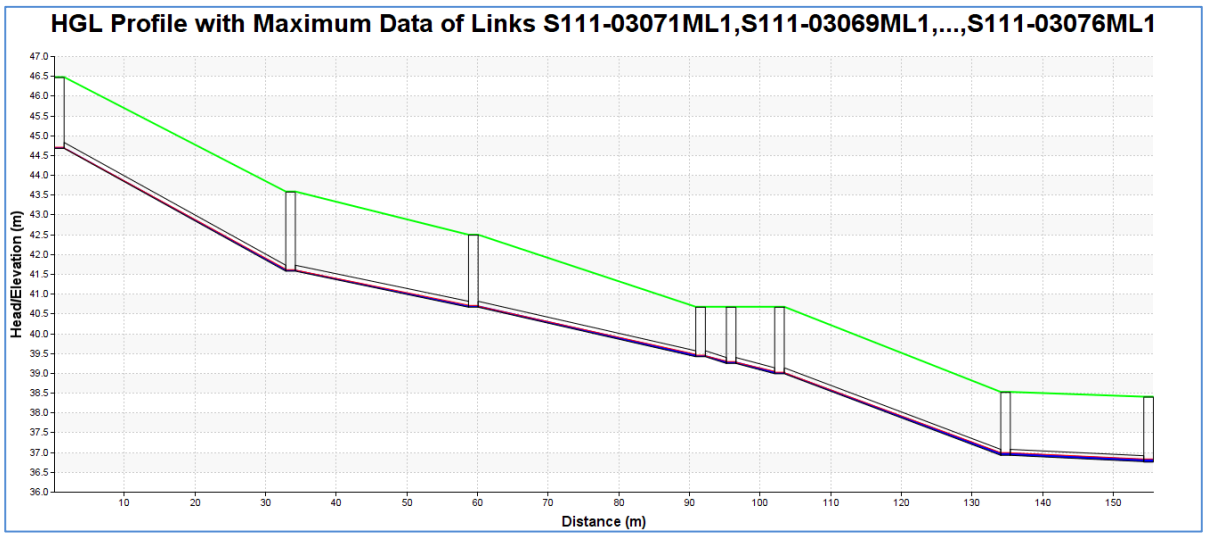




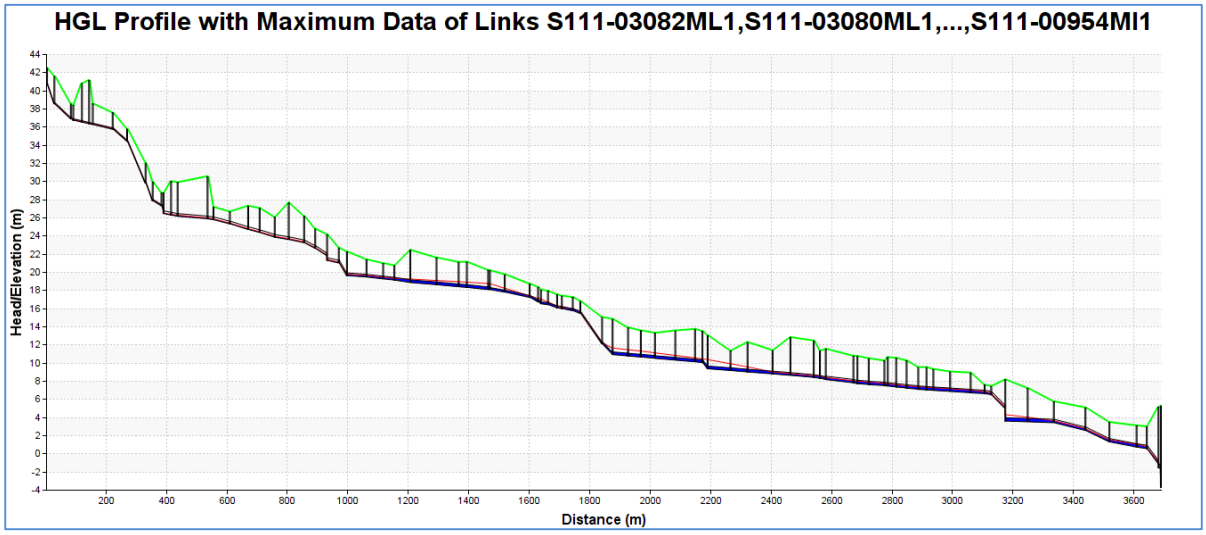
2066 Post-develop.

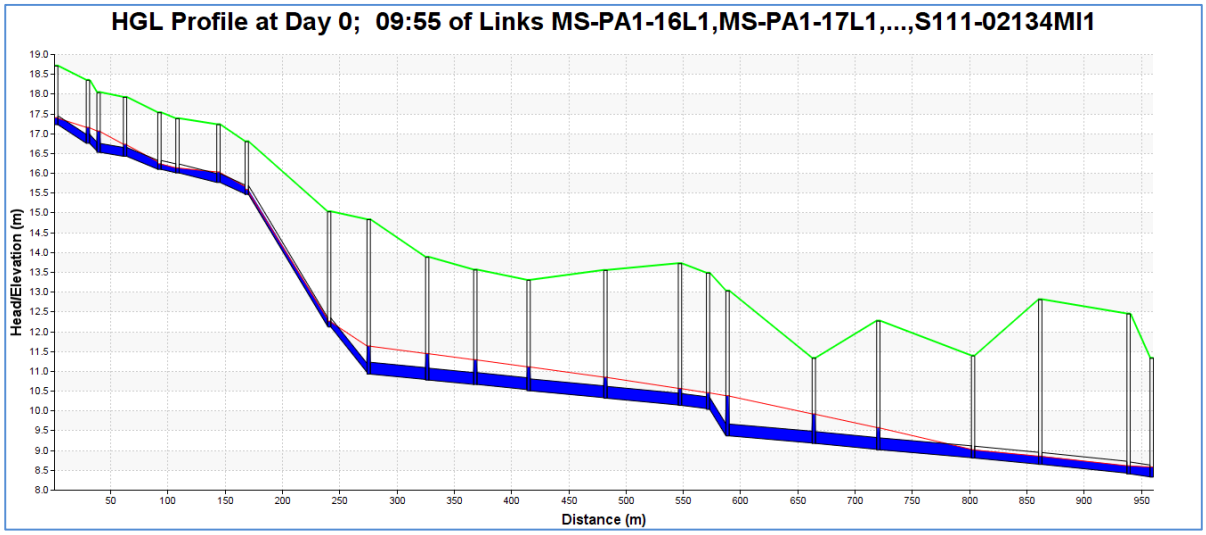




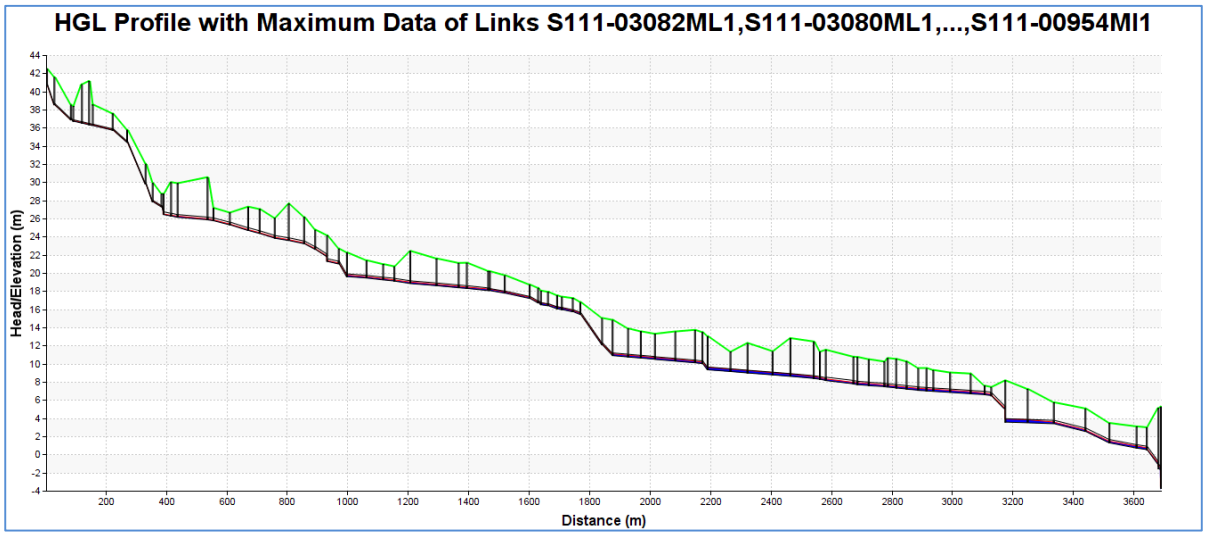


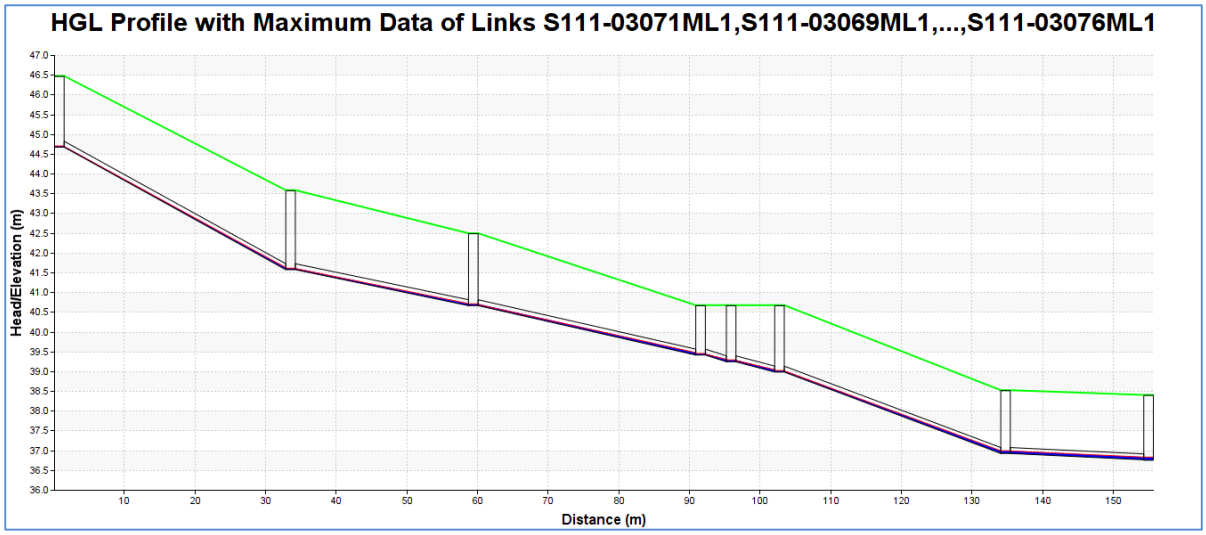
2066 Post-develop. and DN300 Gravity Main Augmentation





2036 Post-develop.





		2016, Post-develop.		2036, Post-develop.		2066, Post-develop.	
Pipe ID	Dia. (mm)	Flow (L/s)	d/D (%)	Flow (L/s)	d/D (%)	Flow (L/s)	d/D (%)
S111-03082ML1	150	1.0	12%	1.0	12%	1.0	12%
S111-03080ML1	150	1.0	13%	1.0	13%	1.0	13%
S111-03078ML1	150	1.0	28%	1.0	28%	1.0	28%
S111-03079ML1	150	6.6	51%	6.6	51%	6.6	51%
S111-03081ML1	150	6.6	50%	6.6	50%	6.6	50%
S111-03084ML1	150	6.6	51%	6.6	51%	6.6	51%
S111-03083ML1	150	6.6	45%	6.6	45%	6.6	45%
S111-03085ML1	150	6.6	35%	6.6	35%	6.6	35%
S111-03086ML1	150	6.6	28%	6.6	28%	6.6	28%
S111-03089ML1	150	8.4	40%	8.4	40%	8.4	40%
S111-03090ML1	150	8.4	40%	8.4	40%	8.4	40%
S111-03091ML1	150	8.4	29%	8.4	29%	8.4	29%
S111-02998ML1	300	8.4	25%	8.4	25%	8.4	25%
GM139	300	13.0	36%	13.0	36%	13.0	36%
S111-03002ML1	300	18.0	40%	18.0	40%	18.0	40%
S111-03001ML1	300	18.0	36%	18.0	36%	18.0	36%
S111-03006ML1	300	18.0	31%	18.0	31%	18.0	31%
S111-03005ML1	300	18.0	30%	18.0	30%	18.0	30%
S111-03009ML1	300	18.0	31%	18.0	31%	18.0	31%
S111-03008ML1	300	18.0	30%	18.0	30%	18.0	30%
S111-03007ML1	300	18.0	35%	18.0	35%	18.0	35%
S111-03012ML1	300	18.0	33%	18.0	33%	18.0	33%
S111-03011ML1	300	18.0	26%	18.0	26%	18.0	26%
S111-03010ML1	300	18.0	25%	18.0	25%	18.0	25%
S111-03013ML1	300	18.0	28%	18.0	28%	18.0	28%
S111-02881ML1	300	18.0	38%	18.0	38%	18.0	60%
S111-00176MI1	300	24.3	48%	24.3	48%	28.4	100%
S111-00175MI1	300	24.7	44%	26.3	46%	41.0	100%
S111-00172MI1	300	24.7	46%	26.3	47%	40.8	100%
S111-00174MI1	300	24.7	46%	26.3	48%	40.3	100%
S111-00173MI1	300	24.7	48%	26.3	50%	42.4	100%
S111-00171MI1	300	24.7	46%	26.3	48%	41.8	100%
S111-00170MI1	300	24.7	47%	26.3	49%	42.1	100%
S111-00169MI1	300	24.7	52%	26.3	54%	41.9	100%
S111-02389MI1	300	26.1	56%	27.6	59%	43.4	100%
S111-00179ML1	225	26.6	67%	28.2	70%	44.0	100%
MS-PA1-15L1	225	26.7	63%	28.3	65%	44.1	100%
MS-PA1-16L1	225	26.7	46%	28.3	48%	44.1	100%
MS-PA1-17L1	225	26.8	64%	28.3	68%	44.1	100%
S111-00462ML1	225	34.0	81%	35.6	82%	52.6	100%
MS-PA1-18L1	225	34.0	74%	35.6	77%	52.6	100%

MS-PA1-19L1	225	34.0	78%	35.6	81%	52.6	100%
MS-PA1-20L1	225	34.0	74%	35.6	77%	52.6	100%
MS-PA1-21L1	225	34.0	62%	35.6	64%	52.6	92%
S111-00438MI1	225	34.0	42%	35.6	43%	54.8	77%
S111-00425MI1	225	34.0	56%	35.6	58%	54.9	100%
S111-00423MI1	300	34.1	57%	35.6	58%	62.6	100%
S111-00424MI1	300	34.1	64%	35.6	66%	56.5	100%
S111-02381MI1	300	34.9	57%	36.5	58%	57.5	100%
S111-00422MI1	300	35.4	59%	37.0	60%	58.1	100%
S111-00420MI1	300	37.3	61%	39.0	62%	61.1	100%
S111-00419MI1	300	37.3	56%	39.0	58%	66.6	100%
S111-00418MI1	300	37.4	59%	39.0	60%	68.6	100%
S111-00421MI1	300	47.3	73%	49.0	75%	79.1	100%
S111-02137MI1	300	47.3	86%	49.0	89%	78.4	100%
S111-01953MI1	300	47.9	74%	49.6	76%	77.1	100%
S111-02136MI1	300	47.9	71%	49.6	73%	73.5	100%
S111-02135MI1	300	48.5	71%	50.1	73%	74.2	85%
S111-02134MI1	300	48.5	65%	50.2	66%	74.2	85%
S111-02133MI1	300	48.5	58%	50.2	59%	74.2	78%
S111-01289MI1	375	48.6	46%	50.3	47%	74.4	60%
S111-01266MI1	375	49.3	52%	51.0	54%	75.0	70%
S111-01265MI1	375	49.3	51%	51.0	52%	75.0	65%
S111-01264MI1	375	49.5	53%	51.1	54%	75.2	67%
S111-01258MI1	375	49.5	48%	51.1	49%	80.7	69%
S111-01263MI1	375	49.5	49%	51.1	50%	76.1	63%
S111-01262MI1	375	49.8	49%	51.5	50%	75.6	63%
S111-01256MI1	375	49.9	50%	51.6	51%	75.6	64%
S111-01331MI1	375	50.1	52%	51.8	53%	81.6	79%
S111-01314MI1	375	54.3	61%	56.1	62%	87.1	81%
S111-01284MI1	375	51.2	54%	52.8	55%	77.8	69%
S111-01294MI1	375	50.8	54%	52.4	55%	76.4	69%
S111-01282MI1	375	50.7	53%	52.4	54%	76.4	67%
S111-01283MI1	375	50.7	47%	52.4	48%	76.3	60%
S111-01281MI1	375	50.7	28%	52.4	28%	76.3	34%
S111-01384MI1	375	69.2	70%	71.0	71%	114.3	100%
S111-01373MI1	375	69.2	69%	71.0	70%	102.5	80%
S111-01311MI1	375	69.4	47%	71.1	48%	101.9	60%
S111-01310MI1	375	69.4	44%	71.1	45%	101.9	56%
S111-01276MI1	375	78.4	57%	80.1	58%	112.5	75%
S111-01309MI1	375	78.4	59%	80.1	60%	112.5	75%
S111-01302MI1	375	85.5	34%	87.2	34%	120.0	41%
S111-00954MI1	450	156.6	54%	158.8	55%	215.1	66%
S111-03071ML1	150	4.1	23%	4.1	23%	4.1	23%
S111-03069ML1	150	4.1	28%	4.1	28%	4.1	28%
S111-03072ML1	150	5.6	29%	5.6	29%	5.6	29%
S111-00932NL1	150	5.6	29%	5.6	29%	5.6	29%
S111-03073ML1	150	5.6	29%	5.6	29%	5.6	29%
S111-00931NL1	150	5.6	36%	5.6	36%	5.6	36%
S111-03076ML1	150	5.6	45%	5.6	45%	5.6	45%

		2066, Post-develop + DN300 Aug.	
Pipe ID	Dia. (mm)	Flow (L/s)	d/D (%)
S111-03082ML1	150	1.0	12%
S111-03080ML1	150	1.0	13%
S111-03078ML1	150	1.0	28%
S111-03079ML1	150	6.6	51%
S111-03081ML1	150	6.6	50%
S111-03084ML1	150	6.6	51%
S111-03083ML1	150	6.6	45%
S111-03085ML1	150	6.6	35%
S111-03086ML1	150	6.6	28%

S111-03089ML1	150	8.4	40%
S111-03090ML1	150	8.4	40%
S111-03091ML1	150	8.4	29%
S111-02998ML1	300	8.4	25%
GM139	300	13.0	36%
S111-03002ML1	300	18.0	40%
S111-03001ML1	300	18.0	36%
S111-03006ML1	300	18.0	31%
S111-03005ML1	300	18.0	30%
S111-03009ML1	300	18.0	31%
S111-03008ML1	300	18.0	30%
S111-03007ML1	300	18.0	35%
S111-03012ML1	300	18.0	33%
S111-03011ML1	300	18.0	26%
S111-03010ML1	300	18.0	25%
S111-03013ML1	300	18.0	28%
S111-02881ML1	300	18.0	38%
S111-00176MI1	300	28.3	58%
S111-00175MI1	300	41.0	64%
S111-00172MI1	300	40.3	61%
S111-00174MI1	300	40.3	86%
S111-00173MI1	300	42.4	100%
S111-00171MI1	300	41.8	100%
S111-00170MI1	300	42.1	100%
S111-00169MI1	300	41.9	100%
S111-02389MI1	300	43.5	100%
S111-00179ML1	225	44.0	100%
MS-PA1-15L1	225	44.1	89%
MS-PA1-16L1	225	44.1	89%
MS-PA1-17L1	225	44.5	100%
S111-00462ML1	225	52.6	100%
MS-PA1-18L1	225	52.6	92%
MS-PA1-19L1	225	22.5	59%
MS-PA1-19L1AUG	300	30.1	46%
MS-PA1-20L1	225	22.7	78%
MS-PA1-20L1AUG	300	29.9	66%
MS-PA1-21L1	225	52.6	92%
S111-00438MI1	225	55.0	56%
S111-00425MI1	225	60.3	83%
S111-00423MI1	300	64.5	100%
S111-00424MI1	300	60.1	100%
S111-02381MI1	300	63.1	100%
S111-00422MI1	300	60.4	100%
S111-00420MI1	300	64.2	100%
S111-00419MI1	300	71.7	100%
S111-00418MI1	300	64.4	100%
S111-00421MI1	300	74.1	100%
S111-02137MI1	300	74.1	100%
S111-01953MI1	300	73.5	85%
S111-02136MI1	300	36.7	60%
S111-02136ML1AUG	300	36.7	60%
S111-02135MI1	300	37.1	60%
S111-02135ML1AUG	300	37.1	60%
S111-02134MI1	300	37.1	75%
S111-02134ML1AUG	300	37.1	75%
S111-02133MI1	300	74.2	78%
S111-01289MI1	375	74.4	60%
S111-01266MI1	375	75.0	70%
S111-01265MI1	375	75.0	65%
S111-01264MI1	375	75.2	67%
S111-01258MI1	375	80.7	69%
S111-01263MI1	375	76.1	63%

S111-01262MI1	375	75.6	63%
S111-01256MI1	375	75.6	64%
S111-01331MI1	375	81.6	79%
S111-01314MI1	375	87.2	81%
S111-01284MI1	375	77.8	69%
S111-01294MI1	375	76.5	69%
S111-01282MI1	375	76.3	67%
S111-01283MI1	375	76.3	60%
S111-01281MI1	375	76.3	34%
S111-01384MI1	375	101.8	100%
S111-01373MI1	375	101.8	80%
S111-01311MI1	375	101.9	60%
S111-01310MI1	375	101.9	56%
S111-01276MI1	375	112.5	75%
S111-01309MI1	375	112.5	75%
S111-01302MI1	375	120.0	41%
S111-00954MI1	450	215.1	66%

Operational Storage

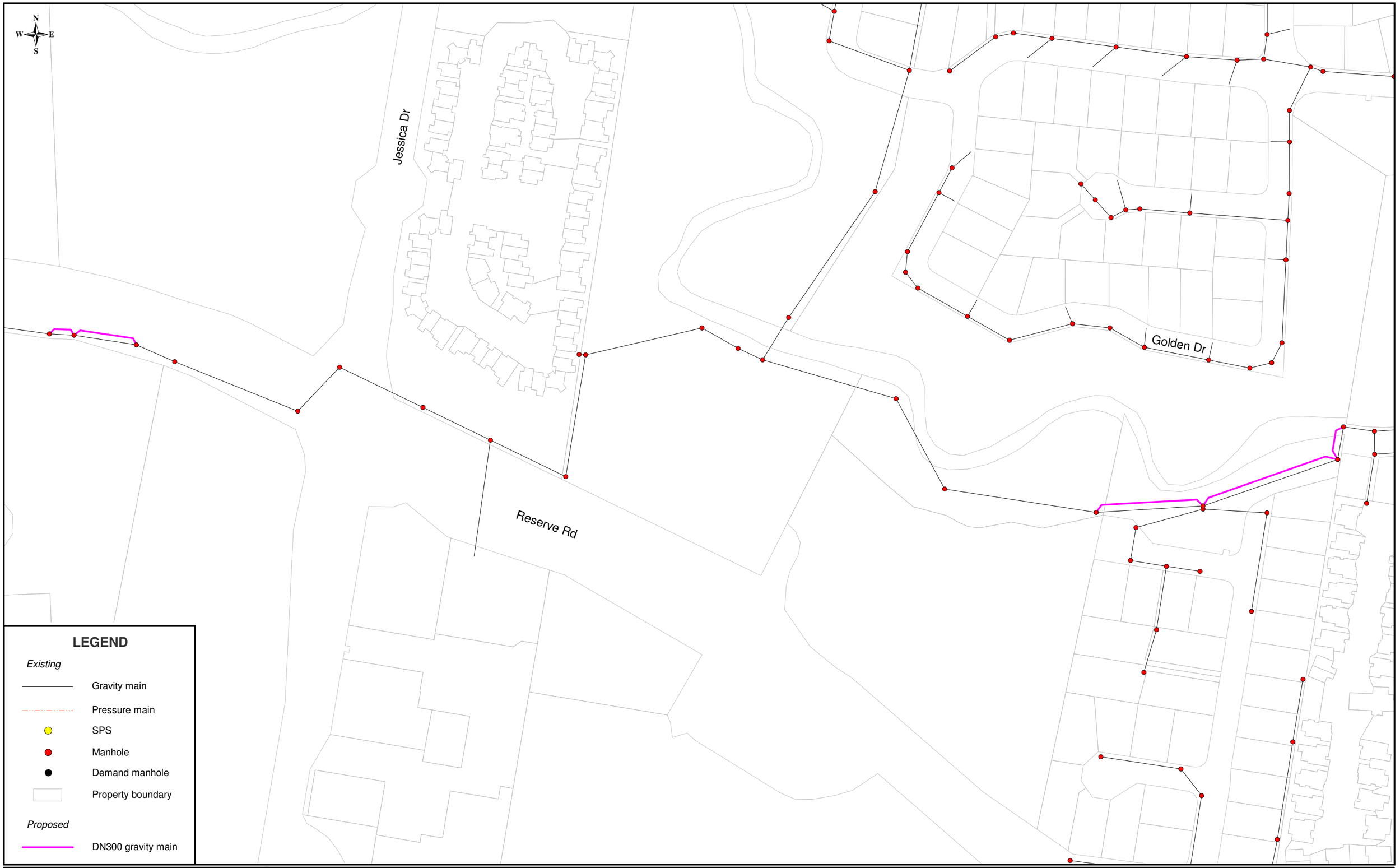
		2016, Post-develop.	2066, Post-develop.
Single Pump Capacity Required	C1	3.5	3.5
	ADWF (L/s)	31.3	43.0
	Q (L/s)	109.5	150.4
Operational Storage Capacity Required	Duty Flow (L/s)	109.5	150.4
	Duty Head (m)	NA	NA
	Pump Efficiency (%)	NA	NA
	Duty Power (kW)	30.0	30.0
	No. pump starts (n)	12.0	12.0
	OSCR (kL)	8.2	11.3
Operational Storage Capacity Available	Duty Start (m)	1.55	1.55
	Duty Stop (m)	0.31	0.31
	Duty Height (m)	1.24	1.24
	WW Diam. (m)	4.0	4.0
	OSCA (kL)	15.6	15.6
OUTCOME	**Difference (kL)**	+7.4	+4.3
	Pass / Fail	PASS	PASS

Emergency Storage

	Pipe ID	US IL (m)	DS IL (m)	Length (m)	Length Below OF (m)	Slope (%)	Diam. (m)	Radius (m)	d/D (%)	Pipe Flow Depth (m)	Pipe Wetted Area (m)	Empty Vol. Below OF (m^3)	ADWF Vol. Below OF (m^3)	ES Vol. (m3)
2016 Pre-develop.	S111-00954MI1	- 1.53	- 1.65	5.4	5.4	0.0223	0.450	0.23	20.3%	0.091	0.0231	0.9	0.1	0.7
	S111-01276MI1	1.31	0.76	93.3	93.3	0.0059	0.375	0.19	21.9%	0.082	0.0179	10.3	1.7	8.6
	S111-01302MI1	0.55	- 1.07	38.2	38.2	0.0425	0.375	0.19	14.2%	0.053	0.0096	4.2	0.4	3.8
	S111-01309MI1	0.74	0.59	33.2	33.2	0.0047	0.375	0.19	23.1%	0.087	0.0193	3.7	0.6	3.0
	S111-01310MI1	2.57	1.33	82.1	82.1	0.0151	0.375	0.19	16.4%	0.062	0.0118	9.1	1.0	8.1
	S111-01311MI1	3.43	2.59	109.2	19.4	0.0077	0.375	0.19	19.1%	0.072	0.0147	2.1	0.3	1.9
2016 Post-develop.	S111-00954MI1	- 1.53	- 1.65	5.4	5.4	0.0223	0.450	0.23	20.9%	0.094	0.0241	0.9	0.1	0.7
	S111-01276MI1	1.31	0.76	93.3	93.3	0.0059	0.375	0.19	23.1%	0.087	0.0193	10.3	1.8	8.5
	S111-01302MI1	0.55	- 1.07	38.2	38.2	0.0425	0.375	0.19	14.9%	0.056	0.0103	4.2	0.4	3.8
	S111-01309MI1	0.74	0.59	33.2	33.2	0.0047	0.375	0.19	24.4%	0.092	0.0209	3.7	0.7	3.0
	S111-01310MI1	2.57	1.33	82.1	82.1	0.0151	0.375	0.19	17.5%	0.066	0.0130	9.1	1.1	8.0
	S111-01311MI1	3.43	2.59	109.2	19.4	0.0077	0.375	0.19	20.3%	0.076	0.0161	2.1	0.3	1.8
2066 Pre-develop.	S111-00954MI1	- 1.53	- 1.65	5.4	5.4	0.0223	0.450	0.23	24.3%	0.109	0.0299	0.9	0.2	0.7
	S111-01276MI1	1.31	0.76	93.3	93.3	0.0059	0.375	0.19	26.7%	0.100	0.0237	10.3	2.2	8.1
	S111-01302MI1	0.55	- 1.07	38.2	38.2	0.0425	0.375	0.19	17.0%	0.064	0.0125	4.2	0.5	3.7
	S111-01309MI1	0.74	0.59	33.2	33.2	0.0047	0.375	0.19	28.4%	0.107	0.0258	3.7	0.9	2.8
	S111-01310MI1	2.57	1.33	82.1	82.1	0.0151	0.375	0.19	20.8%	0.078	0.0166	9.1	1.4	7.7
	S111-01311MI1	3.43	2.59	109.2	19.4	0.0077	0.375	0.19	23.7%	0.089	0.0200	2.1	0.4	1.8
2066 Post-develop.	S111-00954MI1	- 1.53	- 1.65	5.4	5.4	0.0223	0.450	0.23	24.8%	0.112	0.0307	0.9	0.2	0.7
	S111-01276MI1	1.31	0.76	93.3	93.3	0.0059	0.375	0.19	27.8%	0.104	0.0251	10.3	2.3	8.0
	S111-01302MI1	0.55	- 1.07	38.2	38.2	0.0425	0.375	0.19	17.6%	0.066	0.0131	4.2	0.5	3.7
	S111-01309MI1	0.74	0.59	33.2	33.2	0.0047	0.375	0.19	29.5%	0.111	0.0272	3.7	0.9	2.8
	S111-01310MI1	2.57	1.33	82.1	82.1	0.0151	0.375	0.19	21.7%	0.081	0.0177	9.1	1.5	7.6
	S111-01311MI1	3.43	2.59	109.2	19.4	0.0077	0.375	0.19	24.7%	0.093	0.0212	2.1	0.4	1.7

	2016	2036	2066
LGIP ES Available (kL)	277.7	277.7	273.8
LGIP ES Upgrade (kL)	236.9	236.9	236.9
Site ADWF ES Reduction (kL)	-0.34	-0.34	-0.31
ES Required (kL)	-406.5	-411.8	-540.9
Difference (kL)	+107.8	+102.5	-30.5
Pass / Fail	Pass	Pass	Fail

Appendix 9. Recommended sewer parallel gravity main upgrade



LEGEND

Existing

- Gravity main
- Pressure main
- SPS
- Manhole
- Demand manhole
- Property boundary

Proposed

- DN300 gravity main

H2ONE

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DRAWN:	D Colledge
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APPROVED:	J May
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No.	REVISION	APPROVED
A	ORIGINAL ISSUE - 15 MAY 2018	

DATUM:
HORIZ: MGA94 (ZONE 56)
HEIGHT: AHD

SCALE:

0 40 80
Metres

SURVEYED BY / DATE:

SURVEY CHECKED:

H2ONE REFERENCES

PROJECT NO: 1804245

FILE REFERENCE:

CAD FILE:

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PO BOX 5042, GCMC QLD 9729

79-99 Courtney Dr
Upper Coomera QLD 4209
Water Supply and Sewerage
Hydraulic Analysis

Appendix 9. Recommended sewer parallel gravity mains upgrade

ORIGINAL ISSUE DATE: MAY, 2018

DATE SCANNED:

DRG No:

REV:

Appendix 10. Water supply hydraulic model pipe layout

LEGEND

- Proposed DN300
- Proposed DN200
- Proposed DN150
- Proposed DN100
- Existing pipe
- Proposed model node
- Model node
- Proposed boundary
- Existing boundary

N
W E
S

FPI_25066_PIPE

J14 P111 H3 P211 P113 H2 J16 P115 P117 H1 P119 P121 H4 P123 H5 P125 H6 P127 H7 CMN2 P131 P129 H8 H9 P133 P135 CMN3 H10 P139 H11 P141 P145 H12 P143 H13 P147 H14 P149 H15 P151 H16 P153 P155 H18 H19 P157 P159 H20 P161 CMN4 P163 H21 P165 H22 Pipe_100 P203 H26 P199 CMN7 P197 H27 P195 P193 H29 P185 H37 P183 H36 P181 P175 H32 P173 CMN6 P187 P189 H28 P191 H25 P201 P205 H24 P207 P209 H31 P171 P169 H35 P179 P177 H33 P167

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APPROVED: J May
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C	REVISED ISSUE - 26 NOV 2018	
B	REVISED ISSUE - 21 SEP 2018	
A	ORIGINAL ISSUE - 15 MAY 2018	

DATUM:
HORIZ: MGA94 (ZONE 56)
HEIGHT: AHD

SCALE:
0 40 80
Metres

SURVEYED BY / DATE:
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PROJECT NO: 1804245
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PO BOX 5042, GCMC QLD 9729

79-99 Courtney Dr Upper Coomera QLD 4209 Water Supply and Sewerage Hydraulic Analysis

Appendix 10. Water supply hydraulic model pipe layout

MAY, 2018
DATE SCANNED:
DRG No:
REV:

Appendix 11. Modelling results for water supply reticulation layout

Pipes

ID	Diameter (DN)	HW Co-efficient	Length (m)	SF PH Flow Rate (L/s)	SF PH Velocity (m/s)	SF PH Head Loss (m/km)
P109	200	110	470.0	7.4	0.2	0.5
P111	100	100	51.9	1.3	0.2	0.7
P113	100	100	50.9	1.1	0.1	0.6
P115	100	100	68.2	1.0	0.1	0.4
P117	150	110	39.6	5.7	0.3	1.3
P119	150	110	25.1	6.5	0.4	1.6
P121	150	110	33.5	4.9	0.3	1.0
P123	150	100	77.5	1.8	0.1	0.2
P125	150	100	63.1	1.7	0.1	0.2
P127	150	100	63.2	1.5	0.1	0.1
P129	150	100	21.0	1.3	0.1	0.1
P131	100	100	33.2	0.6	0.1	0.2
P133	100	100	60.3	0.4	0.1	0.1
P135	100	100	22.9	0.2	0.0	0.0
P137	100	100	34.1	0.6	0.1	0.2
P139	100	100	55.4	0.4	0.1	0.1
P141	100	100	68.0	0.2	0.0	0.0
P143	100	100	65.2	0.1	0.0	0.0
P145	100	100	74.1	0.1	0.0	0.0
P147	150	110	52.7	2.9	0.2	0.4
P149	150	110	51.2	2.7	0.2	0.3
P151	100	100	64.1	0.6	0.1	0.2
P153	100	100	56.8	0.4	0.1	0.1
P155	150	110	55.4	1.9	0.1	0.2
P157	150	110	69.4	1.8	0.1	0.1
P159	150	110	40.3	1.6	0.1	0.1
P161	150	110	32.2	1.4	0.1	0.1
P163	150	110	21.6	1.0	0.1	0.0
P165	150	110	67.6	0.8	0.0	0.0
P167	150	100	75.7	1.2	0.1	0.1
P169	100	100	68.1	0.5	0.1	0.1
P171	100	100	47.0	0.4	0.0	0.1
P173	100	100	58.4	0.1	0.0	0.0
P175	100	100	59.0	0.0	0.0	0.0
P177	100	100	60.8	0.5	0.1	0.1
P179	100	100	59.2	0.4	0.0	0.1
P181	100	100	91.6	0.2	0.0	0.0
P183	100	100	53.5	0.0	0.0	0.0
P185	100	100	69.5	0.2	0.0	0.0
P187	100	100	18.4	0.1	0.0	0.0
P189	100	100	56.0	0.1	0.0	0.0
P191	100	100	32.0	0.3	0.0	0.0
P193	100	100	34.1	0.3	0.0	0.1
P195	100	100	39.3	0.8	0.1	0.3
P197	100	100	20.2	1.0	0.1	0.4
P199	100	100	57.0	1.3	0.2	0.7
P201	100	100	57.6	0.2	0.0	0.0
P203	100	100	57.1	1.5	0.2	0.9
P205	100	100	68.6	0.0	0.0	0.0
P207	100	100	80.1	0.1	0.0	0.0
P209	100	100	46.3	0.3	0.0	0.0
P211	200	110	131.1	5.9	0.2	0.3
PIPE_100	150	110	272.2	0.6	0.0	0.0

Note 1: "SF" is "standard flow" and "PH" is "peak hour"

Note 2: Peak hour occurred at 6 pm.

Nodes

ID	Demand (EP)	RL AHD (m)	SF PH Demand (L/s)	SF PH Pressure (m)	Fire Flow (L/s)	FF 2/3 PH Pressure (m)
CMN1	14.4	51.0	0.17	28.7	15	25.3
CMN2	14.4	46.0	0.17	33.6	15	27.8
CMN3	14.4	51.0	0.17	28.6	15	18.4
CMN4	14.4	60.5	0.17	19.7	15	15.1
CMN5	14.4	53.0	0.17	26.6	15	21.1
CMN6	14.4	59.0	0.17	20.6	15	14.9
CMN7	14.4	52.0	0.17	27.6	15	22.8
H1	14.4	48.0	0.17	31.7	15	28.5
H10	14.4	53.0	0.17	26.6	15	17.9
H11	14.4	52.0	0.17	27.6	15	19.0
H12	14.4	55.0	0.17	24.6	15	15.2
H13	14.4	56.0	0.17	23.6	15	14.2
H14	14.4	56.0	0.17	23.6	15	20.0
H15	14.4	58.0	0.17	21.6	15	17.9
H16	14.4	51.0	0.17	28.6	15	23.4
H18	14.4	60.0	0.17	19.6	15	15.7
H19	14.4	60.0	0.17	19.6	15	15.6
H2	14.4	45.0	0.17	34.8	15	30.2
H20	14.4	60.0	0.17	19.6	15	15.6
H21	14.4	60.5	0.17	19.7	15	15.0
H22	14.4	59.0	0.17	20.6	15	16.5
H23	14.4	60.0	0.17	19.6	15	14.1
H24	14.4	59.0	0.17	20.6	15	14.7
H25	14.4	55.0	0.17	24.6	15	18.9
H26	14.4	52.0	0.17	27.6	15	22.8
H27	14.4	53.0	0.17	26.6	15	21.4
H28	14.4	59.0	0.17	20.6	15	14.6
H29	14.4	54.0	0.17	25.6	15	19.1
H3	14.4	40.0	0.17	39.8	15	35.5
H30	14.4	58.0	0.17	21.6	15	15.7
H31	14.4	60.0	0.17	19.6	15	13.8
H32	14.4	59.4	0.17	20.2	15	13.8
H33	14.4	60.0	0.17	19.6	15	15.1
H34	14.4	60.0	0.17	19.6	15	13.7
H35	14.4	60.0	0.17	19.6	15	13.7
H36	14.4	59.0	0.17	20.6	15	13.3
H37	14.4	58.0	0.17	21.6	15	14.4
H4	14.4	54.0	0.17	25.7	15	22.1
H5	14.4	49.0	0.17	30.6	15	26.3
H6	14.4	43.0	0.17	36.6	15	31.7
H7	14.4	45.0	0.17	34.6	15	29.0
H8	14.4	49.0	0.17	30.6	15	23.4
H9	14.4	49.0	0.17	30.6	15	23.4
J14	14.4	39.0	0.17	40.8	15	37.8
J16	14.4	45.0	0.17	34.8	15	31.6

Note 1: Red text denotes minimum pressure (critical pressure point) within the network.

Note 2: Peak hour occurred at 6 pm and 2/3 peak hour occurred at 12 noon.

Note 3: The critical pressure point nodes with a surface level of RL 60.5 m were assumed at an elevation of RL 59.9 m for the hydraulic analysis. This was to account for CoGC's minimum ground cover requirement, 600 mm below ground level, and to accurately represent residual pressures within the main, at peak hour.

Appendix 12. Modelling results for water supply network capacity assessment

Standard Flow

Provision	2016		2021		2026		2031		2036		2066	
	Post-develop.	Pre-develop.	Post-develop.	Pre-develop.	Post-develop.	Pre-develop.	Post-develop.	Pre-develop.	Post-develop.	Pre-develop.	Post-develop.	Pre-develop.
Connection point (*FCP1040)* min. pressure (m)	45.7	45.7	43.4	44.8	42.0	43.4	41.7	43.1	40.2	41.6	44.1	47.5
Connection point (*W18-03512H)* min. pressure (m)	42.2	42.0	39.7	41.0	38.3	39.6	38.0	39.3	36.5	37.9	40.4	43.6
Connection point (W18-03522H*)* min. pressure (m)	34.5	34.7	33.3	33.5	33.0	33.4	32.5	32.8	30.7	31.0	32.9	33.3
Network min. pressure (m)	28.7	28.6	26.6	27.6	25.1	26.2	24.8	25.9	23.4	24.4	17.2	17.8
Network no. failures	0	0	0	0	0	0	0	0	0	0	8	8
Tank min. water level (%)	15%	15%	12%	16%	32%	33%	27%	27%	15%	18%	15%	15%
Max. pipe velocity (m/s)	1.8	1.8	1.8	1.8	1.8	1.8	2.4	2.4	1.8	1.8	2.3	2.5
Network min. pressure ID	W18-02916H										W18-00888N	

Fire Flow

Scenario		2016		2021		2026		2031		2036		2066	
		Post-develop.	Pre-develop.	Post-develop.	Pre-develop.	Post-develop.	Pre-develop.	Post-develop.	Pre-develop.	Post-develop.	Pre-develop.	Post-develop.	Pre-develop.
Peak Hour	Site hydrant (*FCP1040)* min. pressure (m)	43.3	42.9	39.1	41.1	37.6	39.6	37.3	39.3	35.8	37.8	29.4	37.3
	Site hydrant (W18-03512H*)* min. pressure (m)	35.1	23.2	30.8	21.4	29.2	19.8	28.9	19.5	27.5	18.1	21.1	17.5
	Site hydrant (W18-03522H) min. pressure (m)	32.2	21.5	30.0	20.0	28.5	18.4	28.1	18.4	26.7	16.6	20.3	10.5
	Network hydrant min. pressure (m)	12.7	12.3	10.4	10.5	9.1	8.9	8.9	8.6	7.6	7.2	-1.5	-1.3
	Network hydrant no. failures	0	0	0	0	0	0	0	0	0	0	1	1
	Min. pressure node ID	W18-03521H											
2/3 Peak Hour	Site hydrant (*FCP1040)* min. pressure (m)	44.2	43.8	43.1	43.8	42.9	43.6	42.9	43.6	42.2	43.2	38.7	42.7
	Site hydrant (W18-03512H*)* min. pressure (m)	36.1	24.4	34.9	24.4	34.7	24.2	34.7	24.2	34.1	23.8	30.6	23.1
	Site hydrant (W18-03522H) min. pressure (m)	33.9	22.7	33.8	22.6	33.6	22.5	33.5	22.4	32.9	21.8	29.5	18.5
	Network hydrant min. pressure (m)	13.3	13.3	13.2	13.2	12.8	12.9	12.8	13.0	12.1	12.3	1.7	1.6
	Network hydrants no. failures	0	0	0	0	0	0	0	0	0	0	3	3
	Min. pressure node ID	W18-01475H											

Note 1: Peak hour occurred at 6 pm and 2/3 peak hour occurred at 12 noon.

Note 2: Post-development fire flow results were modelled with all the proposed development pipes activated. This improved network connectivity, resulting in the post-development scenario to present higher system pressures.

Section 4 - SPECIALIST REPORTS

Transport Impact Assessment
Prepared by SLR Consulting

Zone Planning Group

TRAFFIC IMPACT ASSESSMENT

Courtney Drive MCU
79-99 Courtney Drive, Upper Coomera

Prepared for: Courtney Drive Development Pty Ltd

SLR Ref: 620.12553
Version No: -v1.12.0
May 2019

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BASIS OF REPORT

This report has been prepared by SLR Consulting Australia Pty Ltd with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with the Client. Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of Courtney Drive Development Pty Ltd. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR

SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

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620.12553-R01-v2.0	2 May 2019	Matthew Creighton	Kris Stone	Kris Stone
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1 Introduction

SLR Consulting Australia Pty Ltd (SLR) has been commissioned by Courtney Drive Development Pty Ltd to provide traffic engineering advice in relation to the low-density residential development proposed on land described as 79-99 Courtney Drive or Lots 188-192 on RP173728, Upper Coomera.

The subject development application proposes 237 low density residential dwelling lots in addition to provision for road infrastructure and open space/drainage lots. Proposed plans of development are included at Appendix A.

This document has been prepared to inform the City of Gold Coast Council's (Council) assessment of the development application by identifying and addressing the traffic and transport matters relevant to the proposed development.

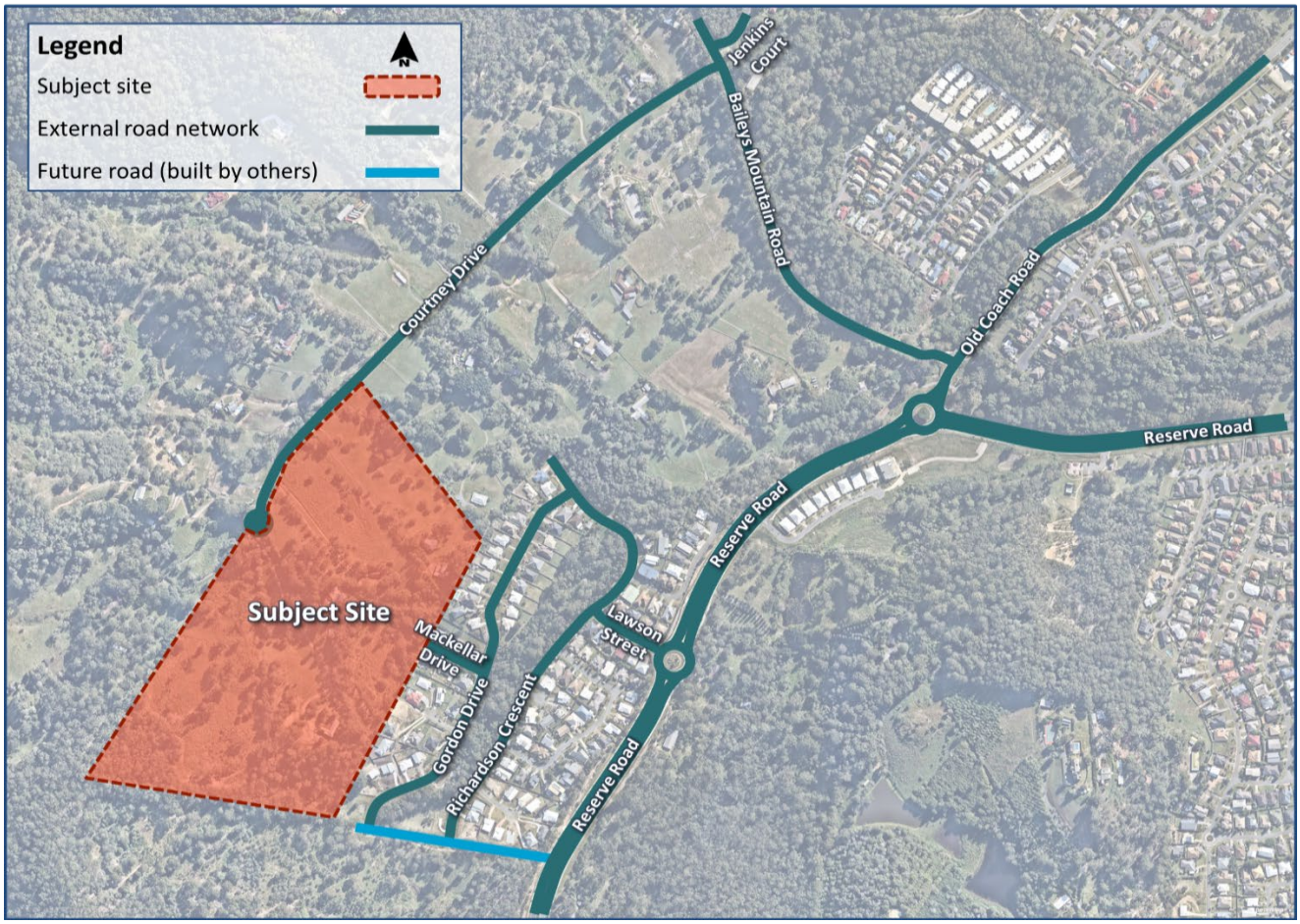
2 Subject Site

2.1 Site Context

The subject site has a real property description of Lots 188-192 on RP173728 and is located within jurisdiction of the City of Gold Coast. The site is located approximately 4km southwest of the Coomera train and bus interchange and 17km northwest of the Southport CBD. The site is currently zoned as rural and rural residential as part of the Council *City Plan Version 6*.

The subject site is shown in the context of the local area on Figure 1.

Figure 1 Site Location: Local Context



Source: Nearmap. Note: Site location is indicative only.

The site is currently occupied by a number of existing residential dwellings and is bound by Courtney Drive to the northwest, rural residential properties to the north and west, and urban residential lots to the east. The site is bound by an existing, unformed road to the south.

Vehicular access to/from the site is currently achieved via Courtney Drive which connects in turn to the broader road network via Baileys Mountain Road and Old Coach Road.

2.2 Surrounding Road Network

Details of the key roads in the vicinity of the subject site are summarised in Table 1.

Table 1 Key Surrounding Roads

Road Name	Road Hierarchy	Authority	Existing Form	Posted Speed
Courtney Dr	Rural access	CoGC	Two-lane (unmarked), bi-directional, undivided, rural form (swale)	50km/h
Mackellar Dr	Residential access	CoGC	Two-lane (unmarked), bi-directional, undivided, urban form (kerb and channel)	50km/h
Gordon Dr / Richardson Cr / Lawson St	Residential collector	CoGC	Two-lane (unmarked), bi-directional, undivided, urban form (kerb and channel)	50km/h
Baileys Mountain Rd	Distributor	CoGC	Two-lane (marked), bi-directional, undivided, rural form	60km/h
Old Coach Rd	Sub-arterial	CoGC	Two-lane (marked), bi-directional, undivided, urban form	60km/h
Reserve Rd	Sub-arterial	CoGC	Four-lane (marked), bi-directional, divided, urban form	70km/h

2.3 Road Network Planning

Council's *Local Government Infrastructure Plan* (LGIP) has been reviewed to identify the location and nature of planned transport infrastructure improvements in the vicinity of the site. Details relating to trunk item *INT_011* are summarised in Table 2.

Table 2 Nearby LGIP Transport Works

Project Reference	Project Description	Estimated Timing	Establishment Cost
INT_011	Old Coach Road-Reserve Road, Upper Coomera	2026	$4,629,885

It is assumed that the *INT_011* works relate to the future upgrading of the Reserve Road/Old Coach Road roundabout. SLR understands that this upgrade will incorporate the realignment of Baileys Mountain Road such that it will form a new, fourth approach to the intersection.

2.4 Public Transport

The subject site currently has limited accessibility to public transport with a lack of direct and legible walkable connections to the existing bus stops located on Reserve Road. Access to this existing bus stop currently necessitates a 20 minute or 2km journey by foot.

The nearest train station is Coomera Station which is an approximate 10-minute journey by car.

A summary of the public transport services that are currently operational in the immediate vicinity is summarised in Table 3.

Table 3 Public Transport Services

Service	Route	Description	Nearest Stop
Bus	727	Coomera - Helensvale via Reserve Road	Reserve Road near Lawson Street
	3050*	Upper Coomera College - Oxenford	
	3060*	Helensvale Primary School - Wongwallan via Helensvale SHS and Upper Coomera	

** indicates a school bus route. Note that these services only drop off passengers at this bus stop.*

2.5 Strategic Planning

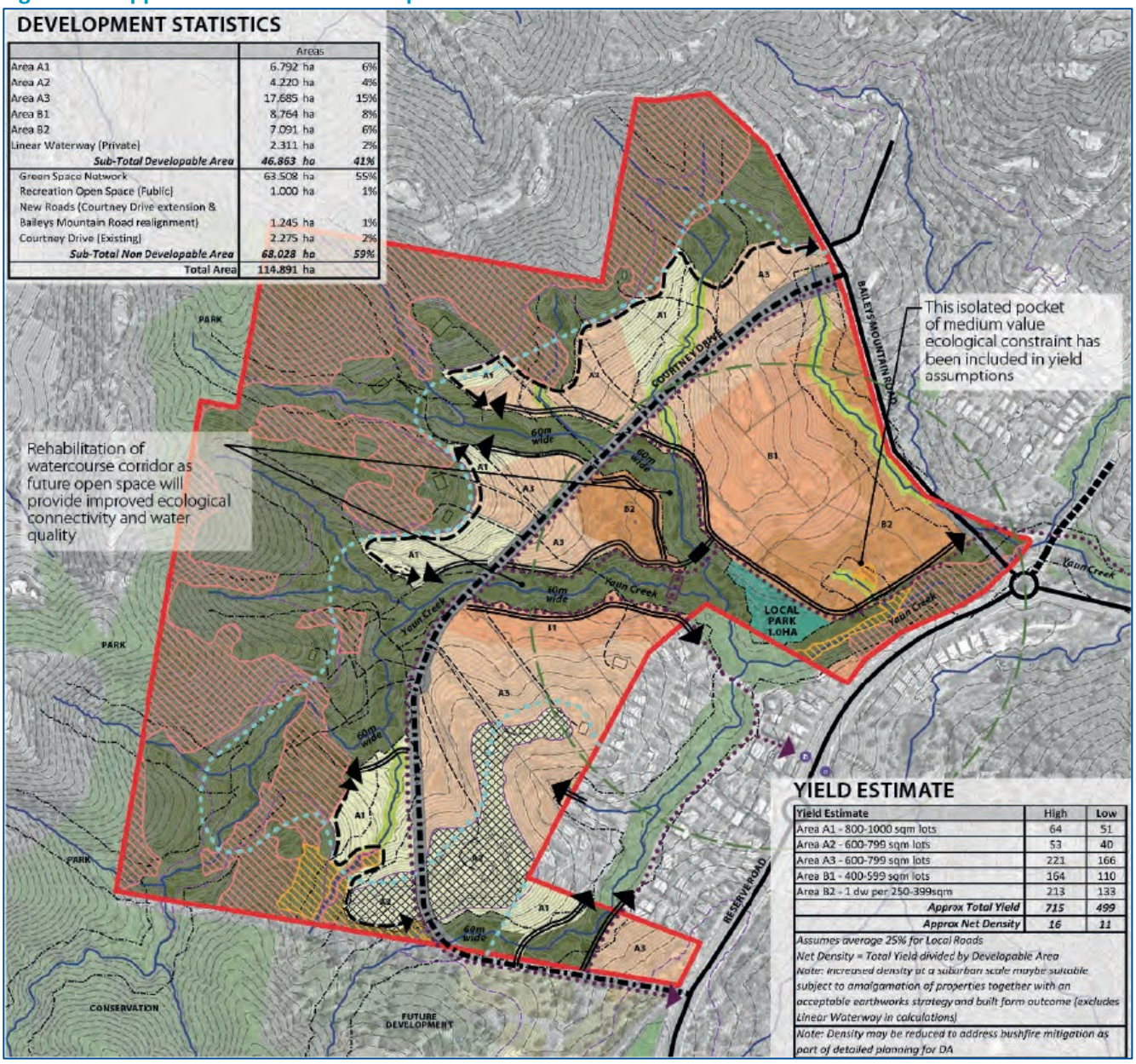
GHD, on behalf of Council, prepared the *Investigation Areas Programme – Courtney Drive, Upper Coomera* study in 2016-17. SLR understands that the Courtney Drive study area was one of several non-urban areas that were investigated across the Gold Coast region. The purpose of these non-urban area studies was to evaluate planning, environmental and infrastructure issues, and opportunities and constraints that would inform Council's future updating of the City Plan.

The GHD study area is reproduced at Figure 2 overleaf. The subject development site is generally located within the "*Area A3"* region shown on the GHD *Draft Concept Plan* indicating an anticipated yield of 166-221 dwellings.

From a traffic engineering and transport planning perspective, the key findings of the GHD study were:

- *"there would be sufficient capacity in the existing [road] network to cater for any increased [development] density"*
- *"Courtney Drive will require upgrading to a Minor Residential Collector Road, with all other internal roads to be allocated as urban access streets"*
- *"The function of Courtney Drive is assumed to be that of a Minor Residential Collector. This street type is considered appropriate for Courtney Drive and has a minimum road reserve width of 16.5m…"*
- *"Footpaths [are] required along one side of road - particularly on bus routes (Courtney Drive - may only require one side. Locate and link footpaths with open space)."*
- *"All local streets are to be 16.5m Local Access Streets; however, there are some areas within the Investigation Area where alternate road types may be acceptable as a response to steep slopes."*
- *"Courtney Drive has been investigated for suitability as a bus route; however, challenging grades required for the connection through to Reserve Road rule this out as an option."*
- *"…It is expected that a CHR is appropriate"…*for the intersection of Courtney Drive extension and Reserve Road
- *"Courtney Drive [daily traffic demand] should be around 2,800vpd (in each direction)"*
- *"City Plan shows Baileys Mountain Road as a future arterial road"*
- *"Council's preference for the Baileys Mountain Road intersection with Reserve Road is a reconstruction of the existing roundabout with a realigned Baileys Mountain Road approach".*

Figure 2 Upper Coomera Draft Concept Plan



Source: GHD, 2017.

In summary, the GHD study identified and recommended the following:

- That Courtney Drive should be extended south to connect to Reserve Road via the existing road reserve
- That Courtney Drive should be constructed as a Minor Residential Collector standard road
- That the existing Mackellar Drive and Richardson Crescent connections should be extended/integrated with the investigation area development
- That Baileys Mountain Road should be upgraded and realigned to form the fourth approach to the existing Reserve Road / Old Coach Road roundabout.

3 Development Overview

3.1 Proposed Development

Based on the development plans prepared by Bennet + Bennet, the subject development proposes 237 low density residential dwelling lots and supporting infrastructure including road and pathway connections to be provided over six stages. Plans of the development are provided at Appendix A.

3.2 Vehicular Access

The proposed site access arrangements for vehicles are illustrated overleaf on Figure 3.

Vehicular access to the subject development will be achieved primarily via an extension of Courtney Drive to Gordon Drive in the south via the exiting road reserve. This extension will connect to the future eastern section of Courtney Drive that has been conditioned by Council as part of the adjacent "Highland Reserve" development. This easternmost section between Gordon Drive and Reserve Road is understood to be delivered as part of the upcoming Stage 35 development and is anticipated to be completed in 2019.

Table 4 summarises the anticipated delivery timing for each of the separate vehicular connections with the southern Courtney Drive extension to Reserve Road forming the primary vehicular access route until the completion of Stage 5 of the development.

Table 4 Access Implementation

Access	Anticipated Time of Implementation
Southern Courtney Drive extension	Stage 1
Mackellar Drive	Stage 2
Northern Courtney Drive connection	Stage 5

This approach is consistent with that ultimately envisaged by GHD in the 2017 strategic planning study.

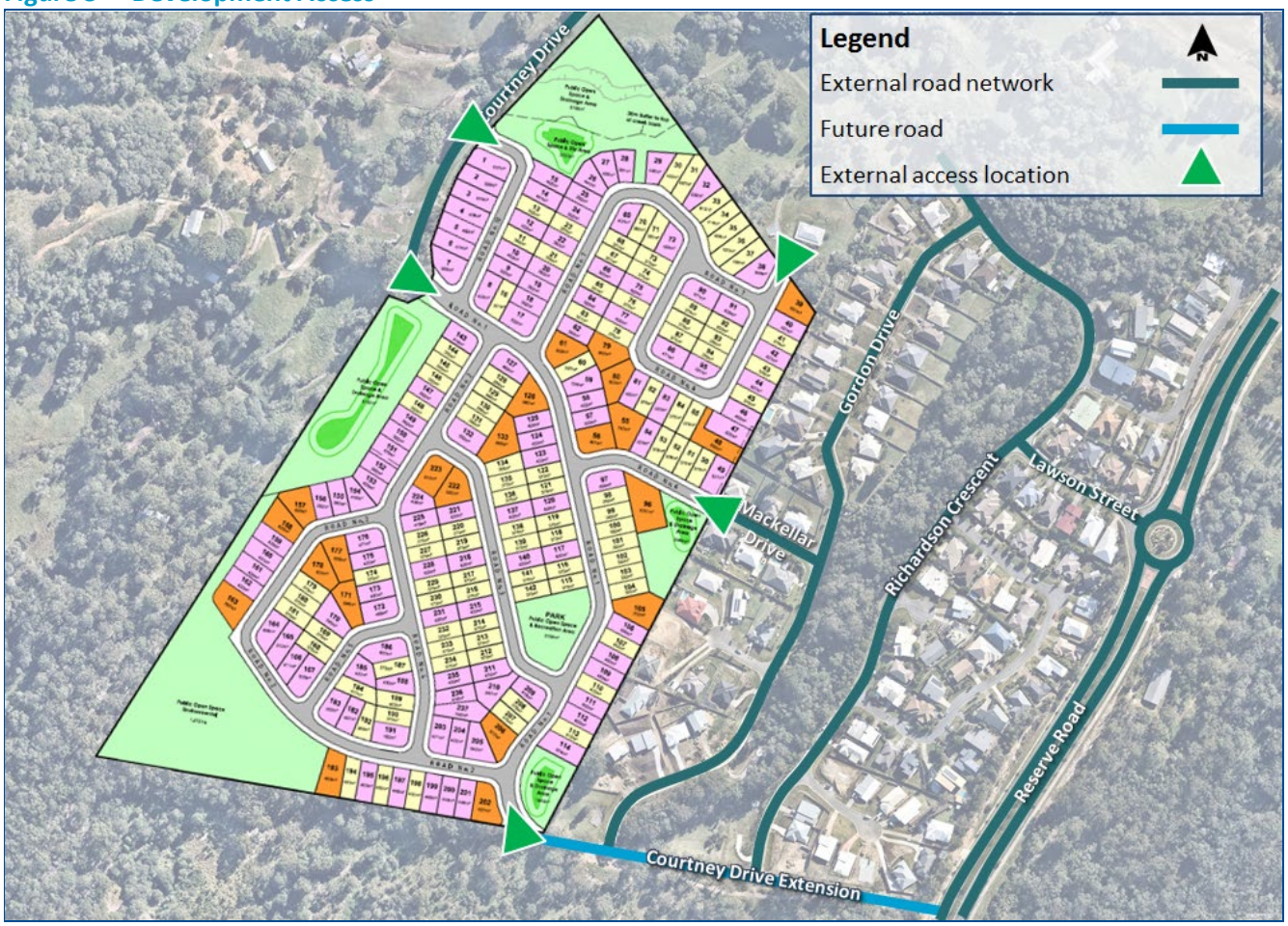
3.3 Pedestrian and Cyclist Access

Pedestrian and cyclist access and movement will be achieved via new footpaths located in road verges. Footpath locations and specifications should be consistent with that identified by Council in the *SC6.11 City Plan Policy - Land Development Guidelines.*

The provision of connections to Reserve Road via both the extended Courtney Drive and Mackellar Drive will significantly improve pedestrian accessibility between the site and the external network.

The proposed site access arrangements for pedestrians and cyclists are illustrated overleaf on Figure 3.

Figure 3 Development Access



4 Design Considerations

4.1 Overview

A review of the proposed site layout was undertaken against the following relevant documents:

- CoGC City Plan: *SC6.11 City Plan Policy - Land Development Guidelines*
- CoGC City Plan: *SC6.15 City Plan Policy - Solid Waste Management*
- CoGC City Plan: *9.4.2 Driveways and Vehicular Crossings Code*
- CoGC City Plan: *9.4.13 Transport Code*
- Australian Standard for Parking Facilities *Part 1: Off-street car parking* (AS2890.1).

Each aspect of the review is discussed in detail below.

4.2 Road Design

The majority of the internal road reserves within the subject site are proposed as being 16.5m wide incorporating 7.5m road pavements and 4.5m verges, with the connections to Courtney Drive comprising 11m pavements within 20m road reserves. These dimensions are consistent with the standards for the Residential Collector Street/Residential Access Street and Sub-Arterial cross-sections respectively specified within *SC6.11 City Plan Policy - Land Development Guidelines.*

Table 5 makes reference to the plans of development and road labels and indicates the proposed hierarchy of individual connections.

Table 5 Road Hierarchy Application

Council Road Hierarchy Type	Proposed Development Connections
Urban Sub-Arterial (two lane)	Road 01 (Courtney Drive - connection with external)
Residential Collector Street	Road 01 (Courtney Drive - internal)
Residential Access Street	Roads 02-10

4.3 Active Travel Design

To encourage the use of active transport and enhance pedestrian permeability within the subject development, it is recommended that footpaths be provided on both sides of the Courtney Drive Collector Street and on one side of all other lower order Access Streets at a minimum.

Bicycle demands will be accommodated via the off-road paths and also on-road with the shared use of the 7.5m road pavement. This sharing of the road space is considered acceptable given the anticipated vehicle and cyclist demands and travel speeds.

4.4 Lot Access

Rather than specifying bespoke outcomes for driveways, the provisions of the CoGC's *Driveways and Vehicular Crossings Code* refer to the following documents regarding the location and design of vehicular crossovers:

- Institute of Public Works Engineers Australasia (IPWEA) - Queensland
- Queensland Development Code
- AS2890.1.

These three sources prescribe solutions that sometimes conflict, and as such, the proposed design and location of the individual lot accesses within the subject development should be evaluated against the combined provisions of these sources with engineering judgement applied as relevant.

The proposed lot arrangements are such that driveway solutions appear possible whilst complying with all or some/most of the various driveway standards.

4.5 Car Parking

Table 9.4.13-3 of the *Transport Code* outlines an Acceptable Solution for car parking for the Dwelling House land use of 2 spaces per large dwelling.

Whilst dwelling plans have not been prepared at this time showing garage and driveway arrangements, it is understood that the lots will accommodate a minimum of two garaged or carport spaces in addition to that which may also be possible in the driveway clear of the verge.

Although not addressed in the City Plan, it is envisaged that the residential development will generate visitor parking demands. IPWEA industry guidance (Queensland Streets 1993) suggests a visitor parking design demand of 0.25-0.5 spaces per dwelling.

The proposed 7.5m road pavement is sufficient to accommodate three effective lanes of travel. This, in combination with the proposed lot frontage dimensions, will ensure that there are sufficient on-street parking opportunities to cater for visitor demand. Furthermore, visitor parking is also likely to be possible in individual lot driveways during very high peak demand events.

4.6 Servicing Arrangements

The proposed 7.5m road pavement is sufficient to accommodate large trucks that will service the site including refuse collection and furniture delivery vehicles. There are no cul-de-sacs proposed as part of the development and no requirements for trucks to reverse or undertake multiple manoeuvres.

Bin pads will likely be required for lots 318/319 and 310/311/312 given their alignment with the fronting road.

It is worth noting that the development integration with Mackellar Drive is projected to improve the serviceability by large trucks for these exiting dwellings given Mackellar Drive has been constructed without a cul-de-sac and trucks must currently reverse back out to Gordon Drive.

5 Traffic Considerations

5.1 Development Traffic Demand

The proposed development traffic demand potential has been forecast based on industry guidance including that specified in the *Guide to Traffic Generating Developments* (RMS, 2002). This information is also consistent with the assumptions adopted by GHD as part of the *Investigation Areas Programme – Courtney Drive, Upper Coomera* study in 2016-17.

The anticipated peak hour traffic generation rate and incremental development demand is summarised in Table 6.

Table 6 Development Traffic Demand

Land Use	Yield	Peak Trip Rate	Peak Hour Traffic Demand
Low density residential (dwelling house)	237	0.8 per dwelling	190 vph
TOTAL			**190 vph**

It is worth noting that this future traffic demand does not consider traffic demands that are already generated by the in-situ rural residential dwellings. This existing traffic has not been considered given its relatively low effect, but it would be in the order of 5-10 vph, therefore resulting in a net increase in traffic demand of approximately 180 vph.

5.2 External Traffic Demands

Traffic surveys undertaken in 2016 for the Reserve Road/Old Coach Road intersection have been sourced as part of this traffic study. Additionally, observations of the Baileys Mountain Road/Reserve Road intersection were made during the 25 October 2018 site inspection. Strategic traffic model forecasts for the 2026 and 2031 scenario years were also sourced from Council.

This existing and forecast data was used to undertake this study and is summarised in Appendix B.

5.3 Traffic Distribution

5.3.1 Directional Split

Development traffic entering/exiting the subject development was assumed to have directional split characteristics similar to that summarised in Table 7.

Table 7 Adopted Directional Split

Land Use	AM		PM	
	In	Out	In	Out
Low density residential	20%	80%	70%	30%

5.3.2 External Distribution

Development traffic was assigned to the nearby road network in accordance with the proportions summarised in Table 8. The assumptions consider the observations made whilst on site and also consideration of the surrounding road hierarchy, convenience, legibility and the location and likely route travelled to/from nearby origins/destinations like schools, shopping and employment etc.

Table 8 Adopted External Distribution

Route	Travel Direction			
	NW	NE	E	S
	5%	**45%**	**30%**	**20%**
Courtney Drive	90%	50%	65%	40%
Mackellar Drive	5%	5%	5%	20%
Courtney Drive southern extension	5%	45%	30%	40%

5.4 Background Traffic Growth

A linear annual growth rate of 4% per annum has been adopted based on a review of the traffic demand forecasts made by Council in their strategic modelling for Old Coach Road and Reserve Road at the 2016- and 2031-time horizons.

Reflective of the above assumptions outlined in Sections 5.1-5.4, traffic demands adopted for the purposes of the transport assessment are included at Appendix B.

6 Operational Assessment

6.1 Study Intersections

An assessment of future traffic operations inclusive of the subject incremental development traffic demand has been undertaken for the four study intersections summarised in Figure 4 and Table 9.

Figure 4 Study Intersections

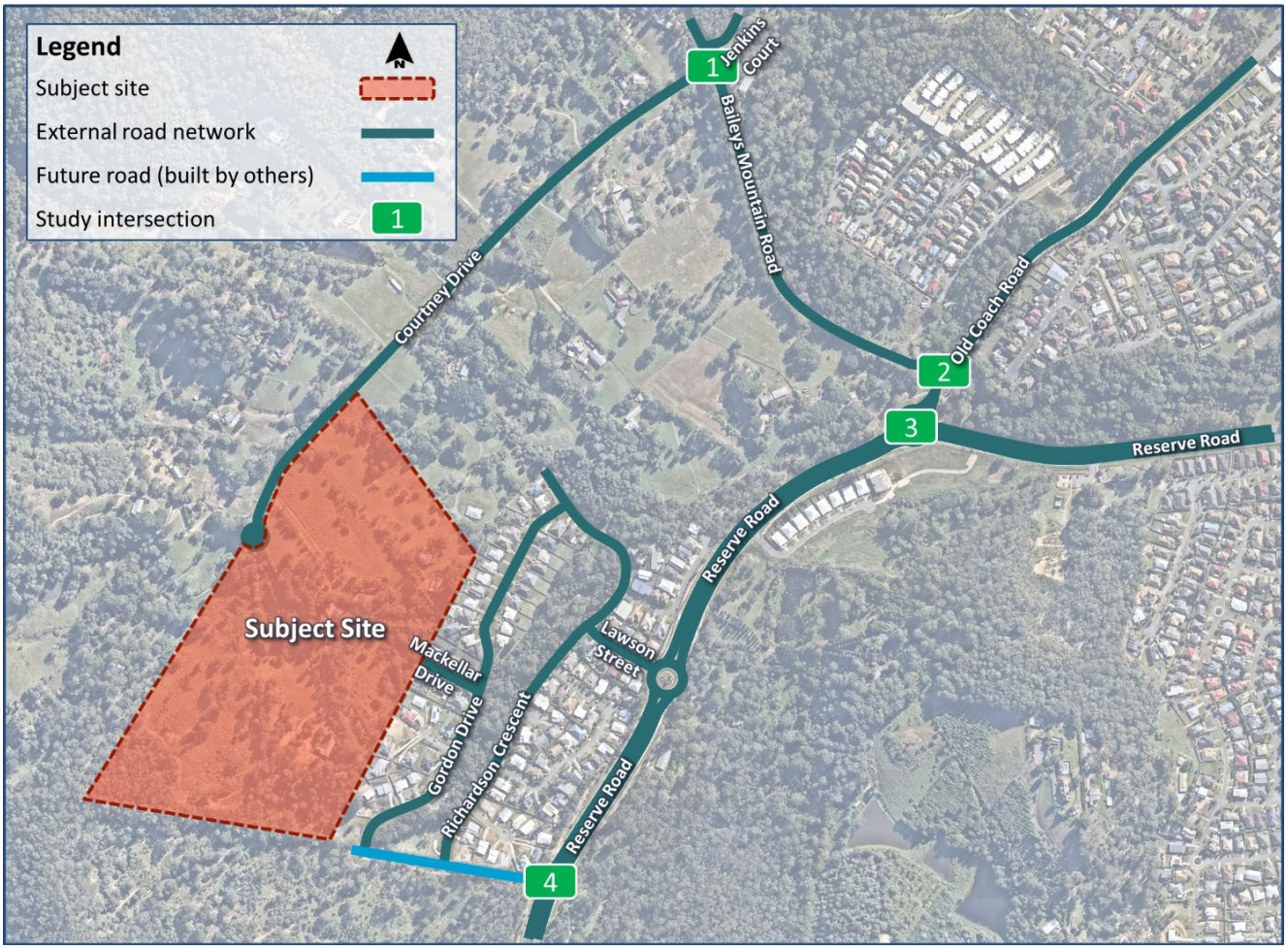


Table 9 Assessed Intersections

ID	Intersection	Existing Form	Future Form	Authority
1	Baileys Mountain Road/Courtney Drive			Council
2	Old Coach Road/Baileys Mountain Road			Council
3	Reserve Road/Old Coach Road			Council
4	Reserve Road/Courtney Drive extension (Southern Access Road)	-		Council

6.2 Assessment Scenarios

6.2.1 Assumptions

For the purposes of undertaking the development traffic assessment, it was assumed that the subject development would be completed and occupied by 2022. Accordingly, the ten-year post-development design horizon would be 2032.

So as to provide clear findings applicable to this application, no other possible development of the investigation area previously evaluated by GHD has been considered. Any future development of the investigation area would be subject to other applications.

It has also been assumed that the LGIP upgrade work proposed for the Reserve Road/Old Coach Road intersection is to be completed within the scheduled delivery year of 2026.

Finally, given the proposed staging of the development only provides the northern Courtney Drive connection at completion of Stage 5, the primary access in the interim is expected to be provided via the southern Courtney Drive extension. A 2021 assessment scenario has therefore been adopted to assess the impact of the development on local traffic conditions upon completion of Stage 4B but before Stage 5, which is likely to represent the critical scenario in terms of development traffic demand given the lack of an alternative major access route during this period.

6.2.2 Assessment Years

Reflective of the above timing assumptions, the performance of the aforementioned intersections has been assessed under the following scenarios:

- **2018 'Background'**: To establish existing operational conditions and baseline results
- **2021 'Background'**: To establish baseline operating conditions during the interim stages of the development whereby the southern Courtney Drive extension is to provide primary vehicular access
- **2021 'With Development'**: To identify the incremental impact of development traffic prior to the connection to Courtney Drive at the northern extent of the development
- **2022 'Background'**: To establish the year of opening baseline operations in the absence of the development
- **2022 'With Development'**: To identify the incremental impact of development traffic at the year of opening
- **2026 'Background'**: To establish baseline operations at/around the projected completion of the Reserve Road/Old Coach Road intersection upgrade
- **2026 'With Development'**: To identify the incremental impact of development traffic at 2026
- **2032 'Background'**: To establish baseline operations at the ten-year design horizon
- **2032 'With Development**: To identify the incremental impact of development traffic at the ten-year design horizon.

For each of these assessment scenarios, the operational performance of the local road network has been analysed during both the AM and PM peak hours on a regular weekday.

6.3 Performance Criteria

The four study intersections were analysed for each of the aforementioned scenarios using SIDRA Intersection 8 (SIDRA). SIDRA is an industry recognised analysis tool used to estimate the capacity and performance of intersections based on input parameters, including geometry and traffic volumes. SIDRA provides an estimate of an intersection's Degree of Saturation (DOS), queues and delays. DOS thresholds defined by the *Guideline for Assessment of Road Impacts of Developments (GARID)* (DTMR, 2006) are presented in Table 10 overleaf.

Table 10 GARID Intersection Performance Thresholds

Intersection Type	DOS Thresholds
Signalised intersections	Less than or equal to 0.90
Roundabouts	Less than or equal to 0.85
Priority controlled intersections	Less than or equal to 0.80

DOS values exceeding those presented in Table 10 indicate that an intersection is nearing its practical capacity and upgrade works may be required. Above these threshold values, users of the intersection are likely to experience rapidly increasing delays and queuing.

Importantly, it is noted that DOS is not the only performance indicator and that other measures such as critical delay should also be considered when assessing the performance of an intersection. Other authorities such as the NSW RMS recommend the use of the critical movement delay for assessing the performance of priority-controlled intersections.

The *Guide to Traffic Generating Developments* (RMS 2002) states that the average delay statistic for the critical movement provides a better indication of intersection performance and safety for roundabouts and priority-controlled intersections than DOS. A summary of the delay thresholds recommended by the NSW RMS is provided in Table 11 below.

Table 11 RMS LOS Criteria for Roundabouts and Priority intersections

LOS	Description	Critical Delay
A	Good operation	< 14 sec
B	Acceptable delays and spare capacity	15 – 28 sec
C	Satisfactory	29 – 42 sec
D	Near capacity	43 – 56 sec
E	At capacity, requires other control mode	57 – 70 sec

6.4 Road Network Capacity Analysis

6.4.1 Courtney Drive

Courtney Drive currently consists of a 5-6m sealed road pavement best described as a rural formation (i.e. no kerb and channel). The existing arrangement is similar to the Rural Access Street cross-section specified by Council in the Land Development Guidelines which has a daily traffic threshold for planning purposes of 150 vpd.

The GHD assessment projected an ultimate daily traffic demand in the order of 2,800vpd at the culmination of development of the Courtney Drive investigation area.

The SLR assessment indicates that, post completion of the subject development and new road connection south to Reserve Road, Courtney Drive will carry approximately 1,240vpd at the 10-year design horizon. This would represent an approximate six-fold increase in traffic demand compared to the existing conditions. However, given the proposed staging of the development, the subject development is unlikely to have a significant impact on the existing Courtney Drive corridor until the completion of Stage 5, at which point the northern connection to Courtney Drive will be implemented.

From a functional perspective, the existing road formation is considered sufficient to accommodate two-way traffic safely when vehicles are travelling at/around 20-30km/h; however, the road should desirably be upgraded to an urban formation to accommodate the projected 10-year design traffic demand with associated urban travel speeds (i.e. > 50km/h). The plans indicate that approximately 200m of the existing Courtney Drive corridor is located within Stage 5 and would be upgraded at the time that this stage was completed.

SLR does not agree with the GHD position noted in Section 5.2.1 of the *Investigation Areas Programme – Courtney Drive, Upper Coomera* study and suggests that it would be reasonable for Courtney Drive to be considered as trunk infrastructure based on consideration of the following:

- It would service multiple land holdings and deliver a through district-level connection
- It would connect to higher order roads including Reserve Road which is defined as a Sub-Arterial road.

It is not considered reasonable for the complete upgrading of Courtney Drive through to Baileys Mountain Road to be the sole responsibility of the subject development (without infrastructure offsets/credits) given the wider benefit this connection would provide to other adjoining development proponents.

6.4.2 Baileys Mountain Road/Courtney Drive Intersection

The Baileys Mountain Road/Courtney Drive intersection is currently configured as a staggered four-way intersection shared with Jenkins Court, although given the negligible demand expected and observed at Jenkins Court this leg has been ignored for the purpose of the analysis conducted herein.

The SIDRA assessed intersection form is illustrated in Figure 5 and analysis results summarised in Table 12. Detailed SIDRA outputs are attached at Appendix C.

Figure 5 Baileys Mountain Road/Courtney Drive - Existing Intersection Form

Table 12 Baileys Mountain Road/Courtney Drive - SIDRA Analysis Outputs

Scenario	AM Peak			PM Peak		
	DOS	Critical Delay	95th %ile Queue	DOS	Critical Delay	95th %ile Queue
Without Development (Existing Intersection Form)						
2019 BG	0.04	6 sec	0m	0.04	6 sec	0m
2021 BG	0.04	6 sec	0m	0.04	6 sec	0m
2022 BG	0.04	6 sec	0m	0.04	6 sec	0m
2026 BG	0.05	6 sec	0m	0.05	6 sec	0m
2032 BG	0.06	6 sec	0m	0.06	6 sec	0m
With Development (Existing Intersection Form)						
2021 BG + DEV	0.04	6 sec	0m	0.04	6 sec	0m
2022 BG + DEV	0.08	6 sec	2m	0.08	6 sec	1m
2026 BG + DEV	0.09	6 sec	2m	0.09	6 sec	1m
2032 BG + DEV	0.09	6 sec	2m	0.09	6 sec	1m

The Table 12 results indicate that the Baileys Mountain Road/Courtney Drive intersection can be expected to operate well within typically accepted performance thresholds for each assessment scenario. Accordingly, no future upgrades or capacity enhancements are deemed necessary at this intersection.

6.4.3 Old Coach Road/Baileys Mountain Road Intersection

The Old Coach Road/Baileys Mountain Road intersection is currently configured as a priority-controlled T-junction located immediately to the north of the Reserve Road/Old Coach Road roundabout. It is understood that, as part of the CoGC LGIP, Baileys Mountain Road will ultimately be realigned to the south to form a fourth leg of the Reserve Road/Old Coach Road intersection by 2026. To ensure a conservative approach, the existing intersection geometry has been modelled herein to allow for any potential delays in implementing the upgrade works.

The SIDRA assessed intersection form is illustrated on Figure 6 and analysis results summarised in Table 13. Detailed SIDRA outputs are attached at Appendix C.

Figure 6 Old Coach Road/Baileys Mountain Road - Existing Intersection Form

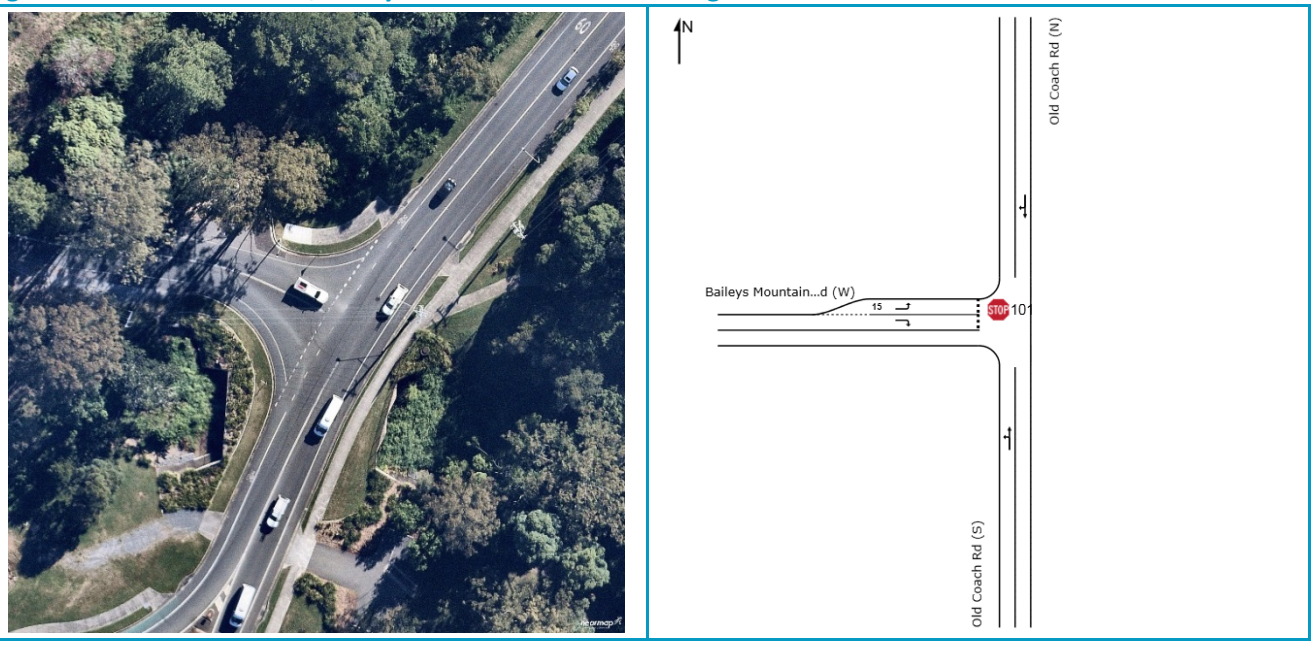


Table 13 Old Coach Road/Baileys Mountain Road - SIDRA Analysis Outputs

Scenario	AM Peak			PM Peak		
	DOS	Critical Delay	95th %ile Queue	DOS	Critical Delay	95th %ile Queue
Without Development (Existing Intersection Form)						
2019 BG	0.45	19 sec	6m	0.52	24 sec	9m
2021 BG	0.48	23 sec	8m	0.56	30 sec	11m
2022 BG	0.50	25 sec	9m	0.58	34 sec	12m
2026 BG	0.57	40 sec	15m	0.69	74 sec	19m
2032 BG	0.85	150 sec	85m	2.15	1,149 sec	205m
With Development (Existing Intersection Form)						
2021 BG + DEV	0.51	26 sec	9m	0.58	35 sec	12m
2022 BG + DEV	0.53	35 sec	13m	0.64	51 sec	23m
2026 BG + DEV	0.83	83 sec	23m	1.17	278 sec	79m
2032 BG + DEV	2.02	1,004 sec	240m	3.83	2,643 sec	349m

The Table 13 results indicate that the Old Coach Road/Baileys Mountain Road intersection capacity will be exceeded within the 10-year design horizon, around 2021/22 based on the critical right turn delay reaching or exceeding Level of Service D for the 'background' and 'with development' traffic conditions. This analysis therefore suggests that the intersection requires updating irrespective of the development status of the subject site or the wider Courtney Drive Investigation Area.

Given the adjacent LGIP planning for the Reserve Road/Old Coach Road intersection, capacity upgrading of the existing intersection location has not been investigated herein. Furthermore, this upgrading cannot be proposed as part of the development as the trunk realignment of Baileys Mountain Road appears to require land that is not road reserve, and which does not form part of the application.

The analysis results also suggest that the completion of the proposed LGIP INT_011 works would need to be completed prior to any substantial development of the Courtney Drive investigation area, of which the subject development forms a part, due to the constrained operational capacity of the local road network in its current form.

6.4.4 Reserve Road/Old Coach Road Intersection

The Reserve Road/Old Coach Road intersection is currently configured as a three-way roundabout with two circulation lanes on all but the southwestern roundabout segment. The LGIP suggests that intersection enhancements are planned to be delivered at this location at/by 2026, which will include the realignment of Baileys Mountain Road to form a new fourth approach to the intersection.

At this time, SLR does not know if the LGIP item will retain the existing roundabout form or if it will incorporate upgrading to signals. Given this ambiguity, the existing roundabout intersection geometry shown in Figure 7 has been assessed.

The SIDRA assessed intersection form is illustrated on Figure 7 and analysis results summarised in Table 14. Detailed SIDRA outputs are attached at Appendix C.

Figure 7 Reserve Road/Old Coach Road - Existing Intersection Form

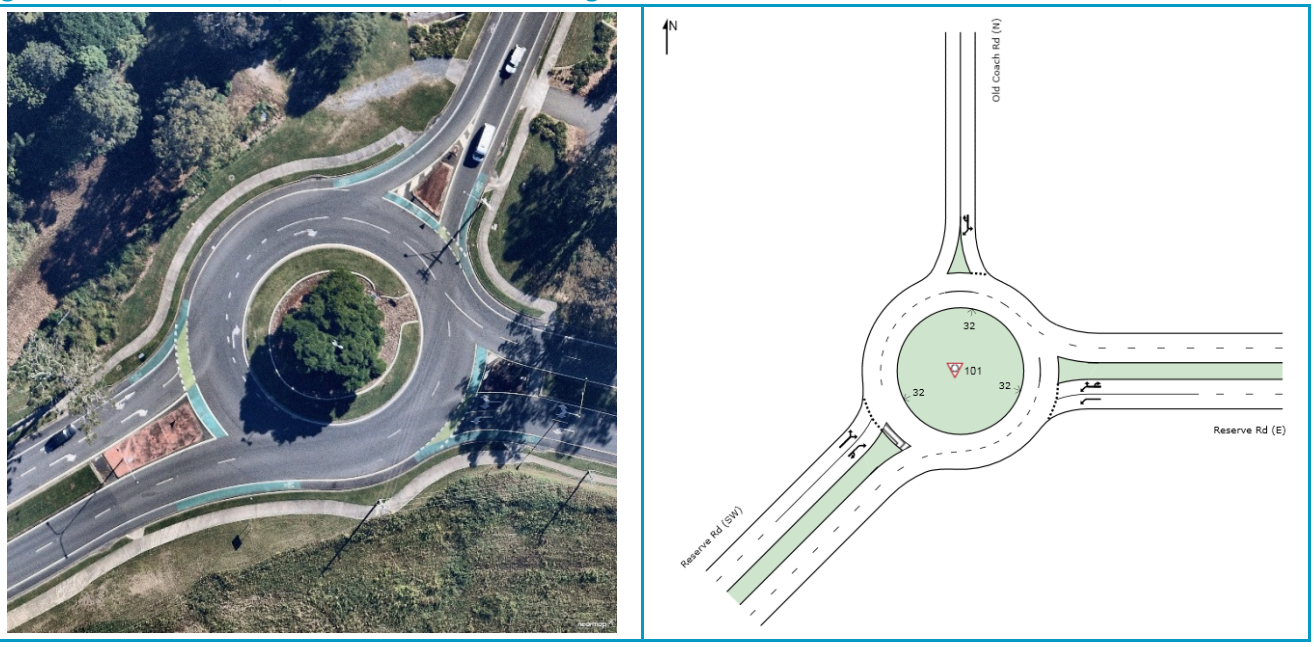


Table 14 Reserve Road/Old Coach Road - SIDRA Analysis Outputs

Scenario	AM Peak			PM Peak		
	DOS	Critical Delay	95th %ile Queue	DOS	Critical Delay	95th %ile Queue
Without Development (Existing Intersection Form)						
2019 BG	0.51	15 sec	26m	0.72	17 sec	54m
2021 BG	0.55	15 sec	30m	0.78	17 sec	66m
2022 BG	0.57	15 sec	32m	0.81	17 sec	74m
2026 BG	0.66	16 sec	42m	0.92	20 sec	163m
2031 BG	0.80	16 sec	80m	1.11	117 sec	860m
With Development (Existing Intersection Form)						
2021 BG + DEV	0.58	15 sec	32m	0.82	17 sec	81m
2022 BG + DEV	0.62	16 sec	37m	0.85	18 sec	94m
2026 BG + DEV	0.71	16 sec	55m	0.97	23 sec	245m
2032 BG + DEV	0.86	17 sec	108m	1.15	156 sec	1,097m

The Table 14 results indicate that the Reserve Road / Old Coach Road intersection capacity will be exceeded within the 10-year design horizon, around 2024 based on the PM assessment period where DOS will reach or exceed 0.85.

The inclusion of development traffic will bring forward this failure threshold to approximately 2022.

The inclusion of a new intersection approach as part of the LGIP INT_011 works is likely to further exacerbate the intersection performance summarised in Table 14. Accordingly, it is likely that the intersection will have to be upgraded to a signalised formation irrespective of the Courtney Drive investigation area or subject development proceeding.

As such, the subject development is not considered to be liable for future the upgrade of this intersection. However, it is considered desirable for the upgrade works to be completed prior to any substantial development of the Courtney Drive investigation area in order to provide sufficient operational capacity to accommodate the anticipated increase in traffic generated by any development of this area.

6.4.5 Reserve Road/Courtney Drive Extension (Southern Access Road) Intersection

The Reserve Road/Courtney Drive Extension intersection is currently under construction by Stockland as part of the development of Stage 35 of the "Highland Rise" development and is expected to comprise a priority-controlled three-way intersection.

The SIDRA assessed intersection form is shown below in Figure 8, with the associated analysis outputs summarised within Table 15. Detailed SIDRA outputs are attached at Appendix C.

Figure 8 Reserve Road/Courtney Drive Extension (Southern Access Road) - Proposed Intersection Form

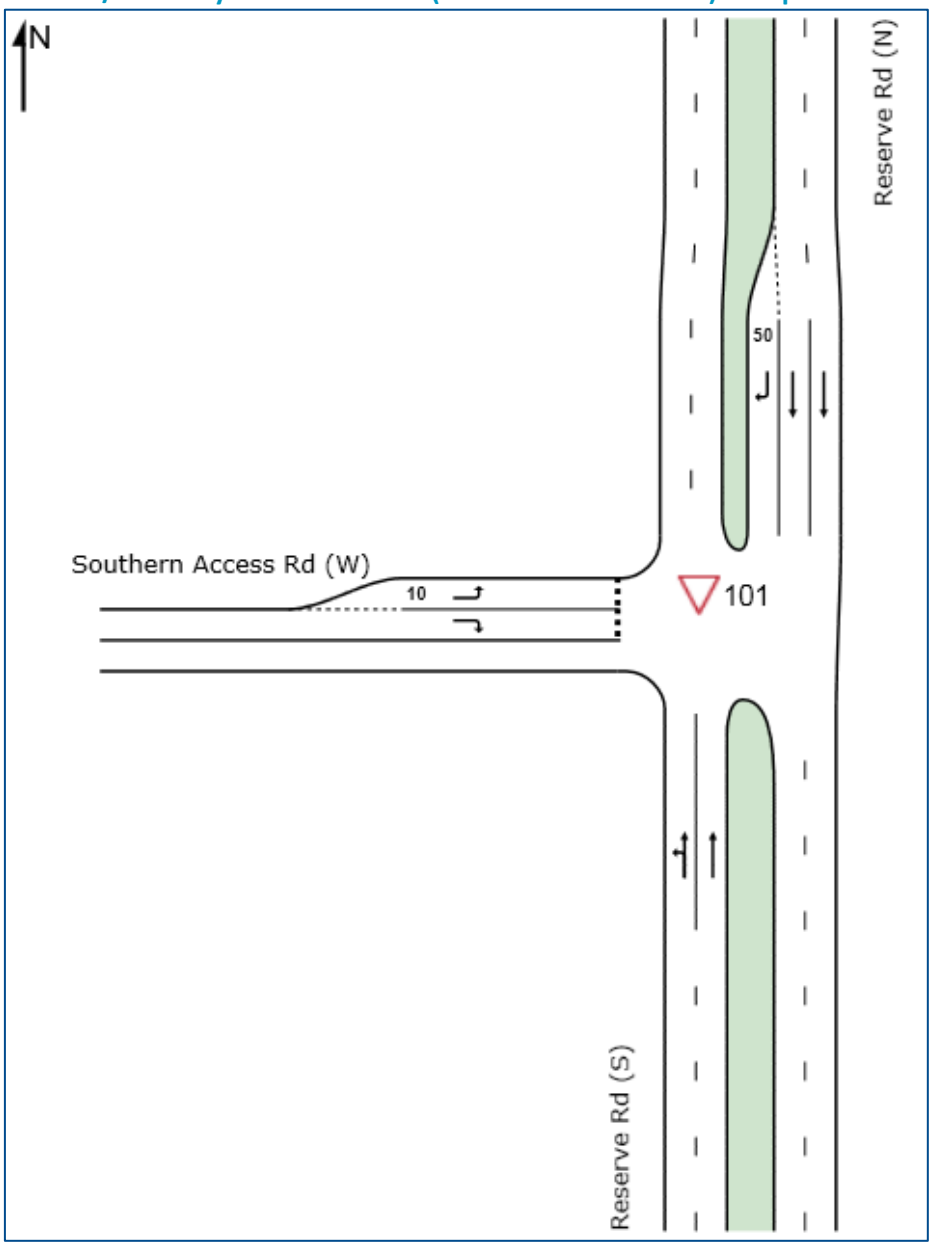


Table 15 Reserve Road/Courtney Drive Extension (Southern Access Road) - SIDRA Analysis Outputs

Scenario	AM Peak			PM Peak		
	DOS	Critical Delay	95th %ile Queue	DOS	Critical Delay	95th %ile Queue
Without Development (Existing Intersection Form)						
2021 BG	0.17	33 sec	1m	0.23	41 sec	1m
2022 BG	0.18	35 sec	1m	0.24	45 sec	1m
2026 BG	0.20	49 sec	1m	0.27	66 sec	1m
2032 BG	0.24	83 sec	2m	0.31	125 sec	1m
With Development (Existing Intersection Form)						
2021 BG + DEV	0.21	38 sec	5m	0.23	49 sec	3m
2022 BG + DEV	0.18	40 sec	4m	0.24	53 sec	2m
2026 BG + DEV	0.24	59 sec	5m	0.27	79 sec	3m
2032 BG + DEV	0.27	67 sec	6m	0.31	90 sec	3m

The analysis outputs summarised within Table 15 show that, without the subject development in place, delays at the southern access intersection are expected to exceed the typically adopted threshold by 2021, at which point traffic turning right out of the access road experiences a Level of Service of D. It is noted that this analysis is conservative in so much that it assumes that vehicles turning right onto Reserve Road do so in one movement. The central median would permit this movement to occur as a dual-stage movement which is typical. Should future capacity concerns eventuate at the location, it may be reasonable to examine the restriction of right turn movements with southbound right turners accommodated via other routes.

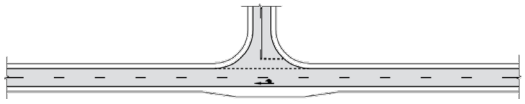
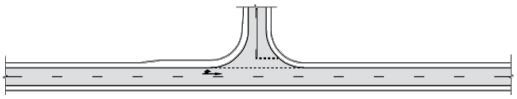
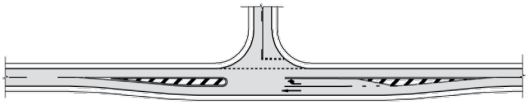
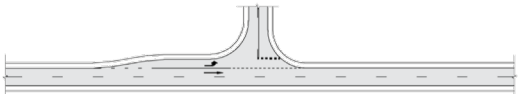
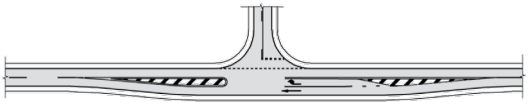
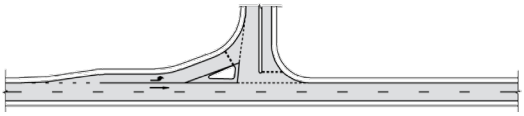
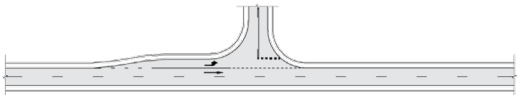
The analysis also suggests that the construction of the subject development in its entirety may potentially improve the performance of this intersection by providing an alternative route via Courtney Drive to the north. However, the volume of through traffic along Reserve Road means that the critical delay for right turn movements out of the access road remain above the desired performance thresholds under all assessment scenarios with or without the subject development in place.

6.5 Turn Warrants Assessment

A turn lane warrant assessment was undertaken to establish the desirable form of the Baileys Mountain Road / Courtney Drive Road intersection in accordance with the industry research summarised within *Austroads Guide to Road Design Part 4A (AGRD4A17)*. The warrants provide guidance where turning lanes should be used based on the design speed and the combination of through and turning traffic movements.

Table 16 details the form of the various turn treatments considered as part of the turn lane warrant assessment.

Table 16 Turn Treatments

Treatment Acronym	Right Turn Treatment	Left Turn Treatment
BAL or **BAR**	 **BAR** (Basic Right Turn)	 **BAL** (Basic Left Turn)
AUL(S) or **CHR(S)**	 **CHR(S)** (Channelised Right Turn (Short))	 **AUL(S)** (Auxiliary Left Turn (Short))
AUL/CHR or **CHL**	 **CHR** (Channelised Right Turn)	 **CHL** (Channelised Left Turn)  **AUL** (Auxiliary Left Turn)

Source: Road Planning and Design Manual (RPDM)

The warrants were developed by Arndt, Troutbeck, Handley and Slattery (2006) and were produced by identifying the location at which the benefits of providing a higher-level treatment (i.e. the reduction in estimated crash costs) are equal to the additional construction costs associated with the treatment. The benefits and costs of a higher-level treatment were compared to the base case (minimum turn treatments). The research notes the following key points:

- *The warrants have been produced by identifying the location at which the benefits of providing a higher-level treatment (the reduction in estimated accident costs) are made equal to a proportion of the additional construction costs. The proportion is the benefit cost ratio (BCR) and applied for an assumed design life;*
- *For the right-turn treatments, a design life of 10 years and a BCR equal to one is assumed in the calculations;*
- *For the left-turn warrants, the curves produced for the right-turn treatments are adopted;*
- *The warrants are based on the construction of intersections on new roads (i.e. Greenfield sites). Therefore, their most appropriate application is to the selection of turn types for intersections on new roads.*

For the purposes of the assessment conducted herein, the curves for the subject intersections have been developed for Greenfield environments to ensure that the safety of the study intersection has been assessed against the most conservative intervention curve.

6.5.1 Baileys Mountain Road/Courtney Drive Intersection

Figures 9 and 10 illustrate the turn warrant assessment completed for the Baileys Mountain Road / Courtney Drive intersection at the 10-year design horizon inclusive of the subject development traffic. The results are for the AM and PM peak periods respectively and illustrate that no auxiliary lanes are warranted.

Figure 9 Baileys Mountain Road/Courtney Drive - AM Peak Turn Warrant

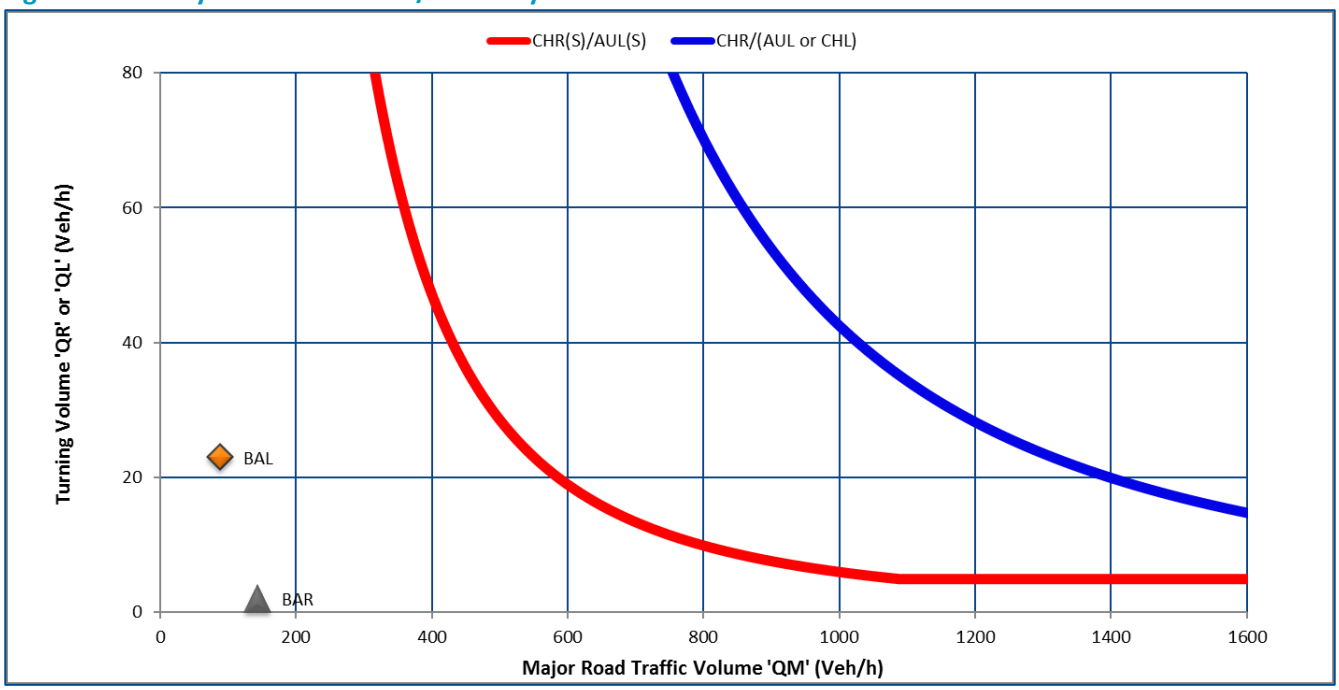
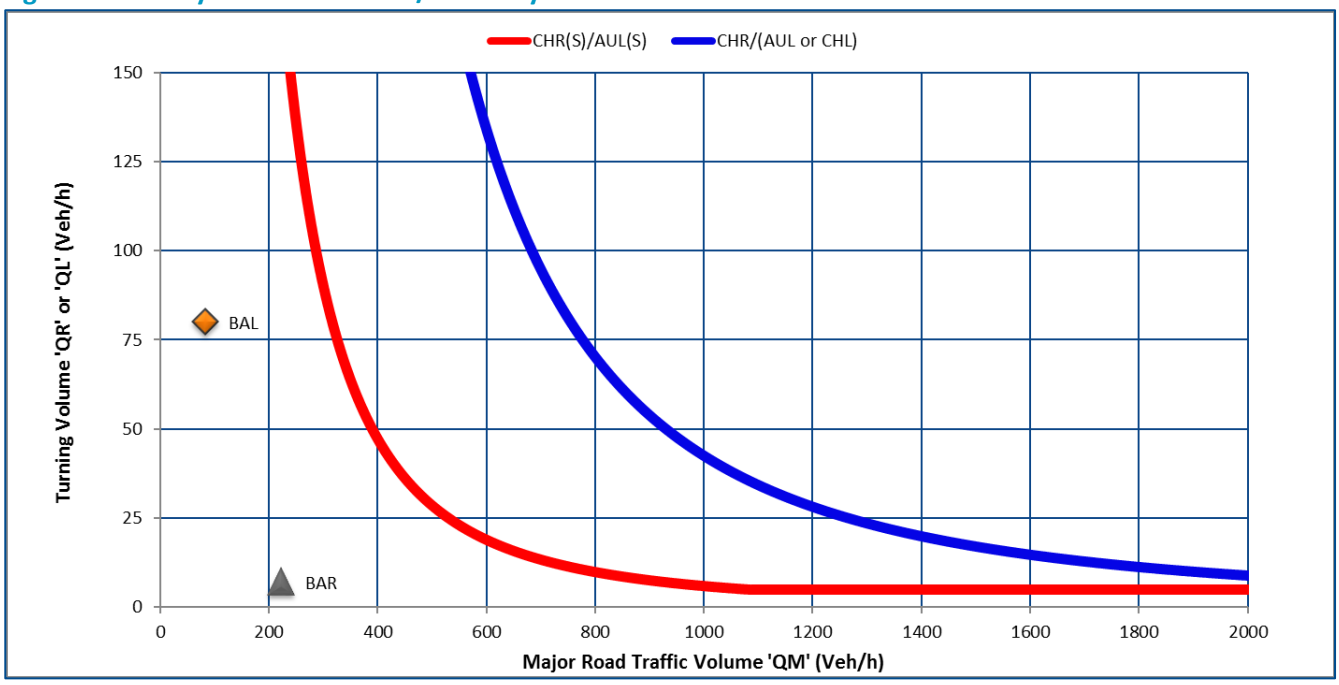


Figure 10 Baileys Mountain Road/Courtney Drive - PM Peak Turn Warrant



6.6 Sight Distance Assessment

Sight distance observations were made at the Baileys Mountain Road / Courtney Drive intersection during the site inspection. The following Safe Intersection Sight Distances were noted:

- ~275m to/from the north along Baileys Mountain Road
- ~55m to/from the south which is constrained primarily by existing vegetation that is located in/near to the southern road reserve (Figure 11).

Figure 11 Sight Distance to the South of the Baileys Mountain Road/Courtney Drive Intersection

Accordingly, it would be reasonable for clearing of exiting vegetation in the public road to occur to ensure safe intersection operation can be maintained, irrespective of the proposed development proceeding.

7 Code Assessment

The traffic and transport aspects of the proposed development have been assessed against the relevant requirements of the following local codes:

- Reconfiguring a Lot code
- Driveways and Vehicular Crossings code
- General Development Provisions code
- Transport code

Responses to these codes from a traffic and transport perspective have been prepared by SLR and are included at Appendix D.

8 Summary

SLR Consulting Australia Pty Ltd (SLR) has been commissioned by Courtney Drive Development Pty Ltd to provide traffic engineering advice in relation to the proposed low density residential development located at 79-99 Courtney Drive, Upper Coomera.

Based on the foregoing analysis and discussion, the following is concluded:

- The internal design of the road network, property accesses and servicing arrangements are considered reasonable and consistent with the proposed scale of the subject development.
- The proposed development including land use, yield and vehicular connectivity is consistent with that assessed and recommended by GHD as part of the *Investigation Areas Programme – Courtney Drive, Upper Coomera* study completed in 2016-17.
- The scale of traffic generated by the subject development is consistent with that assessed by GHD and to which was previously concluded that *"there would be sufficient capacity in the existing [road] network to cater for any increased [development] density"*.
- The existing Courtney Drive road cross-section would be inconsistent with the projected 2031 traffic demands and an urban environment and would require upgrading to an urbanised form. The subject development will deliver this upgrade for the segment that fronts the development site.
- It would be reasonable to define Courtney Drive as trunk infrastructure given it services multiple land holdings and connects immediately to other higher order roads, including Reserve Road which is defined by Council as a Sub-Arterial road.
- No capacity enhancements are warranted at the Courtney Drive / Baileys Mountain Road intersection.
- The capacity of the Old Coach Road/Baileys Mountain Road and Old Coach Road/Reserve Road intersections is projected to be exceeded by 2021 and 2024 respectively without the subject development in place. The inclusion of development traffic at the Old Coach Road/Reserve Road intersection is expected to bring forward to the point of failure to 2022.
- The southern access intersection on Reserve Road currently under construction is expected to operate within degree of saturation capacity thresholds (DOS < 0.80); however, the conservative one-movement analysis outputs that delays will exceed typically accepted limits.
- Committed Council LGIP planning for these intersections suggests the solution will include realigning Baileys Mountain Road and such that it forms a new fourth approach to an upgraded Old Coach Road / Reserve Road intersection.
- Sight distance to the south of the Baileys Mountain Road / Courtney Drive intersection is currently constrained by existing vegetation located near/within the road reserve. It would be desirable that this vegetation is cleared, irrespective of the proposed development proceeding or otherwise.

APPENDIX A

Development Plans

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Surveying, Town Planning & Spatial Services
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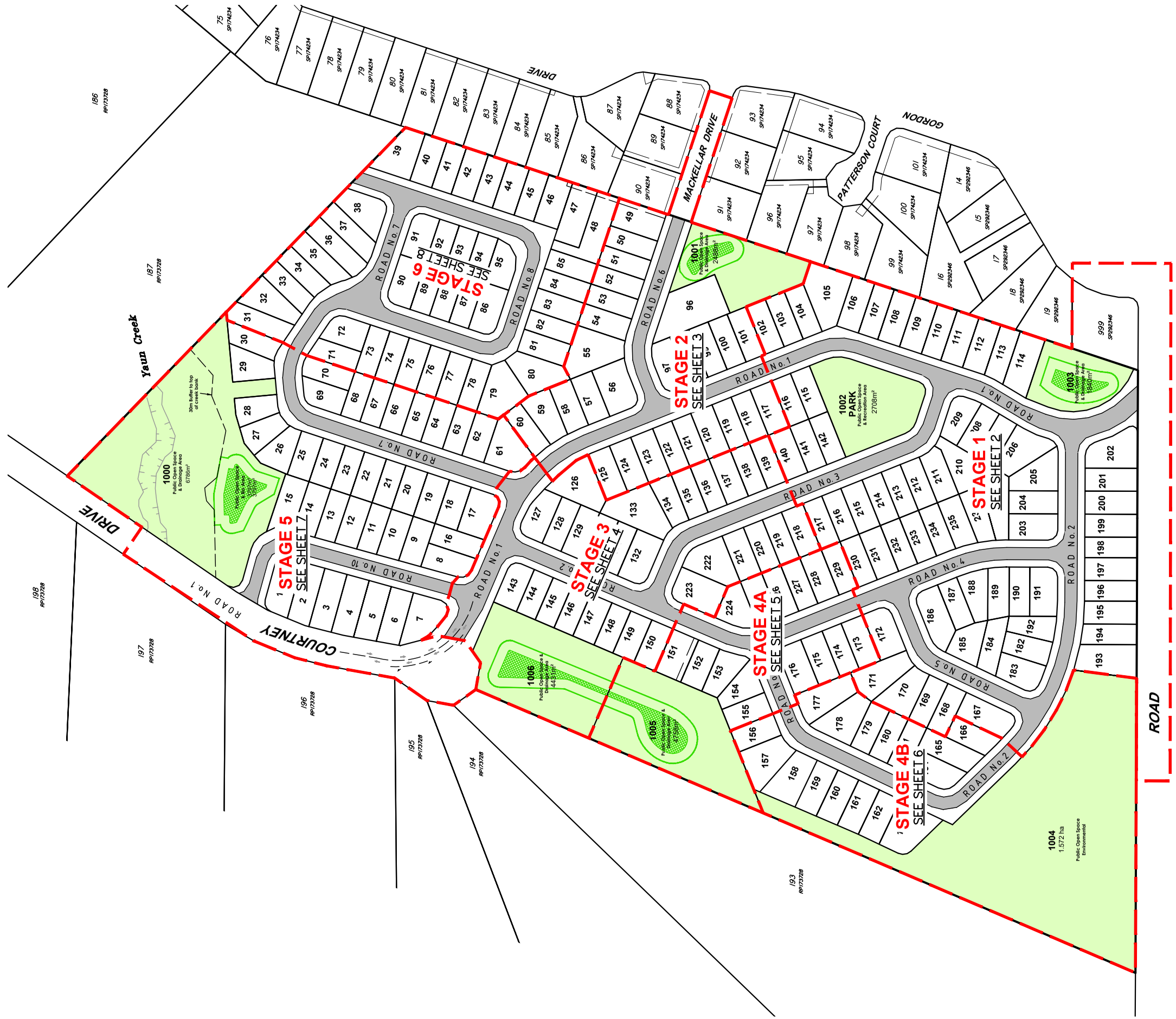


Scale 1:2500
0m 50 100 150 200 250 300 350 400

DEVELOPMENT SUMMARY

Stage 1	- 68
Stage 2	- 27
Stage 3	- 28
Stage 4A	- 15
Stage 4B	- 16
Stage 5	- 40
Stage 6	- 43
TOTAL	237 Lots

LEGEND

Stage boundary

DEVELOPMENT AREAS LEGEND

Total Site Area	18.849 ha
Proposed Public Open Space (Environmental)	1.572 ha
Proposed Public Open Space (Drainage)	2.41 ha
Proposed Public Open Space (Recreation)	2708m²
Proposed Net Developable Area	14.597 ha
Proposed Density	16.1 dwellings/ha
Length of New Road	2541m
Area of New Road	4.163 ha

NOTES:
1. Drawn to scale on an A3 sheet.
2. All dimensions and areas are subject to final survey and approval by G.C.C.C.
3. Dimensions shown are to the nearest decimeter.

Issue	Revision	Int	Date
J	Staging Amended	SDS	25/03/2019
I	Staging Amended	DJL	12/02/2019
H	Staging amended	SDS	1/02/2019
G	Staging Amended	SDS	11/12/2018
F	Staging amended	SDS	26/11/2018
E	Detention Basins Amended	JEW	20/09/2018
D	Lot 1004 + 157 - 163	JEW	18/09/2018
C	Layout Updated	SDS	27/08/2018
B	Layout Updated	JKC	12/06/2018
A	Original Issue		

Title:

Plan of Proposed Staged Subdivision of Lots 1-237

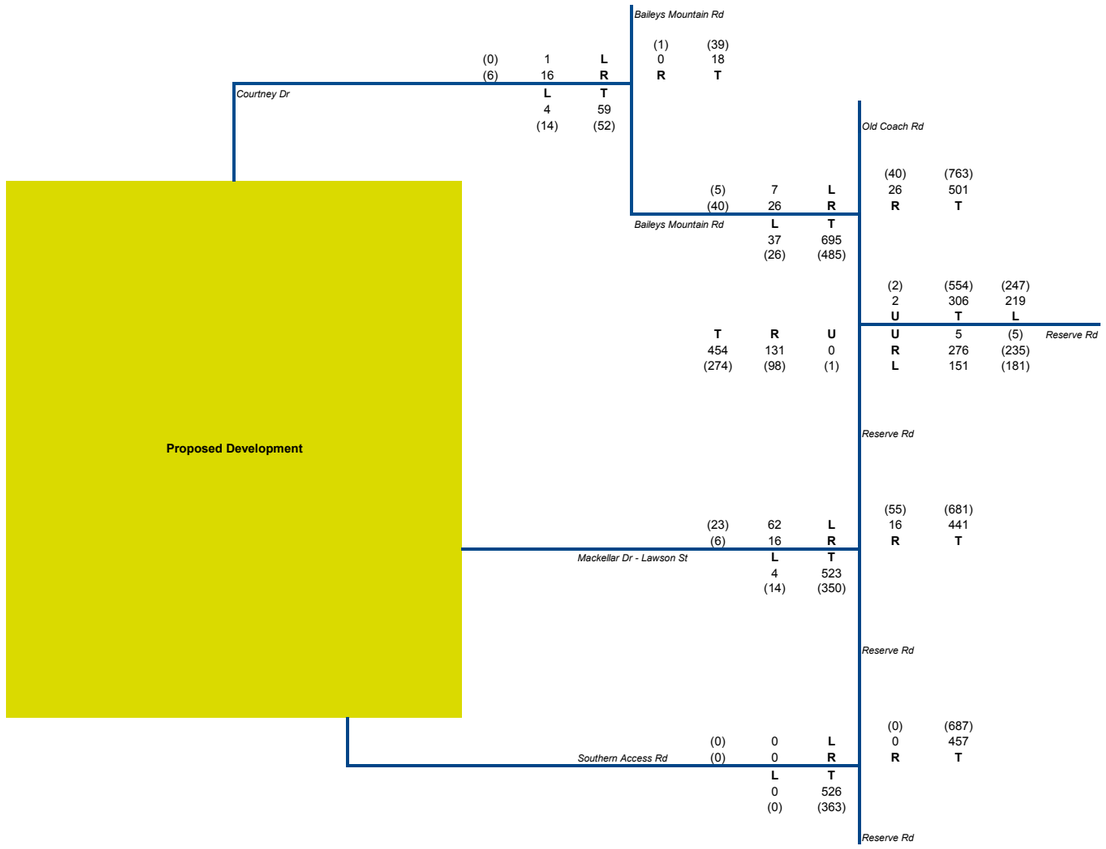
Cancelling Lots 188-192 on RP173728

Client:	**GALLERY HOMES**		
Locality:	UPPER COOMERA		
Local Gov:	GCCC	Prepared By:	SDS
Surveyed By:		Approved:	GWS
Date Created:	15/5/2018	Scale:	1:2500
Comp File:			
Plan No:	**171101_005_PRO**		

A3

APPENDIX B

Road Network Assessment Figures



Legend

L Left Turn
T Through
R Right turn
U U-turn

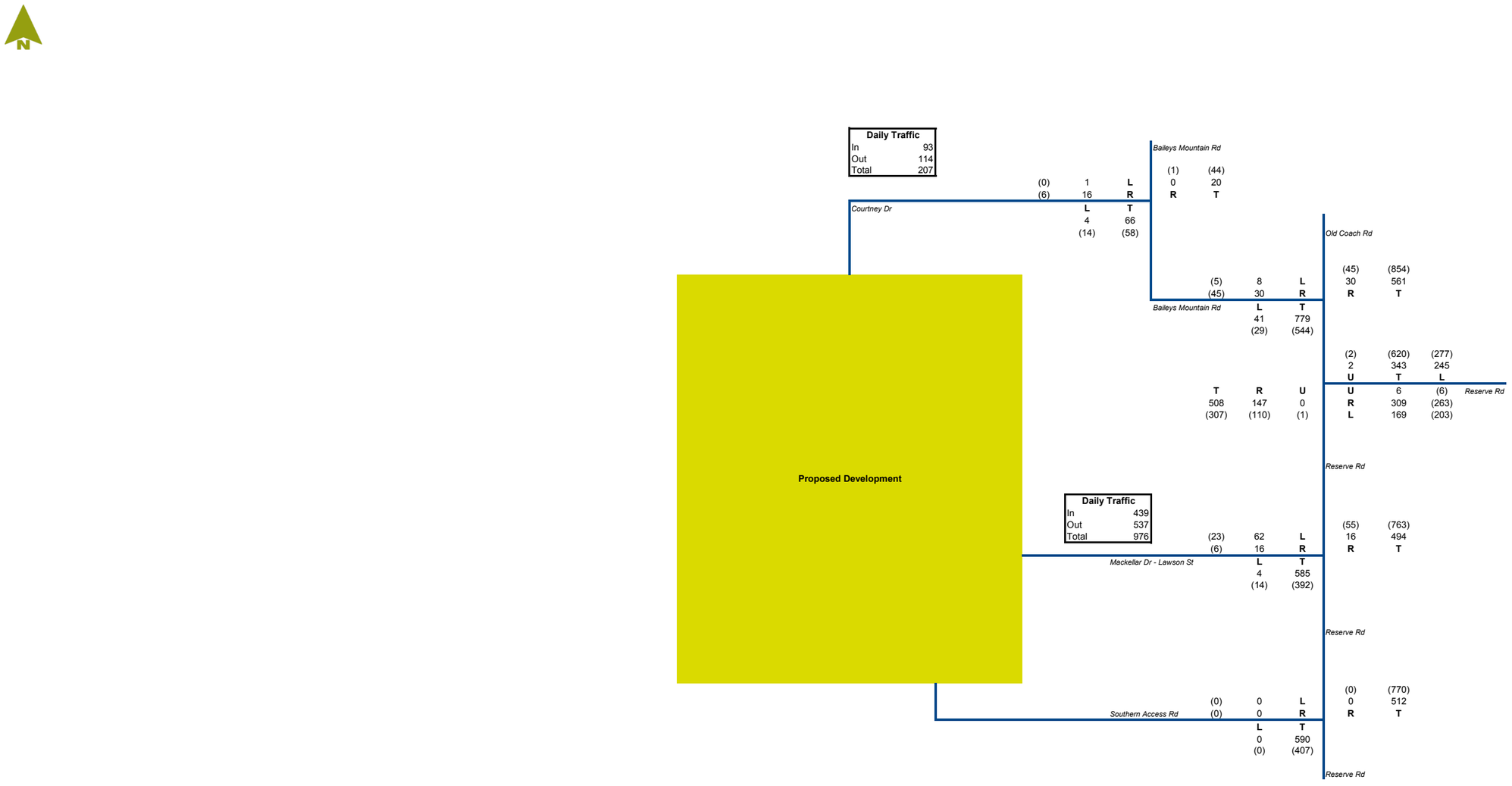
00 Weekday AM Peak Hour Volumes
(00) Weekday PM Peak Hour Volumes

Figure: A1

2016 Surveyed Traffic Volumes

620.12553
Coomera Courtney Dr MCU
18-04-2019

SLR



Legend

L Left Turn
T Through
R Right turn
U U-turn

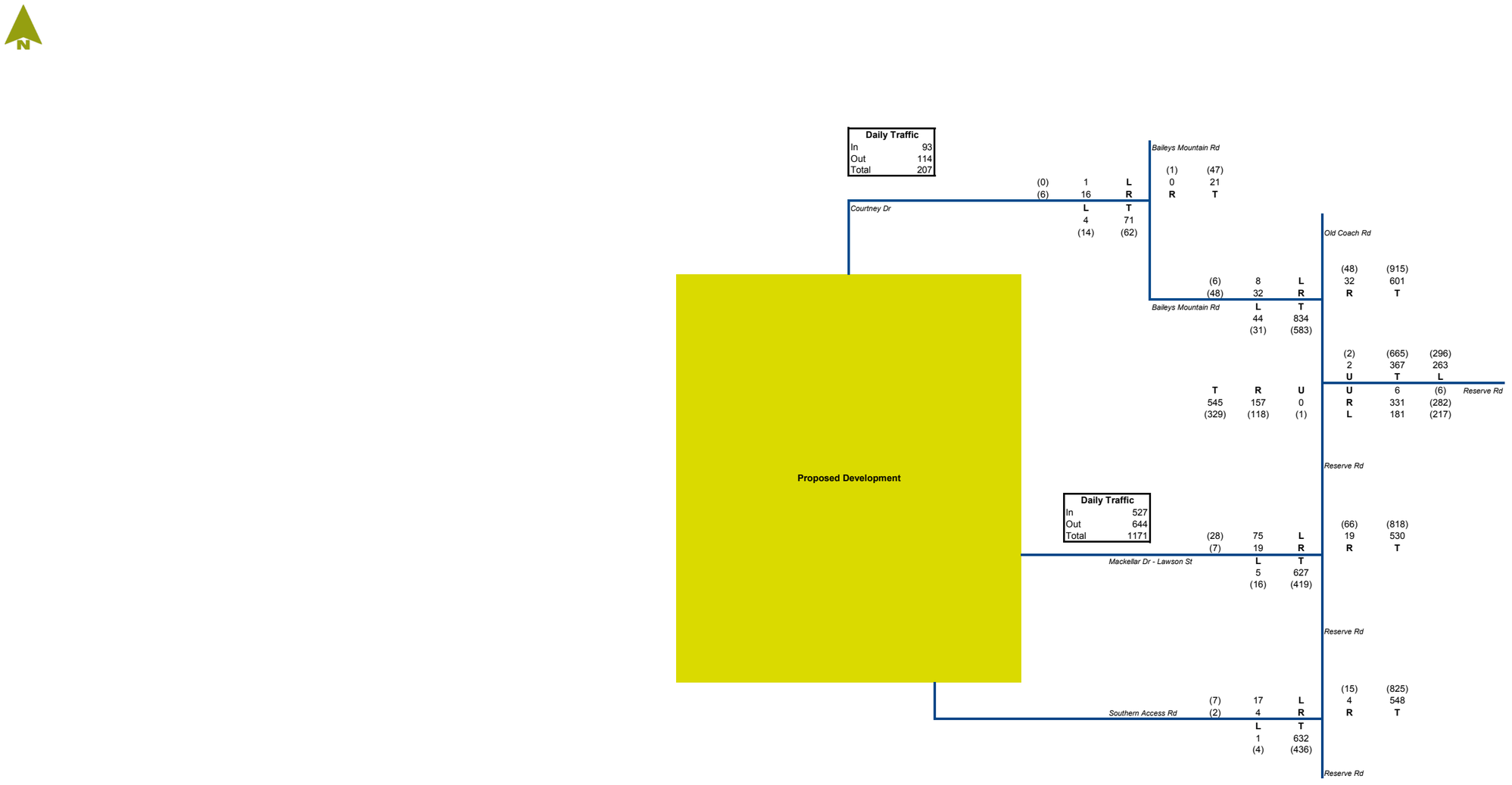
00 Weekday AM Peak Hour Volumes
(00) Weekday PM Peak Hour Volumes

Figure: A2

Background Traffic Volumes: Current Year

620.12553
Coomera Courtney Dr MCU
18-04-2019

SLR



Legend

L Left Turn
T Through
R Right turn
U U-turn

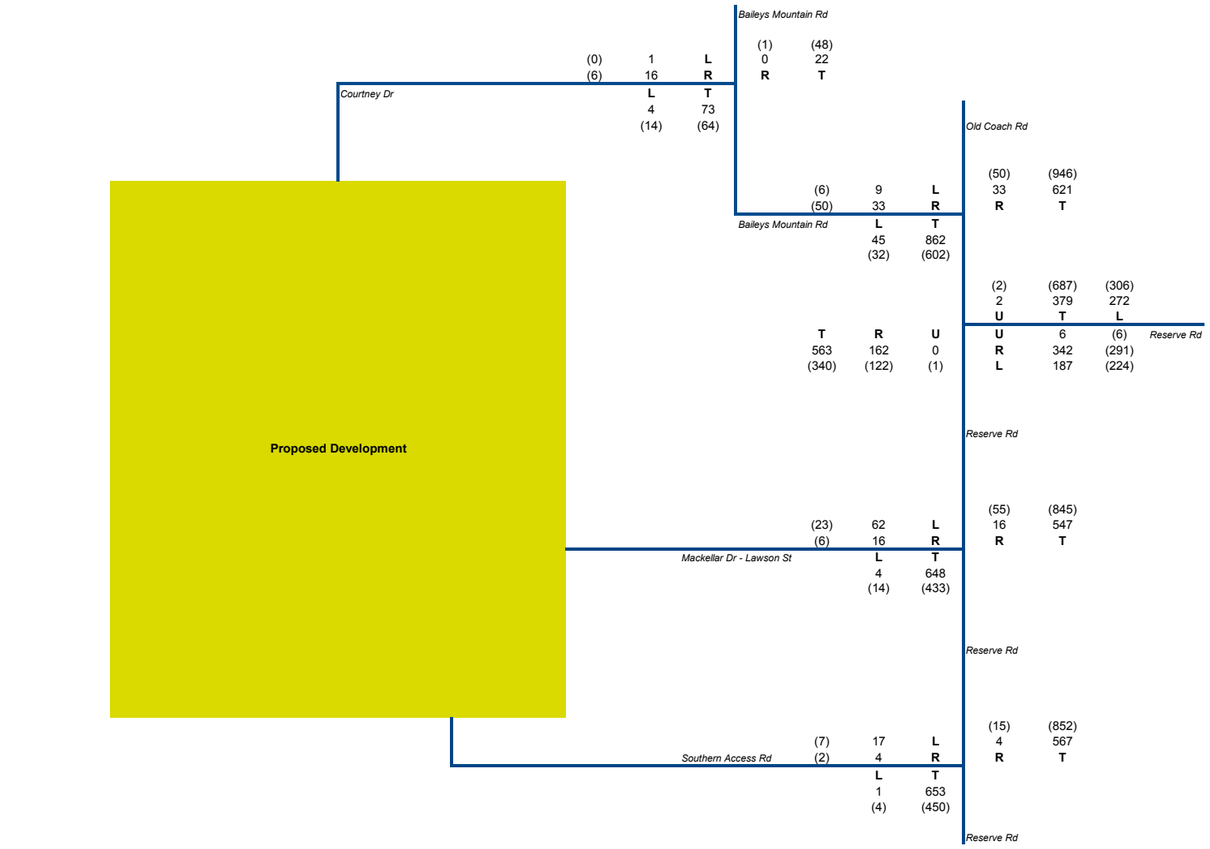
00 Weekday AM Peak Hour Volumes
(00) Weekday PM Peak Hour Volumes

Figure: A3

Background Traffic Volumes: 2021 Prior to Construction of Courtney Dr Link

620.12553
Coomera Courtney Dr MCU
18-04-2019

SLR



Legend

L Left Turn
T Through
R Right turn
U U-turn

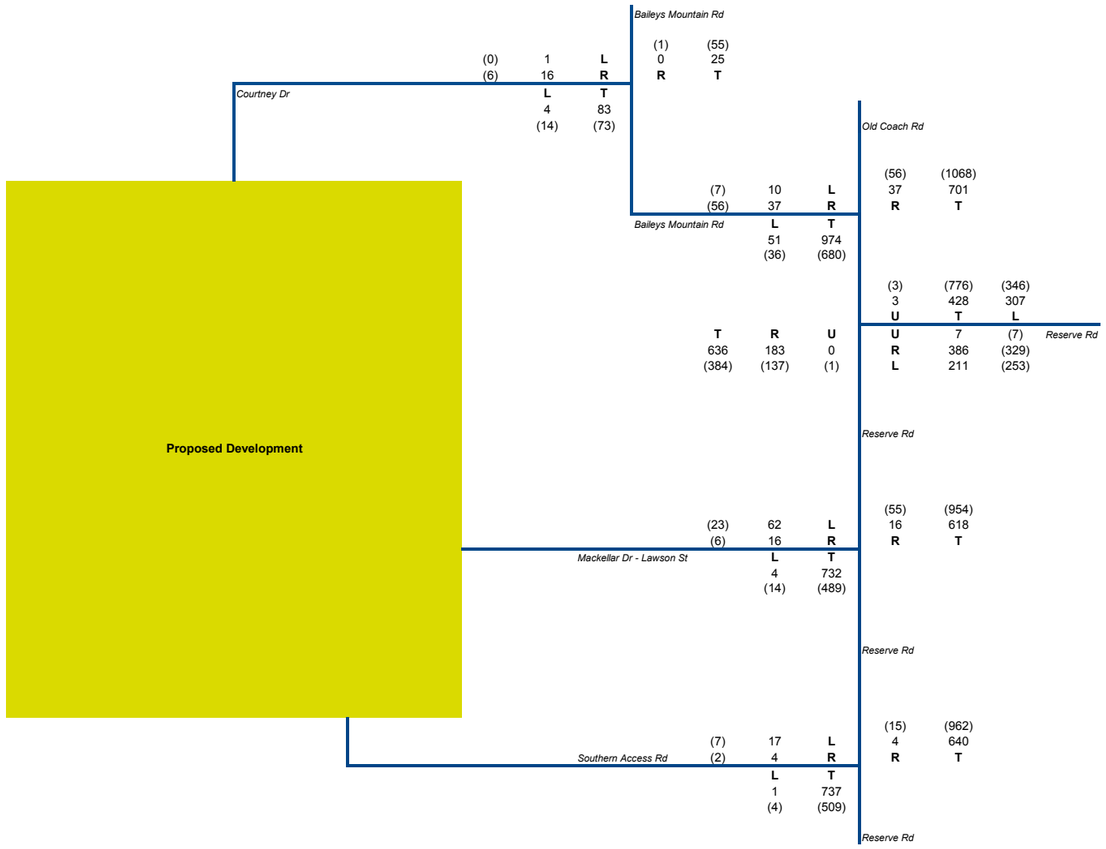
00 Weekday AM Peak Hour Volumes
(00) Weekday PM Peak Hour Volumes

Figure: A4

Background Traffic Volumes: 2022 Year of Full Occupation

620.12553
Coomera Courtney Dr MCU
18-04-2019

SLR



Legend

L Left Turn
T Through
R Right turn
U U-turn

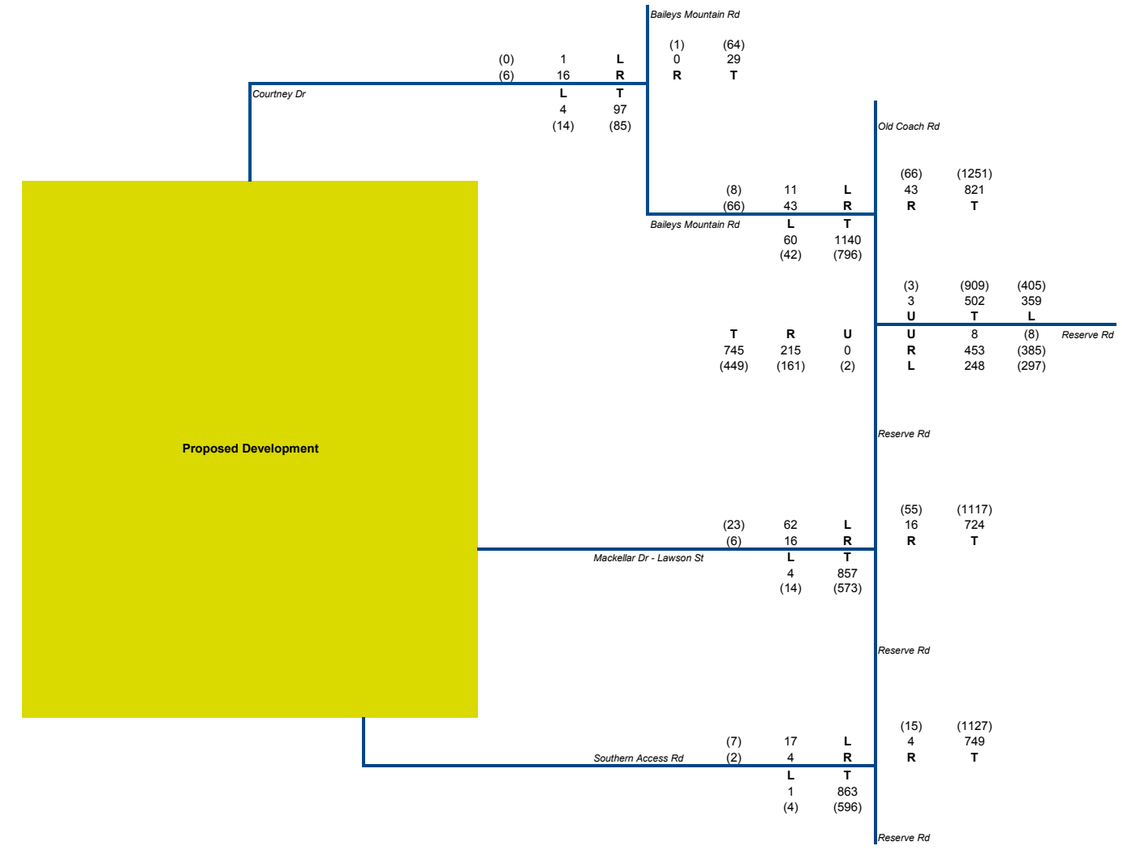
00 Weekday AM Peak Hour Volumes
(00) Weekday PM Peak Hour Volumes

Figure: A5

Background Traffic Volumes: 2026 Year of LGIP Works Completion

620.12553
Coomera Courtney Dr MCU
18-04-2019

SLR



Legend

L Left Turn
T Through
R Right turn
U U-turn

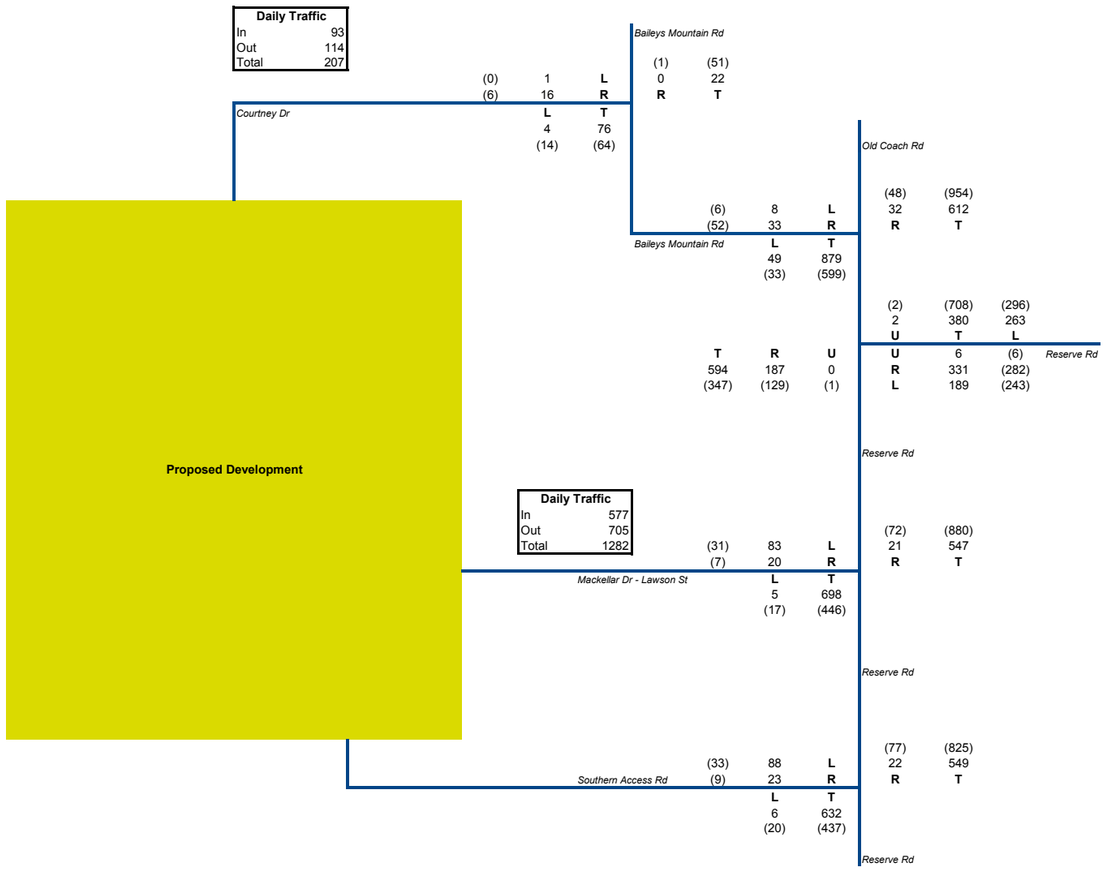
00 Weekday AM Peak Hour Volumes
(00) Weekday PM Peak Hour Volumes

Figure: A6

Background Traffic Volumes: 2031 Design Horizon

620.12553
Coomera Courtney Dr MCU
18-04-2019

SLR



Legend

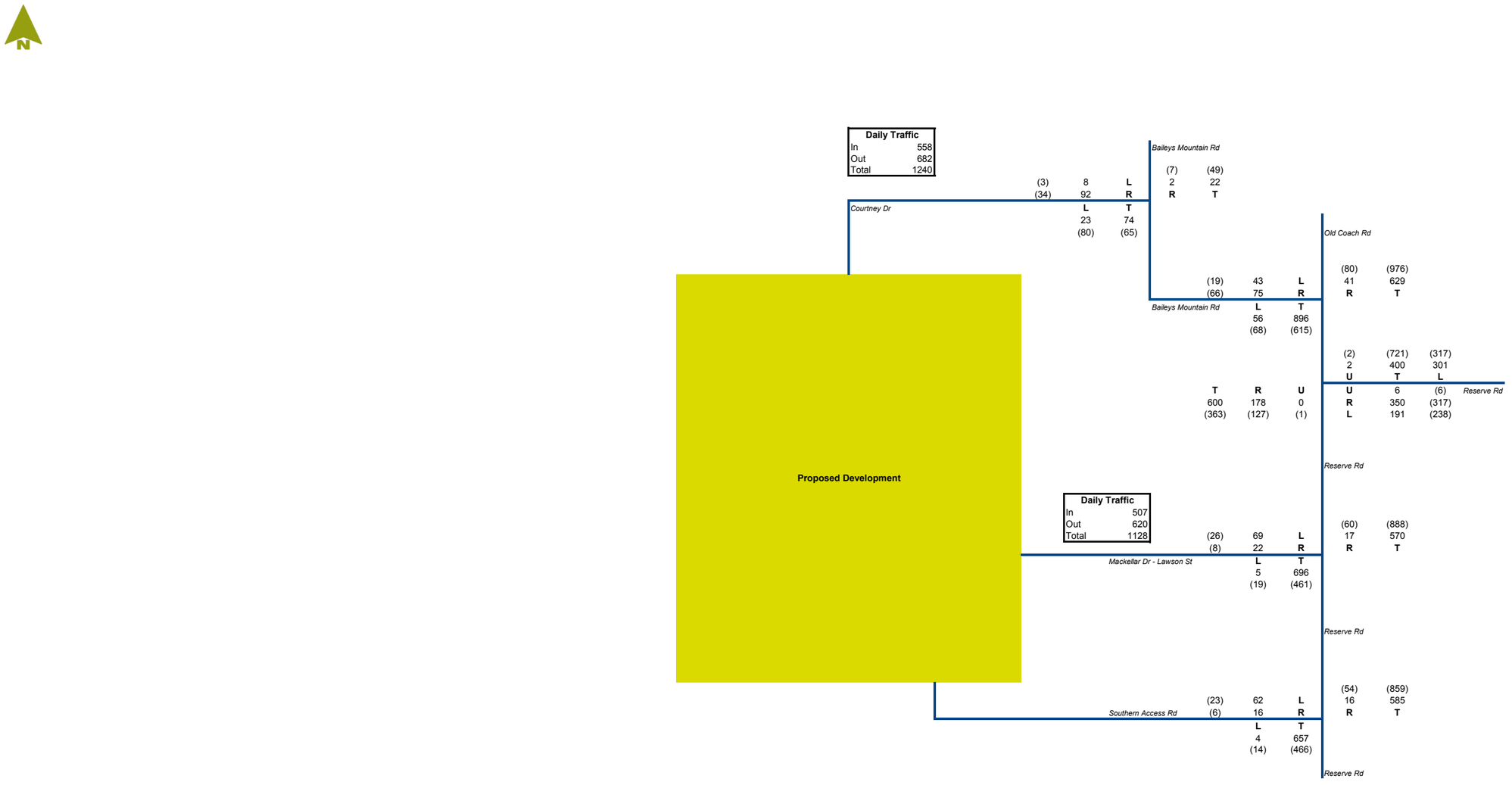
L Left Turn
T Through
R Right turn
U U-turn

00 Weekday AM Peak Hour Volumes
(00) Weekday PM Peak Hour Volumes

Figure: A7

With Development Traffic Volumes: 2021 Prior to Construction of Courtney Dr Link

620.12553
Coomera Courtney Dr MCU
18-04-2019



Legend

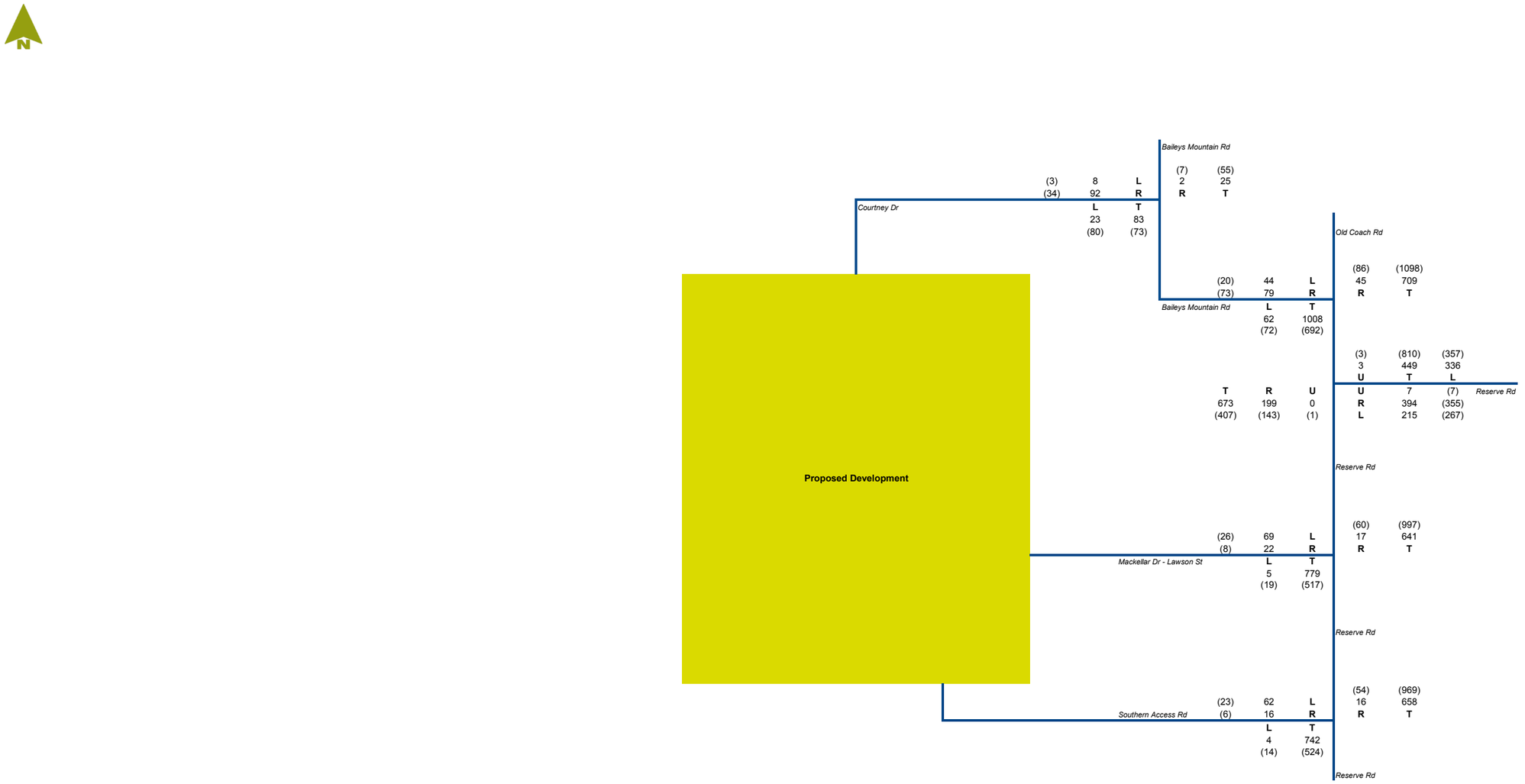
L Left Turn
T Through
R Right turn
U U-turn

00 Weekday AM Peak Hour Volumes
(00) Weekday PM Peak Hour Volumes

Figure: A8

With Development Traffic Volumes: 2022 Year of Full Occupation

620.12553
Coomera Courtney Dr MCU
18-04-2019



Legend

L Left Turn
T Through
R Right turn
U U-turn

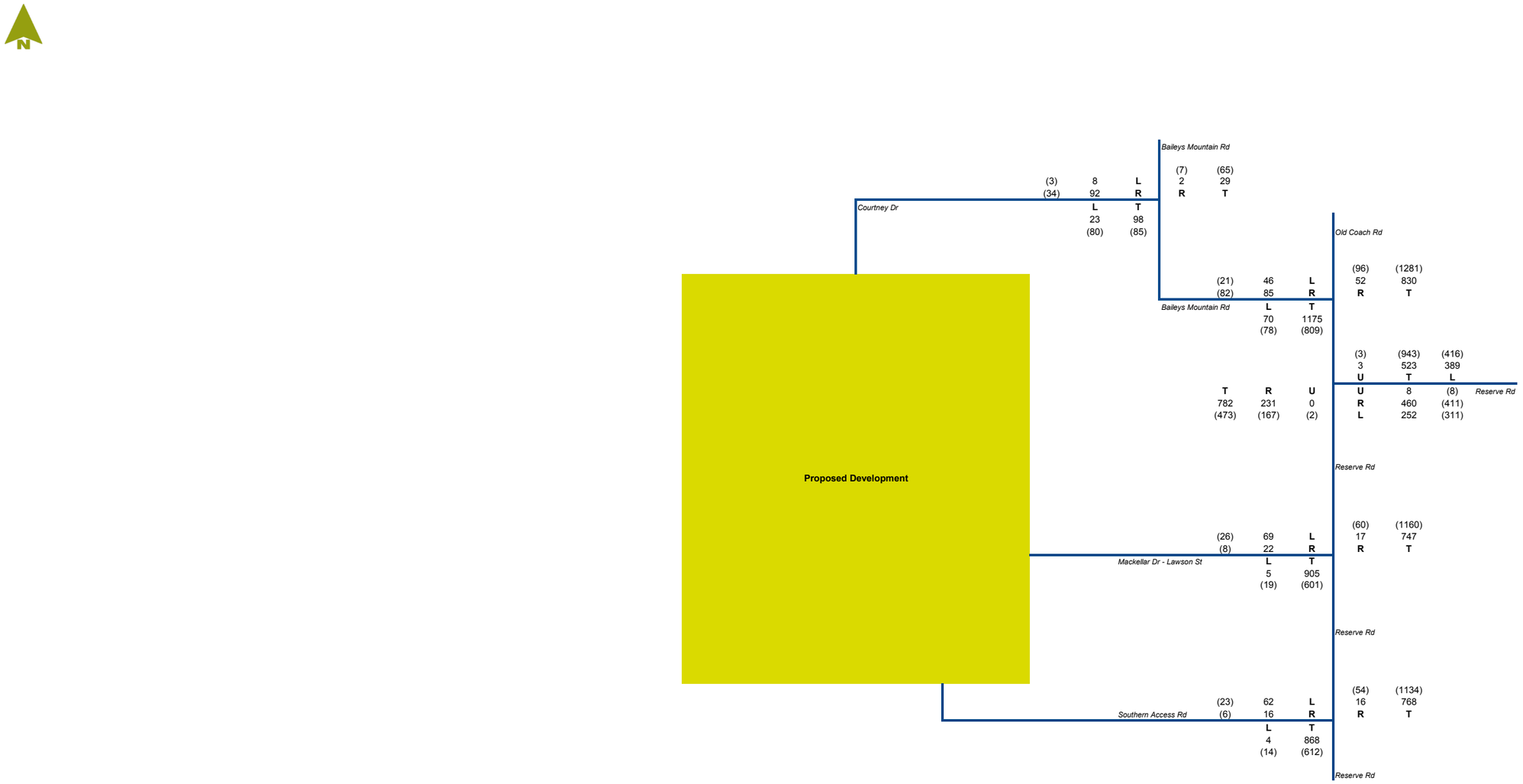
00 Weekday AM Peak Hour Volumes
(00) Weekday PM Peak Hour Volumes

Figure: A9

With Development Traffic Volumes: 2026 Year of LGIP Works Completion

620.12553
Coomera Courtney Dr MCU
18-04-2019

SLR



Legend

L Left Turn
T Through
R Right turn
U U-turn

00 Weekday AM Peak Hour Volumes
(00) Weekday PM Peak Hour Volumes

Figure: A10

With Development Traffic Volumes: 2031 Design Horizon

620.12553
Coomera Courtney Dr MCU
18-04-2019

SLR

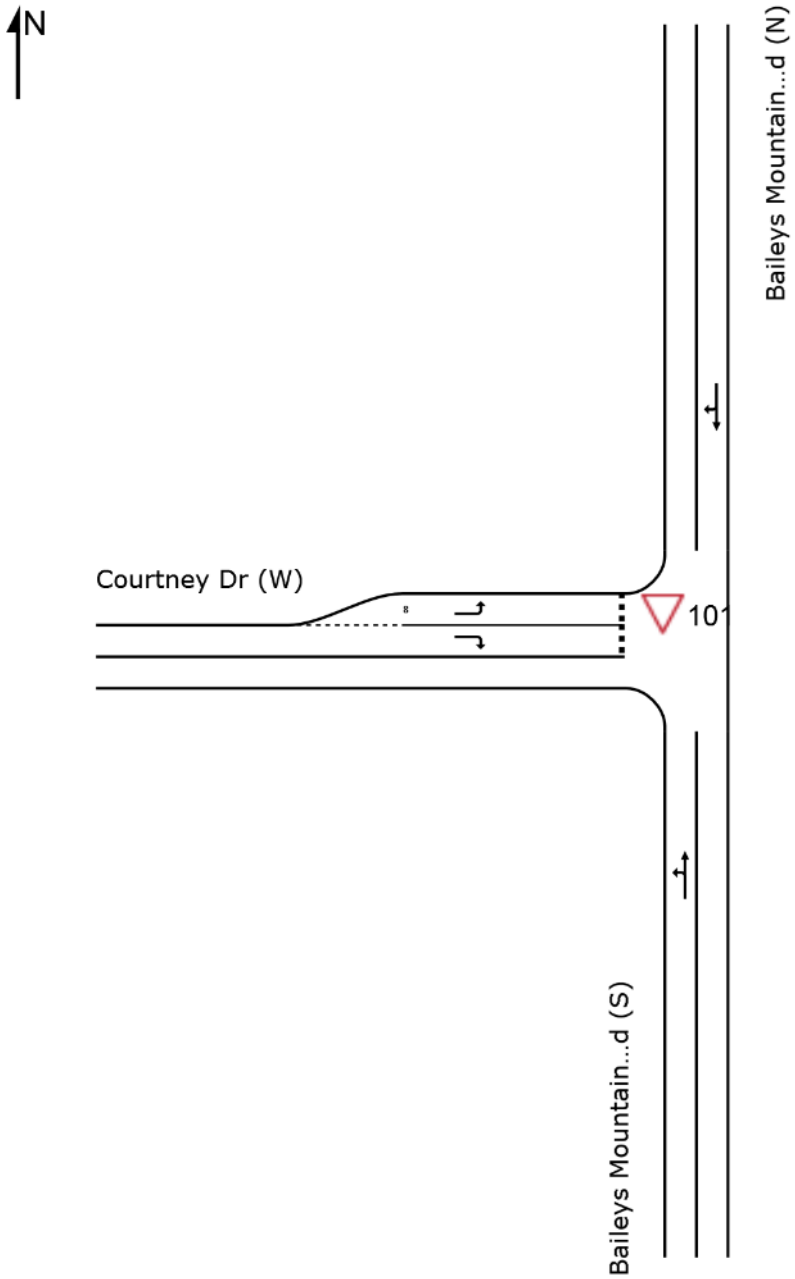
APPENDIX C

SIDRA Analysis Outputs

SITE LAYOUT

Site: 101 [2019_BG_AM]

Priority-controlled intersection: Baileys Mountain Road/Courtney Drive
Prepared by: MC
Reviewed by: KS
Site Category: (None)
Giveway / Yield (Two-Way)



MOVEMENT SUMMARY

Site: 101 [2019_BG_AM]

Priority-controlled intersection: Baileys Mountain Road/Courtney Drive
Prepared by: MC
Reviewed by: KS
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Baileys Mountain Rd (S)												
1	L2	4	3.0	0.039	5.6	LOS A	0.0	0.0	0.00	0.03	0.00	57.9
2	T1	69	3.0	0.039	0.0	LOS A	0.0	0.0	0.00	0.03	0.00	59.7
Approach		74	3.0	0.039	0.3	NA	0.0	0.0	0.00	0.03	0.00	59.6
North: Baileys Mountain Rd (N)												
8	T1	21	3.0	0.012	0.0	LOS A	0.0	0.0	0.02	0.03	0.02	59.7
9	R2	1	3.0	0.012	5.7	LOS A	0.0	0.0	0.02	0.03	0.02	57.6
Approach		22	3.0	0.012	0.3	NA	0.0	0.0	0.02	0.03	0.02	59.6
West: Courtney Dr (W)												
10	L2	1	3.0	0.001	5.8	LOS A	0.0	0.0	0.15	0.52	0.15	53.0
12	R2	17	3.0	0.014	5.8	LOS A	0.0	0.3	0.17	0.57	0.17	52.5
Approach		18	3.0	0.014	5.8	LOS A	0.0	0.3	0.16	0.56	0.16	52.6
All Vehicles		114	3.0	0.039	1.2	NA	0.0	0.3	0.03	0.12	0.03	58.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2019_BG_PM]

Priority-controlled intersection: Baileys Mountain Road/Courtney Drive
Prepared by: MC
Reviewed by: KS
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Baileys Mountain Rd (S)												
1	L2	15	3.0	0.040	5.6	LOS A	0.0	0.0	0.00	0.12	0.00	57.2
2	T1	61	3.0	0.040	0.0	LOS A	0.0	0.0	0.00	0.12	0.00	58.9
Approach		76	3.0	0.040	1.1	NA	0.0	0.0	0.00	0.12	0.00	58.6
North: Baileys Mountain Rd (N)												
8	T1	46	3.0	0.025	0.0	LOS A	0.0	0.0	0.01	0.01	0.01	59.8
9	R2	1	3.0	0.025	5.8	LOS A	0.0	0.0	0.01	0.01	0.01	57.8
Approach		47	3.0	0.025	0.1	NA	0.0	0.0	0.01	0.01	0.01	59.8
West: Courtney Dr (W)												
10	L2	1	3.0	0.001	5.7	LOS A	0.0	0.0	0.14	0.53	0.14	53.1
12	R2	6	3.0	0.006	5.9	LOS A	0.0	0.1	0.19	0.56	0.19	52.5
Approach		7	3.0	0.006	5.8	LOS A	0.0	0.1	0.18	0.56	0.18	52.6
All Vehicles		131	3.0	0.040	1.0	NA	0.0	0.1	0.01	0.10	0.01	58.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2021_BG_AM]

Priority-controlled intersection: Baileys Mountain Road/Courtney Drive
Prepared by: MC
Reviewed by: KS
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Baileys Mountain Rd (S)												
1	L2	4	3.0	0.041	5.6	LOS A	0.0	0.0	0.00	0.03	0.00	57.9
2	T1	75	3.0	0.041	0.0	LOS A	0.0	0.0	0.00	0.03	0.00	59.7
Approach		79	3.0	0.041	0.3	NA	0.0	0.0	0.00	0.03	0.00	59.6
North: Baileys Mountain Rd (N)												
8	T1	22	3.0	0.012	0.0	LOS A	0.0	0.0	0.02	0.03	0.02	59.7
9	R2	1	3.0	0.012	5.8	LOS A	0.0	0.0	0.02	0.03	0.02	57.6
Approach		23	3.0	0.012	0.3	NA	0.0	0.0	0.02	0.03	0.02	59.6
West: Courtney Dr (W)												
10	L2	1	3.0	0.001	5.8	LOS A	0.0	0.0	0.16	0.52	0.16	53.0
12	R2	17	3.0	0.014	5.8	LOS A	0.0	0.3	0.17	0.57	0.17	52.5
Approach		18	3.0	0.014	5.8	LOS A	0.0	0.3	0.17	0.56	0.17	52.6
All Vehicles		120	3.0	0.041	1.1	NA	0.0	0.3	0.03	0.11	0.03	58.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2021_BG_PM]

Priority-controlled intersection: Baileys Mountain Road/Courtney Drive
Prepared by: MC
Reviewed by: KS
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Baileys Mountain Rd (S)												
1	L2	15	3.0	0.042	5.6	LOS A	0.0	0.0	0.00	0.11	0.00	57.3
2	T1	65	3.0	0.042	0.0	LOS A	0.0	0.0	0.00	0.11	0.00	59.0
Approach		80	3.0	0.042	1.0	NA	0.0	0.0	0.00	0.11	0.00	58.7
North: Baileys Mountain Rd (N)												
8	T1	49	3.0	0.027	0.0	LOS A	0.0	0.0	0.01	0.01	0.01	59.8
9	R2	1	3.0	0.027	5.8	LOS A	0.0	0.0	0.01	0.01	0.01	57.8
Approach		51	3.0	0.027	0.1	NA	0.0	0.0	0.01	0.01	0.01	59.8
West: Courtney Dr (W)												
10	L2	1	3.0	0.001	5.7	LOS A	0.0	0.0	0.14	0.52	0.14	53.0
12	R2	6	3.0	0.006	5.9	LOS A	0.0	0.1	0.19	0.56	0.19	52.5
Approach		7	3.0	0.006	5.9	LOS A	0.0	0.1	0.19	0.56	0.19	52.6
All Vehicles		138	3.0	0.042	1.0	NA	0.0	0.1	0.01	0.10	0.01	58.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2021_BG+DEV_AM]

Priority-controlled intersection: Baileys Mountain Road/Courtney Drive
Prepared by: MC
Reviewed by: KS
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Baileys Mountain Rd (S)												
1	L2	4	3.0	0.044	5.6	LOS A	0.0	0.0	0.00	0.03	0.00	58.0
2	T1	80	3.0	0.044	0.0	LOS A	0.0	0.0	0.00	0.03	0.00	59.7
Approach		84	3.0	0.044	0.3	NA	0.0	0.0	0.00	0.03	0.00	59.6
North: Baileys Mountain Rd (N)												
8	T1	23	3.0	0.013	0.0	LOS A	0.0	0.0	0.02	0.03	0.02	59.7
9	R2	1	3.0	0.013	5.8	LOS A	0.0	0.0	0.02	0.03	0.02	57.6
Approach		24	3.0	0.013	0.3	NA	0.0	0.0	0.02	0.03	0.02	59.6
West: Courtney Dr (W)												
10	L2	1	3.0	0.001	5.8	LOS A	0.0	0.0	0.16	0.52	0.16	53.0
12	R2	17	3.0	0.015	5.8	LOS A	0.0	0.3	0.18	0.57	0.18	52.5
Approach		18	3.0	0.015	5.8	LOS A	0.0	0.3	0.18	0.56	0.18	52.5
All Vehicles		126	3.0	0.044	1.1	NA	0.0	0.3	0.03	0.10	0.03	58.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2021_BG+DEV_PM]

Priority-controlled intersection: Baileys Mountain Road/Courtney Drive
Prepared by: MC
Reviewed by: KS
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Baileys Mountain Rd (S)												
1	L2	15	3.0	0.043	5.6	LOS A	0.0	0.0	0.00	0.11	0.00	57.3
2	T1	67	3.0	0.043	0.0	LOS A	0.0	0.0	0.00	0.11	0.00	59.0
Approach		82	3.0	0.043	1.0	NA	0.0	0.0	0.00	0.11	0.00	58.7
North: Baileys Mountain Rd (N)												
8	T1	54	3.0	0.029	0.0	LOS A	0.0	0.0	0.01	0.01	0.01	59.9
9	R2	1	3.0	0.029	5.8	LOS A	0.0	0.0	0.01	0.01	0.01	57.8
Approach		55	3.0	0.029	0.1	NA	0.0	0.0	0.01	0.01	0.01	59.8
West: Courtney Dr (W)												
10	L2	1	3.0	0.001	5.8	LOS A	0.0	0.0	0.15	0.52	0.15	53.0
12	R2	6	3.0	0.006	5.9	LOS A	0.0	0.1	0.20	0.56	0.20	52.5
Approach		7	3.0	0.006	5.9	LOS A	0.0	0.1	0.19	0.56	0.19	52.5
All Vehicles		144	3.0	0.043	0.9	NA	0.0	0.1	0.01	0.09	0.01	58.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2022_BG_AM]

Priority-controlled intersection: Baileys Mountain Road/Courtney Drive
Prepared by: MC
Reviewed by: KS
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Baileys Mountain Rd (S)												
1	L2	4	3.0	0.042	5.6	LOS A	0.0	0.0	0.00	0.03	0.00	57.9
2	T1	77	3.0	0.042	0.0	LOS A	0.0	0.0	0.00	0.03	0.00	59.7
Approach		81	3.0	0.042	0.3	NA	0.0	0.0	0.00	0.03	0.00	59.6
North: Baileys Mountain Rd (N)												
8	T1	23	3.0	0.013	0.0	LOS A	0.0	0.0	0.02	0.03	0.02	59.7
9	R2	1	3.0	0.013	5.8	LOS A	0.0	0.0	0.02	0.03	0.02	57.6
Approach		24	3.0	0.013	0.3	NA	0.0	0.0	0.02	0.03	0.02	59.6
West: Courtney Dr (W)												
10	L2	1	3.0	0.001	5.8	LOS A	0.0	0.0	0.16	0.52	0.16	53.0
12	R2	17	3.0	0.015	5.8	LOS A	0.0	0.3	0.18	0.57	0.18	52.5
Approach		18	3.0	0.015	5.8	LOS A	0.0	0.3	0.17	0.56	0.17	52.5
All Vehicles		123	3.0	0.042	1.1	NA	0.0	0.3	0.03	0.11	0.03	58.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2022_BG_PM]

Priority-controlled intersection: Baileys Mountain Road/Courtney Drive
Prepared by: MC
Reviewed by: KS
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Baileys Mountain Rd (S)												
1	L2	15	3.0	0.043	5.6	LOS A	0.0	0.0	0.00	0.11	0.00	57.3
2	T1	67	3.0	0.043	0.0	LOS A	0.0	0.0	0.00	0.11	0.00	59.0
Approach		82	3.0	0.043	1.0	NA	0.0	0.0	0.00	0.11	0.00	58.7
North: Baileys Mountain Rd (N)												
8	T1	51	3.0	0.027	0.0	LOS A	0.0	0.0	0.01	0.01	0.01	59.9
9	R2	1	3.0	0.027	5.8	LOS A	0.0	0.0	0.01	0.01	0.01	57.8
Approach		52	3.0	0.027	0.1	NA	0.0	0.0	0.01	0.01	0.01	59.8
West: Courtney Dr (W)												
10	L2	1	3.0	0.001	5.8	LOS A	0.0	0.0	0.15	0.52	0.15	53.0
12	R2	6	3.0	0.006	5.9	LOS A	0.0	0.1	0.20	0.56	0.20	52.5
Approach		7	3.0	0.006	5.9	LOS A	0.0	0.1	0.19	0.56	0.19	52.5
All Vehicles		141	3.0	0.043	0.9	NA	0.0	0.1	0.01	0.10	0.01	58.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2022_BG+DEV_AM]

Priority-controlled intersection: Baileys Mountain Road/Courtney Drive
Prepared by: MC
Reviewed by: KS
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Baileys Mountain Rd (S)												
1	L2	24	3.0	0.054	5.6	LOS A	0.0	0.0	0.00	0.14	0.00	57.0
2	T1	78	3.0	0.054	0.0	LOS A	0.0	0.0	0.00	0.14	0.00	58.7
Approach		102	3.0	0.054	1.3	NA	0.0	0.0	0.00	0.14	0.00	58.3
North: Baileys Mountain Rd (N)												
8	T1	23	3.0	0.013	0.0	LOS A	0.0	0.1	0.04	0.05	0.04	59.4
9	R2	2	3.0	0.013	5.8	LOS A	0.0	0.1	0.04	0.05	0.04	57.4
Approach		25	3.0	0.013	0.5	NA	0.0	0.1	0.04	0.05	0.04	59.2
West: Courtney Dr (W)												
10	L2	8	3.0	0.006	5.8	LOS A	0.0	0.2	0.16	0.53	0.16	53.0
12	R2	97	3.0	0.084	5.9	LOS A	0.3	2.0	0.20	0.58	0.20	52.5
Approach		105	3.0	0.084	5.9	LOS A	0.3	2.0	0.20	0.58	0.20	52.5
All Vehicles		233	3.0	0.084	3.3	NA	0.3	2.0	0.09	0.33	0.09	55.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2022_BG+DEV_PM]

Priority-controlled intersection: Baileys Mountain Road/Courtney Drive
Prepared by: MC
Reviewed by: KS
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Baileys Mountain Rd (S)												
1	L2	84	3.0	0.082	5.6	LOS A	0.0	0.0	0.00	0.33	0.00	55.5
2	T1	68	3.0	0.082	0.0	LOS A	0.0	0.0	0.00	0.33	0.00	57.1
Approach		153	3.0	0.082	3.1	NA	0.0	0.0	0.00	0.33	0.00	56.2
North: Baileys Mountain Rd (N)												
8	T1	52	3.0	0.032	0.1	LOS A	0.0	0.3	0.07	0.07	0.07	59.0
9	R2	7	3.0	0.032	6.0	LOS A	0.0	0.3	0.07	0.07	0.07	57.0
Approach		59	3.0	0.032	0.8	NA	0.0	0.3	0.07	0.07	0.07	58.7
West: Courtney Dr (W)												
10	L2	3	3.0	0.002	5.8	LOS A	0.0	0.1	0.15	0.53	0.15	53.0
12	R2	36	3.0	0.033	6.1	LOS A	0.1	0.7	0.24	0.58	0.24	52.3
Approach		39	3.0	0.033	6.1	LOS A	0.1	0.7	0.23	0.58	0.23	52.4
All Vehicles		251	3.0	0.082	3.0	NA	0.1	0.7	0.05	0.31	0.05	56.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2026_BG_AM]

Priority-controlled intersection: Baileys Mountain Road/Courtney Drive
Prepared by: MC
Reviewed by: KS
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Baileys Mountain Rd (S)												
1	L2	4	3.0	0.048	5.6	LOS A	0.0	0.0	0.00	0.03	0.00	58.0
2	T1	87	3.0	0.048	0.0	LOS A	0.0	0.0	0.00	0.03	0.00	59.7
Approach		92	3.0	0.048	0.3	NA	0.0	0.0	0.00	0.03	0.00	59.7
North: Baileys Mountain Rd (N)												
8	T1	26	3.0	0.014	0.0	LOS A	0.0	0.0	0.02	0.02	0.02	59.7
9	R2	1	3.0	0.014	5.8	LOS A	0.0	0.0	0.02	0.02	0.02	57.7
Approach		27	3.0	0.014	0.2	NA	0.0	0.0	0.02	0.02	0.02	59.6
West: Courtney Dr (W)												
10	L2	1	3.0	0.001	5.8	LOS A	0.0	0.0	0.17	0.52	0.17	53.0
12	R2	17	3.0	0.015	5.9	LOS A	0.0	0.3	0.19	0.57	0.19	52.5
Approach		18	3.0	0.015	5.9	LOS A	0.0	0.3	0.19	0.56	0.19	52.5
All Vehicles		137	3.0	0.048	1.0	NA	0.0	0.3	0.03	0.10	0.03	58.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2026_BG_PM]

Priority-controlled intersection: Baileys Mountain Road/Courtney Drive
Prepared by: MC
Reviewed by: KS
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Baileys Mountain Rd (S)												
1	L2	15	3.0	0.048	5.6	LOS A	0.0	0.0	0.00	0.10	0.00	57.4
2	T1	77	3.0	0.048	0.0	LOS A	0.0	0.0	0.00	0.10	0.00	59.1
Approach		92	3.0	0.048	0.9	NA	0.0	0.0	0.00	0.10	0.00	58.8
North: Baileys Mountain Rd (N)												
8	T1	58	3.0	0.031	0.0	LOS A	0.0	0.0	0.01	0.01	0.01	59.9
9	R2	1	3.0	0.031	5.8	LOS A	0.0	0.0	0.01	0.01	0.01	57.8
Approach		59	3.0	0.031	0.1	NA	0.0	0.0	0.01	0.01	0.01	59.8
West: Courtney Dr (W)												
10	L2	1	3.0	0.001	5.8	LOS A	0.0	0.0	0.16	0.52	0.16	53.0
12	R2	6	3.0	0.006	5.9	LOS A	0.0	0.1	0.21	0.56	0.21	52.4
Approach		7	3.0	0.006	5.9	LOS A	0.0	0.1	0.20	0.56	0.20	52.5
All Vehicles		158	3.0	0.048	0.8	NA	0.0	0.1	0.01	0.09	0.01	58.9

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2026_BG+DEV_AM]

Priority-controlled intersection: Baileys Mountain Road/Courtney Drive
Prepared by: MC
Reviewed by: KS
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Baileys Mountain Rd (S)												
1	L2	24	3.0	0.059	5.6	LOS A	0.0	0.0	0.00	0.13	0.00	57.1
2	T1	87	3.0	0.059	0.0	LOS A	0.0	0.0	0.00	0.13	0.00	58.8
Approach		112	3.0	0.059	1.2	NA	0.0	0.0	0.00	0.13	0.00	58.4
North: Baileys Mountain Rd (N)												
8	T1	26	3.0	0.015	0.0	LOS A	0.0	0.1	0.04	0.04	0.04	59.4
9	R2	2	3.0	0.015	5.9	LOS A	0.0	0.1	0.04	0.04	0.04	57.4
Approach		28	3.0	0.015	0.5	NA	0.0	0.1	0.04	0.04	0.04	59.3
West: Courtney Dr (W)												
10	L2	8	3.0	0.006	5.8	LOS A	0.0	0.2	0.17	0.53	0.17	53.0
12	R2	97	3.0	0.085	6.0	LOS A	0.3	2.0	0.21	0.58	0.21	52.4
Approach		105	3.0	0.085	5.9	LOS A	0.3	2.0	0.21	0.58	0.21	52.5
All Vehicles		245	3.0	0.085	3.2	NA	0.3	2.0	0.09	0.31	0.09	55.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2026_BG+DEV_PM]

Priority-controlled intersection: Baileys Mountain Road/Courtney Drive
Prepared by: MC
Reviewed by: KS
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Baileys Mountain Rd (S)												
1	L2	84	3.0	0.086	5.6	LOS A	0.0	0.0	0.00	0.31	0.00	55.6
2	T1	77	3.0	0.086	0.0	LOS A	0.0	0.0	0.00	0.31	0.00	57.3
Approach		161	3.0	0.086	2.9	NA	0.0	0.0	0.00	0.31	0.00	56.4
North: Baileys Mountain Rd (N)												
8	T1	58	3.0	0.035	0.1	LOS A	0.0	0.4	0.07	0.07	0.07	59.1
9	R2	7	3.0	0.035	6.0	LOS A	0.0	0.4	0.07	0.07	0.07	57.1
Approach		65	3.0	0.035	0.8	NA	0.0	0.4	0.07	0.07	0.07	58.9
West: Courtney Dr (W)												
10	L2	3	3.0	0.002	5.8	LOS A	0.0	0.1	0.16	0.53	0.16	53.0
12	R2	36	3.0	0.033	6.1	LOS A	0.1	0.8	0.25	0.59	0.25	52.3
Approach		39	3.0	0.033	6.1	LOS A	0.1	0.8	0.24	0.58	0.24	52.4
All Vehicles		265	3.0	0.086	2.9	NA	0.1	0.8	0.05	0.29	0.05	56.3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2032_BG_AM]

Priority-controlled intersection: Baileys Mountain Road/Courtney Drive
Prepared by: MC
Reviewed by: KS
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Baileys Mountain Rd (S)												
1	L2	4	3.0	0.056	5.6	LOS A	0.0	0.0	0.00	0.02	0.00	58.0
2	T1	102	3.0	0.056	0.0	LOS A	0.0	0.0	0.00	0.02	0.00	59.8
Approach		106	3.0	0.056	0.2	NA	0.0	0.0	0.00	0.02	0.00	59.7
North: Baileys Mountain Rd (N)												
8	T1	31	3.0	0.017	0.0	LOS A	0.0	0.0	0.02	0.02	0.02	59.7
9	R2	1	3.0	0.017	5.8	LOS A	0.0	0.0	0.02	0.02	0.02	57.7
Approach		32	3.0	0.017	0.2	NA	0.0	0.0	0.02	0.02	0.02	59.7
West: Courtney Dr (W)												
10	L2	1	3.0	0.001	5.8	LOS A	0.0	0.0	0.19	0.52	0.19	52.9
12	R2	17	3.0	0.015	5.9	LOS A	0.0	0.3	0.21	0.57	0.21	52.4
Approach		18	3.0	0.015	5.9	LOS A	0.0	0.3	0.21	0.57	0.21	52.5
All Vehicles		156	3.0	0.056	0.9	NA	0.0	0.3	0.03	0.09	0.03	58.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2032_BG_PM]

Priority-controlled intersection: Baileys Mountain Road/Courtney Drive
Prepared by: MC
Reviewed by: KS
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Baileys Mountain Rd (S)												
1	L2	15	3.0	0.055	5.6	LOS A	0.0	0.0	0.00	0.08	0.00	57.5
2	T1	89	3.0	0.055	0.0	LOS A	0.0	0.0	0.00	0.08	0.00	59.2
Approach		104	3.0	0.055	0.8	NA	0.0	0.0	0.00	0.08	0.00	59.0
North: Baileys Mountain Rd (N)												
8	T1	67	3.0	0.036	0.0	LOS A	0.0	0.0	0.01	0.01	0.01	59.9
9	R2	1	3.0	0.036	5.9	LOS A	0.0	0.0	0.01	0.01	0.01	57.8
Approach		68	3.0	0.036	0.1	NA	0.0	0.0	0.01	0.01	0.01	59.8
West: Courtney Dr (W)												
10	L2	1	3.0	0.001	5.8	LOS A	0.0	0.0	0.17	0.52	0.17	52.9
12	R2	6	3.0	0.006	6.0	LOS A	0.0	0.1	0.23	0.56	0.23	52.4
Approach		7	3.0	0.006	6.0	LOS A	0.0	0.1	0.22	0.56	0.22	52.5
All Vehicles		180	3.0	0.055	0.7	NA	0.0	0.1	0.01	0.08	0.01	59.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2032_BG+DEV_AM]

Priority-controlled intersection: Baileys Mountain Road/Courtney Drive
Prepared by: MC
Reviewed by: KS
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Baileys Mountain Rd (S)												
1	L2	24	3.0	0.067	5.6	LOS A	0.0	0.0	0.00	0.11	0.00	57.2
2	T1	103	3.0	0.067	0.0	LOS A	0.0	0.0	0.00	0.11	0.00	59.0
Approach		127	3.0	0.067	1.1	NA	0.0	0.0	0.00	0.11	0.00	58.6
North: Baileys Mountain Rd (N)												
8	T1	31	3.0	0.017	0.0	LOS A	0.0	0.1	0.04	0.04	0.04	59.5
9	R2	2	3.0	0.017	5.9	LOS A	0.0	0.1	0.04	0.04	0.04	57.5
Approach		33	3.0	0.017	0.4	NA	0.0	0.1	0.04	0.04	0.04	59.4
West: Courtney Dr (W)												
10	L2	8	3.0	0.006	5.9	LOS A	0.0	0.2	0.19	0.53	0.19	52.9
12	R2	97	3.0	0.087	6.0	LOS A	0.3	2.1	0.23	0.59	0.23	52.4
Approach		105	3.0	0.087	6.0	LOS A	0.3	2.1	0.23	0.58	0.23	52.4
All Vehicles		265	3.0	0.087	3.0	NA	0.3	2.1	0.09	0.29	0.09	56.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2032_BG+DEV_PM]

Priority-controlled intersection: Baileys Mountain Road/Courtney Drive
Prepared by: MC
Reviewed by: KS
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

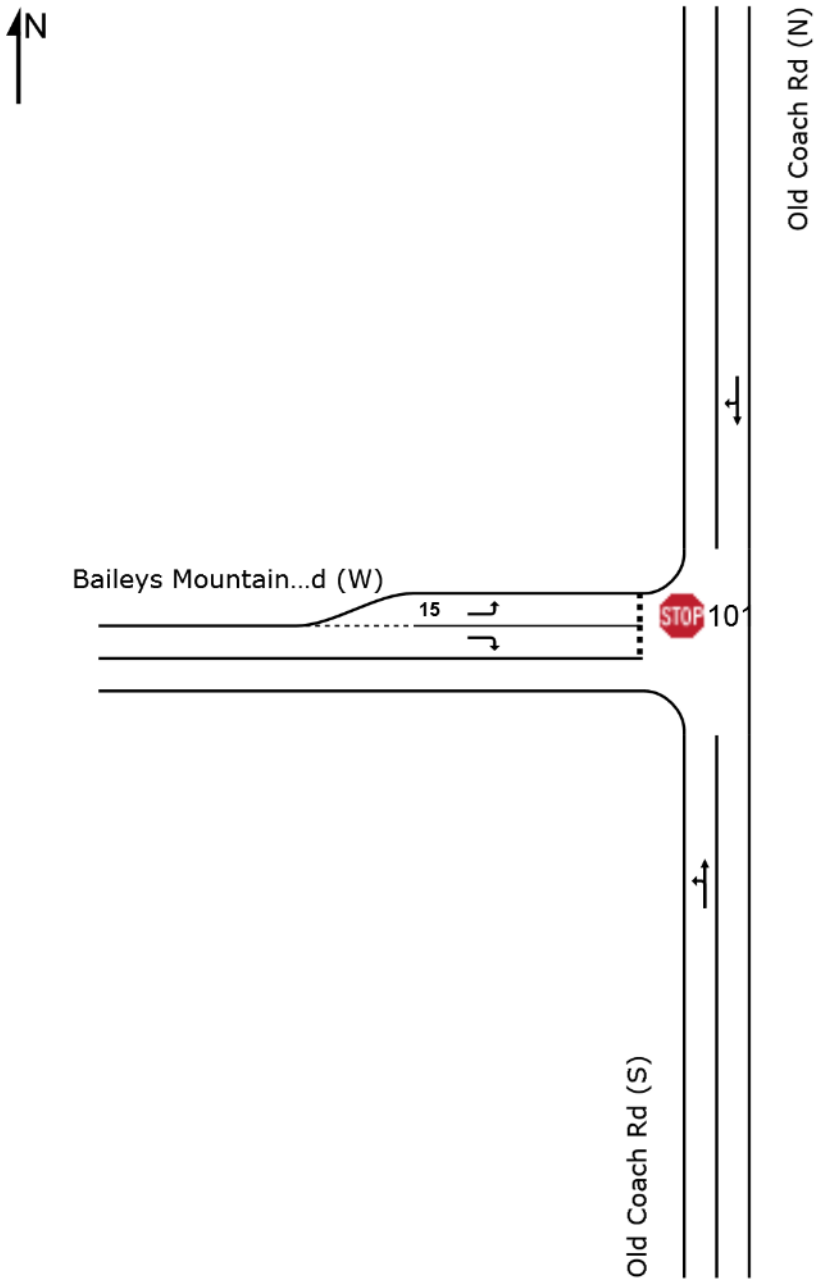
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Baileys Mountain Rd (S)												
1	L2	84	3.0	0.093	5.6	LOS A	0.0	0.0	0.00	0.29	0.00	55.8
2	T1	89	3.0	0.093	0.0	LOS A	0.0	0.0	0.00	0.29	0.00	57.4
Approach		174	3.0	0.093	2.7	NA	0.0	0.0	0.00	0.29	0.00	56.6
North: Baileys Mountain Rd (N)												
8	T1	68	3.0	0.041	0.1	LOS A	0.1	0.4	0.06	0.06	0.06	59.2
9	R2	7	3.0	0.041	6.1	LOS A	0.1	0.4	0.06	0.06	0.06	57.2
Approach		76	3.0	0.041	0.7	NA	0.1	0.4	0.06	0.06	0.06	59.0
West: Courtney Dr (W)												
10	L2	3	3.0	0.002	5.8	LOS A	0.0	0.1	0.17	0.52	0.17	52.9
12	R2	36	3.0	0.034	6.2	LOS A	0.1	0.8	0.27	0.59	0.27	52.3
Approach		39	3.0	0.034	6.2	LOS A	0.1	0.8	0.26	0.59	0.26	52.3
All Vehicles		288	3.0	0.093	2.6	NA	0.1	0.8	0.05	0.27	0.05	56.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 101 [2019_BG_AM]

Priority-controlled intersection: Old Coach Road/Baileys Mountain Road
Prepared by: MC
Reviewed by: KS
Site Category: (None)
Stop (Two-Way)



MOVEMENT SUMMARY

Site: 101 [2019_BG_AM]

Priority-controlled intersection: Old Coach Road/Baileys Mountain Road
Prepared by: MC
Reviewed by: KS
Site Category: (None)
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Old Coach Rd (S)												
1	L2	43	3.0	0.452	4.3	LOS A	0.0	0.0	0.00	0.03	0.00	56.5
2	T1	820	3.0	0.452	0.0	LOS A	0.0	0.0	0.00	0.03	0.00	59.5
Approach		863	3.0	0.452	0.2	NA	0.0	0.0	0.00	0.03	0.00	59.3
North: Old Coach Rd (N)												
8	T1	591	3.0	0.357	0.9	LOS A	0.9	6.4	0.15	0.03	0.20	57.5
9	R2	32	3.0	0.357	12.9	LOS B	0.9	6.4	0.15	0.03	0.20	56.6
Approach		622	3.0	0.357	1.5	NA	0.9	6.4	0.15	0.03	0.20	57.4
West: Baileys Mountain Rd (W)												
10	L2	8	3.0	0.013	9.5	LOS A	0.0	0.3	0.61	0.73	0.61	50.6
12	R2	32	3.0	0.135	19.3	LOS C	0.4	2.8	0.85	0.94	0.85	36.4
Approach		40	3.0	0.135	17.2	LOS C	0.4	2.8	0.80	0.90	0.80	40.0
All Vehicles		1525	3.0	0.452	1.2	NA	0.9	6.4	0.08	0.05	0.10	57.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2019_BG_PM]

Priority-controlled intersection: Old Coach Road/Baileys Mountain Road
Prepared by: MC
Reviewed by: KS
Site Category: (None)
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Old Coach Rd (S)												
1	L2	31	3.0	0.316	4.3	LOS A	0.0	0.0	0.00	0.03	0.00	56.5
2	T1	573	3.0	0.316	0.0	LOS A	0.0	0.0	0.00	0.03	0.00	59.5
Approach		603	3.0	0.316	0.2	NA	0.0	0.0	0.00	0.03	0.00	59.4
North: Old Coach Rd (N)												
8	T1	899	3.0	0.520	0.6	LOS A	1.2	8.9	0.13	0.03	0.19	58.1
9	R2	47	3.0	0.520	11.0	LOS B	1.2	8.9	0.13	0.03	0.19	56.9
Approach		946	3.0	0.520	1.1	NA	1.2	8.9	0.13	0.03	0.19	58.0
West: Baileys Mountain Rd (W)												
10	L2	5	3.0	0.006	7.7	LOS A	0.0	0.1	0.50	0.62	0.50	51.9
12	R2	47	3.0	0.240	23.7	LOS C	0.7	5.1	0.89	0.98	0.97	33.8
Approach		53	3.0	0.240	22.1	LOS C	0.7	5.1	0.85	0.94	0.92	35.8
All Vehicles		1602	3.0	0.520	1.5	NA	1.2	8.9	0.10	0.06	0.14	57.3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2021_BG_AM]

Priority-controlled intersection: Old Coach Road/Baileys Mountain Road
Prepared by: MC
Reviewed by: KS
Site Category: (None)
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Old Coach Rd (S)												
1	L2	46	3.0	0.484	4.3	LOS A	0.0	0.0	0.00	0.03	0.00	56.5
2	T1	878	3.0	0.484	0.0	LOS A	0.0	0.0	0.00	0.03	0.00	59.5
Approach		924	3.0	0.484	0.2	NA	0.0	0.0	0.00	0.03	0.00	59.3
North: Old Coach Rd (N)												
8	T1	633	3.0	0.388	1.2	LOS A	1.1	8.1	0.17	0.03	0.24	57.0
9	R2	34	3.0	0.388	14.4	LOS B	1.1	8.1	0.17	0.03	0.24	56.3
Approach		666	3.0	0.388	1.8	NA	1.1	8.1	0.17	0.03	0.24	56.9
West: Baileys Mountain Rd (W)												
10	L2	8	3.0	0.014	10.1	LOS B	0.0	0.3	0.65	0.76	0.65	50.2
12	R2	34	3.0	0.172	22.8	LOS C	0.5	3.5	0.88	0.96	0.91	34.3
Approach		42	3.0	0.172	20.2	LOS C	0.5	3.5	0.83	0.92	0.86	38.0
All Vehicles		1633	3.0	0.484	1.4	NA	1.1	8.1	0.09	0.05	0.12	57.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2021_BG_PM]

Priority-controlled intersection: Old Coach Road/Baileys Mountain Road
Prepared by: MC
Reviewed by: KS
Site Category: (None)
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Old Coach Rd (S)												
1	L2	33	3.0	0.339	4.3	LOS A	0.0	0.0	0.00	0.03	0.00	56.5
2	T1	614	3.0	0.339	0.0	LOS A	0.0	0.0	0.00	0.03	0.00	59.5
Approach		646	3.0	0.339	0.2	NA	0.0	0.0	0.00	0.03	0.00	59.4
North: Old Coach Rd (N)												
8	T1	963	3.0	0.560	0.8	LOS A	1.5	10.9	0.15	0.03	0.23	57.8
9	R2	51	3.0	0.560	12.1	LOS B	1.5	10.9	0.15	0.03	0.23	56.7
Approach		1014	3.0	0.560	1.3	NA	1.5	10.9	0.15	0.03	0.23	57.7
West: Baileys Mountain Rd (W)												
10	L2	6	3.0	0.007	8.0	LOS A	0.0	0.2	0.51	0.64	0.51	51.7
12	R2	51	3.0	0.317	29.8	LOS D	0.9	6.7	0.92	1.00	1.05	30.7
Approach		57	3.0	0.317	27.4	LOS D	0.9	6.7	0.87	0.96	0.99	33.1
All Vehicles		1717	3.0	0.560	1.8	NA	1.5	10.9	0.12	0.06	0.17	56.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2021_BG+DEV_AM]

Priority-controlled intersection: Old Coach Road/Baileys Mountain Road
Prepared by: MC
Reviewed by: KS
Site Category: (None)
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Old Coach Rd (S)												
1	L2	52	3.0	0.512	4.3	LOS A	0.0	0.0	0.00	0.03	0.00	56.4
2	T1	925	3.0	0.512	0.0	LOS A	0.0	0.0	0.00	0.03	0.00	59.4
Approach		977	3.0	0.512	0.2	NA	0.0	0.0	0.00	0.03	0.00	59.3
North: Old Coach Rd (N)												
8	T1	644	3.0	0.400	1.4	LOS A	1.3	9.3	0.19	0.03	0.26	56.5
9	R2	34	3.0	0.400	15.7	LOS C	1.3	9.3	0.19	0.03	0.26	56.1
Approach		678	3.0	0.400	2.1	NA	1.3	9.3	0.19	0.03	0.26	56.5
West: Baileys Mountain Rd (W)												
10	L2	8	3.0	0.015	10.6	LOS B	0.0	0.4	0.68	0.79	0.68	49.8
12	R2	35	3.0	0.202	25.8	LOS D	0.6	4.1	0.90	0.97	0.95	32.7
Approach		43	3.0	0.202	22.8	LOS C	0.6	4.1	0.86	0.94	0.90	36.5
All Vehicles		1698	3.0	0.512	1.6	NA	1.3	9.3	0.10	0.06	0.13	57.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2021_BG+DEV_PM]

Priority-controlled intersection: Old Coach Road/Baileys Mountain Road
Prepared by: MC
Reviewed by: KS
Site Category: (None)
Stop (Two-Way)
Design Life Analysis (Level of Service Target (Worst Vehicle Movement)): Results for 0 years

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Old Coach Rd (S)												
1	L2	35	3.0	0.349	4.3	LOS A	0.0	0.0	0.00	0.03	0.00	56.5
2	T1	631	3.0	0.349	0.0	LOS A	0.0	0.0	0.00	0.03	0.00	59.5
Approach		665	3.0	0.349	0.2	NA	0.0	0.0	0.00	0.03	0.00	59.4
North: Old Coach Rd (N)												
8	T1	1004	3.0	0.583	0.8	LOS A	1.6	11.8	0.16	0.03	0.24	57.7
9	R2	51	3.0	0.583	12.7	LOS B	1.6	11.8	0.16	0.03	0.24	56.7
Approach		1055	3.0	0.583	1.4	NA	1.6	11.8	0.16	0.03	0.24	57.6
West: Baileys Mountain Rd (W)												
10	L2	6	3.0	0.007	8.1	LOS A	0.0	0.2	0.52	0.64	0.52	51.6
12	R2	55	3.0	0.390	35.0	LOS D	1.2	8.4	0.94	1.02	1.12	28.5
Approach		61	3.0	0.390	32.2	LOS D	1.2	8.4	0.89	0.98	1.05	30.9
All Vehicles		1781	3.0	0.583	2.0	NA	1.6	11.8	0.12	0.06	0.18	56.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2022_BG_AM]

Priority-controlled intersection: Old Coach Road/Baileys Mountain Road
Prepared by: MC
Reviewed by: KS
Site Category: (None)
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Old Coach Rd (S)												
1	L2	47	3.0	0.500	4.3	LOS A	0.0	0.0	0.00	0.03	0.00	56.5
2	T1	907	3.0	0.500	0.0	LOS A	0.0	0.0	0.00	0.03	0.00	59.5
Approach		955	3.0	0.500	0.2	NA	0.0	0.0	0.00	0.03	0.00	59.3
North: Old Coach Rd (N)												
8	T1	654	3.0	0.404	1.3	LOS A	1.3	9.2	0.18	0.04	0.26	56.6
9	R2	35	3.0	0.404	15.2	LOS C	1.3	9.2	0.18	0.04	0.26	56.1
Approach		688	3.0	0.404	2.0	NA	1.3	9.2	0.18	0.04	0.26	56.6
West: Baileys Mountain Rd (W)												
10	L2	9	3.0	0.016	10.5	LOS B	0.1	0.4	0.67	0.79	0.67	49.9
12	R2	35	3.0	0.196	25.0	LOS D	0.6	4.0	0.90	0.97	0.94	33.1
Approach		44	3.0	0.196	21.9	LOS C	0.6	4.0	0.85	0.93	0.88	37.2
All Vehicles		1687	3.0	0.500	1.5	NA	1.3	9.2	0.10	0.06	0.13	57.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2022_BG_PM]

Priority-controlled intersection: Old Coach Road/Baileys Mountain Road
Prepared by: MC
Reviewed by: KS
Site Category: (None)
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Old Coach Rd (S)												
1	L2	34	3.0	0.350	4.3	LOS A	0.0	0.0	0.00	0.03	0.00	56.5
2	T1	634	3.0	0.350	0.0	LOS A	0.0	0.0	0.00	0.03	0.00	59.5
Approach		667	3.0	0.350	0.2	NA	0.0	0.0	0.00	0.03	0.00	59.4
North: Old Coach Rd (N)												
8	T1	996	3.0	0.581	0.8	LOS A	1.7	12.2	0.16	0.04	0.25	57.6
9	R2	53	3.0	0.581	12.7	LOS B	1.7	12.2	0.16	0.04	0.25	56.6
Approach		1048	3.0	0.581	1.4	NA	1.7	12.2	0.16	0.04	0.25	57.5
West: Baileys Mountain Rd (W)												
10	L2	6	3.0	0.007	8.1	LOS A	0.0	0.2	0.52	0.64	0.52	51.6
12	R2	53	3.0	0.371	34.1	LOS D	1.1	7.9	0.93	1.01	1.10	28.8
Approach		59	3.0	0.371	31.3	LOS D	1.1	7.9	0.89	0.97	1.04	31.3
All Vehicles		1775	3.0	0.581	2.0	NA	1.7	12.2	0.13	0.06	0.18	56.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2022_BG+DEV_AM]

Priority-controlled intersection: Old Coach Road/Baileys Mountain Road
Prepared by: MC
Reviewed by: KS
Site Category: (None)
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Old Coach Rd (S)												
1	L2	59	3.0	0.526	4.3	LOS A	0.0	0.0	0.00	0.03	0.00	56.4
2	T1	943	3.0	0.526	0.0	LOS A	0.0	0.0	0.00	0.03	0.00	59.4
Approach		1002	3.0	0.526	0.3	NA	0.0	0.0	0.00	0.03	0.00	59.2
North: Old Coach Rd (N)												
8	T1	662	3.0	0.431	2.0	LOS A	1.8	12.9	0.24	0.04	0.35	55.4
9	R2	43	3.0	0.431	16.6	LOS C	1.8	12.9	0.24	0.04	0.35	55.4
Approach		705	3.0	0.431	2.8	NA	1.8	12.9	0.24	0.04	0.35	55.4
West: Baileys Mountain Rd (W)												
10	L2	45	3.0	0.084	11.2	LOS B	0.3	2.0	0.70	0.87	0.70	49.4
12	R2	79	3.0	0.502	34.9	LOS D	1.6	11.6	0.94	1.04	1.23	28.5
Approach		124	3.0	0.502	26.2	LOS D	1.6	11.6	0.85	0.98	1.04	36.3
All Vehicles		1832	3.0	0.526	3.0	NA	1.8	12.9	0.15	0.10	0.20	54.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2022_BG+DEV_PM]

Priority-controlled intersection: Old Coach Road/Baileys Mountain Road
Prepared by: MC
Reviewed by: KS
Site Category: (None)
Stop (Two-Way)
Design Life Analysis (Level of Service Target (Worst Vehicle Movement)): Results for 0 years

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Old Coach Rd (S)												
1	L2	72	3.0	0.378	4.3	LOS A	0.0	0.0	0.00	0.06	0.00	56.2
2	T1	647	3.0	0.378	0.0	LOS A	0.0	0.0	0.00	0.06	0.00	59.2
Approach		719	3.0	0.378	0.4	NA	0.0	0.0	0.00	0.06	0.00	58.8
North: Old Coach Rd (N)												
8	T1	1027	3.0	0.641	1.7	LOS A	3.2	22.9	0.28	0.06	0.47	55.7
9	R2	84	3.0	0.641	14.5	LOS B	3.2	22.9	0.28	0.06	0.47	55.6
Approach		1112	3.0	0.641	2.6	NA	3.2	22.9	0.28	0.06	0.47	55.7
West: Baileys Mountain Rd (W)												
10	L2	20	3.0	0.024	8.3	LOS A	0.1	0.6	0.53	0.70	0.53	51.5
12	R2	69	3.0	0.608	51.1	LOS F[11]	1.9	13.9	0.97	1.07	1.34	23.3
Approach		89	3.0	0.608	41.5	LOS E[11]	1.9	13.9	0.87	0.99	1.16	28.6
All Vehicles		1920	3.0	0.641	3.6	NA	3.2	22.9	0.21	0.10	0.33	54.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

11 Level of Service is worse than the Level of Service Target specified in the Parameter Settings dialog.

MOVEMENT SUMMARY

Site: 101 [2026_BG_AM]

Priority-controlled intersection: Old Coach Road/Baileys Mountain Road
Prepared by: MC
Reviewed by: KS
Site Category: (None)
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Old Coach Rd (S)												
1	L2	54	3.0	0.566	4.3	LOS A	0.0	0.0	0.00	0.03	0.00	56.4
2	T1	1025	3.0	0.566	0.0	LOS A	0.0	0.0	0.00	0.03	0.00	59.4
Approach		1079	3.0	0.566	0.2	NA	0.0	0.0	0.00	0.03	0.00	59.3
North: Old Coach Rd (N)												
8	T1	738	3.0	0.475	2.3	LOS A	2.1	15.3	0.24	0.04	0.36	54.9
9	R2	39	3.0	0.475	19.9	LOS C	2.1	15.3	0.24	0.04	0.36	55.2
Approach		777	3.0	0.475	3.2	NA	2.1	15.3	0.24	0.04	0.36	55.0
West: Baileys Mountain Rd (W)												
10	L2	11	3.0	0.023	12.1	LOS B	0.1	0.5	0.73	0.87	0.73	48.9
12	R2	39	3.0	0.336	39.5	LOS E	1.0	6.9	0.94	1.01	1.07	26.8
Approach		49	3.0	0.336	33.6	LOS D	1.0	6.9	0.90	0.98	1.00	31.4
All Vehicles		1905	3.0	0.566	2.3	NA	2.1	15.3	0.12	0.06	0.17	56.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2026_BG_PM]

Priority-controlled intersection: Old Coach Road/Baileys Mountain Road
Prepared by: MC
Reviewed by: KS
Site Category: (None)
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Old Coach Rd (S)												
1	L2	38	3.0	0.395	4.3	LOS A	0.0	0.0	0.00	0.03	0.00	56.5
2	T1	716	3.0	0.395	0.0	LOS A	0.0	0.0	0.00	0.03	0.00	59.5
Approach		754	3.0	0.395	0.2	NA	0.0	0.0	0.00	0.03	0.00	59.4
North: Old Coach Rd (N)												
8	T1	1124	3.0	0.664	1.3	LOS A	2.6	18.7	0.22	0.04	0.36	56.6
9	R2	59	3.0	0.664	16.1	LOS C	2.6	18.7	0.22	0.04	0.36	56.1
Approach		1183	3.0	0.664	2.1	NA	2.6	18.7	0.22	0.04	0.36	56.6
West: Baileys Mountain Rd (W)												
10	L2	7	3.0	0.010	8.7	LOS A	0.0	0.2	0.55	0.68	0.55	51.2
12	R2	59	3.0	0.691	74.3	LOS F	2.2	15.6	0.98	1.09	1.42	18.4
Approach		66	3.0	0.691	67.0	LOS F	2.2	15.6	0.93	1.04	1.32	20.9
All Vehicles		2003	3.0	0.691	3.5	NA	2.6	18.7	0.16	0.07	0.26	54.3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2026_BG+DEV_AM]

Priority-controlled intersection: Old Coach Road/Baileys Mountain Road
Prepared by: MC
Reviewed by: KS
Site Category: (None)
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Old Coach Rd (S)												
1	L2	65	3.0	0.591	4.3	LOS A	0.0	0.0	0.00	0.03	0.00	56.4
2	T1	1061	3.0	0.591	0.0	LOS A	0.0	0.0	0.00	0.03	0.00	59.3
Approach		1126	3.0	0.591	0.3	NA	0.0	0.0	0.00	0.03	0.00	59.2
North: Old Coach Rd (N)												
8	T1	746	3.0	0.511	3.4	LOS A	3.0	21.7	0.31	0.05	0.48	53.1
9	R2	47	3.0	0.511	22.1	LOS C	3.0	21.7	0.31	0.05	0.48	54.1
Approach		794	3.0	0.511	4.5	NA	3.0	21.7	0.31	0.05	0.48	53.2
West: Baileys Mountain Rd (W)												
10	L2	46	3.0	0.107	13.1	LOS B	0.3	2.5	0.77	0.90	0.77	48.2
12	R2	83	3.0	0.826	82.8	LOS F	3.1	22.6	0.99	1.19	1.85	17.1
Approach		129	3.0	0.826	57.8	LOS F	3.1	22.6	0.91	1.09	1.47	25.2
All Vehicles		2049	3.0	0.826	5.5	NA	3.1	22.6	0.18	0.10	0.28	51.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2026_BG+DEV_PM]

Priority-controlled intersection: Old Coach Road/Baileys Mountain Road
Prepared by: MC
Reviewed by: KS
Site Category: (None)
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Old Coach Rd (S)												
1	L2	76	3.0	0.423	4.3	LOS A	0.0	0.0	0.00	0.05	0.00	56.2
2	T1	728	3.0	0.423	0.0	LOS A	0.0	0.0	0.00	0.05	0.00	59.2
Approach		804	3.0	0.423	0.4	NA	0.0	0.0	0.00	0.05	0.00	58.9
North: Old Coach Rd (N)												
8	T1	1156	3.0	0.730	2.5	LOS A	4.9	35.1	0.38	0.06	0.66	54.1
9	R2	91	3.0	0.730	18.8	LOS C	4.9	35.1	0.38	0.06	0.66	54.7
Approach		1246	3.0	0.730	3.7	NA	4.9	35.1	0.38	0.06	0.66	54.2
West: Baileys Mountain Rd (W)												
10	L2	21	3.0	0.028	8.8	LOS A	0.1	0.7	0.56	0.73	0.56	51.1
12	R2	77	3.0	1.166	277.9	LOS F	10.9	78.5	1.00	1.76	4.51	6.4
Approach		98	3.0	1.166	220.1	LOS F	10.9	78.5	0.91	1.54	3.66	8.9
All Vehicles		2148	3.0	1.166	12.3	NA	10.9	78.5	0.26	0.13	0.55	44.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2032_BG_AM]

Priority-controlled intersection: Old Coach Road/Baileys Mountain Road
Prepared by: MC
Reviewed by: KS
Site Category: (None)
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Old Coach Rd (S)												
1	L2	63	3.0	0.662	4.3	LOS A	0.0	0.0	0.00	0.03	0.00	56.3
2	T1	1200	3.0	0.662	0.0	LOS A	0.0	0.0	0.00	0.03	0.00	59.3
Approach		1263	3.0	0.662	0.2	NA	0.0	0.0	0.00	0.03	0.00	59.2
North: Old Coach Rd (N)												
8	T1	864	3.0	0.615	5.9	LOS A	11.8	84.7	1.00	0.05	1.25	49.6
9	R2	45	3.0	0.615	32.9	LOS D	11.8	84.7	1.00	0.05	1.25	52.0
Approach		909	3.0	0.615	7.2	NA	11.8	84.7	1.00	0.05	1.25	49.8
West: Baileys Mountain Rd (W)												
10	L2	12	3.0	0.037	15.9	LOS C	0.1	0.8	0.83	0.93	0.83	46.5
12	R2	45	3.0	0.846	149.9	LOS F	2.8	20.0	0.99	1.14	1.66	11.0
Approach		57	3.0	0.846	122.6	LOS F	2.8	20.0	0.96	1.10	1.49	14.4
All Vehicles		2229	3.0	0.846	6.2	NA	11.8	84.7	0.43	0.07	0.55	50.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2032_BG_PM]

Priority-controlled intersection: Old Coach Road/Baileys Mountain Road
Prepared by: MC
Reviewed by: KS
Site Category: (None)
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Old Coach Rd (S)												
1	L2	44	3.0	0.462	4.3	LOS A	0.0	0.0	0.00	0.03	0.00	56.5
2	T1	838	3.0	0.462	0.0	LOS A	0.0	0.0	0.00	0.03	0.00	59.5
Approach		882	3.0	0.462	0.2	NA	0.0	0.0	0.00	0.03	0.00	59.3
North: Old Coach Rd (N)												
8	T1	1317	3.0	0.798	2.8	LOS A	5.6	40.0	0.38	0.04	0.68	53.8
9	R2	69	3.0	0.798	25.5	LOS D	5.6	40.0	0.38	0.04	0.68	54.5
Approach		1386	3.0	0.798	4.0	NA	5.6	40.0	0.38	0.04	0.68	53.9
West: Baileys Mountain Rd (W)												
10	L2	8	3.0	0.013	9.7	LOS A	0.0	0.3	0.62	0.74	0.62	50.5
12	R2	69	3.0	2.154	1149.4	LOS F	28.5	205.0	1.00	2.15	6.55	1.7
Approach		78	3.0	2.154	1026.2	LOS F	28.5	205.0	0.96	2.00	5.91	2.0
All Vehicles		2346	3.0	2.154	36.5	NA	28.5	205.0	0.26	0.10	0.60	28.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2032_BG+DEV_AM]

Priority-controlled intersection: Old Coach Road/Baileys Mountain Road
Prepared by: MC
Reviewed by: KS
Site Category: (None)
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Old Coach Rd (S)												
1	L2	74	3.0	0.687	4.4	LOS A	0.0	0.0	0.00	0.03	0.00	56.3
2	T1	1237	3.0	0.687	0.0	LOS A	0.0	0.0	0.00	0.03	0.00	59.2
Approach		1311	3.0	0.687	0.3	NA	0.0	0.0	0.00	0.03	0.00	59.0
North: Old Coach Rd (N)												
8	T1	874	3.0	0.683	9.2	LOS A	14.0	100.5	1.00	0.06	1.40	45.6
9	R2	55	3.0	0.683	38.4	LOS E	14.0	100.5	1.00	0.06	1.40	49.4
Approach		928	3.0	0.683	10.9	NA	14.0	100.5	1.00	0.06	1.40	45.9
West: Baileys Mountain Rd (W)												
10	L2	48	3.0	0.170	17.8	LOS C	0.5	3.8	0.86	0.95	0.88	45.4
12	R2	89	3.0	2.020	1003.9	LOS F	33.4	239.8	1.00	2.47	7.94	1.9
Approach		138	3.0	2.020	657.6	LOS F	33.4	239.8	0.95	1.93	5.46	3.6
All Vehicles		2377	3.0	2.020	42.6	NA	33.4	239.8	0.45	0.16	0.86	26.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2032_BG+DEV_PM]

Priority-controlled intersection: Old Coach Road/Baileys Mountain Road
Prepared by: MC
Reviewed by: KS
Site Category: (None)
Stop (Two-Way)

Movement Performance - Vehicles

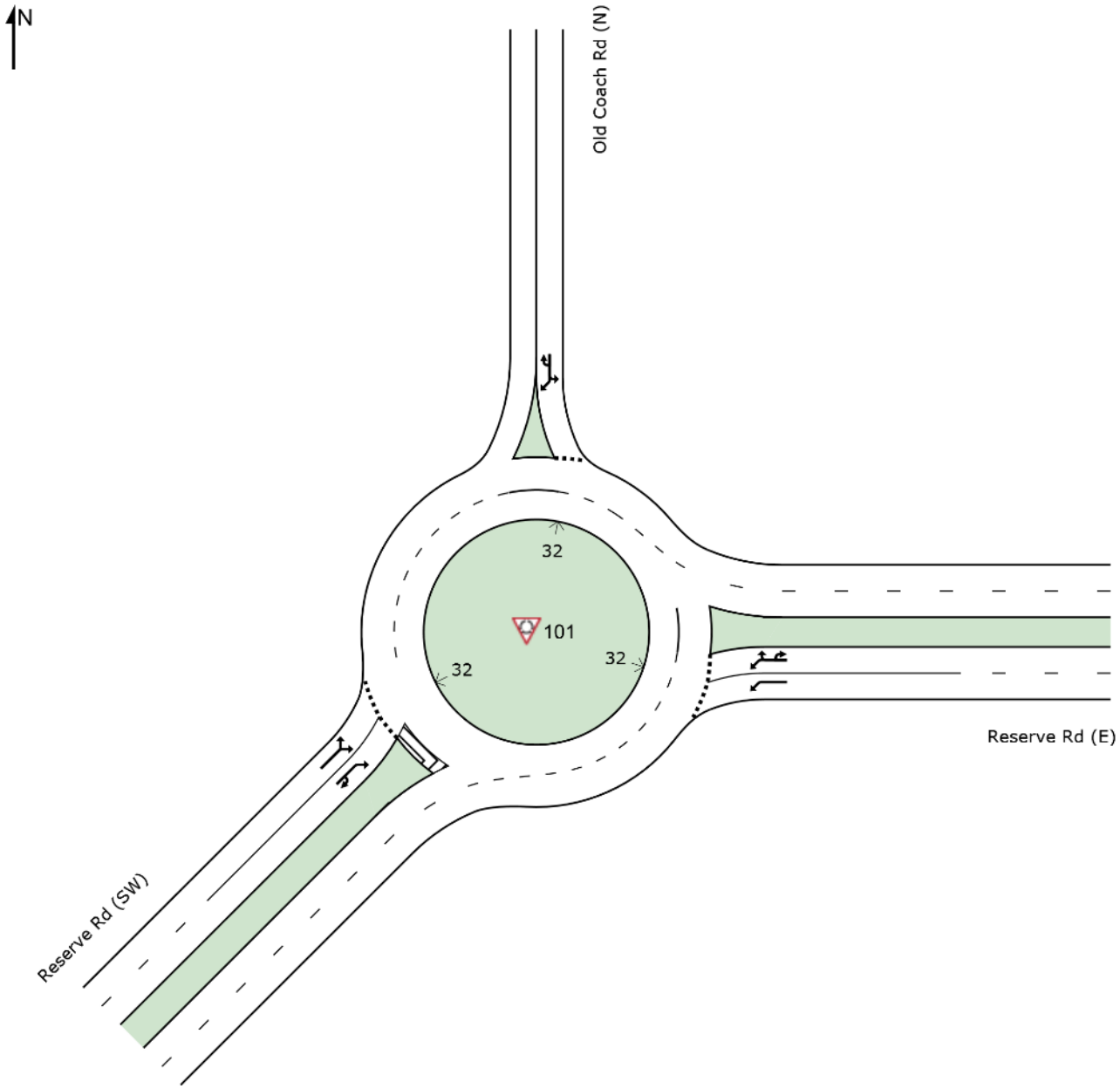
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Old Coach Rd (S)												
1	L2	82	3.0	0.490	4.3	LOS A	0.0	0.0	0.00	0.05	0.00	56.2
2	T1	852	3.0	0.490	0.0	LOS A	0.0	0.0	0.00	0.05	0.00	59.2
Approach		934	3.0	0.490	0.4	NA	0.0	0.0	0.00	0.05	0.00	58.9
North: Old Coach Rd (N)												
8	T1	1348	3.0	0.879	5.8	LOS A	15.0	108.0	1.00	0.08	1.70	49.1
9	R2	101	3.0	0.879	32.2	LOS D	15.0	108.0	1.00	0.08	1.70	51.7
Approach		1449	3.0	0.879	7.6	NA	15.0	108.0	1.00	0.08	1.70	49.4
West: Baileys Mountain Rd (W)												
10	L2	22	3.0	0.035	10.0	LOS A	0.1	0.9	0.64	0.80	0.64	50.3
12	R2	86	3.0	3.828	2643.0	LOS F	48.7	349.4	1.00	2.12	6.45	0.7
Approach		108	3.0	3.828	2106.2	LOS F	48.7	349.4	0.93	1.85	5.26	1.1
All Vehicles		2492	3.0	3.828	96.2	NA	48.7	349.4	0.62	0.15	1.22	15.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 101 [2019_BG_AM]

Roundabout: Old Coach Road/Reserve Road
Prepared by: MC
Reviewed by: KS
Site Category: (None)
Roundabout



MOVEMENT SUMMARY

Site: 101 [2019_BG_AM]

Roundabout: Old Coach Road/Reserve Road
Prepared by: MC
Reviewed by: KS
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
East: Reserve Rd (E)												
4a	L1	178	3.0	0.186	6.0	LOS A	0.9	6.7	0.49	0.58	0.49	62.1
6	R2	325	3.0	0.279	12.2	LOS B	1.6	11.5	0.51	0.71	0.51	36.7
6u	U	6	3.0	0.279	14.9	LOS B	1.6	11.5	0.51	0.71	0.51	58.2
Approach		509	3.0	0.279	10.1	LOS B	1.6	11.5	0.50	0.67	0.50	45.6
North: Old Coach Rd (N)												
7	L2	258	3.0	0.507	3.4	LOS A	3.6	26.0	0.46	0.59	0.46	54.9
9a	R1	361	3.0	0.507	7.9	LOS A	3.6	26.0	0.46	0.59	0.46	55.8
9u	U	2	3.0	0.507	11.5	LOS B	3.6	26.0	0.46	0.59	0.46	30.7
Approach		621	3.0	0.507	6.0	LOS A	3.6	26.0	0.46	0.59	0.46	55.4
SouthWest: Reserve Rd (SW)												
30a	L1	535	3.0	0.377	5.7	LOS A	2.8	20.2	0.58	0.56	0.58	54.2
32a	R1	155	3.0	0.153	11.1	LOS B	0.9	6.3	0.52	0.68	0.52	57.1
32u	U	1	3.0	0.153	15.2	LOS B	0.9	6.3	0.52	0.68	0.52	59.3
Approach		691	3.0	0.377	6.9	LOS A	2.8	20.2	0.57	0.58	0.57	55.1
All Vehicles		1821	3.0	0.507	7.5	LOS A	3.6	26.0	0.51	0.61	0.51	51.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2019_BG_PM]

Roundabout: Old Coach Road/Reserve Road
Prepared by: MC
Reviewed by: KS
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
East: Reserve Rd (E)												
4a	L1	214	3.0	0.275	7.9	LOS A	1.7	12.0	0.71	0.76	0.71	60.8
6	R2	277	3.0	0.303	13.8	LOS B	2.0	14.5	0.73	0.81	0.73	36.1
6u	U	6	3.0	0.303	16.5	LOS B	2.0	14.5	0.73	0.81	0.73	57.3
Approach		497	3.0	0.303	11.3	LOS B	2.0	14.5	0.72	0.79	0.72	46.8
North: Old Coach Rd (N)												
7	L2	292	3.0	0.719	3.5	LOS A	7.5	54.0	0.56	0.58	0.56	53.7
9a	R1	653	3.0	0.719	8.0	LOS A	7.5	54.0	0.56	0.58	0.56	54.6
9u	U	2	3.0	0.719	11.6	LOS B	7.5	54.0	0.56	0.58	0.56	29.7
Approach		946	3.0	0.719	6.6	LOS A	7.5	54.0	0.56	0.58	0.56	54.3
SouthWest: Reserve Rd (SW)												
30a	L1	323	3.0	0.225	5.3	LOS A	1.5	11.1	0.50	0.52	0.50	54.8
32a	R1	116	3.0	0.109	10.8	LOS B	0.6	4.6	0.49	0.65	0.49	57.2
32u	U	1	3.0	0.109	14.8	LOS B	0.6	4.6	0.49	0.65	0.49	59.4
Approach		440	3.0	0.225	6.7	LOS A	1.5	11.1	0.50	0.55	0.50	55.7
All Vehicles		1883	3.0	0.719	7.9	LOS A	7.5	54.0	0.59	0.63	0.59	52.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2021_BG_AM]

Roundabout: Old Coach Road/Reserve Road
Prepared by: MC
Reviewed by: KS
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
East: Reserve Rd (E)												
4a	L1	191	3.0	0.203	6.2	LOS A	1.1	7.6	0.52	0.60	0.52	61.9
6	R2	348	3.0	0.304	12.3	LOS B	1.8	13.0	0.54	0.73	0.54	36.6
6u	U	6	3.0	0.304	15.0	LOS B	1.8	13.0	0.54	0.73	0.54	58.1
Approach		545	3.0	0.304	10.2	LOS B	1.8	13.0	0.53	0.68	0.53	45.5
North: Old Coach Rd (N)												
7	L2	277	3.0	0.548	3.5	LOS A	4.1	29.8	0.50	0.60	0.50	54.7
9a	R1	386	3.0	0.548	8.0	LOS A	4.1	29.8	0.50	0.60	0.50	55.6
9u	U	2	3.0	0.548	11.7	LOS B	4.1	29.8	0.50	0.60	0.50	30.4
Approach		665	3.0	0.548	6.2	LOS A	4.1	29.8	0.50	0.60	0.50	55.2
SouthWest: Reserve Rd (SW)												
30a	L1	574	3.0	0.412	5.9	LOS A	3.2	23.0	0.62	0.57	0.62	53.9
32a	R1	165	3.0	0.166	11.3	LOS B	1.0	7.0	0.55	0.69	0.55	57.0
32u	U	1	3.0	0.166	15.3	LOS B	1.0	7.0	0.55	0.69	0.55	59.1
Approach		740	3.0	0.412	7.1	LOS A	3.2	23.0	0.60	0.60	0.60	54.9
All Vehicles		1951	3.0	0.548	7.6	LOS A	4.1	29.8	0.55	0.62	0.55	51.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2021_BG_PM]

Roundabout: Old Coach Road/Reserve Road
Prepared by: MC
Reviewed by: KS
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
East: Reserve Rd (E)												
4a	L1	228	3.0	0.319	8.4	LOS A	2.0	14.6	0.77	0.81	0.77	60.4
6	R2	297	3.0	0.350	14.3	LOS B	2.5	17.8	0.79	0.84	0.79	35.9
6u	U	6	3.0	0.350	17.0	LOS B	2.5	17.8	0.79	0.84	0.79	57.0
Approach		532	3.0	0.350	11.8	LOS B	2.5	17.8	0.78	0.83	0.78	46.5
North: Old Coach Rd (N)												
7	L2	312	3.0	0.776	3.8	LOS A	9.2	66.1	0.66	0.60	0.66	53.3
9a	R1	700	3.0	0.776	8.3	LOS A	9.2	66.1	0.66	0.60	0.66	54.1
9u	U	2	3.0	0.776	11.9	LOS B	9.2	66.1	0.66	0.60	0.66	29.2
Approach		1014	3.0	0.776	6.9	LOS A	9.2	66.1	0.66	0.60	0.66	53.8
SouthWest: Reserve Rd (SW)												
30a	L1	346	3.0	0.246	5.4	LOS A	1.8	12.6	0.53	0.53	0.53	54.5
32a	R1	124	3.0	0.120	10.9	LOS B	0.7	5.1	0.51	0.66	0.51	57.1
32u	U	1	3.0	0.120	14.9	LOS B	0.7	5.1	0.51	0.66	0.51	59.3
Approach		472	3.0	0.246	6.9	LOS A	1.8	12.6	0.53	0.56	0.53	55.5
All Vehicles		2017	3.0	0.776	8.2	LOS A	9.2	66.1	0.66	0.65	0.66	51.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2021_BG+DEV_AM]

Roundabout: Old Coach Road/Reserve Road
Prepared by: MC
Reviewed by: KS
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
East: Reserve Rd (E)												
4a	L1	199	3.0	0.214	6.2	LOS A	1.1	8.2	0.54	0.61	0.54	61.8
6	R2	348	3.0	0.309	12.4	LOS B	1.9	13.5	0.56	0.73	0.56	36.6
6u	U	6	3.0	0.309	15.1	LOS B	1.9	13.5	0.56	0.73	0.56	58.0
Approach		554	3.0	0.309	10.2	LOS B	1.9	13.5	0.55	0.69	0.55	45.7
North: Old Coach Rd (N)												
7	L2	277	3.0	0.578	3.8	LOS A	4.5	32.3	0.56	0.64	0.56	54.4
9a	R1	400	3.0	0.578	8.3	LOS A	4.5	32.3	0.56	0.64	0.56	55.3
9u	U	2	3.0	0.578	11.9	LOS B	4.5	32.3	0.56	0.64	0.56	30.1
Approach		679	3.0	0.578	6.5	LOS A	4.5	32.3	0.56	0.64	0.56	54.9
SouthWest: Reserve Rd (SW)												
30a	L1	625	3.0	0.449	5.9	LOS A	3.6	26.1	0.64	0.58	0.64	53.7
32a	R1	197	3.0	0.196	11.3	LOS B	1.2	8.5	0.56	0.70	0.56	57.0
32u	U	1	3.0	0.196	15.4	LOS B	1.2	8.5	0.56	0.70	0.56	59.1
Approach		823	3.0	0.449	7.2	LOS A	3.6	26.1	0.62	0.61	0.62	54.8
All Vehicles		2056	3.0	0.578	7.8	LOS A	4.5	32.3	0.58	0.64	0.58	51.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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MOVEMENT SUMMARY

Site: 101 [2021_BG+DEV_PM]

Roundabout: Old Coach Road/Reserve Road
Prepared by: MC
Reviewed by: KS
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
East: Reserve Rd (E)												
4a	L1	256	3.0	0.380	8.9	LOS A	2.8	20.4	0.84	0.86	0.84	60.0
6	R2	297	3.0	0.380	14.7	LOS B	2.8	20.4	0.85	0.87	0.85	35.8
6u	U	6	3.0	0.380	17.4	LOS B	2.8	20.4	0.85	0.87	0.85	56.8
Approach		559	3.0	0.380	12.0	LOS B	2.8	20.4	0.84	0.87	0.84	46.9
North: Old Coach Rd (N)												
7	L2	312	3.0	0.821	4.4	LOS A	11.3	81.3	0.75	0.63	0.77	52.7
9a	R1	745	3.0	0.821	8.9	LOS A	11.3	81.3	0.75	0.63	0.77	53.6
9u	U	2	3.0	0.821	12.5	LOS B	11.3	81.3	0.75	0.63	0.77	28.7
Approach		1059	3.0	0.821	7.6	LOS A	11.3	81.3	0.75	0.63	0.77	53.3
SouthWest: Reserve Rd (SW)												
30a	L1	365	3.0	0.261	5.4	LOS A	1.9	13.6	0.55	0.53	0.55	54.4
32a	R1	136	3.0	0.131	10.9	LOS B	0.8	5.7	0.52	0.66	0.52	57.1
32u	U	1	3.0	0.131	14.9	LOS B	0.8	5.7	0.52	0.66	0.52	59.2
Approach		502	3.0	0.261	6.9	LOS A	1.9	13.6	0.54	0.56	0.54	55.5
All Vehicles		2120	3.0	0.821	8.6	LOS A	11.3	81.3	0.73	0.68	0.73	51.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2022_BG_AM]

Roundabout: Old Coach Road/Reserve Road
Prepared by: MC
Reviewed by: KS
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
East: Reserve Rd (E)												
4a	L1	197	3.0	0.213	6.2	LOS A	1.1	8.0	0.53	0.61	0.53	61.8
6	R2	360	3.0	0.318	12.4	LOS B	1.9	13.9	0.56	0.73	0.56	36.6
6u	U	6	3.0	0.318	15.1	LOS B	1.9	13.9	0.56	0.73	0.56	58.0
Approach		563	3.0	0.318	10.3	LOS B	1.9	13.9	0.55	0.69	0.55	45.4
North: Old Coach Rd (N)												
7	L2	286	3.0	0.569	3.6	LOS A	4.4	31.8	0.52	0.61	0.52	54.6
9a	R1	399	3.0	0.569	8.1	LOS A	4.4	31.8	0.52	0.61	0.52	55.5
9u	U	2	3.0	0.569	11.7	LOS B	4.4	31.8	0.52	0.61	0.52	30.3
Approach		687	3.0	0.569	6.2	LOS A	4.4	31.8	0.52	0.61	0.52	55.1
SouthWest: Reserve Rd (SW)												
30a	L1	593	3.0	0.429	6.0	LOS A	3.4	24.5	0.64	0.58	0.64	53.7
32a	R1	171	3.0	0.173	11.4	LOS B	1.0	7.4	0.56	0.70	0.56	57.0
32u	U	1	3.0	0.173	15.4	LOS B	1.0	7.4	0.56	0.70	0.56	59.1
Approach		764	3.0	0.429	7.2	LOS A	3.4	24.5	0.62	0.61	0.62	54.8
All Vehicles		2015	3.0	0.569	7.7	LOS A	4.4	31.8	0.57	0.63	0.57	51.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2022_BG_PM]

Roundabout: Old Coach Road/Reserve Road
Prepared by: MC
Reviewed by: KS
Site Category: (None)
Roundabout
Design Life Analysis (Final Year): Results for 10 years

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
East: Reserve Rd (E)												
4a	L1	330	3.0	0.656	16.4	LOS B	6.5	46.8	1.00	1.11	1.34	53.9
6	R2	429	3.0	0.703	23.1	LOS C	8.5	60.7	1.00	1.13	1.40	31.8
6u	U	9	3.0	0.703	25.8	LOS C	8.5	60.7	1.00	1.13	1.40	50.8
Approach		768	3.0	0.703	20.2	LOS C	8.5	60.7	1.00	1.12	1.38	41.3
North: Old Coach Rd (N)												
7	L2	451	3.0	1.184	174.0	LOS F[11]	174.7	1254.6	1.00	3.68	6.37	10.4
9a	R1	1012	3.0	1.184	178.5	LOS F[11]	174.7	1254.6	1.00	3.68	6.37	10.4
9u	U	3	3.0	1.184	182.2	LOS F[11]	174.7	1254.6	1.00	3.68	6.37	3.2
Approach		1466	3.0	1.184	177.2	LOS F[11]	174.7	1254.6	1.00	3.68	6.37	10.4
SouthWest: Reserve Rd (SW)												
30a	L1	501	3.0	0.405	6.2	LOS A	3.5	25.0	0.74	0.61	0.74	52.9
32a	R1	180	3.0	0.200	11.7	LOS B	1.3	9.6	0.67	0.73	0.67	56.5
32u	U	1	3.0	0.200	15.8	LOS B	1.3	9.6	0.67	0.73	0.67	58.6
Approach		682	3.0	0.405	7.7	LOS A	3.5	25.0	0.72	0.64	0.72	54.2
All Vehicles		2916	3.0	1.184	96.2	LOS F[11]	174.7	1254.6	0.94	2.30	3.73	18.3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

11 Level of Service is worse than the Level of Service Target specified in the Parameter Settings dialog.

MOVEMENT SUMMARY

Site: 101 [2022_BG+DEV_AM]

Roundabout: Old Coach Road/Reserve Road
Prepared by: MC
Reviewed by: KS
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
East: Reserve Rd (E)												
4a	L1	201	3.0	0.222	6.4	LOS A	1.2	8.6	0.56	0.62	0.56	61.7
6	R2	368	3.0	0.332	12.6	LOS B	2.1	15.0	0.59	0.74	0.59	36.5
6u	U	6	3.0	0.332	15.2	LOS B	2.1	15.0	0.59	0.74	0.59	57.9
Approach		576	3.0	0.332	10.4	LOS B	2.1	15.0	0.58	0.70	0.58	45.3
North: Old Coach Rd (N)												
7	L2	317	3.0	0.621	3.8	LOS A	5.2	37.3	0.58	0.63	0.58	54.4
9a	R1	421	3.0	0.621	8.3	LOS A	5.2	37.3	0.58	0.63	0.58	55.3
9u	U	2	3.0	0.621	12.0	LOS B	5.2	37.3	0.58	0.63	0.58	30.0
Approach		740	3.0	0.621	6.4	LOS A	5.2	37.3	0.58	0.63	0.58	54.9
SouthWest: Reserve Rd (SW)												
30a	L1	632	3.0	0.461	6.1	LOS A	3.8	27.3	0.67	0.59	0.67	53.5
32a	R1	187	3.0	0.191	11.4	LOS B	1.2	8.3	0.57	0.71	0.57	56.9
32u	U	1	3.0	0.191	15.5	LOS B	1.2	8.3	0.57	0.71	0.57	59.0
Approach		820	3.0	0.461	7.3	LOS A	3.8	27.3	0.64	0.62	0.64	54.6
All Vehicles		2136	3.0	0.621	7.8	LOS A	5.2	37.3	0.61	0.65	0.61	51.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2022_BG+DEV_PM]

Roundabout: Old Coach Road/Reserve Road
Prepared by: MC
Reviewed by: KS
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
East: Reserve Rd (E)												
4a	L1	251	3.0	0.397	9.3	LOS A	2.8	20.1	0.86	0.89	0.88	59.9
6	R2	334	3.0	0.440	15.3	LOS B	3.5	25.4	0.89	0.91	0.93	35.6
6u	U	6	3.0	0.440	18.0	LOS B	3.5	25.4	0.89	0.91	0.93	56.5
Approach		591	3.0	0.440	12.8	LOS B	3.5	25.4	0.88	0.90	0.91	45.9
North: Old Coach Rd (N)												
7	L2	334	3.0	0.846	4.7	LOS A	13.0	93.6	0.81	0.63	0.83	52.6
9a	R1	759	3.0	0.846	9.2	LOS A	13.0	93.6	0.81	0.63	0.83	53.4
9u	U	2	3.0	0.846	12.9	LOS B	13.0	93.6	0.81	0.63	0.83	28.5
Approach		1095	3.0	0.846	7.9	LOS A	13.0	93.6	0.81	0.63	0.83	53.1
SouthWest: Reserve Rd (SW)												
30a	L1	382	3.0	0.282	5.6	LOS A	2.1	15.2	0.59	0.54	0.59	54.1
32a	R1	134	3.0	0.135	11.1	LOS B	0.8	5.9	0.56	0.68	0.56	57.0
32u	U	1	3.0	0.135	15.1	LOS B	0.8	5.9	0.56	0.68	0.56	59.1
Approach		517	3.0	0.282	7.0	LOS A	2.1	15.2	0.58	0.58	0.58	55.1
All Vehicles		2202	3.0	0.846	9.0	LOS A	13.0	93.6	0.77	0.69	0.80	51.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2026_BG_AM]

Roundabout: Old Coach Road/Reserve Road
Prepared by: MC
Reviewed by: KS
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
East: Reserve Rd (E)												
4a	L1	222	3.0	0.255	6.6	LOS A	1.4	10.2	0.60	0.65	0.60	61.5
6	R2	406	3.0	0.379	12.8	LOS B	2.5	18.0	0.64	0.76	0.64	36.3
6u	U	7	3.0	0.379	15.5	LOS B	2.5	18.0	0.64	0.76	0.64	57.7
Approach		636	3.0	0.379	10.7	LOS B	2.5	18.0	0.62	0.72	0.62	45.1
North: Old Coach Rd (N)												
7	L2	323	3.0	0.657	4.0	LOS A	5.9	42.2	0.63	0.65	0.63	54.1
9a	R1	451	3.0	0.657	8.5	LOS A	5.9	42.2	0.63	0.65	0.63	55.0
9u	U	3	3.0	0.657	12.1	LOS B	5.9	42.2	0.63	0.65	0.63	29.8
Approach		777	3.0	0.657	6.6	LOS A	5.9	42.2	0.63	0.65	0.63	54.6
SouthWest: Reserve Rd (SW)												
30a	L1	669	3.0	0.507	6.4	LOS A	4.4	31.4	0.73	0.62	0.73	53.0
32a	R1	193	3.0	0.205	11.7	LOS B	1.3	9.1	0.61	0.72	0.61	56.7
32u	U	1	3.0	0.205	15.7	LOS B	1.3	9.1	0.61	0.72	0.61	58.8
Approach		863	3.0	0.507	7.6	LOS A	4.4	31.4	0.70	0.64	0.70	54.2
All Vehicles		2276	3.0	0.657	8.1	LOS A	5.9	42.2	0.65	0.67	0.65	51.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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MOVEMENT SUMMARY

Site: 101 [2026_BG_PM]

Roundabout: Old Coach Road/Reserve Road
Prepared by: MC
Reviewed by: KS
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
East: Reserve Rd (E)												
4a	L1	266	3.0	0.493	11.6	LOS B	4.1	29.2	0.95	1.01	1.08	57.9
6	R2	346	3.0	0.533	17.6	LOS B	5.1	36.4	0.99	1.00	1.14	34.4
6u	U	7	3.0	0.533	20.3	LOS C	5.1	36.4	0.99	1.00	1.14	54.7
Approach		620	3.0	0.533	15.0	LOS B	5.1	36.4	0.97	1.01	1.11	44.5
North: Old Coach Rd (N)												
7	L2	364	3.0	0.924	8.0	LOS A	22.7	162.7	1.00	0.73	1.14	49.4
9a	R1	817	3.0	0.924	12.5	LOS B	22.7	162.7	1.00	0.73	1.14	50.1
9u	U	3	3.0	0.924	16.2	LOS B	22.7	162.7	1.00	0.73	1.14	25.3
Approach		1184	3.0	0.924	11.2	LOS B	22.7	162.7	1.00	0.73	1.14	49.8
SouthWest: Reserve Rd (SW)												
30a	L1	404	3.0	0.305	5.7	LOS A	2.4	17.1	0.63	0.55	0.63	53.8
32a	R1	144	3.0	0.148	11.2	LOS B	0.9	6.7	0.58	0.69	0.58	56.8
32u	U	1	3.0	0.148	15.2	LOS B	0.9	6.7	0.58	0.69	0.58	59.0
Approach		549	3.0	0.305	7.1	LOS A	2.4	17.1	0.62	0.59	0.62	54.9
All Vehicles		2354	3.0	0.924	11.2	LOS B	22.7	162.7	0.90	0.77	1.01	49.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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MOVEMENT SUMMARY

Site: 101 [2026_BG+DEV_AM]

Roundabout: Old Coach Road/Reserve Road
Prepared by: MC
Reviewed by: KS
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
East: Reserve Rd (E)												
4a	L1	226	3.0	0.267	6.8	LOS A	1.5	11.1	0.63	0.66	0.63	61.3
6	R2	415	3.0	0.397	12.9	LOS B	2.7	19.6	0.67	0.78	0.67	36.2
6u	U	7	3.0	0.397	15.6	LOS B	2.7	19.6	0.67	0.78	0.67	57.5
Approach		648	3.0	0.397	10.8	LOS B	2.7	19.6	0.66	0.74	0.66	45.0
North: Old Coach Rd (N)												
7	L2	354	3.0	0.712	4.8	LOS A	7.6	54.6	0.70	0.70	0.74	53.8
9a	R1	473	3.0	0.712	9.4	LOS A	7.6	54.6	0.70	0.70	0.74	54.6
9u	U	3	3.0	0.712	13.0	LOS B	7.6	54.6	0.70	0.70	0.74	29.4
Approach		829	3.0	0.712	7.4	LOS A	7.6	54.6	0.70	0.70	0.74	54.2
SouthWest: Reserve Rd (SW)												
30a	L1	708	3.0	0.542	6.5	LOS A	4.9	34.9	0.76	0.63	0.76	52.7
32a	R1	209	3.0	0.224	11.8	LOS B	1.4	10.2	0.63	0.73	0.63	56.7
32u	U	1	3.0	0.224	15.8	LOS B	1.4	10.2	0.63	0.73	0.63	58.8
Approach		919	3.0	0.542	7.7	LOS A	4.9	34.9	0.73	0.66	0.73	54.0
All Vehicles		2397	3.0	0.712	8.5	LOS A	7.6	54.6	0.70	0.69	0.71	51.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2026_BG+DEV_PM]

Roundabout: Old Coach Road/Reserve Road
Prepared by: MC
Reviewed by: KS
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
East: Reserve Rd (E)												
4a	L1	281	3.0	0.554	13.5	LOS B	4.9	35.1	0.98	1.06	1.19	56.2
6	R2	374	3.0	0.606	19.9	LOS B	6.4	45.7	1.00	1.06	1.25	33.2
6u	U	7	3.0	0.606	22.6	LOS C	6.4	45.7	1.00	1.06	1.25	52.9
Approach		662	3.0	0.606	17.2	LOS B	6.4	45.7	0.99	1.06	1.22	42.9
North: Old Coach Rd (N)												
7	L2	376	3.0	0.967	13.3	LOS B	34.1	244.7	1.00	0.85	1.33	44.1
9a	R1	853	3.0	0.967	17.8	LOS B	34.1	244.7	1.00	0.85	1.33	44.7
9u	U	3	3.0	0.967	21.4	LOS C	34.1	244.7	1.00	0.85	1.33	20.8
Approach		1232	3.0	0.967	16.4	LOS B	34.1	244.7	1.00	0.85	1.33	44.5
SouthWest: Reserve Rd (SW)												
30a	L1	428	3.0	0.331	5.8	LOS A	2.7	19.1	0.66	0.57	0.66	53.5
32a	R1	151	3.0	0.159	11.3	LOS B	1.0	7.3	0.61	0.70	0.61	56.7
32u	U	1	3.0	0.159	15.4	LOS B	1.0	7.3	0.61	0.70	0.61	58.9
Approach		580	3.0	0.331	7.3	LOS A	2.7	19.1	0.65	0.60	0.65	54.7
All Vehicles		2474	3.0	0.967	14.5	LOS B	34.1	244.7	0.92	0.85	1.14	46.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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MOVEMENT SUMMARY

Site: 101 [2032_BG_AM]

Roundabout: Old Coach Road/Reserve Road
Prepared by: MC
Reviewed by: KS
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
East: Reserve Rd (E)												
4a	L1	261	3.0	0.333	7.3	LOS A	2.1	14.9	0.71	0.71	0.71	60.8
6	R2	477	3.0	0.491	13.7	LOS B	3.9	28.0	0.78	0.84	0.81	36.0
6u	U	8	3.0	0.491	16.4	LOS B	3.9	28.0	0.78	0.84	0.81	57.1
Approach		746	3.0	0.491	11.5	LOS B	3.9	28.0	0.75	0.79	0.77	44.7
North: Old Coach Rd (N)												
7	L2	378	3.0	0.796	6.5	LOS A	11.1	79.9	0.84	0.78	0.95	51.7
9a	R1	528	3.0	0.796	11.0	LOS B	11.1	79.9	0.84	0.78	0.95	52.5
9u	U	3	3.0	0.796	14.6	LOS B	11.1	79.9	0.84	0.78	0.95	27.2
Approach		909	3.0	0.796	9.1	LOS A	11.1	79.9	0.84	0.78	0.95	52.1
SouthWest: Reserve Rd (SW)												
30a	L1	784	3.0	0.642	8.3	LOS A	7.5	53.9	0.88	0.82	1.00	51.8
32a	R1	226	3.0	0.260	12.2	LOS B	1.7	12.5	0.70	0.77	0.70	56.4
32u	U	1	3.0	0.260	16.3	LOS B	1.7	12.5	0.70	0.77	0.70	58.5
Approach		1012	3.0	0.642	9.2	LOS A	7.5	53.9	0.84	0.81	0.93	53.3
All Vehicles		2667	3.0	0.796	9.8	LOS A	11.1	79.9	0.81	0.80	0.89	49.9

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2032_BG_PM]

Roundabout: Old Coach Road/Reserve Road
Prepared by: MC
Reviewed by: KS
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
East: Reserve Rd (E)												
4a	L1	313	3.0	0.628	15.7	LOS B	6.0	43.3	1.00	1.10	1.30	54.4
6	R2	405	3.0	0.671	22.2	LOS C	7.7	55.3	1.00	1.11	1.35	32.2
6u	U	8	3.0	0.671	24.9	LOS C	7.7	55.3	1.00	1.11	1.35	51.4
Approach		726	3.0	0.671	19.4	LOS B	7.7	55.3	1.00	1.11	1.33	41.7
North: Old Coach Rd (N)												
7	L2	426	3.0	1.109	108.4	LOS F	119.8	860.3	1.00	2.57	4.40	15.1
9a	R1	957	3.0	1.109	112.9	LOS F	119.8	860.3	1.00	2.57	4.40	15.2
9u	U	3	3.0	1.109	116.5	LOS F	119.8	860.3	1.00	2.57	4.40	4.9
Approach		1386	3.0	1.109	111.5	LOS F	119.8	860.3	1.00	2.57	4.40	15.1
SouthWest: Reserve Rd (SW)												
30a	L1	473	3.0	0.374	6.0	LOS A	3.1	22.5	0.71	0.59	0.71	53.1
32a	R1	169	3.0	0.185	11.6	LOS B	1.2	8.7	0.64	0.72	0.64	56.6
32u	U	2	3.0	0.185	15.6	LOS B	1.2	8.7	0.64	0.72	0.64	58.7
Approach		644	3.0	0.374	7.5	LOS A	3.1	22.5	0.69	0.63	0.69	54.4
All Vehicles		2757	3.0	1.109	63.0	LOS E	119.8	860.3	0.93	1.73	2.72	24.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2032_BG+DEV_AM]

Roundabout: Old Coach Road/Reserve Road
Prepared by: MC
Reviewed by: KS
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
East: Reserve Rd (E)												
4a	L1	265	3.0	0.354	7.5	LOS A	2.3	16.5	0.74	0.73	0.74	60.6
6	R2	484	3.0	0.520	14.2	LOS B	4.5	32.1	0.83	0.87	0.89	35.8
6u	U	8	3.0	0.520	16.9	LOS B	4.5	32.1	0.83	0.87	0.89	56.9
Approach		758	3.0	0.520	11.8	LOS B	4.5	32.1	0.80	0.82	0.84	44.5
North: Old Coach Rd (N)												
7	L2	409	3.0	0.856	8.5	LOS A	15.0	107.5	0.95	0.88	1.17	49.3
9a	R1	551	3.0	0.856	13.1	LOS B	15.0	107.5	0.95	0.88	1.17	50.0
9u	U	3	3.0	0.856	16.7	LOS B	15.0	107.5	0.95	0.88	1.17	24.9
Approach		963	3.0	0.856	11.1	LOS B	15.0	107.5	0.95	0.88	1.17	49.7
SouthWest: Reserve Rd (SW)												
30a	L1	823	3.0	0.683	9.0	LOS A	8.8	63.1	0.92	0.86	1.08	51.5
32a	R1	243	3.0	0.282	12.3	LOS B	1.9	13.9	0.72	0.78	0.72	56.3
32u	U	1	3.0	0.282	16.4	LOS B	1.9	13.9	0.72	0.78	0.72	58.4
Approach		1067	3.0	0.683	9.8	LOS A	8.8	63.1	0.87	0.84	1.00	53.1
All Vehicles		2788	3.0	0.856	10.8	LOS B	15.0	107.5	0.88	0.85	1.01	49.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2032_BG+DEV_PM]

Roundabout: Old Coach Road/Reserve Road
Prepared by: MC
Reviewed by: KS
Site Category: (None)
Roundabout

Movement Performance - Vehicles

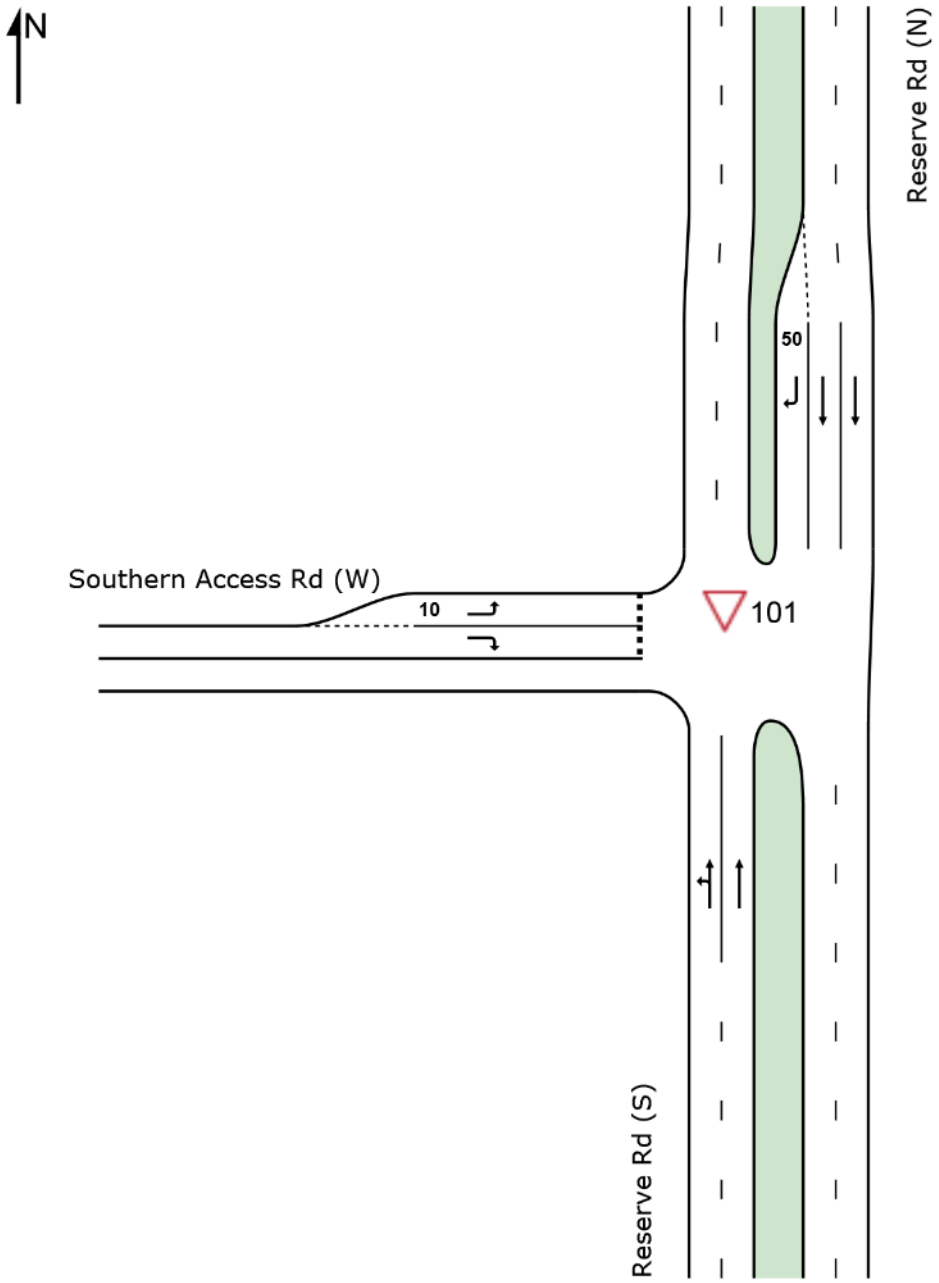
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
East: Reserve Rd (E)												
4a	L1	327	3.0	0.657	16.6	LOS B	6.5	47.0	1.00	1.12	1.34	53.7
6	R2	433	3.0	0.713	23.7	LOS C	8.7	62.8	1.00	1.14	1.43	31.5
6u	U	8	3.0	0.713	26.4	LOS C	8.7	62.8	1.00	1.14	1.43	50.4
Approach		768	3.0	0.713	20.7	LOS C	8.7	62.8	1.00	1.13	1.39	40.9
North: Old Coach Rd (N)												
7	L2	438	3.0	1.154	147.9	LOS F	152.8	1097.1	1.00	3.25	5.60	11.9
9a	R1	993	3.0	1.154	152.4	LOS F	152.8	1097.1	1.00	3.25	5.60	11.9
9u	U	3	3.0	1.154	156.1	LOS F	152.8	1097.1	1.00	3.25	5.60	3.7
Approach		1434	3.0	1.154	151.1	LOS F	152.8	1097.1	1.00	3.25	5.60	11.9
SouthWest: Reserve Rd (SW)												
30a	L1	498	3.0	0.404	6.2	LOS A	3.5	24.9	0.75	0.61	0.75	52.8
32a	R1	176	3.0	0.197	11.7	LOS B	1.3	9.4	0.67	0.73	0.67	56.5
32u	U	2	3.0	0.197	15.8	LOS B	1.3	9.4	0.67	0.73	0.67	58.6
Approach		676	3.0	0.404	7.7	LOS A	3.5	24.9	0.73	0.64	0.73	54.2
All Vehicles		2878	3.0	1.154	82.6	LOS F	152.8	1097.1	0.94	2.07	3.33	20.3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 101 [2021_BG_AM]

Priority-controlled intersection (future): Reserve Road/Southern Access Road
Prepared by: MC
Reviewed by: KS
Site Category: (None)
Giveway / Yield (Two-Way)



MOVEMENT SUMMARY

Site: 101 [2021_BG_AM]

Priority-controlled intersection (future): Reserve Road/Southern Access Road
Prepared by: MC
Reviewed by: KS
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Reserve Rd (S)												
1	L2	1	3.0	0.174	6.4	LOS A	0.0	0.0	0.00	0.00	0.00	31.6
2	T1	665	3.0	0.174	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	69.9
Approach		666	3.0	0.174	0.0	NA	0.0	0.0	0.00	0.00	0.00	69.8
North: Reserve Rd (N)												
8	T1	577	3.0	0.151	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	70.0
9	R2	4	3.0	0.006	9.9	LOS A	0.0	0.2	0.55	0.66	0.55	44.5
Approach		581	3.0	0.151	0.1	NA	0.0	0.2	0.00	0.00	0.00	69.7
West: Southern Access Rd (W)												
10	L2	18	3.0	0.019	6.0	LOS A	0.1	0.5	0.38	0.57	0.38	45.9
12	R2	4	3.0	0.035	32.5	LOS D	0.1	0.7	0.88	0.94	0.88	20.6
Approach		22	3.0	0.035	11.1	LOS B	0.1	0.7	0.48	0.64	0.48	39.2
All Vehicles		1269	3.0	0.174	0.2	NA	0.1	0.7	0.01	0.01	0.01	69.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2021_BG_PM]

Priority-controlled intersection (future): Reserve Road/Southern Access Road
Prepared by: MC
Reviewed by: KS
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Reserve Rd (S)												
1	L2	4	3.0	0.121	6.4	LOS A	0.0	0.0	0.00	0.01	0.00	31.5
2	T1	459	3.0	0.121	0.0	LOS A	0.0	0.0	0.00	0.01	0.00	69.8
Approach		463	3.0	0.121	0.1	NA	0.0	0.0	0.00	0.01	0.00	69.3
North: Reserve Rd (N)												
8	T1	868	3.0	0.228	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	69.9
9	R2	16	3.0	0.018	8.5	LOS A	0.1	0.5	0.47	0.65	0.47	46.2
Approach		884	3.0	0.228	0.2	NA	0.1	0.5	0.01	0.01	0.01	69.3
West: Southern Access Rd (W)												
10	L2	7	3.0	0.007	5.5	LOS A	0.0	0.2	0.30	0.52	0.30	46.3
12	R2	2	3.0	0.023	40.9	LOS E	0.1	0.5	0.90	0.96	0.90	17.9
Approach		9	3.0	0.023	13.3	LOS B	0.1	0.5	0.44	0.62	0.44	36.7
All Vehicles		1357	3.0	0.228	0.2	NA	0.1	0.5	0.01	0.01	0.01	69.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2021_BG+DEV_AM]

Priority-controlled intersection (future): Reserve Road/Southern Access Road
Prepared by: MC
Reviewed by: KS
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Reserve Rd (S)												
1	L2	6	3.0	0.176	6.4	LOS A	0.0	0.0	0.00	0.01	0.00	31.5
2	T1	665	3.0	0.176	0.0	LOS A	0.0	0.0	0.00	0.01	0.00	69.8
Approach		672	3.0	0.176	0.1	NA	0.0	0.0	0.00	0.01	0.00	69.3
North: Reserve Rd (N)												
8	T1	578	3.0	0.152	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	70.0
9	R2	23	3.0	0.034	10.1	LOS B	0.1	0.9	0.56	0.74	0.56	44.2
Approach		601	3.0	0.152	0.4	NA	0.1	0.9	0.02	0.03	0.02	68.5
West: Southern Access Rd (W)												
10	L2	93	3.0	0.099	6.2	LOS A	0.4	2.6	0.40	0.62	0.40	45.8
12	R2	24	3.0	0.213	37.5	LOS E	0.7	4.7	0.90	0.97	0.96	18.9
Approach		117	3.0	0.213	12.7	LOS B	0.7	4.7	0.50	0.69	0.52	37.6
All Vehicles		1389	3.0	0.213	1.3	NA	0.7	4.7	0.05	0.07	0.05	64.9

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2021_BG+DEV_PM]

Priority-controlled intersection (future): Reserve Road/Southern Access Road
Prepared by: MC
Reviewed by: KS
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Reserve Rd (S)												
1	L2	21	3.0	0.126	6.4	LOS A	0.0	0.0	0.00	0.06	0.00	31.2
2	T1	460	3.0	0.126	0.0	LOS A	0.0	0.0	0.00	0.03	0.00	69.2
Approach		481	3.0	0.126	0.3	NA	0.0	0.0	0.00	0.03	0.00	66.9
North: Reserve Rd (N)												
8	T1	868	3.0	0.229	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	69.9
9	R2	81	3.0	0.095	8.8	LOS A	0.4	2.7	0.49	0.72	0.49	45.7
Approach		949	3.0	0.229	0.8	NA	0.4	2.7	0.04	0.06	0.04	67.1
West: Southern Access Rd (W)												
10	L2	35	3.0	0.033	5.5	LOS A	0.1	0.8	0.30	0.54	0.30	46.3
12	R2	9	3.0	0.124	49.2	LOS E	0.3	2.5	0.93	0.97	0.93	15.8
Approach		44	3.0	0.124	14.9	LOS B	0.3	2.5	0.44	0.63	0.44	35.5
All Vehicles		1475	3.0	0.229	1.0	NA	0.4	2.7	0.04	0.07	0.04	65.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2022_BG_AM]

Priority-controlled intersection (future): Reserve Road/Southern Access Road
Prepared by: MC
Reviewed by: KS
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Reserve Rd (S)												
1	L2	1	3.0	0.180	6.4	LOS A	0.0	0.0	0.00	0.00	0.00	31.6
2	T1	687	3.0	0.180	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	69.9
Approach		688	3.0	0.180	0.0	NA	0.0	0.0	0.00	0.00	0.00	69.8
North: Reserve Rd (N)												
8	T1	597	3.0	0.156	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	70.0
9	R2	4	3.0	0.006	10.1	LOS B	0.0	0.2	0.56	0.67	0.56	44.2
Approach		601	3.0	0.156	0.1	NA	0.0	0.2	0.00	0.00	0.00	69.7
West: Southern Access Rd (W)												
10	L2	18	3.0	0.019	6.1	LOS A	0.1	0.5	0.39	0.58	0.39	45.8
12	R2	4	3.0	0.039	35.2	LOS E	0.1	0.8	0.89	0.95	0.89	19.7
Approach		22	3.0	0.039	11.6	LOS B	0.1	0.8	0.48	0.65	0.48	38.7
All Vehicles		1312	3.0	0.180	0.2	NA	0.1	0.8	0.01	0.01	0.01	69.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2022_BG_PM]

Priority-controlled intersection (future): Reserve Road/Southern Access Road
Prepared by: MC
Reviewed by: KS
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Reserve Rd (S)												
1	L2	4	3.0	0.125	6.4	LOS A	0.0	0.0	0.00	0.01	0.00	31.5
2	T1	474	3.0	0.125	0.0	LOS A	0.0	0.0	0.00	0.01	0.00	69.8
Approach		478	3.0	0.125	0.1	NA	0.0	0.0	0.00	0.01	0.00	69.3
North: Reserve Rd (N)												
8	T1	897	3.0	0.236	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	69.9
9	R2	16	3.0	0.018	8.6	LOS A	0.1	0.5	0.47	0.65	0.47	46.0
Approach		913	3.0	0.236	0.2	NA	0.1	0.5	0.01	0.01	0.01	69.4
West: Southern Access Rd (W)												
10	L2	7	3.0	0.007	5.5	LOS A	0.0	0.2	0.31	0.52	0.31	46.2
12	R2	2	3.0	0.026	44.7	LOS E	0.1	0.5	0.91	0.96	0.91	16.8
Approach		9	3.0	0.026	14.2	LOS B	0.1	0.5	0.44	0.62	0.44	35.9
All Vehicles		1400	3.0	0.236	0.2	NA	0.1	0.5	0.01	0.01	0.01	69.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2022_BG+DEV_AM]

Priority-controlled intersection (future): Reserve Road/Southern Access Road
Prepared by: MC
Reviewed by: KS
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Reserve Rd (S)												
1	L2	4	3.0	0.182	6.4	LOS A	0.0	0.0	0.00	0.01	0.00	31.6
2	T1	692	3.0	0.182	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	69.8
Approach		696	3.0	0.182	0.0	NA	0.0	0.0	0.00	0.00	0.00	69.5
North: Reserve Rd (N)												
8	T1	616	3.0	0.162	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	70.0
9	R2	17	3.0	0.026	10.3	LOS B	0.1	0.7	0.56	0.73	0.56	44.0
Approach		633	3.0	0.162	0.3	NA	0.1	0.7	0.02	0.02	0.02	69.0
West: Southern Access Rd (W)												
10	L2	65	3.0	0.071	6.2	LOS A	0.3	1.8	0.40	0.61	0.40	45.8
12	R2	17	3.0	0.166	39.7	LOS E	0.5	3.5	0.91	0.96	0.93	18.2
Approach		82	3.0	0.166	13.1	LOS B	0.5	3.5	0.50	0.68	0.51	37.3
All Vehicles		1411	3.0	0.182	0.9	NA	0.5	3.5	0.04	0.05	0.04	66.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2022_BG+DEV_PM]

Priority-controlled intersection (future): Reserve Road/Southern Access Road
Prepared by: MC
Reviewed by: KS
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Reserve Rd (S)												
1	L2	15	3.0	0.132	6.4	LOS A	0.0	0.0	0.00	0.04	0.00	31.3
2	T1	491	3.0	0.132	0.0	LOS A	0.0	0.0	0.00	0.02	0.00	69.5
Approach		505	3.0	0.132	0.2	NA	0.0	0.0	0.00	0.02	0.00	67.9
North: Reserve Rd (N)												
8	T1	904	3.0	0.238	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	69.9
9	R2	57	3.0	0.068	8.9	LOS A	0.3	1.9	0.50	0.71	0.50	45.6
Approach		961	3.0	0.238	0.5	NA	0.3	1.9	0.03	0.04	0.03	67.9
West: Southern Access Rd (W)												
10	L2	24	3.0	0.023	5.6	LOS A	0.1	0.6	0.32	0.54	0.32	46.2
12	R2	6	3.0	0.090	52.8	LOS F	0.3	1.8	0.93	0.97	0.93	15.0
Approach		31	3.0	0.090	15.3	LOS C	0.3	1.8	0.44	0.63	0.44	35.1
All Vehicles		1497	3.0	0.238	0.7	NA	0.3	1.9	0.03	0.05	0.03	66.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2026_BG_AM]

Priority-controlled intersection (future): Reserve Road/Southern Access Road
Prepared by: MC
Reviewed by: KS
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Reserve Rd (S)												
1	L2	1	3.0	0.203	6.4	LOS A	0.0	0.0	0.00	0.00	0.00	31.6
2	T1	776	3.0	0.203	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	69.9
Approach		777	3.0	0.203	0.0	NA	0.0	0.0	0.00	0.00	0.00	69.8
North: Reserve Rd (N)												
8	T1	674	3.0	0.176	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	70.0
9	R2	4	3.0	0.007	10.9	LOS B	0.0	0.2	0.59	0.70	0.59	43.3
Approach		678	3.0	0.176	0.1	NA	0.0	0.2	0.00	0.00	0.00	69.7
West: Southern Access Rd (W)												
10	L2	18	3.0	0.021	6.4	LOS A	0.1	0.5	0.42	0.59	0.42	45.6
12	R2	4	3.0	0.055	48.7	LOS E	0.2	1.1	0.92	0.96	0.92	15.9
Approach		22	3.0	0.055	14.4	LOS B	0.2	1.1	0.51	0.66	0.51	36.2
All Vehicles		1477	3.0	0.203	0.3	NA	0.2	1.1	0.01	0.01	0.01	68.9

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2026_BG_PM]

Priority-controlled intersection (future): Reserve Road/Southern Access Road
Prepared by: MC
Reviewed by: KS
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Reserve Rd (S)												
1	L2	4	3.0	0.141	6.4	LOS A	0.0	0.0	0.00	0.01	0.00	31.5
2	T1	536	3.0	0.141	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	69.8
Approach		540	3.0	0.141	0.1	NA	0.0	0.0	0.00	0.00	0.00	69.4
North: Reserve Rd (N)												
8	T1	1013	3.0	0.266	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	69.9
9	R2	16	3.0	0.020	9.0	LOS A	0.1	0.5	0.50	0.67	0.50	45.5
Approach		1028	3.0	0.266	0.2	NA	0.1	0.5	0.01	0.01	0.01	69.4
West: Southern Access Rd (W)												
10	L2	7	3.0	0.007	5.7	LOS A	0.0	0.2	0.33	0.53	0.33	46.1
12	R2	2	3.0	0.039	65.9	LOS F	0.1	0.8	0.94	0.97	0.94	12.8
Approach		9	3.0	0.039	19.0	LOS C	0.1	0.8	0.47	0.63	0.47	32.3
All Vehicles		1578	3.0	0.266	0.2	NA	0.1	0.8	0.01	0.01	0.01	69.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2026_BG+DEV_AM]

Priority-controlled intersection (future): Reserve Road/Southern Access Road
Prepared by: MC
Reviewed by: KS
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Reserve Rd (S)												
1	L2	4	3.0	0.205	6.4	LOS A	0.0	0.0	0.00	0.01	0.00	31.6
2	T1	781	3.0	0.205	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	69.8
Approach		785	3.0	0.205	0.0	NA	0.0	0.0	0.00	0.00	0.00	69.6
North: Reserve Rd (N)												
8	T1	693	3.0	0.183	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	69.9
9	R2	17	3.0	0.029	11.1	LOS B	0.1	0.7	0.60	0.77	0.60	43.0
Approach		709	3.0	0.183	0.3	NA	0.1	0.7	0.01	0.02	0.01	69.0
West: Southern Access Rd (W)												
10	L2	65	3.0	0.075	6.5	LOS A	0.3	1.9	0.43	0.64	0.43	45.4
12	R2	17	3.0	0.240	59.3	LOS F	0.7	5.0	0.94	0.99	1.01	13.8
Approach		82	3.0	0.240	17.3	LOS C	0.7	5.0	0.53	0.71	0.55	33.8
All Vehicles		1577	3.0	0.240	1.0	NA	0.7	5.0	0.03	0.05	0.03	66.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2026_BG+DEV_PM]

Priority-controlled intersection (future): Reserve Road/Southern Access Road
Prepared by: MC
Reviewed by: KS
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Reserve Rd (S)												
1	L2	15	3.0	0.148	6.4	LOS A	0.0	0.0	0.00	0.03	0.00	31.3
2	T1	552	3.0	0.148	0.0	LOS A	0.0	0.0	0.00	0.02	0.00	69.5
Approach		566	3.0	0.148	0.2	NA	0.0	0.0	0.00	0.02	0.00	68.1
North: Reserve Rd (N)												
8	T1	1020	3.0	0.268	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	69.9
9	R2	57	3.0	0.074	9.4	LOS A	0.3	2.0	0.53	0.74	0.53	45.1
Approach		1077	3.0	0.268	0.5	NA	0.3	2.0	0.03	0.04	0.03	68.1
West: Southern Access Rd (W)												
10	L2	24	3.0	0.024	5.7	LOS A	0.1	0.6	0.34	0.55	0.34	46.1
12	R2	6	3.0	0.140	79.0	LOS F	0.4	2.7	0.96	0.98	0.96	11.1
Approach		31	3.0	0.140	20.9	LOS C	0.4	2.7	0.47	0.64	0.47	31.2
All Vehicles		1674	3.0	0.268	0.8	NA	0.4	2.7	0.03	0.04	0.03	66.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2032_BG_AM]

Priority-controlled intersection (future): Reserve Road/Southern Access Road
Prepared by: MC
Reviewed by: KS
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Reserve Rd (S)												
1	L2	1	3.0	0.238	6.4	LOS A	0.0	0.0	0.00	0.00	0.00	31.6
2	T1	908	3.0	0.238	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	69.9
Approach		909	3.0	0.238	0.0	NA	0.0	0.0	0.00	0.00	0.00	69.8
North: Reserve Rd (N)												
8	T1	788	3.0	0.206	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	69.9
9	R2	4	3.0	0.009	12.3	LOS B	0.0	0.2	0.66	0.75	0.66	41.7
Approach		793	3.0	0.206	0.1	NA	0.0	0.2	0.00	0.00	0.00	69.7
West: Southern Access Rd (W)												
10	L2	18	3.0	0.022	6.8	LOS A	0.1	0.5	0.45	0.62	0.45	45.0
12	R2	4	3.0	0.099	82.6	LOS F	0.3	1.9	0.96	0.98	0.96	10.8
Approach		22	3.0	0.099	21.3	LOS C	0.3	1.9	0.55	0.69	0.55	31.2
All Vehicles		1724	3.0	0.238	0.3	NA	0.3	1.9	0.01	0.01	0.01	68.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2032_BG_PM]

Priority-controlled intersection (future): Reserve Road/Southern Access Road
Prepared by: MC
Reviewed by: KS
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Reserve Rd (S)												
1	L2	4	3.0	0.165	6.4	LOS A	0.0	0.0	0.00	0.01	0.00	31.5
2	T1	627	3.0	0.165	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	69.8
Approach		632	3.0	0.165	0.0	NA	0.0	0.0	0.00	0.00	0.00	69.5
North: Reserve Rd (N)												
8	T1	1186	3.0	0.312	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	69.9
9	R2	16	3.0	0.022	9.7	LOS A	0.1	0.6	0.54	0.71	0.54	44.7
Approach		1202	3.0	0.312	0.2	NA	0.1	0.6	0.01	0.01	0.01	69.4
West: Southern Access Rd (W)												
10	L2	7	3.0	0.008	5.9	LOS A	0.0	0.2	0.36	0.54	0.36	46.0
12	R2	2	3.0	0.079	125.3	LOS F	0.2	1.4	0.97	0.99	0.97	7.6
Approach		9	3.0	0.079	32.4	LOS D	0.2	1.4	0.50	0.64	0.50	25.2
All Vehicles		1843	3.0	0.312	0.3	NA	0.2	1.4	0.01	0.01	0.01	68.9

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2032_BG+DEV_AM]

Priority-controlled intersection (future): Reserve Road/Southern Access Road
Prepared by: MC
Reviewed by: KS
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Reserve Rd (S)												
1	L2	4	3.0	0.240	6.4	LOS A	0.0	0.0	0.00	0.01	0.00	31.6
2	T1	914	3.0	0.240	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	69.8
Approach		918	3.0	0.240	0.0	NA	0.0	0.0	0.00	0.00	0.00	69.6
North: Reserve Rd (N)												
8	T1	808	3.0	0.213	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	69.9
9	R2	17	3.0	0.031	11.8	LOS B	0.1	0.8	0.65	0.81	0.65	42.3
Approach		825	3.0	0.213	0.3	NA	0.1	0.8	0.01	0.02	0.01	69.1
West: Southern Access Rd (W)												
10	L2	65	3.0	0.078	6.8	LOS A	0.3	2.0	0.46	0.67	0.46	45.0
12	R2	17	3.0	0.269	67.3	LOS F	0.8	5.5	0.96	1.00	1.03	12.6
Approach		82	3.0	0.269	19.2	LOS C	0.8	5.5	0.56	0.73	0.58	32.4
All Vehicles		1825	3.0	0.269	1.0	NA	0.8	5.5	0.03	0.04	0.03	66.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2032_BG+DEV_PM]

Priority-controlled intersection (future): Reserve Road/Southern Access Road
Prepared by: MC
Reviewed by: KS
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Reserve Rd (S)												
1	L2	15	3.0	0.172	6.4	LOS A	0.0	0.0	0.00	0.03	0.00	31.4
2	T1	644	3.0	0.172	0.0	LOS A	0.0	0.0	0.00	0.01	0.00	69.6
Approach		659	3.0	0.172	0.1	NA	0.0	0.0	0.00	0.01	0.00	68.4
North: Reserve Rd (N)												
8	T1	1194	3.0	0.314	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	69.9
9	R2	57	3.0	0.077	9.8	LOS A	0.3	2.1	0.55	0.77	0.55	44.6
Approach		1251	3.0	0.314	0.5	NA	0.3	2.1	0.03	0.03	0.03	68.3
West: Southern Access Rd (W)												
10	L2	24	3.0	0.025	5.9	LOS A	0.1	0.6	0.37	0.57	0.37	45.9
12	R2	6	3.0	0.159	90.4	LOS F	0.4	3.0	0.97	0.99	0.98	10.0
Approach		31	3.0	0.159	23.4	LOS C	0.4	3.0	0.49	0.66	0.49	29.7
All Vehicles		1940	3.0	0.314	0.7	NA	0.4	3.0	0.02	0.04	0.02	67.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

APPENDIX D

Code Assessments

City Plan code template

This code template supports the preparation of a development application against either the acceptable outcome(s) or performance outcome(s) contained in the code. Development assessment rules are outlined in **Section 5.3.3** of the City Plan.

Please note:

For assessment against the overall outcomes, refer to the appropriate code.

Note: The whole of the planning scheme is identified as the assessment benchmark for impact assessable development. This specifically includes assessment of impact assessable development against this strategic framework. The strategic framework may contain intentions and requirements that are additional to and not necessarily repeated in zone, overlay or other codes. In particular, the performance outcomes in zone codes address only a limited number of aspects, predominantly related to built form. Development that is impact assessable must also be assessed against the overall outcomes of the code as well as the strategic framework.

9.4.2 Driveways and vehicular crossings code

9.4.2.1 Application

This code applies to assessing operational work for vehicle crossing works and material change of use for any development involving vehicle access or driveway works where indicated within **Part 5 Tables of assessment**.

When using this code, reference should be made to **Section 5.3.2** and, where applicable, **Section 5.3.3,** in **Part 5**.

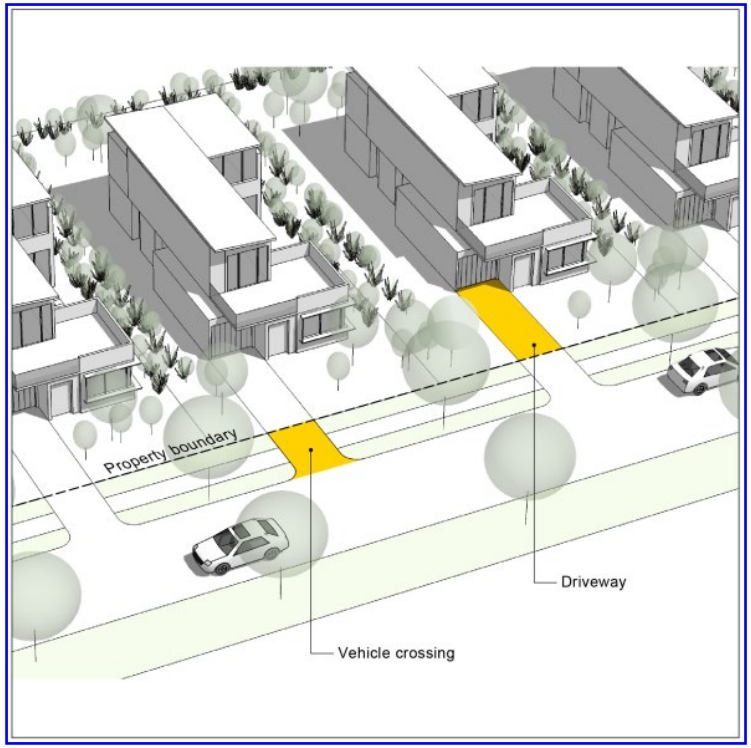


Figure 9.4.2-1
Illustration showing driveway and vehicle crossing for access to parking spaces

9.4.2.2 Purpose

(1) The purpose of the Driveways and vehicular crossings code is to provide design standards for the construction, repair or modification to a driveway and/or a vehicular crossing and to ensure that the decisions are compatible.

(2) The purpose of the code will be achieved through the following overall outcomes:

(a) Vehicular crossings provide safe access from the edge of the road carriageway to the property boundary.

(b) Vehicular crossings are located and constructed to avoid adverse impacts on City or utility infrastructure.

(c) Vehicular crossings are constructed to a standard that is consistent with a standard vehicle.

(d) Vehicular crossings are designed to ensure that there is minimal loss of on-street car parking spaces.

(e) Driveways provide safe access from the property boundary to the on-site vehicle accommodation or standing area.

(f) Driveways are located to ensure damage to existing street trees located within the verge is avoided.

(g) Driveways are located to retain space for the future planting of street trees.

(h) The construction, location and design of vehicular crossings and driveways prevent interference with the safe movement of vehicles or the safe use of the footpath to maintain the amenity of the area.

(i) The design and construction of the driveway and vehicular crossing are such that vertical and horizontal alignments provide a continuous, smooth access of good rideability and clearance for vehicles and driveway and vehicular crossing do not cause adverse stormwater drainage impacts.

9.4.2.3 Specific benchmarks for assessment

Table 9.4.2-3: Driveways and vehicular crossings code – assessable development for driveways

Performance outcomes	Acceptable outcomes	Does the proposal meet the acceptable outcome? If not, justify how the proposal meets either the performance outcome or overall outcome	Internal use
Location			
PO1 The location of the driveway is considered at the design stage of the development to ensure it does not unnecessarily damage street trees and allows space for the planting of street trees within the verge.	**AO1** The design of the driveway: (a) does not cause damage to street trees in the verge; and (b) retains space for the planting of street trees within the verge.	**COMPLIES WITH AO1** Location of driveways provides sufficient spacing in which to plant street trees within the verge.	
Design			

<table>
<tr><th>Performance outcomes</th><th>Acceptable outcomes</th><th>Does the proposal meet the acceptable outcome?
If not, justify how the proposal meets <u>either</u> the performance outcome or overall outcome</th><th>Internal use</th></tr>
<tr><td rowspan="4">PO2
The driveway is designed and constructed to ensure:
(a) safe access for a B85 vehicle (AS/NZS 2890(Set):2009 Parking Facilities Set) from the property boundary to the on-site vehicle accommodation or standing area;
(b) it does not cause adverse stormwater drainage impacts on or off the site; and
(c) safe pedestrian movement in the proximity of the site.</td><td>AO2
The driveway is designed in accordance with the following design standards:
<table><tr><th>Land use</th><th>Design standard</th></tr><tr><td>• Dual occupancy
• Dwelling house
• Multiple dwellings (where the development is for townhouses)</td><td>Queensland Development Code – NMP 1.1 - Driveways</td></tr><tr><td>All other land uses</td><td>AS/NZS 2890.1:2004 – Parking facilities – Part 1: Off-street car parking</td></tr></table></td><td rowspan="4">COMPLIES WITH PO2 AND GENERALLY WITH AO2
The design of crossovers and driveways is to be in accordance with NMP 1.1 - Driveways of the Queensland Development Code.</td><td></td></tr>
<tr><td></td></tr>
<tr><td></td></tr>
<tr><td>OR
Where particularly restrictive physical conditions exist and the above standard arrangements are not attainable, the design and construction of the proposed driveway is certified by a RPEQ having regard to the following:
(a) Disability Discrimination Act 1992;
(b) AS/NZS 2890.1:2004 Parking facilities Part 1:Off-street car parking;
(c) QUDM; and
(d) Good engineering practice.</td><td></td></tr>
</table>

Table 9.4.2-4: Driveways and vehicular crossings code – assessable development for vehicular crossings

Performance outcomes	Acceptable outcomes	Does the proposal meet the acceptable outcome? **If not, justify how the proposal meets <u>either</u> the performance outcome or overall outcome**	Internal use
Construction of vehicular crossings			
PO1 The vehicle crossing is designed and constructed to ensure: (a) safe access for a B85 vehicle (*AS/NZS 2890(Set):2009 Parking Facilities Set*) from the road carriageway to the property boundary; (b) it does not cause adverse stormwater drainage impacts on or off the site; and (c) safe pedestrian movement in the proximity of the site.	**AO1** Prior to the use commencing a vehicular crossing is constructed to provide access from the road to the property. Either: (a) The vehicular crossing is designed and constructed in accordance with the relevant vehicular crossing standards drawing in **SC6.11City Plan policy – Land development guidelines, Section 2 – Transport network standards**; or (b) where particularly restrictive physical conditions exist and the above standard arrangements are not attainable, the design and construction of the proposed vehicular crossing is certified by a RPEQ having regard to the following: (i) *Disability Discrimination Act 1992*; (ii) *AS/NZS 2890.1:2004 Parking facilities Part 1: Off-street car parking*; (iii) *QUDM*; and (iv) Good engineering practice.	**COMPLIES WITH PO1 AND GENERALLY WITH A01** All crossovers are to be designed and constructed in accordance with either AS2890.1 and/or the IPWEA standard prescribed in SC6.11. See SLR Traffic Statement.	
PO2 Location and construction of the vehicular crossing avoids damage to utility services, pathways, kerbs, road pavement and seal and other municipal infrastructure.	**AO2** The vehicular crossing is designed and constructed in accordance with the relevant vehicular crossing standards in **SC6.11 City Plan policy – Land development guidelines, Section 2 – Transport network standards.**	**COMPLIES WITH PO2 AND GENERALLY WITH AO2** All driveways are to be designed in accordance with *NMP1.1 - Driveways* of the Queensland Development Code and IPWEA sketch RS-049. See SLR Traffic Statement.	

<table>
<tr><th>Performance outcomes</th><th>Acceptable outcomes</th><th>Does the proposal meet the acceptable outcome?
If not, justify how the proposal meets either the performance outcome or overall outcome</th><th>Internal use</th></tr>
<tr><td colspan="4">Maximum number of vehicular crossings per site</td></tr>
<tr><td>PO3
The number of vehicular crossings per site are minimised to avoid the loss of on-street car parking spaces and to prevent adverse interference with:
(a) the safety, capacity and operations of the existing or planned road network;
(b) the proposed driveway; and
(c) cycleways or pedestrian footpaths.</td><td>AO3
The maximum number of vehicular crossings per site, for the following land uses, is as follows:<table><tr><th>Land use</th><th>Maximum number of vehicular crossings per site</th></tr><tr><td>Dwelling house</td><td>1
OR
2 - when the road frontage at the kerb is at least 40m</td></tr><tr><td>Dual occupancy
Multiple dwelling</td><td>1
OR
2 - where the road frontage at the kerb is greater than 20m</td></tr><tr><td>Non–residential use</td><td>2</td></tr></table></td><td>COMPLIES WITH AO3
Only one vehicular crossing is proposed for each lot within the subject development.
See SLR Traffic Statement.</td><td></td></tr>
<tr><td colspan="4">Separation distances</td></tr>
<tr><td>PO4
Vehicular crossings are appropriately separated from other vehicular crossings and side property boundaries to prevent interference with:
(a) the safety, capacity and operations of the existing or planned road network;
(b) adjoining properties; and
(c) cycleways or pedestrian footpaths.</td><td>AO4
Vehicular crossings are separated from:<table><tr><th>Instance</th><th>Minimum distance (m)</th></tr><tr><td>Any other vehicular crossing</td><td>3m</td></tr><tr><td>Any side property boundary:
• for residential development of 2 dwellings or less</td><td>1.5m</td></tr><tr><td>• All other development</td><td>2m</td></tr></table></td><td>COMPLIES WITH PO4 AND GENERALLY WITH A04
Sufficient lot geometry is provided to facilitate the location of vehicular crossings in compliance with AO4.
See SLR Traffic Statement.</td><td></td></tr>
</table>

Performance outcomes	Acceptable outcomes	Does the proposal meet the acceptable outcome? **If not, justify how the proposal meets <u>either</u> the performance outcome or overall outcome**	Internal use
Location			
PO5 Vehicle access to a public roadway is safe and does not compromise the efficiency, function, convenience of use or capacity of the road network.	**AO5.1** The location of the vehicular crossing to a public roadway is consistent with *AS/NZS2890.1:2004 Parking facilities Part 1: Off-street car parking* and *AS2890.2 – 2002 Parking facilities Part 2: Off-street commercial vehicle facilities*.	**COMPLIES WITH AO5.1** All vehicular crossings joining a public roadway are designed fully in accordance with AS2890.1. See SLR Traffic Statement.	
	AO5.2 No new vehicular crossings are created on roads identified on the **Functional Road Hierarchy** as shown on the Zone maps or **the Pacific motorway service road types overlap map.**	**COMPLIES WITH AO5.2** No new vehicular crossings are proposed on roads identified on the *Functional Road Hierarchy* as shown on the zoning maps or the *Pacific motorway service road types overlap map*.	
PO6 Vehicular crossings are located to: (a) avoid damage to existing street trees located within the verge; and (b) retain space for the future planting of street trees within the verge.	**AO6** No acceptable outcome provided.	**COMPLIES WITH PO6** Location of driveways provides sufficient spacing in which to plant street trees within the verge.	
Sight distances and lines			
PO7 Vehicular crossings are designed to prevent conflict between vehicles with cyclists and pedestrians.	**AO7.1** Safe sight distances are provided, based on the vehicle speed at the vehicular crossing. **Note: This AO does not apply to the following uses:** • **Dwelling house;** • **Secondary dwelling;** • **Dual occupancy; or** • **Multiple dwelling (where there are 3 dwellings or less).**	**NOT APPLICABLE** This Acceptable Outcome is not applicable for dwelling house developments.	

Performance outcomes	Acceptable outcomes	Does the proposal meet the acceptable outcome? **If not, justify how the proposal meets <u>either</u> the performance outcome or overall outcome**	Internal use
	AO7.2 Vehicular crossings are designed to provide safe sight lines for vehicles exiting the vehicular crossing in accordance with *AS2890.2-2002 Parking facilities Part 2: Off-street commercial vehicle facilities*. Where no service vehicle is required to access the site, including waste collection, the requirements for sight lines at the vehicular crossing are in accordance with *AS/NZS 2890.1:2004 Parking facilities Part 1: Off-street car parking*. **Note: This AO does not apply to the following uses:** • **Dwelling house;** • **Secondary dwelling;** • **Dual occupancy; or** • **Multiple dwelling (where there are 3 dwellings or less).**	**NOT APPLICABLE** This Acceptable Outcome is not applicable to dwelling house developments.	

City Plan code template

This code template supports the preparation of a development application against either the acceptable outcome(s) or performance outcome(s) contained in the code. Development assessment rules are outlined in **Section 5.3.3** of the City Plan.

Please note:

For assessment against the overall outcomes, refer to the appropriate code.

Note: The whole of the planning scheme is identified as the assessment benchmark for impact assessable development. This specifically includes assessment of impact assessable development against this strategic framework. The strategic framework may contain intentions and requirements that are additional to and not necessarily repeated in zone, overlay or other codes. In particular, the performance outcomes in zone codes address only a limited number of aspects, predominantly related to built form. Development that is impact assessable must also be assessed against the overall outcomes of the code as well as the strategic framework.

9.4.4 General development provisions code

9.4.4.1 Application

The code applies to assessing material change of use, building work, reconfiguring a lot or operational work where indicated within **Part 5 Tables of assessment**.

When using this code, reference should be made to **Section 5.3.2** and, where applicable, **Section 5.3.3,** in **Part 5**.

9.4.4.2 Purpose

(1) The purpose of the General development provisions code is to provide a consistent approach to city wide issues and avoid duplication of regulation throughout the City Plan.

(2) The purpose of the code will be achieved through the following overall outcomes:

- (a) Development is designed to maintain the expected level of amenity for the area.
- (b) Development promotes a safe environment and reduces the potential for crime.
- (c) Development is designed to respect the natural values of the land, including vegetation, natural topography and development on steep slopes to minimise impacts on the landscape character of the city's rural, urban and hinterland areas.
- (d) Development does not result in unsightly retaining walls.
- (e) Building services and storage areas are designed and located to avoid nuisance to adjoining premises and avoid an unattractive appearance when viewed from the street.
- (f) Development does not cause adverse stormwater drainage impacts on or off the site.
- (g) Development is connected to essential services and public utilities in accordance with infrastructure provider requirements.

(h) Development is designed and located to ensure it does not adversely impact on Council infrastructure.

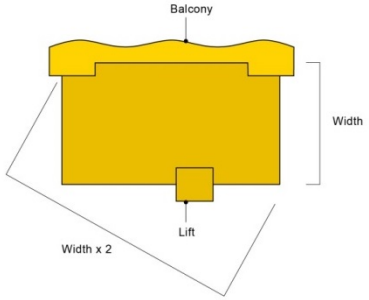
9.4.4.3 Specific benchmarks for assessment

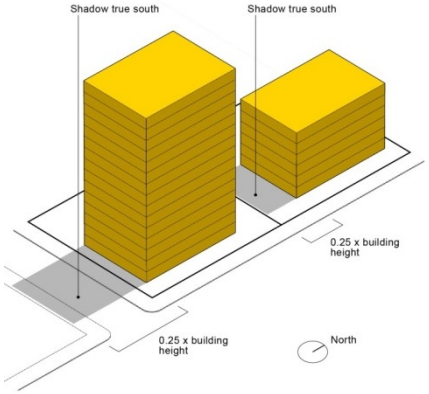
Table 9.4.4-2: General development provisions code – for assessable development

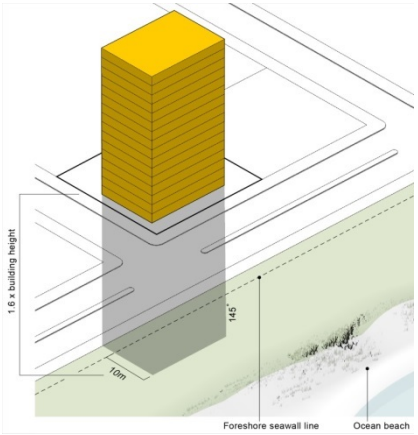
Performance outcomes	Acceptable outcomes	Does the proposal meet the acceptable outcome? If not, justify how the proposal meets either the performance outcome or overall outcome	Internal use
Amenity protection			
PO1 Development mitigates any negative effects to amenity, health and safety from existing surrounding activities having regard to: (a) noise; (b) hours of operation; (c) traffic; (d) signage; (e) visual amenity; (f) wind effects; (g) privacy; (h) vibration; (i) contaminated substances; (j) hazardous chemicals; (k) odour and emissions; and (l) safety.	**AO1** No acceptable outcome provided.	**COMPLIES WITH PO1** The subject development is not projected to result in any unreasonable local traffic effects beyond those primarily caused by growth in background traffic.	
PO2 The proposed development prevents loss of amenity and threats to health and safety, having regard to: (a) noise; (b) hours of operation; (c) traffic; (d) signage;	**AO2** No acceptable outcome provided.	**COMPLIES WITH PO2** The subject development has been designed to prevent or mitigate any loss of amenity with regard to traffic. The subject development is not projected to result in any unreasonable local traffic effects beyond those primarily caused by growth in background traffic.	

Performance outcomes	Acceptable outcomes	Does the proposal meet the acceptable outcome? If not, justify how the proposal meets either the performance outcome or overall outcome	Internal use
(e) visual amenity; (f) wind effects; (g) privacy; (h) vibration; (i) contaminating substances; (j) hazardous chemicals; (k) odour and emissions; and (l) safety.			
Development along the Pacific Motorway and heavy railway line			
PO3 Development adjacent to the Pacific Motorway and heavy railway line minimises views of the storage of outdoor plant and equipment, including service areas to provide an attractive outlook for persons using the transport network.	**AO3** Where the site is adjacent to the Pacific Motorway or a heavy rail line, areas used for outdoor storage, including service areas are screened from view from users of the motorway or heavy rail line by buildings, solid fencing or vegetation.	**TO BE ADDRESSED BY OTHERS** Screening and other such treatments are beyond the scope of the traffic engineering assessment.	
Landscaping			
PO4 The proposal provides landscape work that protects and enhances the character of the local area.	**AO4.1** For all development except dwelling houses, dual occupancies, caretaker's accommodation and community residences a Statement of Landscape Intent prepared in accordance with **SC6.12 City Plan policy – Landscape work** demonstrating that the landscaping will provide amenity for site users and will protect and enhance the character of the local area. **AO4.2** An Open Space Management Statement is prepared in accordance with **SC6.12 City Plan policy – Landscape work** where landscape works are proposed to be undertaken	**TO BE ADDRESSED BY OTHERS** Landscaping and other similar treatments is beyond the scope of the traffic engineering assessment.	

Performance outcomes	Acceptable outcomes	Does the proposal meet the acceptable outcome? **If not, justify how the proposal meets <u>either</u> the performance outcome or overall outcome**	Internal use
	on land that is or is intended to be, public open space.		
Building services			
PO5 All mechanical equipment is located and housed so as not to cause disturbance to residents within or adjoining the development.	**AO5** **For all development except dwelling houses, dual occupancies, caretaker's accommodation and community residences:** The mechanical equipment, including air-conditioning plant and swimming pool pumps, is incorporated within the building. OR The mechanical equipment, including air-conditioning plant and swimming pool pumps, is housed external to the principal building and: (a) is contained within a solid structure; and (b) located no closer than 1.5m to any site boundary.	**NOT APPLICABLE** This Acceptable Outcome is not applicable for dwelling house developments.	
Casual surveillance and lighting			
PO6 Development facilitates casual surveillance of public areas and incorporates lighting to reduce opportunities for crime.	**AO6** No acceptable outcome provided.	**COMPLIES WITH PO6** Residential dwellings are located with oversight of fronting public road that should be lighted to the appropriate vehicle and/or pedestrian standard.	
Lighting			
PO7 Lighting associated with any development does not cause a nuisance.	**AO7** Direct or reflected light emissions from the premises must be positioned and shielded to prevent light spillage outside the boundaries of the site.	**TO BE ADDRESSED BY OTHERS** Lighting or lighting emissions are beyond the scope of the traffic engineering assessment.	

Performance outcomes	Acceptable outcomes	Does the proposal meet the acceptable outcome? **If not, justify how the proposal meets <u>either</u> the performance outcome or overall outcome**	Internal use
Shadow impacts – for all development 3 or more storeys			
PO8 The building is designed and located to ensure that the shadow cast by the building does not detract from a comfortable living and ground level environment and the access of adequate sunlight to private and public spaces having regard to: (a) the degree of containment of the shadow on the subject site at different times of the day on the summer and winter solstice and spring and autumn equinox; (b) the cumulative impact of the shadow and existing shadows; (c) the effect of the shadow on the ocean beach, Broadwater foreshore, or riverside or beachside public open space; (d) the location of the shadow on non-residential areas external to the site; and (e) the effect of the shadow on any other site or other building.	**AO8.1** The width of the shadow cast in any direction by each level of the building, excluding balconies and lift wells, does not exceed twice the width of the shadow cast in any other direction.  **Figure 9.4.4-1** Illustration showing width ratio shadow outcome	**TO BE ADDRESSED BY OTHERS** Shadow impacts are beyond the scope of the traffic and transport assessment.	
	AO8.2 The shadow cast by the building in a true south direction has a length 0.25 times the height of the building, as measured from ground level adjacent to the southern side of the subject building to the top of the topmost storey, and does not intrude onto any other site, or does not cast shadow onto any other building on the same site.		

Performance outcomes	Acceptable outcomes	Does the proposal meet the acceptable outcome? **If not, justify how the proposal meets <u>either</u> the performance outcome or overall outcome**	Internal use
	 **Figure 9.4.4-2** Illustration showing southern shadow outcome		
	AO8.3 **Bermuda Point precinct** The shadow cast by the building in a true south direction has a length 0.25 times the height of the building, as measured from the top of the podium adjacent to the southern side of the subject building to the top of the topmost storey, and does not intrude onto any other site, or does not cast shadow onto any other building on the same site. **Note: The podium is excluded from any southern shadow calculations.**		
	AO8.4 The shadow cast by any building does not cover any part of the ocean beach or Broadwater foreshore when the shadow has a bearing of 145° east of true north and the length of the shadow is 1.6 times the height of the building as		

Performance outcomes	Acceptable outcomes	Does the proposal meet the acceptable outcome? If not, justify how the proposal meets either the performance outcome or overall outcome	Internal use
	measured from the ground level to the top of the topmost storey. **Note: For the purpose of this acceptable outcome, the ocean beach is defined as that area east of a line 10m east of and parallel to the foreshore seawall line and the Broadwater foreshore is defined as that area east of the leading edge of the revetment wall.**  **Figure 9.4.4-3** Illustration showing ocean beach and Broadwater foreshore shadow outcome		
	AO8.5 The shadow cast by the building in the direction of true south does not intrude more than 10m into a riverside public open space reserve.		
Earthworks and treatment of retaining walls			
PO9 Earthworks and retaining walls associated with the development do not	**AO9** Retaining walls and batters comply with the requirements of **SC6.11 City Plan**	**TO BE ADDRESSED BY OTHERS** The design and construction of earthworks, including retaining walls and batters, is beyond the scope of the	

Performance outcomes	Acceptable outcomes	Does the proposal meet the acceptable outcome? If not, justify how the proposal meets either the performance outcome or overall outcome	Internal use
create a negative visual impact upon neighbouring properties or the streetscape.	**policy – Land development guidelines, Section 3 – Change to ground level standards**.	traffic engineering assessment.	
Stormwater drainage			
PO10 Development does not cause adverse stormwater drainage impacts on or off the site.	**AO10** All development incorporates stormwater drainage works to comply with the requirements of **SC6.11 City Plan policy – Land development guidelines, Section 4 – Stormwater drainage and water sensitive urban design standards**.	**TO BE ADDRESSED BY OTHERS** Stormwater drainage is beyond the scope of the traffic engineering assessment.	
Infrastructure			
PO11 All development ensures connection to public utilities to meet the needs of the development, including sewer, water, electricity and communications services.	**AO11** All development is provided with services, as follows: (a) electricity supply and communication services (b) reticulated water supply, when within the mapped 'water supply service area' identified in the Local government infrastructure plan, and not located in the Conservation, Extractive industry, Major tourism (Island resorts precinct), Open space or Rural zones (c) reticulated sewer network, when within the mapped 'wastewater service area' identified in the Local government infrastructure plan, and not located in the Conservation, Extractive industry, Major tourism (Island resorts precinct), Open space, Rural or Rural residential zones.	**TO BE ADDRESSED BY OTHERS** The connection and provision of public utility infrastructure is beyond the scope of the traffic engineering assessment.	

Performance outcomes	Acceptable outcomes	Does the proposal meet the acceptable outcome? **If not, justify how the proposal meets <u>either</u> the performance outcome or overall outcome**	Internal use
PO12 Development is undertaken in accordance with the Performance Criteria specified in the *Queensland Development Code MP1.4 – Building over or near relevant infrastructure.*	**AO12** Development is undertaken in accordance with the Acceptable Solutions specified in the *Queensland Development Code MP1.4 – Building over or near relevant infrastructure*.	**TO BE ADDRESSED BY OTHERS** Compliance with the provisions of *MP1.4 - Building over or near relevant infrastructure* within the Queensland Development Code is beyond the scope of the traffic engineering assessment.	
Site analysis			
PO13 Development is designed to: (a) complement the character and address any impacts on the amenity and environment of the local area; (b) avoid any risk to life or property arising from natural hazards; and (c) protect significant natural habitat areas, wildlife corridors, wetlands and waterway corridors.	**AO13** A site analysis plan is prepared in accordance with **SC6.13 City Plan policy – Site analysis**.	**TO BE ADDRESSED BY OTHERS** Site analysis with respect to character, natural hazards, environment or amenity is beyond the scope of the traffic engineering assessment.	

City Plan code template

This code template supports the preparation of a development application against either the acceptable outcome(s) or performance outcome(s) contained in the code. Development assessment rules are outlined in **Section 5.3.3** of the City Plan.

Please note:

For assessment against the overall outcomes, refer to the appropriate code.

Note: The whole of the planning scheme is identified as the assessment benchmark for impact assessable development. This specifically includes assessment of impact assessable development against this strategic framework. The strategic framework may contain intentions and requirements that are additional to and not necessarily repeated in zone, overlay or other codes. In particular, the performance outcomes in zone codes address only a limited number of aspects, predominantly related to built form. Development that is impact assessable must also be assessed against the overall outcomes of the code as well as the strategic framework.

9.4.8 Reconfiguring a lot code

9.4.8.1 Application

This code applies to assessing reconfiguring a lot for development where indicated within **Part 5 Tables of assessment**.

When using this code, reference should be made to **Section 5.3.2** and, where applicable, **Section 5.3.3,** in **Part 5**.

9.4.8.2 Purpose

(1) The purpose of the Reconfiguring a lot code is to ensure that the reconfiguring a lot lays the foundations for high-quality urban design that supports the outcomes for the zone and is sensitive to the environment, topography and landscape features.

(2) The purpose of the code will be achieved through the following overall outcomes:

- (a) Subdivisions provide a range of lot sizes and frontages to facilitate:
  - (i) different development expected in the zone;
  - (ii) on-street parking which generally caters for demand within the street; and
  - (iii) public utilities and street trees.
- (b) Reconfiguring a lot allows for increased yields in close proximity to public transport, retail, commercial, community, and recreation facilities.
- (c) Reconfiguring a lot where creating small lots, demonstrates a Dwelling house can be accommodated, where it meets the relevant zone code and the Small lot housing (infill focus) code, through:
  - (i) a site plan for all lots with an area of 250m^2 to 400m^2; and
  - (ii) site plan, floor plan and elevations for all lots with an area less than 250m^2.

(d) Reconfiguring a lot results in safe and interconnected streets that promote the use of public transport, walking and cycling.

(e) Reconfiguring a lot within the Coomera Town Centre area provides an integrated network of predominantly public streets to ensure efficient movement of pedestrians, cyclists, vehicles and strong public transport connections.

Note: Indicative access and mobility outcomes for the Coomera Town Centre area are identified on Figure 9.4.13-2 Coomera Town Centre Indicative Access and Mobility within Part 9.4.13 Transport code.

(f) Reconfiguring a lot results in lot configuration and orientation to facilitate climatically responsive site design.

(g) Reconfiguring a lot takes into account the physical, environmental and infrastructure constraints, creating lots that respond to the natural topography of the land by minimising the extent of earthworks required.

(h) Reconfiguring a lot contributes to the provision of a safe, accessible, convenient and useable network of open space for local communities.

(i) Reconfiguring a lot provides for community infrastructure and other non-residential activities to support the local neighbourhood, commensurate with the stages of development.

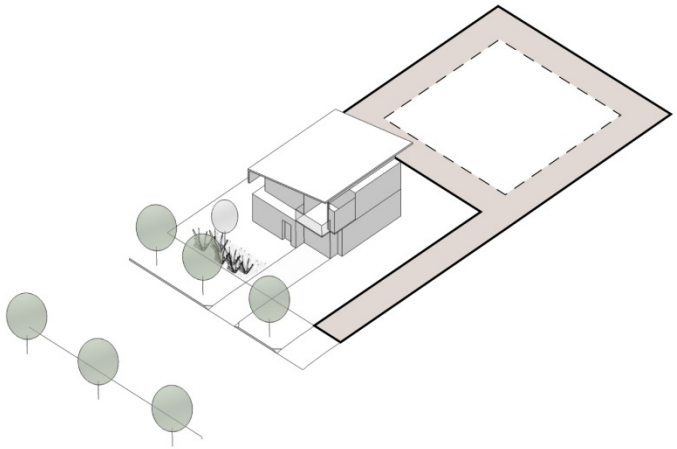
(j) Reconfiguring a lot ensures that new lots are connected to essential services and public utilities to meet the demand of end users whilst minimising risk of failure or environmental harm.

(k) Where necessary, new lots are provided with on-site sewerage facilities that are appropriately sited to respond to on and off site constraints.

9.4.8.3 Specific benchmarks for assessment

Table 9.4.8-1: Reconfiguring a lot code – for assessable development

Performance outcomes	Acceptable outcomes	Does the proposal meet the acceptable outcome? If not, justify how the proposal meets either the performance outcome or overall outcome	Internal use
Reconfiguration of sloping lots			
PO1 Where the development is for residential uses and would result in allotments with an average finished slope that exceeds 10%: (a) earthworking provides for finished ground levels that facilitate development of the allotments for the intended purpose and its related/ancillary areas (e.g. areas of useable private open space) without the need to provide additional retaining walls; and (b) earthworking is undertaken in a way that provides good quality amenity outcomes for future lot users and to the public realm. **Note: an earthworking plan illustrating compliance with the above components is Council's preferred method of addressing the above.**	**AO1** Allotments have an average finished slope less than 10%.	**TO BE ADDRESSED BY OTHERS** Lot gradients are beyond the scope of the traffic and transport assessment.	

Performance outcomes	Acceptable outcomes	Does the proposal meet the acceptable outcome? **If not, justify how the proposal meets <u>either</u> the performance outcome or overall outcome**	Internal use
Additional provisions for creation of rear lots in residential zones			
PO2 Reconfiguration of a lot that creates a rear lot: (a) does not result in unreasonable amenity impacts for adjoining lots by limiting the number of rear lots to one; (b) protects the safety of pedestrians and cyclists by ensuring that access strips to the road frontage are designed to maintain visibility to the verge; (c) provides an adequate internal manoeuvring area for vehicles to exit the rear lot in a forward gear; and (d) allows sufficient street frontage for waste collection.	**AO2.1** The rear lot has the same width as the lot it is positioned behind.	**TO BE ADDRESSED BY OTHERS** The provision and design of rear lots is beyond the scope of the traffic and transport assessment.	
	AO2.2 Only one rear lot is created.		
	AO2.3 The rear lot is created for a dwelling house.		
 **Figure 9.4.8-1** Illustration showing the Reconfiguring a lot outcomes for creation of rear lots in residential zones			

Performance outcomes	Acceptable outcomes	Does the proposal meet the acceptable outcome? **If not, justify how the proposal meets <u>either</u> the performance outcome or overall outcome**	Internal use
Road access			
PO3 Lot configuration provides safe and efficient access for vehicles and pedestrians.	**AO3** All lots have legal road access in accordance with **SC6.11 City Plan policy – Land development guidelines, Section 2 – Transport network standards**.	**COMPLIES WITH AO3** Lot configuration and road access to all lots is provided in accordance with the relevant standards specified within *SC6.11 City Plan policy - Land development guidelines, Section 2 - Transport network standards.* See SLR Transport Statement.	
PO4 The widths of access strips and easements provide safe and efficient access for vehicles and pedestrians.	**AO4** Minimum widths for access strips and easements comply with **Table 9.4.8-2: Minimum width of access strips or easements**.	**COMPLIES WITH AO4** Access strips for Lot 48 and between Lots 28 and 29 both comply with the minimum width for access strips specified for rural residential and low density residential zones. See SLR Transport Statement.	
Infrastructure			
PO5 New lots are created with provision of essential services and public utilities, including sewerage, water, electricity and communication services that are designed and located to: (a) meet the needs of users; (b) enhance the health, safety and convenience of the community; (c) be cost effective over their life-cycle; (d) minimise adverse impacts to the environment (including the amenity of the local area); (e) minimise risk of failure or damage during a natural hazard event; and (f) support connection to fibre telecommunication infrastructure.	**AO5.1** All lots are connected to electricity supply and telecommunications services, with the telecommunications infrastructure designed to support connection to fibre telecommunications infrastructure.	**TO BE ADDRESSED BY OTHERS** Provision of services/utilities and associated infrastructure is beyond the scope of the traffic and transport assessment.	
	AO5.2 Electricity supply and telecommunications infrastructure are provided underground, where the development involves the creation of more than five lots, five dwellings, or five tenancies, except in the Rural zone.		
	AO5.3 All new lots within the Local government infrastructure plan boundary are connected to reticulated water supply in accordance with **SC6.11 City Plan policy – Land**		

Performance outcomes	Acceptable outcomes	Does the proposal meet the acceptable outcome? If not, justify how the proposal meets either the performance outcome or overall outcome	Internal use
	development guidelines, Section 6 – Water supply and sewerage reticulation standards, except in the Extractive industry, Rural and Conservation zones.		
	AO5.4 All new lots within the Local government infrastructure plan boundary are connected to reticulated sewerage in accordance with **SC6.11 City Plan policy – Land development guidelines, Section 6 – Water supply and sewerage reticulation standards**, except in the Extractive industry, Rural and Conservation zones, and those lands within the Rural residential zone unless specifically stated in the Rural residential zone code.		
	AO5.5 On-site water supply is provided in accordance with **SC6.11 City Plan policy – Land development guidelines, Section 6 – Water supply and sewerage reticulation standards** for all new lots created in the Extractive industry, Rural, Rural residential and Conservation zones or in areas outside the Local government infrastructure plan boundary.		
	AO5.6 On-site sewage disposal is provided in accordance with Council's ***Guidelines for the Installation and Operation of Aerobic Wastewater Treatment Plants for Domestic and Small Scale Commercial Users 1995*** and ***AS1547*** for all new lots created in the Extractive industry, Rural, Rural residential and		

Performance outcomes	Acceptable outcomes	Does the proposal meet the acceptable outcome? If not, justify how the proposal meets either the performance outcome or overall outcome	Internal use
	Conservation zones or in areas outside the Local government infrastructure plan boundary.		
On-site sewerage provision			
PO6 The sewerage disposal area is located in a position that is sufficiently separated from adjoining property boundaries and nearby waterways.	**AO6** For development involving on-site sewage disposal, an Effluent Disposal Report prepared by a qualified expert shall be submitted demonstrating that new lots are of a sufficient size and design to allow for the required separation distances of the disposal area from: (a) adjoining property boundaries; (b) adjacent wastewater systems; (c) nearby waterways; (d) inappropriate soil types; and (e) other general site constraints that would inhibit the disposal of wastewater to an acceptable environmental and health standard. **Note: the Effluent Disposal Report shall demonstrate the type, size and location of the effluent disposal and dispersal area, the extent of vegetation clearing that is required to achieve the disposal and dispersal area, and the extent of earthworks required to achieve the effluent disposal.**	**TO BE ADDRESSED BY OTHERS** On-site sewage disposal is beyond the scope of the traffic and transport assessment.	
Rearranging lot boundaries			
PO7	**AO7.1**	**COMPLIES WITH PO7**	

Performance outcomes	Acceptable outcomes	Does the proposal meet the acceptable outcome? **If not, justify how the proposal meets <u>either</u> the performance outcome or overall outcome**	Internal use
Rearranging a lot boundary results in lots which have practical shapes and allow for the intended uses described in the zone. **Note: irregular shaped lots will only be accepted to address encroachments.**	The rearranging of a lot boundary does not restrict the lawful use of either lot.	All proposed lots are practically shaped and sized and support the development of low density residential dwellings as proposed in this application.	
	AO7.2 The rearranging of a lot boundary results in lots which comply with the applicable zone requirements.		
	AO7.3 The rearranging of a lot boundary ensures that a building or structure that is not intended for common use and sharing by a formal title arrangement is not located across a boundary or within a setback.		
Additional provisions for volumetric subdivisions			
PO8 Volumetric subdivision (of the space above or below ground level) facilitates efficient delivery of development and does not result in the creation of parcels that cannot achieve any development rights, or that will not have adequate access to infrastructure. **Note: a Building Management Statement(s) ('BMS') may be conditioned to ensure compliance with this provision. The BMS will be required to note the continuing application of existing development permits.**	**AO8** No acceptable outcome provided.	**TO BE ADDRESSED BY OTHERS** Volumetric subdivision items are beyond the scope of the traffic and transport assessment.	
PO9 The volumetric subdivision does not compromise any of the requirements of the earlier development approval.	**AO9** No acceptable outcome provided.	**TO BE ADDRESSED BY OTHERS** Volumetric subdivision items are beyond the scope of the traffic and transport assessment.	

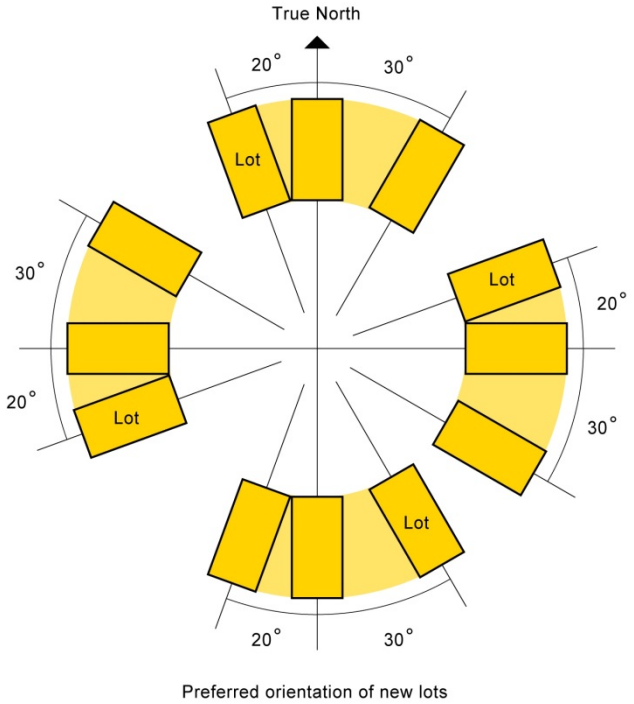
Performance outcomes	Acceptable outcomes	Does the proposal meet the acceptable outcome? **If not, justify how the proposal meets <u>either</u> the performance outcome or overall outcome**	Internal use
PO10 Adequate access to services and facilities is provided for all lots, including water, sewer, access, car parking, etc. in accordance with earlier development approvals. **Note: a Building Management Statement(s) ('BMS') may be conditioned to ensure compliance with this provision. The BMS will be required to note the continuing application of existing development permits.**	**AO10** No acceptable outcome provided.	**COMPLIES WITH PO10** Roads and car parking are sufficient and designed appropriately with respect to City Plan requirements and expected demands.	
Housing diversity			
PO11 Residential subdivisions creating 10 or more lots vary lot sizes to accommodate potential multiple dwelling development where the zone allows.	**AO11** No acceptable outcome provided.	**TO BE ADDRESSED BY OTHERS** Lot distribution, arrangement and sizing is beyond the scope of the traffic and transport assessment.	
PO12 Small lots in residential subdivisions are distributed amongst larger lots to facilitate variation in dwelling form and to meet the purpose of the zone.	**AO12** No acceptable outcome provided.	**TO BE ADDRESSED BY OTHERS** Distribution of lots is beyond the scope of the traffic and transport assessment.	
PO13 Narrow lots are distributed amongst wider lots to provide: (a) variation in dwelling form; (b) space for public utilities and street trees; and (c) on-street parking. **Note: Rear lane layout is required for a series of lots with frontages less than 10m.**	**AO13** No acceptable outcome provided.	**TO BE ADDRESSED BY OTHERS** Distribution of lots is beyond the scope of the traffic and transport assessment.	

Performance outcomes	Acceptable outcomes	Does the proposal meet the acceptable outcome? If not, justify how the proposal meets either the performance outcome or overall outcome	Internal use
Creation of small lots			
PO14 Reconfiguring a lot where creating small lots demonstrates a Dwelling house can be accommodated, where it meets the relevant zone code and the Small lot housing (infill focus) code, through: (a) a site plan for all lots with an area 250m^2 to 400m^2; and (b) site, floor plans, and elevations for all lots with an area less than 250m^2. **Notes:** **(a) PO14 does not apply to the creation of** small lots where associated with an existing residential building. **(b) House plans provided as part of a Reconfiguring a lot application will not be conditioned as part of an approval.**	**AO14** No acceptable outcome provided.	**TO BE ADDRESSED BY OTHERS** Architectural issues associated with the creation of small lots are beyond the scope of the traffic and transport assessment.	
Circulation and street access design			
PO15 An overall street network is provided which: (a) prioritises pedestrians and cycling over motor vehicles; (b) establishes a connected and legible street network; (c) provides a high level of internal accessibility and high-quality external connections for pedestrians and cyclists and appropriate external connections for vehicles; (d) creates safe conditions for pedestrians, cyclists and vehicles for both day and night-time usage; (e) caters for the extension of existing or	**AO15** Streets are designed to: (a) comply with design standards in **SC6.11 City Plan policy – Land development guidelines, Section 2 – Transport network standards**; (b) establish a safe walkable and permeable street network that provides clear pedestrian and cycle access to commercial, public transport, parks and community service areas; (c) provide street trees in accordance with **SC6.12 City Plan policy – Landscape work**; (d) allow for efficient, safe and	**COMPLIES WITH AO15** Complies with parts a, b, d, f, g and i, with the remaining clauses either outside the scope of the traffic and transport assessment or not applicable for the subject development. See SLR Transport Statement.	

Performance outcomes	Acceptable outcomes	Does the proposal meet the acceptable outcome? If not, justify how the proposal meets either the performance outcome or overall outcome	Internal use
future public transport routes to provide services that are convenient and accessible for all the community; (f) facilitates connections for future development, minimising travel distances; (g) are designed to be responsive to the natural contours of the land; (h) facilitates safe and efficient access for service vehicles including refuse collection; and (i) does not compromise future development to achieve the same outcomes listed above.	unimpeded movement of buses alongside pedestrians, cyclists and other motorists; (e) incorporate signals, pedestrian refuge and splitter islands for the safe crossing of pedestrians and cyclists for intersections and long roads; (f) accommodate service vehicle requirements; (g) have footpaths that link to existing footpaths, road crossings, parks and public transport facilities, and designed in accordance with **SC6.11 City Plan policy – Land development guidelines, Section 2 – Transport network standards**; (h) provide street lighting in accordance with **SC6.11 City Plan policy – Land development guidelines, Section 2 – Transport network standards**; and (i) provide for future extensions to the street network.		
PO16 Development within the Coomera Town Centre area provides an integrated network of predominantly public streets to ensure efficient movement of pedestrians, cyclists, vehicles and strong public transport connections. **Note: indicative access and mobility outcomes for the Coomera Town Centre area are identified on Figure 9.4.13-2 within Part 9.4.13 Transport code.**	**AO16** No acceptable outcome provided.	**NOT APPLICABLE** Development is not located within the Coomera Town Centre area.	
Additional provisions for subdivisions which result in the creation of 20 lots or more			

Performance outcomes	Acceptable outcomes	Does the proposal meet the acceptable outcome? If not, justify how the proposal meets either the performance outcome or overall outcome	Internal use
Neighbourhood design, character and integration			
PO17 Development provides a neighbourhood with a strong and positive identity, through: (a) clearly readable streets and useable open space networks; (a) an appropriate response to site characteristics and settings (including landmarks and views); (b) development of a scale consistent with the surrounding urban area, with open space and roads interconnecting to adjoining networks; (c) allowing for increased densities in close proximity to public transport and local services; (d) location of community, retail and commercial facilities at walkable focal points; and (e) providing for a safer community by maximising opportunities for casual surveillance, minimising opportunities for crime and vandalism. **Note: a Comprehensive Plan of Development submitted as part of a material change of use application, prepared in accordance with SC6.6 City Plan policy – Comprehensive plans of development, is Council's preferred method of addressing the above outcomes.**	**AO17** No acceptable outcome provided.	**COMPLIES WITH PO17** Complies with Parts a, b, c. Other items are beyond the scope of the traffic and transport assessment.	

Performance outcomes	Acceptable outcomes	Does the proposal meet the acceptable outcome? **If not, justify how the proposal meets <u>either</u> the performance outcome or overall outcome**	Internal use
Climatically responsive design			
PO18 The street and lot orientation facilitates the construction of energy-efficient buildings that respond to the local climatic conditions by: (a) maximising solar access to the north in winter; (b) minimising solar access to the east and west in the summer; (c) maximising access to any prevailing summer breezes; and (d) minimising exposure to prevailing winter winds.	**AO18.1** A site analysis prepared in accordance with **SC6.13 City Plan policy – Site analysis** identifies how the proposed lot orientation results in the potential for energy efficient buildings that respond to the local climatic conditions.	**TO BE ADDRESSED BY OTHERS** Climatically responsible design and other architectural issues are beyond the scope of the traffic and transport assessment.	
	AO18.2 Roads and lots are generally configured in a grid pattern and run in: (a) north-south direction within 20° west and 30° east of north; and (b) east-west direction within 30° south and 20° north of east.		

Performance outcomes	Acceptable outcomes	Does the proposal meet the acceptable outcome? If not, justify how the proposal meets either the performance outcome or overall outcome	Internal use
 **Figure 9.4.8-2** Illustration showing the Reconfiguring a lot preferred lot orientation outcomes			
Public transport integration			
PO19 Subdivision design supports public transport integration.	**AO19** At least 60% of lots are within 400m walking distance of roads which have a minimum carriageway width of 10m and are capable of supporting a bus route.	**COMPLIES WITH AO19** The proposed development is located within 400m walking distance of Reserve Road, which has a 10m carriageway and currently supports a bus route. It is also anticipated that Baileys Mountain Road will be upgraded in the future, at which point it is also likely to be capable of supporting a bus route.	
Retail and community services			

Performance outcomes	Acceptable outcomes	Does the proposal meet the acceptable outcome? If not, justify how the proposal meets either the performance outcome or overall outcome	Internal use
PO20 Large developments include a site for the location of neighbourhood stores and community facilities to promote a walkable neighbourhood. **Note: an adaptable sales office which is used as a shop after the completion of subdivision sales would satisfy this performance outcome.**	**AO20.1** Lots are allocated and designed to accommodate neighbourhood stores and for community facilities in subdivisions of more than 250 lots.	**NOT APPLICABLE** The subject development does not propose the provision of more than 250 lots, nor lots intended to be used for neighbourhood stores or community facilities.	
	AO20.2 Any lots identified as suitable for neighbourhood stores or community facilities are located in prominent and easily accessible locations within the development.		
Open space provision			
PO21 A public open space network is provided which: (a) has a range of recreation settings and adequate facilities to meet the needs of the community; (b) offers opportunities for residents to conveniently participate in passive recreational activities; (c) delivers well distributed public open space that contributes to the legibility, accessibility, safety, and character of the development; (d) creates safe and attractive settings and focal points; (e) facilitates casual surveillance from adjacent streets and land uses and provides for open space areas with public road frontages; (f) delivers stormwater and flood management and care of valuable environmental resources; and	**AO21.1** Land intended for public open space is of a physical standard and condition in accordance with the **SC6.11 City Plan policy – Land development guidelines, Section 5 – Public open space standards**.	**TO BE ADDRESSED BY OTHERS** The provision of open space is beyond the scope of the traffic and transport assessment.	
	AO21.2 **For trunk recreational open space** Recreation and sporting parklands and land for community facilities are designed and provided in accordance with the Local government infrastructure plan and approved Council master plans. OR Public open space is provided in accordance with an already approved open space strategy, relevant approved material change of use, adopted concept plan, master plan or structure plan.		

Performance outcomes	Acceptable outcomes	Does the proposal meet the acceptable outcome? If not, justify how the proposal meets either the performance outcome or overall outcome	Internal use
(g) is cost effective to maintain.	**AO21.3** **For non-trunk recreational open space** Residential subdivisions creating more than 100 lots provide a minimum of 20m^2 of land per dwelling, for open space that is: (a) within 400m walking distance of all residential lots; and (b) designed to adequately meet the recreational needs of users.		
PO22 The design and location of open space results in high-quality parkland which: (a) enables the retention and protection of matters of environmental significance, their associated buffers, assessable vegetation, habitat features and natural cultural features; (b) contributes to the visual amenity of the area and facilitates casual surveillance; (c) can be easily accessed along road frontages; (d) directly adjoins existing or proposed open space areas; and (e) creates opportunities for linkages between open space areas.	**AO22.1** Open space is provided adjacent to waterway buffers with roads servicing linear parkland, and lots located on the opposite side of the road.	**TO BE ADDRESSED BY OTHERS** The design and location of open space is beyond the scope of the traffic and transport assessment.	
	AO22.2 Open space for conservation purposes is consolidated with other conservation areas to allow for a connected movement corridor.		
	AO22.3 Recreational open space areas less than 5,000m^2 directly adjoin existing or proposed recreational open space areas to provide: (a) a consolidated useable area; and (b) connectivity between open spaces.		
Open space, safety and design			
PO23 Open space areas are designed and managed to promote user safety.	**AO23.1** Areas intended for use during times of darkness are lit in accordance with **SC6.11 City Plan policy – Land development guidelines, Section 5 –**	**TO BE ADDRESSED BY OTHERS** Design and safety factors associated with open space are beyond the scope of the traffic and transport assessment.	

Performance outcomes	Acceptable outcomes	Does the proposal meet the acceptable outcome? If not, justify how the proposal meets either the performance outcome or overall outcome	Internal use
	Public open space standards.		
	AO23.2 Casual surveillance is achieved by parks and open space being overlooked by housing, commercial or other development, as well as passing pedestrian and vehicle traffic.		
	AO23.3 Fencing greater than 1.2m in height adjoining a park is to be at least 50% transparent (i.e. swimming pool style or timber picket fencing) and any landscaping adjacent to the fence is to be designed to maximise the opportunity for casual surveillance.		
Staging of subdivision			
PO24 Staging of the subdivision ensures that safe and convenient access to public transport, open space, community facilities, convenience shopping and local employment opportunities integrate with community need.	**AO24** No acceptable outcome provided.	**NOT APPLICABLE** Development is not expected to be constructed in stages.	

Table 9.4.8-2: Minimum width of access strips or easements

Zone	Minimum width of access strips or easements (metres)
Rural	10
Rural residential	6
Township	4.5
Low density residential	4.5
Medium density residential	4.5
High density residential	6.0
Centre	4.5
Neighbourhood centre	4.5
Mixed use	8
Medium impact industry	8
Low impact industry	8
Extractive industry	10
Waterfront and marine industry	8
Community facilities	4.5
Sport and recreation	4.5
Open space	15
Emerging community	No acceptable outcome provided
Conservation	No acceptable outcome provided
Limited development (constrained land)	No acceptable outcome provided
Special purpose	No acceptable outcome provided
Innovation	4.5
Major tourism	No acceptable outcome provided

City Plan code template

This code template supports the preparation of a development application against either the acceptable outcome(s) or performance outcome(s) contained in the code. Development assessment rules are outlined in **Section 5.3.3** of the City Plan.

Please note:

For assessment against the overall outcomes, refer to the appropriate code.

Note: The whole of the planning scheme is identified as the assessment benchmark for impact assessable development. This specifically includes assessment of impact assessable development against this strategic framework. The strategic framework may contain intentions and requirements that are additional to and not necessarily repeated in zone, overlay or other codes. In particular, the performance outcomes in zone codes address only a limited number of aspects, predominantly related to built form. Development that is impact assessable must also be assessed against the overall outcomes of the code as well as the strategic framework.

9.4.13 Transport code

9.4.13.1 Application

This code applies to assessing a material change of use for all development where indicated within **Part 5 Tables of assessment** unless the development is listed as accepted subject to requirements and is:

(a) establishing in an existing lawful non-residential premises; and

(b) involving:

(i) no building work (other than an internal fit-out); or

(ii) only minor building work; and

(c) the development results in no loss of car parking spaces.

When using this code, reference should be made to **Section 5.3.2** and, where applicable, **Section 5.3.3**, in **Part 5.**

9.4.13.2 Purpose

(1) The purpose of the Transport code is to ensure transport needs associated with the development of land are met.

(2) The purpose of the code will be achieved through the following overall outcomes:

(a) Development –

(i) ensures that onsite access and parking, manoeuvring and servicing areas are designed to result in a safe, pedestrian focussed environment and promote a high quality public realm.

(ii) ensures that onsite access and parking, manoeuvring and servicing areas are designed to result in a functional and efficient site layout that minimises impacts on surrounding areas and traffic movement.

(b) An integrated transport system is provided that:

(i) is convenient, efficient and flexible, being able to accommodate major events and provide a high level of connectivity between all activity centres, urban neighbourhoods, mixed use and industrial areas, inclusive of all modes, including active transport networks;

(ii) supports well designed urban development, which is concentrated within activity centres and urban neighbourhoods, that is easy to access via frequent public transport, walking and cycling, thereby reducing the need to travel by car;

(iii) supports community and privately operated transport services as viable alternatives to the private car;

(iv) reduces congestion and car dependency and significantly increases levels of walking, cycling and public transport use; and

(v) ensures existing and future transport corridors are protected.

(c) Active transport networks are provided that:

(i) are direct, safe, pleasant and comfortable to make walking and cycling an attractive alternative to the car;

(ii) ensure development within centres and urban neighbourhoods, including the light rail corridor have access to high quality active transport infrastructure including paths, bicycle parking and end of trip facilities;

(iii) are directly connected to local attractions and services;

(iv) are clear and easily accessed; and

(v) ensure the active transport infrastructure are completed in the early stages of development.

(d) Public transport networks are provided that:

(i) are of a standard and quality to provide an attractive alternative to the car;

(ii) ensure district and regional level community uses are within walking distance of public transport facilities; and

(iii) are clear and easily accessed.

(e) A road network is provided that:

(i) is developed and managed efficiently and meets the city's needs for the movement of people and goods, and can be safely shared by all users;

(ii) ensures development impacts on amenity caused by traffic and parking is consistent with the community's reasonable expectations for the intended use;

(iii) develops local road networks that are permeable and legible to facilitate a high level of connectivity, are safe and are shared with active and public transport;

(iv) ensures developments are designed for safe and efficient waste collection, carried out with minimal disruption or impact to the road network; and

(v) within the Coomera Town Centre area, provides an integrated network of predominantly public streets to ensure efficient movement of pedestrians, cyclists, vehicles and strong public transport connections that is guided by the indicative access and mobility outcomes in Figure 9.4.13-2 Coomera Town Centre Indicative Access and Mobility..

(f) Major freight corridors and haulage routes:

(i) are protected from incompatible uses and ensure their safe and efficient operation.

(g) Navigable waterways:

(i) support active and public transport facilities in waterfront locations for public water transport and enhance access to the city's waterways.

9.4.13.3 Specific benchmarks for assessment

Table 9.4.13-2: Transport code – for assessable development

<table>
<tr><th>Performance outcomes</th><th colspan="2">Acceptable outcomes</th><th>Does the proposal meet the acceptable outcome?
If not, justify how the proposal meets either the performance outcome or overall outcome</th><th>Internal use</th></tr>
<tr><td colspan="3">Car parking</td><td></td><td></td></tr>
<tr><td rowspan="4">PO1
Development provides off-street car parking to accommodate the parking demand.
OR
Where located in the Centre zone or the Southport Priority Development Area at rates that:
(a) reduce congestion and car dependency;
(b) maximise the efficiency of car parking provided; and
(c) encourage alternative transport options such as walking, cycling and the use of public transport.</td><td colspan="2">AO1
Off- street car parking spaces are provided in accordance with the identified relevant table as follows:</td><td rowspan="4">COMPLIES WITH AO1
Internal car parking spaces are to be provided in accordance with the relevant rate/s specified within Table 9.4.13-3 of the City Plan.</td><td></td></tr>
<tr><td>Location</td><td>Off-street car parking rate</td><td></td></tr>
<tr><td>All zones except:
(a) Centre zone;
(b) High density residential zone (where located in the Transport hub area in Figure 9.4.13-1); or
(c) Special purposes zone – Special development area precinct – Southport Priority Development Area</td><td>Table 9.4.13-3</td><td></td></tr>
<tr><td>Centre zone and High density residential zone where nominated</td><td>Table 9.4.13-4</td><td></td></tr>
</table>

Performance outcomes	Acceptable outcomes		Does the proposal meet the acceptable outcome? **If not, justify how the proposal meets <u>either</u> the performance outcome or overall outcome**	Internal use
	in the Transport hub area in **Figure 9.4.13-1**			
	Centre zone not nominated in the Transport hub area in **Figure 9.4.13-1**	**Table 9.4.13-5**		
	Special purposes zone – Special development area precinct – Southport Priority Development Area	**Table 9.4.13-6**		
	Note: Where off-street car parking cannot be reasonably provided, Council may consider improvements to active and public transport to offset the shortfall in car parking spaces.			
PO2 Development ensures that access to car parking spaces is provided for employees and bona fide visitors.	**AO2** Car parking spaces for employees and visitors do not have gateways, doors or similar devices which restrict vehicular access.		**COMPLIES WITH AO2** Access to visitor parking spaces is not impinged upon by any devices which may restrict vehicular access.	
PO3 Extensions to development are provided with additional car parking spaces to meet the increased parking demand. **Note: Additional car parking spaces are not required where it can be demonstrated that the existing parking on-site was in excess of the City Plan requirements at the time of approval or the applicable parking rates currently in effect or results in the loss of existing pedestrian and cycling facilities.**	**AO3** Extensions to development provide additional car parking spaces based on the increased TUA.		**NOT APPLICABLE** Subject proposal does not consist of an extension to the TUA of an existing development.	
Travel demand measures				
PO4 Development provides alternative modes of travel to reduce dependency on	**AO4.1** Development that is identified in the Transport hub area in **Figure 9.4.13-1: Transport hub area**		**NOT APPLICABLE** Subject site is not located within the Transport hub area as specified in	

Performance outcomes	Acceptable outcomes	Does the proposal meet the acceptable outcome? If not, justify how the proposal meets either the performance outcome or overall outcome	Internal use
private vehicle usage.	applies travel demand measures in accordance with **Table 9.4.13-7: Travel demand measures**.	Figure 9.4.13-1.	
	AO4.2 Development applies the car sharing travel demand measure in accordance with **Table 9.4.13-7: Travel demand measures**, where: (a) located in the Centre zone and not identified in the Transport hub area in **Figure 9.4.13-1: Transport hub area**; or (b) located in any other zone (except the Centre zone).	**NOT APPLICABLE** Subject site is not located within the Transport hub area as specified in Figure 9.4.13-1.	
Servicing			
PO5 Development accommodates for the required design service vehicle, including waste collection vehicles to service the development.	**AO5** Development is designed to cater for the largest service vehicle in accordance with **Table 9.4.13-9: Minimum class of service vehicle**.	**COMPLIES WITH AO5** While no minimum class of service vehicle is specified for Dwelling House developments, the proposed design of the internal road network is considered suitable to accommodate refuse collection and other service vehicles.	
PO6 Development is designed to ensure: (a) that areas are provided for loading and unloading of service vehicles; (b) that loading operations are contained wholly within the site; and (c) that pathways from service areas to tenancies are an appropriate width to allow for pallets and trolleys to manoeuvre without conflicting with doors, gates or landscaping.	**AO6.1** Development is designed to provide for the design service vehicle in accordance with **Table 9.4.13-8: Service vehicle requirements**.	**NOT APPLICABLE** Service bay requirements are not applicable for Dwelling House developments.	
	AO6.2 Service areas are designed in accordance with *AS2890.2-2002 Parking facilities Part 2: Off-street commercial vehicle facilities*.	**NOT APPLICABLE** Service bay requirements are not applicable for Dwelling House developments.	

Performance outcomes	Acceptable outcomes	Does the proposal meet the acceptable outcome? **If not, justify how the proposal meets either the performance outcome or overall outcome**	Internal use
PO7 Development ensures that service vehicle routes to and from the development minimise impacts on residential safety and amenity.	**AO7** Development ensures that service vehicles use the shortest and most direct route to and from the major road network as identified on the Functional road hierarchy network as shown on the Zone map without impacting upon residential amenity and safety of surrounding local area.	**COMPLIES WITH AO7** The design of the internal road network supports the use of the shortest and most direct route to and from the major road network by service vehicles.	
Public transport network			
PO8 Development that attracts a high proportion of people using high frequency public transport incorporates on-site provision for integration with the public transport network. This includes appropriate pedestrian and cyclist linkages which are safe, attractive and convenient to use and connected with adjoining uses, public areas and the functional road hierarchy.	**AO8** Development provides for the integration of an off-road public passenger transport facility for the following land uses: (a) Air services; (b) Educational establishment (new and existing); (c) Hospital; (d) Major sport, recreation and entertainment facility; (e) Shop (2,000m² or greater); and (f) Tourist attraction.	**NOT APPLICABLE** Development does not propose the provision of any of the land uses listed within AO8.	
PO9 Development that attracts a reasonable proportion of people utilising public transport and is located within 400m walking distance of an existing or future: (a) bus stop on a high frequency public transport route; (b) light rail station; and (c) heavy rail station; provides appropriate pedestrian and cyclist linkages, including crossing points, which are safe, attractive and convenient to use and connect with public transport infrastructure.	**AO9** Development that is located within 400m walking distance of a public passenger transport facility provide footpaths and crossing points to access nearby transport facilities such as bus stops or rail stations safely.	**NOT APPLICABLE** Development is not currently located within 400m walking distance of a public passenger transport facility.	

Performance outcomes	Acceptable outcomes	Does the proposal meet the acceptable outcome? If not, justify how the proposal meets either the performance outcome or overall outcome	Internal use
Active transport network			
PO10 Development ensures that adequate off-street bicycle parking and end-of-trip facilities are provided to encourage use and meet the needs and volumes of predicted pedestrian and cyclist users.	**AO10.1** Development provides off-street bicycle parking and end-of-trip facilities in accordance with **Table 9.4.13-10: Bicycle parking rates** and **Table 9.4.13-11: End-of-trip facilities for active travel users**. **Note: This AO does not apply to the following uses:** • **Dwelling house;** • **Secondary dwelling;** • **Dual occupancy; or** • **Multiple dwelling (where there are 3 dwellings or less).**	**NOT APPLICABLE** This Acceptable Outcome is not applicable for dwelling house developments.	
	AO10.2 Development locates end-of-trip facilities within the site in close proximity to areas of bicycle parking and entrances to the site and/or building.	**NOT APPLICABLE** No end of trip facilities are required as part of a residential dwelling development.	
	AO10.3 Signage for end-of-trip facilities and bicycle parking areas is provided within the site at: (a) ground level, external to buildings, identifying the location of bicycle parking areas; and (b) at bicycle parking areas, indicating the location of end-of-trip facilities.	**NOT APPLICABLE** No end of trip facilities are required as part of a residential dwelling development.	
PO11 Development ensures that access for pedestrians and cyclists from the street frontage and from any car parking or set down area to the main entry of the building is designed to provide safe	**AO11.1** Development with 20 dwellings or less and have a single road frontage, provides a footpath, separated from the extension of the access driveway, from the property boundary for a distance equivalent to the zone front setback.	**NOT APPLICABLE** The subject development consists of more than 20 dwellings.	

Performance outcomes	Acceptable outcomes	Does the proposal meet the acceptable outcome? If not, justify how the proposal meets either the performance outcome or overall outcome	Internal use
movement. It should be convenient and clearly identifiable and avoid conflict with vehicle movements.	**AO11.2** Development with 20 dwellings or less and have more than 1 road frontage, provides a pedestrian and cyclist pathway from the primary road frontage that is separated from vehicle movements for a distance equivalent to the zone front setback.	**NOT APPLICABLE** The subject development consists of more than 20 dwellings.	
	AO11.3 Development with 21 dwellings or more provides for at least 1 continuous pedestrian and cyclist pathway from each road frontage that is separated from vehicle movements.	**COMPLIES WITH AO11.3** Development proposes numerous direct pedestrian/cyclist connections to the surrounding active transport infrastructure.	
	AO11.4 Pathways are to be designed and constructed in accordance with *AS1428.1-2009: Design for access and mobility Part 1: General requirements for access – New building work*.	**DEEMED TO COMPLY** The proposed pathway network (both within road verges and off-road) should be constructed in accordance with relevant standards.	
	AO11.5 Where a non-residential land use is to occupy an established residential premises, there is no requirement to provide for a pathway from any road frontage.	**NOT APPLICABLE** Only residential land uses are proposed as part of the subject development.	
PO12 Development ensures that off-street bicycle parking areas are designed to be: (a) located outside pedestrian movements paths and be visible from the street (casual surveillance); (b) easily accessible from the road; (c) arranged so that parking and unparking manoeuvres in a car park do not damage adjacent bicycles; (d) as close as practical to the cyclists ultimate destination;	**AO12** Development provides bicycle parking within the site that is designed, constructed and maintained in accordance with the *Cycling Aspects of Austroads* and *AS2890.3:2015 Parking facilities – Part 3: Bicycle parking* and the following: (a) employee and residential bicycle parking is provided to a User Class 2 classification accessed by users with a key or security device; (b) visitor (residential and non-residential) is provided to a User Class 3 classification, positioned at ground level in a visible line of sight to the developments main entry; and	**NOT APPLICABLE** Given the provision of garage facilities, no bicycle parking is proposed as part of the subject development.	

Performance outcomes	Acceptable outcomes	Does the proposal meet the acceptable outcome? **If not, justify how the proposal meets <u>either</u> the performance outcome or overall outcome**	Internal use
(e) well lit by appropriate lighting; and (f) protected from the weather.	(c) ramps and pathways be provided as direct as possible from the roadway and/or pathways to the bicycle parking facilities.		
PO13 Development ensures that access for pedestrians and cyclists to and from the site is designed to be direct, safe, pleasant and comfortable environments that connect people with places of local interest, services, public transport facilities and neighbourhoods.	**AO13** Development provides for a disability access compliant shared path or footpath along the frontage of the site within the road reserve, designed and constructed in accordance with the Functional road hierarchy network as shown on the Zone map and **SC6.11 City Plan policy – Land development guidelines, Section 2 – Transport network standards**. **Note: This AO does not apply to the following uses:** • **Dwelling house;** • **Secondary dwelling;** • **Dual occupancy; or** • **Multiple dwelling (where there are 3 dwellings or less).**	**NOT APPLICABLE** This Acceptable Outcome is not applicable to dwelling house developments.	
PO14 Development contributes to the safe and efficient provision and operation of the bicycle network.	**AO14.1** Development that abuts a service road as shown on the **Bicycle network classification map** provides: (a) 2m on-road exclusive bike lane to be constructed along the full frontage of the site – development side only; and (b) on-road exclusive bicycle lanes (full-time; minimum 2.0 metres in width) through any new intersection with the required navigational aids such as (but not limited to) directional signage, route markers, pavement treatments and schematic signage. **Note: This AO does not apply to the following uses:** • **Dwelling house;** • **Secondary dwelling;** • **Dual occupancy; or**	**NOT APPLICABLE** This Acceptable Outcome is not applicable to dwelling house developments.	

Performance outcomes	Acceptable outcomes	Does the proposal meet the acceptable outcome? If not, justify how the proposal meets either the performance outcome or overall outcome	Internal use
	• **Multiple dwelling (where there are 3 dwellings or less)**		
	AO14.2 Development that abuts a Principal route or District route as shown on the **Bicycle network classification map** provides a 3m off-road shared footpath to be constructed along the full frontage of the site – development side only. **Note: This AO does not apply to the following uses:** • **Dwelling house;** • **Secondary dwelling;** • **Dual occupancy; or** • **Multiple dwelling (where there are 3 dwellings or less).**	**NOT APPLICABLE** This Acceptable Outcome is not applicable to dwelling house developments.	
	AO14.3 Development that abuts a Neighbourhood route as shown on **Bicycle network classification map** provides a 2.5m off-road shared footpath to be constructed along the full frontage of the site – development side only. **Note: This AO does not apply to the following uses:** • **Dwelling house;** • **Secondary dwelling;** • **Dual occupancy; or** • **Multiple dwelling (where there are 3 dwellings or less).**	**NOT APPLICABLE** This Acceptable Outcome is not applicable to dwelling house developments.	
	AO14.4 Development that abuts a Principal route, District route or Neighbourhood route as shown on **Bicycle network classification map** provides a 2m wide on-road cycle lanes. **Note: This AO does not apply to the following uses:** • **Dwelling house;**	**NOT APPLICABLE** This Acceptable Outcome is not applicable to dwelling house developments.	

Performance outcomes	Acceptable outcomes	Does the proposal meet the acceptable outcome? **If not, justify how the proposal meets <u>either</u> the performance outcome or overall outcome**	Internal use
	• **Secondary dwelling;** • **Dual occupancy; or** • **Multiple dwelling (where there are 3 dwellings or less).**		
	AO14.5 Footpaths and on-road cycle lanes are designed and constructed in accordance with **SC6.11 City Plan policy – Land development guidelines, Section 2 – Transport network standards**.	**COMPLIES WITH AO14.5** All internal footpaths are to be designed and constructed in compliance with Section 2 of *SC6.11 City Plan policy - Land development guidelines*	
	AO14.6 Development does not remove or compromise existing on-road and off-road bicycle and pedestrian infrastructure and facilities.	**COMPLIES WITH AO14.6** Development is unlikely to have any adverse or material impact on existing active transport infrastructure.	
Roads and freight			
PO15 Where new development creates public road, the road is to be constructed to an appropriate standard.	**AO15.1** Development provides public roads that are designed and constructed in accordance with **SC6.11 City Plan policy – Land development guidelines, Section 2 – Transport network standards** and *Austroads*.	**DOES NOT COMPLY WITH AO15.1** The internal street system is designed in accordance with the relevant requirements of Austroads as well as *SC6.11 City Plan policy - Land development guidelines, Section 2 - Transport network standards.* See SLR Transport Statement.	
	AO15.2 Development provides public roads which prevent the need for traffic calming devices to manage vehicle design speed, deter through traffic and create safe conditions for pedestrians and cyclists.	**COMPLIES WITH AO15.2** Subject development does not require the installation of traffic calming devices given the passive speed restriction resulting from horizontal curves and site topography.	
PO16 Where development provides for an access easement, the easement: (a) is an adequate width; (b) is constructed to a standard	**AO16** No acceptable outcome provided.	**NOT APPLICABLE** No access easement is proposed as part of the subject development.	

Performance outcomes	Acceptable outcomes	Does the proposal meet the acceptable outcome? If not, justify how the proposal meets either the performance outcome or overall outcome	Internal use
appropriate to the situation; and (c) does not result in unreasonable detriment or nuisance to an adjacent premises.			
PO17 Development ensures that corner lots to a public roadway provide a corner truncation to ensure safety, functioning and visibility at the intersection.	**AO17.1** Development provides for a corner truncation, if not already provided, at each corner of a site to a public roadway.	**COMPLIES WITH AO17.1** All corner lots provide for corner truncations at each corner of a site to a public roadway.	
	AO17.2 Land required to provide a corner truncation made by three equal chords of a 6m radius (8m where in an Industrial estate) on the corner of the site to a public roadway must be dedicated to Council as road reserve.	**COMPLIES WITH AO17.2** All corner lot truncations are to be designed with three equal 6m chords.	
	AO17.3 At roundabouts and intersections, the truncation must be enlarged to maintain verge widths and sight line requirements.	**COMPLIES WITH AO17.3** Intersections and truncations have been designed to maintain consistent verge widths and sufficient sight distance.	
	AO17.4 In brownfield areas, the truncation must not reduce the size of the existing verge area.	**NOT APPLICABLE** Development is not located within a brownfield area	
	AO17.5 At the entry/exit to a laneway, the truncation is an area made by one chord of a 2m radius.	**NOT APPLICABLE** Laneway arrangement not proposed.	
PO18 Development that provides a new intersection is designed to ensure: (a) safety and does not compromise the efficiency, function, convenience of use or capacity of the road network; (b) verge areas that provide sufficient	**AO18.1** Development that creates a new intersection within a public roadway ensures that the intersection is designed and constructed in accordance with *Austroads* and **SC6.11 City Plan policy – Land development guidelines, Section 2 – Transport network standards**.	**COMPLIES WITH PO18** All road intersections are to be designed and constructed in accordance with the relevant provisions specified by Austroads and within *SC6.11 City Plan policy - Land development guidelines, Section 2 - Transport network standards.*	

Performance outcomes	Acceptable outcomes	Does the proposal meet the acceptable outcome? **If not, justify how the proposal meets <u>either</u> the performance outcome or overall outcome**	Internal use
area for safe pedestrian and cycling movement; and (c) sufficient area to provide essential services and infrastructure, including traffic management.		See SLR Transport Statement.	
	AO18.2 In brownfield areas, verge areas are not to be reduced but may be widened to accommodate essential services and infrastructure, including bicycle and pedestrian pathways and public transport infrastructure.	**NOT APPLICABLE** Development is not located within a brownfield area.	
Ingress and egress			
PO19 Development ensures that all vehicles ingress and egress the site in a forward gear.	**AO19** Development is designed so that all vehicle classes enter and exit the site in a forward gear, unless otherwise stated in **Table 9.4.13-8: Service vehicle requirements.** **Note: This AO does not apply to the following uses:** • **Dwelling house;** • **Secondary dwelling;** • **Dual occupancy; or** • **Multiple dwelling (where there are 3 dwellings or less).**	**NOT APPLICABLE** This Acceptable Outcome is not applicable for a dwelling house development.	
Integrated transport and land use			
PO20 Development is: (a) appropriately located to reduce the need to travel by car and is accessible by public transport, walking and cycling; and (b) designed to reduce impacts on the amenity, safety and operation of the road network through appropriate measures to ensure that the function and capacity of the road network is not compromised.	**AO20** A Traffic Impact Assessment is prepared and submitted to Council in the following instances: (a) when the development is identified as "any other use not listed in this table" or "any other undefined use" in **Part 5 – Tables of assessment;** (b) when the development is freight dependent; (c) when vehicle access will be required to a road identified on the **Function road hierarchy map;** (d) when vehicle access will be required to a service road as identified on the **Pacific**	**COMPLIES WITH AO20** A TIA for the subject development is attached to this code response.	

Performance outcomes	Acceptable outcomes	Does the proposal meet the acceptable outcome? If not, justify how the proposal meets either the performance outcome or overall outcome	Internal use
	motorway service road types overlay map; (e) when vehicle access will be required within 100m of a signalised intersection; (f) when vehicle access will be required within 50m of a roundabout; or (g) when a new intersection is proposed.		
PO21 Development is not located in areas that compromise future transport corridors, including roads, public transport and active transport.	**AO21** Land shown on the zone maps for the purposes of existing or future road network infrastructure, is to be dedicated to Council as public road.	**COMPLIES WITH A021** Subject site is not located on land currently shown as that required for future road network infrastructure.	
PO22 Staged development is planned, designed and constructed to ensure that: (a) the construction of active and public transport infrastructure occurs in initial stages of development; and (b) adequate car parking is provided for each stage to support the function of the development.	**AO22** No acceptable outcome provided.	**NOT APPLICABLE** Development is not proposed to be constructed in stages.	
PO23 Development within the Coomera Town Centre area provides an integrated network of predominantly public streets to ensure efficient movement of pedestrians, cyclists, vehicles and strong public transport connections. **Note: Indicative access and mobility outcomes for the Coomera Town Centre area are identified on Figure 9.4.13-2.**	**AO23** No acceptable outcome provided.	**NOT APPLICABLE** Development is not located within the Coomera Town Centre area.	
General			

Performance outcomes	Acceptable outcomes	Does the proposal meet the acceptable outcome? If not, justify how the proposal meets either the performance outcome or overall outcome	Internal use
PO24 New development ensures continuous circulation aisles are provided linking all driveways and intersections to access car parking modules and service areas, and avoids the use of the road network when accessing areas within the development.	**AO24.1** All car parking modules and service areas are accessed by circulation aisles.	**NOT APPLICABLE** No car parking modules or service areas are proposed as part of the subject development.	
	AO24.2 Circulation aisles are not disconnected by car parking modules or service areas.	**NOT APPLICABLE** No parking circulation aisles are proposed as part of the subject development.	
	AO24.3 All access driveways are linked by circulation aisles free from parking manoeuvres.	**NOT APPLICABLE** No separate off-street parking facilities are proposed as part of the subject development.	
	AO24.4 All vehicles can circulate throughout the new development in a forward gear without performing reverse manoeuvres.	**COMPLIES WITH AO24.4** The design of the internal road network is considered sufficient to accommodate the circulation of all private and service vehicles. Bin pads are to be provided for Lots 39/40 and Lots 46/47/48 to remove the need for refuse collection vehicles to perform any reversing manoeuvres.	
PO25 Off street car parking areas are designed to: (a) provide a legible and efficient internal layout; (b) ensure the safety and security of users; (c) clearly distinguishable from pedestrian paths and entry points; (d) be easily negotiated by vehicles and	**AO25.1** Off street car parking is designed, constructed, line marked and maintained in accordance with *AS2890.1:2004 – Parking facilities – Part 1: Off-street car parking*, *AS2890.2–2002 Parking facilities – Part 2: Off-street commercial vehicle facilities, AS/NZS 2890.6:2009 Parking facilities Part 6: Off-street parking for people with disabilities* and *AS1428.1–2009: Design for access and mobility Part 1: General requirements for access – New building work*.	**COMPLIES WITH AO25.1** All garage facilities are to be designed in accordance with the relevant provisions of AS2890.1.	

Performance outcomes	Acceptable outcomes	Does the proposal meet the acceptable outcome? If not, justify how the proposal meets either the performance outcome or overall outcome	Internal use
pedestrians including persons with a disability; (e) ensure that there is no disruptions to or queues onto the public road network; (f) provide sight distances from driveways to ensure visibility between vehicles on the driveway and pedestrians on the verge; and (g) be marked and maintained to the current relevant standard.	**AO25.2** The entry/exit to a driveway, internal to the property boundary of the development, is separated by a central island containing an intercom or similar electronic access device. The intercom (or similar device) is to be setback 4m from the property boundary. OR The intercom: (a) is positioned on the right hand side of the access driveway against a wall; and (b) setback 4m from the property boundary, internal to the development. **Note: The intercom system is only required where visitor car parking is provided behind a security gate.**	**NOT APPLICABLE** No intercom facility is proposed as part of the subject development.	
	AO25.3 Development does not provide pavement humps or raised platforms in queuing areas.	**NOT APPLICABLE** Development does not propose the provision of any pavement humps or raised platforms.	
	AO25.4 Development is designed so that vehicles do not reverse across marked pedestrian crossings.	**NOT APPLICABLE** No marked pedestrian crossings are proposed as part of the subject development.	
PO26 Car parking spaces do not restrict any other space unless it is in a tandem arrangement where no inconvenience arises from its use.	**AO26.1** Tandem car parking (2 car spaces parked nose to tail) are counted as 1 space, except in the following cases: (a) the spaces are designated and signed for residential purposes of the same dwelling; or (b) the spaces are designed and signed for the occupants of the site, in a single tenancy; or (c) the off-street car parking is to be operated as a	**NOT APPLICABLE** No tandem car parking is proposed as part of the subject development.	

Performance outcomes	Acceptable outcomes	Does the proposal meet the acceptable outcome? **If not, justify how the proposal meets <u>either</u> the performance outcome or overall outcome**	Internal use
	privately operated public car park with on-site management whereby the off-street tandem car parking spaces may be counted as no greater than 1.5 spaces.		
	AO26.2 The minimum length of a tandem car space is 10.4m.	**NOT APPLICABLE** No tandem car parking is proposed as part of the subject development.	
	AO26.3 The minimum length of a tandem garage is 11m.	**NOT APPLICABLE** No tandem car parking is proposed as part of the subject development.	
PO27 Development ensures that where provision is made for a porte cochere, it is designed to enable vertical clearance, manoeuvring, access and queuing of vehicles. The capacity of the porte cochere must accommodate vehicles entirely within the site, including the queuing of vehicles.	**AO27** The porte cochere is to be a minimum of 4.5m in height.	**NOT APPLICABLE** No porte cocheres are proposed as part of the subject development.	

Table 9.4.13-3: Car parking rates – all zones except Centre zone or Special purpose zone – Special development area precinct – Southport Priority Development Area

This table sets out the minimum number of car parking spaces required according to the use applied for. Where the calculated number of car spaces is not a whole number, the number of car parking spaces required must be the next higher whole number.

Land use	Minimum number of off-street car parking spaces	
Adult store	5 per 100m² of TUA (total use area)	
Agricultural supplies store	2 per tenancy or lot plus 1 per 50m² of TUA up to and including 500m², and 1 per 100m² of TUA over 500m²	
Animal husbandry	1 per staff in addition to parking provided for the primary dwelling	
Animal keeping	1 per staff in addition to parking provided for the primary dwelling	
Bar	5 per 100m² of TUA	
Brothel	1 per each room plus 1 per 2 staff	
Bulk landscape supplies	2 per tenancy or lot plus 1 per 50m² of TUA up to and including 500m², and 1 per 100m² of TUA over 500m²	
Caretaker's accommodation	2	
Car wash	**DIY car wash**	0
	Hand-wash	1 per 2 staff
Child care centre	1 per staff plus 1 per 5 children enrolled, which may be provided as a passenger set-down/pick-up area	
Club	6 per 100m² of TUA	
Community care centre	14, plus 5 per 100m² of TUA	
Community residence	2 plus 1 for a manager residence OR resident support worker	
Community use	6 per 100m² of TUA	
Crematorium	10 per 100m² of TUA	
Cropping	1 per staff in addition to parking provided for the primary dwelling	
Dual occupancy	2 per dwelling	
Dwelling house	**Dwelling house**	1 per 1 bedroom dwelling
		2 per dwelling with 2 or more bedrooms
	Secondary dwelling	1

Land use	Minimum number of off-street car parking spaces	
	where 80m² or less	
	Secondary dwelling where greater than 80m²	2
Dwelling unit	2	
Educational establishment	**Preparatory**	1 per staff, plus 1 per 5 children enrolled which may be provided as a passenger set-down/pick-up area
	Primary	1 per staff
	Secondary	1 per staff plus 1 per 10 Year 12 students
	Before and after school care	1 per staff, plus 1 per 5 children enrolled which may be provided as a passenger set-down/pick-up area
	Tertiary and further education	To be determined upon submission of a Car Parking Assessment to Council
	In addition to the car parking requirements a set down/pick-up area is provided.	
Food and drink outlet	5 per 100m² of TUA, plus queuing area for 10 vehicles for any drive-thru facility from the collection point	
Function facility	10 per 100m² of TUA	
Funeral parlour	The greater of: (a) 1 per 10m² of TUA; or (b) 1 per 2.5 persons, based on maximum occupancy	
Garden centre	10, plus 1 space per 100m² of TUA in excess of 3,000m²	
Hardware and trade supplies	2 per tenancy or lot plus 1 per 50m² of TUA up to and including 500m², and 1 per 100m² of TUA over 500m²	
Health care services	5 per 100m² of TUA	
High impact industry	2 per tenancy or lot plus 1 per 50m² of TUA up to and including 500m², and 1 per 100m² of TUA over 500m²	
Home based business	2, in addition to parking provided for the primary dwelling	
	Bed and breakfast	1 per guest room in addition to parking provided for the primary dwelling
	Home office	1, in addition to parking provided for the primary dwelling
	Home based child care	0
Hospital	0.8 per staff plus 1 per 2 beds	

Land use	Minimum number of off-street car parking spaces	
Hotel	6 spaces per 100m² of TUA and 1 space per short term/serviced apartment plus queuing area for 10 vehicles for any drive-through facility from the collection point	
Indoor sport and recreation	**Gymnasium (where 24hr and no classes)**	1 per 20m² of TUA
	Amusement parlour	5 per 100m² TUA
	Squash or enclosed tennis court	6 per court
	Indoor cricket or other court game	20 per court
	Swimming pool or skating rink	15, plus 1 per 100m² of TUA
	Any other operation	1 per 10m² of TUA
Intensive animal industry	1 per staff in addition to parking provided for primary dwelling	
Intensive horticulture	1 per staff in addition to parking provided for primary dwelling	
Low impact industry	2 per tenancy or lot plus 1 per 50m² of TUA up to and including 500m², and 1 per 100m² of TUA over 500m²	
Marine industry	2 per tenancy or lot plus 1 per 50m² of TUA up to and including 500m², and 1 per 100m² of TUA over 500m²	
Market	1 per 2 stalls	
Medium impact industry	**Medium impact industry**	2 per tenancy or lot plus 1 per 50m² of TUA up to and including 500m², and 1 per 100m² of TUA over 500m²
	Salvage Yard	0.7 per 100m² of TUA, with a minimum of 5 spaces
Multiple dwelling	(a) 1 per 1 bedroom unit or dwelling (b) 1.25 per 2 bedroom unit or dwelling (c) 1.5 per 3 bedroom unit or dwelling (d) 2 per 4 bedroom unit or dwelling (e) *2 plus 1 per 10 units or dwellings for visitors **Note: At least 50% of visitor parking to be provided in a single location**	
Nightclub	5 per 100m² of TUA	
Office	**Office, if real estate agent**	To be determined upon submission of a Car Parking Assessment to Council
	Office, if call centre	To be determined upon submission of a Car Parking Assessment to Council

Land use	Minimum number of off-street car parking spaces	
	Office n.e.i	3 per 100m² of TUA
Outdoor sales	**Vehicle hire**	3 per 100m² of TUA plus 1 per 1.5 vehicles in the vehicle hire fleet and 1 on-site wash bay
	Motor vehicles sale yard	3 per 100m² of TUA plus 0.5 per 100m² of display area
Outdoor sport and recreation	**Tennis court**	4 per court
	Lawn bowls (stand-alone)	20 per green
	Swimming pool	15, plus 1 per 100m² of TUA
	Golf course	The greater of: • 4 per hole, plus 3 per 100m² of TUA of clubhouse; or • 6 per 100m² of TUA of clubhouse
	Football ground	50 per field
	Any other court game	20 per court
Permanent plantation	1 per staff in addition to parking provided for the primary dwelling	
Place of worship	1 per 2.5 persons, based on maximum occupancy	
Port services	**Marina**	(a) 0.6 per wet berth designed for boats 10m and under; (b) 0.8 per wet berth designed for boats between 10m and 15m; (c) 1 per wet berth designed for boats greater than 15m; (d) 0.2 per dry berth or swing mooring; plus (e) 0.5 spaces per staff; (f) 1 per 50m² TUA of ancillary activities associated with the marina.
Relocatable home park	**Relocatable home park**	1 per relocatable home plus 1 per 5 homes for visitors
Research and technology industry	2 per tenancy or lot plus 1 per 50m² of TUA up to and including 500m², and 1 per 100m² of TUA over 500m²	
Resort complex	1 per 4 dwellings	

Land use	Minimum number of off-street car parking spaces	
Retirement facility	**Low care facility**	1 per independent living, self contained dwelling plus 1 per 4 dwellings for visitor car parking, and 1 per staff based on maximum residential occupancy **Note: 50% of visitor parking to be provided in a single location**
	Medium care facility	1 per 2 beds plus 1 per 2 dwellings for visitor car parking, and 1 per staff based on maximum residential occupancy **Note: 50% of visitor parking to be provided in a single location**
	High care facility	1 per 4 beds plus 1 per 2 dwellings for visitor car parking, and 1 per staff based on maximum residential occupancy **Note: 50% of visitor parking to be provided in a single location**
Roadside stall	4	
Rooming accommodation	**Student accommodation**	1 per 2 students, based on maximum occupancy plus 1 for a manager residence
	Hostel	1 per room, excluding communal areas, plus 1 for a manager residence
	Any other operation	To be determined upon submission of a Car Parking Assessment to Council
Rural industry	1 per staff in addition to parking provided for primary dwelling plus 1 visitor space	
Sales office	**Sales office**	5
	Display home	0
Service industry	**Service industry**	5 per 100m² of TUA
	Laundromat	5 per 100m² of TUA
Service station	2, plus 5 per 100m² of TUA	
Shop	5 per 100m² of TUA	
Short-term accommodation	1 per room plus 1 per managers residence	
Showroom	2 per tenancy or lot plus 1 per 50m² of TUA up to and including 500m², and 1 per 100m² of TUA over 500m²	
Theatre	**Stand-alone**	To be determined upon submission of a Car Parking

Land use	Minimum number of off-street car parking spaces	
		Assessment to Council
	Where part of a shopping centre	1 per 8 seats
Tourist attraction	**Existing**	To be determined upon submission of a Car Parking Assessment to Council
Tourist park	**Caravan park**	11 per 10 sites plus 1 per 10 sites for visitors
	Holiday cabins	1 per site or cabin plus 1 per 10 sites for visitors
Transport depot	To be determined upon submission of a Car Parking Assessment to Council	
Veterinary services	5 per 100m² of TUA	
Warehouse	**Warehouse**	2 per tenancy or lot plus 1 per 50m² of TUA up to and including 500m², and 1 per 100m² of TUA over 500m²
	Self storage sheds	1 per 10 storage sheds plus 3.3 per 100m² of TUA for administration
Wholesale nursery	10, plus 1 space per 100m² of TUA in excess of 3,000m²	
Winery	To be determined upon submission of a Car Parking Assessment to Council	
Any other land use or land use operation	To be determined upon submission of a Car Parking Assessment to Council	

Table 9.4.13-4: Car parking rates – Centre zone and High density residential zone – Transport Hub Area

This table sets out the minimum number of car parking spaces required according to the use applied for. Where the calculated number of car spaces is not a whole number, the number of car parking spaces required must be the next higher whole number.

Zone	Site proximity to a light rail station	Land use	Minimum number of off-street car parking spaces
Centre zone	Where the property boundary of a development directly abuts a Light rail station platform	Non-residential	0
Centre zone	Within 400m walking distance	Residential – permanent/long-term accommodation	0.75 per unit or dwelling and 1 per 10 units or dwelling for visitors. A minimum of 17.5% residential parking, excluding visitor, is to be unbundled.
		Residential – serviced and short-term accommodation (and rooming accommodation for students)	1 per 4 units or dwellings
		Non-residential	1 per 100m² of TUA
Centre zone	Within 800m walking distance	Residential – permanent/long-term accommodation	0.9 per unit or dwelling and 1 per 10 units or dwelling for visitors. A minimum of 17.5% residential parking, excluding visitor, is to be unbundled.
		Residential – serviced and short-term accommodation (and rooming accommodation for students)	1 per 4 units or dwellings
		Non-residential	1 per 75m² of TUA
High density residential zone	Within mapped boundaries of the Transport hub area	Residential – permanent/long-term accommodation	1 per unit or dwelling and 1 per 10 units or dwelling for visitors
High density residential zone	Within 400m walking distance	Non-residential	1 per 100m² of TUA
High density residential zone	Within 800m walking distance	Non-residential	1 per 75m² of TUA

Note: Where 1 space is provided per unit or dwelling, there is no requirement to unbundle car parking.

Table 9.4.13-5: Car parking rates – Centre zone – outside Transport hub area

This table sets out the minimum number of car parking spaces required according to the use applied for. Where the calculated number of car spaces is not a whole number, the number of car parking spaces required must be the next higher whole number.

Centre zone	Land Use	Minimum number of off-street car parking spaces
Principal centre		
Coomera	Residential – permanent/long-term accommodation	1 per unit or dwelling and 1 per 10 units or dwellings for visitors
	Residential – serviced and short-term accommodation	1 per 4 units
	Non-residential	1 per 100m² of TUA
Specialist centre		
Bundall	Office	2.5 per 100m² of TUA
	Food and drink outlet, shop, service industry	2.5 per 100m² of TUA
	Any other land use	Refer to **Table 9.4.13-3: Car parking rates**
Varsity Central/ Bond University	Residential – permanent/long-term accommodation	1 per unit or dwelling and 1 per 10 units or dwellings for visitors
	Residential – serviced and short-term accommodation	1 per 2 units, plus 1 for a manager residence
	Non-residential	Refer to **Table 9.4.13-3: Car parking rates**
Bond University campus	Residential – serviced and short-term accommodation where on Lot 10 on SP148599	1 per 4 units, plus 1 for a manager residence
Varsity Station Village	Residential	1 per unit or dwelling and 1 per 10 units or dwellings for visitors
	Non-residential	1 per 100m² of TUA
Biggera Waters (Harbour Town)	Residential	1 per unit or dwelling and 1 per 10 units or dwellings for visitors
	Non-residential	3.3 per 100m² of TUA
Major centre		
Nerang	Residential	1 per unit or dwelling and 1 per 10 units or dwellings for visitors
	Non-residential	3.3 per 100m² of TUA

Centre zone	Land Use	Minimum number of off-street car parking spaces
Coolangatta	Residential	1 per unit or dwelling and 1 per 10 units or dwellings for visitors
	Non-residential	3.3 per 100m² of TUA
Helensvale	Residential	1 per unit or dwelling and 1 per 10 units or dwellings for visitors
	Non-residential	1 per 100m² of TUA
District centres		
Burleigh	Residential	1 per unit or dwelling and 1 per 10 units or dwellings for visitors
	Non-residential	3.3 per 100m² of TUA
Oxenford	All	Refer to **Table 9.4.13-3: Car parking rates**
Ormeau	Residential	1 per unit or dwelling and 1 per 10 units or dwellings for visitors
	Non-residential	5 per 100m²
Pimpama **Old Pacific Highway, Pimpama**	All	Refer to **Table 9.4.13-3: Car parking rates**
Coomera City Centre Days Rd and City Centre Drive	All	Refer to **Table 9.4.13-3: Car parking rates**
Hope Island Marina Quays Dr	All	Refer to **Table 9.4.13-3: Car parking rates**
Runaway Bay Shopping Centre Cnr Morala and Lae Dr	All	Refer to **Table 9.4.13-3: Car parking rates**
Ashmore City Cnr Southport-Nerang Rd and Currumburra Rd	All	Refer to **Table 9.4.13-3: Car parking rates**
Ashmore Plaza Cotlew St	All	Refer to **Table 9.4.13-3: Car parking rates**
Southport Park Shopping Centre Cnr Drury Av, Ferry Rd and Benowa Rd	All	Refer to **Table 9.4.13-3: Car parking rates**

Centre zone	Land Use	Minimum number of off-street car parking spaces
Q-Superstore Cnr Bermuda and Markeri St	All	Refer to **Table 9.4.13-3: Car parking rates**
Mudgeeraba Village	All	Refer to **Table 9.4.13-3: Car parking rates**
Treetops (Urbia) Cnr Bermuda Street and Reedy Creek Rd	All	Refer to **Table 9.4.13-3: Car parking rates**
West Burleigh Shopping Centre Reedy Creek Rd, Burleigh Waters	All	Refer to **Table 9.4.13-3: Car parking rates**
Palm Beach	Residential	1 per unit or dwelling and 1 per 10 units or dwellings for visitors
	Non-residential	3.3 per 100m² of TUA
The Pines Shopping Centre Cnr K P McGrath Dr and Guineas Creek	All	Refer to **Table 9.4.13-3: Car parking rates**
Tugun	Residential	1 per unit or dwelling plus 1 per 10 for visitors
	Non-residential	3.3 per 100m² of TUA
All other centres	All	Refer to **Table 9.4.13-3: Car parking rates**

Table 9.4.13-6: Car parking rates – Southport Priority Development Area

This table sets out the minimum number of car parking spaces required according to the use applied for. Where the calculated number of car spaces is not a whole number, the number of car parking spaces required must be the next higher whole number.

Precinct	Site proximity to a light rail station	Land use	Minimum number of off-street car parking spaces
Precinct 1	Where the property boundary of a development directly abuts a Light rail station platform	Residential – permanent/long term accommodation	0.75 per unit or dwelling and 1 per 10 units or dwelling for visitors. A minimum of 17.5% residential parking, excluding visitor, is to be unbundled and provided in a pooled parking arrangement.
		Residential – serviced and short-term accommodation (and rooming accommodation for students)	1 per 4 units or dwellings
		Non-residential	0
	Within 400m walking distance	Residential – permanent/long-term accommodation	0.75 per unit or dwelling and 1 per 10 units or dwelling for visitors. A minimum of 17.5% residential parking, excluding visitor, is to be unbundled and provided in a pooled parking arrangement.
		Residential – serviced and short-term accommodation (and rooming accommodation for students)	1 per 4 units or dwellings
		Non-residential	1 per 100m² of TUA
	Outside 400m walking distance and within the boundaries of the precinct	Residential – permanent/long term accommodation	0.9 per unit or dwelling and 1 per 10 units or dwellings for visitors. A minimum of 17.5% residential parking, excluding visitor, is to be unbundled and provided in a pooled parking arrangement.
		Residential – serviced and short-term accommodation (and rooming accommodation for students)	1 per 4 units or dwellings
		Non-residential	1 per 75m² TUA
Precinct 2	Within the boundaries of the precinct	Residential – permanent/long-term accommodation	0.9 per unit or dwelling and 1 per 10 units or dwellings for visitors. A minimum of 17.5% residential parking, excluding visitor, is to be unbundled and provided in a pooled parking arrangement.
		Residential – serviced and short-term accommodation (and rooming accommodation for students)	1 per 4 units or dwellings
		Non-residential	1 per 75m² TUA

Precinct	Site proximity to a light rail station	Land use	Minimum number of off-street car parking spaces
Precinct 3	Within 400m walking distance	Residential – permanent/long term accommodation	0.75 per unit or dwelling and 1 per 10 units or dwellings for visitors. A minimum of 17.5% residential parking, excluding visitor, is to be unbundled and provided in a pooled parking arrangement.
		Residential – serviced and short-term accommodation (and rooming accommodation for students)	1 per 4 units or dwellings
		Non-residential	1 per 100m² TUA
	Outside 400m walking distance and within the boundaries of the precinct	Residential – permanent/long term accommodation	0.9 per unit or dwelling and 1 per 10 units or dwellings for visitors. A minimum of 17.5% residential parking, excluding visitor, is to be unbundled and provided in a pooled parking arrangement.
		Residential – serviced and short-term accommodation (and rooming accommodation for students)	1 per 4 units or dwellings
		Non-residential	1 per 75m² TUA

Table 9.4.13-7: Travel demand measures

Travel demand measure	Indicative reduction
Car sharing	Each car share vehicle off-sets 5 spaces (equates to a relaxation of 4 spaces)
Unbundled parking	20% to 50% unbundled – 30% reduction in minimum rate
Motorcycle/motor scooter parking	Every 2 motorcycles spaces can replace 1 car space, up to 15% of the minimum parking requirement
Bicycle parking (where provided in excess of the requirement under relevant section of this code)	Every 6 bicycles offsets 1 car space, up to 15% of the minimum parking requirement
Any other travel demand measure	To be approved by Council

Table 9.4.13-8: Service vehicle requirements

Site area (m²)	Service vehicle requirements
Less than 1,000m²	Demonstrate that the development can accommodate the design service vehicle – in accordance with **Table 9.4.13-9: Minimum class of service vehicle** – but a separate service bay and associated manoeuvring area are not required. Where it can be demonstrated that loading and unloading of goods and services can take place within the road reserve, in accordance with the Department of Transport and Main Roads Manual of Uniform Traffic Control Devices, without impact on the safe and efficient operation of traffic – including pedestrian and cyclists – and with no detrimental impact on surrounding amenity consistent with the community's reasonable expectations, Council may determine that heavy rigid vehicle (HRV) and articulated vehicle (AV) access in not required.
1,000m² – 2,000m²	(a) Service bay to accommodate the design service vehicle in accordance with **Table 9.4.13-9: Minimum class of service vehicle**. (b) Restricted manoeuvring from a public roadway is allowed for a heavy rigid vehicle (HRV) and/or articulated vehicle (AV) is the design service vehicle. (c) Full on-site manoeuvring is required all for all other classes of service vehicle (VAN, SRV & MRV).
2,000m² – 4,000m²	(a) Service bay to accommodate the design service vehicle in accordance with **Table 9.4.13-9: Minimum class of service vehicle**. (b) Restricted manoeuvring from a public roadway is allowed for an articulated vehicle. (c) Full on-site manoeuvring is required all for all other classes of service vehicle (VAN, SRV, MRV, LRV, RCV & HRV).
4,000m² and greater	(a) Service bay to accommodate the design service vehicle in accordance with **Table 9.4.13-9: Minimum class of service vehicle**. (b) Full on-site manoeuvring is required all for all classes of service vehicle.

Editorial note – Restricted manoeuvring is designed as a single point reverse manoeuvre from the public roadway into the site to access a servicing area. This manoeuvre may be performed from the kerbside lane where it is clearly demonstrated that the design vehicle can achieve the manoeuvre to access the service area.

Table 9.4.13-9: Minimum class of service vehicle

Where waste collection is required to be provided for on-site, and the stated service vehicle in the table below is less than a Council refuse collection vehicle, then the development must be designed to cater for a waste collection vehicle in accordance with **SC6.15 City Plan policy – Solid waste management** (or as amended) and **SC6.11 City Plan policy – Land development guidelines, Section 2 – Transport network standards** (or as amended) as required.

Land use	Minimum class of service vehicle
Adult store	SRV
Agricultural supplies store	AV
Animal husbandry	AV
Animal keeping	VAN
Brothel	VAN
Bulk landscape supplies	AV
Caretaker's accommodation	Not applicable
Car wash	SRV
Child care centre	VAN
Club	SRV
Community care centre	SRV
Community residence	VAN
Community use	SRV
Crematorium	SRV
Cropping	Not applicable
Dual occupancy	Not applicable
Dwelling house	Not applicable
Dwelling unit	Not applicable
Educational establishment	SRV
Food and drink outlet	SRV
Food and drink outlet if: (a) a take away food premises; or (b) including a drive through facility	HRV

Land use	Minimum class of service vehicle
Function facility	MRV
Funeral parlour	SRV
Garden centre	HRV
Hardware and trade supplies	AV
Health care services	SRV
High impact industry	AV
Home based business	Not applicable
Hospital	AV
Hotel	HRV
Indoor sport and recreation	SRV
Intensive animal industry	AV
Intensive horticulture	AV
Low impact industry	AV
Marine Industry	AV
Market	Not applicable
Medium impact industry	AV
Multiple dwelling	Not applicable
Multiple dwelling if: (a) there are 3 dwellings or less	Not applicable
Multiple dwelling if: (a) an internal (private) circulation road way is proposed (b) a vertical built form (tower) is proposed	Standing area for an MRV on-site
Nightclub	SRV
Office	VAN
Outdoor sales	AV
Outdoor sport and recreation	SRV
Outdoor sport and recreation if:	Not applicable

Land use	Minimum class of service vehicle
(a) for a football ground	
Permanent plantation	AV
Place of worship	SRV
Relocatable home park	VAN
Research and technology industry	AV
Resort complex	HRV
Retirement facility	HRV
Roadside stall	Not applicable
Rooming accommodation	SRV
Student accommodation	SRV
Hostel accommodation	SRV
Rural industry	AV
Sales office	Not applicable
Service industry	SRV
Service station	SRV and AV (fuel tanker)
Shop	SRV
Shop (GFA less than 400m²)	SRV
Shop (GFA 400m² - 1,500m²)	HRV
Shop (GFA greater than 1,500m²)	AV
Short-term accommodation	COACH
Showroom	AV
Tourist park	COACH
Tourist park if: (a) a caravan park	VAN
Transport depot	AV
Veterinary services	VAN

Land use	Minimum class of service vehicle
Veterinary hospital	MRV
Warehouse	AV
Warehouse if: (a) for self storage sheds	Not applicable
Wholesale nursery	AV
Any other land use	As determined upon submission of a Service vehicle assessment

Editorial note – A VAN is a 99.8th percentile vehicle equivalent to the AS2890.1-2004 B99 vehicle or large car.

Table 9.4.13-10: Bicycle Parking Rates

Land use	Long and medium term off-street bicycle parking (staff – Class 2)	Short term off-street bicycle parking (visitors – Class 3)	Additional end-of-trip facilities required (refer to Table 9.4.13-11)
Adult store	1 per 100m² TUA	1 per 50m² TUA	No
Child care centre	1 per 10 staff	2 per centre	Yes
Club	1 per 25m² TUA public bar area plus 1 per 100m² public lounge and beer garden area	1 per 100m² TUA	Yes
Educational establishment	1 per 3 students Year 4 and above plus 1 per 10 staff	N/A	Yes
Food and drink outlet	1 per 100m² TUA	1 per 50m² TUA	No
Health care services	1 per 8 consultation rooms	1 per 4 consultation rooms	Yes
High impact industry	1 per 800m² TUA	1 per 200m² TUA	No
Hotel	1 per 25m² TUA public bar area plus 1 per 100m² public lounge and beer garden area	1 per 100m² TUA	No
Indoor sport and recreation	1 per 4 employees	1 per 200m² TUA	Yes
Low impact industry	1 per 150m² TUA	N/A	No
Medium impact industry	1 per 150m² TUA	N/A	No
Multiple dwelling	1 per dwelling	1 per 3 dwellings	No
Office	1 per 100m² where within 800m walking distance to light rail station, otherwise 1 per 200m² TUA	1 per 500m² TUA	Yes
Rooming accommodation	1 per bedroom	N/A	No
Rooming accommodation if for a hostel	1 per 3 rooms	1 per 12 rooms	No
Retirement facility	1 per dwelling	1 per 3 dwellings	No
Service industry	1 per 100m² TUA	1 per 50m² TUA	No
Service station	1 per 200m² TUA	2 per Service station	No
Shop	1 per 100m² TUA	1 per 50m² TUA	No
Short-term accommodation	1 per 40 dwellings	1 per 20 dwellings	No

Land use	Long and medium term off-street bicycle parking (staff – Class 2)	Short term off-street bicycle parking (visitors – Class 3)	Additional end-of-trip facilities required (refer to Table 9.4.13-11)
Showroom	1 per 800m² TUA	1 per 200m² TUA	No
Warehouse	1 per 800m² TUA	1 per 200m² TUA	No
Waterfront industry	1 per 150m² TUA	N/A	No

Note: User Class as referred to and defined in *Austroads*

Table 9.4.13-11: End of trip facilities for active travel users

Number of long-term bicycle spaces to be provided	Number of lockers to be provided	Number of showers (within an associated change room) to be provided		Number of toilets to be provided	Number of wash basin stations (including mirrors, electrical outlet & counter top
1-5	1.5 per bicycle space	1 shower and change room of unisex design		1	1
		Male	**Female**		
6-10	1.5 per bicycle space	1 plus change room	1 plus change room	1	2
11-20	1.5 per bicycle space	2 plus change room	2 plus change room	2	4
21-30	1.5 per bicycle space	3 plus change room	3 plus change room	2	6
31-40	1.5 per bicycle space	4 plus change room	4 plus change room	3	8
41-50	1.5 per bicycle space	5 plus change room	5 plus change room	1 per 3 showers required or part thereof	1 per shower
50+	1.5 per bicycle space	4 showers, plus 1 per shower for each 10 bicycle spaces provided	4 showers, plus 1 per shower for each 10 bicycle spaces provided	1 per 3 showers required or part thereof	1 per shower

Figure 9.4.13-1: Transport hub area

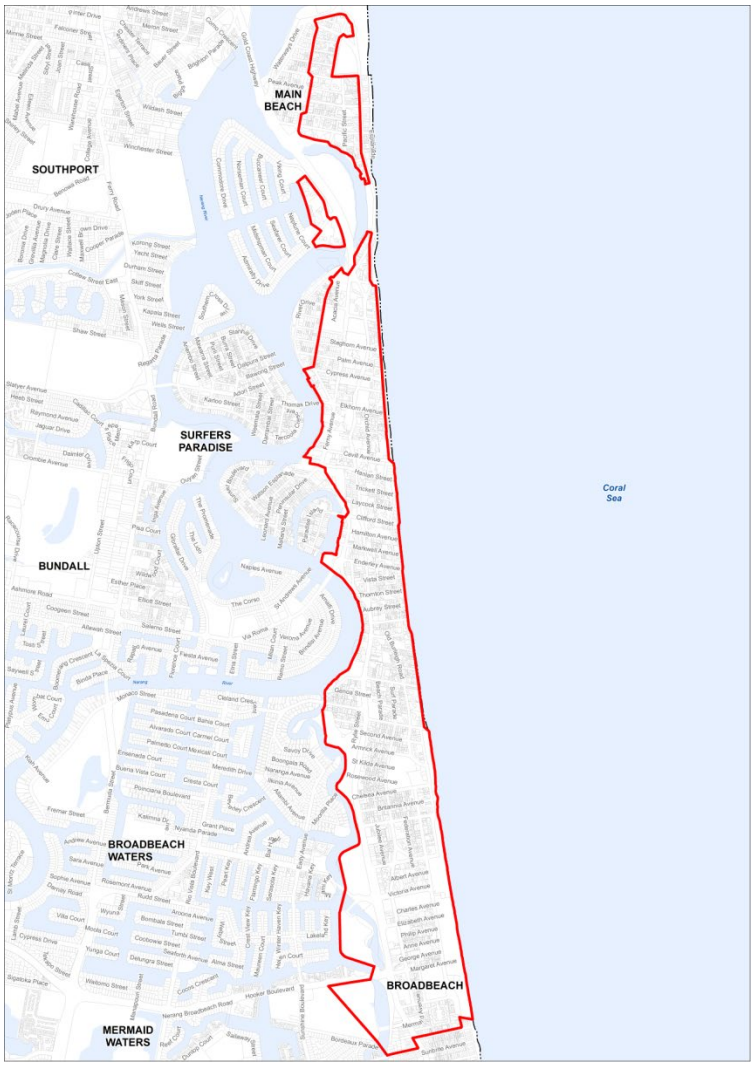
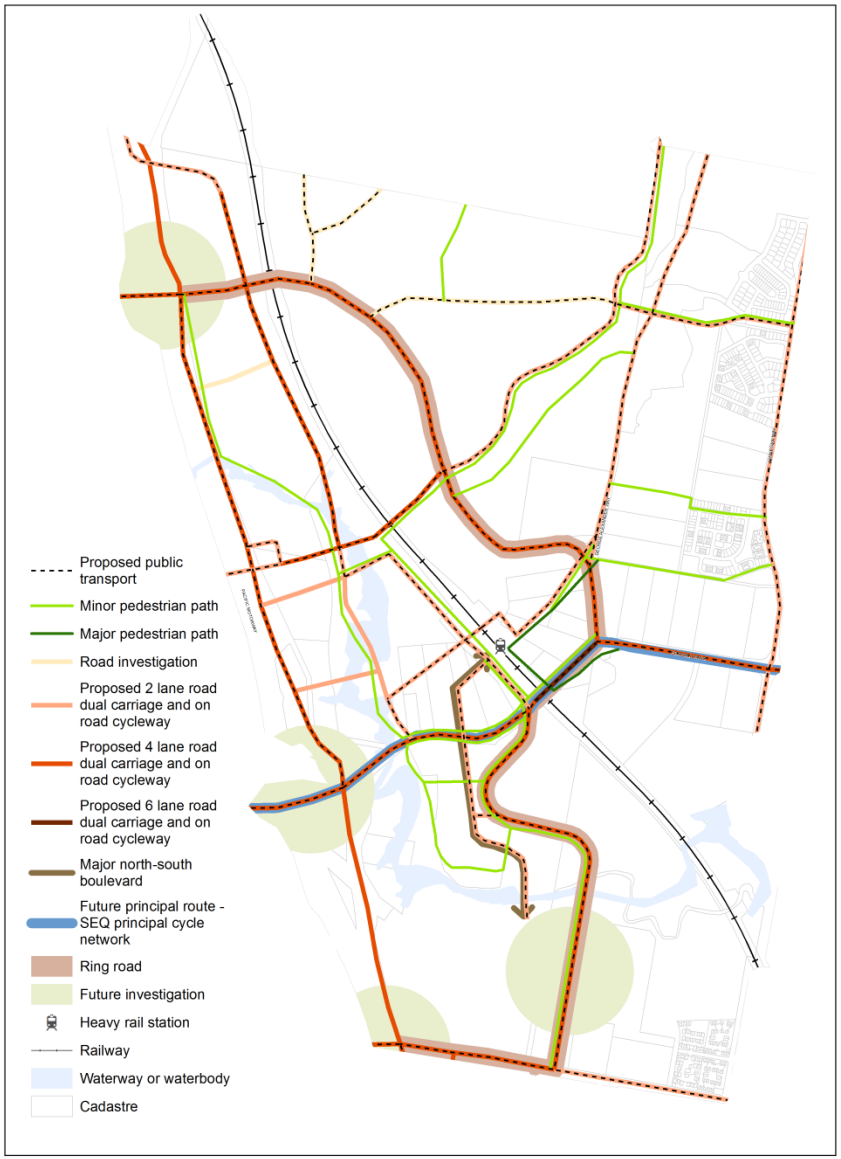


Figure 9.4.13-2: Coomera Town Centre indicative access and mobility



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