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14 November 2024

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Stormwater Tech Memo

1. Introduction

EDGE Consulting Engineers have been engaged by Hutchinson Builders Pty Ltd to prepare the following Stormwater Tech Memo to discuss the proposed stormwater strategy for the Aura Bulky Goods Project. This development is proposed on Aura Precinct 5 (Superlot 5), within an industrial and residential area. Corbould Park is west of the site and Bells Creek North is south. The site is bounded by Edison Crescent to the north, Aura Boulevard to the east, Graf Drive to the south and Packer Road to the west. An aerial view of the site can be seen in Figure 1 below.



Figure 1: Site Locality (Google Maps Imagery, 2024)

Two existing vegetated swales are directly east of the site and along the western side of Packer Road. The site has an existing McDonalds development to the southern corner, with two bio-retention basins within the existing car park.

An approved Stormwater Quality Management Plan (Approval no.: DEV2013/439/112, Version 1.7, 15/09/2022) was completed by Design Flow Pty Ltd and is attached in Appendix A. The below sections outline the DA Approval Conditions and current stormwater management strategies for the proposed development of Bulky Goods Warehouse buildings and associated car parks/driveway.

2. Current Stormwater Quality Management Plan

Two existing treatment systems have been constructed, directly north of Bells Creek North (south of the site), as per approved Stormwater Quality Management Plan (Approval no.: DEV2013/439/112, Version 1.7, 15/09/2022), completed by Design Flow Ltd Pty. This current Stormwater Quality Management Plan (SQMP) shows that the 'East Catchment' and 'West Catchment' of Precincts 3-5 (including the development site) drain toward the two treatment systems (WSUD East and WSUD West). Each treatment train includes vegetated swales and an end-of-line treatment system; a wetland inlet pond, a wetland and a bio-retention basin. The sizing and locations are shown in Figure 7 and Table 3 of the current approved SQMP. These treatment systems provide both treatment and detention for Precincts 3-5, post-development.

The current approved SQMP states that on site rainwater tanks are included in the stormwater strategy but were not included in the MUSIC modelling and sizing of the treatment systems, therefore the treatment modelling is conservative and will ensure resilience in the stormwater treatment strategy should the water demands on tanks be less than anticipated. The tanks are to capture rainfall runoff from the roof area (minimum 50m^2 of roof area for each connected required pedestal) and to be sized at 1.0kL per toilet or urinal with a minimum size of 5kL.

3. DA Approval Conditions

The DA Approval Conditions (Approval no.: DEV2023/1389, 1/09/2023) are attached in Appendix B. Conditions 21 and 22 outline the Stormwater Quality and Quantity Conditions respectively. These include providing a stormwater design generally in accordance with the PDA Guidelines, the Stormwater Drainage Concept Layout (Layout Plan 30031846-9000-SK01, Rev 1, 07/07/2023) and the Stormwater Drainage Concept Longsection (Layout Plan 30031846-9000-SK02, Rev 1, 07/07/2023) completed by SMEC.

Condition 22 requires Gross Pollutant and Oil Management Traps (litter, course sediment and oil removal) to be provided to capture all ground level runoff. Further, there are no requirements for bio-retention basins to be constructed on the development site.

4. Background

The existing car park (that includes the two existing bio-retention basins) on the application site, was approved and constructed prior to the current approved SQMP. The previously approved version of the SQMP and Plan of Development (PoD) required stormwater treatment to be provided on all lots greater than 1200m^2. The treatment was to be achieved with installation of

bio-retention systems sized at 1% of the contributing ground surface area with an extended detention depth of 200mm. It has since been determined that individual onsite bio-retention basins have led to poor outcomes on the ground and are ultimately no longer required as the end-of-line treatment systems have been constructed in their entirety and satisfy the overall development treatment requirements. The requirement for individual onsite bio-retention basins has now been removed from the current approved SQMP and PoD.

5. Proposed Design Approach

The proposed development treatment strategy will be to treat all ground level runoff through Gross Pollutant and Oil Management Traps and to capture rainfall runoff from proposed roof area into onsite rainwater re-use tanks in accordance with the requirements of DA conditions. It is proposed to install Atlan Stormsacks (or approved equivalent) in all grated inlet pits to treat ground level runoff. Two rainwater tanks are proposed on the development to capture roof runoff from the western building in accordance with the hydraulic engineer's requirements. The two existing bio-retention basins located within the McDonalds car park will be removed as they are no longer required due to the recent construction of downstream treatment systems (WSUD East and WSUD West). The above treatment strategy complies with the requirements of DA condition 22 and approved Stormwater Quality Management Plan (Approval no.: DEV2013/439/112, Version 1.7, 15/09/2022).

As shown in the Engineering Drawings, attached in Appendix C, the majority of the site will discharge directly into the existing vegetated swale, northeast of the site, via a new rock scour outlet. The northern portion of the site is proposed to connect to the existing stormwater infrastructure, within Edison Crescent, before also discharging into the vegetated swale northeast of the site via the existing outlet. This vegetated swale discharges into the WSUD East treatment system. The western portion of the site is proposed to discharge to the existing stormwater infrastructure within Packer Road before out letting into the vegetated swale west of Packer Road. This vegetated swale discharges into the WSUD West treatment system. Refer to Appendix C for the Civil Drawings.

6. Summary

The proposed stormwater design is generally in accordance with the current approved Stormwater Quality Management Plan and DA Approval Conditions.

Author

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Reviewer

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Civil Engineering Manager (RPEQ 21,411)

Appendix A- Approved Stormwater Management Plan
Appendix B- DA Approval Conditions
Appendix C- Engineering Drawings

Appendix A – Approved Stormwater Management Plan

AURA PRECINCTS 3-5

STORMWATER QUALITY MANAGEMENT PLAN

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SUMMARY

Precincts 3-5 of the Aura masterplan development covers 134ha of industrial, commercial, arterial road, sports field, linear park land uses, Bells Creek Arterial and various environmental buffer zones. The site drains in two directions. The majority of the site (125 ha) drains southwards into Bells Creek North and a small portion of the site flows into Lamerough Creek to the north. The two receiving waterways have different stormwater quality objectives.

The area of Precincts 3-5 draining southwards, flows into a State Government declared High Ecological Value area (Pumicestone Passage) as well as Ramsar listed wetlands. Consequently requirements for comprehensive stormwater quality improvement from the site are imperative. Stormwater quality objectives for development runoff from Aura have been determined as part of a wider water quality assessment of Bells Creek and Pumicestone Passage.

The area draining northwards into Lamerough Creek (9.6ha) does not require the same level of stormwater pollutant reduction. This area is, however, required to provide stormwater quality treatment to levels defined by State Planning Policy.

This document describes the stormwater quality management strategy for Aura Precincts 3-5 to meet required stormwater quality objectives.

Area draining south (>90% of site)

This strategy proposes a comprehensive combination of treatment systems responding to the very high value receiving waters. Vegetated swales convey flows to the south and two wetland and bioretention treatment systems at the southern edge of the development to provide the majority of treatment. In addition, rainwater tanks are used on allotments for water reuse in toilets and outdoor demands. These systems combined provide required stormwater treatment prior to discharge into Bells Creek North.

The treatment systems have been all be located within the constraints of site levels, available space and requirements for environmental buffers (e.g. avoid frog habitat and frog zone).

The treatment strategy meets the requirements for stormwater quality improvement to ensure there are no adverse impacts on Bells Creek and Pumicestone Passage. This includes reducing annual pollutant loads by more than the required 95% for total suspended solids (TSS), 89% for total phosphorus (TP) and 68% for total nitrogen (TN) from developed areas. These stormwater objectives were established as part of the stormwater planning and waterway modelling for the whole Aura development as documented in *Aura Development Stormwater Quality Management Plan* (DesignFlow & BMT, 2019).

Area draining north (<10% of site)

The area draining northwards will be treated using rainwater tanks, at-source bioretention systems within allotments and along the roads and a vegetated swale. The stormwater treatment strategy achieves the required annual pollutant reduction of 80%, 60% and 45% for TSS, TP and TN.

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1 Introduction

The Aura development site has been the focus of extensive water quality and stormwater quality management investigations over the last 10 years. This work has established the water quality characteristics of the receiving waterways (i.e. Bells Creek), monitored the quality of stormwater quality exiting the site, completed extensive catchment and receiving waterbody modelling, established water quality objectives and defined stormwater treatment strategies to meet these objectives. These requirements are now included in Federal and State Government approvals for the site.

This report focusses on Precincts 3-5, approximately 134 hectares of land including industrial, commercial, and sports field land uses as well as a section of the Bells Creek Arterial road and areas of buffers and environmental zones adjacent to Bells Creek North.

This report presents a SQMP for Precincts 3-5 of Aura reflecting recent investigations and consideration of site constraints and proposed development land uses and levels. The strategy ensures the stormwater quality objectives for Aura are achieved using treatment measures that respond to the site constraints while providing flexibility through future detailed design.

The treatment strategy for Precincts 3-5 is consistent with the stormwater objectives, planning and modelling documented in *Aura Development Stormwater Quality Management Plan* (DesignFlow & BMT, 2019) and recently approved by Economic Development Queensland (EDQ). This report defines stormwater management objectives for the Aura development (i.e. reduction in annual pollutant loads by the required 95% for total suspended solids, 89% for total phosphorus, and 68% for total nitrogen from developed areas) to ensure no adverse impacts to Bells Creek and Pumicestone Passage. The stormwater treatment strategy for Precinct 3-5 ensures these objectives are achieved.

1.1 Precincts 3-5 development

Precincts 3-5 is located in the north of the Aura development site and is directly west of Precinct 2 (Figure 1).

Areas covered in this SQMP include approximately (Figure 2):

- 65 hectares of industrial land
- 16 hectares of commercial land
- 17 hectares of arterial road (Bells Creek Arterial)
- 11 hectares of waterways and linear park
- 8 hectares of sports field
- 17 hectares of linear park, buffers and environmental zones adjacent to Bells Creek North.

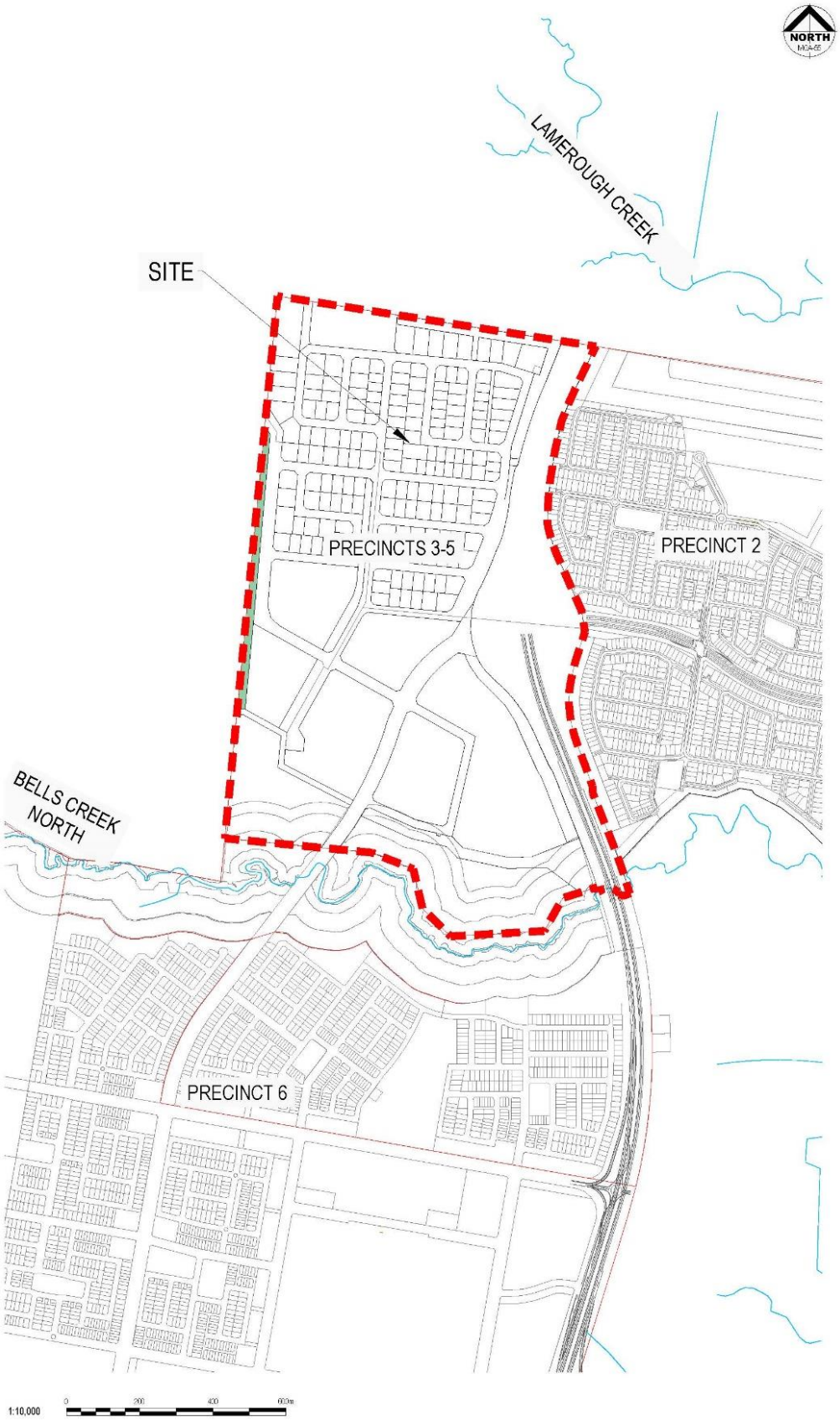


Figure 1 Aura Precincts 3-5 Location



Figure 2 Aura Precincts 3-5 Development

2 Site Characteristics

The description of the site presented here relates to elements that affect the stormwater quality management strategy for Precincts 3-5. More thorough site descriptions of soils, geology, climate, vegetation and habitats are not replicated as these are covered in other reports relating to the site.

2.1 Current land use

Precincts 3-5 cover approximately 135 hectares of predominantly cleared grazing land. The area is bordered by Bells Creek North to the south, Precinct 2 to the east, Lamerough Creek to the north and bushland and pine forest to the west (Figure 3).

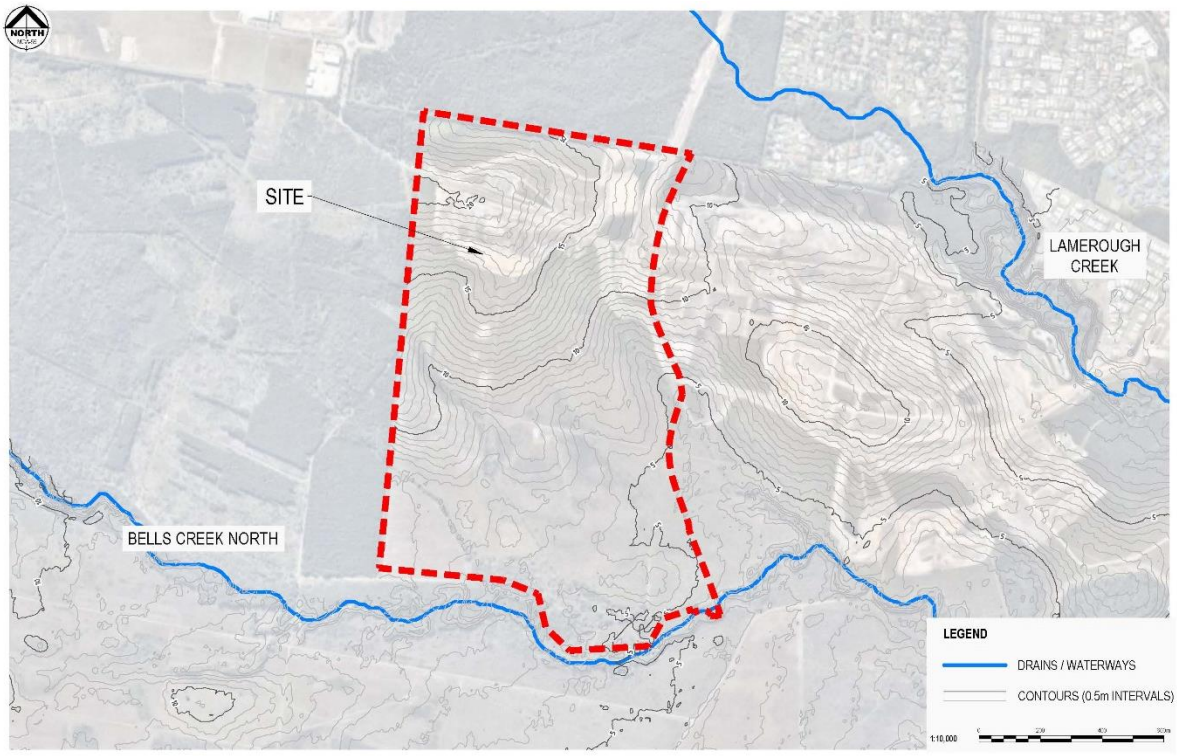


Figure 3 Existing land use, topography and drainage

2.2 Topography and drainage

The majority of the site (~90%) slopes generally from north to south into Bells Creek North. Approximately 10% of the area drains northwards and flows into Lamerough Creek.

The site generally has mild grades (from approximately RL 20m AHD in the north to 5m AHD in the south). The mild grades offer some potential to redirect flows across catchments where it suits the overall stormwater management approach.

Bells Creek North has water levels of approximately RL 6m AHD at the western edge and RL 3.5m AHD at the eastern edge of the development area. These levels are a critical consideration when establishing the stormwater network layout and operation of treatment devices discharging into Bells Creek North.

Using this information in the development of the stormwater treatment strategy a catchment plan was developed.

2.3 Bells Creek North

Bells Creek North (a tributary of Bells Creek) is a healthy waterway which supports a range of wetland and riparian flora and fauna (see photo below). The condition of the creek, including water quality, has been extensively monitored and presented in other reports and is not covered here.



The total catchment of Bells Creek including the Aura development is 4,630ha . Precinct 3-5 form approximately 125ha of this catchment with commercial, industrial and road land uses (this represents 2.7% of the total Bells Creek catchment). The context of Precincts 3-5 in the wider Bells Creek catchment is shown in Figure 4.

Protection of Bells Creek and the downstream Pumicestone Passage are a critical component of the Aura development and stormwater runoff from the whole area is required to meet a general "no worsening" water quality concentration condition in Pumicestone Passage . This is discussed further with regard to the stormwater treatment objectives (Section 3).

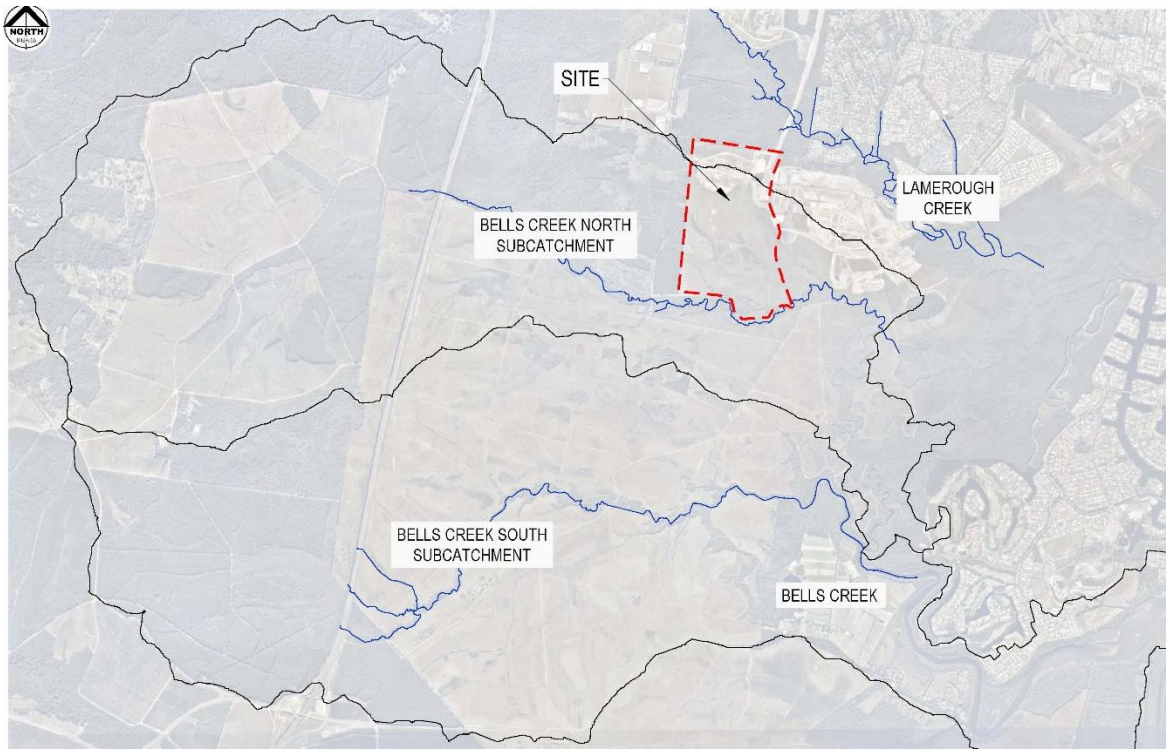


Figure 4 Bells Creek Catchment

2.4 Frog habitat

Frog habitat has been identified across the Aura development for the following frogs which have federal or state significance:

- Wallum Sedgefrog
- Wallum Froglet
- Wallum Rocket Frog.

Management of the Wallum Sedgefrog is to occur in accordance with the approved *Caloundra South Wallum Sedge Frog Management Plan*. Some Sedgefrog habitat areas within the development footprint will be removed and compensatory Sedgefrog habitat areas recreated within the Aura development site (typically within frog zones and buffers as per Section 2.5).

The Wallum Froglet and Wallum Rocket Frog will be managed in accordance with the *Caloundra South Acid Frog Management Plan*, the requirements of which are very similar to the Wallum Sedgefrog outlined above.

2.5 Waterway and frog buffers

To preserve and enhance the riparian function of Bells Creek and meet the requirements of the *Caloundra South Wallum Sedge Frog Management Plan* and *Caloundra South Acid Frog Management Plan*, the development edges in Precincts 3-5 are required to incorporate the following:

- 25m wide riparian buffers from top of waterway banks (for preservation and rehabilitation of riparian vegetation)
- 50m width Frog Zone (for creation of Wallum Frog habitat)
- 50m Frog Buffer (buffer to the Frog Zone and additional space for creation of Wallum Frog Habitat).

The Frog Buffer can incorporate some stormwater management as per *Caloundra South Wallum Sedge Frog Management Plan* and details of permitted encroachment into the frog buffer is described in Section 5.3.4.

3 Stormwater Quality Objectives

3.1 Bells Creek Catchment

The majority of Precinct 3-5 drains to Bells Creek. There are several fundamental drivers for managing stormwater quality from Aura.

The adjacent sections of Pumicestone Passage which receive runoff from the site have been defined as having High Ecological Value (HEV) status in the *Environmental Protection Policy (EPP) – Water* (2009). Water quality objectives that accompany HEV status are of the nature of 'no worsening', but more specifically are quantified as maintaining existing water quality (20th, 50th and 80th percentiles) in the receiving waterway (Department of Environment and Heritage Protection).

Pumicestone Passage and the estuarine sections of Bells Creek have also been defined as having Ramsar wetland status. The associated significance criteria which accompany this designation include:

- Areas of the wetland being destroyed or substantially modified
- A substantial and measurable change in the hydrological regime of the wetland (e.g. volume, timing, duration and frequency of surface and groundwater flows)
- The habitat or lifecycle of native species being seriously affected
- A substantial and measurable change in the water quality of the wetland that may adversely impact on biodiversity, ecological integrity, social amenity or human health
- An invasive species that is harmful to the ecological character of the wetland becoming established, or an existing invasive species spreading.

With such significant high value environmental areas downstream of Aura, considerable investigation and planning has gone into protecting these areas from the impacts of urbanisation as outlined in a range of previous reports (not reproduced here). These reports have attempted to establish load base stormwater quality design objectives which will ensure the 'no worsening' receiving water quality requirement is achieved.

Objectives that are applied to Precincts 3-5 are based on recent catchment and waterway modelling completed for the Bells Creek catchment and Aura development site presented in *Aura Development Stormwater Quality Management Plan* (DesignFlow & BMT, 2019). The stormwater load based reduction targets are presented in Table 1. These exceed *State Planning Policy* requirements, reflecting the significance of the receiving waters. These objectives apply to stormwater runoff from development areas or landuses only and exclude excludes waterway and frog buffers, Environmental Protection Zone, undeveloped areas and stormwater treatment systems, which do not required stormwater treatment.

Table 1: Stormwater quality design objectives – Bells Creek Catchment

Pollutant	Objective - Minimum reduction in mean annual load from unmitigated development area[1]
Total Suspended Solids	95%
Total Phosphorus	89%
Total Nitrogen	68%
Gross Pollutants	90%

3.2 Lamerough Creek Catchment

The far northern part of Precincts 3-5 drains to Lamerough Creek. For this portion of the development the State Planning Policy, and relevant objectives in the Sunshine Coast City Plan, have been applied as per Table 2.

Table 2: Stormwater quality design objectives – Lamerough Creek Catchment

Pollutant	Objective - Minimum reduction in mean annual load from unmitigated development area
Total Suspended Solids	80%
Total Phosphorus	60%
Total Nitrogen	45%
Gross Pollutants	90%

[1] Objectives apply to development areas. This excludes waterway and frog buffers, Environmental Protection Zone, undeveloped areas and stormwater treatment systems.

4 Stormwater Quality Management Strategy

This section provides an overview of the stormwater design philosophy and describes the treatment systems proposed for Precincts 3-5.

4.1 Design principles

To develop a robust stormwater treatment strategy, a number of principles were applied for managing stormwater quality. These include:

1. Flexibility – The stormwater treatment strategy will have flexibility and redundancy to allow adjustment in response to site constraints and issues identified as part of future design. This allows the design to be modified during detailed design if an unforeseen constraint is identified.
2. Avoid double treating – As much as practically possible, stormwater that has been "treated" in a wetland or bioretention system should not flow into a downstream treatment, but rather be discharged to the receiving waterway.
3. Identify end-of-line treatment opportunities – Explore all "end-of-pipe" treatment systems initially. Treatment systems are located along the southern perimeter of the development and need to work within the constraints of areas for frog habitat, buffer and existing Bells Creek North levels. This approach reduces the number of treatment devices needing maintenance and increases opportunities for adaptive management.
4. At-source treatments – Tanks are to be provided on all lows for water conservation and gross pollutant traps to manage litter from the industrial/commercial landuses. At-source biopods (bioretention) are proposed for the northern catchment only where end-of-line treatment is not feasible due to space and level constraints.
5. Frogs – Ensure the requirements of the *Caloundra South Wallum Sedge Frog Management Plan* and *Caloundra South Acid Frog Management Plan* are achieved.
6. Match catchments, levels and drainage to end-of line treatments– Consideration of slopes and drainage requirements resulted in a portion of the northern part of the area to be directed to Lamerough Creek with the remainder flowing to Bells Creek North. Capacity restrictions prevent high flows being directed to Lamerough Creek, therefore, the conveyance network accounts for the northern area high flows being directed to Bells Creek North.

4.2 Stormwater treatment strategy

A concept layout for the stormwater treatment strategy for Precincts 3-5 is presented in Figure 5. It shows how stormwater is directed to the two receiving waters (Lamerough Creek and Bells Creek North) and the interactions of biopods (Lamerough Creek only), swales, wetlands and bioretention with flows, overflows and treated water.

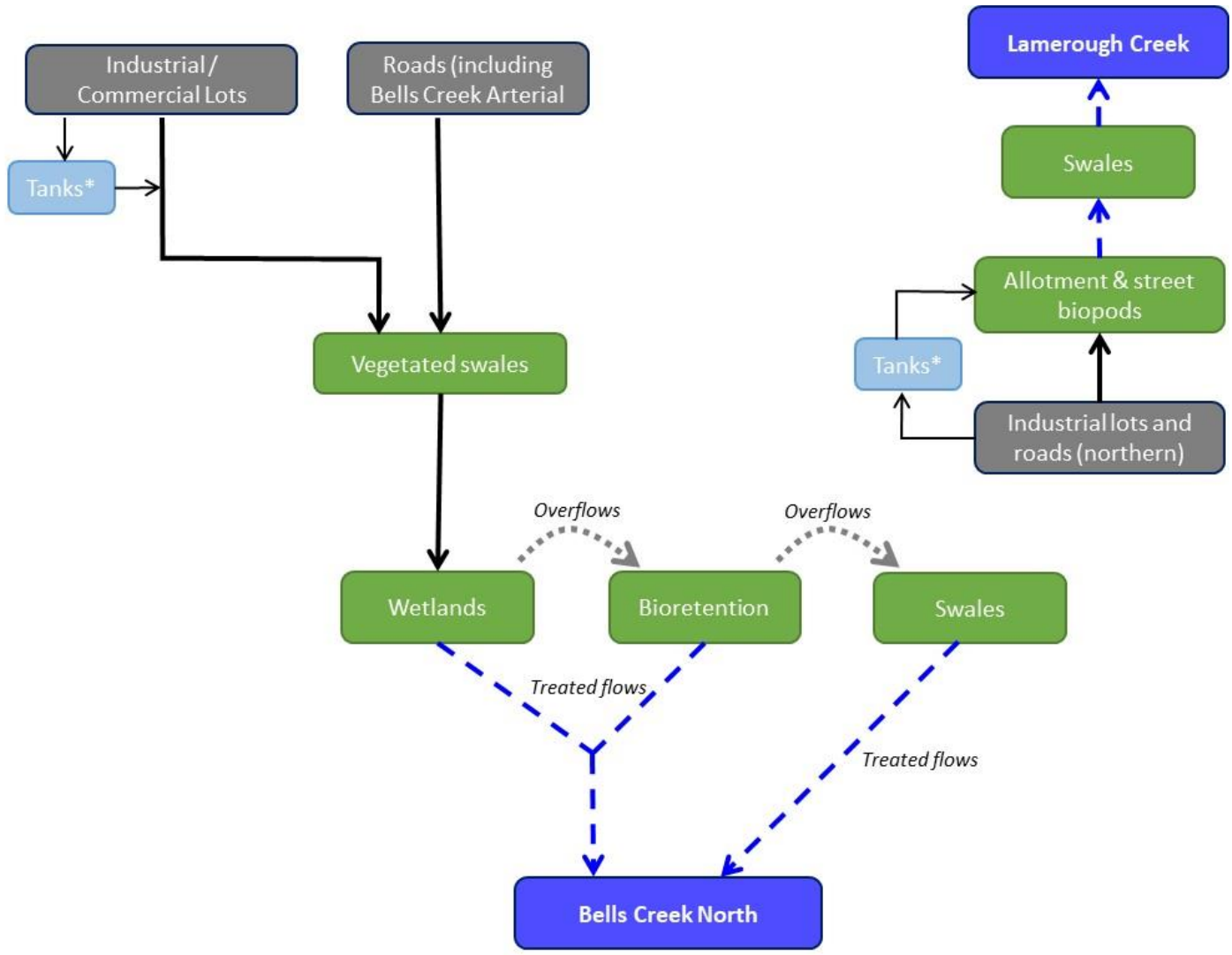


Figure 5 Stormwater treatment train flow diagram

The strategy adopts a similar approach to that taken in previous precincts of Aura. The same suite of stormwater treatment measures are used (i.e. rainwater tanks, biopods, end-of-line bioretention and wetland systems and vegetated swales in various forms). For Precincts 3-5, the treatment measures have been applied responding to proposed land uses and the constraints of the site while providing flexibility to achieve the stormwater quality objectives.

Important aspects of the treatment strategy are:

1. **Tanks** are included in the strategy and will provide a water conservation function. To be conservative in the assessment of stormwater loads for Precinct 3-5, the stormwater quality benefits of tanks have not been included in the MUSIC modelling and sizing of the stormwater treatment systems. This results in slightly oversized stormwater treatment systems thus ensuring resilience in the stormwater treatment strategy should the water demands on tanks be less than anticipated (refer to Section 6).
2. **Biopods in the Northern Catchment** are required to treat all stormwater runoff from the allotments and roads. These are to be sized at 1.35% of the allotment or road catchment. The allotment bipods will be privately owned and the road bipods will he Council owned.
3. **Vegetated swales** throughout the development will convey the majority of runoff southwards and direct flows into the end-of-line treatment systems adjacent to Bells Creek North.
4. **End-of-line treatment systems** (i.e. combined sediment basins, wetlands and bioretention systems have been sized to achieve the stormwater quality objectives in combination with upstream swales. Based on concept layouts (Section 5) there is suitable space having given consideration to other land requirements (e.g. frog zones).

Figure 6 presents the proposed catchment areas draining to the treatments and Figure 7 shows a summary of the overall treatment strategy, including the location and sizes of the end-of line treatment systems at the southern edge of the development layout. The exact location for biopods (for allotments and roads in Lamerough Creek catchment) is subject to detailed design. Design principles for biopods are described in Section 5.

Table 3 presents catchment and treatment size details for the proposed treatment systems.

Note:

- The sizes nominated in Table 3 for treatment areas are the wet areas of wetlands (i.e. normal water level) and the filter area surfaces of bioretention basins. They do not include land for required batters, access tracks etc. Total land requirements have been considered carefully when developing the concept layouts and are included in those diagrams (Section 5.4).
- The end-of-line treatment systems include a safety factor in the design given the industrial and commercial landuse in precinct 3-5 and the associated risk to Bells Creek. The sensitivity testing completed in MUSIC illustrates the bioretention filter media area can be reduced (due to blockage or other failure) by 30% and still achieve the stormwater quality objectives.

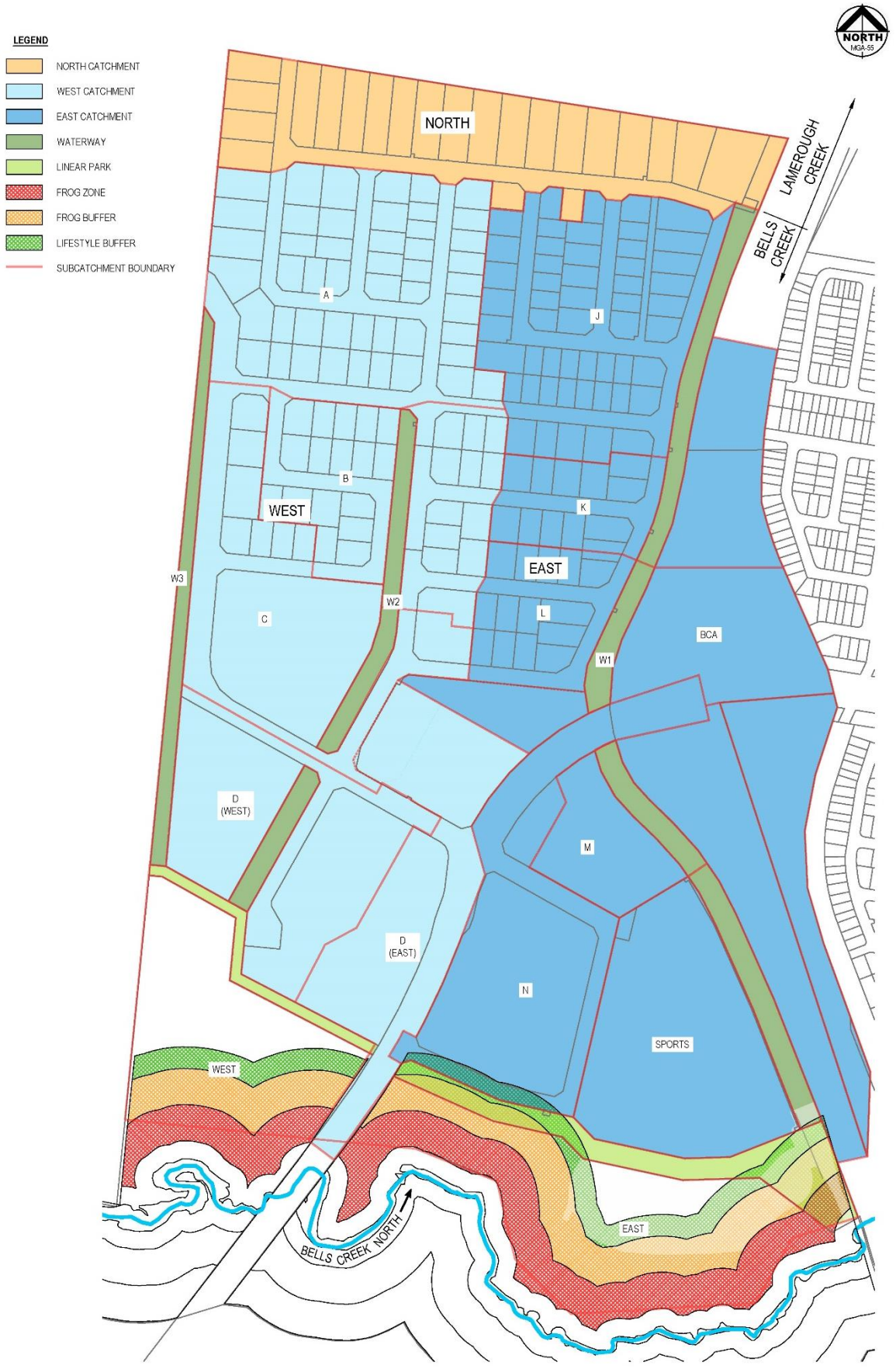


Figure 6 Proposed catchments for treatment in precincts 3-5

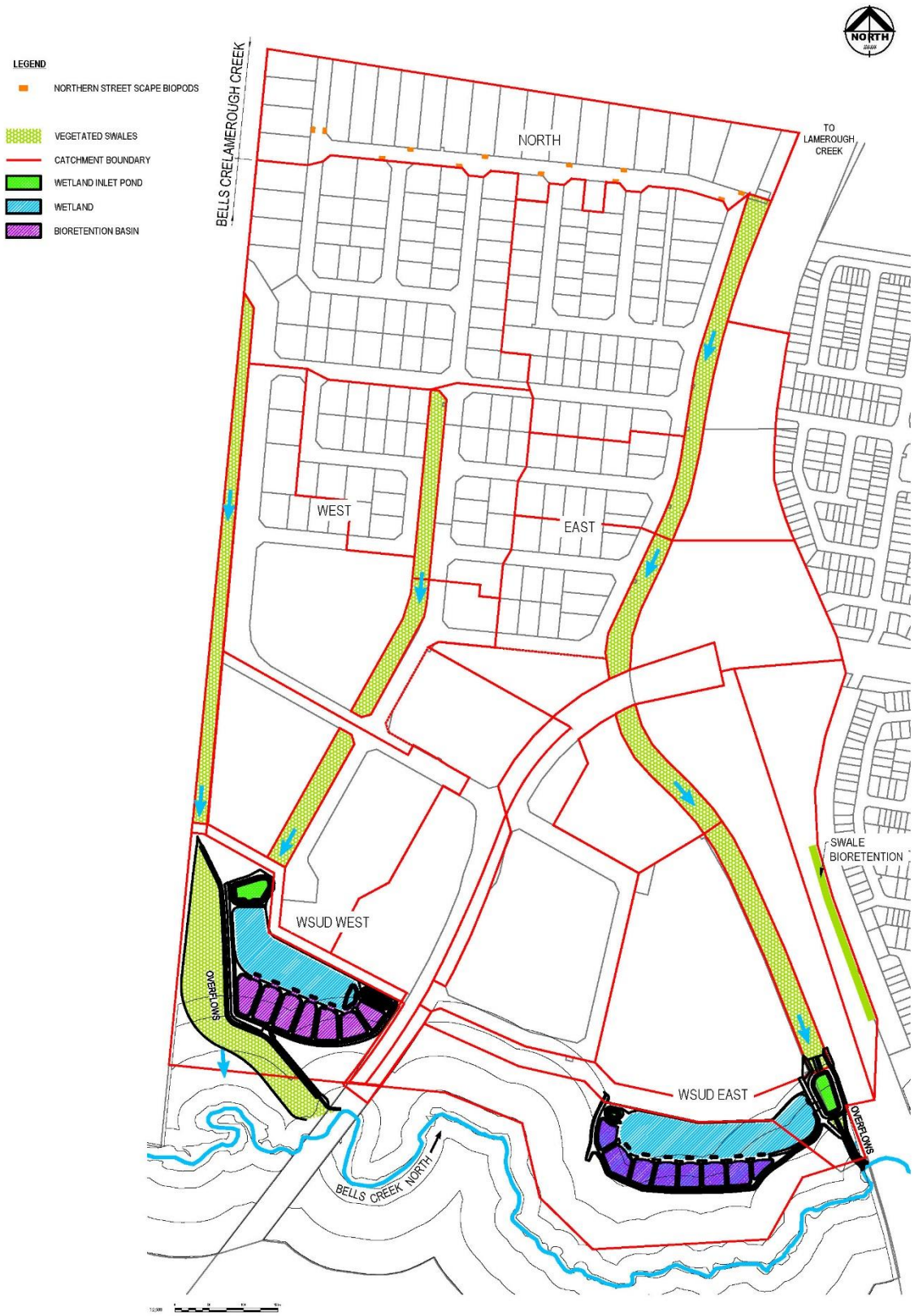


Figure 7 Summary of the stormwater treatment strategy for Precincts 3-5

Refer to Figure 6 for the location of specific catchments within Precincts 3-5.

Table 3 Stormwater catchments and treatment system areas for Precincts 3-5

CATCHMENT ID	Area ha	Allotment biopods m^2	Street biopods m^2	Wetland inlet pond m^3	Wetland m^2	Bioretention basin m^2
WEST CATCHMENT						
A - industrial	12.23					
B - industrial	7.14					
C - industrial	8.82					
C - commercial	1.40					
D -industrial	10.53					
D - commercial	1.75					
Linear park	0.67					
Road (Aura Bde)	1.76					
Swale	3.74					
Buffers and WSUD	6.99					
TOTAL - WEST	**55.03**			**2,596**	**11,400**	**8,086**
EAST CATCHMENT						
J - industrial	10.11					
K - industrial	2.85					
L - industrial	3.48					
L - commercial	1.35					
M - commercial	3.48					
N - commercial	6.08					
Road (BCA, Aura Bde)	18.87					700#
SPORTS	7.74					
Linear park	1.83					
Swale	4.14					
Buffers and WSUD	9.9					
TOTAL EAST	**69.83**			**2,400**	**14,800**	**7,700**
NORTH CATCHMENT						
North - industrial	9.59	540	239			
TOTAL NORTH	**9.59**	**540**	**239**			
TOTAL P3-5	**134.5**					

 # Bioswale on east side of BCA

4.3 Summary of proposed stormwater treatment measures

The table below briefly describes the stormwater treatments measures adopted for Precincts 3-5. Many have been applied to other precincts of the Aura development.

Table 4 Summary of Stormwater Treatment Measures for Precincts 3-5

Measure	Description
Education and Awareness	Education of stormwater management approaches at Aura will be built into community communication through signs, kerb messages and other media. While education can play a role in reducing pollutants reaching waterways, the benefits of education on reduced pollutant loads have not been included in the MUSIC modelling assessment.
Rainwater Tanks	As part of Stockland's water conservation policy rainwater tanks accepting runoff from at least 50% of roof areas are proposed for all properties. Tanks are to be sized at 1.0KL per toilet or urinal with a minimum 5 KL size, and water from the tanks is to be plumbed to indoor non-potable and outdoor uses. While the tanks serve an important water conservation role they also contribute to reducing stormwater pollutant export. However, given the high variability in tank demand for commercial and industrial land uses, tanks have not been included in the MUSIC modelling of the stormwater pollutant reduction (Section 6).
Biopods (Streetscape raingardens) Lamerough Creek Catchment Only	Biopods (referred to as streetscape raingardens in previous stormwater strategies) have formed an important part of the stormwater strategy for the Aura site and have been implemented as part of earlier Precincts including Bells Reach and Precinct 2. The systems work by receiving runoff from the kerb in set down areas in the road verge. Stormwater then percolates through a vegetated soil matrix that promotes fine filtration and biological uptake of pollutants. Treated water is collected at the base and discharged into the stormwater system. The street biopods are assumed to have 200mm ponding depth. Biopods are proposed for the roads in the northern catchment of Precincts 3-5 that drain to Lamerough Creek, sized at 1.35% of their catchments.
Biopods (allotment raingardens) Lamerough Creek Catchment Only	Biopods are proposed for the allotments in the northern catchment which drains to Lamerough Creek as indicated in Figure 7. The systems work by the ground levels of the lots to be formed to direct all runoff to biopods. Stormwater then spreads over the biopod surface and is allowed to pond by up to 200mm before percolating through a vegetated soil matrix. The biopods are sized to be 1.35% of the whole lot and pond up to 200mm. Biopods will provide effective capture of gross pollutants (i.e. litter), sediment and nutrients and also any oil that may be in stormwater runoff (very low risk of oil contamination and biopods will manage).
Gross pollutant management	Where allotments do not have biopods, then gross pollutant management will be provided on the allotment for all ground level runoff to remove litter and other gross pollutants prior to discharge from the allotment. No specific oil management is required because the risk of oil is very low and suitable treatment of oil will be provided in the end-of-line wetland and bioretention systems. The design of high risk landuses such as service stations must occur in accordance with Council and State Government policy. Structural separation (installation of bunds and rooves/canopies) of high pollutant generating operations, such has fuel bowsers and car wash areas on the lot, must be adopted to effectively exclude these areas from stormwater runoff.

Measure	Description
Constructed Wetlands	Two constructed wetlands are proposed at southern perimeter of Precincts 3-5. The wetlands will receive flows from vegetated swales, hold water for treatment for approximately 3 days with overflows being transferred to adjacent bioretention basins. Constructed wetland systems are shallow extensively vegetated water bodies that use enhanced sedimentation, fine filtration and pollutant uptake processes to remove pollutants from stormwater. Water levels rise during rainfall events (by up to 350mm) and outlets are configured to slowly release flows, typically over two to three days, back to dry weather water levels. Wetlands consist of an inlet zone (sediment basin to remove coarse sediments), a macrophyte zone (a shallow heavily vegetated area to remove fine particulates and facilitate the uptake of soluble pollutants) and a high flow bypass (to protect the macrophyte zone). The proposed operation of the wetlands and interaction with the subsequent bioretention basins is described in Section 5. Treated flows from the wetlands will be discharged to Bells Creek North. Overflows from the wetland will enter bioretention basins located immediately around the wetland perimeter to receive further treatment. During large events, overflows from the inlet pond will drain via overflow swales to Bells Creek North. The wetlands will all be designed in accordance with the WSUD Technical Design Guidelines for SEQ (Water by Design).
Bioretention Basins	Bioretention basins are proposed to receive stormwater that overflows from the wetlands at the southern edge of Precincts 3-5. There are a number of advantages in considering the bioretention systems in this manner: • bioretention systems accept untreated stormwater thus avoiding double treating stormwater • bioretention systems do not receive regular "trickle' flows (that can cause algal growth and block their surface) • allows the bioretention basins to be positioned higher than the wetland normal water level. This approach minimises the head required to operate the wetland and bioretention treatment combination and thus reduces the level the development pad is required to be lifted to enable free draining to and from the treatment systems. Treated flow that collects in the underdrainage pipes will combine with treated water from the wetlands and discharge into Bells Creek North (or be diverted for harvesting). Design of the bioretention systems will occur in accordance with Bioretention Technical Design Guideline (Water by Design).
Overflow Swales	Overflows (i.e. high flow bypass flows) from the wetland and bioretention systems will be directed to wide shallow vegetated areas that will convey flows to Bells Creek North. The areas will act to filter the overflows and slow flows down before entering the creek. The systems will essentially act like occasional flowing wide swales.

5 Design Principles

5.1 Rainwater Tanks

Rainwater tanks are an important part of Stockland's water conservation and stormwater management strategy for Aura. Table 5 summaries the proposed tank approach for Precincts 3-5 which is consistent with the tank approach outlined in *Aura Development Stormwater Quality Management Plan* (DesignFlow & BMT, 2019). These have been written into the Plan of Development for Precincts 3-5 to ensure compliance with this Stormwater Quality Management Plan.

Table 5: Rainwater tank approach for Precinct 11-14

Landuse	Roof Area	Tank size (minimum)	Tank Connections / Fixtures / Uses
All non-residential uses including but not limited to: • Commercial • Retail • Industrial • School • Community	50% roof must connect / drain to tank If multiple buildings then 50% of total roof area must connect / drain to tank	1KL per toilet or urinal or 25kL/ha Minimum 5 KL size	Tanks must be connected to and supply water to all non-potable uses and fixtures including but not limited to: • Toilets (all toilets) • Urinals (all urinals) • Laundry cold (all taps in laundry) • Outdoor taps (all outdoor taps)

5.2 Biopod Design Principles (Lamerough Creek Catchment)

Biopods are to be used in the following locations and with the nominated sizes and average ponding depths across Precincts 3-5 (refer to Figure 7 and Table 3):

1. Allotments in the northern catchment (1.35% of the allotment area – 200mm average ponding depth)
2. Roads in the northern catchment (1.35% of the contributing catchment – 200mm ponding depth)

The detailed design for each biopod will be developed during further stages of design. Stockland has extensive experience on other Precincts of Aura in delivering biopods in different locations. While the particular aspects of the biopods will differ between the locations (e.g. in a car park compared to within an allotment) the operating principles are all similar and council's requirements will be accommodated.

Important design considerations will include:

- Biopod filter media minimum width of 1.0m
- Batters of 1 in 2 or flatter
- Consider one-way cross-fall pavement for streets
- Locate biopods to avoid driveways and parking areas
- No conflict with services other than sewer which may pass under a biopod, with correct protection.
- Avoid interaction of pedestrians and trip hazards with the bipods as much as possible.

- Where possible moving pedestrian pathways and non-compatible services to the opposite verge from the biopod to create space where required.
- Where it is not possible to pedestrian pathways away from biopods, small vertical walls may be adopted in accordance with *Bioretention Technical Design Guideline* (Water by Design, 2014). In this case suitable balustrade will be installed to minimize hazards of pedestrians or bicycle riders falling into basin.

There are many variations of biopod designs but the proposal for Precincts 3-5 will be to create systems similar to other areas of Aura so that maintenance can be streamlined. Some examples in the photos below show variations in biopod type.



Photo: Linear Car Park Biopod



Photo: Biopods at end of parking bays



Photo: Example of biopod (Aura Precinct 2)

5.3 Wetland and Bioretention System Design

Designs for the end-of-line treatment systems (i.e. constructed wetlands, bioretention basins and overflow swales) involved a number of steps:

1. Resolving the function of the treatment systems (i.e. how they interact hydraulically to maximize treatment performance)
2. Identifying available space for treatment adjacent to Bells Creek North and accommodating the required buffers
3. Ensuring there is sufficient space for the contributing catchments
4. Completing MUSIC modelling to confirm treatment performance
5. Completing survey of creek levels (top of bank and standing water level)
6. Defining operating levels in the wetlands and bioretention systems (using discharge levels into the creek)
7. Optimising the swale levels and associated earthworks in the development.

The following sections summarise the considerations and findings of this process.

5.3.1 Treatment system operation

The wetland and bioretention treatment systems receive flows for the swales running southwards in the development (Figure 7). As flow enters the treatment systems it follows the sequence below (refer to Figure 8):

- **Inlet pond** - Flows from the swales enter an inlet pond where coarse sediment will settle out and low flows will pass via a pit/pipe system to the wetland.
- **Wetland** - Flows enter the macrophyte zone of a wetland for treatment. The wetland will treat base flows and small storm events with treated flows discharged to Bells Creek North. Wetlands will typically have a 48-72hr notional detention time (in this case we have adopted 72hr notional detention time) and a maximum depth of 350mm above normal water level (when bioretention is fully engaged) which will drain back to 50-100mm depth quickly.
- **Bioretention** – During rainfall events, the wetlands begin to fill and as water levels increase by more than 50mm they will overtop weirs into adjacent bioretention basins. As flow increases water ponds over the bioretention by up to 300mm. The ponded water is combined with that over the wetland. As a storm ends, water then flows through the bioretention media (the majority) and through the wetland outlet. Treated flows from the bioretention basins will be discharged to Bells Creek North. The bioretention basins are divided into "cells" to provide management flexibility, promote better flow spreading and allow easier construction and maintenance).
- **Overflow swales** – The vast majority of stormwater will pass through the wetland and bioretention system to achieve the performance objectives listed in Section 3. Large storm events will overflow a weir in the inlet pond and pass through an overflow swale which will be vegetated. The swale will promote sedimentation and filtration of sediment and particulate phosphorus and discharge large flow events to the creek.

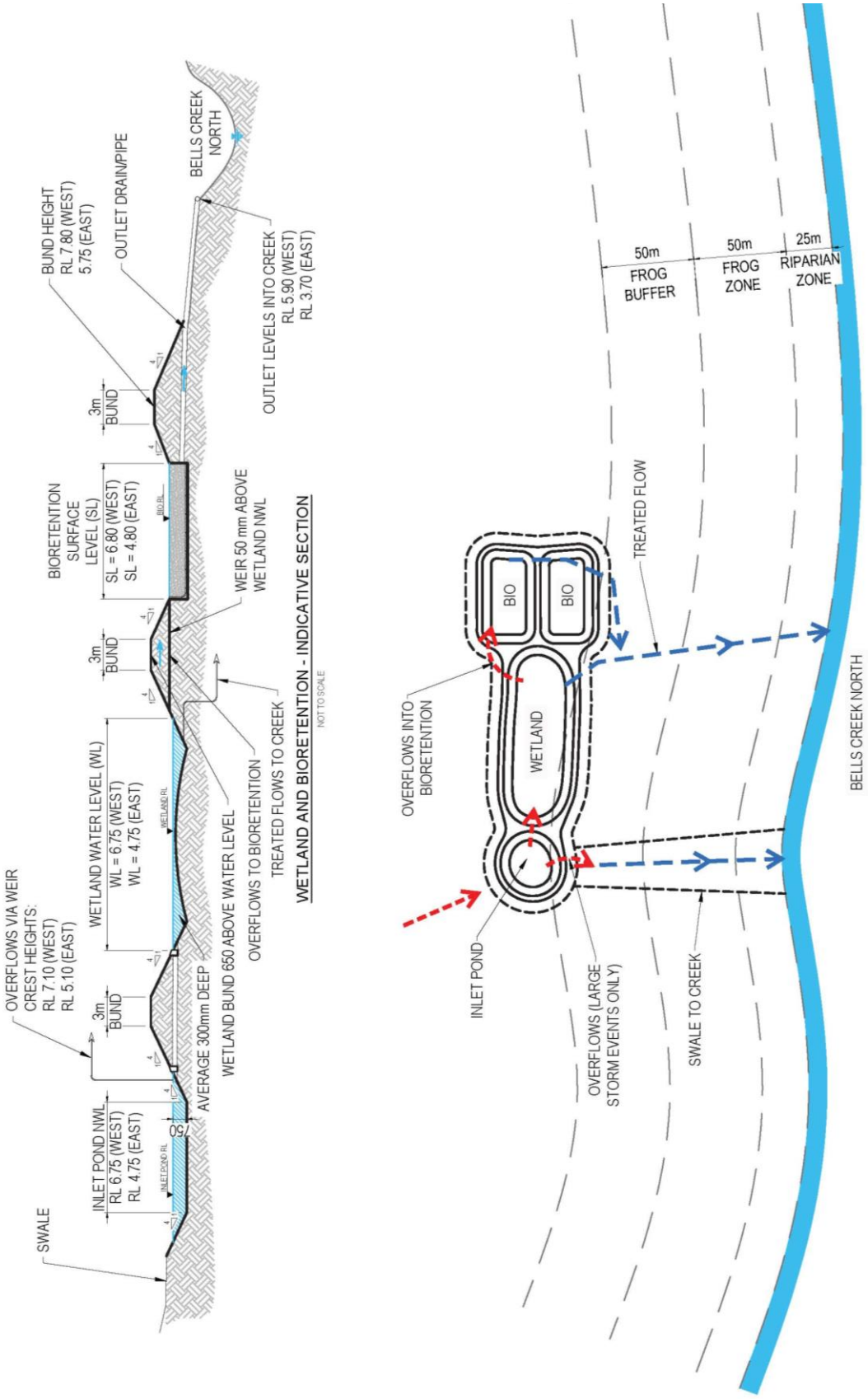


Figure 8 Function and operating levels wetland and bioretention treatment systems

5.3.2 Operating levels

A critical consideration of the end-of-line treatment systems is the operating levels and how the systems will discharge into Bells Creek North. Figure 8 provides a conceptual cross section through the wetlands and bioretention systems to illustrate how water will move through the systems and drain freely into the adjacent creek.

It shows there is 1-2-1.5m between the outfall levels in the creek to the swale invert entering the wetlands. Survey of the creek standing water level and top of bank was completed as part of the conceptual design to define outfall levels, which have been set above the standing water and low flow levels in the creek.

5.3.3 Location and size

The end-of-line wetlands and bioretention systems have been carefully located considering the constraints including:

- Existing Wallum Sedgefrog habitat (no stormwater management allowed)
- Riparian buffer of 25m (no stormwater management allowed)
- Frog zone of 50m (no stormwater management allowed)
- Frog buffer of 50m (stormwater management allowed) following appropriate criteria (Section 5.3.4)
- Existing vegetation
- Existing drainage
- Parkland, following appropriate criteria (Section 5.3.5)
- Suitable discharge points for treated stormwater.

Sufficient space for the treatment areas as well as batters and access tracks etc. have been provided. In addition, consideration of flood levels of Bells Creek North and requirements for pedestrian paths have influenced their proposed locations.

5.3.4 Frog buffer considerations

Stormwater treatment systems are located in parts of the frog buffer ensuring the following criteria are met (developed in consultation with Australian Wetlands Consulting):

1. No more than 40% of the Frog Buffer can be used for stormwater management devices, including drainage channels. Stormwater management devices must be placed uniformly along the length of the Frog Buffer to ensure no restriction to the overall connectivity of Wallum Sedgefrog (WSF) habitat within the Frog Zone and Frog Buffer.
2. Where stormwater management is located within the Frog Buffer, an average minimum set back of 20m is required between all the edges of each stormwater management measure and the Frog Zone boundary. This set back distance does not apply to stormwater outlet drainage channels.
3. The final locations of the stormwater management devices will be determined during detailed design. The location will consider the proposed WSF breeding ponds, foraging habitat and overall habitat connectivity to ensure compliance with Key Performance Criteria 5, listed in Table 6.2a within the *Wallum Sedgefrog Management Plan* and Table 8.2a within the *Acid Frog Management Plan*.

5.3.5 Parklands considerations

Stormwater treatment systems have been placed in parklands in accordance with the *Caloundra South Infrastructure Agreement*:

1. Land provided for stormwater treatment facilities for the park are to have a minimal impact on the park's functionality.
2. Max. 5% of total park area for stormwater treatment
3. Where possible, stormwater treatment facilities are to be integrated with planting areas and form part of the overall vegetated area.
4. 30% of the parkland area can be below the 5yr ARI
5. Max grade 1:4, 1:6 preferred for maintenance requirements.

5.4 End-of-line concept designs

Proposed sizes, shapes and configurations for wetland and bioretention systems were resolved by considering available areas for the treatment systems, catchments, required treatment areas and surveyed outfall levels. The operational principles as shown in Figure 8 were applied to develop the concepts.

Figure 9 (west) and Figure 10 (east) show the concepts for the two end-of-line systems. They show sizes, shapes, earthworks and levels for each system. They demonstrate how the proposed system can feasibly fit within the available space and operate hydraulically with the levels of the area and Bells Creek North.



Figure 9 Western end-of-line treatment system concept

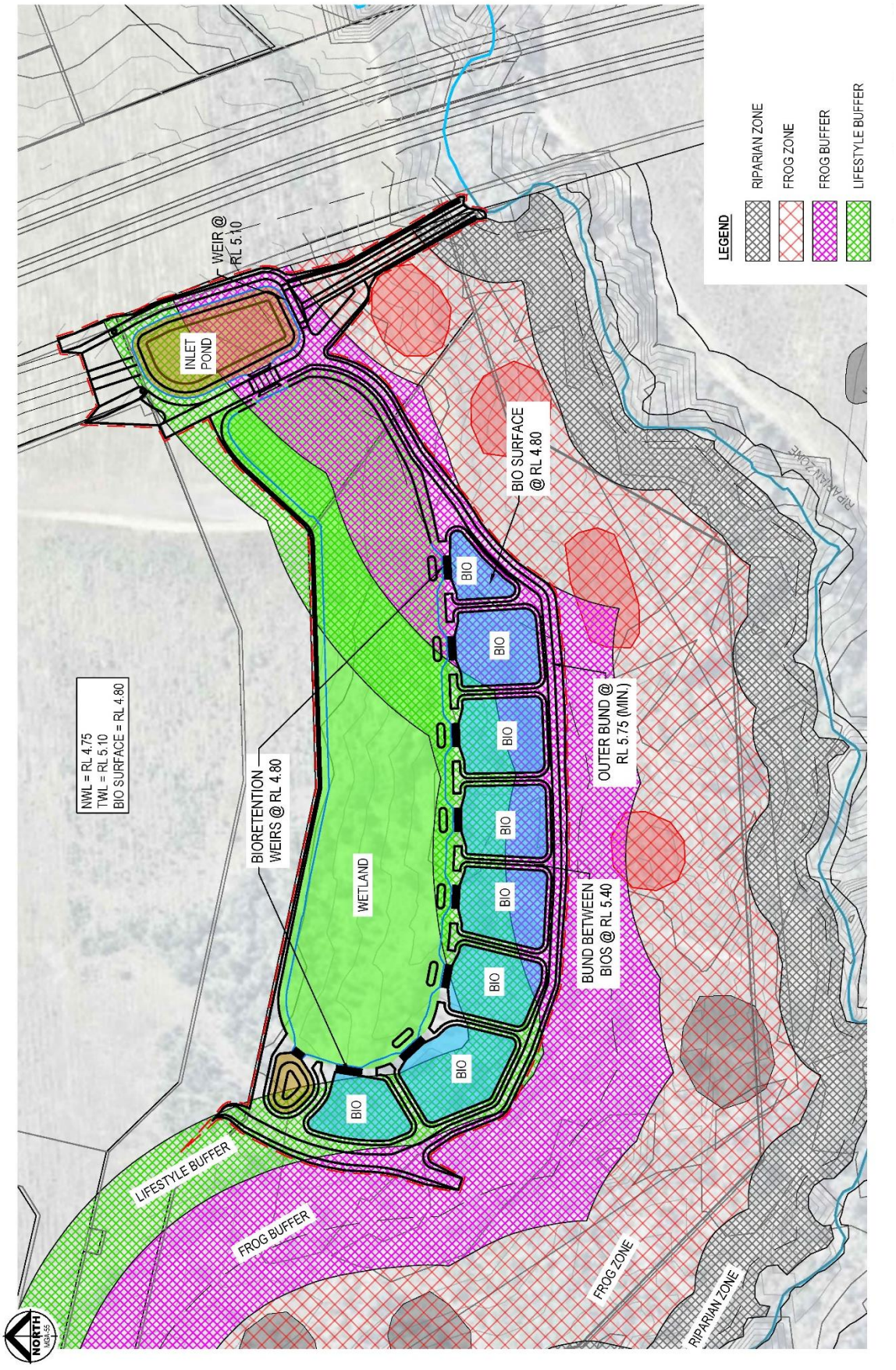


Figure 10 Eastern end-of-line treatment system concept

5.5 Stormwater harvesting for the sports field

The eastern treatment system is located adjacent to proposed sports fields. An opportunity to use a stormwater harvesting scheme to supply irrigation was identified. This will need to be worked through with Council further and is presented here as an opportunity only (i.e. it is not relied upon to meet required stormwater treatment targets).

The system would direct treated water from the eastern treatment system (from both wetlands and bioretention systems) to a storage tank for subsequent reuse.

The tank (most likely to be located underground) would then be used to supply irrigation water following some additional disinfection. The location of the infrastructure will be confirmed during if the scheme proceeds and required components would be:

- Pumping station to transfer treated water to a storage tank (including pump, power and control systems) – e.g. 10 L/s pump rate
- Pipe connection to the storage tank
- Storage tank (most likely underground) – approximately 800m^3 of storage
- Irrigation pump station (including filter, disinfection (e.g. UV), pump, power, controls and mains water back up)
- Dedicated irrigation supply pipes (with back-flow prevention to mains water supply).

The harvesting system will meet approximately two thirds of the sports field irrigation demand of 40 ML/year.

This is a conservative irrigation demand because it is assumed the sports fields will be of high quality and therefore require considerable irrigation (e.g. 800mm/year).

To pursue this opportunity, Stockland have committed to working with Council to develop a business case for the harvesting scheme and provide other details to enable council to assess its merits.

6 Performance Assessment (MUSIC modelling)

6.1 MUSIC modelling approach

MUSIC modelling was undertaken to quantitatively assess the performance of the proposed stormwater strategy. MUSIC version 6.2.1 was used for the assessment and the parameters have been established in accordance with the *MUSIC Modelling Guidelines* (Water by Design, 2018).

6.1.1 Model structure

The Precincts 3-5 MUSIC model layout is shown in Figure 11. Details of the modelling assumptions, parameters and results are provided below.

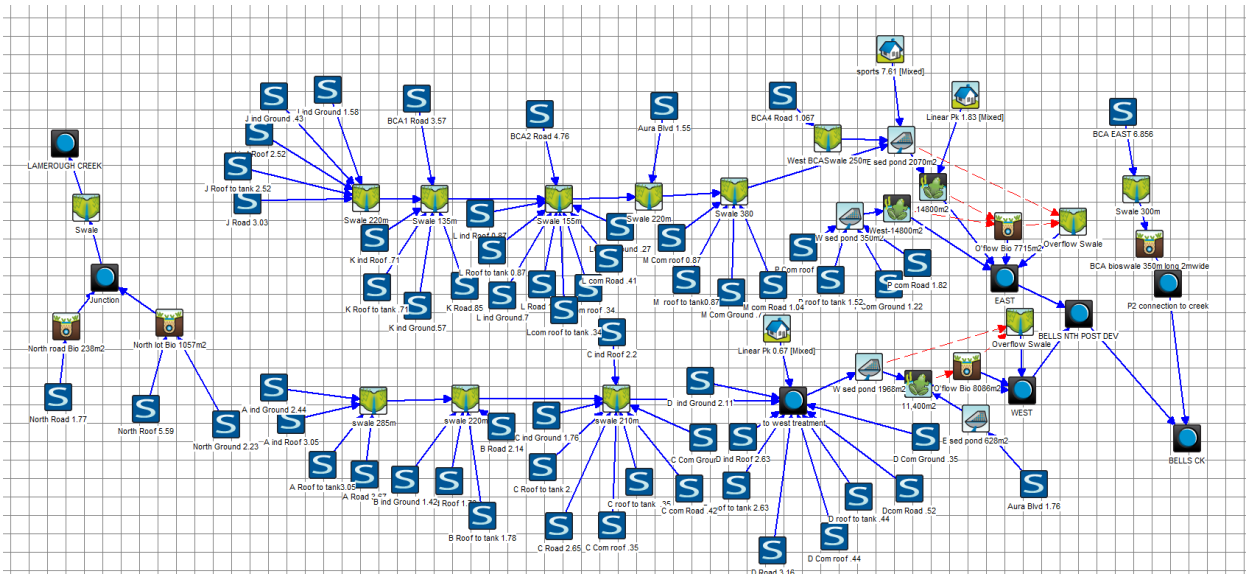


Figure 11 Precincts 3-5 MUSIC model layout

Table 6 provides a summary of the meteorological data on which the model is based.

Table 6 Meteorological and rainfall runoff data

Input	Data used in modelling
Rainfall station	40496 Caloundra (Updated)
Time step	6 minute
Modelling period	1997 – 2009
Mean annual rainfall	1,570 mm (for the period used)
Mean annual evapotranspiration	1,628 mm
Rainfall runoff parameters	Per SEQ MUSIC Guidelines
Pollutant export parameters	Per SEQ MUSIC Guidelines

6.1.2 Catchments

The stormwater catchments presented in Figure 6 were used and the various land uses (residential, commercial or parkland) within these catchments were measured. The model uses split land uses.

The overall catchment areas and land use types are presented in Table 3 and details of the split catchments are shown in Table 7.

Table 7 Catchment land use area MUSIC details

CATCHMENT ID	Area ha	Ground level ha	Roads ha	Roof ha	Open space ha
WEST CATCHMENT					
A - industrial	12.23	2.45	3.67	6.12	
B - industrial	7.14	1.43	2.14	3.57	
C - industrial	8.82	1.76	2.65	4.41	
C - commercial	1.40	0.28	0.42	0.70	
D -industrial	10.53	2.11	3.16	5.27	
D - commercial	1.75	0.35	0.53	0.88	
Linear park	0.67				0.67
Road (Aura Bde)	1.76		1.76		
TOTAL - WEST	**44.30**				
EAST CATCHMENT					
J - industrial	10.11	2.02	3.03	5.06	
K - industrial	2.85	0.57	0.86	1.43	
L - industrial	3.48	0.70	1.04	1.74	
L - commercial	1.35	0.27	0.41	0.68	
M - commercial	3.48	0.70	1.04	1.74	
N - commercial	6.08	1.22	1.82	3.04	
Road (BCA, Aura Bde)	18.87		9.44		9.44
SPORTS	7.74				7.74
Linear park	2.81				2.81
TOTAL EAST	**56.77**				
NORTH CATCHMENT					
North - industrial	9.59	2.23	1.77	5.59	
TOTAL NORTH	**9.59**				
TOTAL P3-5	**110.7**				

6.2 Treatment systems

A summary of the treatment system sizes is shown in Table 3 and the characteristics for MUSIC modelling purposes of each treatment system are summarised below.

6.2.1 Tanks

Rainwater tanks were not included in the MUSIC model for Precinct 3-5. Although the tanks are to be installed on the lots in accordance with this strategy and will provide a water quality benefit, the tanks were not included in the MUSIC model given the variable demand on the tanks in industrial and commercial landuses. This is a conservative approach and ensures the end of line treatment systems are likely oversized.

6.2.2 Swales

The swales are represented in MUSIC using the preliminary design for the swales (Calibre Consulting, 2016).

Typical characteristics include:

- Slopes between 0.2 – 0.75%
- Base width 2m – 13m
- Top width 22m – 30m
- Depth = 1.5 – 2.2m
- Vegetation height = 300mm.

6.2.3 Biopods

Biopods all have the same characteristics of:

- Saturate hydraulic conductivity of 200mm/hour
- Filter depths of 400mm
- No exfiltration (lined bases with underdrains)
- Use vegetation with effective nutrient removal.

For the MUSIC modelling, only the northern catchment included the biopods in the model as these are required to achieve the stormwater quality objectives for Lamerough Creek. The biopods have not been included in the MUSIC modelling for the East and West catchments draining to Bells Creek which is a conservative approach.

Model of the biopods adopted parameters in accordance with the *MUSIC Modelling Guidelines* (Water by Design, 2018). The only variation from the *MUSIC Modelling Guidelines* (Water by Design, 2018) is the bioretention media specifications for Ortho-P of 20mg/kg and TN of 400mg/kg which have been justified previously by BMT WBM and previously accepted by EDQ reviewers.

6.2.4 Wetland systems

Wetlands were modelled in accordance with the *MUSIC Modelling Guidelines* (Water by Design, 2018). The inlet pond volume was defined through design with a notional depth of 1.5m. Weir and bypass flows were directed to the bioretention basins and treated pipe flows bypass the bioretention.

6.2.5 Bioretention basins

The bioretention basins were modelled to only receive overflows from the wetlands with the adopted parameters in accordance with the *MUSIC Modelling Guidelines* (Water by Design, 2018). The only variation from the *MUSIC Modelling Guidelines* (Water by Design, 2018) is the bioretention media specifications Ortho-P of 20mg/kg and TN of 400mg/kg which have been justified previously by BMT WBM and previously accepted by EDQ reviewers.

The extended detention depth above the bioretention basins is configured to include the ponding depth above the wetlands once the wetlands spill into the bioretention basins. This is because the two systems will 'share' this ponded water and the bioretention basins will draw down much faster than the wetland systems, hence the vast majority of ponded water will filter through the bioretention media.

6.2.6 Overflow swales

The swales that take untreated overflows from the end-of-line treatments and the swales have the following characteristics:

- Length = 100m
- 0.2% bed slope
- Base width = varies 8m
- Top width = varies 40m
- Depth = 500-700mm
- Vegetation height = 250mm
- Exfiltration = 0 mm/hour

6.3 Results

The results of the MUSIC modelling for flow entering Bells Creek North from Precincts 3-5 using the proposed strategy are shown in Table 8.

The results demonstrate that the proposed stormwater strategy achieves the stormwater quality load reduction objectives as outlined in Section 3. In reality the water quality performance for Bells Creek North should be greater than that presented in Table 8 due to the influence of tanks which were not included in the modelling.

Table 8 MUSIC modelling results for Bells Creek Catchment

Parameter	Unmitigated	Mitigated	% Removal
Flow (ML/yr)	1,240	1,160	7%
TSS (kg/yr)	280,000	8,320	97%
TP (kg/yr)	538	47	91%
TN (kg/yr)	3,000	929	69%
Gross Pollutants (kg/yr)	25,500	0	100%

The results of the MUSIC modelling for flows directed to Lamerough Creek from Precincts 3-5 are showncool in Table 9. The results demonstrate that the proposed stormwater strategy achieves the stormwater quality load reduction objectives as outlined in Section 3.

Table 9 MUSIC modelling results for Lamerough Creek Catchment

Parameter	Unmitigated	Mitigated	% Removal
Flow (ML/yr)	132	128	3%
TSS (kg/yr)	16,900	3,320	80%
TP (kg/yr)	41.2	15.3	63%
TN (kg/yr)	305	162	47%
Gross Pollutants (kg/yr)	2,850	0	100%

6.4 Sensitivity Testing

To assess the robustness of the stormwater quality strategy to achieve or failure the following sensitivity tests were completed.

1. Sediment basin highflow bypass

The highflow bypass in the sediment basin was set to 3.2m³/s for the eastern system and 9m³/s in the western system to match the detailed design. Flows above this bypass the wetland and biorerention system via a secondary link. The results are provided in Table 10 and show the stormwater quality objectives are still achieved. Further testing found that the highflow bypass on both the eastern and western system could be reduced to approximately 2m³/s and still achieve the objectives. Bypass rates below 2m³/s result in a reduction in performance below the objectives.

Table 10 MUSIC modelling results for Sensitivity Test 1

Parameter	Unmitigated	Mitigated	% Removal
Flow (ML/yr)	1,240	1,160	7%
TSS (kg/yr)	280,000	8,390	97%
TP (kg/yr)	538	47	91%
TN (kg/yr)	3,000	929	69%
Gross Pollutants (kg/yr)	25,500	0	100%

2. Highflow bypass on the wetlands

The highflow bypass in the wetlands was set to 1m^3/s to assess whether the wetland provides any treatment in large flows (i.e. the wetland is designed to manage low flows and provide a buffer storage). The results are provided in Table 11 and show the stormwater quality objectives are still achieved

Table 11 MUSIC modelling results for Sensitivity Test 2

Parameter	Unmitigated	Mitigated	% Removal
Flow (ML/yr)	1,240	1,160	7%
TSS (kg/yr)	280,000	8,320	97%
TP (kg/yr)	538	47	91%
TN (kg/yr)	3,000	929	69%
Gross Pollutants (kg/yr)	25,500	0	100%

3. Western Sediment basin direct to bioretention

There is small sediment basin in the western end-of-line system which short circuits the wetland and likely drains directly to the biorerention treatment. The MUSIC model was updated to simulate this process. The results are provided in Table 12 and show the stormwater quality objectives are still achieved

Table 12 MUSIC modelling results for Sensitivity Test 3

Parameter	Unmitigated	Mitigated	% Removal
Flow (ML/yr)	1,240	1,160	7%
TSS (kg/yr)	280,000	8,320	97%
TP (kg/yr)	538	47	91%
TN (kg/yr)	3,000	929	69%
Gross Pollutants (kg/yr)	25,500	0	100%

4. Sensitivity tests 1-2-3

All three sensitivity tests were applied with the results in Table 13 showing the stormwater quality objectives are still achieved.

Table 13 MUSIC modelling results for Sensitivity Test 1-2-3

Parameter	Unmitigated	Mitigated	% Removal
Flow (ML/yr)	1,240	1,160	7%
TSS (kg/yr)	280,000	8,390	97%
TP (kg/yr)	538	47	91%
TN (kg/yr)	3,000	929	69%
Gross Pollutants (kg/yr)	25,500	0	100%

5. Reduction in Bioretention Filter Media Area

The area of the filter media was reduced by 10%, 20% and 30% in the end-of-line treatment system to similar blockage or failure of the bioretention filter media. The results are presented in the tables below and illustrate the stormwater quality objectives are still achieved. The illustrates there is safety factor within the end-of-line systems of up to 30%.

Table 14 MUSIC modelling results for reduction in bioretention filter media area of 10%

Parameter	Unmitigated	Mitigated	% Removal
Flow (ML/yr)	1,240	1,160	7%
TSS (kg/yr)	280,000	8,390	97%
TP (kg/yr)	538	48	91%
TN (kg/yr)	3,000	942	69%
Gross Pollutants (kg/yr)	25,500	0	100%

Table 15 MUSIC modelling results for reduction in bioretention filter media area of 20%

Parameter	Unmitigated	Mitigated	% Removal
Flow (ML/yr)	1,240	1,160	7%
TSS (kg/yr)	280,000	8,400	97%
TP (kg/yr)	538	49	91%
TN (kg/yr)	3,000	946	68%
Gross Pollutants (kg/yr)	25,500	0	100%

Table 16 MUSIC modelling results for reduction in bioretention filter media area of 30%

Parameter	Unmitigated	Mitigated	% Removal
Flow (ML/yr)	1,240	1,160	7%
TSS (kg/yr)	280,000	8,780	97%
TP (kg/yr)	538	50	91%
TN (kg/yr)	3,000	959	68%
Gross Pollutants (kg/yr)	25,500	0	100%

7 Conclusions

This report describes a Stormwater Quality Management Plan for Precincts 3-5 of Aura. It comes as a results of thorough assessments of constraints to stormwater treatment measures.

Precincts 3-5 drain to two catchments, Bells Creek North (>90% of the area) and Lamerough Creek. The two receiving waters have different discharge requirements, with Bells Creek North requiring more stringent stormwater quality improvement because of the sensitive receiving environment of Bells Creek and Pumicestone Passage.

The strategy provides a comprehensive stormwater treatment strategy which reflects the high valued receiving waters (i.e. Bells Creek). It includes using rainwater tanks, at source biopods (for Lamerough Creek catchment), vegetated conveyance swales and an innovative combination of end of line wetland and bioretention basins.

Principles of the strategy focus on not treating already treated water and providing flexibility in the treatment train to adjust the design in response to constraints and other design requirements. The proposal takes advantage of available areas at the southern perimeter of the site adjacent to Bells Creek North and gives careful consideration of the existing levels within the creek.

The treatment strategy meets the requirements for stormwater quality improvement for the two separate receiving waterways. The measures proposed here will help to ensure there are no adverse impacts on Bells Creek and Pumicestone Passage. This includes reducing annual pollutant loads by more than 95% for suspended solids, 89% for total phosphorus and 68% for total nitrogen from the developed areas of the site draining to Bells Creek North.

8 References

Calibre Consulting (2016), *Design plans for swales Application 3*, March

Corrs Chambers McGrath (2015) *Caloundra South Infrastructure Agreement*

DesignFlow and BMT (2019) *Aura Development Stormwater Quality Management Plan*

Stockland (2017) *Caloundra South Wallum Sedge Frog Management Plan*

Stockland (2017) *Caloundra South Acid Frog Management Plan*

Water by Design (2009), *Construction and Establishment Guidelines: Swales, Bioretention Systems and Wetlands*, SEQ Healthy Waterways Partnership. Brisbane, Queensland.

Water by Design (2006), *Water Sensitive Urban Design Technical Design Guidelines for South East Queensland Version 1.* Moreton Bay and Waterways Catchments Partnership. Brisbane, Queensland.

Water by Design (2014), *Bioretention Chapter Technical Design Guidelines for South East Queensland.*

Water by Design (2010 and 2018), *MUSIC Modelling Guidelines*. Water by Design - SEQ Healthy Waterways Partnership. Brisbane, Queensland.

Appendix B – DA Approval Conditions

Queensland Government

Department of
State Development, Infrastructure, Local Government and Planning

Our ref: DEV2023/1389

1 September 2023

Stockland Development Pty Ltd
C/- Evolve Planning
11 Staghorn Place
Palmview QLD 4553

Email: kate@evolveplanning.net.au; shelbi.niebling@stockland.com.au

Dear Kate and Shelbi

S89(1)(a) Approval of PDA development application
PDA Development Permit for a Material Change of Use for Showroom; Food Premises; and Indoor Sport and Recreation (where maximum of 2,000m² GFA); Reconfiguring a Lot for an Access Easement; and Operational Work for Advertising Signage at Corner of Graf Drive and Aura Boulevard, Baringa described as part of Lot 345 On SP305382 (Proposed lot 9000)

On 1 September 2023, pursuant to s.85(4)(b) of the *Economic Development Act 2012,* the Minister for Economic Development Queensland (MEDQ) decided to grant **all** of the PDA development application applied for, in accordance with the attached PDA decision notice.

The PDA decision notice and approved plans / documents can also be viewed in the MEDQ Development Approvals Register via the Department website at www.dsdilgp.qld.gov.au/pda-da-applications.

If you require any further information, please contact Andrew McKnight, A / Manager, Development Assessment, in Economic Development Queensland, by telephone on (07) 3452 7406 or at Andrew.McKnight@dsdilgp.qld.gov.au, who will assist.

Yours sincerely

Amanda Dryden
Director
Development Assessment
Economic Development Queensland

Economic Development Queensland
GPO Box 2202
Brisbane Queensland 4001 Australia
Website www.edq.qld.gov.au
ABN 76 590 288 697

PDA Decision Notice

Site information		
Name of priority development area (PDA)	Caloundra South PDA	
Site address	Vacant land at Aura Boulevard, Graf Drive, Packer Road and Graf Drive, Baringa QLD 4551	
Lot on plan description	Lot number	Plan description
	Part of Lot 345 (Proposed lot 9000)	SP305382

PDA development application details	
DEV reference number	DEV2023/1389
'Properly made' date	25 May 2023
Type of application	☒ PDA development application for: ☒ Material change of use ☐ Preliminary approval ☒ Development permit ☒ Reconfiguring a lot ☐ Preliminary approval ☒ Development permit ☒ Operational work ☐ Preliminary approval ☒ Development permit ☐ Application to change PDA development approval ☐ Application to extend currency period
Proposed development	Material Change of Use for Showroom; Food Premises; and Indoor Sport and Recreation (where maximum of 2,000m² GFA); Reconfiguring a Lot for an Access Easement; and Operational Work for Advertising Devices

PDA development approval details	
Decision of the MEDQ	The MEDQ has decided to grant **all** of the PDA development approval applied for, **subject to** PDA development conditions forming part of this decision notice. The approval is for: • Development Permit for Showroom; • Development Permit for Food Premises; • Development Permit for Indoor Sport and Recreation (where maximum of 2,000m² GFA); • Development Permit for Reconfiguring a Lot - Access Easement; and • Development Permit for Operational Work – Advertising Devices.
Decision date	1 September 2023
Currency period	6 years from the date of the decision

Economic Development Queensland
GPO Box 2202
Brisbane Queensland 4001 Australia
Website www.edq.qld.gov.au
ABN 76 590 288 697

Approved plans and documents			
The plans and documents approved by the MEDQ and referred to in the PDA development conditions for the PDA development approval are detailed below.			
Approved plans and documents		**Number**	**Date**
Architectural Design by Hames Sharley – Project 63166			
1.	Cover Sheet – Aura Bulky Goods	DA000 Revision F	05/07/2023
2.	Location Plan – Aura Bulky Goods	DA101 Revision F	05/07/2023
3.	Site Plan – Aura Bulky Goods	DA210 Revision AG	05/07/2023 (Amended in red 11 August 2023)
4.	Site Plan Easement Plan – Aura Bulky Goods	DA212 Revision B	05/07/2023
5.	Roof Plan – Aura Bulky Goods	DA230 Revision H	05/07/2023
6.	Elevations Site – Aura Bulky Goods	DA400 Revision L	05/07/2023 (Amended in red 11 August 2023)
7.	Elevations Detail – Aura Bulky Goods	DA401 Revision J	05/07/2023 (Amended in red 11 August 2023)
8.	Sections Site – Aura Bulky Goods	DA501 Revision F	05/07/2023 (Amended in red 11 August 2023)
9.	Sections Detail – Aura Bulky Goods	DA502 Revision F	05/07/2023
10.	Signage Layout Plan – Aura Bulky Goods	DA800 Revision E	05/07/2023 (Amended in red 11 August 2023)
11.	Signage Detail – Aura Bulky Goods	DA801 Revision F	05/07/2023
12.	Circulation Diagram Vehicles – Aura Bulky Goods	DA900 Revision F	05/07/2023
13.	Circulation Diagram Pedestrian – Aura Bulky Goods	DA901 Revision F	05/07/2023 (Amended in red 11 August 2023)
14.	Materials Selection – Aura Bulky Goods	DA911 Revision F	05/07/2023 (Amended in red 11 August 2023)
15.	Perspective (01) – Aura Bulky Goods	DA920 Revision F	05/07/2023
16.	Perspective (02) – Aura Bulky Goods	DA921 Revision F	05/07/2023
17.	Perspective (03) – Aura Bulky Goods	DA922 Revision D	05/07/2023 (Amended in red 11 August 2023)
18.	Perspective (04) – Aura Bulky Goods	DA923 Revision B	05/07/2023
19.	Pedestrian Access to Edison Crescent – Aura Bulky Goods – Hames Sharley	DA924 Revision B	05/07/2023
20.	Pedestrian Access to Edison Crescent – Aura Bulky Goods	DA925 Revision A	05/07/2023 (Amended in red 11 August 2023)

21.	Public Bicycle Area – Aura Bulky Goods	DA926 Revision A	05/07/2023
22.	Pedestrian Entry from Aura Boulevard – Aura Bulky Goods	DA927 Revision A	05/07/2023
23.	3D Views – Aura Bulky Goods	SK019 Revision A	03/08/2023
Landscape Design - Aura Business Park Lot 9000 Proposed Showroom Development by Arcadis – Project B22-204			
24.	Landscape Design – Cover sheet	Project No. B 22-204	11/07/2023 (Amended in red 11 August 2023)
25.	Landscape Design – Contents sheet	Project No. B 22-204 Revision 8	11/07/2023 (Amended in red 11 August 2023)
26.	Landscape Design – 01 Strategy sheet	Project No. B 22-204	11/07/2023
27.	Landscape Design – Site understanding	Project No. B 22-204	11/07/2023
28.	Landscape Design – Design Principles	Project No. B 22-204	11/07/2023
29.	Landscape Design – Landscape Strategies and Vision	Project No. B 22-204	11/07/2023
30.	Landscape Design – Design Drivers Re-interpreted	Project No. B 22-204	11/07/2023
31.	Landscape Design – Project Precedents	Project No. B 22-204	11/07/2023
32.	Landscape Design – Character Precedents	Project No. B 22-204	11/07/2023
33.	Landscape Design – 02 Landscape Concept	Project No. B 22-204	11/07/2023
34.	Landscape Design – Landscape Concept Plan	Project No. B 22-204	11/07/2023 (Amended in red 11 August 2023)
35.	Landscape Design – Landscape Typologies Plan	Project No. B 22-204	11/07/2023 (Amended in red 11 August 2023)
36.	Landscape Design – Landscape Typology 1	Project No. B 22-204	11/07/2023 (Amended in red 11 August 2023)
37.	Landscape Design – Landscape Typology 2	Project No. B 22-204	11/07/2023
38.	Landscape Design – Landscape Typology 3	Project No. B 22-204	11/07/2023
39.	Landscape Design – Landscape Typology 4	Project No. B 22-204	11/07/2023
40.	Landscape Design – Landscape Typology 5	Project No. B 22-204	11/07/2023

41.	Landscape Design – Landscape Typology 6	Project No. B 22-204	11/07/2023
42.	Landscape Design – Landscape Typology 7	Project No. B 22-204	11/07/2023 (Amended in red 11 August 2023)
43.	Landscape Design – Landscape Typology 8	Project No. B 22-204	11/07/2023 (Amended in red 11 August 2023)
44.	Landscape Design – Landscape Typology 9	Project No. B 22-204	11/07/2023
45.	Landscape Design – 03 Design Palettes	Project No. B 22-204	11/07/2023
46.	Landscape Design – Planting Schedule	Project No. B 22-204	11/07/2023
47.	Landscape Design – Amended Planting Schedule Landscape Typology 6	Project No. B 22-204	11/07/2023 (Amended in red 11 August 2023)
48.	Landscape Design – Planting Palette trees	Project No. B 22-204	11/07/2023
49.	Landscape Design – Planting Palette understorey	Project No. B 22-204	11/07/2023
50.	Landscape Design – Planting Palette WSUD Planting	Project No. B 22-204	11/07/2023
Engineering Concept – Aura Precinct 5 Lot 9000 Car Park by SMEC			
51.	Stormwater Drainage Concept Layout – Layout Plan	30031846-9000-SK01, Revision 1	07/07/2023
52.	Stormwater Drainage Concept Long section – Layout Plan	30031846-9000-SK02, Revision 1	07/07/2023
Aura Bulky Goods by SLR Consulting – Project No: 620.31228			
53.	Edison Crescent Egress 20m AV Swept Paths	Figure SK01	30/06/2023
54.	Edison Crescent Ingress 20m AV Swept Paths	Figure SK02	30/06/2023
55.	Aura Blvd Ingress McDonalds 18P Swept Path	Figure SK03	30/06/2023
56.	Aura Blvd Egress McDonalds 18P Swept Path	Figure SK04	30/06/2023
57.	Aura Blvd Grade Check McDonalds 18P Swept Path	Figure SK05	07/07/2023
58.	Edison Crescent Grade Check 20M AV Swept Path	Figure SK06	07/07/2023

PDA development conditions

PREAMBLE AND ABBREVIATIONS

For the purpose of interpreting this approval, including the conditions, the following applies:

The following is a list of abbreviations utilised in this approval:

1. **AILA** means a Landscape Architect registered by the Australian Institute of Landscape Architects.
2. **Certification Procedures Manual** means the document titled *Certification Procedures Manual*, prepared by EDQ, dated April 2020 (as amended from time to time).
3. **Council** means the relevant local government for the land the subject of this approval.
4. **DSDILGP** means the Department of State Development, Infrastructure Local Government and Planning.
5. **EDQ** means Economic Development Queensland.
6. **EDQ DA** means Economic Development Queensland's – Development Assessment team.
7. **EDQ IS** means Economic Development Queensland's – Infrastructure Solutions team.
8. **MEDQ** means the Minister for Economic Development Queensland.
9. **PDA** means Priority Development Area.
10. **RPEQ** means Registered Professional Engineer of Queensland.
11. **WWIA** means the Caloundra South Infrastructure Agreement (Water and Wastewater Infrastructure Agreement) in effect 20 March 2017 (as amended from time to time).

COMPLIANCE ASSESSMENT:

Where a condition of this approval requires Compliance Assessment, Compliance Assessment is required in accordance with the following:

a) The applicant must:
   i) pay to MEDQ at the time of submission the relevant fee for Compliance Assessment, including any third party peer review costs which will be charged on a 100% cost recovery basis. The Compliance Assessment fees are set out in EDQ Development Assessment Fees and Charges Schedule[1] (as amended from time to time).

   ii) submit to EDQ DA a duly completed Compliance Assessment form[2].

   iii) submit to EDQ DA the documentation as required under the relevant condition.

b) Where EDQ is satisfied the documentation submitted for Compliance Assessment meets the requirements of the relevant condition (or element of the condition), EDQ will endorse the documentation and advise by written notice.

c) Compliance Assessment and endorsement can be repeated where a different design or solution, to that already endorsed, is sought.

d) The process and timeframes that apply to Compliance Assessment are as follows:

[1] The EDQ Development Assessment Fees and Charges Schedule is available at EDQ's website.

[2] The Compliance Assessment form is available at EDQ's website. It sets out how to submit documentation for Compliance Assessment and how to pay Compliance Assessment fees.

i) applicant submits items required under a) above to EDQ DA for Compliance Assessment.

ii) **within 20 business days** – EDQ assesses the documentation and:
   1. if satisfied, endorses the documentation; or
   2. if not satisfied, notifies the applicant accordingly.

iii) if the applicant is notified under ii.2. above, revised documentation must be submitted **within 20 business days** from the date of notification.

iv) **within 20 business days** – EDQ assesses the revised documentation and:
   1. if satisfied, endorses the revised documentation; or
   2. if not satisfied, notifies the applicant accordingly.

v) where EDQ notifies the applicant as stated under iv.2. above, repeat steps iii. and iv. above. If either party is not satisfied by the outcome of this process, that party can elect to enter into a mediation process with an independent mediator agreed to by both parties.

Despite note v. above, the condition (or element of the condition) is determined to have been met only when EDQ endorses relevant documentation.

SUBMITTING DOCUMENTATION TO EDQ:

Where a condition of this approval requires documentation to be submitted to either EDQ DA or EDQ IS, submit the documentation to:

a) EDQ DA at: pdadevelopmentassessment@dsdmip.qld.gov.au

b) EDQ IS at: EDQ_PrePostConstruction@dsdmip.qld.gov.au

No.	Condition	Timing
Material Change of Use		
1.	**Carry Out and Maintain the Approved Development** Carry out and maintain the approved development generally in accordance with: a) the approved plans and documents; and b) any other documentation endorsed via Compliance Assessment as required by these conditions.	Prior to commencement of use
2.	**Hours of Operation – Indoor Sport and Recreation** The part of the premises, being Indoor Sport and Recreation use, can operate 24 hours a day, 7 days a week.	At all times
Construction Management		
3.	**Hours of Work – Construction** Unless otherwise endorsed, via Compliance Assessment for out of hours work, construction hours for the approved development are limited to Monday to Saturday between 6:30am to 6:30pm, excluding public holidays.	During construction unless otherwise endorsed
4.	**Out of Hours Work – Compliance Assessment** Where out of hours work is proposed, submit to EDQ DA, for Compliance Assessment, an out of hours work request. The out of hours work request must include a duly completed out of hours work request form[3].	Minimum of 10 business days prior to proposed out of hours work commencement date
5.	**Certification of Operational Work** Carry out all Operational Work under this approval in accordance with the *Certification Procedures Manual.*	At all times
6.	**Construction Management Plan** a) Submit to EDQ IS a site-based Construction Management Plan (CMP) prepared by the principal site contractor and reviewed by a suitably qualified and experienced person responsible for overseeing the site works, to manage construction impacts, including: i) noise and dust in accordance with the EP Act; ii) stormwater flows around and through the site without increasing the concentration of total suspended solids or Prescribed Water Contaminants (as defined in the EP Act), causing erosion, creating any ponding and causing any actionable nuisance to upstream and downstream properties; iii) contaminated land, where required under a site suitability statement prepared in accordance with section 389 of the EP Act; iv) complaints procedures; v) site management:	a) Prior to commencing work

[3] The out of hours work request form is available at EDQ's website.

	1. for the provision of safe and functional alternative pedestrian routes, past, through or around the site; 2. to mitigate impacts to public sector entity assets, including street trees, on or external to the site; 3. for safe and functional temporary vehicular access points and frequency of use; 4. for the safe and functional loading and unloading of materials including the location of any remote loading sites; 5. for the location of materials, structures, plant and equipment; 6. of waste generated by construction activities; 7. detailing how materials are to be loaded/unloaded; 8. of proposed external hoardings and gantries (with clearances to street furniture and other public sector entity assets); 9. of employee and visitor parking areas; 10. of anticipated staging and programming; 11. for the provision of safe and functional emergency exit routes; and 12. any out of hours work as endorsed via Compliance Assessment. b) A copy of the CMP submitted under part a) of this condition must be current and available on site. c) Carry out all construction work generally in accordance with the CMP submitted under part a) of this condition.	b) During construction c) During construction
7.	**Erosion and sediment management** a) Submit to EDQ IS an Erosion and Sediment Control Plan (ESCP), certified by a RPEQ or an accredited professional in erosion and sediment control, and prepared generally in accordance with the following: i) construction phase stormwater management design objectives of the State Planning Policy 2017 (Appendix 2 Table A); ii) Healthy Land and Water Technical Note: Complying with the SPP – Sediment Management on Construction Sites. b) Implement the certified ESCP submitted under part a) of this condition.	a) Prior to commencing work b) During construction
8.	**Traffic management plan** a) Submit to EDQ IS a Traffic Management Plan (TMP) certified by a person holding a current Traffic Management Design qualification. The TMP must include the following: i) provision for the safe and functional management of traffic around and through the site during and outside of construction work hours; ii) provision for the safe and functional management of pedestrian traffic, including alternative pedestrian routes past, through or around the site;	a) Prior to commencing work

	iii) provision of parking for workers and materials delivery; iv) risk identification, assessment and identification of mitigation measures; v) ongoing monitoring, management review and certified updates (as required); and vi) traffic control plans and/or traffic control diagrams, prepared in accordance with *Austroads Guide to Temporary Traffic Management*, for any temporary part or full road closures. b) Carry out all construction work generally in accordance with the certified TMP submitted under part a) of this condition, which is to be current and available on site. *NOTE: Operational traffic changes, such as temporary and permanent lane modifications, relaxation of clearway zone hours or footpath closures may require authorisation from Council or DTMR as road manager. It is recommended that applicants engage directly with the applicable road manager.*	b) During construction
9.	**Public Infrastructure (Damage, Repairs and Relocation)** a) Repair any damage to existing public infrastructure caused by works carried out in association with the approved development. b) Where existing public infrastructure require repair or relocation, due to the approved development and/or works associated with the approved development, repair and/or relocate the public infrastructure at no cost to others and in accordance with statutory requirements and the External Authority's design standards; and *NOTE: It is recommended applicants record their own dated photographic evidence of the condition of relevant existing public infrastructure both before and after works carried out in association with the approved development.*	a) Prior to commencement of use b) Prior to commencement of use
10.	**Earthworks** a) Submit to EDQ IS detailed earthworks plans certified by a RPEQ, and designed generally in accordance with: i) *Australian Standard AS3798 – 2007 Guidelines on Earthworks for Commercial and Residential Developments;* The certified earthworks plans are to: i) include a geotechnical soils assessment of the site; ii) accord with the Erosion and Sediment Control Plans, as required by condition 7 – Erosion and sediment management; iii) include the location and finished surface levels of any cut and/or fill; iv) detail areas where dispersive soils will be disturbed, treatment of dispersive soils and their rehabilitation; v) provide details of any areas where surplus soils are to be stockpiled;	a) Prior to commencing earthworks

	vi) detail protection measures to: 1. ensure adjoining properties and roads are not impacted by ponding or nuisance stormwater resulting from earthworks associated with the approved development; 2. preserve all drainage structures from structural loading impacts resulting from earthworks associated with the approved development; and vii) where rock or ground anchors are required within adjoining road or land, include consents from relevant road manager(s) and/or landowner(s). b) Carry out earthworks generally in accordance with the certified plans submitted under part a) of this condition. c) Submit to EDQ IS RPEQ certification that: i) all earthworks have been carried out generally in accordance with the certified plans submitted under part a) of this condition; and ii) any unsuitable material encountered has been treated or replaced with suitable material.	b) Prior to commencement of use c) Prior to commencement of use
11.	**Acid Sulfate Soils** a) Where on-site ASS are encountered, submit to EDQ IS an ASS management plan, prepared in accordance with the *Queensland Acid Sulfate Soil Technical Manual Soil Management Guidelines v4.0 2014* (as amended from time to time. b) Excavate, remove and/or treat on site all disturbed ASS generally in accordance with the ASS management plan submitted under part a) of this condition. c) Submit to EDQ IS a validation report, certified by a suitably qualified environmental or soil scientist, confirming that all earthworks have been carried out in accordance with the ASS management plan submitted under part b) of this condition.	a) Prior to commencement of or during earthworks b) Prior to commencement of use c) Prior to commencement of use
12.	**Retaining Walls** a) Submit to EDQ IS detailed engineering plans, certified by a RPEQ, of all retaining walls 1m or greater in height. Retaining walls must be: i) certified to achieve a minimum 50 year design life; ii) designed generally in accordance with *Australian Standard AS4678 – Earth Retaining Structures* and relevant material standards (e.g. *AS3600 – Concrete Structures*); b) Construct retaining walls generally in accordance with the certified plans required under part a) of this condition. c) Submit to EDQ IS certification from an RPEQ that all retaining wall works 1.0m or greater in height have been	a) Prior to commencing earthworks b) Prior to commencement of use

	constructed generally in accordance with the certified plans submitted under part a) of this condition.	c) Prior to commencement of use
13.	**Vehicle Access** Construct vehicle access: a) located generally in accordance with the approved plans: i) *Circulation Diagram Vehicles - Drawing No: DA900 Revision F dated 05/07/2023* by Hames Sharley; ii) *Aura Bulky Goods – Edison Crescent Egress 20m AV Swept Paths – Figure SK01 dated 30 June 2023 by SLR Consulting;* iii) *Aura Bulky Goods – Edison Crescent Ingress 20m AV Swept Paths – Figure SK02 dated 30 June 2023 by SLR Consulting;* iv) *Aura Bulky Goods – Aura Blvd Ingress McDonalds 18P Swept Path – Figure SK03 Dated 30 June 2023 by SLR Consulting;* v) *Aura Bulky Goods – Aura Blvd Egress McDonalds 18P Swept Path – Figure SK04 Dated 30 June 2023 by SLR Consulting;* vi) *Aura Bulky Goods – Aura Blvd Grade Check McDonalds 18P Swept Path – Figure SK05 Dated 7 July 2023 by SLR Consulting; and* vii) *Aura Bulky Goods – Edison Crescent Grade Check 20M AV Swept Path – Figure SK06 Dated 30 June 2023 by SLR Consulting;* b) Submit to EDQ IS RPEQ certification that the crossovers have been constructed in accordance with part a) of this condition.	a) Prior to commencement of use b) Prior to commencement of use
14.	**Car Parking** Construct, sign and delineate car parking spaces generally in accordance with *Australian Standard AS2890 – Parking Facilities* and the approved plans.	Prior to commencement of use
15.	**Bicycle Parking** a) Construct, sign and delineate bicycle parking facilities generally in accordance with *Australian Standard AS2890.3 Bicycle parking facilities* and the approved plans. For Building 1 End of trip (EOT) facilities provide, in accordance with *Aura Bulky Goods Site Plan Drawing Number DA210 Revision AG dated 05/07/2023 by Hames Sharley*, (as amended in red 11 August 2023): • Separate male and female change rooms: o 1 changing room with minimum of 1 shower, 1 WC, 1 wash basin with associated socket outlet and mirror o Capacity for 10 persons each change room	a) Prior to commencement of use

	○ Shower/s, sanitary devices and taps to be water efficient ○ Shower/s to include bench seating and hook provision ○ Lockers at 1.6 x bicycle parking space ○ Lockers to have a minimum dimension – 900mm (H) X 300(w) x 450m (D) • Sufficient secure bike parking spaces for each change room to meet the intended capacity. b) Submit to EDQ IS building certification plans that the EOT in Building 1 has been constructed in accordance with part a) of this condition.	b) Prior to commencement of use
16.	**Electric Vehicle Readiness** a) Include electric vehicle readiness in the development as follows: i) Provision of electrical capacity for Destination (regular) EVSE chargers to a minimum 10% of short-term parking bays, including provision of conduits, cable trays and/or wiring from distribution board/s to individual parking spaces. These are to be equitably provisioned across spaces in the immediate vicinity of Buildings' 1 and 2 to meet the intended user needs; ii) Installation of EVSE chargers within provisioned bays to 1% of short-term parking spaces b) Submit to EDQ IS, certified evidence from a suitably qualified and experienced electrical engineer, that the electric vehicle readiness required by part a) of this condition has been provided. <u>Advice note</u>*: The ratio and type of EV chargers may be varied to suit the use, location and user profile. For example, DC (fast) chargers might be more appropriate than Destination (regular) chargers where adjacent to highways or where there is a community need for DC (fast) charging. One DC (fast) charger would equal multiple Destination (regular) chargers, based on the ratio of kilowatt capacity outputs.*	a) Prior to commencement of the use b) Prior to commencement of the use
17.	**Screening** a) All refuse and plant areas will be suitably screened to all boundaries. b) All air conditioning, ventilation plant and other equipment located on the roof or externally around the building will be treated as an integral part of the building and either screened from view or painted to match the surrounding building.	Prior to commencement of use

18.	**Water Connection** Connect the approved development to the existing water reticulation network generally in accordance with Unitywater current adopted standards.	Prior to commencement of use
19.	**Sewer Connection** Connect the approved development to the existing sewer reticulation network generally in accordance with Unitywater current adopted standards.	Prior to commencement of use
20.	**Stormwater Connection** Connect the approved development to a lawful point of discharge: a) with 'no-worsening' to upstream or downstream properties for storm events up to 1% Annual Exceedance Probability; and b) generally in accordance with Council's current adopted standards.	Prior to commencement of use
21.	**Stormwater Management (Quantity)** a) Submit to EDQ IS detailed engineering drawings, sections and hydraulic calculations, certified by a RPEQ, for the stormwater drainage system designed generally in accordance with: i) *PDA Guideline No. 13 Engineering standards* – Stormwater quantity; ii) *Stormwater Drainage Concept Layout – Layout Plan 30031846-9000-SK01, Revision 1 dated 07/07/2023 by SMEC; and* iii) *Stormwater Drainage Concept Longsection – Layout Plan 30031846-9000-SK02, Revision 1 dated 07/07/2023 by SMEC* b) Construct stormwater works generally in accordance with the certified plans submitted under part a) of this condition. c) Submit to EDQ IS "as constructed" plans, certified by a RPEQ that the stormwater works have been constructed in accordance with part a) of this condition.	a) Prior to commencement of stormwater works b) Prior to commencement of use c) Prior to commencement of use
22.	**Stormwater Management (Quality)** a) Submit to EDQ IS detailed engineering drawings, certified by a RPEQ, for stormwater treatment devices designed generally in accordance with: i) *PDA Guideline No. 13 Engineering standards – Stormwater quality*; ii) Gross pollutant and oil management traps (litter, course sediment and oil removal) are to be provided to capture all ground level runoff; and	a) Prior to commencement of stormwater works

	b) Construct stormwater works generally in accordance with the certified plans submitted under part a) of this condition c) Submit to EDQ IS "as constructed" plans, certified by a RPEQ that the stormwater works including treatment devices have been constructed in accordance with part a) of this condition.	b) Prior to commencement of use c) Prior to commencement of use
23.	**Electricity** a) Submit to EDQ IS a Certificate of Electricity Supply from Energex for the provision of electricity supply to the approved development. b) Connect the approved development in accordance with the Certificate of Electricity Supply submitted under part a) of this condition.	a) Prior to commencement of use b) Prior to commencement of use
24.	**Telecommunications** a) Submit to EDQ IS documentation from an authorised telecommunication service provider confirming that an agreement has been entered into for the provision of underground telecommunication services to the approved development. b) Connect the approved development in accordance with the documentation submitted under part a) of this condition.	a) Prior to commencement of use b) Prior to commencement of use
25.	**Broadband** a) Submit to EDQ IS written agreement, from an authorised telecommunications service provider, confirming that fibre-ready pit and pipe infrastructure designed to service the approved development can accommodate services compliant with *Industry Guideline G645:2017 Fibre-Ready Pit and Pipe Specification for Real Estate Development Projects*. b) Construct the fibre-ready pit and pipe infrastructure specified in the agreement submitted under part a) of this condition.	a) Prior to commencement of use b) Prior to commencement of use
26.	**Landscape Works** a) Submit to EDQ IS detailed landscape plan certified by an AILA generally in accordance with the following approved landscape concept design set: i) *Aura Business Park Lot 9000 Proposed Showroom Development Landscape Design by Arcadia* dated 11 July 2023 (as amended in red 11 August 2023); and ii) The detailed landscape plan should include: A. Total landscape planting area schedule with detailed planting design showing plant density / m^2; species numbers; pot sizes; setbacks to	a) Prior to commencement of site works

	pathways / infrastructures; and materials schedule for edging and hardscapes (if applicable). B. Location of proposed services and features. C. Landscape maintenance access. Safety harness anchor point/s should be provided where necessary for vertical features. D. Centralised irrigation/fertigation system to vertical gardens to ensure plants are sufficiently nourished. E. Preventative measures to ensure no accidental dropping plant material from vertical gardens; and nesting of birds within the vertical landscape features. The landscaping on the licensed area to McDonalds is to be coordinated and continue the intended typologies 1 and 8. The on-site stormwater network should maximise opportunities for stormwater infiltration into landscaped areas. b) Construct the landscape works generally in accordance with the certified plans submitted under part a) of this condition. c) Submit to EDQ IS "as constructed" plans, certified by an AILA that the landscape works have been undertaken generally in accordance with part (a) of this condition.	b) Prior to commencement of use c) Prior to commencement of use
27.	**Refuse Collection** a) Submit to EDQ IS evidence of approved refuse collection arrangements, from Council or a private waste contractor, for the approved development; b) Implement the refuse collection arrangements submitted under part a) of this condition.	a) Prior to commencement of use b) At all times following commencement of use
28.	**Outdoor Lighting** Outdoor lighting within the site is to be designed and constructed in accordance with *Australian Standard AS 4282:1997 Control of the Obtrusive Effects of Outdoor Lighting.*	Prior to commencement of use
29.	**Easements over Infrastructure** Provide public utility easements, in favour of and at no cost to the grantee, over infrastructure located in land (other than road) for Contributed Assets. The terms of public utility easements are to be to the satisfaction of the Chief Executive Officer of the authority which is to accept and maintain the Contributed Assets.	Prior to commencement of use

Infrastructure Charges		
30.	**Sub-Regional (Water and Sewer) Charge** In lieu of paying the sub-regional (water and sewer) infrastructure charges, provide the MEDQ a copy of the Payment Certificate in accordance with clause W25.8 of the WWIA.	Prior to commencement of use

PDA Development Conditions – Reconfiguring a Lot – Access Easement		
No.	**Condition**	**Timing**
General		
31.	**Carry out the Approved Development** Carry out the approved development generally in accordance with the approved plans and documents.	Prior to survey plan endorsement
32.	**Easement (Access)** Provide access easement (denoted in purple), in favour of and at no cost to the grantee/s, over the part of the lot giving access to the other lot, being Lot 1 on SP308152, as shown on the approved *Aura Bulk Goods Site Plan – Easement Plan, Drawing Number DA212 Revision B dated 05/07/2023* by Hames Sharley	At the registration of the Survey plan

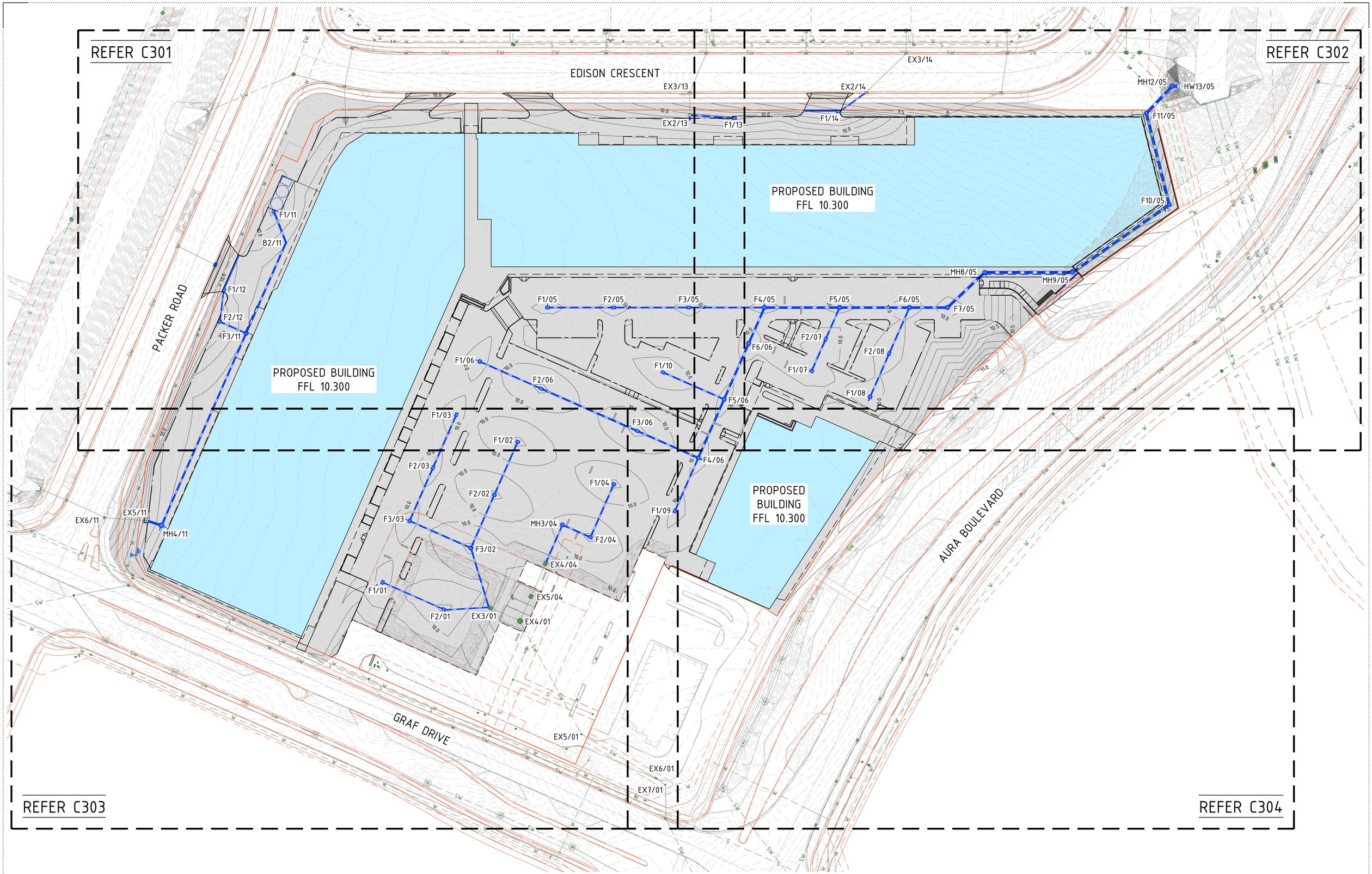
PDA Development Conditions – Operational Work – Advertising Devices		
No.	**Condition**	**Timing**
General		
33.	**Advertising Devices** a) Advertising devices are to be designed, located and installed generally in accordance with the approved plans: i) *Aura Bulky Goods - Signage Layout* Plan, Drawing Number DA800 Revision E dated 05/07/2023 by Hames Sharley (amended in red 11 August 2023); and ii) *Aura Bulky Goods – Signage Detail, Drawing Number DA801 Revision FG dated 05/07/2023* by Hames Sharley	Ongoing
34.	**Structural Design** a) Submit to EDQ IS detailed structural plans, certified by an RPEQ, for all proposed free standing advertising devices. b) Construct the works generally in accordance with the certified plans required under part a) of this condition.	a) Prior to commencement of construction of the relevant advertising device b) As indicated

STANDARD ADVICE

Please note that to lawfully undertake development, it may be necessary to obtain approvals other than this PDA development approval. For advice on other approvals that may be necessary in relation to your proposal, it is recommended that you seek professional advice.

**** End of Package ****

Appendix C – Engineering Drawings



PLANS AND DOCUMENTS referred to in the PDA DEVELOPMENT APPROVAL

Approval no: DEV2023/1389/2

Date: 26 February 2025

Queensland Government

AURA Home + Life

HUTCHINSON BUILDERS

Established 1912

WARNING

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0 10 20

SCALE 1:500 @A1

N

Rev	Date	Description	By	Chk
P02	29.10.24	ISSUED FOR APPROVAL	ST	ME
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Project Name
AURA HOME & LIFE
LOT 1195 AURA BOULEVARD
BARINGA QLD 4551

Client
HUTCHINSON BUILDERS

Designed | Drawn | Checked

Drawing Title
OVERALL STORMWATER & SITE GRADING PLAN

Project No. **AU240885**

PRELIMINARY
NOT FOR CONSTRUCTION

Drawing No. **C300**

Revision **P02**

PROPOSED	EXISTING	
		PROPERTY BOUNDARY
		EASEMENT
22.2	22.2	MINOR CONTOUR / MAJOR CONTOUR
		BUILDING
		BARRIER KERB & CHANNEL
		BARRIER KERB
		MOUNTABLE KERB & CHANNEL
		MOUNTABLE KERB
		CONCRETE
		EDGE OF BITUMEN
		BATTER TOP
		BATTER TOE
		SWALE
	BLK WALL	BLOCKWORK WALL
	INT WALL	BUILDING WALL
	SW	STORMWATER
W	W	WATER
S	S	SEWER
	T	TELECOMMUNICATIONS
	E	ELECTRICAL

NOTES

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5. INSTALL TACTILE GROUND SURFACE INDICATORS IN ACCORDANCE WITH IPWEA STANDARD DWGS.

EDISON CRESCENT

PACKER ROAD

EXISTING Ø375 STORMWATER PIPE

PROPOSED STUB FOR HYDRAULIC CONNECTION

EXISTING Ø450 STORMWATER PIPE

EX3/13

CONNECT NEATLY TO EXISTING FIELD INLET

EX2/13

F1/13

PROPOSED STUB FOR HYDRAULIC CONNECTION

RAINWATER TANKS. REFER HYDRAULIC PLANS FOR DETAILS

F1/11

B2/11

PROPOSED BUILDING
FFL 10.300

EXISTING Ø450 STORMWATER PIPE

MODIFY EXISTING GULLY PIT TO V-SHAPE GRATED INLET

300mm WIDE TRENCH GRATE

F1/12

F2/12

F3/11

PROPOSED BUILDING
FFL 10.300

PROPOSED STUB FOR HYDRAULIC CONNECTION

F1/05

F2/05

F3/05

PROPOSED STUB FOR HYDRAULIC CONNECTION

F1/06

F2/06

F3/06

F1/10

F5/06

F1/03

F1/02

FOR CONTINUATION REFER C302

FOR CONTINUATION REFER C303

PLANS AND DOCUMENTS referred to in the PDA DEVELOPMENT APPROVAL

Approval no: DEV2023/1389/2

Date: 26 February 2025

Queensland Government

KEY PLAN

SCALE 1:7,500

EDISON CRESCENT, PACKER ROAD, GRAF DRIVE, AURA BOULEVARD

AURA Home + Life

HUTCHINSON BUILDERS

Established 1912

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0 5 10

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P03	29.10.24	ISSUED FOR APPROVAL	ST	ME
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Project Name
AURA HOME & LIFE
LOT 1195 AURA BOULEVARD
BARINGA QLD 4551

Client
HUTCHINSON BUILDERS

Designed | Drawn | Checked

Drawing Title
STORMWATER & SITE GRADING PLAN
SHEET 1

Project No. **AU240885**

PRELIMINARY
NOT FOR CONSTRUCTION

Drawing No. **C301**

Revision **P03**

FOR CONTINUATION REFER C301

EDISON CRESCENT

EX3/14

EXISTING Ø375 STORMWATER PIPE

EX2/14

PROPOSED STUB FOR HYDRAULIC CONNECTION

EXISTING Ø600 STORMWATER PIPE

CONNECT NEATLY TO EXISTING GULLY PIT

F1/14

F1/13

300mm WIDE TRENCH GRATE

PROPOSED ROCK SCOUR PROTECTION

MH12/05

HW13/05

F11/05

F10/05

PROPOSED BUILDING
FFL 10.300

PROPOSED STUB FOR HYDRAULIC CONNECTION

MH8/05

MH9/05

PROPOSED STUB FOR HYDRAULIC CONNECTION

F5/05

F6/05

F4/05

F7/05

F6/06

F2/07

F2/08

F1/07

F1/08

F5/06

PROPOSED STUB FOR HYDRAULIC CONNECTION

EXTERNAL WORKS BY OTHERS

JOIN NEATLY TO EXTERNAL ROAD PAVEMENT AND KERB. EXACT LEVELS AND LOCATION TO BE CONFIRMED

AURA BOULEVARD

PROPOSED	EXISTING	
		PROPERTY BOUNDARY
		EASEMENT
		MINOR CONTOUR
22.2	22.2	MAJOR CONTOUR
		BUILDING
		BARRIER KERB & CHANNEL
		BARRIER KERB
		MOUNTABLE KERB & CHANNEL
		MOUNTABLE KERB
		CONCRETE
		EDGE OF BITUMEN
		BATTER TOP
		BATTER TOE
		SWALE
	BLK WALL	BLOCKWORK WALL
	INT WALL	BUILDING WALL
	SW	STORMWATER
W	W	WATER
S	S	SEWER
	T	TELECOMMUNICATIONS
	E	ELECTRICAL

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5. INSTALL TACTILE GROUND SURFACE INDICATORS IN ACCORDANCE WITH IPWEA STANDARD DWGS.

PLANS AND DOCUMENTS referred to in the PDA DEVELOPMENT APPROVAL

Approval no: DEV2023/1389/2

Date: 26 February 2025

Queensland Government

FOR CONTINUATION REFER C304

EDISON CRESCENT
PACKER ROAD
AURA BOULEVARD
GRAF DRIVE

KEY PLAN
SCALE 1:7,500

AURA Home + Life
HUTCHINSON BUILDERS
Established 1912

WARNING

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ISO 9001 ISO 45001 ISO 14001

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AURA HOME & LIFE
LOT 1195 AURA BOULEVARD
BARINGA QLD 4551

Client
HUTCHINSON BUILDERS

Designed | Drawn | Checked

Drawing Title
STORMWATER & SITE GRADING PLAN
SHEET 2

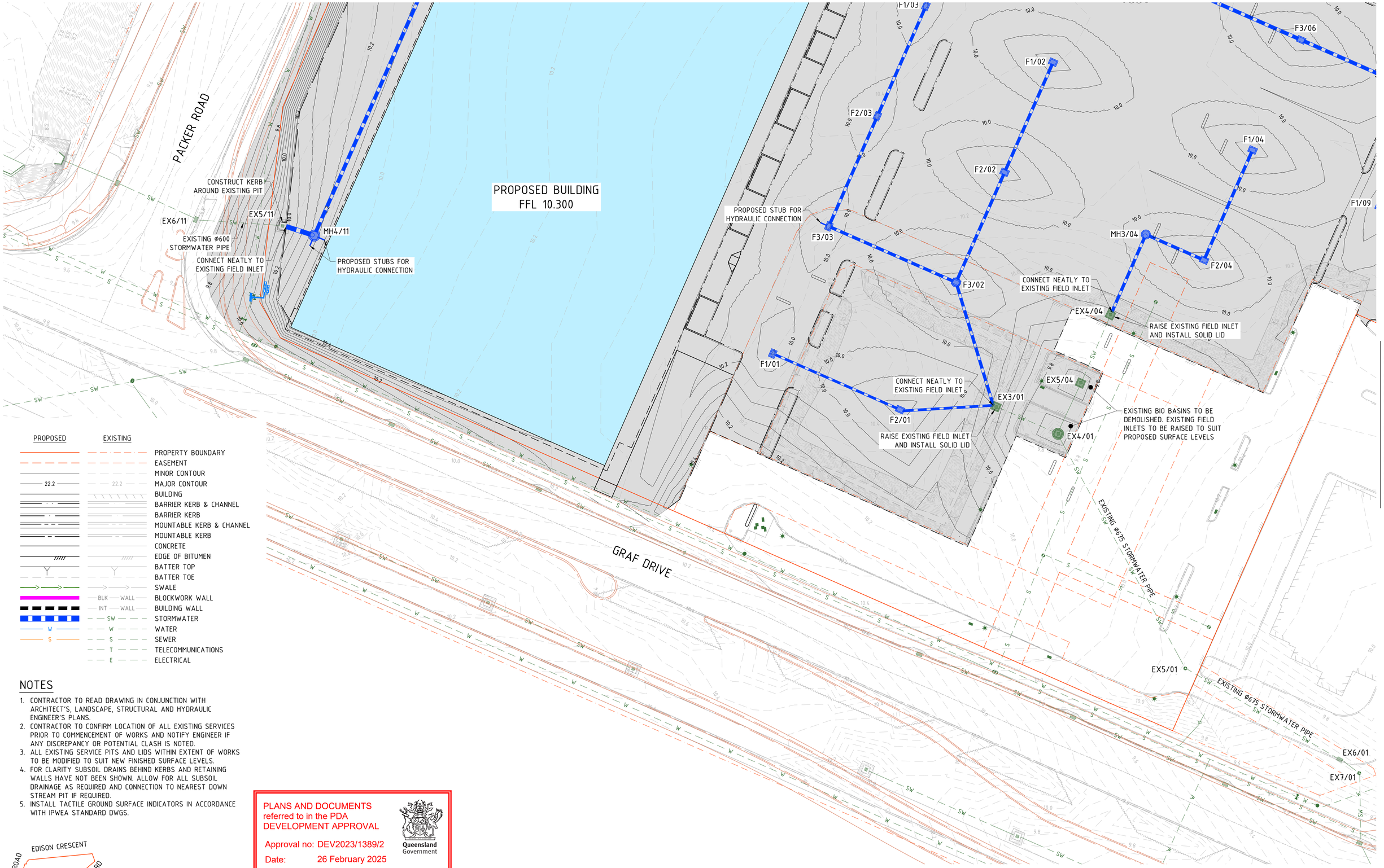
Project No.
AU240885

Drawing No.
C302

Revision
P03

PRELIMINARY
NOT FOR CONSTRUCTION

FOR CONTINUATION REFER C301



FOR CONTINUATION REFER C304

PROPOSED	EXISTING	
		PROPERTY BOUNDARY
		EASEMENT
	22.2	MINOR CONTOUR
22.2		MAJOR CONTOUR
		BUILDING
		BARRIER KERB & CHANNEL
		BARRIER KERB
		MOUNTABLE KERB & CHANNEL
		MOUNTABLE KERB
		CONCRETE
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	SW	STORMWATER
W	W	WATER
S	S	SEWER
	T	TELECOMMUNICATIONS
	E	ELECTRICAL

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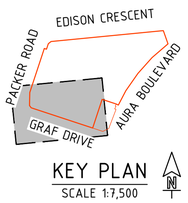
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PLANS AND DOCUMENTS referred to in the PDA DEVELOPMENT APPROVAL

Approval no: DEV2023/1389/2

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Queensland Government



KEY PLAN
SCALE 1:7,500

AURA Home + Life
HUTCHINSON BUILDERS
Established 1912

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LOT 1195 AURA BOULEVARD
BARINGA QLD 4551

Client
HUTCHINSON BUILDERS

Designed | Drawn | Checked

Drawing Title
STORMWATER & SITE GRADING PLAN
SHEET 3

Project No.
AU240885

PRELIMINARY
NOT FOR CONSTRUCTION

Drawing No.
C303

Revision
P03

FOR CONTINUATION REFER C302

FOR CONTINUATION REFER C303

F3/06

F4/06

F1/09

PROPOSED STUB FOR HYDRAULIC CONNECTION

PROPOSED BUILDING
FFL 10.300

EXTERNAL WORKS BY OTHERS

AURA BOULEVARD

EX6/01

EX7/01

EDISON CRESCENT

PACKER ROAD

GRAF DRIVE

AURA BOULEVARD

KEY PLAN
SCALE 1:7,500

PROPOSED	EXISTING	
		PROPERTY BOUNDARY
		EASEMENT
		MINOR CONTOUR
22.2	22.2	MAJOR CONTOUR
		BUILDING
		BARRIER KERB & CHANNEL
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ISO 9001 Quality Management | ISO 45001 Safety Management | ISO 14001 Environmental Management

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Designed | Drawn | Checked

Drawing Title
STORMWATER & SITE GRADING PLAN
SHEET 4

Project No.
AU240885

PRELIMINARY
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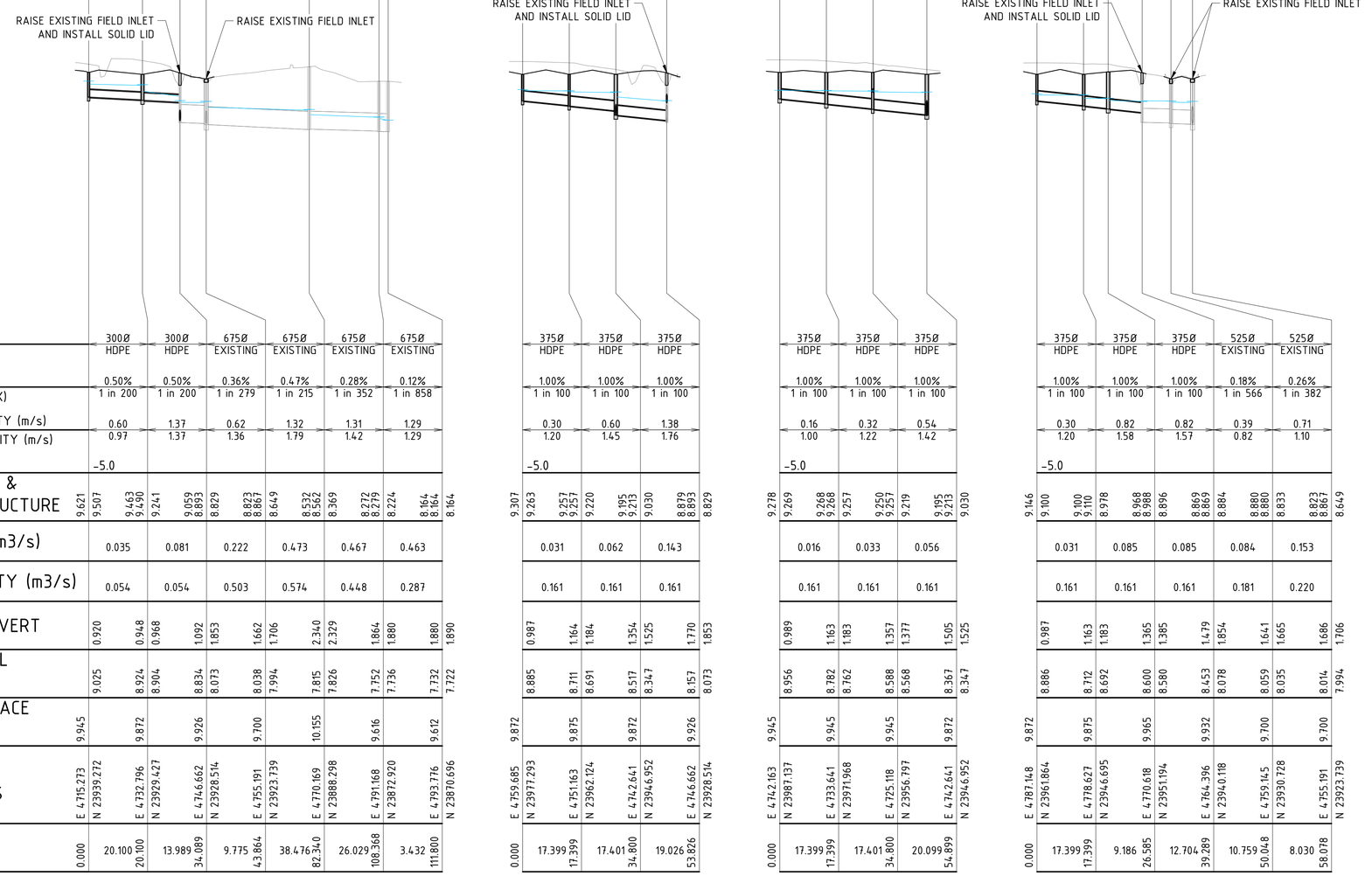
Drawing No.
C304

Revision
P03

SURFACE LEGEND

NATURAL SURFACE
DESIGN SURFACE
10% AEP HGL

ATLAN STORMSACKS TO BE INSTALLED IN ALL GRATED INLET PITS



STRUCTURE NAME	F1/01	F2/01	EX3/01	EX4/01	EX5/01	EX6/01	EX7/01
STRUCTURE DESCRIPTION	900 x 600 GRATED FIELD INLET	900 x 600 GRATED FIELD INLET	EXISTING FIELD INLET CONTRACTOR TO CONFIRM LOCATION AND DEPTH	EXISTING FIELD INLET CONTRACTOR TO CONFIRM LOCATION AND DEPTH	EXISTING MANHOLE CONTRACTOR TO CONFIRM LOCATION AND DEPTH	EXISTING FIELD INLET CONTRACTOR TO CONFIRM LOCATION AND DEPTH	EXISTING MANHOLE CONTRACTOR TO CONFIRM LOCATION AND DEPTH
PIPE SIZE (mm)	300Ø	300Ø	675Ø	675Ø	675Ø	675Ø	
PIPE CLASS	HDPE	HDPE	EXISTING	EXISTING	EXISTING	EXISTING	
PIPE GRADE (%)	0.50%	0.50%	0.36%	0.47%	0.28%	0.12%	
PIPE SLOPE (1 in X)	1 in 200	1 in 200	1 in 279	1 in 215	1 in 352	1 in 858	
FULL PIPE VELOCITY (m/s)	0.60	1.37	0.62	1.32	1.31	1.29	
PART FULL VELOCITY (m/s)	0.97	1.37	1.36	1.79	1.42	1.29	
DATUM RL	-5.0						
H.G.L IN PIPE & W.S.E IN STRUCTURE	9.621	9.507 9.490	9.463 9.241	9.059 8.893	8.829	8.823 8.807	8.649 8.532 8.562
	8.369	8.272 8.279	8.224	8.164 8.164	8.164		
PIPE FLOW (m3/s)		0.035		0.081		0.222	0.473
	0.467		0.463				
PIPE CAPACITY (m3/s)		0.054		0.054		0.503	0.574
	0.448		0.287				
DEPTH OF INVERT	0.920	0.948	0.968	1.092	1.853	1.662	1.706
	2.340	2.329	1.864	1.880	1.880	1.890	
INVERT LEVEL OF DRAIN	9.025	8.924	8.904	8.834	8.073	8.038	7.994
	7.815	7.826	7.752	7.736	7.732	7.722	
DESIGN SURFACE LEVEL	9.945	9.872	9.926	9.700	10.155	9.616	9.612
SETOUT COORDINATES	E 4715.273 N 23939.272	E 4732.796 N 23929.427	E 4746.662 N 23928.514	E 4755.191 N 23923.739	E 4770.169 N 23888.298	E 4791.168 N 23872.920	E 4793.776 N 23870.696
CHAINAGE	0.000	20.100 20.100	13.989 34.089	9.775 43.864	38.476 82.340	26.029 108.368	3.432 111.800
LINE	01						

STRUCTURE NAME	F1/02	F2/02	F3/02	EX3/01
STRUCTURE DESCRIPTION	900 x 600 GRATED FIELD INLET	900 x 600 GRATED FIELD INLET	900 x 600 GRATED FIELD INLET OVER 1050Ø MANHOLE	EXISTING GULLY PIT CONTRACTOR TO CONFIRM LOCATION AND DEPTH
PIPE SIZE (mm)	375Ø	375Ø	375Ø	
PIPE CLASS	HDPE	HDPE	HDPE	
PIPE GRADE (%)	1.00%	1.00%	1.00%	
PIPE SLOPE (1 in X)	1 in 100	1 in 100	1 in 100	
FULL PIPE VELOCITY (m/s)	0.30	0.60	1.38	
PART FULL VELOCITY (m/s)	1.20	1.45	1.76	
DATUM RL	-5.0			
H.G.L IN PIPE & W.S.E IN STRUCTURE	9.307	9.263	9.257 9.257	9.220
	9.195 9.213	9.030	8.879 8.893	8.829
PIPE FLOW (m3/s)		0.031		0.062
	0.143			
PIPE CAPACITY (m3/s)		0.161		0.161
	0.161			
DEPTH OF INVERT	0.987	1.164	1.184	1.354
	1.525	1.770	1.853	
INVERT LEVEL OF DRAIN	8.885	8.711	8.691	8.517
	8.347	8.157	8.073	
DESIGN SURFACE LEVEL	9.872	9.875	9.872	9.926
SETOUT COORDINATES	E 4759.685 N 23977.293	E 4751.163 N 23962.124	E 4742.641 N 23946.952	E 4746.662 N 23928.514
CHAINAGE	0.000	17.399 17.399	17.401 34.800	19.026 53.826
LINE	02			

STRUCTURE NAME	F1/03	F2/03	F3/03	F3/02
STRUCTURE DESCRIPTION	900 x 600 GRATED FIELD INLET	900 x 600 GRATED FIELD INLET	900 x 600 GRATED FIELD INLET	900 x 600 GRATED FIELD INLET OVER 1050Ø MANHOLE
PIPE SIZE (mm)	375Ø	375Ø	375Ø	
PIPE CLASS	HDPE	HDPE	HDPE	
PIPE GRADE (%)	1.00%	1.00%	1.00%	
PIPE SLOPE (1 in X)	1 in 100	1 in 100	1 in 100	
FULL PIPE VELOCITY (m/s)	0.16	0.32	0.54	
PART FULL VELOCITY (m/s)	1.00	1.22	1.42	
DATUM RL	-5.0			
H.G.L IN PIPE & W.S.E IN STRUCTURE	9.278	9.269	9.268 9.268	9.257
	9.250 9.257	9.219	9.195 9.213	9.030
PIPE FLOW (m3/s)		0.016		0.033
	0.056			
PIPE CAPACITY (m3/s)		0.161		0.161
	0.161			
DEPTH OF INVERT	0.989	1.163	1.183	1.357
	1.377	1.505	1.525	
INVERT LEVEL OF DRAIN	8.956	8.782	8.762	8.588
	8.568	8.367	8.347	
DESIGN SURFACE LEVEL	9.945	9.945	9.945	9.872
SETOUT COORDINATES	E 4742.163 N 23987.137	E 4733.641 N 23971.968	E 4725.118 N 23956.797	E 4742.641 N 23946.952
CHAINAGE	0.000	17.399 17.399	17.401 34.800	20.099 54.899
LINE	03			

STRUCTURE NAME	F1/04	F2/04	MH3/04	EX4/04	EX5/04	EX4/01
STRUCTURE DESCRIPTION	900 x 600 GRATED FIELD INLET	900 x 600 GRATED FIELD INLET	1050Ø MANHOLE	EXISTING FIELD INLET CONTRACTOR TO CONFIRM LOCATION AND DEPTH	EXISTING FIELD INLET CONTRACTOR TO CONFIRM LOCATION AND DEPTH	EXISTING FIELD INLET CONTRACTOR TO CONFIRM LOCATION AND DEPTH
PIPE SIZE (mm)	375Ø	375Ø	375Ø	375Ø	525Ø	525Ø
PIPE CLASS	HDPE	HDPE	HDPE	HDPE	EXISTING	EXISTING
PIPE GRADE (%)	1.00%	1.00%	1.00%	1.00%	0.18%	0.26%
PIPE SLOPE (1 in X)	1 in 100	1 in 100	1 in 100	1 in 100	1 in 566	1 in 382
FULL PIPE VELOCITY (m/s)	0.30	0.82	0.82	0.82	0.39	0.71
PART FULL VELOCITY (m/s)	1.20	1.58	1.57	0.82	1.10	
DATUM RL	-5.0					
H.G.L IN PIPE & W.S.E IN STRUCTURE	9.146	9.100	9.100 9.110	8.978	8.968 8.988	8.896
	8.869 8.869	8.884	8.880 8.880	8.833	8.823 8.867	8.649
PIPE FLOW (m3/s)		0.031		0.085		0.085
	0.084		0.153			
PIPE CAPACITY (m3/s)		0.161		0.161		0.161
	0.181		0.220			
DEPTH OF INVERT	0.987	1.163	1.183	1.365	1.385	1.479
	1.854	1.641	1.665	1.686	1.706	
INVERT LEVEL OF DRAIN	8.886	8.712	8.692	8.600	8.580	8.453
	8.078	8.059	8.035	8.014	7.994	
DESIGN SURFACE LEVEL	9.872	9.875	9.965	9.932	9.700	9.700
SETOUT COORDINATES	E 4787.148 N 23961.864	E 4778.627 N 23946.695	E 4770.618 N 23951.194	E 4764.396 N 2394.0.118	E 4759.145 N 23930.728	E 4755.191 N 23923.739
CHAINAGE	0.000	17.399 17.399	9.186 26.585	12.704 39.289	10.759 50.048	8.030 58.078
LINE	04					

PLANS AND DOCUMENTS referred to in the PDA DEVELOPMENT APPROVAL

Approval no: DEV2023/1389/2

Date: 26 February 2025

Queensland Government

AURA Home + Life

HUTCHINSON BUILDERS
Established 1912

WARNING

THE CONTRACTOR SHALL CONFIRM THE LOCATION OF ALL EXISTING SERVICES ON AND EXTERIOR TO THE SITE INCLUDING WATER MAINS, SEWER MAINS, GAS MAINS, TELECOMMUNICATIONS CABLES, ELECTRICAL CABLES, AND STORMWATER PIPES PRIOR TO WORKS COMMENCING.

SHOULD ANY CONFLICTS OCCUR, EDGE CONSULTING ENGINEERS ARE TO BE NOTIFIED IMMEDIATELY.

ANY DAMAGE TO EXISTING SERVICES SHALL BE REPAIRED AT THE CONTRACTORS EXPENSE.

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HORIZ: SCALE 1:1000 @A1

Rev	Date	Description	By	Chk
P02	29.10.24	ISSUED FOR APPROVAL	ST	ME
P01	27.09.24	50% DD ISSUE	ST	ME

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Project Name
AURA HOME & LIFE
LOT 1195 AURA BOULEVARD
BARINGA QLD 4551

Client
HUTCHINSON BUILDERS

Designed | Drawn | Checked

Drawing Title
STORMWATER LONGITUDINAL SECTIONS
SHEET 1

Project No. AU240885

PRELIMINARY
NOT FOR CONSTRUCTION

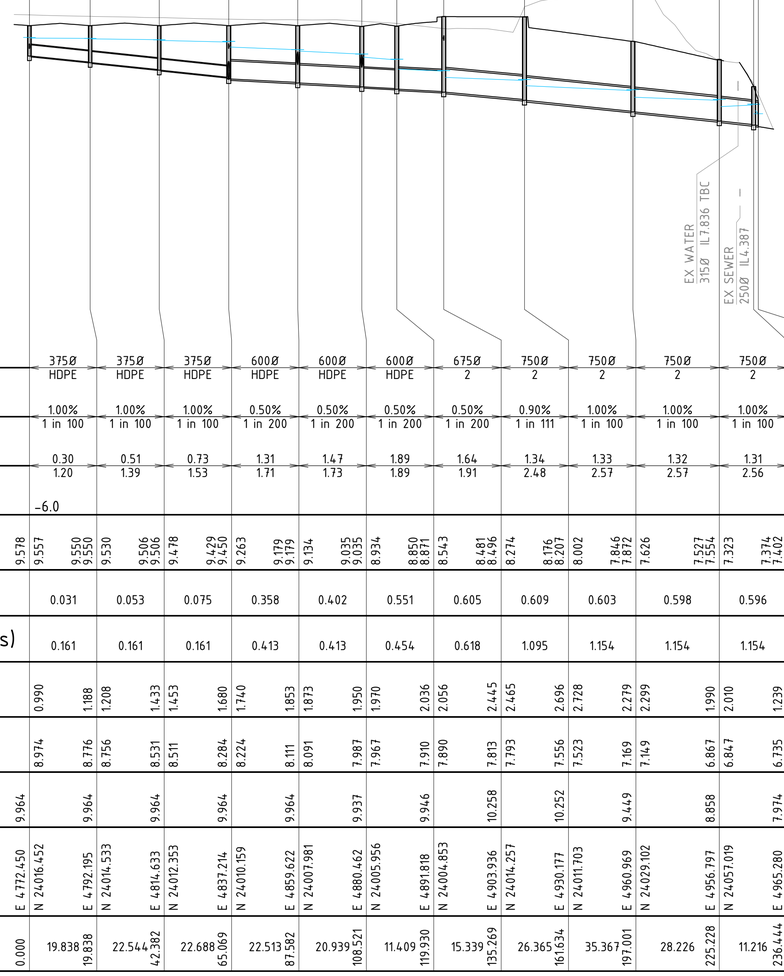
Drawing No. C341

Revision P02

SURFACE LEGEND

NATURAL SURFACE
DESIGN SURFACE
10% AEP HGL

ATLAN STORMSACKS TO BE INSTALLED IN ALL GRATED INLET PITS



STRUCTURE NAME	F1/05	F2/05	F3/05	F4/05	F5/05	F6/05	F7/05	MH8/05	MH9/05	F10/05	F11/05	MH12/05	HW13/05
STRUCTURE DESCRIPTION	900 x 600 GRATED FIELD INLET	900 x 600 GRATED FIELD INLET	900 x 600 GRATED FIELD INLET	900 x 600 GRATED FIELD INLET OVER 1050ø MANHOLE	900 x 600 GRATED FIELD INLET OVER 1050ø MANHOLE	900 x 600 GRATED FIELD INLET OVER 1050ø MANHOLE	900 x 600 GRATED FIELD INLET OVER 1050ø MANHOLE	1050ø MANHOLE	1050ø MANHOLE	900 x 600 GRATED FIELD INLET OVER 1050ø MANHOLE	900 x 600 GRATED FIELD INLET OVER 1050ø MANHOLE	1050ø MANHOLE	PRECAST CONCRETE HEADWALL WITH GROUTED ROCK SCOUR PROTECTION
PIPE SIZE (mm)	375ø	375ø	375ø	600ø	600ø	600ø	675ø	750ø	750ø	750ø	750ø	750ø	
PIPE CLASS	HDPE	HDPE	HDPE	HDPE	HDPE	HDPE	2	2	2	2	2	2	
PIPE GRADE (%)	1.00%	1.00%	1.00%	0.50%	0.50%	0.50%	0.50%	0.90%	1.00%	1.00%	1.00%	1.00%	
PIPE SLOPE (1 in X)	1 in 100	1 in 100	1 in 100	1 in 200	1 in 200	1 in 200	1 in 200	1 in 111	1 in 100	1 in 100	1 in 100	1 in 100	
FULL PIPE VELOCITY (m/s)	0.30	0.51	0.73	1.31	1.47	1.89	1.64	1.34	1.33	1.32	1.31	1.31	
PART FULL VELOCITY (m/s)	1.20	1.39	1.53	1.71	1.73	1.89	1.91	2.48	2.57	2.57	2.56	2.56	
DATUM RL	-6.0												
H.G.L IN PIPE & W.S.E IN STRUCTURE	9.578 / 9.557	9.550 / 9.550	9.530	9.506 / 9.506	9.478	9.429 / 9.429	9.263	9.179 / 9.179	9.134	9.035 / 9.035	8.934	8.850 / 8.871	8.543
	8.481 / 8.496	8.274	8.176 / 8.207	8.002	7.846 / 7.872	7.626	7.527 / 7.554	7.323	7.374 / 7.402	7.190	7.087 / 7.087	7.087	
PIPE FLOW (m3/s)	0.031	0.053	0.075	0.358	0.402	0.551	0.605	0.609	0.603	0.598	0.596	0.594	
PIPE CAPACITY (m3/s)	0.161	0.161	0.161	0.413	0.413	0.454	0.618	1.095	1.154	1.154	1.154	1.158	
DEPTH OF INVERT	0.990	1.188	1.208	1.433	1.453	1.680	1.740	1.853	1.873	1.950	1.970	2.036	2.056
	2.445	2.465	2.696	2.728	2.279	2.299	1.990	2.010	1.239	1.259	0.760	0.760	
INVERT LEVEL OF DRAIN	8.974	8.776	8.756	8.531	8.511	8.284	8.224	8.111	8.091	7.987	7.967	7.910	7.890
	7.813	7.793	7.556	7.523	7.169	7.149	6.867	6.847	6.735	6.715	6.700	6.700	
DESIGN SURFACE LEVEL	9.964	9.964	9.964	9.964	9.964	9.937	9.946	10.258	10.252	9.449	8.858	7.974	7.460
SETOUT COORDINATES	E 4772.450	E 4792.195	E 4814.633	E 4837.214	E 4859.622	E 4880.462	E 4891.818	E 4903.936	E 4930.177	E 4960.969	E 4956.797	E 4965.280	E 4966.773
	N 24016.452	N 24014.533	N 24012.353	N 24010.159	N 24007.981	N 24005.956	N 24004.853	N 24014.257	N 24011.703	N 24029.102	N 24057.019	N 24064.355	N 24064.210
CHAINAGE	0.000	19.838 / 19.838	22.544 / 42.382	22.688 / 65.069	22.513 / 87.582	20.939 / 108.521	11.409 / 119.930	15.339 / 135.269	26.365 / 161.634	35.367 / 197.001	28.226 / 225.228	11.216 / 236.444	1.500 / 237.944
LINE	05												

STRUCTURE NAME	F1/06	F2/06	F3/06	F4/06	F5/06	F6/06	F4/05
STRUCTURE DESCRIPTION	900 x 600 GRATED FIELD INLET	900 x 600 GRATED FIELD INLET	900 x 600 GRATED FIELD INLET	900 x 600 GRATED FIELD INLET	900 x 600 GRATED FIELD INLET OVER 1050ø MANHOLE	900 x 600 GRATED FIELD INLET OVER 1050ø MANHOLE	900 x 600 GRATED FIELD INLET OVER 1050ø MANHOLE
PIPE SIZE (mm)	375ø	450ø	450ø	525ø	525ø	525ø	
PIPE CLASS	HDPE	HDPE	HDPE	HDPE	HDPE	HDPE	
PIPE GRADE (%)	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	
PIPE SLOPE (1 in X)	1 in 200	1 in 200	1 in 200	1 in 200	1 in 200	1 in 200	
FULL PIPE VELOCITY (m/s)	0.37	0.53	0.75	0.94	1.16	1.22	
PART FULL VELOCITY (m/s)	0.99	1.19	1.30	1.49	1.56	1.57	
DATUM RL	-5.0						
H.G.L IN PIPE & W.S.E IN STRUCTURE	9.868 / 9.855	9.844 / 9.844	9.823	9.794 / 9.794	9.764	9.727 / 9.739	9.642
	9.598 / 9.598	9.568	9.504 / 9.504	9.474	9.429 / 9.450	9.263	
PIPE FLOW (m3/s)	0.038	0.079	0.112	0.198	0.246	0.258	
PIPE CAPACITY (m3/s)	0.114	0.184	0.184	0.295	0.295	0.295	
DEPTH OF INVERT	1.019	1.045	1.065	1.213	1.233	1.413	1.413
	1.509	1.529	1.620	1.640	1.720	1.740	
INVERT LEVEL OF DRAIN	8.928	8.827	8.807	8.650	8.630	8.530	8.530
	8.434	8.414	8.322	8.302	8.244	8.224	
DESIGN SURFACE LEVEL	9.947	9.872	9.863	9.943	9.943	9.943	9.964
SETOUT COORDINATES	E 4750.683	E 4768.207	E 4795.670	E 4813.105	E 4822.504	E 4831.472	E 4837.214
	N 24002.308	N 23992.463	N 23977.034	N 23967.240	N 23983.971	N 23999.937	N 24010.159
CHAINAGE	0.000	20.100 / 20.100	31.500	51.600	19.998 / 71.598	19.191 / 90.789	18.313 / 109.102	11.724 / 120.825
LINE	06						

STRUCTURE NAME	F1/07	F2/07	F5/05
STRUCTURE DESCRIPTION	900 x 600 GRATED FIELD INLET	900 x 600 GRATED FIELD INLET	900 x 600 GRATED FIELD INLET OVER 1050ø MANHOLE
PIPE SIZE (mm)	375ø	375ø	
PIPE CLASS	HDPE	HDPE	
PIPE GRADE (%)	1.00%	1.00%	
PIPE SLOPE (1 in X)	1 in 100	1 in 100	
FULL PIPE VELOCITY (m/s)	0.17	0.30	
PART FULL VELOCITY (m/s)	1.03	1.20	
DATUM RL	-5.0		
H.G.L IN PIPE & W.S.E IN STRUCTURE	9.206 / 9.190	9.190 / 9.190	9.182
	9.179 / 9.179	9.134	
PIPE FLOW (m3/s)	0.018	0.031	
PIPE CAPACITY (m3/s)	0.161	0.161	
DEPTH OF INVERT	0.987	1.102	1.122
	1.244	1.873	
INVERT LEVEL OF DRAIN	8.948	8.843	8.823
	8.720	8.091	
DESIGN SURFACE LEVEL	9.935	9.945	9.964
SETOUT COORDINATES	E 4849.432	E 4854.561	E 4859.622
	N 23989.844	N 23998.973	N 24007.981
CHAINAGE	0.000	10.472 / 10.472	10.332 / 20.804
LINE	07		

STRUCTURE NAME	F1/08	F2/08	F6/05
STRUCTURE DESCRIPTION	900 x 600 GRATED FIELD INLET	900 x 600 GRATED FIELD INLET	900 x 600 GRATED FIELD INLET OVER 1050ø MANHOLE
PIPE SIZE (mm)	375ø	375ø	
PIPE CLASS	HDPE	HDPE	
PIPE GRADE (%)	1.00%	1.00%	
PIPE SLOPE (1 in X)	1 in 100	1 in 100	
FULL PIPE VELOCITY (m/s)	0.86	1.15	
PART FULL VELOCITY (m/s)	1.59	1.70	
DATUM RL	-5.0		
H.G.L IN PIPE & W.S.E IN STRUCTURE	9.243 / 9.219	9.196 / 9.196	9.107
	9.035 / 9.035	8.934	
PIPE FLOW (m3/s)	0.089	0.119	
PIPE CAPACITY (m3/s)	0.161	0.161	
DEPTH OF INVERT	0.990	1.132	1.152
	1.308	1.970	
INVERT LEVEL OF DRAIN	8.941	8.800	8.780
	8.629	7.967	
DESIGN SURFACE LEVEL	9.932	9.931	9.937
SETOUT COORDINATES	E 4866.138	E 4873.076	E 4880.462
	N 23980.456	N 23992.807	N 24005.956
CHAINAGE	0.000	14.167 / 14.167	15.082 / 29.249
LINE	08		

STRUCTURE NAME	F1/09	F4/06
STRUCTURE DESCRIPTION	900 x 600 GRATED FIELD INLET	900 x 600 GRATED FIELD INLET
PIPE SIZE (mm)	375ø	
PIPE CLASS	HDPE	
PIPE GRADE (%)	1.00%	
PIPE SLOPE (1 in X)	1 in 100	
FULL PIPE VELOCITY (m/s)	0.18	
PART FULL VELOCITY (m/s)	1.04	
DATUM RL	-5.0	
H.G.L IN PIPE & W.S.E IN STRUCTURE	9.737 / 9.729	9.727 / 9.739
	9.642	
PIPE FLOW (m3/s)	0.019	
PIPE CAPACITY (m3/s)	0.161	
DEPTH OF INVERT	0.989	1.163
	1.413	
INVERT LEVEL OF DRAIN	8.954	8.780
	8.530	
DESIGN SURFACE LEVEL	9.943	9.943
SETOUT COORDINATES	E 4804.583	E 4813.105
	N 23952.069	N 23967.240
CHAINAGE	0.000	17.400 / 17.400
LINE	09	

PLANS AND DOCUMENTS referred to in the PDA DEVELOPMENT APPROVAL

Approval no: DEV2023/1389/2

Date: 26 February 2025

Queensland Government

AURA Home + Life

HUTCHINSON BUILDERS
Established 1912

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HORIZ: SCALE 1:1000 @A1

Rev	Date	Description	By	Chk
P02	29.10.24	ISSUED FOR APPROVAL	ST	ME
P01	27.09.24	50% DD ISSUE	ST	ME

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ISO 9001 ISO 45001 ISO 14001

Project Name
AURA HOME & LIFE
LOT 1195 AURA BOULEVARD
BARINGA QLD 4551

Client
HUTCHINSON BUILDERS

Designed | Drawn | Checked

Drawing Title
STORMWATER LONGITUDINAL SECTIONS SHEET 2

Project No. **AU240885**

PRELIMINARY NOT FOR CONSTRUCTION

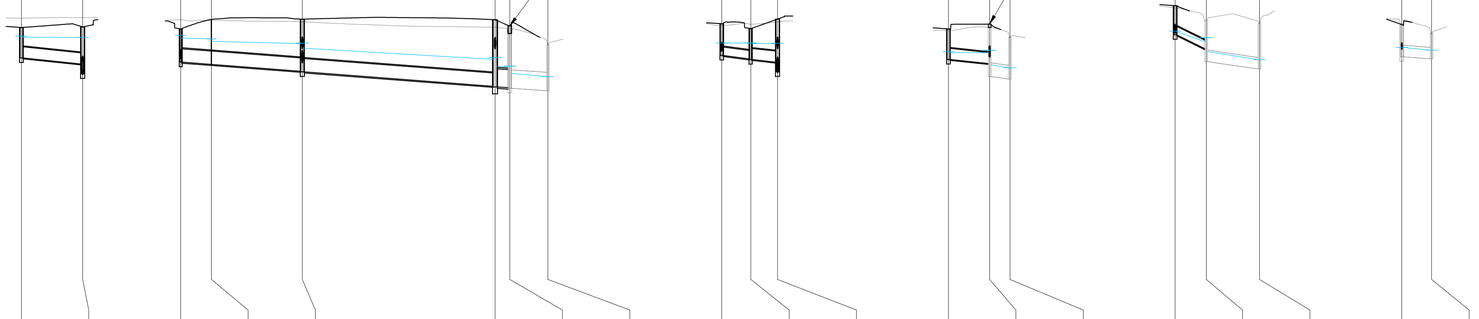
Drawing No. **C342**

Revision **P02**

SURFACE LEGEND

NATURAL SURFACE
DESIGN SURFACE
10% AEP HGL

ATLAN STORMSACKS TO BE INSTALLED IN ALL GRATED INLET PITS



STRUCTURE NAME	F1/10	F5/06	F1/11	B2/11	F3/11	MH4/11	EX5/11	EX6/11	F1/12	F2/12	F3/11	F1/13	EX2/13	EX3/13	F1/14	EX2/14	EX3/14	EX1/15	EX2/15
STRUCTURE DESCRIPTION	900 x 600 GRATED FIELD INLET	900 x 600 GRATED FIELD INLET OVER 1050ø MANHOLE	600 x 600 GRATED FIELD INLET	PIPE BEND	900 x 600 GRATED FIELD INLET OVER 1050ø MANHOLE	1200ø MANHOLE	EXISTING FIELD INLET CONTRACTOR TO CONFIRM LOCATION AND DEPTH	EXISTING GULLY PIT CONTRACTOR TO CONFIRM LOCATION AND DEPTH	900 x 600 GRATED FIELD INLET	900 x 600 GRATED FIELD INLET	900 x 600 GRATED FIELD INLET OVER 1050ø MANHOLE	900 x 600 GRATED FIELD INLET	EXISTING FIELD INLET CONTRACTOR TO CONFIRM LOCATION AND DEPTH	EXISTING GULLY PIT CONTRACTOR TO CONFIRM LOCATION AND DEPTH	900 x 600 GRATED FIELD INLET	EXISTING GULLY PIT CONTRACTOR TO CONFIRM LOCATION AND DEPTH	EXISTING GULLY PIT CONTRACTOR TO CONFIRM LOCATION AND DEPTH	EXISTING FIELD INLET CONTRACTOR TO CONFIRM LOCATION AND DEPTH	EXISTING GULLY PIT CONTRACTOR TO CONFIRM LOCATION AND DEPTH
PIPE SIZE (mm)		375ø		450ø	450ø	450ø	600ø	600ø		300ø	375ø		375ø	450ø		300ø	375ø		375ø
PIPE CLASS		HDPE		HDPE	HDPE	HDPE	HDPE	EXISTING		HDPE	HDPE		HDPE	EXISTING		HDPE	EXISTING		EXISTING
PIPE GRADE (%)		1.00%		0.75%	0.75%	0.75%	0.50%	0.64%		1.20%	1.00%		1.00%	1.20%		4.50%	1.38%		0.72%
PIPE SLOPE (1 in X)		1 in 100		1 in 133	1 in 133	1 in 133	1 in 200	1 in 156		1 in 83	1 in 100		1 in 100	1 in 83		1 in 22	1 in 72		1 in 139
FULL PIPE VELOCITY (m/s)		0.35		0.89	0.88	1.33	1.48	1.74		0.15	0.26		0.31	1.96		0.30	1.86		1.35
PART FULL VELOCITY (m/s)		1.26		1.58	1.58	1.71	1.73	1.98		0.92	1.15		1.21	2.24		1.80	2.13		1.54
DATUM RL		-5.0		-5.0						-5.0			-5.0			-6.0			-5.0
H.G.L IN PIPE & W.S.E IN STRUCTURE	9.640	9.609 9.598	9.666	9.577 9.552	9.552 9.472	9.396 9.412	9.249	8.885 8.943	8.649	8.627 8.666	8.428	8.319 8.319	8.319	9.419	9.417 9.415	9.416 9.399	9.396 9.412	9.249	9.136	9.102 9.103	9.181 8.707	8.608 8.608	8.608	8.805	8.795 8.460	8.591 8.138	7.877 7.877	7.877	9.275	9.275 9.184	9.184 9.184	9.184
PIPE FLOW (m3/s)		0.037		0.132	0.131	0.198	0.403	0.492		0.009	0.027		0.032	0.312		0.018	0.206		0.149													
PIPE CAPACITY (m3/s)		0.161		0.226	0.226	0.226	0.413	0.492		0.083	0.161		0.161	0.312		0.161	0.206		0.149													
DEPTH OF INVERT	0.990	1.211	1.081	1.475	1.475	1.701	1.721	2.174	2.194	2.015	2.035	1.495	1.535	1.037	0.988	1.008	1.406	1.721	0.996	1.192	1.619	1.372	1.352	0.945	0.920	1.343	1.490	1.790	1.046	0.835	1.205													
INVERT LEVEL OF DRAIN	8.932	8.732	8.794	8.719	8.719	8.496	8.476	8.004	7.984	7.960	7.940	7.860	7.820	9.012	8.898	8.878	8.791	8.476	8.882	8.747	8.320	8.240	8.230	8.690	8.233	7.810	7.570	7.270	8.970	8.900	8.530													
DESIGN SURFACE LEVEL	9.921	9.943	9.875		10.193	10.197		10.178		9.975	9.355			10.049		9.886	10.197		9.878		9.939	9.612		9.635		9.153	9.060		10.016		9.735													
SETOUT COORDINATES	E 4805.069 N 23993.766	E 4822.504 N 23983.971	E 4693.430 N 24052.914	E 4696.320 N 24043.401	E 4681.783 N 24011.524		E 4650.964 N 23962.662	E 4646.535 N 23964.494	E 4634.283 N 23966.552	E 4676.463 N 24030.977	E 4674.174 N 24021.798	E 4681.783 N 24011.524		E 4833.745 N 24061.519	E 4820.470 N 24069.666	E 4821.093 N 24076.300		E 4864.904 N 24066.500	E 4873.802 N 24071.082	E 4886.872 N 24082.174		E 4717.681 N 24078.359	E 4718.273 N 24088.056																							
CHAINAGE	0.000	19.998 19.998	0.000	10.027 10.027	29.681 39.708	62.926	102.634	4.798 107.432	12.449 119.881	0.000	9.495 9.495	8.727 18.223		0.000	13.454 13.454	6.665 20.120		0.000	10.170 10.170	17.388 27.559		0.000	9.715 9.715																							
LINE	10		11							12				13				14					15																							

PLANS AND DOCUMENTS referred to in the PDA DEVELOPMENT APPROVAL

Approval no: DEV2023/1389/2

Date: 26 February 2025

Queensland Government

AURA Home + Life

HUTCHINSON BUILDERS
Established 1912

WARNING

THE CONTRACTOR SHALL CONFIRM THE LOCATION OF ALL EXISTING SERVICES ON AND EXTERIOR TO THE SITE INCLUDING WATER MAINS, SEWER MAINS, GAS MAINS, TELECOMMUNICATIONS CABLES, ELECTRICAL CABLES, AND STORMWATER PIPES PRIOR TO WORKS COMMENCING.

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ANY DAMAGE TO EXISTING SERVICES SHALL BE REPAIRED AT THE CONTRACTORS EXPENSE.

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VERT: SCALE 1:100 @A1

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Rev	Date	Description	By	Chk
P02	29.10.24	ISSUED FOR APPROVAL	ST	ME
P01	27.09.24	50% DD ISSUE	ST	ME

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BARINGA QLD 4551

Client
HUTCHINSON BUILDERS

Designed | Drawn | Checked

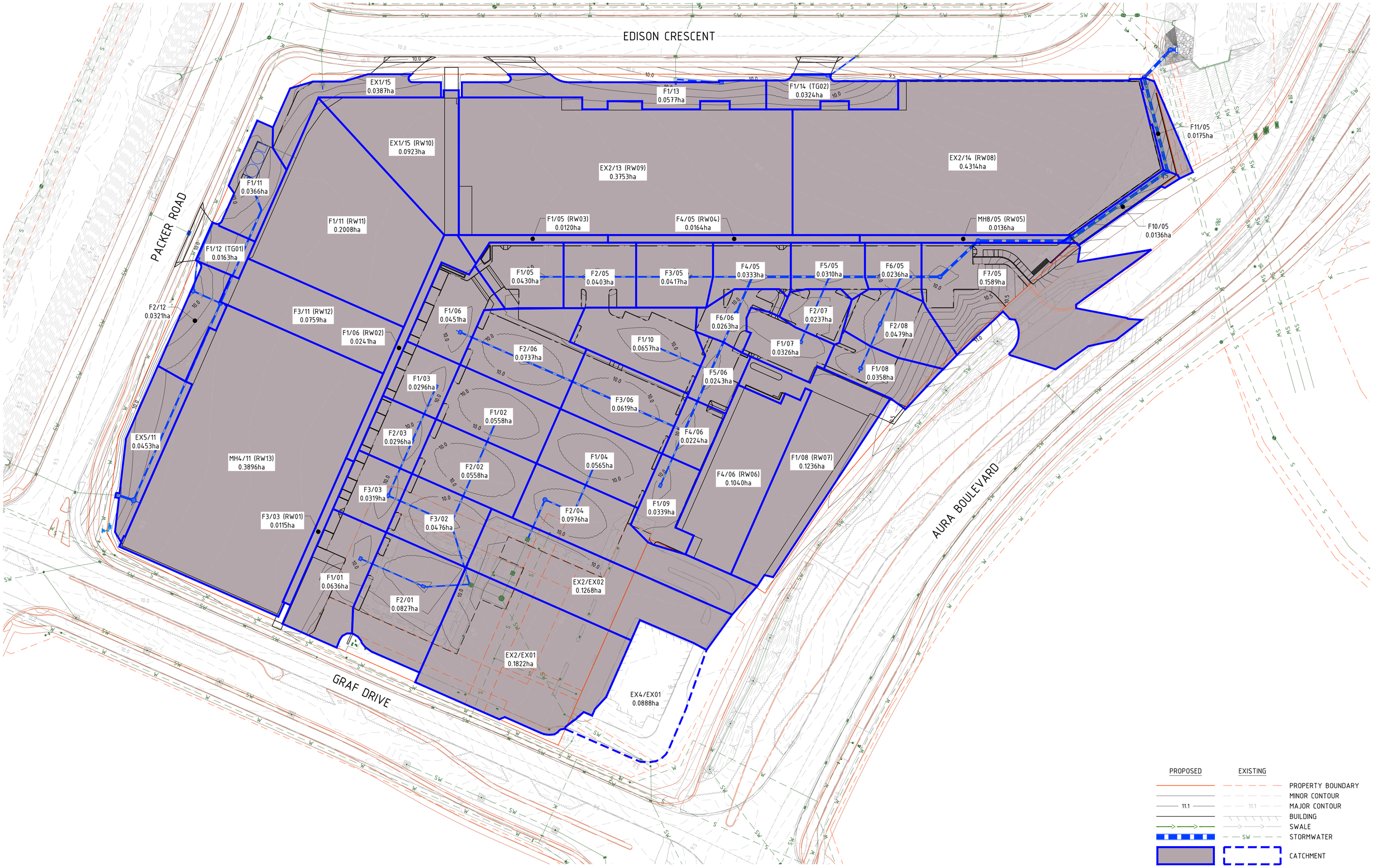
Drawing Title
STORMWATER LONGITUDINAL SECTIONS SHEET 3

Project No. **AU240885**

PRELIMINARY NOT FOR CONSTRUCTION

Drawing No. **C343**

Revision **P02**



PLANS AND DOCUMENTS
referred to in the PDA
DEVELOPMENT APPROVAL

Approval no: DEV2023/1389/2

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AURA Home + Life

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P02	29.10.24	ISSUED FOR APPROVAL	ST	ME
P01	27.09.24	50% DD ISSUE	ST	ME

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Project Name
AURA HOME & LIFE
LOT 1195 AURA BOULEVARD
BARINGA QLD 4551

Client
HUTCHINSON BUILDERS

Designed | Drawn | Checked

Drawing Title
STORMWATER CATCHMENT PLAN

Project No.
AU240885

PRELIMINARY
NOT FOR CONSTRUCTION

Drawing No.
C391

Revision
P02

LOCATION			SUB-CATCHMENT RUNOFF						INLET DESIGN										DRAIN DESIGN														HEAD LOSSES						PART FULL		DESIGN LEVELS								
			Tc	I		A	CA	Qc	Qa										Tc	I	CA	Qrat	Q	L	S		Vf=Q/A	Qcap	Vcap	Vt		Vf^2/g	Ku	hu	Kw	hw	Sf	hf	dn	Vn								
STRUCTURE No.	CATCHMENT CONTRIBUTING	DRAIN SECTION	SUB-CATCHMENT TIME OF CONC.	RAINFALL INTENSITY	CO-EFFICIENT OF RUNOFF	SUB-CATCHMENT AREA	EQUIVALENT AREA	SUB-CATCHMENT DISCHARGE	FLOW IN K&C (INC. BYPASS)	HALF ROAD CAPACITY	FLOW WIDTH	FLOW DEPTH	FLOW DxV	ROAD GRADE AT INLET	ROAD XFALL AT INLET	INLET TYPE	BLOCKAGE FACTOR	INLET CURVE	FLOW INTO INLET	BYPASS FLOW	BYPASS STRUCTURE No.	CRITICAL TIME OF CONC.	RAINFALL INTENSITY	TOTAL (C x A)	PEAK FLOW	PIPE FLOW	REACH LENGTH	PIPE GRADE	PIPE SIZE	FULL PIPE VELOCITY	CAPACITY FLOW	CAPACITY VELOCITY	TRAVEL VELOCITY	CHART(S) USED	VELOCITY HEAD	U/S HEAD LOSS COEFFICIENT	U/S HEAD LOSS	W.S.E COEFFICIENT	CHANGE IN W.S.E	PIPE FRICTION SLOPE	PIPE FRICTION HEAD LOSS	NORMAL DEPTH	NORMAL DEPTH VEL.	PIPE U/S I.L	PIPE D/S I.L	PIPE U/S H.G.L	PIPE D/S H.G.L	W.S.E	SURFACE LEVEL	FREEBOARD
			min	mm/h		ha	ha	L/s	L/s	L/s	m	m	m^2/s	%	%				L/s	L/s		min	mm/hr	ha	L/s	L/s	m	%	mm	m/s	L/s	m/s	m/s		m		m		m	%	m	m	m/s	m	m	m	m	m	m	
F1/01	F1/01	F1/01 to F2/01	5.00	226.00	0.89	0.06	0.06	35.36	35.36	68.80		0.06		1.00	3.00	900 x 600 FIELD INLET	1.00	SAG	35.36		F2/01	5.00	226.00	0.06	35.36	35.36	20.10	0.50	274.00	0.60	53.72	0.91	2.00	G2	0.02	3.76	0.07		0.07	0.22	0.04	0.16	0.97	9.02	8.92	9.79	9.74	9.86	9.95	0.09
F2/01	F2/01	F2/01 to EX3/01	5.00	226.00	0.89	0.08	0.07	45.92	45.92	133.12		0.07		1.00	3.00	900 x 600 FIELD INLET	1.00	SAG	45.92		EX4/01	5.17	224.49	0.13	80.74	80.74	13.99	0.50	274.00	1.37	53.72	0.91	2.00	G2/T3/T6	0.10	1.79	0.17	1.90	0.18	1.13	0.16	0.27	1.37	8.90	8.83	9.57	9.42	9.76	9.87	0.12
EX3/01	EX3/01	EX3/01 to EX4/01												1.00	3.00	EXISTING FIELD INLET						5.45	221.96	0.36	221.98	221.98	9.77	0.36	675.00	0.62	503.21	1.41	2.00	T6/T9	0.02	1.99	0.04	2.88	0.06	0.07	0.01	0.31	1.36	8.07	8.04	9.38	9.37	9.43	9.93	0.49
EX4/01	EX4/01	EX4/01 to EX5/01	5.00	226.00	0.89	0.18	0.16	101.21	101.21	419.00		0.10		1.00	3.00	EXISTING FIELD INLET	1.00	SAG	101.21		BYPASS 1	5.42	222.23	0.77	643.42	643.42	38.48	0.47	675.00	1.80	573.59	1.60	2.00	T3/T6	0.16	1.79	0.30	2.01	0.33	0.59	0.23	0.68	1.80	7.99	7.82	9.07	8.85	9.41	9.70	0.29
EX5/01	EX5/01	EX5/01 to EX6/01												1.00	3.00	EXISTING MANHOLE						5.74	219.35	0.77	637.27	637.27	26.03	0.28	675.00	1.78	448.39	1.25	2.00	T3/T6	0.16	1.84	0.30	2.16	0.35	0.57	0.14	0.68	1.78	7.83	7.75	8.55	8.40	8.90	10.15	1.25
EX6/01	EX6/01	EX6/01 to EX7/01								100000.00				1.00	3.00	EXISTING FIELD INLET	1.00					5.96	217.40	0.77	633.11	633.11	3.43	0.12	675.00	1.77	287.11	0.80	2.00	T1/T3	0.16	0.58	0.09	0.67	0.11	2.11	0.02	0.68	1.77	7.74	7.73	8.31	8.24	8.42	9.62	1.20
EX7/01	EX7/01													1.00	3.00	EXISTING MANHOLE																															8.24	9.61	
F1/02	F1/02	F1/02 to F2/02	5.00	226.00	0.89	0.06	0.05	30.99	30.99	160.60		0.05		1.00	3.00	900 x 600 FIELD INLET	1.00	SAG	30.99		F2/02	5.00	226.00	0.05	30.99	30.99	17.40	1.00	363.00	0.30	160.83	1.55	2.00	G2	0.00	4.94	0.02		0.02	0.04	0.01	0.11	1.20	8.89	8.71	9.77	9.76	9.79	9.87	0.08
F2/02	F2/02	F2/02 to F3/02	5.00	226.00	0.89	0.06	0.05	30.99	30.99	160.60		0.05		1.00	3.00	900 x 600 FIELD INLET	1.00	SAG	30.99		F3/02	5.14	224.70	0.10	61.62	61.62	17.40	1.00	363.00	0.60	160.83	1.55	2.00	T1	0.02	1.36	0.02		0.02	0.15	0.03	0.16	1.45	8.69	8.52	9.74	9.71	9.76	9.88	0.11
F3/02	F3/02	F3/02 to EX3/01	5.00	226.00	0.89	0.05	0.04	26.45	26.45	69.82		0.05		1.00	3.00	900 x 600 FIELD INLET	1.00	SAG	26.45		EX5/04	5.31	223.19	0.23	143.08	143.08	19.03	1.00	363.00	1.38	160.83	1.55	2.00	T6	0.10	1.48	0.14	1.55	0.15	0.79	0.15	0.27	1.76	8.35	8.16	9.57	9.42	9.72	9.87	0.15
EX3/01	EX3/01													1.00	3.00	EXISTING FIELD INLET																															9.43	9.93	0.49
F1/03	F1/03	F1/03 to F2/03	5.00	226.00	0.89	0.03	0.03	16.43	16.43	53.50		0.03		1.00	3.00	900 x 600 FIELD INLET	1.00	SAG	16.43		F2/03	5.00	226.00	0.03	16.43	16.43	17.40	1.00	363.00	0.16	160.83	1.55	2.00	G1	0.00	4.23	0.01		0.01	0.01	0.00	0.08	1.00	8.96	8.78	9.77	9.77	9.78	9.95	0.17
F2/03	F2/03	F2/03 to F3/03	5.00	226.00	0.89	0.03	0.03	16.43	16.43	53.50		0.03		1.00	3.00	900 x 600 FIELD INLET	1.00	SAG	16.43		F3/03	5.14	224.70	0.05	32.67	32.67	17.40	1.00	363.00	0.32	160.83	1.55	2.00	T1	0.01	1.40	0.01		0.01	0.04	0.01	0.11	1.22	8.76	8.59	9.77	9.76	9.77	9.95	0.17
F3/03	F3/03	F3/03 to F3/02	5.00	226.00	0.89	0.03	0.03	17.70	17.70	68.80		0.04		1.00	3.00	900 x 600 FIELD INLET	1.00	SAG	17.70		F3/02	5.29	223.39	0.09	56.28	56.28	20.10	1.00	363.00	0.54	160.83	1.55	2.00	T10	0.02	1.54	0.02	1.88	0.03	0.12	0.02	0.15	1.42	8.57	8.37	9.74	9.71	9.76	9.95	0.18
F3/02	F3/02		5.00	226.00	0.89	0.05	0.04	26.45	26.45	69.82		0.05		1.00	3.00	900 x 600 FIELD INLET	1.00	SAG	26.45		EX5/04	5.31	223.19	0.23	143.08	143.08	19.03	1.00	363.00	1.38	160.83	1.55	2.00	T6		1.48	0.14	1.55	0.15									9.72	9.87	0.15
F1/04	F1/04	F1/04 to F2/04	5.00	226.00	0.89	0.06	0.05	31.37	31.37	160.60		0.05		1.00	3.00	900 x 600 FIELD INLET	1.00	SAG	31.37		F2/04	5.00	226.00	0.05	31.37	31.37	17.40	1.00	363.00	0.30	160.83	1.55	2.00	G2	0.00	6.66	0.03		0.03	0.04	0.01	0.11	1.20	8.89	8.71	9.61	9.60	9.64	9.87	0.23
F2/04	F2/04	F2/04 to MH3/04	5.00	226.00	0.89	0.10	0.09	54.23	54.23	160.60		0.08		1.00	3.00	900 x 600 FIELD INLET	1.00	SAG	54.23		EX5/04	5.14	224.70	0.14	85.10	85.10	9.19	1.00	363.00	0.82	160.83	1.55	2.00	G1/T10	0.03	2.21	0.08	2.52	0.09	0.28	0.03	0.19	1.58	8.69	8.60	9.53	9.50	9.61	9.88	0.26
MH3/04	MH3/04	MH3/04 to EX4/04												1.00	3.00	1050DIA MANHOLE						5.22	224.01	0.14	84.84	84.84	12.70	1.00	363.00	0.82	160.83	1.55	2.00	T10	0.03	1.80	0.06	1.93	0.07	0.28	0.04	0.19	1.57	8.58	8.45	9.44	9.40	9.51	9.97	0.46
EX4/04	EX4/04	EX4/04 to EX5/04												1.00	3.00	EXISTING FIELD INLET						5.33	223.05	0.14	84.48	84.48	10.76	0.18	525.00	0.39	180.80	0.84	2.00	T1	0.01	-2.01	-0.02		-0.02	0.04	0.00	0.25	0.82	8.08	8.06	9.42	9.42	9.40	9.93	0.53
EX5/04	EX5/04	EX5/04 to EX4/01	5.00	226.00	0.89	0.13	0.11	70.45	70.45	83.02		0.08		1.00	3.00	EXISTING FIELD INLET	1.00	SAG	70.45		EX4/01	5.27	223.55	0.25	153.45	153.45	8.03	0.26	525.00	0.71	220.02	1.02	2.00	T1	0.03	1.37	0.04		0.04	0.13	0.01	0.32	1.10	8.04	8.01	9.38	9.37	9.42	9.70	0.28
EX4/01	EX4/01		5.00	226.00	0.89	0.18	0.16	101.21	101.21	419.00		0.10		1.00	3.00	EXISTING FIELD INLET	1.00	SAG	101.21		BYPASS 1														T3/T6		1.79	0.30	2.01	0.33									9.41	9.70	0.29
F1/05	F1/05	F1/05 to F2/05	5.00	226.00	0.89	0.04	0.04	23.91	23.91	53.50		0.04		1.00	3.00	900 x 600 FIELD INLET	1.00	SAG	23.91		F2/05	5.01	225.90	0.05	30.56	30.56	19.84	1.00	363.00	0.30	160.83	1.55	2.00	G1/T10	0.00	4.50	0.02	4.79	0.02	0.04	0.01	0.11	1.20	8.97	8.78	9.56	9.55	9.58	9.96	0.39
F2/05	F2/05	F2/05 to F3/05	5.00	226.00	0.89	0.04	0.04	22.40	22.40	53.50		0.04		1.00	3.00	900 x 600 FIELD INLET	1.00	SAG	22.40		F3/05	5.17	224.51	0.08	52.61	52.61	22.54	1.00	363.00	0.51	160.83	1.55	2.00	T1	0.01	1.46	0.02		0.02	0.11	0.02	0.14	1.39	8.76	8.53	9.53	9.51	9.55	9.96	0.41
F3/05	F3/05	F3/05 to F4/05	5.00	226.00	0.89	0.04	0.04	23.19	23.19	53.50		0.04		1.00	3.00	900 x 600 FIELD INLET	1.00	SAG	23.19		F4/05	5.35	222.82	0.12	75.08	75.08	22.69	1.00	363.00	0.73	160.83	1.55	2.00	T1	0.03	1.04	0.03		0.03	0.22	0.05	0.17	1.53	8.51	8.28	9.48	9.43	9.51	9.96	0.46
F4/05	F4/05	F4/05 to F5/05	5.00	226.00	0.89	0.03	0.03	18.51	18.51	53.50		0.04		1.00	3.00	900 x 600 FIELD INLET	1.00	SAG	18.51		F6/06	5.84	218.45	0.59	357.54	357.54	22.51	0.50	589.00	1.31	413.45	1.52	2.00	T6/T9	0.09	1.89	0.17	2.13	0.19	0.37	0.08	0.42	1.71	8.22	8.11	9.26	9.18	9.45	9.96	0.51
F5/05	F5/05	F5/05 to F6/05	5.00	226.00	0.89	0.03	0.03	17.22	17.22	53.50		0.04		1.00	3.00	900 x 600 FIELD INLET	1.00	SAG	17.22		F4/05	5.76	219.12	0.66	401.62	401.62	20.94	0.50	589.00	1.47	413.44	1.52	2.00	T1/T2	0.11	0.40	0.04		0.04	0.47	0.10	0.47	1.73	8.09	7.99	9.13	9.04	9.18	9.96	0.79
F6/05	F6/05	F6/05 to F7/05	5.00	226.00	0.89	0.02	0.02	13.09	41.75	37.18		0.06		1.00	3.00	900 x 600 FIELD INLET	1.00	SAG	37.18	4.57	F2/08	5.94	217.55	0.86	522.24	550.89	11.41	0.50	610.00	1.89	453.93	1.55	2.00	T1/T2	0.18	0.56	0.10		0.10	0.74	0.08	0.61	1.89	7.97	7.91	8.93	8.85	9.04	9.94	0.90
F7/05	F7/05	F7/05 to MH8/05	5.00	226.00	0.89	0.16	0.14	88.27	88.27	59.62		0.08		1.00	3.00	900 x 600 FIELD INLET	1.00	SAG	59.62	28.65	F6/05	6.01	216.89	1.00	604.90	604.90	15.34	0.50	685.00	1.64	618.43	1.68	2.00	T3/T6	0.14	2.24	0.31	2.39	0.33	0.40	0.06	0.55	1.91	7.89	7.81	8.54	8.48	8.87	9.95	1.07
MH8/05	MH8/05	MH8/05 to MH9/05												0.00	3.00	1050DIA MANHOLE						6.14	215.76	1.02	608.90	608.90	26.37	0.90	760.00	1.34	1094.57	2.41	2.00	T3/T6	0.09	2.25	0.21	2.42	0.22	0.37	0.18	0.41	2.48	7.79	7.56	8.27	8.18	8.50	10.26	1.76
MH9/05	MH9/05	MH9/05 to F10/05												1.00	3.00	1050DIA MANHOLE						6.36	213.78	1.02	603.32	603.32	35.37	1.00	760.00	1.33	1153.79	2.54	2.00	T3/T6	0.09	1.93	0.17	2.28	0.21	0.44	0.26	0.39	2.57	7.52	7.17	8.00	7.85	8.21	10.25	2.04
F10/05	F10/05	F10/05 to F11/05	5.00	226.00	0.89	0.01	0.01	7.55	7.55	34194.47	1.26	0.02	0.01	1.35	5.00	900 x 600 FIELD INLET	1.00	1G,3.5X	3.02	4.53	F11/05	6.65	211.13	1.03	602.88	598.35	28.23	1.00	760.00	1.32	1153.78	2.54	2.00	T9/T10	0.09	2.47	0.22	2.77	0.25	0.35	0.20	0.39	2.57	7.15	6.87	7.63	7.53	7.87	9.45	1.58
F11/05	F11/05	F11/05 to MH12/05	5.00	226.00	0.89	0.02	0.02	9.72	14.24	4.59	1.10	0.01	0.03	2.25	5.00	900 x 600 FIELD INLET	1.00	2G,3.3X	4.85	9.40	BYPASS 2	6.88	209.11	1.04	605.83	596.43	11.22	1.00	760.00	1.31	1153.78	2.54	2.00	T6/T9	0.09	2.32	0.20	2.62	0.23	-0.46	0.04	0.39	2.56	6.85	6.74	7.32	7.37	7.55	8.86	1.30
MH12/05	MH12/05	MH12/05 to HW13/05												1.00	3.00	1050DIA MANHOLE						6.97	208.27	1.04	603.39	593.99	1.50	1.00	760.00	1.31	1158.22	2.55	2.00	T6/T9	0.09	2.11	0.18	2.42	0.21	6.87		0.39	2.56	6.72	6.70	7.19	7.09	7.40	7.97	0.57
HW13/05	HW13/05													1.00	3.00	HEADWALL																															7.09	7.46	
F1/06	F1/06	F1/06 to F2/06	5.00	226.00	0.89	0.05	0.04	25.05	25.05	53.50		0.05		1.00	3.00	900 x 600 FIELD INLET	1.00	SAG	25.05		F1/03	5.01	225.90	0.06	38.43	38.43	20.10	0.50	363.00	0.37	113.73	1.10	2.00	G2/T1	0.01	1.82	0.01		0.01	0.06	0.01	0.15	0.99	8.93	8.83	9.86	9.84	9.87	9.95	0.08
F2/06	F2/06	F2/06 to F3/06	5.00	226.00	0.89	0.07	0.07	40.97	40.97	184.00		0.06		1.00	3.00	900 x 600 FIELD INLET	1.00	SAG	40.97		F1/02	5.17	224.49	0.13	78.86	78.86	31.50	0.50	435.00	0.53	184.25	1.24	2.00	G1/T1	0.01	1.44	0.02		0.02	0.09	0.03	0.20	1.19	8.81	8.65	9.82	9.79	9.84	9.87	0.03
F3/06	F3/06	F3/06 to F4/06	5.00	226.00	0.89	0.06	0.05	34.37	34.37	184.00		0.06		1.00	3.00	900 x 600 FIELD INLET	1.00	SAG	34.37		F1/04	5.43	222.13	0.18	111.81	111.81	20.00	0.50	435.00	0.75	184.25	1.24	2.00	T1	0.03	1.05	0.03		0.03	0.18	0.04	0.24	1.30	8.63	8.53	9.76	9.73	9.79	9.86	0.07
F4/06	F4/06	F4/06 to F5/06	5.00	226.00	0.89	0.02	0.02	12.43	12.43	60.64		0.03		1.00	3.00	900 x 600 FIELD INLET	1.00	SAG	12.43		F1/09	5.43	222.14	0.32	198.04	198.04	19.19	0.50	519.00	0.94	295.05	1.39	2.00	T9/T10	0.04	1.91	0.09	2.17	0.10	0.23	0.04	0.31	1.49	8.53	8.43	9.64	9.60	9.74	9.94	0.20
F5/06	F5/06	F5/06 to F6/06	5.00	226.00	0.89	0.02	0.02	13.52	13.52	65.74		0.03		1.00	3.00	900 x 600 FIELD INLET	1.00	SAG	13.52		F4/06	5.59	220.70	0.40	245.61	245.61	18.31	0.50	519.00	1.16	295.05	1.39	2.00	T1/T2	0.07	0.45	0.03		0.03	0.35	0.06	0.36	1.56	8.41	8.32	9.57	9.50	9.60	9.94	0.34
F6/06	F6/06	F6/06 to F4/05	5.00	226.00	0.89	0.03	0.02	14.62	14.62	70.84		0.03		1.00	3.00	900 x 600 FIELD INLET	1.00	SAG	14.62		F5/06	5.74	219.32	0.42	258.27	258.27	11.72	0.50	519.00	1.22	295.05	1.39	2.00	T1	0.08	0.40	0.03		0.03	0.38	0.04	0.38	1.57	8.30	8.24	9.47	9.43	9.50	9.94	0.44
F4/05	F4/05		5.00	226.00	0.89	0.03	0.03	18.51	18.51	53.50		0.04		1.00	3.00	900 x 600 FIELD INLET	1.00	SAG	18.51		F6/06														T6/T9		1.89	0.17	2.13	0.19									9.45	9.96	0.51
F1/07	F1/07	F1/07 to F2/07	5.00	226.00	0.89	0.03	0.03	18.10	18.10	35.14		0.04		1.00	3.00	900 x 600 FIELD INLET	1.00	SAG	18.10		F6/06	5.00	226.00	0.03	18.10	18.10	10.47	1.00	363.00	0.17	160.83	1.55	2.00	G2	0.00	9.70	0.02		0.02	0.00	0.00	0.08	1.03	8.95	8.84	9.19	9.19	9.21	9.94	0.73
F2/07	F2/07	F2/07 to F5/05	5.00	226.00	0.89	0.02	0.02	13.17	13.17	31.06		0.03		1.00	3.00	900 x 600 FIELD INLET	1.00	SAG	13.17		F1/07	5.09	225.21	0.05	31.16	31.16	10.33	1.00	363.00	0.30	160.83	1.55	2.00	T1	0.00	1.83	0.01		0.01	0.03	0.00	0.11	1.20	8.82	8.72	9.18	9.18	9.19	9.95	0.75
F5/05	F5/05		5.00	226.00	0.89	0.03	0.03	17.22	17.22	53.50		0.04		1.00	3.00	900 x 600 FIELD INLET	1.00	SAG	17.22		F4/05														T1/T2		0.40	0.04		0.04									9.18	9.96	0.79
F1/08	F1/08	F1/08 to F2/08	5.00	226.00	0.89	0.04	0.03	19.90	19.90	61.66		0.04		1.00	3.00	900 x 600 FIELD INLET	1.00	SAG	19.90		F1/07	5.01	225.90	0.14	88.56	88.56	14.17	1.00	363.00	0.86	160.83	1.55	2.00	T1	0.04	0.65	0.02		0.02	0.16	0.04	0.19	1.59	8.94	8.80	9.22	9.20	9.24	9.93	0.69
F2/08	F2/08	F2/08 to F6/05	5.00	226.00	0.89	0.05	0.04	26.61	31.18	47.38		0.05		1.00	3.00	900 x 600 FIELD INLET	1.00	SAG	31.18		F1/08	5.13	224.84	0.18	114.61	119.18	15.08	1.00	363.00	1.15	160.83	1.55	2.00	T1	0.07	1.31	0.09		0.09	0.48	0.08	0.23	1.70	8.78	8.63	9.11	9.04	9.20	9.93	0.74
F6/05	F6/05		5.00	226.00	0.89	0.02	0.02	13.09	41.75	37.18		0.06		1.00	3.00	900 x 600 FIELD INLET	1.00	SAG	37.18	4.57	F2/08														T1/T2		0.56	0.10		0.10									9.04	9.94	0.90
F1/09	F1/09	F1/09 to F4/06	5.00	226.00	0.89	0.03	0.03	18.83	18.83	60.64		0.04		1.00	3.00	900 x 600 FIELD INLET	1.00	SAG	18.83		F1/04	5.00	226.00	0.03	18.83	18.83	17.40	1.00	363.00	0.18	160.83	1.55	2.00	G1	0.00	4.47	0.01		0.01	0.01	0.00	0.08	1.04	8.95	8.78	9.73	9.73	9.74	9.94	0.21
F4/06	F4/06		5.00	226.00	0.89	0.02	0.02	12.43	12.43	60.64		0.03		1.00	3.00	900 x 600 FIELD INLET	1.00	SAG	12.43		F1/09														T9/T10		1.91	0.09	2.17	0.10									9.74	9.94	0.20
F5/06	F5/06		5.00	226.00	0.89	0.02	0.02	13.52	13.52	65.74		0.03		1.00	3.00	900 x 600 FIELD INLET	1.00	SAG	13.52		F4/06														T1/T2		0.45	0.03		0.03									9.60	9.94	0.34
F1/11	F1/11	F1/11 to B2/11	5.00	226.00	0.89	0.04	0.03	20.32	20.32	148.90		0.05		1.40	3.00	600 x 600 FIELD INLET	1.00	SAG	20.32		1/12 (TG01	5.01	225.90	0.21	131.82	131.82	10.03	0.75	435.00	0.89	225.66	1.52	2.00	T6	0.04	2.05	0.08	2.18	0.09	0.26	0.03	0.24	1.58	8.79	8.72	9.61	9.59	9.70	9.87	0.17
B2/11	B2/11	B2/11 to F3/11												1.00	3.00	PIPE BEND						5.09	225.15	0.21	131.38	131.38	29.68	0.75	435.00	0.88	225.66	1.52	2.00		0.04	2.00	0.08		0.08	0.25	0.08	0.24	1.58	8.72	8.50	9.51	9.43	9.59	10.19	0.60
F3/11	F3/11	F3/11 to MH4/11												1.00	3.00	900 x 600 FIELD INLET	1.00					5.34	222.92	0.32	198.22	198.22	62.93	0.75	435.00	1.33	225.66	1.52	2.00	T3/T6	0.09	1.58	0.14	1.75	0.16	0.58	0.36	0.32	1.71	8.48	8.00	9.29	8.93	9.45	10.20	0.75
MH4/11	MH4/11	MH4/11 to EX5/11												1.00	3.00	1200DIA MANHOLE						5.87	218.20	0.66	402.99	402.99	4.80	0.50	589.00	1.48	413.43	1.52	2.00	T9/T10	0.11	2.10	0.23	2.60	0.29	0.48	0.02	0.47	1.73	7.98	7.96	8.69	8.67	8.98	10.18	1.20
EX5/11	EX5/11	EX5/11 to EX6/11	5.00	226.00	0.89	0.05	0.04	25.19	25.19	174.00		0.04		1.50	3.00	EXISTING FIELD INLET	1.00	SAG	25.19		BYPASS 1	5.91	217.85	0.70	516.60	516.60	12.45	0.64	600.00	1.83	492.42	1.74	2.00	T1/T3	0.17	1.29	0.22	1.54	0.26	0.96	0.09	0.52	1.97	7.94	7.86	8.45	8.33	8.71	9.98	1.26
EX6/11	EX6/11													1.00	3.00	EXISTING GULLY PIT																															8.33	9.35	
F1/12	F1/12	F1/12 to F2/12												0.35	3.00	900 x 600 FIELD INLET	1.00