

SITE BASED STORMWATER MANAGEMENT PLAN

VANTAGE YATALA – STAGE 2 DEVELOPMENT APPLICATION FOR RECONFIGURING A LOT

ADDRESS

60 Stapylton Jacobs Well Road, Stapylton

REAL PROPERTY DESCRIPTION

Lot 501 on SP295994

PREPARED FOR

Frasers Property (Australia) Pty Ltd

February 2021 (Rev. 2)



gassman
development
perspectives

project coordination
urban + regional planning
landscape + urban design
engineering services
environmental management
visualisation + spatial services
surveying services
advisory services

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1.0 INTRODUCTION

Gassman Development Perspectives (GDP) has been engaged by Frasers Property (Australia) Pty Ltd (Client) to prepare a Site Based Stormwater Management Plan over land situated at 60 Stapylton Jacobs Well Road, Stapylton (Lot 501 on SP295994) being the 'subject site'.

This report has been prepared for submission to City of Gold Coast Council (Council) as part of a Development Application for Reconfiguring a Lot to facilitate Stage 2 of the *Vantage Yatala* industrial development with the intent of investigating and addressing the stormwater quantity and stormwater quality requirements for the proposed development in accordance with the applicable State and Local Government standards.

Stormwater quantity is addressed through pre and post development scenarios modelled in XPSTORM software utilising temporal pattern inputs from the Australian Rainfall & Runoff (AR&R) Data Hub and the AR&R Storm Generator.

A strategy for managing post development peak flows discharging from the site and the required attenuation measures are provided to demonstrate that any increase in peak flows can be managed within the subject site as not to measurably impact neighbouring properties.

Stormwater quality analysis is also undertaken through the use of MUSIC software to confirm the adequacy of proposed Stormwater Quality Improvement Devices (SQIDs) required to meet the State Planning Policy's (SPP 2017) Water Quality Objectives (WQOs) and the pollutant removal targets set by City of Gold Coast Council.

A copy of the XPSTORM and MUSIC modelling data files can be provided upon request.

2.0 SITE CHARACTERISTICS

2.1 LOCATION

The subject site is located within the City of Gold Coast Council local government boundaries.

The subject site is bounded by Stapylton Jacobs Well Road and existing industrial uses to the north, Christensen Road and existing industrial uses to the west and City of Gold Coast Council's land fill facility to the east.

The site has recently been cleared of all vegetation under existing Operational Works approval obtained from Council.

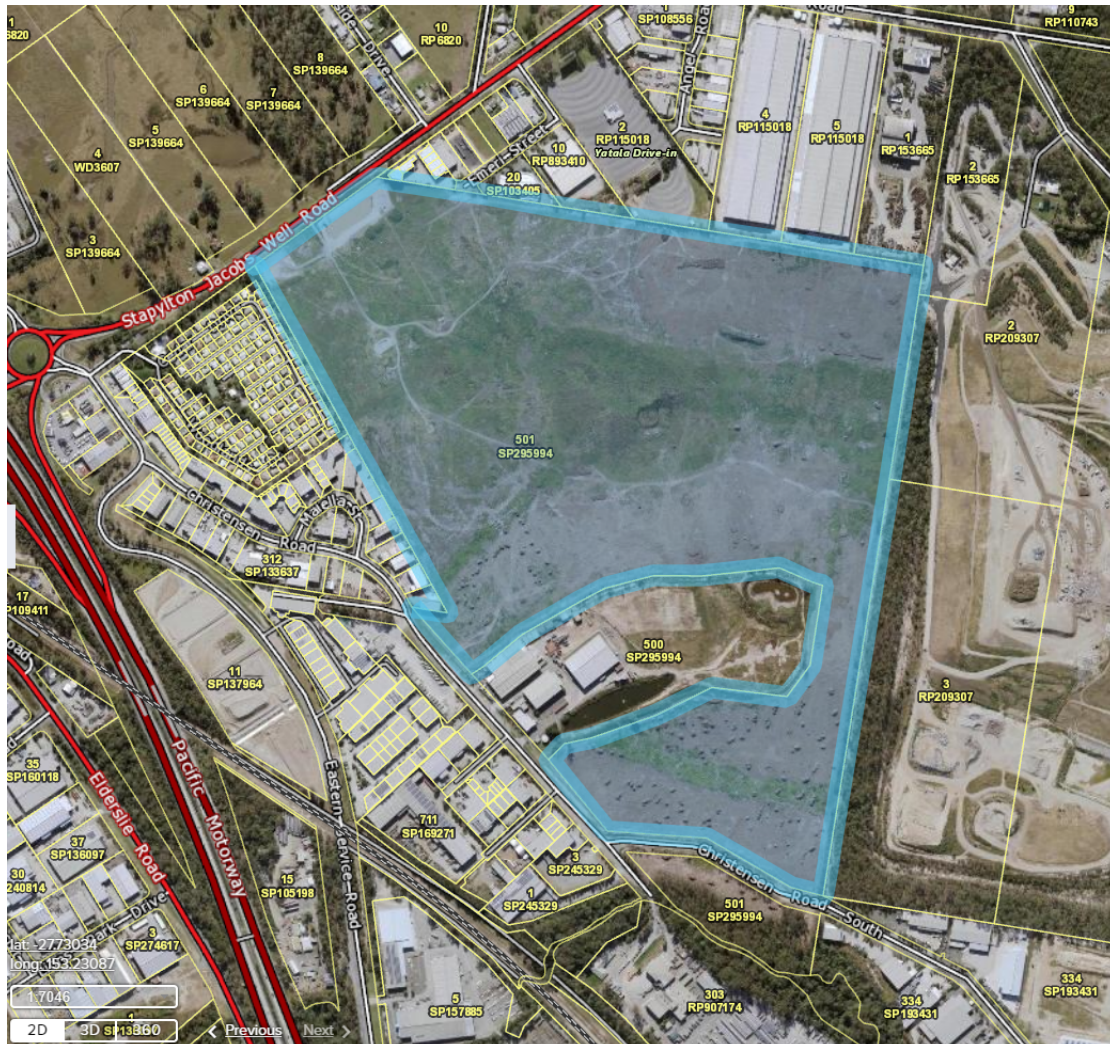


Figure 2.1.1: Site Locality Plan, Source: QLD Globe 2020

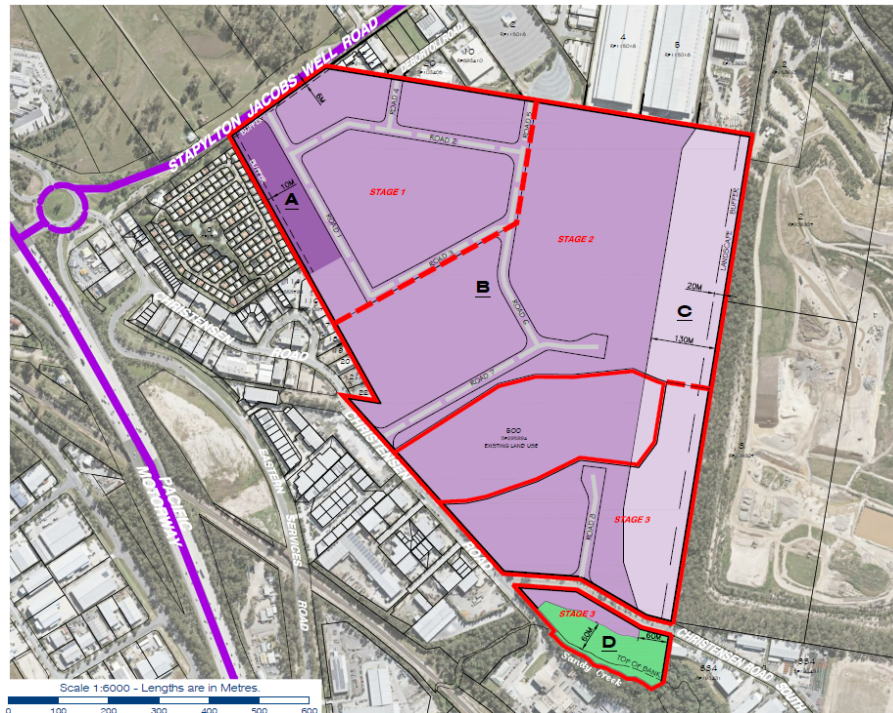


Figure 2.1.2: Vantage Yatala Staging Plan, Source: CoGC Prelim Approval

2.2 SITE AREA

The current area of the site is 64.239 Ha of which Stage 2 makes up 32.235Ha (refer Figure 2.1.2 above). Refer to **Appendix J** for the proposed Reconfiguration of a Lot (ROL) plan.

2.3 EXISTING TOPOGRAPHY AND SITE DRAINAGE

Along the south-eastern boundary of the subject site is the existing high point of 29.23m AHD with a ridge line extending through to the properties' northern boundary. This existing topography defines the existing catchments of the site and current stormwater discharge locations along the northern and eastern boundaries. These low points are visible within **Appendix A – Site Survey Plan** of the report with the pre development catchments defined within **Appendix B – Pre and Post Development Catchment Plans**.

2.4 EXISTING LAND USAGE

The subject land is vacant following the clearing of all vegetation in 2019.

2.5 PLANNING PROVISIONS AND PROPOSED DEVELOPMENT

The subject site is zoned “Low Impact Industry, Future Precinct” and “Medium Impact Industry, Future Precinct” under Council’s current City Plan for which Stage 2 sits wholly within the “Medium Impact Industry, Future Precinct”. The current proposal involves creating further industrial lots behind approved Stage 1 within the subject site which will require large scale bulk earthworks necessary to facilitate clear and flat earthwork pads suitable for this land use.

2.6 FLOODING

The subject site is located within the extent of the Flood Overlay as defined in Council’s City Plan Interactive Mapping – Version 5, 6 and 7 (refer **Figure 2.6** below).

As part of Stage 1 of the development compensatory earthworks within private property located off Yellowwood Road to the north was undertaken in 2019 to balance flood storage where fill within the subject site is proposed below the Designated Flood Level of RL8.60m AHD (Q₁₀₀) utilising CoGC City Plan v5 which was current at the time of the existing approval.

As shown within **Figure 2.6** below, the extent of Stage 2 development proposed as part of this application is not subject to any mapped flooding and as such no compensatory works are proposed or required to facilitate the development.



Figure 2.6 Council Flood Mapping of Subject Site, Source: CoGC Interactive Mapping

3.0 CONVEYANCE MANAGEMENT AND PRE AND POST DEVELOPMENT CATCHMENTS

3.1 LAWFUL POINT OF DISCHARGE

The *Queensland Urban Drainage Manual* (QUDM) 1992 edition *formerly* set criteria that defined a lawful point of discharge for a proposed development. The term described a two-point test. This criterion is obsolete.

The meaning defined in QUDM 2017 is different from the more general term 'lawful discharge of stormwater' because it *"requires the stormwater to be released at a location that is under the lawful control of the local government or other statutory authority from whom permission to discharge has been received."*

The revised criteria for determining a lawful point of discharge are: (taken from QUDM 2017)

- i) Will the proposed development alter the sites stormwater discharge characteristics in a manner that may substantially damage a third party property?
- ii) Is the location of the discharge from the development site under the lawful control of the local government or other statutory authority from whom permission to discharge has been received?
- iii) An authority to discharge over affected properties will be necessary. In descending order of certainty, an authority may be in the form of: a) dedication of a drainage reserve or park, b) a registered easement for stormwater discharge / works or written discharge approval.

The subject development proposal for Stage 2 will utilise one (1) lawful point of discharge being the existing low point along the site's south-eastern common boundary shared with Council's land fill facility where the existing gully line conveying both internal and upstream external catchments through the subject site lawfully discharges.

3.2 PRE DEVELOPMENT CATCHMENTS

The existing natural slope currently dictates the overland flow and drainage pattern of the subject site as illustrated in the pre development stormwater catchment plan within **Appendix B**. The flow patterns generally follow the ridgeline falling towards the existing low points of the site.

3.3 POST DEVELOPMENT CATCHMENTS

The intent of the proposed bulk earthworks outlined within this Stormwater Management Plan is to generally follow the pre development conditions to ensure no worsening of stormwater impacts downstream both during and post the construction period.

Whilst the proposed bulk earthworks over the site generally flatten the existing steep grades of the land as part of creating the earthworked pads, the increase in impervious areas

associated with the proposed land use mean that a hydrologic review is required to determine the changes in discharge characteristics (i.e. peak flow, water quality) from the site and to identify suitable attenuation measures that need to be implemented to mitigate any potential downstream impacts.

The post development catchments are illustrated within the post development catchment plan included within **Appendix B**. As demonstrated within these plans, the LPoD for Stage 2 remains consistent in both the pre and post development scenarios.

3.4 EXTERNAL CATCHMENT CONVEYANCE

An assessment of the surrounding boundary conditions for Stage 2 via Lidar survey have identified a number of external catchments that run through the site that will need to be managed and conveyed through the proposed development in the post-development scenario. These have been identified within the catchment mapping contained within **Appendix B** of the report and are summarised as follows:

- **CAT-X1** – Is an upstream catchment contained on the neighbouring northern allotment discharging into the Stage 2 extent falling to the natural low point of the site.
- **CAT-X2** – Discharges into the Stage 2 extent via an existing 750mm stormwater pipe and headwall located to the immediate west of proposed Lot 206.
- **CAT-6A** – Is an upstream catchment contained within 82 Christensen Road (Lot 55 on SP295994) that discharges into the Stage 2 extent via an existing dam weir directed into the proposed Common Property near the south-east boundary of the subject site.

A strategy for managing the conveyance of the external catchments through the subject site in a manner that still facilitates the intended Stage 2 development layout is shown within **Appendix N**.

4.0 HYDROLOGICAL ASSESSMENT

4.1 TEMPORAL PATTERNS AND RAINFALL DATA

Rainfall data for use in XPSTORM software has been sourced from the Australian Rainfall & Runoff 2016 Storm Generator and the AR&R Data Hub. This application generates rainfall data for the various design storm hydrographs which have been utilised in the below modelling of stormwater runoff from the subject site.

Appendix H contains a copy of the Intensity-Frequency-Duration (IFD) data sourced from the Bureau of Meteorology (BoM) utilised for the hydraulic analysis and sediment basin sizing.

Appendix I contains a copy of the AR&R Data Hub rainfall data utilised for the XPSTORM hydrological analysis. It is noted that the predicted climate change factors, and pre-burst losses are incorporated into the data for analysis.

4.2 CATCHMENTS

As discussed within Section 3 of this report the pre and post development stormwater catchments (refer **Appendix B**) have been determined using a combination of the site based Contour and Detail survey undertaken by Gassman Development Perspectives (refer **Appendix A**) along with LiDAR survey of the surrounding area to identify any potential external catchments.

A summary of the parameters assigned to these sub-catchments used to assess the pre and post development flows is contained within *Tables 4.2A, 4.2B and 4.2C* below which aligns with the two scenarios assessed within this reporting.

Parameter	Sub-Catchments (Pre Development – Contributing to LPoD-1 / Stage 2)		
Name	CAT-X1	CAT-X2	CAT-1
Area (Ha)	1.637	2.182	12.715
Vectored Slope (%)	1.00	1.00	5.41
Impervious Area (%)	90.00	90.00	5.00
Pervious Area (%)	10.00	10.00	95.00
Roughness (n)	0.020	0.020	0.080
Parameter	Sub-Catchments (Pre Development – Contributing to LPoD-1 / Stage 2)		
Name	CAT-2	CAT-3	CAT-4
Area (Ha)	7.114	3.015	8.666
Vectored Slope (%)	5.95	5.54	5.80
Impervious Area (%)	1.00	0.00	0.00
Pervious Area (%)	99.00	100.00	100.00
Roughness (n)	0.050	0.080	0.100
Parameter	Sub-Catchments (Pre Development – Contributing to LPoD-1 / Stage 2)		
Name	CAT-5	CAT-6	CAT-6A
Area (Ha)	4.144	6.474	4.767
Vectored Slope (%)	4.02	3.91	3.50
Impervious Area (%)	0.00	0.00	35.00
Pervious Area (%)	100.00	100.00	65.00
Roughness (n)	0.050	0.100	0.030

Table 4.2A: Pre Development Catchment Parameters

Parameter	Contributing Catchments
Reporting Location	LPoD-1
Contributing Sub Catchments	CAT-1, CAT-2, CAT-3, CAT-4, CAT-5, CAT-6, CAT-6A, CAT-X1 and CAT-X2
Area (Ha)	50.714
Initial Loss (mm)	17.20
Continuing Loss (mm/hr)	1.60

Table 4.2B: Contributing Catchment Parameters to Reporting Location LPoD-1

Parameter	Catchments (Post Development for Stage 2)	
Name	LPoD-1 <i>Impervious Catchment</i>	LPoD-1 <i>Pervious Catchment</i>
Total Area (Ha)	36.599 (83% Impervious, 17% Pervious)	
Area Split (Ha)	30.153	6.446
Vectored Slope (%)	1.00	1.00
Impervious Area (%)	100.00	0.00
Roughness (n) for Impervious Area	0.015	N/A
Pervious Area (%)	0.00	100.00
Roughness (n) for Pervious Area	N/A	0.045
Initial Loss (mm)	0.00	17.20
Continuing Loss (mm/hr)	1.60	1.60

Table 4.2C: Post Development Catchment Parameters LPoD-1

4.3 LAND USE

Land uses were mapped within the pre and post development catchments with the varying hydraulic roughness and hydrological losses input into the XPSTORM model summarised in *Table 4.3 below*.

Land Use Type LPoD-1 (Stage 2)	Initial Loss (mm)	Continuing Loss (mm/hr)
Pre Developed		
Pervious	17.20	1.60
Impervious	0.00	1.60

Land Use Type LPoD-1 (Stage 2)	Initial Loss (mm)	Continuing Loss (mm/hr)
Post Developed		
Pervious	17.20	1.60
Impervious	0.00	1.60

Table 4.3: Summary of Adopted Initial & Continuing Losses (AR&R Data-HUB 2016)

4.4 PRE AND POST DEVELOPMENT FLOW CALCULATIONS

XPSTORM modelling software was utilised to determine the pre and post development discharge flow rate for the contributing catchments based on the parameters listed above.

The computations were undertaken for the standard Average Exceedance Probabilities (AEP) 63.2%, 0.5EY, 20%, 10%, 5%, 2% and 1%.

Catchment runoff volumes to the respective existing Lawful Points of Discharge (reporting locations) are summarised in *Table 4.4*.

Catchment	Peak Flow Rates for Average Exceedance Probability (m ³ /s)						
Pre Developed Condition	63.2%	0.5EY	20%	10%	5%	2%	1%
LPoD-1	4.4845	6.4926	9.3301	11.1359	13.9592	16.3402	19.4076

Catchment	Peak Flow Rates for Average Exceedance Probability (m ³ /s)						
Post Developed Condition	63.2%	0.5EY	20%	10%	5%	2%	1%
LPoD-1	8.6323	10.8501	13.3258	15.8757	18.2378	21.1192	23.2979

Table 4.4: Flow Rates Calculated Using the Laurenson Method in XPSTORM at LPoD-1

Figures 4.12 and 4.13 below contains the pre-developed peak flow rate hydrograph at the lawful point of discharge (LPoD-1). Refer also **Appendix K**.

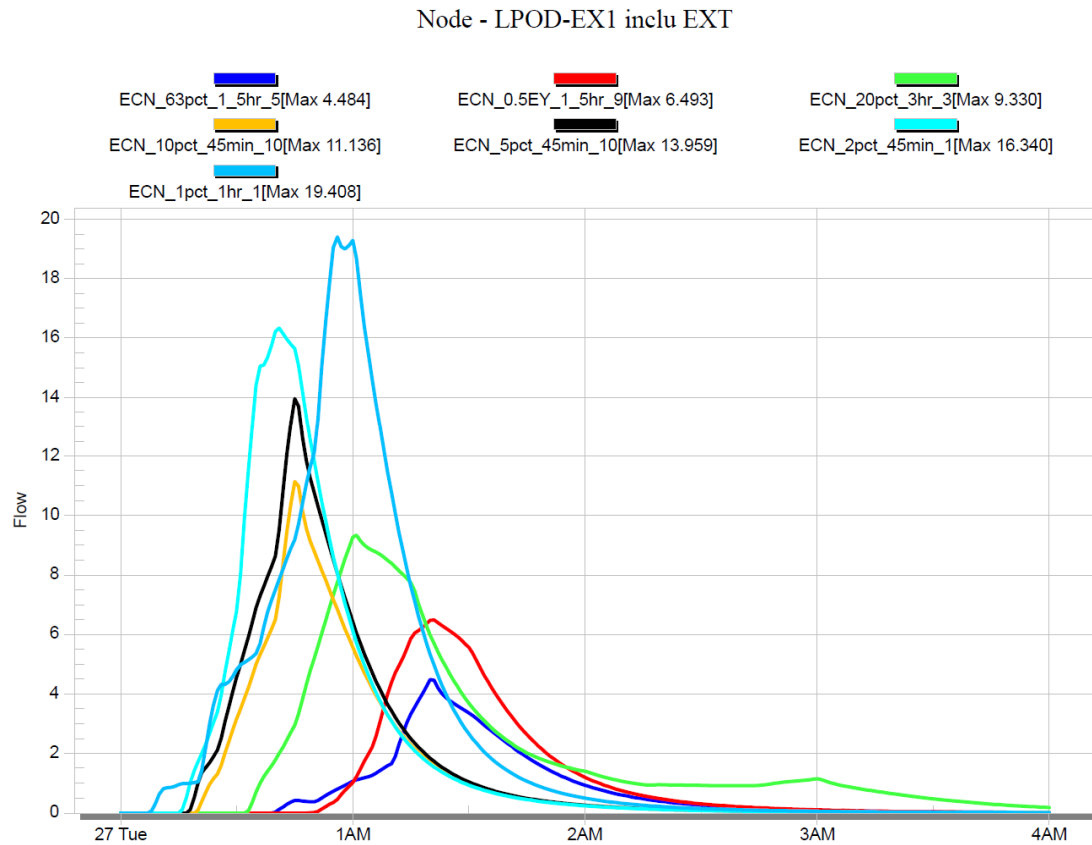


Figure 4.12: Pre Developed Peak Flow Rate Hydrograph (LPoD-1)



Node - LPOD-EX1 inclu EXT

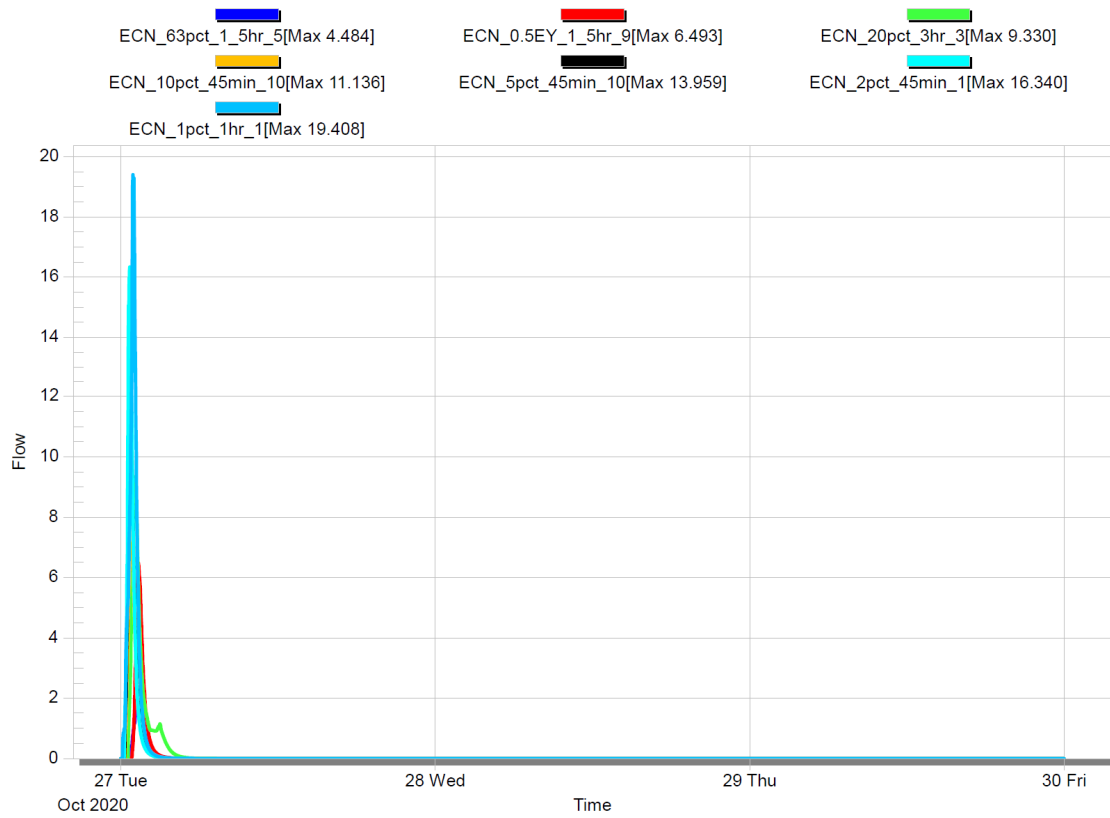


Figure 4.13: Pre Developed Peak Flow Rate Hydrograph (LPoD-1) 72-Hr Duration

Figures 4.14 and 4.15 below contains the *post* developed peak flow rate hydrograph at the lawful point of discharge (LPoD-1). Refer also **Appendix K**.

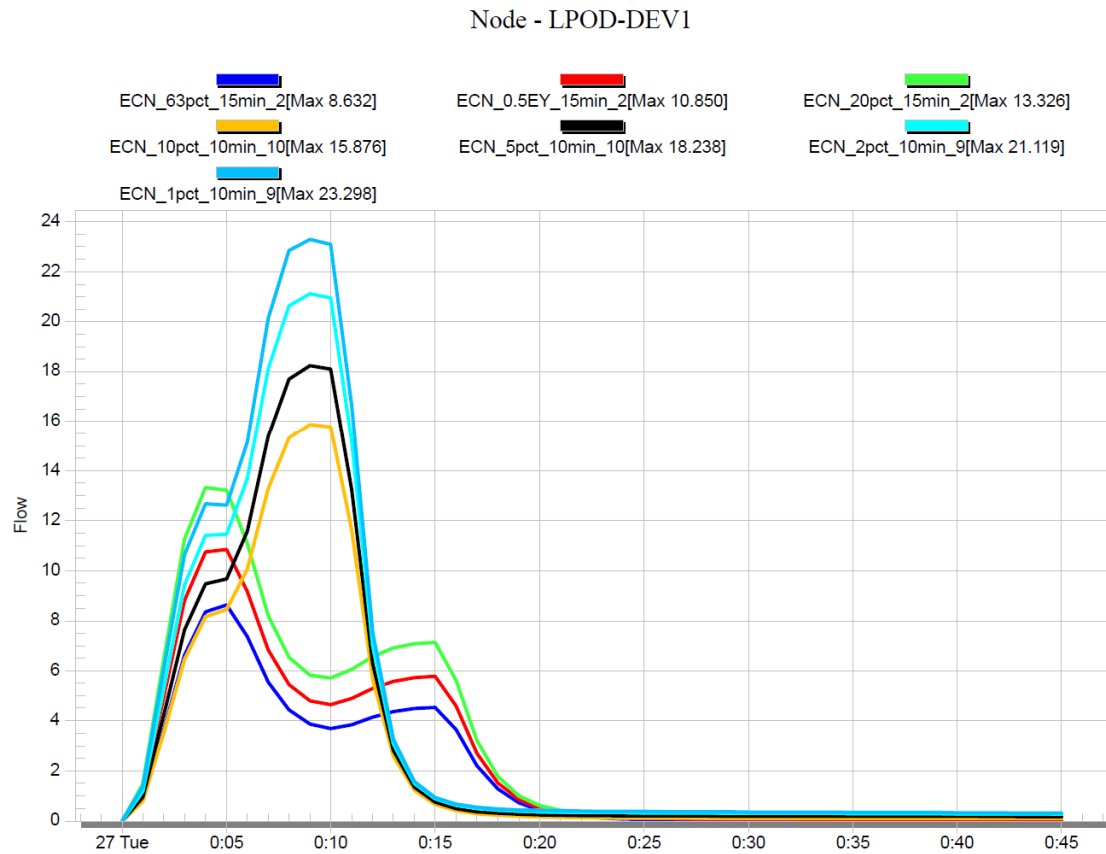


Figure 4.14: Post Developed Peak Flow Rate Hydrograph (LPoD-1)

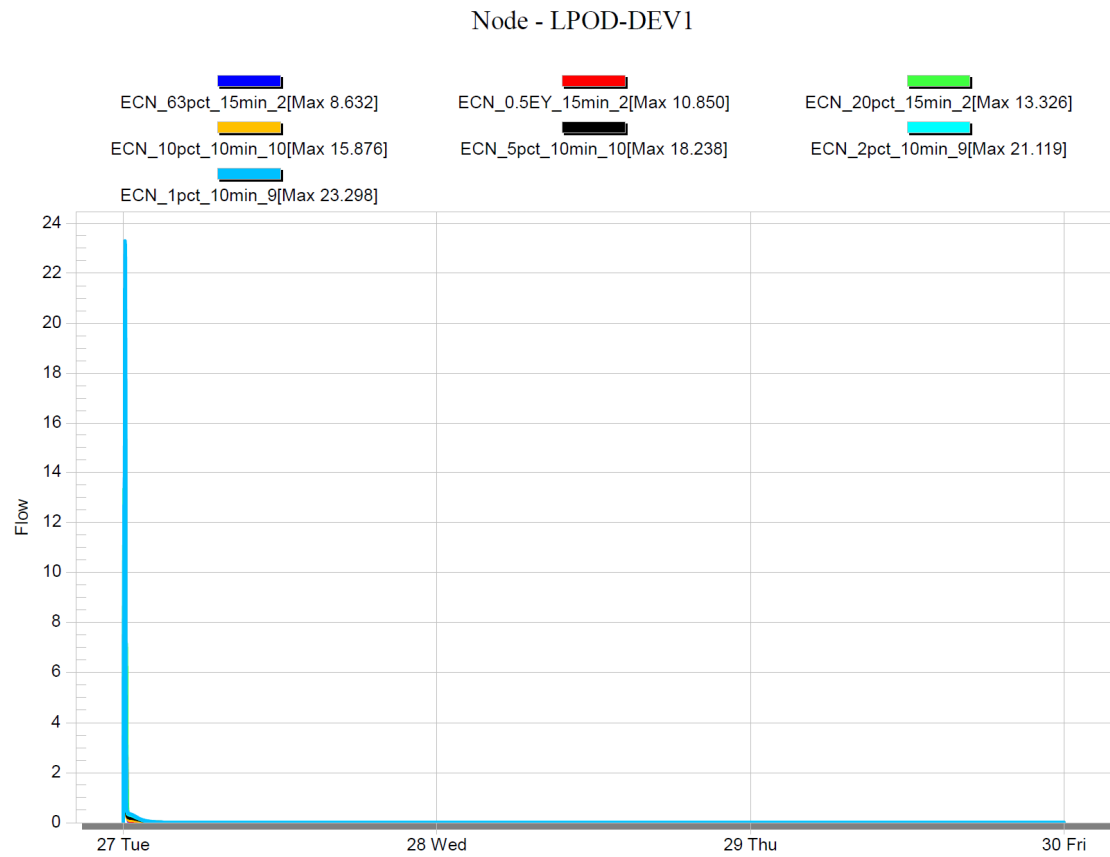


Figure 4.15: Post Developed Peak Flow Rate Hydrograph (LPoD-1) 72-Hr Duration

5.0 STORMWATER QUANTITY, DETENTION & HYDRAULIC DESIGN

5.1 ATTENUATION OF DEVELOPED FLOWS

To ensure that the increased flow rates from the developed site have minimal impact on downstream property, the following hydrological objective has been set for stormwater exiting the subject site;

- *No increase in peak discharge flow rates from the developed site to downstream infrastructure.*

To achieve this objective, stormwater discharge from the development site must be detained to pre-development flow rates for all storms events up to and including the 1% AEP (equiv. to Q_{100}). The following sections provide a summary of the procedure used to design the onsite detention system at subject site.

5.2 METHODOLOGY

For the site catchment identified as having increase in peak flow rates when developed, a hydrologic model was created using XPSTORM. The model was then used to route post-development runoff through various proposed detention structures to determine the most efficient on-site detention system.

5.2.1 MODEL CONDITIONS

In XPSTORM three (3) hydraulic conditions were modelled in order to demonstrate the stormwater quantity, detention and hydraulic objective;

1. Existing Condition - Current condition of site with all the external catchments to assess the natural hydrology.
2. Developed Condition - Future condition of site when developed with all the external catchments. The main changes in hydrology as part of development include; increase in impervious area of the subject site due to the construction of the hardstand and other impervious areas and reduction in Manning's roughness coefficient for sections of the site to be developed.
3. Mitigated Condition - Future condition of site when developed with proposed detention structures in place with all the external catchments *where applicable*.

5.2.2 CRITICAL STORM EVENT AND DURATIONS

An analysis of storm events ranging from 63.2% AEP to 1% AEP was undertaken to determine the critical storm event and the critical storm duration per contributing catchment. The determined critical storm events for the pre developed and post developed condition are indicated in *Table 5.2.2* below.

MODEL CONDITION	CRITICAL STORM EVENT	PEAK DURATION	PEAK FLOW
Pre Developed	AEP / Storm Ensemble #	(mins)	(m ³ /s)
LPoD-1	1% / 1	60	19.4076

MODEL CONDITION	CRITICAL STORM EVENT	PEAK DURATION	PEAK FLOW
Post Developed	AEP / Storm Ensemble #	(mins)	(m ³ /s)
LPoD-1	1% / 9	10	23.2979

Table 5.2.2: Critical Storm Event and Duration Summary Table

Refer to **Appendix L** of this report which presents the detailed XPSTORM Box & Whisker plots for the above hydrological assessments.

5.2.3 DETENTION SYSTEM DESIGN

Detention devices capture and temporarily store stormwater runoff during major / critical storm events and release to the Lawful Point of Discharge (LPoD) at a controlled rate. Hence, detention devices act to mitigate potential downstream flooding impacts and also provide minor water quality treatment.

Therefore, to achieve the objective of zero post development flow rate increase to pre-developed 63.2% AEP (equiv. Q_1) to the 1% AEP (equiv. Q_{100}) flow rates at the downstream reporting location (outfall), on-site detention basins are introduced with low and high flow outlet configurations.

Table 5.2.3 includes the design details for the proposed on site detention system for Stage 2.

Parameter	Value
Catchment	LPoD-1
Type	Detention basin (in ground)
Internal Batter Slope on Basin Sides	1 in 3
Basin Floor RL	10.470m AHD
Basin Embankment / Crown R.L	13.000m AHD
Basin Transverse Weir Crest RL	11.640m AHD
Freeboard to Crown (1% AEP WSL)	1.008m
Detention Volume Depth	1.522m to 1% AEP WSL (<i>measured from floor / IL of basin</i>)
Detention Volume to Crown	17,109m ³ to RL 13.000m (<i>deducting 0.30m extended detention</i>)
Detention Volume to 1% AEP WSL	7,824m ³ to RL 11.992m (<i>deducting 0.30m extended detention</i>)
Detention Volume to Weir Crest	5,139m ³ to RL 11.640m (<i>deducting 0.30m extended detention</i>)
Low Flow Outlets	5 / 900mm x 900mm grated field inlet pits connected to a low flow outlet pipe (450mm diameter at 0.62%) <i>Top of grate levels set at 0.300m above basin floor at RL10.77m AHD (typical and unless noted otherwise)</i>
High Flow Outlets	25 metre wide broad crested transverse weir <i>1.17m above basin floor at RL11.640m AHD</i> <i>1.70 discharge coefficient for transverse weir</i> 3 / 675mm RCP laid at max. grade of 1.324%

Table 5.2.3: Summary of Design Parameters of Proposed Detention System (Stage 2)

5.2.4 MODEL RESULTS

Table 5.2.4.1 presents the results obtained from XPSTORM modelling as a result of implementing the above detention system for flow mitigation.

PRE-DEVELOPED PEAK FLOWS FOR LPoD-1							
AEP	63.2%	0.5EY	20%	10%	5%	2%	1%
Peak Flow (m3/sec)	4.4845	6.4926	9.3301	11.1359	13.9592	16.3402	19.4076

POST-DEVELOPED PEAK FLOWS (MITIGATED) FOR LPoD-1							
AEP	63.2%	0.5EY	20%	10%	5%	2%	1%
Mitigated Flow (m3/sec)	3.1637	4.2134	7.0749	10.8745	13.3266	16.2640	18.4156
Max Water Elevation RL	11.458	11.611	11.737	11.812	11.875	11.944	11.992
Peak Duration (min)	25min	30min	30min	60min	60min	30min	30min
Depth to WSL (m)	0.988	1.141	1.267	1.342	1.405	1.474	1.522

Table 5.2.4.1: Summary of XPSTORM Hydrologic / Hydraulic Results Catchment LPoD-1

Table 5.2.4.2 sums the mitigated discharges and compares directly against the pre developed hydrology condition across a range of standard storm events.

MITIGATED DISCHARGE SUMMARY FOR PROPOSED DETENTION BASIN (LPoD-1)							
AEP	63.2%	0.5EY	20%	10%	5%	2%	1%
900 x 900mm F.I. (1) (m³/s)	0.0000	0.0141	0.1818	0.5175	0.5840	0.6499	0.6913
900 x 900mm F.I. (2) (m³/s)	0.0000	0.0141	0.1818	0.5175	0.5840	0.6499	0.6913
900 x 900mm F.I. (3) (m³/s)	0.0000	0.0141	0.1818	0.5175	0.5840	0.6499	0.6913
900 x 900mm F.I. (4) (m³/s)	0.0000	0.0141	0.1818	0.5175	0.5840	0.6499	0.6913
900 x 900mm F.I. (5) (m³/s)	0.0000	0.0141	0.1818	0.5175	0.5840	0.6499	0.6913
25m High Flow Weir (m³/s)	0.0000	0.0000	1.2907	3.0316	4.8428	7.1310	8.8652
3/675mm dia Outlet (m3/s)	3.1367	4.1429	4.8752	5.2554	5.5638	5.8835	6.0939
TOTAL (m³/s)	3.1367	4.2134	7.0749	10.8745	13.3266	16.2640	18.4156

Flow Mitigation from Existing Condition (m³/s)	1.3208	2.2792	2.2552	0.2614	0.6326	0.0762	0.9920
Attenuation Achieved (Y/N)	Y	Y	Y	Y	Y	Y	Y
Flow Mitigation Achieved	29.5%	35.1%	24.2%	2.3%	4.5%	0.5%	5.1%

Table 5.2.4.2: Summary of Mitigated Discharges from XPSTORM Hydrologic / Hydraulic Results

Important Note:

Due to the predicted water surface elevations and depths – it is proposed that the bio-retention basin be fenced at its perimeter to restrict public access for safety. Fencing is proposed as the City of Gold Coast Council's standard chain wire type fencing (or approved equivalent) at a height of 1.80 metres above finished ground level.

Details of the fence type, embellishments and colour will be confirmed at the detailed design phase. Provision shall be made for a master-keyed gate location to enable access for Council staff to the maintenance track/s.

5.2.5 DISCUSSION ON MODELLING OUTCOMES

The above hydraulic modelling has confirmed that there is no increase in peak discharge flow rates from the development site to existing infrastructure or downstream / neighbouring properties by implementing the proposed designed detention measures.

All AEP's ranging from 63.2% (equiv. Q_1) to 1% (equiv. Q_{100}) achieve mitigation.

6.0 STORMWATER QUALITY

Stormwater quality analysis has been undertaken through the use of MUSIC software to confirm the adequacy of proposed Stormwater Quality Improvement Devices (SQIDs) required to meet the State Planning Policy's (SPP) Water Quality Objectives (WQOs) and the pollutant removal targets set by the City of Gold Coast Council. A suitable treatment strategy addressing the typical pollutant types generated during construction and operation of an industrial development are outlined within this section of reporting.

6.1 POLLUTANTS OF CONCERN

There are a number of pollutants typically generated during the operational phase (following construction) of an industrial development. These include:

- **Litter / gross pollutants**
- **Sediment**
- Toxic materials
- Heavy metals
- Hydrocarbons
- **Nutrients (i.e. nitrogen & phosphorous)**
- Pathogens / faecal coliforms
- Oxygen demanding substance
- Surfactants
- Acid or alkaline substances
- Organochlorines & organophosphates
- Thermal pollution

The key pollutants highlighted in **bold** above represent those that will be further addressed within this report. This will be done through the use of MUSIC modelling software which will assist in estimating the generation of the pollutants in the developed condition and the associated treatment measures requiring implementation in order to meet the stormwater quality objectives as defined within Section 6.2 of this report.

6.2 STORMWATER QUALITY OBJECTIVES (OPERATIONAL PHASE)

City of Gold Coast Council have set stormwater quality objectives with the intent of "protecting receiving water quality by limiting the quantity (loads) of stormwater pollutants discharged into receiving waters from development" such as that proposed over the subject site.

These are summarised in *Table 4.10 of SC6.11.4 Stormwater Drainage and Water Sensitive Urban Design standards* of Council's City Plan Version 7, and outlined below:

Pollutant Type	Load Reduction Objective (in mean annual load)
Gross Pollutants (>5mm)	90.0%
Total Suspended Solids (TSS)	80.0%
Total Phosphorous (TP)	60.0%
Total Nitrogen (TN)	45.0%

Table 6.2: CoGC's Stormwater Quality Objectives (Source: City Plan v7, Schedule SC6.11.4)

6.3 PROPOSED STORMWATER QUALITY MANAGEMENT STRATEGY

Development over the subject site has the potential to introduce increased pollutant loads and concentrated stormwater runoff into existing downstream waterways. To mitigate any potential increase in the export of pollutants from the subject site, suitable stormwater treatment devices will be utilised throughout the developed area as part of the integrated design of the road and stormwater drainage networks.

The implementation of a site-specific stormwater treatment train prior to the discharge of stormwater from the site will ensure the quality objectives outlined in Section 6.2 of this report are achieved.

6.3.1 BIO RETENTION BASINS

Due to the spatial allowances over the subject site and the proposed development type being an industrial estate, bio retention basins have been identified as a suitable Stormwater Quality Improvement Device (SQID) to reduce the off-site discharge of pollutants in line with the operational phase stormwater quality objectives identified within this report.

Bio retention basins are designed to treat conveyed stormwater by filtering contaminated runoff through various layers of vegetation, biologically active sands and loam filter media which capture the pollutants as the water percolates down through the system.

The treated water is then conveyed through a series of perforated pipes to downstream drainage systems. A typical configuration of a bio retention system is outlined in Figure 6.3.1 below.

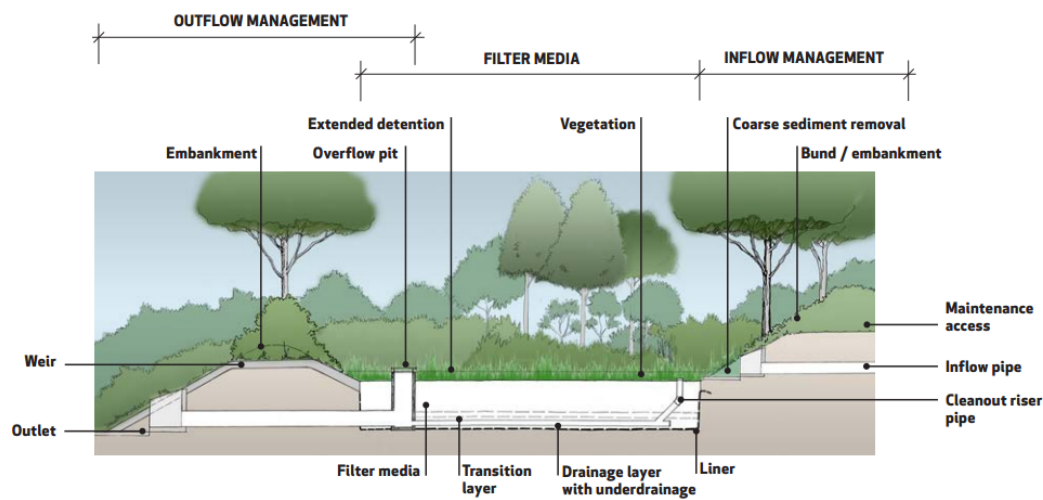


Figure 6.3.1: Components of a Typical Bio Retention System (Source: Water by Design, Bio Retention Technical Design Guidelines Version 1.1 Oct 2014)

The bio retention basin for the subject site has been designed in accordance with *Bio Retention Technical Design Guidelines (2014)* with the properties as outlined in *Table 6.3.1* below.

Outlet structures within the basin are designed to ensure an extended detention depth of 300mm is maintained over the filter media. The required surface area and filter media profile required to adequately treat the contributing developed catchment is discussed within Section 6.4 of this report.

Parameter	Value
Geofabric Lining to Base	Yes
Hydraulic Conductivity (normal analysis)	200 mm/hr
Orthophosphate Content	30 mg/kg
Filter Media's TN Content	400 mg/kg
Vegetation Properties	Basin to be vegetated with effective nutrient removal plants

Table 6.3.1: Summary of Adopted Bio Retention Parameters

6.4 MUSIC MODELLING METHODOLOGY FOR THE DEVELOPMENT SITE

MUSIC Version 6.3.0 was utilised for the water quality modelling of the proposed development in accordance with *Water by Design's MUSIC Modelling Guidelines 3.0 (2018)*.

Modelling of the developed scenario with the nominated SQIDs in place was undertaken to replicate the transfer of pollutants through a stormwater drainage system and to assist in determining the effectiveness of the proposed stormwater treatment train in meeting City of Gold Coast's Stormwater Quality Objectives.

6.4.1 METEOROLOGICAL DATA

The meteorological data required for input into MUSIC software was obtained through CoGC's pre-determined MUSIC-link v6.32 software application for Beenleigh Bowls Club (Weather Station No. 040406). The data utilised is in the form of 6-minute pluviographic data for a 10-year period from 01st January 1990 to 31st December 1999. The mean average rainfall for this period was 1,105mm.

Daily potential evapo-transpiration (PET) data (01/01/1990 to 31/12/1999) from the above-mentioned station has been used.

A summary of the information is indicated below:

Catchment Name: 5941 CoGC Industrial Development, Yatala MUSIC Model Stg 2
Rainfall Station: 40406 BEENLEIGH
ET Station: User-defined monthly PET
Start Date: 1/01/1990 12:00 AM
End Date: 31/12/1999 11:54 PM
Modelling Time Step: 6 Minutes

	Rainfall/6 Minutes	Evapo-Transpiration
mean	0.013	4.086
median	0.000	3.600
maximum	22.100	6.290
minimum	0.000	2.000
10 percentile	0.000	2.033
90 percentile	0.001	6.194
mean annual	1105	1492

6.4.2 SOURCE NODES

MUSIC modelling has utilised the *City of Gold Coast (North) MUSIC-Link data (Version 6.32)* to define the parameters assigned to the pollutant source node inputs for the MUSIC model. Refer images on the following page. No calibration was undertaken to CoGC source nodes.

Refer **Appendix E** for the MUSIC Catchment Plan relevant to the modelling.

CITY OF GOLD COAST™	
City of Gold Coast (Central)	
City of Gold Coast Central.mlb	
City of Gold Coast (North)	
City of Gold Coast North.mlb	
City of Gold Coast (South)	
City of Gold Coast South.mlb	

Current Project Version	
Music Version	6.3.0
MUSIC-link Data Version	6.32
Authority	City of Gold Coast
Area	City of Gold Coast (North)
Scenario	City of Gold Coast (North)

The intended industrial land use allows the developed catchment parameters to be conservatively assumed with the catchments broken down into a number of major surface types being ground level, roads (includes entire road reserve) and roofs.

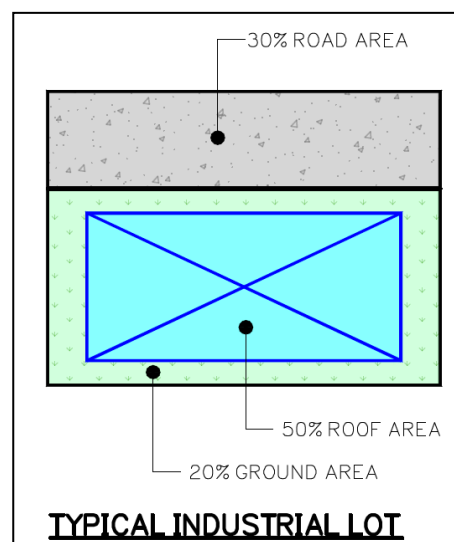
These surface types were allocated an impervious area (%) and further refined through the MUSIC modelling process via the “split” catchment approach in accordance with the *Healthy Waterways MUSIC Modelling Guidelines Version 3.0 – 2018 Table 3.4 and 3.6*.

The below table and figures summarise the imperviousness of the allocated source nodes within the MUSIC model for Stage 1. Where a proposed architectural design was available for the site, the MUSIC modelling has assumed these areas to be exact. However, in the absence of an architectural layout; the modelling has been guided by *Table 3.4 Typical Surface-Type Splits* for Industrial Development type – where the surface splits are defined below:

Road – 30%
 Roof – 50%
 Ground – 20%

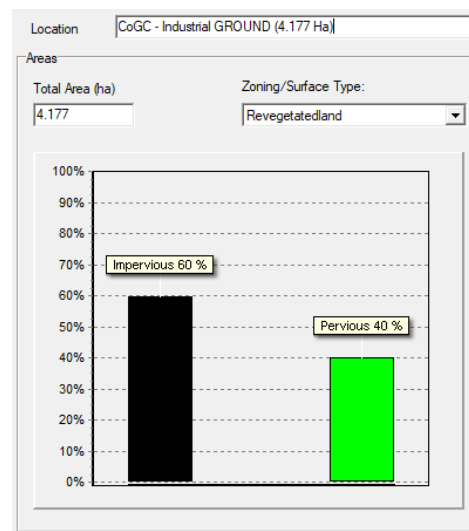
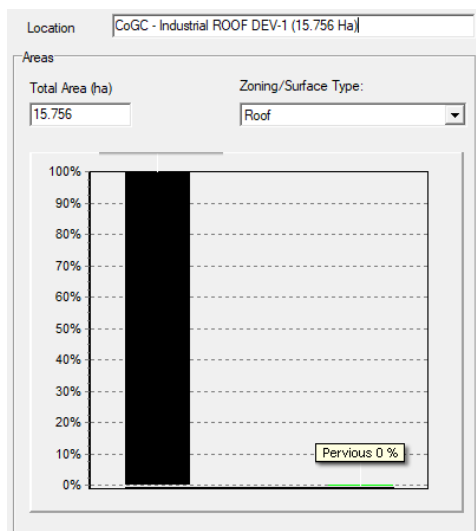
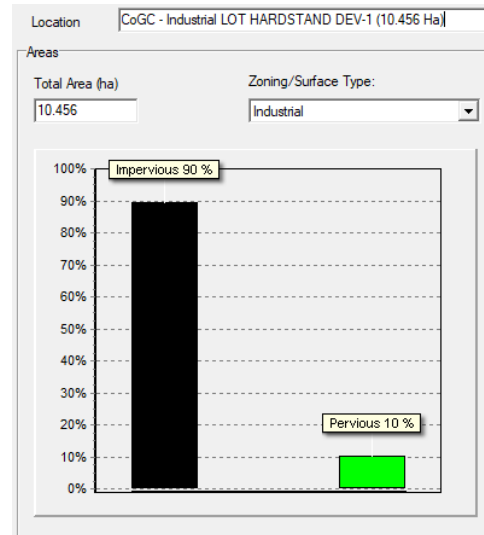
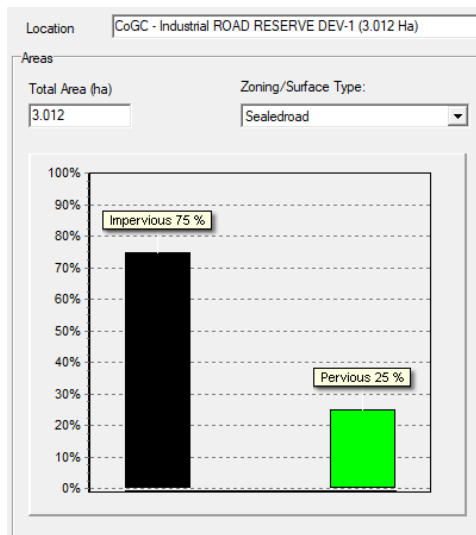
(extract from *Healthy Waters V3.0*)

External catchments that are conveyed through the site are assumed to be treated on site by the relevant upstream lot owner prior to entering the subject site.



MUSIC Source Node	Modelling Approach	Area (Ha)	Impervious %
Stage 2 (DEV-1) Total Catchment = 36.599 Ha <i>including 'DEV-1 Part'</i>			
Road	SPLIT	3.012	75
Hardstand	SPLIT	10.456	90
Roof	SPLIT	15.756	100
Ground	SPLIT	4.177	60
Lot 119	SPLIT	0.382	80
Lot 207	SPLIT	0.235	80
Drainage Reserve	SPLIT	1.310	20
20m Ecological Buffer	SPLIT	1.271	0
Total		36.599	

Table 6.4: MUSIC Modelling Summary of Source Node Impervious Allocations



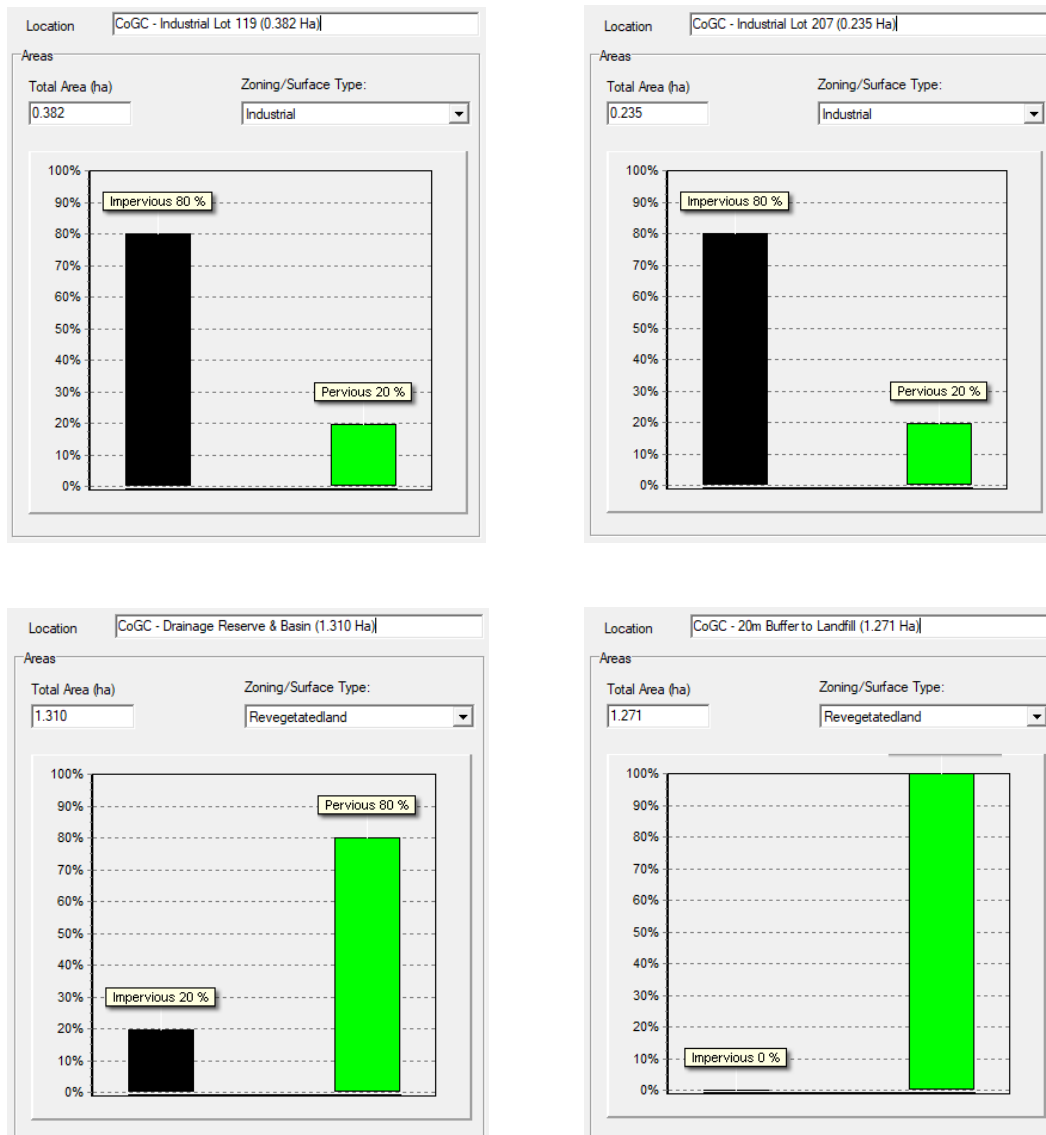


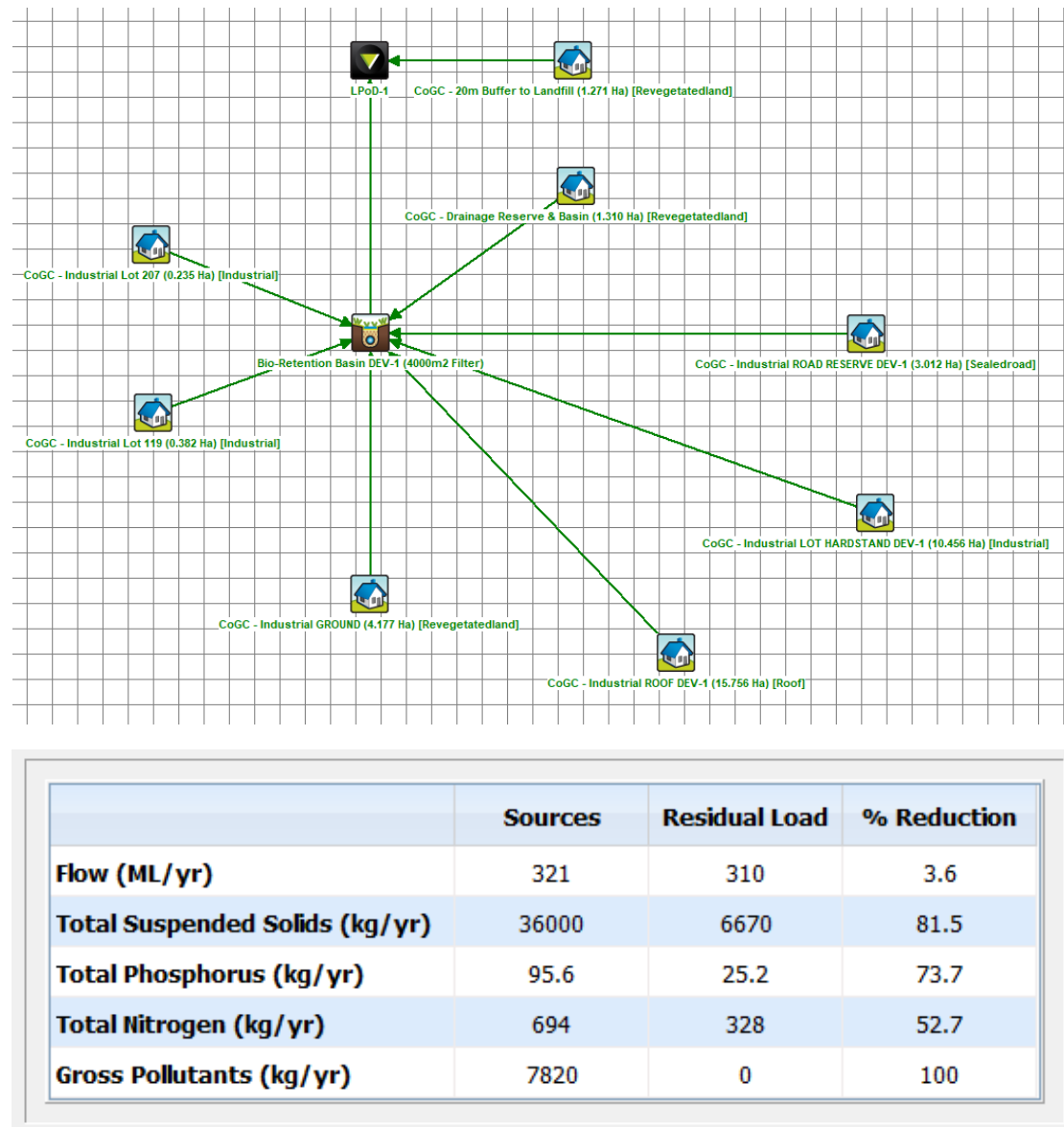
Figure 6.4.1: MUSIC Modelling Source Node Impervious Allocations

6.4.3 DRAINAGE LINKS

No routing has been adopted for the drainage links within the modelling that has been undertaken. This approach is believed to provide more conservative results.

6.4.4 MUSIC MODEL LAYOUT AND RESULTS

The diagrammatic representation of the source nodes, modelling configuration and results of pollutant reduction are outlined in Figure 6.4.4-1 below for the post developed catchment.



NORMAL ANALYSIS @ 200mm/hr SATURATED HYDRAULIC CONDUCTIVITY (SHC).

Figure 6.4.4-1: Catchment LPoD-1 MUSIC Layout and Results

The normal analysis returns a satisfactory result for meeting the SPP Water Quality Objectives. Refer above image for modelling outcomes.

The reduction in target pollutants to meet City of Gold Coast Council's requirements are achieved based on the below bio retention measures being implemented for the catchment.

Parameter	Value
	LPoD-1
Filter Media Area (m2)	4,000
Filter Media Depth (m) to support tree planting	0.70
Extended Detention Depth (m)	0.30
Weir Crest Width (m)	25.00

Refer also **Appendix F** for the CoGC MUSIC-Link summary report card to support the modelling outcomes described in this section.

Location		Bio-Retention Basin DEV-1 (4000m2 Filter)
Inlet Properties		
Low Flow By-pass (cubic metres per sec)		0.000
High Flow By-pass (cubic metres per sec)		100.000
Storage Properties		
Extended Detention Depth (metres)		0.30
Surface Area (square metres)		4000.00
Filter and Media Properties		
Filter Area (square metres)		4000.00
Unlined Filter Media Perimeter (metres)		0.01
Saturated Hydraulic Conductivity (mm/hour)		200.00
Filter Depth (metres)		0.70
TN Content of Filter Media (mg/kg)		400
Orthophosphate Content of Filter Media (mg/kg)		30.0
Infiltration Properties		
Exfiltration Rate (mm/hr)		0.00

NORMAL ANALYSIS @ 200mm/hr SHC

Table 6.4.4: Summary of Proposed Bio Retention Measures

Lining Properties	
Is Base Lined?	☒ Yes ☐ No
Vegetation Properties	
☒ Vegetated with Effective Nutrient Removal Plants	
☐ Vegetated with Ineffective Nutrient Removal Plants	
☐ Unvegetated	
Outlet Properties	
Overflow Weir Width (metres)	25.00
Underdrain Present?	☒ Yes ☐ No
Submerged Zone With Carbon Present?	☐ Yes ☒ No
Depth (metres)	0.45

NORMAL ANALYSIS @ 200mm/hr SHC

Table 6.4.4: Summary of Proposed Bio Retention Measures (cont.)

The MUSIC modelling outcome achieves the following results for the subject catchment in direct comparison to the *Load Reduction Objectives* required by Council:

Pollutant Type	Load Reduction Objective (in mean annual load)	Load Reduction Achieved
Gross Pollutants (>5mm)	90.0%	100.0% complies
Total Suspended Solids (TSS)	80.0%	81.5% complies
Total Phosphorous (TP)	60.0%	73.7% complies
Total Nitrogen (TN)	45.0%	52.7% complies

7.0 CONSTRUCTION, OPERATIONAL MANAGEMENT & MAINTENANCE

7.1 CONSTRUCTION PHASE SEDIMENT AND EROSION CONTROL

The operational phase detention basin within Stage 2 is proposed to be utilised as a HES (High Efficiency Sediment basin) during the construction phase of the development. The sizing of the basin has been determined using the ICEA Best Practice Erosion & Sediment Control Guidelines as well as calculation spreadsheets prepared by an industry provider.

Refer to **Appendix D** which contains copies of the Sediment Basin design calculations, and the Sediment & Erosion Control plans.

Where ultimate detention basin sizing does not align with the volumetric requirements of International Erosion Control Association's (IECA) Best Practice Guidelines, temporary construction phase sediment basins will be implemented.

Monitoring and maintenance of both the construction phase sediment basins and associated sediment and erosion control measures implemented over the site will be in accordance with IECA's Best Practice Guidelines and City of Gold Coast Council's standards.

7.2 ASSET OWNERSHIP AND HANDOVER

The SQIDs have been designed in accordance with QUDM standards and City of Gold Coast Council's Land Development Guidelines and in doing so aim to provide suitable and safe vehicular access for future maintenance.

The current development proposal involves dedication of proposed Lot 901 containing the SQIDs to Council through a formal 'On Maintenance' handover in accordance with Council's Land Development Guidelines to ensure the SQIDs have been built in accordance with the requirements.

7.3 MAINTENANCE OF BIO RETENTION BASINS DURING OPERATIONAL PHASE

Inspections and maintenance are to be carried out on a yearly basis to determine if the SQIDs are functioning as intended.

The WSUD Technical Design Guideline for South East Queensland incorporates Maintenance Checklists (*Refer Appendix G*) covering the items to be inspected and should be utilised and kept on record to ensure that a mechanism is in place to log the continued effectiveness of the SQIDs.

Inspections and any required maintenance will be the responsibility of the asset owner.

Refer to **Appendix C** which contains copies of the Operational Phase Bio Retention basin plans.

8.0 CONCLUSION

Gassman Development Perspectives have prepared this Site Based Stormwater Management Plan to support an application for *Reconfiguration of Lot* over Lot 501 on SP295994 (60 Stapylton Jacobs Well Road, Stapylton).

The purpose of which is to address and manage stormwater quantity and quality requirements of the proposed development of Stage 2 over the subject site in accordance with the relevant State and Local Authority's legislation and regulatory guidelines.

The key outcomes achieved through the analysis and modelling undertaken within this report are demonstrated in the stormwater bio-retention and sediment basin designs within **Appendix C and Appendix D**, and are as described below:

Stormwater Quantity

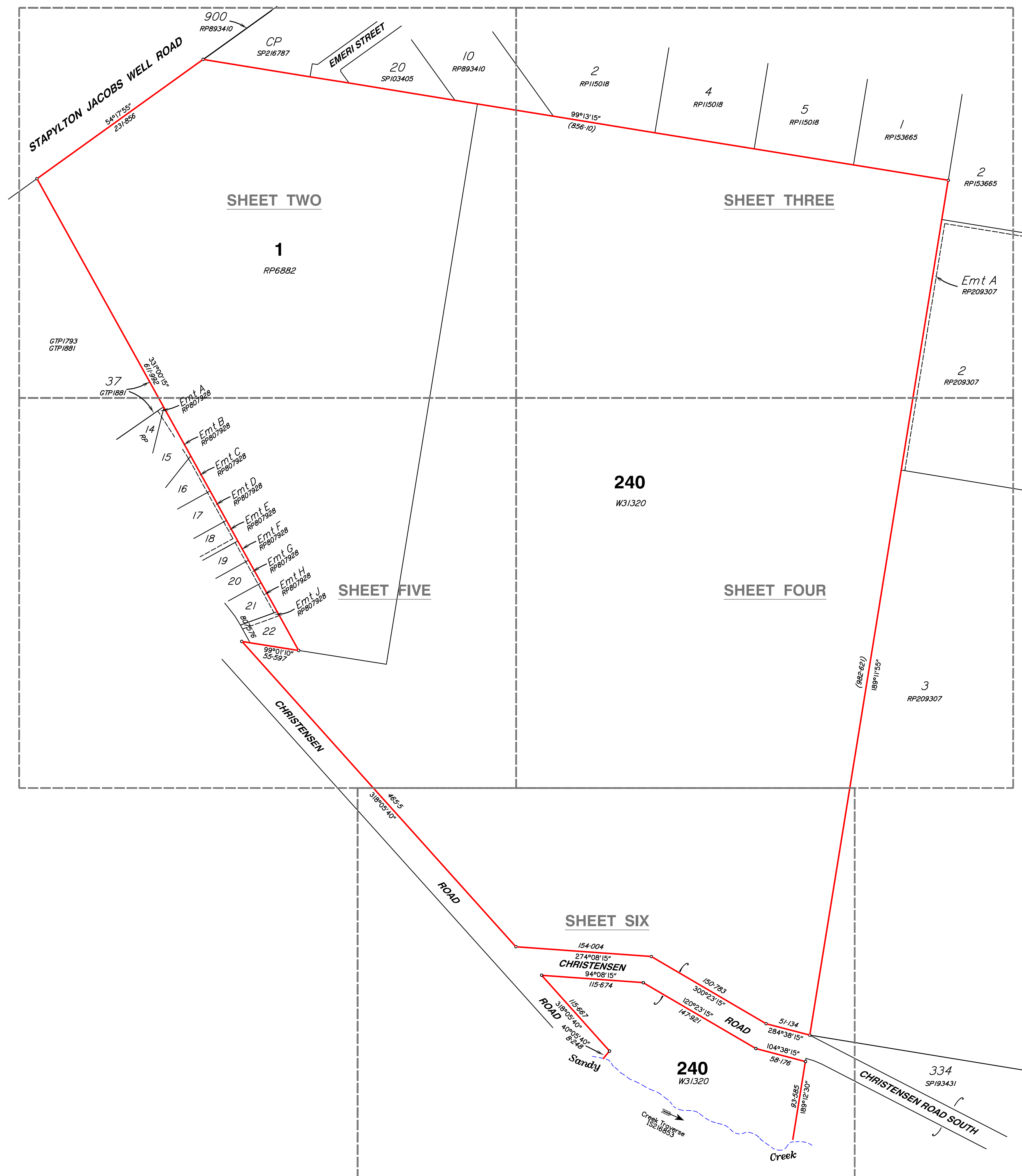
Suitable attenuation measures are able to be incorporated into the proposed development to ensure there is no adverse impacts to downstream properties, waterways or infrastructure as a result of an increase in peak stormwater flow rates discharging from the subject site upon development.

This is achieved through the design of an appropriately sized detention basin that complies with City of Gold Coast Council's Land Development Guidelines and the Queensland Urban Drainage Manual (QUDM).

Stormwater Quality

Stormwater quality objectives for the subject site are achieved through the design of a suitable stormwater treatment train that implements all necessary steps to ensure that the quality of stormwater discharging from the subject site meets the necessary standards to comply with City of Gold Coast Council's Water Sensitive Urban Design (WSUD) requirements, Queensland Urban Drainage Manual (QUDM) and the performance objectives of the Queensland State Planning Policy (SPP).

Appendix A – Site Survey Plan



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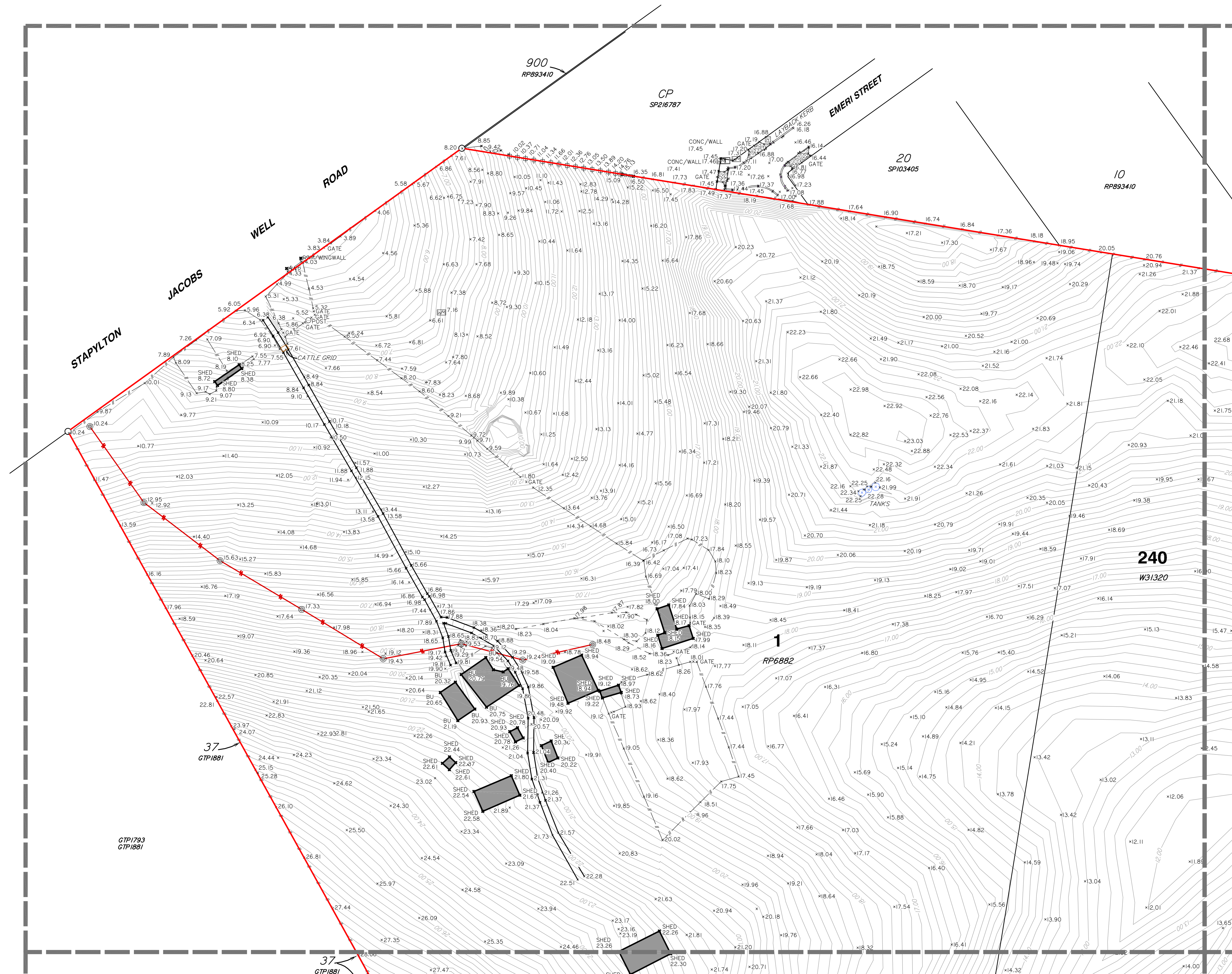


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or www.gassman.com.au

REFERENCE No. 5093-10
PLAN No. **5093 S CD 01**



Scale 1:1000 - Lengths are in Metres.
0 10 20 30 40 50 60 70 80

- LEGEND**
- PERMANENT MARK
 - SEWER MANHOLE
 - SEWER INSPECTION OUTLET
 - ELECTRICITY PILLAR
 - ELECTRICITY POLE
 - ELECTRICITY POLE WITH LIGHT
 - TELSTRA PIT
 - MANHOLE
 - STORMWATER MANHOLE
 - GULLY TRAP
 - WATER METER
 - FIRE HYDRANT
 - VALVE
 - GATE
 - BOLLARD
 - CONCRETE
 - EDGE OF BITUMEN
 - FENCE
 - OVERHEAD ELECTRICITY
 - OPEN DRAIN
 - RETAINING WALL
 - EDGE OF GARDEN
 - CONTOUR LEVEL

Notes

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Property boundaries have not been defined by this survey and have been compiled from 15216853.

Only those underground features and services as shown on this plan have been located by this survey. Prior to any construction, demolition or excavation on the site, the relevant authority should be contacted for the location of any further underground services and detailed location of all services.

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Client
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Project
CONTOUR AND DETAIL PLAN

Over Lot 1 on RP6882 and Lot 240 on WD31320

Parish of **ALBERT**
County of **Ward**
Local Govt **GOLD COAST CITY COUNCIL**

Level Datum	A.H.D.	Date Surveyed	Jan 2011
Meridian	IS133471	Surveyor	A. Macdonald
Contour Interval	0.2	Drawn	S. Holt
F.B.	No	Date Drafted	02-02-2011
Origin	PSM 133471	Checked	
	RL 22.169		
Scale (on A1 original)		Designed	
		Drawn	
		Date Designed	



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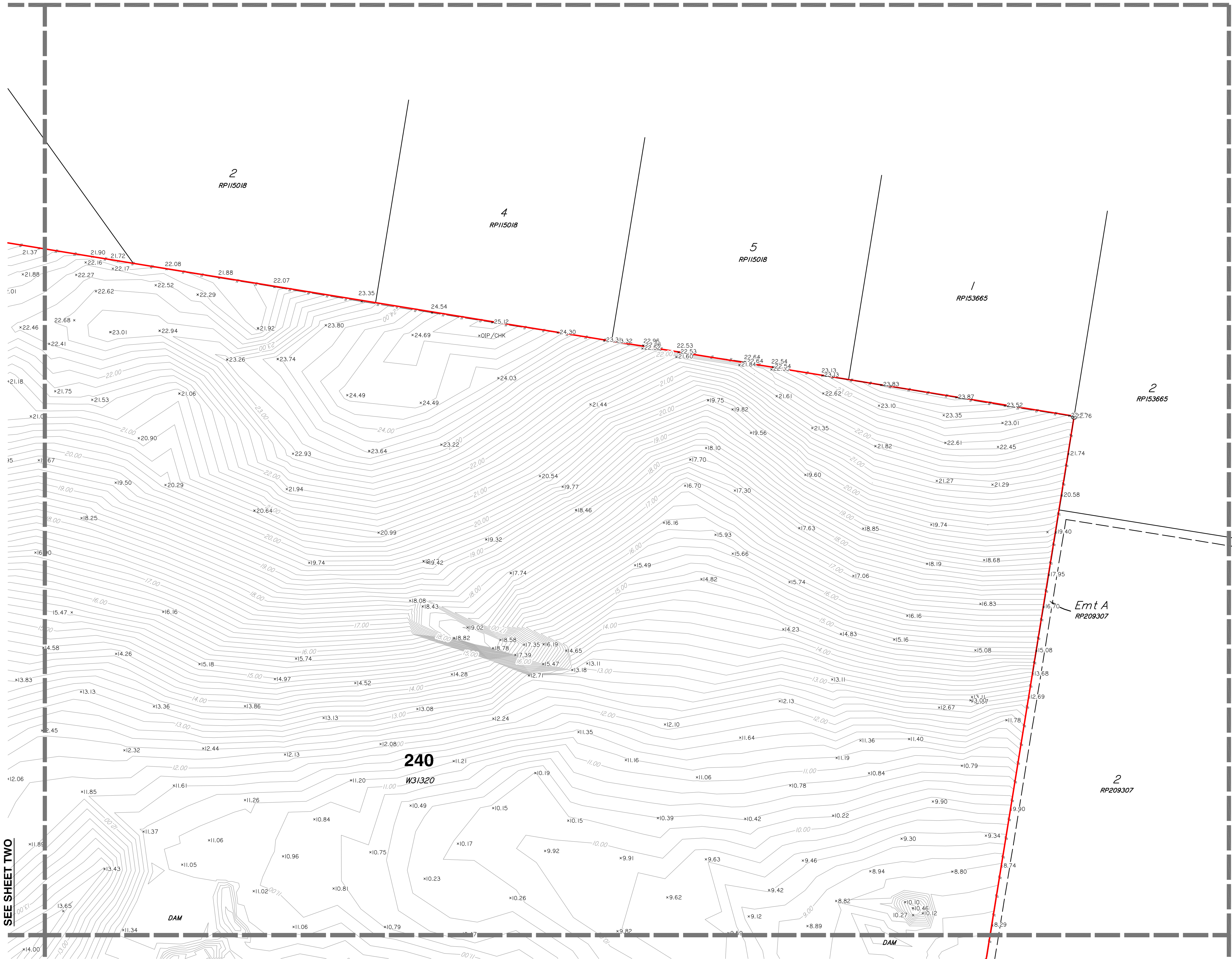


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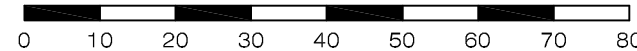
SHEET 3 OF 6



SEE SHEET TWO

SEE SHEET FOUR

Scale 1:1000 - Lengths are in Metres.



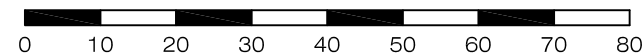


SEE SHEET THREE



SEE SHEET SIX

Scale 1:1000 - Lengths are in Metres.



LEGEND

- PERMANENT MARK
- SEWER MANHOLE
- SEWER INSPECTION OUTLET
- ELECTRICITY PILLAR
- ELECTRICITY POLE
- ELECTRICITY POLE WITH LIGHT
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Parish of **ALBERT**

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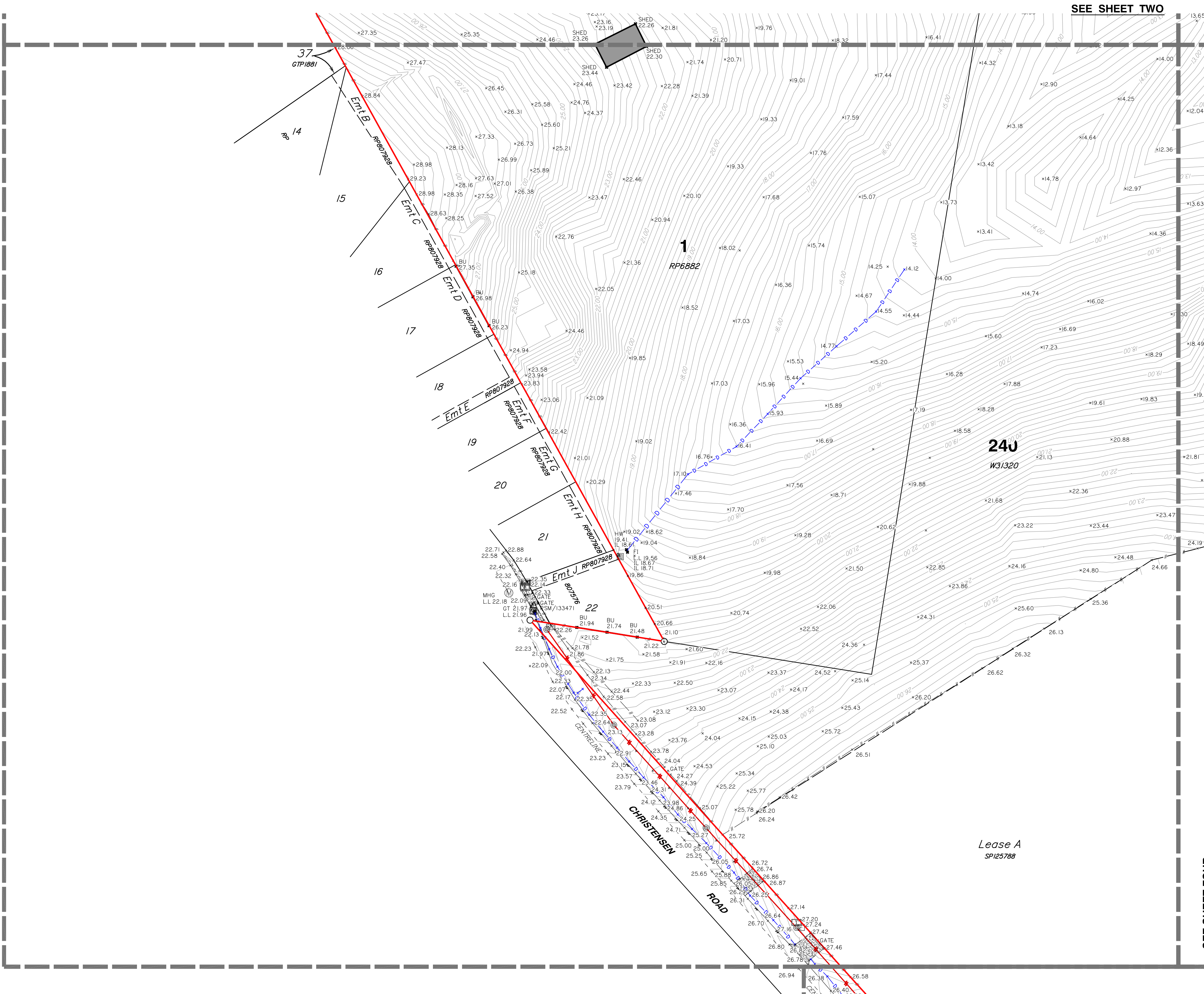
Scale (on A1 original)	Designed
1:1000	Drawn
	Date Designed



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f: (07) 32217308
Gold Coast and Logan Office
Access Business Park
76 Business Street Yatala Q. 4207
t: (07) 38073333
f: (07) 32975461
e: mail@gassman.com.au
w: www.gassman.com.au

REFERENCE No. **5093-10**

PLAN No. **5093 S CD 01**



- LEGEND**
- PERMANENT MARK
 - SEWER MANHOLE
 - SEWER INSPECTION OUTLET
 - ELECTRICITY PILLAR
 - ELECTRICITY POLE
 - ELECTRICITY POLE WITH LIGHT
 - TELSTRA PIT
 - MANHOLE
 - STORMWATER MANHOLE
 - GULLY TRAP
 - WATER METER
 - FIRE HYDRANT
 - VALVE
 - GATE
 - BOLLARD
 - CONCRETE
 - EDGE OF BITUMEN
 - FENCE
 - OVERHEAD ELECTRICITY
 - OPEN DRAIN
 - RETAINING WALL
 - EDGE OF GARDEN
 - CONTOUR LEVEL

Notes

This plan has been prepared for the exclusive use and purposes of the client as stated on this plan and should not be used by any other person or corporation and for any other purpose.

Property boundaries have not been defined by this survey and have been compiled from IS216853.

Only those underground features and services as shown on this plan have been located by this survey. Prior to any construction, demolition or excavation on the site, the relevant authority should be contacted for the location of any further underground services and detailed location of all services.

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Client

HESTER

Project

CONTOUR AND DETAIL PLAN

Over Lot 1 on RP6882 and Lot 240 on WD31320

Parish of **ALBERT**

County of **Ward**

Local Govt **GOLD COAST CITY COUNCIL**

Level Datum	A.H.D.	Date Surveyed	Jan 2011
Meridian	IS216853	Surveyor	A. Macdonald
Contour Interval	0.2	Drawn	S. Holt
F.B.	No	Date Drafted	02-02-2011
Origin	PSM 133471	Checked	RL 22.169

Scale (on A1 original)	Designed
1:1000	Date Designed



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Brisbane Office
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e: mail@gassman.com.au
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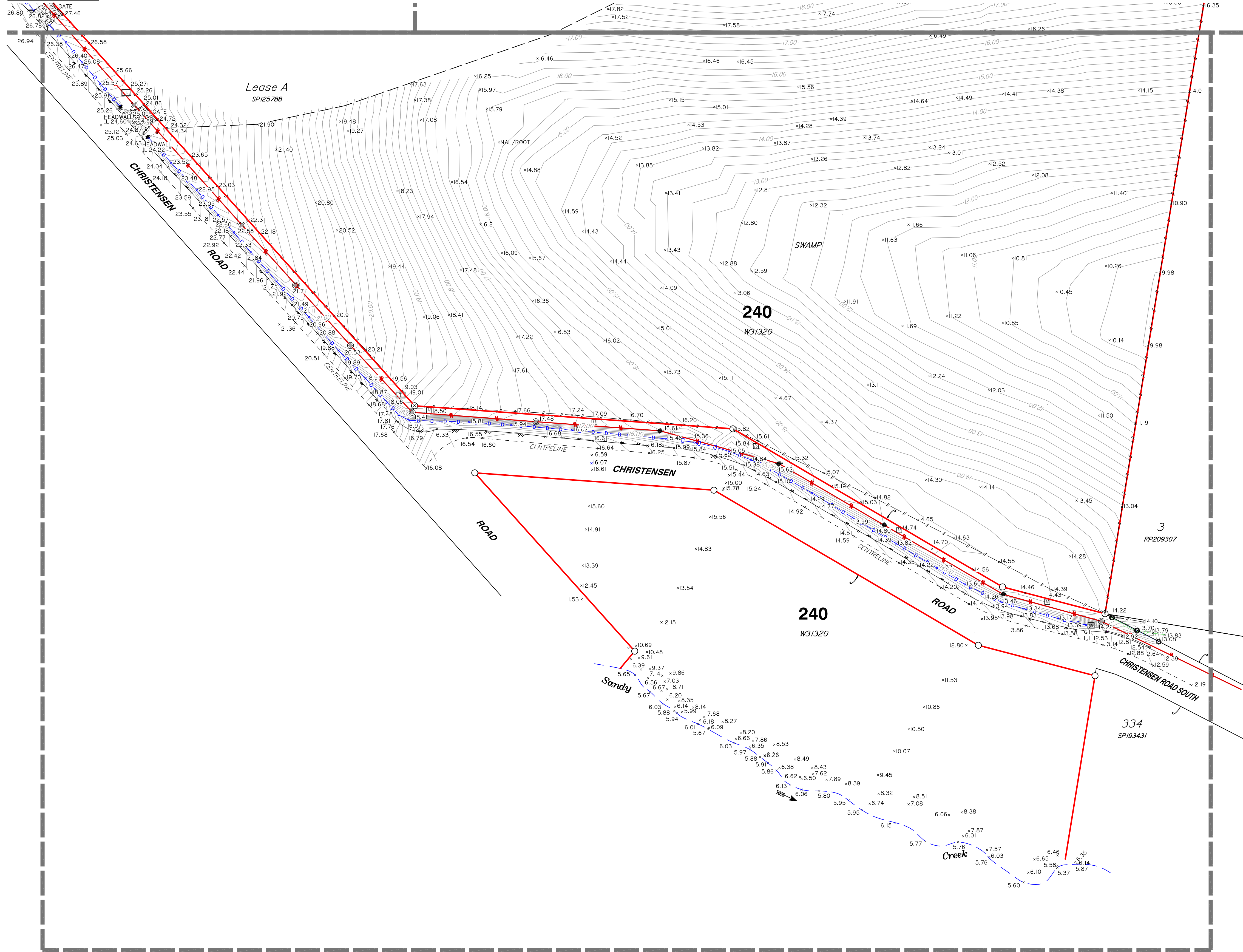
REFERENCE No. **5093-10**

PLAN No. **5093 S CD 01**



SEE SHEET FIVE

SEE SHEET FOUR



LEGEND

- PERMANENT MARK
- SEWER MANHOLE
- SEWER INSPECTION OUTLET
- ELECTRICITY PILLAR
- ELECTRICITY POLE
- ELECTRICITY POLE WITH LIGHT
- TELSTRA PIT
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Client

HESTER

Project

CONTOUR AND DETAIL PLAN

Over Lot 1 on RP6882 and Lot 240 on WD31320

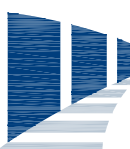
Parish of **ALBERT**

County of **Ward**

Local Govt **GOLD COAST CITY COUNCIL**

Level Datum	A.H.D.	Date Surveyed	Jan 2011
Meridian	IS216853	Surveyor	A. Macdonald
Contour Interval	0.2	Drawn	S. Holt
F.B.	No	Date Drafted	02-02-2011
Origin	PSM 133471	Checked	
	RL 22.169		

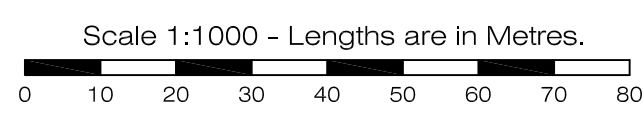
Scale (on A1 original)	Designed
1:1000	Date Designed

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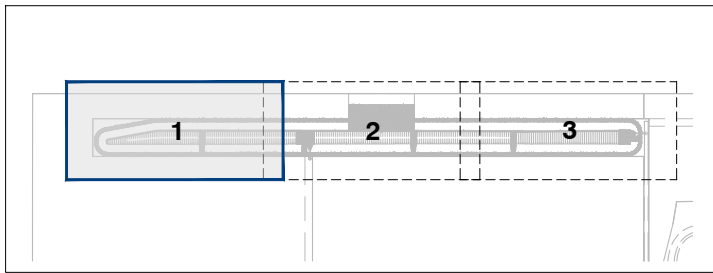
REFERENCE No. **5093-10**

PLAN No. **5093 S CD 01**

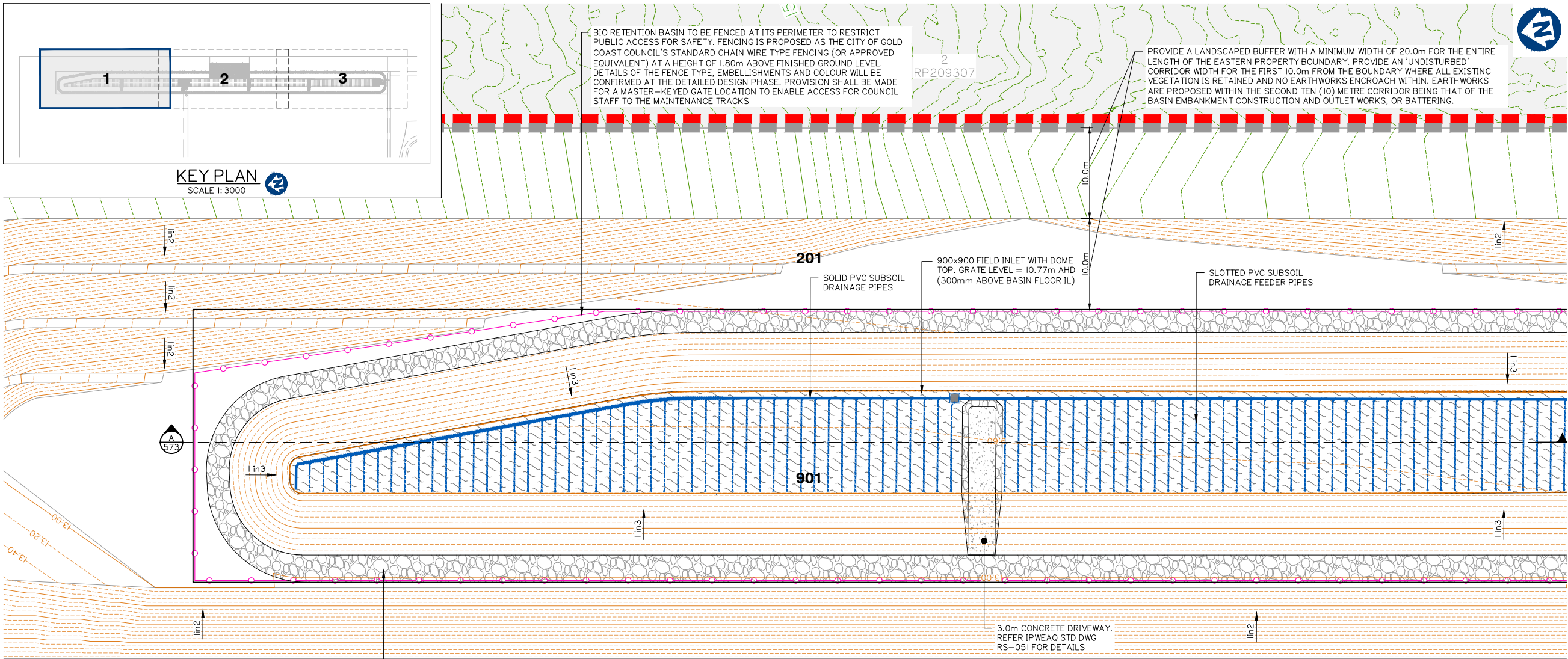


Appendix B – Pre and Post Development Catchment Plans

Appendix C – Design of Stormwater Quantity and Quality Basin



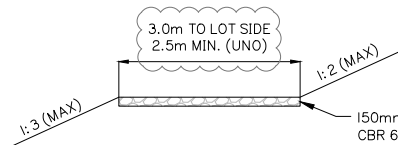
KEY PLAN
SCALE 1:3000



BIORETENTION BASIN I LAYOUT PLAN

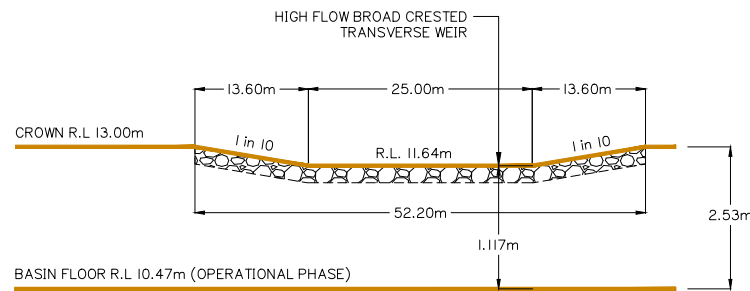
SCALE 1:250 (A1)

3.0m WIDE MAINTENANCE ACCESS TRACK TO BASIN WHERE IMMEDIATELY ADJACENT TO THE DEVELOPMENT LOTS. 2.5m WIDE TO REMAINING PERIMETER OF BASIN. EMBANKMENT CROWN LEVEL 13.00m AHD (REFER TYPICAL DETAIL BELOW).



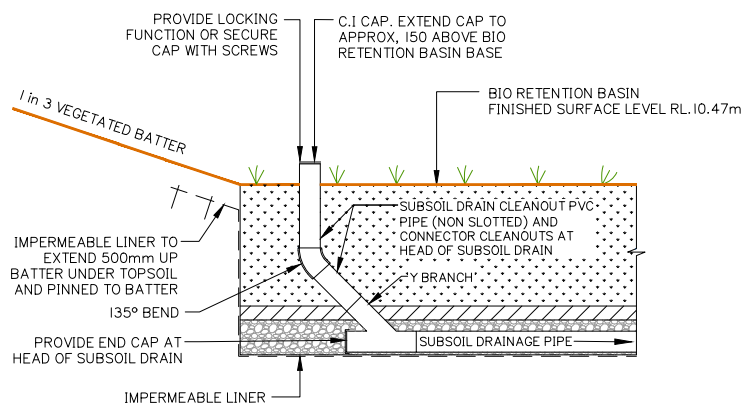
MAINTENANCE ACCESS TRACK - TYPICAL SECTION

N.T.S. UNO DENOTES 'UNLESS NOTED OTHERWISE'



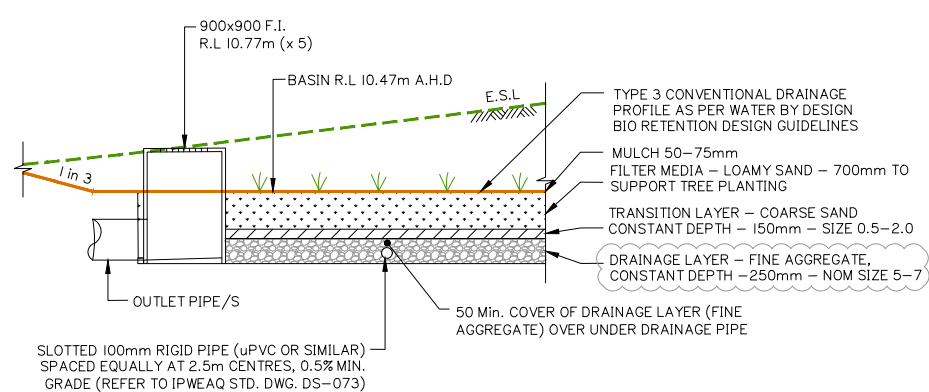
WEIR / SPILLWAY - TYPICAL ELEVATION

N.T.S.



SUBSOIL DRAIN CLEANOUT - IN BASIN

N.T.S.



TYPICAL BIO-RETENTION BASIN DETAIL

N.T.S.

BIO-RETENTION NOTES:

MINIMUM BIO-RETENTION 'PROFILE' IS TO BE 1.10m AND IS TO CONSIST OF THE FOLLOWING:

* 0.70 OF SANDY LOAM MATERIAL WITH A HYDRAULIC CONDUCTIVITY OF 200mm/h AND A PARTICLE SIZE OF 0.45-0.50mm.

* 0.15m OF COURSE SAND. PARTICLE SIZE TYPICALLY 0.5-2.0mm.

* 0.25m OF GRAVEL DRAINAGE. PARTICLE SIZE 5-7mm SCREENING.

AEP (%)	MAX. WATER ELEVATION (m) A.H.D.	MAX. WATER DEPTH (m)
63.2	11.458	0.988
0.5EY	11.611	1.141
20	11.737	1.267
10	11.812	1.342
5	11.875	1.405
2	11.944	1.474
1	11.992	1.522

Client:



FRASERS PROPERTY
(AUSTRALIA) PTY. LTD.

Project:

VantageYatala
STAGE 2

Site Address:

60 STAPYLTON JACOBS WELL
ROAD, STAPYLTON QLD 4207

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COUNCIL
Level Datum: AHD
Meridian: -
Contour Interval: -
PSM: -
RL: -

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DRAWING TITLE
OPERATIONAL PHASE
BIORETENTION BASIN
SHEET 1 OF 4

Rev	Date	Description	IG	MG
B	15-02-2021	INFORMATION REQUEST RESPONSE	IG	MG
A	20-11-2020	ORIGINAL ISSUE	BA	MG
Issue	Date	Description	BA	MG

SCALE IN METRES



1:250 (FULL SIZE A1)
1:500 (HALF SIZE A3)

Scale at A1: 1:250

Designed: IG

Drafted: BA

Approved: MG

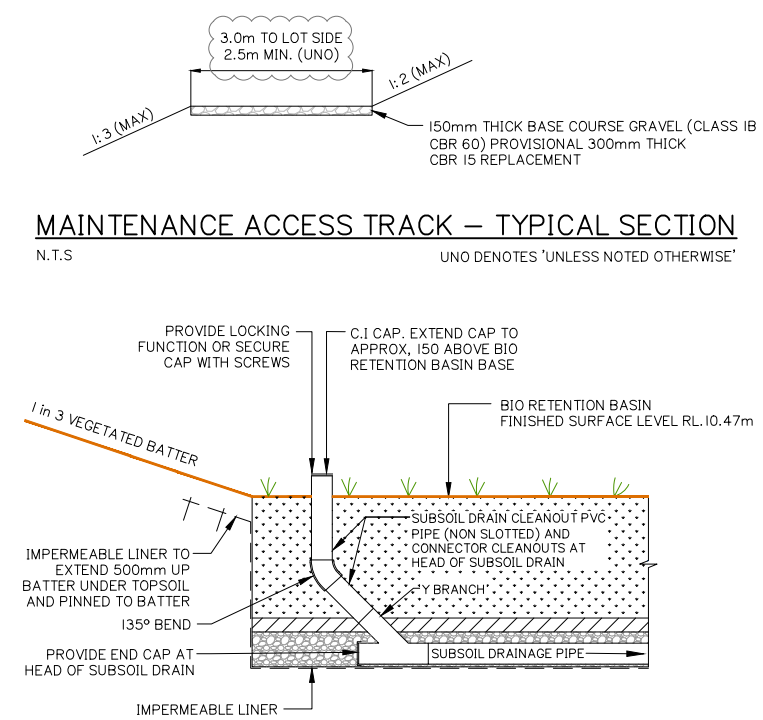
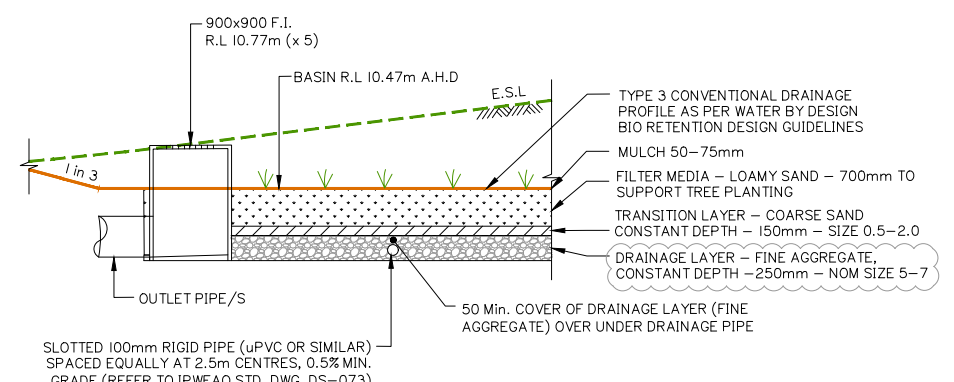
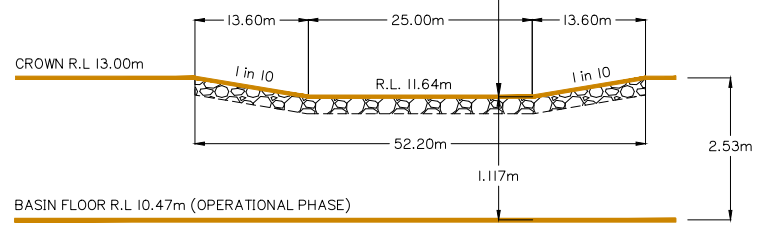
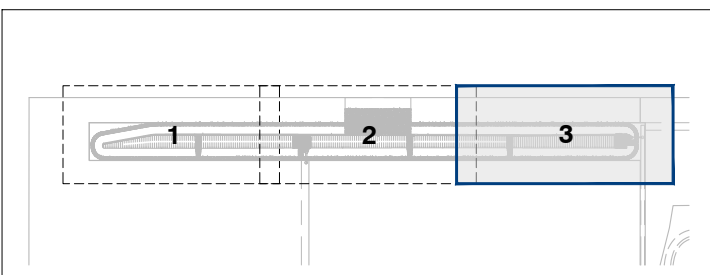
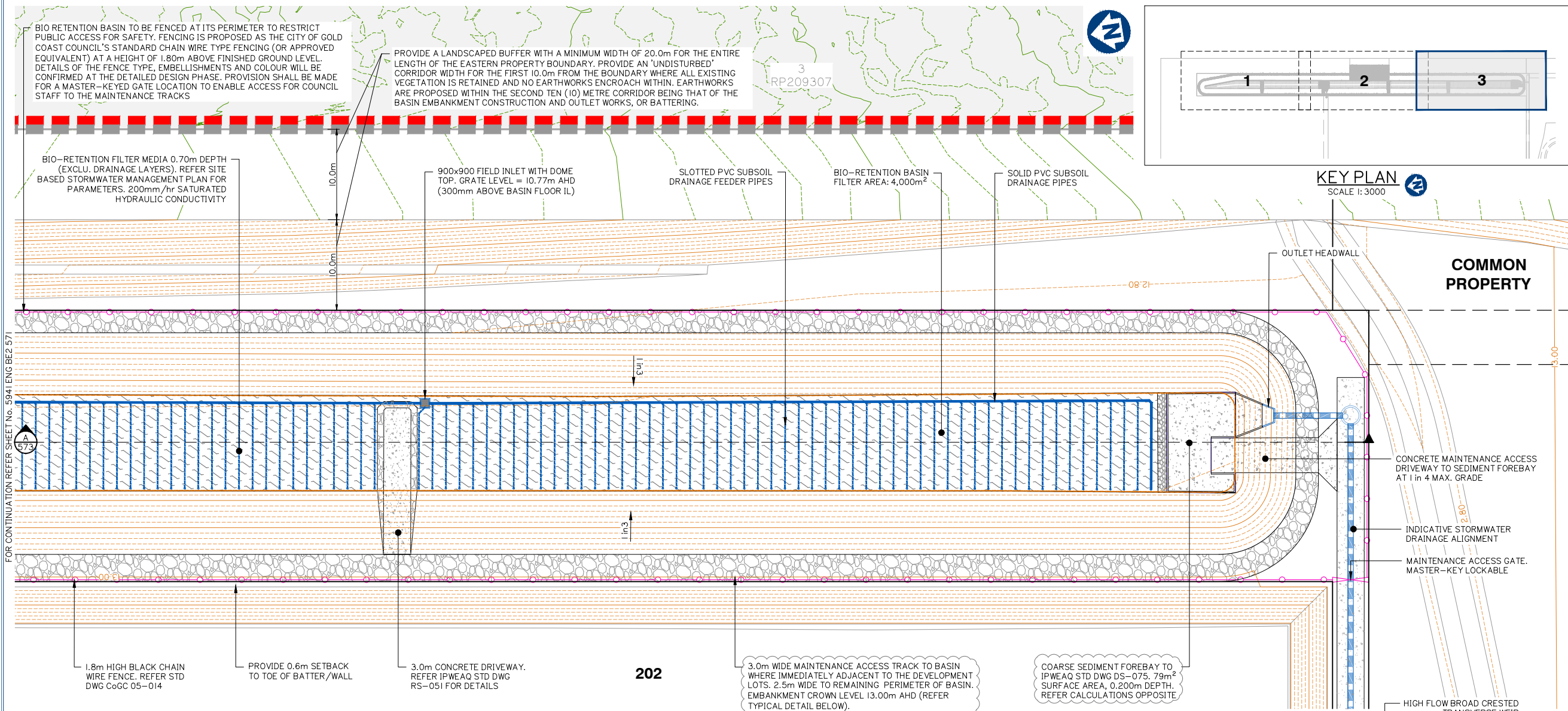
RPEQ: 16939

Signed:

Date: 15-02-2021

Drawing No:
5941 ENG BE2 570

Rev. No:
B



BIO-RETENTION NOTES:

MINIMUM BIO-RETENTION 'PROFILE' IS TO BE 1.0m AND IS TO CONSIST OF THE FOLLOWING:

- * 0.70 OF SANDY LOAM MATERIAL WITH A HYDRAULIC CONDUCTIVITY OF 200mm/h AND A PARTICLE SIZE OF 0.45-0.50mm.
- * 0.15m OF COARSE SAND. PARTICLE SIZE TYPICALLY 0.5-2.0mm.
- * 0.25m OF GRAVEL DRAINAGE. PARTICLE SIZE 5-7mm SCREENING.

BIO RETENTION – COURSE SEDIMENT FOREBAY
SIZING GUIDE CALCULATIONS (TOTAL)

$$V_s = A_c \times R \times L_o \times F = 6.4953 \text{ m}^3$$

$$R = 1 - \left[\frac{+1 \times \frac{V_s}{Q/A_c}}{0.7/A_c} \right]^{-0.5}$$

$$0.8 = 1 - \left[\frac{+1 \times \frac{0.10}{1.597/A_c}}{0.5} \right]^{-0.5} \quad Af = 191.64 \text{ m}^2$$

$$D_o = \frac{V_s}{A_f} \quad D_o = \frac{6.4953}{191.64} = 0.020 \text{ m}$$

OPTIMIZATION OF MINIMUM FOREBAY SIZE:

$$D_s = \frac{6.4953 \text{ m}^3}{79.00 \text{ m}^2 \text{ (DESIGN)}} = 0.082 \text{ m}$$


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Project: **VantageYatala**
STAGE 2

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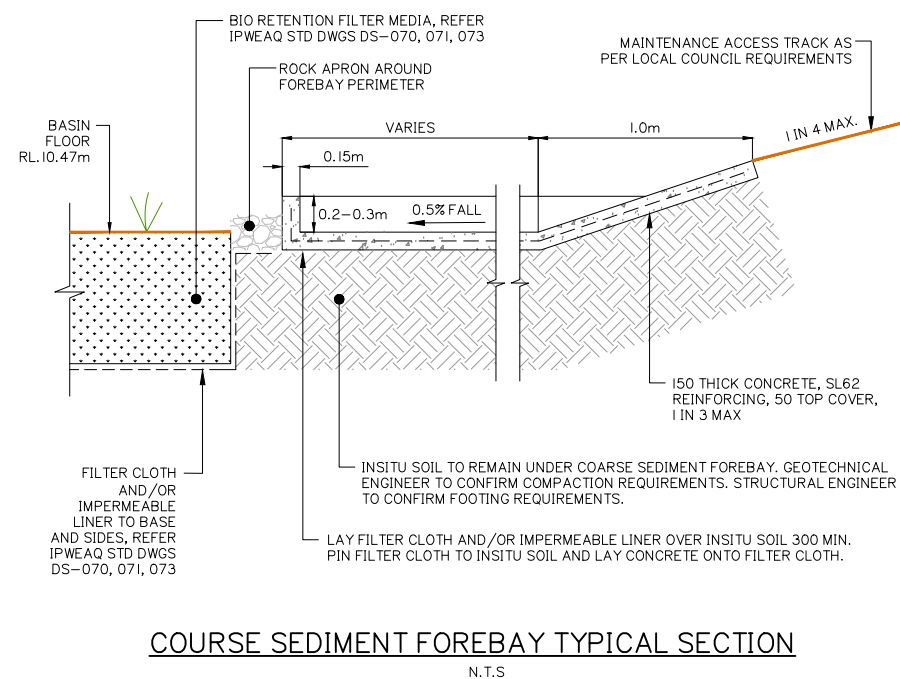
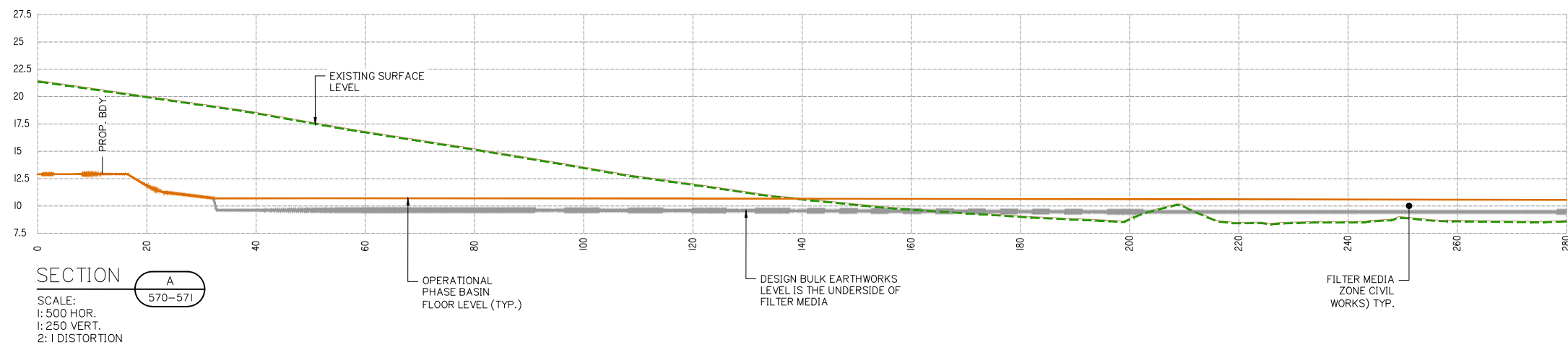
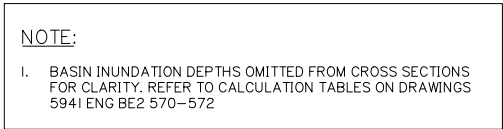
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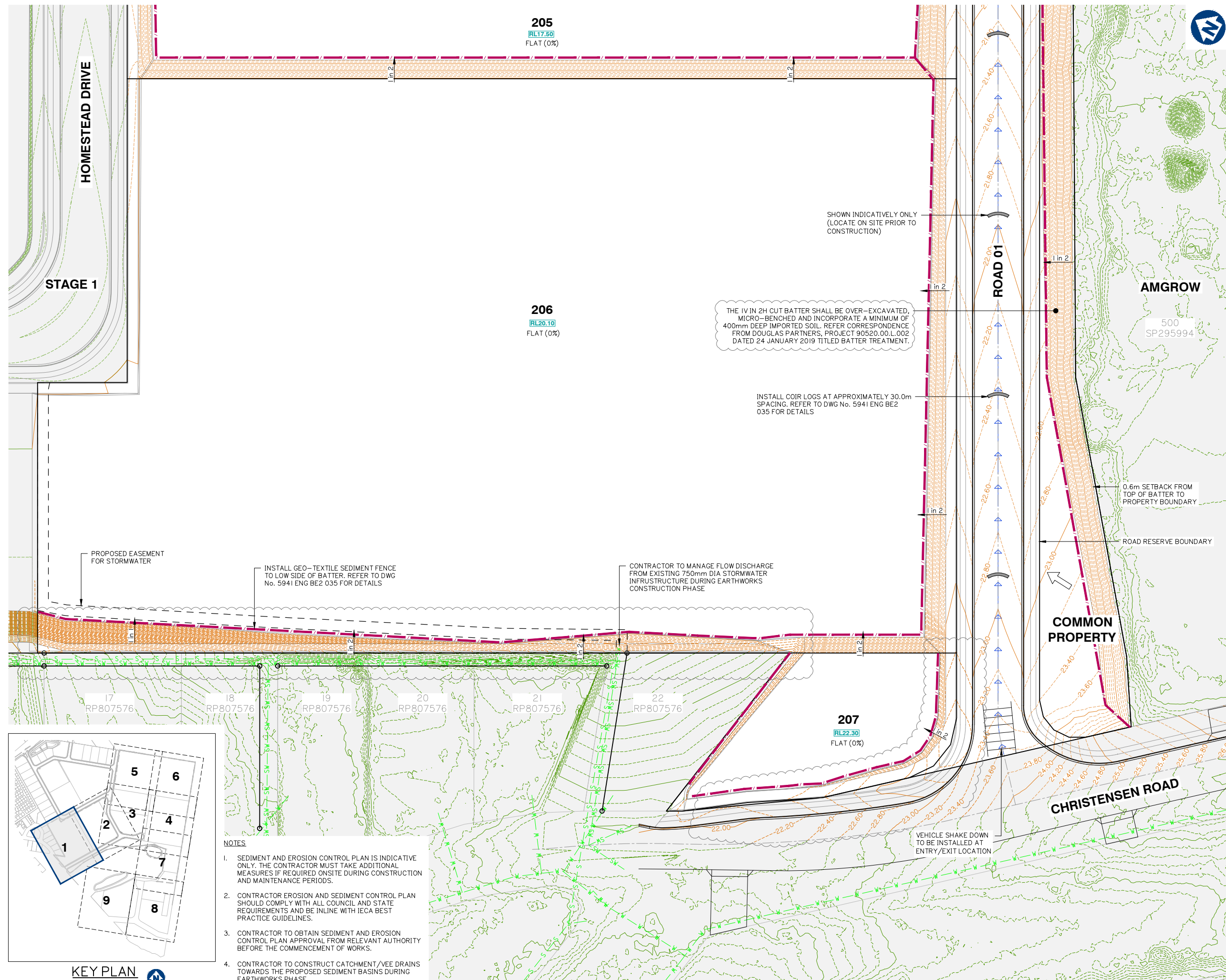
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A	20-11-2020	ORIGINAL ISSUE	BA	MG
Issue	Date	Description	DRN	CHK

Scale at A1:	1:250
Designed:	IG
Drafted:	BA
Approved:	MG
RPEQ:	16939
Signed:	
Date:	15-02-2021

Drawing No:	Rev. No:
5941 ENG BE2 572	B



Appendix D – Sediment & Erosion Control Plans



Client:

FRASERS PROPERTY
(AUSTRALIA) PTY. LTD.

Project:

VantageYatala
STAGE 2

Site Address:

60 STAPYLTON JACOBS WELL
ROAD, STAPYLTON QLD 4207THIS DRAWING IS INTENDED TO
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RPD:

Lot: 501
Plan: SP295994
Local Authority: CITY OF GOLD COAST
COUNCIL
Level Datum: AHD
Meridian: -
Contour Interval: -
PSM: -
RL: -

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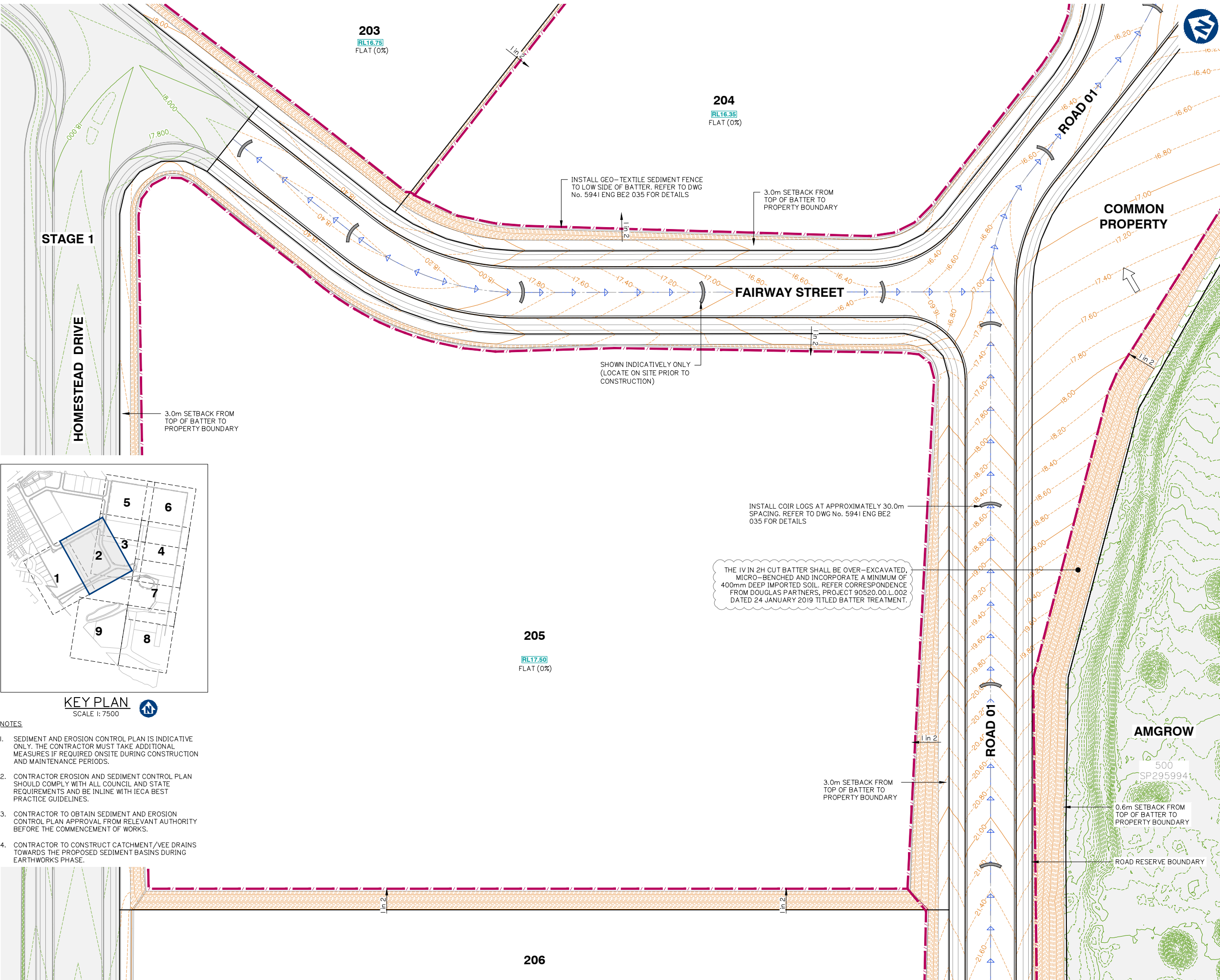
DRAWING TITLE
**SEDIMENT AND
EROSION CONTROL
PLAN SHEET 1 OF 9**

B	15-02-2021	INFORMATION REQUEST RESPONSE	IG	MG
A	20-11-2020	ORIGINAL ISSUE	BA	MG
Issue	Date	Description	DRN	CHK

SCALE IN METRES
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1:500 (FULL SIZE A1)
1:1000 (HALF SIZE A3)

Scale at A1:	1:500
Designed:	IG
Drafted:	BA
Approved:	MG
RPEQ:	16939
Signed:	
Date:	15-02-2021

Drawing No: 5941 ENG BE2 020
Rev. No: B



Client:



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(AUSTRALIA) PTY. LTD.

Project:

VantageYatala
STAGE 2

Site Address:

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ROAD, STAPYLTON QLD 4207

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RPD:

Lot: 501
Plan: SP295994
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EROSION CONTROL
PLAN SHEET 2 OF 9

B	15-02-2021	INFORMATION REQUEST RESPONSE			YC	MU
A	20-11-2020	ORIGINAL ISSUE			BA	MU
Issue	Date	Description			DBN	CH

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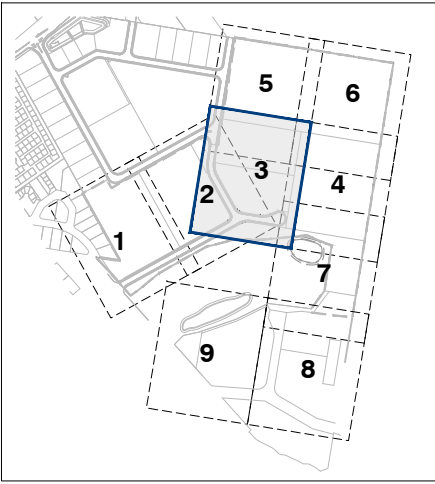
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1:1000 (HALF SIZE A3)

Scale at A1: 1:500

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Drafted:	BA
Approved:	MG
RPEQ:	16939
Signed:	
Date:	15-02-2021

Drawing No:
5941 ENG BE2 021

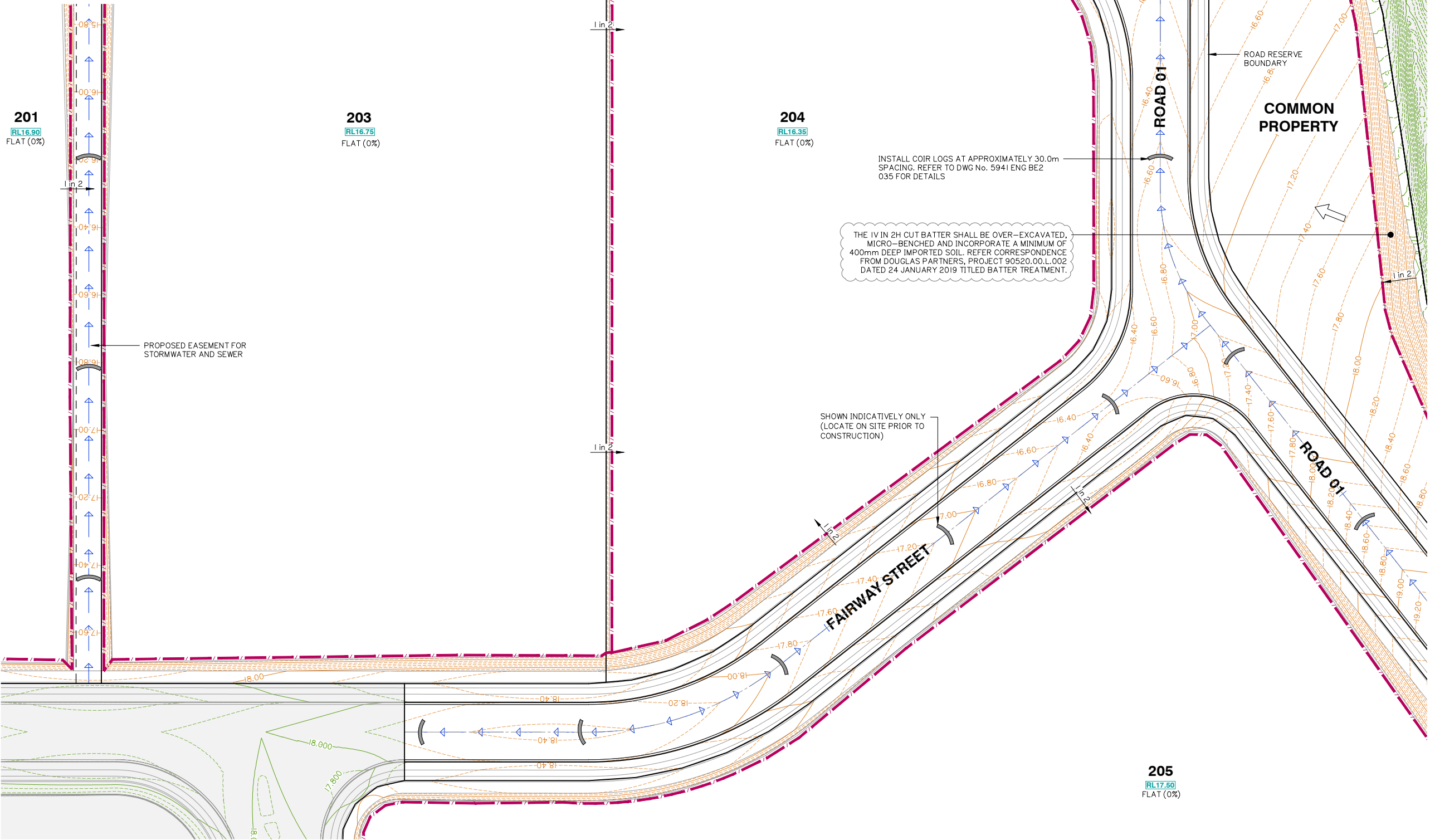
Rev. No:
B



KEY PLAN
SCALE 1: 7500

NOTES

1. SEDIMENT AND EROSION CONTROL PLAN IS INDICATIVE ONLY. THE CONTRACTOR MUST TAKE ADDITIONAL MEASURES IF REQUIRED ONSITE DURING CONSTRUCTION AND MAINTENANCE PERIODS.
2. CONTRACTOR EROSION AND SEDIMENT CONTROL PLAN SHOULD COMPLY WITH ALL COUNCIL AND STATE REQUIREMENTS AND BE IN LINE WITH IECA BEST PRACTICE GUIDELINES.
3. CONTRACTOR TO OBTAIN SEDIMENT AND EROSION CONTROL PLAN APPROVAL FROM RELEVANT AUTHORITY BEFORE THE COMMENCEMENT OF WORKS.
4. CONTRACTOR TO CONSTRUCT CATCHMENT / VEE DRAINS TOWARDS THE PROPOSED SEDIMENT BASINS DURING EARTHWORKS PHASE.



Client:



FRASERS PROPERTY
(AUSTRALIA) PTY. LTD.

Project:

VantageYatala
STAGE 2

Site Address:

60 STAPYLTON JACOBS WELL
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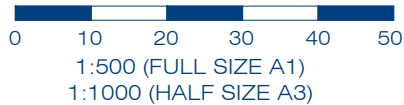
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DRAWING TITLE

SEDIMENT AND
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PLAN SHEET 3 OF 9

Rev	Date	Description	IG	MG
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Issue	Date	Description	DRN	CHK

SCALE IN METRES



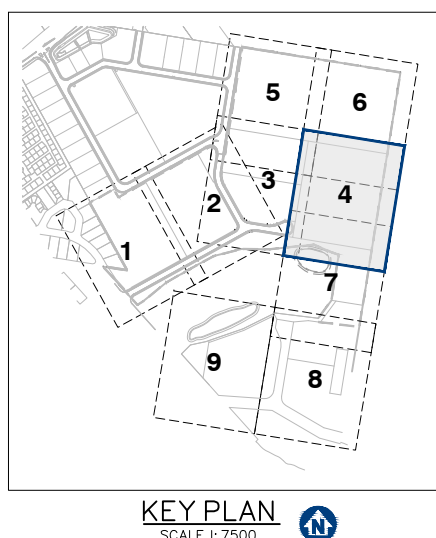
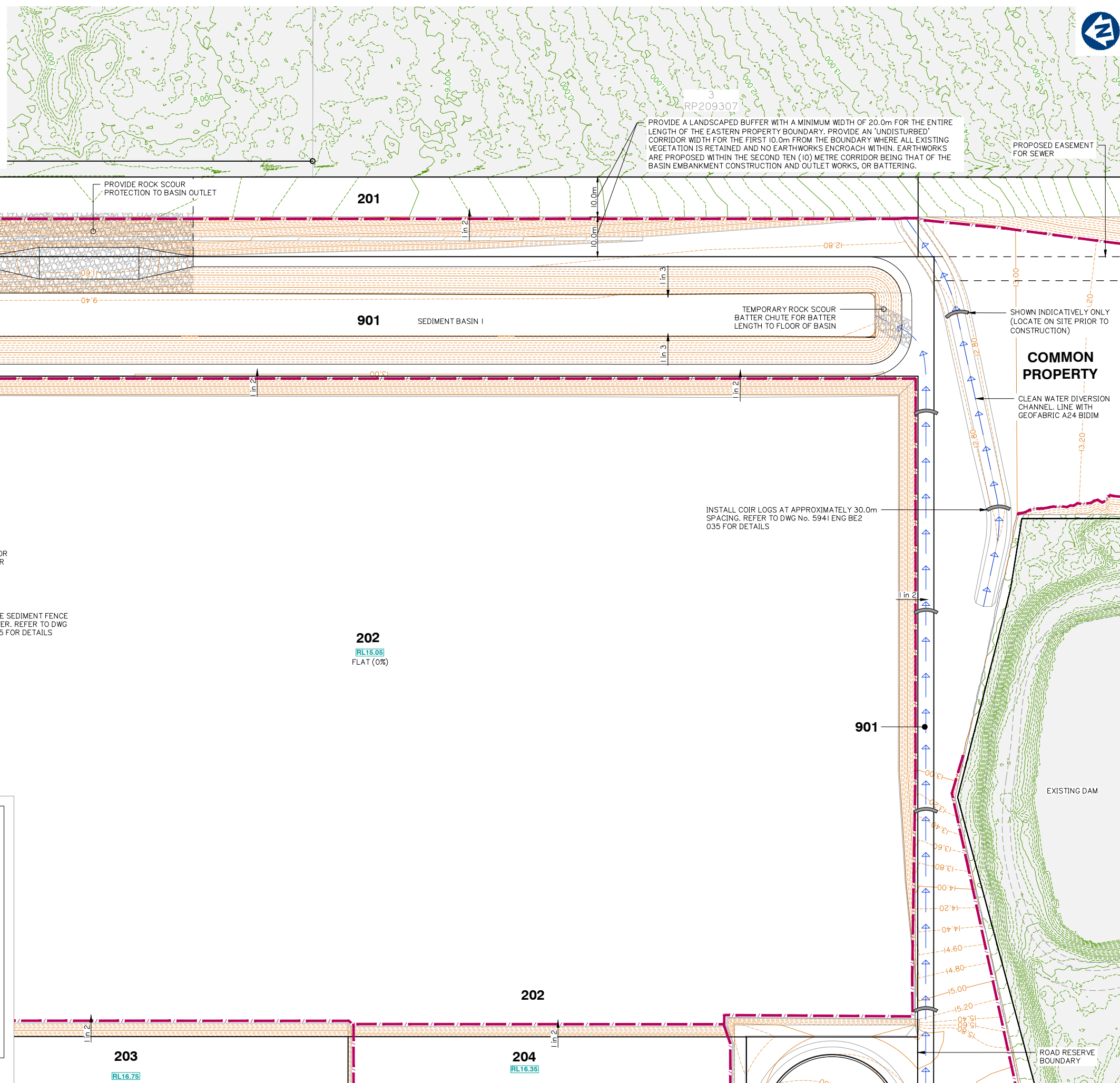
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Designed:	IG
Drafted:	BA
Approved:	MG
RPEQ:	16939
Signed:	
Date:	15-02-2021

Drawing No:
5941 ENG BE2 022

Rev. No:
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3. CONTRACTOR TO OBTAIN SEDIMENT AND EROSION CONTROL PLAN APPROVAL FROM RELEVANT AUTHORITY BEFORE THE COMMENCEMENT OF WORKS.
4. CONTRACTOR TO CONSTRUCT CATCHMENT /VEE DRAINS TOWARDS THE PROPOSED SEDIMENT BASINS DURING EARTHWORKS PHASE.



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Project:

VantageYatala
STAGE 2

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Level Datum:	AHD
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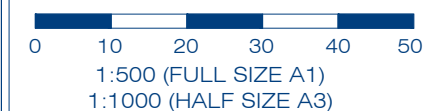
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SEDIMENT AND
EROSION CONTROL
PLAN SHEET 4 OF 9

A	20-11-2020		ORIGINAL ISSUE	BA	MG
Issued by:	Date		Description	(RN)	(2=K)

SCALE IN METRES

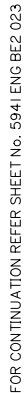


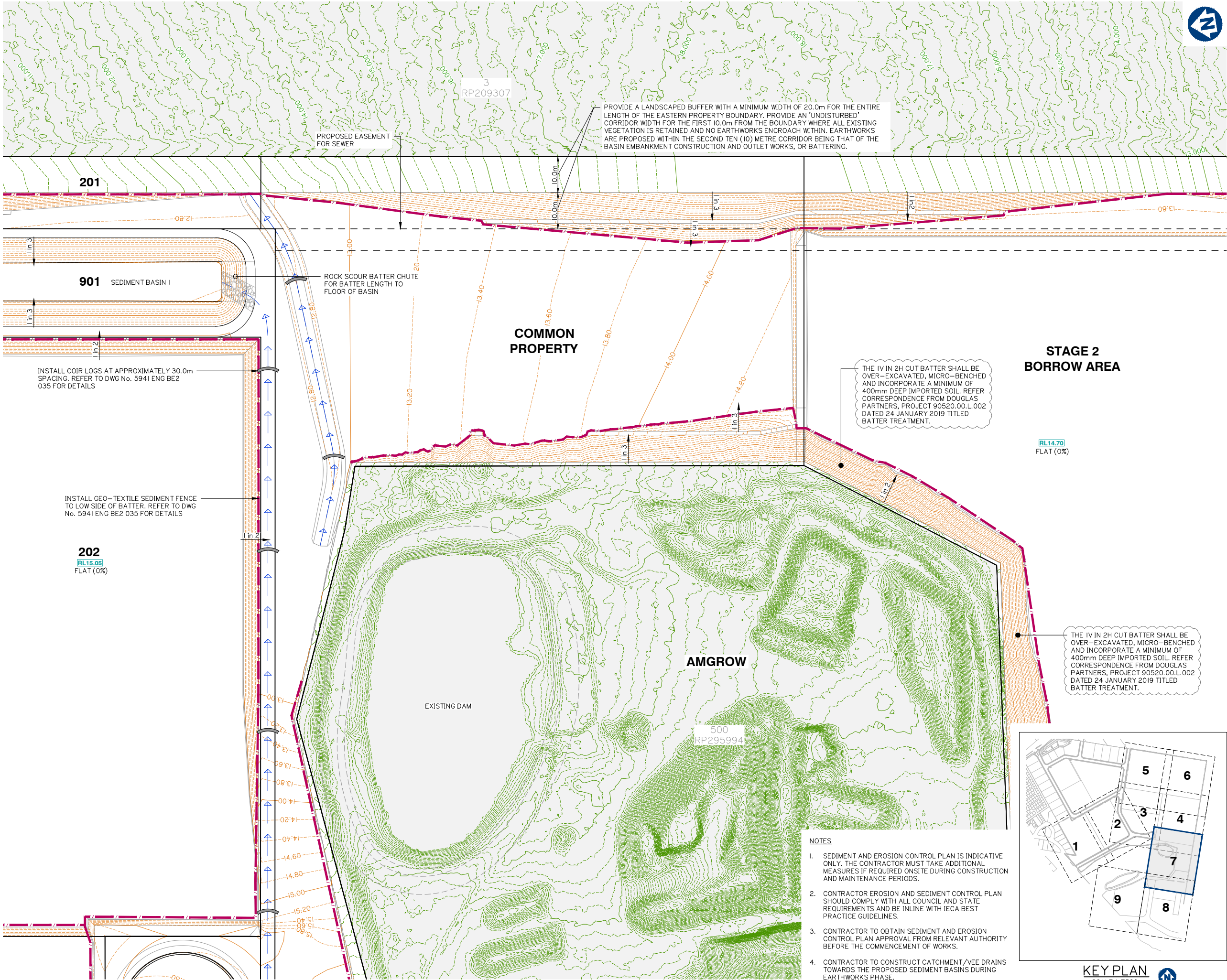
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Drafted:	BA
Approved:	MG
RPEQ:	16939
Signed:	
Date:	20-11-2020

Drawing No:
5941 ENG BE2 023

Rev. No:
A



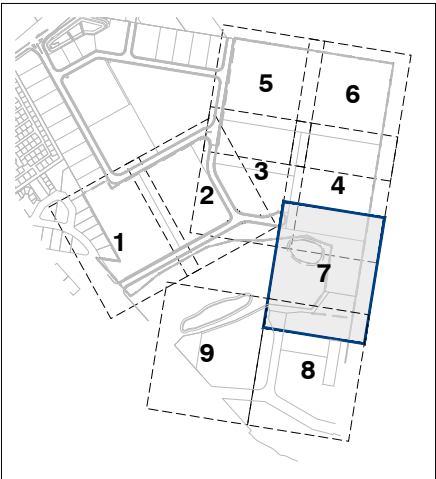


FOR CONTINUATION REFER SHEET No. 5941 ENG BE2 023

FOR CONTINUATION REFER SHEET No. 5941 ENG BE2 027

NOTES

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3. CONTRACTOR TO OBTAIN SEDIMENT AND EROSION CONTROL PLAN APPROVAL FROM RELEVANT AUTHORITY BEFORE THE COMMENCEMENT OF WORKS.
4. CONTRACTOR TO CONSTRUCT CATCHMENT/VEE DRAINS TOWARDS THE PROPOSED SEDIMENT BASINS DURING EARTHWORKS PHASE.



KEY PLAN
SCALE 1:7500

Client:



FRASERS PROPERTY
(AUSTRALIA) PTY. LTD.

Project:

VantageYatala
STAGE 2

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Lot: 501
Plan: SP295994
Local Authority: CITY OF GOLD COAST
COUNCIL
Level Datum: AHD
Meridian: -
Contour interval: -
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DRAWING TITLE

SEDIMENT AND
EROSION CONTROL
PLAN SHEET 7 OF 9

SCALE IN METRES

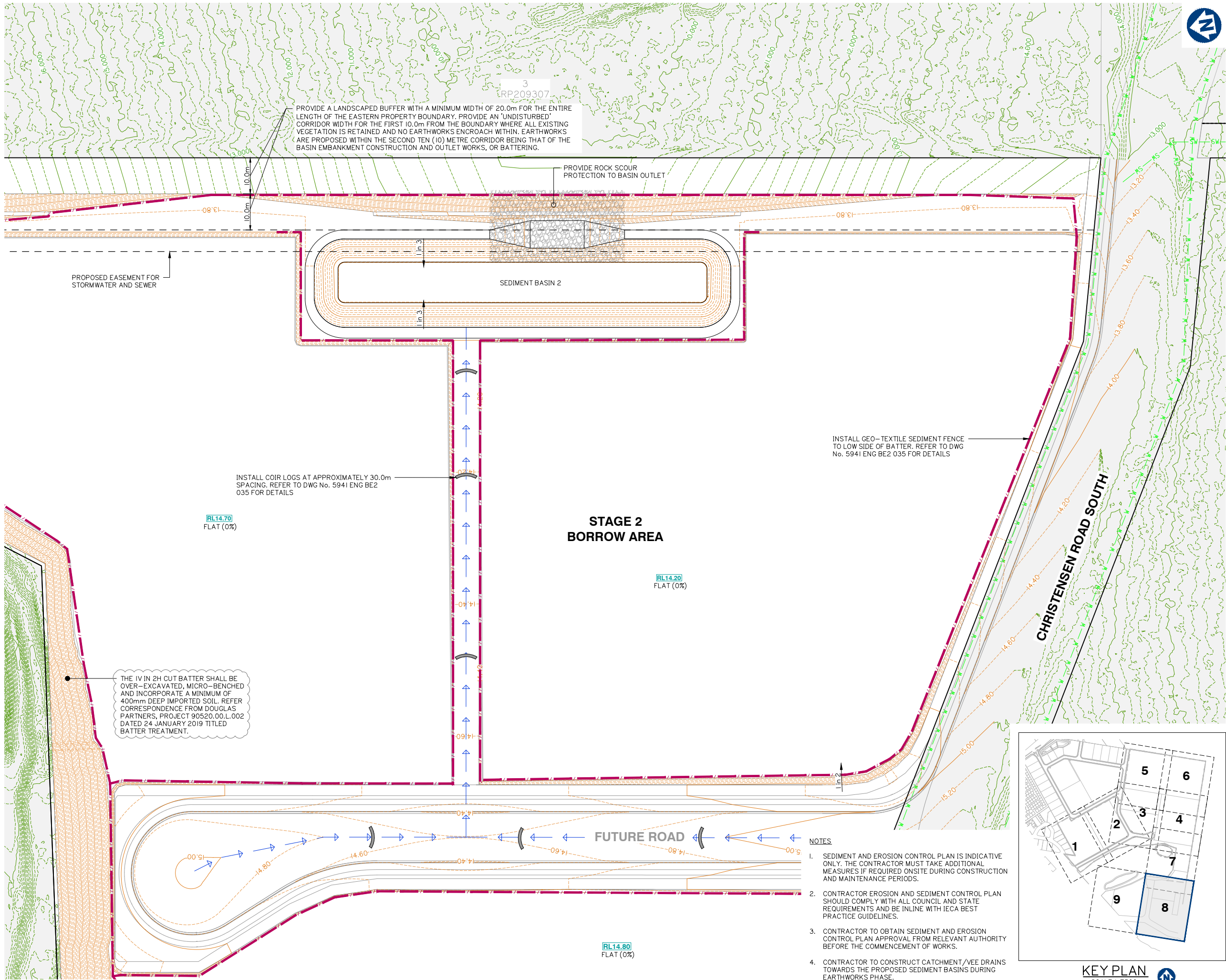
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Designed:	IG
Drafted:	BA
Approved:	MG
RPEQ:	16939
Signed:	
Date:	15-02-2021

Drawing No:
5941 ENG BE2 026

Rev. No:
B



FOR CONTINUATION REFER SHEET No. 5941 ENG BE2 026

FOR CONTINUATION REFER SHEET No. 5941 ENG BE2 028

SEDIMENT AND EROSION CONTROL PLAN SHEET 8 OF 9



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Client:



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(AUSTRALIA) PTY. LTD.

Project:

VantageYatala
STAGE 2

Site Address:

60 STAPYLTON JACOBS WELL
ROAD, STAPYLTON QLD 4207

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RPD:

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SEDIMENT AND
EROSION CONTROL
PLAN SHEET 8 OF 9

B	15-02-2021	INFORMATION REQUEST RESPONSE	IG	MG
A	20-11-2020	ORIGINAL ISSUE	BA	MG
Issue	Date	Description	DRN	CHK

SCALE IN METRES



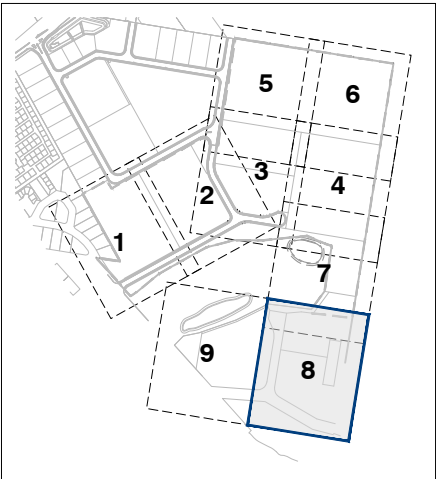
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Scale at A1: 1:500

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KEY PLAN
SCALE 1:7500



NOTES

1. SEDIMENT AND EROSION CONTROL PLAN IS INDICATIVE ONLY. THE CONTRACTOR MUST TAKE ADDITIONAL MEASURES IF REQUIRED ONSITE DURING CONSTRUCTION AND MAINTENANCE PERIODS.
2. CONTRACTOR EROSION AND SEDIMENT CONTROL PLAN SHOULD COMPLY WITH ALL COUNCIL AND STATE REQUIREMENTS AND BE IN LINE WITH IECA BEST PRACTICE GUIDELINES.
3. CONTRACTOR TO OBTAIN SEDIMENT AND EROSION CONTROL PLAN APPROVAL FROM RELEVANT AUTHORITY BEFORE THE COMMENCEMENT OF WORKS.
4. CONTRACTOR TO CONSTRUCT CATCHMENT/VEE DRAINS TOWARDS THE PROPOSED SEDIMENT BASINS DURING EARTHWORKS PHASE.



Project: **VantageYatala**
STAGE 2

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RPD:	
Lot:	501
Plan:	SP295994
Local Authority:	CITY OF GOLD COAST COUNCIL
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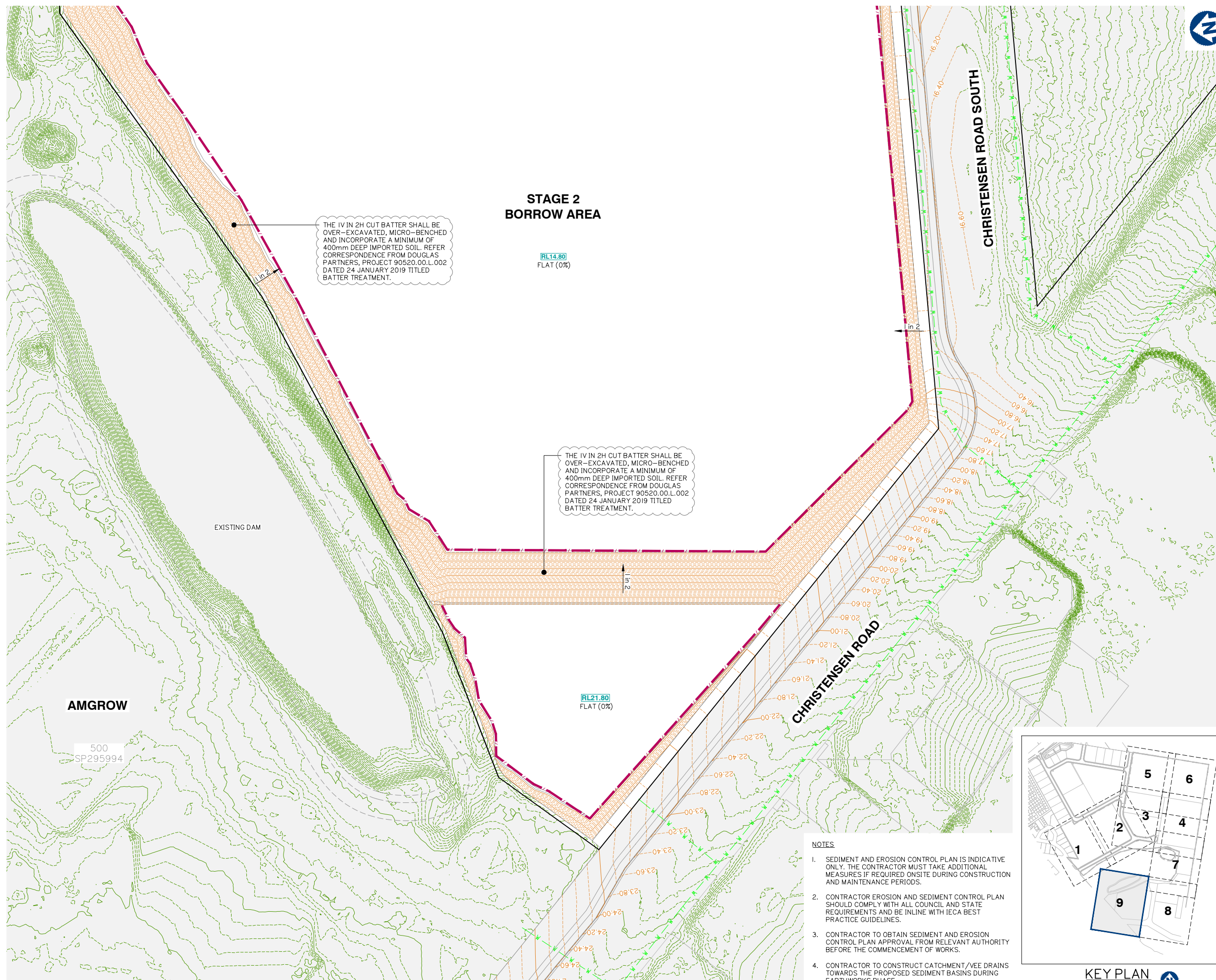
DRAWING TITLE
SEDIMENT AND
EROSION CONTROL
PLAN SHEET 9 OF 9

B	15-02-2021	INFORMATION REQUEST RESPONSE		IG	MCI
A	20-11-2020	ORIGINAL ISSUE		BA	MCI
Issue	Date	Description		DRN	CH

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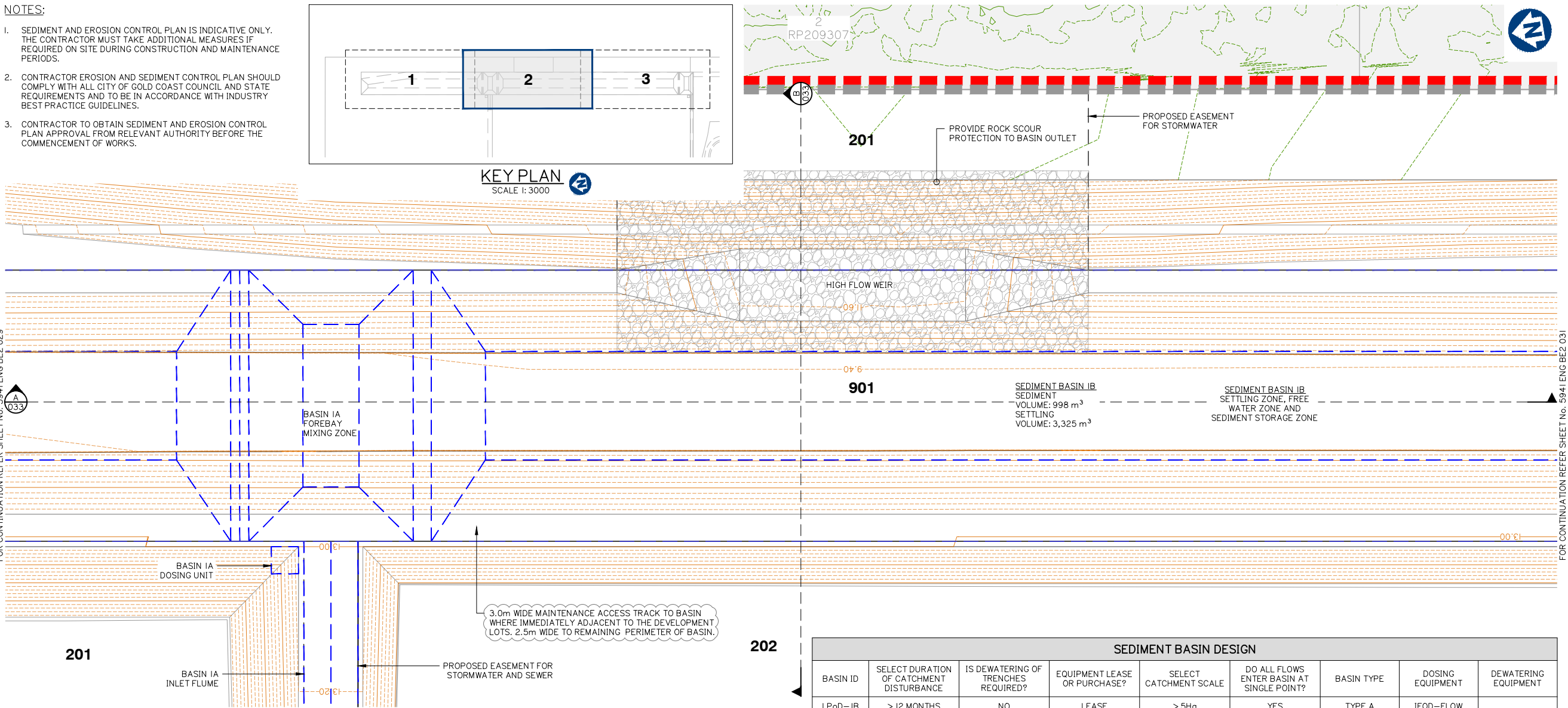
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Signed:	
Date:	15-02-2021

Drawing No:	Rev. No:
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NOTES:

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- CONTRACTOR TO OBTAIN SEDIMENT AND EROSION CONTROL PLAN APPROVAL FROM RELEVANT AUTHORITY BEFORE THE COMMENCEMENT OF WORKS.



SEDIMENT BASIN DESIGN								
BASIN ID	SELECT DURATION OF CATCHMENT DISTURBANCE	IS DEWATERING OF TRENCHES REQUIRED?	EQUIPMENT LEASE OR PURCHASE?	SELECT CATCHMENT SCALE	DO ALL FLOWS ENTER BASIN AT SINGLE POINT?	BASIN TYPE	DOSING EQUIPMENT	DEWATERING EQUIPMENT
LPoD-IB	> 12 MONTHS	NO	LEASE	> 5Ha	YES	TYPE A	IFOD-FLOW	

BASIN ID	CATCHMENT AREA	DESIGN EVENT	I _x yr, 24 hr	WATER TEMPERATURE	K _s	SETTLING ZONE DEPTH (D _s)	W: L	OPTIMUM LOW-FLOW DECAN RATE	SELECTED LOW-FLOW DECAN RATE (Q _d)	MIN SETTLING ZONE VOLUME (Min V _s)	MIN SETTLING ZONE SURFACE AREA (Min A _s)	LIMITING CRITERIA
	(Ha)	(1: X YEARS)	(mm/hr)	(°C)	(s/m)	(m)	(1: X)	(L/s/Ha)	(L/s/Ha)	(m ³)	(m ²)	
LPoD-IB	13.352	I	4.53	20	11150	1.82	3.1	9	9	3325	1358	VOLUME

BASIN ID	SETTLING ZONE			FREE WATER ZONE		SEDIMENT STORAGE ZONE		OVERALL DIMENSIONS RELATIVE TO SPILLWAY CREST (EXCL. FOREBAY)			
	ACTUAL SETTLING ZONE VOLUME (V _s)	ACTUAL SETTLING ZONE AREA (A _s)	SCOUR VELOCITY	DEPTH OF FREE WATER ZONE	VOLUME OF FREE WATER ZONE	SEDIMENT STORAGE VOLUME	SEDIMENT STORAGE DEPTH (APPROX.)	BATTER	WIDTH	LENGTH	DEPTH
	(m ³)	(m ²)	(m/s)	(m)	(m ³)	(m ³)	(m)	(1: X)	(m)	(m)	(m)
LPoD-IB	3325	1827	0.008	0.35	333	998	0.83	3	29.74	92.19	3.00

BASIN ID	BASIN DESIGN LIFE	DESIGN ARI	SPILLWAY								
			C ₀	C	t _c	I	Q	HEAD OVER SPILLWAY	SPILLWAY CREST LENGTH	SPILLWAY CREST RL	MIN EMBANKMENT RL
						(mm/hr)	(m ³ /s)	(m)	(m)	(m)	(m)
LPoD-IB	> 12 MONTHS	1: 50	0.80	0.92	25.00	143.00	4.95	0.20	25.00	11.64	12.29

BASIN ID	FLOW RATE		FLUME DESIGN PARAMETERS				VELOCITY CHECK			OUTPUT PARAMETERS		
	BASIN DESIGN FLOW (m ³ /s)	FLUME DESIGN FLOW (m ³ /s)	BASE WIDTH (m)	SLIDE SLOPE (1: x)	LONGITUDINAL SLOPE (m/m)	FLUME LINING	MAX ALLOWABLE VELOCITY (m/s)	MANNINGS ROUGHNESS	VELOCITY (m/s)	FLOW DEPTH (m)	FLUME DEPTH (m)	CALCULATED FLOW (m ³ /s)
			b	x	s					d	y	
LPoD-IB	4.95	7.43	4.00	2.00	0.01	CONCRETE	5.00	0.013	3.817	0.42	0.57	7.76

BASIN ID	SETTLING ZONE (incl. sediment storage)				FOREBAY				HYDRAULIC CONTROLS						
	VOLUME (m ³)	LENGTH (m)	WIDTH (m)	DEPTH (m)	VOLUME (m ³)	LENGTH (m)	WIDTH (m)	DEPTH (m)	SPILLWAY CREST LENGTH (m)	SPILLWAY CREST (RL)	EMBANKMENT (RL)	CREST (RL)	FLUME BASE WIDTH (m)	FLUME BATTERS (X: 1)	FLUME DEPTH (m)
LPoD-IB	4323.1	92.2	29.7	3.00	822.44	9.2	29.7	3.00	25.0	11.64	12.29	11.84	4.0	2.0	0.6

Client:

Project:

VantageYatala
STAGE 2

Site Address:

60 STAPYLTON JACOBS WELL
ROAD, STAPYLTON QLD 4207

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DRAWING TITLE

CONSTRUCTION PHASE
SEDIMENT BASIN 1
LAYOUT SHEET 2 OF 4

Issue	Date	Information Request Response	Original Issue	BA	MG	DRN	CHK
B	15-02-2021						
A	20-11-2020						

SCALE IN METRES



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1:500 (HALF SIZE A3)

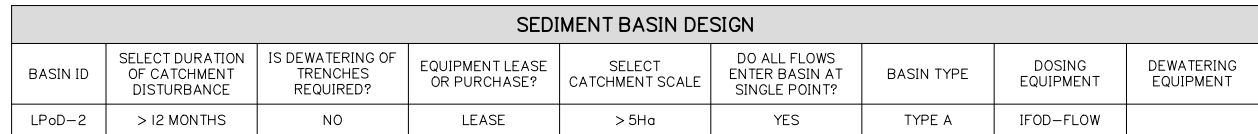
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Designed: IG
Drafted: BA
Approved: MG
RPEQ: 16939
Signed:
Date: 15-02-2021

Drawing No:
5941 ENG BE2 030

Rev. No:
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1. SEDIMENT AND EROSION CONTROL PLAN IS INDICATIVE ONLY. THE CONTRACTOR MUST TAKE ADDITIONAL MEASURES IF REQUIRED ON SITE DURING CONSTRUCTION AND MAINTENANCE PERIODS.
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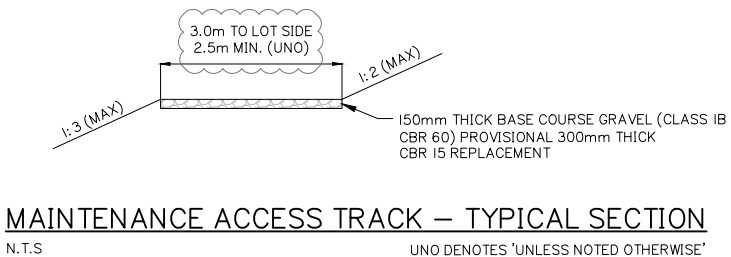
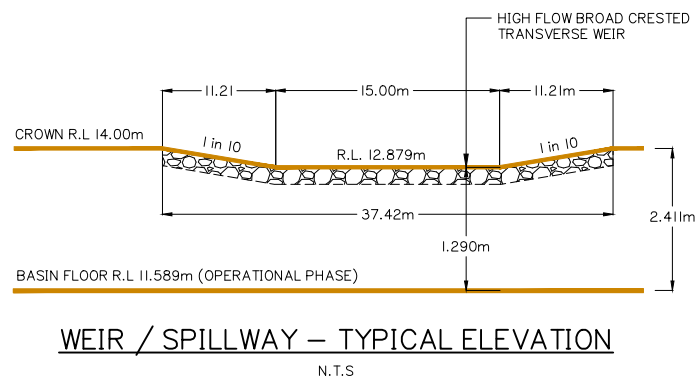
BASIN ID	CATCHMENT AREA	DESIGN EVENT	$I_{x \text{ yr}, 24 \text{ hr}}$	WATER TEMPERATURE	K_s	SETTLING ZONE DEPTH (D_s)	W:L	OPTIMUM LOW-FLOW DECAT RATE	SELECTED LOW-FLOW DECAT RATE (Q_d)	MIN SETTLLING ZONE VOLUME (Min V_s)	MIN SETTLLING ZONE SURFACE AREA (Min A_s)	LIMITING CRITERIA
	(Ha)	(1: X YEARS)	(mm/hr)	(°C)	(s/m)	(m)	(1: X)	(L/s/Ha)	(L/s/Ha)	(m^3)	(m^2)	
LPoD-2	9.904	I	4.53	20	III50	1.76	3	9	9	2434	994	VOLUME

	SETTLING ZONE			FREE WATER ZONE		SEDIMENT STORAGE ZONE		OVERALL DIMENSIONS RELATIVE TO SPILLWAY CREST (EXCL. FOREBAY)			
BASIN ID	ACTUAL SETTLING ZONE VOLUME (V_s)	ACTUAL SETTLING ZONE AREA (A_s)	SCOUR VELOCITY	DEPTH OF FREE WATER ZONE	VOLUME OF FREE WATER ZONE	SEDIMENT STORAGE VOLUME	SEDIMENT STORAGE DEPTH (APPROX.)	BATTER	WIDTH	LENGTH	DEPTH
	(m^3)	(m^2)	(m/s)	(m)	(m^3)	(m^3)	(m)	(1: X)	(m)	(m)	(m)
LPoD-2	2434	1383	0.007	0.35	243	730	0.89	3	26.75	80.25	3.00

BASIN ID	SPILLWAY										
	BASIN DESIGN LIFE	DESIGN ARI	C ₁₀	C	tc	I	Q	HEAD OVER SPILLWAY	SPILLWAY CREST LENGTH	SPILLWAY CREST RL	MIN EMBANKMENT RL
		yr				(mm/hr)	(m ³ /s)	(m)	(m)	(m)	(m)
LPoD-2	> 12 MONTHS	1: 50	0.80	0.92	25	143	3.62	0.20	15.0	12.879	13.529

BASIN ID	FLOW RATE		FLUME DESIGN PARAMETERS				VELOCITY CHECK			OUTPUT PARAMETERS		
	BASIN DESIGN FLOW (m³/s)	FLUME DESIGN FLOW (m³/s)	BASE WIDTH (m)	SLIDE SLOPE (1: x)	LONGITUDINAL SLOPE (m/m)	FLUME LINING	MAX ALLOWABLE VELOCITY (m/s)	MANNINGS ROUGHNESS	VELOCITY (m/s)	FLOW DEPTH (m)	FLUME DEPTH (m)	CALCULATED FLOW (m³/s)
			b	x	s					d	y	
LPoD-2	3.62	5.43	3.00	2.00	0.01	CONCRETE	5.00	0.013	3.515	0.42	0.57	5.67

BASIN ID	SETTLING ZONE (incl. sediment storage)				FOREBAY				HYDRAULIC CONTROLS						
	VOLUME (m³)	LENGTH (m)	WIDTH (m)	DEPTH (m)	VOLUME (m³)	LENGTH (m)	WIDTH (m)	DEPTH (m)	SPILLWAY CREST LENGTH (m)	SPILLWAY CREST (RL)	EMBANKMENT (RL)	CREST (RL)	FLUME BASE WIDTH (m)	FLUME BATTERS (X: 1)	FLUME DEPTH (m)
LPoD-2	3164.1	80.3	26.8	3.00	644.01	8.0	26.8	3.00	15.0	12.88	13.53	13.08	3.0	2.0	0.6



Client:



Project:

VantageYatala

STAGE 2

Site Address:

60 STAPYLTON JACOBS WELL
ROAD, STAPYLTON QLD 4207

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RPD:

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CONSTRUCTION PHASE
SEDIMENT BASIN 2
LAYOUT SHEET 4 OF 4

B	15-02-2021	INFORMATION REQUEST RESPONSE	IQ	MO
A	20-11-2020	ORIGINAL ISSUE	BA	MG
Issue	Date	Description	DRN	CHN

SCALE IN METRES



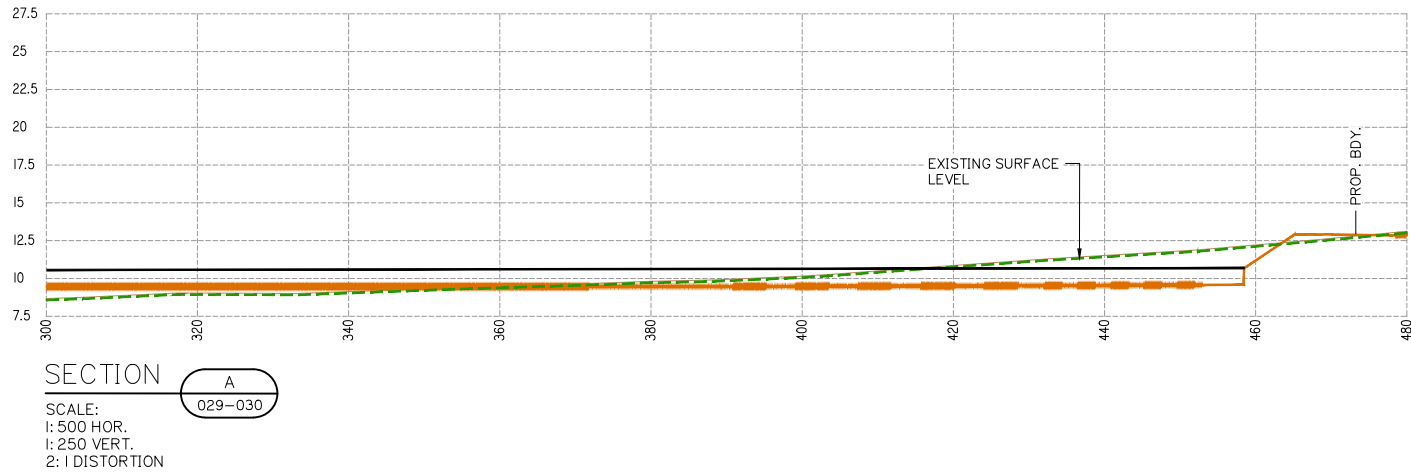
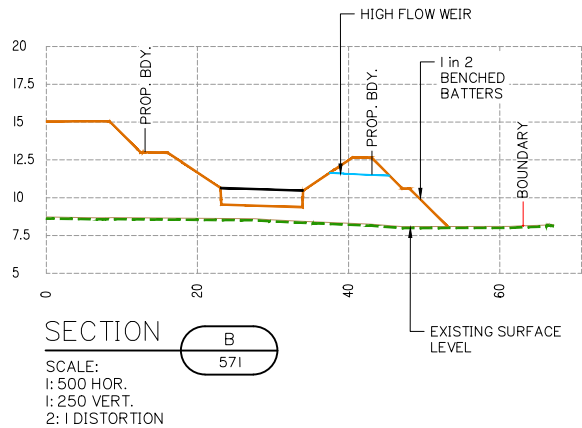
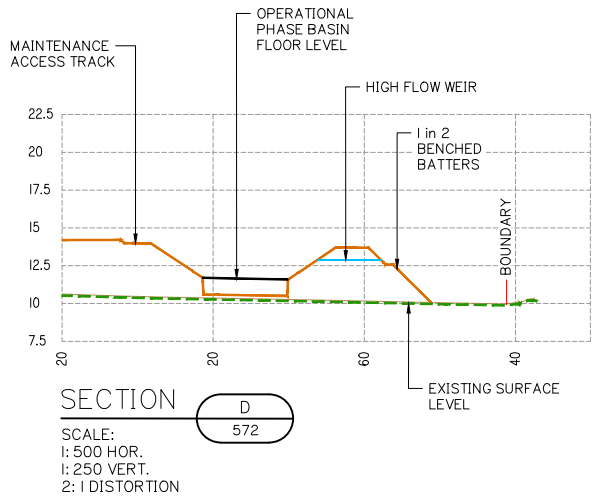
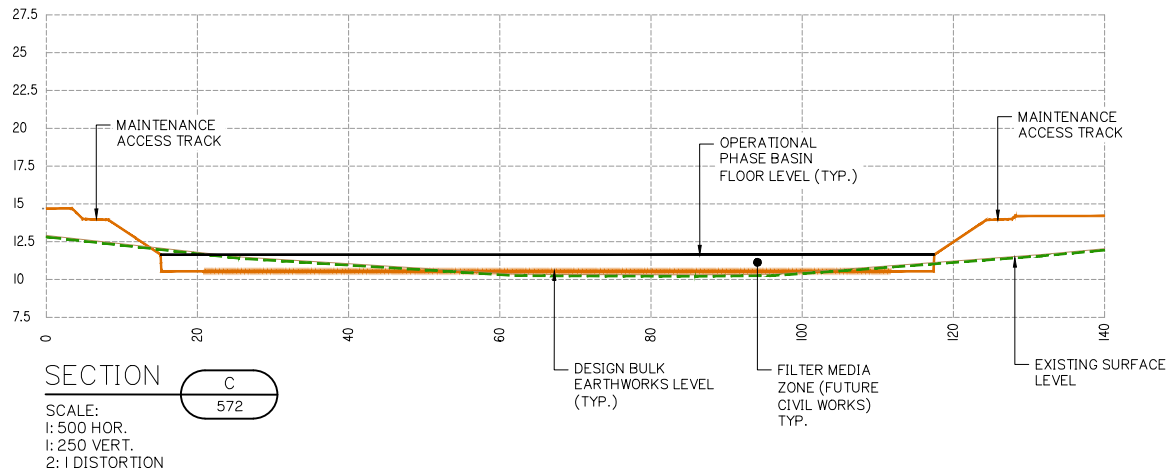
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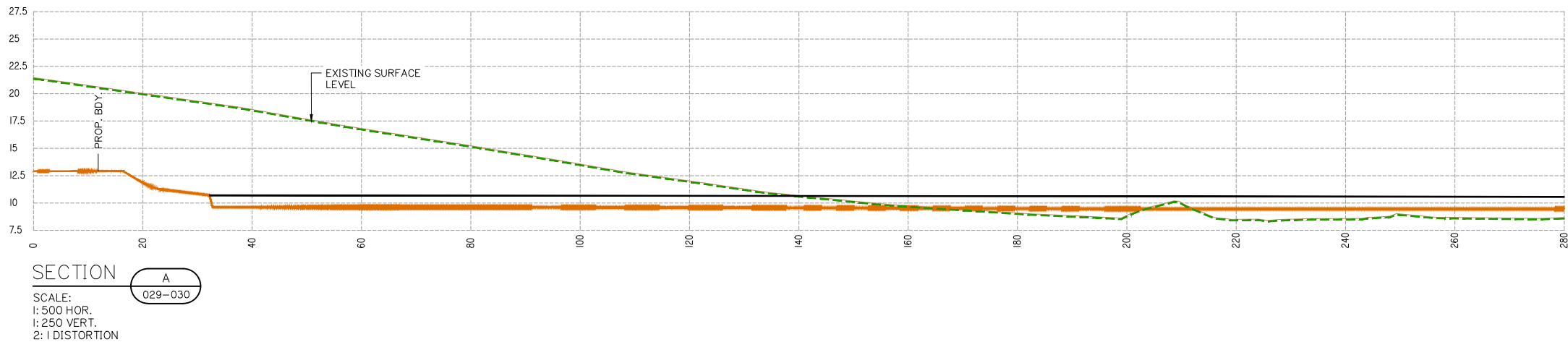
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Approved:	MG
RPEQ:	16939
Signed:	
Date:	15-02-2021

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5941 ENG BE2 032

Rev. No:
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NOTE:
I. SEDIMENT ACCUMULATION DEPTHS, FREE WATER ZONES, AND SETTLEMENT DEPTHS ARE OMITTED FROM CROSS SECTIONS FOR CLARITY. REFER TO CALCULATION TABLES ON DRAWINGS 5941 ENG BE2 029-032



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(AUSTRALIA) PTY. LTD.

Project:

VantageYatala
STAGE 2

Site Address:

60 STAPYLTON JACOBS WELL
ROAD, STAPYLTON QLD 4207

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DRAWING TITLE
CONSTRUCTION PHASE
SEDIMENT BASIN
SECTIONS

A	20-11-2020	ORIGINAL ISSUE	BA	MG
Issue	Date	Description	DRN	CHK

SCALE IN METRES



1:250 (FULL SIZE A1)
1:500 (HALF SIZE A3)

Scale at A1: 1:250

Designed:	IG
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Approved:	MG
RPEQ:	16939
Signed:	
Date:	20-11-2020

Drawing No:
5941 ENG BE2 033

Rev. No:
A

CONSTRUCTION PHASE SEDIMENT BASIN SECTIONS



Drawing No:	Rev. No:
5941 ENG BE2 034	A

Appendix E – MUSIC Catchment Plan

Appendix F – MUSIC Link Report

MUSIC-link Report

Project Details		Company Details	
Project:	5941 Frasers Property Yatala LPoD-1 (VANTAGE YATALA STAGE 2)	Company:	Frasers Property c/o Gassman Development Perspectives Pty. Ltd.
Report Export Date:	18/11/2020	Contact:	Mitchell Gassman
Catchment Name:	5941 CoGC Vantage	Address:	OFFICE: 76 Business Street Yatala 4207
Catchment Area:	36.599ha	Phone:	0738073333
Impervious Area*:	83.68%	Email:	mitchell@gassman.com.au
Rainfall Station:	40406 BEENLEIGH		
Modelling Time-step:	6 Minutes		
Modelling Period:	1/01/1990 - 31/12/1999 11:54:00 PM		
Mean Annual Rainfall:	1105mm		
Evapotranspiration:	1492mm		
MUSIC Version:	6.3.0		
MUSIC-link data Version:	6.32		
Study Area:	City of Gold Coast (North)		
Scenario:	City of Gold Coast (North)		

* takes into account area from all source nodes that link to the chosen reporting node, excluding Import Data Nodes

Treatment Train Effectiveness		Treatment Nodes		Source Nodes	
Node: LPoD-1	Reduction	Node Type	Number	Node Type	Number
Flow	3.56%	Bio Retention Node	1	Urban Source Node	8
TSS	81.5%				
TP	73.7%				
TN	52.7%				
GP	100%				

Comments

Bio retention basin
4000m2 filter media
700mm depth
200mm/hr SHC
Lot 119 and Lot 207 are included
Part of Stage 1 (DEV-1 part) diverted catchment (4.38Ha) is included
Part of Stage 1 catchment split: 2.140 Ha road, 1.311 Ha roof, 0.929 Ha ground (refer stage 1 approved MUSIC Link report)

Passing Parameters

Node Type	Node Name	Parameter	Min	Max	Actual
Bio	Bio-Retention Basin DEV-1 (4000m2 Filter)	Exfiltration Rate (mm/hr)	None	None	0
Bio	Bio-Retention Basin DEV-1 (4000m2 Filter)	Extended detention depth (m)	None	1	0.3
Bio	Bio-Retention Basin DEV-1 (4000m2 Filter)	Filter depth (m)	0.4	1	0.7
Bio	Bio-Retention Basin DEV-1 (4000m2 Filter)	Hi-flow bypass rate (cum/sec)	None	None	100
Bio	Bio-Retention Basin DEV-1 (4000m2 Filter)	Orthophosphate Content in Filter (mg/kg)	None	None	30
Bio	Bio-Retention Basin DEV-1 (4000m2 Filter)	PET Scaling Factor	2.1	2.1	2.1
Bio	Bio-Retention Basin DEV-1 (4000m2 Filter)	Saturated Hydraulic Conductivity (mm/hr)	50	200	200
Bio	Bio-Retention Basin DEV-1 (4000m2 Filter)	Total Nitrogen Content in Filter (mg/kg)	None	None	400
Receiving	LPoD-1	% Load Reduction	None	None	3.56
Receiving	LPoD-1	GP % Load Reduction	90	None	100
Receiving	LPoD-1	TN % Load Reduction	45	None	52.7
Receiving	LPoD-1	TP % Load Reduction	60	None	73.7
Receiving	LPoD-1	TSS % Load Reduction	80	None	81.5
Urban	CoGC - 20m Buffer to Landfill (1.271 Ha)	Area Impervious (ha)	None	None	0
Urban	CoGC - 20m Buffer to Landfill (1.271 Ha)	Area Pervious (ha)	None	None	1.271
Urban	CoGC - 20m Buffer to Landfill (1.271 Ha)	Total Area (ha)	None	None	1.271
Urban	CoGC - Drainage Reserve & Basin (1.310 Ha)	Area Impervious (ha)	None	None	0.260
Urban	CoGC - Drainage Reserve & Basin (1.310 Ha)	Area Pervious (ha)	None	None	1.049
Urban	CoGC - Drainage Reserve & Basin (1.310 Ha)	Total Area (ha)	None	None	1.31
Urban	CoGC - Industrial GROUND (4.177 Ha)	Area Impervious (ha)	None	None	2.497
Urban	CoGC - Industrial GROUND (4.177 Ha)	Area Pervious (ha)	None	None	1.679
Urban	CoGC - Industrial GROUND (4.177 Ha)	Total Area (ha)	None	None	4.177
Urban	CoGC - Industrial Lot 119 (0.382 Ha)	Area Impervious (ha)	None	None	0.306
Urban	CoGC - Industrial Lot 119 (0.382 Ha)	Area Pervious (ha)	None	None	0.075
Urban	CoGC - Industrial Lot 119 (0.382 Ha)	Total Area (ha)	None	None	0.382
Urban	CoGC - Industrial Lot 207 (0.235 Ha)	Area Impervious (ha)	None	None	0.188
Urban	CoGC - Industrial Lot 207 (0.235 Ha)	Area Pervious (ha)	None	None	0.046
Urban	CoGC - Industrial Lot 207 (0.235 Ha)	Total Area (ha)	None	None	0.235
Urban	CoGC - Industrial LOT HARDSTAND DEV-1 (10.456 Ha)	Area Impervious (ha)	None	None	9.365
Urban	CoGC - Industrial LOT HARDSTAND DEV-1 (10.456 Ha)	Area Pervious (ha)	None	None	1.090
Urban	CoGC - Industrial LOT HARDSTAND DEV-1 (10.456 Ha)	Total Area (ha)	None	None	10.45
Urban	CoGC - Industrial ROAD RESERVE DEV-1 (3.012 Ha)	Area Impervious (ha)	None	None	2.255
Urban	CoGC - Industrial ROAD RESERVE DEV-1 (3.012 Ha)	Area Pervious (ha)	None	None	0.756
Urban	CoGC - Industrial ROAD RESERVE DEV-1 (3.012 Ha)	Total Area (ha)	None	None	3.012
Urban	CoGC - Industrial ROOF DEV-1 (15.756 Ha)	Area Impervious (ha)	None	None	15.756
Urban	CoGC - Industrial ROOF DEV-1 (15.756 Ha)	Area Pervious (ha)	None	None	0
Urban	CoGC - Industrial ROOF DEV-1 (15.756 Ha)	Total Area (ha)	None	None	15.756

Only certain parameters are reported when they pass validation

Appendix G – WSUD Bio Retention Basin Maintenance Checklists

BIORETENTION BASIN CONSTRUCTION INSPECTION CHECKLIST											
Asset I.D.					Inspected By:						
Site:					Date:						
					Time:						
Constructed By:					Weather:						
					Contact During Visit:						
Items inspected		Checked		Satisfactory		Items inspected		Checked		Satisfactory	
		Y	N	Y	N			Y	N	Y	N
DURING CONSTRUCTION & ESTABLISHMENT											
A. FUNCTIONAL INSTALLATION						Structural components					
Preliminary Works						15. Location and configuration of inflow systems as designed					
1. Erosion and sediment control plan adopted						16. Location and levels of overflow pits as designed					
2. Temporary traffic/safety control measures						17. Under-drainage connected to overflow pits as designed					
3. Location same as plans						18. Concrete and reinforcement as designed					
4. Site protection from existing flows						19. Set down to correct level for flush kerbs (streetscape applications only)					
Earthworks and Filter Media						20. Kerb opening width as designed					
5. Bed of basin correct shape and slope											
6. Batter slopes as plans						B. SEDIMENT & EROSION CONTROL (IF REQUIRED)					
7. Dimensions of bioretention area as plans						21. Stabilisation immediately following earthworks and planting of terrestrial landscape around basin					
8. Confirm surrounding soil type with design						22. Silt fences and traffic control in place					
9. Confirm filter media specification in accordance with Step 4						23. Temporary protection layers in place					
9. Provision of liner (if required)											
10. Under-drainage installed as designed						C. OPERATIONAL ESTABLISHMENT					
11. Drainage layer media as designed						24. Temporary protection layers and associated silt removed					
12. Transition layer media as designed (if required)						Vegetation					
14. Extended detention depth as designed						25. Planting as designed (species and densities)					
						26. Weed removal and watering as required					
FINAL INSPECTION											
1. Confirm levels of inlets and outlets						6. Check for uneven settling of banks					
2. Confirm structural element sizes						7. Under-drainage working					
3. Check batter slopes						8. Inflow systems working					
4. Vegetation as designed						9. Maintenance access provided					
5. Bioretention filter media surface flat and free of clogging											
COMMENTS ON INSPECTION											
ACTIONS REQUIRED											
Inspection officer signature:											

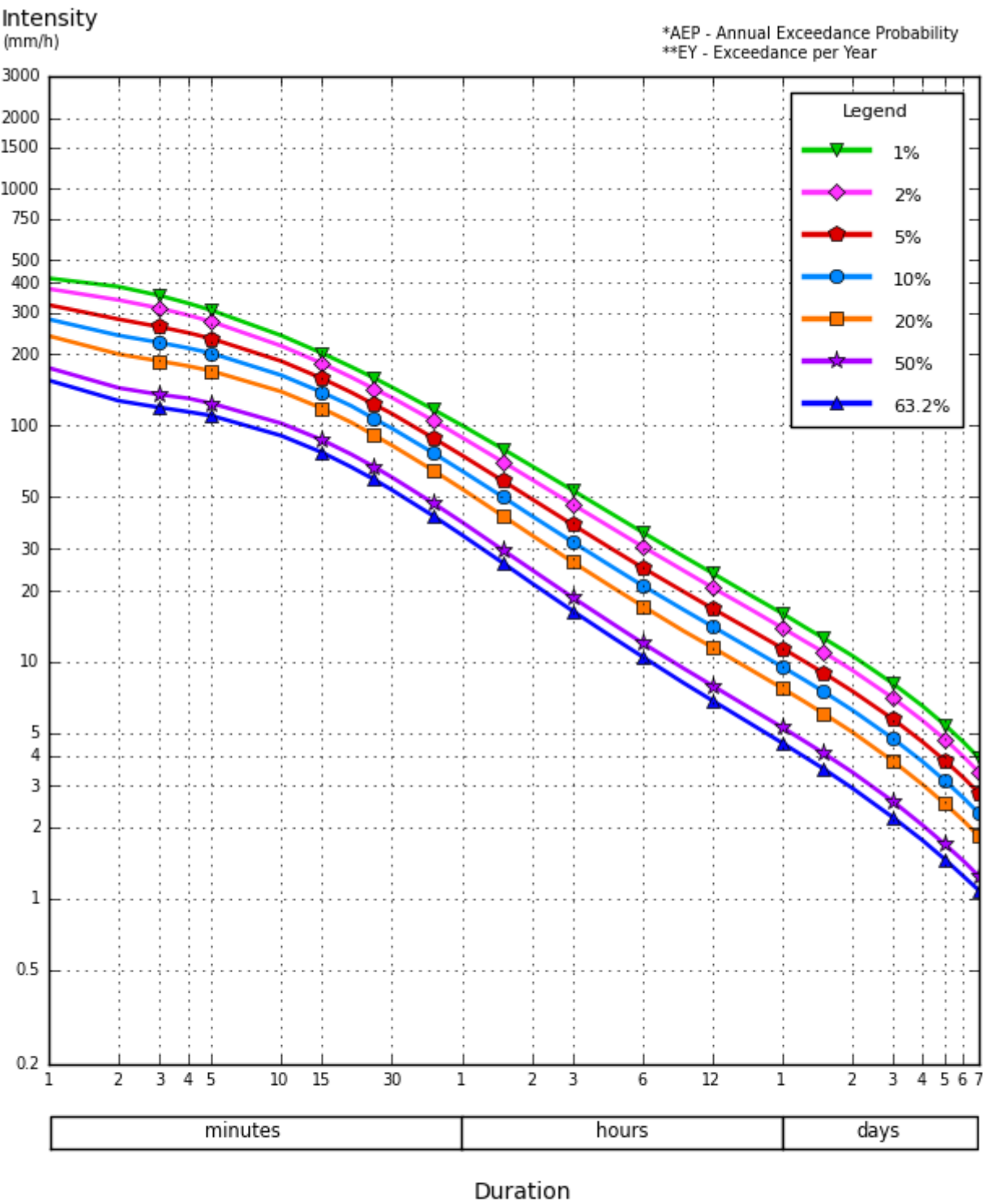
BIORETENTION BASIN MAINTENANCE CHECKLIST			
Inspection Frequency:	1 to 6 monthly	Date of Visit:	
Location:			
Description:			
Asset I.D.			
Site Visit by:			
INSPECTION ITEMS:	Y	N	Action Required (details)
Sediment accumulation at inflow points?			
Litter within basin?			
Erosion at inlet or other key structures?			
Traffic damage present?			
Evidence of dumping (e.g. building waste)?			
Vegetation condition satisfactory (density, weeds etc)?			
Watering of vegetation required?			
Replanting required?			
Mowing/slashing required?			
Clogging of drainage points (sediment or debris)?			
Evidence of ponding?			
Damage/vandalism to structures present?			
Surface clogging visible?			
Drainage system inspected?			
Resetting of system required?			
COMMENTS			

BIORETENTION BASIN ASSET TRANSFER CHECKLIST			
Asset I.D.			
Asset Location:			
Construction by:			
'On-maintenance' Period:			
TREATMENT	Y	N	
System appears to be working as designed visually?			
No obvious signs of under-performance?			
MAINTENANCE	Y	N	
Maintenance plans and indicative maintenance costs provided for each asset?			
Vegetation establishment period completed (2 years)?			
Inspection and maintenance undertaken as per maintenance plan?			
Inspection and maintenance forms provided?			
ASSET INSPECTED FOR DEFECTS AND/OR MAINTENANCE ISSUES AT TIME OF ASSET TRANSFER	Y	N	
Sediment accumulation at inflow points?			
Litter within basin?			
Erosion at inlet or other key structures?			
Traffic damage present?			
Evidence of dumping (e.g. building waste)?			
Vegetation condition satisfactory (density, weeds etc)?			
Watering of vegetation required?			
Replanting required?			
Mowing/slashing required?			
Clogging of drainage points (sediment or debris)?			
Evidence of ponding?			
Damage/vandalism to structures present?			
Surface clogging visible?			
Drainage system inspected?			
COMMENTS/ACTIONS REQUIRED FOR ASSET TRANSFER			
ASSET INFORMATION	Y	N	
Design Assessment Checklist provided?			
As constructed plans provided?			
Copies of all required permits (both construction and operational) submitted?			
Proprietary information provided (if applicable)?			
Digital files (e.g. drawings, survey, models) provided?			
Asset listed on asset register or database?			

Appendix H – Bureau of Meteorology Rainfall Data

Unit:

mm/h ▾



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Location

Label: Vantage Yatala Stage 2

Latitude: -27.736 [Nearest grid cell: 27.7375 ([S](#))]

Longitude:153.238 [Nearest grid cell: 153.2375 ([E](#))]

IFD Design Rainfall Intensity (mm/h)

Issued: 26 May 2020

Rainfall intensity for Durations, Exceedance per Year (EY), and Annual Exceedance Probabilities (AEP).
[FAQ for New ARR probability terminology](#)

	Annual Exceedance Probability (AEP)						
Duration	63.2%	50%#	20%*	10%	5%	2%	1%
1 min	155	175	239	281	323	378	419
2 min	127	144	200	240	281	339	386
3 min	119	135	187	224	261	313	354
4 min	114	130	178	212	246	292	328
5 min	110	124	170	202	233	275	307
10 min	90.5	102	139	163	187	217	240
15 min	76.8	86.8	118	138	158	183	202
20 min	66.7	75.5	103	121	138	160	177
25 min	59.2	67.0	91.1	107	123	143	159
30 min	53.3	60.3	82.3	97.1	112	131	145
45 min	41.5	47.0	64.6	76.6	88.6	105	117
1 hour	34.4	39.0	53.9	64.2	74.7	88.9	100
1.5 hour	26.2	29.7	41.4	49.8	58.3	70.1	79.5
2 hour	21.5	24.5	34.3	41.4	48.8	59.0	67.3
3 hour	16.4	18.7	26.4	32.1	38.0	46.3	53.1
4.5 hour	12.6	14.4	20.5	25.0	29.7	36.4	41.8
6 hour	10.5	12.0	17.2	21.0	25.0	30.7	35.3
9 hour	8.14	9.38	13.5	16.6	19.8	24.3	27.9
12 hour	6.85	7.92	11.5	14.1	16.8	20.6	23.7
18 hour	5.38	6.24	9.11	11.2	13.4	16.4	18.8
24 hour	4.53	5.27	7.72	9.51	11.4	13.9	16.0
30 hour	3.95	4.60	6.76	8.35	10.0	12.2	14.0
36 hour	3.53	4.11	6.05	7.48	8.98	11.0	12.6
48 hour	2.92	3.41	5.04	6.24	7.51	9.20	10.6
72 hour	2.19	2.56	3.79	4.72	5.71	7.01	8.07
96 hour	1.76	2.04	3.03	3.79	4.59	5.65	6.51
120 hour	1.46	1.69	2.51	3.14	3.82	4.70	5.41
144 hour	1.24	1.44	2.13	2.66	3.24	3.98	4.58
168 hour	1.08	1.24	1.83	2.29	2.79	3.42	3.93

Note:

The 50% AEP IFD **does not** correspond to the 2 year Average Recurrence Interval (ARI) IFD. Rather it corresponds to the 1.44 ARI.

* The 20% AEP IFD **does not** correspond to the 5 year Average Recurrence Interval (ARI) IFD. Rather it corresponds to the 4.48 ARI.

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Location

Label: Vantage Yatala Stage 2

Latitude: -27.736 [Nearest grid cell: 27.7375 ([S](#))]

Longitude:153.238 [Nearest grid cell: 153.2375 ([E](#))]

Very Frequent Design Rainfall Intensity (mm/h)

Issued: 26 May 2020

Rainfall intensity for Durations, Exceedance per Year (EY), and Annual Exceedance Probabilities (AEP).
[FAQ for New ARR probability terminology](#)

	Exceedance per Year (EY)							
Duration	12EY	6EY	4EY	3EY	2EY	1EY	0.5EY#	0.2EY*
1 min	65.1	75.1	92.3	105	123	155	194	243
2 min	56.3	64.3	78.2	87.9	102	127	160	204
3 min	52.3	60.0	73.4	82.8	96.2	119	150	191
4 min	49.2	56.8	69.8	79.0	92.0	114	144	182
5 min	46.4	53.9	66.6	75.6	88.2	110	138	174
10 min	36.6	43.0	53.9	61.6	72.4	90.5	114	142
15 min	30.3	35.8	45.2	51.8	61.1	76.8	96.4	120
20 min	26.0	30.8	39.0	44.8	53.0	66.7	83.8	105
25 min	22.9	27.1	34.4	39.6	46.8	59.2	74.4	93.0
30 min	20.5	24.3	30.9	35.5	42.1	53.3	67.0	83.9
45 min	15.8	18.7	23.8	27.4	32.6	41.5	52.2	65.9
1 hour	12.9	15.4	19.6	22.6	26.9	34.4	43.3	54.9
1.5 hour	9.73	11.5	14.7	17.0	20.3	26.2	33.0	42.3
2 hour	7.92	9.39	12.0	13.9	16.6	21.5	27.2	35.0
3 hour	5.93	7.03	9.00	10.4	12.5	16.4	20.8	27.0
4.5 hour	4.46	5.29	6.79	7.91	9.54	12.6	16.0	20.9
6 hour	3.66	4.35	5.60	6.53	7.91	10.5	13.3	17.6
9 hour	2.79	3.32	4.29	5.02	6.11	8.14	10.4	13.8
12 hour	2.31	2.76	3.57	4.19	5.11	6.85	8.79	11.7
18 hour	1.78	2.13	2.77	3.26	3.99	5.38	6.93	9.29
24 hour	1.48	1.77	2.31	2.73	3.35	4.53	5.85	7.87
30 hour	1.28	1.54	2.01	2.37	2.91	3.95	5.11	6.90
36 hour	1.14	1.36	1.79	2.11	2.59	3.53	4.56	6.17
48 hour	0.935	1.12	1.47	1.74	2.14	2.92	3.78	5.14
72 hour	0.696	0.837	1.10	1.30	1.60	2.19	2.84	3.87
96 hour	0.553	0.666	0.876	1.04	1.28	1.76	2.27	3.09
120 hour	0.456	0.549	0.724	0.859	1.06	1.46	1.88	2.56
144 hour	0.385	0.464	0.613	0.730	0.906	1.24	1.60	2.17
168 hour	0.330	0.399	0.528	0.631	0.785	1.08	1.38	1.87

Note:

The 0.5 EY design rainfall corresponds to the 2 year Average Recurrence Interval (ARI) IFD **not** the 50% AEP IFD.

* The 0.2 EY design rainfall corresponds to the 5 year Average Recurrence Interval (ARI) IFD **not** the 20% AEP IFD.

This page was created at **06:10 on Tuesday 26 May 2020 (UTC)**

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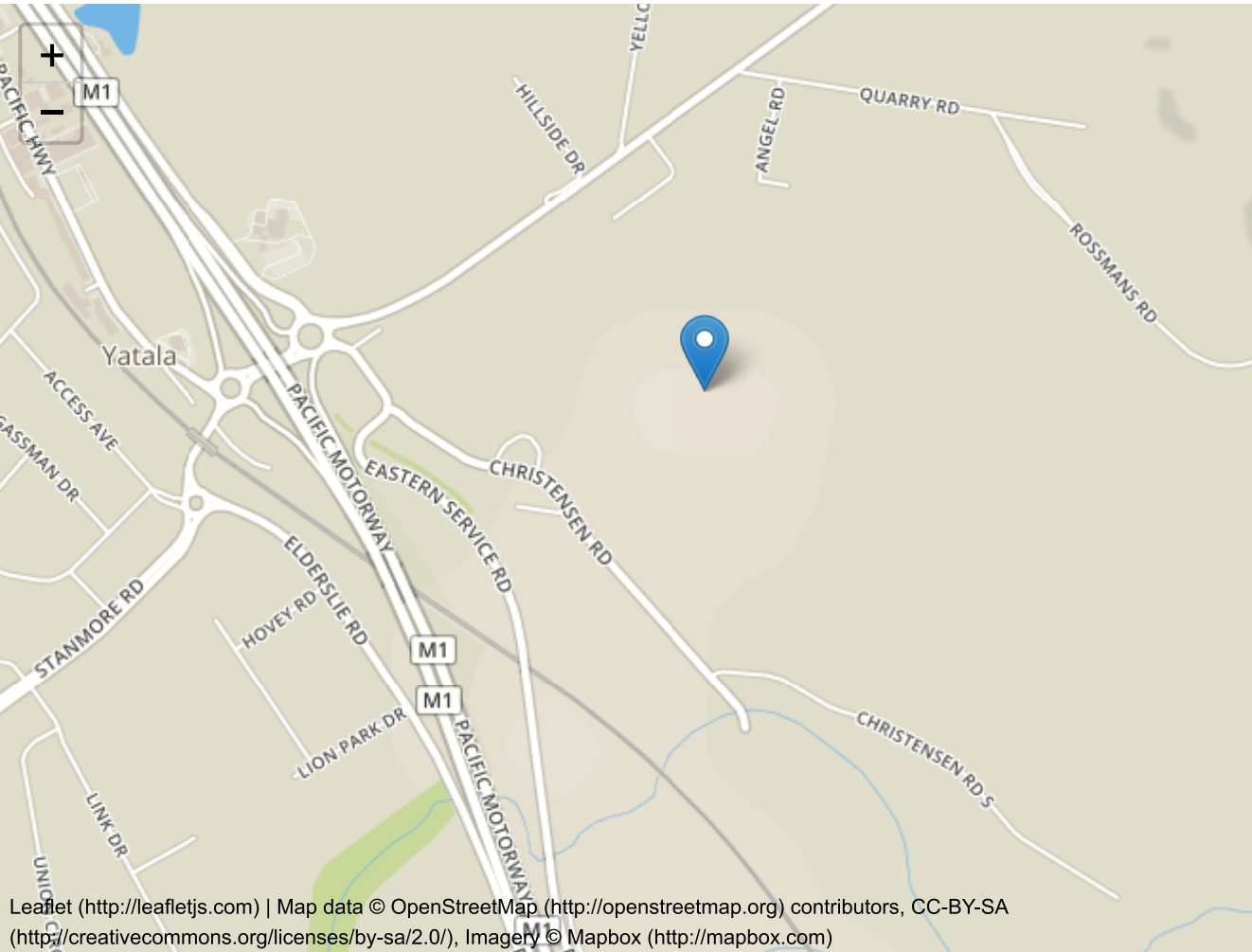
Appendix I – AR&R Storm & Loss Data

ATTENTION: This site was updated recently, changing some of the functionality. Please see the changelog ([./changelog](#)) for further information

Australian Rainfall & Runoff Data Hub - Results

Input Data

Longitude	153.238
Latitude	-27.736
Selected Regions (clear)	
River Region	show
ARF Parameters	show
Storm Losses	show
Temporal Patterns	show
Areal Temporal Patterns	show
BOM IFDs	show
Median Preburst Depths and Ratios	show
10% Preburst Depths	show
25% Preburst Depths	show
75% Preburst Depths	show
90% Preburst Depths	show
Interim Climate Change Factors	show
Baseflow Factors	show



Data

River Region

Division	North East Coast
River Number	45
River Name	Logan-Albert Rivers

Layer Info

Time Accessed	26 November 2019 12:45PM
Version	2016_v1

ARF Parameters

$$ARF = Min \left\{ 1, \left[1 - a \left(Area^b - c \log_{10} Duration \right) Duration^{-d} \right. \right. \\ \left. \left. + e Area^f Duration^g \left(0.3 + \log_{10} AEP \right) \right. \right. \\ \left. \left. + h 10^{i Area \frac{Duration}{1440}} \left(0.3 + \log_{10} AEP \right) \right] \right\}$$

Zone	a	b	c	d	e	f	g	h	i
East Coast North	0.327	0.241	0.448	0.36	0.00096	0.48	-0.21	0.012	-0.0013

Short Duration ARF

$$ARF = Min \left[1, 1 - 0.287 \left(Area^{0.265} - 0.439 \log_{10} (Duration) \right) . Duration^{-0.36} \right. \\ \left. + 2.26 \times 10^{-3} \times Area^{0.226} . Duration^{0.125} \left(0.3 + \log_{10} (AEP) \right) \right. \\ \left. + 0.0141 \times Area^{0.213} \times 10^{-0.021 \frac{(Duration-180)^2}{1440}} \left(0.3 + \log_{10} (AEP) \right) \right]$$

Layer Info

Time Accessed	26 November 2019 12:45PM
Version	2016_v1

Storm Losses

Note: Burst Loss = Storm Loss - Preburst

Note: These losses are only for rural use and are **NOT FOR DIRECT USE** in urban areas

ID	27987.0
Storm Initial Losses (mm)	27.0
Storm Continuing Losses (mm/h)	1.6

Layer Info

Time Accessed	26 November 2019 12:45PM
Version	2016_v1

Temporal Patterns | Download (.zip) (static/temporal_patterns/TP/ECnorth.zip)

code	ECnorth
Label	East Coast North

Layer Info

Time Accessed	26 November 2019 12:45PM
Version	2016_v2

Areal Temporal Patterns | Download (.zip)
(./static/temporal_patterns/Areal/Areal_ECnorth.zip)

code	ECnorth
arealabel	East Coast North

Layer Info

Time Accessed	26 November 2019 12:45PM
---------------	--------------------------

Version	2016_v2
---------	---------

BOM IFDs

Click here (http://www.bom.gov.au/water/designRainfalls/revised-ifd/?year=2016&coordinate_type=dd&latitude=-27.736&longitude=153.238&sdmin=true&sdhr=true&sdday=true&user_label=) to obtain the IFD depths for catchment centroid from the BoM website

Layer Info

Time Accessed	26 November 2019 12:45PM
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Median Preburst Depths and Ratios

Values are of the format depth (ratio) with depth in mm

min (h)\AEP(%)	50	20	10	5	2	1
60 (1.0)	2.5 (0.064)	4.6 (0.085)	6.0 (0.093)	7.3 (0.098)	8.7 (0.098)	9.8 (0.098)
90 (1.5)	2.8 (0.063)	10.7 (0.172)	15.9 (0.213)	20.9 (0.239)	16.8 (0.160)	13.8 (0.115)
120 (2.0)	2.6 (0.053)	9.9 (0.144)	14.8 (0.178)	19.4 (0.199)	20.9 (0.177)	21.9 (0.163)
180 (3.0)	3.8 (0.067)	13.4 (0.169)	19.8 (0.205)	25.9 (0.227)	32.8 (0.236)	38.0 (0.238)
360 (6.0)	5.8 (0.080)	19.3 (0.187)	28.2 (0.223)	36.8 (0.245)	64.4 (0.350)	85.1 (0.401)
720 (12.0)	6.0 (0.063)	19.6 (0.142)	28.6 (0.169)	37.2 (0.184)	61.7 (0.250)	80.1 (0.282)
1080 (18.0)	7.1 (0.063)	15.9 (0.097)	21.8 (0.108)	27.3 (0.113)	47.7 (0.162)	63.0 (0.186)
1440 (24.0)	7.0 (0.055)	12.7 (0.069)	16.5 (0.072)	20.2 (0.074)	32.0 (0.096)	40.9 (0.107)
2160 (36.0)	0.0 (0.000)	6.6 (0.030)	10.9 (0.041)	15.1 (0.047)	28.6 (0.072)	38.8 (0.086)
2880 (48.0)	0.0 (0.000)	5.5 (0.023)	9.1 (0.030)	12.6 (0.035)	23.2 (0.053)	31.1 (0.061)
4320 (72.0)	0.0 (0.000)	0.9 (0.003)	1.4 (0.004)	2.0 (0.005)	10.2 (0.020)	16.3 (0.028)

Layer Info

Time Accessed	26 November 2019 12:45PM
Version	2018_v1
Note	Preburst interpolation methods for catchment wide preburst has been slightly altered. Point values remain unchanged.

10% Preburst Depths

Values are of the format depth (ratio) with depth in mm

min (h)\AEP(%)	50	20	10	5	2	1
60 (1.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
90 (1.5)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
120 (2.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
180 (3.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
360 (6.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
720 (12.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.9 (0.004)	1.5 (0.005)
1080 (18.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
1440 (24.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
2160 (36.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
2880 (48.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
4320 (72.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)

Layer Info

Time Accessed	26 November 2019 12:45PM
Version	2018_v1
Note	Preburst interpolation methods for catchment wide preburst has been slightly altered. Point values remain unchanged.

25% Preburst Depths

Values are of the format depth (ratio) with depth in mm

min (h)\AEP(%)	50	20	10	5	2	1
60 (1.0)	0.1 (0.003)	0.3 (0.005)	0.4 (0.006)	0.5 (0.007)	0.7 (0.008)	0.9 (0.009)
90 (1.5)	0.0 (0.000)	0.7 (0.011)	1.2 (0.016)	1.6 (0.019)	1.0 (0.009)	0.5 (0.004)
120 (2.0)	0.0 (0.000)	1.2 (0.017)	2.0 (0.024)	2.7 (0.028)	1.7 (0.014)	1.0 (0.007)
180 (3.0)	0.0 (0.000)	0.9 (0.012)	1.6 (0.016)	2.2 (0.019)	3.6 (0.026)	4.7 (0.029)
360 (6.0)	0.0 (0.000)	1.8 (0.017)	2.9 (0.023)	4.0 (0.027)	5.6 (0.030)	6.8 (0.032)
720 (12.0)	0.0 (0.000)	2.5 (0.018)	4.2 (0.025)	5.8 (0.029)	20.8 (0.084)	32.0 (0.113)
1080 (18.0)	0.0 (0.000)	2.2 (0.013)	3.7 (0.018)	5.1 (0.021)	9.5 (0.032)	12.7 (0.038)
1440 (24.0)	0.0 (0.000)	0.3 (0.002)	0.5 (0.002)	0.7 (0.002)	6.9 (0.021)	11.6 (0.030)
2160 (36.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	1.7 (0.004)	3.0 (0.007)
2880 (48.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	2.0 (0.005)	3.5 (0.007)
4320 (72.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)

Layer Info

Time Accessed	26 November 2019 12:45PM
Version	2018_v1
Note	Preburst interpolation methods for catchment wide preburst has been slightly altered. Point values remain unchanged.

75% Preburst Depths

Values are of the format depth (ratio) with depth in mm

min (h)\AEP(%)	50	20	10	5	2	1
60 (1.0)	26.3 (0.675)	35.6 (0.661)	41.8 (0.650)	47.7 (0.639)	45.7 (0.514)	44.2 (0.441)
90 (1.5)	25.6 (0.573)	56.5 (0.909)	77.0 (1.031)	96.6 (1.105)	96.4 (0.917)	96.2 (0.806)
120 (2.0)	27.1 (0.554)	61.6 (0.896)	84.3 (1.017)	106.2 (1.089)	143.2 (1.213)	171.0 (1.270)
180 (3.0)	39.7 (0.708)	71.9 (0.907)	93.3 (0.969)	113.7 (0.999)	150.7 (1.085)	178.5 (1.120)
360 (6.0)	36.5 (0.507)	70.0 (0.678)	92.2 (0.730)	113.4 (0.755)	146.0 (0.792)	170.3 (0.803)
720 (12.0)	27.3 (0.287)	66.3 (0.481)	92.0 (0.544)	116.8 (0.578)	175.7 (0.710)	219.8 (0.773)
1080 (18.0)	37.0 (0.329)	56.1 (0.342)	68.7 (0.340)	80.8 (0.335)	114.2 (0.387)	139.2 (0.411)
1440 (24.0)	31.0 (0.245)	46.9 (0.253)	57.4 (0.251)	67.5 (0.247)	91.4 (0.274)	109.3 (0.285)
2160 (36.0)	10.3 (0.070)	30.1 (0.138)	43.1 (0.160)	55.7 (0.172)	89.0 (0.225)	114.0 (0.251)
2880 (48.0)	6.0 (0.037)	30.3 (0.125)	46.4 (0.155)	61.8 (0.171)	89.8 (0.203)	110.8 (0.219)
4320 (72.0)	0.1 (0.000)	17.4 (0.064)	28.9 (0.085)	40.0 (0.097)	57.9 (0.115)	71.4 (0.123)

Layer Info

Time Accessed	26 November 2019 12:45PM
Version	2018_v1
Note	Preburst interpolation methods for catchment wide preburst has been slightly altered. Point values remain unchanged.

90% Preburst Depths

Values are of the format depth (ratio) with depth in mm

min (h)\AEP(%)	50	20	10	5	2	1
60 (1.0)	69.8 (1.790)	104.6 (1.942)	127.6 (1.987)	149.7 (2.005)	191.9 (2.160)	223.6 (2.234)
90 (1.5)	118.2 (2.648)	152.7 (2.458)	175.6 (2.353)	197.6 (2.261)	245.2 (2.333)	280.9 (2.354)
120 (2.0)	99.3 (2.026)	145.0 (2.112)	175.3 (2.115)	204.4 (2.096)	264.9 (2.244)	310.3 (2.304)
180 (3.0)	130.9 (2.333)	181.1 (2.284)	214.4 (2.227)	246.3 (2.163)	291.9 (2.102)	326.0 (2.046)
360 (6.0)	106.3 (1.476)	150.2 (1.455)	179.2 (1.420)	207.1 (1.378)	259.5 (1.409)	298.8 (1.409)
720 (12.0)	75.3 (0.792)	135.6 (0.984)	175.5 (1.037)	213.8 (1.059)	267.1 (1.080)	307.1 (1.080)
1080 (18.0)	86.2 (0.767)	131.6 (0.802)	161.6 (0.801)	190.4 (0.790)	215.9 (0.732)	235.1 (0.694)
1440 (24.0)	73.3 (0.580)	110.6 (0.597)	135.3 (0.593)	159.0 (0.582)	201.0 (0.602)	232.5 (0.607)
2160 (36.0)	38.4 (0.260)	82.9 (0.380)	112.3 (0.417)	140.6 (0.435)	184.6 (0.467)	217.5 (0.480)
2880 (48.0)	25.8 (0.158)	81.8 (0.338)	118.8 (0.396)	154.3 (0.428)	180.1 (0.408)	199.4 (0.393)
4320 (72.0)	6.5 (0.035)	44.8 (0.164)	70.2 (0.206)	94.5 (0.230)	107.5 (0.213)	117.2 (0.202)

Layer Info

Time Accessed	26 November 2019 12:45PM
Version	2018_v1
Note	Preburst interpolation methods for catchment wide preburst has been slightly altered. Point values remain unchanged.

Interim Climate Change Factors

	RCP 4.5	RCP6	RCP 8.5
2030	0.869 (4.3%)	0.783 (3.9%)	0.983 (4.9%)
2040	1.057 (5.3%)	1.014 (5.1%)	1.349 (6.8%)
2050	1.272 (6.4%)	1.236 (6.2%)	1.773 (9.0%)
2060	1.488 (7.5%)	1.458 (7.4%)	2.237 (11.5%)
2070	1.676 (8.5%)	1.691 (8.6%)	2.722 (14.2%)
2080	1.810 (9.2%)	1.944 (9.9%)	3.209 (16.9%)
2090	1.862 (9.5%)	2.227 (11.5%)	3.679 (19.7%)

Layer Info

Time Accessed	26 November 2019 12:45PM
Version	2019_v1
Note	ARR recommends the use of RCP4.5 and RCP 8.5 values. These have been updated to the values that can be found on the climate change in Australia website.

Baseflow Factors

Downstream	0
Area (km2)	3779.48325962
Catchment Number	7250
Volume Factor	0.150296
Peak Factor	0.04523

Layer Info

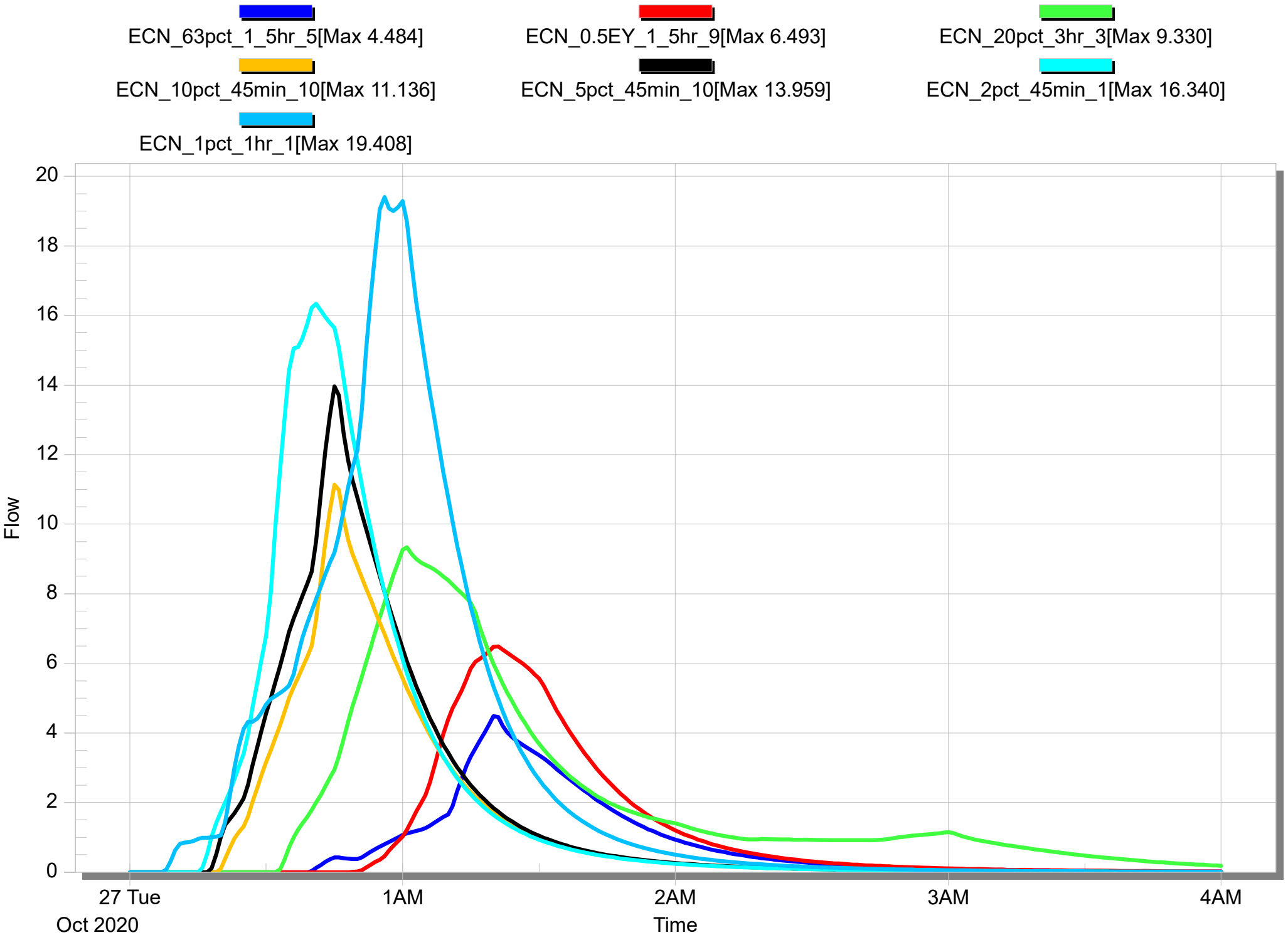
Time Accessed	26 November 2019 12:45PM
Version	2016_v1

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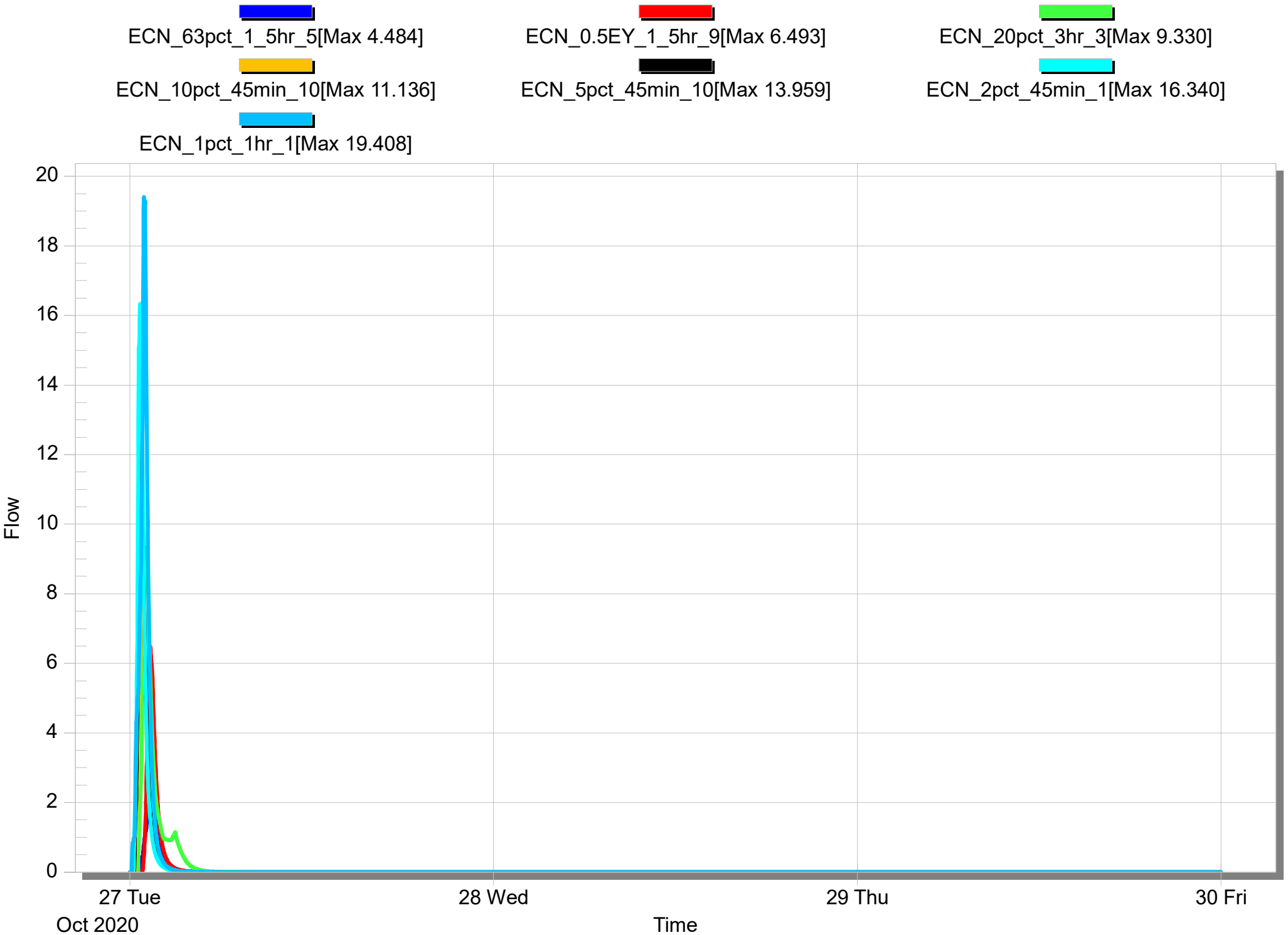
Appendix J – Proposed Reconfiguration of Lot Plan (ROL)

Appendix K – Pre and Post Development Peak Flow Hydrographs

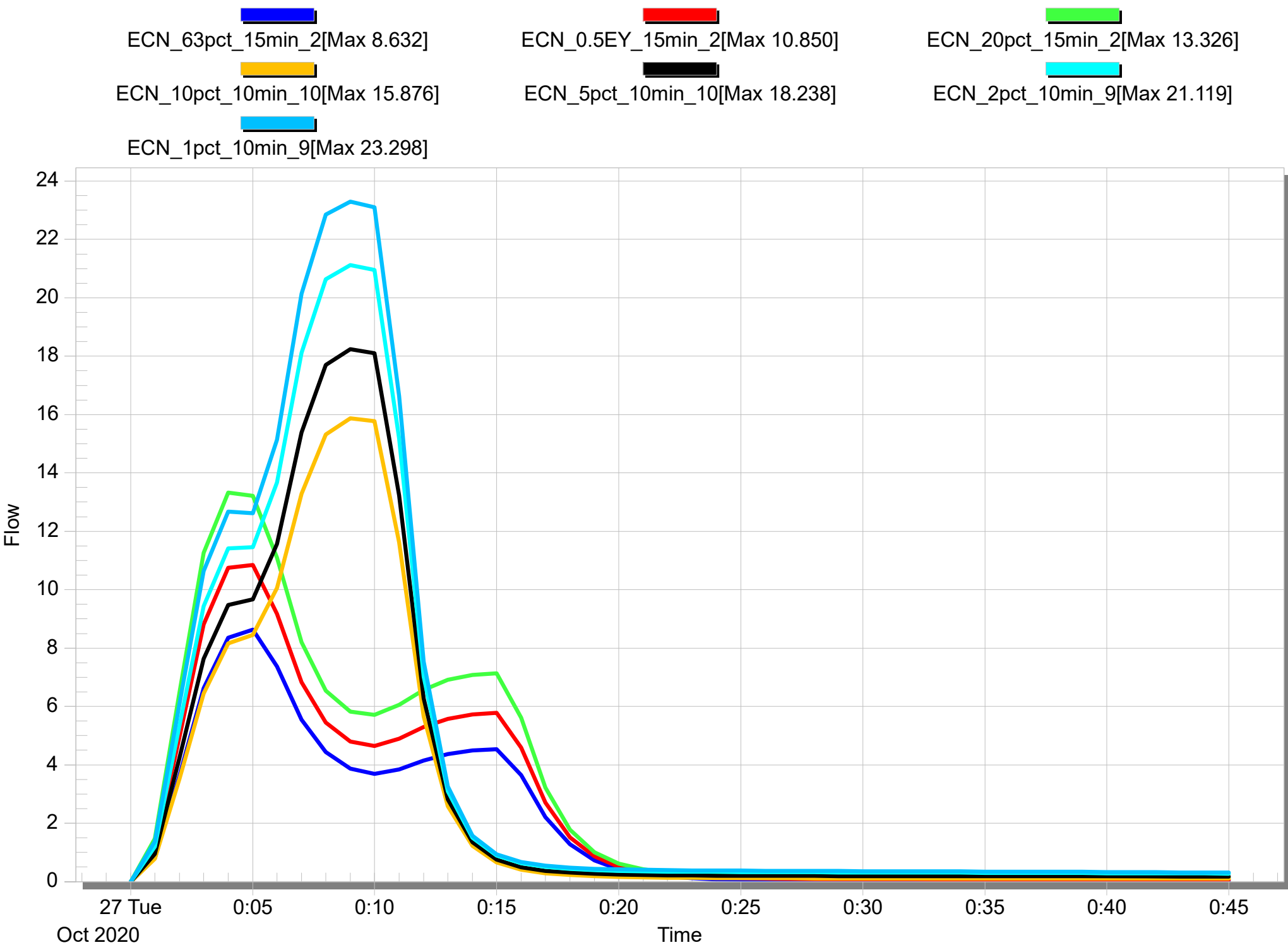
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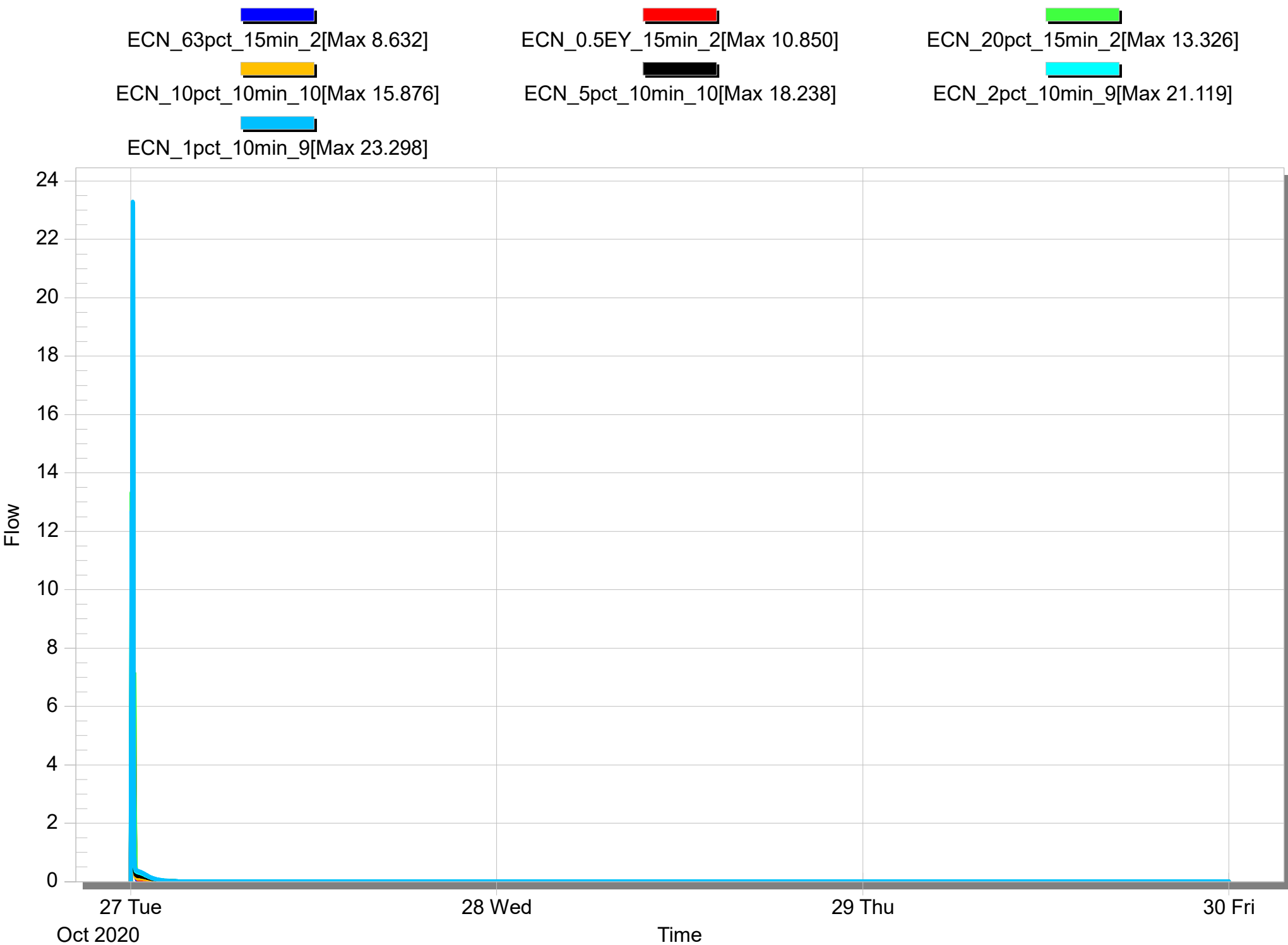
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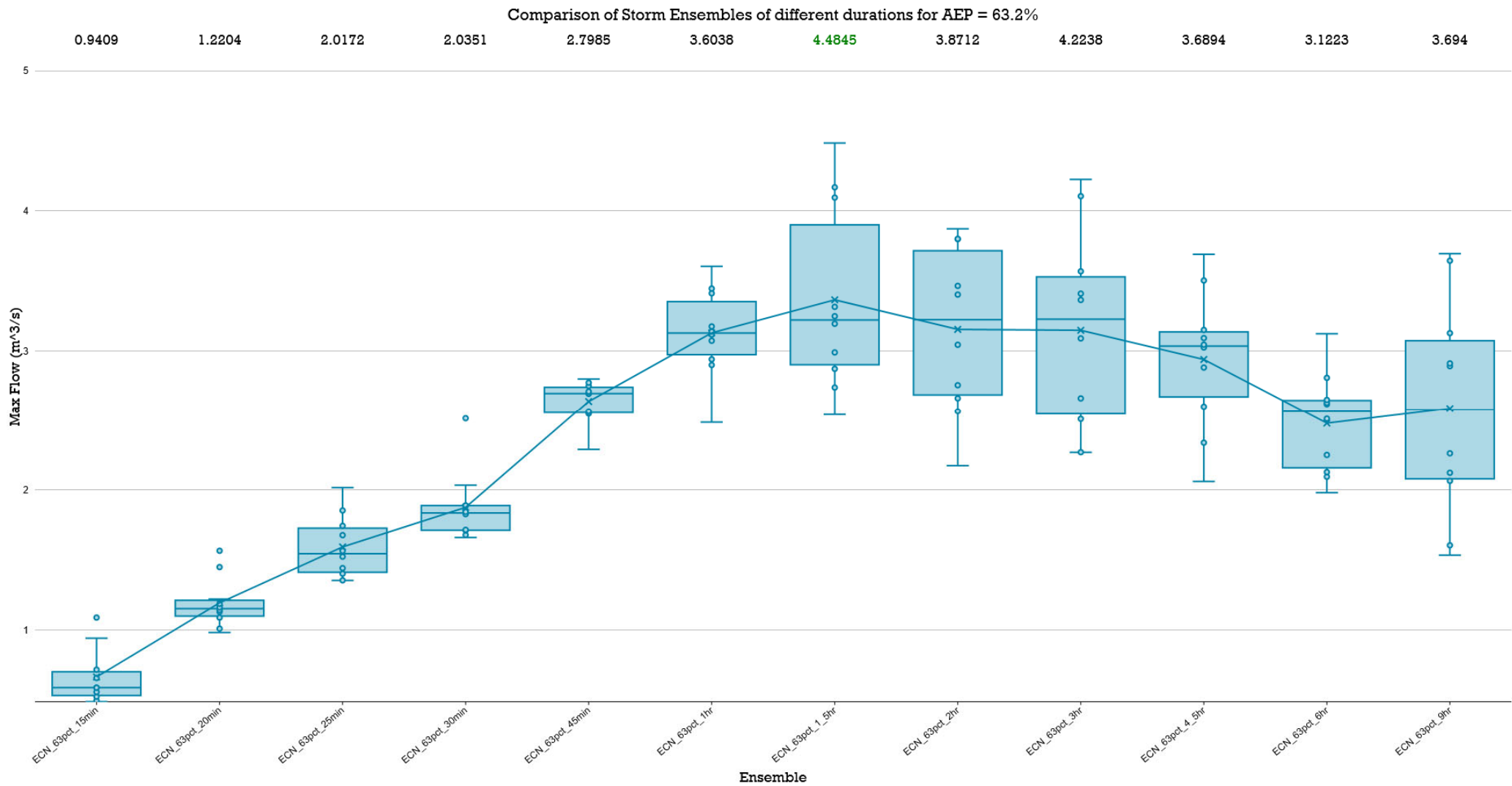
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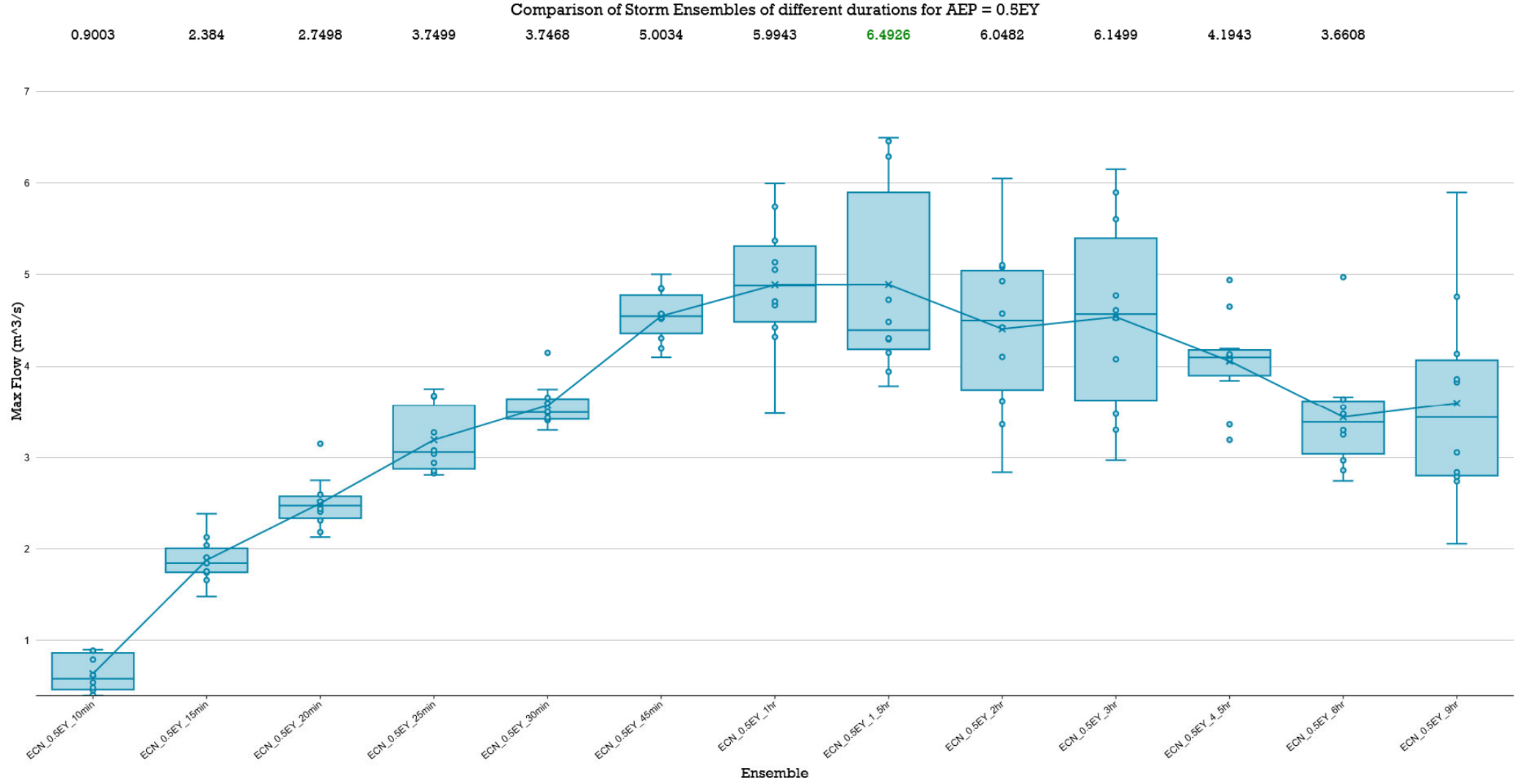


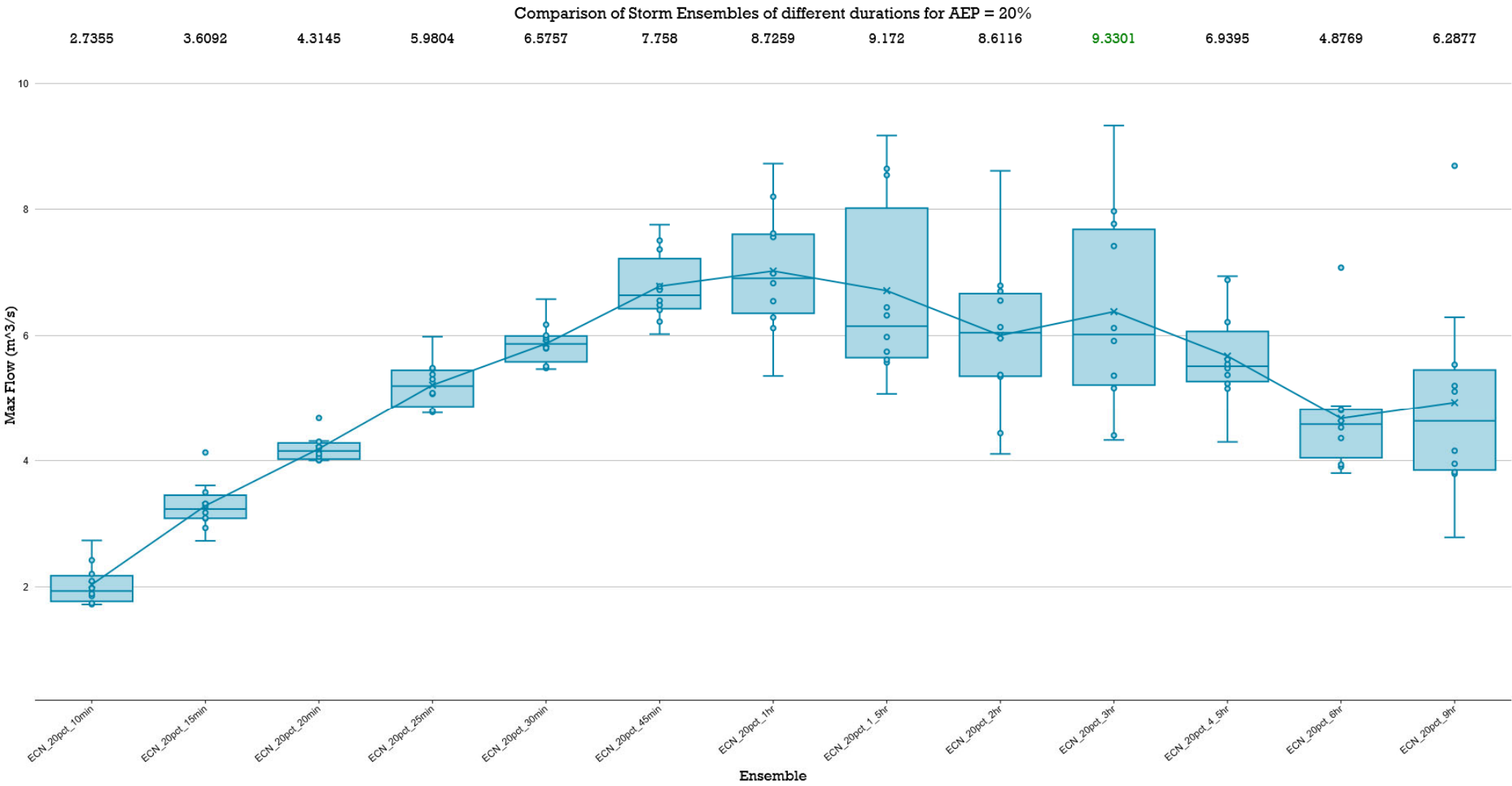
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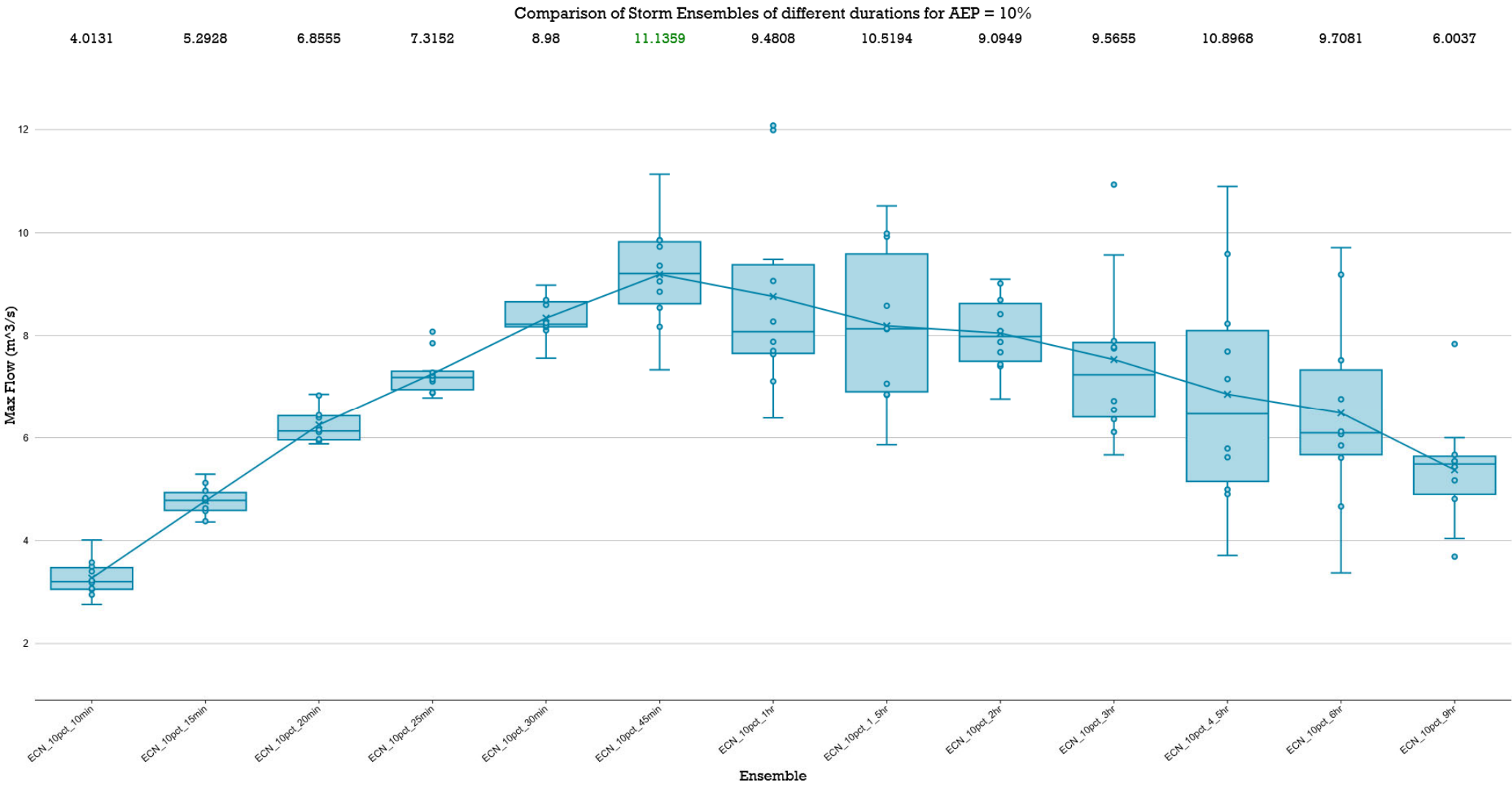


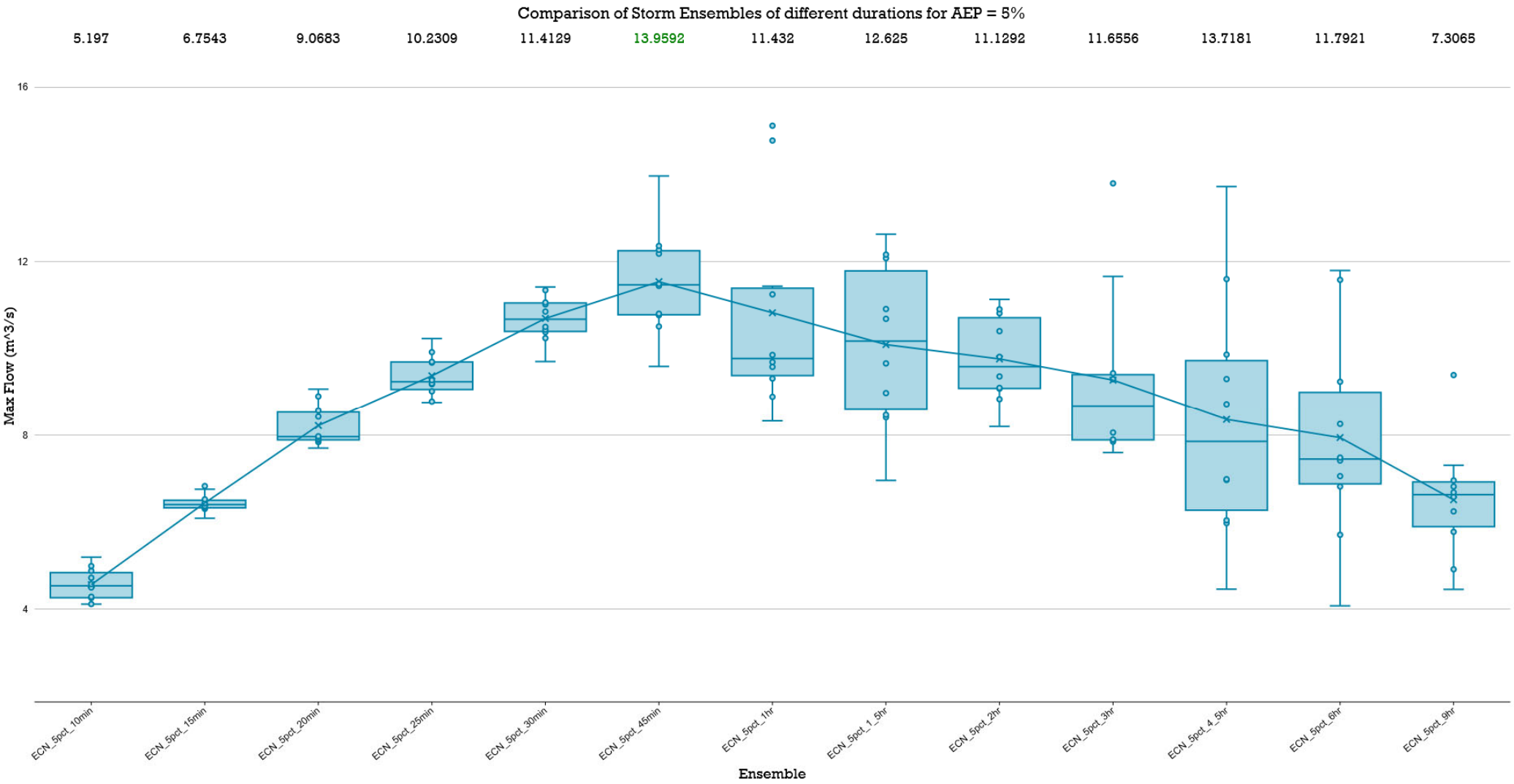
Appendix L – Peak Flow Box & Whisker Plots

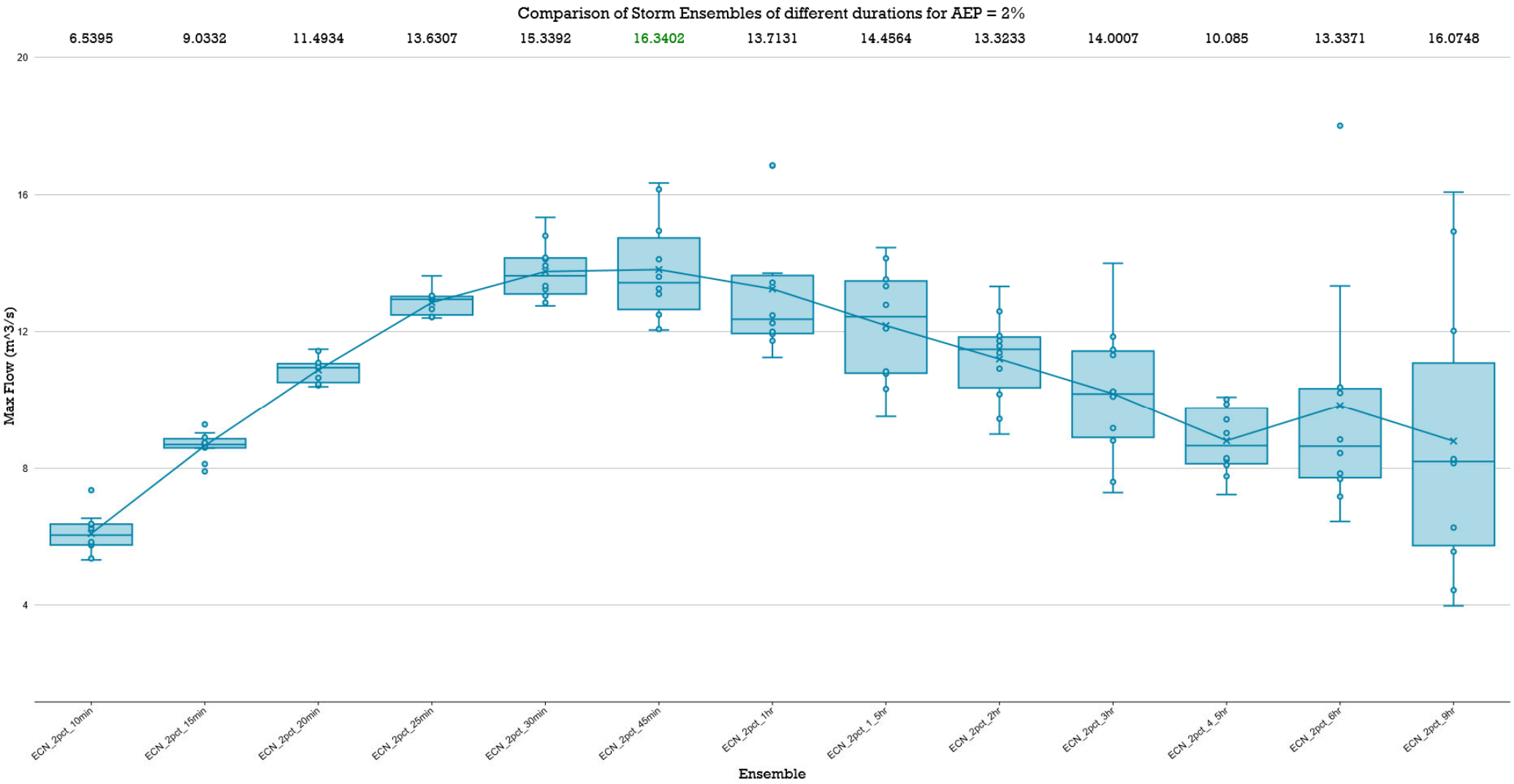


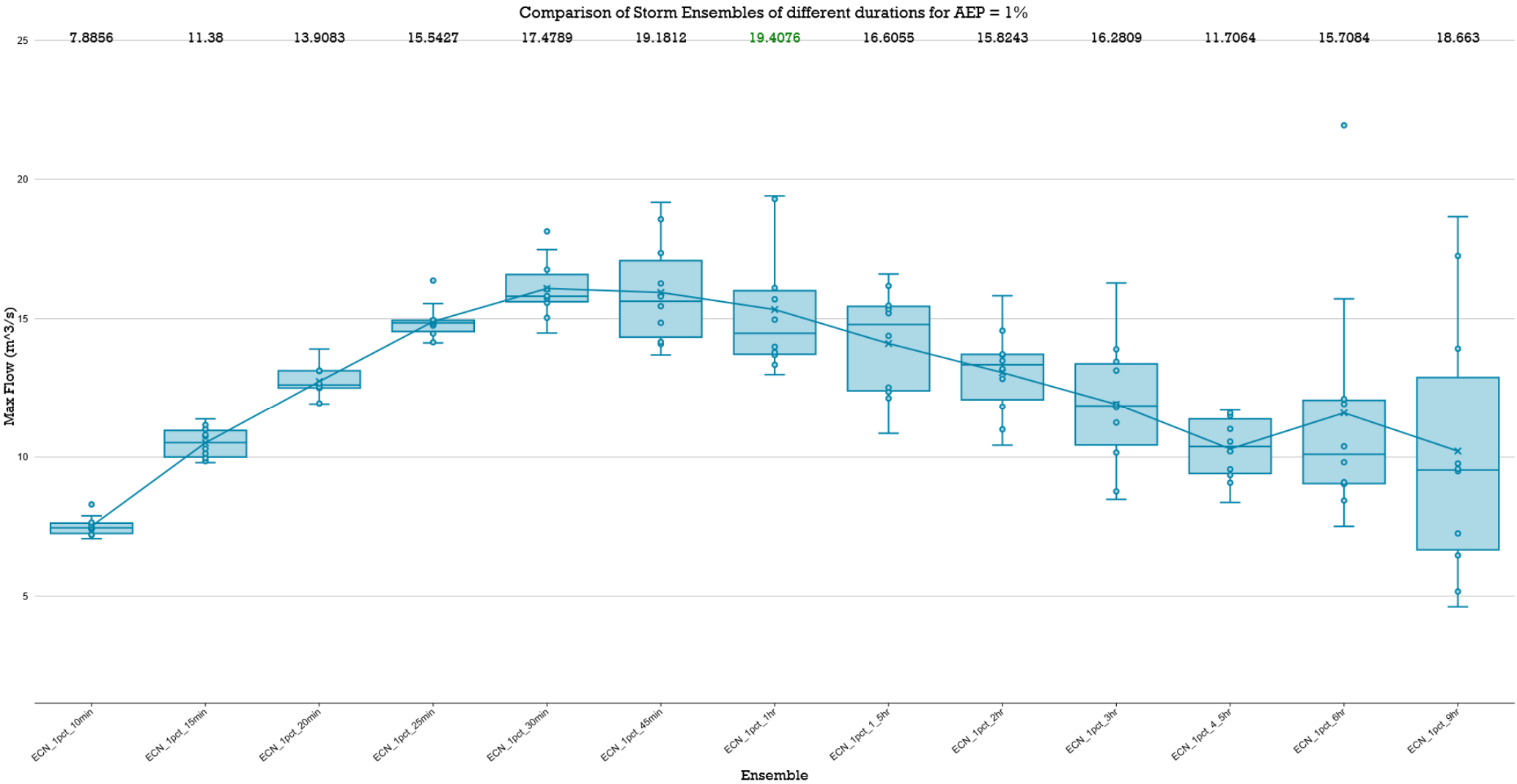


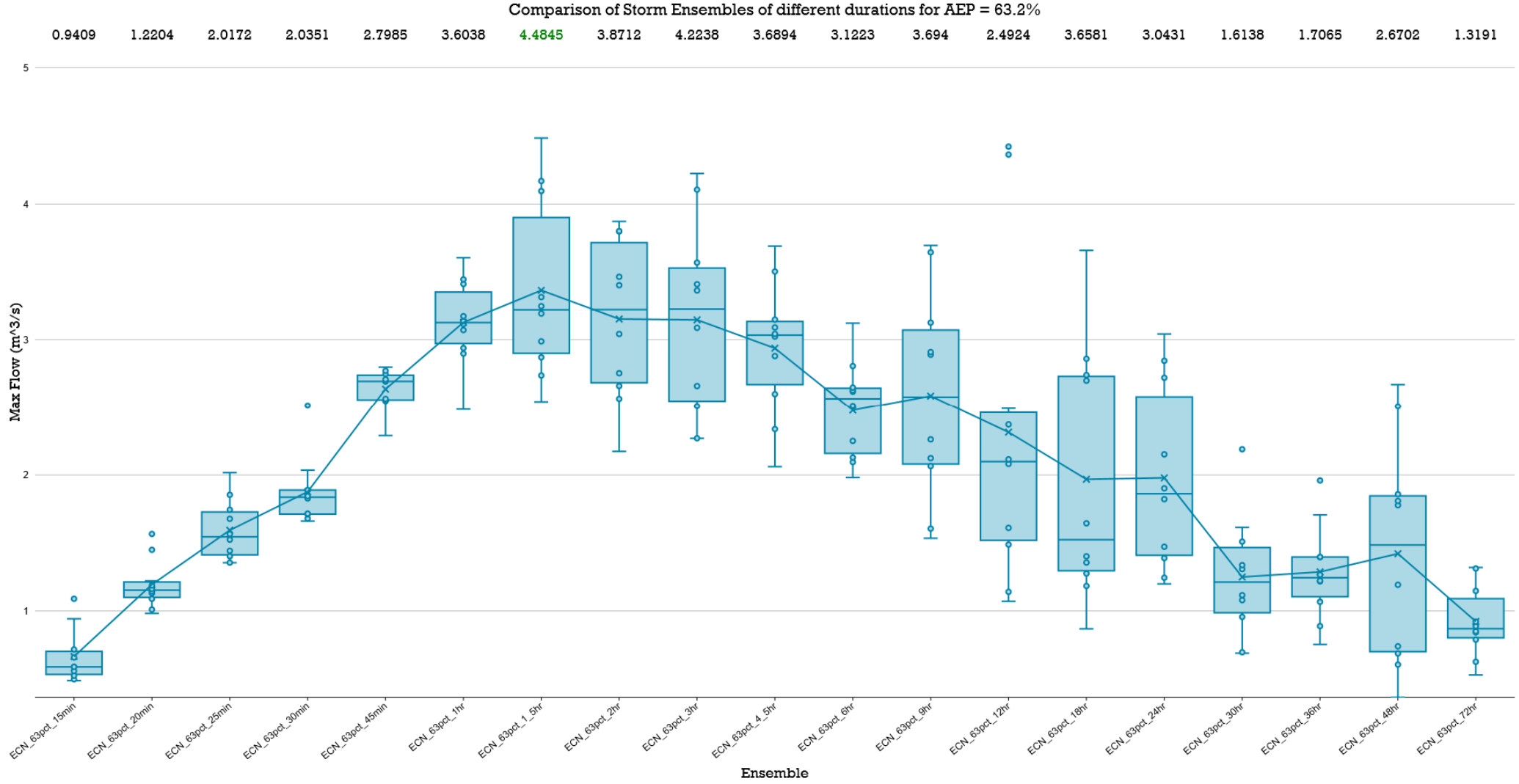


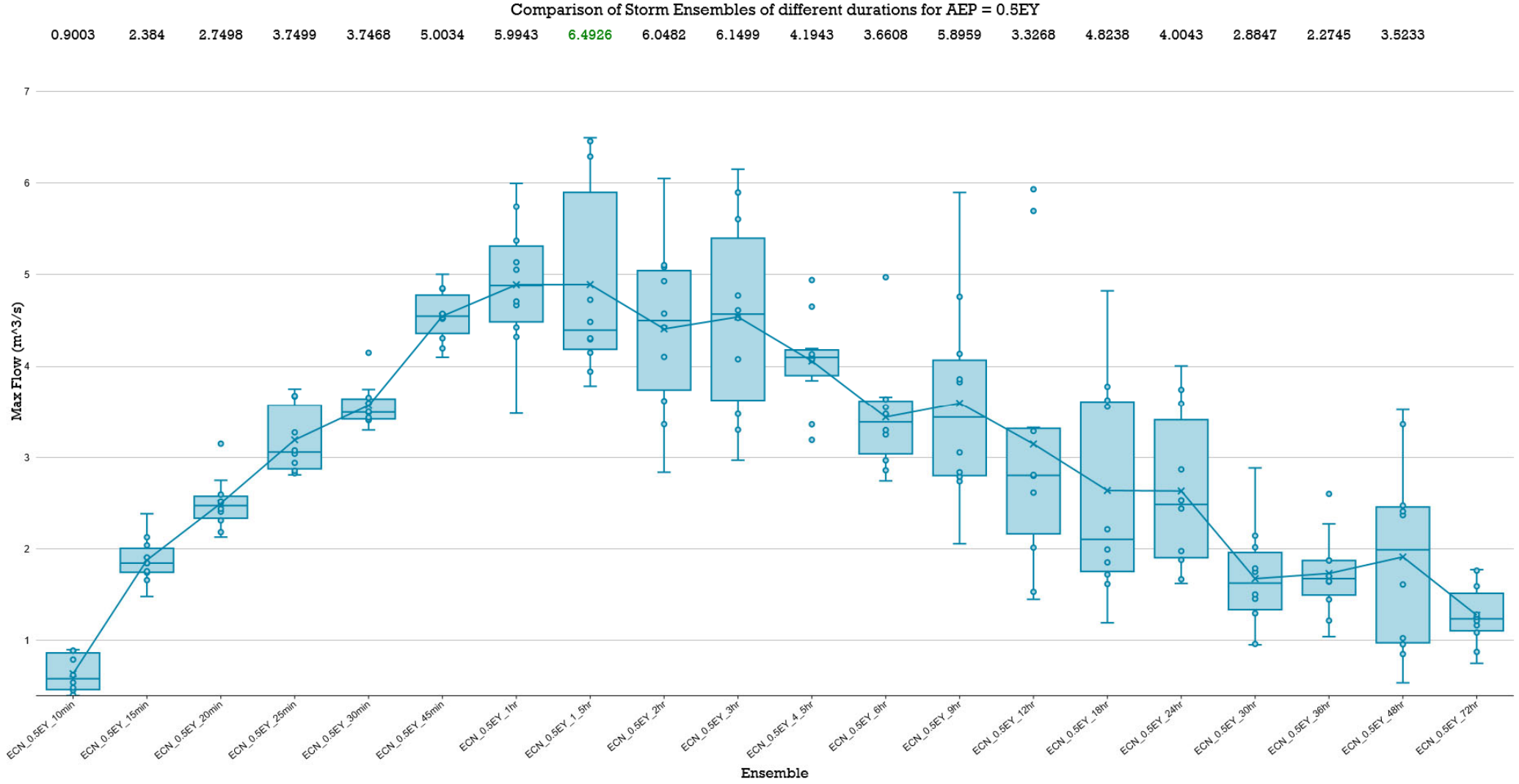


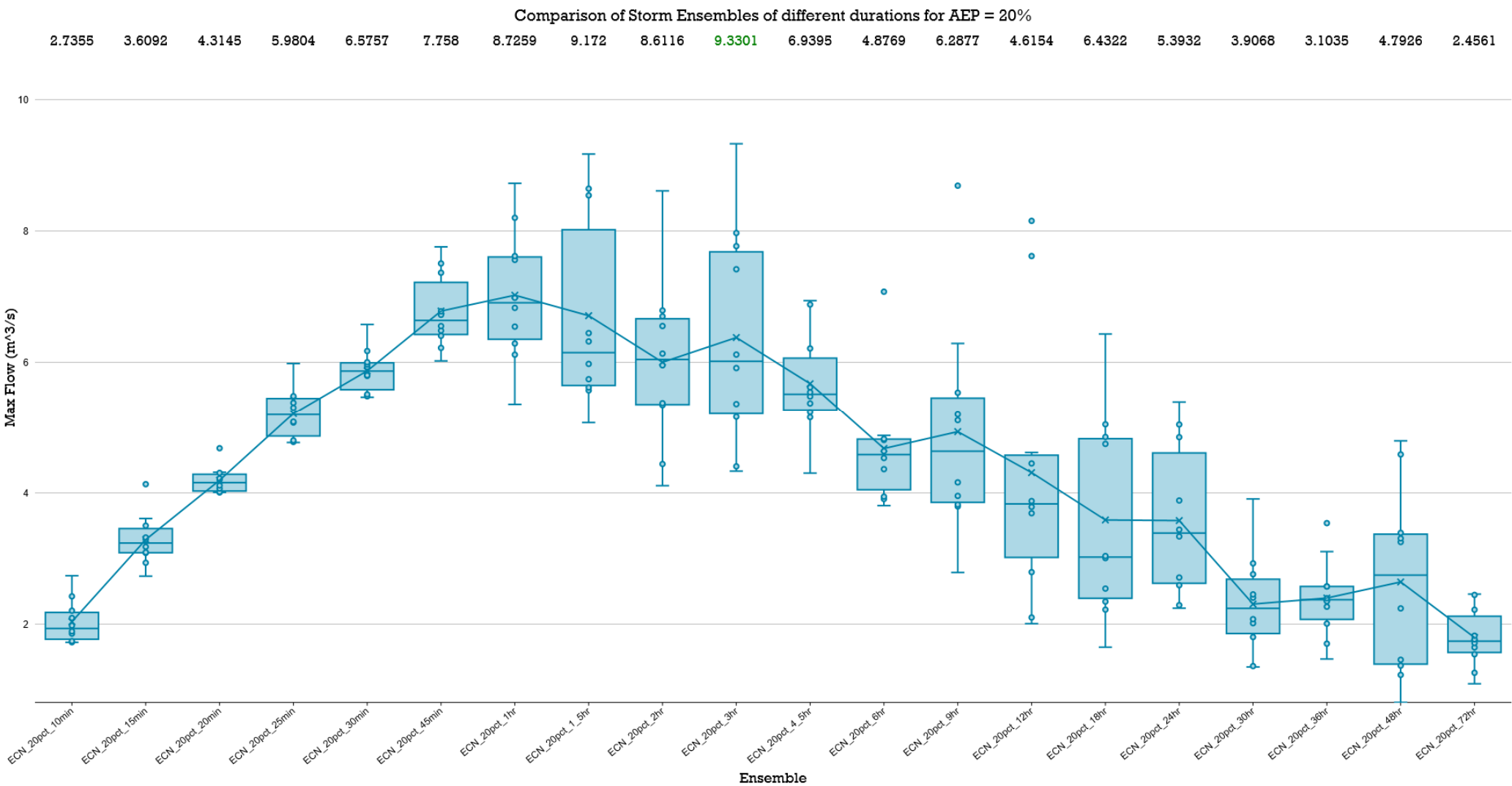


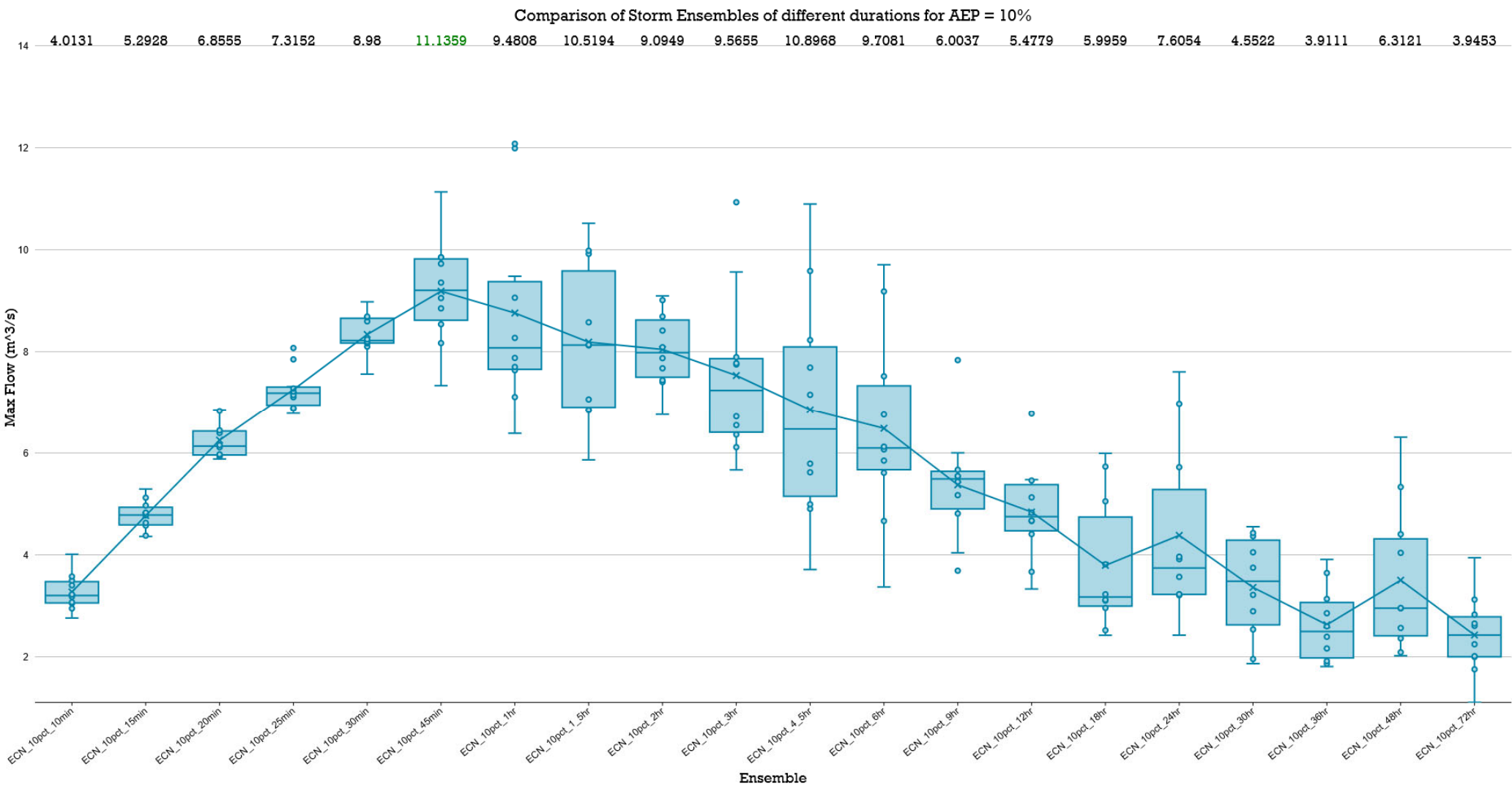


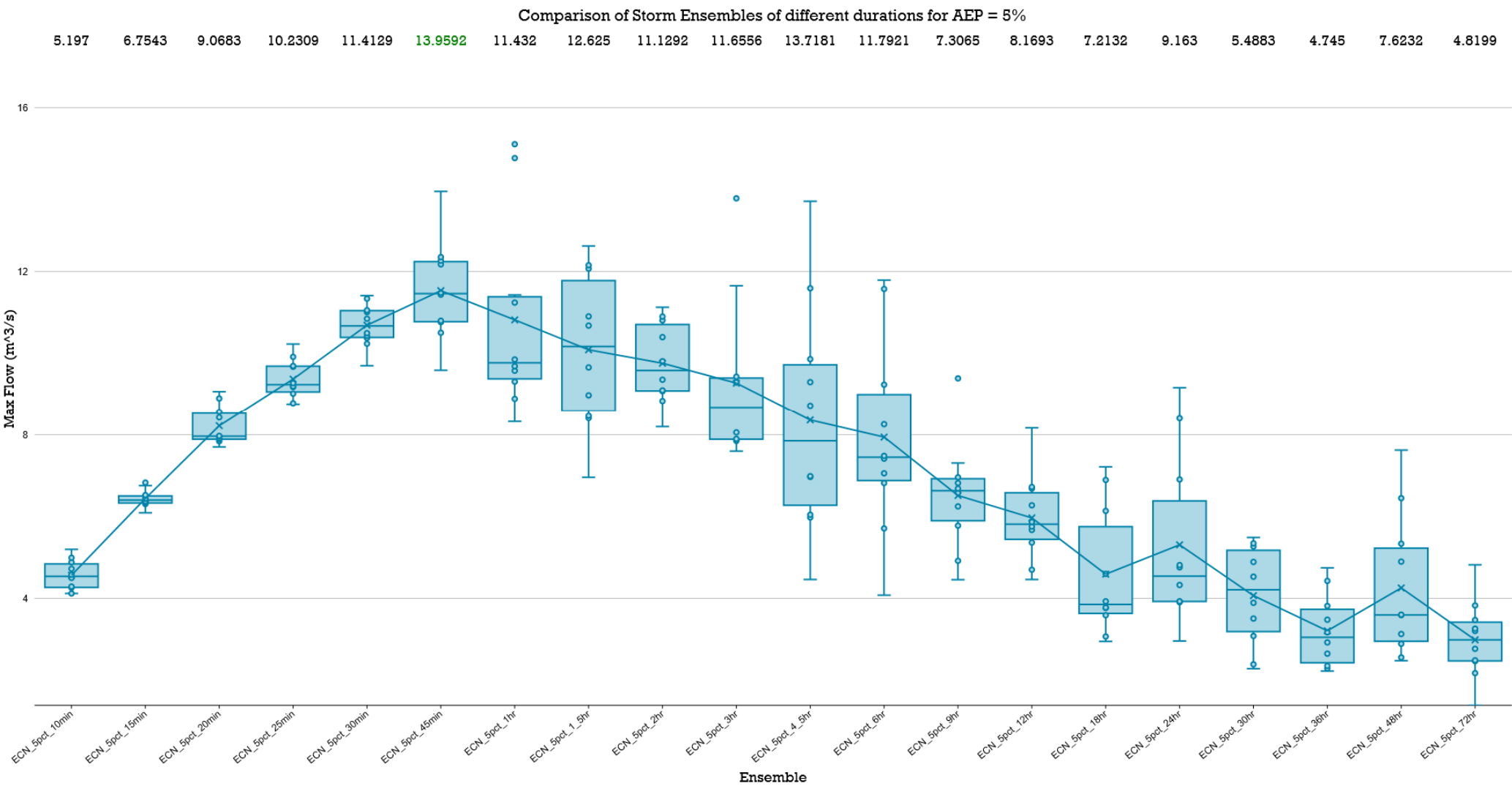


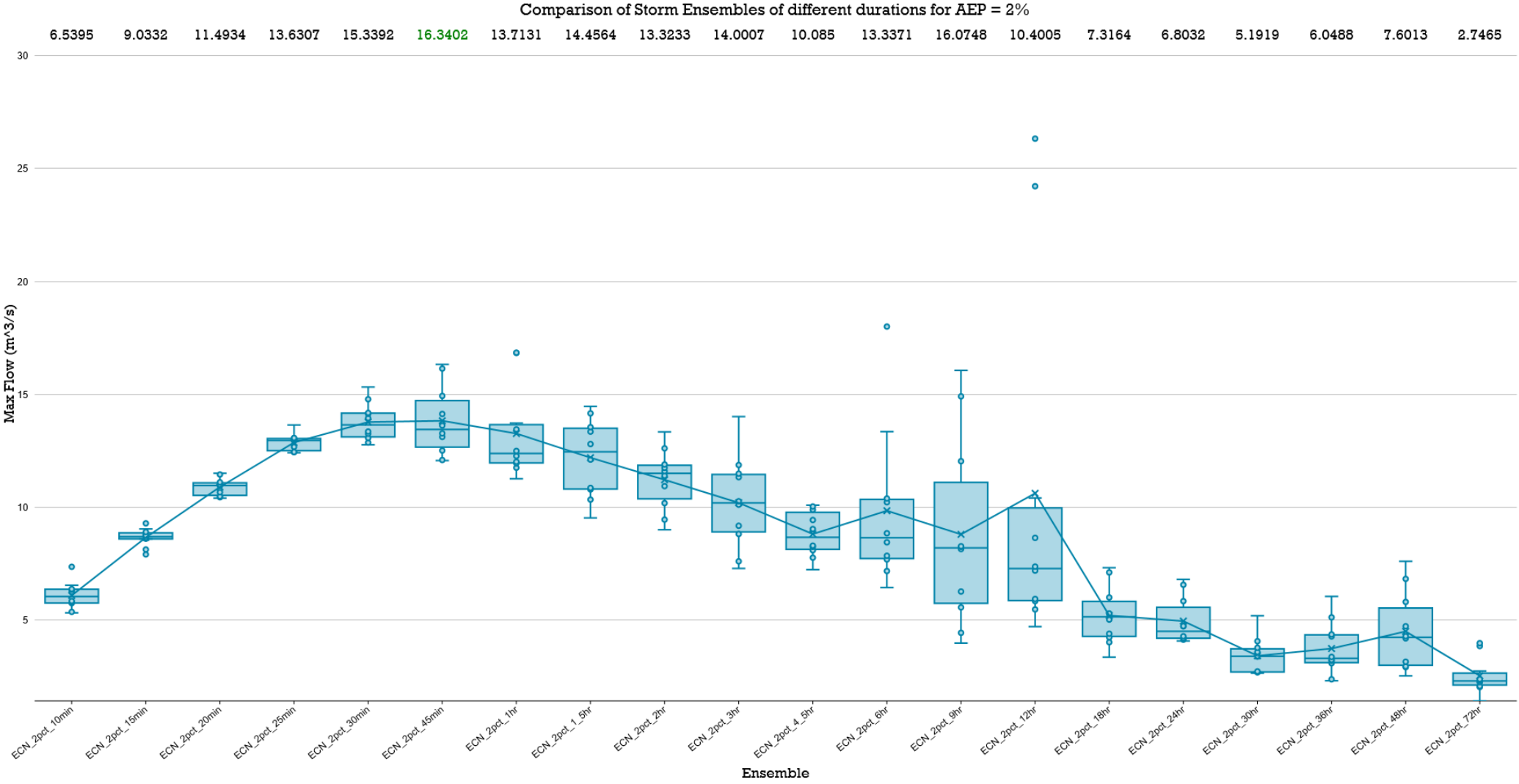


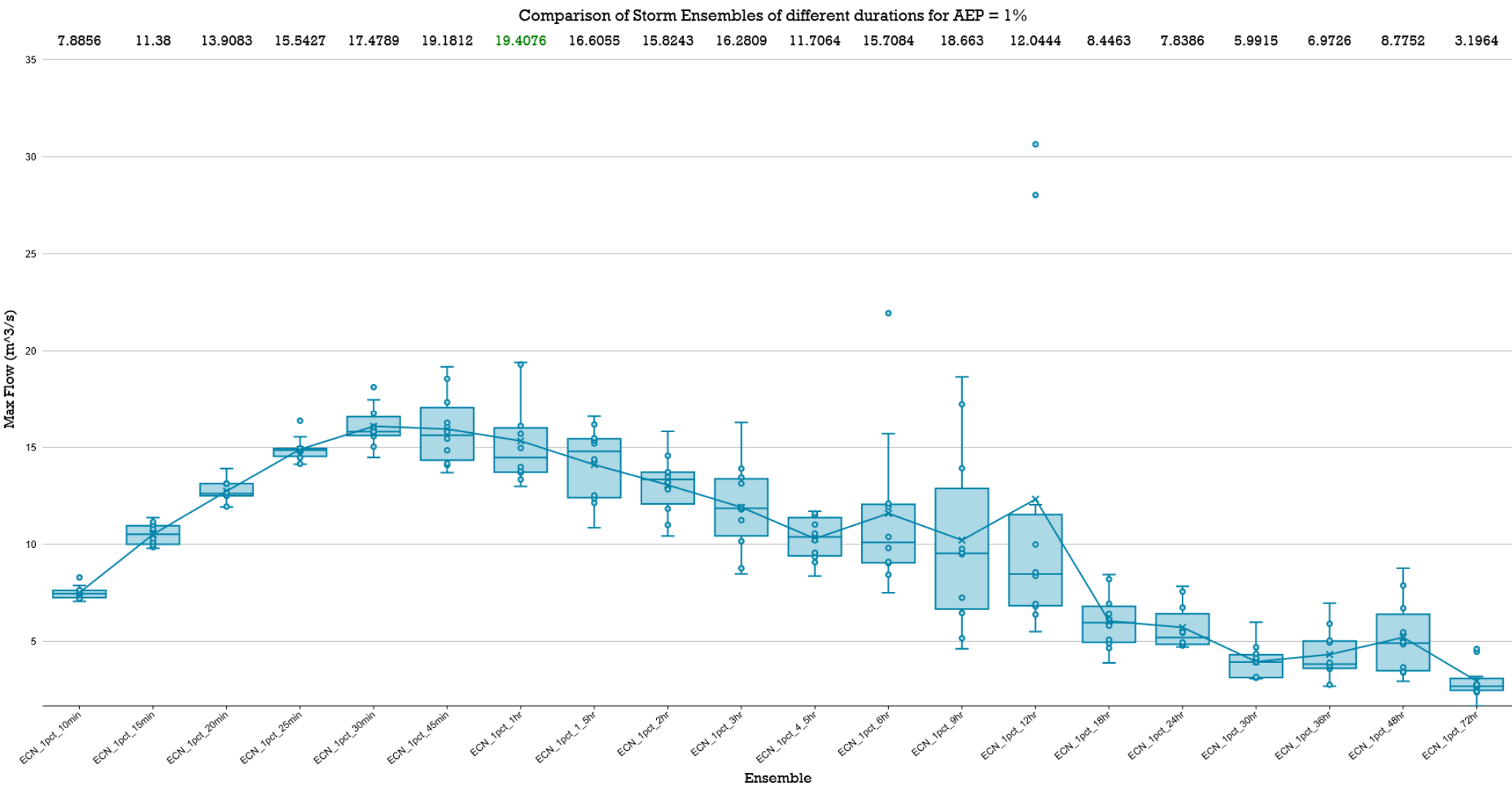


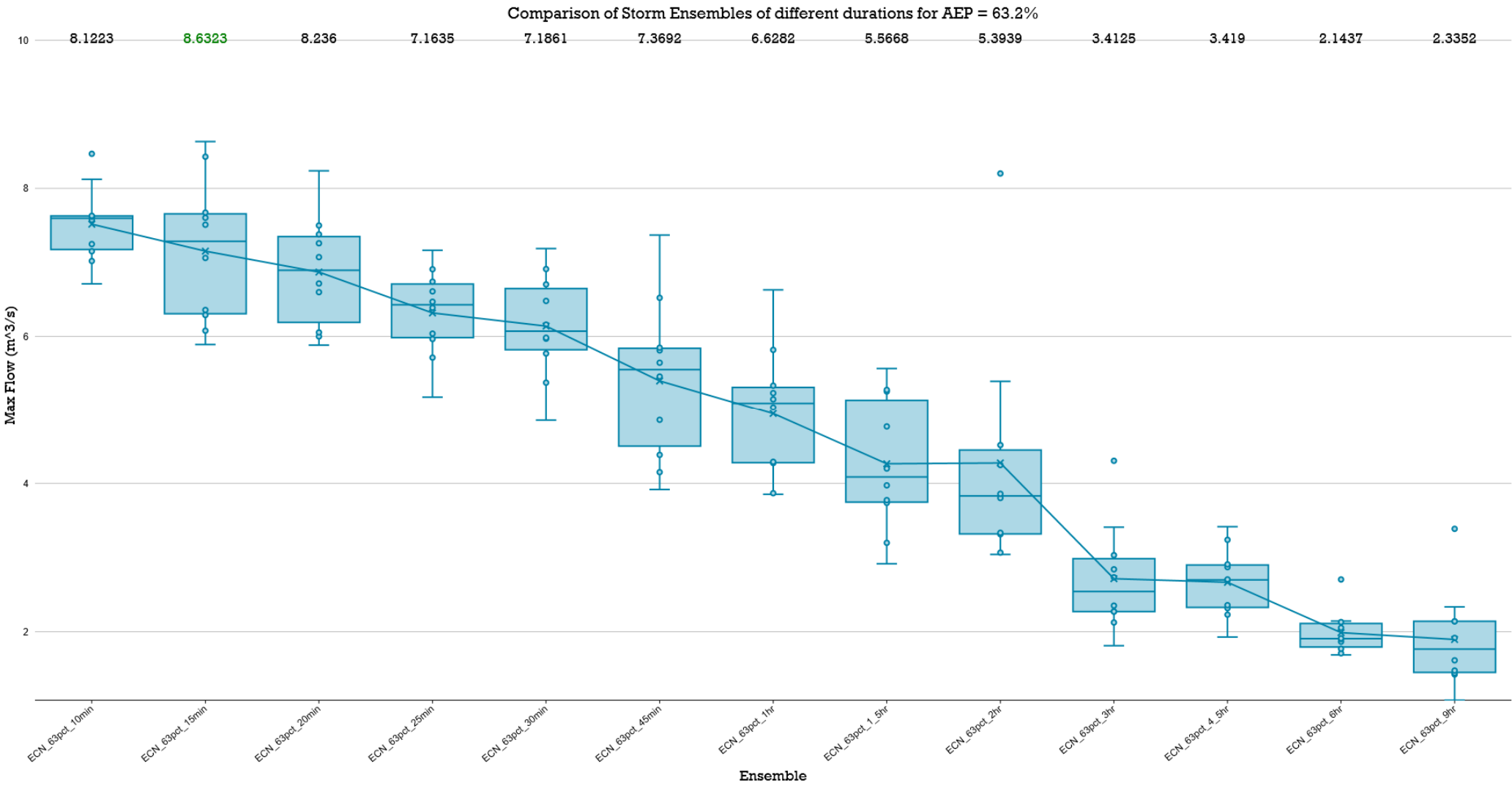


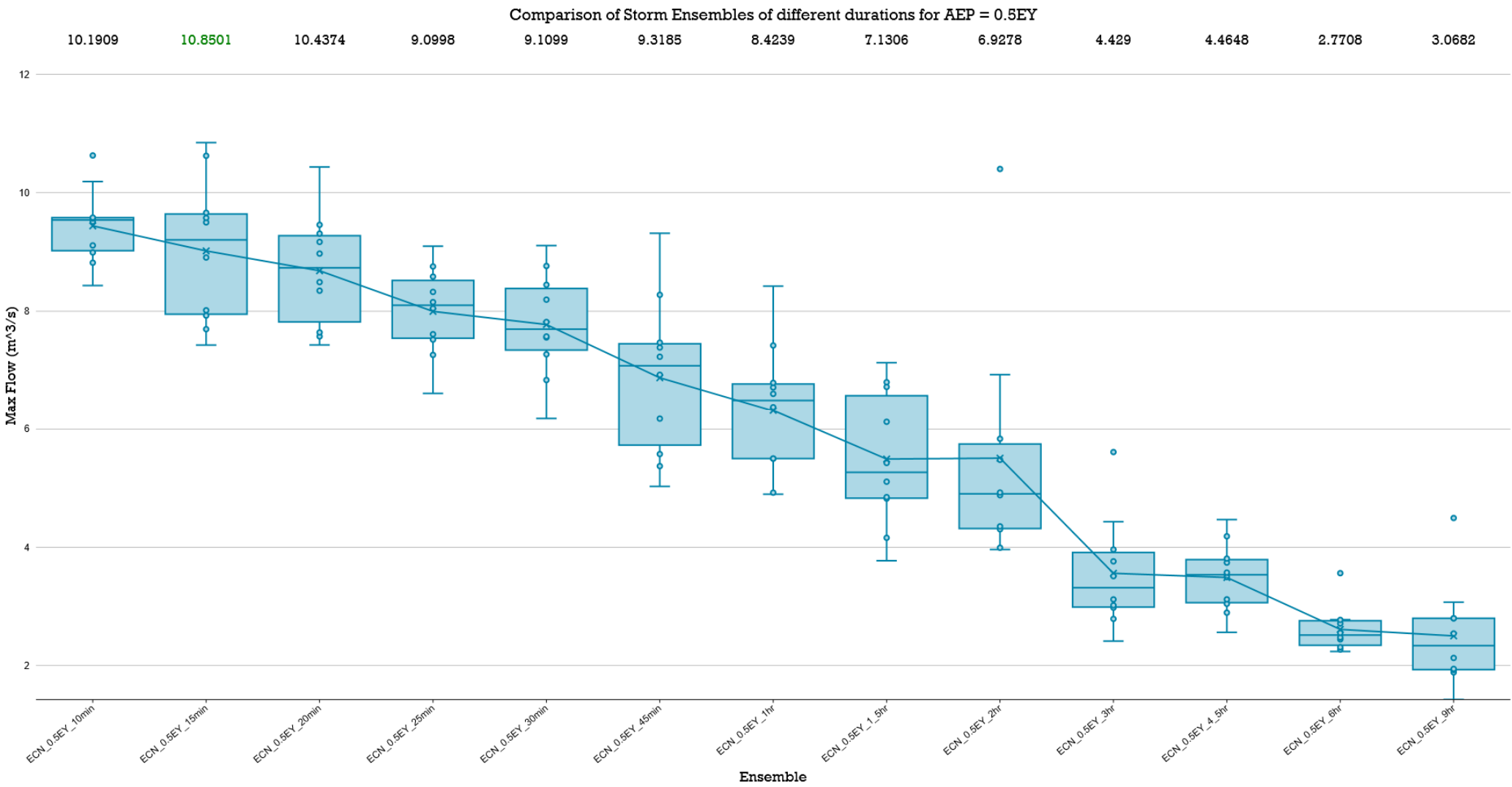


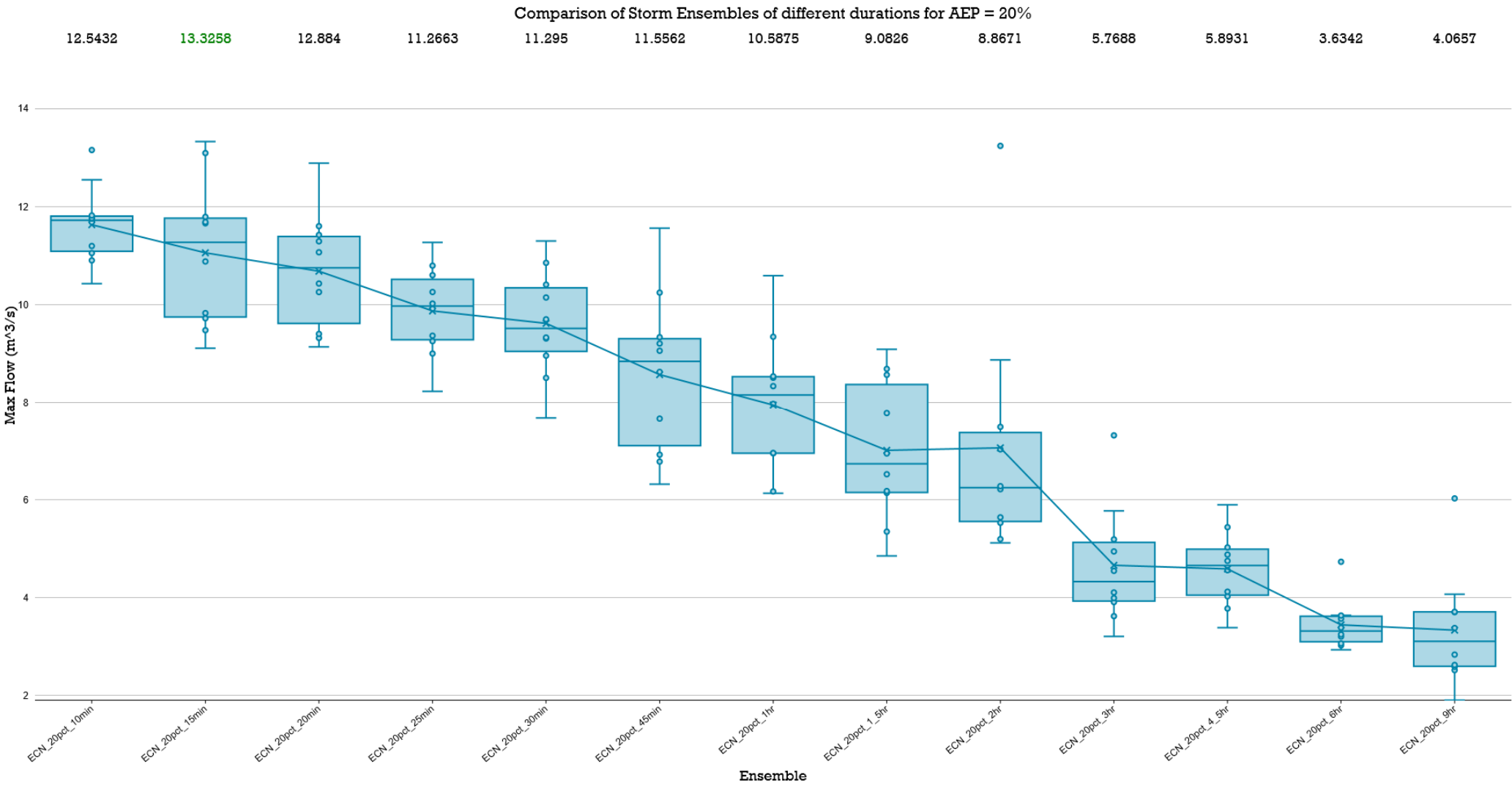


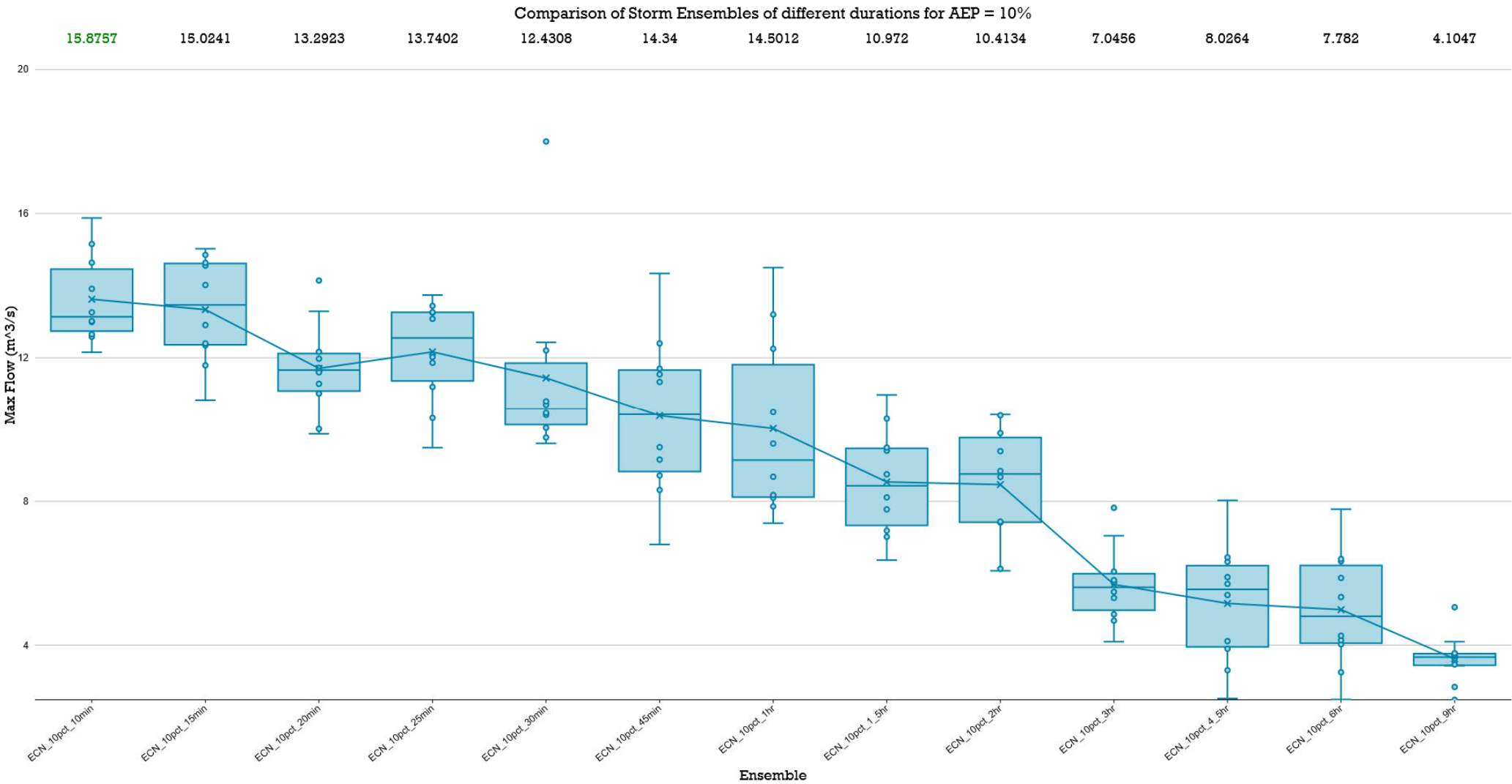


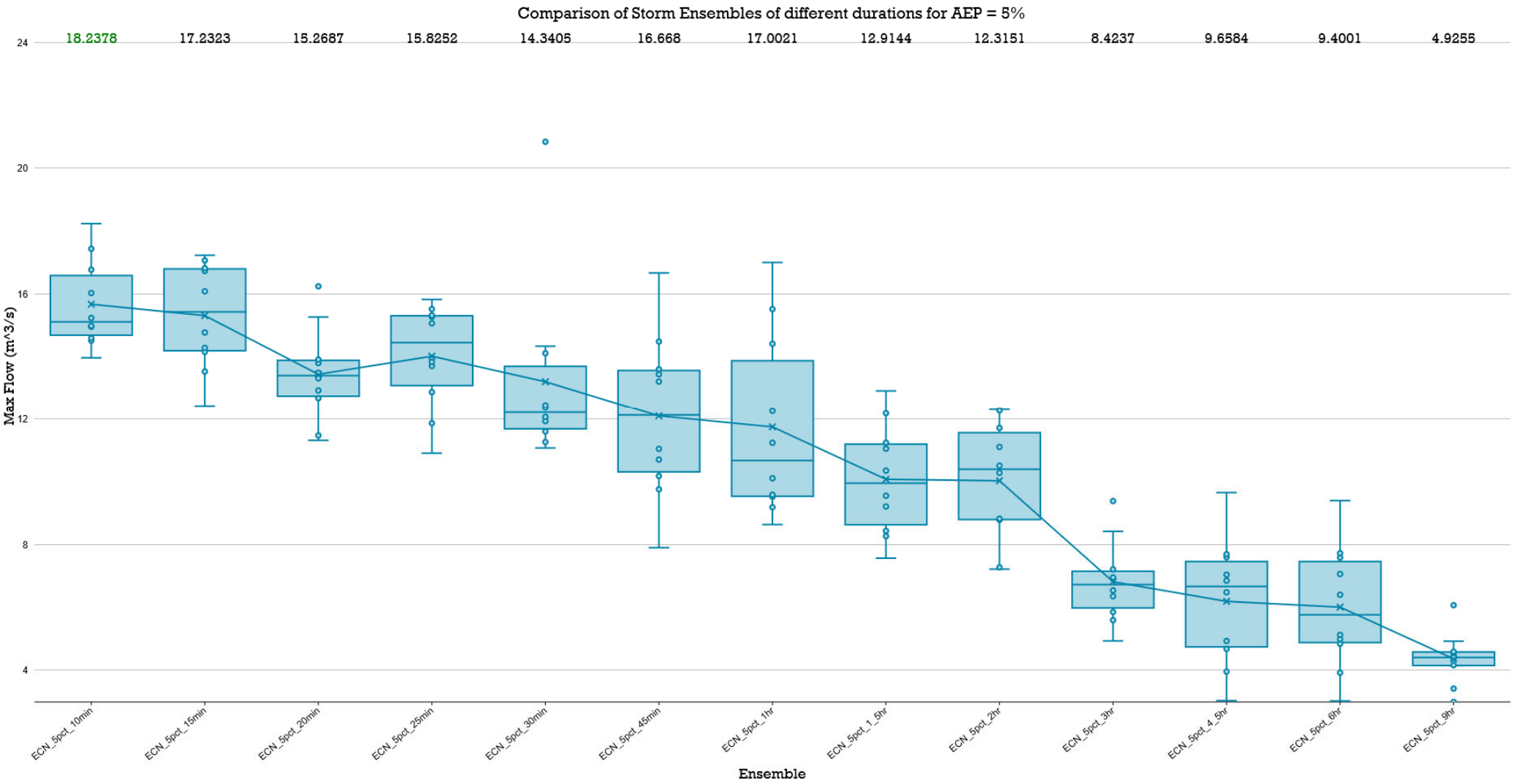


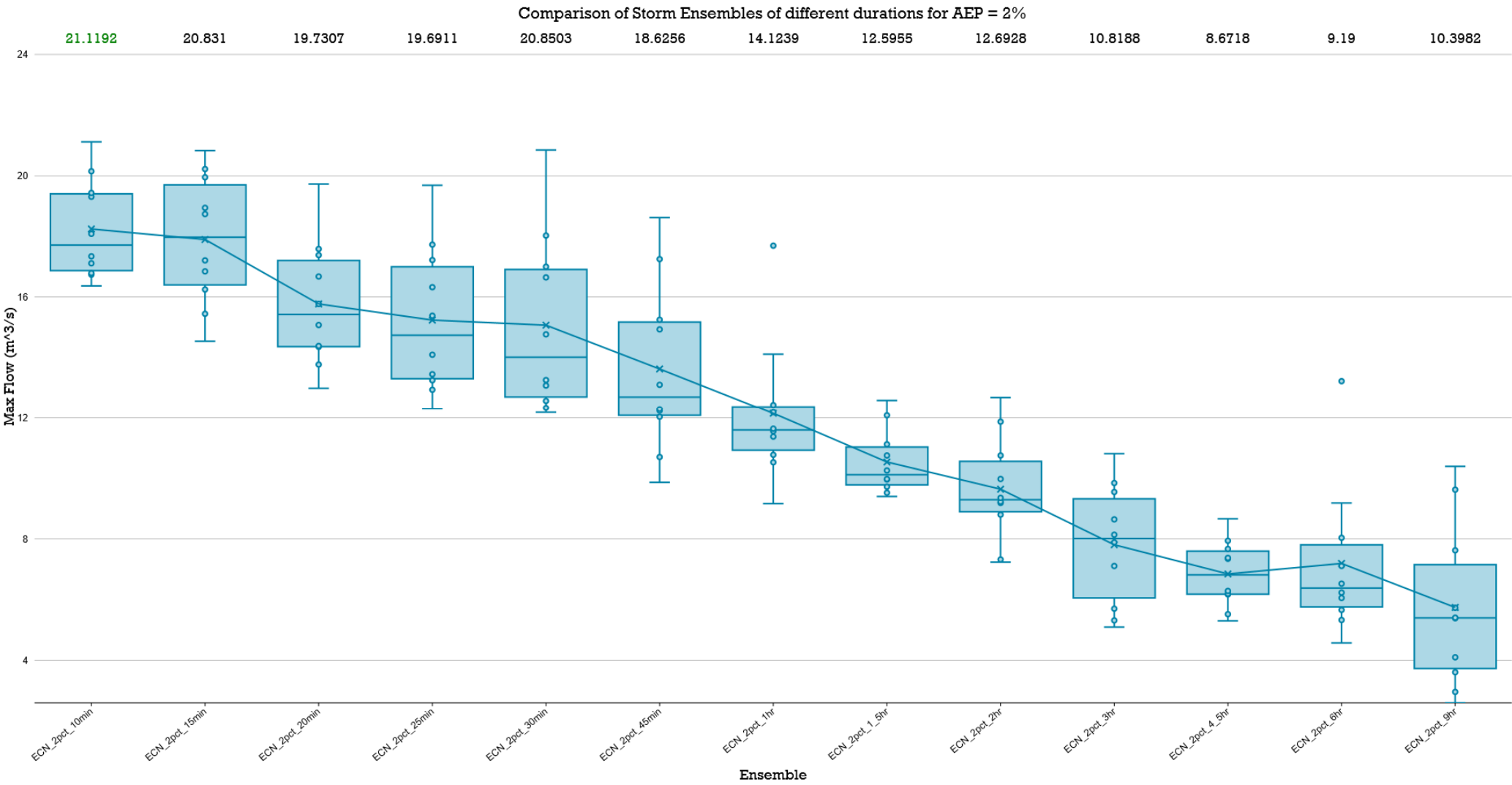






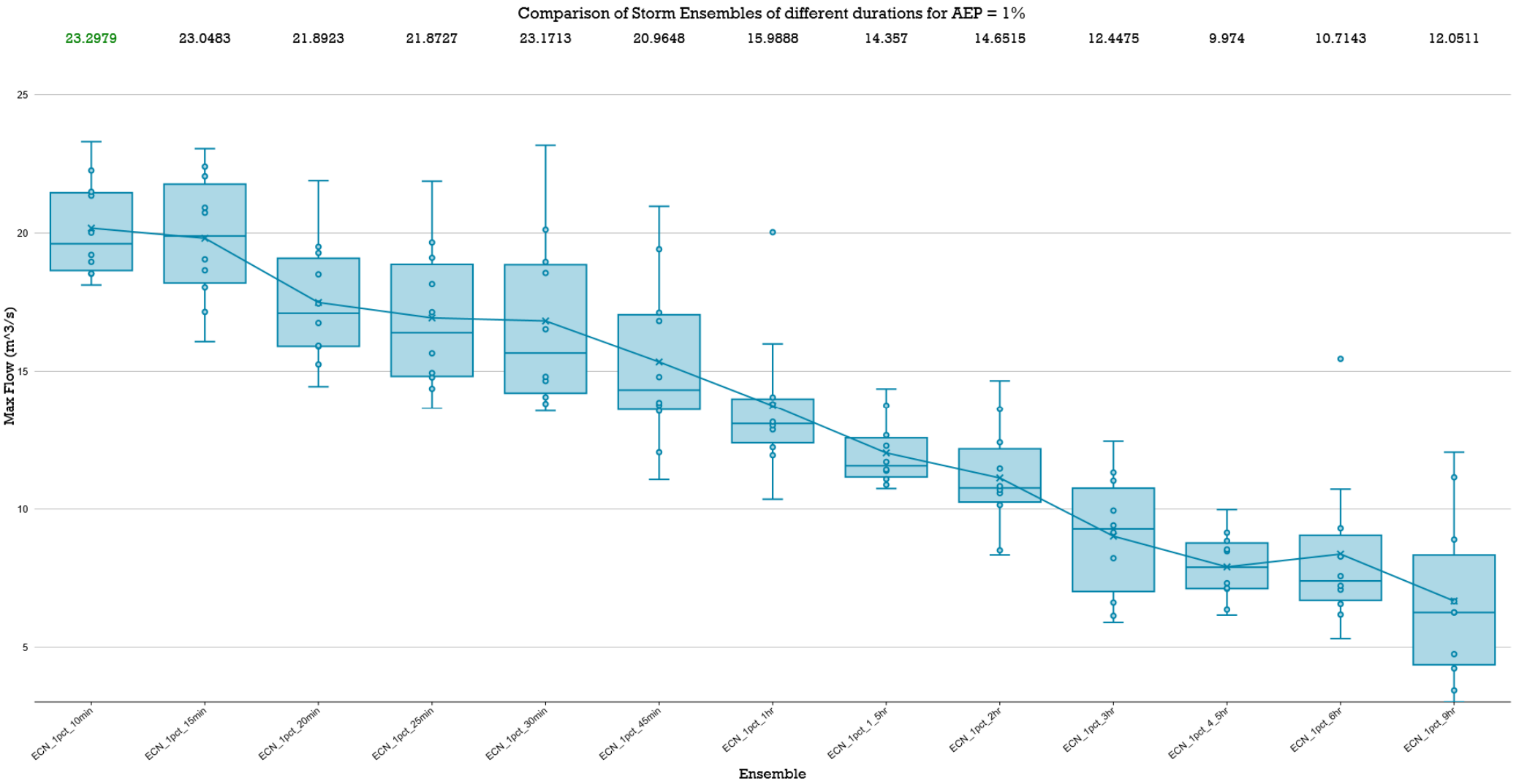


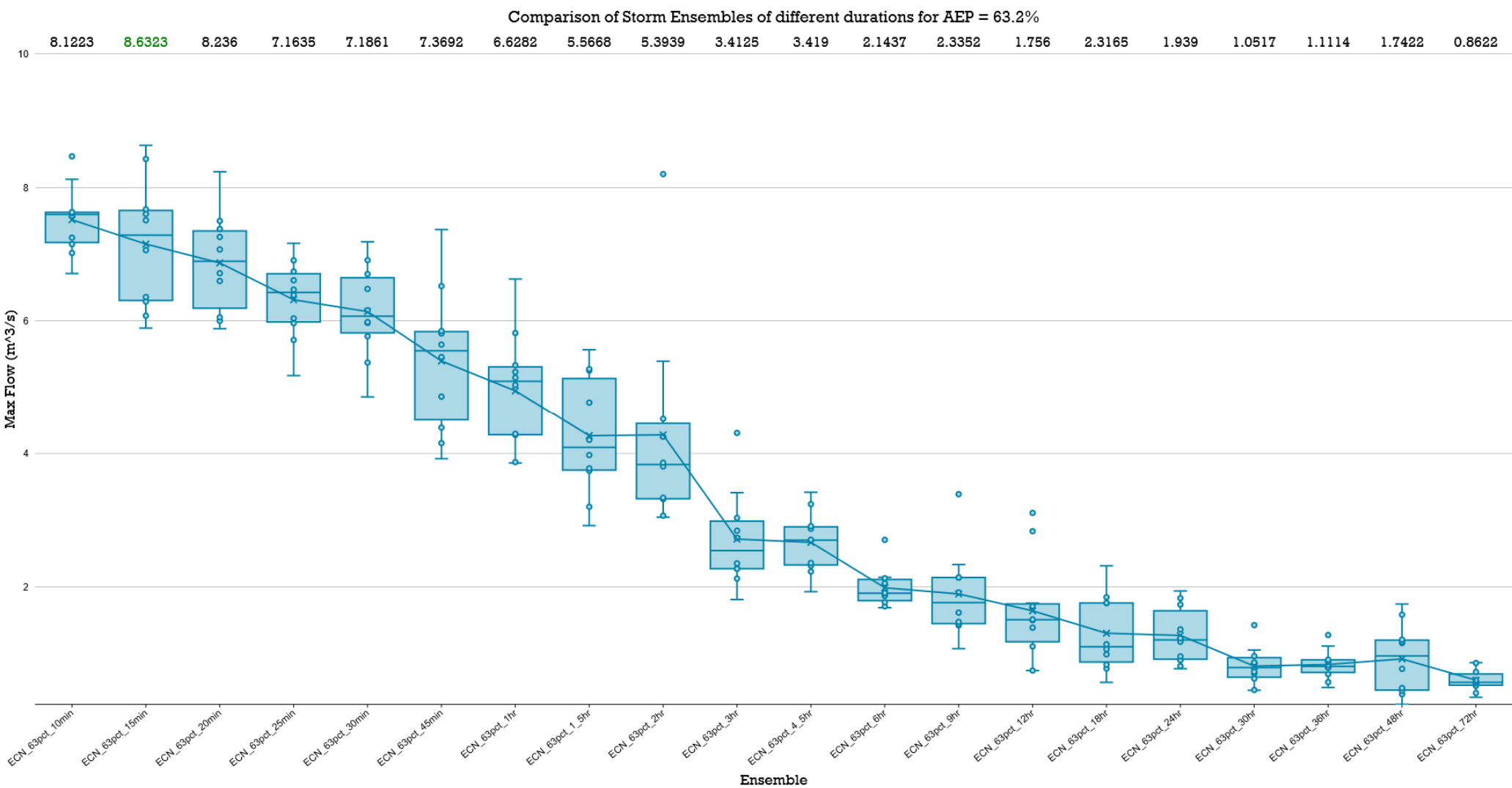


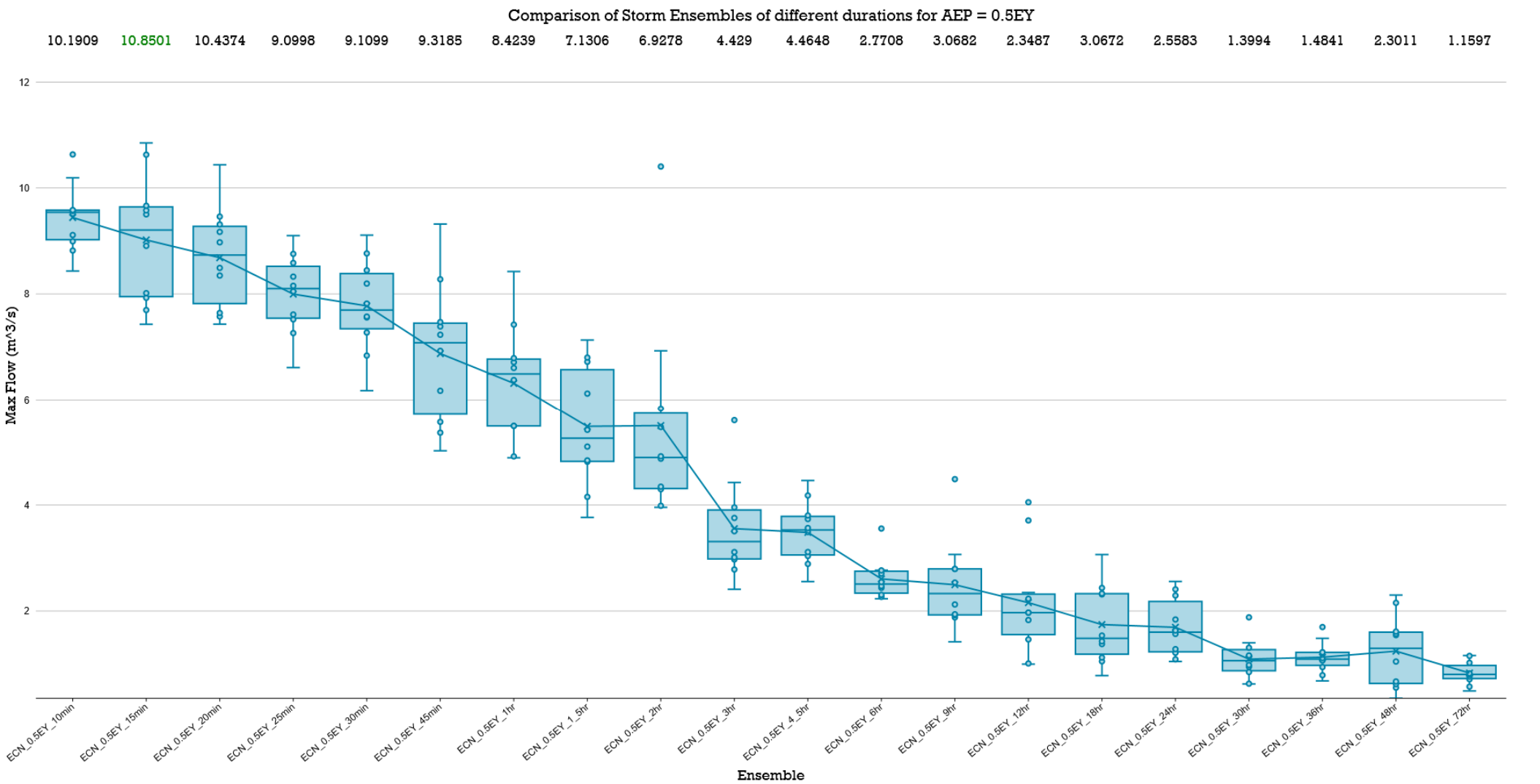


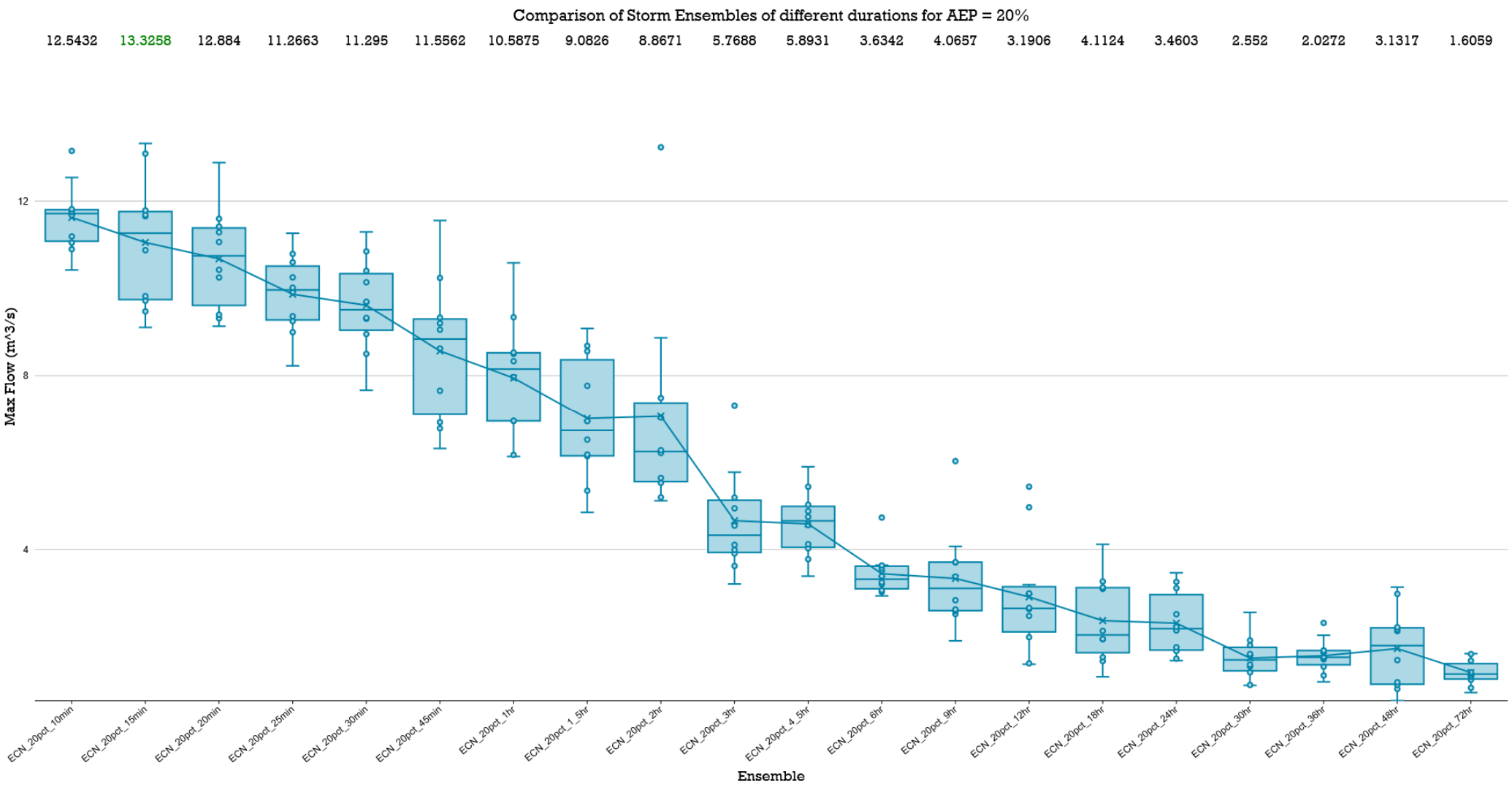
LPoD-1 POST Box & Whisker Plots

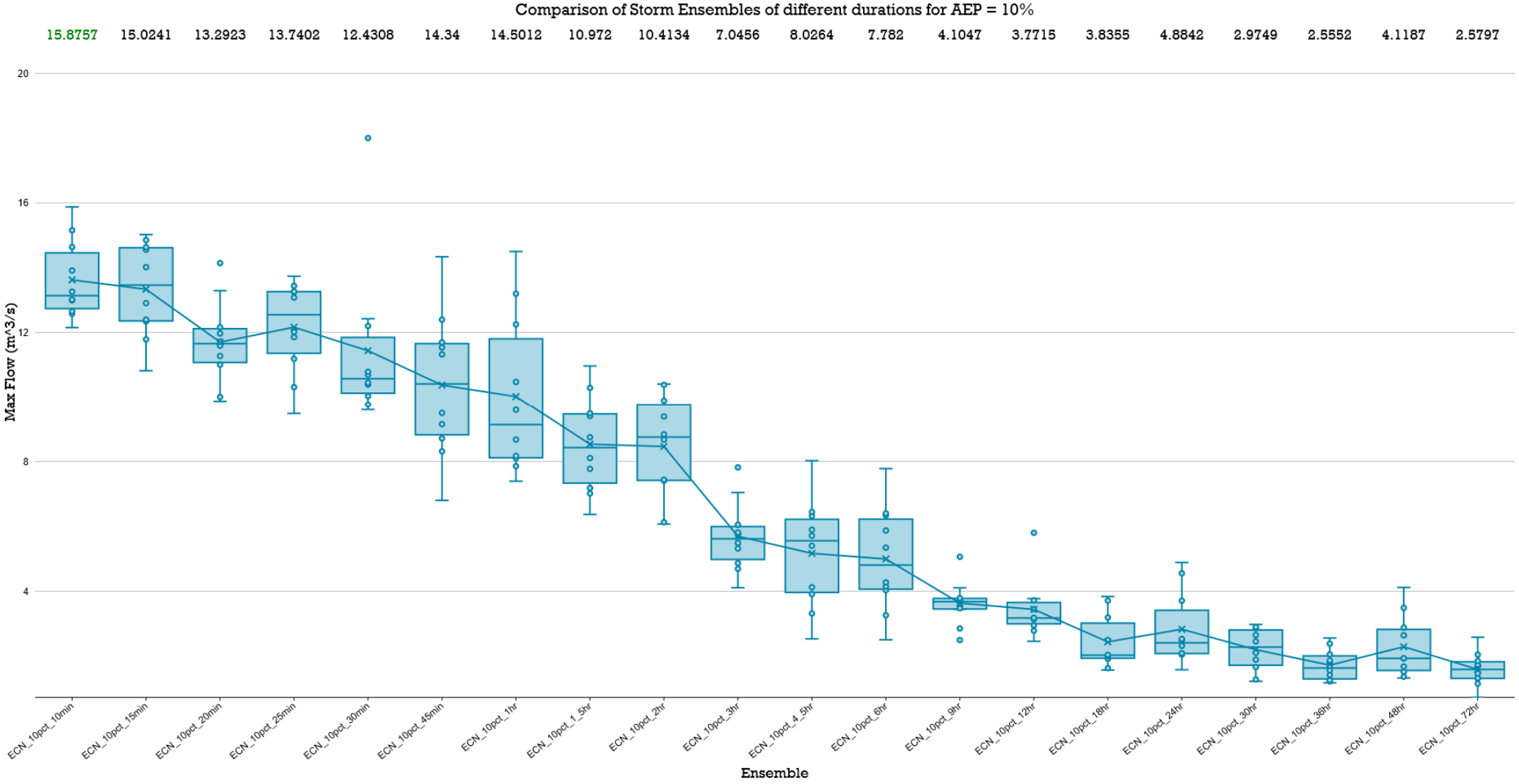
Peak Flow Highlighted Green

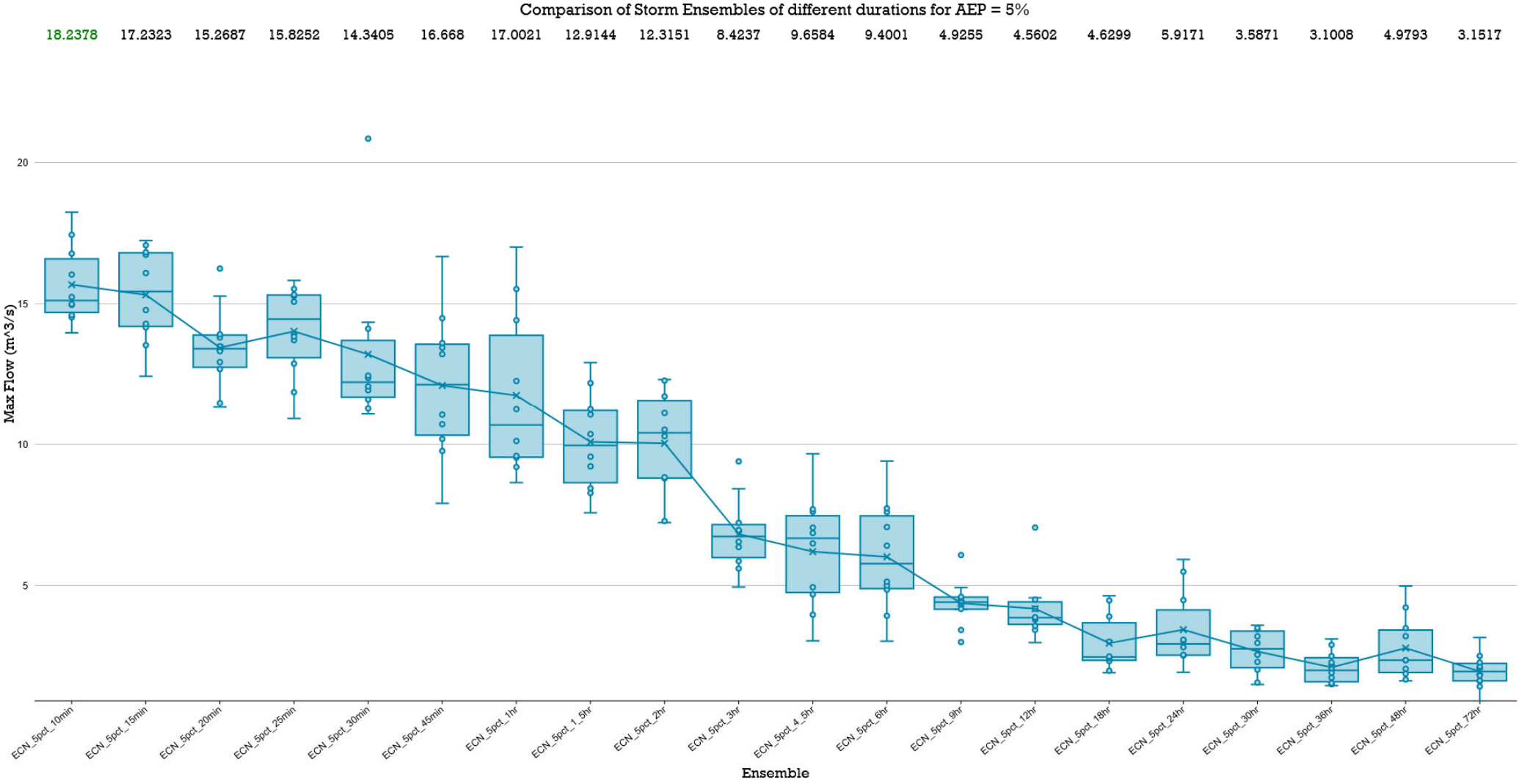


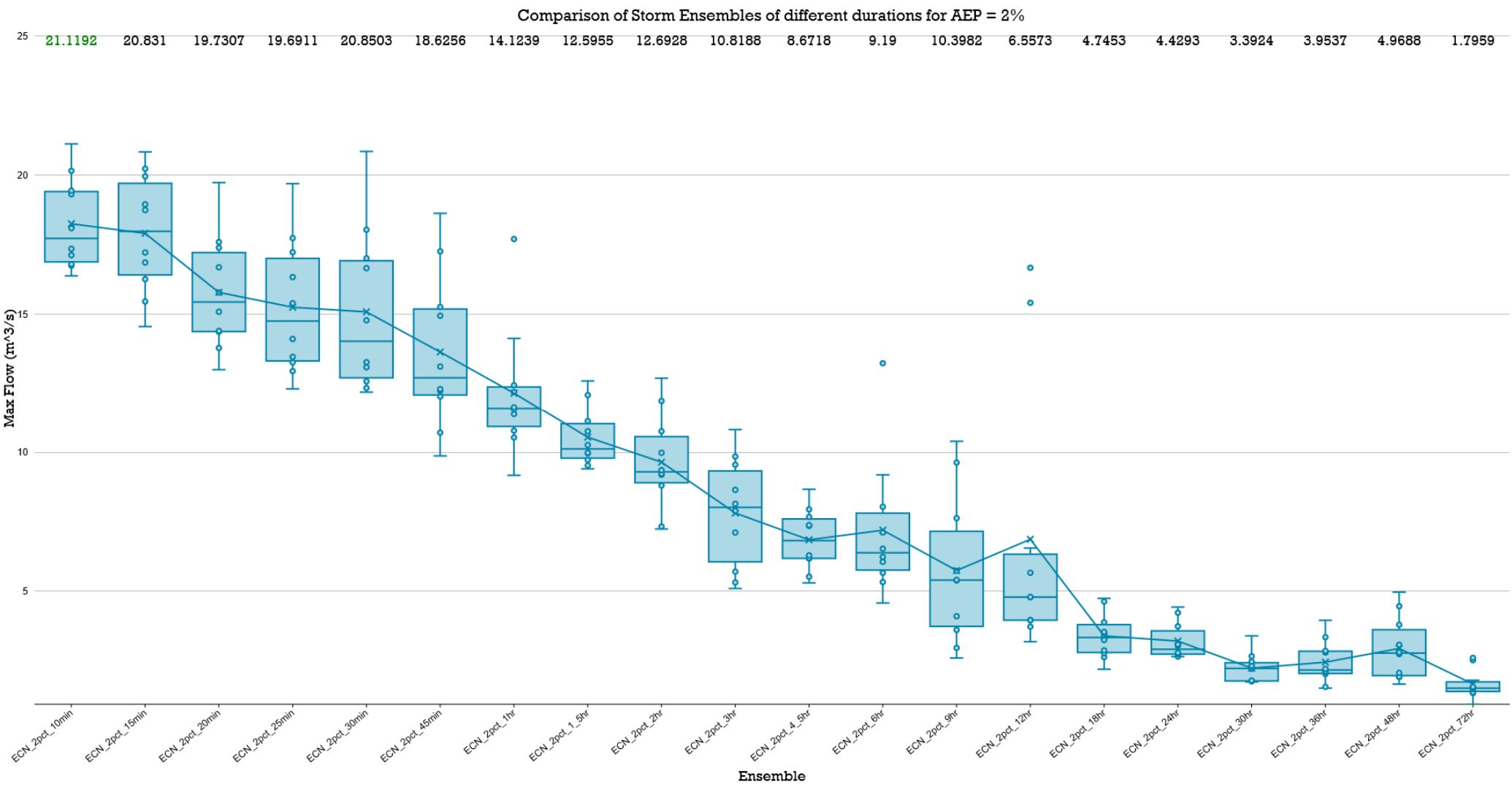


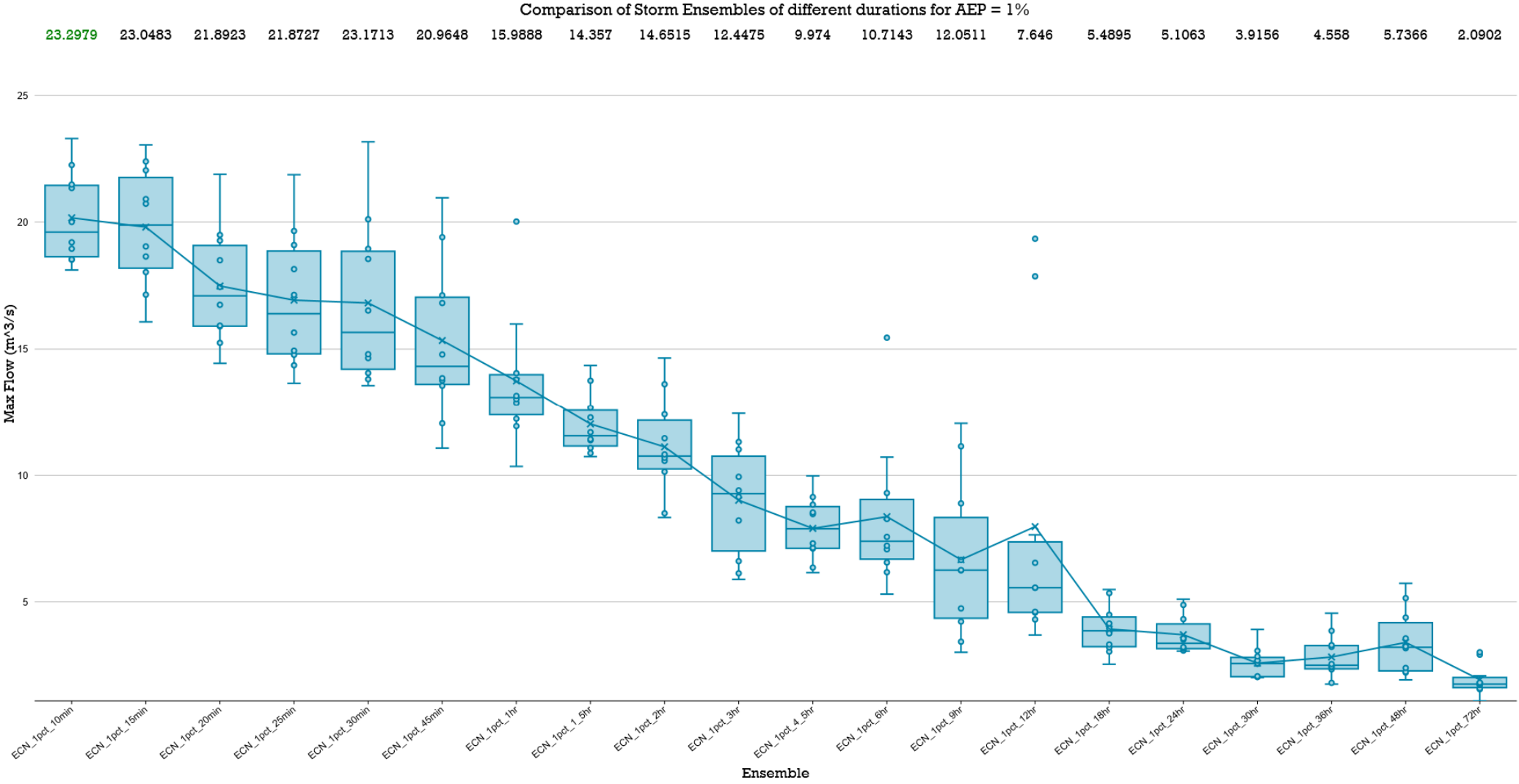












Appendix M – Mitigation Results

EVENT	PEAK UNMITIGATED FLOW	PEAK MITIGATED FLOW m3/s	TARGET FLOW (PRE-DEV) m3/s	PRE-DEVELOPED PEAK STORM		PASS?	STORM		CONDUIT								BASIN INUNDATION DEPTHS			Complies?	
				DURATION	ENSEMBLE #		DURATION	ENSEMBLE	1	2	3	4	5	6	7	TOTAL	Depth	WSE R.L.	Nominal Basin IL		
63pct	8.6323	3.1637	4.4845	ECN_63pct_1_5hr	5	Yes	ECN_63pct_25min	Storm 9	0.0000	3.1637	0.0000	0.0000	0.0000	0.0000	0.0000	3.1637	0.988	11.458	10.470		
0.5EY	10.8501	4.2134	6.4926	ECN_0.50EY_1_5hr	9	Yes	ECN_0.50EY_30min	Storm 1	0.0000	4.1429	0.0141	0.0141	0.0141	0.0141	0.0141	4.2134	1.141	11.611	10.470		
20pct	13.3258	7.0749	9.3301	ECN_20pct_3hr	3	Yes	ECN_20pct_30min	Storm 1	1.2907	4.8752	0.1818	0.1818	0.1818	0.1818	0.1818	7.0749	1.267	11.737	10.470		
10pct	15.8757	10.8745	11.1359	ECN_10pct_45min	10	Yes	ECN_10pct_1hr	Storm 10	3.0316	5.2554	0.5175	0.5175	0.5175	0.5175	0.5175	10.8745	1.342	11.812	10.470		
5pct	18.2378	13.3266	13.9592	ECN_5pct_45min	10	Yes	ECN_5pct_1hr	Storm 10	4.8428	5.5638	0.5840	0.5840	0.5840	0.5840	0.5840	13.3266	1.405	11.875	10.470	NO	< 1.20m
2pct	21.1192	16.2640	16.3402	ECN_2pct_45min	1	Yes	ECN_2pct_30min	Storm 3	7.1310	5.8835	0.6499	0.6499	0.6499	0.6499	0.6499	16.2640	1.474	11.944	10.470		
1pct	23.2979	18.4156	19.4076	ECN_1pct_1hr	1	Yes	ECN_1pct_30min	Storm 3	8.8652	6.0939	0.6913	0.6913	0.6913	0.6913	0.6913	18.4156	1.522	11.992	10.470	NO	< 1.50m

DESCRIPTION OF OUTLETS:	WEIR 1.170m ABOVE IL	HIGH FLOW OUTLET PIPE 3/675 @ 1.324% IL 0.3m ABOVE IL	900x900 - 1	900x900 - 2	900x900 - 3	900x900 - 4	900x900 - 5
-------------------------	-------------------------	--	-------------	-------------	-------------	-------------	-------------

EVENT	PEAK MITIGATED FLOW m3/s	TARGET FLOW (PRE-DEV) m3/s	MITIGATED BY m3/s	MITIGATED BY %
63pct	3.1637	4.4845	1.3208	29.5%
0.5EY	4.2134	6.4926	2.2792	35.1%
20pct	7.0749	9.3301	2.2552	24.2%
10pct	10.8745	11.1359	0.2614	2.3%
5pct	13.3266	13.9592	0.6326	4.5%
2pct	16.2640	16.3402	0.0762	0.5%
1pct	18.4156	19.4076	0.9920	5.1%

AREA FOR DETENTION = 7,015m ²
AREA FOR TREATMENT = 4,000m ²

NOTE: low flow outlet pipe size shall be 450mm dia laid at 0.62% grade (Maximum contributng floor / filter area = 3500m2) - REFER BELOW

NOTE: exclusion fencing shall be installed to the basin perimeter to mitigate risks of public safety regarding safe wading depths

----- Surface Area measured at Weir Crest Level of RL11.640m AHD

-----< Refer MUSIC-Link Report

BASIN FLOOR IL: 10.470 (at lowest point)

BASIN WEIR RL: 11.640

BASIN CROWN: 13.000

PARAMETERS TABLE						20% blockage	
ation.	D	0.45	Pipe diameter in metres	hydraulic conductivity		mm/hr	200
	R	0.225	Pipe radius in metres	l/s	0.055556	mm/hr	240
	h	0.45	Depth of flow in pipe in metres	pipe capacity	194.4188	l/s	0.066667
	S	0.62	Slope of channel bed in percent.	max area	3499.538	pipe capac	194.4188
	n	0.015	Manning's "n" which is the pipe roughness.	max length (1.5m spacings)	2333.025	max area	2916.282
	N	1	The number of pipes.			max length	1944.188

Appendix N – External Stormwater Catchment Conveyance Strategy



G:\Projects\5941\engineering\Acad\BE2 CGL\Current\5941 ENG BE2 400-402.dwg



Site Address:
60 STAPYLTON JACOBS WELL
ROAD, STAPYLTON QLD 4207

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RPD:

Lot:	501
Plan:	SP295994
Local Authority:	CITY OF GOLD COAST COUNCIL
Level Datum:	AHD
Meridian:	-
Contour Interval:	-
PSM:	-
RL:	-

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DRAWING TITLE

CONTROL LINE LAYOUT PLAN

B	15-02-2021	INFORMATION REQUEST RESPONSE	IQ	MG	
A	20-11-2020	ORIGINAL ISSUE	BA	MG	
Issue	Date	Description	DRN	CHK	

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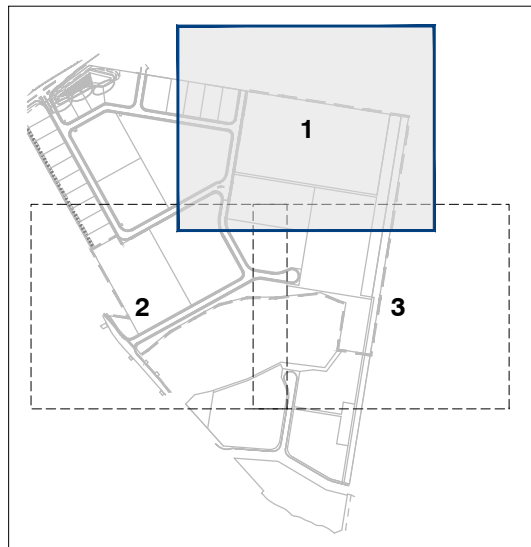


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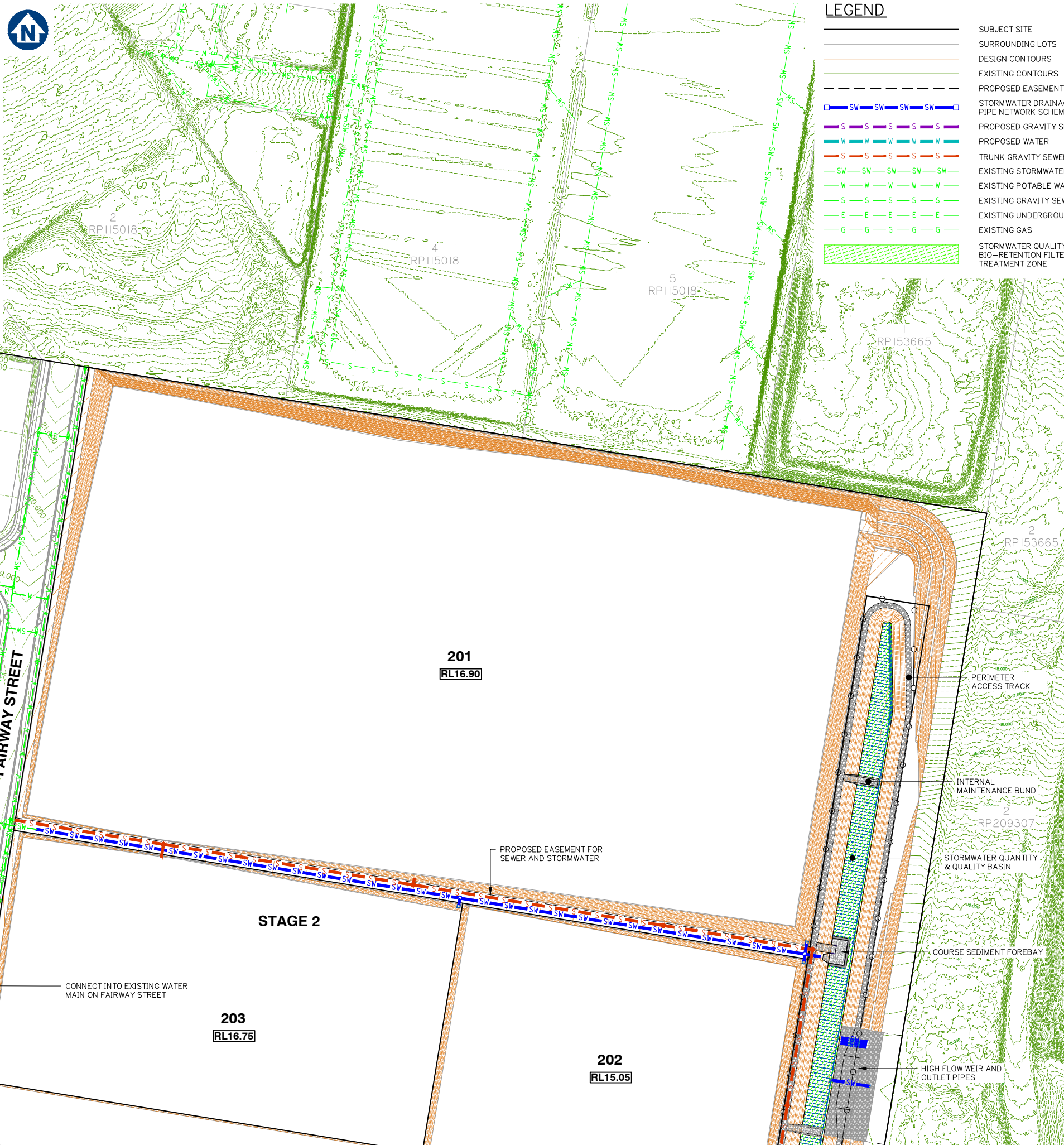
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Designed:	IG
Drafted:	BA
Approved:	MG
RPEQ:	16939
Signed:	
Date:	15-02-2021

Drawing No:	Rev. No:
5941 ENG BE2 400	B



KEY PLAN
SCALE 1:10000



FOR CONTINUATION REFER SHEET 5941 ENG SP 002

FOR CONTINUATION REFER SHEET 5941 ENG SP 003

STAGE 2 – ENGINEERING SERVICING STRATEGY PLAN SHEET 1 OF 3



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Project:

VantageYatala
STAGE 2

Site Address:

60 STAPYLTON JACOBS WELL
ROAD, STAPYLTON QLD 4207

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RPD:

Lot: 501
Plan: SP295994
Local Authority: CITY OF GOLD COAST
COUNCIL
Level Datum: AHD
Meridian: -
Contour Interval: -
PSM: -
RL: -

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DRAWING TITLE
STAGE 2 - ENGINEERING
SERVICING STRATEGY PLAN
SHEET 1 OF 3

Issue	Date	Original Issue Description	BA	MG	DRN	CHK
A	20-11-2020	ORIGINAL ISSUE				

SCALE IN METRES



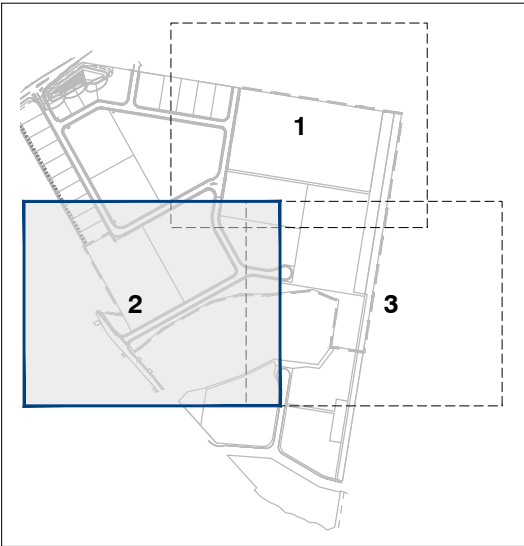
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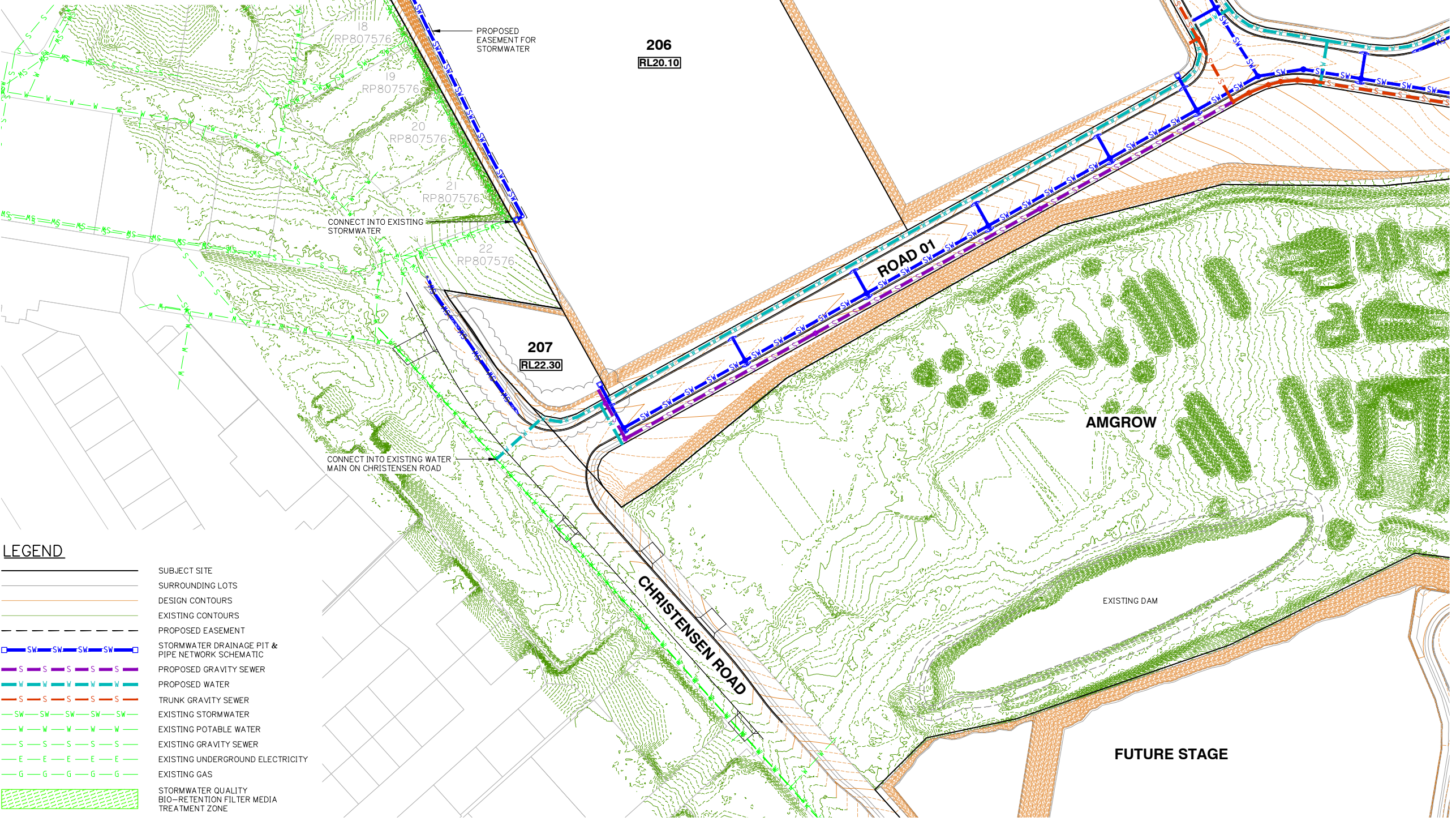
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Drafted:	BA
Approved:	MG
RPEQ:	16939
Signed:	
Date:	20-11-2020

Drawing No:
5941 ENG SP 001

Rev. No:
A



KEY PLAN
SCALE 1:10000



- LEGEND**
- SUBJECT SITE
 - SURROUNDING LOTS
 - DESIGN CONTOURS
 - EXISTING CONTOURS
 - PROPOSED EASEMENT
 - STORMWATER DRAINAGE PIT & PIPE NETWORK SCHEMATIC
 - PROPOSED GRAVITY SEWER
 - PROPOSED WATER
 - TRUNK GRAVITY SEWER
 - EXISTING STORMWATER
 - EXISTING POTABLE WATER
 - EXISTING GRAVITY SEWER
 - EXISTING UNDERGROUND ELECTRICITY
 - EXISTING GAS
 - STORMWATER QUALITY BIO-RETENTION FILTER MEDIA TREATMENT ZONE

FOR CONTINUATION REFER SHEET 5941 ENG SP 001

FOR CONTINUATION REFER SHEET 5941 ENG SP 003

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Project:
VantageYatala
STAGE 2

Site Address:
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RPD:
Lot: 501
Plan: SP295994
Local Authority: CITY OF GOLD COAST COUNCIL
Level Datum: AHD
Meridian: -
Contour Interval: -
PSM: -
RL: -

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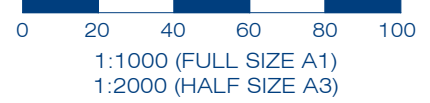
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DRAWING TITLE
STAGE 2 - ENGINEERING SERVICING STRATEGY PLAN
SHEET 2 OF 3

Issue	Date	Description	IG	BA	MG	DRN	CHK
B	15-02-2021	MINOR AMENDMENT TO EARTHWORKS DESIGN	IG	MG			
A	20-11-2020	ORIGINAL ISSUE	BA	MG			

SCALE IN METRES



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Drafted:	BA
Approved:	MG
RPEQ:	16939
Signed:	
Date:	15-02-2021

Drawing No: 5941 ENG SP 002
Rev. No: B



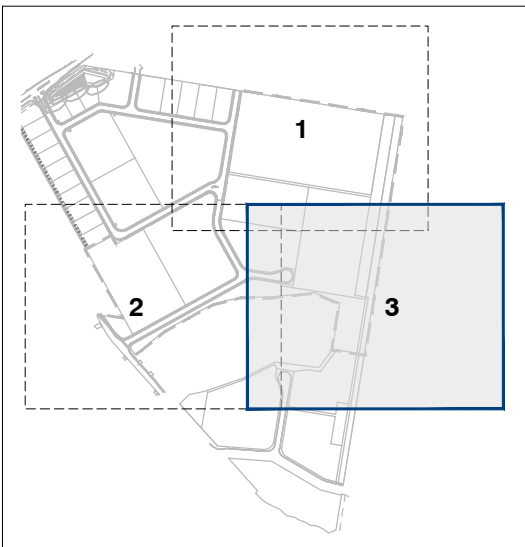
203
RL16.75

204
RL16.35

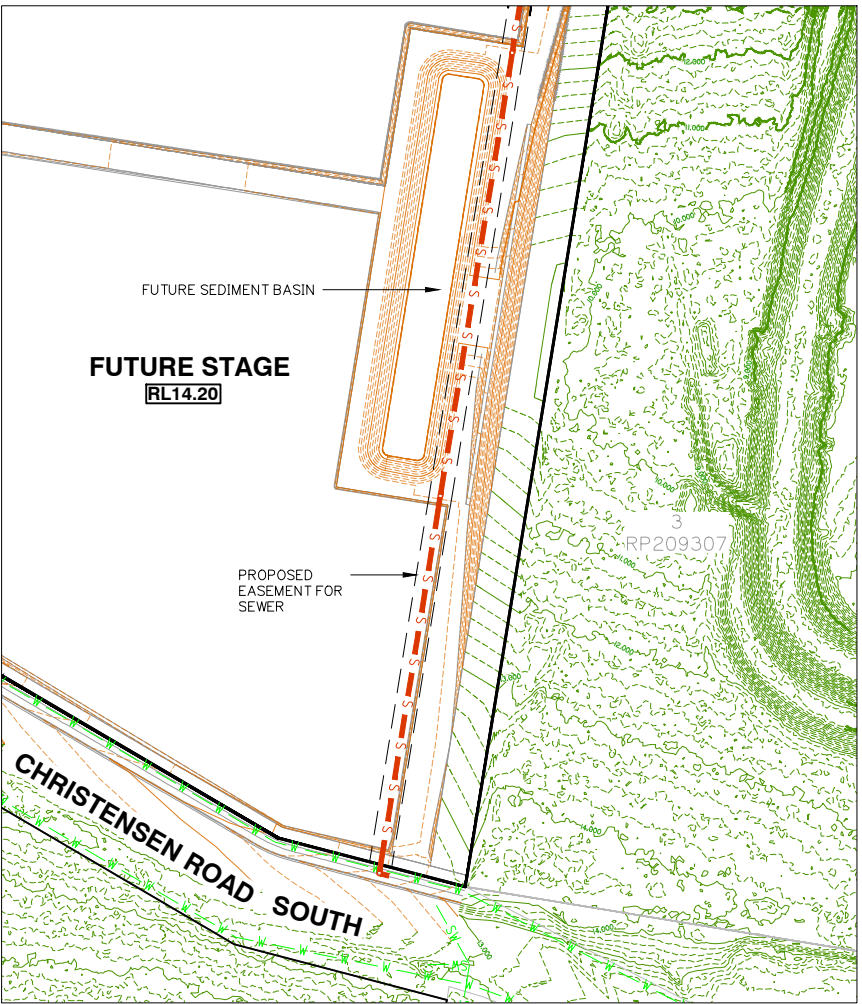
202
RL15.05

LEGEND

- SUBJECT SITE
- SURROUNDING LOTS
- DESIGN CONTOURS
- EXISTING CONTOURS
- PROPOSED EASEMENT
- STORMWATER DRAINAGE PIT & PIPE NETWORK SCHEMATIC
- PROPOSED GRAVITY SEWER
- PROPOSED WATER
- TRUNK GRAVITY SEWER
- EXISTING STORMWATER
- EXISTING POTABLE WATER
- EXISTING GRAVITY SEWER
- EXISTING UNDERGROUND ELECTRICITY
- EXISTING GAS
- STORMWATER QUALITY BIO-RETENTION FILTER MEDIA TREATMENT ZONE



KEY PLAN
SCALE 1:10000



INSET

Client:



Project:

VantageYatala
STAGE 2

Site Address:

60 STAPYLTON JACOBS WELL
ROAD, STAPYLTON QLD 4207

THIS DRAWING IS INTENDED TO
BE PRINTED IN COLOUR

RPD:

Lot: 501
Plan: SP295994
Local Authority: CITY OF GOLD COAST
COUNCIL
Level Datum: AHD
Meridian: -
Contour Interval: -
PSM: -
RL: -

ISSUED FOR APPROVAL
NOT FOR CONSTRUCTION

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ALL DRAWINGS ARE TO BE READ IN CONJUNCTION WITH GENERAL NOTES

DRAWING TITLE
STAGE 2 - ENGINEERING
SERVICING STRATEGY PLAN
SHEET 3 OF 3

Issue	Date	Original Issue Description	BA	MG
A	20-11-2020			

SCALE IN METRES

0 20 40 60 80 100
1:1000 (FULL SIZE A1)
1:2000 (HALF SIZE A3)

Scale at A1: 1:1000

Designed: IG

Drafted: BA

Approved: MG

RPEQ: 16939

Signed:

Date: 20-11-2020

Drawing No: 5941 ENG SP 003
Rev. No: A

Appendix O – WSUD Design Checklists

APPENDIX D – Assessment Checklists

TABLE D.1 GENERAL APPLICATION INFORMATION

(GDP Ref. 5941)

APPLICATION INFORMATION		
Site or Project Name	VANTAGE STG.2	DA No.
Lot and Plan No.	LOT 501 ON SP295994	
Location	60 STAPYLTON JACOBS WELL ROAD, STAPYLTON	

TABLE D.2 CLIMATE AND TIME STEP ASSESSMENT CHECKLIST (REFER TO SECTION 3 & APPENDIX A)

CLIMATE & TIME-STEP (CHECK REPORTING TABLE C1)	Y	N	COMMENTS/ISSUES TO FOLLOW UP
Has the correct rainfall station been used?	✓		CoQC MUSIC LINK NORTH
Has a 6-minute time-step been used for assessment against stormwater quality management objectives?	✓		
Has the correct modelling period been selected?	✓		
Has the correct potential evapotranspiration been selected?	✓		

TABLE D.3 CATCHMENT AND SOURCE NODE ASSESSMENT CHECKLIST (REFER TO SECTION 3.3)

CLIMATE & TIME-STEP (CHECK REPORTING TABLE C1)	Y	N	COMMENTS/ISSUES TO FOLLOW UP
Are the source node areas reported appropriate with respect to catchment areas shown on the plan?	✓		
Does the total area reported reflect the total catchment relative to the development application?	✓		
Does the land use reported reflect the proposed land use?	✓		
Is the total imperviousness percentage for each land type appropriate (for development applications this must be measured direct from plans)?	✓		

CATCHMENT SPLIT (CHECK REPORTING TABLE C3)	Y	N	COMMENTS/ISSUES TO FOLLOW UP
Has a 'split catchment' approach been used?	✓		
Does the area of each land use/surface type reported reflect the areas shown on the plan?	✓		
Does the total area reported reflect the total catchment?	✓		
Do the land uses or surface types reported reflect the proposed development i.e. have correct source nodes been used?	✓		
Is the fraction imperviousness for each land uses or surface type appropriate? Nb: for development applications this must be measured direct from plan, otherwise refer Section 3.3.3.	✓		
For split catchment modelling where rainwater tanks are proposed as treatment nodes, is the percentage of connected roof area appropriate (Section 4.2)?	N/A		

TABLE D.4 RAINFALL AND RUNOFF ASSESSMENT CHECKLIST (REFER TO SECTION 3.3 AND APPENDIX A)

RAINFALL RUN-OFF AND POLLUTANT EXPORT PARAMETER (CHECK REPORTING TABLE B4 AND TABLE)	Y	N	COMMENTS/ISSUES TO FOLLOW UP
Have the correct rainfall runoff parameters been used?	✓		
Are appropriate pollutant export parameters used?	✓		
Has stochastic generation been used for all pollutants?	✓		

TABLE D.5 ALL TREATMENT NODES ASSESSMENT CHECKLIST

ALL TREATMENT NODES	Y	N	COMMENTS/ISSUES TO FOLLOW UP
Will treatment nodes modelled be free draining? Compare the total depth of the treatment measures modelled against development plan levels.	✓		
Have any receiving environments been modelled as treatment systems? These include natural waterways, natural wetlands, naturalised channel systems, environmental buffers, freshwater and brackish lake and pond systems (existing or constructed). Stormwater must be treated before it discharges to these systems.	✓		20m ECOLOGICAL BUFFER WAS MODELLED

TABLE D.6 RAINWATER TANK NODES ASSESSMENT CHECKLIST (REFER TO SECTION 4.2)

RAINWATER TANKS (CHECK REPORTING TABLE B6)	Y	N	COMMENTS/ISSUES TO FOLLOW UP
Has the volume below overflow pipe (kL) been calculated appropriately?			N/A
Has the depth above the overflow been calculated appropriately?			
If tanks are lumped, is depth below overflow the same as a single tank and overflow pipe scaled accordingly. (Section 4.2.5?)			
Has the total tank surface area been calculated appropriately? For lumped tanks refer to Section 4.2.5.			
Has the overflow pipe diameter been calculated appropriately? For lumped tanks this must be equivalent to the diameter of the overflow pipe of a single tank multiplied by the square root of the number of tanks (Section 4.2.5).			
Has stormwater reuse been calculated appropriately? PET PET – Rain			
Have appropriate indoor connections been selected?			
Has the indoor demand been calculated appropriately?			
Has the outdoor demand been calculated appropriately?			
Has the daily demand been calculated appropriately?			
Has the monthly distribution of annual demand been calculated appropriately?			
Have K and C^* been retained as default values? (Y/N)			

TABLE D.7 WETLAND NODE ASSESSMENT CHECKLIST (REFER TO SECTION 4.3)

RAINWATER TANKS (CHECK REPORTING TABLE B6)	Y	N	COMMENTS/ISSUES TO FOLLOW UP
Has the inlet pond volume sized appropriately to capture coarse sediment?			N/A
Has the macrophyte zone surface area been calculated appropriately?			
Is the extended detention depth less than, or equal to, 0.5 m?			
Has the permanent pool volume been calculated appropriately?			
Is the exfiltration rate set to 0 mm/hr?			
If an exfiltration rate has been used, has the secondary drainage link been used to return the exfiltrated flows to the model? (Section 4.1)			
Has the evaporative loss as % of PET been set to 125% or less?			
Has the equivalent pipe diameter been set so that the notional detention time is about 48 hours?			
Has the overflow weir width been calculated appropriately?			
Is the notional detention time (hrs) approximately 48 hours?			
Are the number of CSTRs appropriate for the shape of the system?			
Have K and C* been retained as default values for all parameters except nitrogen which has been adjusted to reflect Section 4.3.4? (Y/N)			

TABLE D.8 SWALE NODE ASSESSMENT CHECKLIST (REFER TO SECTION 4.4)

SWALES (CHECK REPORTING TABLE C8)	Y	N	COMMENTS/ISSUES TO FOLLOW UP
Is the length equivalent to the length shown on the development plans and does it account for conveyance capacity and safety limitations selected in accordance with the WSUD Technical Design Guidelines for SEQ?			
Is the bed slope less than or equal to 4%?			
Are the base width, top width and depth equivalent to the length shown on the development plans?			
Is the set vegetation height appropriate for the selected species (Section 4.4)?			
Is the exfiltration rate set to 0 mm/hr?			
If an exfiltration rate has been used, has the secondary drainage link been used to return the exfiltrated flows to the model? (Section 4.1)			
If the swale accepts point source discharges at given locations, is it split into separate lengths?			
Have K and C* been retained as default values?			
BIORETENTION SWALE CHECKS			
Is the swale node located in the model downstream of bioretention swale surface component? (Y/N)			
Is the low-flow bypass of the swale node set to the infiltration rate of the filter? (Y/N)			

TABLE D.9 BIORETENTION AND BIORETENTION SWALE NODES ASSESSMENT CHECKLIST (REFER TO SECTION 4.5)

BIORETENTION AND BIORETENTION SWALE FILTER COMPONENTS (CHECK REPORTING TABLE C8 AND TABLE C9)	Y	N	COMMENTS/ISSUES TO FOLLOW UP
Has the filter surface area been calculated appropriately?	✓		
Is the extended detention depth consistent with the depth shown on the development plans and between 0-0.4 m?	✓		0.3m
Is the filter media area consistent with the area shown on the development plans?	✓		
Has an appropriate unlined filter media perimeter been set?	✓		
Has an appropriate saturated hydraulic conductivity been set? This should be modelled once at 50 mm/hr, once at 200 mm/hr and both scenarios reported.	✓		200mm/hr
Is the filter media depth modelled equivalent to the depth of media shown on the plans? This depth should not include the intermediate layer, drainage layers, or submerged zone.	✓		
Is the TN content in the filter media set to either 400 mg/kg or another suitably justified value?	✓		
Is the orthophosphate content in the filter media set to 30 mg/kg or another suitably justified value?	✓		
Is the base lined?	✓		
Has the system been modelled to reflect the nutrient removal properties of the plants to be used on site?	✓		
Is the overflow weir width appropriate?	✓		25m
Is the exfiltration rate set to zero?	✓		
If an exfiltration rate has been used, has the secondary drainage link been used to return the exfiltrated flows to the model? (Section 4.1)	N/A		
If exfiltration rate has been used, is the exfiltration rate justified?	N/A		
Has the system been modelled with underdrains present?	✓		
Is a submerged zone with carbon present?		✓	
Is the depth of submerged zone consistent with plans?		N/A	
If bioretention systems are modelled in series, is there a low-flow bypass modelled in the downstream bioretention system/s? (Note: separate drainage systems are required if a low-flow bypass is modelled)	N/A		
Have K and C* been retained as default values? (Y/N)			
BIORETENTION SWALE COMPONENT ONLY (CHECK TABLE C8)			
Has an extended detention depth of 0 m been used? (Y/N)			
Has the low flow bypass been calculated? The calculation should be provided by the applicant separately.		N/A	

TABLE D.10 BUFFER NODE ASSESSMENT CHECKLIST (REFER TO SECTION 4.7)

BUFFERS (CHECK REPORTING TABLE C10)	Y	N	COMMENTS/ISSUES TO FOLLOW UP
Does the treatment node reflect the vegetated area receiving sheet flow only?			
Is the percentage of upstream area buffered consistent with catchment plans?			
Does the buffer area accurately reflect the percentage impervious area as shown on the development plans?		N/A	
Is the exfiltration rate set to zero?			
If an exfiltration rate has been used, has the secondary drainage link been used to return the exfiltrated flows to the model? (Section 4.1)			

TABLE D.11 PROPRIETARY & CUSTOM PRODUCTS (INC GROSS POLLUTANT TRAPS) NODE ASSESSMENT CHECKLIST (REFER TO SECTION 4.8)

PROPRIETARY & CUSTOM PRODUCTS (CHECK REPORTING TABLE C11)	Y	N	COMMENTS/ISSUES TO FOLLOW UP
Are the proposed pollutant reduction efficiencies independently verified using a method suited to local conditions (Section 4.8)?			
Does the data provided include performance results under dry weather flows (to account for potential pollutant leaching)? (Y/N).			
Is the assumed high-flow bypass rate consistent with manufacturer specifications? (Y/N)		N/A	
UNLESS "YES" HAS BEEN ANSWERED TO ALL THREE QUESTIONS ABOVE THE PROPOSED POLLUTANT REDUCTION RATES CANNOT BE RELIED UPON AS BEING REASONABLE ASSUMPTIONS OF THE UNIT'S PERFORMANCE.			
Is the storage volume modelled consistent with the proposed unit?			
Is the expected maintenance frequency a reasonable assumption?			
Is the storage volume large enough to contain all sediments and gross pollutants received by unit during inter-maintenance periods?			

TABLE D.12 SEDIMENT BASIN NODE ASSESSMENT CHECKLIST (SECTION 4.9)

SEDIMENT BASINS (CHECK REPORTING TABLE C12)	Y	N	COMMENTS/ISSUES TO FOLLOW UP
Has the surface area been calculated appropriately (Section 4.3.2)?			
Is the extended detention depth consistent with the development plans?			
Is the permanent pool volume consistent with the development plans?			
Is the exfiltration rate set to 0 mm/hr?			
If an exfiltration rate has been used, has the secondary drainage link been used to return the exfiltrated flows to the model? (Section 4.1)			
Is the evaporative loss as % of PET reasonable?			
Has the equivalent pipe diameter been set appropriately? (Where appropriate refer to Section 4.3.3 for advice on accounting for user-defined stage-discharge relationship)?			
Is the overflow weir width consistent with the development plans?			
Is the notional detention time set to account for potential flow restriction?			
Are the number of CSTRs appropriate for the shape of the system?			
Have the K and C* values been retained as default values? (Y/N)			

N/A

TABLE D.13 INFILTRATION NODE ASSESSMENT CHECKLIST (REFER TO SECTION 4.10)

INFILTRATION (CHECK REPORTING TABLE C13)	Y	N	COMMENTS/ISSUES TO FOLLOW UP
Is the exfiltration rate justified?			
Has the secondary drainage link been used to return the exfiltrated flows to the model? (Section 4.1). If the secondary drainage link is not used, WQO's must be achieved prior to stormwater entering an infiltration system.			
Can the hydraulic conductivity of the in-situ soils be guaranteed even during earthworks?			
IF "NO" WAS ANSWERED TO ANY OF THE ABOVE QUESTIONS THIS NODE CANNOT BE USED.			
Is the pond surface area consistent with the plans?			
Is the extended detention depth consistent with the plans?	N/A		
Is the filter area consistent with the plans?			
Is the unlined filter media perimeter appropriate?			
Is the depth of infiltration media consistent with the plans?			
Is the exfiltration rate justified?			
Is the overflow weir width consistent with the plans?			
Is the evaporative loss as % of PET reasonable?			
Have the K and C* values been retained as default values?			

TABLE D.14 POROUS PAVEMENT NODE ASSESSMENT CHECKLIST (REFER TO SECTION 4.11)

POROUS PAVEMENTS (CHECK REPORTING TABLE C14)	Y	N	COMMENTS/ISSUES TO FOLLOW UP
Has the applicant answered "Y" to all questions in the reporting table?	N/A		

NB: Check all other parameters for the porous pavement using Table C9.

TABLE D.15 MEDIA FILTRATION NODE ASSESSMENT CHECKLIST (REFER TO SECTION 4.8.3)

MEDIA FILTRATION SYSTEM (CHECK REPORTING TABLE C15)	Y	N	COMMENTS/ISSUES TO FOLLOW UP
Is the extended detention depth consistent with plans?			
Is the surface area consistent with plans?			
Is the exfiltration rate set to zero?			
If an exfiltration rate has been used, has the secondary drainage link been used to return the exfiltrated flows to the model? (Section 4.1)			
Is the filter area consistent with plans?			
Is the filter depth consistent with plans?			
Is the filter media particle diameter consistent with manufacturer information?			
Is the saturated hydraulic conductivity consistent with manufacturer information?			
Is the depth below underdrain consistent with plans?			
Have the K and C* values been retained as default values or otherwise justified?			

N/A

TABLE D.16 OVERALL APPROVAL ASSESSMENT CHECKLIST

DESIGN OBJECTIVES (CHECK REPORTING TABLE C16)	Y	N	COMMENTS/ISSUES TO FOLLOW UP
Have all water quality objectives been met?	✓		
Is the MUSIC model approved?			