



ENGINEERING SERVICES REPORT

APPLICATION FOR RECONFIGURING A LOT – BOUNDARY REALIGNMENT

ADDRESS

60 Stapylton Jacobs Well Road, Stapylton

REAL PROPERTY DESCRIPTION

Lot 501 on SP295994

PREPARED FOR

FPI Queensland Pty. Ltd.

January 2022 (Rev. 1)



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development
perspectives

project coordination
urban + regional planning
landscape + urban design
engineering services
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Revision / Checking History

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Rev. No.	Name	Position	Signature	Date
1.	Mitchell Gassman	Civil Project Engineer RPEQ 16939		27 January 2021

Final Distribution

FPI Queensland Pty. Ltd. (Client)	1 electronic copy
City of Gold Coast Council (Assessment Manager)	1 electronic copy
GDP File	1 electronic copy

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1.0 INTRODUCTION

Gassman Development Perspectives (GDP) has been engaged by FPI Queensland Pty. Ltd. (Client) to prepare an Engineering Services Report over land situated at 60 Stapylton Jacobs Well Road, Stapylton (Lot 501 on SP295994) and specifically Lots 120-122 within the ROL-approved Stage 1 extent of the Vantage Yatala industrial development which has recently been plan sealed by Council.

This report has been prepared for submission to City of Gold Coast Council (Council) as part of an Application for a Development Permit for Reconfiguring a Lot – Boundary Realignment (**Appendix A – Proposed Site Plan**)

The purpose of this report is to supply information relating specifically to Civil Engineering infrastructure, services and issues over the subject lots the need to reconfigure the approved extent of Lots 120-122 to cater for the revised boundary alignments as per **Figure 1** below can be managed through either the use of existing or minor augmentation to the existing Stage 1 or OPW-approved Stage 2 civil infrastructure.

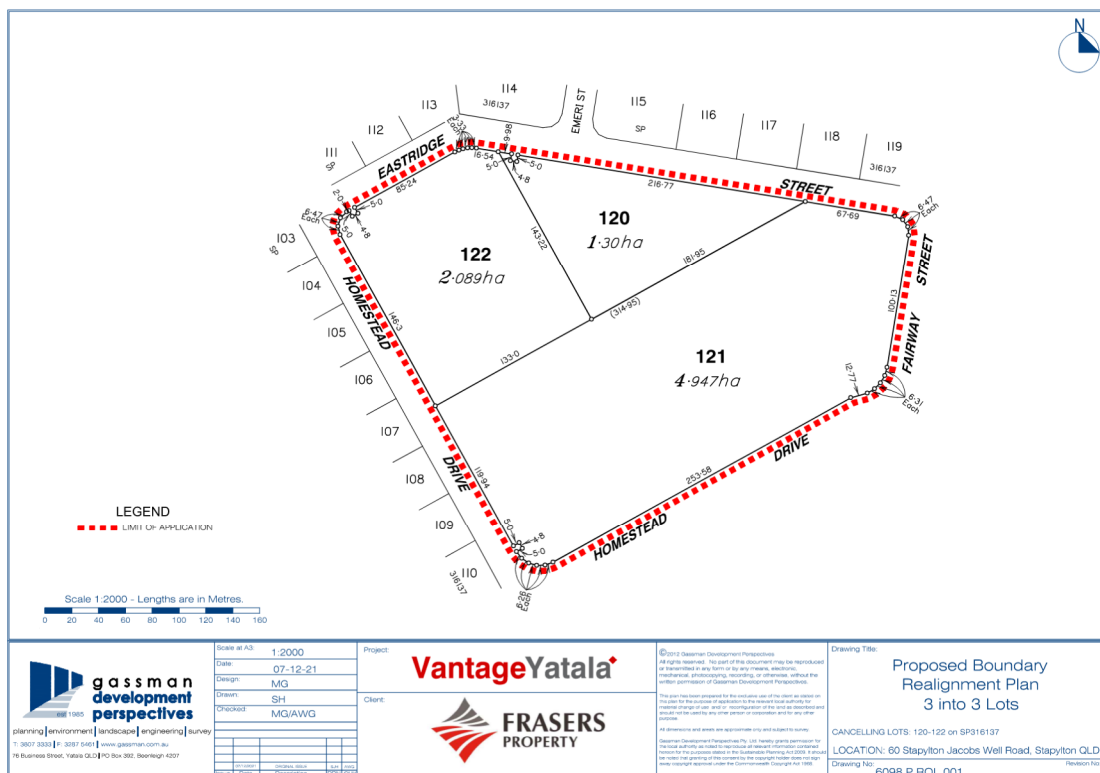


Figure 1.1: Lots 120, 121 & 122 Boundary Realignment Plan, Source: GDP

2.0 SITE DESCRIPTION

2.1 SITE LOCATION

The subject site is located within the City of Gold Coast Council's (Council) local government boundaries, in Council's "Future Low Impact Industry" and "Future Medium Impact Industry" zone precinct. The subject site is bounded by Stapylton Jacobs Well Road to the north, Christensen Road and existing industrial uses to the west and Council's land fill facility to the south-east (refer to **Figure 2.1**).

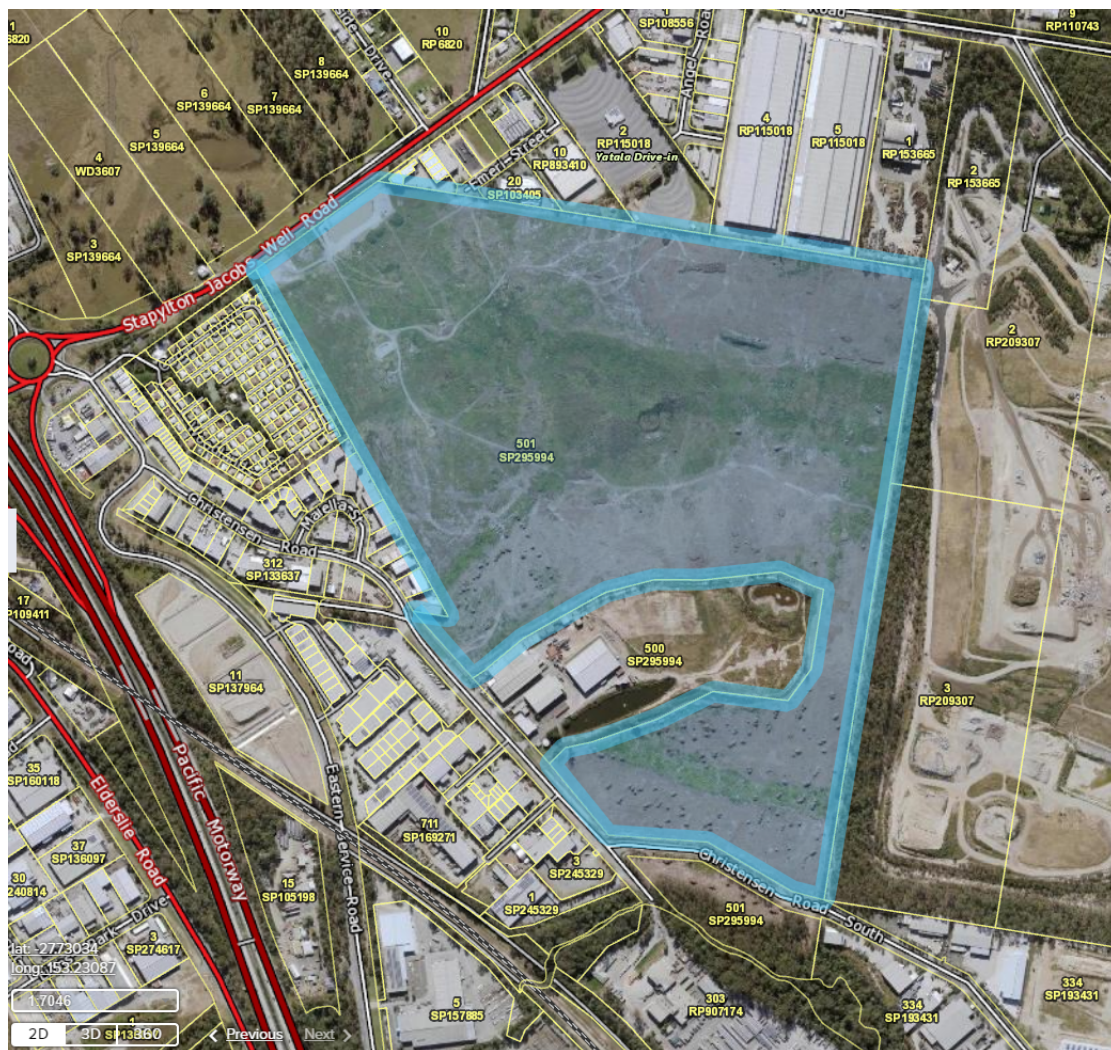


Figure 2.1: Site Locality Plan, Source: Google Earth 2017

2.2 LAND ENCUMBRANCES

There are no existing encumbrances over the subject site.

2.3 EXISTING LAND USES

The subject land is vacant following vegetation clearing to facilitate the industrial development.

2.4 TOPOGRAPHY

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

2.5 EXISTING VEGETATION

The subject land and specifically the land that will form Lots 120-122 is vacant of vegetation following recent clearing completed under Council approvals OPW201800486 and OPW201801219. A 10m retained vegetation buffer exists along the subject site's south-east boundary shared with Council's landfill facility. A component of this buffer falls within the Stage 2 extent.

2.6 CONTAMINATED LAND

The subject site is not known to be contaminated.

3.0 EARTHWORKS

Due to the existing topography of the subject site (refer **Appendix B**) major bulk earthworks were undertaken as part of Stage 1 of the development to provide generally flat pads suitable for the intended industrial use based on the ROL-approved lot layout (Council Ref: COM/2020/262).

As part of the realignment of the lot boundaries to facilitate the proposed warehouse land use, an updated bulk earthworks strategy has been developed by Gassman Development Perspectives over Lots 120-122 of the development which is linked to the boundary realignment application being lodged concurrently with council to the warehouse MCU. The lot-specific change to ground level works which incorporate the required retaining structure along the Lots 121-122 common boundary are shown within contained within **Appendix C**.

4.0 ROADWORKS AND ACCESS

Stage 1 of the proposed development will ultimately gain access via two (2) locations being the existing approved road network through Stage 1 of the development which links the subject site to its frontage to the State-controlled Stapylton Jacobs Well Road via a signalised intersection along with a secondary connection to the local road network (Christensen Road) proposed as part of the forthcoming Stage 2 currently under construction. Due to the subject site's proximity to Exit 38 of the M1 Motorway the conceptual design of the Christensen Road external intersection has included access provisions for A-Double vehicular movements into the development.

In accordance with the superseded planning scheme approval in place over the subject site, the internal road network will be constructed in accordance with the typical cross section shown on Council standard drawing 05-02-004 for an Industrial Collector Street (refer **Figure 4.1** below). It is noted this road reserve configuration has been applied to internal roads that would typically be classed as "Industrial Access Streets" to maintain greater access and manoeuvrability throughout the proposed development. In line with the design intent of the external intersection, the radii of kerb returns throughout the estate have also been designed to accommodate A-Double vehicular movements.

The truncations to lot boundaries necessary to maintain minimum road verge widths through these kerb returns have not been altered within the proposed boundary realignment plan and all three lots maintain lawful access locations to the surrounding Council road reserves.

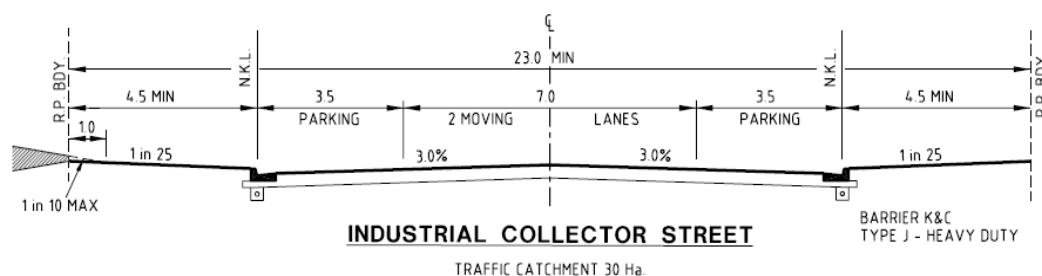


Figure 4.1: Proposed Internal Roads Cross Section, Source: CoGC Std Dwg 05-02-004

5.0 INFRASTRUCTURE SERVICES

5.1 SEWERAGE

As existing Operational Works Approval (Council Ref: MIN/2021/95, Decision Notice dated 21 June 2021) from CoGC is in place for the civil servicing of Vantage Stage 1 and the currently approved lot configuration. Due to the lot boundary changes required to facilitate the warehouse facility over 121 which has in turn triggered the proposed boundary realignment, minor augmentation of the currently approved and constructed gravity sewer network will be required.

The extension of the 150mm diameter gravity sewer line along Homestead Drive and installation of the new property connection to service new Lot 121 are shown within the Engineering Servicing Strategy Plan contained within **Appendix C**. The existing sewer property connections to Lots 120 and 122 are not affected by the boundary alignment and as such no augmentation is proposed to these. As the Stage 1 civil works are expected to be On Maintenance with CoGC at the time of Council's approval of the warehouse MCU. A new Operational Works application will be made to undertake the required works.

5.2 WATER SUPPLY

As existing Operational Works Approval (Council Ref: MIN/2021/95, Decision Notice dated 21 June 2021) from CoGC is in place for the civil servicing of Vantage Stage 1 and the currently approved lot configuration. The existing provisions for property connections made within the approved and constructed works facilitate the proposed warehouse lot layout and as such no augmentation of the existing potable water main is required to facilitate the development.

Suitable spatial provisions have also been made within the proposed site plan (refer **Appendix A**) for the location of the above ground water meters and their associated access easement requirements needed to service the subject lot from a potable and fire main perspective. The proposed connection location is noted within the Engineering Servicing Strategy Plan contained within **Appendix C**.

5.3 ELECTRICITY AND TELECOMMUNICATIONS

Stage 1 of the Vantage industrial development has underground reticulated electrical and telecommunications (NBN) networks approved by the relevant service authorities (electrical and communications reticulation to the subject site's road frontage).

The adequacy of this infrastructure in its current form along with the necessity for any augmentation or upgrades to cater for the proposed use will be confirmed through the detailed design process by the appointed electrical consultant.

6.0 SITE BASED STORMWATER MANAGEMENT

6.1 STORMWATER CONVEYANCE

Due to the shift south in the common boundary between Lots 121 and 122 to facilitate the proposed warehouse development over Lot 121, the existing stormwater property connection for Lot 121 which has been constructed as part of Stage 1 of the Vantage development (Council ref: MIN/2021/195) will need to be extended within the lot and within an easement into the new Lot 121 extent to provide a LPoD. These works are shown within the Engineering Servicing Strategy Plan contained within **Appendix C**. The stormwater connections for Lots 120 and 122 as currently constructed within the development do not require any augmentation to facilitate the boundary realignment.

6.2 STORMWATER QUANTITY

A Site Based Stormwater Management Plan (SWMP) has been prepared by Gassman Development Perspectives (Version 4, dated 5 February 2021) and approved by Council as part of the Vantage Stage 1 ROL (Council Ref: COM/2020/123). This report demonstrates that attenuation measures are able to be incorporated into the proposed development at a regional level to ensure there is no adverse impacts to downstream properties, waterways or infrastructure occur as a result of an increase in peak stormwater flow rates discharging from the subject site upon development.

This is achieved through the detailed design and implementation of appropriately sized detention basin for Stage 1 that comply with City of Gold Coast Council's Land Development Guidelines along with the Queensland Urban Drainage Manual (QUDM). It is noted that whilst the boundaries for Lots 120-122 have been realigned to facilitate the proposed warehouse development, there is no increase in overall size in contributing catchment to the Stage 1 or future Stage 2 basin which would trigger the need to augment the regional stormwater quantity measures in place for the development. This is demonstrated in the Stormwater Catchment Boundary Plan contained within **Appendix D**.

6.2 STORMWATER QUALITY

A suitable stormwater treatment train is to be implemented as part of the construction of Vantage Stage 1 to ensure the servicing of both the proposed industrial lots, surrounding public road reserves and common property.

A Site Based Stormwater Management Plan (SWMP) has been prepared by Gassman Development Perspectives (Version 4, dated 5 February 2021) and approved by Council as part of the Vantage Stage 1 ROL (Council Ref: COM/2020/123) outlining how 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

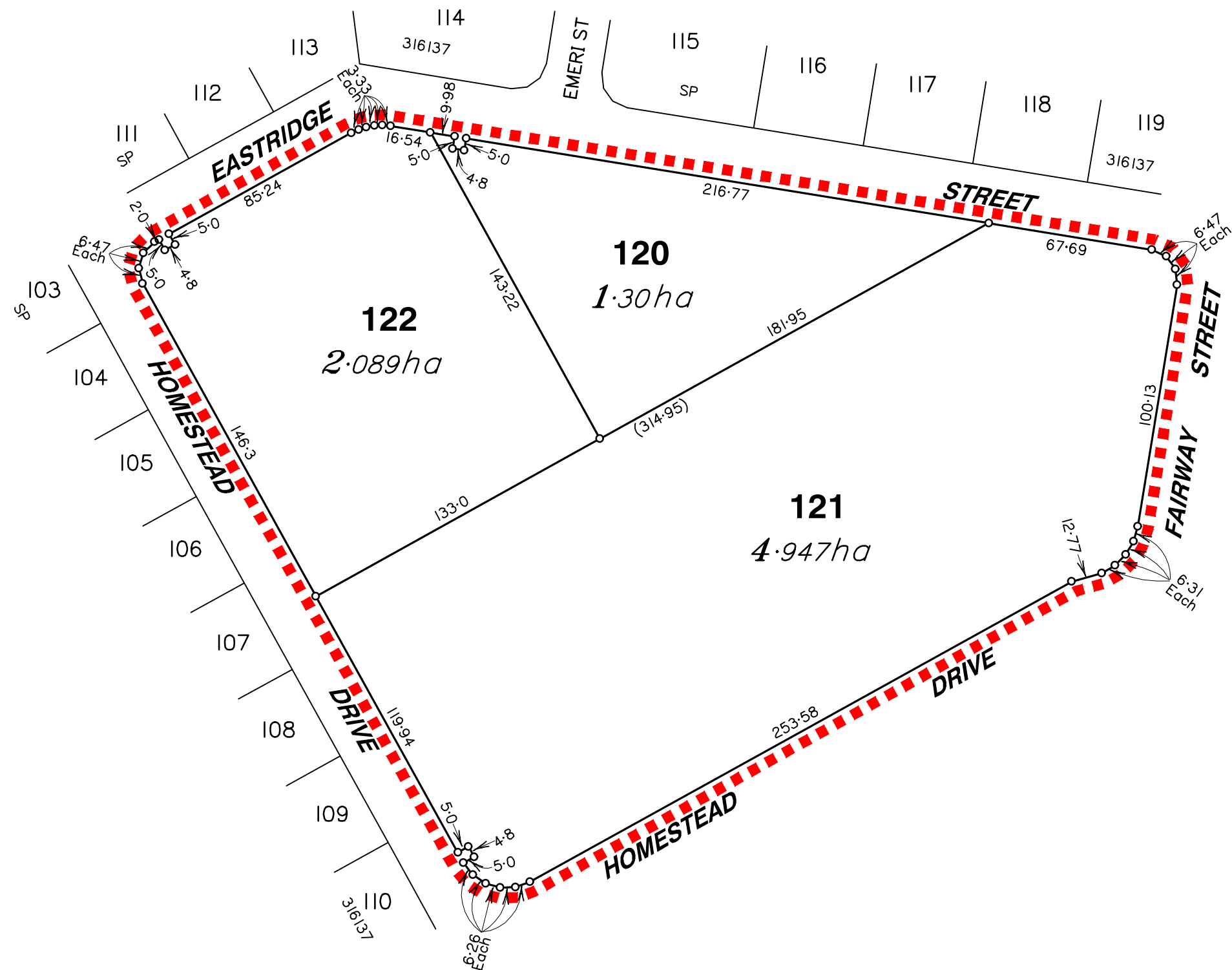
performance objectives of the Queensland State Planning Policy (SPP). This SWMP demonstrates stormwater quality measures for the development are to be implemented at a regional level.

It is noted that whilst the boundaries for Lots 120-122 have been realigned to facilitate the proposed warehouse development, there is no increase in overall size in contributing catchment to the Stage 1 or future Stage 2 basin which would trigger the need to augment the regional stormwater quality measures in place for the development. This is demonstrated in the Stormwater Catchment Boundary Plan contained within **Appendix D**.

7.0 CONCLUSION

The above reporting demonstrates that proposed warehouse development can be undertaken through the construction of Civil Engineering infrastructure and services that meet the requirements of City of Gold Coast City Council's Land Development Guidelines and associated Australian Standards.

Appendix A – Proposed Site Plan



LEGEND

--- LIMIT OF APPLICATION

Scale 1:2000 - Lengths are in Metres.



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Scale at A3:		1:2000	
Date:		07-12-21	
Design:		MG	
Drawn:		SH	
Checked:		MG/AWG	
	07/12/2021	ORIGINAL ISSUE	SJH AWG
Issue	Date	Description	DRN CHK

Project: **VantageYatala**

Client: **FRASERS PROPERTY**

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Drawing Title: **Proposed Boundary Realignment Plan 3 into 3 Lots**

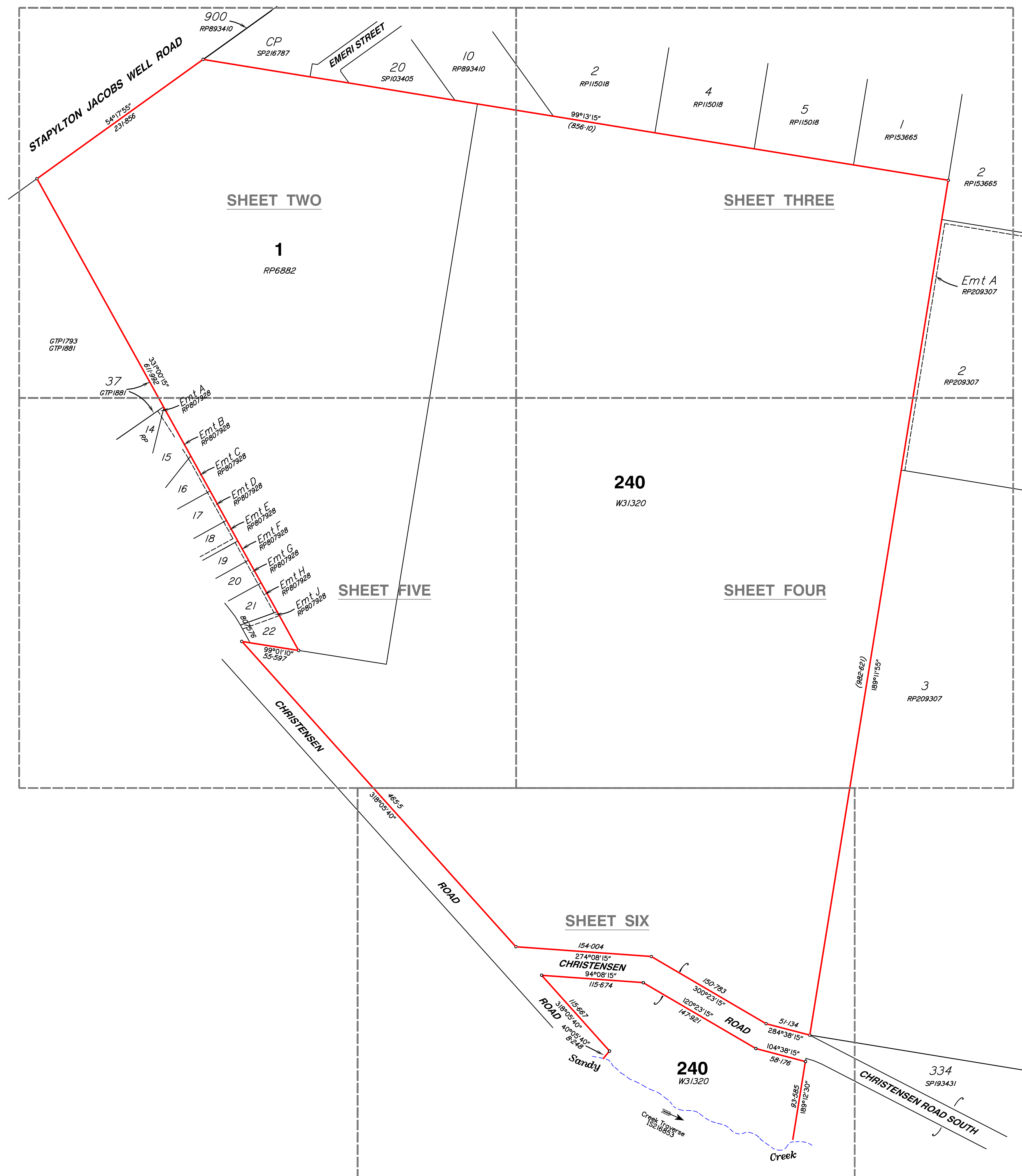
CANCELLING LOTS: 120-122 on SP316137

LOCATION: 60 Stapylton Jacobs Well Road, Stapylton QLD

Drawing No: **6098 P ROL 001**

Revision No:

Appendix B – Site Survey



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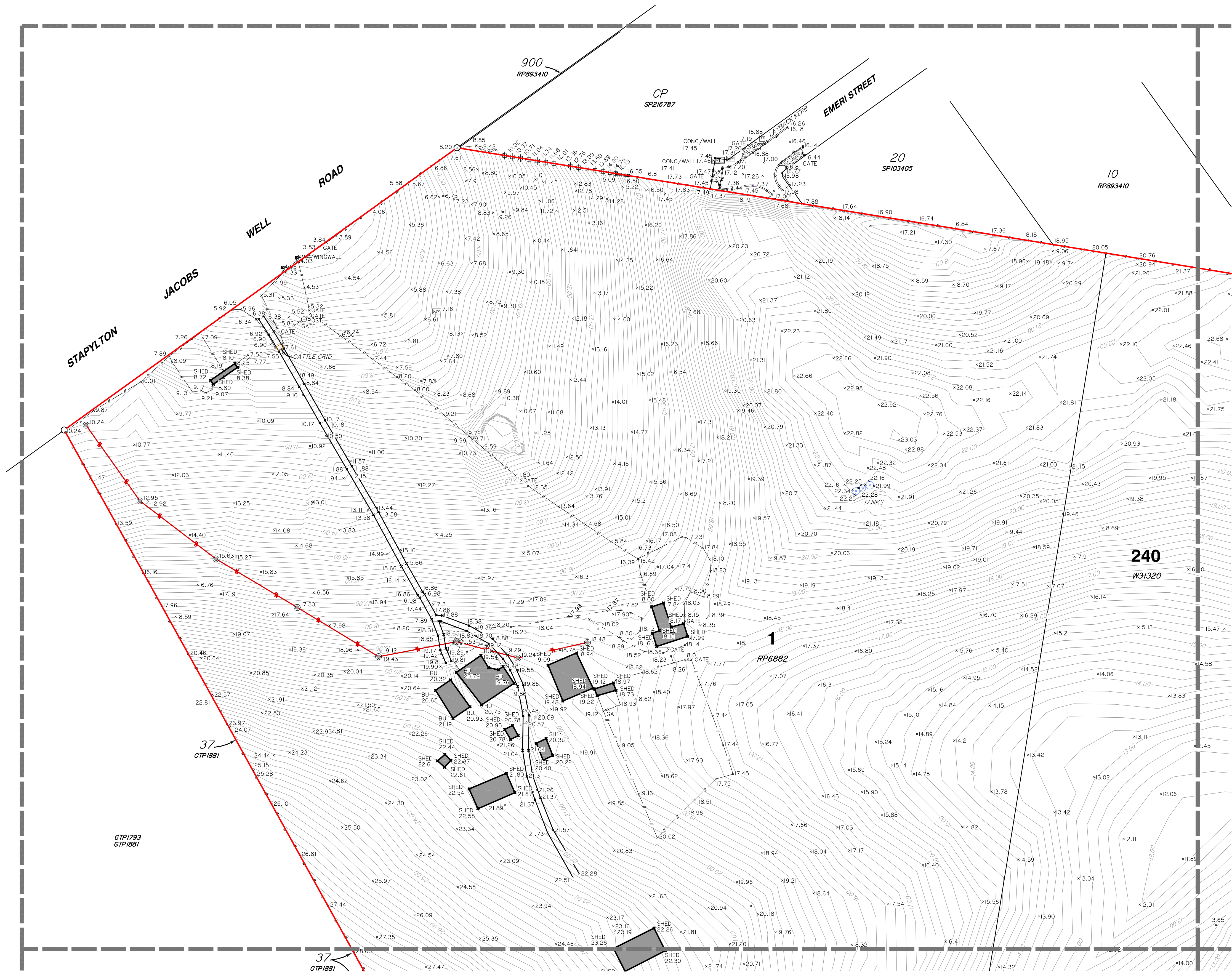


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REFERENCE No. 5093-10
PLAN No. **5093 S CD 01**



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- SEWER INSPECTION OUTLET
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- ELECTRICITY POLE
- ELECTRICITY POLE WITH LIGHT
- TELSTRA PIT
- MANHOLE
- STORMWATER MANHOLE
- GULLY TRAP
- WATER METER
- FIRE HYDRANT
- VALVE
- GATE
- BOLLARD
- CONCRETE
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- FENCE
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CONTOUR AND DETAIL PLAN

Over Lot 1 on RP6882 and Lot 240 on WD31320

Parish of **ALBERT**

County of **Ward**

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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	
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SHEET 2 OF 6



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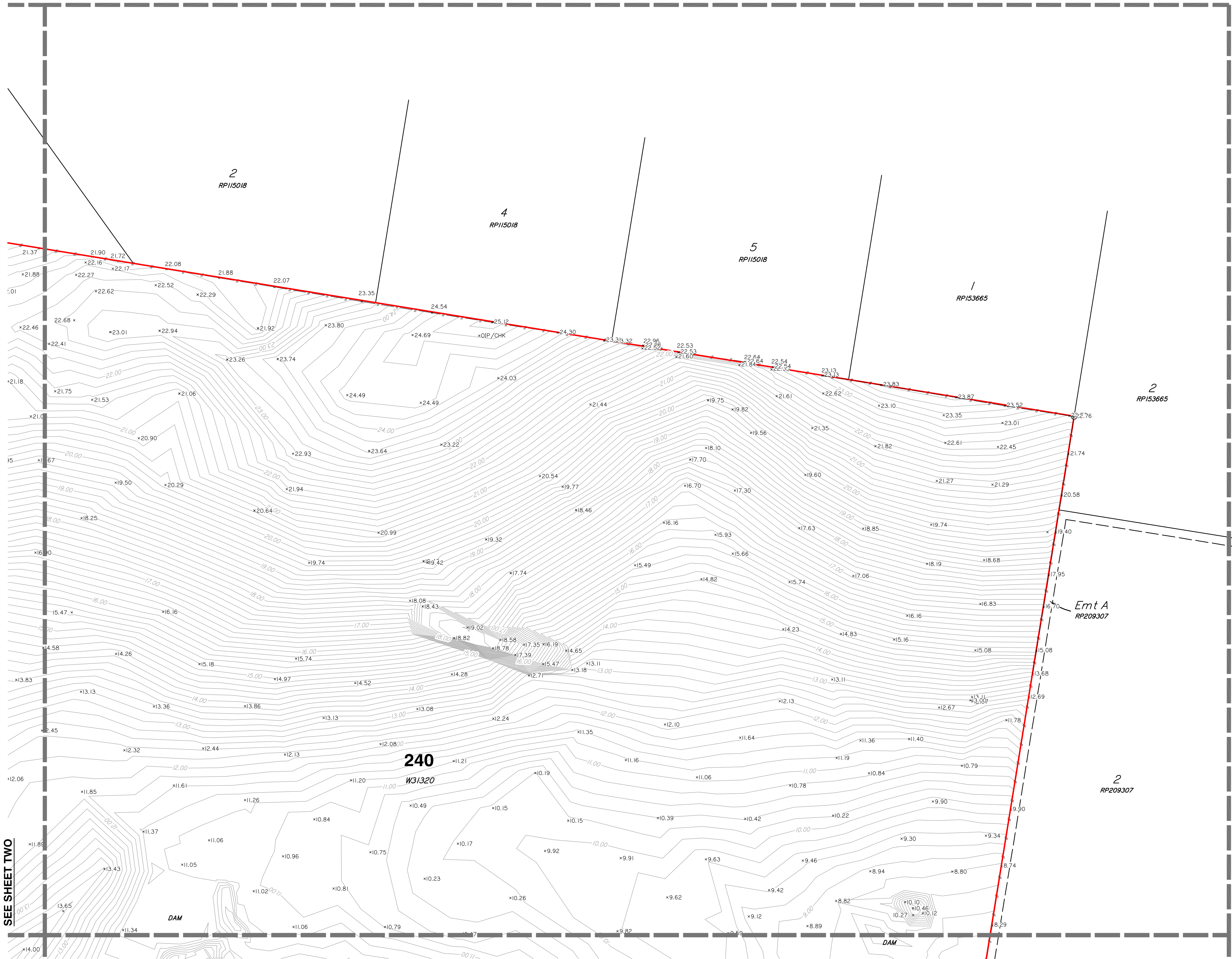
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SEE SHEET TWO

SEE SHEET FOUR

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SEE SHEET THREE



SEE SHEET SIX

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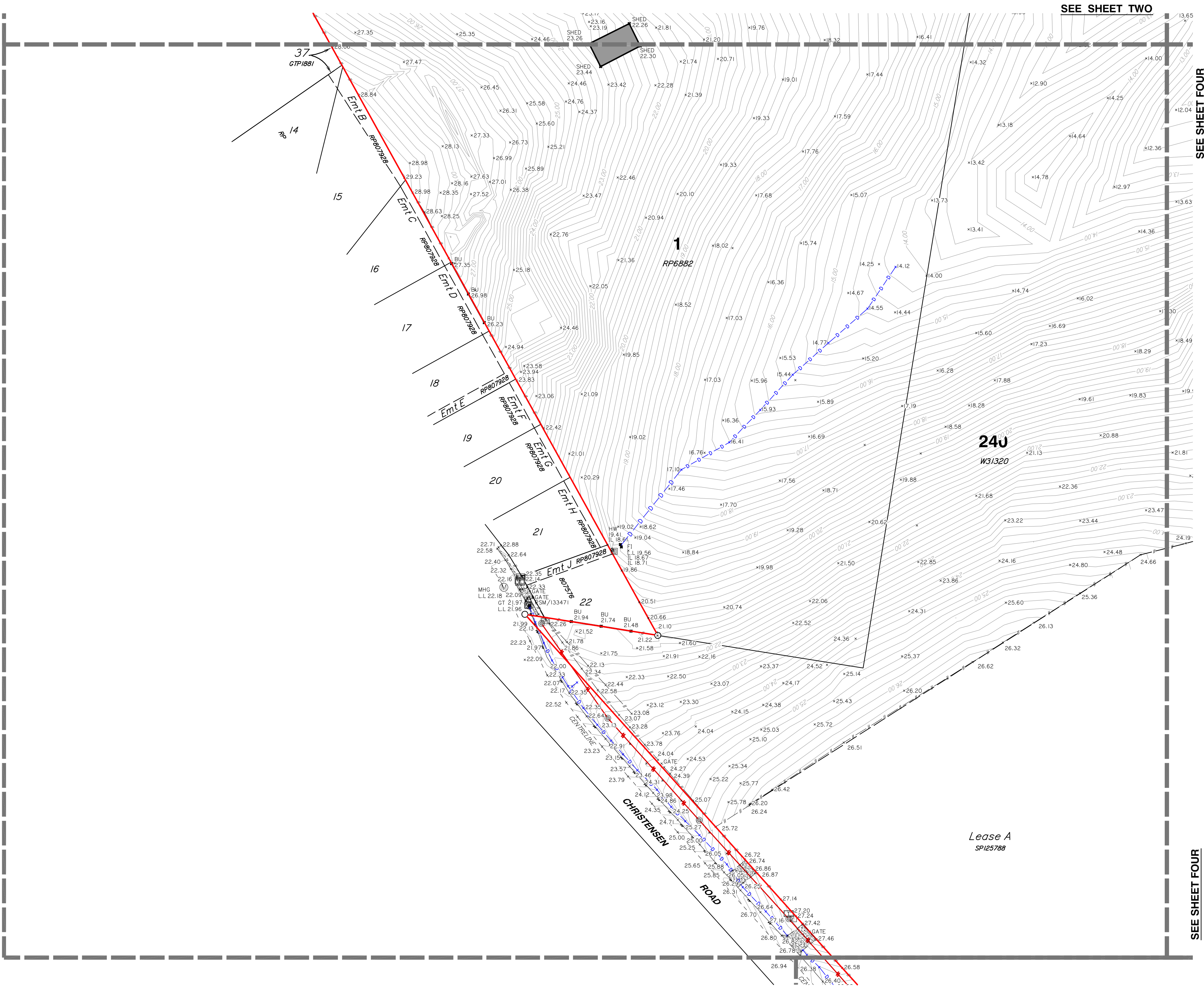
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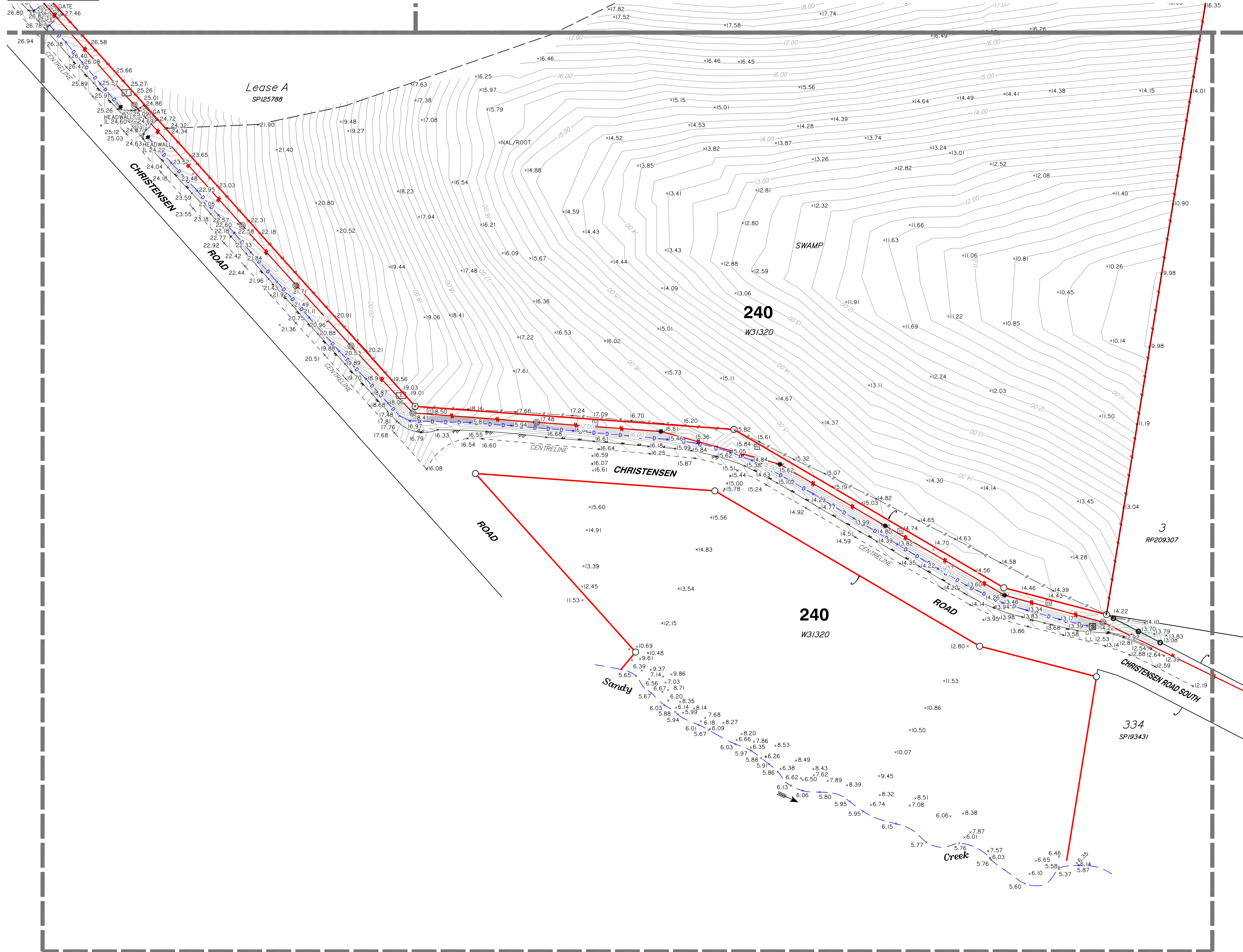
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PLAN No. **5093 S CD 01**



SEE SHEET FIVE

SEE SHEET FOUR



LEGEND

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

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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 C – Civil Servicing Strategy Plan

LEGEND

SUBJECT SITE
BOUNDARY SITE
EXISTING CONTOURS
PROPOSED EASEMENT

PROPOSED GRAVITY SEWER

EXISTING STORMWATER
EXISTING POTABLE WATER
EXISTING GRAVITY SEWER



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Client:



FPI QUEENSLAND PTY. LTD.

Project:

LOT 120-122 BOUNDARY
REALIGNMENT

Site Address:

HOMESTEAD DRIVE,
STAPYLTON QLD 4207

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RPD:

Lot: 120 - 122
Plan: SP316168
Local Authority: CITY OF GOLD COAST
COUNCIL
Level Datum: AHD
Meridian: -
Contour interval: -
PSM: -
RL: -

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DRAWING TITLE

LOTS 120-122 BOUNDARY
REALIGNMENT

Issue	Date	Original Issue	Description	DRN	CHK
A	27-01-2022	ORIGINAL ISSUE		DV	MG

SCALE IN METRES



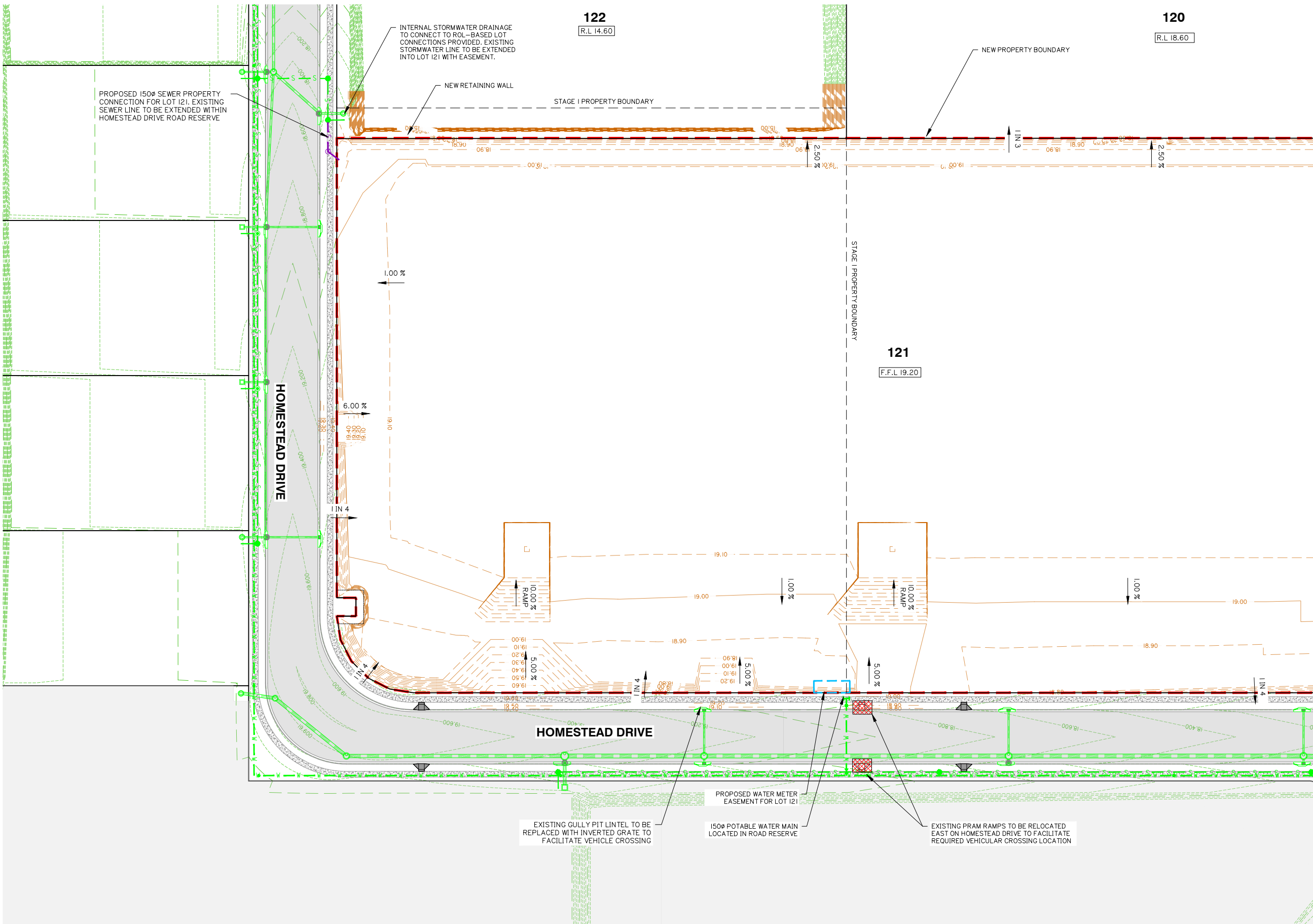
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1:1000 (HALF SIZE A3)

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Designed:	DV
Drafted:	DV
Approved:	MG
RPEQ:	16939
Signed:	
Date:	27-01-2022

Drawing No:
6098 ENG BDY 001

Rev. No:
A



LOT 121 – ENGINEERING SERVICING STRATEGY PLAN

FOR CONTINUATION REFER SHEET No.6098 ENG SP 002

PROPOSED EASEMENT

— SW — SW — SW — SW — SW — EXISTING STORMWATER
— W — W — W — W — W — EXISTING POTABLE WATER
— S — S — S — S — S — EXISTING GRAVITY SEWER

EXISTING GRAVITY SEWER



Client:



Project:

LOT 120-122 BOUNDARY REALIGNMENT

Site Address:

HOMESTEAD DRIVE,
STAPYLTON QLD 4207

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RPD:

Lot:	120 - 122
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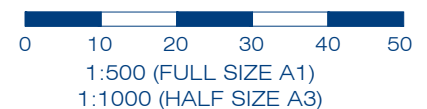
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LOTS 120-122 BOUNDARY
REALIGNMENT

A	27-01-2022							DV	MQ
log up	Date				ORIGINAL ISSUE			[PR]	C=K

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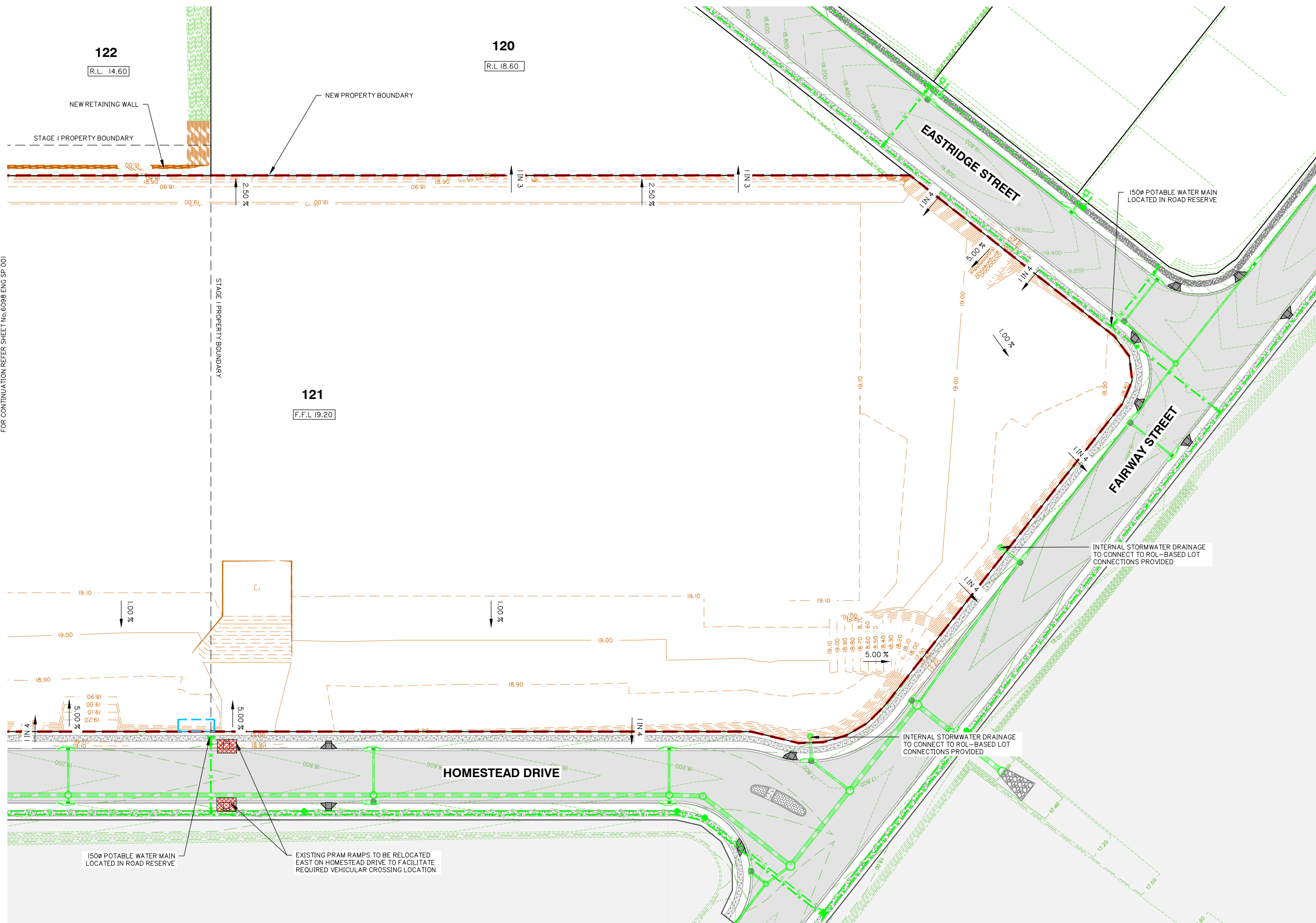
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Date:	27-01-2022
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LOT 121 – ENGINEERING SERVICING STRATEGY PLAN

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Appendix D – Stormwater Catchment Boundary Plan

LEGEND

- SUBJECT SITE
- BOUNDARY SITE
- EXISTING CONTOURS
- PROPOSED EASEMENT
- EXISTING STORMWATER CATCHMENT BOUNDARY
- PROPOSED RECONFIGURED STORMWATER CATCHMENT TO MATCH EXISTING INFRASTRUCTURE CAPACITY



PROPOSED STORMWATER DRAINAGE
GRAVITY SEWER

EXISTING STORMWATER
EXISTING POTABLE WATER
EXISTING GRAVITY SEWER



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Client:

FRASERS PROPERTY
FPI QUEENSLAND PTY. LTD.

Project:

LOT 120-122 BOUNDARY REALIGNMENT

Site Address:

HOMESTEAD DRIVE,
STAPYLTON QLD 4207

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RPD:

Lot: 120 - 122
Plan: SP316168
Local Authority: CITY OF GOLD COAST COUNCIL
Level Datum: AHD
Meridian: -
Contour Interval: -
PSM: -
RL: -

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LOT 120 - 122
STORMWATER CATCHMENT
BOUNDARY PLAN

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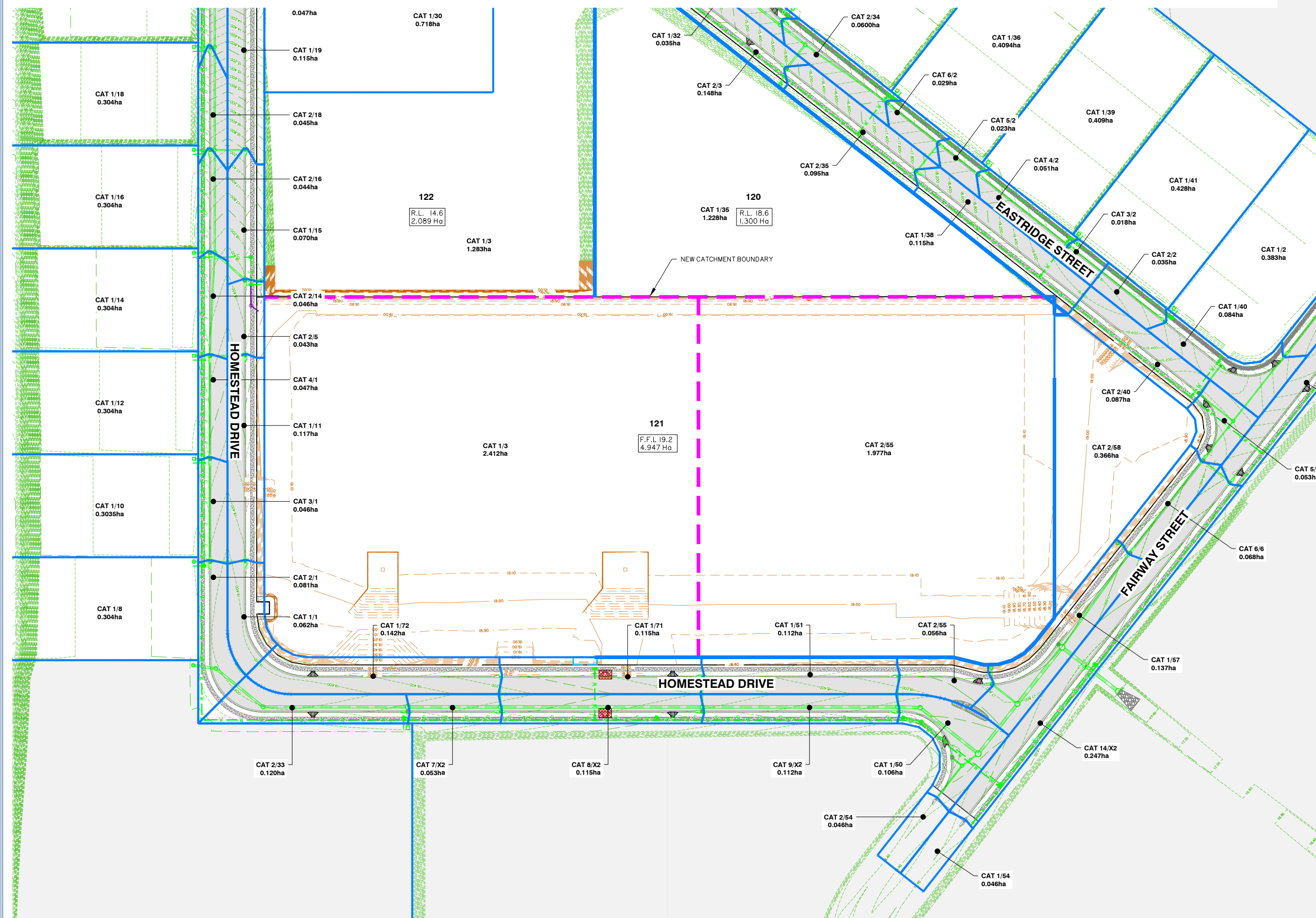
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Drafted:	DV
Approved:	MG
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Signed:	
Date:	27-01-2022

Drawing No: 6098 ENG SWD 001 Rev. No: A



STORMWATER CATCHMENT BOUNDARY PLAN

SITE BASED STORMWATER MANAGEMENT PLAN

VANTAGE YATALA STAGE 1 APPLICATION FOR RECONFIGURING A LOT – BOUNDARY RELAINMENT

ADDRESS

60 Stapylton Jacobs Well Road, Stapylton

REAL PROPERTY DESCRIPTION

Lot 501 on SP295994

PREPARED FOR

FPI Queensland Pty Ltd

January 2022 (Rev. 5)



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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Revision / Checking History

No.	Author	Reviewer	Date
INTERNAL DRAFT	Ian Grieves	Mitchell Gassman	16 December 2019
1.	Ian Grieves	Mitchell Gassman	20 December 2019
2.	Ian Grieves	Mitchell Gassman	20 February 2020
3.	Ian Grieves	Mitchell Gassman	12 March 2020
4.	Mitchell Gassman	Mitchell Gassman	5 February 2021
5.	Mitchell Gassman	Mithell Gassman	27 January 2022

Approval for Issue

Rev. No.	Name	Position	Signature	Date
5.	Mitchell Gassman	Civil Project Engineer RPEQ 16939		27 January 2022

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City of Gold Coast Council (Assessment Manager)	1 electronic copy
GDP File	1 electronic copy

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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 an application for Development Permit for Reconfiguration of Lot – Boundary Realignment associated with constructed Lots 120-122 within Stage 1 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.

Revision 5 Update:

It is noted that the extent of the proposed stormwater quantity and quality basin servicing the proposed lot boundaries associated with Lots 120-122 does not alter from those approved by Council via "Site Based Stormwater Management Plan – Development Application for Reconfiguration of Lot Revision 3" prepared by Gassman Development Perspectives dated 12 March 2021 as part of the overarching ROL for Vantage Stage 1 and the associated Civil Operational Works Approval (Council Ref: MIN/2021/195) covering the detailed design of the Stage 1 stormwater basin. This is due to the changes in lot boundaries triggered by this application altering the spatial form of sub-catchments only as opposed to the overall size of contributing catchments to the respective basin which remains consistent with that currently approved by Council.

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 Operation Works approval obtained from Council.

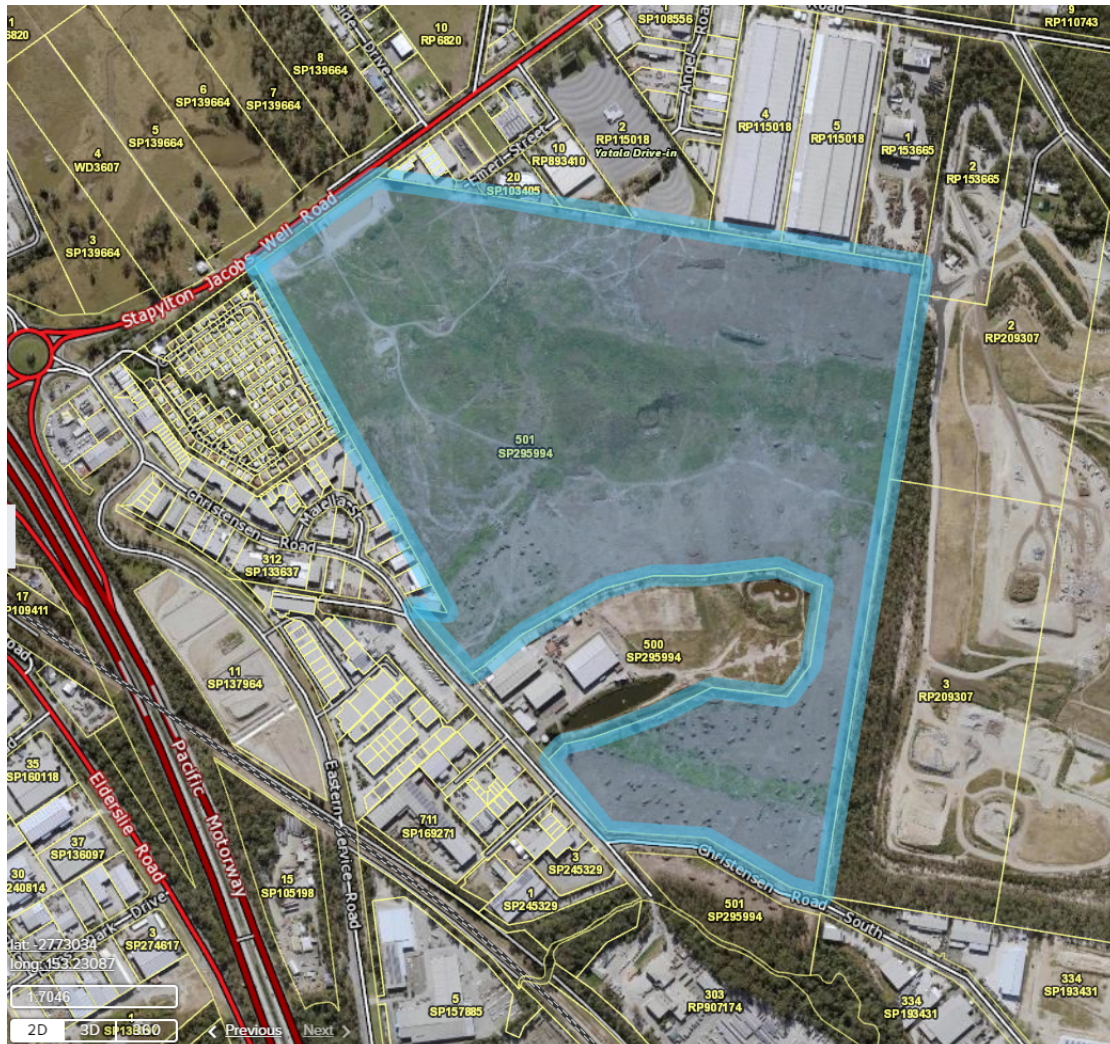


Figure 2.1: Site Locality Plan, Source: QLD Globe 2019

2.2 SITE AREA

The current area of the site is 64.239 Ha of which the proposed bulk earthworks change to ground level works for Stage 1 makes up approximately 27.681 Ha, (19.34 Ha development stage area including the drainage reserve). 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. The current proposal involves creating further industrial lots created 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.

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.

On-site regional flood storage volumes have been calculated for the site based on Council's provided flood level of 8.60m AHD (CoGC City Plan v5) and the existing surface levels within the property boundary. The volume of on-site regional flood storage is equal to 19,927m³. In summary, the compensatory balance flood storage works was provided as follows:

Site Address	Available Q ₁₀₀ Flood Storage Volume	
	Pre Developed	Post Developed
60 Stapylton Jacobs Well Road, Stapylton	19,927 m ³	14,544 m ³
Shortfall of Flood Storage at Subject Site	5,383 m ³	
Earthworks below Q ₁₀₀ at Yellowwood Rd	5,769 m ³ *	

* A gain of 386 m³ of flood storage has been achieved in the post development scenario.

Appendix D provides detailed drawings of the bulk earthworks undertaken and that a flood storage balance between the pre and post development scenario has been achieved.



3.0 CONVEYANCE MANAGEMENT AND PRE AND POST DEVELOPMENT CATCMENTS

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 will utilise one (1) lawful point of discharge being to the northern boundary of the site; utilising the existing 2.70m x 3.00m RCBC “cattle crossing” located under Stapylton Jacobs Well Road. The existing structure – historically used for paddock-to-paddock farm access is an asset of DTMR. An extension to this structure is required to accommodate for the widened carriageway of the ultimate DTMR signalised intersection upgrade which provides vehicular access to the development. Please refer to **Appendix M** for the detailed functional layout plans of the intersection.

Modifications works to the upstream side of the cattle crossing culvert are required to provide a suitable utility services corridor within the upgraded verge. Modifications will involve reducing the height of the box culvert cell by replacing with multiple pipe culverts in conjunction with the basin outlet configuration works.

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**.

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 - Total Site)		
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		Catchments (Pre Development - Total Site)		
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		Catchments (Pre Development - Total Site)		
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
Parameter		Catchments (Pre Development - Total Site)		
Name		CAT-7	CAT-7A	CAT-8
Area (Ha)		9.981	3.410	2.481
Vectored Slope (%)		3.51	2.50	3.00
Impervious Area (%)		0.00	85.00	0.00
Pervious Area (%)		100.00	15.00	100.00
Roughness (n)		0.060	0.020	0.060
Parameter		Catchments (Pre Development - Total Site)		
Name		CAT-9	CAT-10	
Area (Ha)		2.210	8.523	
Vectored Slope (%)		2.21	6.75	
Impervious Area (%)		0.00	9.50	
Pervious Area (%)		100.00	90.50	
Roughness (n)		0.060	0.030	

Table 4.2A: Pre Development Catchment Parameters

Parameter		Catchments (Total Site)	
Reporting Location	LPoD-1	LPoD-2	LPoD-3
Contributing Sub Catchments	CAT-1, CAT-2, CAT-3, CAT-X2, CAT-4, CAT-5, CAT-6, CAT-6A, and CAT-X1	CAT-7 and CAT-7A	CAT-8
Area (Ha)	50.714	13.391	2.481
Vectored Slope (%)	4.01	3.01	3.00
Impervious Area (%)	3.10	2.50	0.00
Pervious Area (%)	96.90	97.50	100.00
Roughness (n)	0.059	0.059	0.060
Initial Loss (mm)	17.20	17.20	17.20
Continuing Loss (mm/hr)	1.10	1.10	1.10
Parameter		Catchments (Total Site)	
Reporting Location	LPoD-4	LPoD-5	
Contributing Sub Catchments	CAT-9	CAT-10	
Area (Ha)	2.21	8.523	
Vectored Slope (%)	2.21	6.75	
Impervious Area (%)	0.00	9.50	
Pervious Area (%)	100.00	90.50	
Roughness (n)	0.060	0.030	
Initial Loss (mm)	17.20	5.00	
Continuing Loss (mm/hr)	1.10	2.50	

Table 4.2B: Contributing Catchment Parameters to Reporting Locations

Parameter		Catchments (Post Development - Stage 1)	
Name		DEV-5 <i>Impervious Catchment</i>	DEV-5 <i>Pervious Catchment</i>
Total Area (Ha)		15.071 (81% Impervious, 19% Pervious)	
Area Split (Ha)		12.208	2.863
Vectored Slope (%)		1.70	1.70
Impervious Area (%)		100.00	0.00
Roughness (n) for Impervious Area		0.020	-
Pervious Area (%)		0.00	100.00
Roughness (n) for Pervious Area		-	0.035
Initial Loss (mm)		0.00	17.20
Continuing Loss (mm/hr)		2.50	1.10

Table 4.2C: Post Development Catchment Parameters

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 DEV-5 ONLY	Initial Loss (mm)	Continuing Loss (mm/hr)
Pre Developed		
Pervious	5.00	2.50
Impervious	0.00	2.50

Land Use Type DEV-5 ONLY	Initial Loss (mm)	Continuing Loss (mm/hr)
Post Developed		
Pervious	17.20	1.10
Impervious	0.00	2.50

Land Use Type	Initial Loss (mm)	Continuing Loss (mm/hr)
Pre Developed		
Pervious	17.20	1.10
Impervious	0.00	1.10

Land Use Type	Initial Loss (mm)	Continuing Loss (mm/hr)
Post Developed		
Pervious	17.20	1.10
Impervious	0.00	1.10

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 each catchment based on the parameters listed above.

The computations were undertaken for the standard Average Exceedance Probabilities (AEP) 63.2%, 50%, 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*.

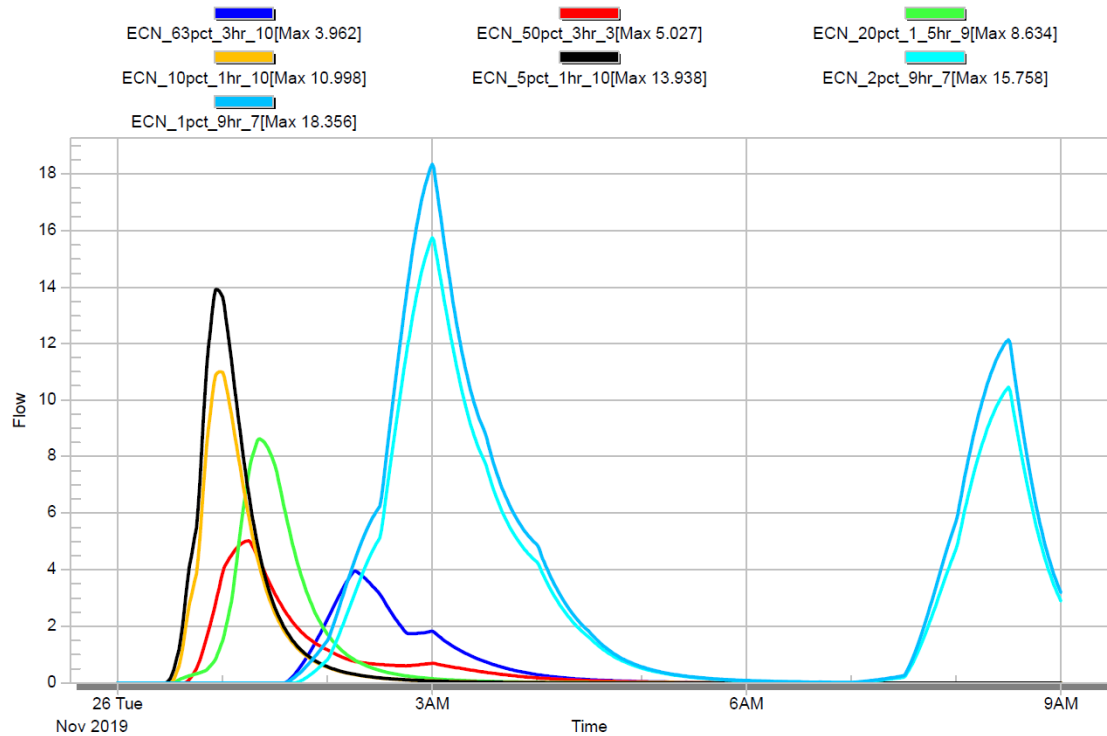
Catchment	Peak Flow Rates for Average Exceedance Probability (m ³ /s)						
Pre Developed Condition	63.2%	50%	20%	10%	5%	2%	1%
LPOD-1	3.962	5.027	8.634	10.998	13.938	15.758	18.356
LPOD-2	1.161	1.493	2.540	3.136	3.844	4.541	5.336
LPOD-3	0.278	0.351	0.555	0.665	0.789	0.991	1.150
LPOD-4	0.219	0.283	0.465	0.563	0.676	0.808	0.923
LPOD-5	1.769	2.049	2.919	3.571	4.148	4.818	5.487

Catchment	Peak Flow Rates for Average Exceedance Probability (m ³ /s)						
Post Developed Condition	63.2%	50%	20%	10%	5%	2%	1%
LPOD-5	3.913	4.427	6.106	7.253	8.358	9.717	10.723

Table 4.4: Flow Rates Calculated Using the Laurenson Method in XPSTORM

Figure 4.12 below contains the pre-developed peak flow rate hydrographs per reporting location / lawful point of discharge:

Node - LPOD-EX1



Node - LPOD-EX2

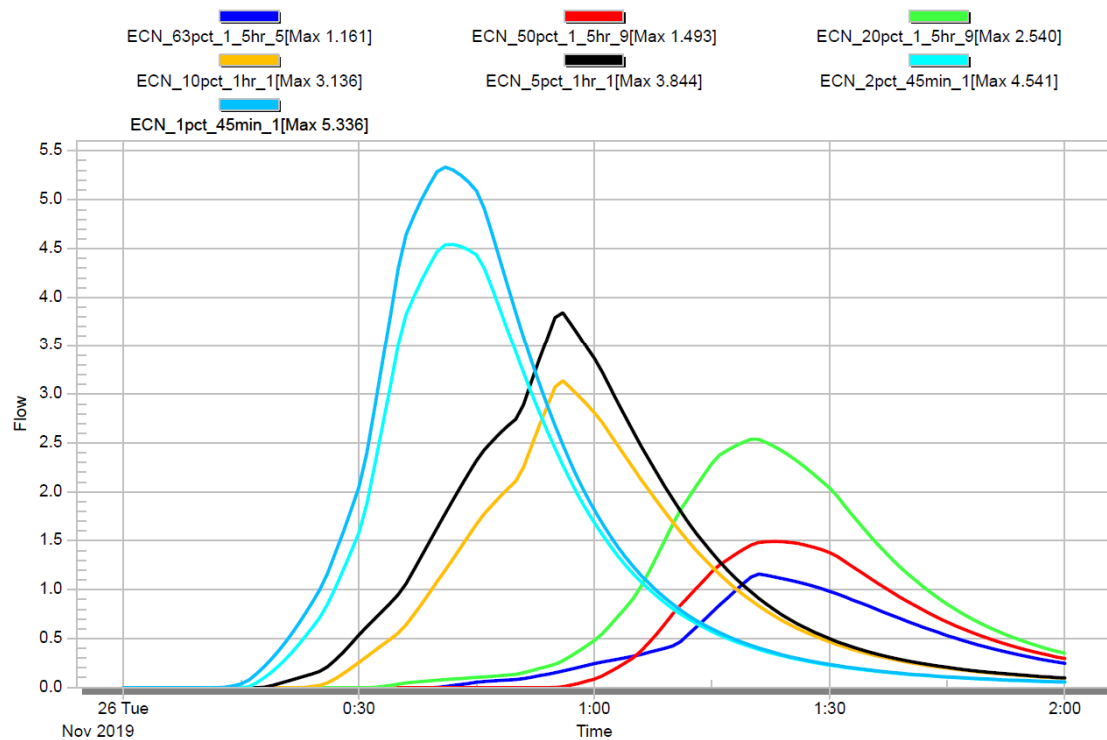
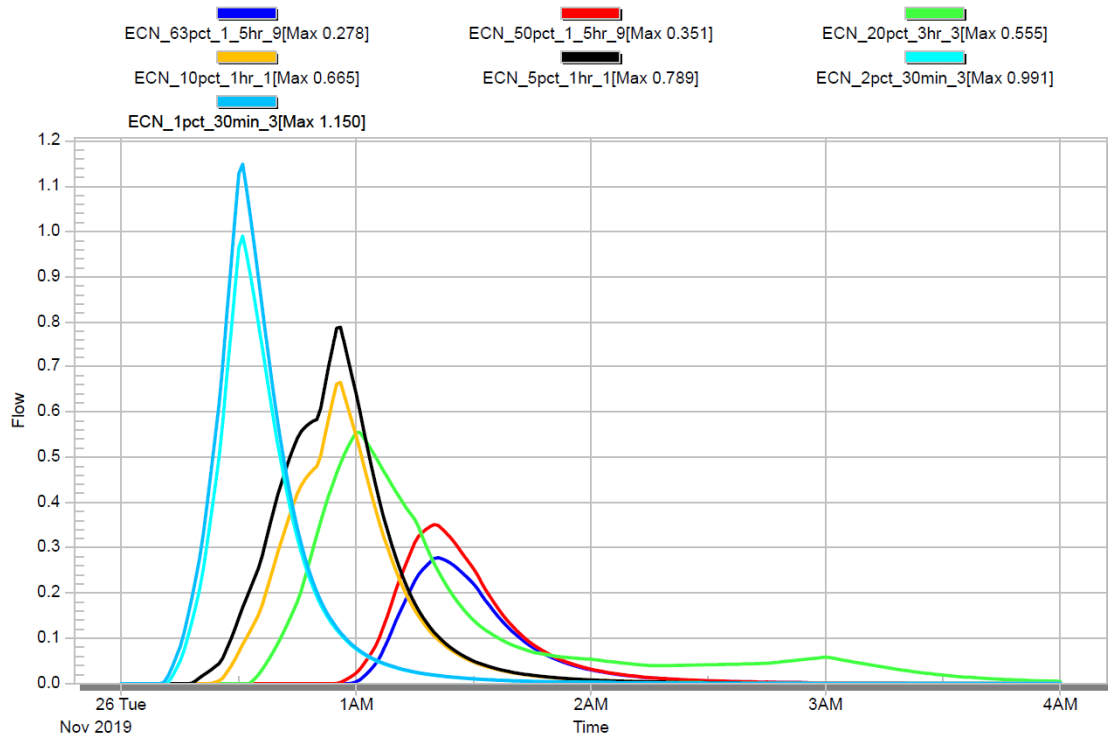


Figure 4.12: Pre Developed Peak Flow Rate Hydrographs

Node - LPOD-EX3



Node - LPOD-EX4

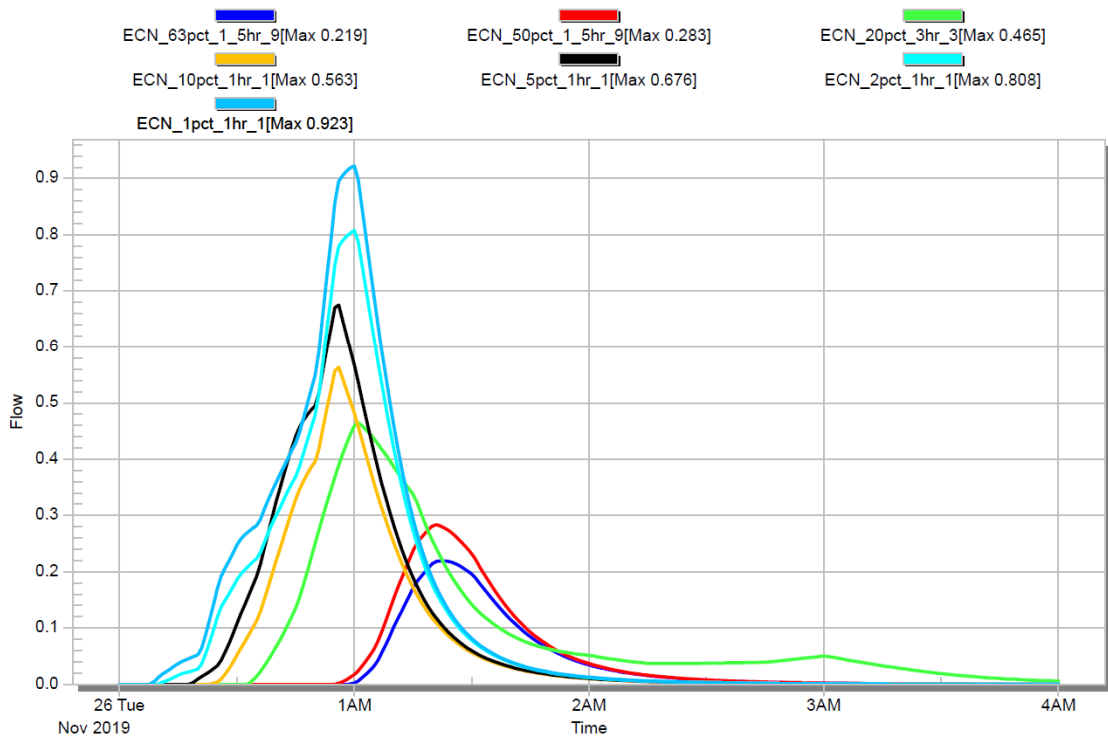


Figure 4.12: Pre Developed Peak Flow Rate Hydrographs (cont.)

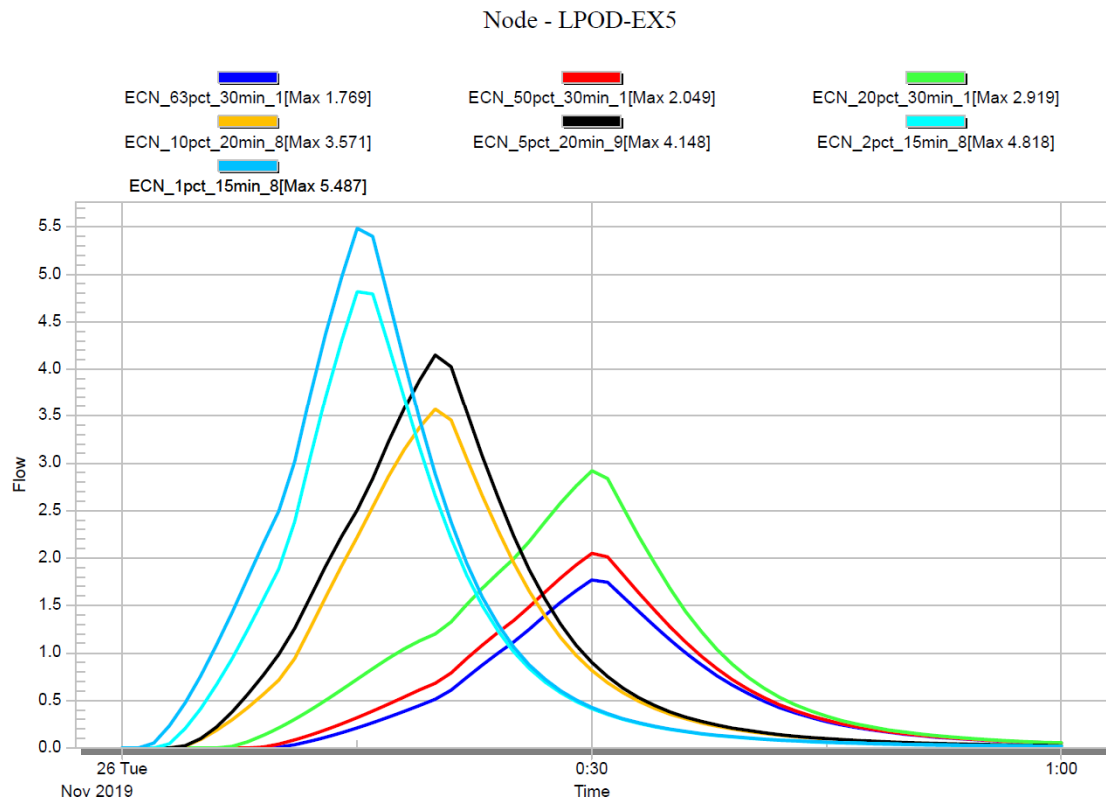


Figure 4.12: Pre Developed Peak Flow Rate Hydrographs (cont.)

Figure 4.13 below contains the *post* developed peak flow rate hydrograph at the reporting location / lawful point of discharge (CAT-10A / LPoD-5):

Node - LPOD-DEV5

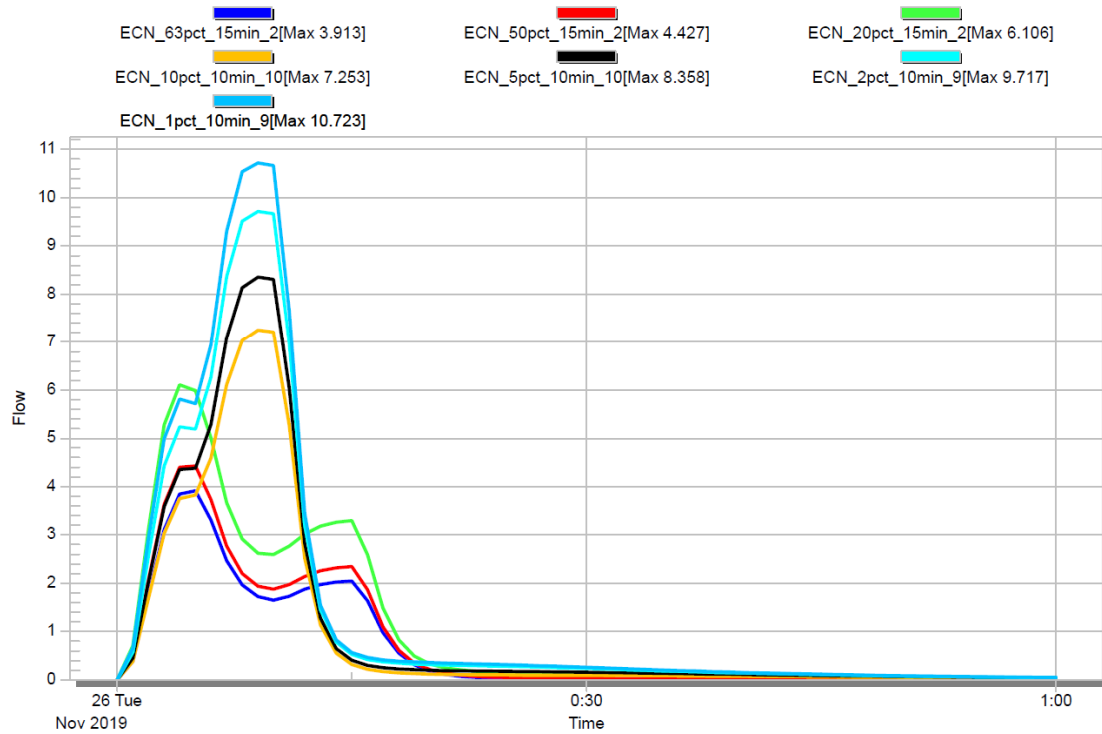


Figure 4.13: Post Developed Peak Flow Rate Hydrograph

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 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% / 7	540 mins (9 Hrs)	18.356
LPOD-2	1% / 1	45 mins	5.336
LPOD-3	1% / 3	30 mins	1.150
LPOD-4	1% / 1	60 mins	0.923
LPOD-5	1% / 8	15 mins	5.487

MODEL CONDITION	CRITICAL STORM EVENT	PEAK DURATION	PEAK FLOW
Post Developed	AEP / Storm Ensemble #	(mins)	(m ³ /s)
LPOD-5	1% / 9	10 mins	10.723

Table 5.2.2: Critical Storm Event and Duration Summary Table

Critical storm duration hydrographs per model condition are indicated in *Figures 5.2.1 and 5.2.2*.

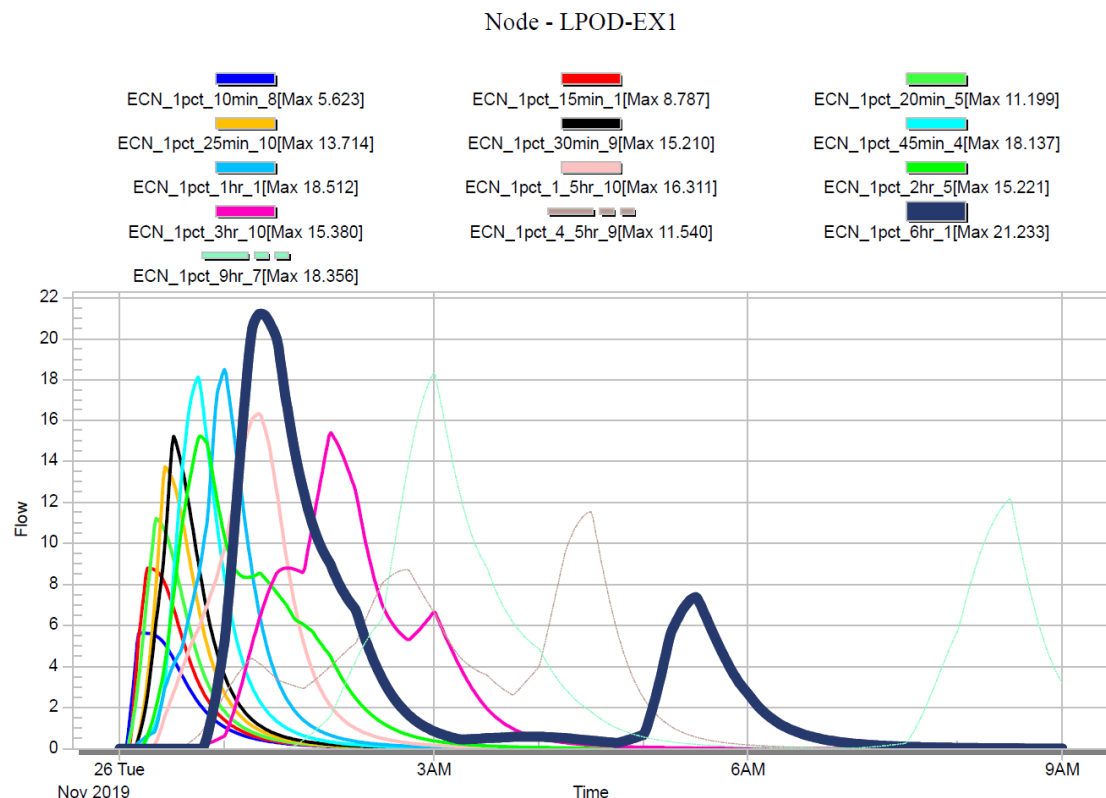
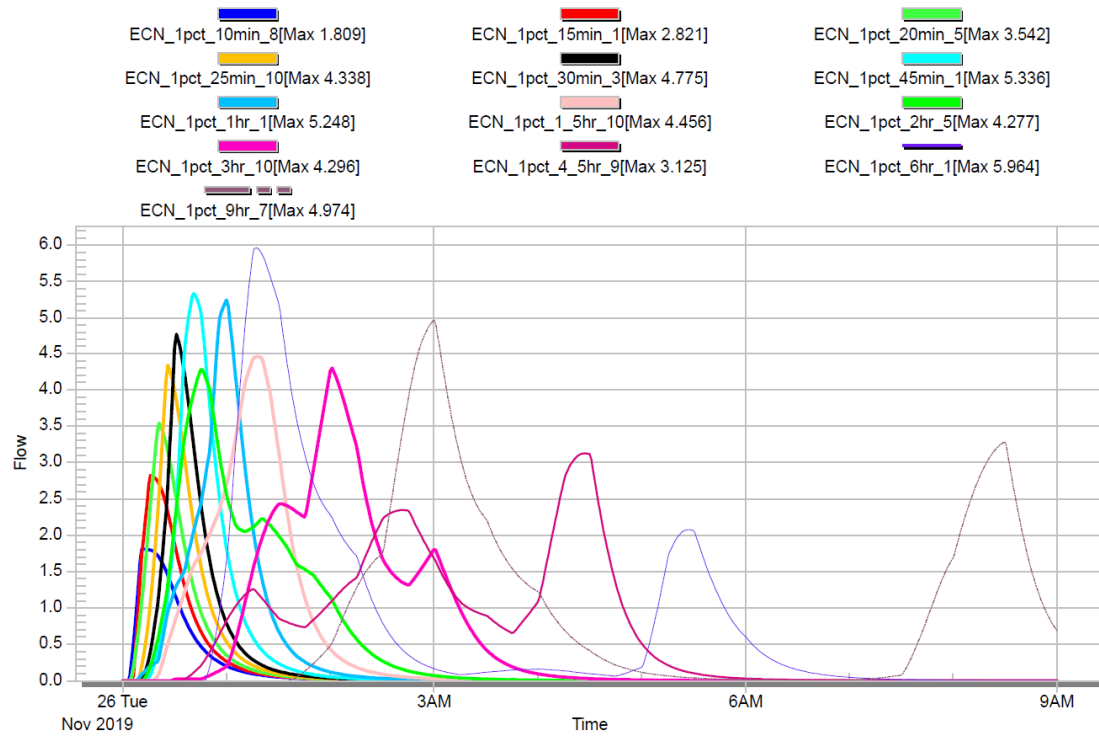


Figure 5.2.1: Critical Storm Event Durations for *Pre Developed* Catchments

Node - LPOD-EX2



Node - LPOD-EX3

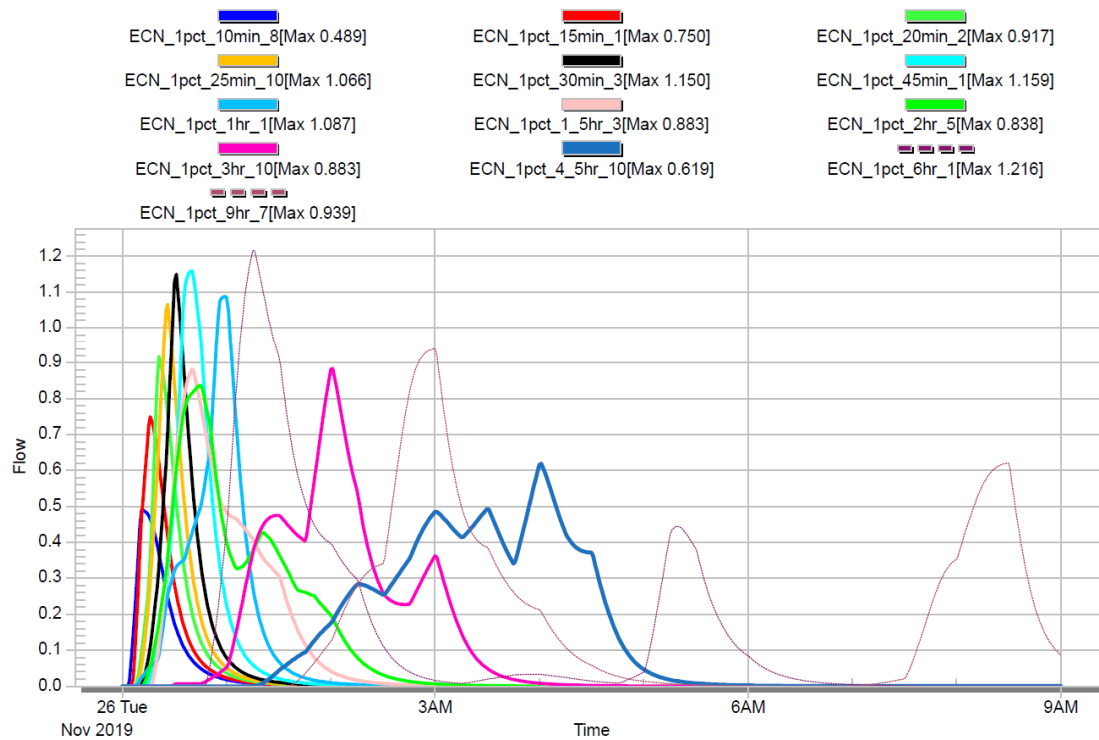
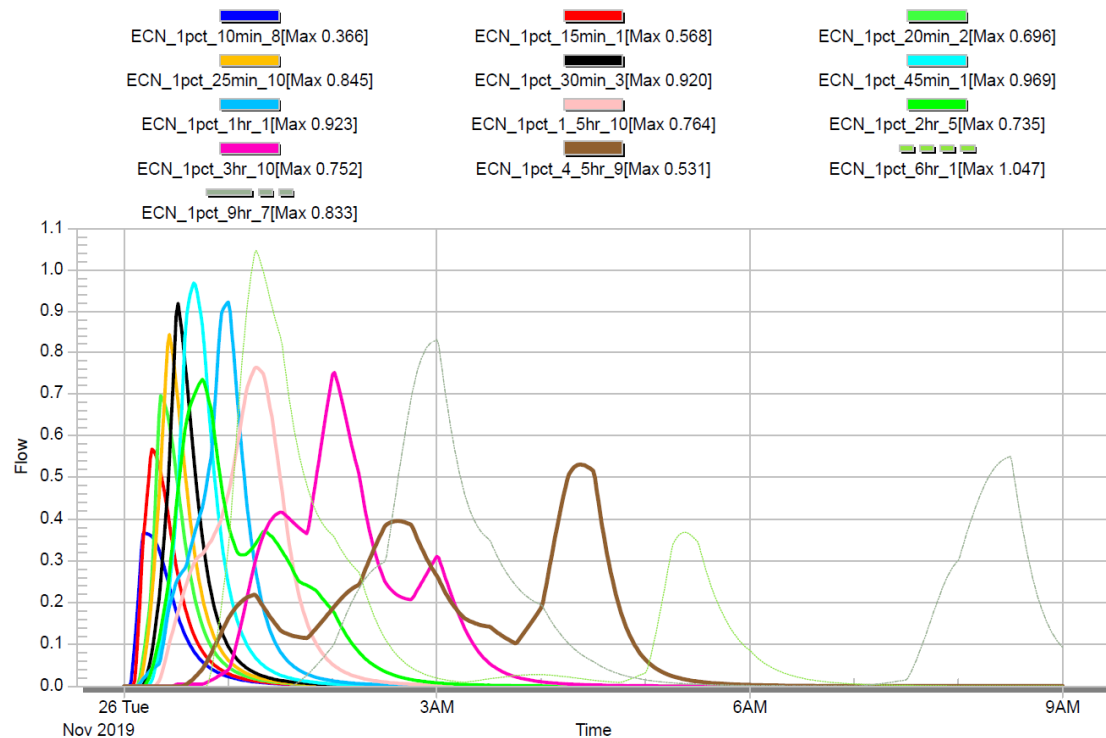


Figure 5.2.1: Critical Storm Event Durations for *Pre Developed* Catchments (cont.)

Node - LPOD-EX4



Node - LPOD-EX5

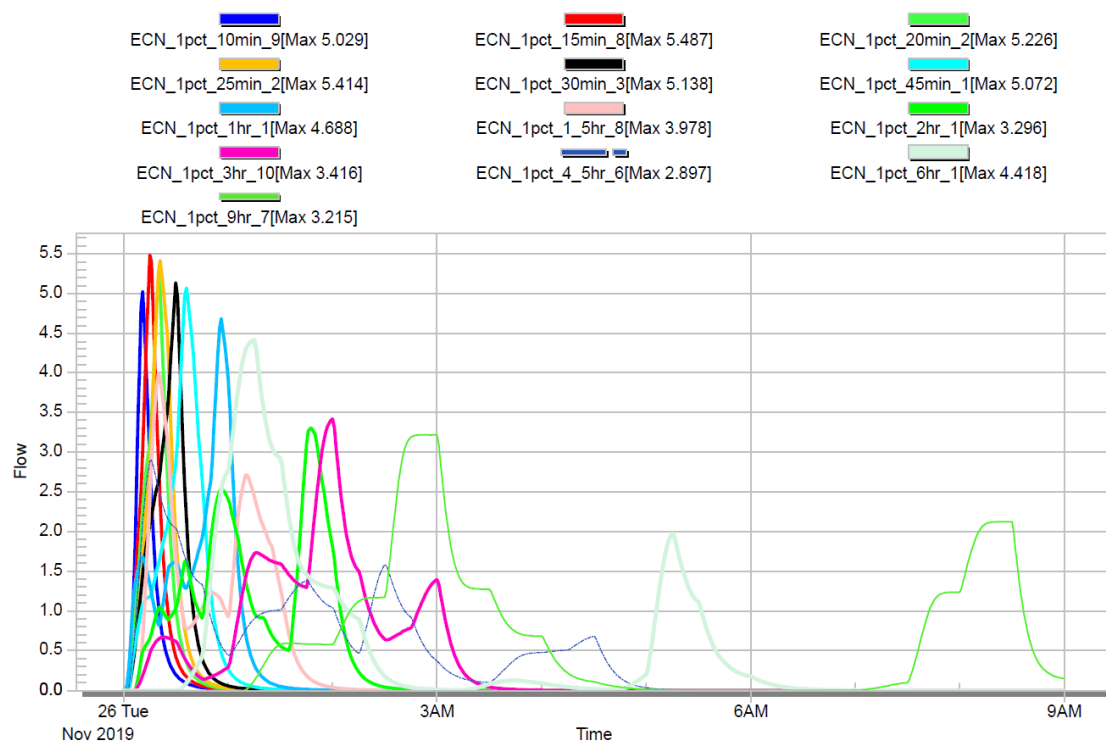


Figure 5.2.1: Critical Storm Event Durations for *Pre Developed* Catchments (cont.)

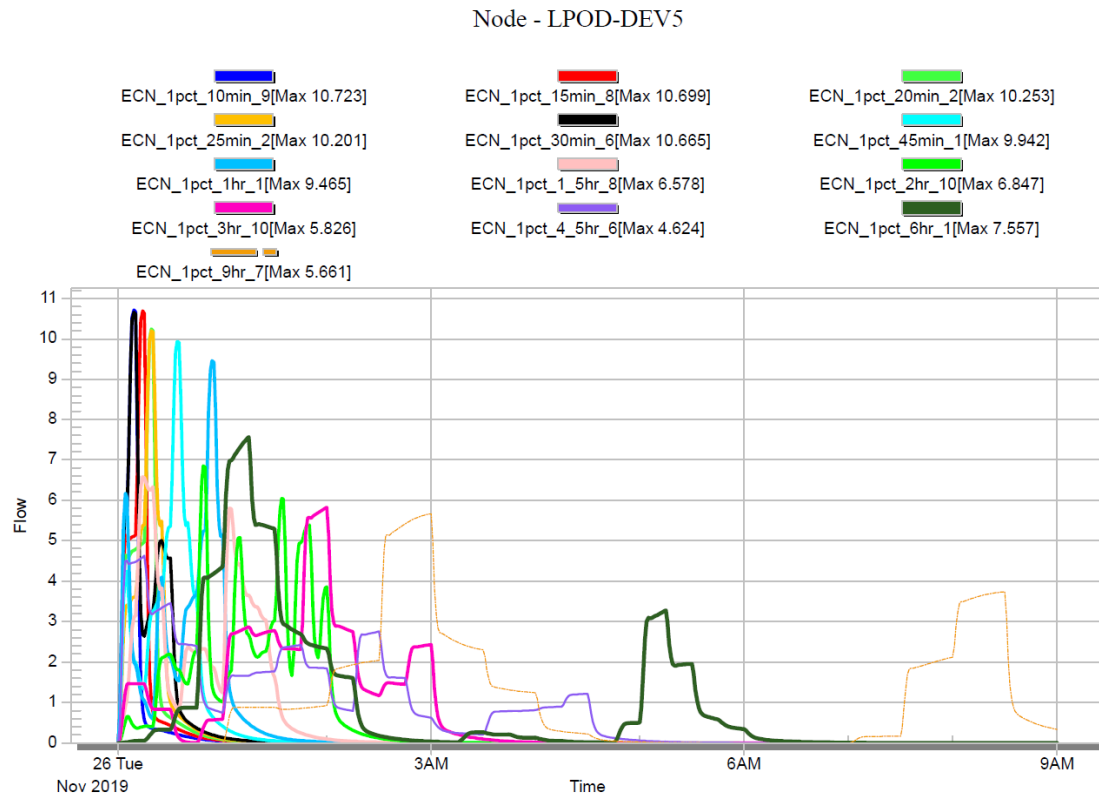


Figure 5.2.2: Critical Storm Event Durations for *Post Developed* Catchment (LPOD-5)

Refer **Appendix K** 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 1.

Parameter	Value
Catchment	DEV-5
Type	Detention basin (in ground)
Internal Batter Slope on Basin Sides	1 in 3
Basin Floor RL	5.800 m AHD
Basin Embankment / Crown R.L	8.100 m AHD
Basin Transverse Weir Crest RL	7.660 m AHD
Freeboard to Crown	0.440m
Detention Volume Depth	1.689m to 1% AEP WSL (<i>measured from floor / IL of basin</i>)
Detention Volume to Crown	8,458 m ³ to RL 8.100m (<i>deducting 0.30m extended detention</i>)
Detention Volume to 1% AEP WSL	5,498 m ³ to RL 7.489m (<i>deducting 0.30m extended detention</i>)
Detention Volume to Weir Crest	6,208 m ³ to RL 7.660m (<i>deducting 0.30m extended detention</i>)
Low Flow Outlets	3 / 600mm x 600mm grated field inlet pits <i>Top of grate levels set at 0.300m above basin floor at RL6.10m AHD</i> 225mm dia. circular orifice <i>IL at 0.600m above basin floor at IL6.40m AHD</i>
High Flow Outlets	1 / 1500 x 2000mm grated field inlet pit <i>1.175m above basin floor at RL6.975m AHD</i> 10 metre wide broad crested transverse weir <i>1.860m above basin floor at RL7.660m AHD</i> <i>1.70 discharge coefficient for transverse weir</i> 2 / 825mm RCP laid at max. grade of 1.084%

Table 5.2.3: Summary of Design Parameters of Proposed Detention System for Stage 1

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 CAT-10							
AEP	63.2%	50%	20%	10%	5%	2%	1%
LPOD-5 (CAT-10)	1.769	2.049	2.919	3.571	4.148	4.818	5.487

POST-DEVELOPED PEAK FLOWS (MITIGATED) FOR DEV-5							
AEP	63.2%	50%	20%	10%	5%	2%	1%
Mitigated Flow (m ³ /sec)	1.095	1.225	1.746	3.441	4.138	4.598	5.231
Max Water Elevation RL	6.635	6.720	7.057	7.179	7.256	7.357	7.489
Peak Duration (min)	30	180	180	60	60	360	360
Depth to WSL (m)	0.835	0.920	1.257	1.379	1.456	1.557	1.689

Table 5.2.4.1: Summary of XPSTORM Hydrologic / Hydraulic Results Catchment CAT-10 / DEV-5

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 (DEV-5)							
AEP	63.2%	50%	20%	10%	5%	2%	1%
1500 x 2000mm F.I. (m ³ /s)	0	0	0.136	1.708	2.309	2.671	3.164
600 x 600mm F.I. (1) (m ³ /s)	0.352	0.379	0.471	0.503	0.529	0.552	0.589
600 x 600mm F.I. (2) (m ³ /s)	0.352	0.379	0.471	0.503	0.529	0.552	0.589
600 x 600mm F.I. (3) (m ³ /s)	0.352	0.379	0.471	0.503	0.529	0.552	0.589
225mm dia. Orifice (m ³ /s)	0.041	0.090	0.199	0.223	0.243	0.272	0.302
10m Emergency Weir (m ³ /s)	0 *	0 *	0 *	0 *	0 *	0 *	0 *
TOTAL (m ³ /s)	1.095	1.225	1.746	3.441	4.138	4.598	5.231

Flow Mitigation from Existing Condition (m ³ /s)	0.674	0.824	1.173	0.130	0.011	0.220	0.256
Attenuation Achieved (Y/N)	Y	Y	Y	Y	Y	Y	Y
Flow Mitigation Achieved	38.1%	40.2%	40.2%	3.6%	0.3%	4.6%	4.7%

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

* The emergency weir does not activate in a 1% AEP storm event – with predicted water surface levels only reaching RL7.489m. Freeboard of 0.171m is achieved in the major storm event to provide sufficient serviceability of the adjacent DTMR footpath to which emergency overflows are directed from the detention basin. Furthermore, the lowest allotment pad (Lot 101) adjacent the basin is proposed to be constructed +1.8 metres above the emergency weir crest level. Allotment pads 111, 112, 113 and 114 are proposed to be constructed +3.5 metres above the emergency weir crest level.

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.

Refer important note below.

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 adjoining the internal entry road in Stage 1.

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%
Total Suspended Solids (TSS)	80%
Total Phosphorous (TP)	60%
Total Nitrogen (TN)	45%

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.

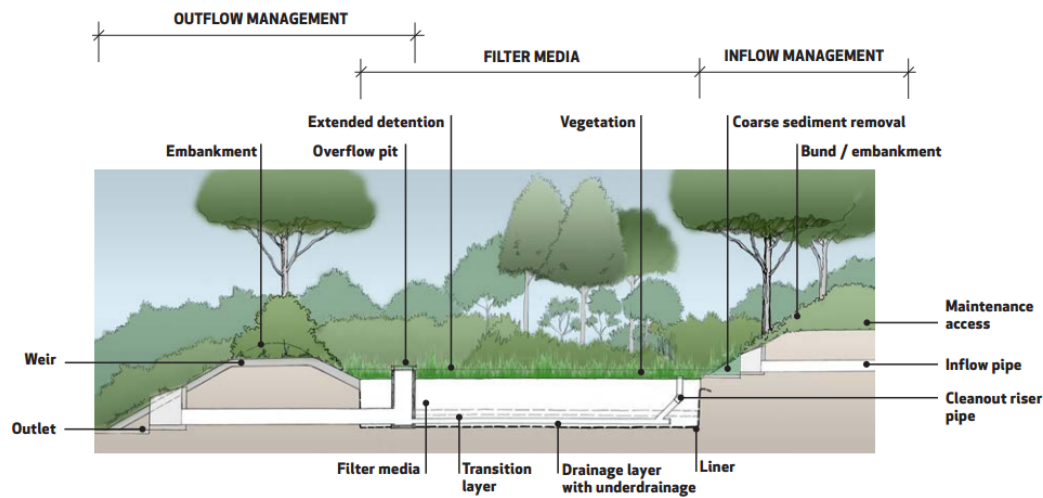


Figure 6.3.1: Components of a Typical Bio Retention System (Source: Water by Design, Bio Retention Technical Design Guidelines Version 1.1 Oct 2014)

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 <i>Normal Analysis</i>	200 mm/hr
Hydraulic Conductivity <i>Sensitivity Analysis</i>	50 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 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 the City of Gold Coast Stormwater Quality Objectives.

6.4.1 METEOROLOGICAL DATA

The meteorological data required for input into MUSIC software was obtained through CoGC's predetermined MUSIC-link v6.32 software application for Beenleigh Bowls Club (Stn 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
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
	Rainfall	Evapo-Transpiration
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 Allocation Plans 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*.

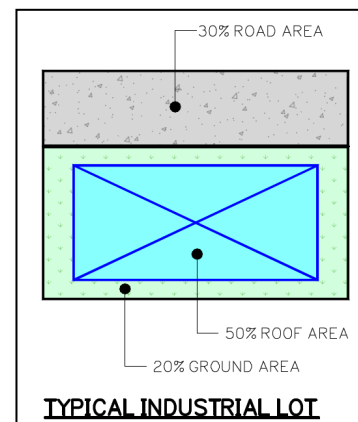
The below table and figures summarise the imperviousness of the allocated source nodes within the MUSIC model for Stage 1. Where a proposed architectural design was available for the site, the MUSIC modelling has assumed these areas to be exact. However, in the absence of an architectural layout; the 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.



Surface Type: Industrial	MUSIC Source Node	Modelling Approach	Area (Ha)	Impervious %
(Percentage of Contributing Catchment)	Stage 1 (DEV-5) Total Catchment = 15.453 Ha			
Impervious (81%)	Road	Split	6.224	75
	Roof	Split	6.296	100
Pervious (19%)	Ground	Split	2.933	60
	Total		15.453	

Table 6.4: MUSIC Modelling Summary of Source Node Impervious Allocations

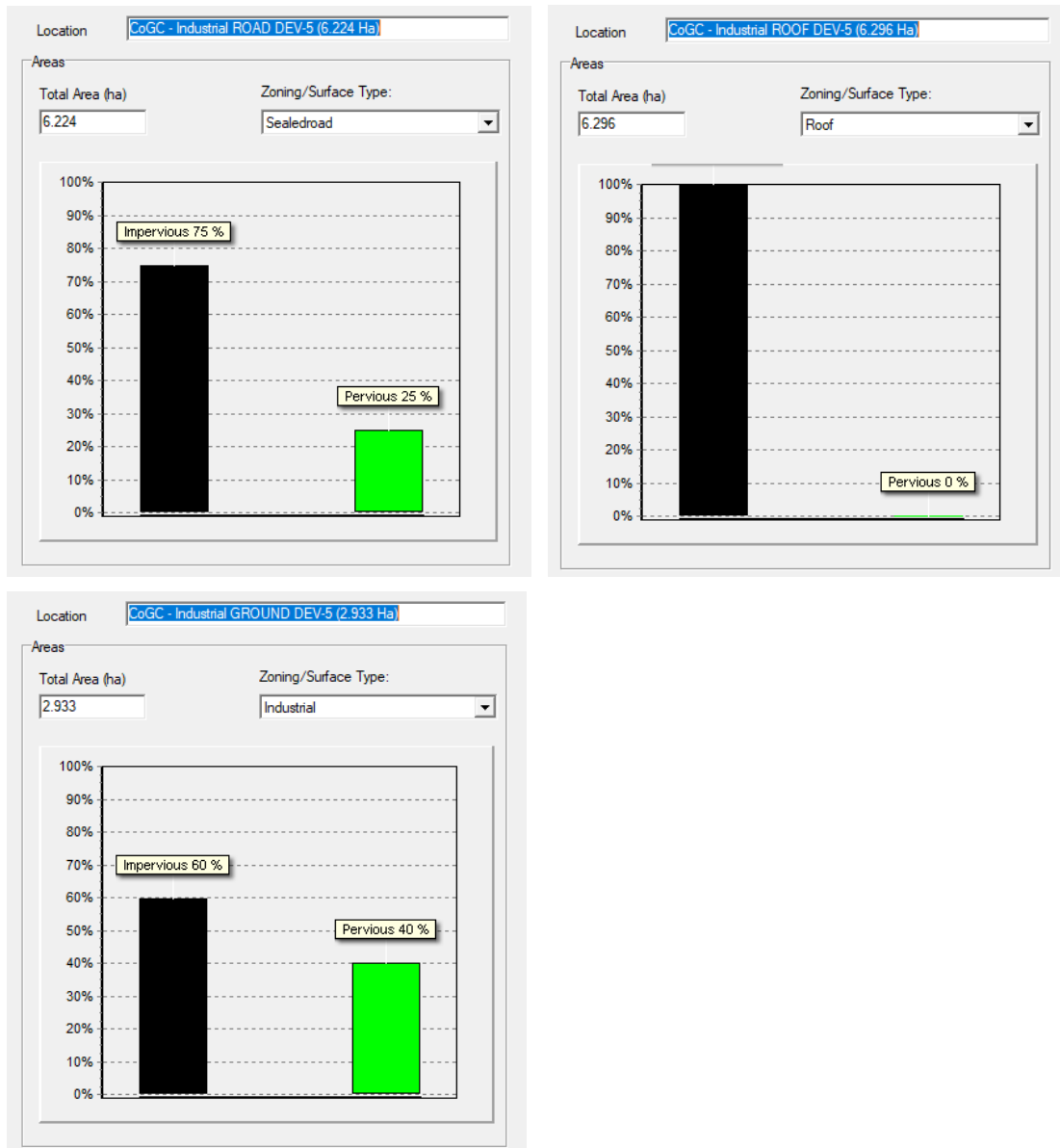


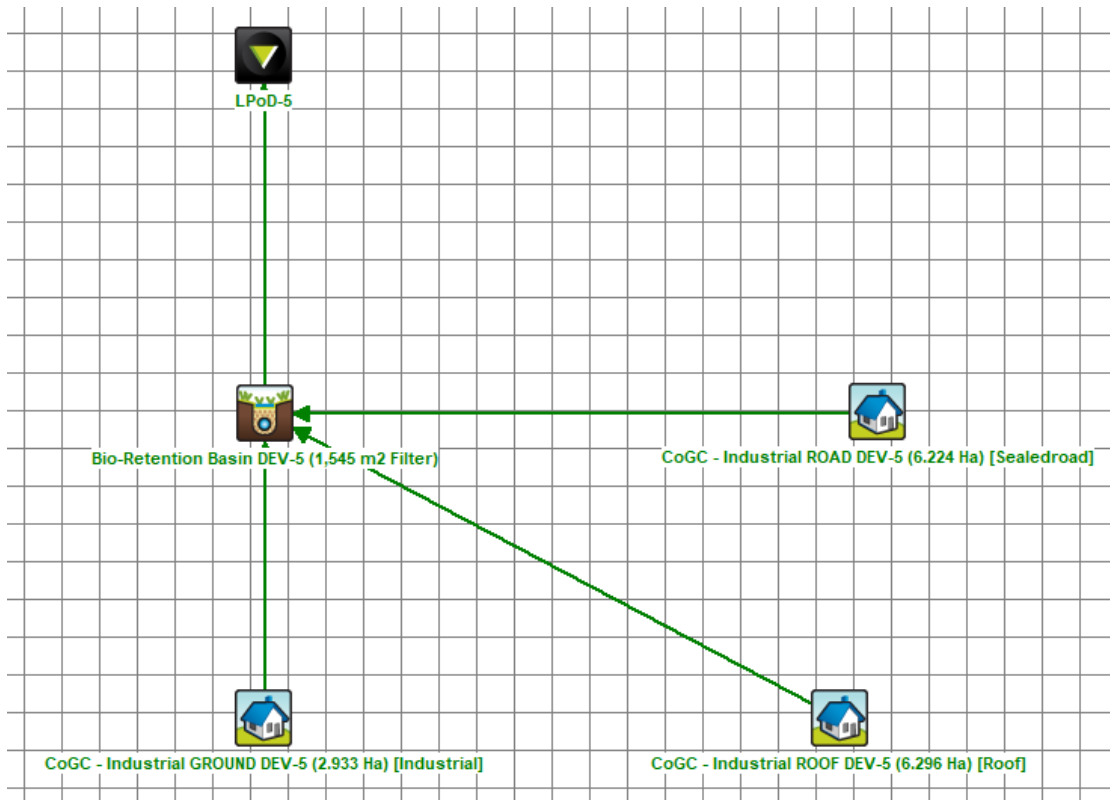
Figure 6.4.1: MUSIC Modelling Source Node Impervious Allocations

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.



	Sources	Residual Load	% Reduction
Flow (ML/yr)	134	129	3.4
Total Suspended Solids (kg/yr)	25200	6520	74.2
Total Phosphorus (kg/yr)	51.2	20	61
Total Nitrogen (kg/yr)	291	190	34.7
Gross Pollutants (kg/yr)	3350	0	100

SENSITIVITY ANALYSIS @ 50mm/hr SATURATED HYDRAULIC CONDUCTIVITY.

	Sources	Residual Load	% Reduction
Flow (ML/yr)	134	129	3.3
Total Suspended Solids (kg/yr)	25200	4530	82
Total Phosphorus (kg/yr)	51.2	13.8	73.1
Total Nitrogen (kg/yr)	291	143	51
Gross Pollutants (kg/yr)	3350	0	100

NORMAL ANALYSIS @ 200mm/hr SATURATED HYDRAULIC CONDUCTIVITY.

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

Figure 6.4.4-1: Catchment DEV-5 MUSIC Layout and Results

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
	DEV-5
Filter Area (m2)	1,545
Filter Media Depth (m)	0.70
Extended Detention Depth (m)	0.30
Weir Crest Width (m)	10.00

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

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)	1545.00
Filter and Media Properties	
Filter Area (square metres)	1545.00
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

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)	10.00
Underdrain Present?	☒ Yes ☐ No
Submerged Zone With Carbon Present?	☐ Yes ☒ No
Depth (metres)	0.45

NORMAL ANALYSIS

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

CATCHMENT DRAINING TO THE SOUTH OF STAGE 1 (DEV-1 part)

Part of the developed catchment for Stage 1 has been designed to discharge to the south of Stage 1 into the future Stage 2 basin. MUSIC modelling was undertaken to determine the required bio-filtration media area to sufficiently treat the contributing runoff in line with the WQO's outlined in Section 6.2.

In the ultimate developed scenario – the stormwater quality and quantity basin is proposed to be located along the eastern boundary of the site (adjacent the CoGC Stapylton landfill buffer) catering for the entire future (Stage 2) industrial development proposal. As Council's policy requires that 80% of the total catchment must be developed prior to installation of the filter media, it is proposed that filter media associated with the part of Stage 1 will be bonded as uncompleted works with Council for the purpose of plan sealing of Stage 1 allotments and the temporary sediment basin as documented in the Change to Ground Level detailed Engineering Drawings. Servicing this part of the catchment will stay in place until such time as Stage 2 is developed to facilitate installation of the required stormwater quality treatment measures.

The modelling undertaken below is for the contributing Stage 1 *balance* catchment only, not the ultimate catchment.

Surface Type: Industrial	MUSIC Source Node	Modelling Approach	Area (Ha)	Impervious %
(Percentage of Contributing Catchment)	Stage 1 Balance (DEV-1 part) Total Catchment = 4.380 Ha			
Impervious (79%)	Road	Split	2.140	75
	Roof	Split	1.311	100
Pervious (21%)	Ground	Split	0.929	60
	Total		4.380	

Table 6.5: MUSIC Modelling Summary of Source Node Impervious Allocations (DEV-1 part.)

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
	DEV-1 part
Filter Area (m2)	660
Filter Media Depth (m)	0.70
Extended Detention Depth (m)	0.30
Weir Crest Width (m)	5.00

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

	Sources	Residual Load	% Reduction
Flow (ML/yr)	36.9	35	5.2
Total Suspended Solids (kg/yr)	8280	1550	81.3
Total Phosphorus (kg/yr)	15.3	4.26	72.1
Total Nitrogen (kg/yr)	78.2	43.5	44.4
Gross Pollutants (kg/yr)	933	0	100

SENSITIVITY ANALYSIS @ 50mm/hr SATURATED HYDRAULIC CONDUCTIVITY.

	Sources	Residual Load	% Reduction
Flow (ML/yr)	36.9	35	5.1
Total Suspended Solids (kg/yr)	8280	1000	87.9
Total Phosphorus (kg/yr)	15.3	2.68	82.4
Total Nitrogen (kg/yr)	78.2	32.1	59
Gross Pollutants (kg/yr)	933	0	100

NORMAL ANALYSIS @ 200mm/hr SATURATED HYDRAULIC CONDUCTIVITY.

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

7.0 CONSTRUCTION, OPERATIONAL MANAGEMENT & MAINTENANCE

7.1 CONSTRUCTION PHASE SEDIMENT AND EROSION CONTROL

The operational phase detention basin (within Stage 1) is proposed to be utilised as a sediment basin during the construction phase of the development. The sizing of this basin has been determined using the ICEA Best Practice Erosion & Sediment Control Guidelines.

A High Efficiency Sediment (HES) basin is proposed off the balance fill pad to the immediate south of the development stage boundary. The sizing of the sediment basins have been undertaken in accordance with the requirements of the SPP.

Refer to **Appendix C** which contains copies of the sediment basin designs and calculations.

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 retains the SQIDs as assets of the developer though a formal handover from the Contractor to the Asset Owner will be required 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.

8.0 CONCLUSION

Gassman Development Perspectives have prepared this Site Based Stormwater Management Plan to support an application for *Reconfiguration of Lot – Boundary Realignment* 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 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 are as described below:

Stormwater Quantity

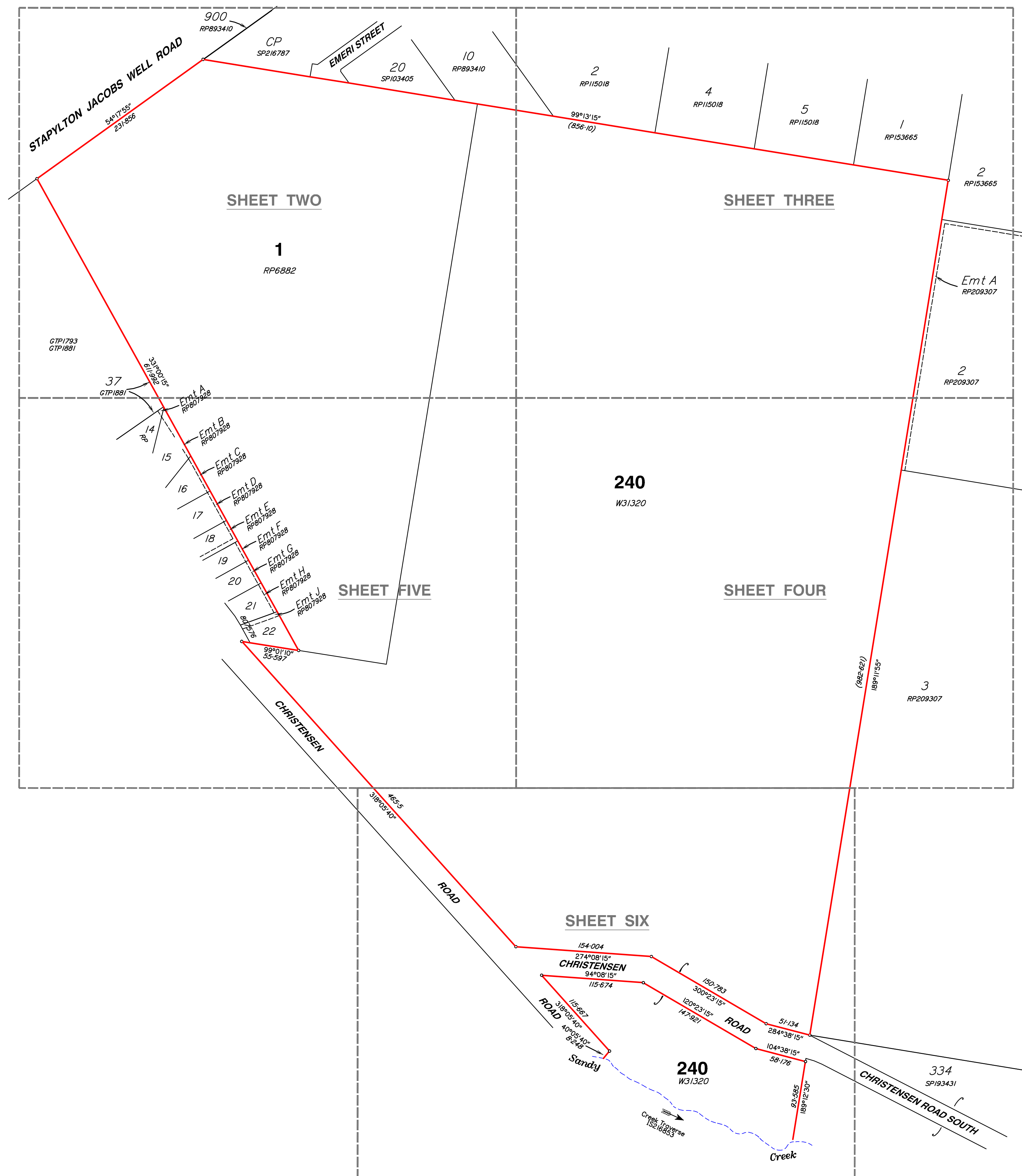
Suitable attenuation measures are able to be incorporated into the proposed development to ensure there is no adverse impacts to downstream properties, waterways or infrastructure as a result of an increase in peak stormwater flow rates discharging from the subject site upon development.

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). The approved form of these stormwater quantity measures does not require any alteration to accommodate the proposed boundary realignment.

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). The approved form of these stormwater quality measures does not require any alteration to accommodate the proposed boundary realignment.

Appendix A – Site Survey Plan



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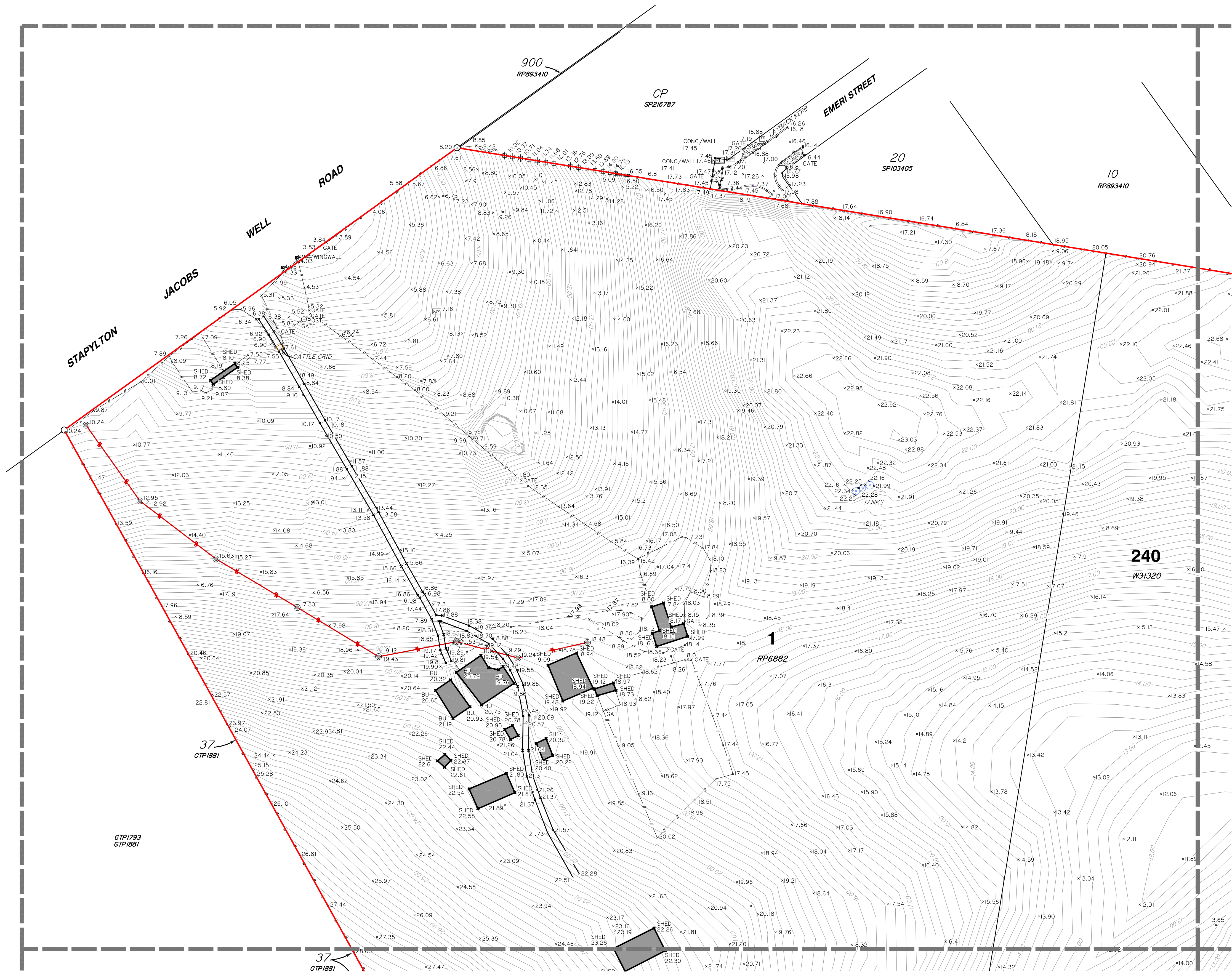


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REFERENCE No. 5093-10
PLAN No. **5093 S CD 01**



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
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 - VALVE
 - GATE
 - BOLLARD
 - CONCRETE
 - EDGE OF BITUMEN
 - FENCE
 - OVERHEAD ELECTRICITY
 - OPEN DRAIN
 - RETAINING WALL
 - EDGE OF GARDEN
 - CONTOUR LEVEL

Notes

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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		
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		Drawn	
		Date Designed	

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SEE SHEET THREE



SEE SHEET SIX

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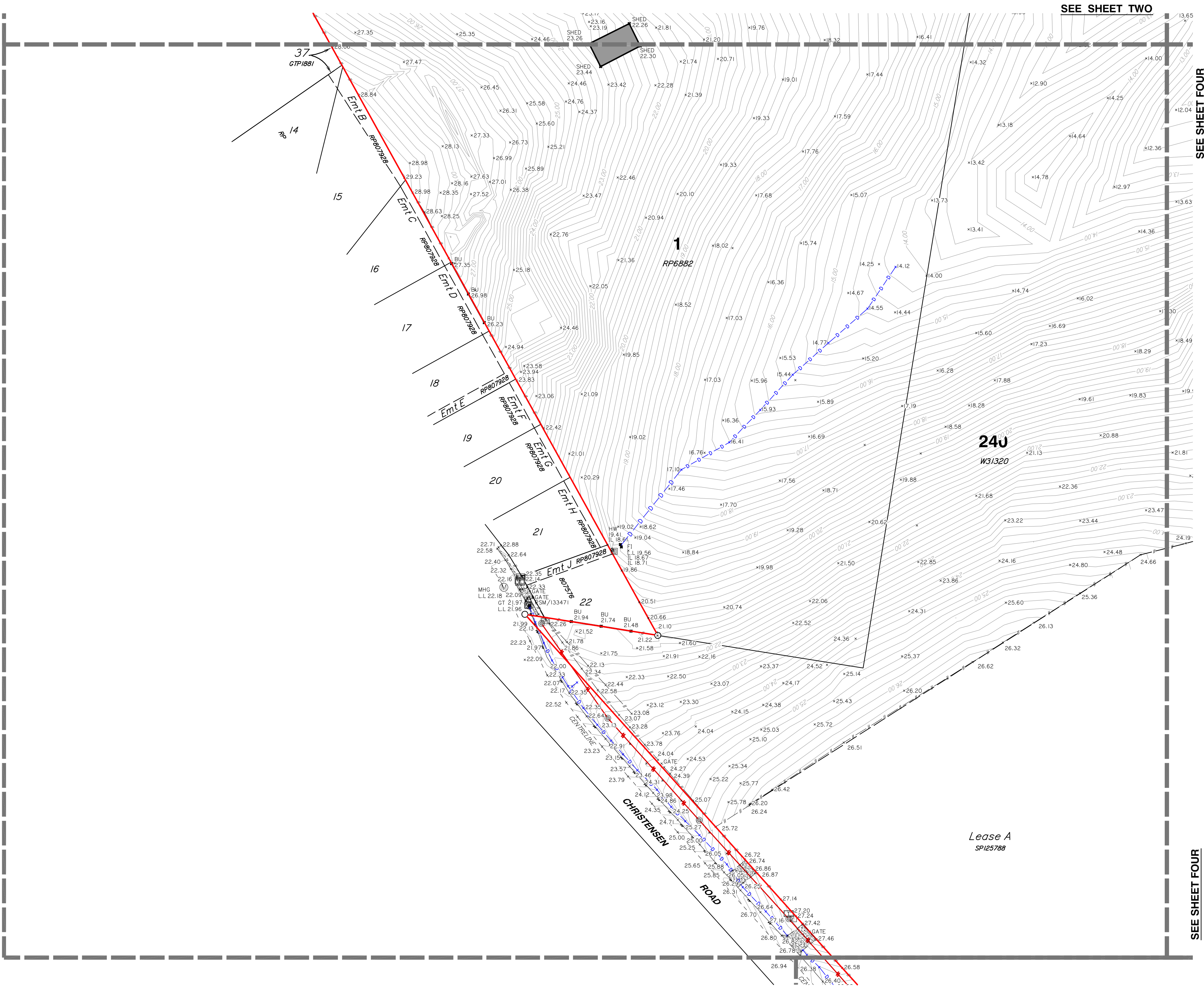
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Scale 1:1000 - Lengths are in Metres.
0 10 20 30 40 50 60 70 80

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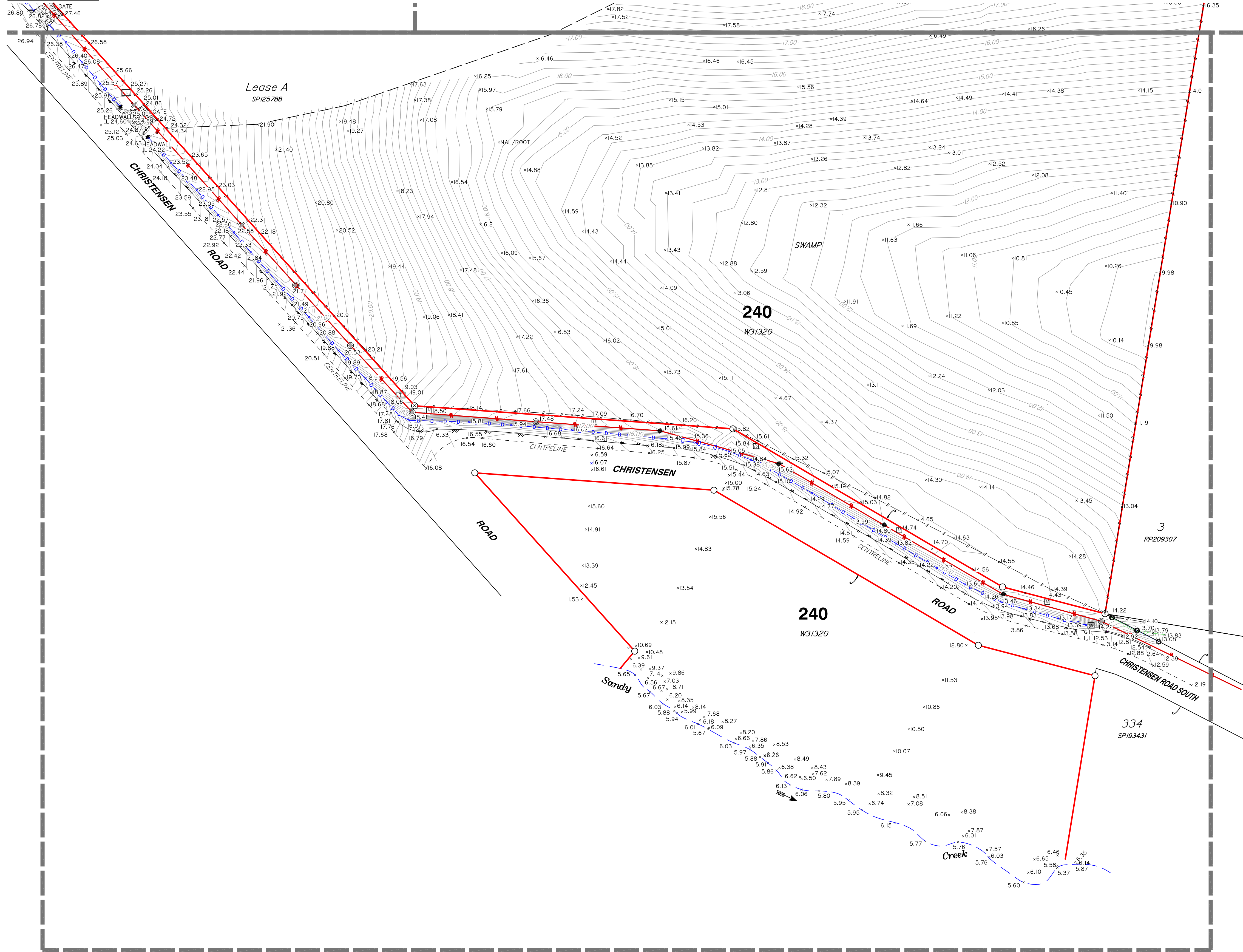
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SEE SHEET FIVE

SEE SHEET FOUR



LEGEND

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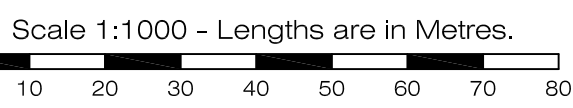
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1:1000	Date Designed



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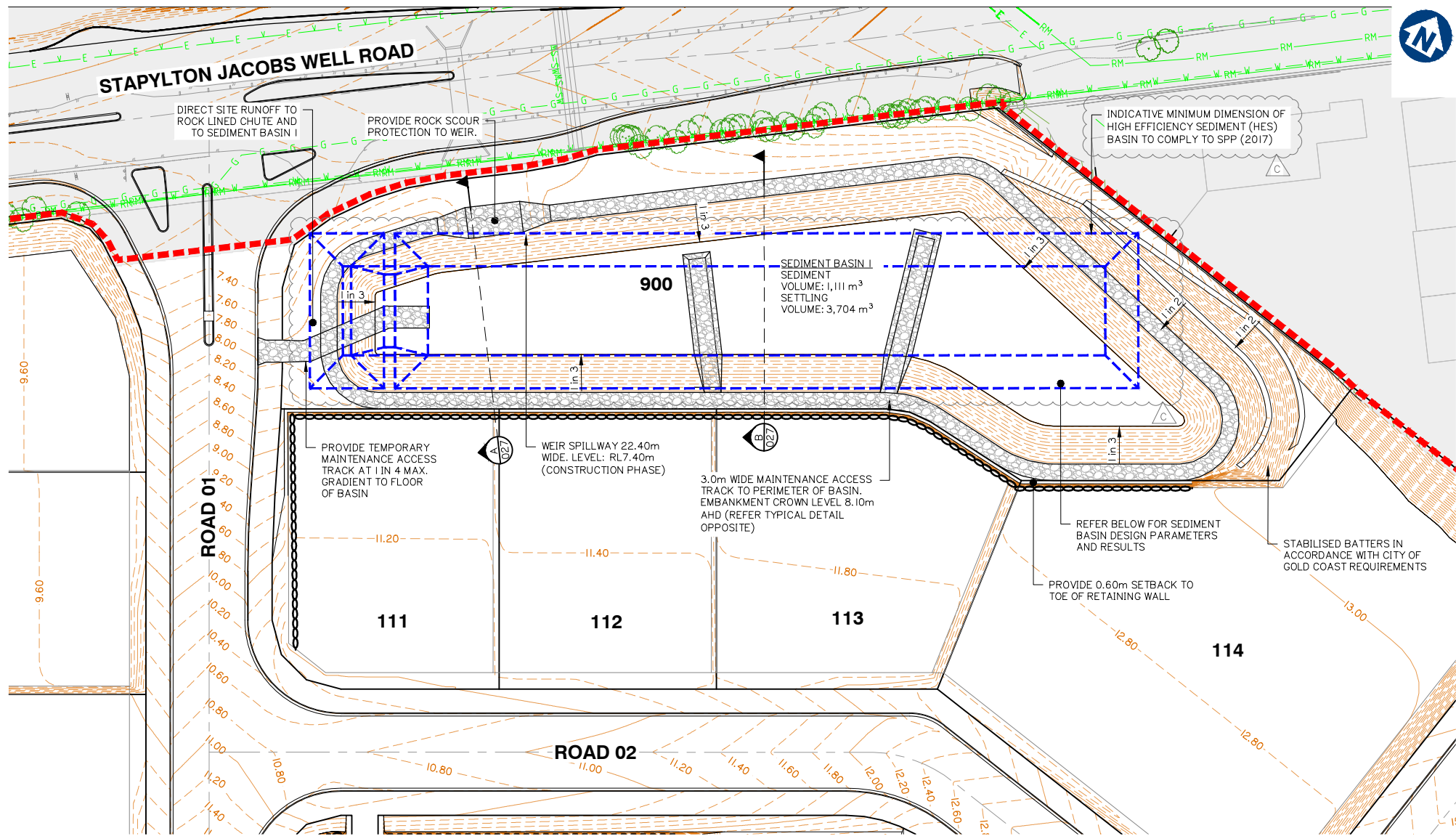
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Appendix B – Pre and Post Development Catchment Plans

Appendix C – Design of Stormwater Quantity and Quality Basin



- NOTES:
- ALL ALLOTMENTS TO GRADE TOWARDS THE ROAD AT MINIMUM 1:150 (0.67%) FALL, EXCEPT IF NOTED OTHERWISE.
 - SEDIMENT AND EROSION CONTROL PLAN IS INDICATIVE ONLY. THE CONTRACTOR MUST TAKE ADDITIONAL MEASURES IF REQUIRED ON SITE DURING CONSTRUCTION AND MAINTENANCE PERIODS.
 - CONTRACTOR EROSION AND SEDIMENT CONTROL PLAN SHOULD COMPLY WITH ALL CITY OF GOLD COAST COUNCIL AND STATE REQUIREMENTS AND TO BE IN ACCORDANCE WITH INDUSTRY BEST PRACTICE GUIDELINES.
 - CONTRACTOR TO OBTAIN SEDIMENT AND EROSION CONTROL PLAN APPROVAL FROM RELEVANT AUTHORITY BEFORE THE COMMENCEMENT OF WORKS.

Client:



FRASERS PROPERTY
(AUSTRALIA) PTY. LTD.

Project: M38 INDUSTRIAL
PARK YATALA

Site Address:
60 STAPYLTON JACOBS WELL
ROAD & 31 YELLOWWOOD
ROAD, STAPYLTON QLD 4207

THIS DRAWING IS INTENDED TO
BE PRINTED IN COLOUR

RPD:

Lot: 501, 4
Plan: SP295994, RP6843
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
CONSTRUCTION PHASE
SEDIMENT BASIN 1
LAYOUT

C	12-03-2020	INFORMATION REQUEST RESPONSE	SK	MG
B	20-02-2020	INFORMATION REQUEST RESPONSE	IG	MG
A	20-12-2019	ORIGINAL ISSUE	JRG	MG
Issue	Date	Description	DRN	CHK

SCALE IN METRES



Scale at A1: 1:500

Designed: IG

Drafted: JRG

Approved: MG

RPEQ: 16939

Signed:

Date: 12-03-2020

Drawing No:
5941 ENG BE1 026

Rev. No:
C

CONSTRUCTION PHASE SEDIMENT BASIN I LAYOUT

SCALE 1:500 (A1)

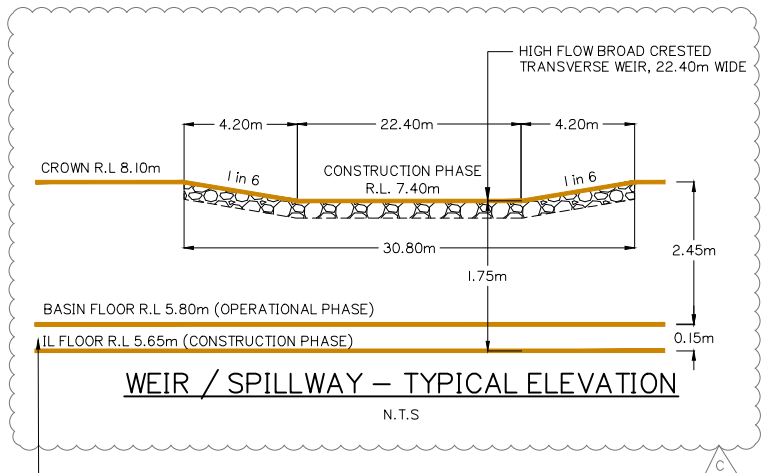
SEDIMENT BASIN DESIGN							
BASIN ID	SELECT DURATION OF CATCHMENT DISTURBANCE	IS DEWATERING OF TRENCHES REQUIRED?	EQUIPMENT LEASE OR PURCHASE?	SELECT CATCHMENT SCALE	DO ALL FLOWS ENTER BASIN AT SINGLE POINT?	BASIN TYPE	DOSING EQUIPMENT
No. 1	> 12 MONTHS	NO	LEASE	> 5Ha	NO	TYPE A	IFOD-RAIN

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 DECANAT RATE	SELECTED LOW-FLOW DECANAT RATE (Q_d)	MIN SETTling ZONE VOLUME (Min V_d)	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)	(m³)	(m²)	
No. 1	15.071	1	4.53	20	11150	1.3	4.8	9	9	3704	1512	VOLUME

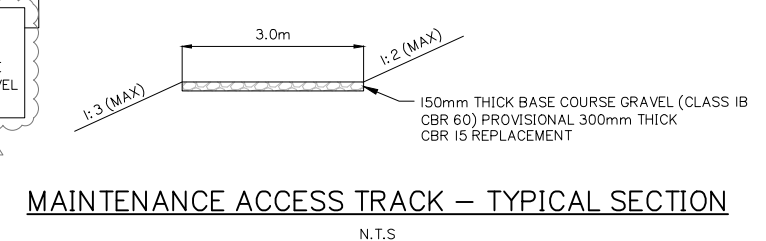
BASIN ID	SETTLING ZONE		SCOUR VELOCITY	FREE WATER ZONE		SEDIMENT STORAGE ZONE		OVERALL DIMENSIONS RELATIVE TO SPILLWAY CREST (EXCL. FOREBAY)			
	ACTUAL SETTling ZONE VOLUME (V_d)	ACTUAL SETTling ZONE AREA (A_s)		DEPTH OF FREE WATER ZONE	VOLUME OF FREE WATER ZONE	SEDIMENT STORAGE VOLUME	SEDIMENT STORAGE DEPTH (APPROX.)	BATTER	WIDTH	LENGTH	DEPTH
No. 1	3704	2827	0.009	(m)	(m³)	(m³)	(m)	(1: X)	(m)	(m)	(m)
No. 1	3704	2827	0.009	0.22	370	1111	0.47	3	28.2	135.4	2.00

BASIN ID	BASIN DESIGN LIFE	DESIGN ARI	C_{10}	C	t_c	I	Q	HEAD OVER SPILLWAY	SPILLWAY CREST LENGTH	SPILLWAY CREST RL	MIN EMBANKMENT RL
		yr				(mm/hr)	(m³/s)	(m)	(m)	(m)	(m)
No. 1	> 12 MONTHS	1: 50	0.85	0.98	20.00	160.00	6.55	0.25	30.80	7.40	8.10

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)	LEVEL SPREADER CREST (RL)
No. 1	5185.2	135.4	28.2	2.00	763.40	13.5	28.2	2.00	30.8	7.40	8.10	7.60



IF FURTHER SEDIMENT STORAGE VOLUME IS REQUIRED, CONTRACTOR SHALL SEEK THE APPROVAL OF THE SUPERINTENDENT TO EXCAVATE TO SUBGRADE LEVEL OF THE FUTURE BIO-RETENTION BASIN FILTER LAYER (TO A LEVEL NOT LOWER THAN RL 4.80m)



MAINTENANCE ACCESS TRACK – TYPICAL SECTION

N.T.S.

CONSTRUCTION PHASE SEDIMENT BASIN I LAYOUT



Client:



FRASERS PROPERTY
(AUSTRALIA) PTY. LTD.

Project: M38 INDUSTRIAL
PARK YATALA

Site Address:
60 STAPYLTON JACOBS WELL
ROAD & 31 YELLOWWOOD
ROAD, STAPYLTON QLD 4207

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RPD:

Lot: 501, 4
Plan: SP295994, RP6843
Local Authority: CITY OF GOLD COAST
COUNCIL
Level Datum: AHD
Meridian: -
Contour Interval: -
PSM: -
RL: -

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DRAWING TITLE
CONSTRUCTION PHASE
SEDIMENT BASIN 1
SECTIONS

C	12-03-2020	INFORMATION REQUEST RESPONSE	SK	MG	
B	20-02-2020	INFORMATION REQUEST RESPONSE	IG	MG	
A	20-12-2019	ORIGINAL ISSUE	JRG	MG	
Issue	Date	Description	DRN	CHK	

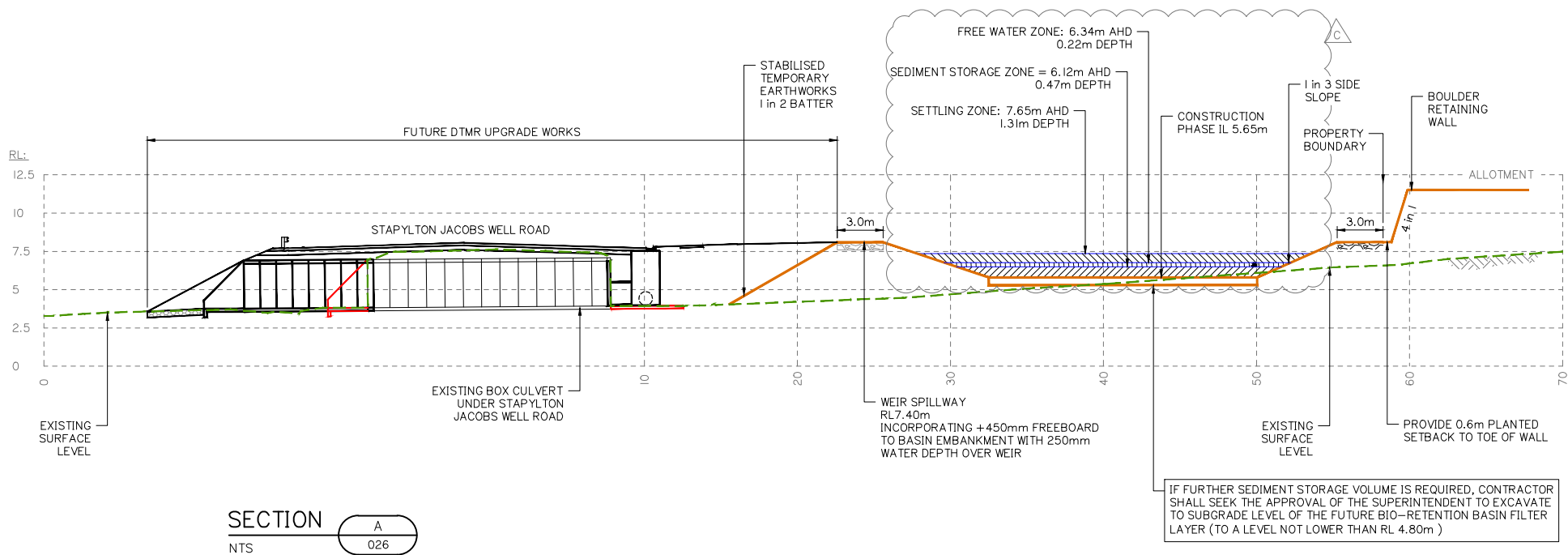
NOT TO SCALE

Scale at A1: NTS

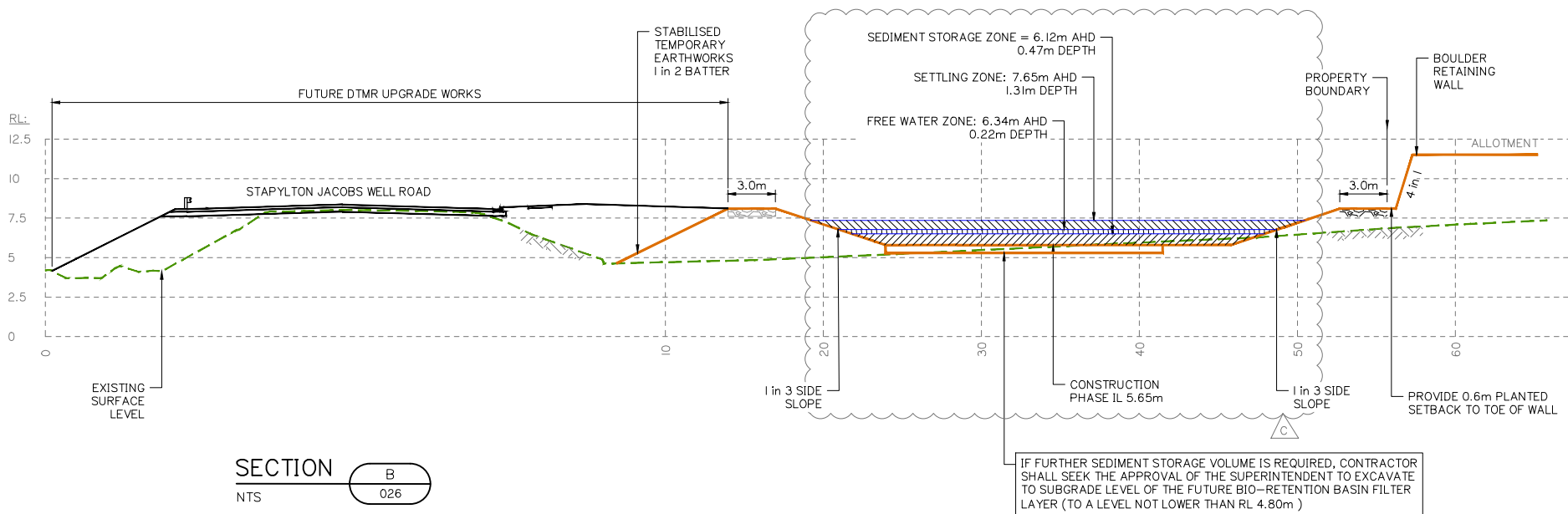
Designed:	IG
Drafted:	JRG
Approved:	MG
RPEQ:	16939
Signed:	
Date:	12-03-2020

Drawing No:
5941 ENG BE1 027

Rev. No:
C

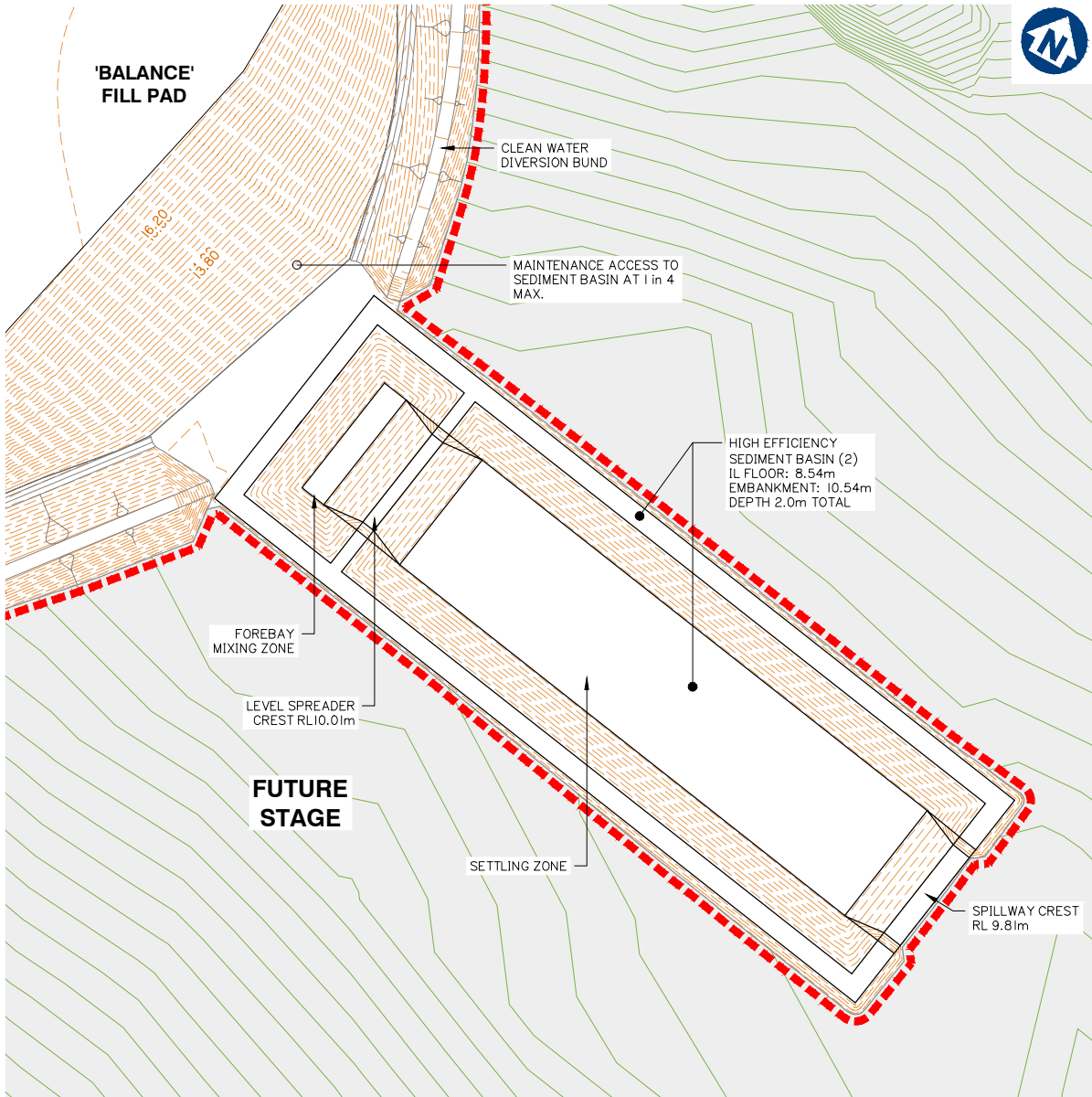


SECTION A
NTS 026



SECTION B
NTS 026

CONSTRUCTION PHASE SEDIMENT BASIN 1 SECTIONS



CONSTRUCTION PHASE SEDIMENT BASIN 2 LAYOUT
SCALE 1: 500 (A1)

DESIGN SEDIMENT BASIN PARAMETERS												
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)	LEVEL SPREADER CREST (RL)
No.2	4113.1	94.0	31.3	2.00	589.57	9.4	31.3	2.00	19.1	9.81	10.54	10.01

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
No. 2	> 12 MONTHS	NO	LEASE	> 5Ha	NO	TYPE A	IFOD-RAIN	2.00

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 T RATE	SELECTED LOW-FLOW DECAN T RATE (Q _d)	MIN SETT LING ZONE VOLUME (Min V _s)	MIN SETT LING 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)	(m³)	(m²)	
No. 2	11,955	1	4.53	20	11150	1.3	3	13	9	2938	1200	VOLUME

BASIN ID	SETTLING ZONE			FREE WATER ZONE		SEDIMENT STORAGE ZONE		OVERALL DIMENSIONS RELATIVE TO SPILLWAY CREST (EXCL. FOREBAY)			
	ACTUAL SETT LING ZONE VOLUME (V _s)	ACTUAL SETT LING 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
	(m³)	(m²)	(m/s)	(m)	(m³)	(m³)	(m)	(1: X)	(m)	(m)	(m)
No. 2	2938	2260	0.007	0.22	294	881	0.48	3	31.3	94.0	2.00

BASIN ID	BASIN DESIGN LIFE	DESIGN ARI	C ₁₀	C	t _c	SPILLWAY					
		yr				I	Q	HEAD OVER SPILLWAY	SPILLWAY CREST LENGTH	SPILLWAY CREST RL	MIN EMBANKMENT RL
						(mm/hr)	(m³/s)	(m)	(m)	(m)	(m)
No. 2	> 12 MONTHS	1: 50	0.88	1.01	25.00	143.00	4.81	0.28	19.10	9.81	10.54

Client:



FRASERS PROPERTY
(AUSTRALIA) PTY. LTD.

Project: M38 INDUSTRIAL
PARK YATALA

Site Address:
60 STAPYLTON JACOBS WELL
ROAD & 31 YELLOWWOOD
ROAD, STAPYLTON QLD 4207

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CONSTRUCTION PHASE
SEDIMENT BASIN 2
LAYOUT

B	20-02-2020	INFORMATION REQUEST RESPONSE	IG	MG
A	20-12-2019	ORIGINAL ISSUE	JRG	MGL
Issue	Date	Description	DRN	CHK

SCALE IN METRES



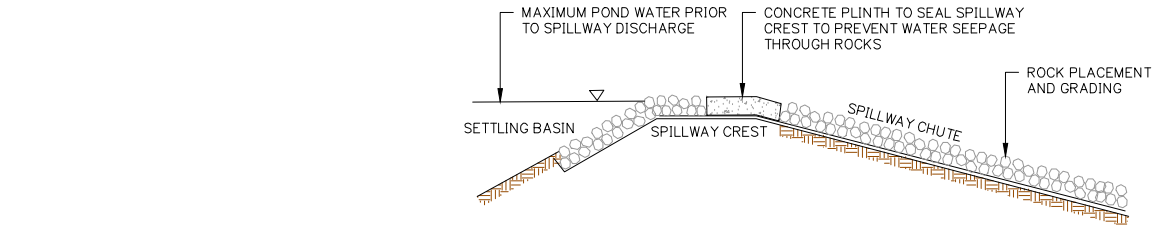
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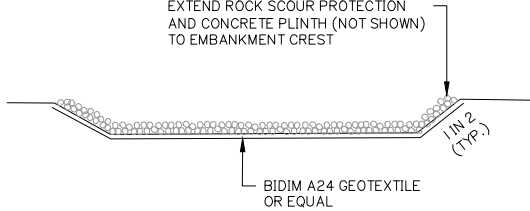
Designed:	IG
Drafted:	JRG
Approved:	MG
RPEQ:	16939
Signed:	
Date:	20-02-2020

Drawing No: 5941 ENG BE1 028
Rev. No: B

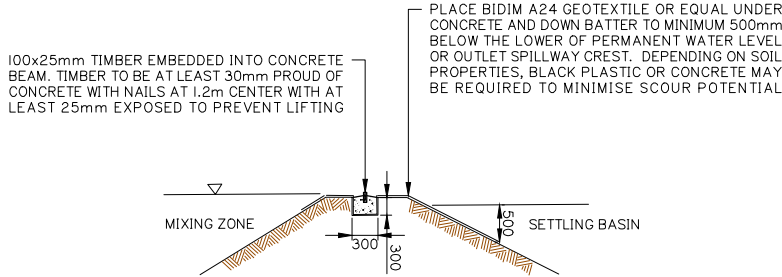
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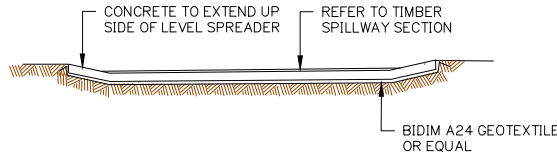
OUTLET SPILLWAY DETAILS
TYPICAL CROSS SECTION
NOT TO SCALE



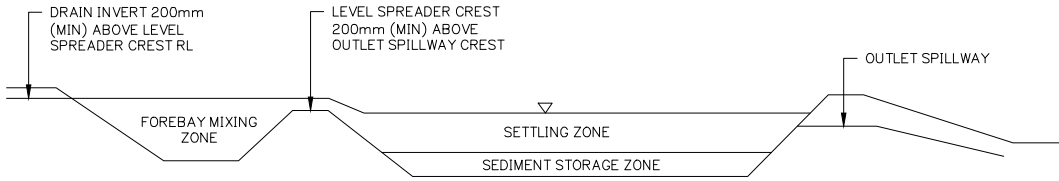
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TYPICAL LONGITUDINAL
SECTION
NOT TO SCALE



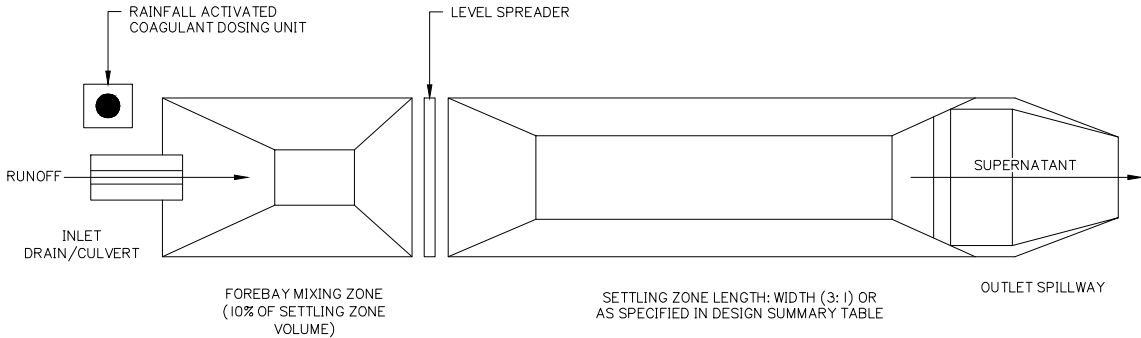
LEVEL SPREADER DETAILS
TYPICAL CROSS SECTION
NOT TO SCALE



LEVEL SPREADER DETAILS
TYPICAL LONG SECTION
NOT TO SCALE



TYPE A SEDIMENT BASIN LONGITUNDAL SECTION (TYP.)
NOT TO SCALE



TYPE A SEDIMENT BASIN PLAN VIEW (TYP.)
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CONSTRUCTION PHASE SEDIMENT BASIN 2 SECTIONS

Client:



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Project: M38 INDUSTRIAL
PARK YATALA

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CONSTRUCTION PHASE
SEDIMENT BASIN 2
SECTIONS

B	20-02-2020	INFORMATION REQUEST RESPONSE		IG	MG
A	20-12-2019	ORIGINAL ISSUE		JRG	MG
Issue	Date	Description		DRN	CHK

SCALE IN METRES



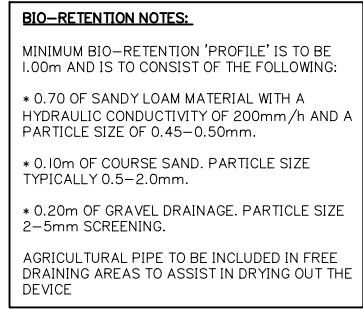
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Scale at A1: 1:500

Designed:	IG
Drafted:	JRG
Approved:	MG
RPEQ:	16939
Signed:	
Date:	20-02-2020

Drawing No:
5941 ENG BE1 029

Rev. No:
B



**BIO RETENTION – COARSE SEDIMENT
FOREBAY SIZING GUIDE CALCULATIONS**

$$V_s = A_c \times R \times L_o \times F = 7.234 \text{ m}^3$$

$$R = 1 - \left[1 + \frac{1}{2} \times \frac{V_s}{Q \times A_f} \right]^{-n}$$

$$0.8 = 1 - \left[\frac{1}{0.5} + \frac{0.10}{2.423/A_f} \right]^{-0.5} \quad A_f = 234.72 \text{ m}^2$$

$$D_s = \frac{V_s}{A_f} \quad D_s = \frac{7.234}{234.72} = 0.031 \text{ m}$$

OPTIMIZATION OF MINIMUM FOREBAY SIZE:

$$D_s = \frac{7.234 \text{ m}^3}{175.2 \text{ m}^2} = 0.041 \text{ m}$$

$$V_s = 7.234 \text{ m}^3 \quad (\text{Workings Above})$$

$$A_c = 15.071 \text{ ha} \quad (\text{Refer Catchment Plans})$$

UNMITIGATED POST-DEVELOPMENT FLOW

$$Q = 1.956 \text{ m}^3/\text{s} \quad (3 \text{ month ARI} = 0.5 \times 63.2\% \text{ AEP})$$

$$V_s = 0.1 \text{ m}^3/\text{s} \quad (\text{Recommended for Imm Particle})$$

$$R = 0.1 \text{ m/s} \quad (\text{Recommended } 80\% \text{ Capture})$$

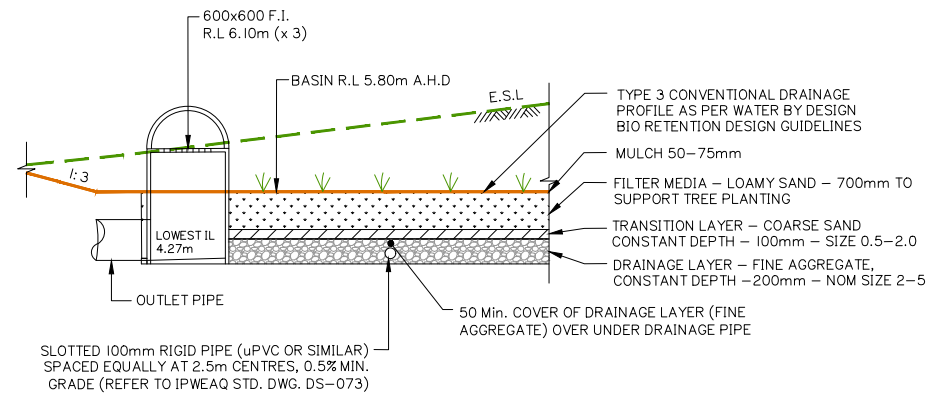
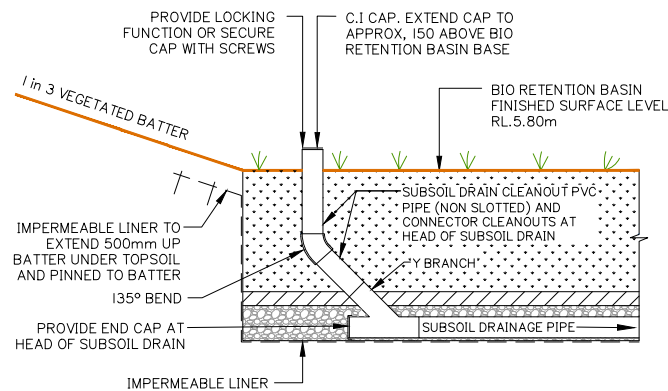
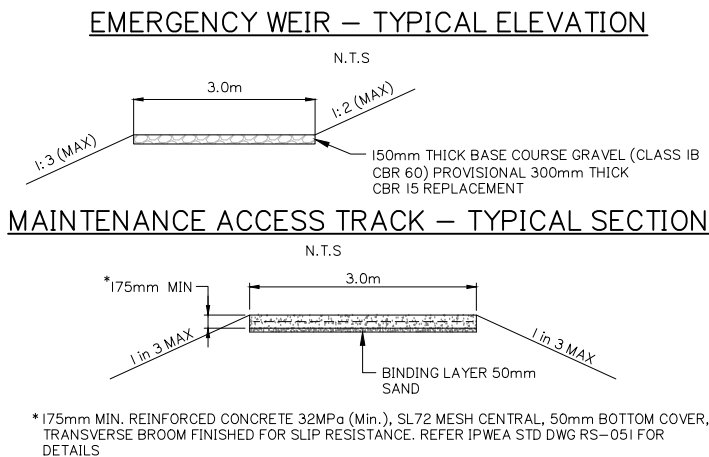
$$L_o = 0.6 \quad (\text{From Healthy Waterways Guide})$$

$$n = 0.5 \quad (\text{Recommended Turbulence})$$

$$F_c = 1.0 \quad (\text{Frequency of Clean Out / Yr})$$

**REFER TO BIO RETENTION TECHNICAL
DESIGN GUIDELINES FOR FURTHER
INFORMATION**

AEP (%)	MAX. WATER ELEVATION (m) A.H.D	MAX. WATER DEPTH (m)
63.2	6.635	0.835
50	6.720	0.920
20	7.057	1.257
10	7.179	1.379
5	7.256	1.456
2	7.357	1.557
1	7.489	1.689



The image displays two logos. The top logo is for Gassman Development Perspectives, featuring a stylized graphic of blue and white steps or a staircase on the left, with the text 'est 1985' below it. To the right of the graphic, the company name 'gassman development perspectives' is written in a bold, sans-serif font, with 'gassman' in black and 'development perspectives' in blue. Below this logo, the text 'planning | environment | landscape | engineering | survey' is written in a smaller, black, sans-serif font. Further down, the contact information 'T: 3807 3333 | F: 3287 5461 | www.gassman.com.au' is provided, followed by the address 'Gold Coast & Logan | 78 Business Street, Yatala QLD | PO Box 392, Beenleigh 4207'.

The bottom logo is for Frasers Property (Australia) Pty. Ltd. It features a stylized graphic on the left consisting of several curved, overlapping shapes in shades of red and brown, resembling a fan or a stylized flame. To the right of the graphic, the company name 'FRASERS PROPERTY' is written in a large, bold, black, sans-serif font. Below this logo, the text 'FRASERS PROPERTY (AUSTRALIA) PTY. LTD.' is written in a smaller, black, sans-serif font.

Project:	VANTAGE YATALA STAGE 1
Site Address:	60 STAPYLTON JACOBS WELL ROAD, STAPYLTON QLD 4207
<i>THIS DRAWING IS INTENDED TO BE PRINTED IN COLOUR</i>	

RPD:	
Lot:	501
Plan:	SP295994
Local Authority:	CITY OF GOLD COAST COUNCIL
Level Datum:	AHD
Meridian:	-
Contour Interval:	-
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DRAWING TITLE OPERATIONAL PHASE BIORETENTION BASIN SHEET 1 OF 2					
A	05-02-2021	<u>ORIGINAL ISSUE</u>		BA	MG
Issue	Date	Description		DRN	CHK

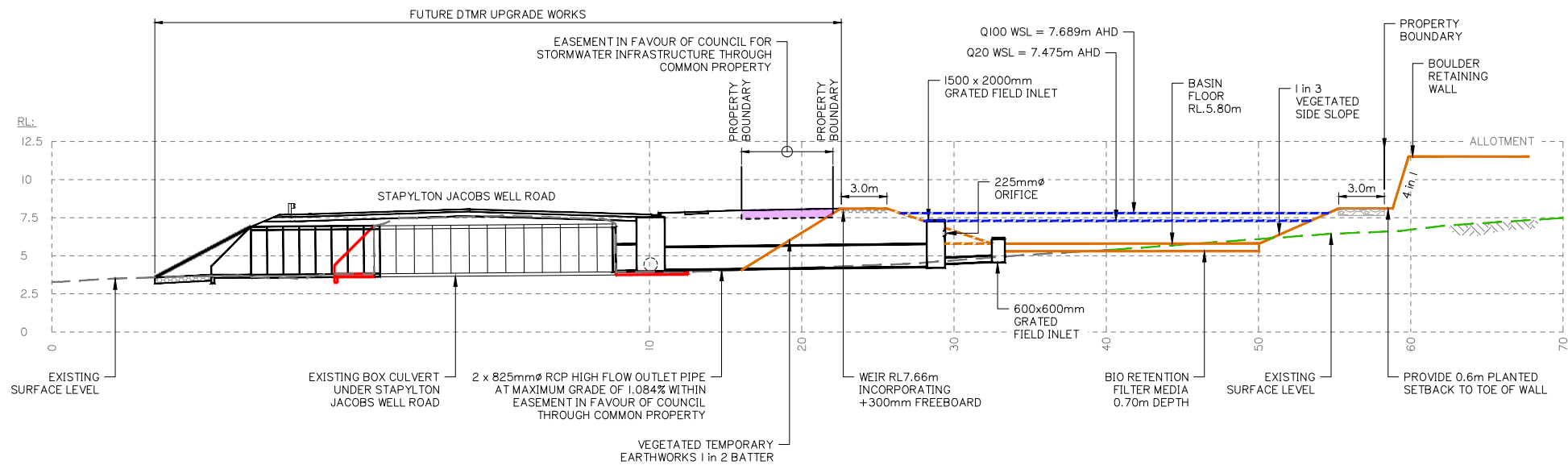
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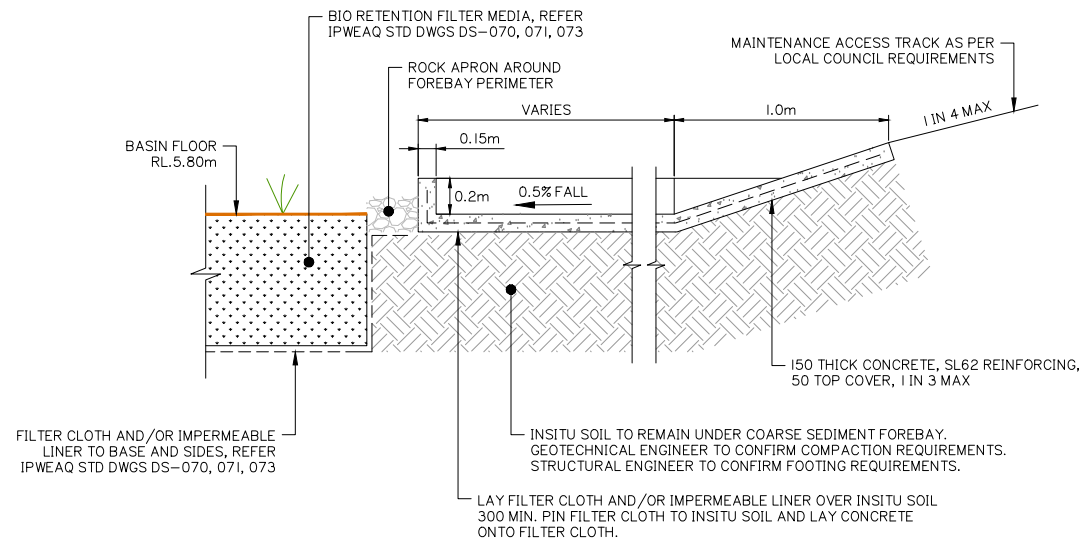
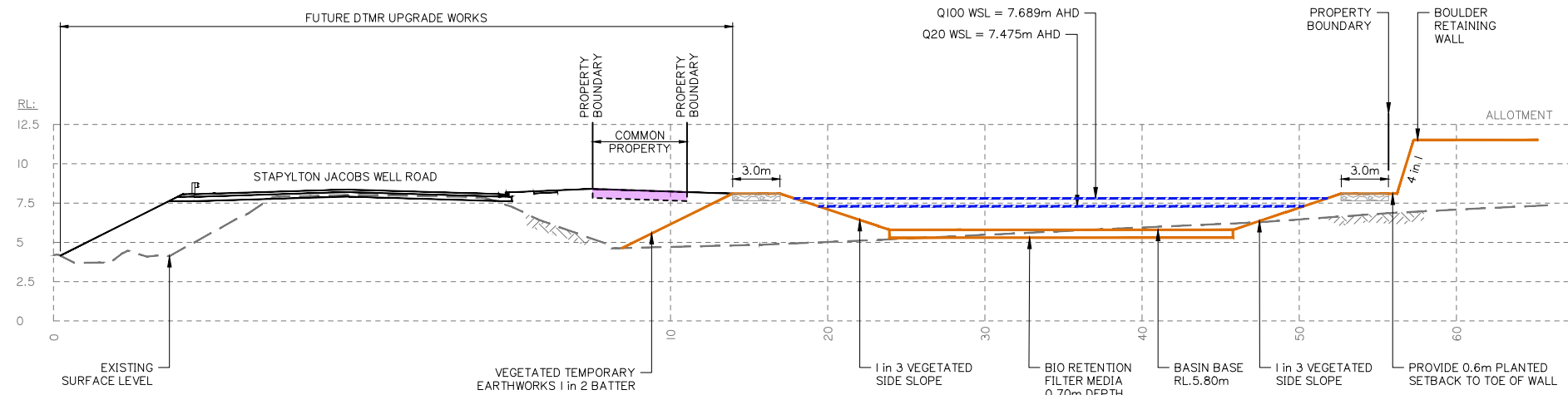
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Scale at A1:	1:500
Designed:	IG
Drafted:	BA
Approved:	MG
RPEQ:	16939
Signed:	
Date:	05-02-2021

SECTION
NTS

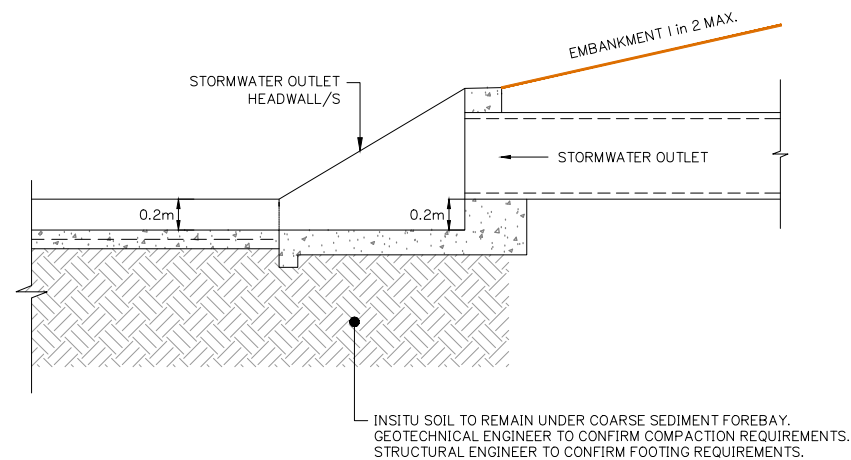


SECTION
NTS



COURSE SEDIMENT FOREBAY TYPICAL SECTION

N.T.S



TYPICAL STORMWATER OUTLET TO SEDIMENT FOREBAY

N.T.S

Client:



Project:

VANTAGE YATALA
STAGE 1

Site Address:

60 STAPYLTON JACOBS WELL
ROAD, STAPYLTON QLD 4207

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DRAWING TITLE
OPERATIONAL PHASE
BIORETENTION BASIN
SHEET 2 OF 2

Issue	Date	Description	BA	MG
A	05-02-2021	ORIGINAL ISSUE	BA	MG

SCALE IN METRES

NOT APPLICABLE

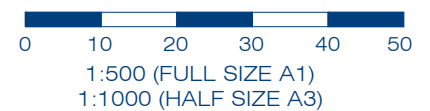
Scale at A1:	NTS
Designed:	IG
Drafted:	BA
Approved:	MG
RPEQ:	16939
Signed:	
Date:	05-02-2021

Drawing No: 5941 ENG SMP1 006
Rev. No: A

Appendix D – Balance Earthworks Below Defined Flood Event Level



B	20-02-2020	INFORMATION REQUEST RESPONSE	IQ	MQ	
A	20-12-2019	ORIGINAL ISSUE	JRG	MG	
Issue	Date	Description	DRN	CHK	

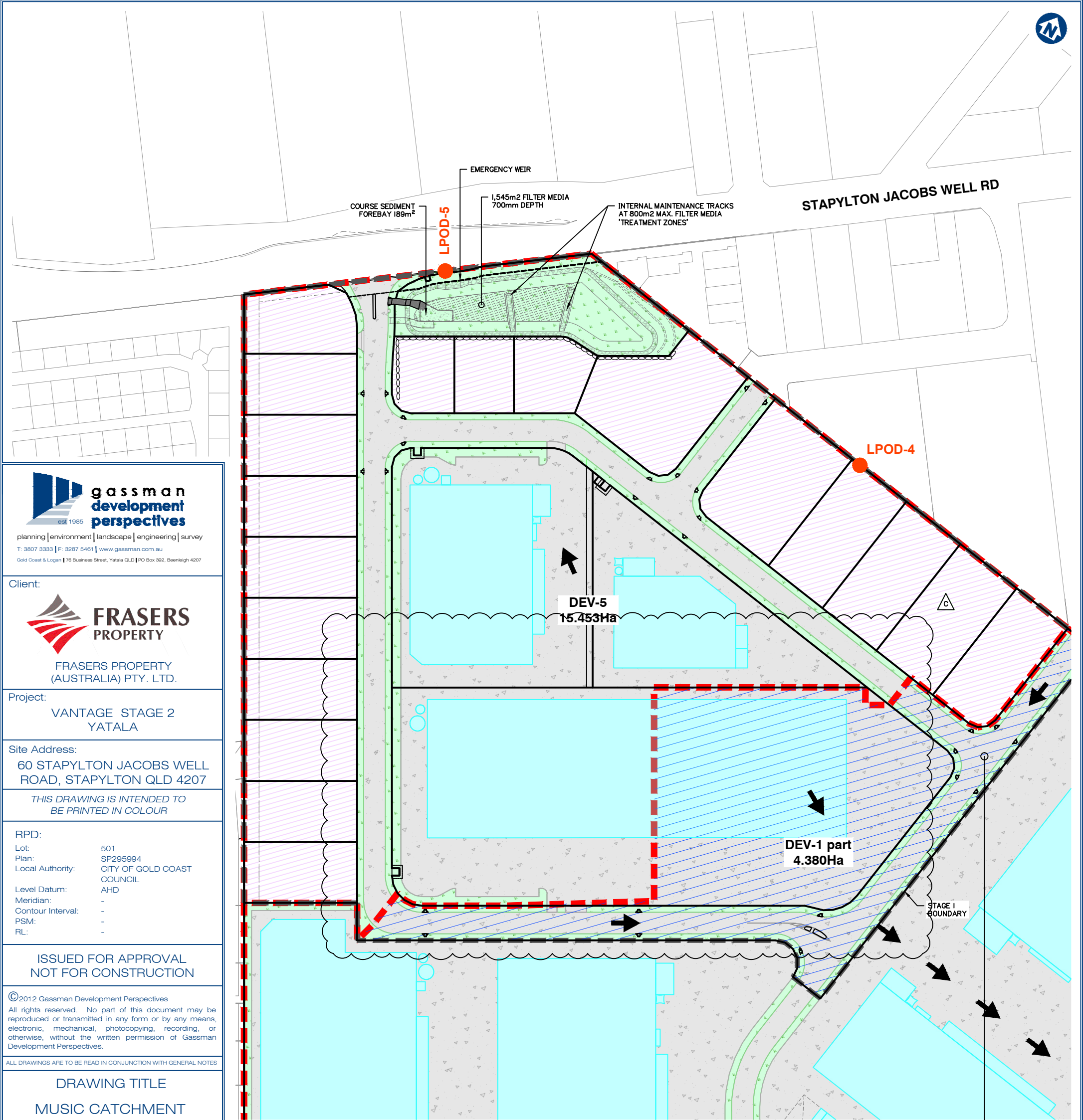


Designed:	IG
Drafted:	JRG
Approved:	MG
RPEQ:	16939
Signed:	
Date:	20-02-2020



Drawing No:	Rev. No:
5941 ENG BE1 471	C

Appendix E – MUSIC Catchment Allocation Plan



BIO RETENTION BASIN (DEV-I part) DETAILS

- 660m² FILTER AREA.
- 0.70m FILTER DEPTH.
- 300mm EXTENDED DETENTION.
- 660m² EXTENDED DETENTION SURFACE AREA.
- 200mm/hr HYDRAULIC CONDUCTIVITY.
- 400mg/kg TN CONTENT OF FILTER MEDIA.
- 30mg/kg ORTHOPHOSPHATE CONTENT OF FILTER MEDIA.
- BASE OF BASIN IS LINED.
- BASIN IS VEGETATED WITH EFFECTIVE NUTRIENT REMOVAL PLANTS.
- 5.0m BROAD CRESTED WEIR ASSUMED.
- PERFORATED AND SOLID UNDER DRAINAGE IS PRESENT.

(REFER BLUE CROSS-HATCHED AREA)

MUSIC CATCHMENT ALLOCATION PLAN STAGE I

TYPICAL INDUSTRIAL LOT

TAKEN FROM MUSIC MODELLING GUIDELINES v3.0 (2018)

Appendix F – MUSIC Link Report

MUSIC-link Report

Project Details		Company Details	
Project:	5941 Frasers Property Yatala DEV-1 part	Company:	Gassman Development Perspectives Pty. Ltd
Report Export Date:	20/02/2020	Contact:	Mitchell Gassman
Catchment Name:	5941 CoGC M88	Address:	c/o 76 Business Street Yatala 4207
Catchment Area:	4.38ha	Phone:	0738073333
Impervious Area*:	79.19%	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 (part)	Reduction	Node Type	Number	Node Type	Number
Flow	5.09%	Bio Retention Node	1	Urban Source Node	3
TSS	87.9%				
TP	82.4%				
TN	59%				
GP	100%				

Comments

Sized for 'DEV-1 part' catchment only, discharge to ultimate basin within Stage 2

Passing Parameters

Node Type	Node Name	Parameter	Min	Max	Actual
Bio	Bio-Retention Basin DEV-1 part (660 m2 Filter)	Exfiltration Rate (mm/hr)	None	None	0
Bio	Bio-Retention Basin DEV-1 part (660 m2 Filter)	Extended detention depth (m)	None	1	0.3
Bio	Bio-Retention Basin DEV-1 part (660 m2 Filter)	Filter depth (m)	0.4	1	0.7
Bio	Bio-Retention Basin DEV-1 part (660 m2 Filter)	Hi-flow bypass rate (cum/sec)	None	None	100
Bio	Bio-Retention Basin DEV-1 part (660 m2 Filter)	Orthophosphate Content in Filter (mg/kg)	None	None	30
Bio	Bio-Retention Basin DEV-1 part (660 m2 Filter)	PET Scaling Factor	2.1	2.1	2.1
Bio	Bio-Retention Basin DEV-1 part (660 m2 Filter)	Saturated Hydraulic Conductivity (mm/hr)	50	200	200
Bio	Bio-Retention Basin DEV-1 part (660 m2 Filter)	Total Nitrogen Content in Filter (mg/kg)	None	None	400
Receiving	LPoD-1 (part)	% Load Reduction	None	None	5.09
Receiving	LPoD-1 (part)	GP % Load Reduction	90	None	100
Receiving	LPoD-1 (part)	TN % Load Reduction	45	None	59
Receiving	LPoD-1 (part)	TP % Load Reduction	60	None	82.4
Receiving	LPoD-1 (part)	TSS % Load Reduction	80	None	87.9
Urban	CoGC - Industrial GROUND DEV-1 part (0.929 Ha)	Area Impervious (ha)	None	None	0.555
Urban	CoGC - Industrial GROUND DEV-1 part (0.929 Ha)	Area Pervious (ha)	None	None	0.373
Urban	CoGC - Industrial GROUND DEV-1 part (0.929 Ha)	Total Area (ha)	None	None	0.929
Urban	CoGC - Industrial ROAD DEV-1 part (2.140 Ha)	Area Impervious (ha)	None	None	1.602
Urban	CoGC - Industrial ROAD DEV-1 part (2.140 Ha)	Area Pervious (ha)	None	None	0.537
Urban	CoGC - Industrial ROAD DEV-1 part (2.140 Ha)	Total Area (ha)	None	None	2.14
Urban	CoGC - Industrial ROOF DEV-1 part (1.311 Ha)	Area Impervious (ha)	None	None	1.311
Urban	CoGC - Industrial ROOF DEV-1 part (1.311 Ha)	Area Pervious (ha)	None	None	0
Urban	CoGC - Industrial ROOF DEV-1 part (1.311 Ha)	Total Area (ha)	None	None	1.311

Only certain parameters are reported when they pass validation

MUSIC-link Report

Project Details		Company Details	
Project:	5941 Frasers Property Yatala DEV-5	Company:	Gassman Development Perspectives Pty. Ltd.
Report Export Date:	5/02/2020	Contact:	Mitchell Gassman
Catchment Name:	5941 CoGC M88	Address:	c/o 76 Business Street Yatala 4207
Catchment Area:	15.453ha	Phone:	0738073333
Impervious Area*:	82.24%	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-5	Reduction	Node Type	Number	Node Type	Number
Flow	3.31%	Bio Retention Node	1	Urban Source Node	3
TSS	81.1%				
TP	73.2%				
TN	51.6%				
GP	100%				

Comments

05/02/2020 MUSIC model amended to increase depth of filter media by +0.20m to a total of 0.70m excluding the transition layer and drainage layer. Filter media surface area has reduced to 1,545m² using 200mm/hr saturated hydraulic conductivity. In accordance with Healthy Land and Water's (HLW) MUSIC Modelling Guidelines Version 3.0 (November 2018) "for sensitivity testing, it is recommended that the designer simulate the bioretention system in MUSIC using a saturated hydraulic conductivity of 50mm/hr and present the results with the development application". – Section 4.5.2 Page 47. It is noted, however, that "compliance with water quality objectives is only required for the actual long term expected hydraulic conductivity i.e. 200mm/hr". – Section 4.5.2 Page 47

Passing Parameters

Node Type	Node Name	Parameter	Min	Max	Actual
Bio	Bio-Retention Basin DEV-5 (1_545 m2 Filter)	Exfiltration Rate (mm/hr)	None	None	0
Bio	Bio-Retention Basin DEV-5 (1_545 m2 Filter)	Extended detention depth (m)	None	1	0.3
Bio	Bio-Retention Basin DEV-5 (1_545 m2 Filter)	Filter depth (m)	0.4	1	0.7
Bio	Bio-Retention Basin DEV-5 (1_545 m2 Filter)	Hi-flow bypass rate (cum/sec)	None	None	100
Bio	Bio-Retention Basin DEV-5 (1_545 m2 Filter)	Orthophosphate Content in Filter (mg/kg)	None	None	30
Bio	Bio-Retention Basin DEV-5 (1_545 m2 Filter)	PET Scaling Factor	2.1	2.1	2.1
Bio	Bio-Retention Basin DEV-5 (1_545 m2 Filter)	Saturated Hydraulic Conductivity (mm/hr)	50	200	200
Bio	Bio-Retention Basin DEV-5 (1_545 m2 Filter)	Total Nitrogen Content in Filter (mg/kg)	None	None	400
Receiving	LPoD-5	% Load Reduction	None	None	3.31
Receiving	LPoD-5	GP % Load Reduction	90	None	100
Receiving	LPoD-5	TN % Load Reduction	45	None	51.6
Receiving	LPoD-5	TP % Load Reduction	60	None	73.2
Receiving	LPoD-5	TSS % Load Reduction	80	None	81.1
Urban	CoGC - Industrial GROUND DEV-5 (2.933 Ha)	Area Impervious (ha)	None	None	1.753
Urban	CoGC - Industrial GROUND DEV-5 (2.933 Ha)	Area Pervious (ha)	None	None	1.179
Urban	CoGC - Industrial GROUND DEV-5 (2.933 Ha)	Total Area (ha)	None	None	2.933
Urban	CoGC - Industrial ROAD DEV-5 (6.224 Ha)	Area Impervious (ha)	None	None	4.660
Urban	CoGC - Industrial ROAD DEV-5 (6.224 Ha)	Area Pervious (ha)	None	None	1.563
Urban	CoGC - Industrial ROAD DEV-5 (6.224 Ha)	Total Area (ha)	None	None	6.224
Urban	CoGC - Industrial ROOF DEV-5 (6.296 Ha)	Area Impervious (ha)	None	None	6.296
Urban	CoGC - Industrial ROOF DEV-5 (6.296 Ha)	Area Pervious (ha)	None	None	0
Urban	CoGC - Industrial ROOF DEV-5 (6.296 Ha)	Total Area (ha)	None	None	6.296

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



Location

Label: 60 Stapylton Road FRASERS

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: 13 December 2019

Rainfall intensity for Durations, Exceedance per Year (EY), and Annual Exceedance Probabilities (AEP).

[FAQ for New ARR probability terminology](#)

Duration	Annual Exceedance Probability (AEP)						
	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
11 min	87.4	98.9	134	158	180	209	230
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

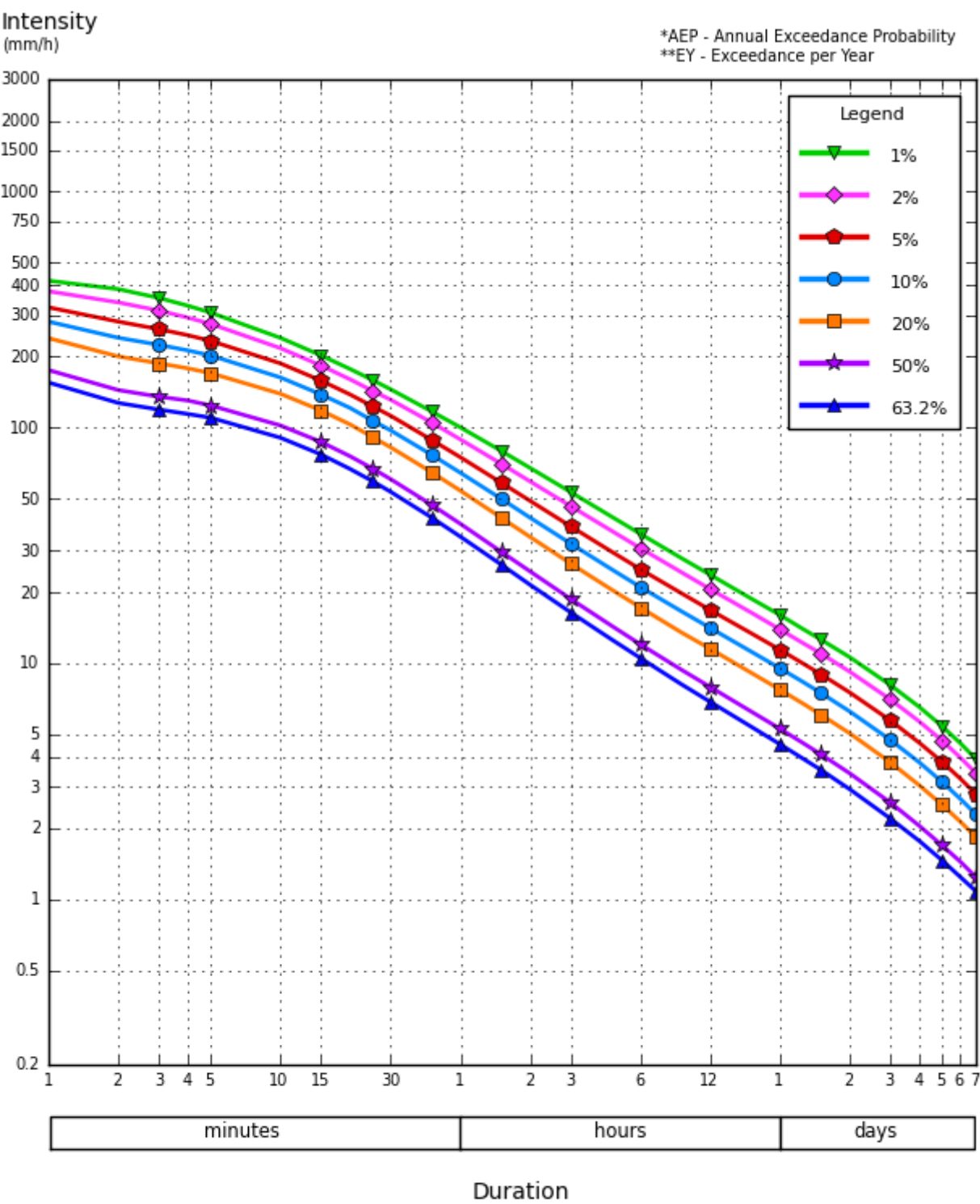
Note:

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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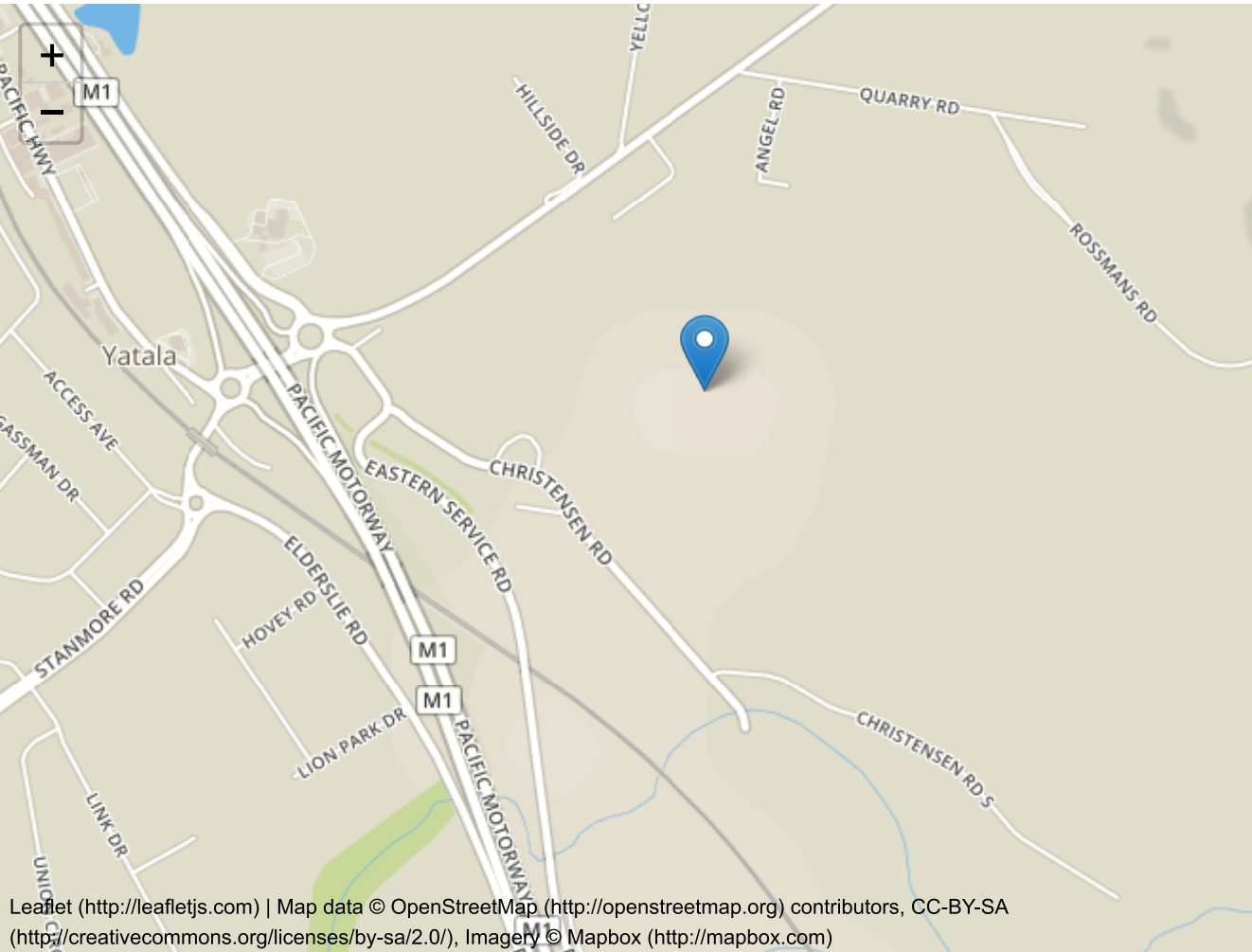
Appendix I – AR&R 2016 Storm Loss Data

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
---------------	--------------------------

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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- Download JSON (downloads/5e94d649-e516-45a9-b4fb-f374cf5791a5.json)
- Generating PDF... (downloads/579e9dd3-c6b7-4ec5-8a64-fc262213ce3d.pdf)

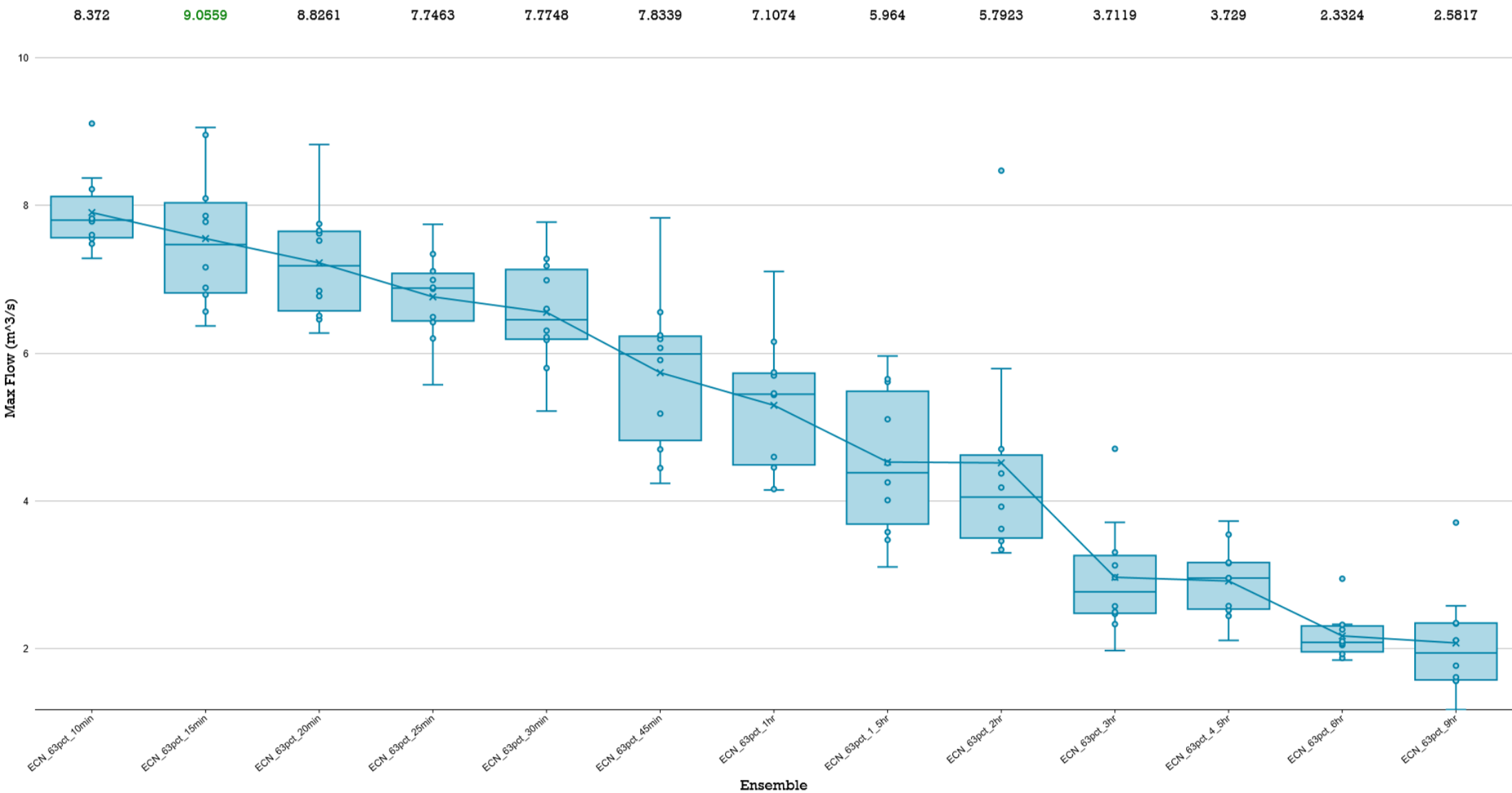
Appendix J – Proposed Reconfiguration of a Lot Plan

Revision No:

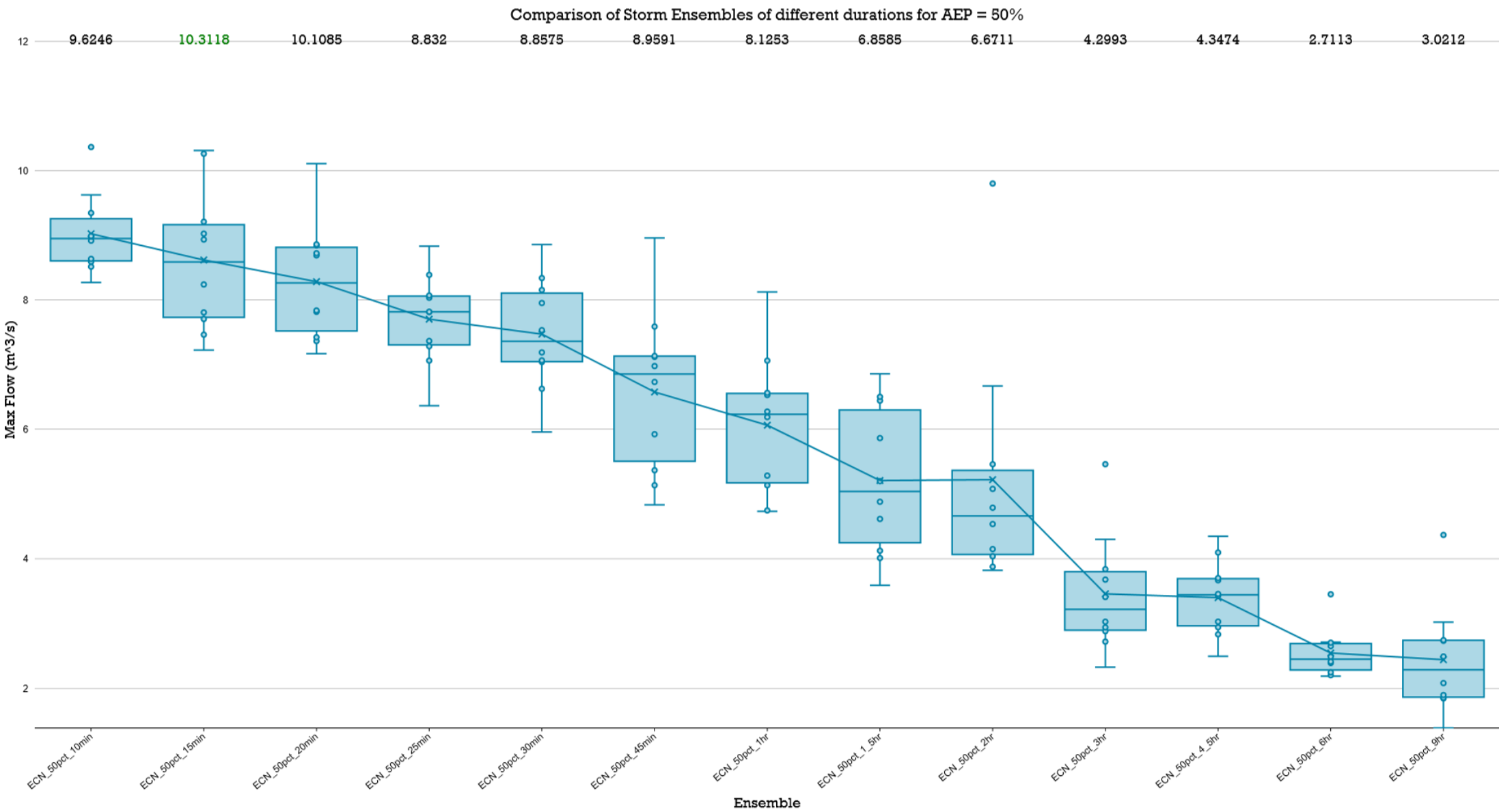
Appendix K – Pre and Post Development Hydrographs

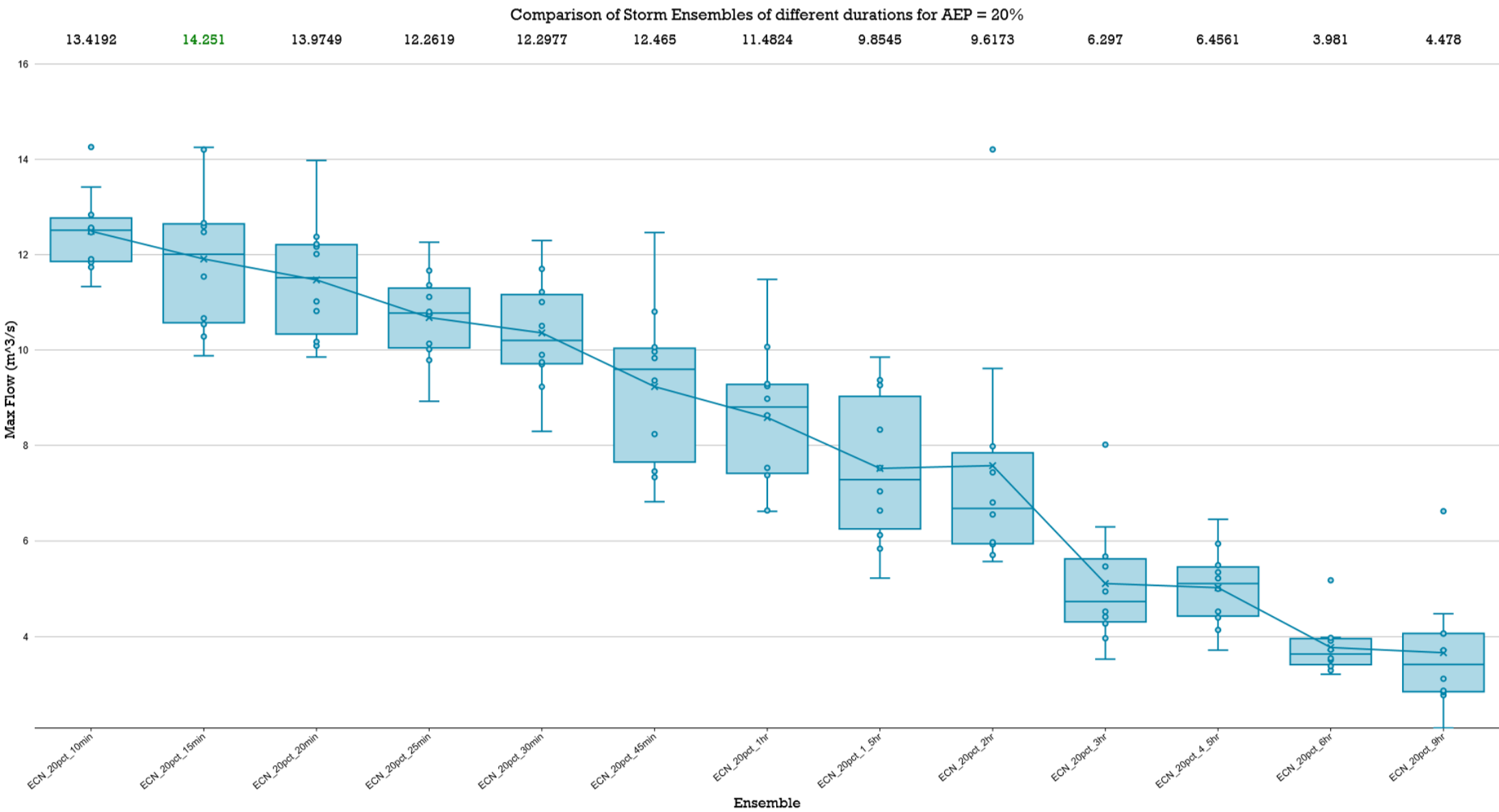
LPoD 1 POST-DEVELOPMENT

Comparison of Storm Ensembles of different durations for AEP = 63.2%

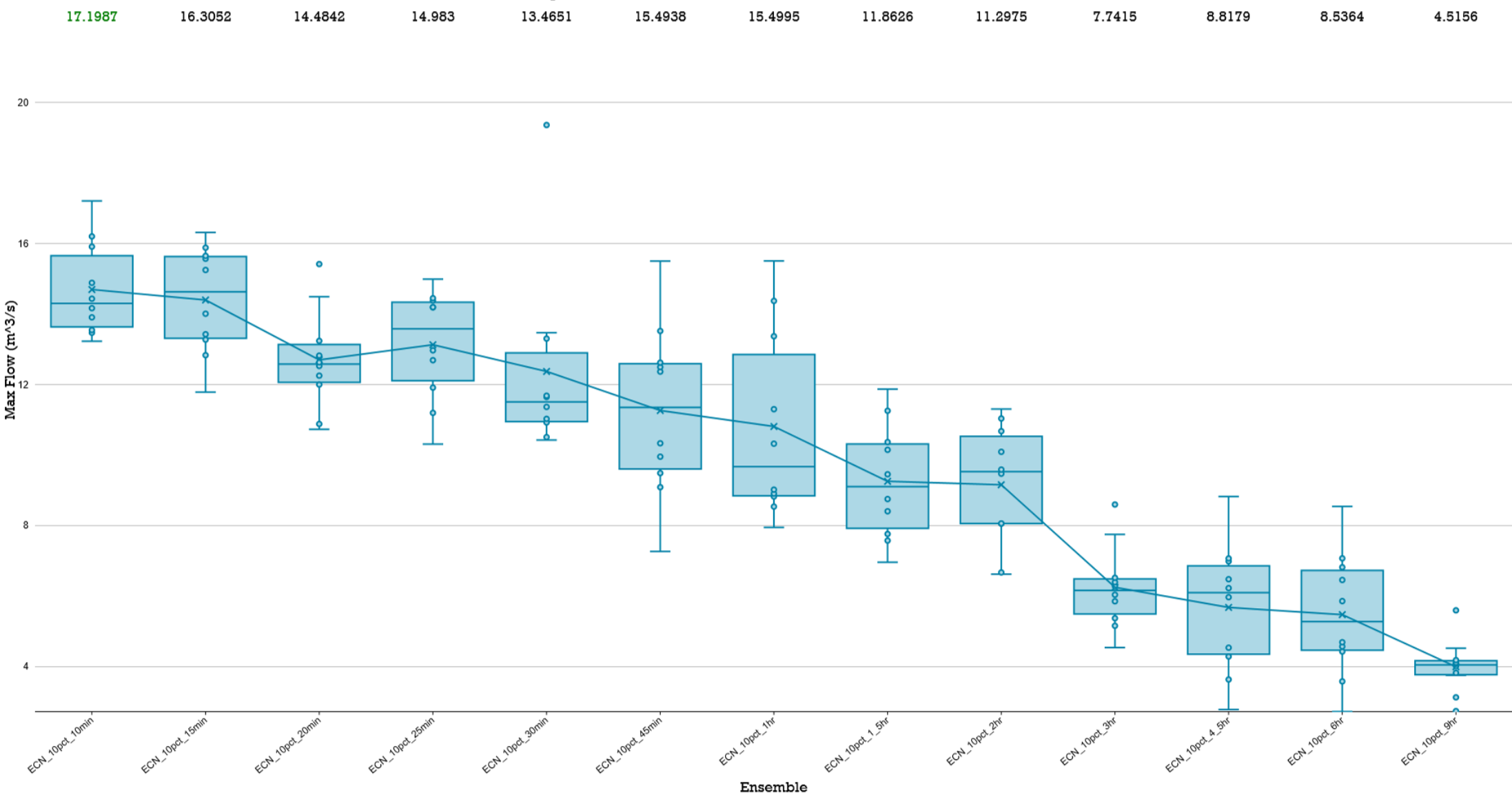


BOX & WHISKER PLOTS

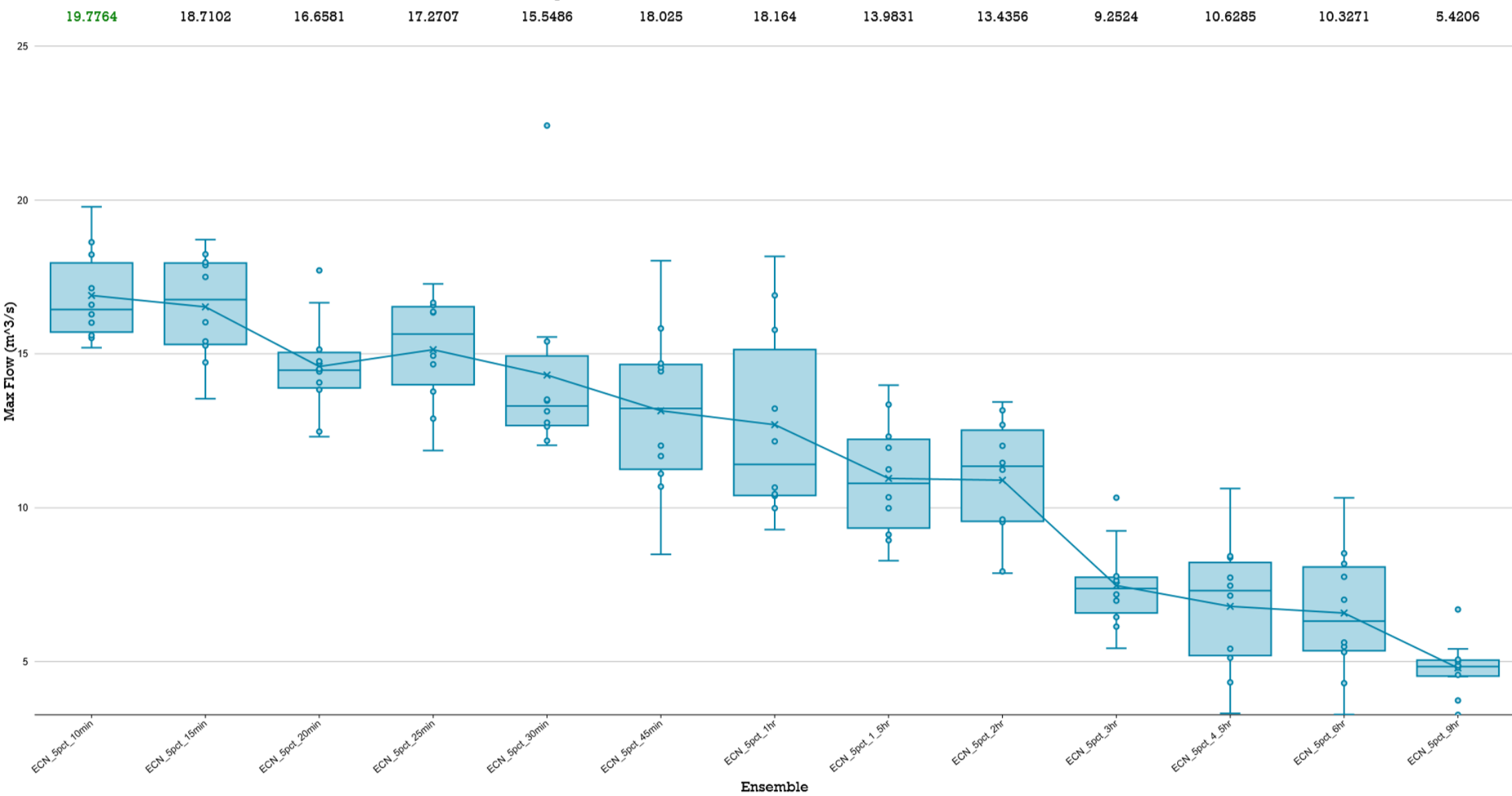




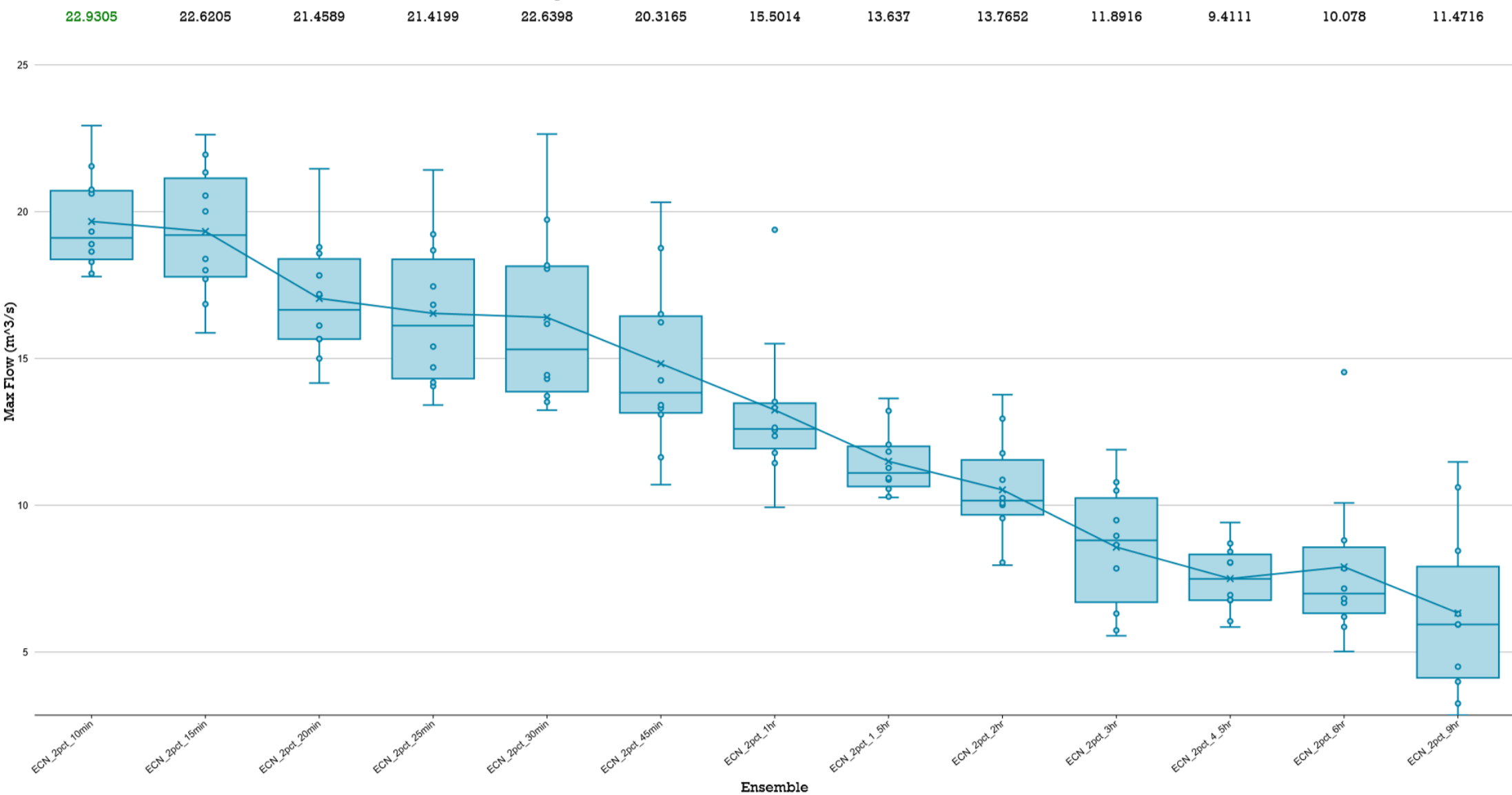
Comparison of Storm Ensembles of different durations for AEP = 10%



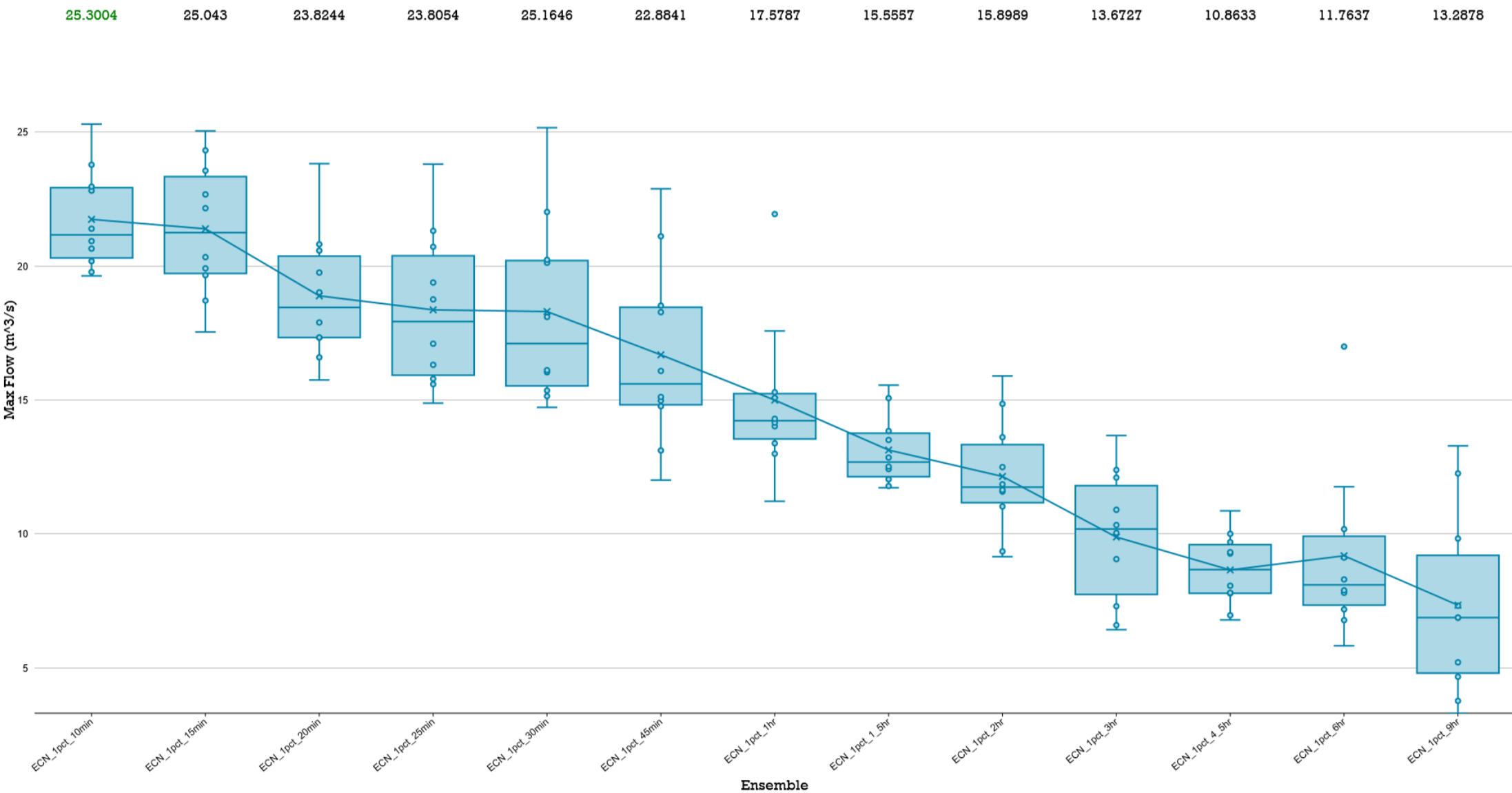
Comparison of Storm Ensembles of different durations for AEP = 5%



Comparison of Storm Ensembles of different durations for AEP = 2%

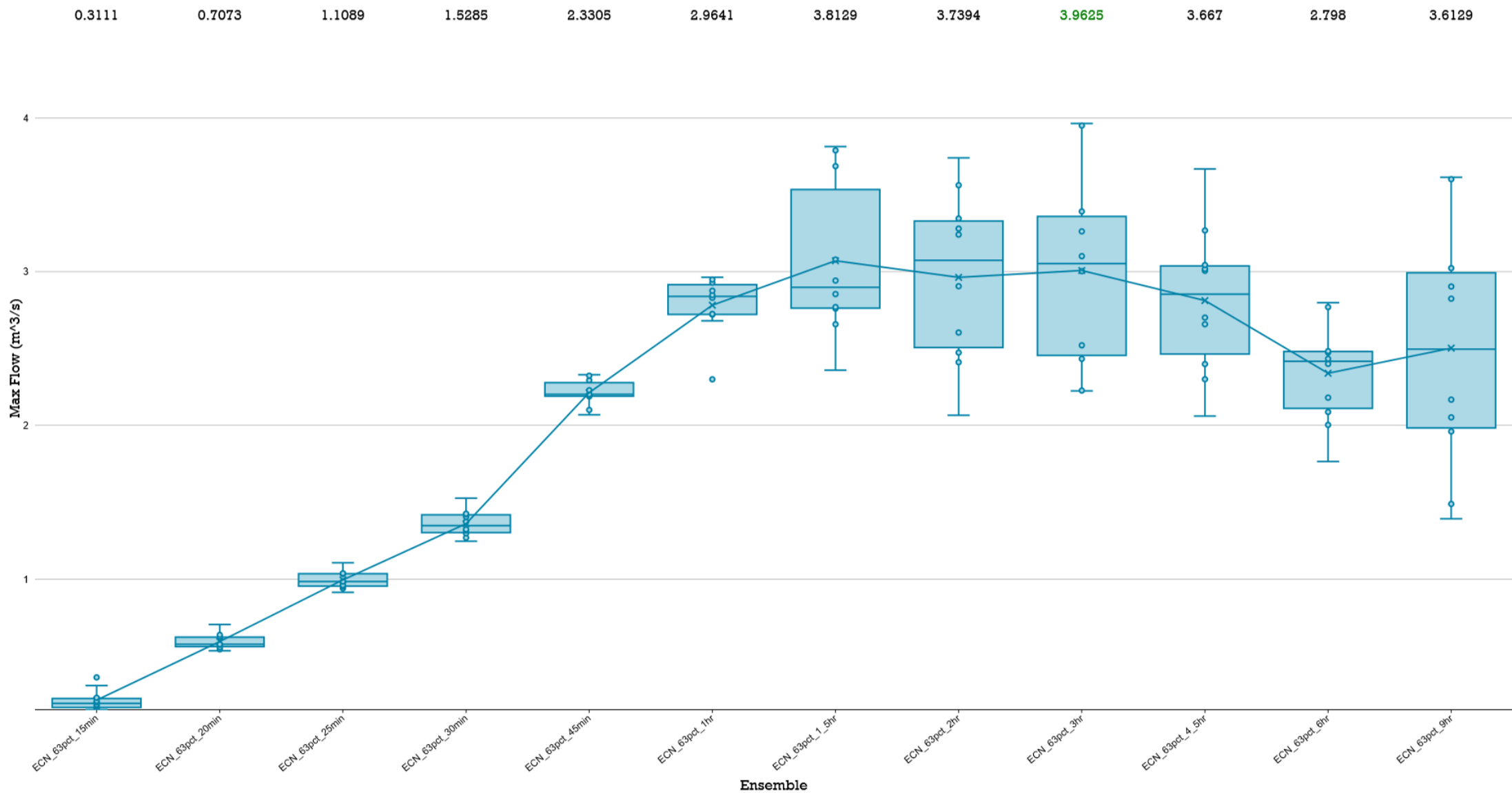


Comparison of Storm Ensembles of different durations for AEP = 1%

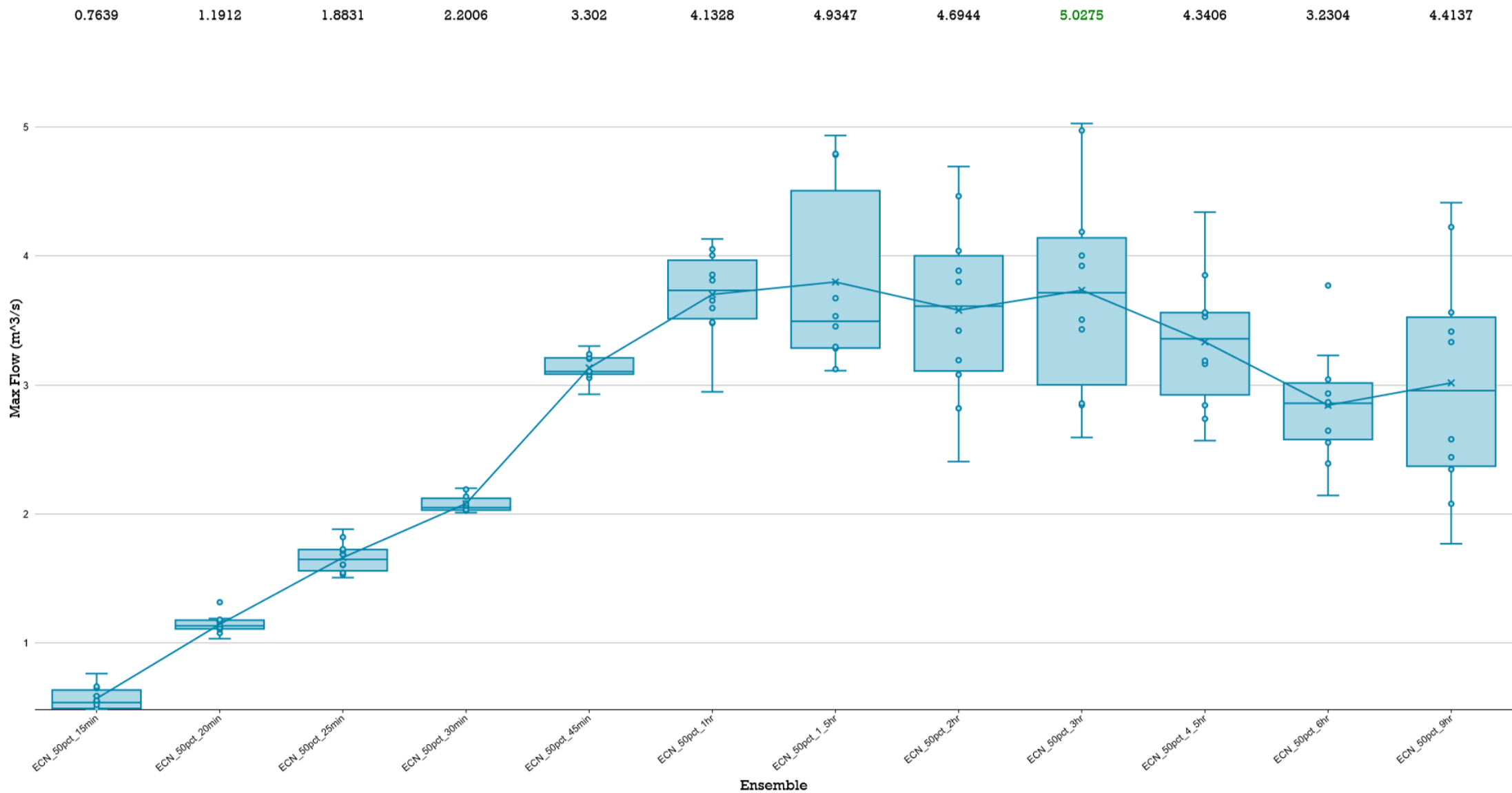


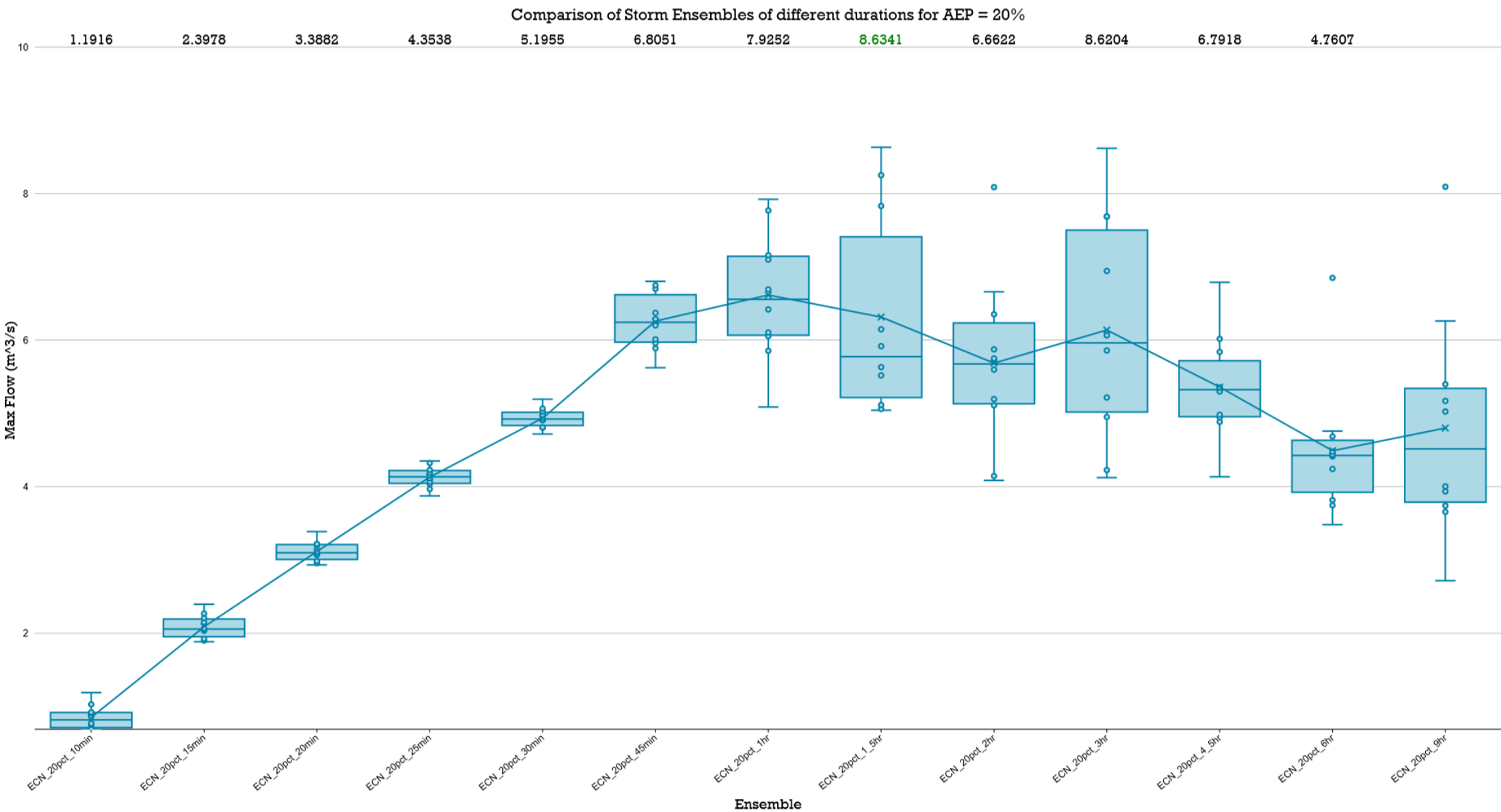
LPoD 1 PRE-DEVELOPMENT

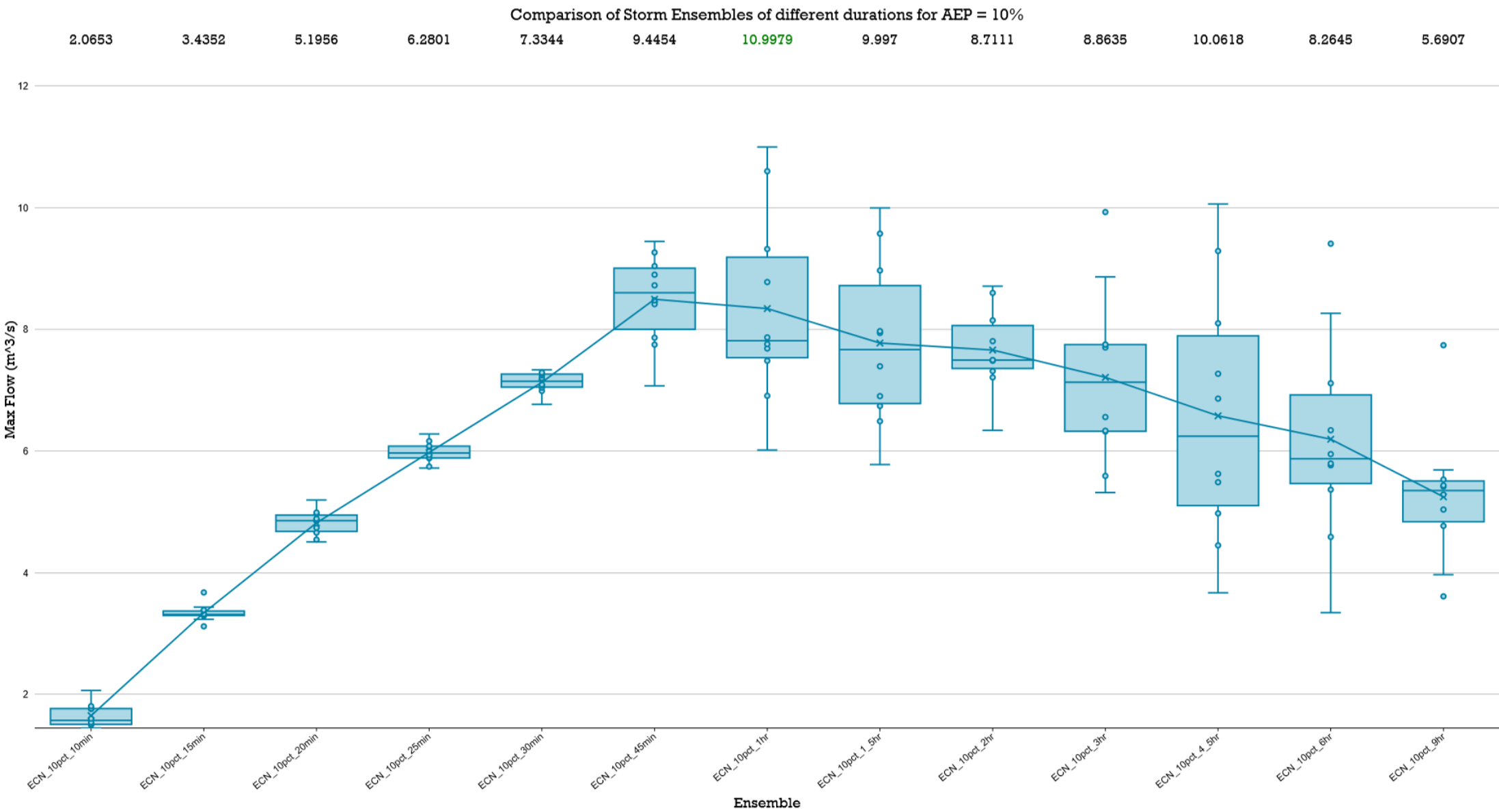
Comparison of Storm Ensembles of different durations for AEP = 63.2%

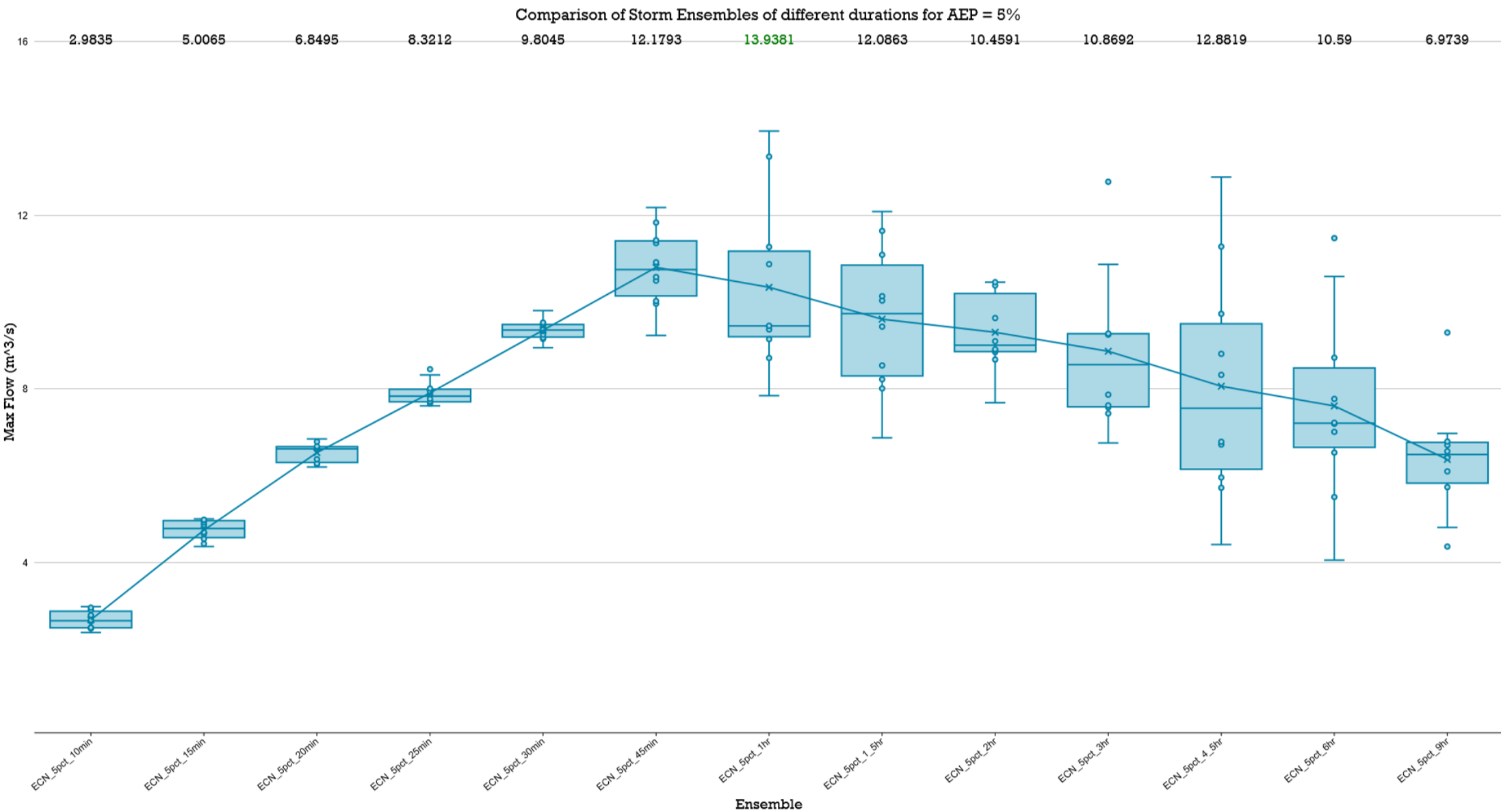


Comparison of Storm Ensembles of different durations for AEP = 50%

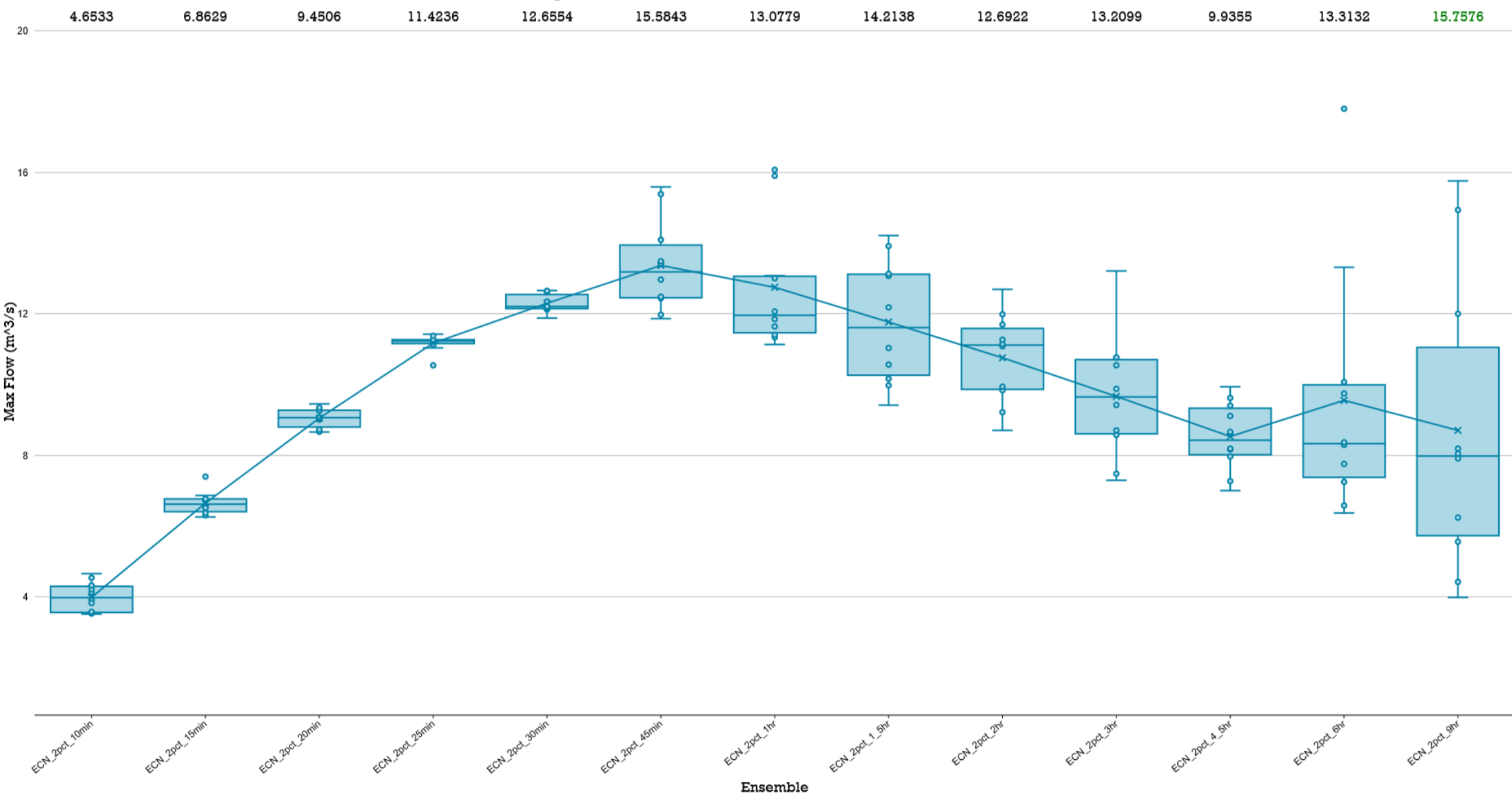






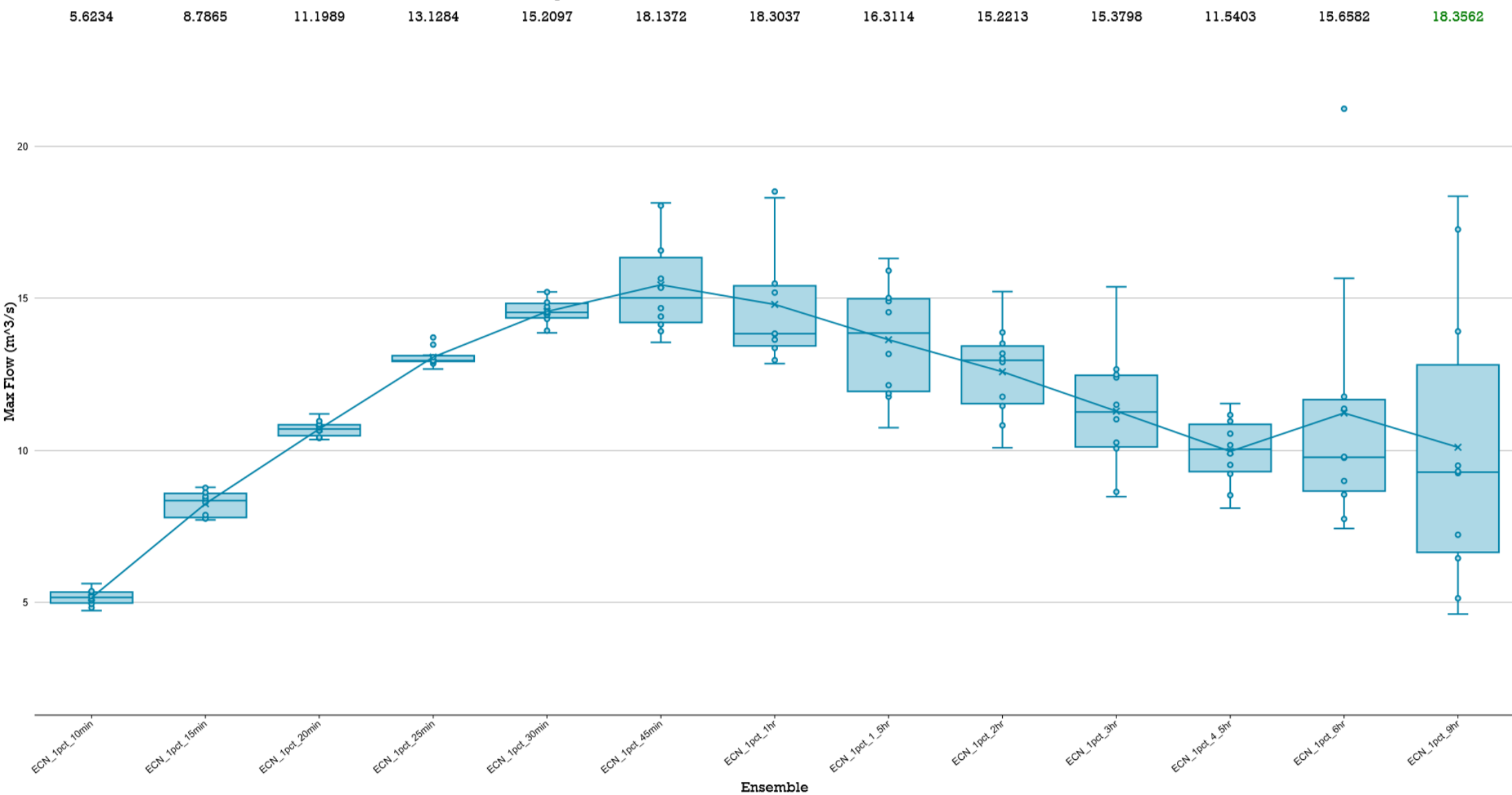


Comparison of Storm Ensembles of different durations for AEP = 2%

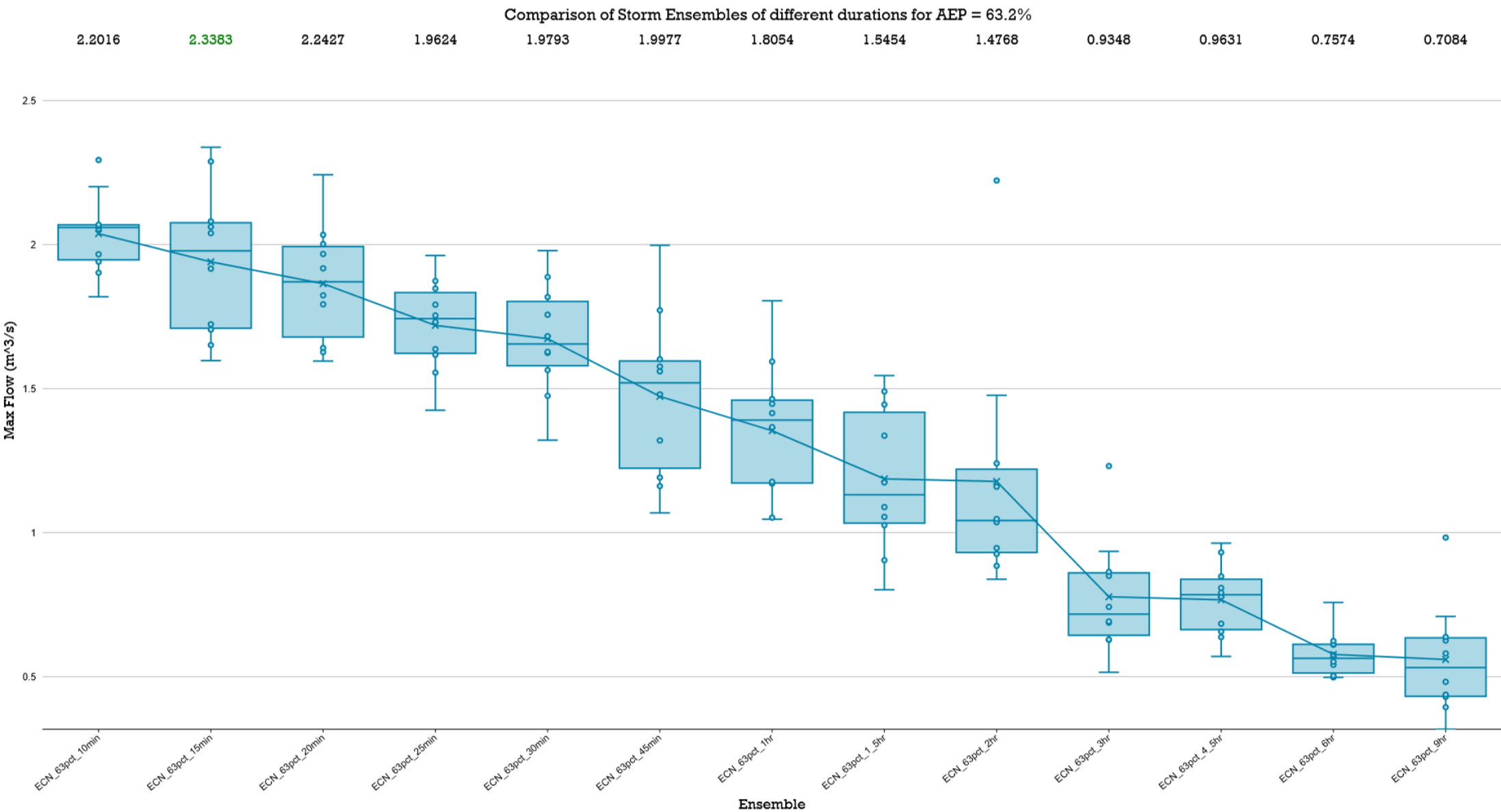


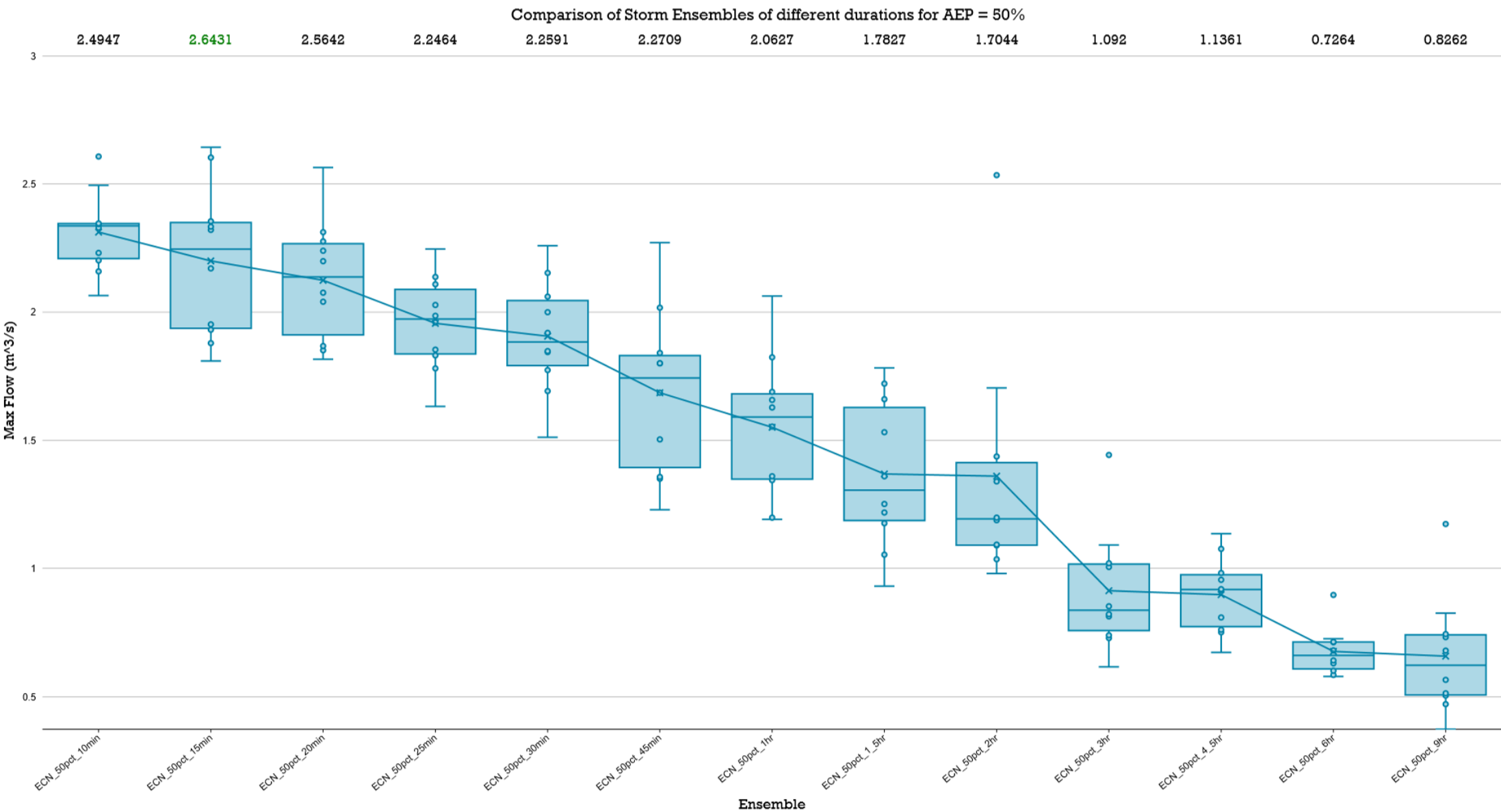
BOX & WHISKER PLOTS

Comparison of Storm Ensembles of different durations for AEP = 1%

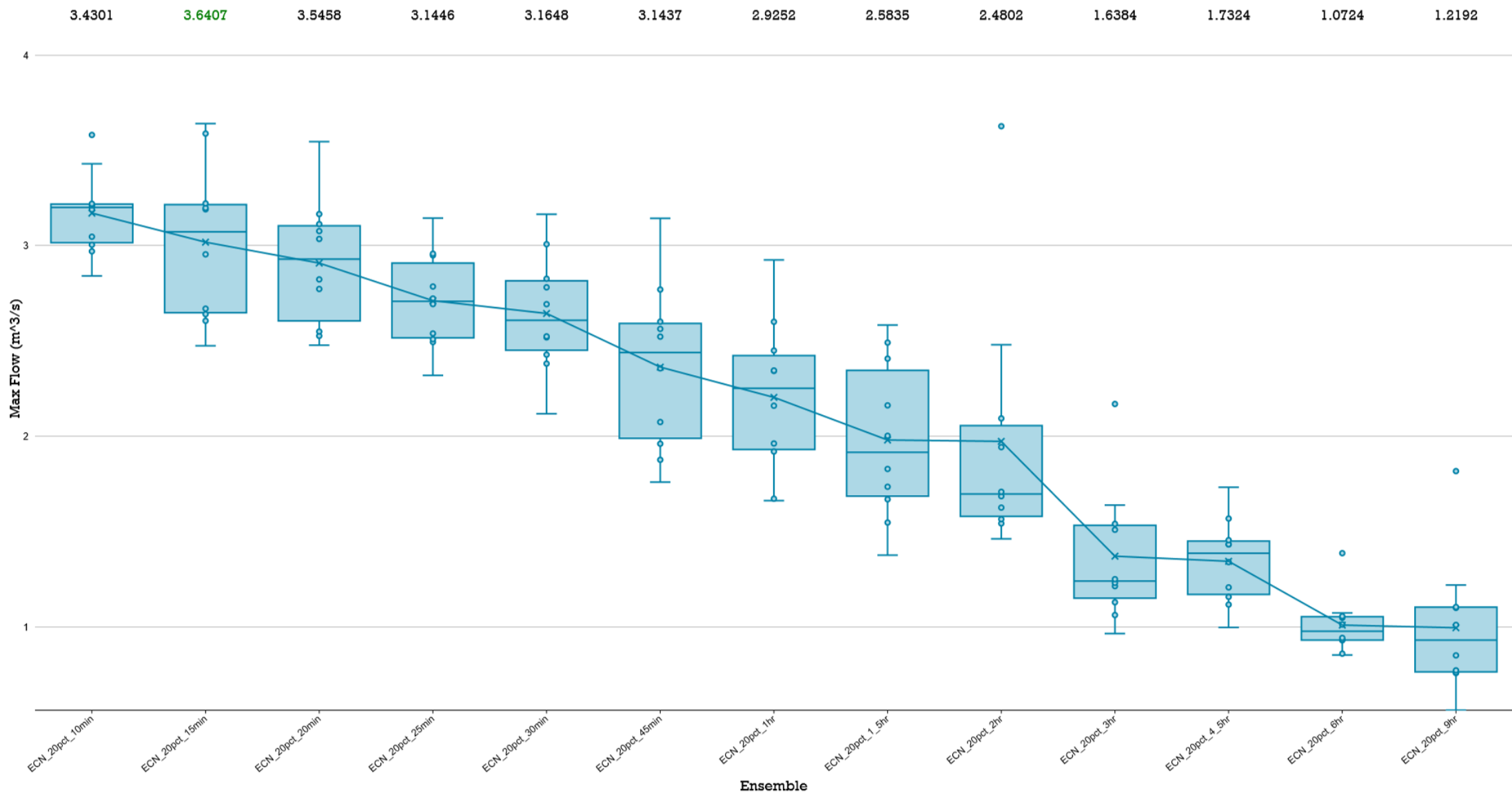


LPoD 2 POST-DEVELOPMENT

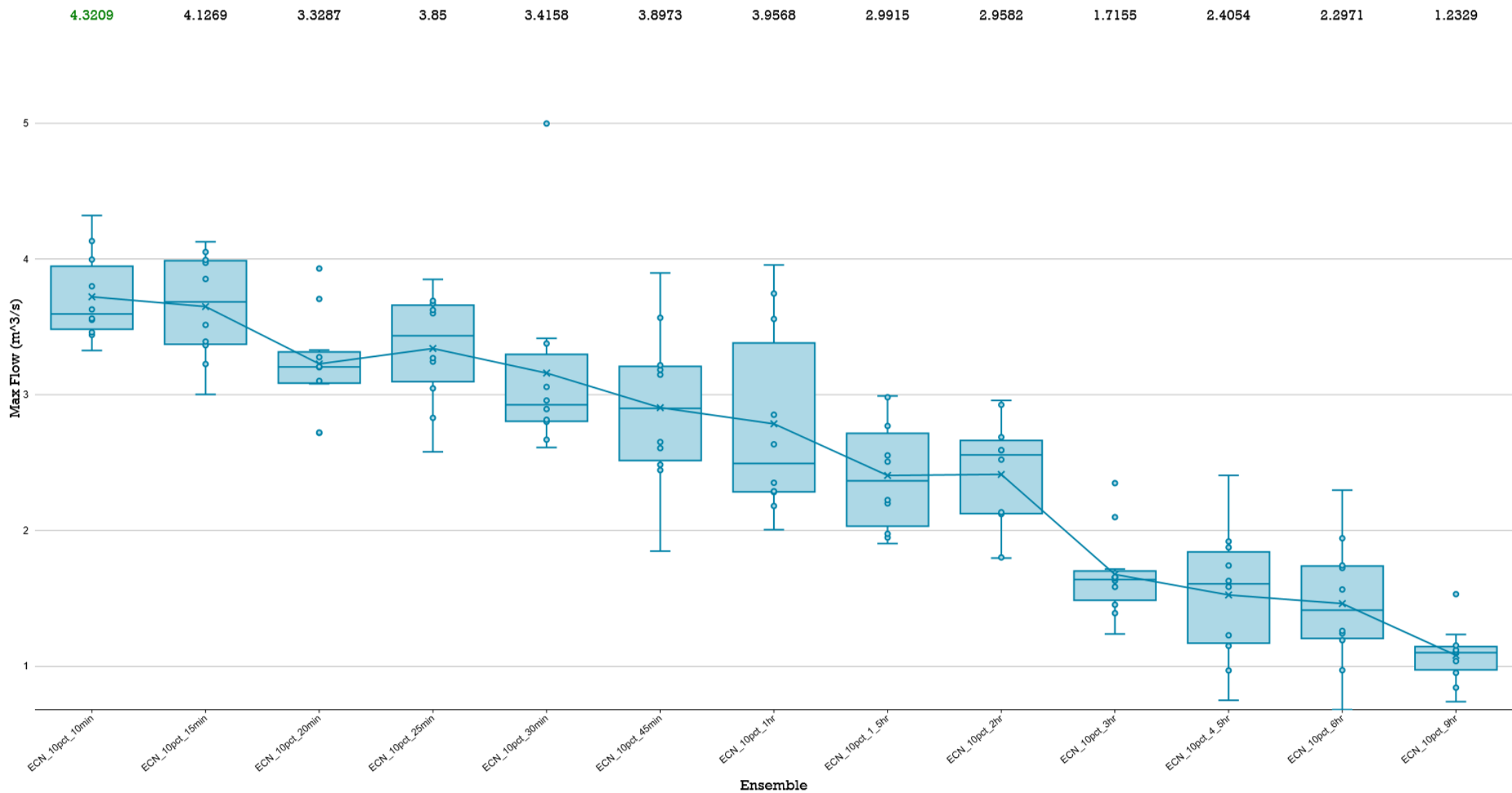




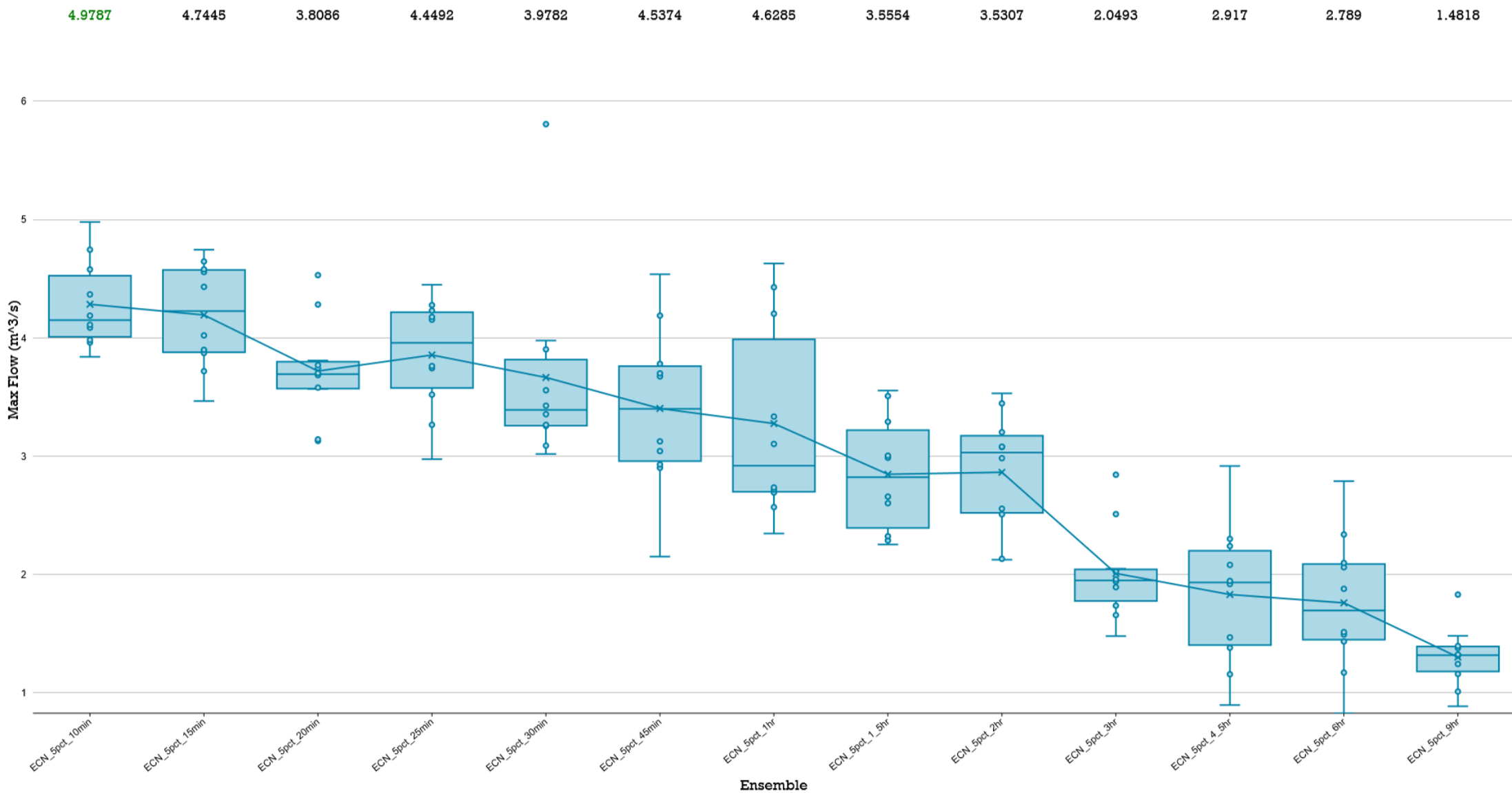
Comparison of Storm Ensembles of different durations for AEP = 20%



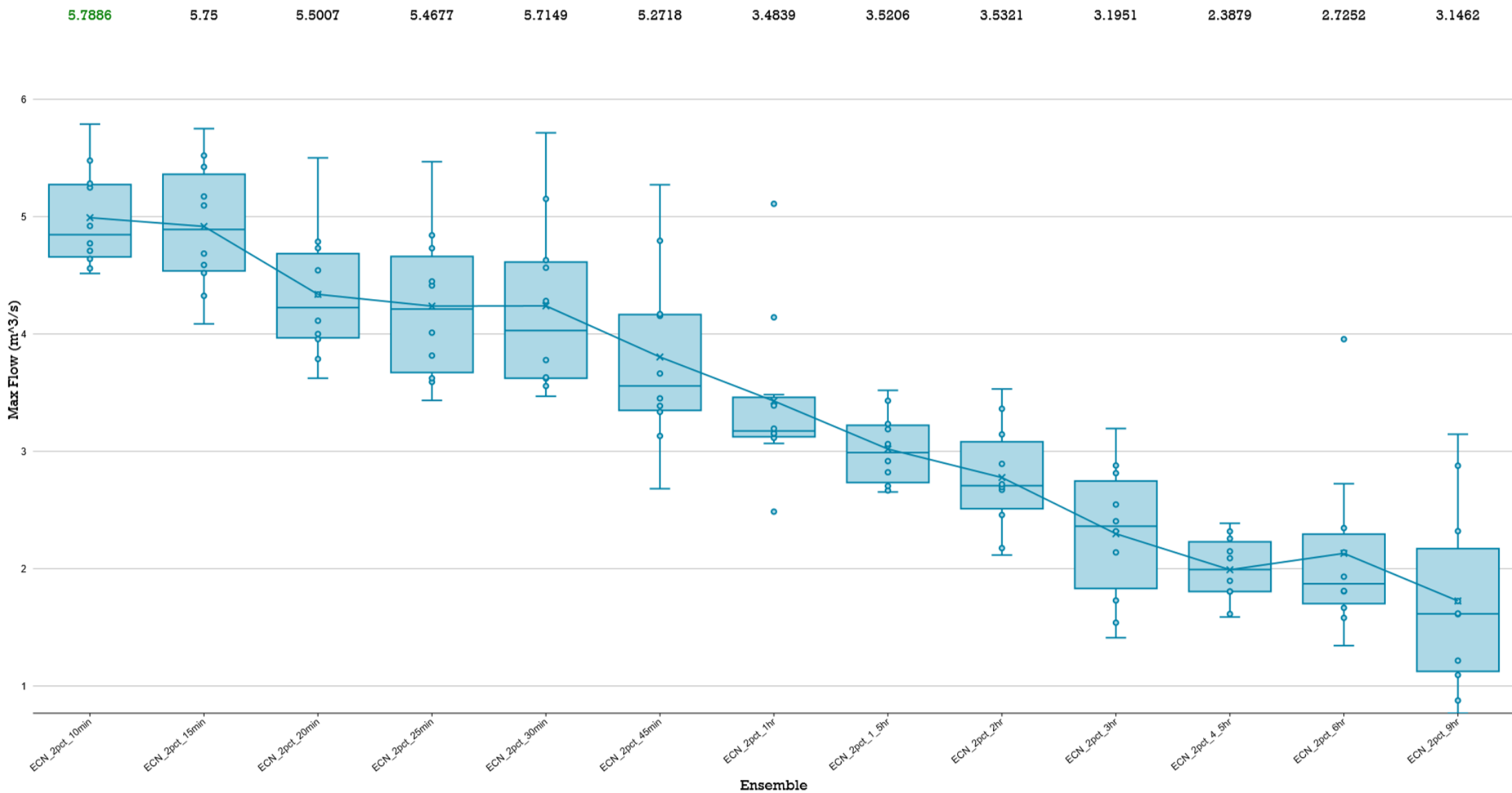
Comparison of Storm Ensembles of different durations for AEP = 10%

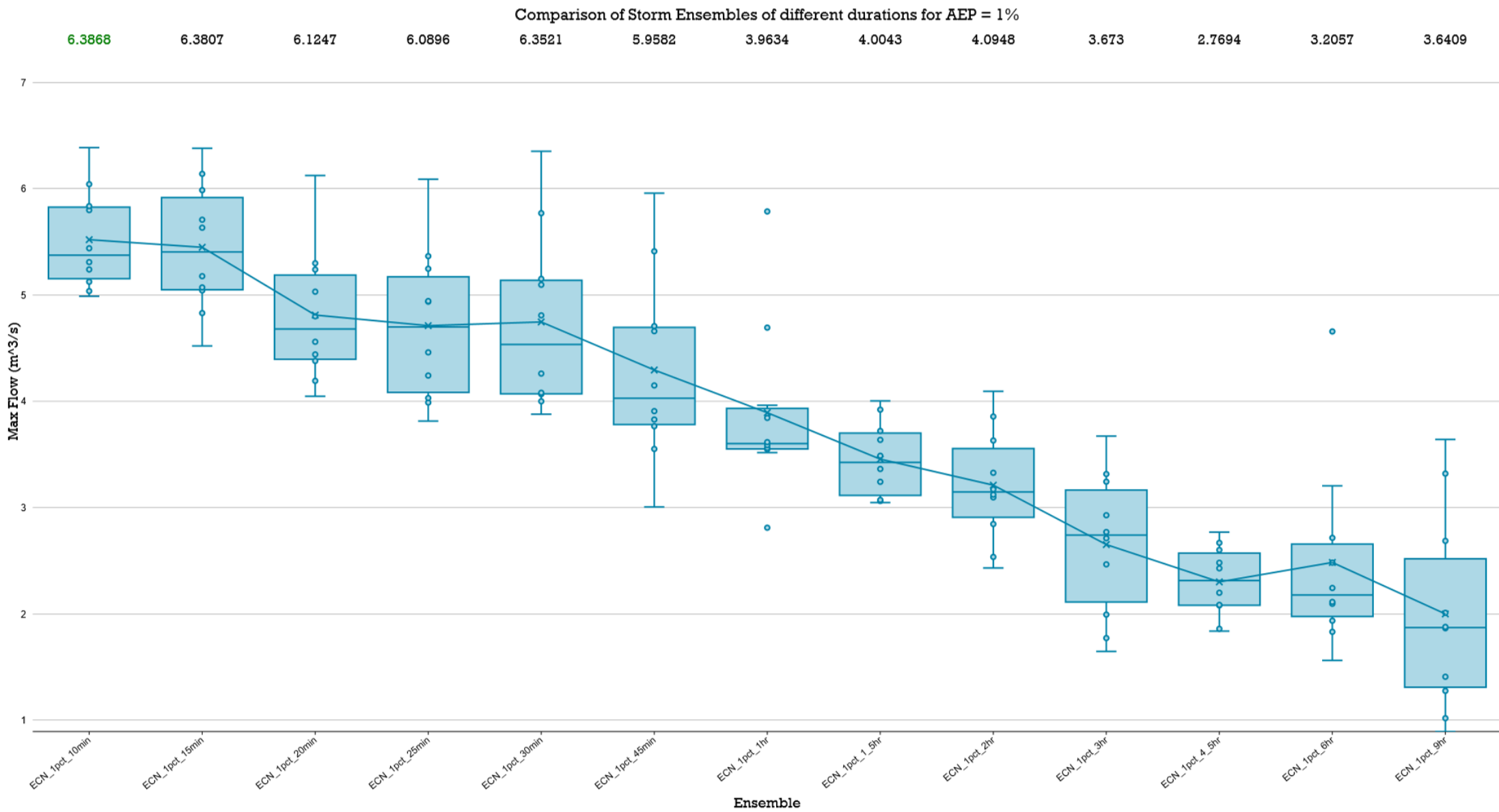


Comparison of Storm Ensembles of different durations for AEP = 5%

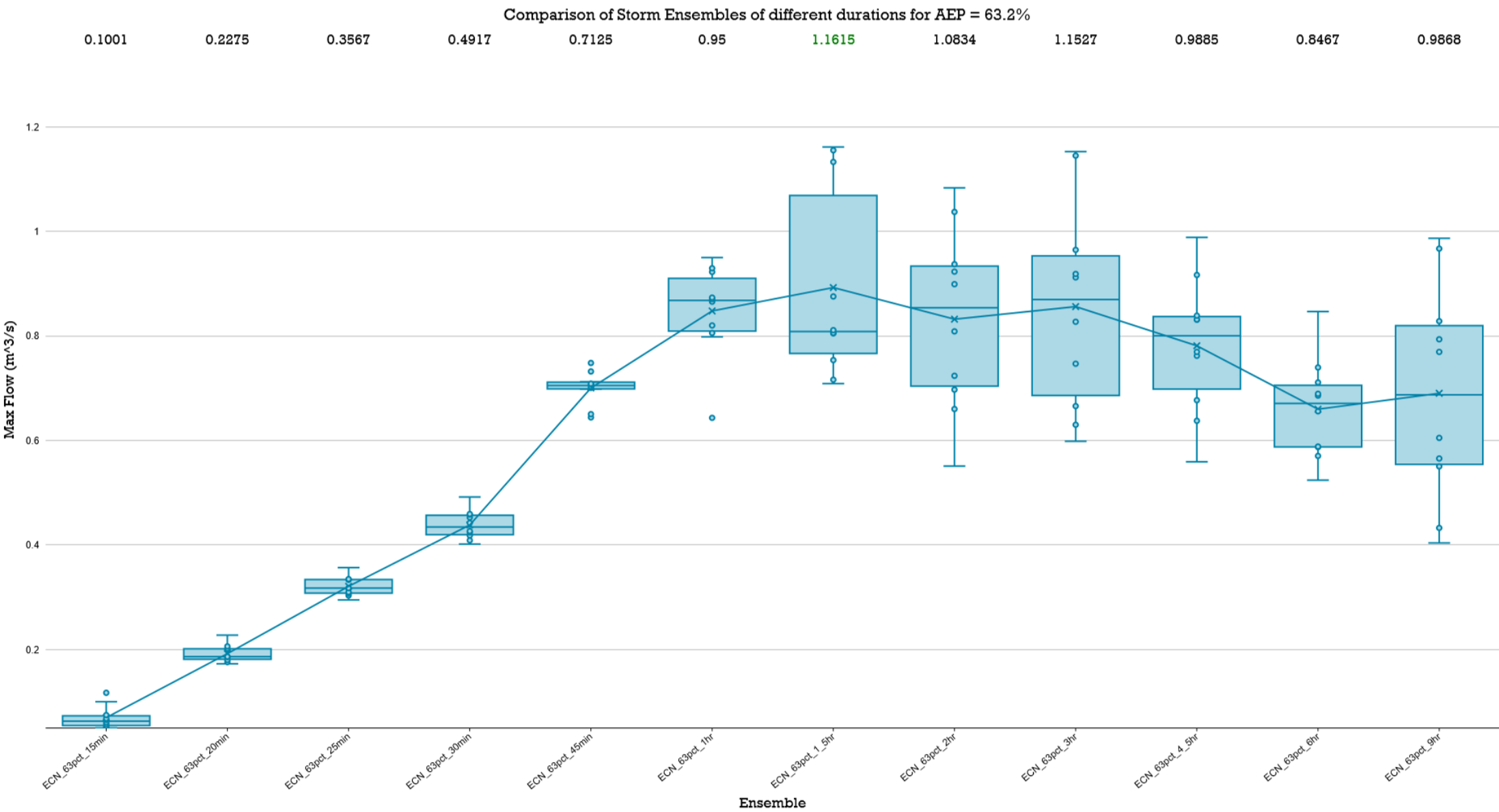


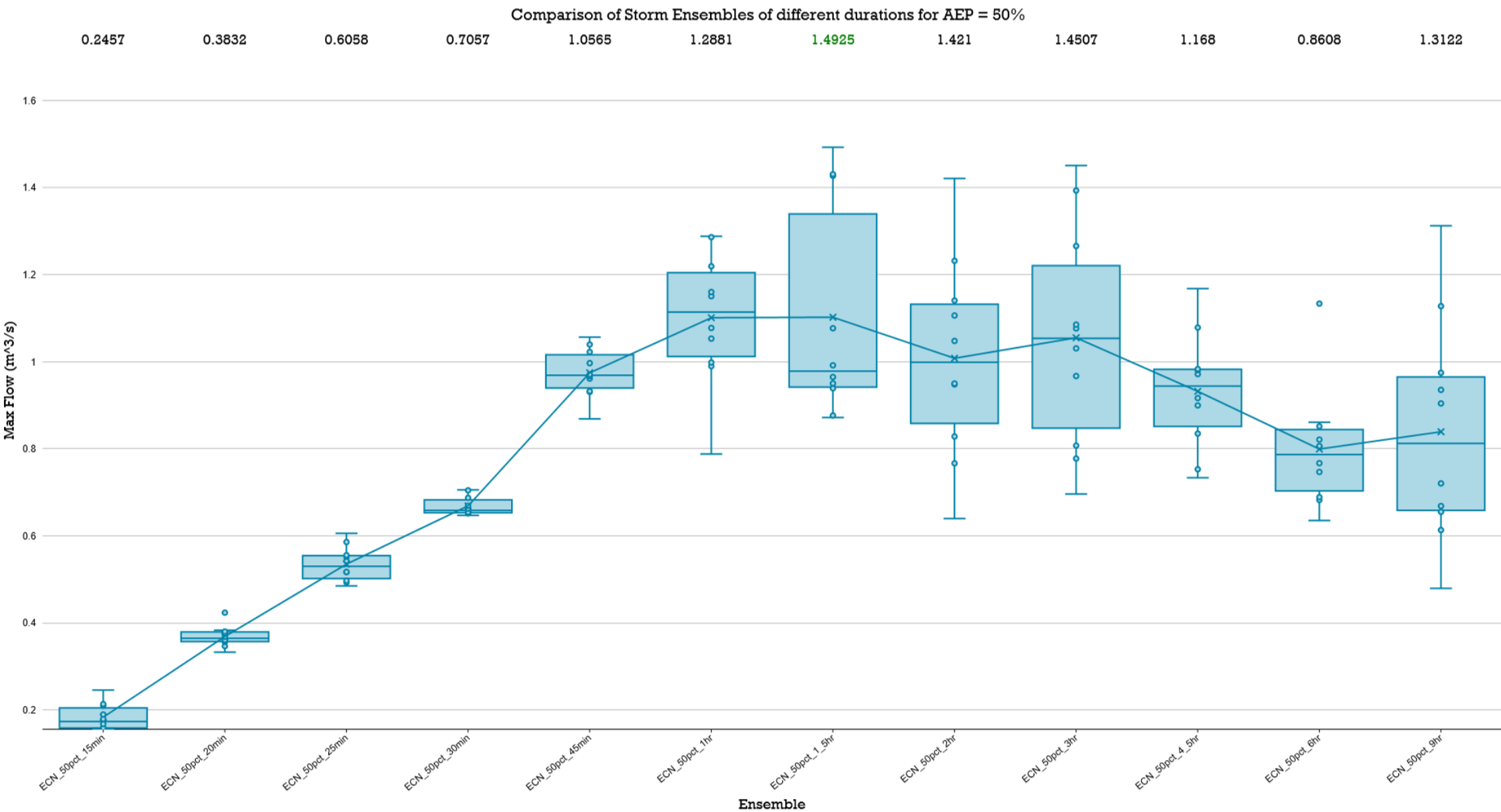
Comparison of Storm Ensembles of different durations for AEP = 2%

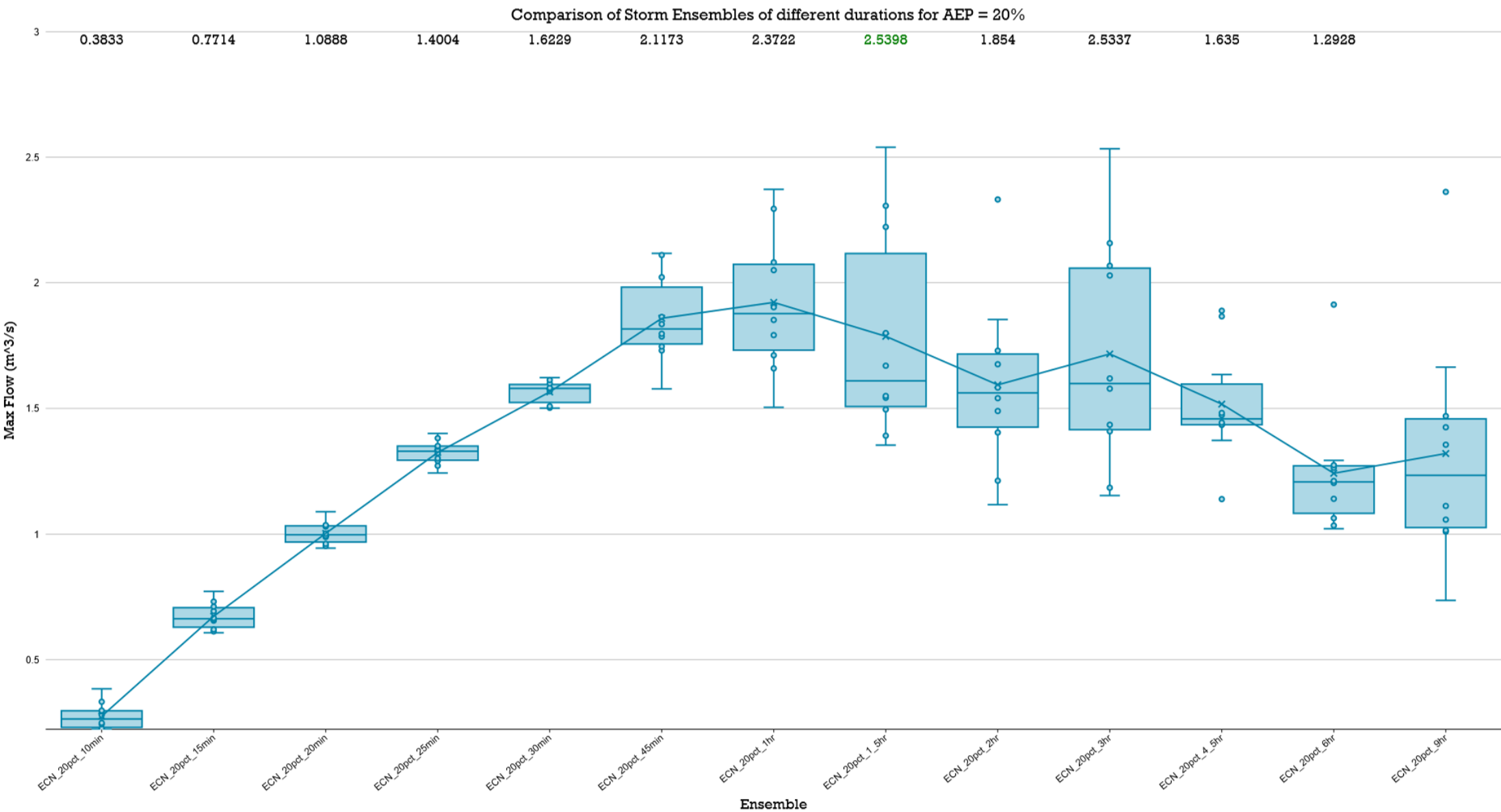




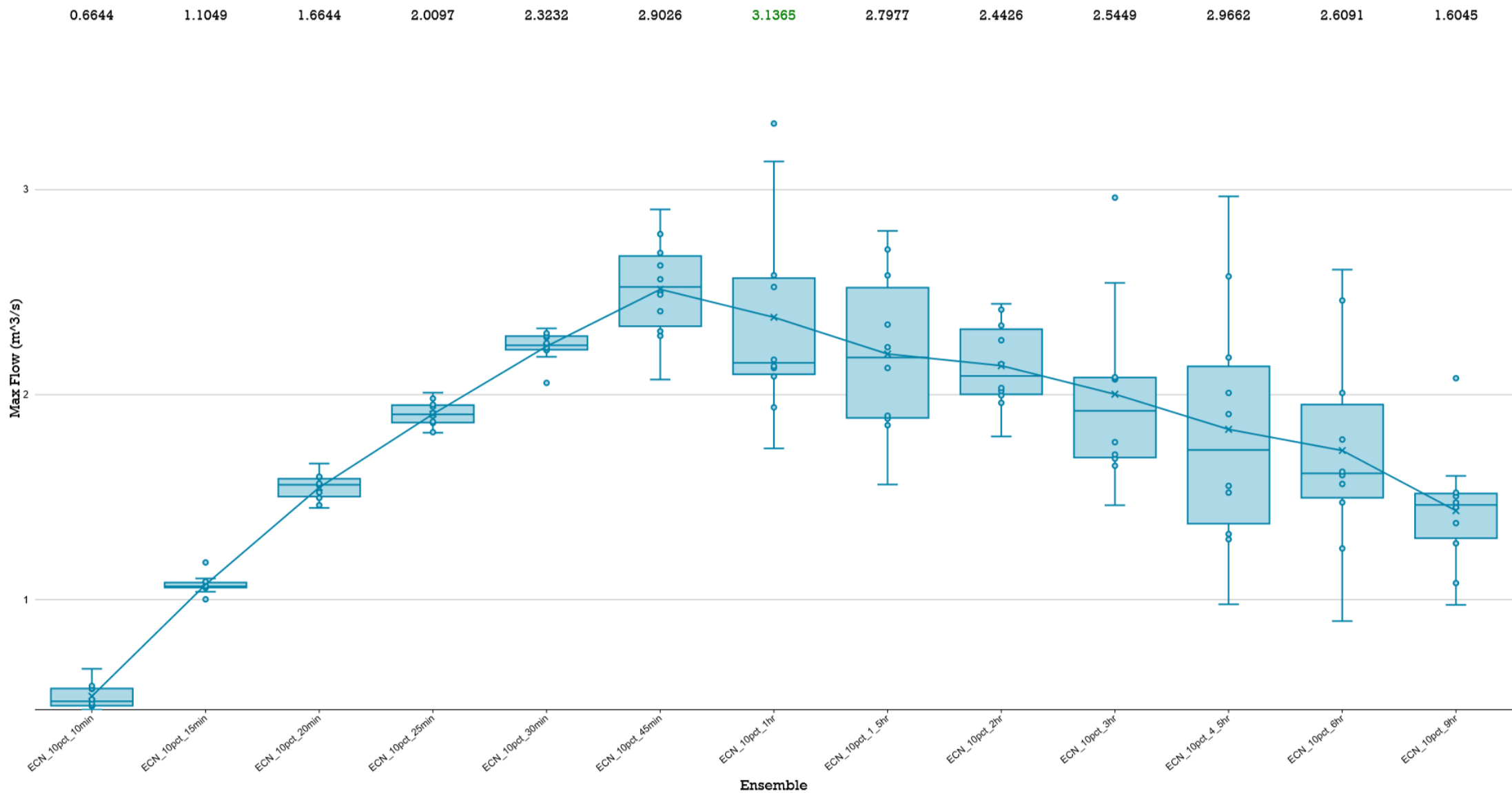
LPoD 2 PRE-DEVELOPMENT



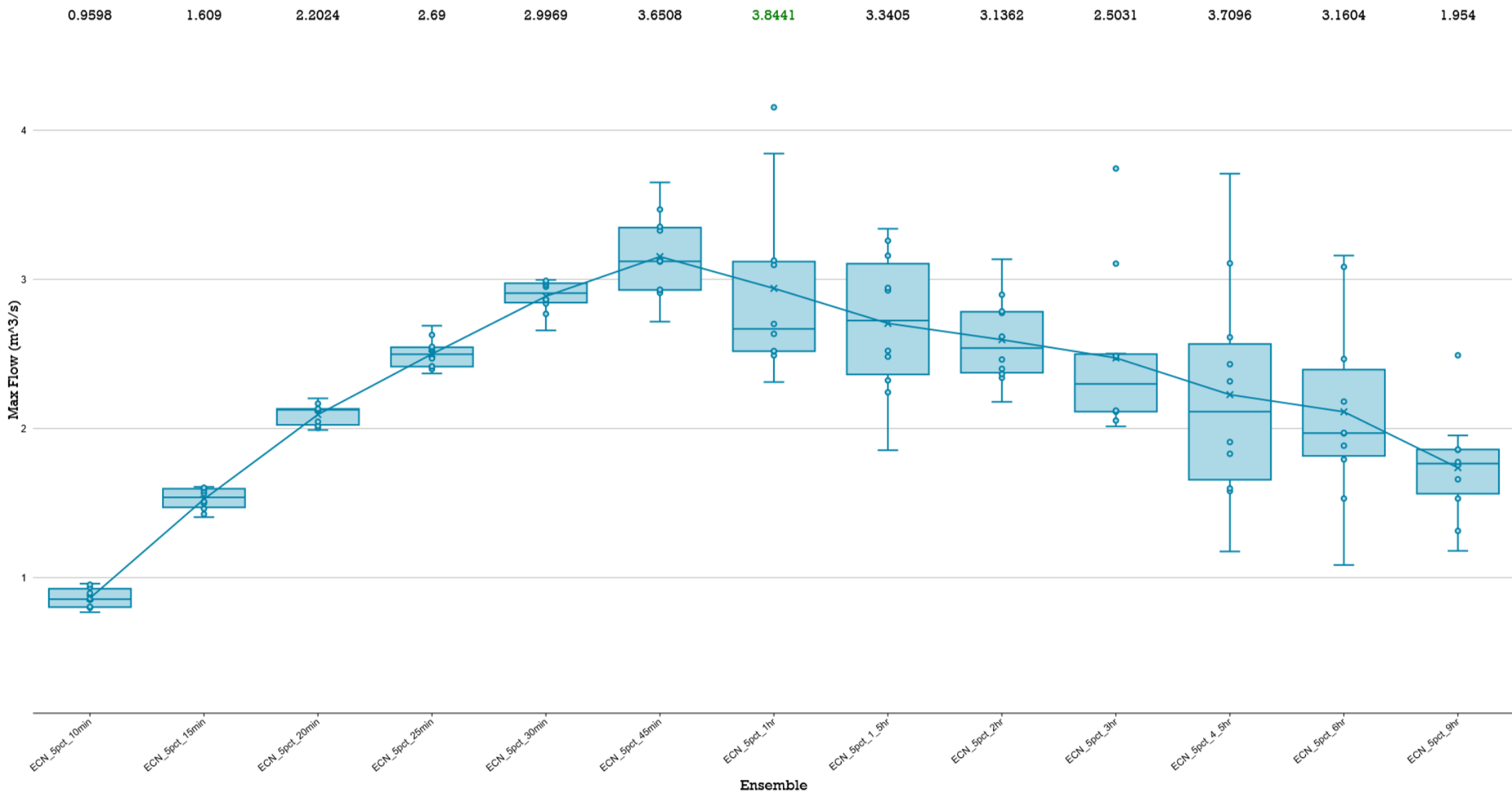




Comparison of Storm Ensembles of different durations for AEP = 10%

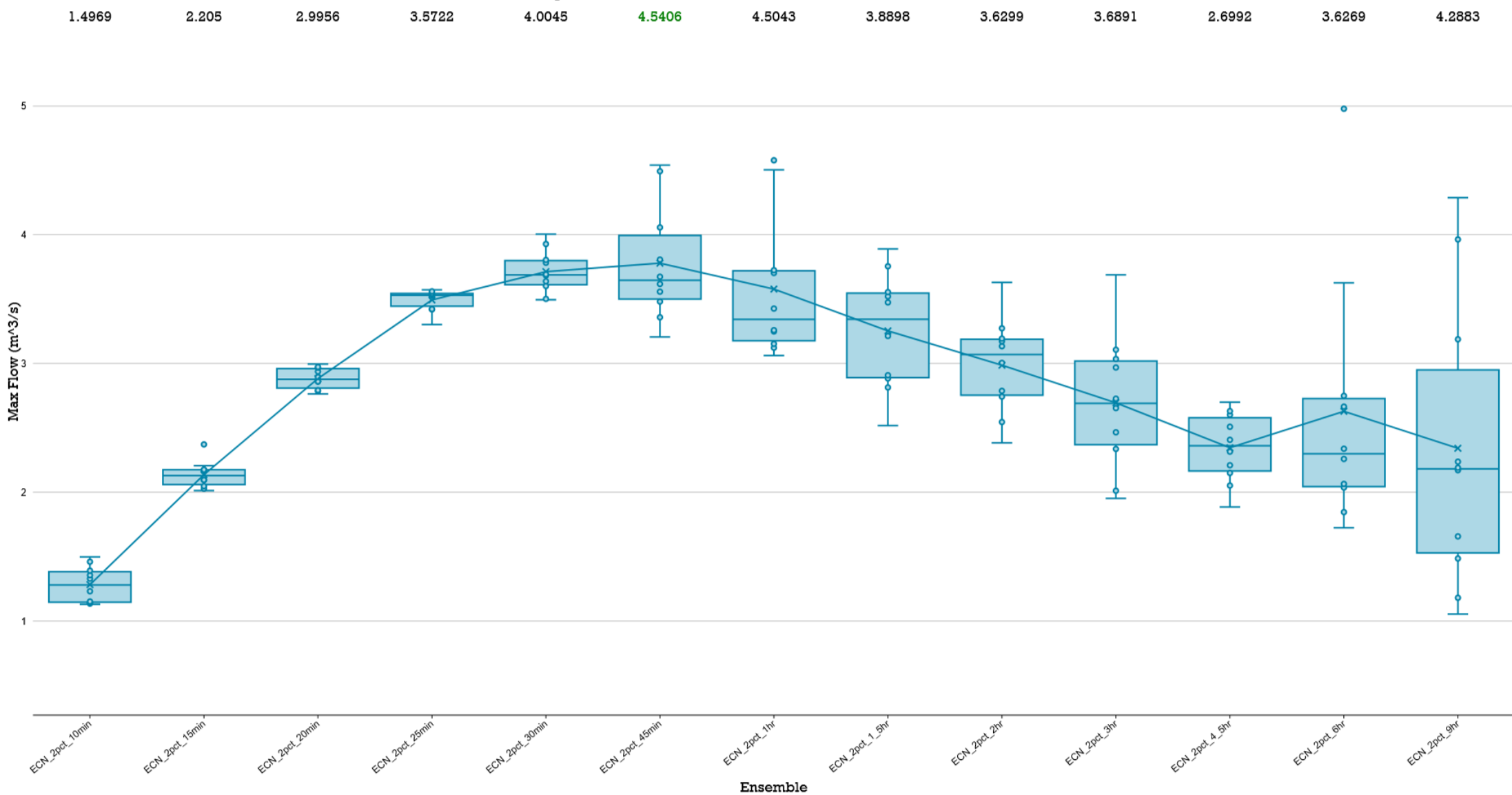


Comparison of Storm Ensembles of different durations for AEP = 5%

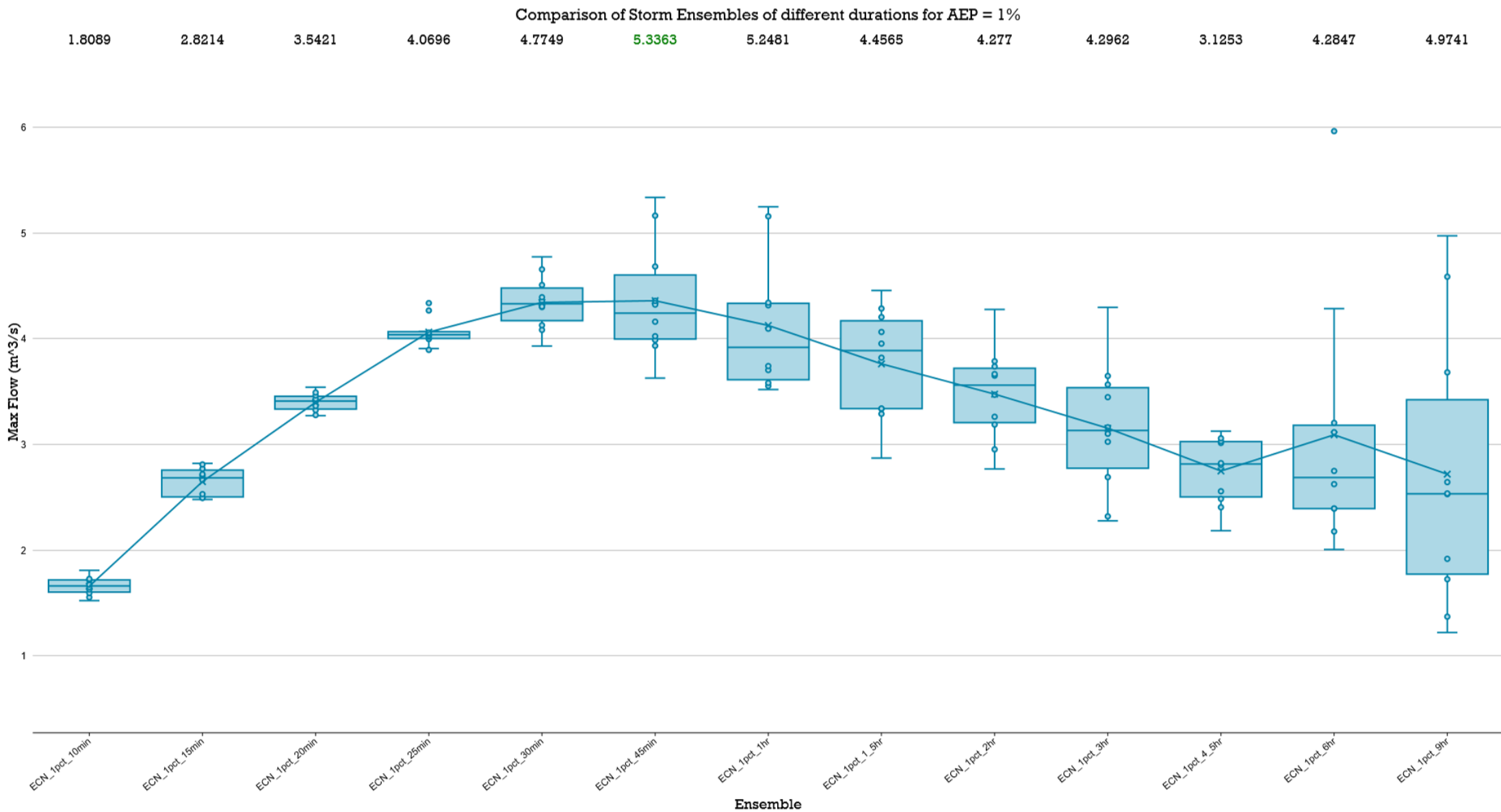


BOX & WHISKER PLOTS

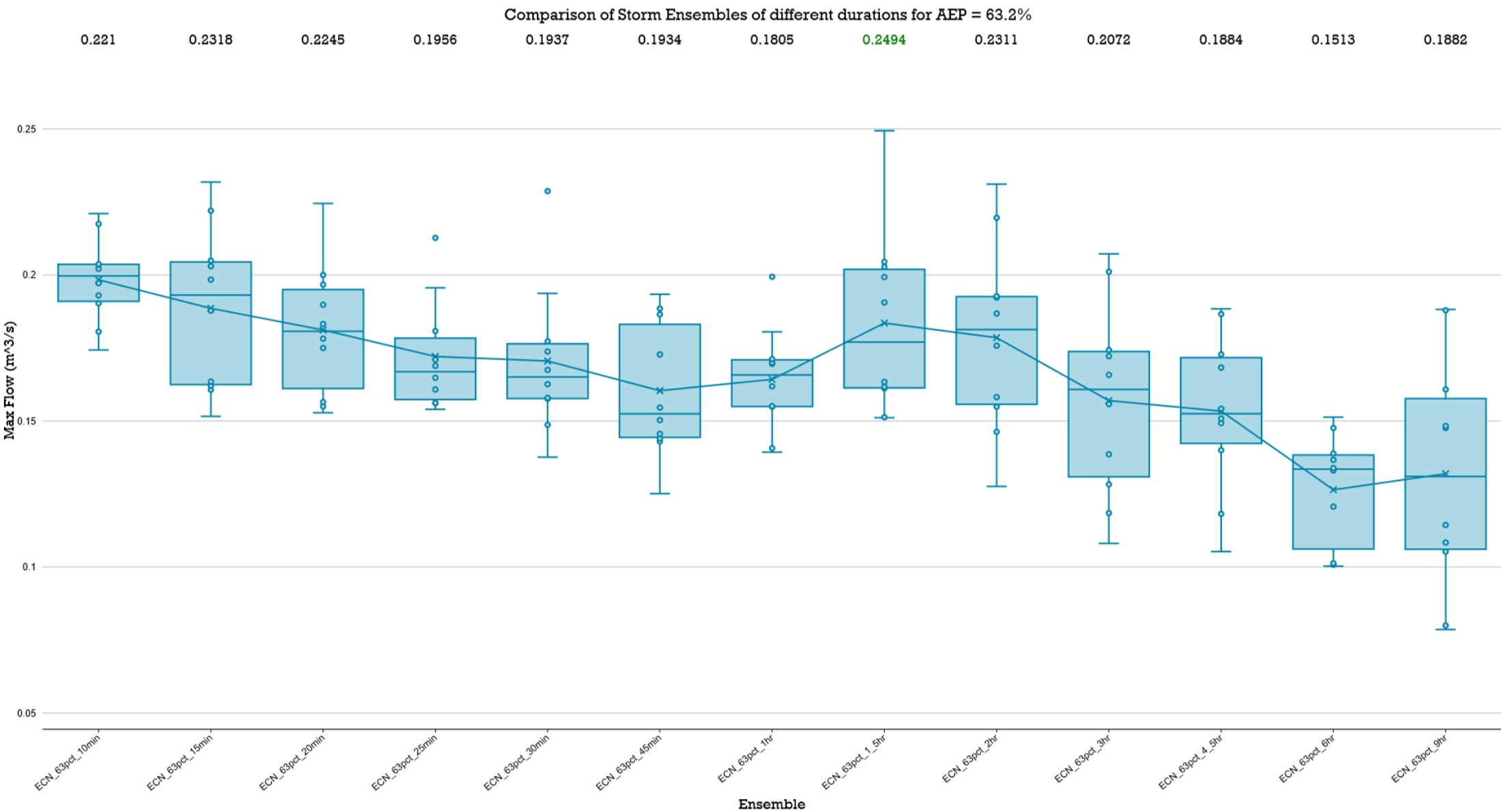
Comparison of Storm Ensembles of different durations for AEP = 2%

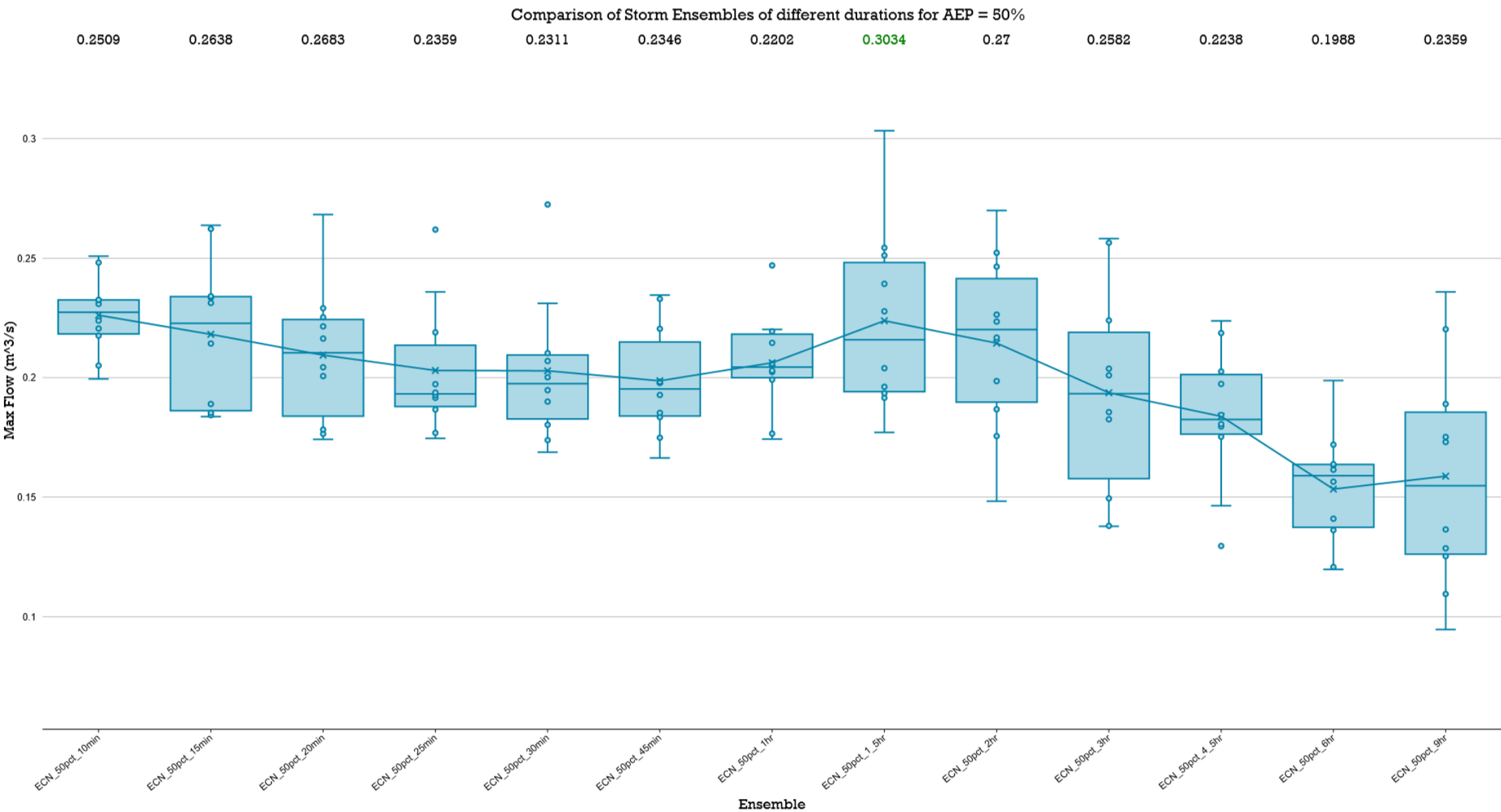


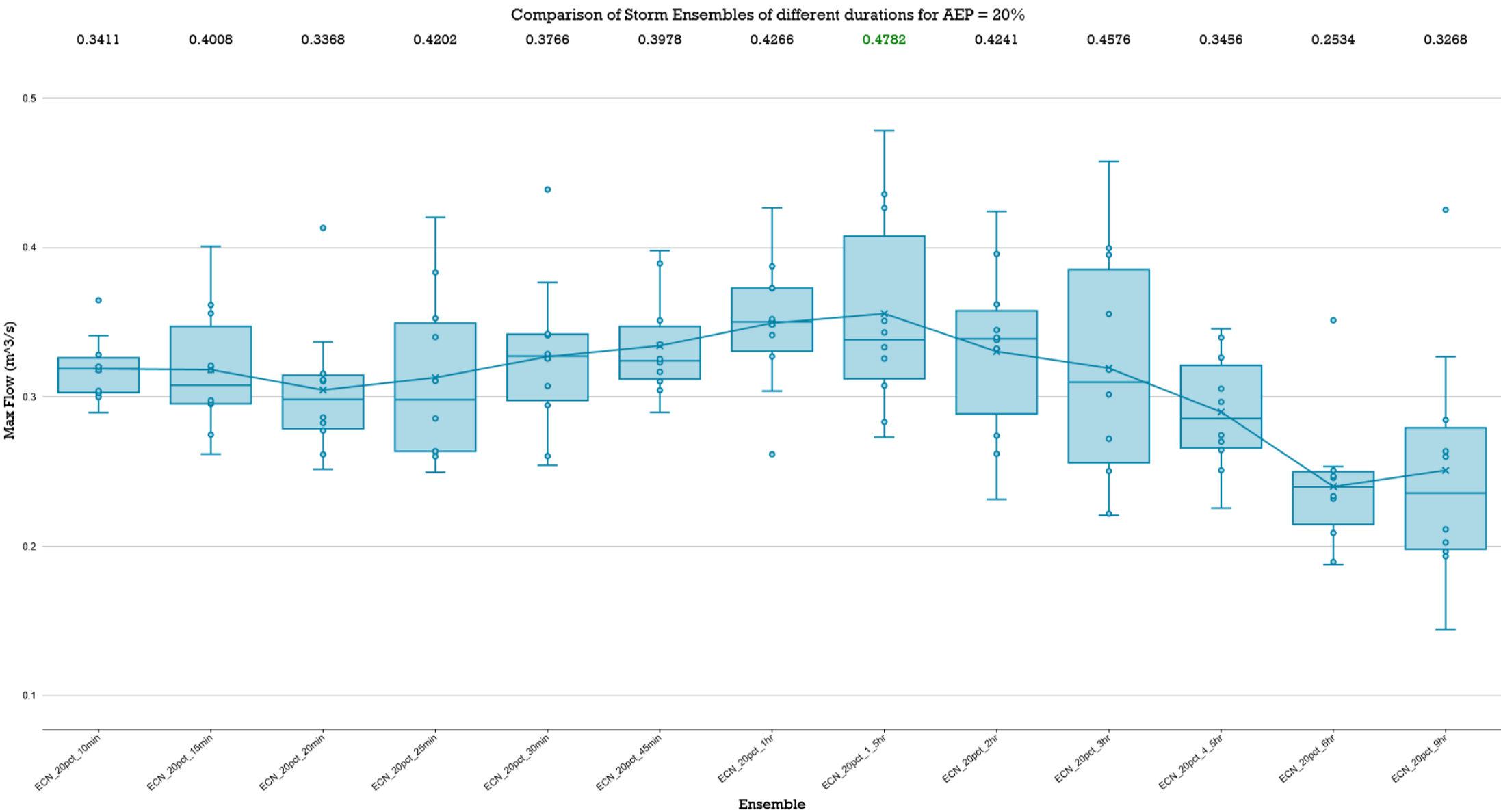
BOX & WHISKER PLOTS

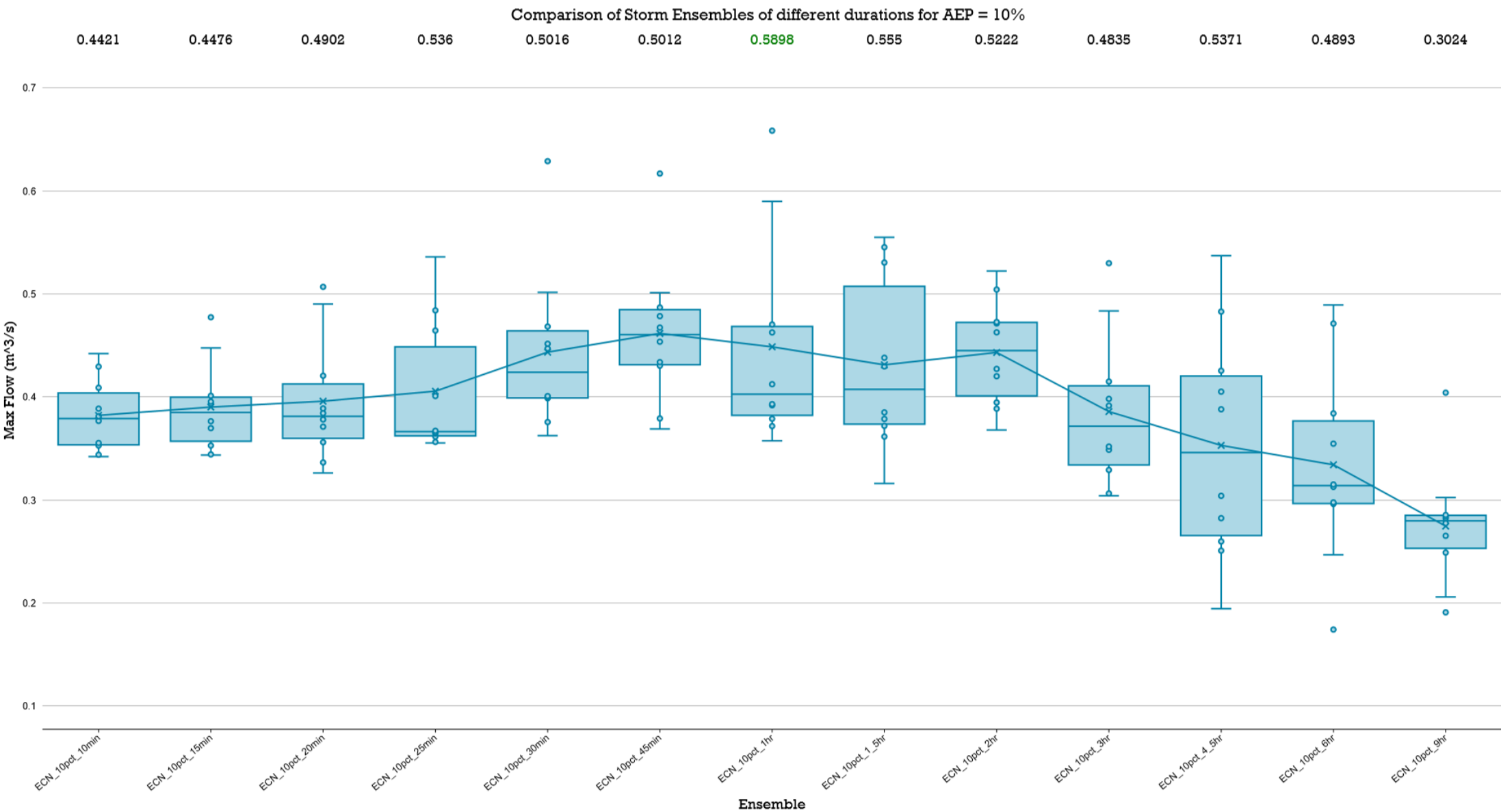


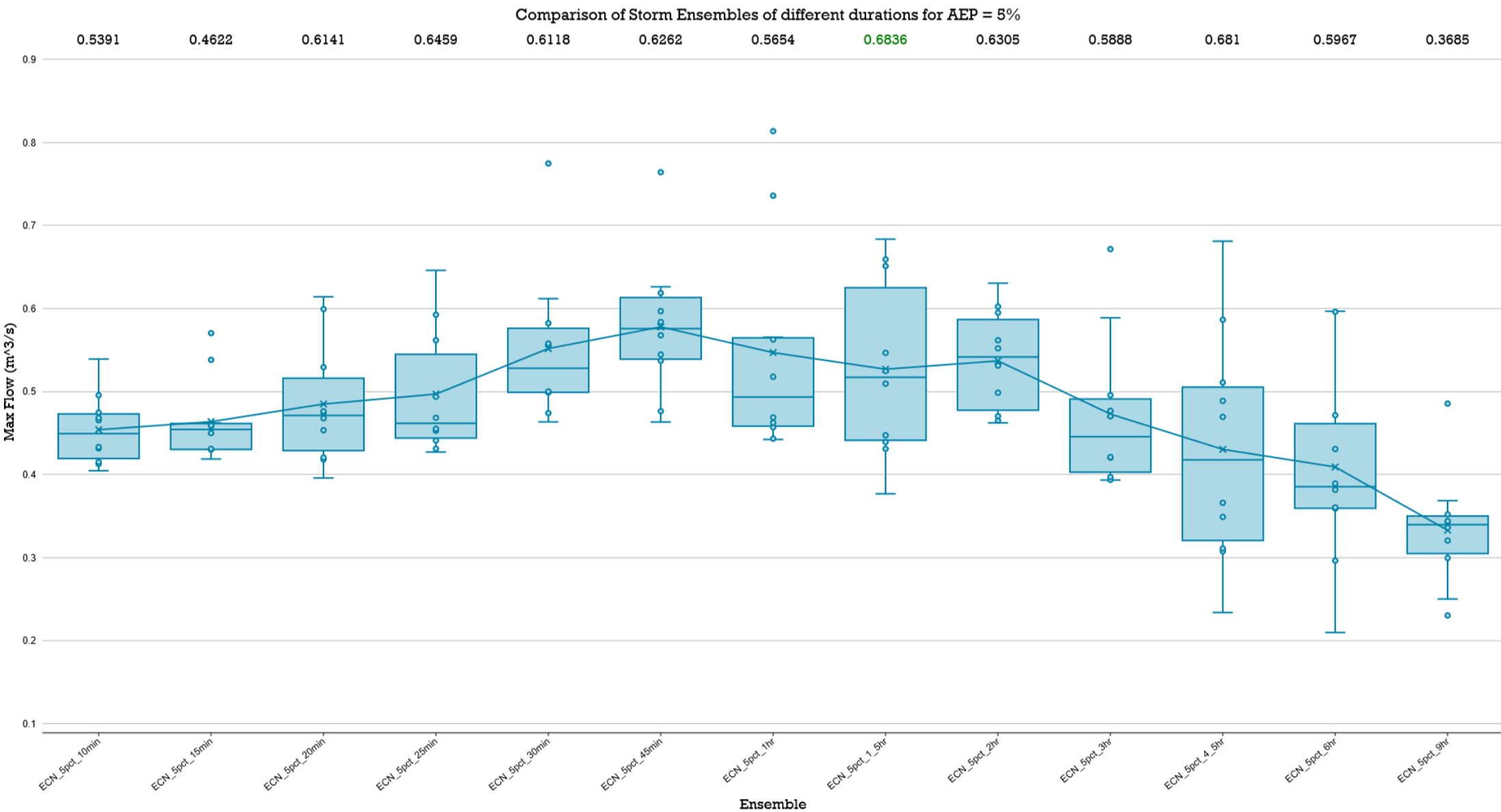
LPoD 3 POST-DEVELOPMENT

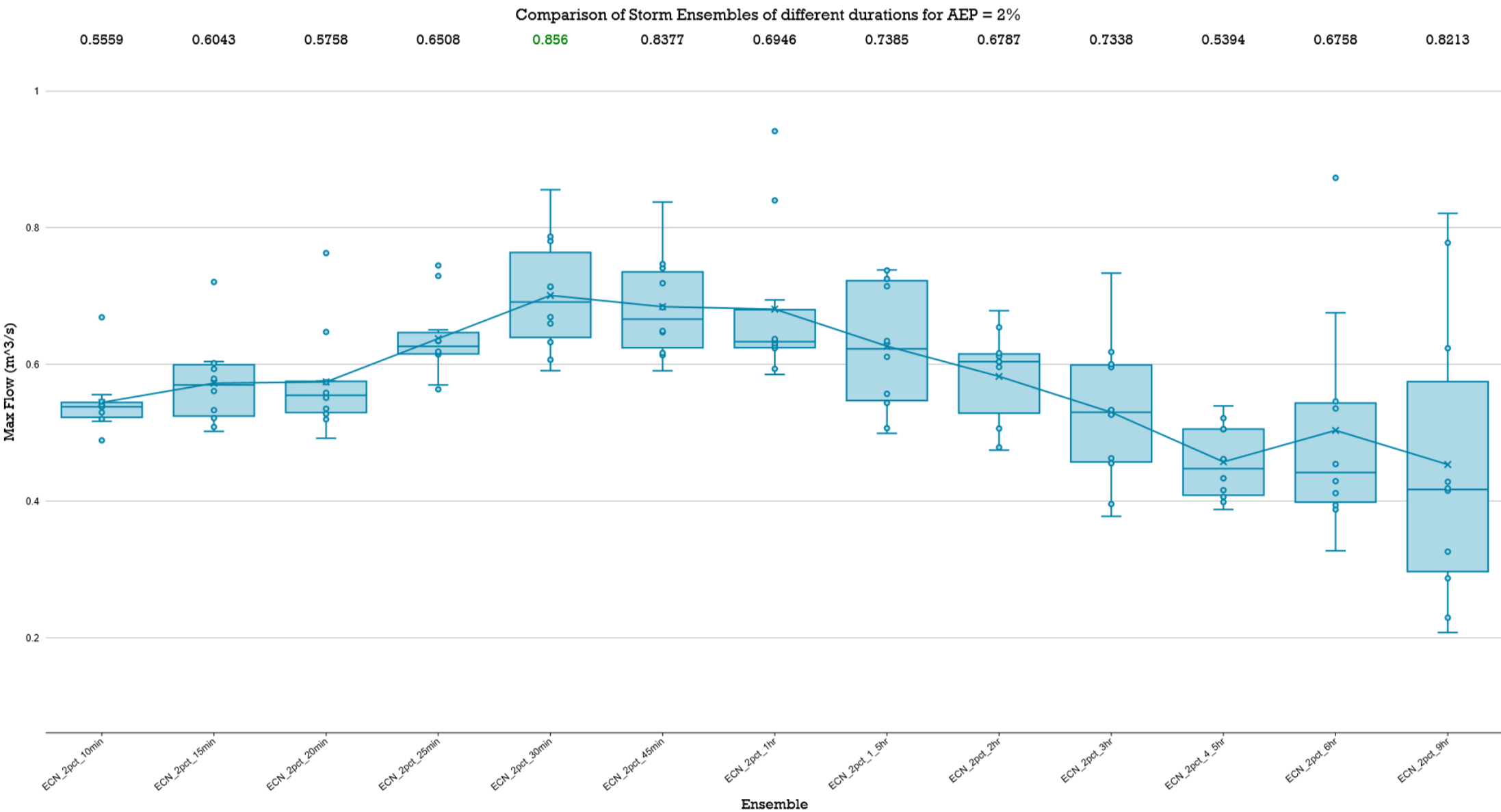


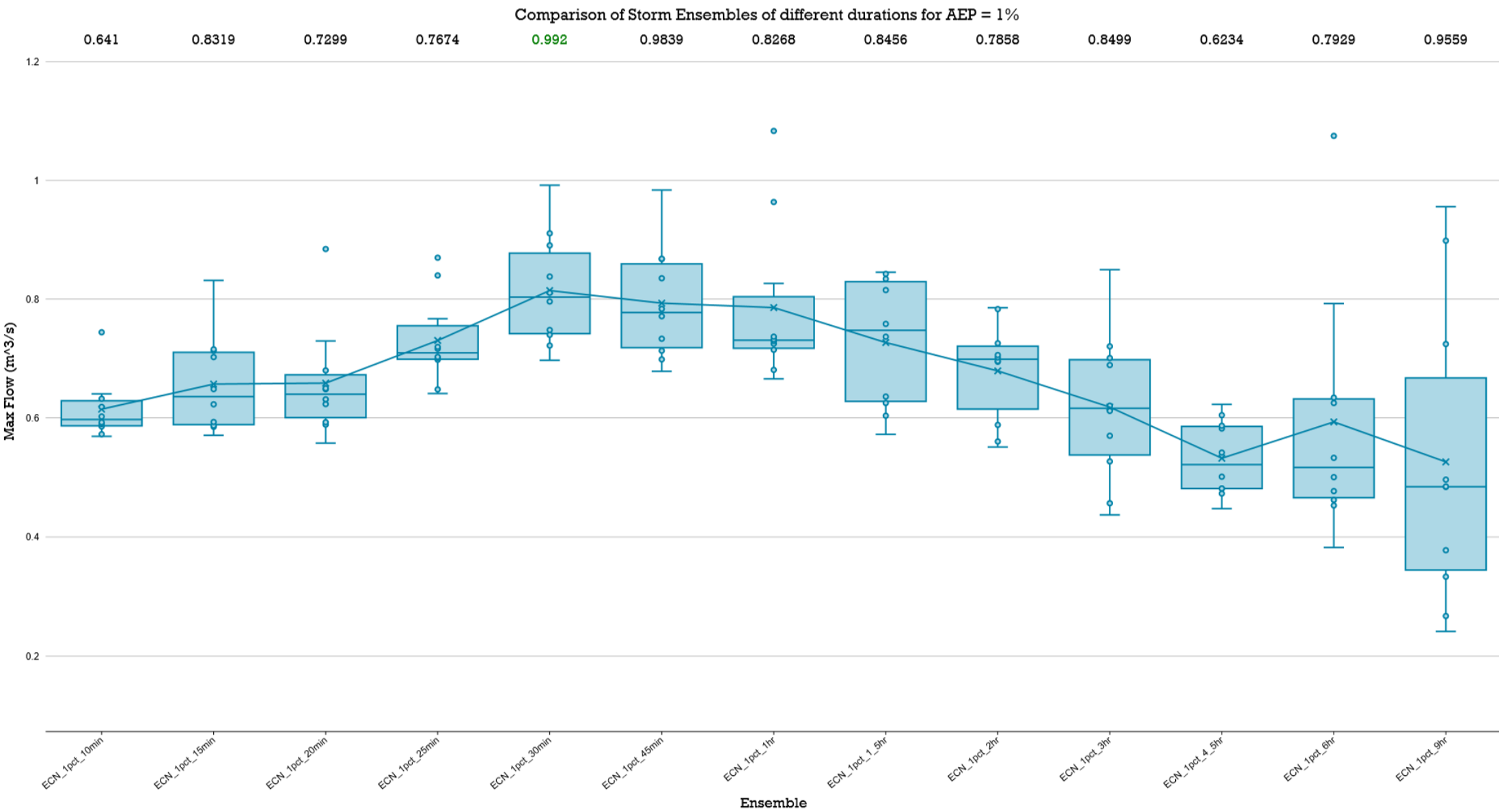




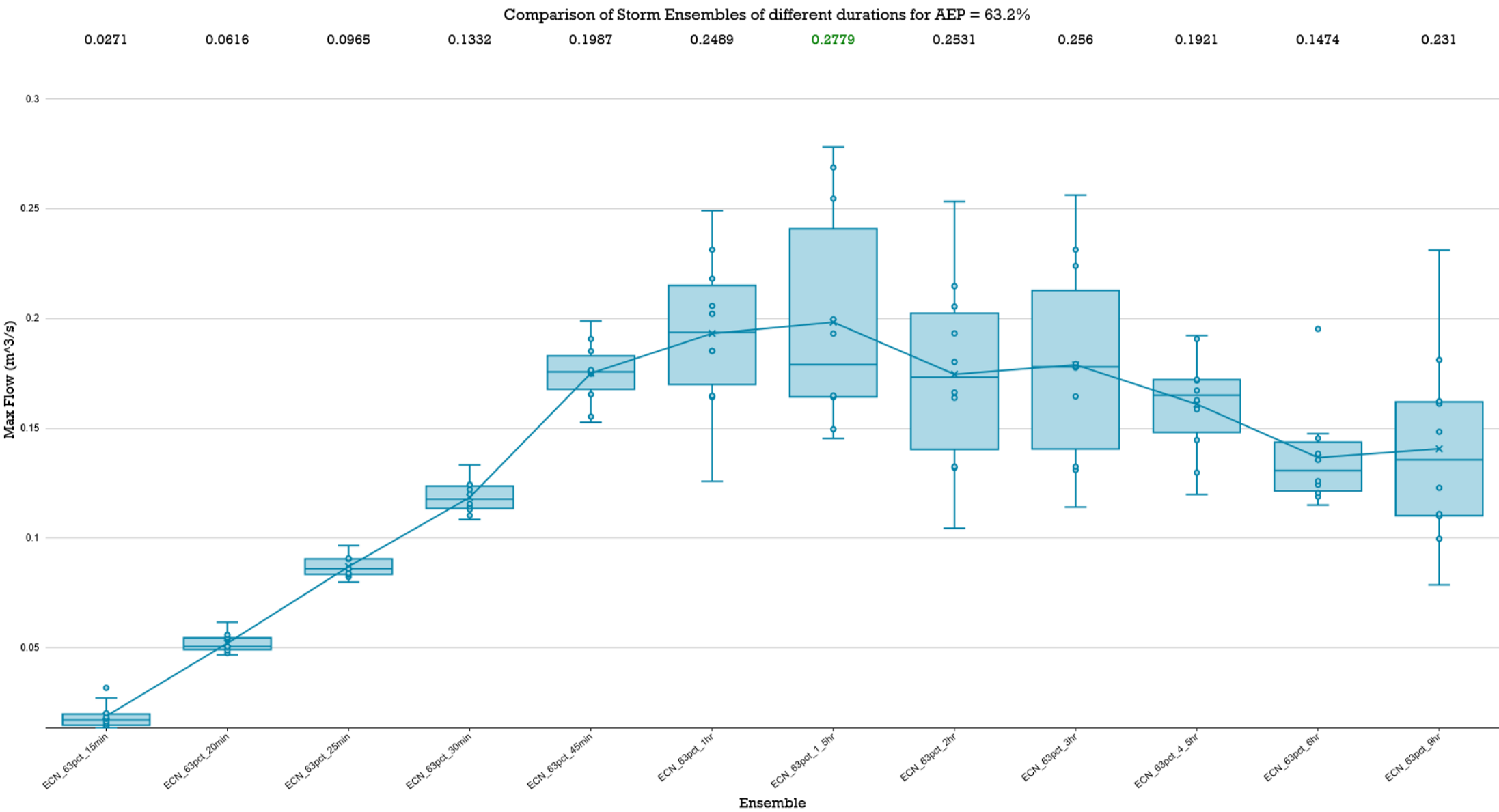


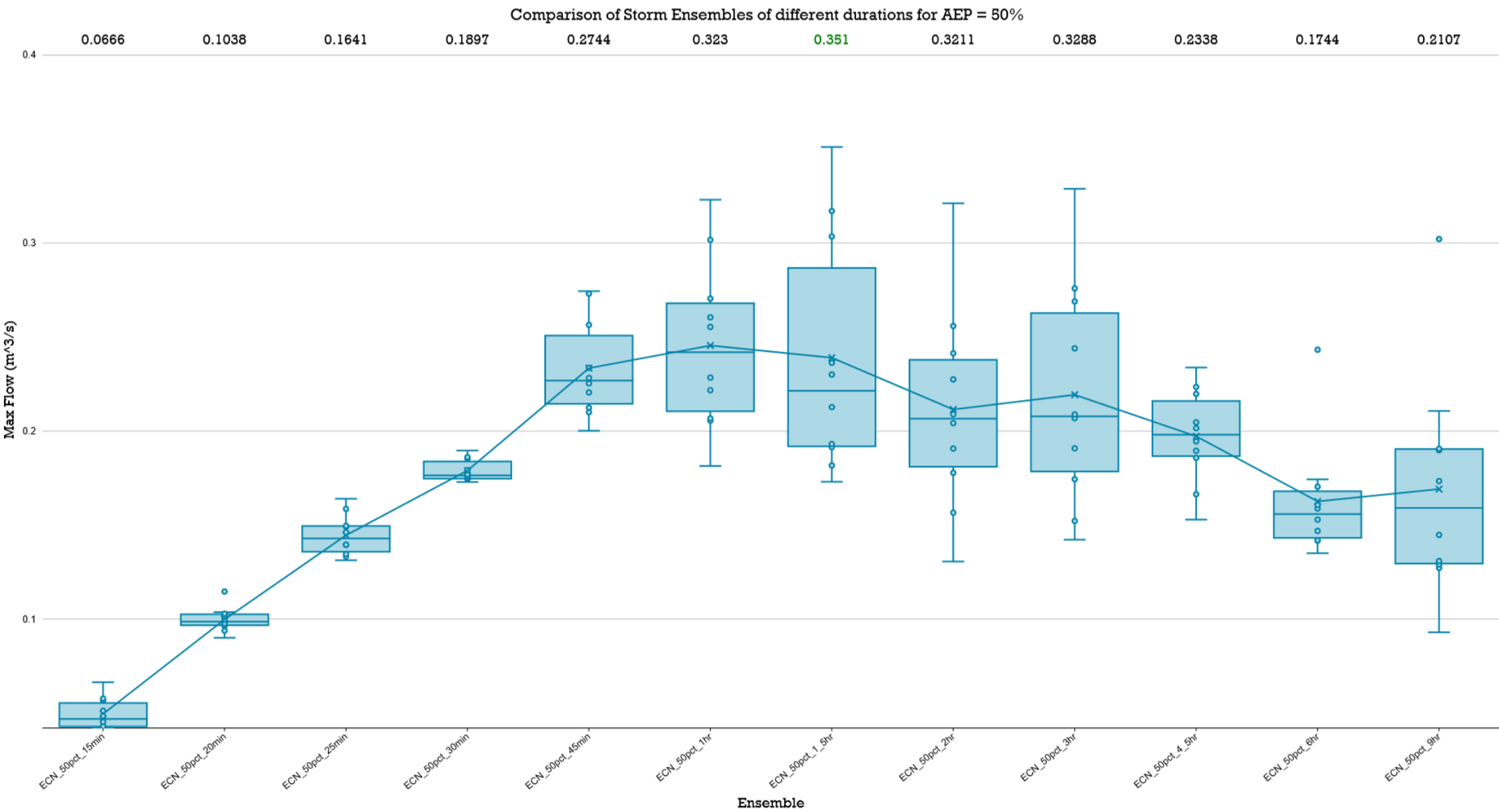


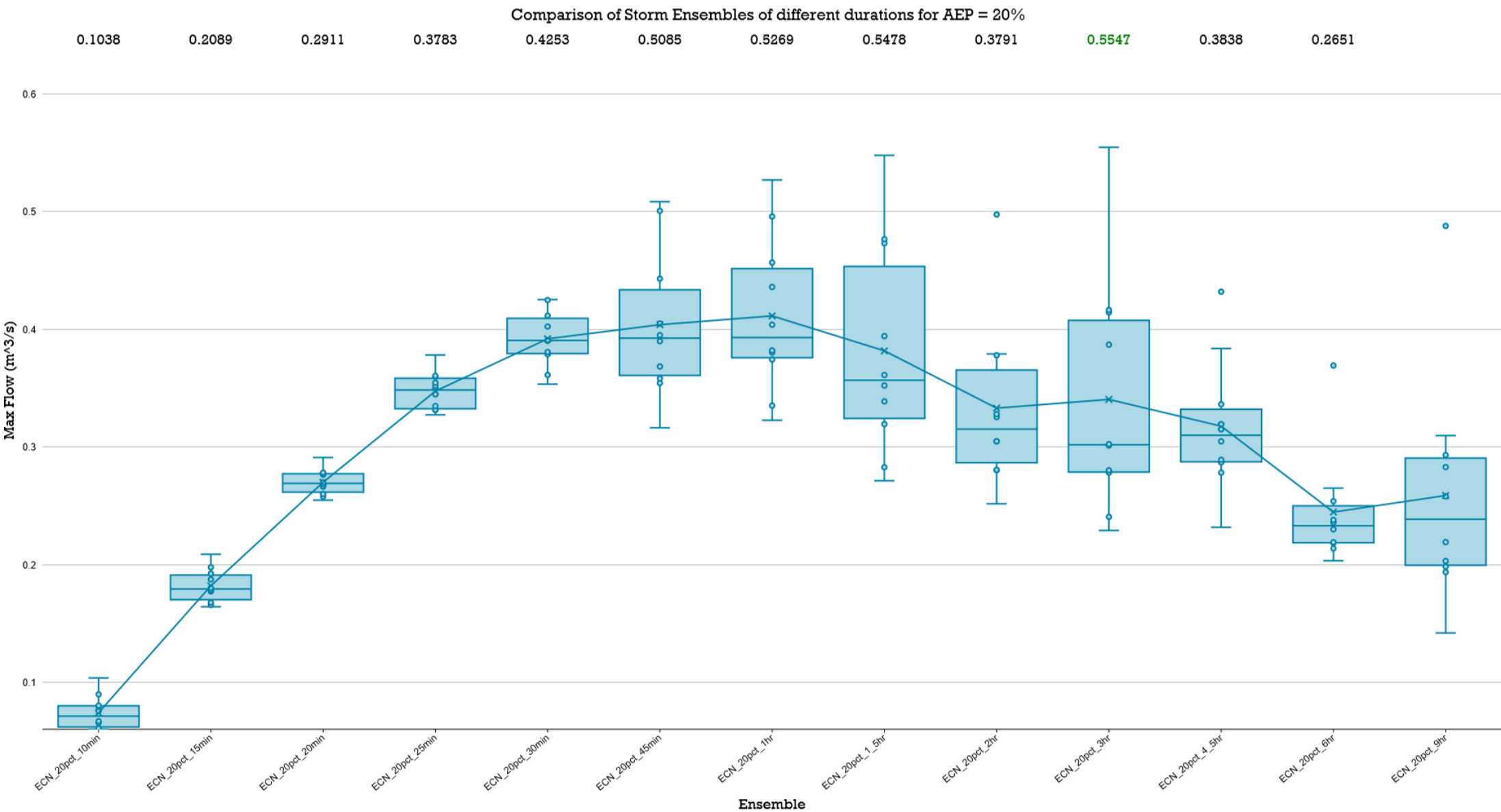


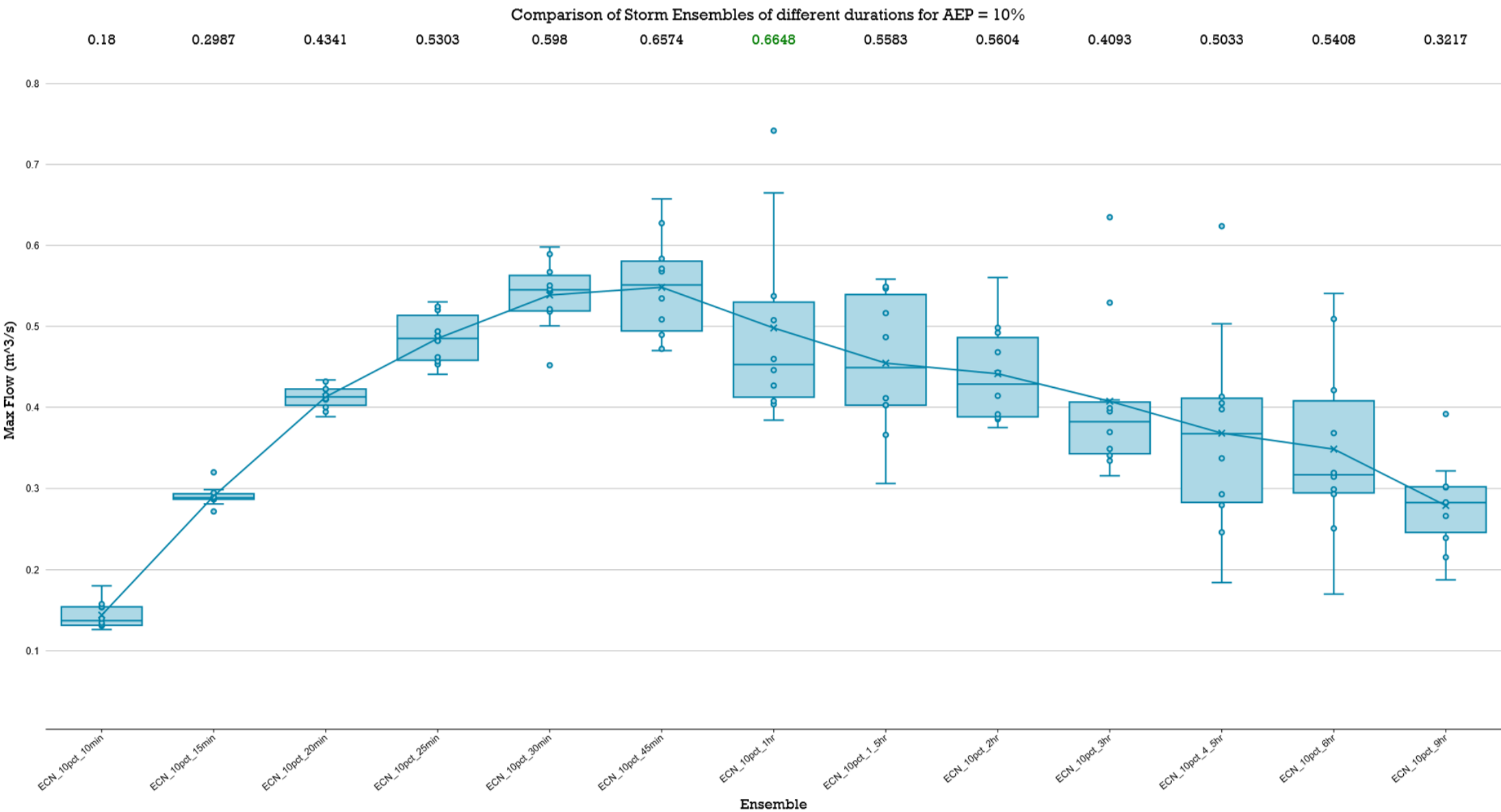


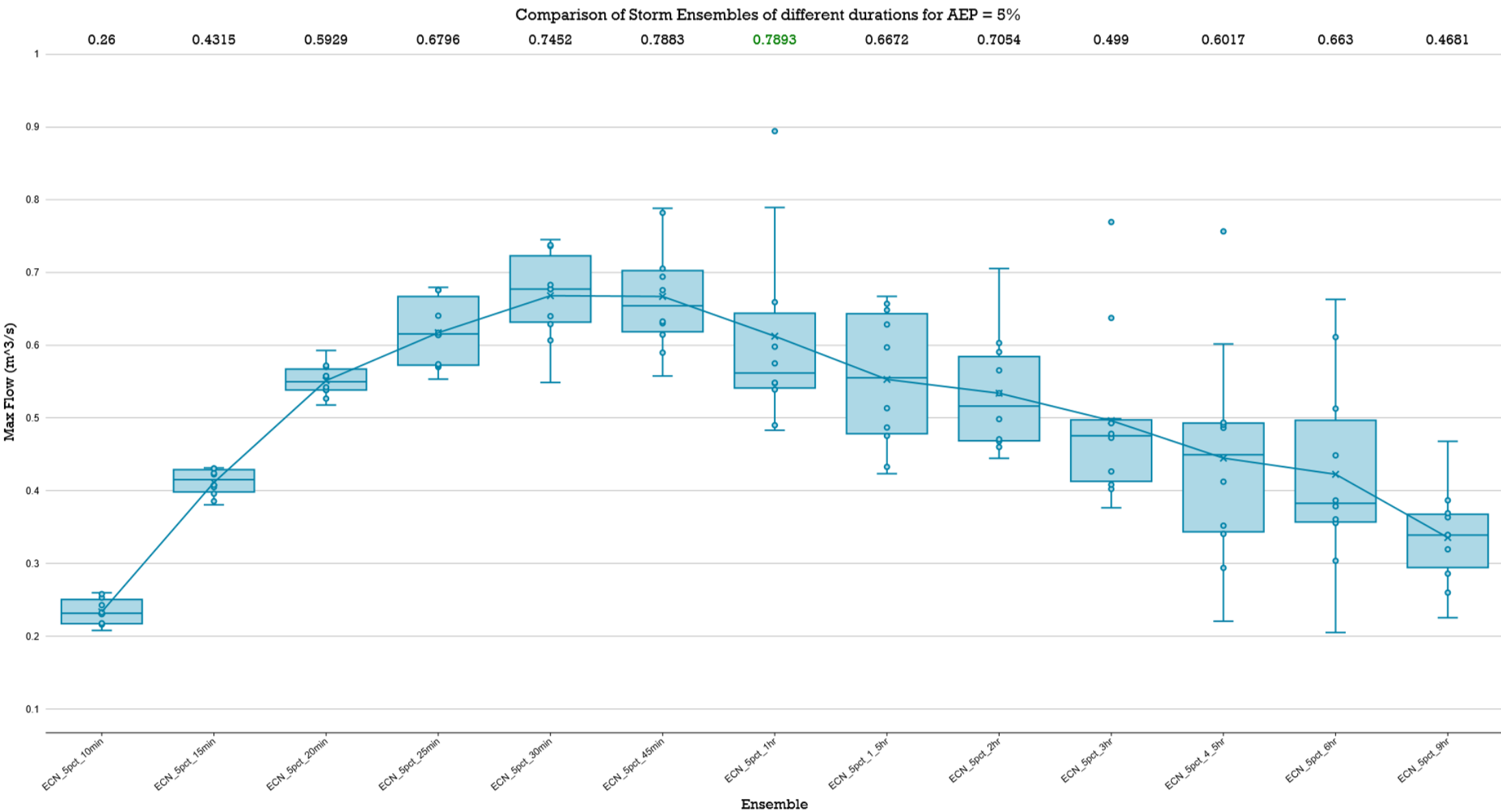
LPoD 3 PRE-DEVELOPMENT

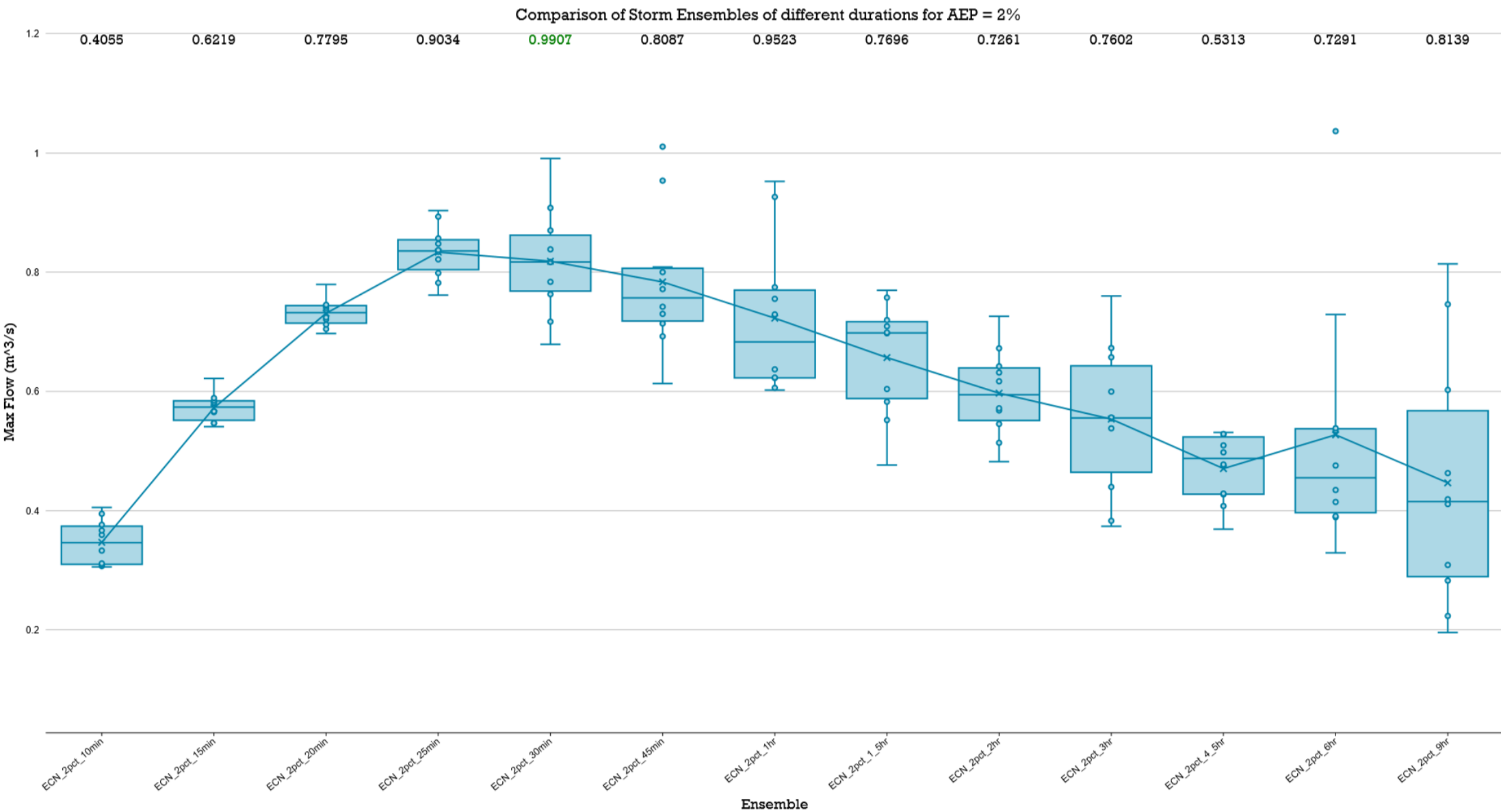


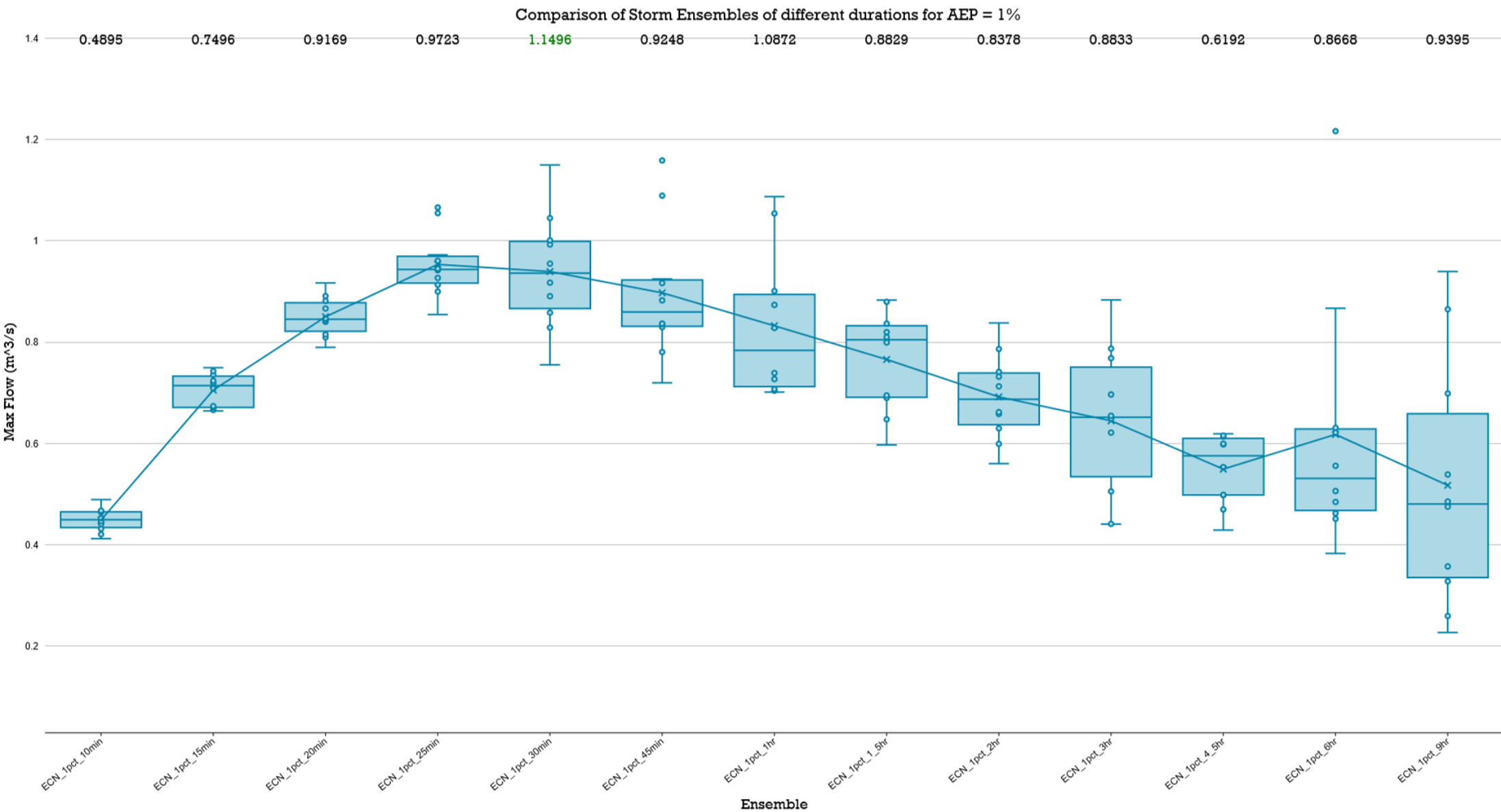




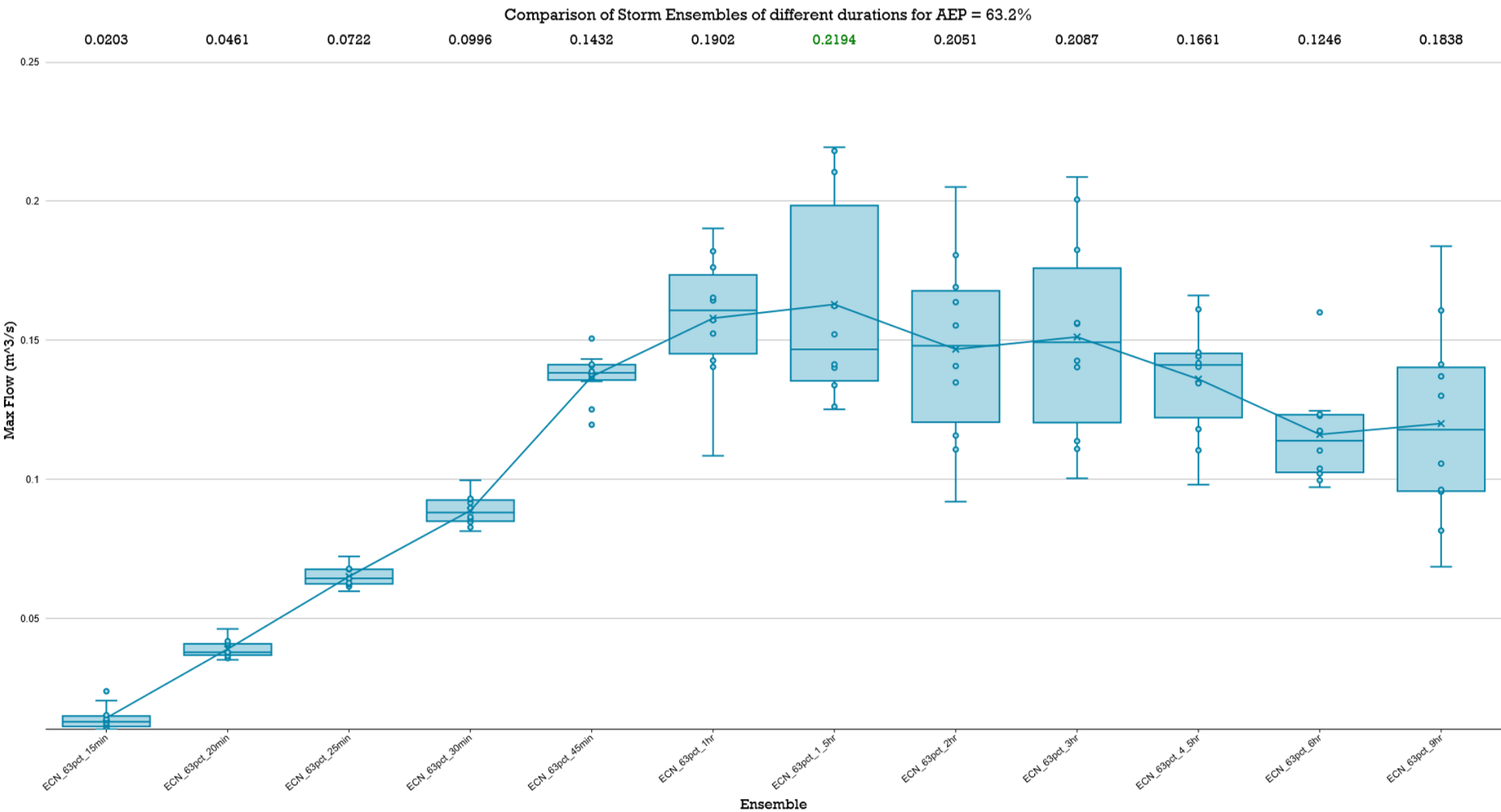


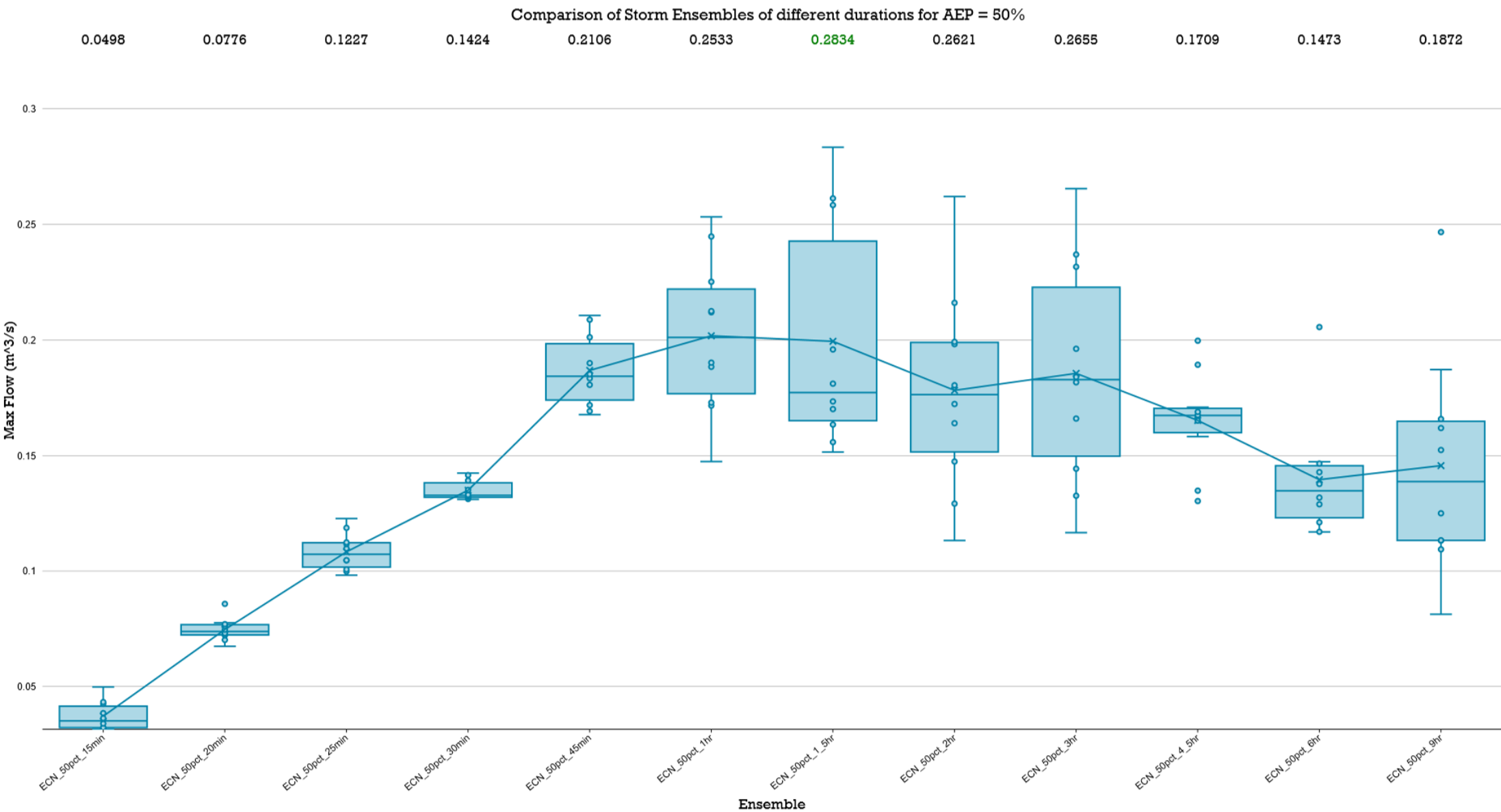


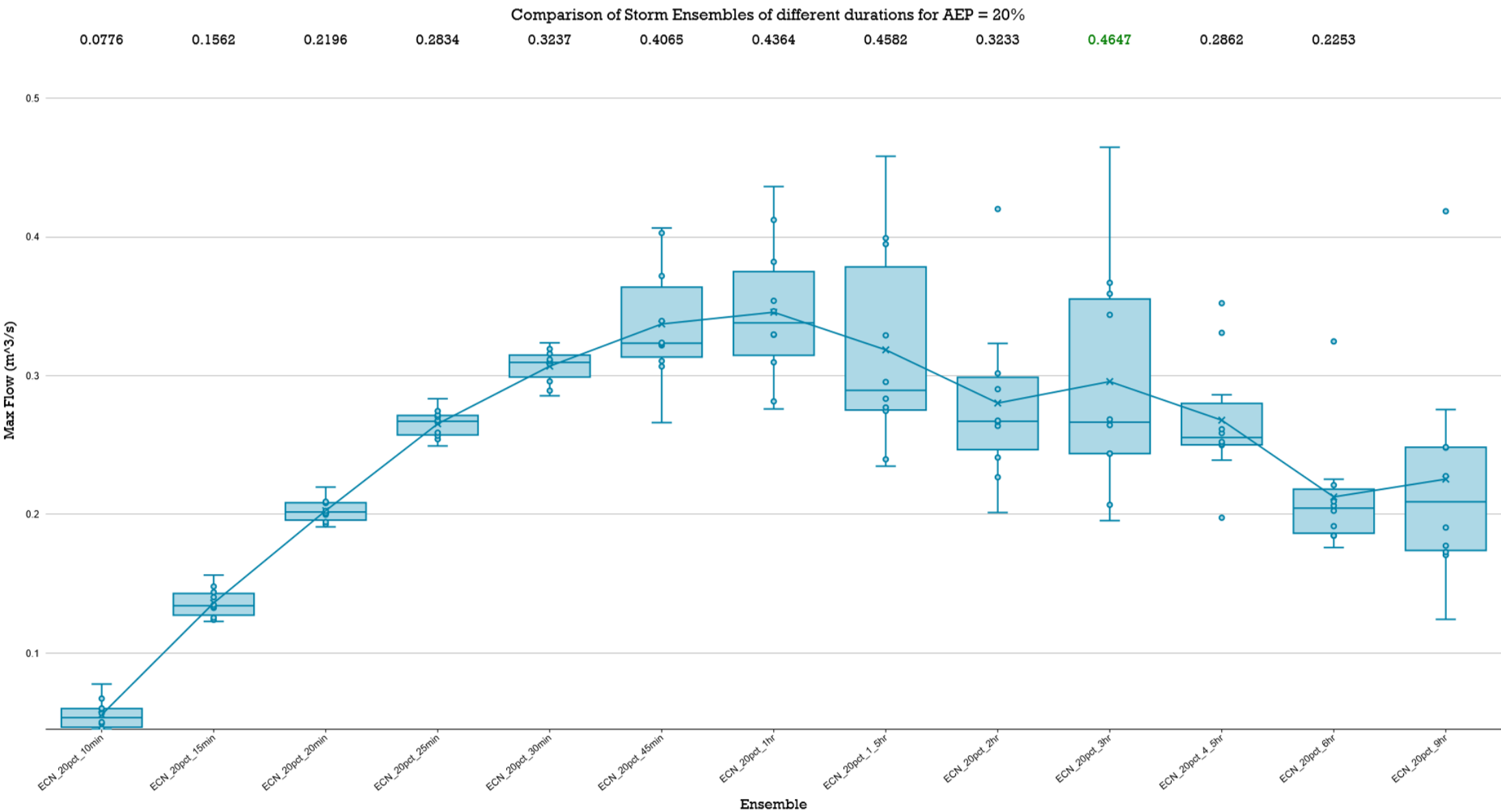


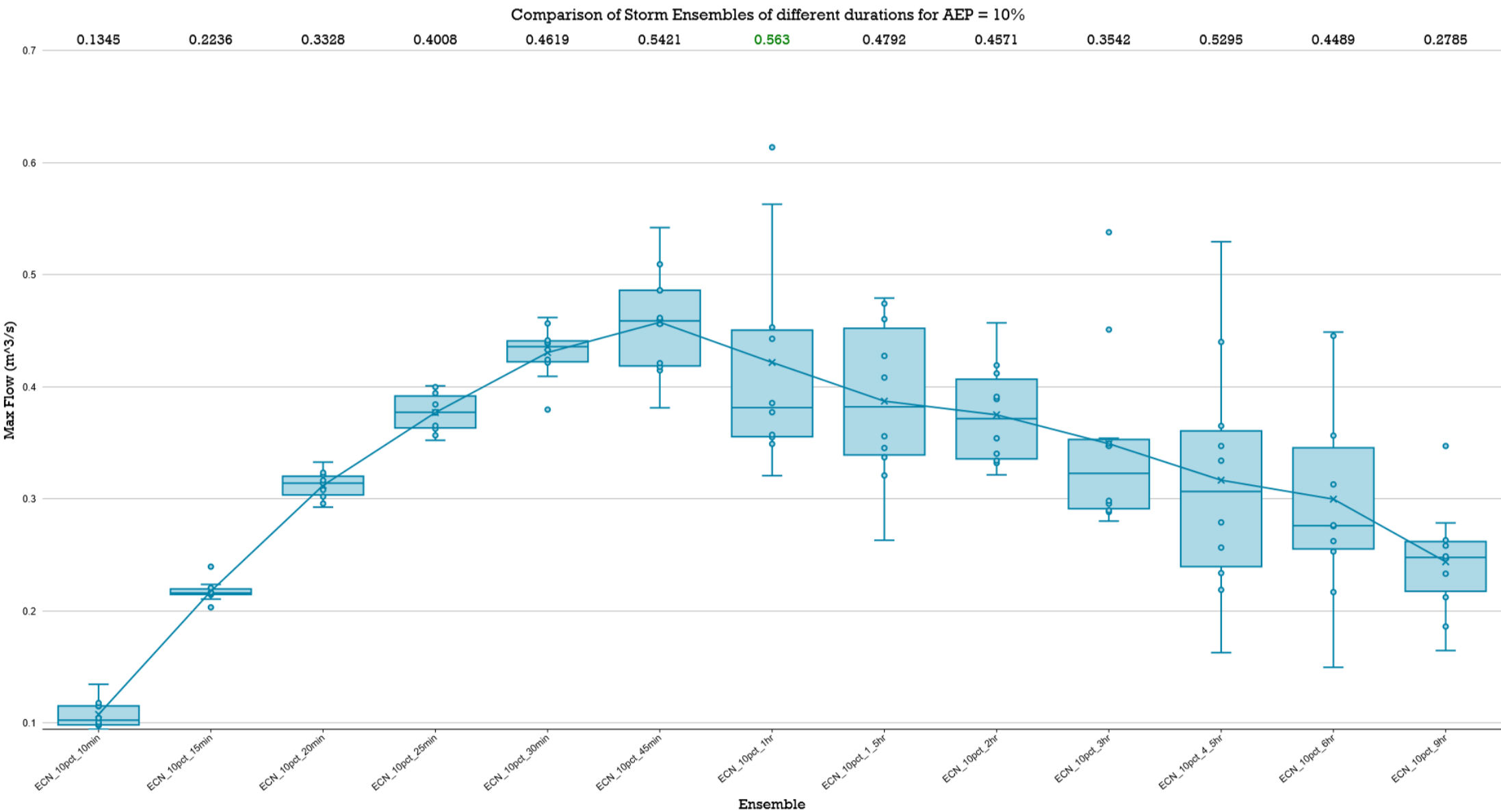


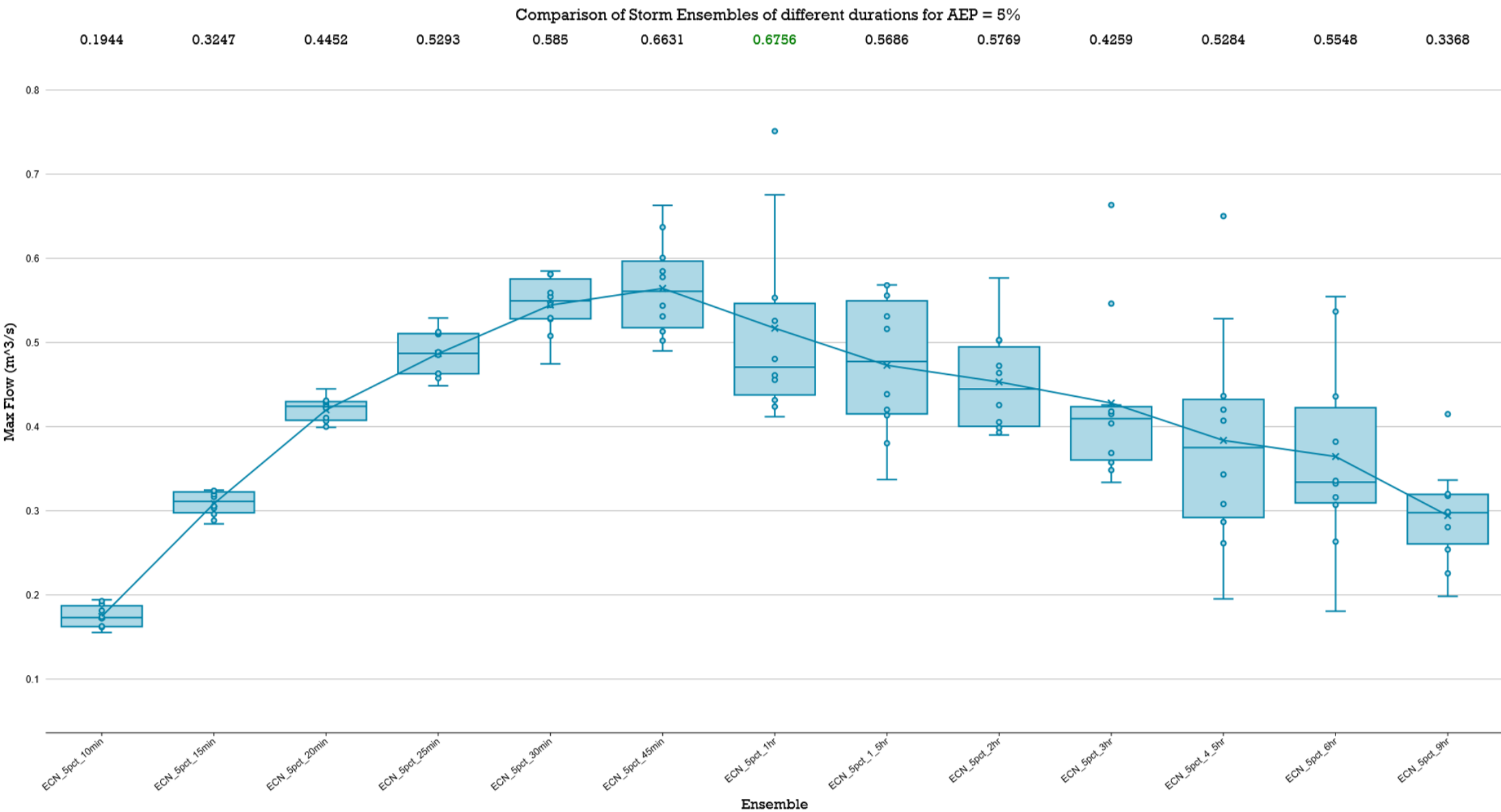
LPoD 4 PRE-DEVELOPMENT

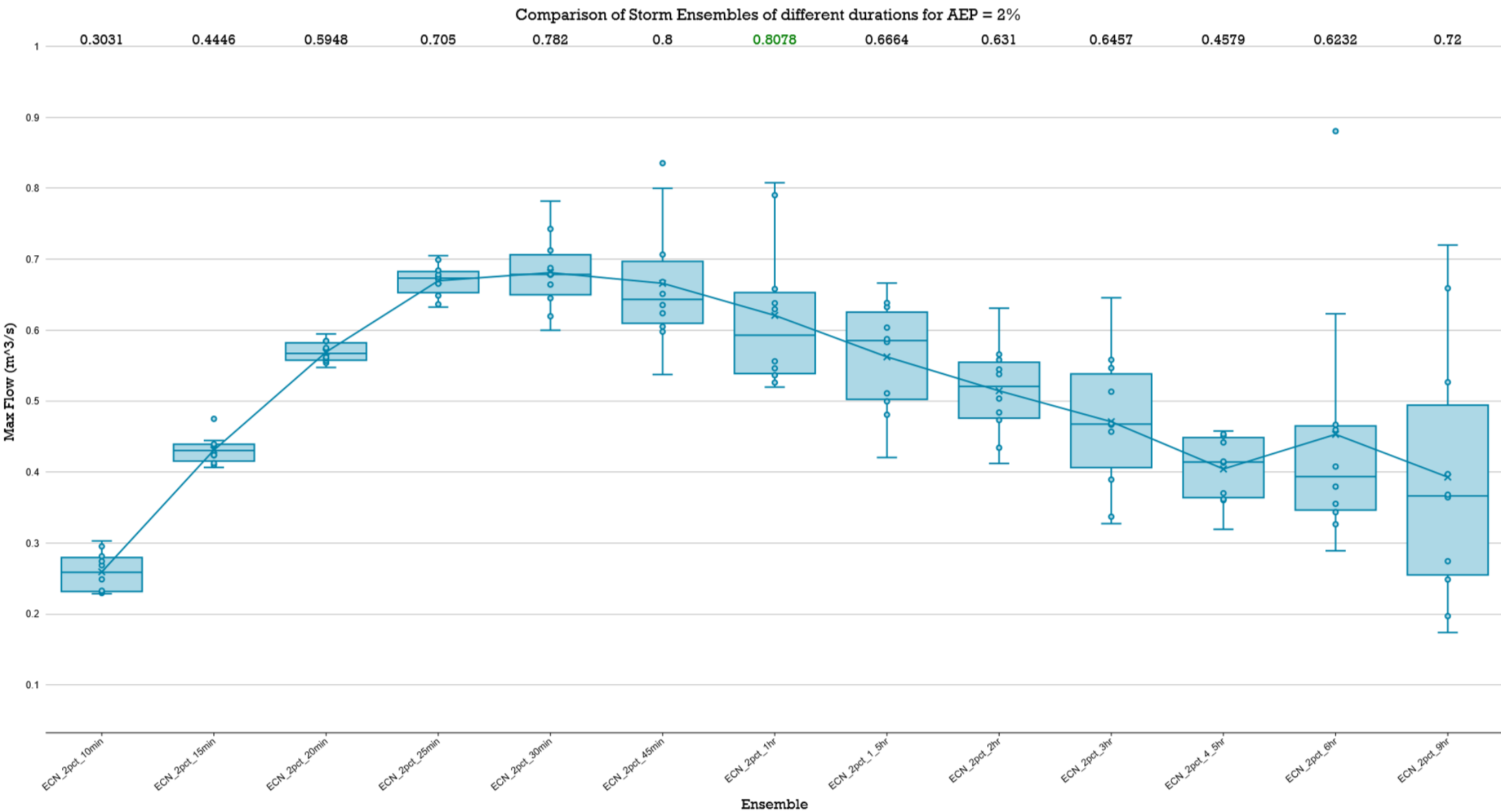


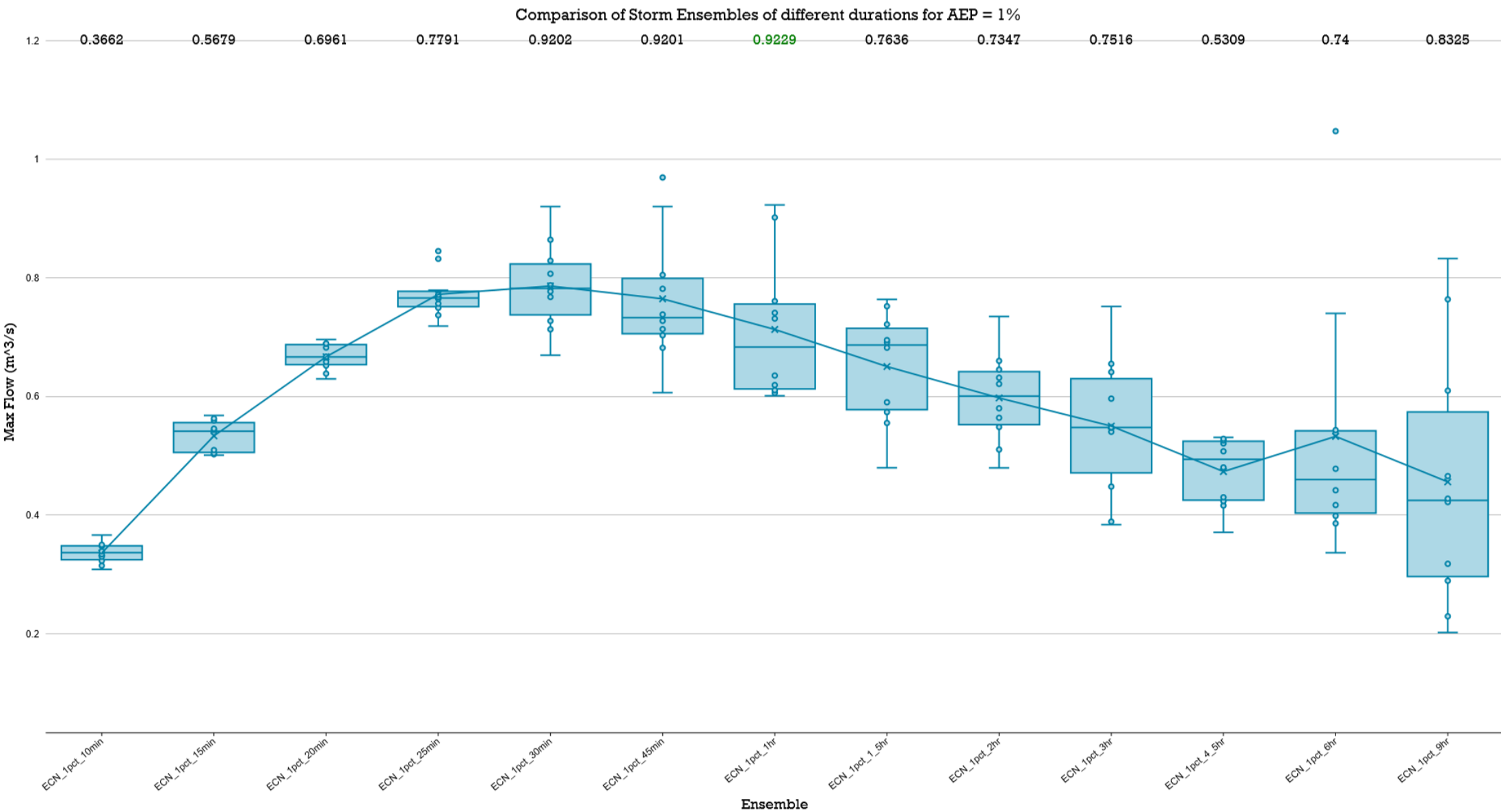






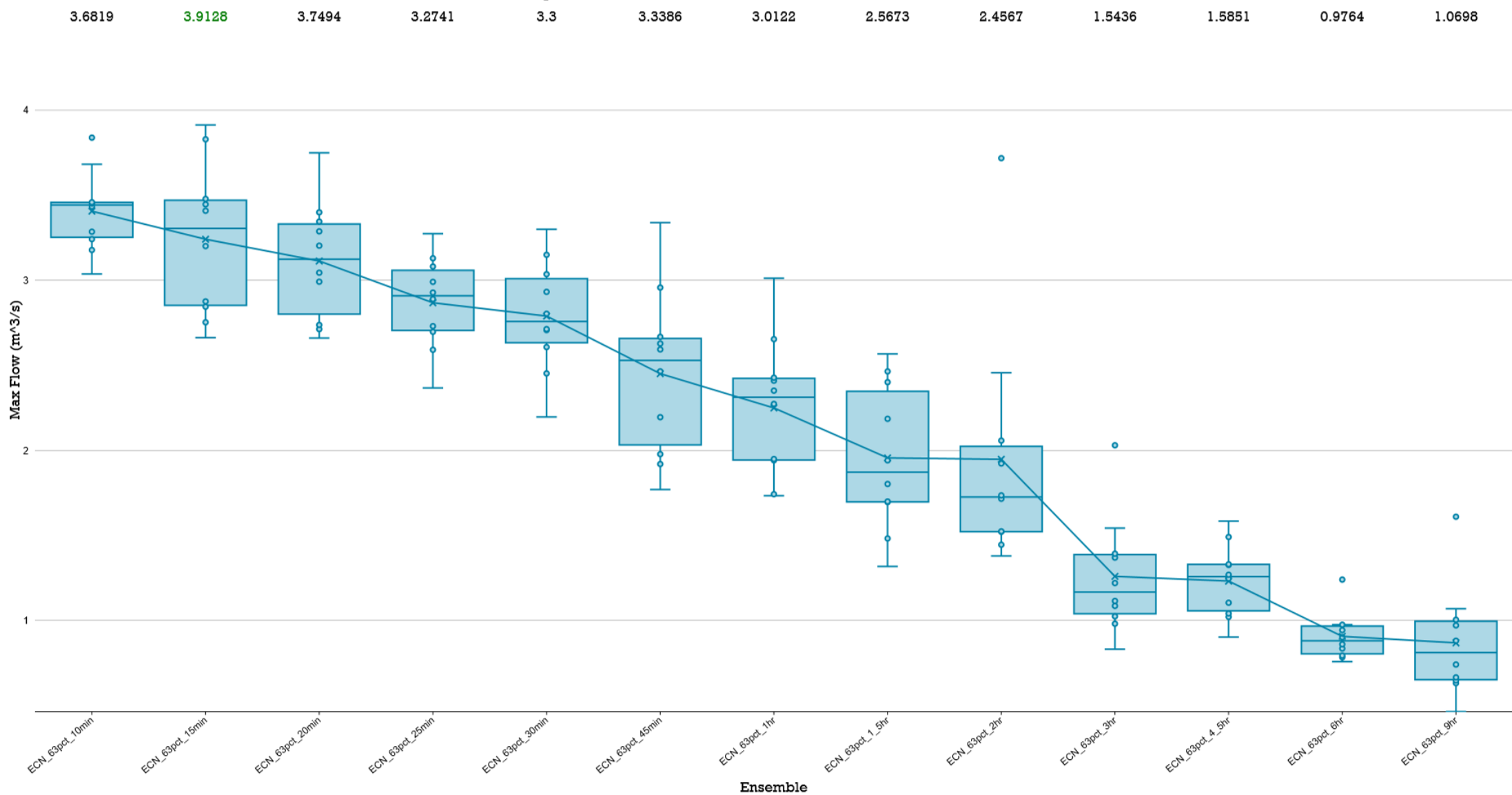




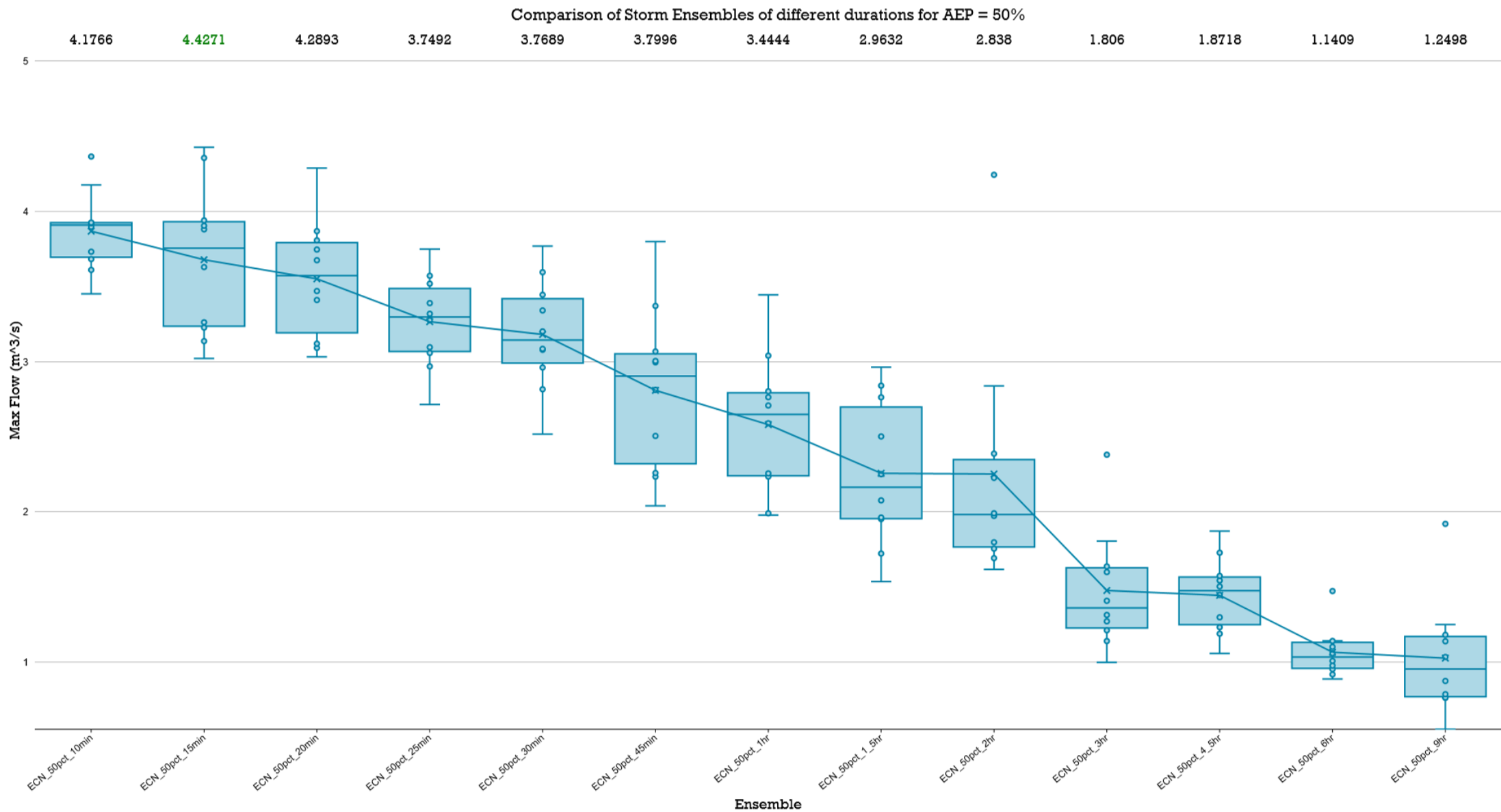


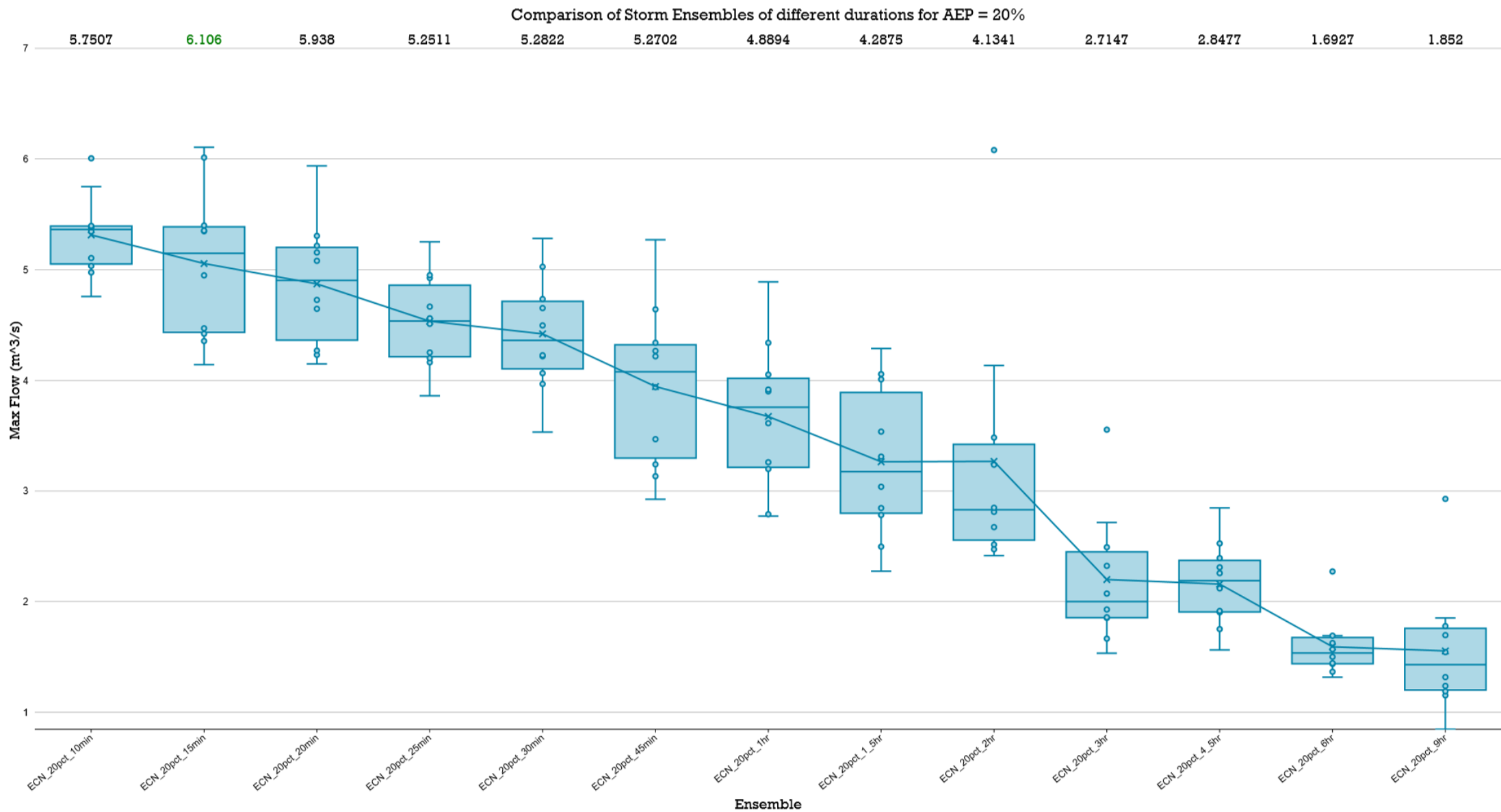
LPoD 5 POST-DEVELOPMENT

Comparison of Storm Ensembles of different durations for AEP = 63.2%

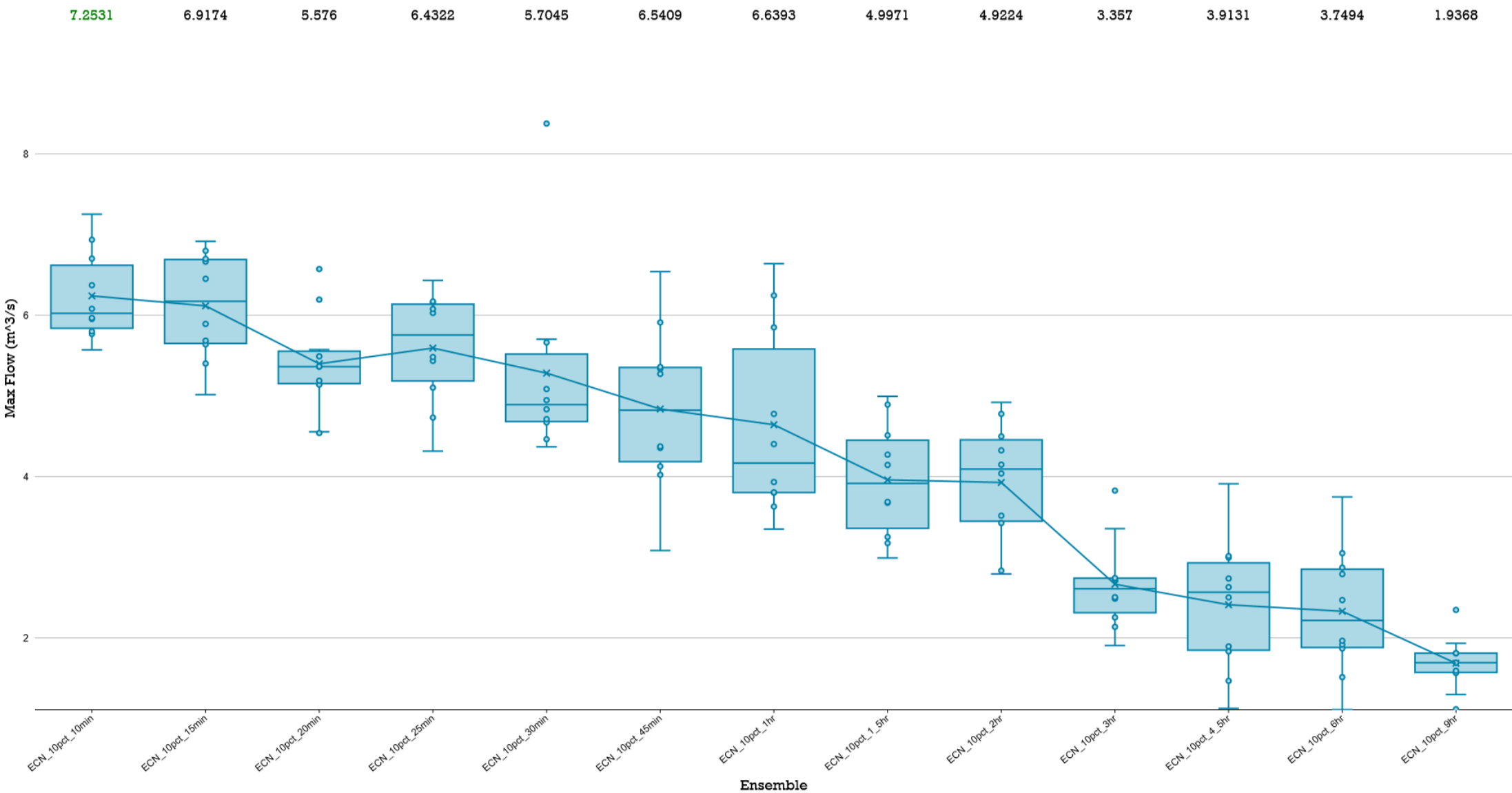


BOX & WHISKER PLOTS

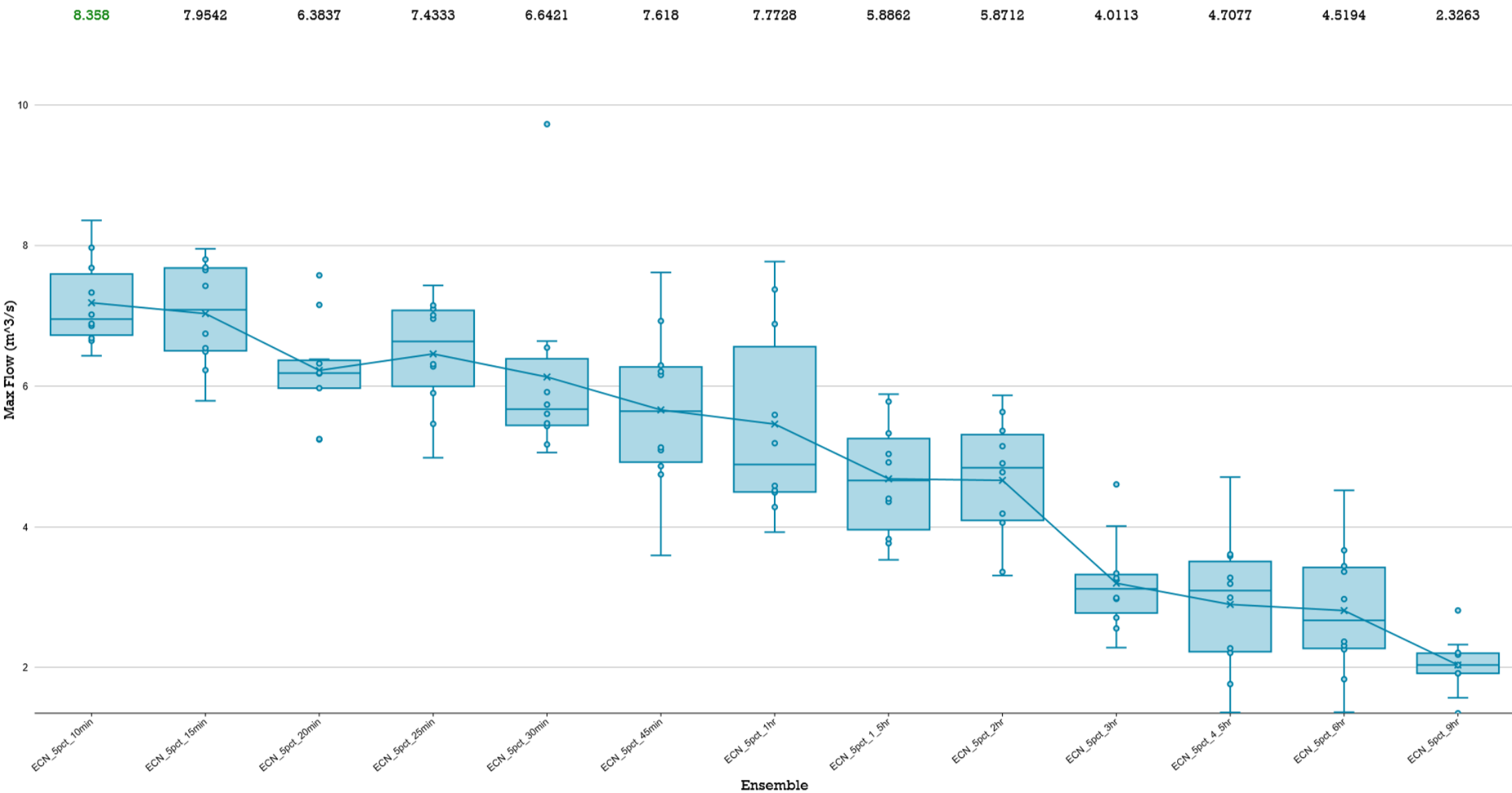




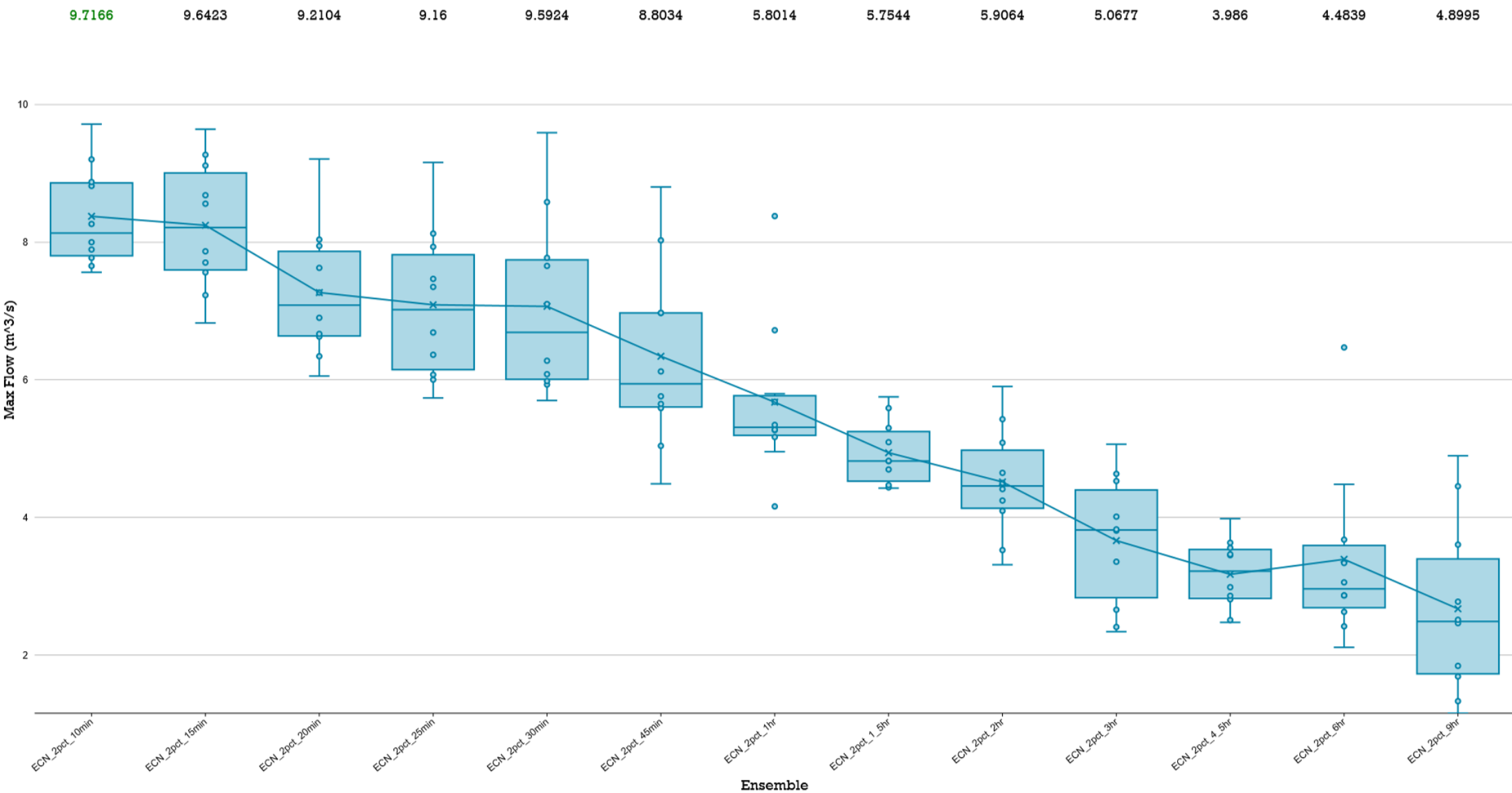
Comparison of Storm Ensembles of different durations for AEP = 10%

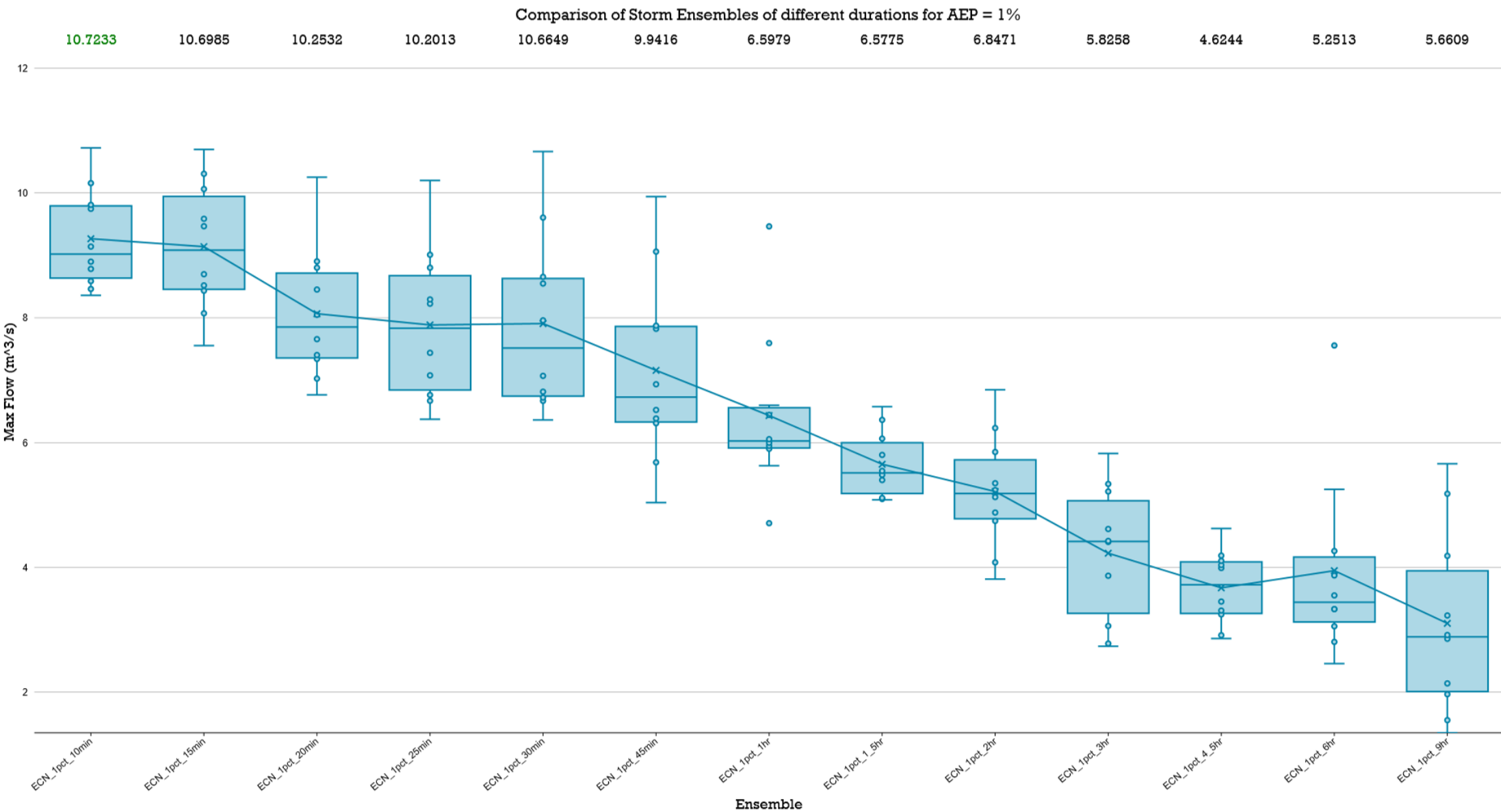


Comparison of Storm Ensembles of different durations for AEP = 5%

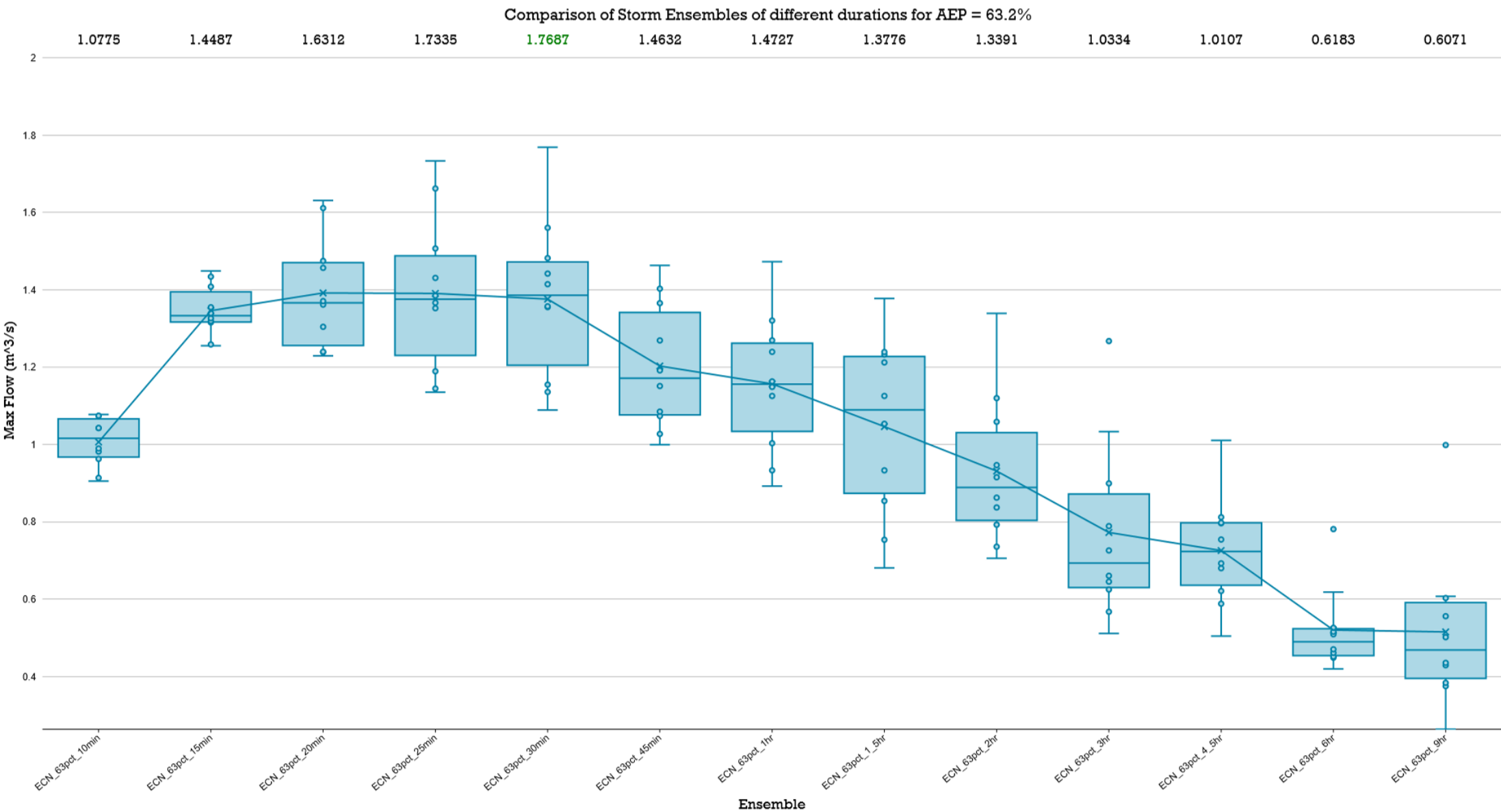


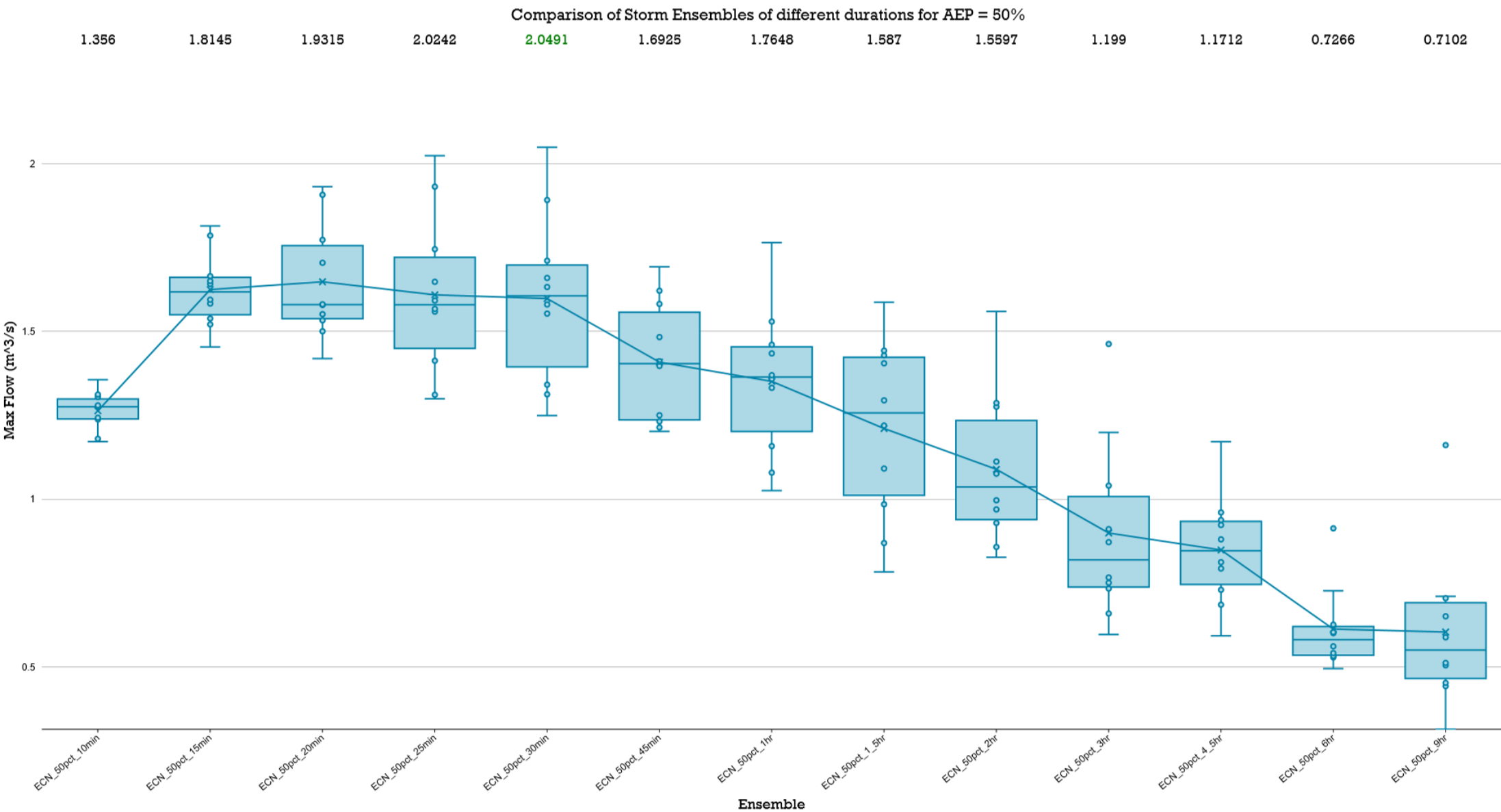
Comparison of Storm Ensembles of different durations for AEP = 2%

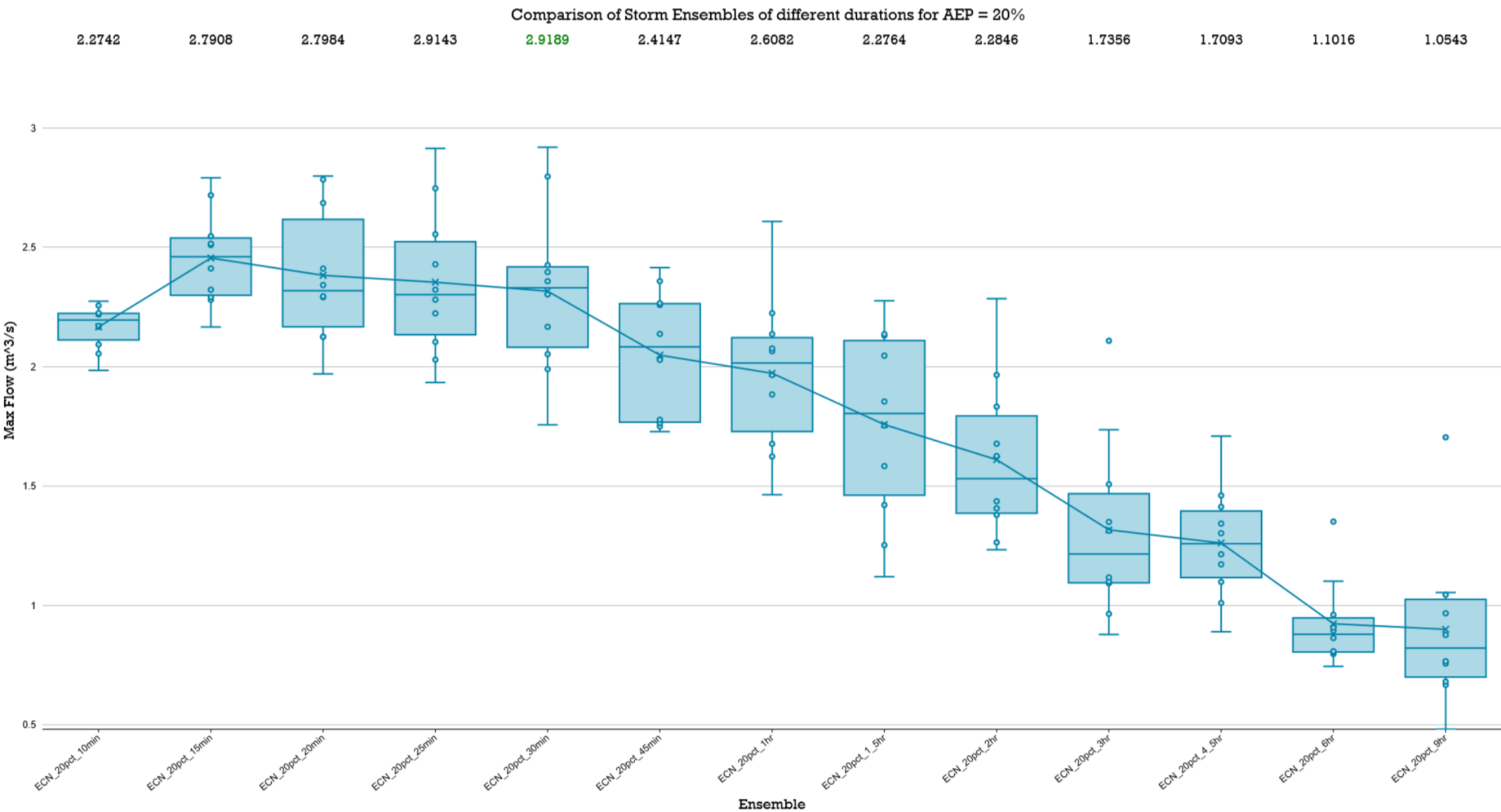


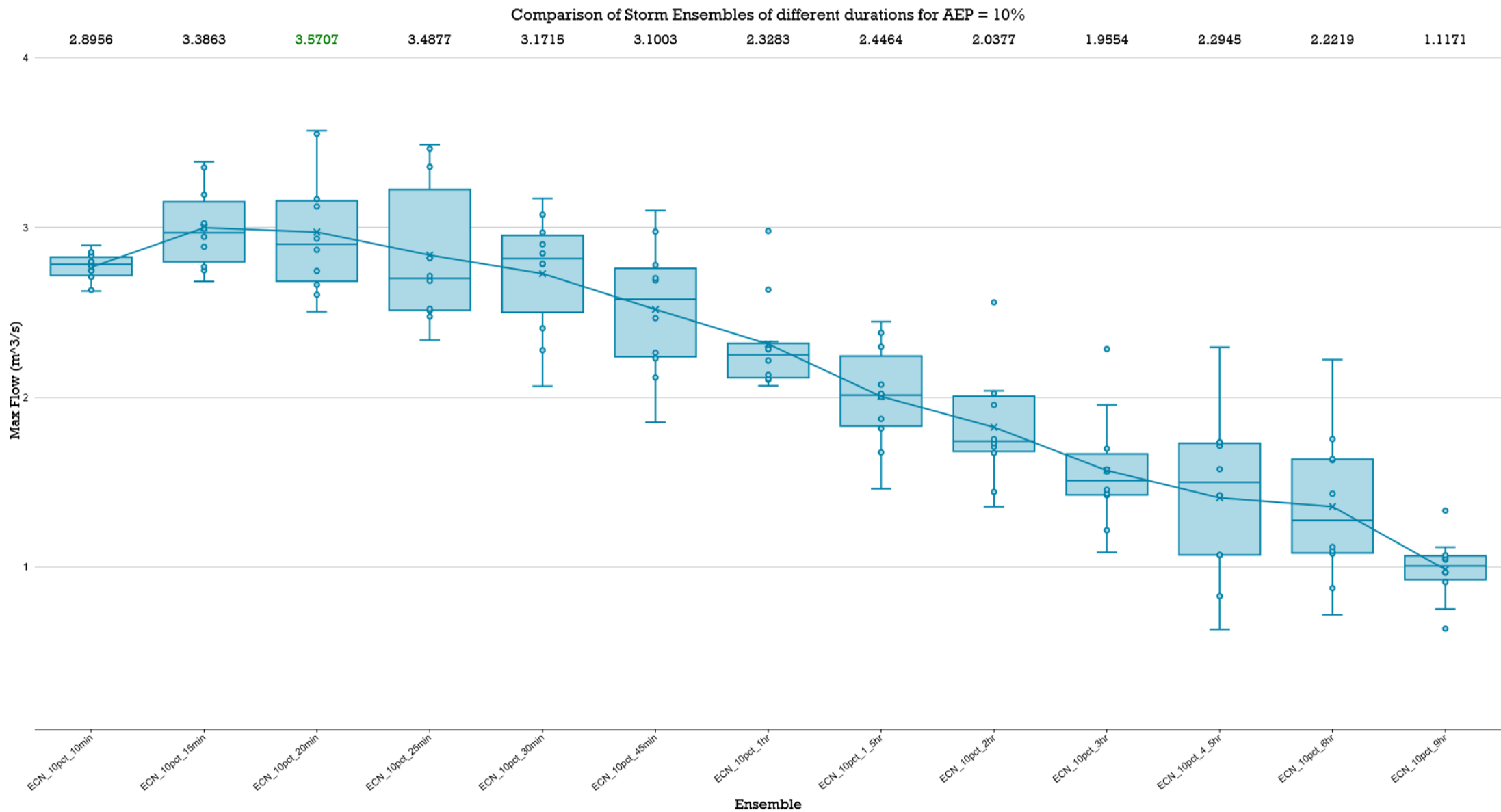


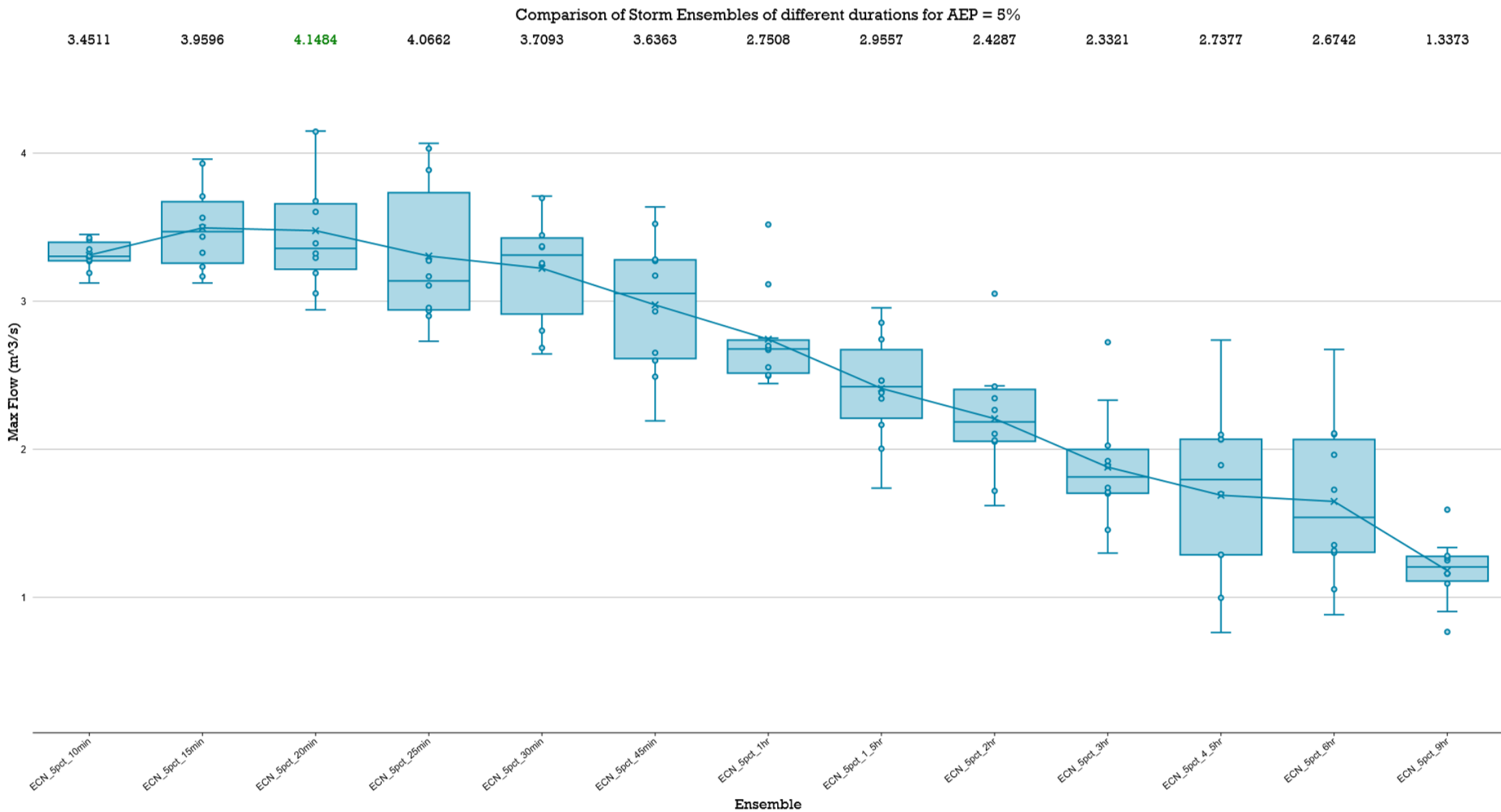
LPoD 5 PRE-DEVELOPMENT

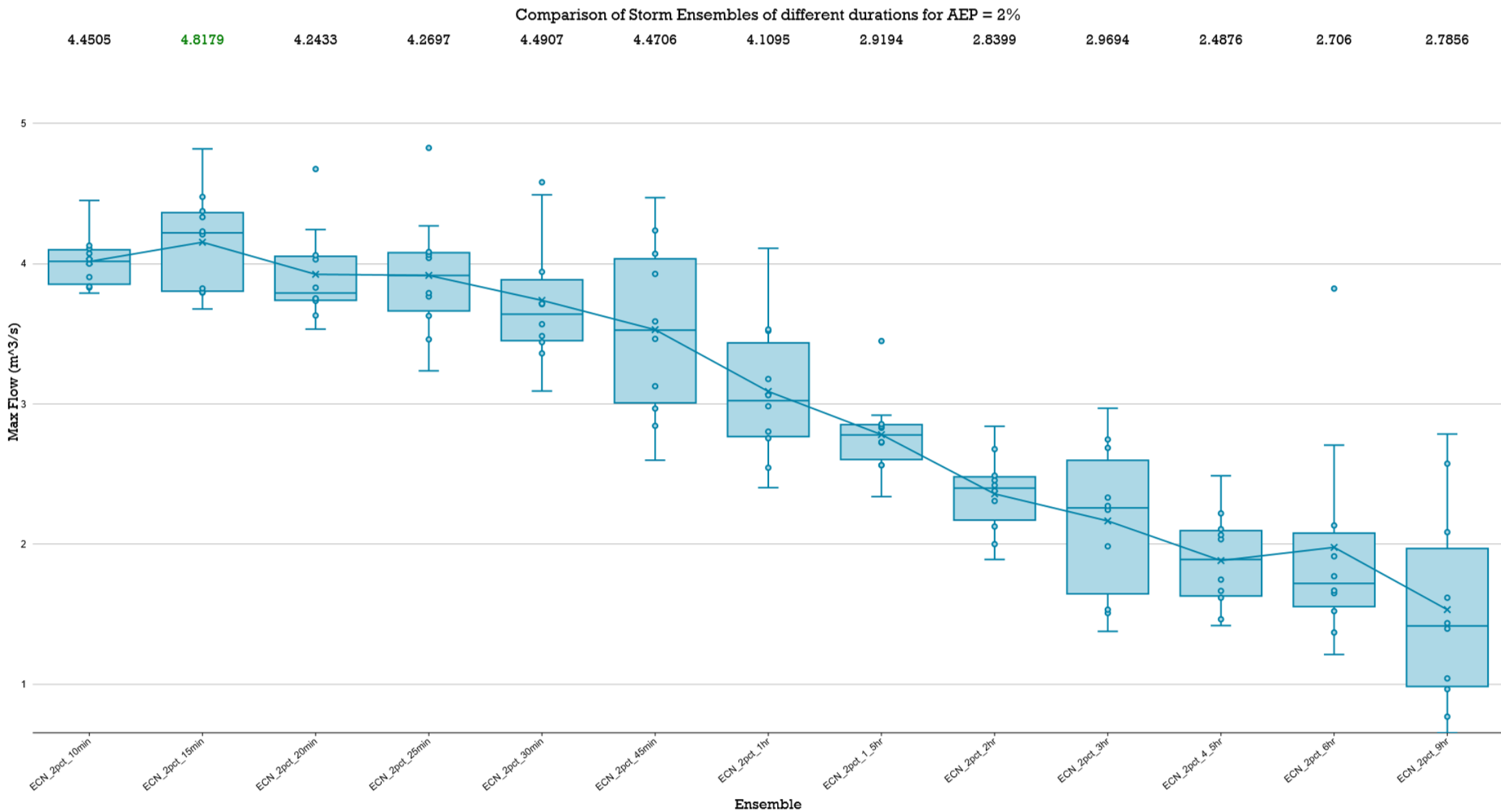


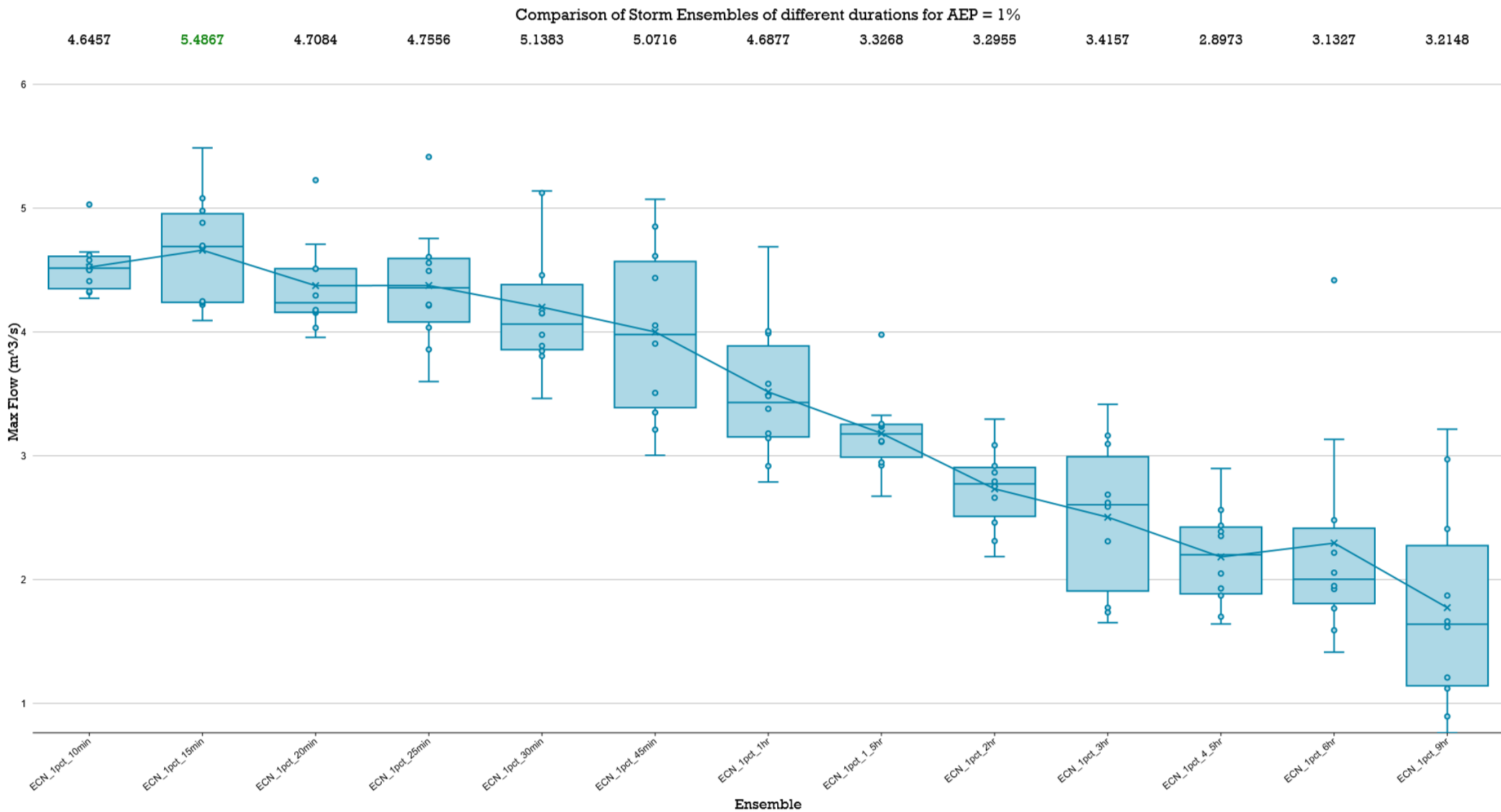












Appendix L – Mitigation Results

HYDROLOGICAL PEAK FLOW SUMMARY [STAGE 1] - CATCHMENT LPoD-5

EVENT	PEAK <i>UNMITIGATED</i> FLOW	PEAK <i>MITIGATED</i> FLOW m3/s	TARGET FLOW (PRE-DEV) m3/s	PRE-DEVELOPED PEAK STORM		PASS?	STORM	
				DURATION	ENSEMBLE #		DURATION	ENSEMBLE
63pct	3.913	1.095	1.769	ECN_63pct_30min	1	Yes	ECN_63pct_30min	Storm 1
50pct	4.427	1.225	2.049	ECN_50pct_30min	1	Yes	ECN_50pct_3hr	Storm 3
20pct	6.106	1.746	2.919	ECN_20pct_30min	1	Yes	ECN_20pct_3hr	Storm 3
10pct	7.253	3.441	3.571	ECN_10pct_20min	8	Yes	ECN_10pct_1hr	Storm 10
5pct	8.358	4.138	4.148	ECN_5pct_20min	9	Yes	ECN_5pct_1hr	Storm 1
2pct	9.717	4.598	4.818	ECN_2pct_15min	8	Yes	ECN_2pct_6hr	Storm 1
1pct	10.723	5.231	5.487	ECN_1pct_15min	8	Yes	ECN_1pct_6hr	Storm 1

BASIN OUTLET CONFIGURATION SUMMARY [STAGE 1]

OUTLET CONFIGURATION FLOWS PER CONDUIT (m3/s)							
1	2	3	4	5	6	7	TOTAL
0.000	0.000	0.352	0.352	0.352	0.041	0.000	1.095
0.000	0.000	0.379	0.379	0.379	0.090	0.000	1.225
0.000	0.136	0.471	0.471	0.471	0.199	0.000	1.746
0.000	1.708	0.503	0.503	0.503	0.223	0.000	3.441
0.000	2.309	0.529	0.529	0.529	0.243	0.000	4.138
0.000	2.671	0.552	0.552	0.552	0.272	0.000	4.598
0.000	3.164	0.589	0.589	0.589	0.302	0.000	5.231
EMERGENCY WEIR	F.I. 1.5 x 2.0m	F.I. (1) 0.6 x 0.6	F.I. (2) 0.6 x 0.6	F.I. (3) 0.6 x 0.6	225 dia ORIFICE	NOT USED	

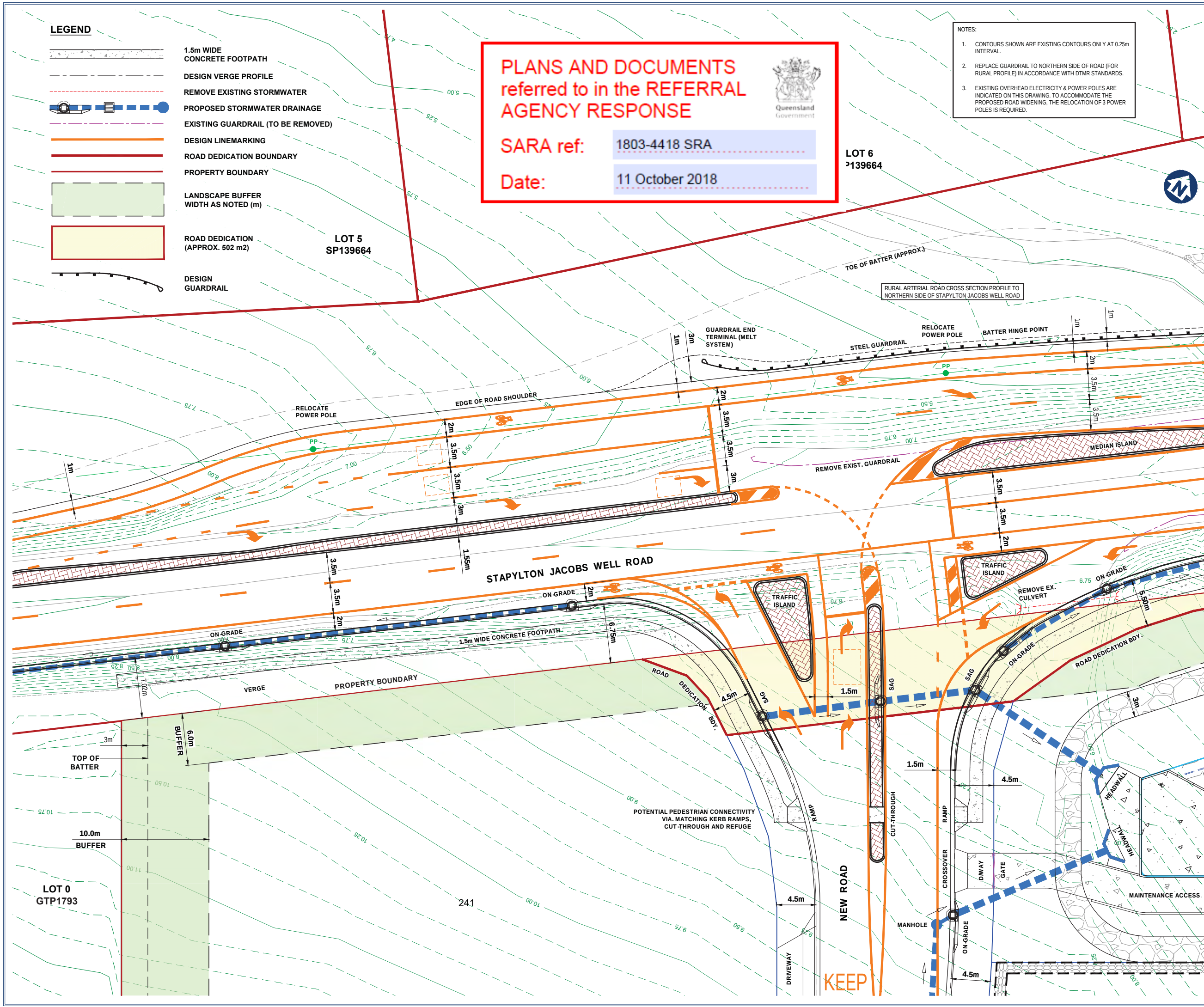
FLOW MITIGATION SUMMARY [STAGE 1]

EVENT	PEAK <i>MITIGATED</i> FLOW m3/s	TARGET FLOW (PRE-DEV) m3/s	MITIGATED BY m3/s	MITIGATED BY %	MITIGATED?
63pct	1.095	1.769	0.674	38.1%	Y
50pct	1.225	2.049	0.824	40.2%	Y
20pct	1.746	2.919	1.173	40.2%	Y
10pct	3.441	3.571	0.130	3.6%	Y
5pct	4.138	4.148	0.011	0.3%	Y
2pct	4.598	4.818	0.220	4.6%	Y
1pct	5.231	5.487	0.256	4.7%	Y

BASIN AND WATER LEVEL SUMMARY [STAGE 1]

DETENTION BASIN		BASIN INVERT LEVEL (IL)	IS WATER DEPTH COMPLIANT TO QUDM 2017 RECOMMENDATIONS?		PROPOSAL
Water Depth (m)	WSL R.L.				
0.835	6.635	5.800	N/A	N/A	PROVIDE CoGC STANDARD 1.8 METRE HIGH CHAINMESH FENCING TO PERIMETER OF DRAINAGE RESERVE TO RESTRICT PUBLIC ACCESS
0.920	6.720	5.800	N/A	N/A	
1.257	7.057	5.800	N/A	N/A	
1.379	7.179	5.800	N/A	N/A	
1.456	7.256	5.800	NO	D < 1.20m ?	
1.557	7.357	5.800	N/A	N/A	
1.689	7.489	5.800	NO	D < 1.50m ?	

Appendix M – Stapylton Jacobs Well Rd Approved Intersection Plans



PLANS AND DOCUMENTS
referred to in the REFERRAL
AGENCY RESPONSE

SARA ref: 1803-4418 SRA

Date: 11 October 2018

- NOTES:
1. CONTOURS SHOWN ARE EXISTING CONTOURS ONLY AT 0.25m INTERVAL.
 2. REPLACE GUARDRAIL TO NORTHERN SIDE OF ROAD (FOR RURAL PROFILE) IN ACCORDANCE WITH DTMR STANDARDS.
 3. EXISTING OVERHEAD ELECTRICITY & POWER POLES ARE INDICATED ON THIS DRAWING. TO ACCOMMODATE THE PROPOSED ROAD WIDENING, THE RELOCATION OF 3 POWER POLES IS REQUIRED.

Client:

KS8 Pty. Ltd.

Site Address:

60 STAPYLTON JACOBS
WELL ROAD, STAPYLTON

RPD:

Lot / Plan: 1 on RP6882
240 on W31320
4 on RP6843

Parish: Albert
County: Ward
Local Authority: City of Gold Coast
Council

Level Datum: AHD
Meridian: IS216853
Contour Interval: -
PSM:
RL:

ISSUED FOR APPROVAL
NOT FOR CONSTRUCTION

DRAWING TO BE READ IN CONJUNCTION WITH GENERAL NOTES

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DRAWING TITLE

FUNCTIONAL ROAD
LAYOUT PLAN AND
STORMWATER DRAINAGE
LAYOUT PLAN
SHEET 1 OF 2

B	24-07-18	AMENDMENTS AS PER DTMR REQUEST	IG	MG
A	18-07-18	ORIGINAL ISSUE	IG	MG
Issue	Date	Description	DRN	CHK

SCALE IN METRES

0 2 4 6 8 10m

1:200 @ A1

Scale at A1: 1:200

Designed: IG

Drafted: IG

Approved: MG

RPEQ: 16939

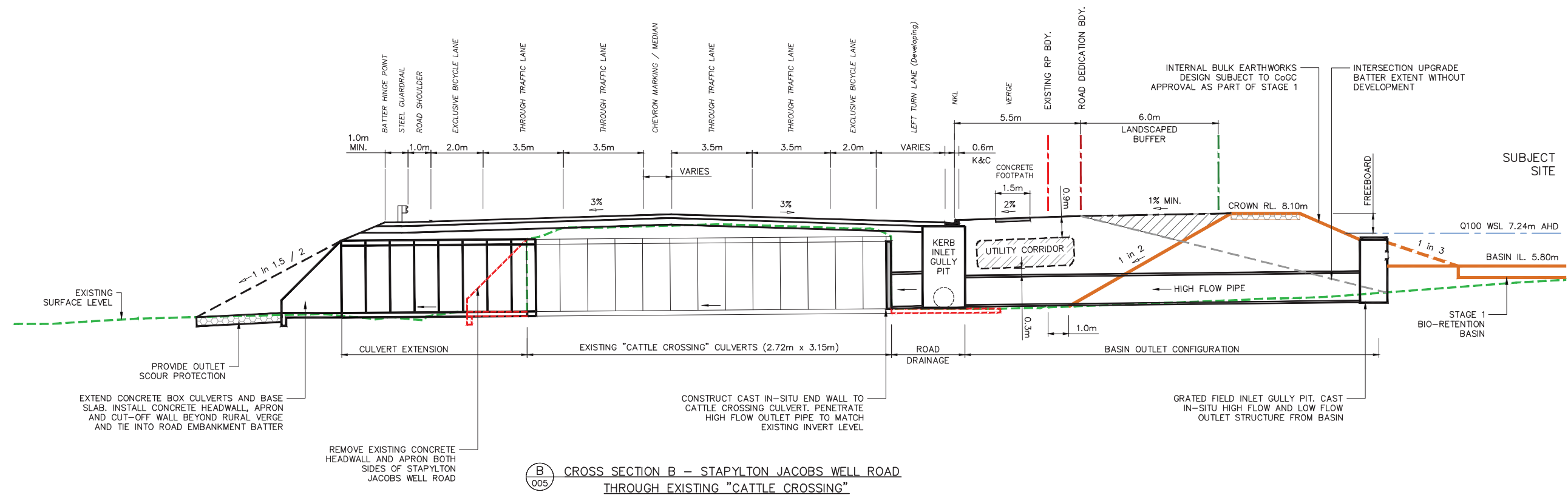
Signed:

Date: 24-07-18

Drawing No: 5738 ENG BE1 SK-004

Rev. No: B

DTMR WORKS
STAGE 1 BULK EARTHWORKS
EXISTING SURFACE LEVEL



Queensland
Government

Date: 11 October 2018

Site Address:

60 STAPYLTON JACOBS
WELL ROAD, STAPYLTON

RPD:	
Lot / Plan:	1 on RP6882 240 on W31320 4 on RP6843
Parish:	Albert
County:	Ward
Local Authority:	City of Gold Coast Council
Level Datum:	AHD
Meridian:	IS216853
Contour Interval:	-
PSM:	
RL:	

ISSUED FOR APPROVAL
NOT FOR CONSTRUCTION

DRAWING TO BE READ IN CONJUNCTION WITH GENERAL NOTES

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TYPICAL CROSS SECTIONS OF STAPYLTON JACOBS WELL ROAD

0 1 2 3 4 5m
1:100 @ A1

Date:	24-07-18
-------	----------

Drawing No:	Rev. No:
5738 ENG BE1 SK-006	B

OPERATIONAL WORKS FOR CHANGE TO GROUND LEVEL

DRAWING INDEX		
DRAWING No.	Rev No.	DRAWING TITLE
6098 ENG BE 001	A	DRAWING INDEX AND LOCALITY PLAN
6098 ENG BE 002	A	GENERAL NOTES SHEET 1 OF 2
6098 ENG BE 003	A	GENERAL NOTES SHEET 2 OF 2
6098 ENG BE 004	A	LEGEND
6098 ENG BE 005	A	KEY PLAN LAYOUT
6098 ENG BE 010	A	EXISTING SURFACE AND FEATURES PLAN SHEET 1 OF 2
6098 ENG BE 011	A	EXISTING SURFACE AND FEATURES PLAN SHEET 2 OF 2
6098 ENG BE 020	A	SEDIMENT AND EROSION CONTROL PLAN SHEET 1 OF 2
6098 ENG BE 021	A	SEDIMENT AND EROSION CONTROL PLAN SHEET 2 OF 2
6098 ENG BE 035	A	SEDIMENT AND EROSION TYPICAL DETAILS
6098 ENG BE 050	A	BULK EARTHWORKS CUT AND FILL LAYOUT PLAN SHEET 1 OF 2
6098 ENG BE 051	A	BULK EARTHWORKS CUT AND FILL LAYOUT PLAN SHEET 2 OF 2
6098 ENG BE 100	A	FINISHED BULK EARTHWORKS SURFACE LEVEL PLAN SHEET 1 OF 2
6098 ENG BE 101	A	FINISHED BULK EARTHWORKS SURFACE LEVEL PLAN SHEET 2 OF 2
6098 ENG BE 150	A	FINISHED BULK EARTHWORKS CROSS SECTIONS
6098 ENG BE 400	A	BOULDER RETAINING WALL CONTROL LINE LAYOUT PLAN
6098 ENG BE 401	A	BOULDER RETAINING WALL LONGITUDINAL SECTION AND SETOUT TABLE

CLIENT



FPI QUEENSLAND PTY. LTD.

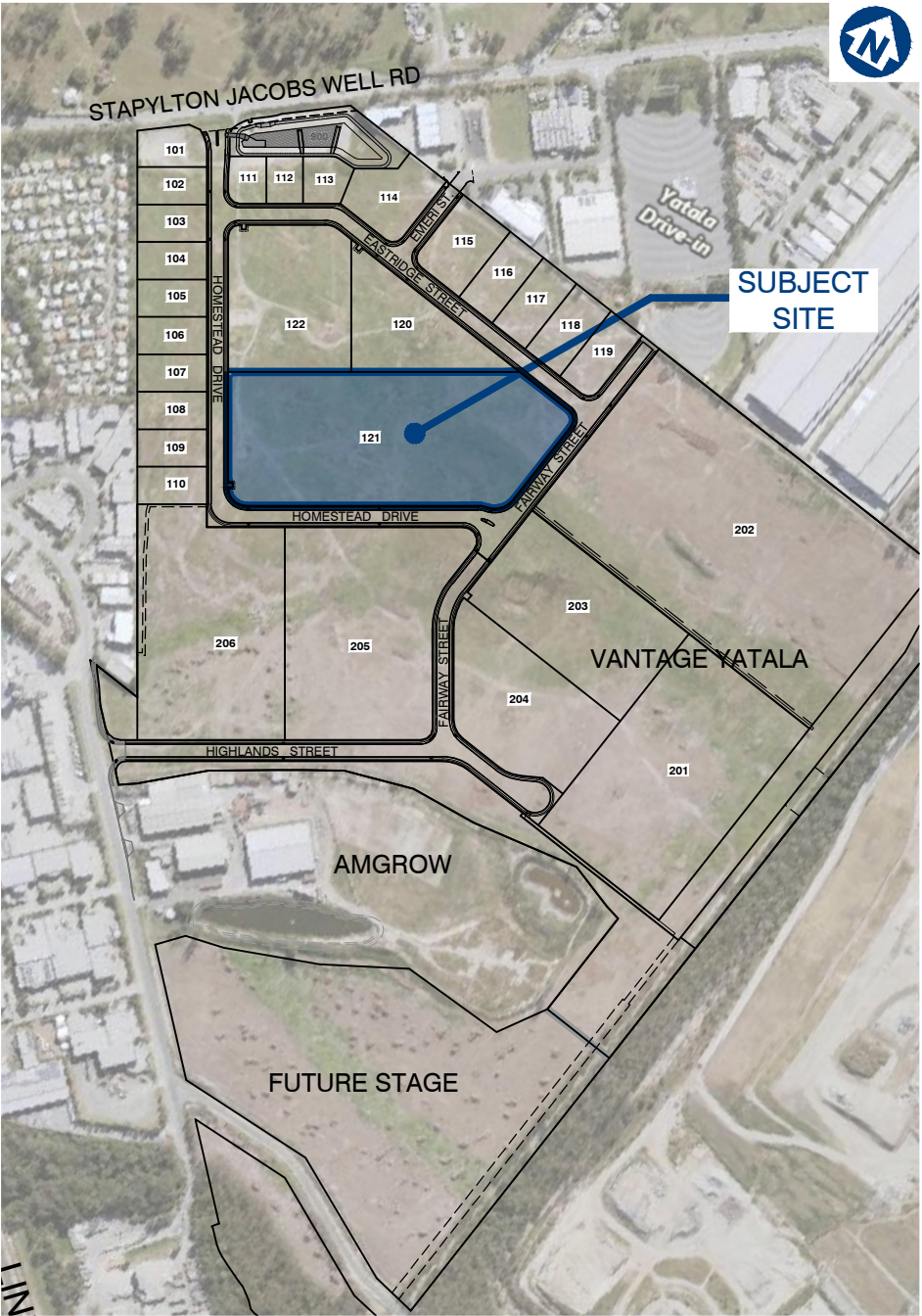
VantageYatala

SITE ADDRESS

LOT 121 & 122 on SP316168
HOMESTEAD DRIVE
STAPYLTON QLD 4207

DWG No. 6098 ENG BE 001 – REV A

JANUARY 2022



LOCALITY PLAN
SCALE 1: 4000 (A1)

GENERAL NOTES

1. **CONTRACT DOCUMENTATION**
ALL DRAWINGS ARE TO BE READ IN CONJUNCTION WITH THE CONTRACT SPECIFICATION AND CoGC STANDARD DRAWINGS AND SPECIFICATIONS.
2. **DATUM**
LEVELS SHOWN ON THE PLANS ARE A.H.D.
3. **SURVEY SETOUT**
THE SURVEY SET OUT INFORMATION TO ALLOW THE CONTRACTOR TO ACCURATELY SET OUT THE WORKS HAS BEEN ESTABLISHED ON SITE BY THE PRINCIPAL’S SURVEYOR. THE CONTRACTOR IS NOT TO SCALE FROM THESE PLANS AS A MEANS OF OBTAINING SETOUT INFORMATION.
4. **EXISTING SURVEY CONTROL STATIONS**
IT IS THE CONTRACTOR’S RESPONSIBILITY TO ENSURE THAT EXISTING SURVEY CONTROL STATIONS ARE NOT DISTURBED OR DAMAGED BY CONSTRUCTION ACTIVITIES. SHOULD THE CONTRACTOR IDENTIFY ANY CONFLICT BETWEEN EXISTING SURVEY CONTROL AND THE REQUIRED CONSTRUCTION ACTIVITIES THE SUPERINTENDENT IS TO BE NOTIFIED IMMEDIATELY.
5. **EXISTING SERVICES**
THE LOCATION OF EXISTING SERVICES WHERE SHOWN ON THE PLANS ARE INDICATIVE ONLY. IT IS THE CONTRACTOR’S RESPONSIBILITY TO CONTACT THE RELEVANT SERVICE AUTHORITIES TO ASCERTAIN THE EXACT LOCATION OF ALL EXISTING SERVICES PRIOR TO THE COMMENCEMENT OF WORKS AND TAKE ALL NECESSARY PRECAUTIONS TO AVOID DAMAGE TO THE EXISTING SERVICES.
6. **SITE ACCESS**
THE CONTRACTOR SHALL ONLY GAIN ACCESS TO THE SITE VIA ACCESS LOCATIONS APPROVED BY THE SUPERINTENDENT. FREEDOM OF ACCESS TO OTHER WORK AREAS ON THE SITE SHALL BE MAINTAINED AT ALL TIMES.
7. **PROVISION FOR TRAFFIC**
PROVISION FOR TRAFFIC ON LOCAL ROADS SHALL BE IN ACCORDANCE WITH THE MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES AND CoGC COUNCIL REQUIREMENTS.
8. **WORK EXTENT**
THE CONTRACTOR IS TO RESTRICT ACTIVITIES TO THOSE AREAS DESIGNATED AS WORKS AREAS UNDER THE CONTRACT. AT NO TIME IS THE CONTRACTOR TO ENTER ADJOINING PROPERTIES OR CONTRACT AREAS WITHOUT THE WRITTEN AUTHORISATION OF THE SUPERINTENDENT.
9. **TESTING**
ALL TESTING IS TO BE CARRIED OUT BY AN APPROVED N.A.T.A TESTING AUTHORITY IN ACCORDANCE WITH THE PROJECT SPECIFICATION AND REQUIREMENTS OF CoGC COUNCIL.
10. **"AS CONSTRUCTED" SURVEY**
"AS CONSTRUCTED" SURVEY SHALL BE CARRIED OUT BY THE PRINCIPAL’S SURVEYOR AS WORK PROCEEDS. THE CONTRACTOR IS TO PROVIDE ADEQUATE NOTICE TO THE PRINCIPAL’S SURVEYOR ON WHEN THIS IS REQUIRED TO ENSURE COMPLIANCE WITH THE REQUIREMENTS OF CoGC COUNCIL.
11. **MAINTENANCE OF SITE CONDITION**
AT THE COMPLETION OF WORKS THE SITE IS TO BE LEFT IN A CLEAN AND TIDY CONDITION TO THE SATISFACTION OF THE SUPERINTENDENT AND CoGC.

EARTHWORKS

1. **PRECEDENCE**
EARTHWORKS SPECIFICATION PREPARED BY PROJECT GEOTECHNICAL ENGINEER TO TAKE PRECEDENCE OVER STANDARD COUNCIL EARTHWORKS NOTES.
2. **TOPSOIL STRIPPING**
TOPSOIL SHALL BE STRIPPED ACROSS THE ENTIRE LIMIT OF THE EARTHWORKS CUT AND FILL AREAS AND SHALL BE STOCKPILED IN A LOCATION APPROVED BY THE SUPERINTENDENT. THE EXISTING STRATA IS TO BE TREATED IN ACCORDANCE WITH THE SPECIFICATION PRIOR TO PLACING ANY FILL.
3. **EARTHWORKS LEVELS**
EARTHWORKS LEVELS SHOWN ON THE DRAWING ARE TO FINISHED SURFACE LEVELS AND INCLUDE 100mm OF TOPSOIL. _THE CONTRACTOR SHALL VERIFY BENCH MARK LEVELS AND ADVISE THE SUPERINTENDENT OF ANY DISCREPANCY BEFORE COMMENCEMENT OF CONSTRUCTION.
4. **UNDESIRABLE MATERIAL**
THE ENTIRE SITE/WORK AREAS SHALL BE CLEARED OF ALL UNDESIRABLE MATTER. THIS SHALL INCLUDE DEAD TIMBER, GRASS, OLD FOUNDATIONS, CONCRETE, MASONRY REMAINS, GARBAGE, DEBRIS AND ALL OTHER OBSTRUCTIONS TO THE WORKS UNLESS NOTED OTHERWISE. HOLES LEFT BY THE REMOVAL OF ANY OF THE ABOVE SHALL BE FILLED WITH APPROVED COMPACTED MATERIAL WITH PROPERTIES AT LEAST SIMILAR TO INSITU SOILS.
5. **COMPACTION STANDARD**
FILL MATERIAL SHALL BE COMPACTED TO THE FOLLOWING STANDARD, WHERE DRY DENSITY RATIO IS DETERMINED IN ACCORDANCE WITH AS 1289 USING STANDARD COMPACTION METHODS.
a. 100% DRY DENSITY RATIO IN COHESIVE MATERIAL OR 80% IN COHESIONLESS MATERIAL FOR ROAD SUBGRADE.
b. 98% DRY DENSITY RATIO IN COHESIVE MATERIAL OR 65% IN COHESIONLESS MATERIAL FOR ALL AREAS OTHER THAN THE ROADWAY AND BUILDING PADS.
c. 98% DRY DENSITY RATIO IN COHESIVE MATERIAL OR 70% IN COHESIONLESS MATERIAL FOR BUILDING PADS.
5. **PAVEMENT DEPTHS**
EARTHWORKS VOLUMES DO NOT INCLUDE DESIGN PAVEMENT DEPTHS AS INDICATED ON THE TYPICAL BULK EARTHWORKS ROAD SECTION.
6. **TESTING**
ALL EARTHWORKS TO BE CARRIED OUT UNDER LEVEL 1 SUPERVISION IN ACCORDANCE WITH AUSTRALIAN STANDARDS AS 3798 UNLESS DIRECTED OTHERWISE BY THE SUPERINTENDENT. ALL COMPACTION TESTING SHALL BE CARRIED OUT BY AN APPROVED N.A.T.A TESTING AUTHORITY.
7. **ROCK**
THE CONTRACTOR IS TO INCLUDE ROCK EXCAVATION AS PART OF THEIR EARTHWORKS RATES UNLESS SCHEDULED OTHERWISE WITHIN THE CONTRACT DOCUMENT.

8. **DAMS AND PONDS**
WHERE POSSIBLE, WATER FROM DAMS AND PONDS SHALL BE MAINTAINED AND UTILISED FOR CONSTRUCTION PURPOSES AND DUST SUPPRESSION. DAMS AND PONDS NOT TO BE RETAINED SHALL BE DEWATERED, CLEARED OF ANY FOREIGN MATTER AND ORGANIC MATERIAL WITH THIS MATERIAL TO BE REMOVED OFF SITE.
9. **RETAINING STRUCTURES**
THE DESIGN AND STRUCTURAL CERTIFICATION OF RETAINING STRUCTURES SHALL BE UNDERTAKEN BY THE CONTRACTOR’S STRUCTURAL ENGINEER (RPEQ) IN CONSULTATION WITH THE PROJECT’S CIVIL ENGINEER AND LANDSCAPE CONSULTANT. THE CONTRACTOR IS RESPONSIBLE FOR THE SUBMISSION AND APPROVAL COORDINATION OF THE ASSOCIATED DRAWINGS AND CERTIFICATION TO GoGC. A COPY OF THIS SUBMISSION IS TO BE PROVIDED TO THE SUPERINTENDENT.
10. **TOPSOIL REPLACEMENT**
ALL BATTERS AND ALLOTMENT CUT & FILL AREAS SHALL BE TOP SOILED FROM ONSITE STOCKPILES. IF DIRECTED BY THE SUPERINTENDENT THE TOPSOIL SHALL BE SCREENED PRIOR TO PLACING. THE CONTRACTOR SHALL ALLOW IN THEIR RATE FOR SCREENING AND THE DISPOSAL OF REJECT MATERIAL TO TIP OFFSITE INCLUDING ALL FEES. THE CONTRACTOR MUST ENSURE THAT THE STRIPPING SHALL BE UNDERTAKEN IN SUCH A MANNER AS TO AVOID CONTAMINATION BY OVER CUTTING. IF TOPSOIL IS CONTAMINATED BY OVER CUTTING AND DETERMINED NOT SUITABLE FOR REUSE BY THE SUPERINTENDENT, THE CONTRACTOR SHALL BEAR THE COST OF REMOVAL FROM SITE OF ALL CONTAMINATED TOPSOIL AND THE COST TO SUPPLY AND IMPORT SUITABLE TOPSOIL FOR RE–SPREADING.
11. **GRASSING / SEEDING**
ALL CUT & FILL AREAS AND DISTURBED AREAS SHALL BE GRASSED OR SEEDDED TO THE SATISFACTION OF THE SUPERINTENDENT.
12. **STOCKPILES**
ALL MATERIAL/SPOIL ARISING FROM WORKS ON SITE SHALL BE COMPACTED TO AN APPROPRIATE STANDARD WITHIN THE FILL AREAS OF FUTURE STAGES AS NOMINATED BY THE SUPERINTENDENT. THE CONTRACTOR IS NOT TO CREATE STOCKPILES OF SURPLUS MATERIALS UNLESS WRITTEN AUTHORIZATION IS RECEIVED FROM THE SUPERINTENDENT.

SEDIMENT AND EROSION

1. THE OBJECTIVES OF THE EROSION AND SEDIMENT CONTROL PROGRAM ARE:
a. ALLOW STORMWATER TO PASS THROUGH THE SITE IN A CONTROLLED MANNER AT NON–EROSIVE FLOW VELOCITIES.
b. MINIMISE SOIL EROSION FROM WATER AND WIND
c. MINIMISE ADVERSE EFFECTS OF SEDIMENT RUNOFF.
d. MINIMISE OR PREVENT ENVIRONMENTAL HARM ASSOCIATED WITH DISCHARGE FROM THE CONSTRUCTED SITE.
e. ENSURE THAT THE VALUE AND USE OF RESIDENTIAL AND INDUSTRIAL PROPERTIES ADJACENT TO THE DEVELOPMENT ARE NOT DIMINISHED AS A RESULT OF THE MIGRATION OF SEDIMENT FROM THE DEVELOPMENT.
2. THE EROSION AND SEDIMENT CONTROL PROGRAM SHALL COMPLY WITH THE ENVIRONMENTAL BEST ENGINEERING GUIDELINES FOR QUEENSLAND CONSTRUCTION SITES. THE CURRENT INSTITUTION OF ENGINEERS AUSTRALIA AND LOCAL AUTHORITY GUIDELINES. THE CONTRACTOR SHALL TAKE ALL NECESSARY PRECAUTIONS TO CONTROL EROSION AND DOWNSTREAM SEDIMENTATION DURING ALL STAGES OF CONSTRUCTIONS INCLUDING THE MAINTENANCE PERIOD. NOTWITHSTANDING THE FINISHED EARTHWORK DESIGN SHOWN ON THE DRAWINGS THE CONTRACTOR IS RESPONSIBLE TO IMPLEMENT ADDITIONAL SEDIMENT CONTROL MEASURES AND DEVICES USING BEST PRACTICES AS NECESSARY TO MINIMISE THE QUANTITY LEAVING THE SITE DURING CONSTRUCTION AND UPON COMPLETION OF EARTHWORKS.
3. THE CONTRACTOR IS TO FOLLOW CONSTRUCTION PHASE AS OUTLINED IN THE CONSTRUCTION SEQUENCE/SILT MANAGEMENT PROGRAM. ALL SEDIMENT CONTROL DEVICES SHALL BE MONITORED, CLEANED AND/OR REPLACED WHENEVER THE ACCUMULATED SEDIMENT REDUCES THE CAPACITY BY 50%. ALL PERIMETER BANK/SWALES SHALL HAVE UNINTERRUPTED POSITIVE GRADE TO AN OUTLET. AT ALL TIMES THE CONTRACTOR SHALL MONITOR THE PREVAILING WEATHER CONDITIONS AND PROTECT ANY DOWNSTREAM CONSTRUCTION AND GULLY INLETS. INLETS TO HAVE SILT PROTECTION IN ACCORDANCE WITH KERB INLET PROTECTION DETAIL AT LOCATIONS SHOWN OR AS INDICATED BY THE ENGINEER.
4. PRIOR TO THE COMMENCEMENT OF EARTHWORKS, THE CONTRACTOR IS TO CARRY OUT SOIL TESTING (IF REQUIRED BY SUPERINTENDENT) TO DETERMINE THE DISPERSIVE CHARACTERISTICS OF THE SOIL AND RESULTS TO BE GIVEN TO THE ENGINEERS SO THE FINALIZATION OF THE EROSION AND SEDIMENT CONTROL PLAN CAN BE COMPLETE.
5. TOPSOIL SHALL BE STRIPPED AND STOCKPILED IN LOCATIONS AGREED WITH THE SUPERINTENDENT. CLEARING OF SITE AND STOCKPILE AREAS TO BE AS DIRECTED BY THE SUPERVISING ENGINEER. THE CONTRACTOR SHALL BE RESPONSIBLE FOR CONTROLLING DUST AT ALL TIMES INCLUDING WEEKENDS AND PUBLIC HOLIDAYS.
6. SUITABLE ACCESS SHALL BE PROVIDED TO ALLOW MAINTENANCE OF ALL SEDIMENT CONTROL DEVICES (IT IS TO BE NOTED THAT CLEARING SHALL ONLY OCCUR IN AREAS WHERE THERE IS NO OTHER ALTERNATIVE TO GAIN ACCESS TO THE LOCATION OF THE SEDIMENT CONTROL DEVICES). APPROVAL FOR REMOVAL OF PROTECTED SIZE VEGETATION MUST BE OBTAINED PRIOR TO CLEARING.
7. ROCK BUNDS TO BE PLACED AROUND ALL HEADWALLS DURING CONSTRUCTION.
8. 0.8m TURF IS TO BE PLACED BEHIND ON ALL BATTERS WITHIN PRIVATE OPEN SPACE STEEPER THAN 1:4 UNLESS OTHERWISE NOTED. THE EXTENT OF GRASSING SHALL BE DETERMINED BY THE ENGINEER AND SHALL BE SEEDDED, AS SPECIFIED, WITHIN 7 DAYS OF FINAL TRIMMING. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ENSURING THAT GRASS STRIKE RATES ARE ACHIEVED AT ON AND OFF MAINTENANCE INSPECTION IN ACCORDANCE WITH COUNCIL REQUIREMENTS.
9. TURF IS TO BE PLACED FROM BACK OF KERB TO ROAD RESERVE BOUNDARY ON ALL ROADS AFTER EARTHWORKS ARE COMPLETE.
10. GEO–FABRIC LINING OF CHANNELS AND CHECK DAMS MAY BE REQUIRED SUBJECT TO THE SITE CONDITIONS.
11. FILLING AND OR MAINTENANCE OF EXISTING AND OR SEDIMENT BASINS MAY REQUIRE FLOCCULATION.
12. BATTERS WITHIN PUBLIC OPEN SPACE TO BE VEGETATED IN ACCORDANCE WITH THE APPROVED OPEN SPACE MANAGEMENT PLAN (OSMP).
13. IT IS THE CONTRACTOR’S RESPONSIBILITY TO CLEAN OUT GPT’S, SEDIMENT FOREBAYS AND ALL OTHER SEDIMENT CONTROL DEVICES DURING CONSTRUCTION AND PRIOR BOTH ON AND OFF MAINTENANCE INSPECTIONS WITH CoGC. THE CONTRACTOR SHALL ALLOW FOR THE COST OF THESE WORKS WITHIN THEIR SUBMITTED TENDER PRICE.

CONSTRUCTION SEQUENCE/SILT MANAGEMENT PROGRAM

1. **PRE START**
a. ERECT SITE SIGNAGE, CONSTRUCT ENTRY AND EXIT POINT AS INDICATED CONSTRUCT VEHICLE WASH–DOWN AREA AND ASSOCIATED SILT MANAGEMENT DEVICES.
b. CONSTRUCT SITE OFFICE AND STORAGE COMPOUND AREA
c. ERECT SILT FENCE AT LOW POINTS OF THE SITE AS DEMONSTRATED
d. ERECT TEMPORARY TREE PROTECTION FENCING FOR VEGETATION TO BE RETAINED IN ACCORDANCE WITH AN OPW (TREE CLEARING) APPROVAL OR IN ACCORDANCE WITH AS4970 PROTECTION OF TREES ON DEVELOPMENT SITE.
e. CONSTRUCT ROCK CHECK DAMS AND SILT FENCE DOWN STREAM OF BASIN.
f. CONSTRUCT BASIN TO FULL DEPTH.
g. CONSTRUCT BALANCE OF BASIN IN CONJUNCTION WITH CLEARING AND BULK EARTHWORKS OPERATIONS.
h. BASIN TO BE UTILISED AS A TEMPORARY SEDIMENT BASIN. DO NOT FILL IN FILTRATION MATERIAL UNTIL CONSTRUCTION OF DEVELOPMENT IS COMPLETE.
2. **CLEARING AND BULK EARTHWORKS**
THERE SHALL BE NO CLEARING OF PROTECTED SITE VEGETATION WITHOUT AN APPROVED TREE CLEARING PLAN WHICH SHALL BE IN ACCORDANCE WITH AS4970. SILT FENCE, SAND BAGS AND EARTH RILLS WITHIN ROADS TO BE ERECTED AS INDICATED OR REQUIRED DURING CLEARING & EARTHWORKS. SUPERINTENDENT TO CONFIRM THE EXTENT OF CLEARING PRIOR TO COMMENCEMENT OF WORKS.
3. **CONSTRUCTION OF SEWER/ROOFWATER/ STORMWATER/SERVICES**
EXCAVATED MATERIAL TO BE PLACED ON HIGH SIDE OF TRENCH AND TO PROTECT PIPE WORK AND DIRECT SURFACE MATERIAL AWAY FROM EXCAVATIONS. TOPSOIL AND GRASS SEED AREAS IN ALLOTMENTS IMMEDIATELY AFTER COMPLETING THE SEWER AND ROOFWATER DRAINAGE CONSTRUCTION. DEPRESS GROUND AROUND TEMPORARY FIELD INLETS TO CREATE SILT POND.
4. **CONSTRUCTION – SEDIMENT BASINS**
SEDIMENT BASIN TO BE CONSTRUCTED TO THE EARTHWORK PROFILES SHOWN. STORMWATER OUTLET PIPES TO BE TEMPORARY BLOCKED OFF UNTIL DECOMMISSIONING OF SEDIMENT BASIN (SUBSEQUENT TO CONSTRUCTION OF ALL STAGES). PLACE SPOIL FROM SEDIMENT BASIN INTO ALLOCATED AREAS AS ENGINEERED FILL IN ACCORDANCE WITH THE STAGING ORDER. SEDIMENT BASIN SHALL ONLY BE REMOVED AFTER APPROVAL BY SUPERINTENDENT AND COUNCIL.
5. **CONSTRUCTION – STOCKPILING**
TEMPORARY SILT FENCE TO BE ERECTED 5m FROM TOE OF BATTER ON LOW SIDE OF STOCKPILING. STOCKPILE SITE TO BE CLEARED OF ADJACENT PROPERTY BOUNDARIES SO AS NOT TO CAUSE NUISANCE TO ADJOINING PROPERTIES. NO STOCKPILES ARE TO BE LOCATED WITHIN THE DRIP ZONE OR STRUCTURAL ROOT ZONE OF ANY RETAINED VEGETATION.
6. **CONSTRUCTION – ROADWORKS**
SILT FENCES TO ALLOTMENTS TO BE ERECTED. KERB INLET PROTECTION TO BE PROVIDED TO ALL GULLIES.
7. **CONSTRUCTION – ALLOTMENTS**
TOPSOIL AND SEED ALLOTMENTS. SILT FENCES TO ALLOTMENTS TO BE RE–ERECTED. COVERS TO GULLY GRATES TO BE REMOVED IF THE SUPERINTENDENT INDICATE THE GRASS STRIKE IS SUFFICIENT (80% WITHIN 30 CALENDAR DAYS OF FINAL ALLOTMENT RIMMING).
8. **POST CONSTRUCTION – ALLOTMENTS**
TOPSOIL AND GRASS SEED ALL ALLOTMENTS. COVERS TO GULLY GRATES TO BE REMOVED IF THE SUPERINTENDENT INDICATES THE GRASS STRIKE IS SUFFICIENT (80% WITHIN 30 CALENDAR DAYS OF FINAL ALLOTMENT TRIMMING).
9. **POST CONSTRUCTION – BASIN**
BASIN TO CONTINUE ACTING AS SEDIMENT BASIN UNTIL COMPLETION OF ALL STAGES.
10. **POST CONSTRUCTION – ROAD RESERVES**
TOPSOIL AND TURFING IS TO BE PROVIDED BEHIND KERB.
11. **MAINTENANCE (PRE TO POST CONSTRUCTION)**
THE SILT FENCES ARE TO BE INSPECTED WEEKLY. ANY REPAIRS REQUIRED ARE TO BE EFFECTED IMMEDIATELY. SILT AFTER RAIN IS TO BE CLEANED FROM STREETS AND ALLOTMENTS IMMEDIATELY AND CORRECTIVE ACTION TAKEN TO AVOID A RE–OCCURRENCE OF THE FAILURE.
12. **BASIN CONSTRUCTION**
PRIOR TO COMMENCING CONSTRUCTION OF THE DETENTION BASIN THE DIVERSION OF SURFACE WATER FROM THE PROPOSED WORK AREAS, USING MEASURES SUCH AS OPEN DRAINS/SUMPS, ARE REQUIRED TO AID IN SITE DE–WATERING. BASIN TO CONTINUE ACTING AS SEDIMENT BASIN UNTIL 85% OF CATCHMENT CONSTRUCTION IS COMPLETE. THE CLAY FILLING FOR THE BASIN WALLS SHALL BE PLACED IN HORIZONTAL LAYERS OF 200mm THICKNESS AND COMPACTED TO DENSITY RATIO WITHIN THE RANGE 98%–102% STANDARD COMPACTION (AS 1289.5.1.i). PLACEMENT MOISTURE CONTENT SHOULD BE WITHIN THE RANGE OMC –1% TO OMC –2% (WHERE OMC = OPTIMUM MOISTURE CONTENT FOR STANDARD COMPACTION). CONTRACTOR TO PROVIDE SAFETY FENCING TO BASIN DURING CONSTRUCTION AND APPROPRIATE SIGNAGE (PERMANENT OR TEMPORARY).



HES BASIN GENERAL NOTES

AUTO DOSER

1. PROVIDED AS EITHER 'FLOC BOX' OR 'IFOD-RAIN' DOSING UNIT OR APPROVED EQUIVALENT TO MANUFACTURERS SPECIFICATION.
2. DOSER AND SUPPLY OF FLOCCULANT TO BE PROVIDED ON LEVEL PAD 4mX4m WITHIN 10m OF DOSING POINT.
3. ALL-WEATHER ACCESS TRACK TO BE PROVIDED TO DOSER.
4. FLOCCULANT PROVIDED AS TURBICLEAR (ACH) OR APPROVED EQUIVALENT. IF ALTERNATIVE FLOCCULANT USED THEN THE BASIN SIZE IS TO BE INCREASED ACCORDING TO JAR SETTLEMENT TEST (REFER TO TABLE BELOW).

JAR SETTLEMENT AFTER 15 MINS	MULTIPLICATION FACTOR TO SETTLING ZONE
(mm)	VOLUME
50	x3.0
75	x2.0
100	x1.5
150	x1.0

BASIN CONSTRUCTION

MATERIALS

5. EARTH FILL: CLEAN SOIL WITH EMERSION CLASS 2(I), 3, 4 OR 5 AND FREE OF ROOTS, WOODY VEGETATION, ROCKS AND OTHER UNSUITABLE MATERIAL. SOIL WITH EMERSION CLASS 4 AND 5 MAY NOT BE SUITABLE DEPENDING ON PARTICLE SIZE DISTRIBUTION AND DEGREE OF DISPERSION. CLASS 2 (I) SHOULD ONLY BE USED UPON RECOMMENDATION FROM GEOTECHNICAL SPECIALIST.
6. SPILLWAY ROCK: HARD, ANGULAR, DURABLE, WEATHER RESISTANT AND EVENLY GRADED ROCK WITH 50% BY WEIGHT LARGER THAN THE SPECIFIED NOMINAL (D50) ROCK SIZE. LARGE ROCK SHOULD DOMINATE, WITH SUFFICIENT SMALL ROCK TO FILL THE VOIDS BETWEEN LARGER ROCK. THE DIAMETER OF THE LARGEST ROCK SHOULD BE NO LARGER THAN 1.5 TIMES THE NOMINAL ROCK SIZE. THE SPECIFIC GRAVITY SHOULD BE AT LEAST 2.5.
7. GEOTEXTILE FABRIC: HEAVY DUTY, NEEDLE-PUNCHED, NON-WOVEN CLOTH, MINIMUM 'BIDIM' A24 OR EQUIVALENT.

CONSTRUCTION

8. NOTWITHSTANDING ANY DESCRIPTION CONTAINED WITH APPROVED PLANS OR SPECIFICATIONS, THE CONTRACTOR SHALL BE RESPONSIBLE FOR SATISFYING THEMSELVES AS TO THE NATURE AND EXTENT OF THE SPECIFIED WORKS AND THE PHYSICAL AND LEGAL CONDITIONS UNDER WHICH THE WORKS WILL BE CARRIED OUT. THIS SHALL INCLUDE MEANS OF ACCESS, EXTENT OF CLEARING, NATURE OF THE MATERIALS TO BE EXCAVATED, TYPE AND SIZE OF MECHANICAL PLANT REQUIRED, LOCATION AND SUITABILITY OF WATER SUPPLY FOR CONSTRUCTION AND TESTING PURPOSES, AND ANY OTHER LIKELY MATTERS AFFECTING THE CONSTRUCTION OF THE WORKS.
9. REFER TO APPROVED PLANS FOR LOCATION, DIMENSIONS, AND CONSTRUCTION DETAILS. IF THERE ARE QUESTIONS OR PROBLEMS WITH THE LOCATION, DIMENSIONS, OR METHOD OF INSTALLATION, CONTACT THE ENGINEER OR RESPONSIBLE ON-SITE OFFICER FOR ASSISTANCE.
10. BEFORE STARTING ANY CLEARING OR CONSTRUCTION, ENSURE ALL THE NECESSARY MATERIALS AND COMPONENTS ARE ON THE SITE TO AVOID DELAYS IN COMPLETING THE SEDIMENT BASIN ONCE WORKS BEGIN.
11. INSTALL REQUIRED SHORT TERM SEDIMENT CONTROL MEASURES DOWNSTREAM OF THE PROPOSED EARTHWORKS TO CONTROL SEDIMENT RUNOFF DURING CONSTRUCTION OF THE BASIN.
12. THE AREA TO BE COVERED BY THE EMBANKMENT, BORROW PITS AND INCIDENTAL WORKS, TOGETHER WITH AN AREA EXTENDING BEYOND THE LIMITS OF EACH FOR A DISTANCE NOT EXCEEDING FIVE (5) METRES ALL AROUND MUST BE CLEARED OF ALL TREES, SCRUB, STUMPS, ROOTS, DEAD TIMBER AND RUBBISH AND DISPOSED OF IN A SUITABLE MANNER. DELAY CLEARING THE MAIN BASIN AREA UNTIL THE EMBANKMENT IS COMPLETE.
13. ENSURE ALL HOLES MADE BY GRUBBING WITHIN THE EMBANKMENT FOOTPRINT ARE FILLED WITH SOUND MATERIAL, ADEQUATELY COMPACTED, AND FINISHED FLUSH WITH THE NATURAL SURFACE.

CUT-OFF TRENCH

14. BEFORE CONSTRUCTION OF THE CUT-OFF TRENCH OR ANY ANCILLARY WORKS WITHIN THE EMBANKMENT FOOTPRINT, ALL GRASS GROWTH AND TOPSOIL MUST BE REMOVED FROM THE AREA TO BE OCCUPIED BY THE EMBANKMENT AND MUST BE DEPOSITED CLEAR OF THIS AREA AND RESERVED FOR TOPDRESSING THE COMPLETED EMBANKMENT.

15. EXCAVATE A CUT-OFF TRENCH ALONG THE CENTRE LINE OF THE EARTH FILL EMBANKMENT. CUT THE TRENCH TO STABLE SOIL MATERIAL, BUT IN NO CASE MAKE IT LESS THAN 600mm DEEP. THE CUT-OFF TRENCH MUST EXTEND INTO BOTH ABUTMENTS TO AT LEAST THE ELEVATION OF THE OUTLET SPILLWAY CREST. MAKE THE MINIMUM BOTTOM WIDTH WIDE ENOUGH TO PERMIT OPERATION OF THE EXCAVATION AND COMPACTION EQUIPMENT, BUT IN NO CASE LESS THAN 600mm. MAKE THE SIDE SLOPES OF THE TRENCH NO STEEPER THAN 1:2 (H:V).
16. ENSURE ALL WATER, LOOSE SOIL, AND ROCK ARE REMOVED FROM THE TRENCH BEFORE BACKFILLING COMMENCES. THE CUT-OFF TRENCH MUST BE BACKFILLED WITH SELECT EARTH—FILL OF THE TYPE SPECIFIED FOR THE EMBANKMENT, AND THIS SOIL MUST HAVE A MOISTURE CONTENT AND DEGREE OF COMPACTION THE SAME AS SPECIFIED FOR THE CORE ZONE.
17. MATERIAL EXCAVATED FROM THE CUT-OFF TRENCH MAY BE USED IN THE CONSTRUCTION OF THE EMBANKMENT PROVIDED IT IS SUITABLE AND IT IS PLACED IN THE CORRECT ZONE ACCORDING TO ITS CLASSIFICATION.

EMBANKMENT

18. SCARIFY AREAS ON WHICH FILL IS TO BE PLACED BEFORE PLACING THE FILL.
19. ENSURE ALL FILL MATERIAL USED TO FORM THE EMBANKMENT MEETS THE SPECIFICATIONS CERTIFIED BY A SOIL SCIENTIST OF GEOTECHNICAL SPECIALIST.
20. THE FILL MATERIAL MUST CONTAIN SUFFICIENT MOISTURE SO IT CAN BE FORMED BY HAND INTO A BALL WITHOUT CRUMBLING. IF WATER CAN BE SQUEEZED OUT OF THE BALL, IT IS TOO WET FOR PROPER COMPACTION. PLACE FILL MATERIAL IN 150 TO 200mm CONTINUOUS LAYERS OVER THE ENTIRE LENGTH OF THE FILL AREA AND THEN COMPACT BEFORE PLACEMENT OF FURTHER FILL.
21. UNLESS SPECIFIED ON THE APPROVED PLANS, COMPACT THE SOIL AT ABOUT 1% TO 2% WET OPTIMUM AND TO 95% MODIFIED OR 100% STANDARD COMPACTION.
22. WHERE BOTH DISPERSIVE AND NON-DISPERSIVE CLASSIFIED EARTH-FILL MATERIALS ARE AVAILABLE, NON-DISPERSIVE EARTH-FILL MUST BE USED IN THE CORE ZONE. THE REMAINING CLASSIFIED EARTH-FILL MATERIALS MUST ONLY BE USED AS DIRECTED BY THE SITE SUPERINTENDENT.
23. WHERE SPECIFIED, CONSTRUCT THE EMBANKMENT TO AN ELEVATION 10% HIGHER THAN THE DESIGN HEIGHT TO ALLOW FOR SETTLING; OTHERWISE FINISHED DIMENSIONS OF THE EMBANKMENT AFTER SPREADING OF TOPSOIL MUST CONFORM TO THE DRAWING WITH A TOLERANCE OF 75mm FROM SPECIFIED DIMENSIONS.
24. ENSURE DEBRIS AND OTHER UNSUITABLE BUILDING WASTE IS NOT PLACED WITHIN THE EARTH EMBANKMENT.
25. AFTER COMPLETION OF THE EMBANKMENT ALL LOOSE UNCOMPACTED EARTH-FILL MATERIAL ON THE UPSTREAM AND DOWNSTREAM BATTER MUST BE REMOVED PRIOR TO SPREADING TOPSOIL.
26. TOPSOIL AND RE-VEGETATE/STABILISE ALL EXPOSED EARTH AS DIRECTED WITHIN THE APPROVED PLANS.

ESTABLISHING THE SETTLING POND

27. THE AREA TO BE COVERED BY THE STORED WATER OUTSIDE OF THE LIMITS OF THE BORROW PITS MUST BE CLEARED OF RUBBISH. TREES MUST BE CUT DOWN STUMP HIGH AND REMOVED FROM THE IMMEDIATE VICINITY OF THE WORK.
28. ESTABLISH ALL REQUIRED INFLOW CHUTES AND INLET BAFFLES IF SPECIFIED TO ENABLE WATER TO DISCHARGE INTO THE BASIN IN A MANNER THAT WILL NOT CAUSE SOIL EROSION OR THE RE-SUSPENSION OF SETTLED SEDIMENT.
29. INSTALL A SEDIMENT STORAGE LEVEL MARKER POST WITH A CROSS MEMBER SET JUST BELOW THE TOP OF THE SEDIMENT STORAGE ZONE (AS SPECIFIED ON THE APPROVED PLANS). USE AT LEAST A 75mm WIDE POST FIRMLY SET INTO THE BASIN FLOOR.
30. IF SPECIFIED, INSTALL INTERNAL SETTLING POND BAFFLES. ENSURE THE CREST OF THESE BAFFLES IS SET LEVEL WITH, OR JUST BELOW, THE ELEVATION OF THE EMERGENCY SPILLWAY.
31. INSTALL ALL APPROPRIATE MEASURES TO MINIMISE SAFETY RISK TO ON-SITE PERSONNEL AND THE PUBLIC CAUSED BY THE PRESENCE OF THE SETTLING POND. AVOID STEEP, SMOOTH INTERNAL SLOPES. APPROPRIATELY FENCE THE SETTLING POND AND POST WARNING SIGNS IF UNSUPERVISED PUBLIC ACCESS IS LIKELY OR THERE IS CONSIDERED TO BE AN UNACCEPTABLE RISK TO THE PUBLIC.

SPILLWAY CONSTRUCTION

3. THE SPILLWAY MUST BE EXCAVATED AS SHOWN ON THE PLANS, AND THE EXCAVATED MATERIAL IF CLASSIFIED AS SUITABLE, MUST BE USED IN THE EMBANKMENT, AND IF NOT SUITABLE IT MUST BE DISPOSED OF INTO SPOIL HEAPS.
33. ENSURE EXCAVATED DIMENSIONS ALLOW ADEQUATE BOXING-OUT SUCH THAT THE SPECIFIED ELEVATIONS, GRADES, CHUTE WIDTH, AND ENTRANCE AND EXIT SLOPES FOR THE EMERGENCY SPILLWAY WILL BE ACHIEVED AFTER PLACEMENT OF THE ROCK OR OTHER SCOUR PROTECTION MEASURES AS SPECIFIED IN THE PLANS.
34. PLACE SPECIFIED SCOUR PROTECTION MEASURES ON THE EMERGENCY SPILLWAY. ENSURE THE FINISHED GRADE BLENDS WITH THE SURROUNDING AREA TO ALLOW A SMOOTH FLOW TRANSITION FROM SPILLWAY TO DOWNSTREAM CHANNEL.
35. IF A SYNTHETIC FILTER FABRIC UNDERLAY IS SPECIFIED, PLACE THE FABRIC DIRECTLY ON THE PREPARED FOUNDATION. IF MORE THAN ONE SHEET OF FILTER FABRIC IS REQUIRED, OVERLAP THE EDGES BY AT LEAST 300mm AND PLACE ANCHOR PINS AT MINIMUM 1m SPACING ALONG THE OVERLAP. BURY THE UPSTREAM END OF THE FILTER FABRIC A MINIMUM 300mm BELOW GROUND AND WHERE NECESSARY, BURY THE LOWER END OF THE FABRIC OR OVERLAP A MINIMUM 300mm OVER THE NEXT DOWNSTREAM SECTION AS REQUIRED. ENSURE THE FILTER FABRIC EXTENDS AT LEAST 1000mm UPSTREAM OF THE SPILLWAY CREST.
36. TAKE CARE NOT TO DAMAGE THE FABRIC DURING OR AFTER PLACEMENT. IF DAMAGE OCCURS, REMOVE THE ROCK AND REPAIR THE SHEET BY ADDING ANOTHER LAYER OF FABRIC WITH A MINIMUM OVERLAP OF 300mm AROUND THE DAMAGED AREA. IF EXTENSIVE DAMAGE IS SUSPECTED, REMOVE AND REPLACE THE ENTIRE SHEET.
37. WHERE LARGE ROCK IS USED, OR MACHINE PLACEMENT IS DIFFICULT, A MINIMUM 100mm LAYER OF FINE GRAVEL, AGGREGATE, OR SAND MAY BE NEEDED TO PROTECT THE FABRIC.
38. PLACEMENT OF ROCK SHOULD FOLLOW IMMEDIATELY AFTER PLACEMENT OF THE FILTER FABRIC. PLACE ROCK SO THAT IT FORMS A DENSE, WELL GRADED MASS OF ROCK WITH A MINIMUM OF VOIDS. THE DESIRED DISTRIBUTION OF ROCK THROUGHOUT THE MASS MAY BE OBTAINED BY SELECTIVE LOADING AT THE QUARRY AND CONTROLLED DUMPING DURING FINAL PLACEMENT.
39. THE FINISHED SLOPE SHOULD BE FREE OF POCKETS OF SMALL ROCK OR CLUSTERS OF LARGE ROCKS. HAND PLACING MAY BE NECESSARY TO ACHIEVE THE PROPER DISTRIBUTION OF ROCK SIZES TO PRODUCE A RELATIVELY SMOOTH, UNIFORM SURFACE. THE FINISHED GRADE OF THE ROCK SHOULD BLEND WITH THE SURROUNDING AREA. NO OVER FALL OR PROTRUSION OF ROCK SHOULD BE APPARENT.
40. ENSURE THAT THE FINAL ARRANGEMENT OF THE SPILLWAY CREST WILL NOT PROMOTE EXCESSIVE FLOW THROUGH THE ROCK SUCH THAT THE WATER CAN BE RETAINED WITHIN THE SETTLING BASIN AT THE ELEVATION NO LESS THAN 50mm ABOVE OF BELOW THE NOMINATED SPILLWAY CREST ELEVATION.

	OVERLAND FLOW PATH/SWALE
	CATCH DRAIN (NOT LINED)
	DIVERSION CHANNEL
	TABLE DRAIN
	STREAM INVERT
	CATCH DRAIN (CONCRETE LINED)
	SUBSOIL DRAINAGE
	SAWCUT
	SEDIMENT FENCE
	CHAINWIRE FENCE
	WOODEN FENCE
	BRIFEN WIRE SAFETY BARRIER
	GUARDRAIL (STANDARD)
	RETAINING WALL (PILED)
	RETAINING WALL (WITH FOOTINGS)
	RETAINING WALL
	ROCKBLOCK RETAINING WALL
	TOP OF BATTER / BERM
	NOISE WALL
	EDGE OF VEGETATION
	PROPERTY LINE
	PROPERTY LINE WITH FENCE
	PROPOSED KERB, FOOTPATH
	CONTROL LINE / CENTER OF ROAD
	RAILWAY (MAJOR)
	RAILWAY (MINOR)
	EXISTING PROPERTY LINE
	EXISTING PROPERTY LINE WITH FENCE
	EXISTING KERB, FOOTPATH
	EXISTING EDGE OF BITUMEN
	EXISTING RAILWAY (MAJOR)
	EXISTING RAILWAY (MINOR)
	LIMIT OF WORKS
	LIMIT OF SITE
	CATCHMENT BOUNDARY
	EXISTING CONTOURS
	DESIGN CONTOURS

— RM — RM — RM —	PROPOSED RISING MAIN
— S — S — S — S — S — S — S — S —	PROPOSED SEWER
— SW — SW — SW — SW — SW — SW — SW — SW —	PROPOSED STORMWATER
— RW — RW — RW — RW — RW — RW — RW — RW —	PROPOSED ROOFWATER
— SS — SS — SS — SS — SS — SS — SS — SS —	PROPOSED ROOFWATER
— W — W — W — W — W — W — W — W —	PROPOSED SUBSOIL
— W — W — W — W — W — W — W — W —	PROPOSED WATER
— RW — RW — RW — RW — RW — RW — RW — RW —	PROPOSED RECYCLED WATER
— OIL — OIL — OIL — OIL — OIL — OIL — OIL — OIL —	PROPOSED OIL
— F — F — F — F — F — F — F — F —	PROPOSED FUEL
— G — G — G — G — G — G — G — G —	PROPOSED GAS
— P — P — P — P — P — P — P — P —	PROPOSED PIPELINE
— HV — HV — HV — HV — HV — HV — HV — HV —	PROPOSED HIGH VOLTAGE ELECTRICITY
— E — E — E — E — E — E — E — E —	PROPOSED UNDERGROUND ELECTRICITY
— E — E — E — E — E — E — E — E —	PROPOSED OVERHEAD ELECTRICITY
— L — L — L — L — L — L — L — L —	PROPOSED LIGHTING
— T — T — T — T — T — T — T — T —	PROPOSED TELSTRA
— C — C — C — C — C — C — C — C —	PROPOSED COMMUNICATIONS
— GE — GE — GE — GE — GE — GE — GE — GE —	PROPOSED GAS, ELECT
— GT — GT — GT — GT — GT — GT — GT — GT —	PROPOSED GAS, TELSTRA
— ET — ET — ET — ET — ET — ET — ET — ET —	PROPOSED ELECT, TELSTRA
— GET — GET — GET — GET — GET — GET — GET — GET —	PROPOSED GAS, ELECTRICITY, TELSTRA
— RM — RM — RM —	EXISTING RISING MAIN
— S — S — S — S — S — S — S — S —	EXISTING SEWER
— SW — SW — SW — SW — SW — SW — SW — SW —	EXISTING STORMWATER
— RW — RW — RW — RW — RW — RW — RW — RW —	EXISTING ROOFWATER
— SS — SS — SS — SS — SS — SS — SS — SS —	EXISTING SUBSOIL
— W — W — W — W — W — W — W — W —	EXISTING WATER
— RW — RW — RW — RW — RW — RW — RW — RW —	EXISTING RECYCLED WATER
— OIL — OIL — OIL — OIL — OIL — OIL — OIL — OIL —	EXISTING OIL
— F — F — F — F — F — F — F — F —	EXISTING FUEL
— G — G — G — G — G — G — G — G —	EXISTING GAS
— P — P — P — P — P — P — P — P —	EXISTING PIPELINE
— HV — HV — HV — HV — HV — HV — HV — HV —	EXISTING HIGH VOLTAGE ELECTRICITY
— E — E — E — E — E — E — E — E —	EXISTING UNDERGROUND ELECTRICITY
— E — E — E — E — E — E — E — E —	EXISTING OVERHEAD ELECTRICITY
— L — L — L — L — L — L — L — L —	EXISTING LIGHTING
— T — T — T — T — T — T — T — T —	EXISTING TELSTRA
— C — C — C — C — C — C — C — C —	EXISTING COMMUNICATIONS
— GE — GE — GE — GE — GE — GE — GE — GE —	EXISTING GAS, ELECT
— GT — GT — GT — GT — GT — GT — GT — GT —	EXISTING GAS, TELSTRA
— ET — ET — ET — ET — ET — ET — ET — ET —	EXISTING ELECT, TELSTRA
— GET — GET — GET — GET — GET — GET — GET — GET —	EXISTING GAS, ELECTRICITY, TELSTRA

— RM — X — RM — X — RM — X — RM — X —	DEMOLISH RISING MAIN
— S — X — S — X — S — X — S — X —	DEMOLISH SEWER
— SW — X — SW — X — SW — X — SW — X —	DEMOLISH STORMWATER
— SS — X — SS — X — SS — X — SS — X —	DEMOLISH SUBSOIL
— W — X — W — X — W — X — W — X —	DEMOLISH WATER
— OIL — X — OIL — X — OIL — X — OIL — X —	DEMOLISH OIL
— F — X — F — X — F — X — F — X —	DEMOLISH FUEL
— HV — X — HV — X — HV — X — HV — X —	DEMOLISH HIGH VOLTAGE ELECTRICITY
— E — X — E — X — E — X — E — X —	DEMOLISH UNDERGROUND ELECTRICITY
— E — X — E — X — E — X — E — X —	DEMOLISH OVERHEAD ELECTRICITY
— L — X — L — X — L — X — L — X —	DEMOLISH LIGHTING
— G — X — G — X — G — X — G — X —	DEMOLISH GAS
— P — X — P — X — P — X — P — X —	DEMOLISH PIPELINE
— T — X — T — X — T — X — T — X —	DEMOLISH TELSTRA
— C — X — C — X — C — X — C — X —	DEMOLISH COMMUNICATIONS

BK(A)	BARRIER KERB (A)
BK(B)	BARRIER KERB (B)
BK(G)	BARRIER KERB (G)
MK(D)	MOUNTABLE KERB (D)
SMK(C)	SEMI MOUNTABLE KERB (C)
ER(E)	EDGE RESTRAINT (E)
KER(F)	KERB EDGE RESTRAINT (F)
RK&C(H)	ROLL TOP KERB & CHANNEL (H)
BK&C(J)	BARRIER KERB & CHANNEL (J)
ERH	KERB EDGE RESTRAINT (HIGH)
ERL	KERB EDGE RESTRAINT (LOW)
CS(K/L)	CHANNEL SECTION (K/L)
PMB	PRECAST MOTOR BED
DD	DISH DRAIN
K&G	KERB AND GUTTER
K&T	KERB AND TOE
KO	KERB ONLY
MK	MOUNTABLE KERB
RK	ROLL KERB
	EXISTING SIGN
	PROPOSED SIGN
	PROPOSED ROAD EDGE GUIDE POST
	EXISTING BIN
	POST BOX
	TELEPHONE BOX
	TELSTRA PIT
	TELSTRA MARKER POST
	WATER METER
	WATER VALVE
	FIRE HYDRANT
	WATER TAP
	WATER HYDRANT
	WATER TEE
	WATER REDUCER
	WATER ENDCAP
	WATER CONNECTION
	WATER CROSSING
	WATER DIEL
	SEWER MANHOLE
	SEWER RODDING END
	SEWER BEND
	SEWER MAINTENANCE SHAFT
	SEWER 'T' END
	SEWER SLUICE VALVE
	SEWER PIT
	SEWER PUMP STATION
	TEMPORARY SEWER PUMP STATION
	SEWER / STORMWATER PIT NO/LINE
	SETOUT POINT
	OFFSET PIT WITH GRATE
	IN LINE PIT WITH GRATE
	JUNCTION PIT
	LETTERBOX PIT
	GRATED INLET PIT
	MANHOLE
	GULLY PIT (LIP INLINE) BARRIER KERB
	GULLY PIT (LIP INLINE) BARRIER KERB
	GULLY PIT (LIP INLINE) ROLL TOP KERB
	GULLY PIT (LIP INLINE) ROLL TOP KERB
	GULLY PIT (KERB INLINE) – GRADE
	GULLY PIT (KERB INLINE) – SAG
	INFILTRATION TRENCH
	HEADWALL
	GROSS POLLUTANT TRAP
	STORMWATER CHAMBER

	POWER POLE
	POWER POLE WITH LIGHT
	LIGHT POLE
	STAY POLE
	LIGHT POLE WITH EXTENSION
	ELECTRICAL INSPECTION BOX
	ELECTRICAL POLE
	ELECTRICAL TURRET
	TRAFFIC SIGNAL
	MAIN ROADS PIT
	TANGENT POINT
	KERB RETURN NO.
	PRAM RAMP
	GRAVEL ROCK CHECK DAM
	MESH & GRAVEL INLET FILTER
	STORMWATER INLET FILTER
	DIRECTION OF OVERLAND FLOW
	VEHICLE SHAKEDOWN
	GATE
	NOT IN SCOPE OF WORKS
	DEMOLITION
	PROPOSED CONCRETE FOOTPATH
	SCOUR PROTECTION
	TREES
	TADPOLE

Project:
LOT 120-122 BOUNDARY
REALIGNMENT

Site Address:
HOMESTEAD DRIVE,
STAPYLTON QLD 4207

THIS DRAWING IS INTENDED TO
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RPD:

Lot:	121 & 122
Plan:	SP316168
Local Authority:	CITY OF GOLD COAST COUNCIL
Level Datum:	AHD
Meridian:	-
Contour Interval:	-
PSM:	-
RL:	-

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LEGEND

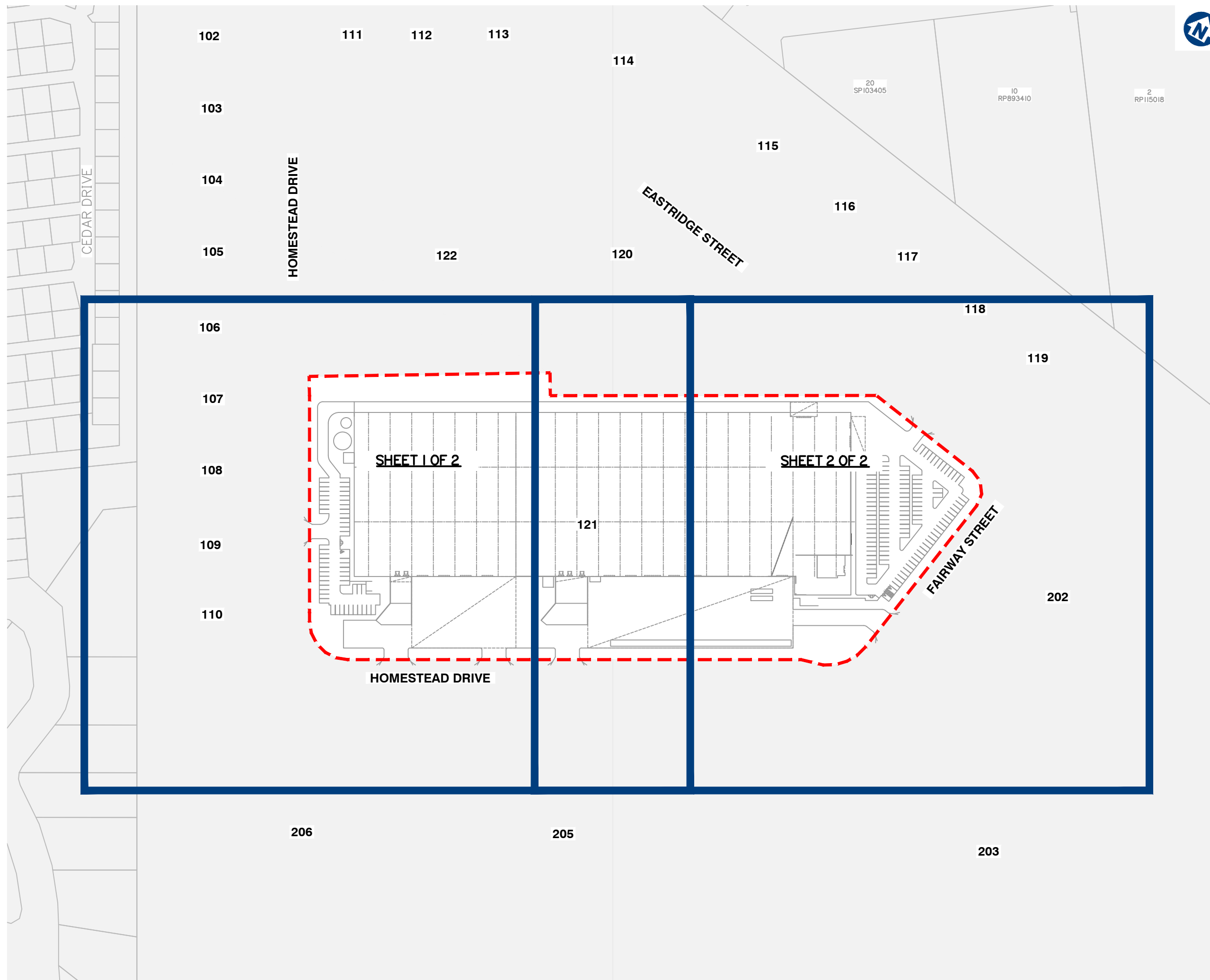
A	21-12-2021	ORIGINAL ISSUE		DV	MG
Issue	Date	Description		DRN	CHK

NOT APPLICABLE

Scale at A1: NTS

Designed:	DV
Drafted:	DV
Approved:	MG
RPEQ:	16939
Signed:	
Date:	14-01-2022

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DRAWING TITLE

KEY PLAN LAYOUT

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SCALE IN METRES



1:1000 (FULL SIZE A1)
1:2000 (HALF SIZE A3)

Scale at A1:	1:1000
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Designed:	DV
Drafted:	DV
Approved:	MG
RPEQ:	16939
Signed:	
Date:	14-01-2022

Drawing No:	Rev. No:
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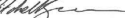
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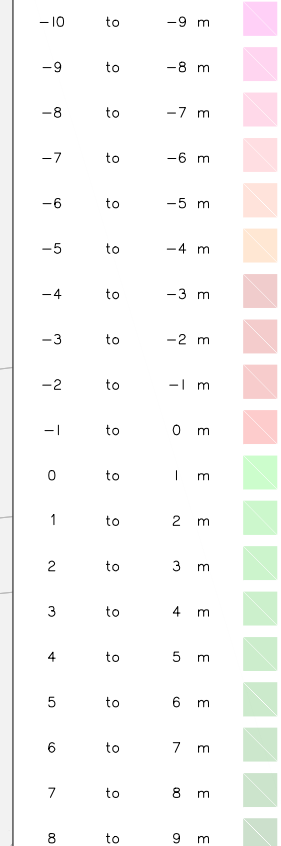
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DRAWING TITLE
SEDIMENT AND
EROSION CONTROL
PLAN SHEET 2 OF 2

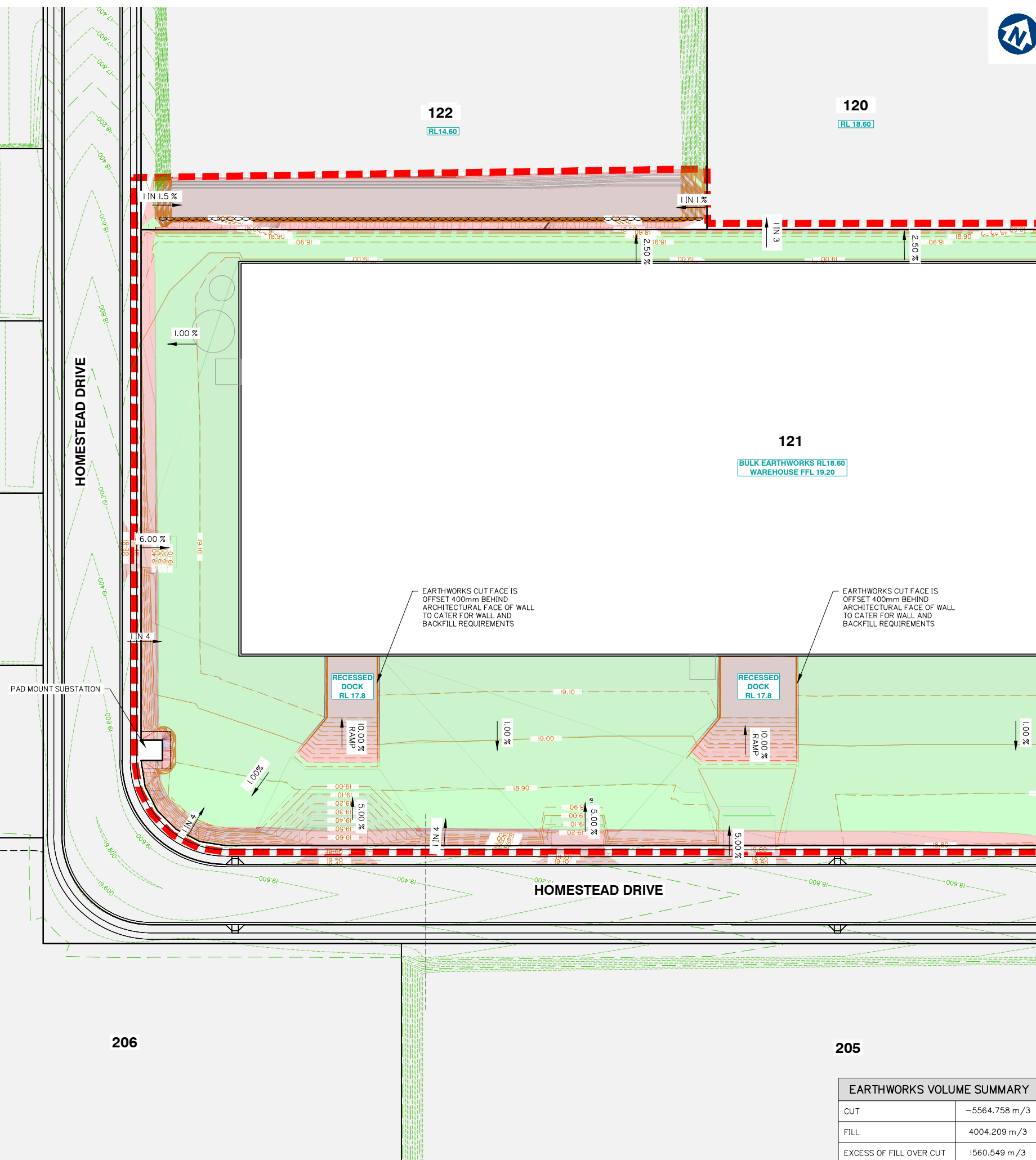
A	21-12-2021	ORIGINAL ISSUE	DV	MG
Issue	Date	Description	DRN	CHK

Designed:	DV
Drafted:	DV
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RPEQ:	16939
Signed:	
Date:	14-01-2022

Drawing No:	Rev. No:
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114
RP85579317
RP807576

18
RP807576



EARTHWORKS VOLUME SUMMARY	
CUT	-5564.758 m ³
FILL	4004.209 m ³
EXCESS OF FILL OVER CUT	1560.549 m ³



Client:



Project:

LOT 120-122 BOUNDARY REALIGNMENT

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DRAWING TITLE
BULK EARTHWORKS CUT
AND FILL LAYOUT PLAN
SHEET 1 OF 2

A	21-12-2021		ORIGINAL ISSUE	DV	MO
Insp	Ten			DPH	CH

SCALE IN METRES



1:500 (FULL SIZE A1)
1:1000 (HALF SIZE A3)

Scale at A1: 1:500

Designed:	DV
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Drafted:	DV
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Approved:	MG
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RPEQ:	16939
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Signed:	
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Date:	13-01-2022
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Drawing No:	Rev. No:
6098 ENG BE2 050	A

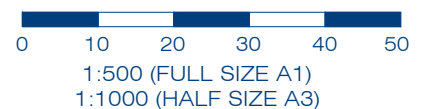
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BULK EARTHWORKS CUT AND FILL LAYOUT PLAN

DRAWING TITLE
BULK EARTHWORKS CUT
AND FILL LAYOUT PLAN
SHEET 2 OF 2

A	21-12-2021	ORIGINAL ISSUE	DV	MG
Issue	Date	Description	DRN	CHK

SCALE IN METRES



Scale at A1:	1:500
Designed:	DV
Drafted:	DV
Approved:	MG
RPEQ:	16939
Signed:	
Date:	14-01-2022



Project:

LOT 120-122 BOUNDARY
REALIGNMENT

te Address:
HOMESTEAD DRIVE,
STAPYLTON QLD 4207

THIS DRAWING IS INTENDED TO
BE PRINTED IN COLOUR

RPD:
 Plot: 121 & 122
 Plan: SP316168
 Local Authority: CITY OF GOLD COAST
 COUNCIL
 Level Datum: AHD
 Meridian: -
 Contour Interval: -
 WSM: -
 RL: -

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DRAWING TITLE
FINISHED BULK
EARTHWORKS SURFACE
LEVEL PLAN SHEET 1 OF 2

21-12-2021	ORIGINAL ISSUE		DV
Date	Description		DRN

SCALE IN METRES



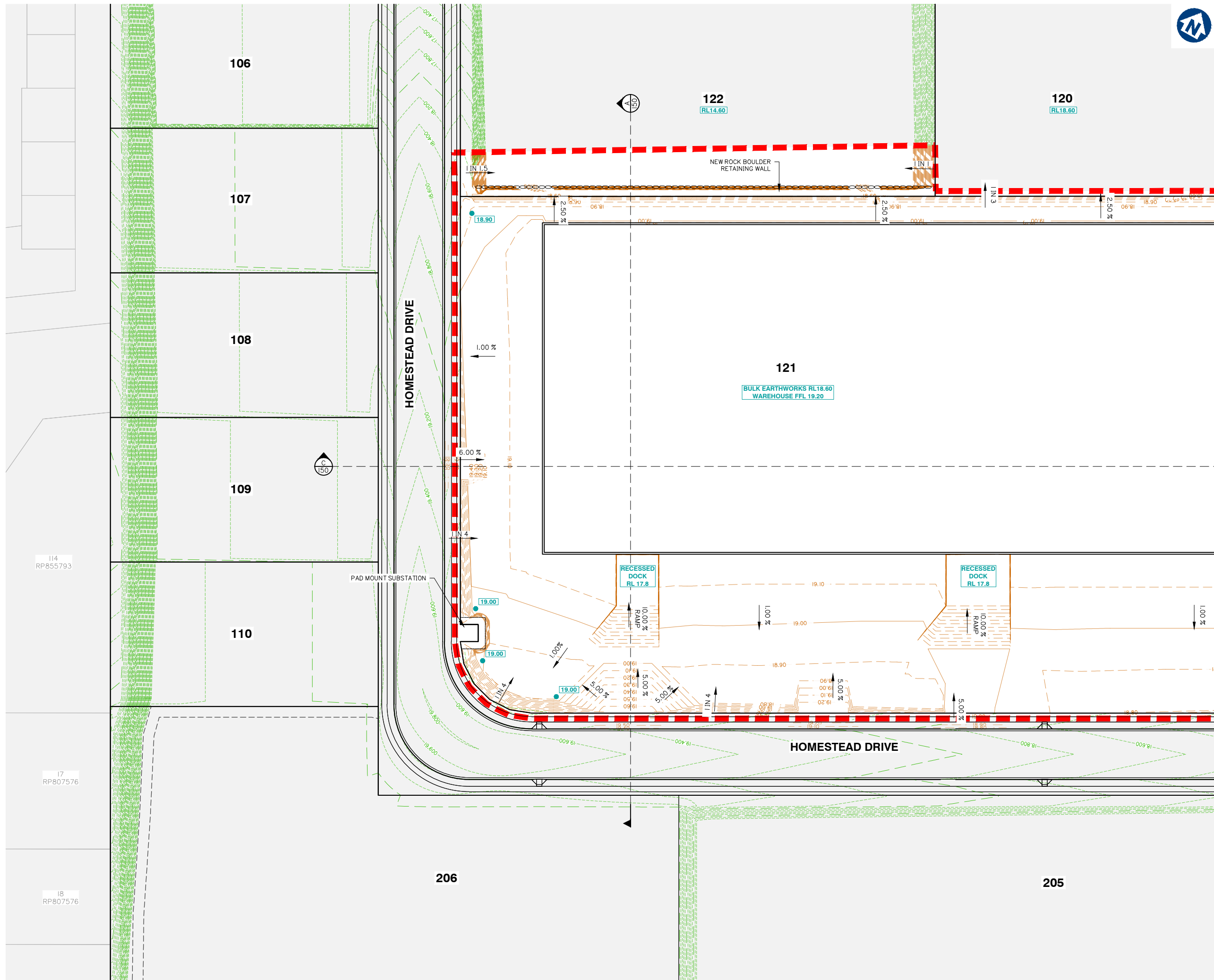
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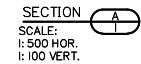
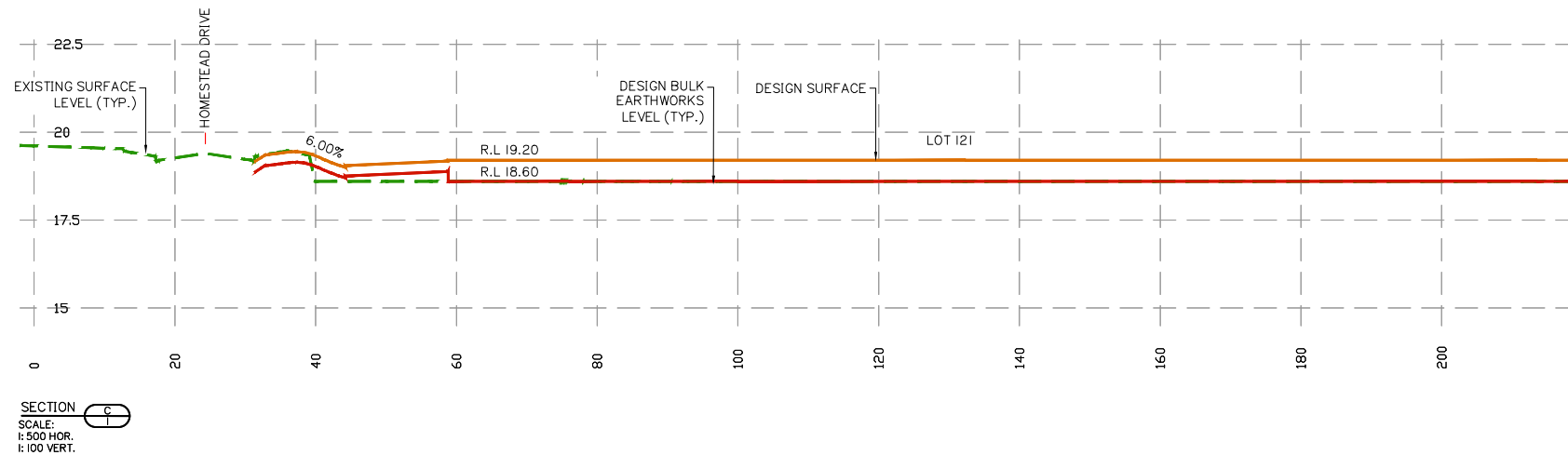
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Designed:	DV
Drafted:	DV
Approved:	MG
PEQ:	16939
Signed:	
Date:	14-01-2022

Drawing No:	Rev. N
098 ENG BE 100	A

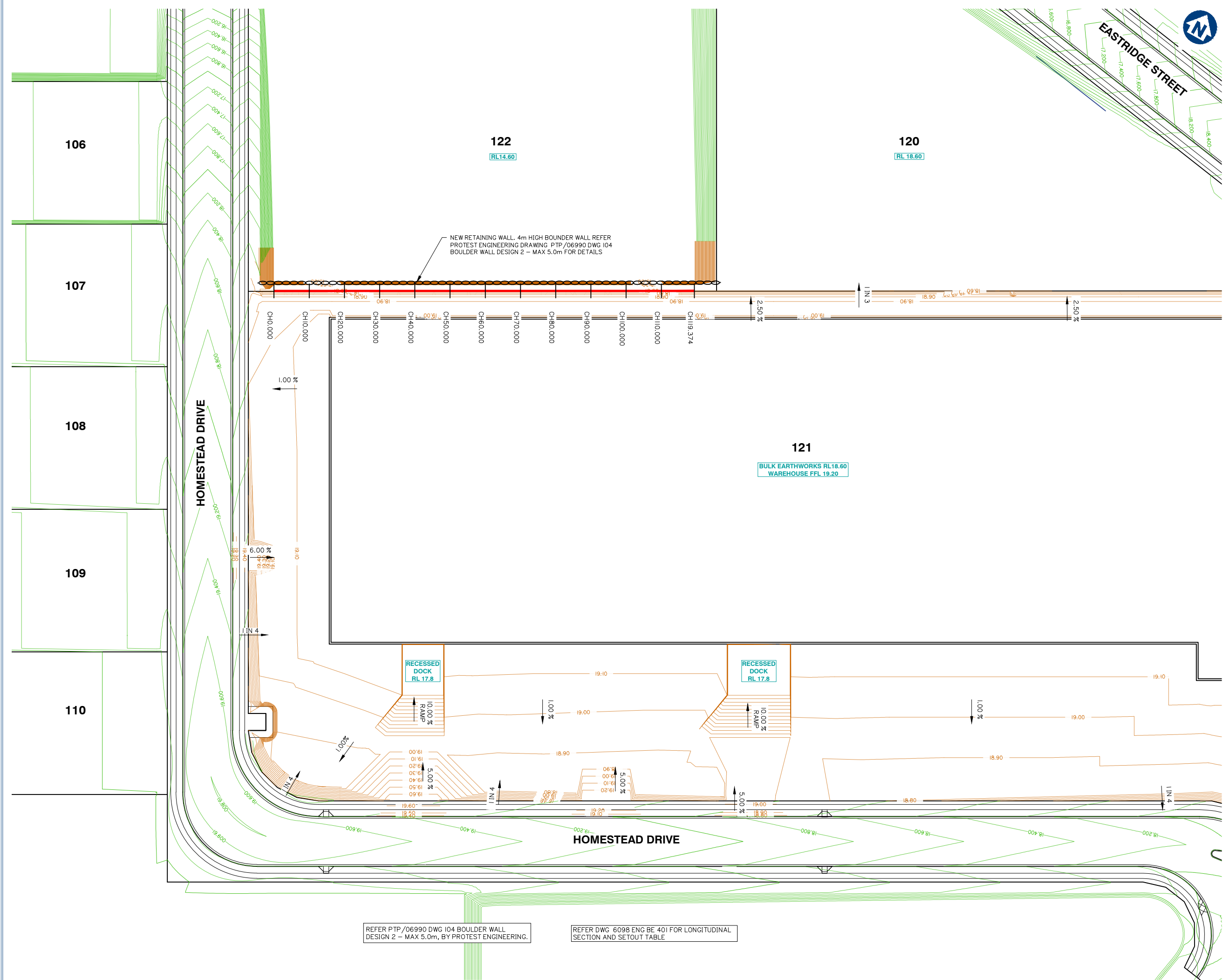






A	21-12-2021	ORIGINAL ISSUE	DV	MG
Issue	Date	Description	DRN	Chk

Designed:	DV
Drafted:	DV
Approved:	MG
RPEQ:	16939
Signed:	
Date:	14-01-2022



REFER PTP/06990 DWG 104 BOULDER WALL DESIGN 2 – MAX 5.0m, BY PROTEST ENGINEERING.

REFER DWG 6098 ENG BE 401 FOR LONGITUDINAL SECTION AND SETOUT TABLE

RETAINING WALL CONTROL LINE LAYOUT PLAN

Client:



FPI QUEENSLAND PTY. LTD.

Project:

LOT 120-122 BOUNDARY
REALIGNMENT

Site Address:

HOMESTEAD DRIVE,
STAPYLTON QLD 4207

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RPD:

Lot: 121 & 122
Plan: SP316168
Local Authority: CITY OF GOLD COAST
COUNCIL
Level Datum: AHD
Meridian: -
Contour Interval: -
PSM: -
RL: -

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DRAWING TITLE
BOULDER RETAINING
WALL CONTROL LINE
LAYOUT PLAN

Issue	Date	Original Issue Description	DV	MG
A	12-01-2022	ORIGINAL ISSUE		

SCALE IN METRES



1:500 (FULL SIZE A1)
1:1000 (HALF SIZE A3)

Scale at A1: 1:500

Designed:	DV
Drafted:	DV
Approved:	MG
RPEQ:	16939
Signed:	
Date:	12-01-2022

Drawing No:
6098 ENG BE2 400

Rev. No:
A

