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PLANS AND DOCUMENTS
referred to in the PDA
DEVELOPMENT APPROVAL

Approval no: DEV2018/988

Date: 30 July 2019

Queensland Government

Bushman + Wyatt

In association with:

HDG HARRISON DEVELOPMENT GROUP

robertsday

BMT WBM

saunders havill group

Cardno

THE CONSULTANCY BUREAU

CRGACOUSTICS

Steven Hosking Surveys Pty Ltd

WATER SUPPLY
INFRASTRUCTURE MASTER PLAN

To support the Reconfiguration of a Lot (Permissible) Development Permit Application for Urban Residential Development.

Address:	Lot 24 Bushman Drive and 68 Wyatt Road, Riverbend Qld 4280
Lot & RP Description:	Lot 24 on SP142997 Lot 1 on RP49296
Parish:	Maclean
County:	Stanley
Assessment Manager:	MEDQ
MUS Reference:	23305-ALL
Prepared for:	PACIFIQ

DATE: 14th February 2019

CIVIL ENGINEERING TOWN PLANNING PROJECT COORDINATION

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Prepared for:

PACIFIQ

Property Address:
Lot 24 Bushman Drive and
68 Wyatt Road,
Riverbend Qld 4280

Real Property Descriptions:
Lot 24 on SP142997
Lot 1 on RP49296

DOCUMENT CONTROL

Report Summary

Document Details

Project Reference:	23305-ALL
Document Title:	'Bushman & Wyatt' | Water Supply IMP

Distribution

Revision	Date	Author	Reviewed	Distributed To
DRAFT	20.09.2018	MM	AS	Client
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Signed:

Warren Morton (RPEQ 4706)

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List of Attachments

Attachment A **Subdivision Proposal Plan**
(Dwg No. 23305-PP-S001, Rev A dated 12.11.2018) (Sheet 1 only)
Prepared by Mortons-Urban Solutions

Attachment B **Prelodgement Meeting Minutes**
(Minutes dated 15.06.2018)
Prepared by EDQ

Attachment C **Recommended Water Desired Standards of Service**
(Appendix D – Master Planning Review – Review of Design Desired Standards of Service, Document Number: 7600-00-P-REP-PL-8211)
Prepared by Logan Water Infrastructure Alliance

Attachment D **External Water Network Staging Plan**
(Dwg. No. 23305-WNA-720, Revision A dated 15.11.2018)
Prepared by Mortons – Urban Solutions

Attachment E **Water Network Calculation Table**
(Dwg. No. 23305-705, Revision A dated 15.11.2018)
Prepared by Mortons – Urban Solutions

Attachment F **EDQ's Previously Advised Boundary Conditions**
(Email dated 25.01.2018)
Prepared by EDQ

Attachment G **Water Network Plan & Tables**
(Dwg. No. 23305-WNA-700, Rev A dated 15.11.2018 – 2 Sheets)
(Dwg. No. 23305-WNA-710, Rev A dated 15.11.2018)
(Dwg. No. 23305-WNA-715, Rev A dated 15.11.2018)
Prepared by Mortons – Urban Solutions

1.0 PURPOSE OF THE INFRASTRUCTURE MASTER PLAN

The purpose of this Infrastructure Master Plan (IMP) is to address the Greater Flagstone Development Scheme and direct the provision of infrastructure as outlined in the Reconfiguration of a Lot (Development Permit) application for 314 lots at 'Bushman & Wyatt'.

During a pre-lodgement meeting Economic Development Queensland requested the inclusion of a:

- **Water Supply Infrastructure Master Plan**; and a
- Sewer Supply Infrastructure Master Plan.

Infrastructure Master Plans are required to:

- Be for the whole of the site;
- Demonstrate compliance with PDA Guideline No. 13 – Engineering Standards;
- Detail applicable infrastructure networks both within an external to the site, and identify where works are required to connect existing or future networks on the site into existing or future sub-regional networks;
- Identify the overall planning and delivery principles for the infrastructure works, required to support the ultimate development of the site; and
- Identify how and when each component of the infrastructure will be provided (including dedication/transfer), or if not known, how and when provision of that infrastructure is to be determined.

This IMP covers the 'Bushman and Wyatt' development within the Greater Flagstone Priority Development Area (GFPDA). This IMP should be considered a 'living' document and may require updating from time to time.

1.1 PDA Guideline No. 13 Engineering Standards

PDA Guideline 13 – Engineering Standards requires the water and sewer is designed and constructed in accordance with the SEQ Water Supply and Sewerage Design and Construction Code.

The requirements of Guideline No. 13 and the SEQ Code have been addressed in this IMP.

2.0 'BUSHMAN & WYATT'

Bushman and Wyatt is a 314 lot subdivision within the Greater Flagstone Priority Development Area (GFPDA). The development will become a community of 391 dwellings positioned adjacent to a future railway station; and the future Flinders Lakes Drive. 'Bushman & Wyatt' development proposes primarily single lots of varying sizes for detached dwellings with duplexes nominated in suitable locations. The proposal plan includes master lots adjacent to the future train station providing an opportunity for medium density residential and 2 commercial sites adjacent to the future Flinders Lakes Drive (refer **Attachment A**). **Figure 1** below provides a reference to the proposed development.

Figure 1: Subdivision Proposal Plan

The parkland shown is proposed to provide a broad range of amenities promoting shelter, shade, and shared path networks which connect the neighbourhood internally, and also provide connections to other facilities and greenspace external to the subject site.

The proposed water supply strategy for the development was discussed with EDQ at the Pre-lodgement Meeting held on 8th June 2018. Outcomes from this meeting were detailed in EDQ email dated 15th June (refer copy in **Attachment B**).

3.0 PLANNING AND DELIVERY PRINCIPLES

The proposed Water Supply Network has been planned to accommodate for 391 dwellings and proposed non-residential development within the GFPDA for 'Bushman & Wyatt' generally in accordance with the discussions held with the EDQ and Logan Water Infrastructure Alliance (LWIA).

The desired standards of service adopted for the master planning of the water infrastructure are outlined below:

- Water demands are based on the recommendations included within Logan Water Alliance's 'Master Planning Review – Review of Desired Standards of Service' document (Task Number 90-12-43 April 2014) (refer **Attachment C**).
    - The Average Day Potable Water Demand (AD) of 165L/EP/day plus estimated non-revenue water of 25L/EP/day.
    - Peaking Factors:
        - MDMM/AD = 1.3
        - MD/AD = 1.7
        - PH/AD = 3.1
- Fire Flow of 15 L/s for Residential and 30 L/s for Commercial.
- A minimum pressure of 22mH, target pressure of 55mH and a maximum pressure of 80mH at the property boundary.
- EP values for residential dwellings were calculated at 2.7 EP / ET as per EDQ advice.

It is noted that the model includes main sizes that differ to the mapping included within the Greater Flagstone Infrastructure Charging and Offset Plan (ICOP) document. It is understood that the ICOP is currently being reviewed to align with LWIA's strategy for the PDA and the individual development's Infrastructure Masterplans where appropriate.

4.0 EXTERNAL WATER NETWORK

Based on several previous meetings with LWIA and EDQ to discuss their water network planning for the Greater Flagstone area, three stages have been identified to ultimately service 'Bushman & Wyatt' and the surrounding GFPDA. These stages are shown on MUS Drawing 23305-WNA-720 (**Attachment D**) which identifies the triggers and extent for each Stage.

The proposed strategy has been developed in accordance with previous advice from EDQ and LWIA regarding surrounding GFPDA developments. The external staging utilises pipe sizes equal to or greater than 250mm and are therefore creditable (in accordance with the ICOP document) if constructed by the 'Bushman & Wyatt' Developer.

It is noted that the staging may change over time and if changes are required, a revised Water Supply Infrastructure Master Plan will be submitted at that time.

4.1 Stage 1: Short Term (Up to 2,500 EP)

Stage 1 involves the construction of approximately 4km of 375mm water main from the intersection of Homestead Drive and Teviot Road, along Teviot Road and the future Flinders Lakes Drive to the development. This 375mm main will service up to 2,500 EP which will adequately supply the estimated 882 EP associated with 'Bushman & Wyatt'.

EDQ have advised (refer **Attachment F**) that the low pressure and flow boundary condition constraint *"will be resolved in 2023 when a significant increase in the flow and pressure available in the 375 trunk main at the Homestead Drive/Teviot Rd intersection" will follow the planning milestones below:*

- *First stage of Wyaralong WTP constructed by Seqwater in 2022 and when operational, the Beaudesert Supply from Round Mountain will be discontinued (it is my understanding that an option for the WTP to supply Round Mountain is also being discussed between LCC and Seqwater).*
- *Chambers Flat offtake operational in 2023 to supply Yarrabilba (currently supply by Round Mountain through the 375mm main/South Maclean pump station)."*

Therefore Stage 1, post 2023, is likely to provide significant additional capacity.

The Stage 1: Short Term servicing strategy is used as the basis of the water modelling for the proposed development (refer **Section 5.0** of this report for the results).

4.2 Long Term & Ultimate Stages (By Others)

The long term and ultimate stages of 'Bushman & Wyatt' as shown on Drawing 23305-WNA-720 (**Attachment D**) service surrounding GFPDA development beyond the 2,500 EP limitation of the Short-Term strategy.

Stage 2 involves the construction of an additional 375mm water main along New Beith Road as an extension of the mains from Round Mountain reservoir.

Stage 3 is the ultimate construction required to service the GFPDA south area. It involves augmenting Stage 2 with an additional 525mm water main along New Beith Road to Dairy Road.

The construction of Stages 2 & 3 will be undertaken by surrounding Land Owners or LWIA depending on development sequencing of the GFPDA.

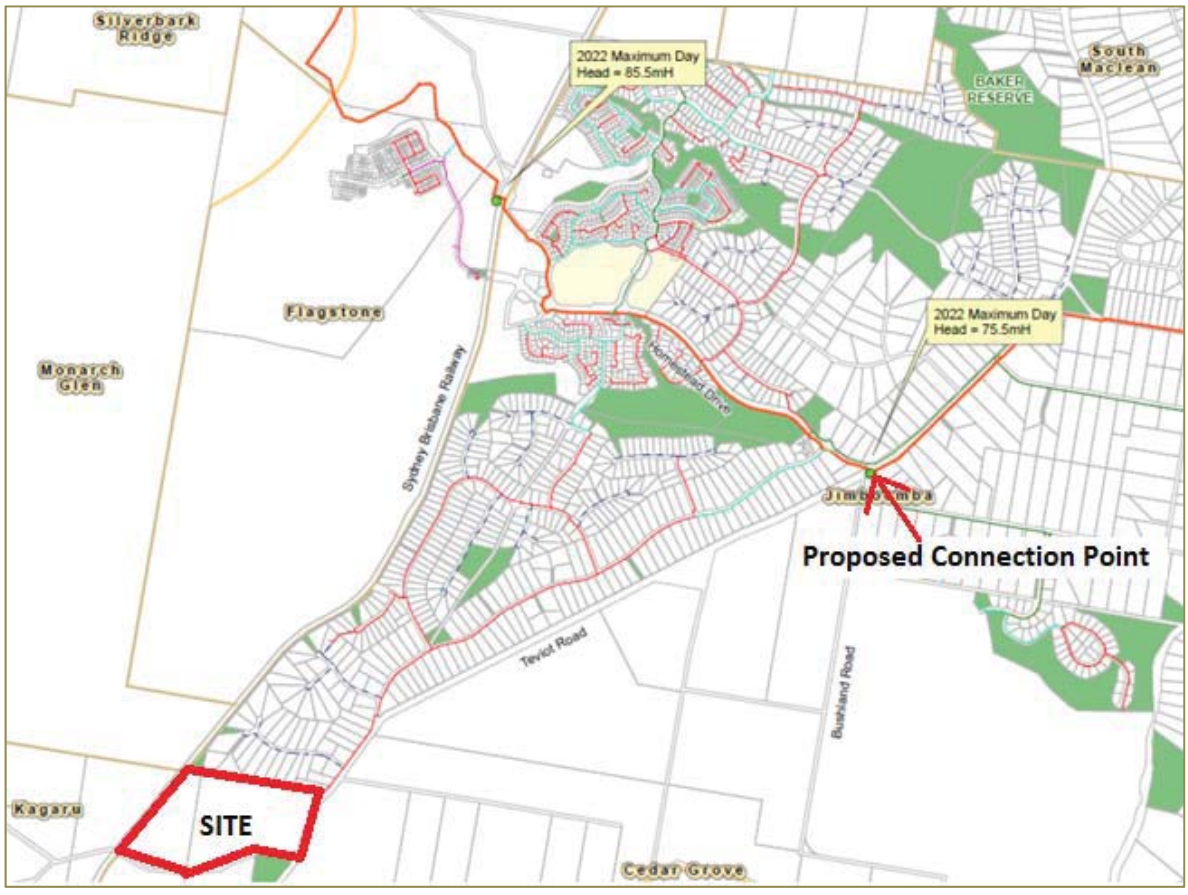
5.0 INTERNAL WATER NETWORK

The Internal Water Supply Network has been developed in accordance with EDQ's advice received at the PLM meeting on 8th June 2018 (refer **Section 2.0** of this report). The indicative watermain alignments are based generally on the road alignments shown on the Subdivision Proposal Plan (refer **Attachment A**) and the calculations associated with developments demand are shown on Drawing 23305-WNA-705 (refer **Attachment E**).

5.1 Boundary Conditions

EDQ's Short Term strategy has been modelled to determine the servicing requirements for the proposed development. EDQ confirmed the boundary conditions via email and an extract is shown in **Figure 2** (also refer **Attachment F**).

Figure 2: EDQ Short Term Boundary Conditions



As noted in **Section 4.1** of this report, following network upgrades expected to be completed circa 2023, it is likely that the Homestead/Teviot Rd connection point will provide significant additional capacity.

5.2 Water Model Results

The 'Bushman & Wyatt' Water Network has been prepared in accordance with EDQ and LWIA's requirements utilising the EPANet modelling software. As noted in **Section 2.0** of this report, the water model was prepared using the lot layout shown in the Subdivision Proposal Plan (refer **Attachment A**) and the water demands provided in **Attachment E**.

The elevation of each node was estimated from the preliminary earthworks model prepared in support of the 'Bushman & Wyatt' ROL Application.

Under peak hour conditions, the following results were observed:

- Lowest pressure at a node with draw was seen at N29 with a pressure of 26.35mH.
- Highest pressure at a node with draw was seen at N42 with a pressure of 41.55mH.

The results of the 'Bushman & Wyatt' Internal Water Model are shown on Drawing 23305-WNA-710 (refer **Attachment G**) which confirms that a minimum of 22mH is achieved at all nodes servicing lots under peak hour conditions.

It is noted that node N3 on the delivery main shows a pressure of 1.65 due to its elevation. As this node has no demand and it has a positive pressure, this is not considered an issue. The watermain could be constructed with additional cover in this location if EDQ or LWIA prefer additional pressure at this location.

Testing for firefighting was completed at a number of locations over the neighbourhood which included residential and commercial flows, where a draw of 15l/s and 30l/s in conjunction with two-third of max hour was used respectively. The minimum requirement of 12mH during firefighting conditions was achieved at all nodes. The firefighting modelling results are outlined in the Node Table contained within **Attachment G**. It is noted the pressure in the delivery main at node N3 is the lowest in the network at 0.51mH under the commercial firefighting conditions. As stated above the watermain could be constructed with additional cover to provide additional available head at this location if required by EDQ or LWIA.

6.0 DEMAND MANAGEMENT

The primary aim of the potable water strategy is to minimise the total demand for potable water throughout the development by:

- increasing the efficiency of appliances and/or uses that must be sourced from a potable water supply;
- provision of non-potable water sources for irrigation purposes; and
- educating the community about managing their water demand, the benefits of water efficient appliances and the use of landscape species that require reduced irrigation.

Similar to the sewer strategy, it is proposed that the staging and overall capacity of the 'Bushman & Wyatt' water network is based upon regular usage monitoring to ensure appropriately sized pipework, pumps and water reservoirs are installed as required.

6.1 Potable Water Conservation

To conserve water by reducing both town water usage and the volume of wastewater generated, water supply demand management measures will be incorporated into the homes and other premises within the project. This may include the use of WELS Scheme rated water-efficient appliances and fittings including taps, showerheads, toilets, dishwashers and washing machines.

6.2 Alternative (non-potable) Water Supply

Options for alternative (non-potable) water supply will be investigated for all 'fit-for-purpose' uses. Consideration will be given to the following:

- Rainwater/roofwater for individual (lot-based) collection tanks.
- Rainwater from community tanks servicing mixed use/medium density and or commercial infrastructure.
- Stormwater harvested from catchment runoff (untreated or treated).
- Small-scale greywater re-use on commercial and mixed-use development parcels,
- Treated effluent re-use from Cedar Grove Waste Water Treatment Plant.

6.3 Education

In planning a community where rainwater availability may be a limiting factor, community education is a critical element in influencing water demand trends and therefore Total Water Cycle Management (TWCM). To avoid the need to implement regulatory frameworks to limit water usage (and the expensive and often impractical enforcement regime), community appreciation for water resources is paramount. To this end, the proposed Demand Management approach includes a mix of the following community education measures:

- Integration of clear, consistent and readily understood Demand Management messages through means of signage, public displays and design elements in the provision of water infrastructure within public spaces (e.g. 'Waterwatch' program).
- Investigation into and the promotion of water usage measurement devices at the home.
- Provision of regular updates and information (by means (as appropriate) of email, letterbox drops, community meetings) to alert residents and businesses as to the status of water resources in their community and any ongoing challenges or behavioural change opportunities.

7.0 INNOVATION AND TWCM

'Bushman & Wyatt' will be serviced via a pump, pipe and reservoir network with water saving measures promoted within the home to reduce potable water demand.

Given the staged construction of this development new technology will be incorporated into the development as construction progresses to contribute towards achieving Total Water Cycle Management objectives.

7.1 Roof Water Harvesting

Consideration will be given to the installation of rainwater tanks on individual lots (5kL for detached and 3kL for attached). In this arrangement the owner would be responsible for the operation and maintenance of the tank and the collected water would be used only on the tank owner's land. The captured water may be used for outdoor applications such as car washing, landscape irrigation or cleaning and indoor uses such as toilet flushing and laundry cold water and will be fitted with a first flush device. These tanks will be fitted with a town water connection, with suitable backflow prevention measures, to ensure that a minimum capacity of 15% is maintained in the tank. In consideration of available area and to assist with housing affordability, for residential lots equal to or less than 250m^2 the installation of a 3kL rainwater tank will be optional.

7.2 Water Usage Monitoring Program

During the initial years of the development it is proposed that a Water Usage Monitoring Program will be implemented to monitor consumption and assess the appropriateness of the 165 + 25 L/EP/day Average Day Potable Water Demand design parameter. It may also be used to test the effectiveness of education and marketing campaigns aimed at reducing demand on the potable water supply.

Depending on results, the program's findings may influence the planning and design of future water infrastructure within the GFPDA.

8.0 INFRASTRUCTURE DELIVERY AND STAGING

The necessary internal and external infrastructure will be installed during construction of each stage of the works as required to maintain the desired standards of service. A water supply servicing report will be updated as development proceeds which will detail a pressure management strategy and the required works to adequately service that stage of the development.

It is intended that on completion of the works, the infrastructure will be transferred to LCC as the asset owner in accordance with the processes outlined by EDQ.

9.0 GREATER FLAGSTONE ICOP - OFFSETABLE INFRASTRUCTURE

Given the size and location of the proposed development within the GFPDA, it is integral in the provision of a suitable water supply strategy for the catchment. As a result of this, the proposed development requires the construction of several items of trunk water infrastructure identified within EDQ's Greater Flagstone Infrastructure Charging Offset Plan (ICOP).

The watermain sizes contained within this IMP were optimised to provide an efficient network and are subject to future detailed design. It is noted that the diameter of some watermains are 250mm or greater and therefore may be considered offsettable infrastructure in accordance with the GFPDA ICOP document.

As requested previously by EDQ, Infrastructure Offsets aren't discussed any further in this IMP as they will be addressed separately to the development assessment process which is outside the scope of this IMP.

ATTACHMENT A

Subdivision Proposal Plan (23305-PP-S001 Rev A) (Sheet 1 Only)

Prepared by Mortons-Urban Solutions
Dated 12.11.2018

SCALE : NTS

Development Summary

STAGE	1	1A	2	3	4	5	6	7	7A	7B	8	9	10	11	12	13	14	15	TOTALS
Area of Park	0.385 ha	-	1.045 ha	-	4.177 ha	-	1.893 ha	3.319 ha	3.213 ha	0.060 ha	-	-	-	-	-	-	0.129 ha	-	14.213 ha
Area of Road	0.276 ha	-	0.204 ha	0.211 ha	0.566 ha	0.314 ha	0.193 ha	0.365 ha	-	-	0.242 ha	0.290 ha	0.170 ha	0.103 ha	-	-	-	-	2.971 ha
Residential Lots	35	-	27	21	31	33	23	41	-	-	36	24	25	13	-	-	-	-	309
Mixed-use / Mulit-res lots	-	-	-	-	-	-	-	-	-	-	-	-	-	-	(1)	(1)	-	-	(2)
Commercial Lots	(1)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	(1)	(2)
Sewer Pump Station Lot	-	0.085 ha	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.085 ha
Stage Area	3.244 ha	0.085 ha	2.693 ha	1.454 ha	7.209 ha	2.453 ha	3.354 ha	5.816 ha	3.223 ha	0.060 ha	2.383 ha	1.706 ha	1.643 ha	0.855 ha	0.572 ha	0.437 ha	0.129 ha	1.145 ha	38.461 ha

Park Area Table

Lot No	900	901	902	903	904	905	907	908
Area	0.129 ha	0.765 ha	1.893 ha	7.295 ha	0.473 ha	0.385 ha	3.213 ha	0.061 ha
Total Park	14.213 ha							

PROJECT NAME

Bushman + Wyatt

CLIENT

PACIFIQ

NOTE:
THIS PLAN WAS PREPARED FOR PLANNING PURPOSES ONLY. AS SUCH ALL PARTICULARS, INCLUDING LOT DESIGN AND DENSITIES, ARE SUBJECT TO DETAILED SURVEY, SITE INVESTIGATIONS AND TO THE REQUIREMENTS OF COUNCIL (SUCH AS, CONFORMITY WITH THE STRATEGIC PLAN, PLANNING SCHEME AND BYLAWS), AND ANY OTHER AUTHORITY WHICH MAY HAVE REQUIREMENTS UNDER ANY RELEVANT LEGISLATION. IN PARTICULAR, NO RELIANCE SHOULD BE PLACED ON THE INFORMATION ON THIS PLAN FOR ANY FINANCIAL DEALINGS INVOLVING THE LAND. THIS NOTE IS AN INTEGRAL PART OF THIS PLAN.

R.P. DESCRIPTION

LOT 24 ON SP142997
AND
LOT 1 ON RP49296

ASSOCIATED CONSULTANTS

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DRAWING TITLE

SUBDIVISION
PROPOSAL PLAN
(Page 1 of 5)

DESIGNED	APPROVED	RPEQ 4706
DRAWN CB	DATE 12/11/18	AMEND DATE
DRAWING NUMBER		AMEND.
23305-PP-S001		A

ATTACHMENT B

Prelodgement Meeting Minutes

Prepared by EDQ
Minutes Dated 15.06.2018

Matthew McLaren

From: Brandon Bouda <Brandon.Bouda@dsdmip.qld.gov.au>
Sent: Friday, 15 June 2018 11:44 AM
To: Gavin Johnson
Subject: Pre-lodgement Bushman Drive / Wyatt Road - PRE2018/335
Attachments: Bushman Drive Draft Sketch Layout_EDQ_Comments_June_2018 (EDQ Comment) (003).pdf

Hi Gavin

Thank you for coming in with Stephen, John and Craig to meet to discuss the proposal and clarify some matters.

The following is a summary of the meeting discussions.

Attendees
Jeanine Stone – EDQ
Brandon Bouda – EDQ
Marco Bonotto – EDQ
Gavin Johnson – Mortons Urban Solutions
John Harrison – Mortons Urban Solutions
Stephen Harrison – Harrison Development Group
Craig Christensen – Robertsday
Idris Glozier

Discussion
The applicant took EDQ through the proposal:

- 42 ha site which is confined by various constraints, including land outside PDA to the north and the railway line to the west.
- The plans submitted include approximately 12has for open space, 2ha for medium density and 24ha for low density residential.
- Open space is along existing waterway corridors and is designed to protect existing ecological values and includes a neighbourhood park and linear corridors.
- Whilst a centre is noted on the plans, this is earmarked to be delivered on the Undullah site (west of the railway line) as per the Undullah endorsed context plan.
- The proposal has considered the future railway station and the potential use of entry/exit at each end of the station.

The applicant will be seeking a combined MCU/ROL application and are looking for early approval.

Planning
EDQ discussed the planning aspects of the proposal.

- Generally the proposal can be supported and is generally consistent with the endorsed context plan for this area, with the following exceptions:
    - the neighbourhood recreational park is located in a different location. This can be supported because it is more central to the development
    - consider the inclusion of a civic park/space in the medium density area, which can be incorporated into a mixed use proposal
- EDQ noted that incorporation of mixed use outcomes near the train station
- Interface to the exiting rural residential lots (prefer larger lots with fewer boundaries adjoining the rural residential properties)
- Interface with Wyatt Road extension – applicant will need to manage acoustic requirements while still ensuring a CPTED outcomes can be maintained. Wyatt Road is proposed to be 4 lane arterial road at its ultimate development.

- Applicant to consider extending the medium density area north of the waterway corridor where adjacent to the railway corridor, whilst managing the interface with the rural residential lots. It is noted that if low density in this area is still proposed, consideration should be given to larger lots to manage an acoustic requirements from the railway line.
- The open space needs to accord with EDQ Guideline 12 – Parks Planning and Design
- EDQ noted the isolated site on the north eastern side adjoining Bushman Drive and queried what is proposed here. The applicant advised it could be a non-residential use, such as a service station.

EDQ notes a revised plan was sent on 11/06 following the prelodgement meeting. EDQ notes that the plan reflects the discussion as noted above. Additional comments are shown on the plan as mark ups.

Engineering
EDQ noted that the following Engineering outcomes:

Traffic
The proposed road layout is generally acceptable with a second connection to be provided to the South-West part of the development (avoiding that all the vehicular traffic of this area be channelled through the roundabout).
It is recommended that roads hierarchy and relative cross sections are discussed with EDQ early in the design process.

** following the meeting, it has been identified that the external road connection will be the planned extension of Teviot Rd and the upgrade of the last section of Bushman Drive. If the applicant seeks to use Bushman Drive in the interim, an impact assessment report shall be undertaken by a suitable qualified engineer and submitted to EDQ for consideration.

Stormwater
Stormwater quality and quantity shall be managed within the site. In particular, it is noted that the site is within the Seqwater drinking water catchment and the proposal shall address the SPP State Interest for Water Quality and Seqwater Development Guidelines.

Water
Water supply will be provided through the planned 375mm main to be constructed along Teviot Rd and Wyatt Rd). A water network analysis shall be provided to support the internal reticulation layout and identified any temporary works (booster pump) that may be required in the short term.

Sewer
The site will be serviced by a local pump station discharging on the gravity network west of the railway (to the sub-regional pump station SPS152). The pump station and reticulation network shall make provision for the two small external catchments (South of Wyatt Rd and East of Bushman Drive).

Other
EDQ will discuss the proposal with the Department of Transport and Main Roads in relation to the railway station and its potential design on lodgement of the application.

Reports to be provided
- Acoustics
- Bushfire
- Ecology
- Traffic
- Water/sewer
- Stormwater, including responding to the SEQwater water supply buffer area outcomes
- Housing Affordability and Diversity OSS
- Community Development OSS – for implementation charges offsets purposes
- Employment and Economic Development OSS – for implementation charges offsets purposes
- Ecological Sustainability and Innovation OSS – for implementation charges offsets purposes

Feel free to contact me if you have any queries.

Regards

Brandon Bouda
Manager
Economic Development Queensland
Department of State Development,
Manufacturing, Infrastructure and Planning

Queensland Government

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ATTACHMENT C

Recommended Water Desired Standards of Service

(Appendix D – Master Planning Review – Review of Design Desired Standards of Service,
Document Number: 7600-00-P-REP-PL-8211)
Prepared by Logan Water Infrastructure Alliance

Appendix D Recommended Water Desired Standards of Service

WATER NETWORK DSS			
Parameter	**Criteria**		
Water Demand			
Average Day demand	On demand areas - 190 L/EP/d. Based on 165 L/EP/d + allowance for leakage/losses (25 L/EP/d).		
	Constant flow areas - 150 L/EP/d. Based on 120 L/EP/d + allowance for leakage/losses (30L/EP/d).		
Peaking factors	**MDMM/AD**	**MD/AD**	**MH/AD**
Residential detached	1.3	1.7	3.1
Residential attached	1.3	1.6	2.6
Rural residential	1.3	1.7	CF services 70 L/hr/property
Commercial	1.2	1.3	2.0
Industry	1.2	1.3	1.7
Parks / Open Space	1.2	1.3	1.7
System planning			
Bulk supply and reticulation	3 days of MDMM. Reservoirs to have a net positive inflow and capable of continuous operation and not fall below the emergency level. 3 days of MD. Reservoirs should not fall below the emergency level. 5 days of AD. Reservoirs should fill from empty to full		
Minimum service pressure			
Minimum operating pressure at MH	On demand areas – 22m at the property boundary based on reservoir at minimum operating level (MOL). MOL defined as 15% of storage height or top of emergency storage		
	Constant flow areas – 10m at the property boundary based on reservoir at minimum operating level (MOL) MOL defined as 15% of storage height or top of emergency storage.		
Maximum operating pressure	80 m at the boundary based on the reservoir at TWL		
Target pressure	55 m at the property boundary based on the reservoir level at TWL		
Fire fighting			
System pressure	On demand areas	12 m minimum at property boundary	
	Constant flow areas	no fire service provided	
Fire flow	Constant flow areas	no fire service provided	
	Rural Residential	7.5 L/s for 2 hrs	
	Rural Commercial / Industrial	15 L/s for 2 hrs	
	Residential	15 L/s for 2 hrs	
	Commercial & Industrial	30 L/s for 4 hrs	
	Special risk / hazard	to be advised by Logan City Council	
Background demand	2/3 PH (as per DEWS requirements)		
Reservoir level	Minimum Operating Level (MOL)		

Water quality	
Drinking water quality	Drinking water to comply with the NHMRC Australian Drinking Water Guidelines – 2004.

Reservoir storage	
Ground level storage capacity	3 (MD - MDMM) + (Greater of emergency storage/fire fighting reserve) Emergency Storage = 4 hr MDMM demand in zone or 0.5 ML whichever is greater. *Fire Fighting* reserve = ***> 4800EP:*** • rural residential 108 kL • industry 540 kL • otherwise 216 kL **< 4800 EP:** • rural residential 54 kL • industry 432 kL • otherwise 108 kL
Elevated storage capacity Guidance Note: In-line pressure booster pumping without high-level storage shall be considered where satisfactory pressures can be provided by gravity flow during low demand periods or booster failure can be mitigated to an acceptable level (risk assessment) and where there is no other feasible means of providing adequate pressure.	6 (PH - 1/12 MDMM) + minimum fire fighting reserve. *Fire Fighting reserve =* ***> 4800EP:*** • rural residential 108 kL • industry 540 kL • otherwise 216 kL **< 4800 EP:** • rural residential 54 kL • industry 432 kL • otherwise 108 kL

Pumping capacity	
Pump supplying a ground level reservoir	MDMM over 20 hr
Pump supplying an elevated reservoir	(6PH – operating volume) / (6 x 3600)
Standby pump capacity	To match duty, except where more than one duty pump or as determined by risk assessment
Reticulation booster pumps/pumped system	PH + fire flow

<table>
<tr><td colspan="3">Pipeline assessment & design</td></tr>
<tr><td>Main capacity</td><td colspan="2">Raw water mains & trunk feeding ground level reservoir : MDMM for a gravity supply and MDMM over 20hrs for a pumped supply
Trunk Mains feeding elevated reservoir: capacity of pumps
Reticulation Mains: PH + fire flow</td></tr>
<tr><td rowspan="2">Mains size</td><td colspan="2">Constant flow areas - where mains terminate in short runs such as cu- de-sacs minimum sizes that may be acceptable are:
DN 63 up to 150 m from main
DN 80 up to 350 m from main</td></tr>
<tr><td colspan="2">On demand areas - minimum reticulation main 100mm in residential areas and 150mm in commercial and industrial areas</td></tr>
<tr><td rowspan="2">Friction default value</td><td>Existing Infrastructure</td><td>Future Infrastructure</td></tr>
<tr><td>Colebrook White k values (mm)
<table>
<tr><th rowspan="2">Pipe Material</th><th colspan="3">Pipeline Age (years)</th></tr>
<tr><th>< 10</th><th>10 to 25</th><th>> 25</th></tr>
<tr><td>Asbestos Cement</td><td>0.15</td><td>0.3</td><td>0.3</td></tr>
<tr><td>Plastic (UPVC, MDPE, Hobas, etc)</td><td>0.06</td><td>0.06</td><td>0.15</td></tr>
<tr><td>MSCL/DICL</td><td>0.3</td><td>0.3</td><td>0.6</td></tr>
<tr><td>CICL</td><td>0.3</td><td>0.3</td><td>0.6</td></tr>
</table></td><td>The design shall be conducted to achieve less than the following head losses:
(a) 5 m head/km for ≤DN 150 (CIOD) or ≤DN 180 (ISO).
(b) 3 m head/km for ≥DN 200 (CIOD) or ≥DN 250 (ISO).
Head loss shall be calculated using computer models or hydraulic formulas.</td></tr>
<tr><td>Maximum velocity</td><td colspan="2">2.5 m/s
At peak hour for trunk mains and at peak hour including fire flow for reticulation</td></tr>
</table>

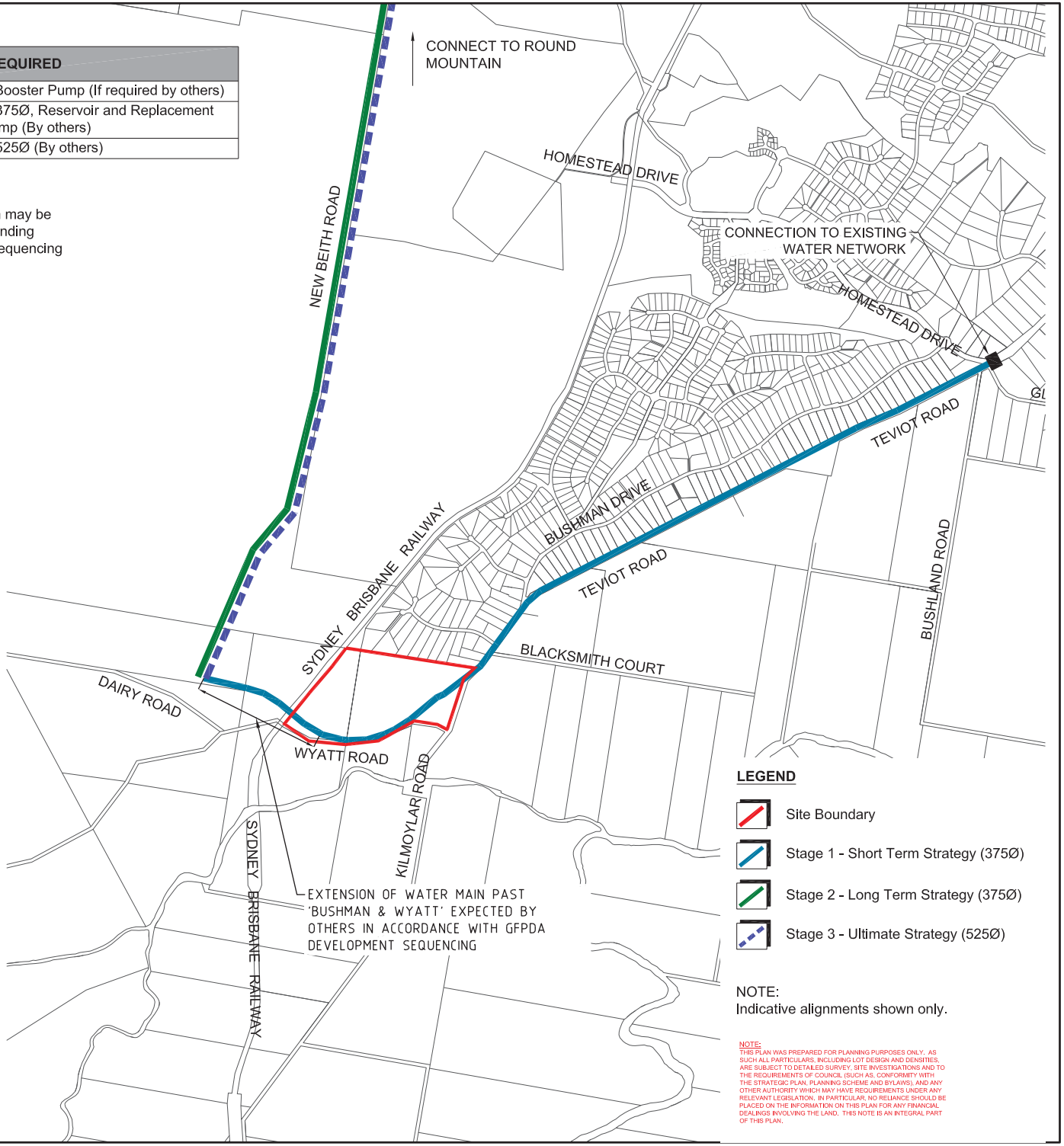
ATTACHMENT D

External Water Network Staging Plan (Drawing: 23305-WNA-720 Rev A)

Prepared by Mortons-Urban Solutions
Dated 15.11.2018

STAGE	TRIGGER	WORKS REQUIRED
1 - Short Term	Upfront	375Ø and Booster Pump (If required by others)
2 - Long Term	2,500EP	Additional 375Ø, Reservoir and Replacement Booster Pump (By others)
3 - Ultimate	31,700EP	Additional 525Ø (By others)

NOTE:
The long term & ultimate stage construction may be undertaken by the Applicant or other surrounding Land Owners depending on development sequencing of the GFPDA.



LEGEND

- Site Boundary
- Stage 1 - Short Term Strategy (375Ø)
- Stage 2 - Long Term Strategy (375Ø)
- Stage 3 - Ultimate Strategy (525Ø)

NOTE:
Indicative alignments shown only.

PROJECT NAME
Bushman + Wyatt
WATER NETWORK

CLIENT
PACIFIQ

NORTH

0 125 250 375 500 625m
Scale 1:12500 - A1 (1:25000 - A3)

ISSUES	DATE
TENDER	
COUNCIL	
CONSTRUCTION	

PRE	DATE	AMENDMENT
A	15-11-18	FOR SUBMISSION

ASSOCIATED CONSULTANTS
HDG Harrison Development Group · robertsday · BMT WBM "Where will our knowledge take you?" · The Consultancy Bureau · Cardno · saunders havill group · CRG Acoustics · Steven Hocking Surveys Pty Ltd

DRAWING TITLE
EXTERNAL WATER NETWORK STAGING PLAN

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Civil Engineering
Project Coordination
MUS Pty Ltd T/As
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DESIGNED	MM	DRAWN	RV
APPROVED		RPEQ 4706	DATE 18-09-18

DRAWING NUMBER	AMEND.
23305-WNA-720	A

ATTACHMENT E

Water Network Calculation Table (Drawing: 23305-WNA-705 Rev A)

Prepared by Mortons-Urban Solutions
Dated 15.11.2018

Wyatt + Bushman - Water Network Table

Node ID	Land Use	Lot Count Res (No.)	Lot Count Duplex (No.)	Lot Count Other (No.)	Dwelling Count (No.)	EP / ET Conversion Area	Unit	EP/ET	EP Count	AD L/EP/day	NRW L/EP/day No Peak Factor	MD (L/day) MD Factor	MD (L/day) Factor x AD	MDMM (L/day) MDMM Factor	MDMM (L/day) Factor x MD	Res Storage (L/day) 3 x (MD - MDMM)	AD (L/S)	PH (L/S) PH Factor	PH (L/S) Factor x AD	PH For Model (L/s)	Node ID
N14	Residential	13			13			2.7	35.1	165	25	1.7	10,723	1.3	8,406	6,950	0.08	3.4	0.24	0.30	N14
	Duplexes		2		4			2.7	5.4	165	25	1.6	1,561	1.3	1,293	802	0.01	2.6	0.03		
	Commercial			1	0	0.2033	ha	30	6.1	165	25	1.3	1,461	1.2	1,360	302	0.01	2.0	0.03		
N15	Residential	7			7			2.7	18.9	165	25	1.7	5,774	1.3	4,527	3,742	0.04	3.4	0.13	0.15	N15
	Duplexes		1		2			2.7	2.7	165	25	1.6	780	1.3	647	401	0.01	2.6	0.02		
N16	Residential	12			12			2.7	32.4	165	25	1.7	9,898	1.3	7,760	6,415	0.07	3.4	0.22	0.22	N16
N17	Residential	8			8			2.7	21.6	165	25	1.7	6,599	1.3	5,173	4,277	0.05	3.4	0.15	0.17	N17
	Duplexes		1		2			2.7	2.7	165	25	1.6	780	1.3	647	401	0.01	2.6	0.02		
N18	Residential	7			7			2.7	18.9	165	25	1.7	5,774	1.3	4,527	3,742	0.04	3.4	0.13	0.16	N18
	Duplexes		2		4			2.7	5.4	165	25	1.6	1,561	1.3	1,293	802	0.01	2.6	0.03		
N19	Residential	6			6			2.7	16.2	165	25	1.7	4,949	1.3	3,880	3,208	0.04	3.4	0.11	0.16	N19
	Duplexes		3		6			2.7	8.1	165	25	1.6	2,341	1.3	1,940	1,203	0.02	2.6	0.05		
N20	Residential	11			11			2.7	29.7	165	25	1.7	9,073	1.3	7,113	5,881	0.07	3.4	0.20	0.22	N20
	Duplexes		1		2			2.7	2.7	165	25	1.6	780	1.3	647	401	0.01	2.6	0.02		
N21	Residential	11			11			2.7	29.7	165	25	1.7	9,073	1.3	7,113	5,881	0.07	3.4	0.20	0.20	N21
N22	Residential	6			6			2.7	16.2	165	25	1.7	4,949	1.3	3,880	3,208	0.04	3.4	0.11	0.13	N22
	Duplexes		1		2			2.7	2.7	165	25	1.6	780	1.3	647	401	0.01	2.6	0.02		
N23	Residential	13			13			2.7	35.1	165	25	1.7	10,723	1.3	8,406	6,950	0.08	3.4	0.24	0.24	N23
N24	Residential	7			7			2.7	18.9	165	25	1.7	5,774	1.3	4,527	3,742	0.04	3.4	0.13	0.15	N24
	Duplexes		1		2			2.7	2.7	165	25	1.6	780	1.3	647	401	0.01	2.6	0.02		
N25	Residential	0			0			2.7	0.0	165	25	1.7	0	1.3	0	0	0.00	3.4	0.00	0.00	N25
N26	Residential	8			8			2.7	21.6	165	25	1.7	6,599	1.3	5,173	4,277	0.05	3.4	0.15	0.18	N26
	Duplexes		2		4			2.7	5.4	165	25	1.6	1,561	1.3	1,293	802	0.01	2.6	0.03		
N27	Residential	7			7			2.7	18.9	165	25	1.7	5,774	1.3	4,527	3,742	0.04	3.4	0.13	0.16	N27
	Duplexes		2		4			2.7	5.4	165	25	1.6	1,561	1.3	1,293	802	0.01	2.6	0.03		
N28	Residential	12			12			2.7	32.4	165	25	1.7	9,898	1.3	7,760	6,415	0.07	3.4	0.22	0.24	N28
	Duplexes		1		2			2.7	2.7	165	25	1.6	780	1.3	647	401	0.01	2.6	0.02		
N29	Residential	0			0			2.7	0.0	165	25	1.7	0	1.3	0	0	0.00	3.4	0.00	0.00	N29
N30	Residential	9			9			2.7	24.3	165	25	1.7	7,424	1.3	5,820	4,811	0.05	3.4	0.17	0.22	N30
	Duplexes		3		6			2.7	8.1	165	25	1.6	2,341	1.3	1,940	1,203	0.02	2.6	0.05		
N31	Residential	7			7			2.7	18.9	165	25	1.7	5,774	1.3	4,527	3,742	0.04	3.4	0.13	0.16	N31
	Duplexes		2		4			2.7	5.4	165	25	1.6	1,561	1.3	1,293	802	0.01	2.6	0.03		
N32	Residential	3			3			2.7	8.1	165	25	1.7	2,475	1.3	1,940	1,604	0.02	3.4	0.06	0.09	N32
	Medium Density			1	17			2	2.0	165	25	1.6	578	1.3	479	297	0.00	2.6	0.01		
	Duplexes		1		2			2.7	2.7	165	25	1.6	780	1.3	647	401	0.01	2.6	0.02		
N33	Residential	6			6			2.7	16.2	165	25	1.7	4,949	1.3	3,880	3,208	0.04	3.4	0.11	0.15	N33
	Duplexes		2		4			2.7	5.4	165	25	1.6	1,561	1.3	1,293	802	0.01	2.6	0.03		
N34	Residential	10			10			2.7	27.0	165	25	1.7	8,249	1.3	6,467	5,346	0.06	3.4	0.18	0.25	N34
	Duplexes		4		8			2.7	10.8	165	25	1.6	3,121	1.3	2,587	1,604	0.02	2.6	0.06		
N35	Residential	11			11			2.7	29.7	165	25	1.7	9,073	1.3	7,113	5,881	0.07	3.4	0.20	0.24	N35
	Duplexes		2		4			2.7	5.4	165	25	1.6	1,561	1.3	1,293	802	0.01	2.6	0.03		
N36	Residential	4			4			2.7	10.8	165	25	1.7	3,299	1.3	2,587	2,138	0.02	3.4	0.07	0.11	N36
	Medium Density			1	23			2	2.0	165	25	1.6	578	1.3	479	297	0.00	2.6	0.01		
	Duplexes		1		2			2.7	2.7	165	25	1.6	780	1.3	647	401	0.01	2.6	0.02		
N37	Residential	11			11			2.7	29.7	165	25	1.7	9,073	1.3	7,113	5,881	0.07	3.4	0.20	0.22	N37
	Duplexes		1		2			2.7	2.7	165	25	1.6	780	1.3	647	401	0.01	2.6	0.02		
N38	Residential	9			9			2.7	24.3	165	25	1.7	7,424	1.3	5,820	4,811	0.05	3.4	0.17	0.20	N38
	Duplexes		2		4			2.7	5.4	165	25	1.6	1,561	1.3	1,293	802	0.01	2.6	0.03		
N39	Residential	10			10			2.7	27.0	165	25	1.7	8,249	1.3	6,467	5,346	0.06	3.4	0.18	0.22	N39
	Duplexes		2		4			2.7	5.4	165	25	1.6	1,561	1.3	1,293	802	0.01	2.6	0.03		
N40	Commercial			1	0	1.145	ha	30	34.4	165	25	1.3	8,227	1.2	7,660	1,700	0.08	2.0	0.15	0.15	N40
N41	Residential	14			14			2.7	37.8	165	25	1.7	11,548	1.3	9,053	7,484	0.08	3.4	0.26	0.26	N41
N42	Residential	7			7			2.7	18.9	165	25	1.7	5,774	1.3	4,527	3,742	0.04	3.4	0.13	0.17	N42
	Duplexes		1		2			2.7	2.7	165	25	1.6	780	1.3	647	401	0.01	2.6	0.02		
	Open Space			1	0			2.8	2.8	165	25	1.6	809	1.3	671	416	0.01	2.6	0.02		
N43	Residential	9			9			2.7	24.3	165	25	1.7	7,424	1.3	5,820	4,811	0.05	3.4	0.17	0.21	N43
	Duplexes		2		4			2.7	5.4	165	25	1.6	1,561	1.3	1,293	802	0.01	3.4	0.04		
N44	Residential	10			10			2.7	27.0	165	25	1.7	8,249	1.3	6,467	5,346	0.06	3.4	0.18	0.20	N44
	Duplexes		1		2			2.7	2.7	165	25	1.6	780	1.3	647	401	0.01	2.6	0.02		
N45	Residential	16			16			2.7	43.2	165	25	1.7	13,193	1.3	10,346	8,554	0.10	3.4	0.29	0.29	N45
N46	Residential	3			3			2.7	8.1	165	25	1.7	2,475	1.3	1,940	1,604	0.02	3.4	0.06	0.08	N46
	Duplexes		1		2			2.7	2.7	165	25	1.6	780	1.3	647	401	0.01	2.6	0.02		
	Total	**267**	**42**	**5**	**391**				**882**								**1.94**			**5.90**	

PROJECT NAME

Bushman + Wyatt

WATER NETWORK

CLIENT

PACIFIQ

ISSUES	DATE
TENDER	
COUNCIL	
CONSTRUCTION	

PRE	DATE	AMENDMENT
A	15-11-18	FOR SUBMISSION

ASSOCIATED CONSULTANTS

HDG robertsday BMT WBM "Where will our knowledge take you?" THE CONSULTANCY BUREAU Cardno saunders havill group CRG ACOUSTICS Steven Hosking Surveys Pty Ltd

DRAWING TITLE

WATER NETWORK TABLE

MORTONS urbansolutions
Urban & Regional Planning
Civil Engineering
Project Coordination

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DESIGNED	MM	DRAWN	RV
APPROVED		RPEQ 4706	DATE 18-09-18

DRAWING NUMBER	AMEND.
23305-WNA-705	A

ATTACHMENT F

Previously Advised Boundary Conditions

Prepared by EDQ
Minutes Dated 25.01.2018

Matthew McLaren

From: Marco Bonotto <Marco.Bonotto@dilgp.qld.gov.au>
Sent: Thursday, 25 January 2018 3:53 PM
To: Matthew McLaren
Subject: RE: Flinders Water Supply Strategy
Attachments: 2022 Network Pressure.png

Hi Matt,

Please find attached a map with boundary conditions for the 2022 planning horizon with the two boundary points we discussed in the meeting held on the 28th November. The head at these points represent the minimum head in the network on a maximum day.

In this scenario, 4ML/day (45L/s for 24hrs) is supplied through the Logan network to Beaudesert through a main on Bushland Road. These boundary conditions represent the minimum pressures before the Wyaralong water treatment plant is operational, at which time Wyaralong will supply Logan. The low pressure and flow at the Teviot intersection will be resolved in 2023 when a significant increase in the flow and pressure available in the 375 trunk main at the Homestead Drive/Teviot Rd intersection will follow the planning milestones below:

- first stage of Wyaralong WTP constructed by Seqwater in 2022 and when operational, the Beaudesert Supply from Round Mountain will be discontinued (it is my understanding that an option for the WTP to supply Round Mountain is also being discussed between LCC and Seqwater).
- Chambers Flat offtake operational in 2023 to supply Yarrabilba (currently supply by Round Mountain through the 375mm main/South Maclean pump station).

Regarding the alternative water main alignment along the railway corridor, there are complexities in fitting the trunk water main within the sewer easement that will result in increased construction costs. In addition, if any room is available, EDQ wish to keep the corridor available for a potential recycled water pipeline.

Considering the above, we have concluded that the best option to service Flinders development will be with the construction of the 375mm main along Teviot Rd. In case of shorth term deficiencies, there is the option of a temporary booster. However, by utilising the correct DSS and by careful consideration of the operating philosophy of the main servicing Beaudesert (by LCC), the need for a temporary booster may be avoided: LCC noted that you are still using our old DSS. This uses a peaking factor of 3.8 vs 3.1, and 260L/EP/d vs 190L/EP/d and they suggested that the modelling be revisited with the new DSS as it might suggest that a booster is not required for those couple of years. If the modelling still indicates that DSS cannot be met in the development, there are operational modifications LCC could make regarding the supply to Beaudesert (i.e. reduce / stop supply during peak hour) which would increase the available pressure at Teviot Rd & Homestead Drive (where we supplied the boundary conditions). This would be a preferable approach than a booster, particularly given the short duration of the deficiency in the network.

Please don't hesitate to contact me if you require any clarifications.

Cheers

Queensland Government

Marco Bonotto
Principal Engineer – Technical Services
Economic Development Queensland
Department of State Development,
Manufacturing, Infrastructure and Planning

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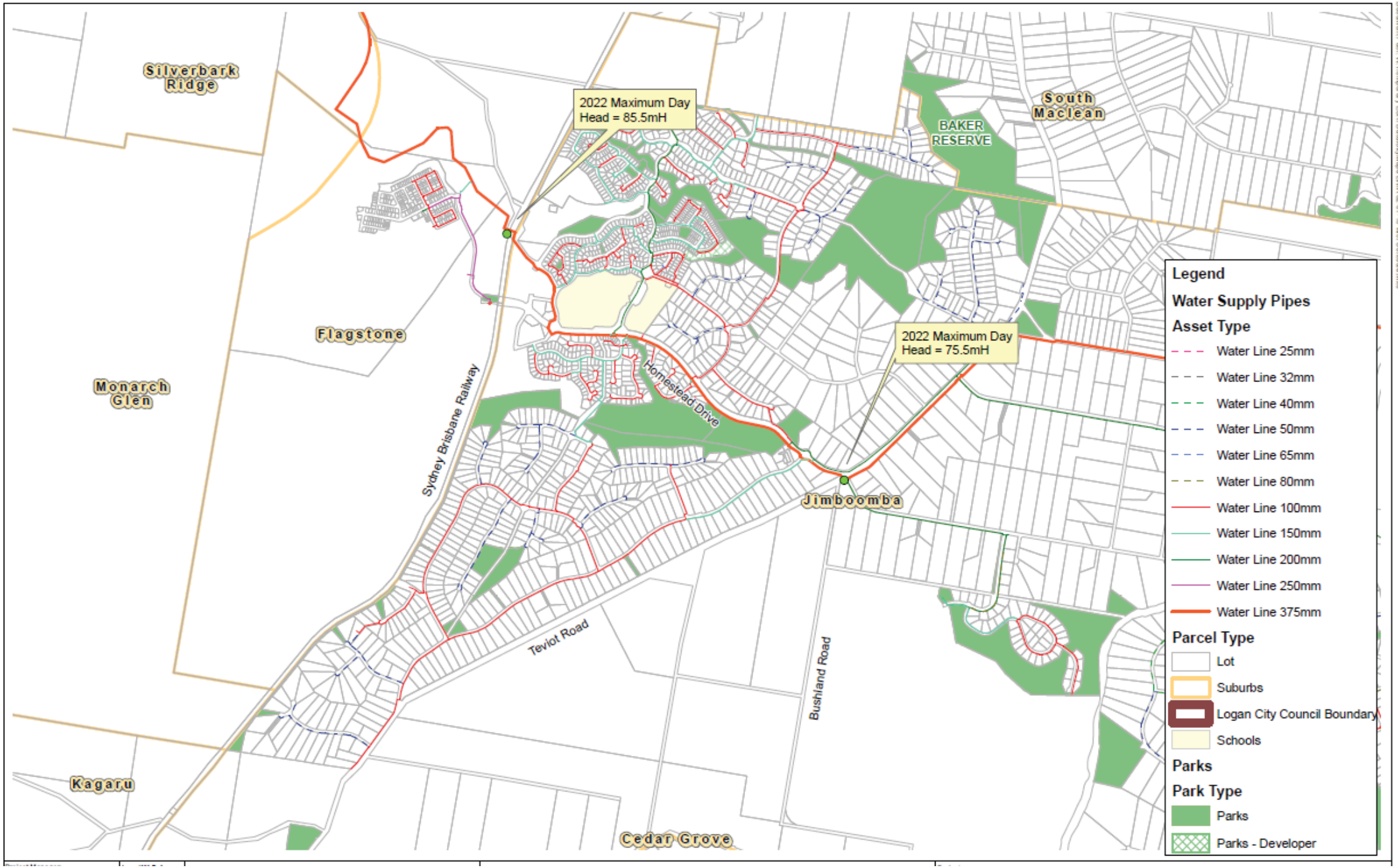
From: Matthew McLaren [mailto:mattmc@urbansolutions.net.au]
Sent: Monday, 22 January 2018 10:30 AM

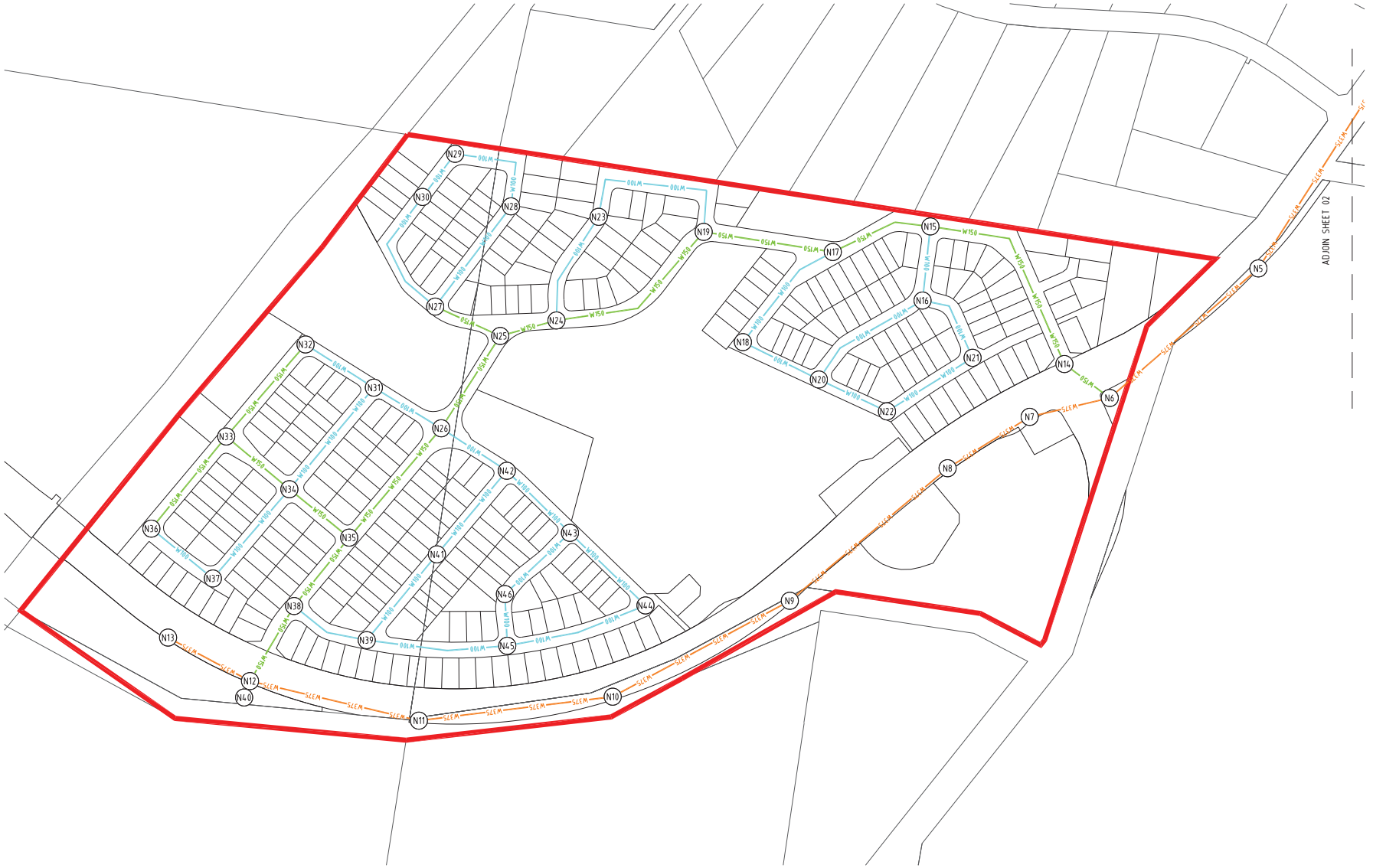

Silverbark Ridge
2022 Maximum Day Head = 85.5mH
BAKER RESERVE
South Maclean
Flagstone
2022 Maximum Day Head = 75.5mH
Monarch Glen
Sydney Brisbane Railway
Homestead Drive
Jimboomba
Teviot Road
Bushland Road
Kagaru
Cedar Grove
Legend
Water Supply Pipes
Asset Type
Water Line 25mm
Water Line 32mm
Water Line 40mm
Water Line 50mm
Water Line 65mm
Water Line 80mm
Water Line 100mm
Water Line 150mm
Water Line 200mm
Water Line 250mm
Water Line 375mm
Parcel Type
Lot
Suburbs
Logan City Council Boundary
Schools
Parks
Park Type
Parks
Parks - Developer

ATTACHMENT G

Water Network Plan & Tables

(Drawing: 23305-WNA-700 Rev A – 2 Sheets)
(Drawing: 23305-WNA-710 Rev A)
(Drawing: 23305-WNA-715 Rev A)

Prepared by Mortons-Urban Solutions
Dated 15.11.2018



LEGEND

- SITE BOUNDARY
- W100 100Ø WATER MAIN
- W150 150Ø WATER MAIN
- W375 375Ø WATER MAIN

NOTE:
INDICATIVE SERVICE ALIGNMENTS ONLY AND ARE SUBJECT TO CHANGE DURING DETAILED DESIGN.

PROJECT NAME

Bushman + Wyatt

WATER NETWORK

CLIENT

PACIFIQ

NORTH

0 20 40 60 80 100m

Scale 1:2000 - A1 (1:4000 - A3)

ISSUES	DATE
TENDER	
COUNCIL	
CONSTRUCTION	

PRE	DATE	AMENDMENT
A	15-11-18	FOR SUBMISSION

ASSOCIATED CONSULTANTS

HDG robertsday BMT WBM "Where will our knowledge take you?" THE CONSULTANCY BUREAU Cardno saunders havill group CRG ACOUSTICS Steven Hosking Surveys Pty Ltd

DRAWING TITLE

WATER NETWORK
PLAN
SHEET 1

MORTONS urbansolutions
Urban & Regional Planning
Civil Engineering
Project Coordination

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DESIGNED	MM	DRAWN	CB
APPROVED		RPEQ 4706	DATE 18-09-18

DRAWING NUMBER	AMEND.
23305-WNA-700	A

LEGEND

- SITE BOUNDARY
- W100 100Ø WATER MAIN
- W150 150Ø WATER MAIN
- W375 375Ø WATER MAIN

NOTE:
INDICATIVE SERVICE ALIGNMENTS ONLY AND ARE SUBJECT TO CHANGE DURING DETAILED DESIGN.

PROJECT NAME

Bushman + Wyatt

WATER NETWORK

CLIENT

PACIFIQ

NORTH

0 50 100 150 200 250m

Scale 1:5000 - A1 (1:10000 - A3)

ISSUES	DATE	
TENDER		
COUNCIL		
CONSTRUCTION		

PRE	DATE	AMENDMENT
A	15-11-18	FOR SUBMISSION

ASSOCIATED CONSULTANTS

HDG Harrison Development Group; robertsday; BMT WBM "Where will our knowledge take you?"; The Consultancy Bureau; Cardno; saunders havill group; CRG Acoustics; Steven Hocking Surveys Pty Ltd

DRAWING TITLE

WATER NETWORK
PLAN
SHEET 2

MORTONS urbansolutions
Urban & Regional Planning
Civil Engineering
Project Coordination

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DESIGNED	MM	DRAWN	CB
APPROVED		RPEQ 4706	DATE 18-09-18

DRAWING NUMBER	AMEND.
23305-WNA-701	A

NODE TABLE

			MAXIMUM HOURLY DEMAND			FF RESIDENTIAL @ N29			FF COMMERCIAL @ N36			FF COMMERCIAL @ N14			FF COMMERCIAL @ N40		
	Elevation	Base Dem	Demand	Head	Pressure	Demand	Head	Pressure	Demand	Head	Pressure	Demand	Head	Pressure	Demand	Head	Pressure
Node ID	m	LPS	LPS	m	m	LPS	m	m	LPS	m	m	LPS	m	m	LPS	m	m
Res-Glynto	75.5	0	-5.9	75.5	0	0	75.49	38.99	0	75.48	38.98	0	75.48	38.98	0	75.48	38.98
N1	36.5	0	0	75.5	39	15	69.07	20.07	0	71.22	22.22	0	73.63	24.63	0	73.23	24.23
N2	36.5	0	0	75.5	39	0.15	70.11	27.11	0.15	71.22	28.22	0.15	73.63	30.63	0.15	73.23	30.23
N3	73.8	0	0	75.45	1.65	0	75.48	38.98	0	75.45	38.95	0	75.45	38.95	0	75.45	38.95
N4	65	0	0	75.45	10.45	0	75.09	1.29	0	74.31	0.51	0	74.31	0.51	0	74.31	0.51
N5	41	0	0	75.44	34.44	0.15	74.24	35.04	0.15	72.58	33.38	0.15	73.73	34.53	0.15	72.74	33.54
N6	36	0	0	75.44	39.44	0.1	74.15	35.55	0.1	68.3	29.7	0.1	73.61	35.01	0.1	73.48	34.88
N7	36.5	0	0	75.44	38.94	0.11	72.91	38.11	0.11	71.22	36.42	0.11	73.63	38.83	0.11	73.23	38.43
N8	36	0	0	75.44	39.44	0.17	74.16	35.16	0.17	69.25	30.25	0.17	73.61	34.61	0.17	73.49	34.49
N9	36.5	0	0	75.44	38.94	0.16	70.79	24.79	0.16	71.22	25.22	0.16	73.63	27.63	0.16	73.23	27.23
N10	37.4	0	0	75.43	38.03	0.16	73.75	31.75	0.16	71.59	29.59	0.16	73.65	31.65	0.16	73.07	31.07
N11	40	0	0	75.43	35.43	0.11	74.15	37.15	0.11	72.37	35.37	0.11	73.72	36.72	0.11	72.82	35.82
N12	43.8	0	0	75.43	31.63	0	74.94	38.44	0	73.83	37.33	0	73.79	37.29	0	73.9	37.4
N13	45	0	0	75.43	30.43	0	74.96	38.46	0	73.89	37.39	0	73.88	37.38	0	73.91	37.41
N14	36.4	0.3	0.3	75.42	39.02	0.11	74.1	40.1	0.11	69.4	35.4	0.11	73.61	39.61	0.11	73.46	39.46
N15	41	0.15	0.15	75.37	34.37	0.1	74.31	33.31	0.1	72.68	31.68	0.1	73.75	32.75	0.1	72.74	31.74
N16	39.2	0.22	0.22	75.36	36.16	0.11	74.18	39.78	0.11	72.46	38.06	0.11	73.72	39.32	0.11	72.77	38.37
N17	37	0.17	0.17	75.36	38.36	0.12	73.98	39.98	0.12	70.87	36.87	0.12	73.61	39.61	0.12	73.41	39.41
N18	34.4	0.16	0.16	75.36	40.96	0.15	74.22	32.42	0.15	71.48	29.68	0.15	73.6	31.8	0.15	73.51	31.71
N19	35.4	0.16	0.16	75.36	39.96	0.16	74.19	34.99	0.16	70.75	31.55	0.16	73.61	34.41	0.16	73.5	34.3
N20	34.6	0.22	0.22	75.36	40.76	0.13	74.45	31.65	0.13	71.97	29.17	0.13	73.61	30.81	0.13	73.64	30.84
N21	37.8	0.2	0.2	75.35	37.55	0.09	74.22	40.02	0.09	72.54	38.34	0.09	73.73	39.53	0.09	72.74	38.54
N22	34.2	0.13	0.13	75.35	41.15	0.11	74.08	40.28	0.11	71.15	37.35	0.11	73.6	39.8	0.11	73.44	39.64
N23	42	0.24	0.24	75.35	33.35	0	74.91	29.91	0	73.72	28.72	0	73.61	28.61	0	73.88	28.88
N24	34.2	0.15	0.15	75.35	41.15	0.14	74.1	39.9	0.14	71.22	37.02	0.14	73.6	39.4	0.14	73.45	39.25
N25	34	0	0	75.35	41.35	0.13	74.11	39.91	0.13	71.24	37.04	0.13	73.6	39.4	0.13	73.45	39.25
N26	34	0.18	0.18	75.35	41.35	0.19	74.13	37.13	0.19	71.28	34.28	0.19	73.6	36.6	0.19	73.46	36.46
N27	34.8	0.16	0.16	75.35	40.55	0.07	74.15	28.15	30.07	65.98	19.98	0.07	73.61	27.61	0.07	73.48	27.48
N28	46	0.24	0.24	75.35	29.35	0	74.99	33.99	0	73.99	32.99	0	73.99	32.99	0	73.99	32.99
N29	49	0	0	75.35	26.35	0	75.06	10.06	0	74.19	9.19	0	74.19	9.19	0	74.19	9.19
N30	43	0.22	0.22	75.35	32.35	0	74.93	37.53	0	73.79	36.39	0	73.72	36.32	0	73.89	36.49
N31	34	0.16	0.16	75.35	41.35	0.05	74.12	38.12	0.05	71.26	35.26	0.05	73.6	37.6	0.05	73.46	37.46
N32	34.8	0.09	0.09	75.35	40.55	0.15	74.15	30.15	0.15	67.27	23.27	0.15	73.6	29.6	0.15	73.48	29.48
N33	38.6	0.15	0.15	75.35	36.75	0.13	74.23	36.43	0.13	72.56	34.76	0.13	73.73	35.93	0.13	72.74	34.94
N34	39	0.25	0.25	75.36	36.36	0.15	74.21	39.61	0.15	72.52	37.92	0.15	73.73	39.13	0.15	72.75	38.15
N35	39.2	0.24	0.24	75.36	36.16	0.11	73.9	38.5	0.11	71.87	36.47	0.11	73.68	38.28	0.11	72.99	37.59
N36	46	0.11	0.11	75.35	29.35	0	74.96	38.96	0	73.91	37.91	0	73.91	37.91	0	73.91	37.91
N37	44	0.22	0.22	75.35	31.35	0	74.95	38.95	0	73.87	37.87	0	73.85	37.85	0	73.9	37.9
N38	42.8	0.2	0.2	75.38	32.58	0	74.91	31.11	0	73.72	29.92	0	73.61	29.81	0	73.88	30.08
N39	41.8	0.22	0.22	75.35	33.55	0.2	74.82	38.42	0.2	73.65	37.25	0.2	73.87	37.47	30.2	72.54	36.14
N40	43	0.15	0.15	75.43	32.43	0	74.92	34.92	0	73.76	33.76	0	73.66	33.66	0	73.89	33.89
N41	37	0.26	0.26	75.35	38.35	0	73.58	39.58	0	71.23	37.23	0	73.63	39.63	0	73.23	39.23
N42	33.8	0.17	0.17	75.35	41.55	-18.93	75.5	0	-33.94	75.5	0	-33.94	75.5	0	-33.94	75.5	0
N43	34.2	0.21	0.21	75.34	41.14	0.1	74.91	31.91	0.1	73.72	30.72	30.1	73.18	30.18	0.1	73.88	30.88
N44	34.2	0.2	0.2	75.34	41.14	0.17	74.14	37.14	0.17	71.3	34.3	0.17	73.6	36.6	0.17	73.47	36.47
N45	37	0.29	0.29	75.34	38.34	0.1	73.68	39.48	0.1	71.43	37.23	0.1	73.64	39.44	0.1	73.15	38.95
N46	36	0.08	0.08	75.34	39.34	0.06	74.14	39.34	0.06	68.49	33.69	0.06	73.61	38.81	0.06	73.48	38.68

PROJECT NAME

Bushman + Wyatt

WATER NETWORK

CLIENT

PACIFIQ

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WATER NETWORK CALCULATION SHEET

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DESIGNED	MM	DRAWN	RV
APPROVED		RPEQ 4706	DATE 18-09-18

DRAWING NUMBER	AMEND.
23305-WNA-710	A

PIPE TABLE

Link ID	Start Node	End Node	Length (m)	Diameter (mm)	Roughness	Flow (LPS)	Velocity (m/s)	Unit Headloss (m/km)	
Pipe P1	N1	N2	61.35	375	110	5.9	0.05	0.02	Open
Pipe P2	N3	N2	2870.42	375	110	-5.9	0.05	0.02	Open
Pipe P3	N3	N4	290	375	110	5.9	0.05	0.02	Open
Pipe P4	N4	N5	512.21	375	110	5.9	0.05	0.02	Open
Pipe P5	N5	N6	192.74	375	110	5.9	0.05	0.02	Open
Pipe P6	N6	N7	80.46	375	110	3.52	0.03	0.01	Open
Pipe P7	N7	N8	94.615	375	110	3.52	0.03	0.01	Open
Pipe P8	N8	N9	201.459	375	110	3.52	0.03	0.01	Open
Pipe P9	N9	N10	196.919	375	110	3.52	0.03	0.01	Open
Pipe P10	N10	N11	190.913	375	110	3.52	0.03	0.01	Open
Pipe P11	N11	N12	169.574	375	110	3.52	0.03	0.01	Open
Pipe P12	N12	N13	90.674	375	110	0	0	0	Open
Pipe P13	N6	N14	54.93	150	100	2.38	0.13	0.3	Open
Pipe P14	N15	N14	211.49	150	100	-2.08	0.12	0.24	Open
Pipe P15	N15	N16	72.86	100	100	0.64	0.08	0.19	Open
Pipe P16	N15	N17	102.26	150	100	1.29	0.07	0.1	Open
Pipe P17	N18	N17	126.69	100	100	-0.29	0.04	0.04	Open
Pipe P18	N17	N19	127.72	150	100	0.83	0.05	0.04	Open
Pipe P19	N16	N20	130.12	100	100	0.18	0.02	0.02	Open
Pipe P20	N20	N18	82.75	100	100	-0.13	0.02	0.01	Open
Pipe P21	N21	N16	82.1	100	100	-0.24	0.03	0.03	Open
Pipe P22	N20	N22	73.55	100	100	0.09	0.01	0	Open
Pipe P23	N22	N21	98.75	100	100	-0.04	0.01	0	Open
Pipe P24	N19	N23	177.41	100	100	0.18	0.02	0.02	Open
Pipe P25	N23	N24	113.09	100	100	-0.06	0.01	0	Open
Pipe P26	N25	N24	57.05	150	100	-0.28	0.02	0.01	Open
Pipe P27	N24	N19	179.13	150	100	-0.49	0.03	0.02	Open
Pipe P28	N25	N26	107.12	150	100	-0.34	0.02	0.01	Open
Pipe P29	N25	N27	69.72	150	100	0.62	0.04	0.02	Open
Pipe P30	N27	N28	122.85	100	100	0.24	0.03	0.03	Open
Pipe P31	N28	N29	103.29	100	100	0	0	0	Open
Pipe P32	N29	N30	52.82	100	100	0	0	0	Open
Pipe P33	N30	N27	135.74	100	100	-0.22	0.03	0.03	Open
Pipe P34	N26	N31	76.92	100	100	-0.08	0.01	0	Open
Pipe P35	N31	N32	79.05	100	100	-0.08	0.01	0	Open
Pipe P36	N32	N33	118.78	150	100	-0.17	0.01	0	Open
Pipe P37	N33	N34	80.39	150	100	-0.49	0.03	0.02	Open
Pipe P38	N34	N35	75.23	150	100	-1.06	0.06	0.07	Open
Pipe P39	N34	N31	129.16	100	100	0.16	0.02	0.01	Open
Pipe P40	N33	N36	115.74	150	100	0.17	0.01	0	Open
Pipe P41	N36	N37	77.85	100	100	0.06	0.01	0	Open
Pipe P42	N37	N34	114.93	100	100	-0.16	0.02	0.01	Open
Pipe P43	N35	N26	139.71	150	100	0.92	0.05	0.05	Open
Pipe P44	N35	N38	85.9	150	100	-2.21	0.13	0.26	Open
Pipe P45	N38	N39	80.83	100	100	0.95	0.12	0.4	Open
Pipe P46	N38	N12	85.1	150	100	-3.37	0.19	0.57	Open
Pipe P47	N12	N40	12.88	150	100	0.15	0.01	0	Open
Pipe P48	N39	N41	103.37	100	100	0.32	0.04	0.05	Open
Pipe P49	N41	N42	105.52	100	100	0.06	0.01	0	Open
Pipe P50	N42	N26	76.34	100	100	-0.48	0.06	0.11	Open
Pipe P51	N42	N43	86.6	100	100	0.36	0.05	0.07	Open
Pipe P52	N43	N44	102.39	100	100	0.11	0.01	0.01	Open
Pipe P53	N44	N45	141.38	100	100	-0.09	0.01	0	Open
Pipe P54	N43	N46	87.34	100	100	0.04	0.01	0	Open
Pipe P55	N46	N45	50.61	100	100	-0.04	0	0	Open
Pipe P56	N45	N39	133.23	100	100	-0.42	0.05	0.09	Open
Pipe 1	N1	Res-Glynto	53.97	375	110	-5.9	0.05	0.02	Open

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PIPE CALCULATION TABLE

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