URBAN LAND DEVLOPMENT AUTHORITY

PROPOSED RESIDENTIAL DEVELOPMENT
THE VILLAGE, OONOONBA

ENGINEERING REPORT
WATER AND SEWERAGE MASTER PLANNING

PLANS AND DOCUMENTS
referred to in the PDA APPROVAL

MEDQ

Report No: ULD100/R01
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PLANS AND DOCUMENTS
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REPORT AUTHORISATION					
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Prepared By		**Reviewed By**		**Authorised By**	
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1 INTRODUCTION

This report assesses the Water and Sewerage Master Planning for the Urban Development Land Authority's (UDLA) development 'The Village' at Oonoonba. 'The Village' residential development is on the former Department of Public Infrastructure (DPI) site and is located to the west of Abbott Street, north of the existing Fairfield Waters development and is bound by Ross River to the west and north.

The proposed development is located on an existing parcel of land described as Lot 7000 on SP247154, is located on the Ross River Flood plain and consists of relatively flat terrain sloping gently in a north-easterly direction towards Ross River.

The previous external trunk water infrastructure sizing and staging was detailed in the "ULDA Oonoonba Residential Development – External Water Supply Planning Report (DPM Water April 2011)" and was based on a higher development yield. The original Development Plan for 'The Village' proposed 1,480 residential allotments and 2,500m^2 of commercial facilities, which resulted in an ultimate equivalent population of 3,512 EP.

The revised Development Plan for 'The Village' has reduced the ultimate development yield to 886 residential allotments and 0.56ha of commercial development and a copy is provided in Appendix A. There is also the further potential for up to an additional 38 lots adjacent to Abbott Street which is dependent upon the final Department of Transport and Main Roads (TMR) land resumption negotiations. Therefore the equivalent population assessment for the revised Development Plan for 'The Village' is 2,524 EP.

Due to the revised Development Plan culminating in a reduced ultimate development yield, the Water and Sewer Master Planning for 'The Village' has been reviewed and this report formulates the updated Water and Sewer Master Planning strategy for the development.

The first stage of 'The Village' was completed in early 2012 and the second stage of 'The Village' is currently under construction and should be completed by late 2012.

2 POPULATION ASSESSMENT

'The Village' is to be comprised of a combination of a maximum of 924 residential lots of varying sizes and demands plus a small commercial area of 0.56ha. The current Council occupancy rates and design standards have been used to assess the equivalent populations for the development.

The population assessment of the revised Development Plan and associated lot yield is summarised in the following table and this assessment has been used to develop the strategy for the overall water and sewer master planning.

Table 2-1 Population Assessment of the Revised Development Plan and Associated Lot Yield

Land Use	Number / Area	Loading Rate	Equivalent Population
Residential (Less than 200m^2)	81 lots	2.0 EP / lot	162 EP
Residential (200m^2 – 299m^2)	336 lots	2.4 EP / lot	806 EP
Residential (300m^2 – 399m^2)	315 lots	2.6 EP / lot	819 EP
Residential (400m^2 or larger)	252 lots	2.8 EP / lot	706 EP
Commercial	0.56 ha	56 EP / ha	31
Total			**2,524 EP**

3 WATER SUPPLY

The detailed water supply strategy undertaken for 'The Village' development is based on the following parameters:

- The external trunk water mains to supply water to the site are fed from the existing Council reservoirs in the CBD (Bottom City Reservoir). This supply source was advised by Council as there is the ability to increase the reservoir capacity (Middle City Reservoir) to provide the ultimate water supply to the development;
- The external trunk water main to supply 'The Village' would be constructed from the CBD reservoir site to the south east, then cross Ross Creek and through the Civic Theatre site to Boundary Street. The trunk water main would then extend southward along Railway Avenue (the service road on the western side of the railway line) and under Ross River to 'The Village' development site;
- The external trunk water infrastructure is to be sized to cater for both 'The Village' development site along with the expected urban consolidation of the South Townsville, Railway Estate and Oonoonba suburbs;
- The water demand for 'The Village' development is based on the equivalent population estimate of 2,524 EP and the current Townsville Water design standards; and
- The WaterGEMS model used to assess the revised Development Plan for 'The Village' is available to Council for review and checking.

The water network modelling has been performed utilizing the Council's WaterGEMS network model and therefore the modelling scenarios and associated results are available on the WaterGEMS model.

3.1 Water Demands

The water supply assessment has been undertaken based on maximum hour demands in accordance with Council requirements.

Utilising the revised Development Plan for 'The Village' and the calculated ultimate equivalent population of 2,524EP, the maximum hour water demand will be 121.2 l/s.

These water demands for 'The Village' development have been calculated in accordance with the Council design standards as follows:

- Maximum Hour (MH) 0.048 l/s / EP
- Fire Flows 15 l/s (concurrent with maximum hour demands)

The water reticulation network has been designed to satisfy the following conditions:

- Minimum HGL of 22.0m above the finished surface level under maximum hour conditions; and
- Minimum HGL of 12.0m above the finished surface level under Fire flow conditions.

3.2 External Water Supply Strategy

A water planning report was developed to determine the sizing and staging of the external trunk water infrastructure to service the full ULDA development. The previous planning report "ULDA Oonoonba Residential Development – External Water Supply Planning Report (DPM Water April 2011)" was based on the previous ultimate equivalent population of 3,512 EP.

Based on the revised Development Plan for 'The Village' and the calculated ultimate equivalent population of 2,524EP, two (2) external trunk water main sizing options were assessed and are detailed below.

'The Village' Development Site Only

An external trunk water supply option that only served 'The Village' development site and no other existing development areas was assessed to determine the required trunk water main size. For this option it was assumed that a dedicated pipeline from the Bottom City / Middle City reservoir site through to 'The Village' development could be constructed with no connections along the way to existing infrastructure. This option was modelled to understand the sizing of the external trunk water main required to supply adequate volumes of water to 'The Village' development only.

However it is noted that a larger diameter trunk water main that will service 'The Village' and also facilitate supplying existing and proposed development areas along the pipeline route would be constructed to take advantage of the obvious efficiencies which can be gained.

The modelling of 'The Village' development only, trunk water main option illustrated the following:

- A DN375 trunk water main would be required from Bottom / Middle City Reservoir site to the south west along Fletcher Street and crossing over Ross Creek (via the old QR rail bridge). This DN375 trunk water main would then pass under the QR rail line and along the boundary of the Civic Theatre site to Boundary Street. The DN375 trunk water main would then extend to the south along Railway Avenue (service road on the western side of the QR rail line) to Queens Road. This section of DN375 trunk water main is approximately 2,100m long;

- At Queens Road the DN375 trunk water main could be reduced in diameter to a DN300 trunk water main. The DN300 trunk water main would continue southward along Railway Avenue, cross under the Ross River and emerge in 'The Village' development site. This section of DN300 trunk water main is approximately 800m long;

- The DN300 trunk water main would also need to be extended a further 250m within 'The Village' development site along with an additional 620m of DN250 water main along the eastern boundary of the site to provide adequate trunk water infrastructure to meet minimum service requirements; and

- A preliminary cost estimate for the above trunk water infrastructure is $2,800,000.00 (ex GST).

'The Village' Development and Urban Densification of existing Suburbs

An external trunk water supply option that served the revised ultimate development of 'The Village' along with the future expected urban densification of the suburbs of South Townsville, Railway Estate and Oonoonba was assessed to determine the required trunk water main size. For this option it was assumed that the trunk water main from the Bottom City / Middle City reservoir site through to 'The Village' development would be constructed with connections to a number of existing trunk water mains along the route including, Flinders Street, Southbank development site, Boundary Street, Queens Road and First Avenue.

The modelling of 'The Village' development and the proposed densification of the adjacent existing suburbs trunk water main option illustrated the following outcomes:

- A DN600 water main would be required from Bottom City / Middle City Reservoir site to the south west along Fletcher Street then crossing over Ross Creek (via the old QR rail bridge). This section of DN600 trunk water main is approximately 760m long;
- A DN375 water main off take would be provided to service the proposed Southbank development and future urban densification in South Townsville. At this location the trunk water main would reduce in size to a DN500. This DN500 main would then pass under the QR rail line and along the boundary of the Civic Theatre site to Boundary Street. This section of DN500 trunk water main is approximately 570m long;
- The DN500 trunk water main would be connected into the existing trunk water main on Boundary Street. Furthermore at this location the trunk water main would be reduced to DN450 and would extend southward along Railway Avenue (service road on the western side of the QR rail line) to Queens Road. This section of DN450 trunk water main is approximately 760m long;
- This DN450 trunk water main would connect into the existing DN225 water main at Queens Road. At this location the trunk water main would also be reduced to DN375 and would continue southward along Railway Avenue, cross under the Ross River and emerge in 'The Village' development site. This section of DN375 trunk water main is approximately 800m long;
- The DN375 trunk water main would also need to be extended a further 250m within 'The Village' development site along with an additional 620m of DN250 water main along the eastern boundary of the site to provide adequate trunk water infrastructure to meet minimum service requirements; and
- A preliminary cost estimate for the above trunk infrastructure is $5,306,000.00 (ex GST).

3.3 Internal Development Water Infrastructure and Staging

'The Village' internal development water mains have been included into the Council WaterGEMS model to confirm the infrastructure sizing and associated staging to meet maximum hour and fire flow scenarios. The WaterGEMS model is illustrated in Appendix B along with 'The Village' master planning water reticulation layout plans shown on drawings ULD100/SK09 to ULD100/SK12.

The modelling has determined the following internal water infrastructure is required to adequately service 'The Village':

- The DN375 trunk water main crossing under the Ross River to 'The Village' continues south providing a DN200 and DN300 connection into the development;
- The above DN375 trunk water main reduces in size to a DN250 at the location where the DN300 connection directs water into 'The Village' development;
- The DN250 water main continues southward and connects into the existing DN250 main that was constructed as part of the first stage of the development; and
- A series of DN250, DN200, DN150 and DN100 water mains connect to the above trunk water mains and deliver water throughout 'The Village'.

This overall network modelling of 'The Village' illustrates the maximum hour water pressures are reduced to 255 kPa within the development. However water pressures are generally maintained around 290 kPa to 320 kPa within the development. With the inclusion of 30 l/s commercial fire flow (at the proposed commercial site) and 15 l/s residential fire flow (at the western boundary) the minimum water pressure is reduced to 163 kPa.

The above water pressures are in excess of Council's minimum requirements and therefore acceptable. The WaterGEMS model used to assess the revised Development Plan for 'The Village' is available to Council for review and checking.

The modelling illustrated that once the external trunk water main to the ULDA site is constructed and connected to the existing DN250 water main constructed with Stage 1, Stages 1 to 11 can be serviced adequately to meet Council's minimum requirements via the associated internal water main network. To develop Stage 12 the DN300 main through Stage 13 and DN250 main through Stage 15 would need to be constructed to ensure adequate water pressures are maintained.

3.4 External Trunk Water Main Staging

The first stage of construction of the external trunk water main would involve the DN250 and DN375 mains on the eastern boundary of 'The Village' site along with the crossing under Ross River to connect to the existing DN100 main in Railway Estate. This section of trunk water main will provide additional water supply and pressure to 'The Village' sufficient for the construction of Stage 4 only.

Prior to the completion of construction of Stage 5 of 'The Village' the next section of the DN375 external trunk water main along the Railway Avenue to Queens Road is required to be completed. The DN375 trunk water main extension would connect to the existing DN225 water main in Queens Road and this connection would provide additional water supply and pressure to 'The Village' to service up to and including Stage 8 of the development.

Prior to the completion of construction of Stage 9 of 'The Village' the next section of the DN450 trunk water main along the Railway Avenue through to Boundary Street is required to be constructed. The DN450 trunk water main extension would connect to the existing DN375 trunk water main in Boundary Street and this connection would provide additional water supply and pressure to 'The Village' to service the ultimate development.

The modelling has illustrated that with the sequential construction of the above external trunk water main sections from 'The Village' to Boundary Street, the ultimate development can be serviced to meet all of Council's minimum supply and pressure requirements. This conclusion is based on the assumption in the modelling that no additional growth has occurred in the South Townsville, Railway estate or Oonoonba areas. The cost estimate for this section of trunk water main is $2,350,000.00 (ex GST).

3.5 Alternative Water Supply Options

Alternative water supply options for 'The Village' development site were assessed and considered to ensure the most effective water supply option to the site was recommended and adopted.

Local Storage Reservoir and Booster Pump System

This option would involve the construction of a ground level reservoir on 'The Village' site for the required water supply storage combined with a booster pump system to provide adequate water pressure throughout the ultimate development. The following would be involved in providing this option:

- A 3.2ML ground reservoir would be required with the reservoir sizing based on Townsville Water design standards to meet seven (7) consecutive days of 95% maximum day demands. This water supply storage requirement would result in approximately a 23m diameter reservoir that is 8m high;
- The required flow rate into the reservoir is 45 l/s to enable it to fill during peak demand periods. A dedicated DN250 trunk water main would be required from the existing DN375 trunk water main at the intersection of Boundary Street and Railway Avenue through to 'The Village' development site which is a length of 2,000m;
- A multistage variable speed drive pump system would draw water from the reservoir and pump it into the development water network. The pump set would require a full duty / standby arrangement that would need to be housed along with a permanent backup diesel generator. The pump duty for the multistage pump set would be approximately 130 l/s @ 30m head to ensure adequate water pressure could be provided throughout the ultimate development (i.e. peak hour demands and concurrent fire flows); and
- It is noted that this option will only service 'The Village' development site and has a number of cost risks associate with it, specifically the unknown ground conditions to hold up a 3.2ML reservoir. This option is estimated to be more expensive than the proposed external trunk water main detailed in this report. The preliminary cost estimate of this option is $2,910,000.00 (excl. GST).

It is further noted that this option would reduce the allotment yield of 'The Village' development site as this local storage reservoir and booster pump facility would require an area of flood free land approximately 50m long and 40m wide.

Alternative Non-Viable Water Supply Options

In addition to the above option a number of additional water supply options were considered for 'The Village' development but were found to either be not viable or cost prohibitive. A summary of the options reviewed follows:

- An alternative trunk water supply option from the Fairfield Waters / Wulguru reticulation system was investigated. The existing Wulguru water supply system has no spare capacity and would need another reservoir plus additional trunk water mains constructed. The existing Wulguru reservoir site has no additional land available to duplicate the reservoir storage capacity and the outlet mains from the reservoir would also need to be upgraded in size. The Wulguru reservoir site is further away from 'The Village' development site than the city reservoir site which has land available for an additional reservoir. The investigation concluded this option was not viable and a detailed review was not undertaken; and

- Alternative existing reservoir sites (instead of the city reservoirs) were also considered. The next closest reservoir site with spare capacity is the West End reservoir. Again the West End reservoir is further away from 'The Village' than the City Reservoirs and would require additional trunk water mains to be constructed along either Ingham Road or Woolcock Street. Both of these roads have very high traffic volumes and minimal available space to accommodate an additional trunk water main. This investigation concluded that this option would be too cost prohibitive and a detailed review was not undertaken.

3.6 Water Reticulation Conclusion

The above detailed assessment of the water supply and distribution options for 'The Village' illustrates that the development can be serviced with a reticulated water supply.

The assessment and modelling undertaken also confirms a strategy for the construction sequence for the external trunk water main in order to meet minimum Council requirements for water supply and pressure.

'The Village's' internal water reticulation layout and construction sequence has also been modelled and determined to ensure Council's minimum requirements for water supply and pressure are maintained during the various stages of the development.

The detailed design of the proposed water supply and distribution system to 'The Village' will be performed as part of each development stage and will be in accordance with this master planning report.

4 SEWERAGE RETICULATION

A reticulated sewerage system is to be designed and constructed for all allotments within 'The Village' and is to be generally in accordance with this report.

4.1 Background and Overview

Stage 1 of 'The Village' has all sewage directed to the recently completed Sewage Pump Station No 1 which is located on the northern side of Riveredge Boulevard. Pump Station No 1 has been designed to accept the ultimate sewage flows from 'The Village' and discharges this sewage into the nearby Council DN900 western outfall pressure main.

The revised Development Plan for 'The Village' and consequent revised ultimate population has necessitated a review of the overall sewer strategy for 'The Village' and the specific details of the revised sewer strategy for 'The Village' are provided in the following sections of this report.

4.2 Sewer Trunk Infrastructure

Internal sewerage collection within 'The Village' shall be via gravity sewers, maintenance holes and lift Pump Stations which will direct sewage to trunk sewers and ultimately Pump Station No 1.

Due to the flat topography and size of 'The Village' there is no opportunity to have the whole site serviced by the existing Pump Station No 1 therefore additional lift Pump Stations are necessary to service future areas of 'The Village'.

The proposed master sewerage reticulation strategy for 'The Village' is shown on Drawings ULD100/SK13 to ULD100/SK16 contained in Appendix C and involves the following infrastructure:

- Existing Pump Station No 1 and the existing incoming DN375 trunk sewer located on Riveredge Boulevard and constructed with Stage 1 of 'The Village'. Both the existing Pump Station No 1 and the existing DN375 incoming sewer were sized for the previous larger proposed ultimate population and therefore have capacity for 'The Village's revised development yield. The southern portion of 'The Village' will directly gravitate to the existing Pump Station No 1 which in turn discharges directly into Council's pressure main;
- Future Pump Station No 2 located off Darter Street will lift sewage into a DN225 sewer extension to the existing Pump Station No 1. The majority of this DN225 sewer was constructed with Stage 1 of 'The Village'. An inter-area overflow around Pump Station No 2 will also need to be designed and constructed such that no environmental overflow would be necessary;
- Future Pump Station No 3, to be located in a planned park reserve on the north eastern portion of 'The Village' (Stage 14), will have a small local gravity catchment and will lift sewage into an adjacent DN225 gravity sewer in the catchment of Pump Station No 2. An inter-area overflow around Pump Station No 3 will also need to be designed and constructed such that no environmental overflow would be necessary; and
- Future Pump Station No 4, to be located in the large open drainage reserve on the northwest portion of 'The Village' (Stage 12), will have a small local gravity catchment and would lift sewage into an adjacent DN225 gravity sewer in the catchment of Pump station No 1. An inter-area overflow around Pump Station No 4 will need to be designed and constructed such that no environmental overflow would be necessary.

The following table summarises the preliminary design flow calculations for the three (3) future Pump Stations and these sewage flows have been calculated in accordance with Council design standards.

Table 4-1 Pump Station Calculations

	Pump Station No 1	Pump Station No 2	Pump Station No 3	Pump Station No 4
Equivalent Population	2,524 EP	1084 EP	669 EP	630 EP
ADWF (l/s)	6.7	2.9	1.8	1.7
Peak Flow (l/s)	33.6	14.4	8.9	8.4

The final sizing of these three (3) future Sewage Pump Stations will be undertaken as part of the detailed design process at which point the contributing catchments can be confirmed.

4.3 Environmental Overflow and Risk Assessment

The existing Pump Station No 1 has a DN300 environmental overflow into the adjacent central drainage swale and the overflow pipe has a screening chamber to minimise the potential of solids discharging to the environment in the unlikely event of a system failure. The pump station also has a backup diesel generator to again minimise the risk of an environmental overflow due to power outages.

The State Government Legislation requires a Sewer Overflow Risk Assessment to be undertaken for sewer pump stations with an environmental overflow. The relevant legislation and guidelines are:

- "Framework for managing sewage infrastructure to reduce overflows and environmental impacts"; and
- "Sewage Pumping Stations ERA 63".

Future Sewage Pump Stations No 3 and No 4 will have a flow rate of less than 40k l/hr and therefore do not met the trigger level for the ERA 63 legislation and therefore will not require an overflow risk assessment to be undertaken or require any specific DERM development approvals. However future Sewage Pump Station No 2 will have a flow rate of greater than 40 kl/hr and therefore during the design process will need to undertake an Environmental Risk Assessment to address the ERA 63 legislative requirements.

4.4 Sewerage Reticulation Conclusion

The above detailed assessment of the trunk sewers and Pump Stations for 'The Village' illustrates that the development can be serviced with a sewerage reticulation system.

The assessment and calculations undertaken also confirms a strategy for the construction of the trunk sewer infrastructure in order to meet the needs of 'The Village' development and the requirements of Council.

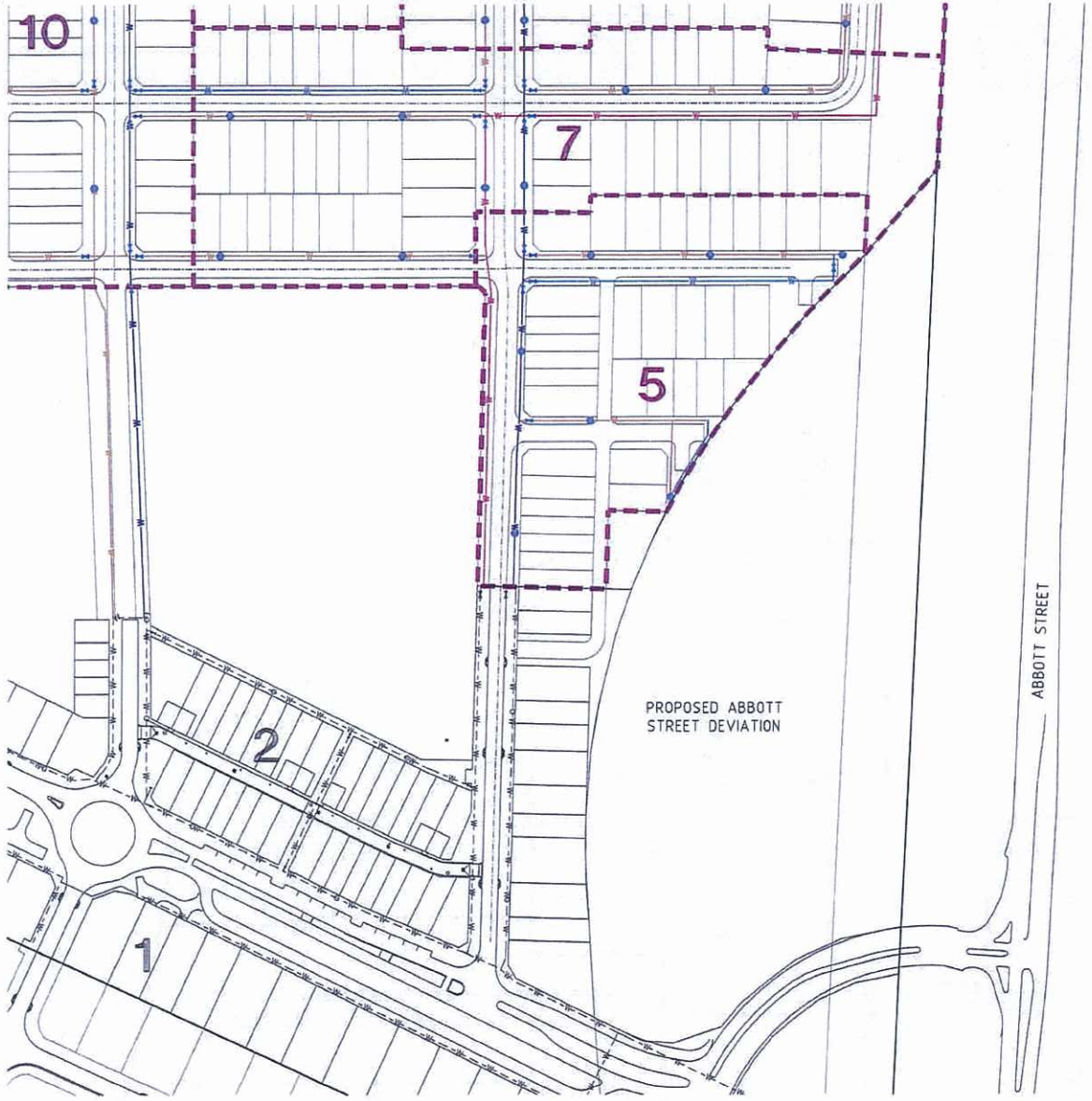
'The Village' will require three (3) additional lift Sewage Pump Stations in combination with trunk sewers that will direct sewage to the existing Pump Station No 1 which in turn will discharge the sewage into Council's existing DN900 western pressure main.

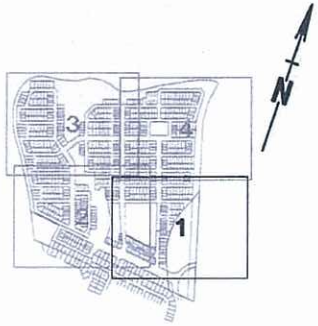
The detailed design of the proposed sewerage reticulation system and associated Sewage Pump Stations for the 'The Village' will be undertaken as part of the relevant development stage and will be generally in accordance with this master planning report.

APPENDIX A
REVISED DEVELOPMENT PLAN LAYOUT

APPENDIX B
MASTER PLANNING
WATER RETICULATION PLANS

APPENDIX C
MASTER PLANNING
SEWERAGE RETICULATION PLANS





KEY PLAN
NTS

LEGEND:

- STAGE BOUNDARY
- DN375Ø TRUNK WATERMAIN
- DN300Ø TRUNK WATERMAIN
- DN250Ø WATERMAIN
- DN200Ø WATERMAIN
- DN150Ø WATERMAIN
- DN100Ø WATERMAIN
- DN63Ø WATERMAIN
- FIRE HYDRANT & VALVE
- EXISTING WATERMAIN

WATER NOTES:

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE RELEVANT COUNCIL AND WSAA STANDARD DRAWINGS.
2. ALL WATER MAINS ARE TO BE LOCATED ON A 1.8m ALIGNMENT OFFSET FROM PROPERTY BOUNDARIES U.N.O.
3. MAINS >= 100Ø TO BE u.P.V.C. CLASS PN16 SERIES 1 O.D. COMPATIBLE TO AS 1477 RUBBER RING JOINTED, WITH SOCKETED D.I.C.L. FITTINGS U.N.O. 6300 MAINS TO BE POLYETHYLENE CLASS PN16 TO AS 4130.

0 20.0 40.0 60.0m
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1	27/07/12	ORIGINAL ISSUE

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URBAN LAND DEVELOPMENT AUTHORITY

THE VILLAGE - MASTER PLANNING
RIVEREDGE BOULEVARD, OONOONBA
WATER RETICULATION PLAN - SHEET 1 OF 4

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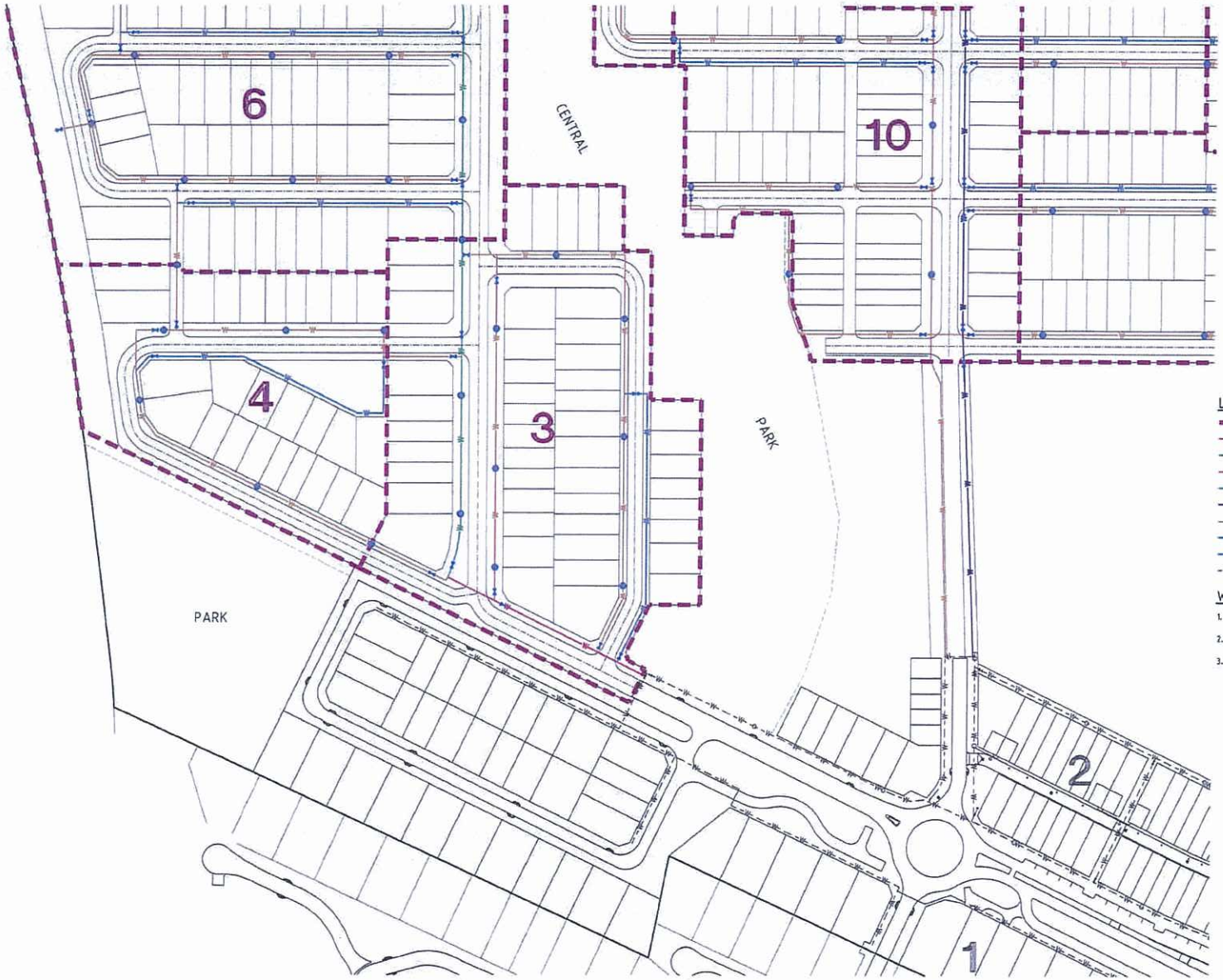

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URBAN LAND DEVELOPMENT AUTHORITY

THE VILLAGE - MASTER PLANNING
RIVEREDGE BOULEVARD, OONOONBA
WATER RETICULATION PLAN - SHEET 2 OF 4

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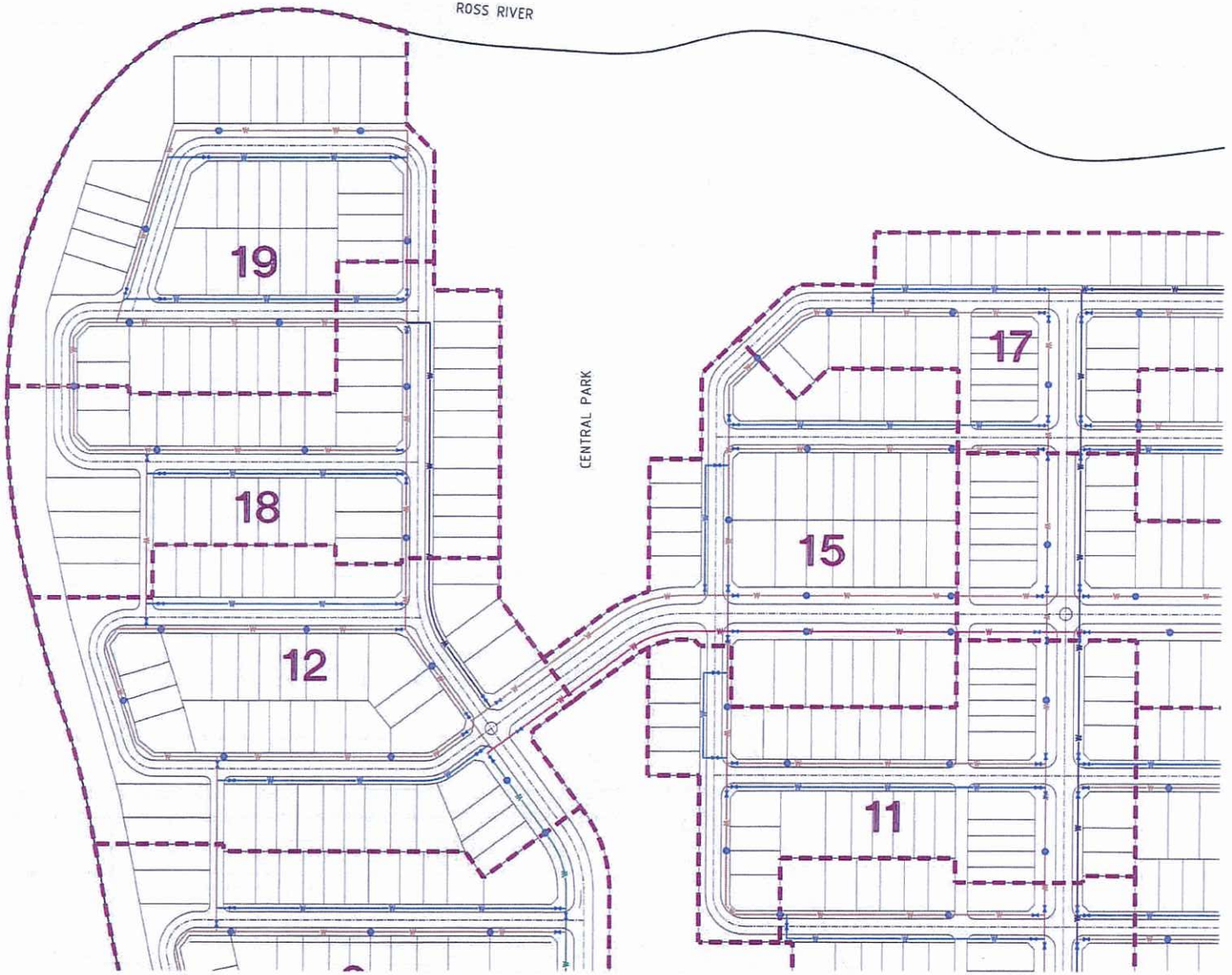
	XREF: ULD100-XR-SKETCH		



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WATER NOTES:

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2. ALL WATER MAINS ARE TO BE LOCATED ON A 1.8m ALIGNMENT OFFSET FROM PROPERTY BOUNDARIES U.N.O.
3. MAINS >= 100Ø TO BE U.P.V.C. CLASS PN16 SERIES 1 O.D. COMPATIBLE TO AS 1477 RUBBER RING JOINTED, WITH SOCKETED D.I.C.L. FITTINGS U.N.O. 630D MAINS TO BE POLYETHYLENE CLASS PN16 TO AS 4130.

0 20.0 40.0 60.0m
SCALE: 1:1000

PRELIMINARY ISSUE NOT FOR CONSTRUCTION

REV.	DATE	REVISIONS
1	27/07/12	ORIGINAL ISSUE

JAS-ANZ ISO 9001

This drawing is produced and remains the property of UDP Consulting Engineers Pty Ltd. This drawing shall not be used in any manner without the prior agreement of UDP Consulting Engineers Pty Ltd. UDP Consulting Engineers Pty Ltd shall not accept any responsibility or liability to any third party as a result of the content contained on this drawing. The Contractor must verify all dimensions on site before commencing any work or making any shop drawings. Figured dimensions must be used in preference to scaled dimensions. All scaled dimensions must be verified on site.

REAL PROPERTY DESCRIPTION:
LOTS 64 TO 101 ON SP 247154

DRAWN: Z.STROGUSZ
DESIGNED:
CHECKED:
DATUM:
PROJECT MANAGER: P.PETERSEN
PROJECT DIRECTOR: P.BRADY RPEQ 7112

UDP Consulting Engineers
Urban Development Design Infrastructure Project Management
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URBAN LAND DEVELOPMENT AUTHORITY

THE VILLAGE - MASTER PLANNING
RIVEREDGE BOULEVARD, OONOONBA
WATER RETICULATION PLAN - SHEET 3 OF 4

DRAWING SIZE	SCALE	1:1000	DRAWING No.	REV
A1	DREF	ULD100-XR-SKETCH	ULD100/SK11	1

KEY PLAN
NTS

LEGEND:

- STAGE BOUNDARY
- DN375Ø TRUNK WATERMAIN
- DN300Ø TRUNK WATERMAIN
- DN250Ø WATERMAIN
- DN200Ø WATERMAIN
- DN150Ø WATERMAIN
- DN100Ø WATERMAIN
- DN63Ø WATERMAIN
- FIRE HYDRANT & VALVE
- EXISTING WATERMAIN

WATER NOTES:

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3. MAINS >= 100Ø TO BE u.P.V.C. CLASS PN16 SERIES 1 O.D. COMPATIBLE TO AS 1477 RUBBER RING JOINTED, WITH SOCKETED D.I.C.L. FITTINGS U.N.O. 6300 MAINS TO BE POLYETHYLENE CLASS PN16 TO AS 4130.

0 20.0 40.0 60.0m
SCALE 1:1000

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URBAN LAND DEVELOPMENT AUTHORITY
THE VILLAGE - MASTER PLANNING
RIVEREDGE BOULEVARD, OONOONBA
WATER RETICULATION PLAN - SHEET 4 OF 4

DRAWING SIZE	SCALE	DRAWING No.	REV
A1	1:1000	ULD100/SK12	1
	XREF ULD100-XR-SKETCH		