



PROPOSED SHUTE HARBOUR MARINA

WATER SUPPLY & SEWERAGE INVESTIGATION

Cardno (Qld) Pty Ltd

ABN 57 051 074 992

Unit 7 "Axis on Main"

55 Main Street, Pinalba, Qld 4655

PO Box 359 Hervey Bay

Queensland 4655 Australia

Telephone: 07 4124 5455

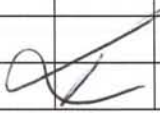
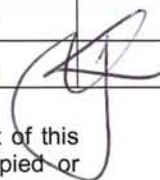
Facsimile: 07 4124 5155

International: +61 7 4124 5455

hbo@cardno.com.au

www.cardno.com.au

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		Name	Initials	Name	Initials
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EXECUTIVE SUMMARY

Cardno have been commissioned by Shute Harbour Marina Development Pty Ltd to undertake a water and sewerage assessment to support the Environmental Impact Statement (EIS) for the proposed Shute Harbour Marina Development.

It is proposed that the development will include tourism based residential and commercial type precincts. Details of the proposed development are as follows:

Table 1 – Development Information

Development Type	Residential/Commercial
Local Authority	Whitsunday Shire Council (WSC)

* A detailed breakdown of the proposed development is attached in Appendix A of this report

Whitsunday Shire Council (WSC) is the water supply and sewerage service provider for the Whitsunday Local Government Area. To provide acceptable outcomes for the proposed development WSC input has been sought and the information obtained was utilised to deliver this report.

This report confirms that suitable water and sewerage infrastructure can be provided to meet the requirements of the proposed Shute Harbour Marina development. The water supply for the development will require connection to the existing 250mm water main on Shute Harbour Road whilst connection to the 150mm sewerage rising main utilising a new pump station will satisfy the effective removal of sewerage from the development upon the completion of the Funnel Bay PS. The water and sewerage load for the development should be confirmed prior to operational works approval.

There are advantages to the operation of the sewage system provided by the proposed Shute harbour Marina development over and above any headworks charges and financial contributions, these include:

1. The connection of the new Shute Harbour Marina PS will increase the velocity in the rising main and reduce detention times which will reduce odour generation. This will reduce the need for magnesium Hydroxide Solution dosing as is currently the case; and
2. The existing 150mm rising main in Shute Harbour Road is oversized as the minimum rising main velocity of 1.5m/s is not achieved. However, connecting the proposed Shute Harbour Marina Development PS to the existing rising main will improve the velocity closer to the minimum design velocity.

1. POPULATION ASSESSMENT – EQUIVALENT PERSONS (EP)

The Department of Natural Resources and Mines – Planning Guidelines for Water Supply and Sewerage (March 2005) identifies the estimated average day demands for multi-use developments and has been adopted to quantify the developments expected water demand and sewerage flows. Details of the assessment are listed in Table 2.

Table 2 – Development Water and Sewerage Loads

#	Land Use	Amt	Unit	Water Unit Demand L/Unit/d	Sewer Unit Flow L/Unit/d	Total Water Demand L/d	Total Sewerage Flow L/d
1	Marina (30% Occupied)	669	Berths	700	450	140490	90315
2	Residential Tourism						
	1 Bedroom	14	Units	700	450	9800	6300
	2 Bedroom	22	Units	1000	600	22000	13200
3	Resort Tourism						
	3 Bedroom	19	Units	1400	750	26600	14250
	1 Bedroom	21	Units	700	450	14700	9450
4	2 Bedroom	70	Units	1000	600	70000	42000
	Mixed Use Precinct						
	Office	477	GFA	800	300	3816	1431
	Commercial	1950	GFA	800	300	15600	5850
5	Amenities	150	GFA	1800	1800	2700	2700
	3 Bedroom	109	Units	1400	750	152600	817.5
	Marina Esplanade/Parks						
TOTAL						461006 L/d	189014 L/d
						5.34 L/s	2.19 L/s

Based on the calculated water and sewerage loads as determined, Table 3 displays the equivalent population calculation for the development. To aid in this calculation the unit water demand of 800 L/EP/day and the unit sewerage load of 180 L/EP/day has been applied, as advised by WSC.

Table 3 – Equivalent Population Calculation

	Water	Sewerage
Development Load	461006 L/d	189014 L/d
EP Unit Load	800 L/EP/d	180 L/EP/d
TOTAL EP	577	1050

2. WATER SUPPLY

Discussions with WSC have indicated that there is currently a 250mm water main under construction (August 2007) to service the nearby Funnel Bay Resort development. Council have advised there is sufficient capacity within the water main to cater for the demand of the development, including the construction demand, hence there will be no requirement for a hydraulic analysis.

The key design criteria for the design of the water supply system are as follows:

Table 4 – Water Design Criteria

Average Day Demand (AD)	5.34 L/s
Mean Day Max Month (MDMM)	1.7 x AD
Peak Day Demand (PD)	2.3 x AD
Peak Hour Demand (PH)	4.5 x AD
Minimum Residual Pressure	22 m
Maximum Residual Pressure	50 m
Commercial Fire Flow	30 L/s
Fire Flow Residual	12 m

* Design Criteria based on WSAA – Water Supply Code

3. WATER SUPPLY CALCULATIONS

Applying the design criteria, the following water supply demands can be expected for the development. Based on the Population Assessment an Average Day Demand (AD) of 5.34 L/s has been applied to aid in the water supply calculations.

Table 5 – Water Supply Calculations

Design Criteria	Total
AD	5.34 L/s
MDMM	9.08 L/s
PD	12.28 L/s
PH	24.03 L/s

Council requires that there is a fire fighting requirement for the proposed development, The Natural Resources Guidelines for Planning and Design of Urban Water Supply Schemes (1989) indicates that for residential areas, the water reticulation is to be designed for a fire fighting flow of 15 L/s and for commercial areas, the water reticulation is to be designed for 30 L/s. Therefore, the fire fighting flow required by the mixed use development will be limited to a maximum of 30 L/s. Any fire fighting flow requirement greater than this can be accommodated by the provision of on-site storage and booster pumps. Notwithstanding this, WSC will not underwrite that there will be 30 L/s available in the water main at anytime and additional storage may be required to counteract the shortfall in supply dependent on the proponents site based risk assessment of the development.

Appendix B depicts the location of the existing 250mm water main on Shute Harbour Road and includes the proposed reticulation layout.

4. SEWERAGE DESIGN

WSC have advised that there is an existing 150mm DICL sewerage rising main along Shute Harbour Road and have confirmed that connection can be provided to this main by the construction a new sewerage pump station (PS) to service the proposed development. The pump station may require telemetry to synchronise communication with the existing Shute Harbour Pump Station.

The existing sewerage collection system at Shute Harbour is a pressure sewer type scheme whereby, each individual connection has a small pump station which discharges into a pressure main. The sewerage reticulation then discharges into the existing Shute Harbour PS for transfer through the existing 150mm DICL rising main to Jubilee Pocket Sewerage Treatment Plant (JPSTP). WSC have advised that the current mode of operation will change upon the commissioning of the Funnel Bay PS as the 150mm rising main will discharge directly to the Funnel Bay PS, effectively dividing the 150mm rising main from Funnel Bay PS to JPSTP. The Shute Harbour PS will pump to Funnel Bay PS and then onto JPSTP.

There is also a Magnesium Hydroxide Solution (MHS) dosing unit installed on the Shute Harbour PS for odour control due to the long detention times on the rising main prior to JBSTP. In effect, the connection of the new Shute Harbour Marina PS will increase the velocity in the rising main and reduce detention times which will reduce odour generation. Upon augmentation it is expected that the Shute Harbour Marina PS details will be as follows:

Table 6 – Shute Harbour PS Details

	Existing	Future*
Duty Flow	8 L/s	8 L/s
Duty Pressure Head	74 m	15 m

* Upon commissioning of Funnel Bay PS

The key design criteria for the design of the sewer supply system are as follows

Table 7 – Sewerage Design Criteria

ADWF	2.19 L/s
EP	1050
PWWF	5 x ADWF
C₁ Flow (3.5 < C₁ < 5)	15 x EP^{-0.1587}
Dual Pump Capacity	5 x ADWF
Emergency Storage	4 hrs x ADWF
Maximum Rising Main Velocity	1.5 m/s
Minimum Rising Main Velocity	0.7 m/s

5. SEWERAGE CALCULATIONS

An Average Dry Weather Flow of 2.19 L/s has been applied to the development to calculate the expected sewerage flows, as defined below:

Table 8– Sewerage Flow Calculation

ADWF	2.19 L/s
C₁ = 4.97	10.89 L/s
PWWF	10.95 L/s

The sewerage flows for the proposed land use and development are defined below

Table 9 – Sewerage Flow Calculation (Land Use)

#	Land Use	EP	ADWF L/s	PWWF L/s
1	Marina (30% Occupied)	502	1.05	5.23
2	Residential Tourism	188	0.39	1.95
3	Resort Tourism	286	0.60	2.98
4	Mixed Use Precinct	60	0.12	0.62
5	Marina Esplanade/Parks	15	0.03	0.16
TOTAL		1050	2.19	10.95

Based on the Land Use types, individual developments will be required to be serviced by a 150mm sewerage gravity main, however upon finalization of the detailed design the sewerage reticulation sizing should be confirmed.

It is proposed that the internal sewerage reticulation will gravity flow to a new internal pump station that will be constructed within the confines of the development site and will be owned and operated by the body corporate, WSC have advised that the connection point will be the tee that is required to be constructed into the existing 150mm rising main. The proponent will also be responsible for obtaining Main Roads approval to construct the rising main under Shute Harbour Road.

WSC have indicated their preference for connection to the existing 150mm rising main on Shute Harbour Road utilising a new pump station constructed specifically for the development. During the design stage of the pump station, the operation of this system will be required to be investigated and designed accordingly to ensure that the PWWF of all the new PS and the Shute Harbour PS can be discharged during simultaneous operation with the existing pump stations that use the main. To achieve this, the pumps within the existing pump stations which utilise the common rising main may be required to be upgraded. This is due to the higher head loss generated by the anticipated larger flows. If this was not the case then the operation would provide additional operational risks due to the proposed intermittent operation of the pump station. This may include the increased likelihood of sewer overflows due to “queuing” which may limit the pump operation during high inflow events.

The minimum pump station requirements for the development are detailed in Table 10. The single pump rate has been increased to 12 L/s to maintain adequate velocities in the rising main.

Table 10 – Internal Pump Station Details

Single Pump Rate (L/s)	Rising Main (mm)	Velocity (m/s)	Emergency Storage (m³) (4hrs x ADWF)
12	100	1.52	32

The 150mm rising main from Shute Harbour PS will now have the additional flow of the new Shute Harbour Marina Development PS. The following table demonstrates the expected rising main velocities:

Table 11 – Rising Main Design Check

	Pump Rate	Rising Main (mm)	Velocity (m/s)
Proposed PS	12.0	100	1.52
Existing Shute Harbour PS	8.0	150	0.45
Total	20.0	150	1.13

Table 11 demonstrates that a 100mm rising main can achieve the minimum design velocity requirement from the proposed Shute Harbour Marina Development PS to the existing 150mm rising main.

The existing 150mm rising main in Shute Harbour Road is oversized as the minimum rising main velocity of 1.5m/s is not achieved. However, by connecting the proposed Shute Harbour Marina Development PS to the existing rising main will improve the velocity closer to the minimum design velocity.

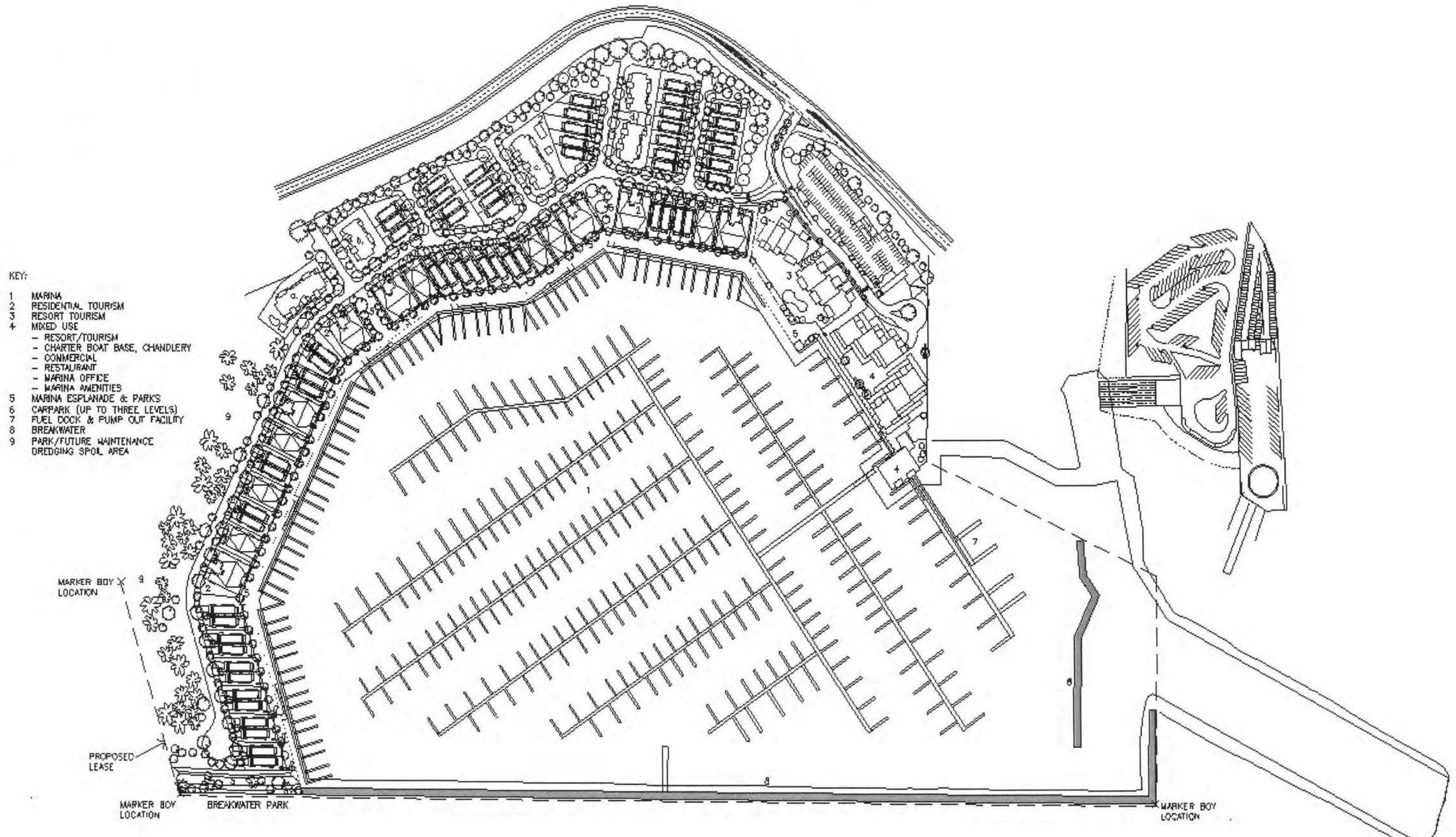
The preliminary sewerage layout is displayed in Appendix C of this report.

6. CONCLUSION

This report confirms that suitable water and sewerage infrastructure can be provided to meet the requirements of the proposed Shute Harbour Marina development. The water supply for the development will require connection to the existing 250mm water main on Shute Harbour Road whilst connection to the 150mm sewerage rising main utilising a new pump station will satisfy the effective removal of sewerage from the development upon the completion of the Funnel Bay PS. The water and sewerage load for the development should be confirmed prior to operational works approval.

APPENDIX A

Development Layout



APPENDIX B

Preliminary Water Infrastructure Layout



APPENDIX C

Preliminary Sewerage Infrastructure Layout

