CITY PACIFIC LIMITED

TOWNSVILLE OCEAN TERMINAL

REVIEW OF TOWNSVILLE CITY COUNCIL WATER AND SEWER PLANNING REPORT FOR ROSS CREEK DEVELOPMENT AREA

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Urban Development
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REPORT AUTHORISATION					
Revision	**Revision Date**	**Details**	**Prepared by**	**Authorised by**	**Signature**
A	10/03/2008	Issued to client as draft for review	Desmond Moseley	Patrick Brady	
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1 INTRODUCTION

A number of residential and commercial developments are proposed in the area known as the Townsville Breakwater, in addition to the existing developments in that area. These potential developments include:

- Townsville Ocean Terminal by City Pacific Limited;
- Breakwater Cove by City Pacific Limited;
- Saltwater Development by Resort Corp Pty Ltd;
- Mariner's Peninsula Development by Mirvac; and
- Redevelopments of the Breakwater Boatramps and Magnetic Island Ferry Terminal, including carpark areas.

Maunsell Australia Pty Ltd were commissioned by Townsville City Council to undertake a water and sewer master plan assessment for this proposed development area with a draft report provided in January 2008 titled "Ross Creek Master Planning Interim Report – Response to EIS for the Townsville Ocean Terminal Project". A copy of that report is attached in Appendix A.

This report identified the required water and sewer trunk infrastructure to service the Townsville Breakwater developments.

UDP Consulting Engineers have been commissioned by City Pacific Limited to:

1. Review the documentation in the EIS prepared by Hyder Consulting; and
2. Undertake a peer review of the Draft Maunsell report.

Townsville City Council in it's response to the EIS has stated that no provision has been made by Council to service the Townsville Ocean Terminal project and, accordingly, the developer will have to cover the cost of the external works necessary to connect the development to Council's water supply and wastewater systems, in addition to the normal headworks contributions.

Based on the Maunsell report, Council estimates the cost of connecting the development to its water supply and wastewater systems to be as high as $4.7M and $1.9M respectively (based on infrastructure sizing for the Ocean Terminal project in isolation). The water and wastewater headworks contributions could be as high as $9.4M and $2.4M respectively. The total water and wastewater connection costs (not including the costs to provide infrastructure within the development) could therefore be up to $18.4M. These cost estimates are based on a water demand of 55 l/s for the Cruise ship terminal which is unrealistic based on advice from Townsville Port Authority. The lower 11.7 l/s water demand is more realistic and should be used in sizing any infrastructure required to service the development.

With the implementation of the Townsville Ocean Terminal project, a significant amount of trunk water and sewer infrastructure will need to be constructed to service the proposed development. It is therefore considered appropriate that some of the cost of this infrastructure be funded by headworks, especially considering:

- The proposed trunk water and sewer infrastructure in the Maunsell Report would have some spare capacity and therefore would also be able to service further developments in the Townsville CBD area, and not just the four developments specified in their report;
- The quantum of headworks charges that will be paid by City Pacific for the Ocean Terminal Project; and
- The CBD revitalisation project (which includes the Ocean Terminal Project) has been an initiative of the Townsville City Council and will include numerous other high rise developments. Most of the other high rise developments would have never previously been considered in the infrastructure planning in the CBD and surrounds so infrastructure upgrades required for these other proposed and future developments would also have to be funded as external works. Provision of trunk infrastructure in this segmented approach is not equitable and is unlikely to provide the most efficient infrastructure solution for Council.

The Maunsell report considered two cost apportionment options for the funding of the trunk water and sewer infrastructure. These were based on City Pacific Limited paying for the equivalent cost of providing trunk infrastructure to just service their development or City Pacific funding a portion of the total cost based on their percentage contributing EP. An alternative funding arrangement has been considered in this report being City Pacific Limited only funding the additional infrastructure cost above that which would have been required to service the other identified developments without the Ocean Terminal project. Further details of this alternative cost apportionment option are presented in Section 3.

The ultimate infrastructure sizing and associated costs in the Maunsell report have been assessed based on only four proposed developments in the Townsville Breakwater area. It is however understood that there are and will be numerous other significant high rise developments in the CBD and surrounds that will necessitate upgraded trunk water & sewer infrastructure. On this basis it is considered appropriate that Townsville City Council undertake an overall water and sewer infrastructure assessment for the Townsville CBD area and surrounds to determine the long term trunk infrastructure requirements, their costs and staging due to the densification that is occurring in the area. This assessment would determine the most efficient long term infrastructure strategy for the area and would allow the cost of this infrastructure to be applied to all future developments as an infrastructure charge, not just the four specific developments currently identified in the Maunsell report.

This report summarises the peer review of the draft Maunsell “Ross Creek Master Planning Interim Report (Jan 2008)”. It is understood that a revised Maunsell

planning report has been completed and provided to Council however this report is still under review by Council and has not been made available for review.

2 MAUNSELL PLANNING REPORT REVIEW COMMENTS

The original Hyder report identified the water demand for the Ocean terminal as 55 l/s. This flow rate was considered excessive in the Maunsell planning report and a lower flow rate of 11.7 l/s was suggested. The Maunsell planning report however still used the 55 l/s flow rate for much of the infrastructure sizing and associated calculations for infrastructure funding.

Discussions with the Townsville Port Authority and cruise ship operators has identified that the lower flow rate is generally applicable. This is demonstrated by cruise ships and naval ships that dock in Townsville currently being re-filled with water through a 50 mm diameter supply line. A 55 l/s flow through this size main would have a 28 m/s velocity, which is not realistic. An 11.7 l/s flow rate would be similar to a fire flow through a hydrant standpipe.

The 11.7 l/s water demand for the Ocean Terminal is therefore more realistic and applicable. The estimated sizing of the external trunk water and sewer infrastructure based on this lower water demand and the associated cost apportionment is provided in Section 3 of this report. It is possible to have this water demand further reduced by the installation of a balance tank however the sizing and cost effectiveness of the balance tank has not been determined in this report and would be assessed as part of the detailed design process.

2.1 Upgrade Summary

The Maunsell report identifies the required external development infrastructure upgrades to service the Townsville Ocean Project in isolation of other proposed developments in the study area. The infrastructure sizing was based on the 55 l/s water demand for the Ocean Terminal and involved:

- A 375 mm diameter trunk water main from the outlet of the existing Council Bottom City Reservoir, along Walker Street, Hamilton Street, Melton Terrace, The Strand and Sir Leslie Thiess Drive. The water main length is approximately 2,900 m; and
- A sewage pump station to service the Ocean Terminal project along with a 225 mm diameter rising main from the pump station to the discharge point being the existing 600 mm diameter rising main near the intersection of Boundary Street and Seventh Avenue. The rising main length is approximately 3,000 m.

The Maunsell report also identified the required external development water infrastructure to service the Townsville Ocean Terminal Project based on an 11.7 l/s flow for the Ocean Terminal. The assessment identified that:

- A 300 mm diameter trunk water main from the outlet of the existing Council Bottom City Reservoir, along Walker Street, Hamilton Street, Melton Terrace, The Strand and Sir Leslie Thiess Drive. The water main length is approximately 2,900 m.

The Maunsell report did not indicate the sewer infrastructure necessary to service the Ocean Terminal project with the reduced Cruise ship terminal demand and sewage generation. A quick calculation has however shown the required trunk sewer infrastructure to include a sewage pump station to service the Ocean Terminal project along with a 200 mm diameter rising main from the pump station to the discharge point being the existing 600 mm diameter rising main near the intersection of Boundary Street and Seventh Avenue. The rising main length is around 3,000 m.

It is noted that larger trunk water mains and rising mains are necessary if other proposed developments in the study area are included in the infrastructure sizing. Additional sewage pump stations would also be required to service the other 3 proposed developments.

2.2 General Comments

Overall, the Maunsell water and sewer planning report identified logical water and sewer strategies to service the proposed Townsville Ocean Terminal and also the other specifically identified developments. The detailed infrastructure sizing was however predominantly based on the Hyder specified 55 l/s water demand for the Ocean Terminal, which is excessive and not realistic. Detailed infrastructure modelling is therefore required based on the lower 11.7 l/s water demand.

Section 3 of this report provides a preliminary infrastructure assessment for water and sewerage based on the revised 11.7 l/s water demand and also provides an alternative cost apportionment strategy.

In addition to the above, the assessment in the Maunsell report only considered existing and specifically proposed developments around the Wickham Street / Strand / Flinders Street area along with Sir Leslie Thiess Drive. It also considered one proposed development on the eastern side of Ross Creek.

Due to the amount of development that is occurring in the Townsville CBD it is expected that further water and sewer infrastructure upgrades will be required to continue to adequately provide the required minimum level of water and sewer services, however these other developments have not been considered in the Maunsell report. The infrastructure identified in the Maunsell report, particularly the water mains would have some spare capacity to allow other future developments in the Townsville CBD to be connected while still maintaining minimum level of service.

Given the continuing revitalisation of the Townsville CBD, an overall water and sewer infrastructure strategy for the CBD and Strand area of Townsville is considered necessary. This overall study would identify the long term water and sewer infrastructure needs of this area, along with costs and staging strategies. The costs of

the ultimate infrastructure would then be equitably spread over the future developments in the area, therefore ensuring the most efficient infrastructure strategy that is fully funded by all future users of the infrastructure. This would essentially create a specific water and sewer infrastructure charge for the Townsville CBD and surrounds.

Given that the CBD revitalisation has been an initiative of the Townsville City Council, it is expected that the infrastructure upgrades would have been identified and planned for, and that a headworks strategy would have been developed.

In addition to the above there were further issues identified in the report, as detailed in the sections below. The main issues are:

- The calculated percentage of the costs attributable to the Townsville Ocean Terminal project. The water cost percentage provided in the report is significantly higher than it should be;
- The water demand and associated sewerage generation from the proposed Townsville Ocean Terminal itself has a noticeable impact on the equivalent population and therefore cost of the water and sewer infrastructure to service the Ocean Terminal project; and
- The size of the sewer infrastructure proposed in the report is not considered large enough to cater for the identified developments. An increase in the sewer infrastructure size is considered necessary, which will therefore increase its estimated cost.

Further details on the above comments are provided in the following report sections.

2.3 Population Assessment Comments

The population assessment detailed in the Maunsell report is generally accurate and has been consistently applied to all the proposed developments. Some issues noted with the Maunsell population assessment are as follows:

- The population assessment has assumed 2.2 EP/unit while the Townsville City Council Headworks Policy identifies that only 2.0 EP/unit be applied. It is noted that the 2.2 EP/unit has been applied to all the existing and proposed units in the development area so this would not significantly impact on the proportion of costs to be paid by the Townsville Ocean Terminal project;
- The estimated water demand for the cruise ship terminal component was estimated by Maunsell as 11.7 l/s but the Hyder Report titled “Townsville Ocean Terminal Infrastructure Summary (January 2008)” had identified it as 55.0 l/s. The difference in equivalent population (EP) between these two assumptions is approximately 900 EP; and
- The proportion of costs being applied between the various proposed developments is based on a percentage of the EP. With this means of

apportioning the costs across the proposed developments, the assumption on water demands and therefore equivalent population for the cruise ship terminal has a noticeable impact on the cost that is applied to the Ocean Terminal Project.

It is noted that the EP values adopted for the Casino and Resort Corp development were previously determined using different assumptions however the same population estimate was made. This therefore illustrates the population assumptions being used in the Maunsell report are reasonable.

2.4 Water Supply Planning Comments

A check of the water infrastructure planning and associated infrastructure sizing detailed in the Maunsell report has been performed. A summary of the assessment is provided below.

The water infrastructure planning in the Maunsell report was determined based on two water demand scenarios. These scenarios were related to the estimated water demand that the cruise ship terminal will require and are listed below:

- 11.7 l/s was estimated by Maunsell, this being 243 EP; and
- 55.0 l/s was estimated by Hyder, this being 1,145 EP.

The 55.0 l/s flow rate identified by Hyder is considered excessive and unrealistic. Discussions with the Townsville Port Authority and cruise ship operators has identified that the lower flow rate is generally applicable. This is demonstrated by cruise ships and naval ships that dock in Townsville currently being re-filled with water through a 50 mm diameter supply line. A 55 l/s flow through this size main would have a 28 m/s velocity, which is not realistic. An 11.7 l/s flow rate would be similar to a fire flow through a hydrant standpipe.

The Maunsell planning report determined the required water infrastructure to service just the Ocean Terminal project for the above two demand scenarios. The proposed water infrastructure sizing was checked, and showed that the infrastructure proposed in the Maunsell report is applicable.

The Maunsell water main sizing for the full development including the other identified developments in the area was also checked. Again the Maunsell assessment was based on the higher 55 l/s demand. A check of the Maunsell infrastructure sizing showed it was reasonable. It is noted that a full review of the actual WaterCAD network model that was used to assess the above infrastructure sizing has not been made to date, however preliminary modelling and manual calculation checks agree with the sizing proposed.

A revised preliminary assessment was performed to identify the infrastructure necessary to service the Ross Creek area including the Townsville Ocean Terminal with the reduced 11.7 l/s demand for the cruise ship terminal. This assessment showed that a 450 mm diameter water main was required from the Bottom City

Reservoir, along Walker Street, Hamilton Street, Melton Terrace, The Strand and part way along Sir Leslie Thiess Drive. A 375 mm diameter main was required for the remainder of the length of Sir Leslie Thiess Drive. This identified infrastructure has no spare capacity for any other developments in the Townsville CBD and surrounds as it just meets the water pressure requirements. The estimated cost of this revised infrastructure (based on the rates provided in the Maunsell report) is $5,894,000.

Based on the review of the identified infrastructure within the Maunsell report, the following items are noted:

- Further preliminary modelling has shown that the infrastructure proposed for the 55 l/s Cruise Ship terminal water demand option had a small amount of spare capacity for other developments in the Townsville City area to use. The calculation showed that around another 730EP (ie 35 l/s) could be supplied off the proposed 500 mm and 450 mm diameter mains while still providing adequate water pressure to the Ocean Terminal project. This equates to around 7.5% spare capacity;

- If the 55 l/s Cruise ship terminal water demand option was adopted then the cost apportionment detailed in the Maunsell report would have to be altered with around 7.5% (ie 730 EP/ 9537 EP) of the infrastructure cost to be applied to Council (i.e. future developers); and

- The cost apportionment in Section 3.4 of the Maunsell report is incorrect and should be 32.4% (3092 / 9537) for the high demand scenario and 25.3% (2188 / 8633) for the low population scenario.

With the revised trunk water infrastructure sizing for the lower 11.7 l/s cruise ship terminal water demand and corrected cost apportionment, the estimated cost apportionment of the trunk water infrastructure costs to City Pacific Limited for the Townsville Ocean Terminal project would be approximately $1,490,000. This is compared to the calculation in the draft Maunsell report that calculated the City Pacific Limited cost as $3,451,000 (for the high 55 l/s demand scenario).

The above costs are significantly lower for City Pacific Limited than the estimated cost of trunk water infrastructure based on only servicing the Ocean Terminal project which was estimated as $4,270,000 for the 11.7 l/s water demand scenario.

Based on the above, spreading the cost over a number of future developments is the more cost effective strategy for City Pacific Limited and also provides a more efficient infrastructure strategy for the development area.

An alternative trunk infrastructure cost apportionment strategy is provided in Section 3 of this report.

2.5 Sewerage System Planning Comments

An assessment of the sewer infrastructure planning and associated infrastructure sizing has been performed.

The sewer assessment detailed in the Maunsell report was performed on the basis that the higher water demand (55 l/s) and therefore equivalent higher sewage generation would occur. It is noted that a review of the actual WaterCAD network model used to assess the sewer infrastructure sizing has not been made to date, however manual calculations have been performed to check the infrastructure sizing.

As detailed in Section 2.4 of this report the 55.0 l/s flow rate identified by Hyder is considered excessive and unrealistic and the 11.7 l/s water demand (and associated sewage generation) should therefore be adopted and used to size the trunk sewer infrastructure.

A revised preliminary assessment was performed to identify the infrastructure necessary to service the Ross Creek area including the Townsville Ocean Terminal based on the equivalent population (and therefore sewage generation) with the reduced 11.7 l/s demand for the cruise ship terminal. The 11.7 l/s water demand equates to 244 EP instead of 1,146 EP based on 55 l/s.

This assessment showed that a 150 mm diameter rising main was required from the proposed Ocean Terminal Project pump station along Entertainment Drive. A 200 mm diameter rising main would be required along Sir Leslie Thiess Drive (once the Casino PS A1A flows were added in). A 250 mm diameter main would be required from the proposed Ross Creek west pump station to discharge into the proposed Ross Creek East pump station (including a crossing of Ross Creek) and finally a 250 mm diameter rising main from the proposed Ross Creek East pump station to the connection with the existing 600 mm diameter trunk rising main. This strategy has the three proposed pump stations on the north western side of Ross Creek discharging into the proposed Ross Creek east pump station. The Ross Creek East pump station would then discharge into the trunk 600 mm diameter common rising main to the Cleveland Bay STP.

The estimated cost of this revised sewer strategy is approximately $4,070,000 (with this based on the rates provided in the Maunsell report for the various rising main sizes). This revised cost includes an increased value of $600,000 for the Ross Creek East pump station as it would need to be a large diameter station due to the ultimate contributing sewage flows. Using the population apportionment costing strategy, City Pacific Limited would have to fund 33.1% (ie 2186EP /6603EP) of the total cost being $1,347,000.

Based on the review of the identified infrastructure detailed in the Maunsell report the following items are noted:

- The proposed rising main from the Ocean Terminal Project was nominated as only 150 mm diameter however with the peak sewage flows of 47 l/s this would have a velocity of 2.6 m/s which would result in extremely high friction losses and therefore pump sizes would not be practical. A 200 mm diameter rising main would be required to just service the Ocean Terminal Project. This increased rising main would have the cost of servicing just the Ocean Terminal project increased to $1,957,000 (compared to $1,883,000 in the Maunsell

report). Even with the reduced sewage flow based on the lower demand for the Cruise ship terminal, a 200 mm diameter rising main would be required the full length;

- The overall sewer strategy also seems to have all rising mains too small. The proposed rising main from the Casino area (i.e. Casino and Ocean Terminal Project) is only 200 mm diameter with a peak sewage flow of 90.7 l/s. This would have a velocity of 2.9 m/s, which is too high. Therefore, this section of rising main would need to be increased to 250 mm diameter. Again this continues along the full rising main length with each proposed rising main section being around one pipe size too small to cater for peak wet weather sewage flows;

- The sewer strategy appears to have each pump station discharging into the next PS all the way to the discharge into the 600 mm diameter trunk pressure main. An improved strategy would be to have the new Ocean Terminal Project pump station, the existing (upgraded) Casino pump station and the Ross Creek West pump station all discharging into a common rising main. These three pump stations would then discharge into the proposed Ross Creek East pump station. The Ross Creek East pump station would then discharge into the 600 mm diameter trunk common rising main. The cost estimate for the Ross Creek East pump station should be increased, as it would have approximately 12,000 EP being directed to it. This final pump station would cost an estimated $600,000, not the $300,000 detailed in the Maunsell draft report;

- The sewer assessment does not appear to have considered the performance of the 600 mm diameter trunk rising main that the system is proposed to discharge into. With these proposed developments and other proposed developments in the city area there is the potential for the 600 mm diameter trunk rising main not having a sufficient capacity. This is only an assumption, however if an overall Townsville CBD and surrounds water and sewer planning study was undertaken (as recommended in Section 2 of this report), this would enable the ultimate size of the trunk infrastructure to be determined; and

- The cost apportionment in Section 4.4 of the Maunsell report is correct and is 41.1% (3092 / 7509) for the high demand Ocean Terminal scenario. If the equivalent sewer flow / EP from the cruise ship terminal is reduced then the percentage would be reduced to 33.1% (2186 / 6603) for the low population scenario.

If the higher sewage flow option (ie based on the equivalent population for the 55 l/s Cruise Ship terminal demand) as detailed in the Maunsell report was adopted, the revised cost estimate for the sewer strategy would be approximately $4,385,000 which is $659,000 higher than detailed in the Maunsell report.

Based on the above, spreading the cost over a number of future developments is the most cost effective strategy for City Pacific Limited and also provides a better efficient infrastructure strategy for the development area.

An alternative trunk infrastructure cost apportionment strategy is provided in Section 3 of this report.

2.6 Infrastructure Upgrade Sequencing

The Maunsell report does not identify any staged trunk infrastructure implementation strategy. A preliminary assessment has been made on the possible staged implementation strategy for the water and sewer trunk infrastructure, which is summarised below. The staged infrastructure is based on the revised infrastructure sizing based on the reduced 11.7 l/s flow rate for the Cruise Ship terminal:

Water

- The 375 mm diameter trunk water main along Sir Leslie Thiess Drive would probably need to be constructed first as the existing 300 mm diameter main would exceed its capacity once either the Cruise Ship Terminal or first few stages of the Breakwater Cove development were constructed. This section of trunk main would likely need to be constructed at the commencement of the development; and

- The 450 mm diameter trunk water main heading back to the Bottom City reservoir could be built in stages with further hydraulic modelling required to determine what stages could be implemented whilst still providing sufficient water pressure to the planned developments.

Sewer

- The proposed pump station at the Ocean terminal project would need to be constructed at the commencement of the development;

- The rising main from the Ocean terminal development all the way to the existing 600 mm diameter trunk rising main would also likely be required at or soon after the commencement of the development. This is because it is understood that the existing gravity sewer system near the CBD is almost at capacity and would not cater for the additional sewage load from the Ocean Terminal project; and

- The other identified pump stations would need to be constructed when their respective developments are commenced.

3 REVISED WATER & SEWER STRATEGY & FUNDING ARRANGEMENT

3.1 Alternative Infrastructure Cost Apportionment Methodology

The assessment detailed in the Maunsell report did not consider an alternative infrastructure cost sharing arrangement that provides a more equitable means of proportioning the cost of the required trunk water and sewer infrastructure to City Pacific.

This alternative strategy is to size the trunk water and sewer infrastructure to service the Ross Creek area developments without the Townsville Ocean Terminal project and then size the infrastructure required to service the Ross Creek development area including the Ocean Terminal project. The cost in providing the additional sized trunk water and sewer infrastructure would then be funded by City Pacific Limited.

This infrastructure cost apportionment methodology provides a fair assessment of the cost that City Pacific Limited should pay for trunk water and sewer infrastructure to service the development. This is because Council (or other developers) would have to build trunk water and sewer infrastructure to service the other proposed developments even if the Townsville Ocean Terminal project did not happen so the Ocean Terminal project should then only fund the additional sized infrastructure needed to service its water demands and sewage loadings.

The following sections of this chapter detail the estimated infrastructure and associated cost apportionment to the Ocean Terminal project based on this methodology. The assessment provided below is based on the cruise ship terminal having a peak water demand of 11.7 l/s (as detailed in the Maunsell report) and not the high 55 l/s demand detailed in the original Hyder report.

Again, as detailed in other sections of this report, it is still recommended that an overall water and sewer infrastructure strategy be performed for the Townsville CBD and surrounds to determine the long term trunk infrastructure requirements, their costs and staging due to the densification that is occurring in the area. This assessment would determine the most efficient long term infrastructure strategy for the area and would allow the cost of this infrastructure to be applied to all future developments as an infrastructure charge, not just the four specific developments currently identified in the Maunsell report.

3.2 Alternative Infrastructure Sizing

Preliminary calculations and modelling have been performed to size infrastructure to service the other identified developments with trunk water & sewer services without the Townsville Ocean Terminal project. The preliminary assessment has shown:

Water Infrastructure

- A 375 mm diameter water main was required from the Bottom City Reservoir, along Walker Street, Hamilton Street, Melton Terrace, The Strand and part way along Sir Leslie Thiess Drive;
- A 300 mm diameter main was required for the remainder of the length of Sir Leslie Thiess Drive;
- This identified infrastructure has no spare capacity for any other developments in the Townsville CBD and surrounds; and
- The estimated cost of this water infrastructure (based on the rates provided in the Maunsell report) is $4,765,000.

Sewer Infrastructure

- Three new pump stations to service the other developments in the study area. These pump station are Replacement PS A1A, Ross Creek West pump and Ross Creek East pump station. The Ross Creek East pump station would be a large than standard station that would receive sewage flows from the other two stations and discharge sewage to the 600 mm diameter trunk common rising main;
- A 150 mm diameter rising main from the replacement PS A1A to the proposed Ross Creek West pump station;
- A 200 mm diameter rising main from the proposed Ross Creek West PS to the proposed Ross Creek East pump station;
- A 225 mm diameter rising main from the proposed Ross Creek East PS to the trunk 600 mm diameter common rising main; and
- The estimated cost of this sewer infrastructure (based on the rates provided in the Maunsell report) is $3,400,000.

3.3 Revised Cost Apportionment

With the revised infrastructure sizing and associated cost estimate (based on the rates in the Maunsell report) the cost apportionment to City Pacific Limited based on the revised methodology is:

- Water Supply - $1,129,000. This is based on the difference in capital costs of $5,894,000 including the Ocean Terminal Project (Refer Section 2.4) and $4,765,000 without the Ocean Terminal Project (Refer Section 3.2); and
- Sewerage - $670,000. This is based on the difference in capital costs of $4,070,000 including the Ocean Terminal Project (Refer Section 2.5) and $3,400,000 without the Ocean Terminal Project (Refer Section 3.2).

The above costs to City Pacific Limited are lower then the other cost apportionment methods detailed in the Maunsell report.

4 SUMMARY AND RECOMMENDATIONS

A water and sewer planning report has been developed by Maunsell for the Ross Creek study area. This study area includes the proposed Townsville Ocean Terminal along with a number of other proposed developments in the area around Sir Leslie Thiess Drive.

A peer review of the draft Maunsell report has been performed. The review has identified that the proposed water and sewer strategies are generally applicable however there were some errors and changes recommended to the Maunsell report. Discussions have been held with Maunsell throughout the review process and they have been advised of the identified issues. The assessment has shown:

- The proposed trunk water infrastructure sizing is applicable based on the high 55 l/s demand for the Cruise Ship Terminal however the apportionment of the cost of this infrastructure to City Pacific Limited was incorrect;
- The assumption of the peak water demand to the cruise ship terminal has an impact on the infrastructure sizing and a noticeable impact on the cost apportionment to City Pacific Limited; and
- The infrastructure sizing for the overall sewer strategy is considered too small for the calculated peak sewer flows. All the identified rising mains should be increased in size. The cost of the final proposed pump station to service the Ross Creek area should also be increased.

The following recommendations are made based on the review of the draft Maunsell report:

- The revised trunk water and sewer infrastructure size detailed in this report based on the lower 11.7 l/s water demand (and associated equivalent sewage generation) for the Cruise ship terminal be checked and modelled in detail as part of the review and update of the draft Maunsell report;
- Townsville City Council undertake an overall water and sewer infrastructure assessment for the Townsville CBD area and surrounds to determine the long term trunk infrastructure requirements, their costs and staging due to the densification that is occurring in the area. This assessment would determine the most efficient long term infrastructure strategy for the area and would allow the cost of this infrastructure to be applied to all future developments as an infrastructure charge, not just the four specific developments currently identified in the Maunsell report. Notwithstanding this, further discussions with Council will be required to agree on the funding arrangement and cost apportionment for the identified trunk water and sewer infrastructure; and
- The alternative cost apportionment methodology detailed in Section 3 of this report be included in the revised Maunsell report and adopted as the means of splitting the cost of the trunk infrastructure (if the above overall Townsville City water and sewer infrastructure planning is not undertaken).

APPENDIX A
ROSS CREEK PLANNING AREA – MAUNSELL REPORT

MAUNSELL | AECOM

DRAFT

Ross Creek Master Planning Interim report

Response to EIS for the Townsville Ocean Terminal Project

Citiwater

Job No. 60027478
January 2008

DRAFT COPY

Interim Report

Prepared for

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Reviewed by Michael Puntil

Revision History

Revision	Revision Date	Details	Authorised	
			Name/Position	Signature

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1.0 Background

Maunsell was commissioned by Citiwater to complete the master planning of water and sewerage infrastructure for the Ross Creek Development Area. The area is experiencing rapid growth and Townsville City Council (TCC) wishes to ensure that its water and sewerage infrastructure can support the additional loading.

City Pacific Limited released the Environmental Impact Assessment (EIS) for the Townsville Ocean Terminal (TOT) Project in November 2007. TOT land is within the Ross Creek Development area. This interim report details the review that was made of the Infrastructure Report (Appendix 10 of the EIS).

The Infrastructure Report indicates that upgrades to water and sewerage infrastructure to service the proposed development will be addressed through the payment of TCC Headworks Charges. TCC Headworks charges will apply to the TOT development in addition to charges for the design and construction of water and sewerage infrastructure required to service the site. The TOT project area is outside the current planning area of Townsville City Council, as it is constructed on reclaimed land that does not currently exist. Therefore this area has never been assessed for the possible future impacts on the TCC water and sewerage infrastructure thus additional charges will apply on top of headworks charges. This report details TCC requirements for water and sewerage infrastructure to serve TOT.

2.0 Population Assessment

Due to the proposed future development in the Ross Creek area, an equivalent persons (EP) assessment is required. This assessment is critical to the design of the required water and sewerage infrastructure for the area. The Ross Creek area is broken down into six precincts. These are as follows:

- Marina Peninsula;
- Townsville Ocean Terminal;
- Ross Creek East;
- Ross Creek West;
- Sir Leslie Thiess Drive; and
- Strand/Flinders/Wickham.

The population assessment for each precinct was calculated using information provided by developers and assigning an EP to each use. The WSA Sewerage Code, NRM 1991 Sewerage Guidelines and advice from TCC was used in the EP calculations. Detailed tables of these calculations from each precinct can be found in Appendix A.

3.0 Water Supply Planning

3.1 Water Demand

The water demand for each of the precincts was calculated using the TCC Design Spec D11. The residential maximum hour demand is 0.048 L/s/EP. The results are shown in Table 1.

Table 1 – Summary of EP for Water

Location	Existing Development		Future Development (Additional Flows)		Total Flows	
	EP	Water MH (L/s)	EP	Water MH (L/s)	EP	Water MH (L/s)
Marina Peninsula Area	550	26.4	606	29.1	1156	55.5
Ocean Terminal	0	0.0	2186	104.9	2186	104.9
Ross Creek West	0	0.0	1170	56.2	1170	56.2
Sir Leslie Drive - Surplus Casino Land	1570	75.4	1327	63.7	2897	139.1
Strand/Flinders/Wickham Area	307	14.7	1422	68.3	1729	83.0
Ross Ck East	100	4.8	1920	92.2	2020	158.4
Totals	**2527**	**121.3**	**8632**	**414.3**	**11159**	**597.1**

The maximum hour flow of 105 L/s for TOT was calculated when adopting an EP of 2186 for the TOT precinct. This flow was compared to the flows reported in the EIS. A summary is shown in Table 2.

Table 2 - EP Comparison

	Rate of Supply (L/s)		
Water Supply	EIS	Maunsell	Combined Option
Breakwater Cove Multiple Dwellings (500)	57.6	52.8	52.8
Breakwater Cove Detached Dwellings (200 EIS) (196 Maunsell)	0.6	26.4	26.4
Breakwater Cove Retail (1500m2)	3.0	3.6	3.6
Commercial Berths (360 EIS) (150 Maunsell)	8.0	7.2	7.2
Super yachts (10)	0.8	1.0	1.0
Marina Club	-	2.4	2.4
Ocean Terminal	55.0	11.7	55.0
Total	**124.9**	**105.0**	**148.4**

There are two major differences between the flows calculated by Maunsell and those detailed in the EIS:

- Breakwater cove detached dwellings; and
- Ocean terminal.

Maunsell believes the flow calculated for the detached dwellings in the EIS is too low. However the flow calculated in the EIS for the ocean terminal is considered to be an informed assumption and 55 L/s has been adopted for the combined option. The original Maunsell total of 105 L/s as well as the new modified flow of 148.4 L/s value has been assessed for water infrastructure sizing. For the

combined option the equivalent EP for this rate of supply is 3092 (148.4 / 0.048). A table displaying the modified water EPs is shown in Table 3.

Table 3 – Summary of EP for Water (Modified)

Location	Existing Development		Future Development (Additional Flows)		Total Flows	
	EP	Water MH (L/s)	EP	Water MH (L/s)	EP	Water MH (L/s)
Marina Peninsula Area	550	26.4	606	29.1	1156	55.5
Ocean Terminal	0	0.0	3092	148.3	3092	148.3
Ross Creek West	0	0.0	1170	56.2	1170	56.2
Sir Leslie Drive - Surplus Casino Land	1570	75.4	1327	63.7	2897	139.1
Strand/Flinders/Wickham Area	307	14.7	1422	68.3	1729	83.0
Ross Ck East	100	4.8	1920	92.2	2020	97.0
Totals	**2527**	**121.3**	**9537**	**457.7**	**12064**	**579.0**

3.2 Existing Infrastructure

The existing water supply infrastructure in Sir Leslie Thiess Drive includes a DN250 pipeline and a DN100 pipeline. The EIS indicated that the TOT would be supplied by these two pipelines. TCC has advised that these pipelines do not have the capacity to support the additional 148.4 or 105 L/s maximum hour demand required for TOT. The existing infrastructure and required infrastructure are shown on Figures R1 – R3 in Appendix B.

3.3 Required Infrastructure

3.3.1 TOT Development Area Only

As the TOT development is outside the current TCC planning scheme, no spare capacity was provided in the existing system. The existing TCC WaterGems model was used to assess what new water supply infrastructure would be required to deliver the maximum hour flow at a minimum head of 30m to the TOT development only.

The result of this analysis concluded that a new water supply pipe is required and that it should connect back into the existing pipe work near the bottom city reservoir located on Castle Hill. This is the closest connection point due to the available capacity of the existing infrastructure. The two flow rates discussed in the water demand section were analysed (105 L/s and 148.4 L/s). Thus, required infrastructure will be one of the following:

- The 105 L/s flow requires a DN300 pipe from the reservoir to the point of supply along Sir Leslie Thiess Drive; and
- The 148.4 L/s flow requires a DN375 pipe from the reservoir to the point of supply along Sir Leslie Thiess Drive.

Staging of the water supply infrastructure may be considered to suit the staging of the development. TCC will require at least two cross connections between the new pipeline from the reservoir and into their existing system. These connections are made to ensure supply by providing a redundancy.

3.3.2 Ross Creek Development Area

As mentioned previously, TOT is just one of many new developments in the Ross Creek area. The required infrastructure to service the Ross Creek Development area (including TOT) was assessed as

a whole. This assessment will be used proportion the costs to TOT. Modelling by TCC has shown that the required infrastructure to service the Ross Creek area is as follows:

- A DN500 pipe from the reservoir to the intersection of the Melton Terrace and the Strand; and
- A DN450 pipe from the Melton Terrace and the Strand intersection to the point of supply along Sir Leslie Thiess Drive.

Staging of the water supply infrastructure may be considered to suit the staging of the development. Again at least two cross connections will be provided between the new pipeline from the reservoir and into the existing system. These connections are made to ensure supply by providing a redundancy.

3.4 Cost

Three budget cost estimates have been prepared for the required water supply infrastructure (Appendix D). Options 1 and 2 detail the estimated cost if only TOT is serviced by new infrastructure. The third estimate details the estimated cost if the TOT, Sir Leslie Thiess Drive and Ross Creek West were all supplied by a new main.

As the infrastructure required to service the TOT development has never been included in the TCC planning a fair method of proportioning the cost was required. The method adopted uses the percentage of EP which contribute to the TOT development compared to the total EP for the total contributing developments. This percentage was calculated to be 55% (3092 EP / 5589 EP).

4.0 Sewerage System Planning

4.1 Sewage Flows

The sewage flows for each of the precincts was calculated using the TCC Development Design Spec D12. The TCC alternative method was adopted which uses a flow of 1313 L/EP/day. However a modification has been made to the TOT EP. The EP used for TOT has been taken from the EP calculated for the combined water supply option. This higher EP represents a worst case scenario. The results are shown in Table 2.

Table 4 - EP summary for Sewage

Location	Existing Development		Future Development (Additional Flows)		Total Flows	
	EP	Sewerage PWWF (L/s)	EP	Sewerage PWWF (L/s)	EP	Sewerage PWWF (L/s)
Marina Peninsula Area	550	4.9	606	6.0	1156	11.0
Ocean Terminal	0	0.0	3092	47.0	3092	47.0
Ross Creek West	0	0.0	1170	17.8	1170	17.8
Sir Leslie Drive - Surplus Casino Land	1570	23.5	1327	20.2	2897	43.7
Strand/Flinders/Wickham Area	307	4.7	1422	21.6	1729	26.3
Ross Ck East	100	1.5	1920	29.2	2020	50.1
Totals	**2527**	**34.7**	**9537**	**141.7**	**12064**	**195.9**

4.2 Existing Infrastructure

The existing sewerage infrastructure near the TOT includes a sewerage pump station with a DN150 rising main which discharges into a DN375 gravity main at the end of Sir Leslie Thiess Drive.

This pump station currently services the casino and entertainment centre. Stages 1 and 2 of the new Saltwater Development and adjacent 26 new residential blocks have been approved for connection to the existing pump station. The pump station will require upgrades to support the sewage flow generated by the Saltwater Development. The proposed upgrade has not yet been finalised but may include upgrading the pumps and/or increasing the wet well volume. There are no plans to upgrade the rising main. With the addition of this new development, TCC has confirmed that the DN375 gravity main does not have the capacity to support the TOT. The existing infrastructure and required infrastructure are shown on Figures R4 – R5 in Appendix C.

4.3 Required Infrastructure

4.3.1 TOT Development Area Only

The TCC SewerCAD model was used to assess the closest possible connection to discharge the TOT sewage. There is a DN600 common rising main at Seventh Avenue in South Townsville which can sustain the additional flow from the TOT. A new pump station and DN150 rising main will be required to deliver the sewage from the TOT to the DN600 rising main.

4.3.2 Ross Creek Development Area

The required infrastructure to service the Ross Creek Development area, for which TOT would also contribute to, was assessed as a whole. This assessment will be used to proportion the costs to TOT. A common rising main design was adopted as this type supports a staged development process. A

separate pump station will be required for each of the four precincts which will pump into the Seventh Avenue rising main. The precincts pumping into the common rising main are:

- TOT;
- Sir Leslie Thiess Drive;
- Ross Creek West; and
- Ross Creek East.

The common rising main sizes can be found on Figure R2, in Appendix C.

4.4 Cost

Two budget cost estimates have been prepared for the required sewerage infrastructure (Appendix E). The first estimate details the cost if only TOT is serviced by new infrastructure. The second estimate details the estimated cost if the TOT, Sir Leslie Thiess Drive, Ross Creek West and Ross Creek East all contributed into the common rising main.

As the infrastructure required to service the TOT development has never been included in the TCC planning a fair method of proportioning the cost was required. The method adopted uses the percentage of EP which contribute to the TOT development compared to the total EP for the total contributing developments. This percentage was calculated to be 41% (3092 EP / 7509 EP).

5.0 Summary

TCC has advised that headworks charges for the required infrastructure to service the TOT development will be applicable in addition to charges for the design and construction of water and sewerage infrastructure required to service the site. Due to the existing infrastructure being at or near capacity, TOT will be required to contribute to the construction cost of new infrastructure. Table 5 shows a summary of the probable construction costs of each of the construction options when considering the TOT component of infrastructure upgrades (excludes headworks charges).

Table 5 - Probable Construction Cost Summary

Option	Description	TOT Cost Component (excluding headworks charges)
Water Supply Infrastructure Option 1 (148 L/s) – TOT Area	TOT dedicated DN375 pipe from the reservoir to the point of supply along Sir Leslie Thiess Drive	$ 4,715,000
Water Supply Infrastructure Option 2 (105 L/s) – TOT Area	TOT dedicated DN300 pipe from the reservoir to the point of supply along Sir Leslie Thiess Drive	$ 4,269,375
Water Supply Infrastructure - Ross Creek Area	A DN500 pipe from the reservoir to the intersection of the Melton Terrace and the Strand and a DN450 pipe from the Melton Terrace and the Strand intersection to the point of supply along Sir Leslie Thiess Drive	$ 3,451,078 (55% of total)
Sewerage Infrastructure – TOT Area	TOT dedicated DN150 rising main from a new pump station at TOT to the DN600 Seventh Avenue rising main	$ 1,883,125
Sewerage Infrastructure - Ross Creek Area	Four new pump stations and a common rising main to the DN600 Seventh Avenue rising main	$ 1,527,660 (41% of total)

Appendix A Population Assessments

MASTER PLANNING OF ROSS CK DEVELOPMENT AREA
EP and Flow Calculations

Marina Peninsula Area

Existing EPs

EPs

	TCC Information Provided		EP Calculation				
Description	Quantity	Item	Factor	Unit	Total	**Assumption**	**Reference**
Mariners North	70	Units	2.2	EP/unit	154		Provided by TCC
Substation site +	1	Substation	0		0	no flow expected	-
Sailing Club	220	Sq.m.	500	EP/ha	11	Table A2	WSA Sewerage Code 2002-2.3 (Table A3)
Marina amenities	2000	Amenities block (EP/day)	0.05	EP/vistior	100	Large Function on Strand	WSA Sewerage Code 2002-2.3
Berths	225	Berths	1	EP/berth	225	Uses existing amenities block	
Existing Shops	1200	Sq.m.	500	EP/ha	60	High density commercial	WSA Sewerage Code 2002-2.3
TOTAL EXISTING EP					**550**	**EP**	

Demand Analysis - Water

			Reference
Expected Population (EPs)	550	EP	See calculation below
Maximum Hour Demand	0.048	L/s/EP	TCC Develop. Design Spec D11 (I/I of 163 L/EP/day)

Total Demands

MH	26	L/s	

Demand Analysis - Sewage

Population

Expected Population	325	persons	Berth EP removed as sewerage is not connected to Berths. Amenities block is utilised.

Flows

Sewerage Flow	1313	L/EP/day	TCC Develop. Design Spec D12 (I/I of 163 L/EP/day)

Peak Sewage Flow **5 l/s**

Future EPs

EPs

	TCC Information Provided		EP Calculation				
Description	Quantity	item	Factor	Unit	Total	**Assumption**	**Reference**
City Pacific	2	dwellings	2.8	EP/lot	6		Provided by TCC
Mirvac	47	2 Br units	2.2	EP/unit	103		Provided by TCC
	54	3 Br units	2.2	EP/unit	119		Provided by TCC
Berths	209	Berths	1	EP/berth	209	Utilise amenities block	1991 Sewerage Guidelines
Future shops	-700	sq.m. GFA	500	EP/ha	-35	High density commercial	WSA Sewerage Code 2002-2.3
(Existing 1200 m^2 less Future 501 ~							
Mirvac	25	2 Br units	2.2	EP/unit	55		Provided by TCC
	45	3 Br units	2.2	EP/unit	99		Provided by TCC
Mirvac	18	Dwellings	2.8	EP/lot	50		Provided by TCC
TOTAL FUTURE EP					**606**	**EP**	

Demand Analysis - Water			**Reference**
Expected Population (EPs)	606	persons	See calculation below
Maximum Hour Demand	0.048	L/s/EP	TCC Develop. Design Spec D11 (I/I of 163 L/EP/day)
Total Demands			
MH	29	L/s	
Demand Analysis - Sewage			Reference
Population			
Expected Population	397	persons	Berth EP removed as sewerage is not connected to Berths. Amenities block is utilised.
Flows			
Sewerage Flow	1313	L/EP/day	TCC Develop. Design Spec D12 (I/I of 163 L/EP/day)
Peak Sewage Flow	**6**	**l/s**	

MASTER PLANNING OF ROSS CK DEVELOPMENT AREA
EP and Flow Calculations

Ross Ck East

Existing EPs

EPs

	TCC Information Provided		EP Calculation				
Description	Quantity	Item	Factor	Unit	Total	**Assumption**	**Reference**
Magnetic Island Car Ferry	2000	sq.m	500	EP/Ha	100	High density commercial	WSA Sewerage Code 2002-2.3
TOTAL EXISTING EP					**100**	**EP**	

Demand Analysis - Water			**Reference**
Expected Population (EPs)	100	EP	See calculation below
Maximum Hour Demand	0.048	L/s/EP	TCC Develop. Design Spec D11 (I/I of 163 L/EP/day)
Total Demands			
MH	5	L/s	

Demand Analysis - Sewage

Population			
Expected Population	100	EP	
Flows			
Sewerage Flow	1313	L/EP/day	TCC Develop. Design Spec D12 (I/I of 163 L/EP/day)
Peak Sewage Flow	**1.52**	**l/s**	

Future EPs

EPs

	TCC Information Provided		EP Calculation				
Description	Quantity	Item	Factor	Unit	Total	**Assumption**	**Reference**
Commercial/retail	31500	sq.m	500	EP/ha	1575	High density commercial	WSA Sewerage Code 2002-2.3
Ferry Terminal	500	Visitors	0.05	EP/Visitor	25	Based on capacity of ferrys	WSA Sewerage Code 2002-2.3
Hotel	160	rooms	2	RP/room	320	Accommodation (Tourist)	1991 Sewerage Guidelines
TOTAL FUTURE EP					**1920**	**EP**	

Demand Analysis - Water			**Reference**
Expected Population (EPs)	1920	EP	See calculation below
Maximum Hour Demand	0.048	L/s/EP	TCC Develop. Design Spec D11 (I/I of 163 L/EP/day)
Total Demands			
MH	92	L/s	

Demand Analysis - Sewage

Population

Expected Population	1920	persons	

Flows

Sewerage Flow	1313	L/EP/day	TCC Develop. Design Spec D12 (I/I of 163 L/EP/day)

Peak Sewage Flow	**29**	**l/s**

MASTER PLANNING OF ROSS CK DEVELOPMENT AREA
EP and Flow Calculations

Ross Ck West

Future EPs

Description	TCC Information Provided Quantity	Item	Factor	EP Calculation Unit	Total	Assumption	Reference
Ross Creek West 2.5 ha							
Commercial/retail/units							
Units (100 units in Stage 1)	100	units	2.2	EP/unit	220		Provided by TCC
Commercial/retail	8000	sq.m.	500	EP/ha	400	High density commercial	WSA Sewerage Code 2002-2.3
Units	250	units	2.2	EP/unit	550		Provided by TCC
TOTAL FUTURE EP					**1170**	**EP**	

Demand Analysis - Water			**Reference**
Expected Population (EPs)	1170	EP	See calculation below
Maximum Hour Demand	0.048	L/s/EP	TCC Develop. Design Spec D11 (I/I of 163 L/EP/day)
Total Demands			
MH	56	L/s	

Demand Analysis - Sewage

Population			
Expected Population	1170	persons	
Flows			
Sewerage Flow	1313	L/EP/day	TCC Develop. Design Spec D12 (I/I of 163 L/EP/day)
Peak Sewage Flow	**18**	**l/s**	

MASTER PLANNING OF ROSS CK DEVELOPMENT AREA
EP and Flow Calculations

Sir Leslie Drive

Existing EPs

Description	TCC Information Provided Quantity	Item	EP Calculation Factor	Unit	Total	Assumption	Reference
Casino Precinct							
Casino/Restaurants	21001	sq.m	280	EP/ha	588	Restaurants with >3 connections	WSA Sewerage Code 2002-2.3
Hotel rooms	194	rooms	2	EP/room	388	Accommodation (Tourist)	1991 Sewerage Guidelines
Entertainment Centre	6250	visitors	0.05	EP/visitors	313	6000 people seated plus 250 staff	WSA Sewerage Code 2002-2.3
Other Uses							
Breakwater Quays	50	Units	2.2	EP/unit	110		Provided by TCC
Breakwater Villas 2	17	Units	2.2	EP/unit	37		Provided by TCC
Breakwater Villas	2	Units	2.2	EP/unit	4		Provided by TCC
Marina berths	21	Berths	1	EP/berth	21	Uses existing amenities	
Peir Resturant	450	Sq.m GFA	500	EP/ha	23	Restaurant with 1 connection	WSA Sewerage Code 2002-2.3
Bowling Clubhouse (Anzac Park)	230	Sq.m	500	EP/ha	12	Restaurant with 1 connection	WSA Sewerage Code 2002-2.4
Townsville Enterprise Offices (this use may be demolished)	1500	Sq.m. GFA	500	EP/ha	75	High density commercial	WSA Sewerage Code 2002-2.3
TOTAL EXISTING EP					**1570**	**EP**	

Demand Analysis - Water			**Reference**
Expected Population (EPs)	1570	EP	See calculation below
Maximum Hour Demand	0.048	L/s/EP	TCC Develop. Design Spec D11 (I/I of 163 L/EP/day)
Total Demands			
MH	75	L/s	
Demand Analysis - Sewage			
Population			
Expected Population	1549	persons	Berth EP removed as sewerage is not connected to Berths.
Flows			
Sewerage Flow	1313	L/EP/day	TCC Develop. Design Spec D12 (I/I of 163 L/EP/day)
Peak Sewage Flow	**24**	**l/s**	

Future EPs

EPs Description	Quantity	item	No. EPs		Total	Assumption	Reference
Units	570	Units	2.2	EP/unit	1254		Provided by TCC
Detached Houses	26	Dwellings	2.8	EP/lot	73		Provided by TCC
TOTAL FUTURE EP					**1327**	**EP**	

Demand Analysis - Water			**Reference**
Expected Population (EPs)	1327	EP	See calculation below
Maximum Hour Demand	0.048	L/s/EP	TCC Develop. Design Spec D11 (I/I of 163 L/EP/day)
Total Demands			
MH	64	L/s	
Demand Analysis - Sewage			
Population			
Expected Population	1327	persons	
Flows			
Sewerage Flow	1313	L/EP/day	TCC Develop. Design Spec D12 (I/I of 163 L/EP/day)
Peak Sewage Flow	**20**	**l/s**	

MASTER PLANNING OF ROSS CK DEVELOPMENT AREA
EP and Flow Calculations

Strand/Flinders/Wickham Precinct

Existing EPs

	TCC Information Provided			EP Calculation				
Description	Quantity	Item	Factor	Unit	Total	**Assumption**	**Reference**
Wickham/The Strand/King/Flinders	1.88 Ha		75	EP/Ha	141	Local commercial	WSA Sewerage Code 2002-2.3
Ross Creek.The Strand/King/Kelleher	0.912 Ha		75	EP/Ha	68	Local commercial	WSA Sewerage Code 2002-2.3
Reef HQ/ Maritime Museum/104/106 Flinders	1.3 Ha		75	EP/Ha	98	Local commercial	WSA Sewerage Code 2002-2.3
TOTAL EXISTING EP					**307**	**EP**	

Demand Analysis - Water			**Reference**
Expected Population (EPs)	307	EP	See calculation below
Maximum Hour Demand	0.048	L/s/EP	TCC Develop. Design Spec D11 (I/I of 163 L/EP/day)
Total Demands			
MH	15	L/s	

Demand Analysis - Sewage			
Population			
Expected Population	307	persons	
Flows			
Sewerage Flow	1313	L/EP/day	TCC Develop. Design Spec D12 (I/I of 163 L/EP/day)
Peak Sewage Flow	**5**	**l/s**	

Future EPs

	TCC Information Provided			EP Calculation				
Description	Quantity	Item	Factor	Unit	Total	**Assumption**	**Reference**
Possible units (2.8Ha)	226	Units	2.2	EP/unit	497		Provided by TCC
Possible Commercial Retail	18500	GFA	500	EP/ha	925	High density commercial	WSA Sewerage Code 2002-2.3
TOTAL FUTURE EP					**1422**	**EP**	

Demand Analysis - Water			**Reference**
Expected Population (EPs)	1422	EP	See calculation below
Maximum Hour Demand	0.048	L/s/EP	TCC Develop. Design Spec D11 (I/I of 163 L/EP/day)
Total Demands			
MH	68	L/s	

Demand Analysis - Sewage		
Population		
Expected Population	1422	persons

Flows

Sewerage Flow	1313 L/EP/day	TCC Develop. Design Spec D12 (I/I of 163 L/EP/day)
Peak Sewage Flow	**22 l/s**	

MASTER PLANNING OF ROSS CK DEVELOPMENT AREA
EP and Flow Calculations

Ocean Terminal Area

Future Eps - Option 1

Description	TCC Information Provided		EP Calculation				
	Quantity	Item	Factor	Unit	Total	**Assumption**	**Reference**
Ocean Terminal							
Café	20	sq.m.	500	EP/ha	1	Similar to restaurant	WSA Sewerage Code 2002-2.3
Kiosk	30	sq.m.	500	EP/ha	2	Similar to restaurant	WSA Sewerage Code 2002-2.4
Office	300	sq.m.	500	EP/ha	15	High density commercial	WSA Sewerage Code 2002-2.3
Visiting Cruise Ship	3500	visitors	0.05	EP/visitor	175	Only one ship at terminal at a time	WSA Sewerage Code 2002-2.3
Visiting Naval Ships					0		
Departure Lounge/Rest Rooms/Viewing Gallery Etc	500	visitors	0.05	EP/visitor	50	Estimated number of visitors to terminal	WSA Sewerage Code 2002-2.3
Breakwater Cove							
Detached Houses	196	lots	2.8	EP/lot	549		Provided by TCC
Units	500	units	2.2	EP/unit	1100		Provided by TCC
Commercial	1500	sq.m.	500	EP/ha	75	High density commercial	WSA Sewerage Code 2002-2.3
Marina	150	berths	1	EP/berth	150	Will use amenities block	1991 Sewerage Guidelines
Marine Club	1000	sq.m.	500	EP/ha	50	Similar to Restaurant	WSA Sewerage Code 2002-2.3
Super Yachts	10	berths	2	EP/berth	20	Similar to Caravan	WSA Sewerage Code 2002-2.3
TOTAL FUTURE EP					**2186**	**EP**	

Demand Analysis - Water			**Reference**
Expected Population (EPs)	2186	EP	See calculation below
Maximum Hour Demand	0.048	L/s/EP	TCC Develop. Design Spec D11 (I/I of 163 L/EP/day)
Total Demands			
MH	105	L/s	

The adopted Sewage flow is shown only in option 2

Future Eps - Option 2

Description	TCC Information Provided		EP Calculation				
	Quantity	Item	Factor	Unit	Total	Assumption	Reference
Ocean Terminal							
Café	20	sq.m.	500	EP/ha	1	Similar to restaurant	WSA Sewerage Code 2002-2.3
Kiosk	30	sq.m.	500	EP/ha	2	Similar to restaurant	WSA Sewerage Code 2002-2.4
Office	300	sq.m.	500	EP/ha	15	High density commercial	WSA Sewerage Code 2002-2.3
Visiting Cruise Ship					1081	Only one ship at terminal at a time	WSA Sewerage Code 2002-2.3
Visiting Naval Ships					0		
Departure Lounge/Rest Rooms/Viewing Gallery Etc	500	visitors	0.05	EP/visitor	50	Estimated number of visitors to terminal	WSA Sewerage Code 2002-2.3
Breakwater Cove							
Detached Houses	196	lots	2.8	EP/lot	549		Provided by TCC
Units	500	units	2.2	EP/unit	1100		Provided by TCC
Commercial	1500	sq.m.	500	EP/ha	75	High density commercial	WSA Sewerage Code 2002-2.3
Marina	150	berths	1	EP/berth	150	Will use amenities block	1991 Sewerage Guidelines
Marine Club	1000	sq.m.	500	EP/ha	50	Similar to Restaurant	WSA Sewerage Code 2002-2.3
Super Yachts	10	berths	2	EP/berth	20	Similar to Caravan	WSA Sewerage Code 2002-2.3
TOTAL FUTURE EP					**3092**	**EP**	

Demand Analysis - Water			**Reference**
Expected Population (EPs)	3092	EP	See calculation below
Maximum Hour Demand	0.048	L/s/EP	TCC Develop. Design Spec D11 (I/I of 163 L/EP/day)
Total Demands			
MH	148	L/s	

Demand Analysis - Sewage			
Population			
Expected Population	3092	persons	
Flows			
Sewerage Flow	1313	L/EP/day	TCC Develop. Design Spec D12 (I/I of 163 L/EP/day)
Peak Sewage Flow	**47**	**l/s**	

Appendix B Required Water Supply Infrastructure

MAUNSELL | AECOM

LEGEND

450 EXISTING TRUNK WATER MAIN AND DIAMETER.

450 PROPOSED WATER MAIN AND DIAMETER.

TOP CITY RESERVOIR

BOTTOM CITY RESERVOIR

STANLEY STREET

WILLS STREET

WALKER STREET

FLINDERS STREET

EYRE STREET

HAMILTON STREET

THE STRAND

MELTON TERRACE

ROSS CREEK

225 300 600 375 250

NOT TO BE USED FOR CONSTRUCTION

	DATE	ISSU
	14.1.08	1

Last modified: 14 Jan 08 - 16:39

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TOWNSVILLE CITY COUNCIL
60027478

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ROSS CREEK WATER AND SEWERAGE MASTER PLAN
ROSS CREEK DEVELOPMENT AREA
TOT DEVELOPMENT WATER LAYOUT - OPTION 1
60027478-R1

MAUNSELL | AECOM

LEGEND

450 EXISTING TRUNK WATER MAIN AND DIAMETER.

450 PROPOSED WATER MAIN AND DIAMETER.

NOT TO BE USED FOR CONSTRUCTION

	DATE	ISSU
	14.1.08	1

TOP CITY RESERVOIR

BOTTOM CITY RESERVOIR

STANLEY STREET

WILLS STREET

WALKER STREET

FLINDERS STREET

EYRE STREET

HAMILTON STREET

THE STRAND

MELTON TERRACE

ROSS CREEK

225 375 600 250

Last modified: 14 Jan 08 - 16:46

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TOWNSVILLE CITY COUNCIL
60027478

0 50 200m 1:5000 (A1)

ROSS CREEK WATER AND SEWERAGE MASTER PLAN
ROSS CREEK DEVELOPMENT AREA
TOT DEVELOPMENT WATER LAYOUT - OPTION 2
60027478-R2

MAUNSELL | AECOM

LEGEND

450 EXISTING TRUNK WATER MAIN AND DIAMETER.

450 PROPOSED WATER MAIN AND DIAMETER.

TOP CITY RESERVOIR

BOTTOM CITY RESERVOIR

STANLEY STREET

WILLS STREET

WALKER STREET

FLINDERS STREET

EYRE STREET

HAMILTON STREET

THE STRAND

MELTON TERRACE

ROSS CREEK

225 WILLS STREET

500 WALKER STREET

600 WALKER STREET

375 FLINDERS STREET

225 EYRE STREET

375 HAMILTON STREET

500 MELTON TERRACE

450 THE STRAND

375 THE STRAND

250

450

NOT TO BE USED FOR CONSTRUCTION

	DATE	ISSU
	14.1.08	1

Last modified: 14 Jan 08 - 16:15

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TOWNSVILLE CITY COUNCIL
60027478

0 50 200m 1:5000 (A1)

ROSS CREEK WATER AND SEWERAGE MASTER PLAN
ROSS CREEK DEVELOPMENT AREA
WATER LAYOUT PLAN
60027478-R3

Appendix C Required Sewerage Infrastructure

MAUNSELL | AECOM

NOT TO BE USED FOR CONSTRUCTION

	DATE	ISSUE
	14.1.08	1

PUMP STATION 7B

PUMP STATION 1A B/UP

PUMP STATION 1A

PROPOSED ROSS CREEK WEST PUMP STATION

PUMP STATION 1A1

REPLACEMENT PUMP STATION 1A1

PROPOSED TOT PUMP STATION

PROPOSED ROSS CREEK EAST PUMP STATION

PUMP STATION 2A

PUMP STATION 3B

THE STRAND

FLINDERS STREET

ROSS CREEK

PERKINS STREET

ALLEN STREET

BOUNDARY STREET

SEVENTH AVENUE

250 225 450 375 600 375 225 150 150 150 150 375 375 600 600

LEGEND

- EXISTING SEWERAGE PUMP STATION
- 450 EXISTING TRUNK SEWER AND DIAMETER.
- 450 EXISTING SEWER RISING MAIN AND DIAMETER.
- 450 PROPOSED SEWER RISING MAIN AND DIAMETER.
- PROPOSED PUMP STATION

Last modified: 14 Jan 08 - 16:50

Cad ref: J:\MMPL\60027478\5_CAD\5.3 Working\REPORT\60027478-R4.dwg

TOWNSVILLE CITY COUNCIL
60027478

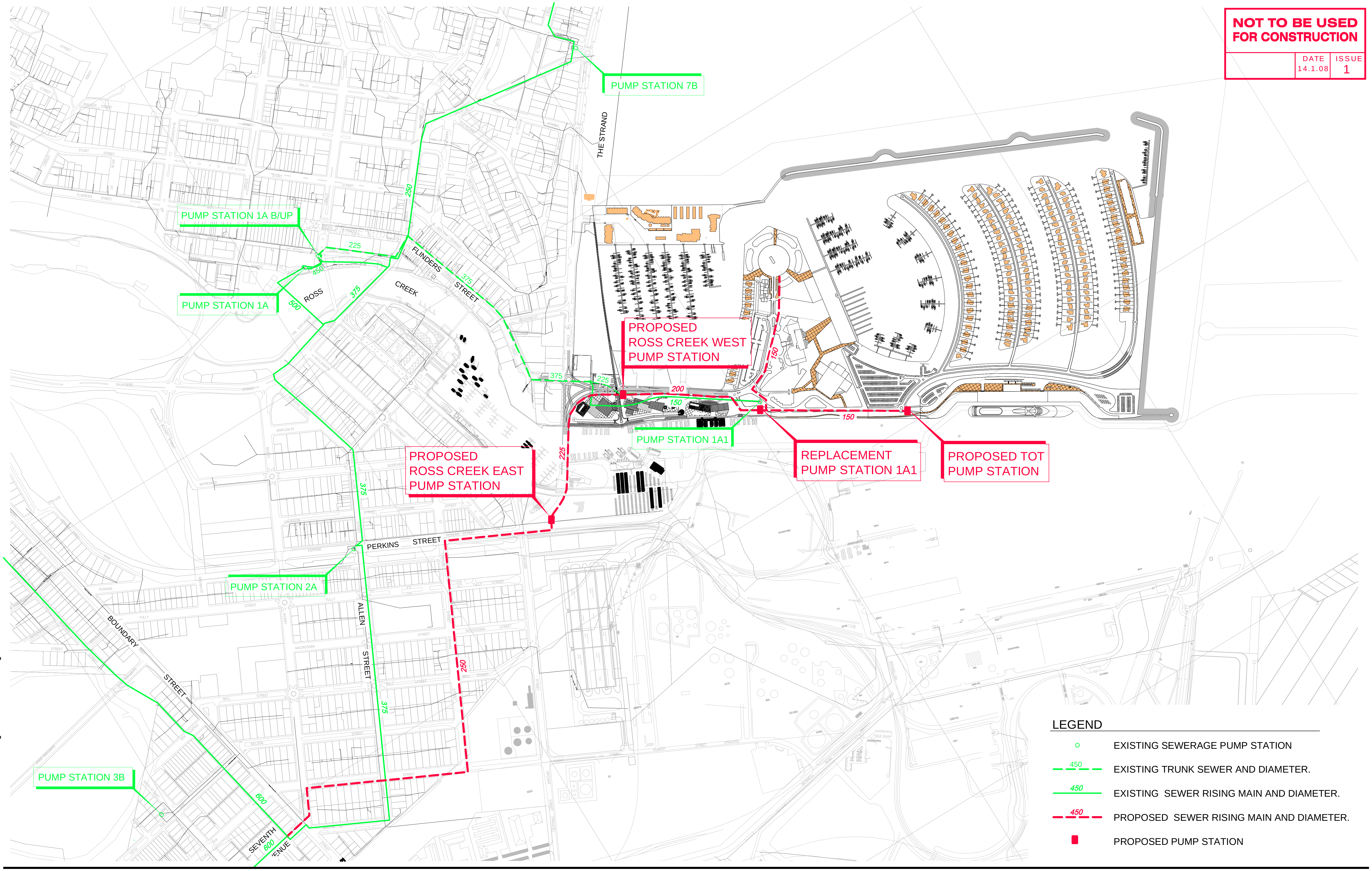
0 50 200m 1:5000 (A1)

ROSS CREEK WATER AND SEWERAGE MASTER PLAN
ROSS CREEK DEVELOPMENT AREA
TOT DEVELOPMENT SEWERAGE LAYOUT
60027478-R4

MAUSELL | AECOM

NOT TO BE USED FOR CONSTRUCTION

DATE	ISSUE
14.1.08	1



PUMP STATION 7B
PUMP STATION 1A B/UP
PUMP STATION 1A
PUMP STATION 2A
PUMP STATION 3B
PUMP STATION 1A1
PROPOSED ROSS CREEK WEST PUMP STATION
PROPOSED ROSS CREEK EAST PUMP STATION
REPLACEMENT PUMP STATION 1A1
PROPOSED TOT PUMP STATION
THE STRAND
FLINDERS STREET
ROSS CREEK
PERKINS STREET
ALLEN STREET
BOUNDARY STREET
SEVENTH AVENUE
LEGEND
EXISTING SEWERAGE PUMP STATION
EXISTING TRUNK SEWER AND DIAMETER.
EXISTING SEWER RISING MAIN AND DIAMETER.
PROPOSED SEWER RISING MAIN AND DIAMETER.
PROPOSED PUMP STATION

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Last modified: 15 Jan 08 - 11:42

TOWNSVILLE CITY COUNCIL
60027478

0 50 200m 1:5000 (A1)

ROSS CREEK WATER AND SEWERAGE MASTER PLAN
ROSS CREEK DEVELOPMENT AREA
SEWERAGE LAYOUT PLAN
60027478-R5

Appendix D Water Infrastructure Costing

DRAFT COPY

TOWNSVILLE CITY COUNCIL
ROSS CREEK DEVELOPMENT AREA
WATER SUPPLY INFRASTRUCTURE
PROBABLE CONSTRUCTION COST
(excluding headworks charges)

TOT DEVELOPMENT ONLY - OPTION 1 (148 L/s)

Item	Description	Unit	Quantity	Rate	Amount
1	**DELIVERY MAINS - SUPPLY & DELIVERY**				
(a)	DN 375 DICL PN35 TYTON2100 SERIES	m	1600	300	480000
2	**CONSTRUCTION**				
(a)	Walker Street Section	m	1000	800	800000
(b)	Hamilton Street Section	m	200	800	160000
(c)	Melton Terrace Section	m	500	1500	750000
(d)	The Strand Section	m	300	800	240000
(e)	Sir Leslie Thiess Drive Section	m	900	800	720000
3	**CONNECTION TO EXISTING**				
(a)	Connection to reservoir	Lump Sum			50000
(b)	Cross connections to existing mains	Per Connection	2	40000	80000
4	**ENGINEERING & COUNCIL COSTS**				
(a)	Percentage	15%			492000
5	**CONTINGENCY**				
(a)	Percentage	25%			943000
	TOTAL AMOUNT OF ESTIMATE (excl of GST)			$	4715000

In undertaking the preparation of our opinion of probable construction cost, Maunsell advises that it has no control over the cost of labour, materials, equipment or services furnished by others, nor has it control over contractors' methods for determining prices, competitive bidding or market conditions. The opinion of probable construction cost that will be provided by Maunsell will be made on the basis of its judgement as an experienced and qualified engineering consultant, familiar with the construction industry. As Maunsell is not a qualified Quantity Surveyor, nor does it employ quantity surveyors, Maunsell cannot and will not guarantee that tenders or actual construction costs will not vary from the opinion of probable construction cost.

DRAFT COPY

TOWNSVILLE CITY COUNCIL
ROSS CREEK DEVELOPMENT AREA
WATER SUPPLY INFRASTRUCTURE
PROBABLE CONSTRUCTION COST
(excluding headworks charges)

TOT DEVELOPMENT ONLY - OPTION 2 (105 L/s)

Item	Description	Unit	Quantity	Rate	Amount
1	**DELIVERY MAINS - SUPPLY & DELIVERY**				
(a)	DN 300 DICL PN35 TYTON2100 SERIES	m	1600	200	320000
2	**CONSTRUCTION**				
(a)	Walker Street Section	m	1000	800	800000
(b)	Hamilton Street Section	m	200	800	160000
(c)	Melton Terrace Section	m	500	1200	600000
(d)	The Strand Section	m	300	800	240000
(e)	Sir Leslie Thiess Drive Section	m	900	800	720000
3	**CONNECTION TO EXISTING**				
(a)	Connection to reservoir	Lump Sum			50000
(b)	Cross connections to existing mains	Per Connection	2	40000	80000
4	**ENGINEERING & COUNCIL COSTS**				
(a)	Percentage	15%			445500
5	**CONTINGENCY**				
(a)	Percentage	25%			853875
	TOTAL AMOUNT OF ESTIMATE (excl of GST)			$	4269375

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TOWNSVILLE CITY COUNCIL
ROSS CREEK DEVELOPMENT AREA
WATER SUPPLY INFRASTRUCTURE
PROBABLE CONSTRUCTION COST
(excluding headworks charges)

ROSS CREEK DEVELOPMENT AREA (WHOLE OF DEVELOPMENT OPTION)

Item	Description	Unit	Quantity	Rate	Amount
1	**DELIVERY MAINS - SUPPLY & DELIVERY**				
(a)	DN 500 DICL PN35 TYTON2100 SERIES	m	1600	450	720000
(b)	DN 450 DICL PN35 TYTON2100 SERIES	m	1300	350	455000
2	**CONSTRUCTION**				
(a)	Walker Street Section	m	1000	900	900000
(b)	Hamilton Street Section	m	200	900	180000
(c)	Melton Terrace Section	m	500	1800	900000
(d)	The Strand Section	m	300	900	270000
(e)	Sir Leslie Thiess Drive Section	m	900	900	810000
3	**CONNECTION TO EXISTING**				
(a)	Connection to reservoir	Lump Sum			50000
(b)	Cross connections to existing mains	Per Connection	2	40000	80000
4	**ENGINEERING & COUNCIL COSTS**				
(a)	Percentage	15%			654750
5	**CONTINGENCY**				
(a)	Percentage	25%			1254938
	TOTAL AMOUNT OF ESTIMATE (excl of GST)			$	6274688
	TOT COMPONENT				
(a)	Percentage	55%		$	3451078

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Appendix E Sewerage Infrastructure Costing

DRAFT COPY

TOWNSVILLE CITY COUNCIL
ROSS CREEK DEVELOPMENT AREA
SEWERAGE INFRASTRUCTURE
PROBABLE CONSTRUCTION COST
(excluding headworks charges)

TOT DEVELOPMENT ONLY

Item	Description	Unit	Quantity	Rate	Amount
1	**DELIVERY MAINS - SUPPLY & DELIVERY**				
(a)	DN 150 DICL PN35 TYTON2100 SERIES	m	3000	100	300000
2	**CONSTRUCTION**				
(a)	Sir Leslie Thiess Drive Section	m	800	200	160000
(b)	Ross Creek Crossing	m	100	1000	100000
(c)	Ross Creek East	m	400	200	80000
(d)	Perkins Street	m	360	200	72000
(e)	Cannan Street Section	m	670	200	134000
(f)	Hubert Street Section	m	470	200	94000
(g)	Morley Street Section	m	200	200	40000
3	**PUMP STATION**				
(a)	TOT Pump Station	Lump Sum			300000
4	**CONNECTION TO SEVENTH AVENUE**				
(a)	Connection to Seventh Avenue	Lump Sum			30000
5	**ENGINEERING & COUNCIL COSTS**				
(a)	Percentage	15%			196500
6	**CONTINGENCY**				
(a)	Percentage	25%			376625
	TOTAL AMOUNT OF ESTIMATE (excl of GST)			$	1883125

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DRAFT COPY

TOWNSVILLE CITY COUNCIL
ROSS CREEK DEVELOPMENT AREA
SEWERAGE INFRASTRUCTURE
PROBABLE CONSTRUCTION COST
(excluding headworks charges)

ROSS CREEK DEVELOPMENT AREA

Item	Description	Unit	Quantity	Rate	Amount
1	**DELIVERY MAINS - SUPPLY & DELIVERY**				
(a)	DN 150 DICL PN35 TYTON2100 SERIES	m	400	100	40000
(b)	DN 200 DICL PN35 TYTON2100 SERIES	m	400	120	48000
(c)	DN 225 DICL PN35 TYTON2100 SERIES	m	500	150	75000
(d)	DN 250 DICL PN35 TYTON2100 SERIES	m	1700	170	289000
2	**CONSTRUCTION**				
(a)	Sir Leslie Thiess Drive Section (DN150)	m	400	200	80000
(b)	Sir Leslie Thiess Drive Section (DN200)	m	400	250	100000
(c)	Ross Creek Crossing	m	100	1000	100000
(d)	Ross Creek East	m	400	250	100000
(e)	Perkins Street	m	360	300	108000
(f)	Cannan Street Section	m	670	300	201000
(g)	Hubert Street Section	m	470	300	141000
(h)	Morley Street Section	m	200	300	60000
3	**PUMP STATION**				
(a)	TOT Pump Station	Lump Sum			300000
(b)	Future Development Area Pump Station	Lump Sum			300000
(c)	Ross Creek West	Lump Sum			300000
(d)	Ross Creek East	Lump Sum			300000
3	**CONNECTION TO SEVENTH AVENUE**				
(a)	Connection to Seventh Avenue	Lump Sum			50000
4	**ENGINEERING & COUNCIL COSTS**				
(a)	Percentage	15%			388800
5	**CONTINGENCY**				
(a)	Percentage	25%			745200
	TOTAL AMOUNT OF ESTIMATE (excl of GST)			$	3726000
	TOT COMPONENT				
(a)	Percentage	41%		$	1527660

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