Executive Summary

The purpose of this report is to provide Gold Coast City Council (GCCC) with short term and long term master planning philosophy for the potable water supply network within the Molendinar and Southport West Water Supply Districts (WSDs). Both water supply districts are located within the Molendinar Potable Water Supply Financial Catchment.

The augmentation strategy presented in this report considers the previous planning strategies recommended in the GCCC Priority Infrastructure Planning (PIP) study undertaken in 2006, along with recent planning and associated augmentations either identified or installed as part of the following key projects:

- Gold Coast Rapid Transit (GCRT) project;
- Gold Coast Health and Knowledge Precinct (GCHKP) development; and
- Fire-fighting augmentations.

This master planning project has been informed by a recent updates to GCCC’s water supply planning instruments, including:

- **H2OMAP Water Model** - The northern part of the Gold Coast City Water Supply Network Model was reviewed and updated to reflect GCCC’s latest GIS information and the key projects detailed above.

- **Infrastructure Demand Model** - The previous Infrastructure Demand Model (IDM) was developed in 2004 as part of the PIP project. GCCC has recently revised the IDM by incorporating the new citywide population and employment projections undertaken in 2010 as well as the detailed growth projections for the GCRT growth corridor undertaken in 2012.

- **Desired Standards of Service (DSS)** - GCCC’s latest Desired Standards of Service (GHD, 2009) were used as the design criteria for the network modelling.

The Molendinar and Southport West WSDs service a fully-developed urban area and have a current water demand of approximately 68,000 ET. Significant infill growth and redevelopment is expected to occur over the next fifty years, with the population projected to double to approximately 130,000 ET. The projected increase in demand for the Molendinar and Southport West WSDs are shown in Table 1.

<table>
<thead>
<tr>
<th>PLANNING HORIZON</th>
<th>ET</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>67,929</td>
</tr>
<tr>
<td>2016</td>
<td>75,113</td>
</tr>
<tr>
<td>2021</td>
<td>84,154</td>
</tr>
<tr>
<td>2026</td>
<td>91,910</td>
</tr>
<tr>
<td>2031</td>
<td>99,273</td>
</tr>
<tr>
<td>2056</td>
<td>128,914</td>
</tr>
</tbody>
</table>
The hydraulic analysis undertaken for this master planning study determined that the existing infrastructure within the Molendinar and Southport West WSDs has insufficient capacity to accommodate the projected increase in demand through to the year 2056. As a result, augmentations are required within the Molendinar and Southport West WSDs with a total capital cost of $7.30 million and a Net Present Cost (NPC) of $2.75 million over the 50-year planning horizon.

The majority of the expenditure is required to satisfy the projected demands for the 2056 planning horizon and will need to be constructed between the year 2031 and 2056. Table 2 indicates the type of asset augmentations and associated costs within the Molendinar and Southport West WSDs.

Table 2  Summary of Potable Water Infrastructure Costs

<table>
<thead>
<tr>
<th>ASSET DESCRIPTION</th>
<th>TOTAL CAPITAL COST</th>
<th>NET PRESENT COST (NPC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reservoirs</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Pump Stations</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Water Mains</td>
<td>$ 4,689,000</td>
<td>$ 1,547,360</td>
</tr>
<tr>
<td>Pressure Reducing Valves</td>
<td>$ 2,606,760</td>
<td>$ 1,209,030</td>
</tr>
<tr>
<td>Total</td>
<td>$ 7,295,760</td>
<td>$ 2,756,390</td>
</tr>
</tbody>
</table>
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1 Introduction

This report presents the results of the master planning study undertaken for the Molendinar and Southport West Potable Water Supply Districts (WSDs). The report includes an assessment of the short and long term performance of the potable water network, identifies relevant infrastructure augmentations and their associated capital cost, and presents the Net Present Cost (NPC) and investment cash flow over the 50-year planning horizon.

The Molendinar Potable Water Financial Catchment is one of the 6 potable water supply financial catchments included in the 2006 PIP study, Molendinar Water Supply Financial Catchment Planning Report. The Molendinar Potable Water Financial Catchment comprises the Molendinar, Southport West, Nerang, Nerang South, Worongary and Gilston WSDs, which encompasses over 130,000 Equivalent Tenements (ET). This current study addresses the Molendinar and Southport West WSDs only.

1.1 Background

The 2006 PIP study identified the short and long term potable water infrastructure requirements to service the projected growth across the GCCC region. The augmentations identified in the 2006 study were the basis for the water supply Infrastructure Charges Schedule (ICS), which provided the long term capital works. The 2006 study identified extensive infrastructure augmentations within the Molendinar Potable Water Financial Catchment.

In 2008, GCCC undertook further planning to identify the optimal augmentation options using the Genetic Algorithm (GA) optimisation techniques. The GA-optimised solutions represented a significant cost saving compared to the 2006 PIP augmentations. Further analysis of the existing water and wastewater infrastructure was undertaken by SKM on behalf of GCCC for the Gold Coast Health and Knowledge Precinct (GCHKP) project.

In 2009, GCCC also commissioned Opus International Consultants Ltd (Opus) to undertake a review of security of supply in the Worongary and Molendinar WSDs and reassess the need for the proposed 600mm diameter main identified in the PIP study.

In 2010, GCCC undertook the “Southport Infrastructure and Financial Strategy” project. This project addressed the need to plan for infrastructure (including financial planning) to meet the increased demand from the proposed population density increase within the Central Southport Master Plan which was published by GCCC in August 2009. The aim of the Master Plan was to develop a water, wastewater, recycled water and financial strategy to meet the progressive and ultimate demands of the area. A portfolio of infrastructure options was investigated and the options were screened using the “Infrastructure Planning Sustainability Framework”. The strategy explored a number of innovative and demand management scenarios.

As a result of these previous works, the study area is expected to experience significant growth in the following growth precincts:

- The Gold Coast Health and Knowledge Precinct (GCHKP) area, including the proposed Commonwealth Games Athlete Village in Parkland;
- The Gold Coast Rapid Transit (GCRT) Growth Corridor;
- The Central Southport Master Plan;
- Central Surfers Paradise.
Although there is no significant area of greenfield development within the study area, significant growth is expected to occur due to infill development and re-development up to the year 2056 development horizon. A review of the above studies was undertaken as part of this current study, which also incorporated the citywide Infrastructure Demand Model (IDM, 2012) and the Desired Standards of Service (DSS, 2009).

1.2 Objectives
The objective of this master plan is to re-assess the infrastructure augmentations identified in the 2006 PIP by considering the recent planning studies, the latest IDM and GCCC’s DSS to establish a revised capital works program.

The following report is also intended to be incorporated into a future revision of the Water Netserv Plan.

1.3 Scope of Works
The scope of works for this project is summarised as follows:

- Update the existing water network model for the study area to reflect 2012 conditions;
- Update the existing potable water model with the latest IDM and DSS. Planning horizons to be assessed are 2011, 2016, 2021, 2026, 2031 and 2056;
- Determine the existing potable water network hydraulic performance based on each planning horizon’s projected demands;
- Identify the infrastructure augmentation and their timing required to service the 2056 planning horizon demand;
- Develop work schedules and cost of infrastructure augmentations for capital works programming; and
- Develop a planning report detailing the methodology and findings of the study.
2 Molendinar Potable Water Supply Financial Catchment

2.1 Catchment Overview

The Molendinar Potable Water Supply Financial Catchment is the largest water catchment within the GCCC water supply network. The catchment is centrally-located within the Gold Coast region and is bounded by the Coombabah Creek to the northwest, the Pacific Ocean to the east and the suburbs of Mermaid Waters to the south and to the west by Gilston. The catchment includes the densely population suburbs of Surfers Paradise, Broadbeach, Southport and Labrador.

The catchment is bound by Coombabah Creek, the Nerang River and the coastal beaches, which results in extensive low-lying flood plains and elevations typically below 20.0m AHD. To the west, the catchment rises towards the hinterland where elevations range from 40.0 m AHD to over 100.0m AHD in some areas.

The full extent of the Molendinar Potable Water Financial Catchment is shown in Appendix A Fig: 1.

2.2 Water Supply Districts

The Molendinar Potable Water Supply Financial Catchment comprises the following Water Supply Districts (WSDs):

- Molendinar;
- Southport West;
- Nerang;
- Nerang South;
- Worongary; and
- Gilston.

This report details the Molendinar and Southport West WSDs only.

2.2.1 Molendinar WSD

The Molendinar WSD services a region from the Pacific Highway to the west through to coastal areas to the east. The area is bounded to the north by the Southport West WSD and is isolated from the Worongary WSD to the south by the Nerang River. The WSD comprises two supply zones:

- Molendinar Low Level Zone (LLZ); and
- Ashmore High Level Zone (HLZ).

Appendix A Fig: 3 shows the extent of the Molendinar WSD. The existing water supply network within the Molendinar WSD is shown in Appendix A Fig: 4.

The Molendinar LLZ comprises multiple District Metered Areas (DMAs) within the zone, namely:

- Activity Crescent;
- Anchusia Street;
- Ashmore Road East;
- Benowa Road;
- Cotleu Street;
- Dalton Street;
- Robyn Street; and
Appendix A Fig: 5 shows the DMAs within the Molendinar WSD.

### 2.2.2 Southport West WSD

The Southport West WSD is bounded by the Pacific Highway to the west and the Molendinar WSD to the south. The Southport West WSD extends eastward to the Gold Coast Seaway and north to the Coombabah Lagoon. The Southport West WSD comprises the following Water Supply Zones:

- Southport West LLZ;
- Arundel HLZ; and
- Kingsway HLZ

Appendix A Fig: 2 shows the extent of the Southport West WSD. The existing water supply network within the Southport West WSD is shown in Appendix A Fig: 21.

The Southport West LLZ comprises multiple DMAs, namely:

- Allied Drive;
- Arundel Drive;
- Government Road;
- Government Road South;
- Hansford Road;
- Napper Road;
- Olsen Avenue;
- Hollywell Rd;
- Sidney Nolan Drive; and
- Turana Street.

Appendix A Fig: 22 shows the DMA’s within the Southport West WSD.
3 Network Planning

3.1 Land Use

The GCCC Planning Scheme outlines the land use within the study area. The planning scheme land use designations and the subsequent development of the GCRT Urban Design Framework have been incorporated into the 2012 IDM. The development types within the study area have been aggregated into seven broad groups. A summary of the gross area for each of the development types within the study area is provided in Table 3-1.

Table 3-1 Land Use Breakdown by Development Type

<table>
<thead>
<tr>
<th>DEVELOPMENT TYPE GROUP</th>
<th>AREA (HECTARES)</th>
<th>% AREA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential Single Family (detached dwellings)</td>
<td>2,196</td>
<td>31</td>
</tr>
<tr>
<td>Residential Multi Family (attached dwellings)</td>
<td>1,345</td>
<td>19</td>
</tr>
<tr>
<td>Tourist</td>
<td>355</td>
<td>5</td>
</tr>
<tr>
<td>Commercial</td>
<td>286</td>
<td>4</td>
</tr>
<tr>
<td>Industrial</td>
<td>368</td>
<td>5</td>
</tr>
<tr>
<td>Community Purpose</td>
<td>974</td>
<td>14</td>
</tr>
<tr>
<td>Open Space</td>
<td>1,542</td>
<td>22</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>7,066</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

3.2 Previous Planning

Previous planning within the Molendinar Potable Water Financial Catchment was undertaken as part of the PIP in 2006. Further planning was undertaken in 2008 and 2010, as detailed in Section 1. The augmentation strategies of the previous reports where considered when developing the planning strategies adopted in this report.

Additional studies have also been undertaken in relation to fire fighting. The conclusions from these studies have been incorporated into the network modelling in this current study where appropriate.

3.3 Bulk Supply

The Molendinar and Southport West WSDs are supplied from the Molendinar Water Treatment Plant (WTP), with raw water sourced from Hinze Dam. An additional supply is available via the Tugun Desalination Plant, when in operation. These bulk assets are owned and operated by the state government (Seqwater). The Molendinar WTP also provides supply to the northern WSDs (not considered in this report) and the Southern Regional Water Pipeline (SRWP). For this study, the operation of the Molendinar WTP and the reservoirs on the WTP site that do not service either the Molendinar or Southport West WSDs have not been considered.
4 Infrastructure Demand Projections

4.1 Infrastructure Demand Model

One of the key drivers for this current project is to assess the impact of the recent update to the citywide IDM on the water supply master planning within the Molendinar and Southport West WSDs. This IDM replaces the 2004 version of IDM which was developed as part of the 2006 PIP.

The new citywide IDM is based on the most recent population and employment growth forecasts developed by the Office of Economic and Statistical Research (OESR), combined with base year demands calculated from actual water consumptions data. The new IDM provides demand forecasts for the 2011, 2016, 2021, 2026, 2031 and 2056 planning horizons.

Since the new IDM was completed, there have been changes to growth forecasts as a result of the Gold Coast Rapid Transit Corridor Land Use and Urban Design Framework (GCRT UDF) study. The GCRT UDF is a key strategic document outlining the priority area for future densification and best practice building design framework promoting transit supportive development policies. The UDF acknowledges that the Gold Coast local government area has a limited supply of broad hectare land available for future residential development and therefore the GCRT Corridor aspires to accommodate some 60% of the city’s infill dwelling targets under the SEQ Regional Plan. The UDF allows for the GCRT corridor to accommodate up to 50,000 new dwellings and up to 45,000 new jobs over the next 20-30 years. The UDF was developed by a range of associated studies including Economic Input and Analysis, Corridor Access and Mobility study, and the Planning Scheme review process.

While the GCRT UDF allows significant growth within the corridor over a long period of time, an interim realistic growth target was adopted for this study. This interim target allowed for a 20% uplift on the new IDM projected growth within the corridor. With this modified growth target within the corridor, a GCRT corridor-specific IDM was developed as part of the GCRT Corridor Study. As the GCRT IDM was not available when the new citywide IDM was developed, it has been included with the new IDM as part of the current study to ensure that the most up to date demand forecast information is utilised for this study.

Since this current master planning exercise commenced, planning for the Broadwater Marine Project and other cruise terminal proposals have been instigated by GCCC. If implemented, these proposals have the potential to add significant water demands to the Molendinar and Southport WSDs. The potential demands from these developments have not been included in this study.

4.2 Infrastructure Demand Model Demands

The IDM information is specified at lot level (both residential and non-residential) in the unit of Equivalent Tenement (ET) and is a GIS-based (MapInfo) model. The demand information used for this study is specified at six (6) planning horizons within the IDM:

- 2011 (existing);
- 2016;
- 2021;
- 2026;
- 2031; and
- 2056.
4.3 IDM Output Demands

Table 4-1 details the breakdown of the water demands for the Molendinar and Southport West WSDs, providing ETs for each planning horizon. The water supply demands detailed in Table 4-1 were adopted for the hydraulic modelling.

### Table 4-1 Molendinar and Southport West Water Supply District Demands

<table>
<thead>
<tr>
<th>WATER SUPPLY ZONE</th>
<th>2011</th>
<th>2016</th>
<th>PLANNING HORIZON</th>
<th>2021</th>
<th>2026</th>
<th>2031</th>
<th>2056</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>2021</td>
<td>2026</td>
<td>2031</td>
<td>2056</td>
<td></td>
</tr>
<tr>
<td>Molendinar LZZ</td>
<td>41,598</td>
<td>46,025</td>
<td>51,579</td>
<td>57,007</td>
<td>62,864</td>
<td>86,060</td>
<td></td>
</tr>
<tr>
<td>Ashmore HLZ</td>
<td>402</td>
<td>422</td>
<td>431</td>
<td>439</td>
<td>465</td>
<td>530</td>
<td></td>
</tr>
<tr>
<td><strong>MOLENDINAR WSD TOTAL</strong></td>
<td>42,000</td>
<td>46,447</td>
<td>52,010</td>
<td>57,446</td>
<td>63,329</td>
<td>86,590</td>
<td></td>
</tr>
<tr>
<td>Southport West LLZ</td>
<td>25,197</td>
<td>27,929</td>
<td>31,402</td>
<td>33,722</td>
<td>35,201</td>
<td>41,571</td>
<td></td>
</tr>
<tr>
<td>Arundel HLZ</td>
<td>493</td>
<td>498</td>
<td>503</td>
<td>503</td>
<td>503</td>
<td>513</td>
<td></td>
</tr>
<tr>
<td>Kingsway HLZ</td>
<td>239</td>
<td>239</td>
<td>239</td>
<td>239</td>
<td>240</td>
<td>240</td>
<td></td>
</tr>
<tr>
<td><strong>SOUTHPORT WEST TOTAL</strong></td>
<td>25,929</td>
<td>28,666</td>
<td>32,144</td>
<td>34,464</td>
<td>35,944</td>
<td>42,324</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>67,929</td>
<td>75,113</td>
<td>84,154</td>
<td>91,910</td>
<td>99,273</td>
<td>128,914</td>
<td></td>
</tr>
</tbody>
</table>

A comparison of the demands between 2004 IDM and the 2012 IDM is provided in Table 4-2 and in Figure 4-1. The change in the total ET at 2056 is not considered to be significant at 3.4%; however, the pattern of growth in the 2012 IDM is delayed with demand projected to occur at a later planning horizon than projected in 2004 IDM.

### Table 4-2 2012 IDM vs 2004 IDM Demands

<table>
<thead>
<tr>
<th>MOLENDINAR AND SOUTHPORT WEST WATER SUPPLY DISTRICTS</th>
<th>2012 IDM</th>
<th>2004 IDM</th>
<th>DIFFERENCE (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>YEAR</strong></td>
<td>(ET)</td>
<td>(ET)</td>
<td></td>
</tr>
<tr>
<td>2011</td>
<td>67,929</td>
<td>85,762</td>
<td>21</td>
</tr>
<tr>
<td>2016</td>
<td>75,113</td>
<td>89,230</td>
<td>16</td>
</tr>
<tr>
<td>2021</td>
<td>84,154</td>
<td>94,587</td>
<td>11</td>
</tr>
<tr>
<td>2026</td>
<td>91,910</td>
<td>98,883</td>
<td>7</td>
</tr>
<tr>
<td>2031</td>
<td>99,273</td>
<td>103,180</td>
<td>4</td>
</tr>
<tr>
<td>2056</td>
<td>128,914</td>
<td>124,662</td>
<td>-3</td>
</tr>
</tbody>
</table>
The key reasons for the difference in population projections include:

- The base year (2011) demand is based on actual water consumption data whereas in the 2004 IDM, the 2011 demand was a forecast demand based on the water consumption data in 2004 and the growth trend adopted then. Hence, a difference of 21% between the two IDMs is observed in base year (2011).

- Although the raw population input to both IDMs were close, the difference in ET demand from 2011 to the 2031 planning horizon is as a result of the reduced water consumption factors. Growth within the adopted 2012 IDM is reflective of the delayed growth trend adopted for the GCRT corridor (40% of the catchment demand). The adopted growth reflects the current slowdown in the development industry. The impact of this trend is particularly noticeable in the 2016 and 2021 planning horizons where the demands are 16% and 11% lower respectively in the 2012 IDM. Eventually the 2056 demand picks up and therefore the 2012 IDM curve crosses the 2004 IDM around the 2031 planning horizon.
5  Demand Analysis and Design Criteria

5.1  Standards of Service

The GCCC DSS were reviewed under previous commissions (by KBR and MWH) for analysis within the 2006 PIP. The developed DSS Design Criteria are documented in the Desired Standards of Service Summary report (KBR, 2006). A subsequent partial review of DSS was undertaken by the Pimpama-Coomera Water Future (PCWF) Master Alliance. Further, GCCC was completed a full review of the DSS in 2009. Appendix C details the adopted DSS for this study.

5.2  Design Criteria

Trunk infrastructure in the potable water network includes the water treatment, bulk water transport and storage and water reticulation systems. Table 5-1 summarises the potable water DSS.

Table 5-1  Key Potable Water Desired Standards of Service – Design Criteria

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DESIGN CRITERIA</th>
<th>DESIRED STANDARD OF SERVICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Demand</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PW1</td>
<td>Distribution System</td>
<td>Refer Appendix C</td>
</tr>
<tr>
<td>PW4</td>
<td>Demand Distribution</td>
<td>Water demand in ET determined by GCW IDM process.</td>
</tr>
<tr>
<td>PW5</td>
<td>Peaking Factors</td>
<td>Refer Appendix C</td>
</tr>
<tr>
<td>PW6</td>
<td>Diurnal Curves</td>
<td>Refer Appendix C</td>
</tr>
<tr>
<td>Minimum Service Pressure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PW10</td>
<td>Minimum Pressure</td>
<td>22 metres</td>
</tr>
<tr>
<td>PW11</td>
<td>Location</td>
<td>In the main adjoining the property boundary</td>
</tr>
<tr>
<td>PW12</td>
<td>Network Condition</td>
<td>Minimum operating level (MOL) at MH under MD condition.</td>
</tr>
<tr>
<td>Maximum Service Pressure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PW13</td>
<td>Maximum Pressure</td>
<td>80 metres</td>
</tr>
<tr>
<td>PW14</td>
<td>Location</td>
<td>In the main adjoining the property boundary</td>
</tr>
<tr>
<td>PW15</td>
<td>Network Condition</td>
<td>Reservoir level at 95% of top water level.</td>
</tr>
<tr>
<td>Target Service Pressure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PW16</td>
<td>Target Maximum Pressure</td>
<td>55 metres</td>
</tr>
<tr>
<td>PW17</td>
<td>Location</td>
<td>At property boundary</td>
</tr>
<tr>
<td>PW18</td>
<td>Network Condition</td>
<td>Reservoir level at 95% of top water level.</td>
</tr>
<tr>
<td>Reservoir Storage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PW25</td>
<td>Ground Level Storage Capacity</td>
<td>Capacity = Operating Volume + Emergency Storage.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Operating Volume</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 * (MD-MDMM)</td>
</tr>
<tr>
<td>ITEM</td>
<td>DESIGN CRITERIA</td>
<td>DESIRED STANDARD OF SERVICE</td>
</tr>
<tr>
<td>------</td>
<td>----------------</td>
<td>----------------------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Emergency Storage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>As defined by Council in commercial, industrial and high density zones.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Greater of 4 hours MDMM demand or 0.5 ML</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Zone &lt;350 ET - 150 kL</td>
</tr>
<tr>
<td>PW26</td>
<td>Elevated Storage Capacity</td>
<td>Capacity = Operating Volume + Fire Storage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Operating volume</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Water supply zones where 8 hours x MH is less than or equal to MDMM demand, operating volume = 2 hours x MH</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Water supply zones where 8 hours x MH is greater than MDMM demand, operating volume = 6 x (MH - (MDMM/12))</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fire Storage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>150 kL</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pumping Capacity Design</td>
<td></td>
</tr>
<tr>
<td>PW27</td>
<td>Duty Pump serving Ground Level Reservoir</td>
<td>MDMM over 20 hours</td>
</tr>
<tr>
<td>PW28</td>
<td>Duty Pump serving Elevated Reservoirs</td>
<td>(6 MH - Operating Volume) / (6 x 3600) (L/s)</td>
</tr>
<tr>
<td>PW29</td>
<td>Standby Pump Capacity</td>
<td>To match the largest single unit pump capacity</td>
</tr>
<tr>
<td></td>
<td>Pipeline Design</td>
<td></td>
</tr>
<tr>
<td>PW30</td>
<td>Pipe Capacity - Bulk Distribution Mains</td>
<td>MDMM</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- 24 hrs/day gravity</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- 20 hrs/day pumped mains</td>
</tr>
<tr>
<td>PW31</td>
<td>Pipe Capacity - Zone Trunk and Reticulation Mains</td>
<td>Minimum serviced pressure criteria or fire fighting requirements (whichever is critical condition)</td>
</tr>
<tr>
<td>PW32</td>
<td>Friction Equation</td>
<td>Hazen-Williams</td>
</tr>
<tr>
<td>PW33</td>
<td>Maximum Velocity</td>
<td>2.5 m/s</td>
</tr>
</tbody>
</table>

Notes:
- Case 1: Potable water only (Traditional Reticulation Areas)
- Case 2: Potable water + rain tanks (Infill Development Areas)
- Case 3: Potable water + recycled water (Greenfield scenario one)
- Case 4: Potable water + rainwater tanks + recycled water (Greenfield scenario two)
- RSF: Residential Single Family - Park Living, Village, Detached Dwellings and Emerging Communities Domains
- RMF: Residential Multi Family - Residential Choice Domains
- COM: Commercial - Integrated Business, Local Business and Fringe Business Domains
- IND: Industrial - Industry 1, Industry 2, Extractive Industry and Marine Industry Domains
- TOR: Tourist - Tourist Residential Domains
- PUB: Public - Community Purpose Domain
- IRR: Irrigation - Conservation, Public Open Space and Private Open Space Domains
6 Potable Water Supply Network Modelling Methodology

6.1 Water Supply Network Model

The Molendinar and Southport West WSDs are contained within the Gold Coast City Northern hydraulic network model. The Northern hydraulic network is a water supply model developed in the H2OMap software platform. The Northern model contains all the water supply districts north of the Nerang River. Modelling analysis was undertaken based on the following hydraulic model supplied by GCCC:

- “Northern Potable Multi-Use v28_Netserv”.

Updates to the model included the addition of network augmentations identified in previous planning studies (e.g. fire fighting) and augmentations identified in the GCHKP and GCRT projects, some of these augmentation may not yet be constructed but are proposed to be operational before the end of financial year 2012-13. These updates have been undertaken utilising GCCC’s supplied GIS information and the ‘As Constructed’ drawings.

6.1.1 Model IDs

The hydraulic network model includes pipes of 100mm diameter and greater, all pumps, valves, hydrants and reservoirs. Each existing element has a unique ID. The first two characters of each ID represent the Water Supply District code in which the element is located. The remaining digits form a unique identifier for each element.

Future elements have also been assigned a unique identifier whereby the ID comprises the prefix ‘F’ for ‘future’, followed by the two-character Water Supply District code. The remaining digits form a unique identifier for the element. A sample of the pipe IDs created within the Molendinar Potable Water Supply Financial Catchment is shown in Table 6-1 below.

Table 6-1 Example of Pipe ID’s

<table>
<thead>
<tr>
<th>Water Supply District</th>
<th>Water Supply District Code</th>
<th>Sample Pipe ID</th>
<th>Sample Future Pipe ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>Molendinar</td>
<td>MO</td>
<td>MO_12204</td>
<td>FMO_300100</td>
</tr>
<tr>
<td>Southport West</td>
<td>SW</td>
<td>SW_13608</td>
<td>FSW_300100</td>
</tr>
</tbody>
</table>

6.1.2 Model Scenarios

Six modelled scenarios were developed within the H2OMap water supply network models. The scenarios represent the existing network along with five planning horizons. The six scenarios are as follows:

- 2011 network (Existing);
- 2016 augmented network;
- 2021 augmented network;
- 2026 augmented network;
- 2031 augmented network; and
- 2056 augmented network.
Future elements and augmentations have been included in the network models to satisfy future demand up to the 2056 planning horizon. Each future element was assigned to a specific planning horizon (e.g. 2016) such that the size of the proposed future element is required to satisfy 2056 demand, and is considered it will be constructed prior to 2016. Future pipes were assigned a nominal diameter and a roughness coefficient dependent on the pipe diameter. The Hazen-Williams formula was adopted as the friction coefficient within the DSS, for use in the network models (refer to Table 5-1, Item PW32). The formula simplifies calculations and takes into account losses for pipe fittings, such as bends, valves, reducers, tees, crosses, etc. and for aging infrastructure. The Hazen-Williams roughness coefficients adopted for the models are provided in Table 6-2.

### Table 6-2 Hazen-Williams Roughness Coefficients

<table>
<thead>
<tr>
<th>Main Type</th>
<th>Pipe Diameter</th>
<th>C Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distribution</td>
<td>D &lt; 300 mm</td>
<td>110</td>
</tr>
<tr>
<td></td>
<td>300 mm ≤ D ≤ 600 mm</td>
<td>120</td>
</tr>
<tr>
<td></td>
<td>D &gt; 600 mm</td>
<td>125</td>
</tr>
<tr>
<td>Reticulation</td>
<td>D &lt; 150 mm</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>150 mm ≤ D &lt; 300 mm</td>
<td>110</td>
</tr>
<tr>
<td></td>
<td>D ≥ 300 mm</td>
<td>120</td>
</tr>
</tbody>
</table>

### 6.2 Modelling Methodology

Six modelled scenarios were developed, representing the existing network along with five planning horizons, as detailed in Section 6.1. The following steps were undertaken in order to develop the scenarios.

#### 6.2.1 Step 1: Enter model inputs

- The 2012 IDM was reviewed against the existing demand allocations and link diagram. Changes in the network the occurred due to the GCRT project resulted in the need to change the demand allocation model node for some allotments, as existing infrastructure had been decommissioned or reconfigured. The updated demand allocation was verified for each water supply zone within the Molendinar and Southport West WSDs.

- Demands were extracted from the new IDM, with units of ET for each planning horizon. Each property was assigned to the nearest non trunk model node including hydrants as shown in Figure 6-1. The number of ETs were summed by development type and potable water supply scenario for each node at each of the planning horizons (e.g. 2011 demand applied to the 2011 scenario).
6.2.2 Step 2: Run network model under MD conditions

Diurnal Patterns were entered for the Maximum Day (MD) scenario. The diurnal patterns were developed from the average day demands (Table 5-1, PW1), the peaking factors (Table 5-1, PW5), and the diurnal curves (Table 5-1, PW6) for the demand. These patterns include the revenue and non-revenue components of the demand. Due to the complex nature of calculation of demands and assignment of diurnal patterns, the average day demand has been incorporated into the patterns applied to the model rather than applied as a global multiplier.

6.2.3 Step 3: Review network capacity using DSS Design Criteria

Ground Level Storage Volume - Sized to maintain minimum emergency storage after 3 continuous MDs (refer Table 5-1, PW25).

Elevated Storage Volume - Sized to maintain minimum emergency storage after 3 continuous MDs (refer Table 5-1, PW26).

Delivery Mains - Maximum allowable velocity of 2.5 m/s (refer Table 5-1, PW33).

Pumps Serving Ground Level Reservoirs - Sized to deliver MDMM flow over 20 hours (refer Table 5-1, PW27).

Pumps Serving Elevated Reservoirs - Sized to deliver flow of \( \frac{(6\text{MH}-\text{Operating Volume})}{(6 \times 3600)} \) (refer Table 5-1, PW28).
6.2.4 Step 4: Review service pressures throughout the network

Minimum Service Pressure = 22 m at property boundary of service, at Maximum Hour (MH) under MD condition with reservoirs at Minimum Operating Level (MOL).

Maximum Service Pressure = 80 m at property boundary of service, when reservoir levels are at 95% of TWL.

6.2.5 Step 5: Propose augmentations to service demands

Sizing of future water supply network will be based on the demand at 2056 planning horizon. Therefore, modelling is required for the 2056 planning horizon first to satisfy the ultimate condition, followed by 2011, 2016, 2021, 2026 and 2031 planning horizons. The year of each augmentation was determined by modelling each planning horizon, from the 2011 to the 2031 planning horizon, and assigning the augmentation to where the specific planning horizon first fails to meet the DSS.

Augmentations have been included as a duplicate main, with the existing main retained for modelling purposes. The equivalent diameter of the two parallel mains would be the size of the installation main. Furthermore, the inclusion of additional feeds to existing DMAs has been identified as a potential augmentation in lieu of lengthy large mains within the zone.

6.3 Model Output

Capital Work Schedules for the Molendinar and Southport West WSDs were developed from the hydraulic analysis detailed above. These work schedules detail all augmentations of the potable water supply network required to achieve GCCC desired standards of service and the service growth. Each work schedule includes a description of the infrastructure item, location, trunk infrastructure category and the estimated capital cost, based on GCCC adopted rates.

The timing of proposed infrastructure in the works schedules has been based on the adopted IDM demand and planning horizons. Should the adopted growth not be achieved, then the estimated timing of infrastructure will need to be revised accordingly.

Capital Works Schedules for the Molendinar and Southport West WSDs are included in Appendix B.
7 Analysis of the Molendinar Water Supply District

7.1 Bulk Supply

The primary source of water for the Molendinar WSD is the Molendinar WTP. Treated water from the Molendinar WTP is conveyed from the Molendinar Reservoir Complex to the reticulation network via twin trunk mains (965 mm and 600 mm). In addition, a 750 mm diameter trunk main along Ashmore Road connects into the 900 mm diameter trunk main to distribute flow within the WSD.

The Molendinar WSD is comprised of multiple pressure zones, with a single high level zone and a low level zone that includes eight DMAs. Details of the projected growth in each zone are provided in Table 7-1.

Appendix A Fig: 3 illustrates the Molendinar WSD.

### Table 7-1 Demand Growth Within the Molendinar Water Supply District

<table>
<thead>
<tr>
<th>WATER SUPPLY ZONE</th>
<th>2011 DEMAND (ET)</th>
<th>2016 DEMAND (ET)</th>
<th>2021 DEMAND (ET)</th>
<th>2026 DEMAND (ET)</th>
<th>2031 DEMAND (ET)</th>
<th>2056 DEMAND (ET)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Molendinar LLZ</td>
<td>41,598</td>
<td>46,025</td>
<td>51,579</td>
<td>57,007</td>
<td>62,864</td>
<td>86,060</td>
</tr>
<tr>
<td>Ashmore HLZ</td>
<td>402</td>
<td>422</td>
<td>431</td>
<td>439</td>
<td>465</td>
<td>530</td>
</tr>
</tbody>
</table>

The existing layout of the trunk main and distribution network, including mains of 100 mm diameter and greater, is shown in Appendix A Fig: 4.

The augmentation schedule (Appendix B) lists all augmentations required within the Molendinar WSD. All augmentations required within the Molendinar WSD to meet future demand are shown from Appendix A Fig: 7 to Appendix A Fig: 19. The following sections discuss the performance of the network and key augmentations required within the WSD.

7.1.2 Molendinar LLZ

The Molendinar LLZ comprises all of the low level areas within the Molendinar WSD and includes eight DMAs. The Zone is served by the three Molendinar-Reservoirs (MO4, MO5 and MO6), which each have a volume of 30 ML and a TWL of 78.4 m AHD. The Molendinar LLZ was analysed to identify any deficiencies relating to storage, pressures and velocities. There are several major augmentations required within the Molendinar LLZ to address the failures shown in Appendix A Fig: 6.

7.1.2.1 2011 Planning Horizon

Modelling identified no augmentations for this planning horizon.

7.1.2.2 2016 Planning Horizon

Significant augmentation is required to improve minimum pressures in the Activity Crescent DMA by 2016. Augmentation with 250 mm diameter mains is proposed to resolve the failures within this DMA.

A new 375 mm diameter supply main is required for the Dalton Street DMA for this Planning Horizon.

The identified augmentations are illustrated on Appendix A Fig: 7.
7.1.2.3 2021 Planning Horizon

Augmentation to the Wilson Street DMA is required by 2021, with the inclusion of a new 300 mm diameter trunk main to the DMA to improve network pressures. The Wilson Street DMA also requires an increase in the size of the feed PRV, with a new 300 mm diameter PRV proposed to reduce the significant headlosses experienced through the existing PRV. A setting of 50 metres is required at the Wilson Street DMA to achieve the DSS. Further augmentations to the feed PRVs for the Anchusia Street and Dalton Street DMAs are proposed. A 200 mm diameter PRV with a setting of 50 metres is proposed for the Anchusia Street DMA, while a 300 mm diameter PRV at a setting of 48 metres is proposed for Dalton Street DMA.

The identified augmentations are illustrated on Appendix A Fig: 8 and Appendix A Fig: 9.

7.1.2.4 2026 Planning Horizon

Previously identified augmentations are sufficient to accommodate the increase in growth for this planning horizon. Provided all previous augmentations are in place, no augmentations are required.

7.1.2.5 2031 Planning Horizon

Significant augmentation is required to accommodate the increase in demand. A new 450 mm diameter trunk main is required along Ashmore Road to improve network pressure and improve flow distribution within the zone. A 375 mm diameter main is required to improve pressures within the Dalton Street DMA. Augmentation to improve pressures within the Benowa Road DMA is required with 250 mm and 200 mm diameter mains.

The identified augmentations are illustrated from Appendix A Fig: 10 to Appendix A Fig: 12.

7.1.2.6 2056 Planning Horizon

Numerous augmentations are required within the network to satisfy velocity constraints within the network, along with augmentations required to maintain minimum pressures. The following mains have been identified as augmentations with modelled results indicating a maximum velocity above 2.5 m/s for the existing mains:

- 3 metres of 450 mm main along Ashmore road, Ashmore;
- 7 metres of 200 mm main along Scarborough Street, Southport;
- 18 metres of 150 mm main along Main Beach Parade, Main Beach;
- 216 metres of 150 mm main along Scarborough Street, Southport;
- 11 metres of 100 mm main along Scarborough Street, Southport;
- 72 metres of 100 mm main along Ocean Avenue, Surfers Paradise; and
- 2 metres of 100 mm main along Palm Avenue, Surfers Paradise;

To improve network pressures to maintain DSS pressures, the following network augmentations are required:

- An extension of the previously identified 375 mm main for the Dalton Street DMA. Further augmentations within the Dalton Street DMA include, approximately 200 metres of 300 mm and 160 metres of 250 mm and 80 metres of 200 mm diameter mains.
- 65 metres of 200 mm diameter main within the Cotlew Street DMA;
- A 300 mm diameter main along Coolibah Street;
- A 250 mm diameter main along Crombie Avenue;
- Multiple 200 mm diameter augmentations along Benowa Road, Barrata Street, Terrigal Crescent, Ewan Street and Johnston Streets; and
- Multiple smaller diameter augmentations (less than 200 mm) are required within the Molendinar LLZ and the Anchusia Street DMA.
In addition, five new PRVs are required to accommodate increased flows in each DMA:

- 100 mm PRV for Anchusia Street DMA, set to 53 metres;
- 150 mm PRV for the Wilson Street DMA, set to 25 metres;
- 200 mm PRV for Dalton Street DMA, set to 30 metres;
- 200 mm PRV at Benowa road DMA, set to 60 metres; and
- 200 mm PRV at Robyn Street DMA, set to 53 metres.

The identified augmentations are illustrated from Appendix A Fig: 13 to Appendix A Fig: 19.

7.1.3 **Ashmore HLZ**

No augmentations have been identified for the Ashmore HLZ from 2011 to 2056 planning horizons.

### 7.2 **Storage Reservoirs**

Details of the existing reservoir storage that services the Molendinar WSD are provided in Table 7-2. The Molendinar reservoir complex represents a total of 90 ML of storage. These reservoirs currently service the Molendinar LLZ and Ashmore HLZ. Analysis of the model has indicated that the Kingsway HLZ will be serviced from 2016 by the 750mm trunk main between the Molendinar reservoirs and the Paperback Court Reservoirs (which supply the Southport West LLZ). Due to the operation of the Paperback Court Reservoirs, the Kingsway HLZ is included as part of the Molendinar Water Supply District, as the inlet control on the Paperback Court Reservoirs prevents back flow to the Kingsway HLZ from these reservoirs. The inclusion of the Kingsway HLZ does not trigger further augmentation of the Molendinar reservoirs.

<table>
<thead>
<tr>
<th>WATER SUPPLY ZONE</th>
<th>RESERVOIR COMPLEX</th>
<th>EXISTING STORAGE</th>
<th>REQUIRED STORAGE AT 2056</th>
<th>PROPOSED STORAGE AUGMENTATIONS</th>
<th>TRIGGER OR YEAR OF AUGMENTATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Molendinar LLZ</td>
<td>Molendinar</td>
<td>90 ML (3 x 30ML)</td>
<td>72.95 ML</td>
<td>No Augmentations required</td>
<td>N/A</td>
</tr>
</tbody>
</table>

The proposed reservoir MO7 was included in this analysis. The required size of this reservoir requires further analysis as it will service the regions beyond the scope of this analysis.
Analysis of the Southport West Water Supply District

8.1 Bulk Supply

Water supply to the Southport West WSD is provided from the Molendinar WTP. Treated water is fed to the Paperbark Court reservoirs via a 750mm diameter gravity main from the clear water storage at the Molendinar WTP.

Supply to the Paperbark Court reservoir will be transferred from the clear water storage to reservoirs MO4, MO5 and MO6 in the future after the cross connection between the existing 750mm and 1125mm diameter mains. This augmentation has been incorporated into the hydraulic model from 2016 onward.

The Southport West WSD is comprised of two water supply zones and ten DMAs, which are shown in Appendix A Fig: 2 and Appendix A Fig: 22. Details of the projected growth in each zone are provided in Table 8-1.

### Table 8-1 Demand Growth within the Southport West Water Supply District

<table>
<thead>
<tr>
<th>WATER SUPPLY ZONE</th>
<th>2011 DEMAND (ET)</th>
<th>2016 DEMAND (ET)</th>
<th>2021 DEMAND (ET)</th>
<th>2026 DEMAND (ET)</th>
<th>2031 DEMAND (ET)</th>
<th>2056 DEMAND (ET)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Southport West LLZ</td>
<td>25,197</td>
<td>27,929</td>
<td>31,402</td>
<td>33,722</td>
<td>35,201</td>
<td>41,571</td>
</tr>
<tr>
<td>Arundel HLZ</td>
<td>493</td>
<td>498</td>
<td>503</td>
<td>503</td>
<td>503</td>
<td>513</td>
</tr>
<tr>
<td>Kingsway HLZ</td>
<td>239</td>
<td>239</td>
<td>239</td>
<td>239</td>
<td>240</td>
<td>240</td>
</tr>
</tbody>
</table>

The existing layout of the trunk main and distribution network, including mains of 100 mm diameter and greater, is shown in Appendix A Fig: 22.

The augmentation schedule (Appendix B) lists all augmentations required within the Southport West WSD. All augmentations required within the Southport West WSD to meet future demand are shown from Appendix A Fig: 24 to Appendix A Fig: 31.

The following sections discuss the performance of the network and key augmentations required within the zones of Southport West WSD.

8.1.2 Southport West LLZ

The Southport West LLZ is supplied by the Paperbark Court Reservoirs, which have volumes of 9.0ML and 20ML and a TWL of 70.5 m AHD.

The Southport West LLZ was analysed to identify any deficiencies relating to storage, pressures and velocities. The analysis showed that there were deficiencies in relation to distribution network within the zone.

8.1.2.1 2011 Planning Horizon

Minimal augmentation is required for the 2011 planning horizon to maintain GCCC’s DSS. An increase to the supply mains delivering flow to the Napper Road DMA is required with a 250 mm diameter main.

Two PRV upgrades are required, with a 150 mm diameter PRV set to 42 metres for the Allied Drive DMA, and a 250 mm diameter PRV set to 47 metres at the Napper Road DMA. The current PRV setting of the Arundel Drive (PRV Zone) should also be increased from 30 to 32m.

A boundary change between the Southport West LLZ and the pressure managed Arundel HLZ is required. The boundary change is proposed using the existing isolation valves.

The identified augmentations are illustrated on Appendix A Fig: 24 and Appendix A Fig: 25.
8.1.2.2 2016 Planning Horizon
A single augmentation is required as velocities exceed the adopted DSS of 2.5 m/s. 55 metres of 200mm diameter main is required along Jacob Drive and Babbidge Street to satisfy GCCC’s DSS.
The identified augmentations are illustrated on Appendix A Fig: 26.

8.1.2.3 2021 Planning Horizon
Significant augmentations are required due to growth in the zone, particularly related to the GCHKP development. Approximately 1.3 kilometres of 250mm diameter main is required to connect the mains along Parklands Drive, Smith Street and Melia Court to maintain minimum pressures in the zone.
An upgrade of the Sidney Nolan Drive DMA PRV is required, with a 150 mm PRV set to 45 metres.
The identified augmentations are illustrated on Appendix A Fig: 27 and Appendix A Fig: 28.

8.1.2.4 2026 Planning Horizon
No augmentations are required to service the Southport West LLZ for this planning horizon.

8.1.2.5 2031 Planning Horizon
Minimal augmentations are required to service demand in the zone for the 2031 planning horizon. A 100 mm main augmentation to the Sidney Nolan Drive DMA is required to avoid velocities in excess of GCCC’s DSS. A 150 mm main augmentation is required within the napper road DMA to maintain minimum pressures in the zone.
The identified augmentations are illustrated on Appendix A Fig: 29.

8.1.2.6 2056 Planning Horizon
Key augmentations for the Southport West LLZ are required to maintain supply and pressures within the zone. These include:
- 300 metres of 300 mm diameter main along Brisbane Road and Government Road;
- Approximately 140 metres of 250 mm diameter main to increase pressures in the Hansford Road DMA;
- Approximately 190 metres of 200 mm diameter mains within the Government Road DMA; and
- A 200 mm diameter main within the Anchusia Street DMA.
The identified augmentations are illustrated on Appendix A Fig: 30 and Appendix A Fig: 31.
8.1.3  **Arundel HLZ**

The Arundel HLZ serves the high level areas around Uplands Drive, the Paperbark Court Reservoirs, Woodlands Way and Greenacre Drive. The Arundel HLZ is served by the 1.89ML Uplands Drive Reservoir, which has a TWL of 111.5 m AHD. The reservoir is supplied by the Woodland Way Pump Station.

No augmentations are required to maintain GCCC’s DSS for the Arundel HLZ from the 2011 to 2056 planning horizons.

8.1.4  **Kingsway HLZ**

The Kingsway HLZ is currently serviced by Kingsway Drive Pump Station (MO3) via 300mm supply main from the northern booster (MO1) pumps. In the future, it will be serviced by Ashmore Road Pump Station (MO4) via the 750 mm diameter main between the Molendinar and Paperbark Court reservoirs. A cross connection between the Molendinar reservoirs (MO4, MO5 and MO6) outlet main and the existing 750mm diameter main is proposed.

The Paperback Court Reservoirs have an inlet and outlet main configuration, with no back flow from the inlet main expected. To improve reliability to the zone, the Kingsway HLZ has been transferred to receive supply from the Molendinar reservoirs.

No augmentations are required within the zone to maintain GCCC’s DSS from 2011 to 2056 planning horizons.

8.2  **Storage Reservoirs**

Details of the existing reservoir storage and all proposed reservoir augmentations within the Southport West Water Supply District are provided in Table 8-2.

No additional storage is required for the reservoirs within the Southport West WSD.

**Table 8-2  Details of Storage Reservoirs**

<table>
<thead>
<tr>
<th>WATER SUPPLY ZONE</th>
<th>RESERVOIR COMPLEX</th>
<th>EXISTING STORAGE</th>
<th>REQUIRED STORAGE AT 2056 (ML)</th>
<th>PROPOSED STORAGE AUGMENTATIONS</th>
<th>TRIGGER OR YEAR OF AUGMENTATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Southport West LLZ</td>
<td>Paperbark Court</td>
<td>29ML (20ML + 9.0ML)</td>
<td>26.15 ML</td>
<td>No Augmentations required</td>
<td>N/A</td>
</tr>
<tr>
<td>Arundel HLZ</td>
<td>Uplands Drive</td>
<td>1.89ML</td>
<td>0.8 ML</td>
<td>No Augmentations required</td>
<td>N/A</td>
</tr>
</tbody>
</table>
9 Costs

This chapter details the capital cost and Net Present Cost (NPC) of constructing the identified augmentations for the Molendinar and Southport West WSDs. The NPC of infrastructure was calculated utilising a discount rate of 9.35% and indexation rate of 4.75% and includes operation and maintenance costs from 2011 to 2056.

The costs identified are based on the unit rates developed for GCCC by Cardno and detailed in “Unit Rates Report, March 2011”. In addition to the GCCC unit rates, rates for the Pressure Reducing Valves have been used, based on industry knowledge and supplier information.

It is possible that the actual construction costs could vary significantly from the cost estimates provided as the tendered construction costs depend upon construction activity at the time of tender, competition in the market place, commercial framework and risks transferred to the contractor, all of which are difficult to predict at this stage of the project.

9.1 Infrastructure Costs

Based on the establishment costs of infrastructure provided in Appendix B, a summary of forecast capital cost and NPC within the Molendinar and Southport West WSDs is provided in Table 9-1. The total capital cost for Molendinar and Southport West WSDs for each planning horizon is shown in Figure 9-1.

The timing of infrastructure is shown in the works schedules in Appendix B.
<table>
<thead>
<tr>
<th>Water supply district</th>
<th>Infrastructure</th>
<th>TOTAL Capital Cost</th>
<th>Net Present Cost (NPC)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Molendinar WSD</strong></td>
<td>Water mains (≤ 200 mm)</td>
<td>$1,996,710</td>
<td>$311,440</td>
</tr>
<tr>
<td></td>
<td>Trunk Water mains (&gt; 200 mm)</td>
<td>$1,400,200</td>
<td>$590,200</td>
</tr>
<tr>
<td></td>
<td>Pump Stations</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Reservoirs</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pressure Reducing Valves</td>
<td>$2,177,760</td>
<td>$849,190</td>
</tr>
<tr>
<td></td>
<td><strong>SUB-TOTAL</strong></td>
<td>$5,574,670</td>
<td>$1,750,830</td>
</tr>
<tr>
<td><strong>Southport West WSD</strong></td>
<td>Water mains (≤ 200 mm)</td>
<td>$357,120</td>
<td>$172,260</td>
</tr>
<tr>
<td></td>
<td>Trunk Water mains (&gt; 200 mm)</td>
<td>$934,970</td>
<td>$473,460</td>
</tr>
<tr>
<td></td>
<td>Pump Stations</td>
<td></td>
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<tr>
<td></td>
<td>Reservoirs</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pressure Reducing Valves</td>
<td>$429,000</td>
<td>$359,840</td>
</tr>
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<td></td>
<td><strong>SUB-TOTAL</strong></td>
<td>$1,721,090</td>
<td>$1,005,560</td>
</tr>
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<td></td>
<td><strong>TOTAL</strong></td>
<td>$7,295,760</td>
<td>$2,756,390</td>
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Figure 9-1  Capital Expenditure between 2011 and 2056 for the Molendinar and Southport West WSDs
10 Conclusions and Recommendations

10.1 Conclusions

Master planning for the Molendinar and Southport West WSDs was previously undertaken during the 2006 PIP. Subsequent revisions were undertaken by GCCC, with several major projects identified within each WSD:

- The GCHKP;
- The Central Southport;
- The Central Surfers Paradise;
- The GCRT; and
- Significant development is expected to occur in the Knowledge Precinct site during the 2013-2018 period due to the construction of the 2018 Commonwealth Games Village at the site.

These major projects resulted in changes to both the existing water supply network and the IDM developed by GCCC. Updates to the existing hydraulic model were undertaken to reflect the changes to the network based on both supplied GIS from GCCC and design drawings. The recent outcomes from the GCRT UDF and Corridor Studies were incorporated into the IDM to ensure that the demand information used for this study was as up-to-date as possible.

An updated 2012 IDM was adopted for this study with changes made from the 2004 IDM to incorporate the new planning densities projected as part of the GCRT and GCHKP projects. The new IDM indicates that the existing population serviced by the Molendinar and Southport West WSDs is 67,929 ET, growing to 128,914 ET by 2056. This growth consistently increases across each planning horizon. Significant changes between the 2004 IDM and the 2012 IDM have been found, with growth generally projected to occur at a later date for most planning horizons within the adopted 2012 IDM. The GCCC’s DSS (2009) design criteria were adopted for this report along with the revised IDM.

Augmentations to resolve network deficiencies within the Molendinar WSD total approximately $5.58M, with capital works within the next 5 years having an approximate cost of $490,000.

Augmentations to resolve network deficiencies within the Southport West WSD total approximately $1.72M, with capital works within the next 5 years having an approximate cost of $31,000.
10.2 Key Issues and Recommendations

Based on the work undertaken during this master water supply planning study, Cardno recommends that Gold Coast City Council adopt the revised augmentations for their capital works program to meet both the projected growth within the region and to maintain the agreed DSS.

The following further recommendations can be made:

- A detailed analysis of the fire fighting capacity of the water mains, reservoirs and pump stations should be undertaken.
- The planned reservoir at Molendinar (MO7) is required to meet the demands of other northern WSDs outside the scope of this study. Further work will need to be undertaken to confirm the required capacity for reservoir MO7.
- An analysis of energy use and the potential for energy conservation should be investigated.
- Detailed design should be undertaken for the recommended PRVs based on the specifications of individual manufacturers.
- Dual feed DMAs provide a benefit in terms of redundancy and also reduce the length of DMA feed augmentations, and should be investigated further.
- Since this master planning exercise commenced, planning for the Broadwater Marine Project and other Cruise terminal proposals have been instigated. If implemented, these proposals have the potential to add significant water demand to the Molendinar Water Catchment. These demands have not been included in this study. Further planning is required to assess the impact of these projects.
Appendix A Fig: 1  Molendinar Financial Catchment
Appendix A Fig: 2  Southport West Water Supply District and Water Supply Zones
Appendix A Fig: 3  Molendinar Water Supply District and Water Supply Zones