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Northeast Business Park Pty Ltd

Environmental Impact Assessment

Water Supply and Sewerage Systems

October 2007

INFRASTRUCTURE | MINING & INDUSTRY | DEFENCE | PROPERTY & BUILDINGS | ENVIRONMENT

DISCLAIMER

This Water Supply and Sewerage Systems Report, October 2007:

1. has been prepared by GHD Pty Ltd for Northeast Business Park Pty Ltd;

2. must not be copied to or used by any person or entity other than Northeast Business Park Pty Ltd;

3. is based on soil investigations completed by others; and

4. is based on broad descriptions of land uses; and is preliminary in nature only. It is recommended the report is refined when further details of the development are available.

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Background

Northeast Business Park Pty Ltd commissioned GHD Pty Ltd to develop a potable and recycled water supply and sewerage infrastructure servicing strategy for the proposed Northeast Business Park (NEBP) in response to the "Northeast Business Park Project Terms Of Reference For An Environmental Impact Statement" (The Coordinator-General, December 2006). This servicing strategy report addresses Sections 3.7.3 and 3.7.5 in the Terms of Reference and considers the sourcing and management of water and wastewater on site to promote a cost-effective, environmentally responsible development.

Within State and Local Government policy, there is a clear directive to employ effective use and reuse of existing water resources where possible. The NEBP development will integrate a range of established water saving and reuse initiatives aiming to provide a quality and efficient infrastructure system with sustainable outcomes for the region.

Northeast Business Park Development Description

The Northeast Business Park (NEBP) is a multi-use marina and business park concept that will integrate marina facilities, appropriate business, industry, commercial, residential heritage and recreational precincts providing a place to live, to work and to play in a master planned riverside precinct on the Caboolture River[1].

The total area of the site is 793 hectares, with approximately 350 hectares of the site considered to be "developable land". The remaining area (443 ha) will be set aside for open space, and active and passive recreational uses. The development will occur over a number of stages extending from 2008 to 2025 with the total development population approximately 9440 EP and 9600 EP for water and sewerage respectively.

Integrated Water Management

Estimation of potable water demands and wastewater production for the site using traditional servicing methods yielded an ultimate average potable water demand of 4.3 ML/day (if potable water was supplied for all water uses on site) and an ultimate average daily sewage flow of 2.3 ML/day.

The development site will adopt a number of integrated water management initiatives. It is proposed that the Northeast Business Park development will incorporate water efficient devices (including 3 star showers, 4 star toilets, and 3 star aerators on tap fittings) and a variety of alternative water sources to reduce potable water demand within the site. Table 1 summarises the proposed water sources and uses for the site.

[1] Northeast Business Park Pty Ltd Consultant Brief, Cardno 2007.

Table 1 Proposed Water Sources and Uses

Alternative Water Source	Proposed Uses
Class A+ recycled water supplied by South Caboolture WRP (and future Burpengary East WRP), using a dual reticulation system.	» Flushing toilets; » Suitable industrial uses[2]; and » Irrigating gardens, sports fields, public space and the golf course.
Rainwater tanks, including: » Residential tanks; and » Rainwater tanks in the industrial precinct.	» Washing clothes,; » Hot water systems; and » Basins
CabWater Municipal Potable Water Supply	» Potable water uses (drinking and cooking); and » Topping up the rainwater tanks.

Assessment included determining of savings from water efficient devices and estimating of recycled water irrigation demand for the site, rainwater tank yields and wastewater treatment options for the site. Discussions with CabWater and the client determined a preference that wastewater from the development is to be treated by Caboolture Shire's wastewater treatment systems rather than on-site alternatives.

The water balance predicts that significant water savings can be achieved through use of the proposed Integrated Water Management (IWM) initiatives. It is estimated that the potable water demand will reduce by 80% compared to the water demand associated with traditional servicing methods (excluding water savings, refer Figure 1).

[2] The type of industrial uses will be defined at a later stage.

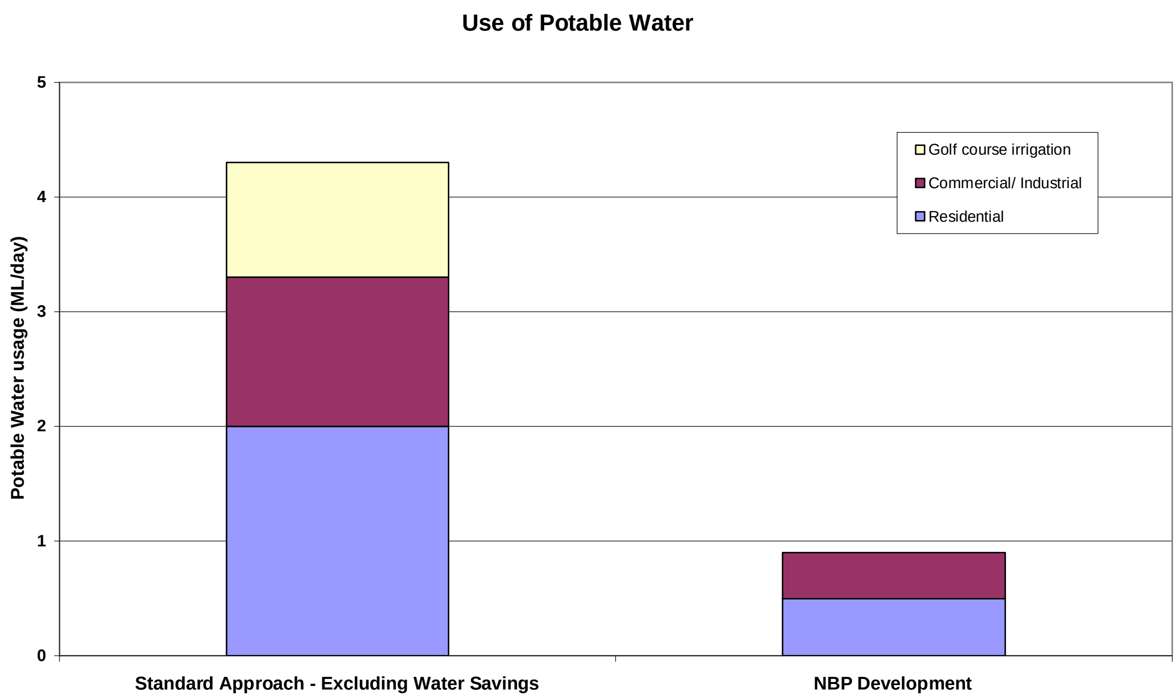

Figure 1 Potable Water Saving

To express the water savings in another way, Table 2 summarises the calculated reductions in the potable water consumption rates. Significant potable water savings can be achieved, and it is predicted that less potable water will be used than even the Southeast Queensland's community level 5 water restriction targets of 140 L/EP/day. The impressive water savings can be attributed to a combination of water efficient devices and potable substitution through the use of high quality recycled water.

Table 2 Potable Water Consumption Rate (L/EP/day).

	Residential	Commercial/ Industrial
Excluding Water Savings	350	350
Northeast Business Park Site	77	118

The overall water supply and sewage flows used for determining the servicing strategy for the site are detailed in the following table.

Table 3 Average Water Supply and Sewage Flows (ML/d)

Land Use	Potable Water Demand (Ignoring Roofwater Collection) (ML/d)	Recycled Water Demand (ML/d)	Sewage Loads (ML/d)
Residential	0.9	1.0	1.4
Non Residential	0.5	0.6	0.9
Open Space Irrigation (including golf course)	0	1.0	
Total	**1.4**	**2.6**	**2.3**

The report also included a desk-top assessment of nutrient export risk. Whenever recycled water is irrigated, nutrient export can potentially occur via deep drainage to groundwater. The analyses considered high irrigation application rates (up to 20mm and well above the levels required to maintain plant health) and concluded that even at these application rates the concentrations of nutrients leached are within those cited within Queensland Water Quality Guidelines 2006.

It is recommended that the analyses are repeated when data characterising the physical and chemical characteristics of the in-situ soil data is available and that an irrigation system is designed to conserve recycled water and to only supply recycled water when there is sufficient demand.

Servicing Strategy

The staging of the development is such that an industrial business precinct included in previous Shire planning will be commenced (located adjacent to the highway) with residential and marina areas following in subsequent stages. The NEBP site is located outside the Council Priority Infrastructure Area (PIA) and is currently isolated from Caboolture Shire's Water and Sewerage Networks. Water supply and sewerage infrastructure has been identified in this report to allow connection to existing Council networks and appropriately service the entire development in addition to providing a recycled water trunk network across the site.

Potable Water Supply Network

The potable water supply trunk network has been developed with proposed connection into the Morayfield Low Level Water Zone. The network has been sized to meet Council's development guidelines[3] and provide residential, commercial and industrial fire supply as required. The potable water demand estimated for the development can be met by the existing network with the connection and internal infrastructure as shown. The proposed water supply network layout is displayed in Figure A5 in Appendix A.

[3] Refer Section 1.4

Recycled Water Supply Network

Council's South Caboolture Water Reclamation Plant (WRP) is located just 1 kilometre from the development, and connection to this water source will be established for construction related and on-going recycled water usage. The sizing of this main will accommodate future development demands, this being sufficient for envisaged construction usage. Construction related demand prior to the connection of this main can be met by tankered supply utilising the existing WRP fill point.

Information from Cabwater indicates that future recycled water demands projected for the NEBP development are likely to outstrip the supply capacity of the South Caboolture WRP. As such, Cabwater advised that an alternative recycled water source is required through a future connection to the Burpengary East Sewage Treatment Plant (STP). Upgrades to this plant have been identified for 2009 to firstly increase treatment to 50 000 EP and secondly, to provide polishing works to produce A+ quality treated recycled water for community use. Recycled water infrastructure enabling connection to this source will be provided once available to augment recycled water substitution capacity (ultimately estimated to be 2.3 ML/day) across the development. The proposed recycled water network including connections and timings is identified in Figure A6 in Appendix A.

The trunk recycled water network is sized in accordance with appropriate supply standards and enable both household and commercial/industrial use, in addition to supplying the irrigation needs for the proposed golf course. Fire fighting has been identified as an appropriate use of recycled water in several publications[4], however potential fire fighting applications do not preclude maintaining a fire fighting supply from the potable water network due to the variability of recycled water production. As such, capacity for the recycled water network to service the fire supply requirements for the development has not been assessed.

Sewerage Network

It is proposed that the sewerage infrastructure required to service the initial industrial development be connected to the South Caboolture STP network. Due to the large growth in development planned for the site and the limited expansion potential at the South Caboolture STP site[5], additional wastewater transfer infrastructure from the development to the Burpengary East STP (located approximately 5 kilometres southeast of the site, refer Figure 4) is proposed to service the ultimate development at the site. The Burpengary East STP will have sufficient capacity to accept flows from the development following planned augmentations at the plant identified for 2007/08.

It has been assumed that 'smart sewers', which reduce the risk of infiltration and inflow into the sewerage network will be constructed within the development. Consequently peaking factors of 3xADWF were adopted for the development.

The sewerage network servicing plan involves dividing the development into essentially two distinct catchments associated with receiving STP. The western catchment discharging to South Caboolture STP encompasses the industrial business precinct and will be first to be connected to Council's system.

Establishment of the residential and commercial/marina precincts will necessitate construction of transfer infrastructure to discharge flows from the eastern catchment to Burpengary East STP. Timings and the proposed internal and connection trunk infrastructure are identified in Figure A7.

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[4] Health Risk Analysis for Firefighters using Class A+ recycled water for Fire Fighting Operations, QLD Department of Emergency Services, Dec 06. EPA Queensland Water Recycling Guidelines, Dec 05.

[5] As advised by CabWater

1. Introduction

1.1 Background

Northeast Business Park Pty Ltd commissioned GHD Pty Ltd to develop a potable and recycled water supply and sewerage infrastructure servicing strategy for the proposed Northeast Business Park (NEBP) development. The commission is in response to Sections 3.7.3 (Water Supply and Storage) and 3.7.5 (Sewerage) detailed in the Terms Of Reference For An Environmental Impact Statement[6]. This servicing strategy report addresses the sourcing and management of water and wastewater on site to promote a cost-effective, environmentally responsible development.

Northeast Business Park Pty Ltd propose to develop the Northeast Business Park in South Caboolture. The development will comprise a number of land uses including residential, commercial and industrial land uses and a golf course. Details of the proposed commercial and industrial uses have not been fully determined at this stage, but will include “marine industry” and shipyards.

NEBP intends to reduce the development’s water consumption dramatically below traditional water supply demands by using water saving strategies. The water saving strategies will include both demand management (for example water-efficient fittings) and using recycled water.

Caboolture Shire’s South Caboolture Water Reclamation Plant (WRP) currently produces tertiary treated recycled water, and there exists an opportunity to harness this high-quality recycled water for reuse in the development through a dual reticulation network, reducing the amount of nutrients discharged to the river compared to traditional water management approaches.

This report includes a water balance to quantify the substantial reduction in potable water demand that will be achieved through an assortment of integrated water management initiatives, including:

- Demand management through use of water–efficient fixtures,
- Potable water substitution for irrigation, toilet flushing and compatible industrial uses, through use of a dual reticulation system; and
- Additional potable water substitution, through use of rainwater tanks.

The report also completes a desk-top assessment of the nutrient export risk from using recycled water for irrigation.

The outcomes of this water balance have been used to assess likely water demands and sewage loads from the development. The potable water, recycled water and sewerage network requirements to service the development have been developed. Additionally, the likely impact Northeast Business Park will have on existing Caboolture Shire water and wastewater systems has been assessed as part of this study.

1.2 Scope

The works undertaken in this investigation consist of:

- Descriptions of the climate and soil at the study area (from available data);

[6] Northeast Business Park Project Terms Of Reference For An Environmental Impact Statement” (The Coordinator-General, December 2006)

- Preliminary discussions with Caboolture Shire Council to ascertain the likely projected demand for recycled water from the South Caboolture WRP from third parties and to determine the existing intended staging of upgrades to the South Caboolture WRP;
- Characterising the expected flow and quality of wastewater on the site;
- Completion of a water and nutrient balance for the site (based on desk-top data);
- MEDLI modelling[7] to determine the nutrient export risk (based on desk-top data);
- Demand analysis utilising the outcomes of the MEDLI water balance;
- Development of servicing strategies to meet peak potable and recycled water demands throughout the development including assessment of:
  - Peak water demands generated from the development;
  - Impact of development on surrounding Council Infrastructure utilising existing Council network models;
  - Required system augmentations to service the development; and
  - Preliminary internal infrastructure layouts and sizing to meet desired standards of service.
- Development of wastewater servicing strategy considering:
  - Peak Wet Weather Flows (PWWF) generated from the development;
  - Impact of development flows on surrounding Council Infrastructure utilising existing Council network models;
  - Proposed internal sewer collection system layout; and
  - Proposed transfer strategy to deliver flows to existing Municipal Sewage Treatment Plants

The scope excluded any salinity analysis.

1.3 Compatibility with Water Efficiency and Environmental Protection Objectives within the State

Raw water supply in South-East Queensland is limited. Existing water sources are nearing capacity and there is limited scope for the development of further traditional sources. This has resulted in a heightened awareness of the need for more efficient water use and this is reflected at all levels of government. Local and state governments are placing increased importance on the development of strategies that maximise water use efficiency.

Innovative subdivision design is moving away from the traditional approach of supplying potable (drinking) public water for all domestic uses (eg drinking, bathroom, laundry, fire-fighting, toilet flushing and landscape irrigation) to instead consider a system where water is applied as *fit for purpose.* For example, while a supply of potable water will continue to be maintained for drinking water and to supplement rainwater supplies when required, treated wastewater will be used for applications such as toilet flushing and landscape irrigation through dual reticulation systems.

[7] MEDLI (Model for Reclaimed water Disposal using Land Irrigation, DNRM 1999) simulates a water and nutrient balance for a site based on the site's particular climate (including rainfall, evaporation, and temperature), the crop type and area irrigated, and the site's typical geology.

The fitness for purpose for use of recycled water for various applications depends on:

- The source (rainwater, greywater or blackwater),
- The application (how much human contact), and
- The degree of treatment.

The treatment can be characterised both by the level of protection to human health (Class D to A^+) and the level of protection to the environment[8] through the degree of nutrient removal.

The Integrated Water Management (IWM) initiatives proposed in this report have been developed within the context of the Queensland Water Recycling Guidelines.

1.3.1 Queensland Water Recycling Guidelines

The Queensland Water Recycling Guidelines (EPA, 2005) recommend a risk management framework to support water recycling projects. The guidelines define a number of classes (A+, A, B, C, and D) to recycled water, based on its quality with respect to protection of human health. The classes of recycled water do not consider either TDS (salts) or nutrients, which may have an effect on the environment.

The Queensland Water Recycling Guidelines (December 2005) promote using water which is fit for purpose based on the estimated exposure level to the public, and provides recommendations on the minimum class suitable for a particular use. For example, it outlines that while only class D may be required for turf or silviculture irrigation in areas with controlled access and other safeguards to protect the health of workers or neighbours, class A+ is required for higher exposure applications such as toilet flushing and outdoor hosing. The guidelines acknowledge that lower classes of recycled water may be acceptable in applications where other controls such as sub-surface irrigation, or fencing off the irrigation area during irrigation exist to reduce the risk of potential exposure.

The Guidelines promote that a water and nutrient balance, using MEDLI (Model for Effluent Disposal Using Land Irrigation) or a similar tool is completed to assess the sustainability of use of the recycled water from an environmental perspective[9]. This report includes the results of a water and nutrient balance which was completed using MEDLI to assess the nutrient export risk of irrigating the recycled water from the dual reticulation network.

Furthermore, the water reductions are calculated based on a combination of Council flow rates, the national Water Efficiency Labelling and Standards Scheme (WELS) rating data, and MEDLI results.

1.3.2 Environmental Protection (Waste Management) Policy 2000

The philosophy adopted for the development of IWM initiatives is consistent with the pertinent policies outlined in the Waste Management Hierarchy in the Environmental Protection (Waste Management) Policy 2000. Specifically, the development has prioritised the avoidance of wasting water and water recycling prior to disposal through various initiatives:

- The proposed development will incorporate water efficient devices to reduce the amount of water consumed and sewage generated within the development;

[8] And indirectly human health.

[9] Queensland Water Recycling Guidelines, p56

- The volume of sewage required to be treated will be reduced further by the adoption of sophisticated technologies such as Smart Sewers, which are expected to dramatically reduce the risk of inflow and infiltration into the sewer; and
- These water saving initiatives will be complemented by informing the community of the importance of sustainable water management on the site.

The Integrated Water Management Initiatives proposed in this report for the site are compatible with ground-breaking projects that have recently achieved international recognition for water planning[10]. These initiatives will substantially reduce the demand for precious potable water for the site.

1.4 Relevant Infrastructure Planning Policies

Water and sewage loading generated from the development area is estimated using the relevant Caboolture Shire Council, Water Services of Australia (WSAA) and Department of Natural Resources and Mines (NRM) Water and Sewerage Planning Guidelines. The desired standards of service outlined in these guidelines forms the basis for infrastructure planning.

1.4.1 Caboolture Shire Council

The development is located within the Caboolture Shire Council and therefore all required water and wastewater systems to service the development must be designed in accordance with the following Caboolture Shire Council Planning Policies.

- ***Caboolture Shire Council Shire Plan 2006*** – This is the Planning Scheme for the Caboolture Shire, and forms the basis of Council infrastructure planning. The Scheme outlines existing land use and future development areas and population projections throughout the Shire.
- ***Planning Scheme Policy 22 Water Supply and Sewerage Infrastructure Contributions*** – This policy document outlines the Equivalent Persons (EP) allowance for specified land use to ensure developer contributions are adequate to provide for any required water and sewerage works to service new developments. This policy was used as the basis for population estimations for the proposed development.
- ***CabWater Design and Development Manual for Water and Sewerage Infrastructure*** – This document outlines the requirements for planning, design and construction of Water Supply and Sewerage Infrastructure. This manual outlines the desired standards of service required with reference to the relevant WSAA guidelines.

1.4.2 Water Services Association of Australia (WSAA) Guidelines

The WSAA Water and Sewerage Codes of Australia provide standards for the planning, design and construction of water and sewerage infrastructure in Australia.

- Water Supply Code of Australia (WSA03 - 2002);
- Sewerage Code of Australia (WSA02 - 2002); and
- Sewerage Pumping Station Code of Australia (WSA04 - 2005).

[10] Pimpama Coomera

1.4.3 Department of Natural Resources and Mines (NRM) Planning Guidelines for Water Supply and Sewerage

The purpose of the NRM Planning Guidelines is to facilitate strategic thinking in the planning process. These guidelines have been developed as State Government Standards for the planning of urban water supply and wastewater systems. They provide a framework for the development of Local Government Planning Policies, outlining design standards to be adopted for infrastructure sizing and service delivery.

2. Description of Study Area

2.1 Site Description[11]

Situated on the southern bank of the Caboolture River approximately 8km inland from the coastline, adjacent to the Bruce Highway and 43km north of the Brisbane CBD, the NEBP site encompasses 793 hectares which includes the following six land parcels:

- Lot 10 on RP902079
- Lot 2 on RP902075
- Lot 7 on RP845326
- Lot 24 on SP158298
- Lot 15 on RP902073
- Lot 12 on RP145197

Elevation across the site varies from RL 15 to RL 20m along the western and southern boundaries, to RL1 towards the river.

Most of the site has been cleared and is currently used for cattle grazing. It is understood that the site was formerly used as a pine plantation and utilised for forestry purposes. There is a very small area of endangered vegetation, located in the south-west corner of the site. The area of endangered vegetation will be left undisturbed and will not be irrigated.

2.2 Development Description

Approximately 350 hectares of the site is considered as "developable land", and will be used for residential, commercial, and industrial land uses. The remaining 443 hectares will be left as open space, including a golf course, active and passive recreational uses and areas designated as coastal management lands[11]. It is proposed that the development will occur over a number of stages extending from 2008 to 2025. Staging of works have been nominally grouped to occur over the following development horizons to allow comparison against the existing Caboolture Planning Scheme.

The NEBP Structure Plan provided by Northeast Business Park Pty Ltd in June 2007 identified planned land uses throughout the site. The proposed development consists of approximately 160 ha of district industry and commercial land uses. Details of the proposed commercial and industrial uses have not been fully determined at this stage, but will include "marine industry" and shipyards. In addition to this, there is approximately 100 ha of developable land earmarked for residential developments and 2 ha for community facilities and restaurants. The development will also include a 1,100 berth marina and 18 hole golf course. The proposed land use breakdown for the development is given in the tables included in Appendix B.

[11] Cardno Consultant Brief, 2007.

2.3 Climate

Daily climate data (from 1957 to 2006) for the site in Caboolture was sourced from the Department of Natural Resources, Mines and Water (DNRMW). DNRMW derived the data based on the approximate location of the site (27.10 S and 153.00 E) in relation to the location of weather stations. The climate data used for the MEDLI analysis is summarised in Table 4.

The site has an average annual rainfall of 1251 mm and most rainfall during the year falls during summer. Figure 2 illustrates the site's rainfall for the last 50 years. Pan evaporation exceeds rainfall on both an annual basis and for most months of the year (Figure 3).

Table 4 Climate data for Northeast Business Park

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Rainfall (mm)	171	176	147	104	109	64	55	42	35	90	117	143	1251
Pan evap (mm)	187	151	146	115	88	76	84	108	140	167	179	194	1635
Ave max temp (°C)	30	29	28	26	24	22	21	22	25	26	28	29	25
Ave min temp (°C)	21	21	20	17	14	11	10	10	13	16	18	20	15
Rad (MJ/m²/day)	23	21	19	17	13	13	14	17	20	22	23	24	18

Figure 2 Site rainfall for the last 50 years

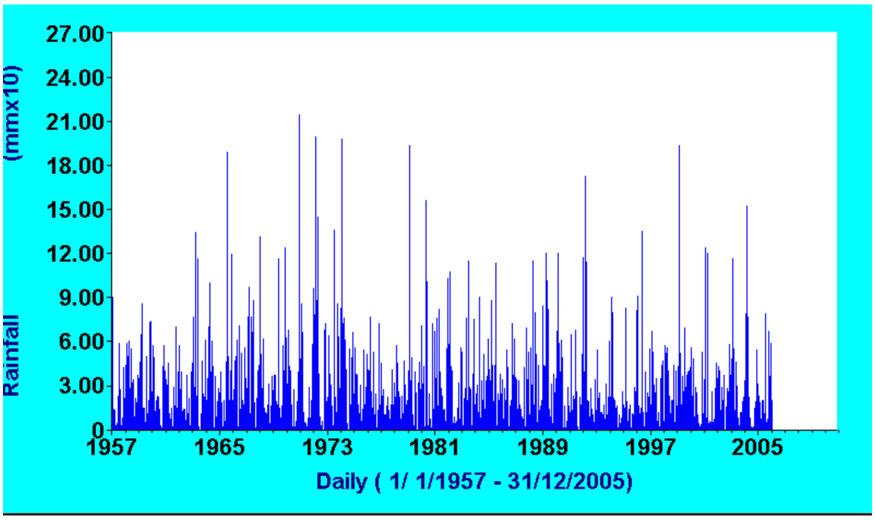
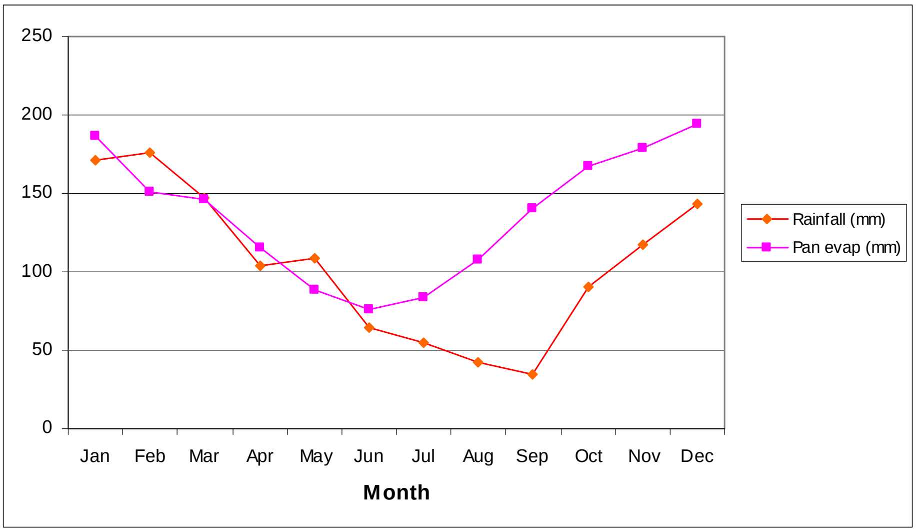


Figure 3 Plot of Rainfall vs Pan Evaporation for Caboolture



2.4 Soils

Coffey Geotechnics completed a preliminary geotechnical investigation for the site in early 2007. The report considered the potential for acid sulphate soil (ASS) contamination and regional geology across the site. The report described four soil types on site based on the excavation of some boreholes and a site walkover. The four soils types are described in Table 5.

Table 5 Soil Categories

Category	Soil Category	Description
1	Dune sand	Fine to medium grained, greyish white, well sorted, sand.
2	Sand or clayey or silty sand	Pale brown or reddish brown, silty sand or brownish grey dry silty sand.
3	Clay – predominantly dry	Reddish brown, stiff, dry sandy silty clay.
4	Clay – predominantly saturated	Dark brown to black, soft, plastic, clay or silty clay.

Furthermore the report described the “typical soil profile” for each land use. This data is summarised in a table included in Appendix B. The table cites not only the textural properties of the soils, but also the depth to groundwater and to bedrock. This information was used as a basis to create tailored soil profiles in MEDLI to represent the major soil groups on site.

The MEDLI soil profiles were formed by tailoring the standard soil profiles (Grey Clay, Sand etc) to reflect the recorded depth to either groundwater or bedrock (whichever occurred first). Because there were no recorded permeability tests or chemical characterisation completed, the MEDLI soil profiles must be regarded as preliminary in nature only.

3. Development Population and Flows

The populations and consequent infrastructure requirements produced for this assessment were based on the Structure Plan proposed for the NEBP in June 2007[12]. It is understood that there may be changes to the details of the structure plan as site constraints, preferred land uses and layouts are identified, however GHD has assumed the water demands and sewage loadings used to determine infrastructure requirements are consistent with the overall scale of the NEBP development identified in the Structure Plan.

3.1 Council Population Projections

The proposed Northeast Business Park (NEBP) site is located outside the existing Priority Infrastructure Area (PIA) and as such no population has been allowed for in future planning of water supply and sewerage infrastructure to service this area[13].

3.2 Equivalent Persons (EP)

An Equivalent Person (EP) is used as a standard unit for water demand or sewage generation. One EP represents either:

- Water EP: Standard unit of water demand based on the average use of water by a typical person in a residential setting over the long term[14].
- Sewerage EP: Standard unit of sewage generation based on the average generation by a typical person in a residential setting over the long term [14].

An estimate of the Equivalent Person population to be serviced in the development area was undertaken using Caboolture Shire Councils' '*Planning Scheme Policy 22 Water Supply and Sewerage Infrastructure Contributions'.* This policy outlines the applicable EP demand based on proposed land use, allotment size and location.

The EP allowance for each land use is detailed in the tables included in Appendix B. A summary of the EP loadings for the entire Northeast Business Park development is given below:

Table 6 Northeast Business Park EP Summary

Land Use	Water EP	Sewer EP
Industrial and Commercial Precincts	3600	3610
Residential	5840	5990
Total	**9440**	**9600**

[12] NEBP Structure Plan – Refer Appendix A.

[13] Report for Trunk Infrastructure Planning – Water Supply and Sewerage, GHD, 2007

[14] Planning Scheme 22 Water Supply and Sewerage Infrastructure Requirements, CabWater.

3.3 Development Staging

It is proposed that the development will occur over twelve stages which extend from 2008 to 2025. Staging of works have been nominally grouped to occur over the following development horizons to allow comparison against the existing Caboolture Planning Scheme:

- Phase 1: 2008-2010 Development Horizon
- Phase 2: 2011-2015 Development Horizon
- Phase 3: 2016-2020 Development Horizon
- Phase 4: 2021-2025 Development Horizon

3.3.1 Phase 1 Development

Phase 1 includes the development of approximately 60 ha into approximately 100 District Industry lots with a total EP loading of 1000 EP. No allowance for residential development has been included in Phase 1. The timing of development works for this phase of the business park is assumed to be completed by the 2011 development horizon.

3.3.2 Phase 2 Development

Phase 2 includes further Business Park development, the construction of the Marina Village and residential developments throughout the site. The construction of a golf course and clubhouse is also expected to occur between 2011 and 2016.

3.3.3 Phase 3 and 4 Development

Phase 3 and 4 includes development of the remaining residential lots and apartment/villa properties proposed for the site. The final stage of the Business Park development and the construction of a 120 room resort is estimated to occur as part of phase 3 development.

The following table gives a summary of the equivalent person projections to be serviced within each development phase.

Table 7 Equivalent Person (EP) Projections (Water) across each development phase

Land Use	Phase 1	Phase 2	Phase 3	Phase 4	Total
Business Park	1000	1170	490		**2660**
Residential Lots		1750	1260	470	**3480**
Apartments		400	530	780	**1710**
Marina Village		390			**390**
Marina Villas		120	90		**210**
Marina Berths		110	110	110	**330**
Golf Villas		90	110		**200**
Golf Club		80			**80**
Shipyard		110			**110**
Yacht Club		30			**30**
Resort			240		**240**
Total	**1000**	**4250**	**2830**	**1360**	**9440**

3.4 Development Flows (Excluding Water Savings)

This scenario estimates system requirements for the development site utilising Council's existing planning polices. These standard planning guidelines outline the required water allowance and sewerage generation (based on a per EP basis) which new development areas must be able to service.

Calculation of the development flows excluding water savings provides a baseline comparison to measure the projected water savings at the NEBP site through the implementation of water management initiatives outlined in this report.

3.4.1 Potable Water Demand

The Caboolture Shire Council Developer Contributions Policy nominates that the average water consumption to be adopted for infrastructure planning is 350L/EP/day.

Based on the EPs identified in Table 7, this equates to a total water demand for the full development of 3.3 ML/d. A further water allowance has been made for golf course irrigation, which was derived from the irrigation demands calculated using MEDLI[15].

[15] The MEDLI analysis was based on irrigation areas provided by Northeast Business Park Pty Ltd, and assumed that irrigation occurred at a 0.5mm soil water deficit trigger, to the drained upper limit.. The value of 0.7 ML/day represents the average irrigation quantity (including no irrigation events) occurring over the 50 year simulation.

Table 8 Potable Water Demand - Excluding Water Savings

Land Use	Water EP	Total EWS Demand (ML/d)
Residential	5840	2.0
Non Residential	3600	1.3
Open Space Irrigation (including golf course)		1.0
Total	**9440**	**4.3**

3.4.2 Sewage Loads

The average dry weather flows (ADWF) adopted by Caboolture Shire Council under its developer contributions policy is 240L/EP/day. This corresponds to a total average sewage flow of 2.3 ML/d for the entire development.

Table 9 ADWF Sewage Flows - Excluding Water Savings

Land Use	Sewer EP	Total ADWF (ML/d)
Excluding Water Savings		
Residential	5990	1.4
Non Residential	3610	0.9
Total	9600	2.3

4. Water Efficient Devices

4.1 Introduction

It is proposed that a number of water efficiency initiatives are implemented on site including:

- Water efficient devices; and
- Educating the residents and emphasising the importance of conserving water in the development.

The level of water efficiency of devices within the home and commercial/industrial premises affects both the water demand and the amount of wastewater generated. This section therefore allows us to predict the potential uptake of recycled water available by reducing the baseline water demand and sewage supply and reducing these figures accordingly.

The Water Efficiency Labelling and Standards Scheme (WELS) is a national program which dictates compulsory water efficiency labeling and minimum performance standards to all household products that use water. The scheme aims to reduce urban water consumption in Australia and supersedes the voluntary National Water Conservation rating and Labeling Scheme (or AAAAA) scheme. The ratings theoretically vary from 1 star to 6 stars, although 6 star fittings are generally not available (at least within Queensland). At least 3 stars are required for a fitting to be considered water efficient.

4.2 Required Water Efficiency

It is currently required by law that certain fittings in new buildings achieve at a minimum a specified level of water efficiency. The mandatory water efficiency requirements have been becoming increasingly more stringent over the years. The minimum current requirements and the highest water efficiency fitting available at the time this report was prepared[16] is presented in Table 10.

Table 10 Proposed Water Efficient Devices within residential units

Fitting	Minimum water efficiency devices proposed	High Water Efficiency Currently Available
Showerhead	3 star	3 star
Toilet suites	3 star	4 star
Tap Equipment/Flow regulators	3 star	6 star

[16] According to the WELS website: www.waterrating.gov.au

4.3 Water Balance for Water Saving from Water Efficient Devices

A water balance, considering water demand on a daily basis was completed. The purpose of the water balance was to determine the effect of incorporating water efficient fittings and to determine a new water demand for the site.

The following assumptions were made:

- Typical sewage production rate advocated by Cab Water (240 L/EP/day) was incorporated into the analyses.
- The proportion of water saved by implementing each device depends on the total amount of water used for each residence. This is likely to vary from dwelling to dwelling based on the habits and ethos of each household. For the purposes of this investigation it was assumed that water within a low water efficiency household is generally used within the following proportions:

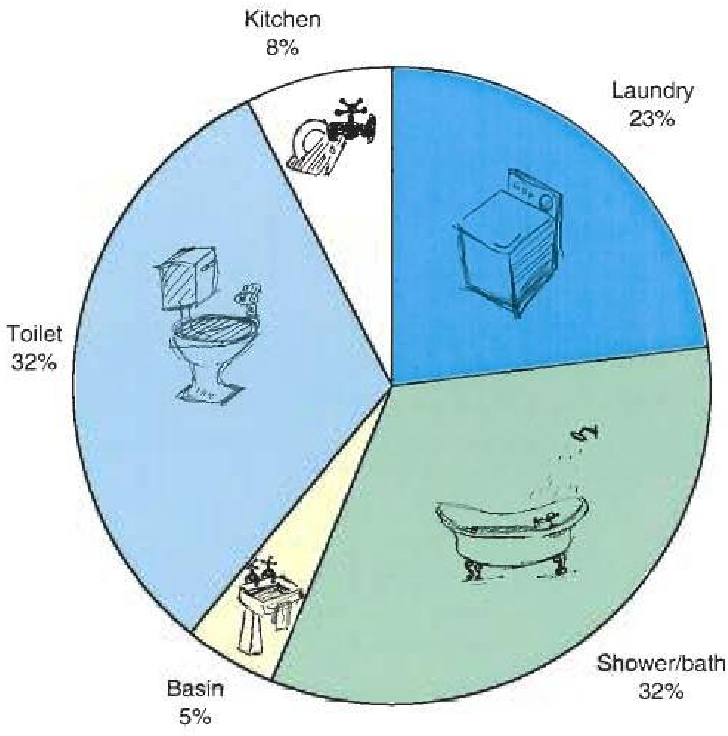


Figure 4 Assumed Proportions of Household Water Used

This data shows that the majority of water is used in the toilet, bathroom and laundry, and is based on the research of Jeppersen and Solly (1994)[17].

Please note that the proportions of water use shown in the chart represent a standard water supply approach, *which is not recommended for this development.* The proportions represent an initial

[17] Please note that relatively old data was used to try and establish the proportions of water used in each sector before water efficient devices became mandatory.

starting point for calculations and the proportions change as a result of implementing water efficient devices.

- It was assumed that the residences would contain a bath.
- Some allowance for the ineffectiveness of water efficient devices where a fixed volume of water is required (to fill a bath or to fill a kitchen sink) was made. It was assumed that 50% of the bathroom water allocation would be used in a shower and the other half would be used in the bath. Similarly it was assumed that 50% of the water used in a kitchen sink would be used to fill a plugged basin and the remaining water would be used to wash vegetables, rinse dishes etc.
- It was assumed that the fittings that are not supplied with the development (ie washing machines) were not water efficient and were only rated 1 star. This is considered to be a conservative approach, as many modern washing machines are substantially more water efficient.
- While the proportions shown in Figure 4 represent residential water consumption, it was assumed that they also represent industrial water consumption (in lieu of similar information pertaining to proportions of industrial water consumption). It is recognised that water consumption proportions are likely to vary from industry to industry.
- A 5% factor of safety was incorporated.

Based on these assumptions, the sewage flow rate reduces from 240 L/EP/day to 204 L/EP/day where the minimum water efficiency devices are incorporated into the development. Similarly, if 4 star toilets are used then the flow rate becomes 198 L/EP/day.

At this conceptual design stage it is assumed that 4 star toilets will be used in the development [18]and a flow rate of 200 L/EP/day is adopted.

Table 11 summarises the total projected water supply demand and sewage flows allowing for the water efficient fittings.

Table 11 Average Day Water Demand and Sewerage Flow Projection

Land Use	Water EP	Potable Water (ML/d)	Sewer EP	Total ADWF (ML/d)
Residential	5840	1.8	5990	1.2
Non Residential	3600	1.1	3610	0.7
Open Space Irrigation (including golf course, parks)		1.0		
Total		**3.9**		**1.9**

The use of water efficient fittings reduces the sewage flows to 1.9 ML/day and water supply demand to 3.9 ML/day. This corresponds to a saving of approximately 10% for the development's water supply demand.

[18] 4 star toilets do not necessarily cost more than 3 star toilets, however there is a limited range so it instead restricts the brand choice to Caroma.

5. Recycled Water Usage Assessment

5.1 Introduction

Whenever recycled water is irrigated, nutrient export can potentially occur via deep drainage to the groundwater (if the nutrients in the applied water is in excess of what the vegetation can use). The sustainability of irrigating recycled water is heavily influenced by the quality of the recycled water, the local soils (and their leaching risk), the climate, and the irrigation regime adopted.

One way to assess whether nutrient export via deep drainage will remain sustainable is to compare the predicted nutrient leaching concentrations with general water quality objectives. The Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC[19] 2000 Guidelines) provide objectives which can apply to both surface water and groundwater. The impact of drainage nutrient concentrations on groundwater can be assessed using those objectives.

The Queensland Water Quality Guidelines 2006 provides guidelines for the quality of the waters of Queensland, and were developed to tailor the ANZECC guidelines to Queensland regions and water types. Using the Queensland Water Quality Guidelines 2006, the median values should not exceed:

» 0.5 mg/L for total nitrogen; and

» 0.05 mg/L for total phosphorus.

For deep drainage, these *median* concentrations are equivalent to **2.2** mg/L of nitrate and **0.2** mg/L of phosphate respectively.

This section of the report summarises the results from MEDLI analyses assessing the risk of nutrient export to the environment, focussing in particular on the proposed dual reticulation system using recycled water sourced from South Caboolture.

5.2 Recycled Water Feasibility Study

The NEBP Integrated Water Management Study (GHD, 2007) investigated the feasibility of a number of water recycling initiatives for the site, including:

» Irrigating greywater;

» Irrigating recycled water sourced from a Biowater network; and

» Using recycled water sourced from the South Caboolture WRP to flush toilets, irrigate gardens and open space, and for any appropriate industrial purposes;

The feasibility of the different systems were determined by constructing MEDLI analyses and comparing the predicted leached nutrient concentrations to the Queensland Water Quality Guidelines 2006.

MEDLI models[20] were constructed to assess the risk of nutrient export to the environment through leaching to groundwater for each of the 6 major soil profiles presented from the Coffey Geotechnics report. Soil conditions are variable across the site – while for some soils groundwater and or bedrock is

[19] Australian and New Zealand Conservation Council

[20] The MEDLI models all considered that the site's climate data from 1957-2006 and assumed that flow (the supply of recycled water) was unlimited. The models also all assumed that irrigation occurred to a depth of 5mm and adopted nutrient concentrations for the technology determined from a literature review.

not encountered for a substantial depth (8m), groundwater is also relatively shallow (0.5m) in a number of locations (refer Appendix C).

The analyses concluded that due to the limitations of some of the soils present on site, the leaching risk of irrigating either greywater or water sourced from a Biowater network was higher than the concentrations recommended in the Queensland Water Quality Guidelines. However, using dual reticulation systems, either using water sourced from the South Caboolture WRP or a customised treatment plant built on site was acceptable[21].

It is understood that Northeast Business Park Pty Ltd consider the use of South Caboolture's Class A+ water more consistent with their vision for the site. The use of water from the South Caboolture WRP and the Burpengary East WRP will address potential issues relating to the on-going maintenance of a 'cluster-system' treatment plant, and is expected to be more efficient[22]. It is therefore proposed that recycled water for the site's dual reticulation system be sourced from the South Caboolture Water Reclamation Plant with future supply supplemented from a proposed water reclamation plant located at Burpengary East.

5.3 Caboolture Shire Council Recycled Water Supply

5.3.1 Recycled Water Quality

The South Caboolture WRP produces Class A^+ recycled water[23]. This classification means that it is safe for relatively high contact water uses such as toilet flushing, fire fighting, and for use in water features, as well as irrigation. It is not approved for drinking (potable) purposes.

The classes of recycled water relate to the relative safety of the water, and the appropriate level of contact. It does not necessarily correlate to the levels of nutrients in the water. However, the recycled water also achieves very significant levels of nutrient reduction, with average concentrations of 1.8 mg/L and 0.3 mg/L cited for total nitrogen and total phosphorus respectively[24].

5.3.2 Recycled Water Availability

It is understood (through discussions with CabWater) that recycled water is available from the South Caboolture WRP to service the initial construction and development phases of the proposed NEBP development. While the treatment plant produces high-quality tertiary treated water, only a small proportion of water is typically used and the majority is pumped into the Caboolture River. Recently, demand for recycled water from the treatment plant has increased with the onset of increasingly onerous water restrictions in Brisbane. However, preliminary indications from Council are that even if the demand from water restrictions were to continue at the current level unabated there would be more than sufficient recycled water available for the Northeast Business Park (at least for the short-medium term). The South Caboolture Water Reclamation Plant currently produces approximately 9ML/day of Class A^+ recycled

[21] With respect to nutrient export risk.

[22] In terms of both maintenance and investment in treatment infrastructure.

[23] This classification is claimed to be achieved by Caboolture Shire Council, and refers to the classes contained in the Queensland Water Recycling Guidelines (2005).

[24] Report for Northeast Business Park IWM Study (GHD, 2007).

water, and this amount is expected to increase over time as the treatment plant's catchment is increased.[25]

In order to meet the long term NEBP development recycled water demands, CabWater propose that recycled water from South Caboolture WRP must be supplemented by a recycled water supply from a water reclamation plant located at the Burpengary East Sewage Treatment Plant. This assumes there will be sufficient capacity at this plant to provide Class A^+ recycled water to the development site after planned upgrades.

As information provided by CabWater does not indicate otherwise, it is assumed that the availability of recycled water for the site is not constrained. The following section quantifies the recycled water demand expected from the development.

5.4 Recycled Water Demands

Recycled water supplied through a dual reticulation network will be used for irrigation throughout the development and for flushing toilets. Recycled water may also be used for suitable industrial and commercial uses, if the quality is determined to be appropriate. The fitness for purpose of the recycled water will depend on the particular industry, and those details are not available at this stage. Therefore the water balance for both dual reticulation options considered assumes that the dual reticulation scheme only supplies water to flush toilets and for irrigation.

5.4.1 Toilet Flushing

On the basis of the water balance (Section 4.3), the recycled water demand due to toilet flushing is estimated at 54 L/EP/day.

5.4.2 Irrigation

Recycled water will be irrigated in residences' backyards, gardens in the commercial and industrial areas, the golf course and in common property throughout the development.

The water balance calculations carried out as part of this study were based on irrigation areas provided by Northeast Business Park Pty Ltd.

[25] The intended planned upgrades to increase the capacity are outlined in Section 10 of this report.

Table 12 Indicative Irrigation Areas Provided by NEBP Pty Ltd

	Irrigation Area (ha)
Open Space Irrigation - Golf Course	40
Open Space Irrigation - Sporting Fields and Parks	15
Commercial/Industrial (assumed 10% of area)	18
Residential (assumed 20% of area)	26
TOTAL	99

A number of MEDLI analyses were completed to estimate irrigation demands assuming that both the supply of recycled water and the nutrients available for the ‘crop’ (grass) were high and generally not limiting to grass growth. The analysis considered the irrigation of 100 hectares at a 0.5mm soil water deficit irrigation trigger. This irrigation trigger assumes that irrigation does not occur on days with rain or on days following larger rain events. Irrigation was scheduled to occur to the ‘drained upper limit’ which means that the quantities of irrigation applied were allowed to vary based on the grass’ demand for water (which varies depending on the time of year) and the antecedent soil moisture conditions. Using the drained upper limit ensures that excess irrigation (runoff) does not occur. The analyses considered all 6 soil profiles present on site and selected.

The irrigation demands are presented in Table 13 and 14. The demands adopted represent the highest 75th percentile value of all the soils present on site (chosen in order to be conservative). Please note that this approach is conservative with respect to the sizing of recycled water infrastructure as it should be practicable to optimise the irrigation to a lower, more regular amount providing appropriate irrigation systems are installed. It is recommended that appropriate irrigation systems are installed to ensure that irrigation only occurs on dry days with suitable antecedent soil moisture conditions and that excess irrigation water is not applied.

Table 13 Northeast Business Park Irrigation Demands (ML/d)

Loading	Total Development Irrigation Demand (ML/d)	Sporting Fields and Park Irrigation Demand (ML/d)[26]	Golf Course Irrigation Demand (ML/d)[27]
Yearly Average Demand (including non-irrigation demand days)	1.8	0.3	0.7
Average Demand of Irrigation Events (when irrigating; no zero days)	3.4	0.5	1.4
Peak (75% peak percentile)	4.6	0.7	1.8

[26] Derived considering that the irrigation of sporting fields and parks represents 15% of the total estimated area.

[27] Derived considering that the irrigation of the golf course represents 40% of the total estimated area.

The total recycled water demand for the development is summarised in the table below.

Table 14 Average Recycled Demand Summary

Land Use	Water EP	Recycled Water Demand (ML/d)
Residential	5840	1.0
Non Residential	3600	0.6
Open Space Irrigation (including golf course)		1.0
Total		**2.6**

5.5 Nutrient Export Risk from Irrigation

This section summarises the results from the MEDLI analyses assessing the risk of nutrient export to the environment through leaching to groundwater. The analyses considered soil characteristics presented from the Coffey Geotechnics report.[28] The input assumptions are outlined in Table 15.

Table 15 Summary of MEDLI Input Parameters to Ascertain Nutrient Export Risk

VARIABLE	VALUE	NOTE
Waste Estimation		
Type	"Other"	
Recycled Water per day (ADWF)	1 ML/d	Set to be non-limiting.
Total Nitrogen (TN) (mg/L)	1.8	Refer to Appendix D (Recycled Water Fact Sheet).
Total Phosphorous (TP) (mg/L)	0.3	Refer to Appendix D (Recycled Water Fact Sheet).
Operating Period	7 days/week	Set to be non-limiting.
Climate		
Site Name	Caboolture	
Latitude	27.10^{o}S	
Longitude	153.00^{o}E	
Start Date	1/01/1957	
End Date	31/12/2006	

[28] The model derived the permeability and chemical characteristics from standard MEDLI soil models.

VARIABLE	VALUE	NOTE
Soil Type	Profile 4	Soil conditions are variable across the site – while for some soils groundwater and or bedrock is not encountered for a substantial depth (8m), groundwater is also relatively shallow (0.5m) in a number of locations (see Appendix C). The shallow depth to groundwater is likely to heavily constrain the quality of recycled water that can be sustainably irrigated on site. The modelling adopted the conservative assumption that irrigation occurred on the most leaching prone soil (Profile 4).
Plant	Kikuyu grass	
Irrigation area	1 hectares	One unit of soil was considered.
Irrigation Trigger	Various	The purpose of this exercise was to establish if any particular restrictions to irrigation depth should be established on the grounds of leaching risk, so various irrigation triggers and quantities were considered.
Irrigation quantity	Various	

The MEDLI analyses considered a range of irrigation triggers and application rates to ascertain if particular irrigation scheduling would be required to prevent predicted leached nutrient concentrations exceeding water quality guideline values.[29] The analyses considered application rates up to 20mm, which are regarded as substantially higher than the levels required to maintain plant health (to be conservative)[30]. Even irrigating 20mm of irrigation water every day, predicted leaching concentrations were within values cited within the Queensland Water Quality Guideline 2006. This is not surprising as the nutrient concentrations in the recycled water are very low at 1.8mg/L Total Nitrogen (TN), and 0.3 mg/L Total Phosphorous (TP).

The above analyses was based on desk-top soil data, and included assumptions pertaining to the physical and chemical characteristics of the soil. It is recommended that the analyses are repeated when in-situ soil data and laboratory tests are completed.

Furthermore, it is recommended that irrigation does not occur on the site when it is raining, and that excessive irrigation is avoided. Instead it is recommended that an optimised irrigation system is determined based on in-situ soil data and designed to irrigate regular, preset quantities (expected to be up to 7mm per application) when there is sufficient demand. This approach is expected to assist in optimising the recycled water main size, reducing leaching and runoff risk, and assist in reducing the minimum storage size in the golf course.

[29] Queensland Water Quality Guidelines 2006.

[30] 20mm is higher than typical application rates either in domestic gardens, golf courses or parks

6. Rainwater Tanks

6.1 Introduction

The implementation of rainwater tanks to provide a supplementary water supply to houses in urban environments is becoming increasingly common across Australia. The advantages of rainwater are that they are publicly perceived as a natural, chemical free source of water. The use of rainwater tanks can also help offset detrimental effects associated with urbanisation relating to increasing flood levels as they help minimise stormwater from new developments.

The quality of water stored in the rainwater tank is expected to be inferior to the mains supply as the water can collect leaves, dirt, detritus, and bird and animal droppings as it travels over the roof before it is collected in the tank. Therefore in urban settings, it is generally more appropriate to use rainwater for non-potable uses such as garden irrigation, toilet flushing, hot water systems, bathroom and laundry.

Rainwater tanks are available in a variety of shapes, sizes, colours and materials, including 3000L Slimline tanks (dimensions: 3m x 2.1m x 0.5m) which can be attached to each dwelling. The appropriate configuration for rainwater tanks that are used will depend on the lot size and building layout.

Rainwater tanks need to be installed by specialists and require appropriate site preparation, structural support and plumbing. If they are sub-surface tanks they should be designed by a structural engineer to mitigate potential buoyancy from groundwater. To work optimally, they also require some maintenance, including:

- Maintenance of supply pumps from the rainwater tank outlet;
- Clearing gutters of leaves and debris;
- Checking and maintaining inlet and overflow screens regularly;
- Checking the integrity of the tank;
- Draining sludge build-up from the tank every two or three years (or if sediment is noticeable in the water); and
- Preferably removing branches which overhang the roof.

All rainwater entering the tank would be screened to remove coarse debris. The first flush of rainwater would be discarded as it can collect contaminants off the roof and contains the highest proportions of pollutants[31]. Mains water would be used to top up the tank once the water level in the tank went under a threshold value to ensure a reliable supply of water to the hot water systems, bathroom and laundry. Council will require that there is no direct connection between pipes taking water from the tanks and pipes connecting the house to the water mains.[32] To minimise the amount of mains water used and to maximise the storage space for the next rainfall, a trickle top up system would be installed, as illustrated below.

[31] The first flush device typically removes 11% - 94% of dissolved solids and 33%-77% of suspended solids inflow to a rainfall tank during a rain event after it has filled (Coombes 2002, as cited in the BASIX technical manual).

[32] As it was established earlier, rainwater tanks represent a less controlled source of water and the Council do not want to risk contaminating the public supply.

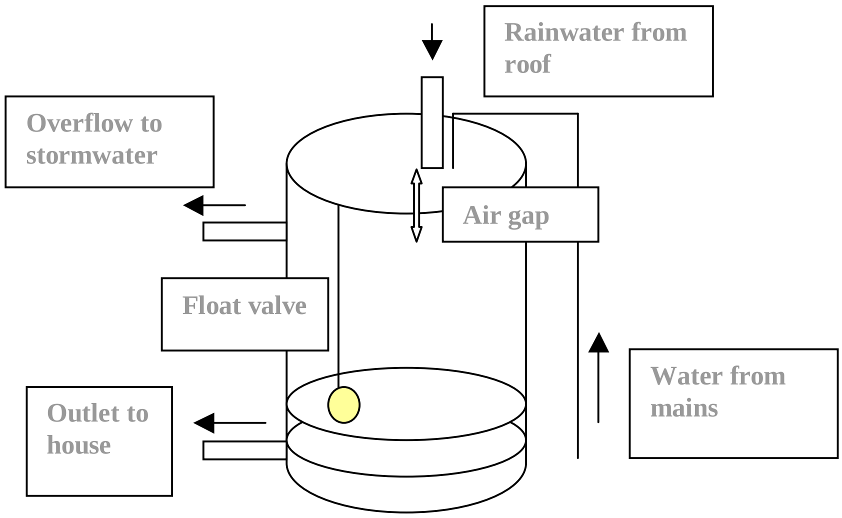


Figure 5 Rainwater tank diagram typical setup

6.2 Rainwater Tanks within the Residential Precinct

A daily water balance for rainwater tanks was completed. The water balance used daily climate data for the last 50 years for the site obtained from DNRM. A number of rainwater tank scenarios were considered, based on the roof area details provided by Northeast Business Park Pty Ltd. The analysis considered rainwater tank sizes that were considered appropriate for the lot size. Sometimes for lots that were slightly larger, two different rainwater tank sizes were considered to test the sensitivity to this parameter. The results of the rainwater tank water balances are presented in Table 16.

The water balance assumed that:

- The rainwater tank would be a trickle-top up system. Potable water from the mains supply would be used to fill the tank to a specified level in tank if water levels were low.
- 2.5 mm from every rainfall event was wasted (due to first/flush/ wetting the roof) and never made it to the tank.
- Rainwater would be used in the laundry, showers/baths, and bathroom basins, using the minimum mandatory water efficient fittings.
- The water demand for flushing toilets was already catered for by using recycled water.

It is important to appreciate that rainwater tanks provide a good quality, but generally unreliable source of recycled water. Their ability to provide water obviously depends on climate conditions. Figure 6 illustrates the variability in annual water savings[33] from using a rainwater tank.

Unlike use of Class A+ recycled water from South Caboolture Shire's recycled water supply, purpose, use of rainwater tanks does not justify reducing the capacity of potable water supply pipelines as during dry periods full potable water supply will be required.

[33] Considering 5000L tanks on a 'residence'.

Table 16 Water Savings from Rainwater Tanks

	Total Roof Footprint	Effective Roof Area	Full internal water demand[34] (L/dwelling/ day)	Rainwater demand (L/dwelling/ day)[35]	Rainwater tank size	Average water saving last 50 years (L/day)	% Water saving on total internal demand	Average water saving 2006 (L/day)	% Water saving on total internal demand (2006)
Water Villas	144	130	576	313	3000L	165	28.6%	147	25.5%
Golf Villas	182	160	576	313	3000L	173	30.0%	161	28.0%
Residences	255	230	720	391	7500L	272	37.8%	246	34.2%
Resort	12915	11624	57600	31312	92000L	11087	19.2%	10268	17.8%
Apartments	20000	18000	410400	223100	92000L	48197	11.7%	45932	11.2%

[34] Not allowing for water efficient devices

[35] The difference between this value and the full internal water demand, allows for water savings from water efficient fittings, and the use of recycled water for toilet flushing.

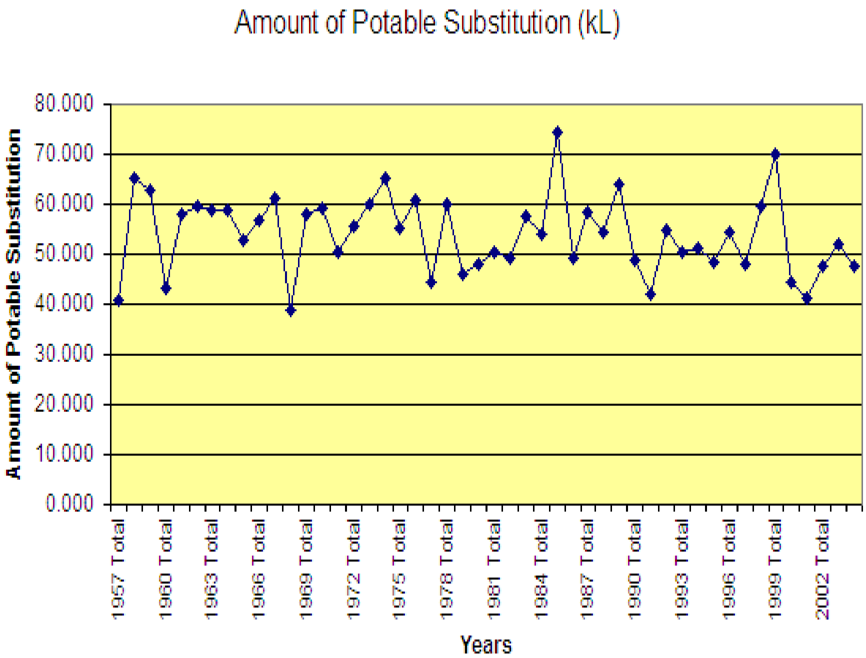


Figure 6 Example Amount of Potable Water Substitution Achieved Through Rainwater Tanks

Table 17 summarises the levels of potable water demand reduction achieved for constructing the specified water tanks for the residential portion of the development. The average water saving ranges from 28.2 L/EP/day to 90.7 L/EP/day. The weighted average water saving (based on the relative proportion of EPs) is 69 L/EP/day.

Table 17 Potable Water Demand Reduction Achieved from Rainwater Tanks in Residential Areas

Land Use	Tank size (L)	Average water saving last 50 years (L/day/dwelling)	EP	Average water saving (L/EP/day)
Water Villas	3000	165	210	68.8
Golf Villas	3000	173	200	72.1
Residences	7500	272	3480	90.7
Resort	92000	11087	240	46.2
Apartments	92000	48197	1710	28.2
		TOTAL	5840	

6.3 Rainwater Tanks within the Industrial Precinct

As stated previously, the industrial precinct of the site is not well defined at this planning stage and roof areas and types of industries are not yet known. Therefore in the absence of specific data, it has been assumed that the average proportion of potable water substitution compared to the total internal demand will be the same as that derived for the apartments. As this is the lowest proportion cited for residential units (Table 16) it is assumed that this approach is conservative. It is therefore assumed that the total potable water substitution for the industrial precinct is 28.2 L/EP/day.

7. Water Savings

The estimated potable water savings for each of the options considered are outlined in Table 18. While the dual reticulation networks alone achieve significant water savings (68%), the addition of rainwater tanks to the dual reticulation network reduce the potable water demand by 80%. Please note that the level of potable water demand reduction estimated is similar to that achieved in the Pimpama Coomera development, which recently won the Global Grand Prize for water planning at the International Water Association's Project Innovation Awards in Beijing[36].

Table 18 Water Savings

Option	Description	Estimated ultimate sewage flows (kL/day)	Estimated ultimate potable water consumption (kL/day)	Estimated potable water savings
0	Excluding Water Savings[37] - assuming potable water is sole water source.	2 304	4 320	N/A
1	Dual Reticulation	1 920	1 380	68%
2	Dual Reticulation + rainwater tanks	1 920	870	80%

Because Northeast Business Park Pty Ltd is committed to achieving significant water savings, it has been proposed that rainwater tanks will complement the use of dual reticulation water on the Northeast Business Park site.

7.1 Reduced Potable Water Demand

Due to the implementation of water efficient devices, recycled water and rainwater tanks throughout the development, the potable network demands have been significantly reduced. Sizing of the required potable water infrastructure will be based on the reduced rate of 142 L/EP/day, as this takes into account demand reduction arising from these water saving strategies. Rainwater tank yields have not been incorporated into the demand reduction calculation so climatic variations are taken into account.

Table 19 summarises the calculated reductions in the rates of potable water consumption. Significant potable water savings are achieved, and it is predicted that less potable water will be used than even the South-East Queensland's community level 5 water restriction targets of 140 L/EP/day. The impressive water savings can be attributed to a combination of water efficient devices and potable substitution through the use of high quality recycled water.

[36] The potable water demand reduction for Pimpama Coomera is estimated at 84%. Source: http://www.goldcoast.qld.gov.au.

[37] Assuming that water to irrigate the golf course is supplied with potable water.

Table 19 Potable Water Consumption Rates (L/EP/day).

	Residential	Commercial/ Industrial
Excluding Water Savings	350	350
The Proposed Option for the Northeast Business Park Site	77	118

A comparison between the total water usage at the site through the implementation of water efficient devices and potable water substitution is shown in Table 20.

Table 20 Average Water Demand Summary

Land Use	Water EP	EWS (ML/d)	Implementation of IWM Initiatives[38] (ML/d)	
		Potable Water	Potable Water	Recycled Water
Residential	5840	2.0	0.5	1.0
Non Residential	3600	1.3	0.4	0.6
Open Space Irrigation (including golf course)		1.0	0	1.0
Total	**9440**	**4.3**	**0.9**	**2.6**

[38] Including allowance for recycling of roofwater.

Figure 7 illustrates that significant water savings are possible with the implementation of the proposed IWM initiatives, compared to the standard servicing approach (excluding water savings).

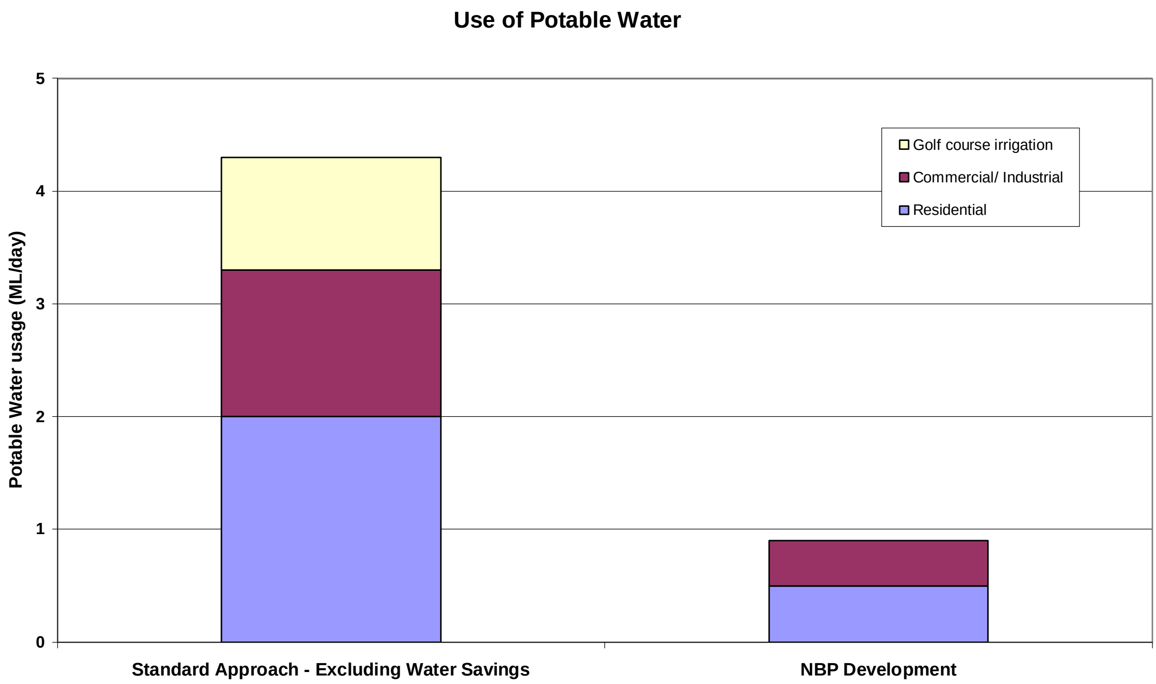


Figure 7 Potable Water Saving

7.2 Reduced Sewerage Generation

The use of water efficient devices will also reduce the average day sewage generation throughout the development to approximately 1.9ML/d. Utilising smart sewers to reduce overall inflow and infiltration into the sewer collection system will also reduce peak sewage flows when compared to traditional servicing requirements.

Table 21 Development Sewage Flows

Land Use	Sewer EP	Total ADWF (ML/d)	Total PWWF (ML/d)
Traditional Sewer Servicing (PWWF = 5 x ADWF)			
Residential	5990	1.4	7.2
Non Residential	3610	0.9	4.3
Total	**9600**	**2.3**	**11.5**
Proposed Water Efficient Devices and Smart Sewers (PWWF = 3 x ADWF)			
Residential	5990	1.2	3.6
Non Residential	3610	0.7	2.2
Total	**9600**	**1.9**	**5.8**

8. Potable Water Network

8.1 Design Parameters

A preliminary conceptual design of the potable water reticulation was undertaken with sizing of mains based on the following peaking factors and design parameters:

- The maximum permitted velocities in the potable water rising main is 2.0 m/s.
- Peaking Factors applied to potable water demands:
  - Maximum Day Demand: 2.25 x Average Demand; and
  - Maximum Hour Demand: 2 x Maximum Day Demand.
- Desired Levels of Service
  - Under Maximum Hour demands, the residual pressure in the system shall not fall below 22m;
  - Under a 15 L/s Fire Flow in the residential zone with a Maximum Hour base demand, the residual pressure in the system shall not fall below 12m; and
  - Under a 30 L/s Fire Flow in the industrial and commercial zone with a Maximum Hour base demand, the residual pressure in the system shall not fall below 12m.
  - Under a 72 hour (3 day) Maximum Day run, no storage reservoirs can empty.
- Rainwater tank yields have not been incorporated into demands used to calculate infrastructure sizing to account for climatic variations.

As advised by CabWater, this water network analysis assumes all fire flow demands throughout the NEBP development area are met utilising the potable water network.

8.2 Servicing Strategy

The NEBP development area is located within the Morayfield Water Supply Zone as shown on Figure A3 in Appendix A. This area is serviced from the Morayfield Reservoir Complex (Top Water Level 60.0m A.H.D) with boosted supply through the Morayfield Low Level (LLZ) Booster Pump.

As outlined in Section 3, the NEBP development will occur over a number of stages. In order to establish infrastructure trigger points, each development stage was modelled in WaterCAD to assess any potential opportunity to stage the required works in line with development; and the impact this may have on the surrounding water infrastructure.

There is currently no water reticulation connecting the proposed development site to the existing water network, and as such, new infrastructure will be required to service the development.

A preliminary potable water reticulation layout and the required network connections are shown on Figure A5 in Appendix A.

The potable water network throughout the development has been sized to meet the target levels of service required under peak hour and fire flow modelling conditions.

Preliminary layouts are based on the (nominal) subdivision layout provided by Northeast Business Park Pty Ltd and the relevant NRM and Council Design Guidelines.

A Maximum Day scenario was also run to determine the impact of development demand on bulk water supply over an extended period (72 hours). Results of this analysis indicated the development area would not have a significant impact on the bulk water supply to the Morayfield zone and the greater Caboolture Shire potable water network.

Several augmentations to the Morayfield Water Supply infrastructure have been identified as part of future planning works. These upgrades include increased Morayfield storage and booster pump capacity, and a number of pipeline augmentations in the area surrounding the NEBP development site. All future development scenarios modelled assume that these augmentations to have been carried out as planned.

In order to service the potable water demands throughout the development, two connection points are proposed as shown on Figure A5 (Appendix A). These are:

- A 1.3km DN300 mm pipeline extension from the existing DN450 mm pipeline at the corner of Graham Road and Buchanan Road; and
- A 1 km DN200 mm pipeline from the DN250 mm Buckley Road/DN150 Coach Road East intersection.

In order to meet industrial and commercial fire flows throughout the site, the development area will be further serviced by a DN200 mm pipeline link along the boundary of the site as shown on the layout.

9. Recycled Water Network

9.1 Design Parameters

To reduce the risk to public health, the following preventative measures advocated by the Queensland Water Recycling Guidelines will be adopted for the proposed recycled water network:

- Recycled water pipelines should be constructed of a permanently deep purple or lilac coloured pipe;
- Inspections, particularly of all new services, are essential to mimimise the risk of cross-connections to the water supply;

Signs are erected (in English and any other appropriate community language) to warn that recycled water is used and not to drink it.

A preliminary conceptual design of the recycled water reticulation was undertaken with sizing of mains based on the following peaking factors and design parameters:

- The maximum permitted velocities in the recycled water rising main is 2.0 m/s;
- Peaking Factors applied to estimated recycled water demand:
  - Maximum Day Demand: 2.25 x Average Demand;
  - Maximum Hour Demand: 2 x Maximum Day Demand; and
  - Golf Course Demand Peaking factor: 1.9 x Yearly Average (This is equal to the average demand of irrigation events, due to allowance for large on-site storage).
- Levels of Service required for the recycled water network:
  - Residual Pressure not to fall below 22m under peak hour modelling conditions.

9.2 Recycled Water Servicing Strategy

The recycled water infrastructure for the development has been sized to meet peak hour irrigation and toilet flushing demands throughout the development as outlined in Section 5.

Recycled Water will be supplied to the NEBP site from the South Caboolture WRP during Phase 1 and Phase 2 development (as shown in Figure A6, Appendix A). To supplement recycled water demand in future development stages (Phase 3 and 4) it is proposed that recycled water is transferred back to the site from the Burpengary East WRP. This can only occur once the treatment plant has been upgraded to produce an acceptable effluent quality (Class A^{+}) to enable use for toilet flushing and irrigation purposes at the NEBP development.

Upgrades to the Burpengary East plant have been identified for 2009 to firstly increase treatment capacity to 50,000 EP, and secondly to provide polishing works to produce A+ quality treated recycled water for community use. Recycled water infrastructure enabling connection to this source will be provided at this stage to augment recycled water substitution capacity (ultimately estimated to be 2.3 ML/day) across the development.

Each proposed development phase was hydraulically modelled in WaterCAD[39] to assess the recycled water network requirements against the target levels of service[40]. Because the internal recycled water layout is based on preliminary designs only, a minimum of DN150 mm reticulation mains was allowed for throughout the development. It is assumed recycled water pipelines will follow the road corridor throughout the site and the proposed alignment and staging of these works will occur in conjunction with the potable water network construction.

The proposed recycled water layout and staging is shown on Figure 6.

There may be some potential to upsize existing Council recycled water infrastructure which is currently planned to service recycled water demands in the area of Coach Road West. As details of this infrastructure is unknown, it is assumed that a dedicated pump station and rising main will be constructed at the existing South Caboolture WRP Site to pump directly to the NEBP development area.

The sizing of the recycled water network is based on peak hour demand conditions[41], with pump stations designed to be able to deliver flow directly from the Water Reclamation Plants. This assumes that there is adequate capacity at the South Caboolture and Burpengary East WRP to supply a peak recycled water flow of 60 L/s and 35 L/s respectively to the development site.

An on-site storage will be available for the golf course irrigation demand and as such, peaking factors for this demand have been reduced as outlined in Section 9.1.

The proposed connection points to enable recycled water supply to the development area are:

» Supply from South Caboolture WRP (to be constructed in initial development stages)
  – Pump Station Duty: 60 L/s @ 45 m (Peak Hour Conditions); and
  – Rising Main: DN300 mm (2 km to site).
» Supply from Burpengary East WRP (to be constructed during Phase 3 development):
  – Pump Station Duty: 35 L/s @ 55 m (Peak Hour Conditions); and
  – Rising Main: DN225 mm (5 km to site)

9.3 Recycled Water for Fire Fighting

CabWater has indicated that all fire fighting demands for the NEBP development are to be met from the potable water network and the potable and recycled water networks have been designed in accordance with this requirement.

It is noted, however, that there is supporting documentation to suggest that fire fighting requirements in new developments can be met through the recycled water network if there is adequate provisional pressures available in the recycled water system supplying the area.

A health risk analysis carried out by the QLD Fire and Rescue Service Steering Committee[42] states that Class A+ recycled water is considered safe for firefighting provided appropriate controls are implemented (includes both recycled water HACCP plan and operational protocols for firefighters).

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[39] Haestead Methods WaterCAD Hydraulic Modelling Software

[40] Recycled Water Levels of Service: Pressure not to fall below 12m under peak hour modelling conditions.

[41] CabWater Design Development Manual; PD = 2.25xAD, PH = 2xAD

[42] Health Risk Analysis for firefighters using Class A+ recycled water for fire fighting operations, QLD Department of Emergency Services, Dec 06.

The Queensland Water Recycling Guidelines[43] also suggests that there is a negligible health risk associated with utilising recycled water for fire fighting purposes and that it may be advantageous to meet fire fighting demands through the recycled water network when dual reticulation systems are planned.

While there may be negligible health risks, these guidelines also highlight the responsibility of employers (of fire fighters) to ensure the health and safety of their employees under the Workplace Health and Safety Act whenever recycled water is proposed for fire fighting purposes.

[43] EPA (December 2005) Queensland Water Recycling Guidelines.

10. Wastewater Collection System

10.1 Introduction

It is proposed that wastewater generated on site will be collected and treated by the municipal treatment plants.

The sewerage infrastructure required to service the development area was designed in accordance with the minimum levels of service outlined in the relevant Caboolture Shire Council and NRM Guidelines[44]. Smart sewers are recommended as the centralised sewerage collection system as they are specifically designed to limit the amount of groundwater and stormwater inflow and infiltration into the wastewater collection network. Smart Sewer technologies are particularly appropriate in sites such as Northeast Business Park, where groundwater levels are high.

10.2 Design Parameters

The sizing of wastewater infrastructure to service the area was sized to meet the following design parameters:

- Peaking Factor for infrastructure sizing:
  - PWWF = 3 x ADWF (Due to utilisation of Smart Sewers)
- Gravity Main Capacity assumes depth shall not be greater than 70% of pipe diameter
- The Levels of Service for Sewerage Infrastructure:
  - Sewer mains to have a capacity greater than PWWF; and
  - Duty pump(s) designed to be capable of meeting PWWF.

10.3 Servicing Strategy

The proposed internal layout and staging of sewerage infrastructure throughout the development is based on a preliminary structure plan provided by Northeast Business Park Pty Ltd and considering the topography in the area. Sewer loadings were estimated using the land use and sewage flow estimates as outlined in Section 4. Due to low lying areas within the development area, a number of internal lift stations are required throughout the site to enable adequate peak wet weather servicing.

Peak Wet Weather Flow analysis was undertaken using hydraulic modelling software[45] to appropriately size the proposed infrastructure for each development stage and to assess potential impacts the NEBP loading will have on the wider Caboolture Shire sewer network.

The proposed sewer infrastructure layout to service the development is shown on Figure A7, Appendix A.

Due to the topography and land uses within the site, it is proposed that two separate sewer catchments be established, one discharging into the South Caboolture STP sewer system and the other discharging directly to the Burpengary East STP. The South Caboolture catchment will service the industrial development area on the western side of the site which represents approximately 2,660 EP while the

[44] CabWater Design and Development Manual for Water and Sewerage, NRM Planning Guidelines for Water Supply and Sewerage

[45] Haestead Methods SewerCAD Sewer Modelling Software

remaining eastern development areas (approximately 6500 EP) will discharge directly to the Burpengary East STP via an on-site southern pump station and dedicated rising main.

Upgrades are planned for both the South Caboolture STP and the Burpengary East STP and it is assumed that there will be adequate capacity to treat the NEBP development flows at each treatment plant. The details of these upgrades are given below:

» South Caboolture STP upgrade in 2008/09 to increase its service capacity to 60,000 EP; and

» Burpengary East STP upgrade in 2006/08 to increase its capacity to 50,000 EP.

It is assumed both these upgrades will be completed prior to the transfer of flows from the development site.

11. Conclusion

GHD were commissioned to investigate the feasibility of different water and wastewater systems to service the proposed Northeast Business Development. This report is produced to address sections 3.7.3 (Water Supply and Storage) and 3.7.5 (Sewerage) of the “Northeast Business Park Project Terms Of Reference For An Environmental Impact Statement” (The Coordinator-General, December 2006).

The proposed development comprises residential, district industry and commercial land uses and is estimated to have a total population of almost 10,000 EP at full development.

The staging of the development is such that a previously approved industrial business precinct will be commenced (located adjacent to the highway) with residential and marina areas following in subsequent stages.

Estimation of potable water demands and wastewater production for the site using traditional servicing methods yielded an ultimate average potable water demand of 4.3 ML/day (including irrigation) and an ultimate average daily sewage flow of 2.3 ML/day.

11.1 Integrated Water Management Initiatives and Water Savings

The findings of this report include a feasibility assessment of integrated water management initiatives to produce the proposed servicing options for the development. Assessment included determination of potable water savings through the use of the water efficient devices, recycled water (for irrigation and toilet flushing purposes) and on-site rainwater tanks.

It is proposed that the Northeast Business Park development will incorporate water efficient devices (including 3 star showers, 4 star toilets, and 3 star aerators on tap fittings) and a variety of different water sources to reduce potable water demand within the site.

Table 22 summarises the proposed water sources and uses for the site.

Table 22 Proposed Water Sources and Uses

Alternative Water Source	Proposed Uses
Class A+ recycled water supplied by South Caboolture WRP (and future Burpengary East WRP), using a dual reticulation system.	» Flushing toilets; » Suitable industrial uses[46]; and » Irrigating gardens, sports fields, public space and the golf course.
Rainwater tanks, including: » Residential tanks; and » Some rainwater tanks in the industrial precinct[47].	» Washing clothes; » Hot water systems; and » Basins

[46] The type of industrial uses will be defined at a later stage.

[47] The water balance assumed that sufficient rainwater tanks were constructed in the industrial precinct to achieve a 12.3% reduction on the total precinct’s internal water demand.

Alternative Water Source	Proposed Uses
CabWater Municipal Potable Water Supply	» Potable water uses (drinking and cooking); and » Topping up the rainwater tanks.

The water balance completed predicts that significant water savings can be achieved through use of the proposed IWM initiatives. It is estimated that the potable water demand will reduce by 80% over the 'Excluding Water Savings' scenario.[48]

The report also included an assessment of the nutrient export risk. Whenever recycled water is irrigated, nutrient export can potentially occur via deep drainage to the groundwater. The analyses considered high irrigation application rates (up to 20mm) and concluded that even at these application rates which are well above the levels required to maintain plant health, the concentrations of nutrients leached are within those cited within Queensland Water Quality Guidelines 2006.

The analyses were based on available desk-top data. It is recommended that the analyses are repeated when data characterising the physical and chemical characteristics of the in-situ soil data is available.

Like the potable water supplies, recycled water should be conserved on the site. Irrigation should only occur when there is sufficient demand, and should not occur when it is raining. The application of excess irrigation water should be avoided, and it is recommended that the irrigation system is optimised when in-situ soil data is available. It is expected that the optimised irrigation system would have regular application rates of up to 7mm (to be identified on completion of optimisation analysis).

The table below provides a summary of the total water demand and sewage flows with the implementation of the dual reticulation system, water efficient devices and a smart sewerage system. The information in this table was used as a basis for completion of the conceptual design for the water, recycled water and sewerage networks. It therefore does not include a reduction in potable water demand from the use of rainwater tanks, as this supply will not be available in prolonged dry weather.

Table 23 Average Water Supply and Sewage Flows (ML/d)

Land Use	Potable Water Demand (Ignoring Roofwater Collection) (ML/d)	Recycled Water Demand (ML/d)	Sewage Loads (ML/d)
Residential	0.9	1.0	1.2
Non Residential	0.5	0.6	0.7
Open Space Irrigation (including golf course)	0	1.0	
Total	**1.4**	**2.6**	**1.9**

[48] If potable water was supplied for all water uses on site without water efficiency initiatives, the total water demand is estimated to be 4.8 ML/day. Similarly, the expected sewage generation rate would be 2.3 ML/day. These rates correspond to the Excluding Water Savings Scenario, which is *not* proposed for the site.

11.2 Infrastructure Servicing Strategy

The NEBP site is located outside the Council's current Priority Infrastructure Area (PIA) and is isolated from Caboolture Shires Water and Sewerage Networks. Water and sewerage infrastructure allowing connection into existing Council networks has been identified to appropriately service the entire development in addition to providing a recycled water trunk network across the site.

11.2.1 Potable Water Network

The potable water supply network has been developed with proposed connection into the Morayfield Low Level Water Zone. The network has been sized to meet Council's development guidelines[49] and provide residential, commercial and industrial fire supply in accordance with Councils' Desired Standards of Service. The proposed water supply network layout is based on the preliminary structure plan provided by Northeast Business Park Pty Ltd and is displayed in Figure 5.

The potable water demand estimated for the development can be met though connection into the existing network at the connection points identified. System augmentations are required to supply the development as it is currently isolated from the existing Morayfield reticulation network.

The proposed potable water trunk infrastructure layout and identified augmentations are displayed on Figure A5.

11.2.2 Recycled Water Network

It is proposed that recycled water demands throughout the development will be sourced from the South Caboolture WRP initially for construction related and on-going recycled water usage for preliminary development stages. Future recycled water demand projected for the NEBP is likely to outstrip the supply capacity of the South Caboolture WRP as development progresses (occurs across the South East area of the site), and as such an alternative recycled water source is planned through future connection to the Burpengary East Sewage Treatment Plant (STP).

The recycled water network was sized in accordance with appropriate supply standards and to enable both household and commercial/industrial use, in addition to supplying the irrigation needs for the proposed golf course. The proposed recycled water layout and staging is shown on Figure A6.

The NEBP development fire fighting supply will be provided by the potable water network due to the variability of recycled water production.

11.2.3 Wastewater Collection System

Following discussions with CabWater and North East Business Park Pty Ltd, it was determined that wastewater from the development is to be treated by Caboolture Shire's wastewater treatment systems rather than on-site alternatives.

The proposed internal layout and staging of sewerage infrastructure throughout the development is based on a preliminary structure plan provided by Northeast Business Park Pty Ltd and considering the topography in the area. The proposed sewerage trunk network is detailed in Figure A7, Appendix A.

Two separate sewer catchments are proposed for the site; a western catchment discharging to South Caboolture STP (initial connection) and a second catchment discharging to the Burpengary East STP

[49] Footnote Development Guidelines Caboolture Shire Council

(located approximately 5 kilometres southeast of the site). The Burpengary East STP will have sufficient capacity to accept flows from the development following planned augmentations at the plant identified for 2006/08.

11.3 Recommendations

It is recommended this response to the Terms of Reference for an Environmental Impact Statement[50], specifically Sections 3.7.3 and 3.7.5, be submitted to the Coordinator-General for consideration.

[50] Northeast Business Park Project Terms of Reference For An Environmental Impact Statement, (The Coordinator-General, 2007)

12. References

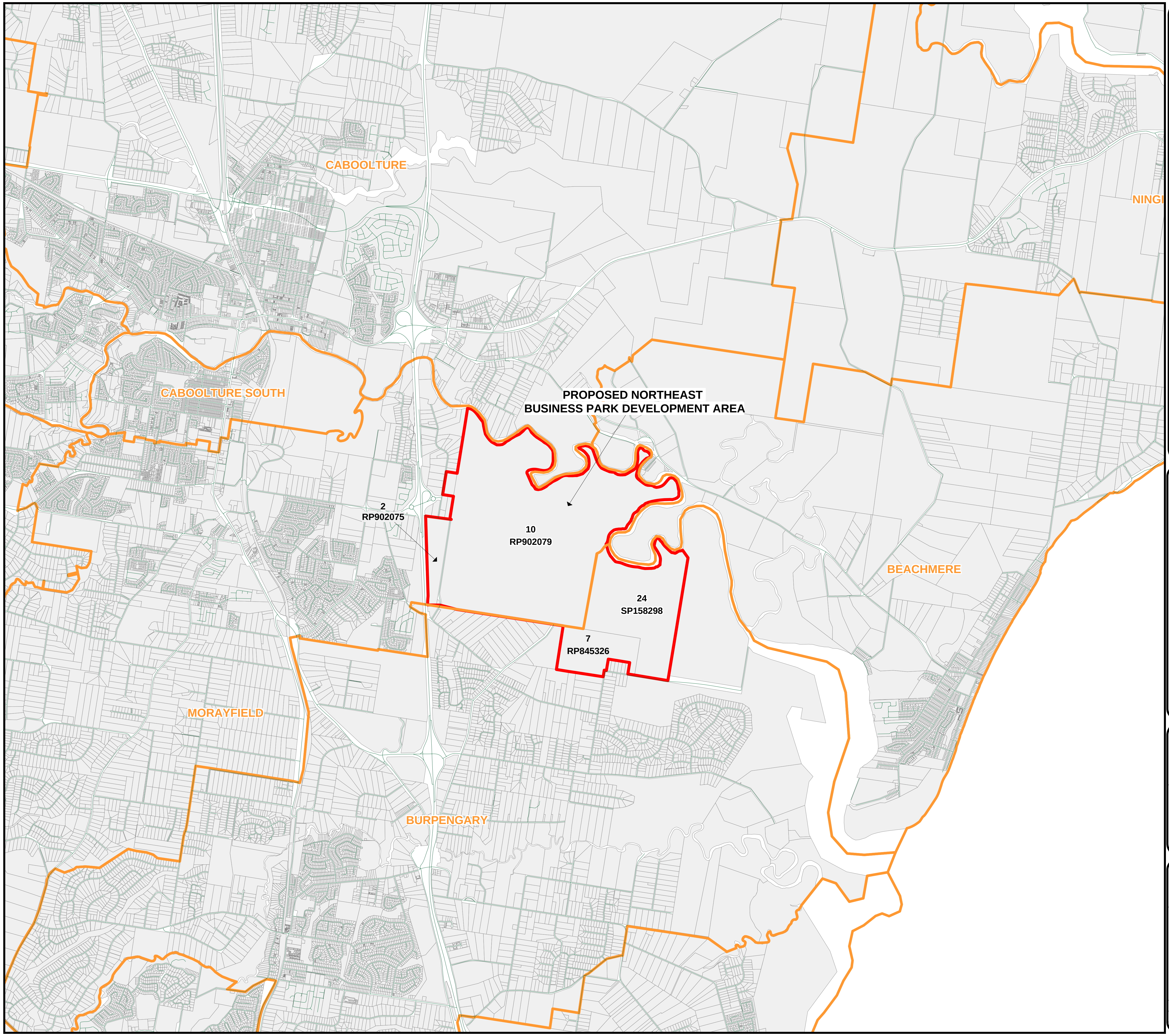
- CabWater "*Planning Scheme Policy 22 Water Supply and Sewerage Infrastructure Contributions".*
- CabWater **"***Design and Development Manual for Water and Sewerage Infrastructure".*
- CABOOLTURE SHIRE COUNCIL (October 2006) "*Recycled Water Fact Sheet Caboolture – Class A+*".
- COFFEY GEOTECHNICS (January 2007), *"Northeast Business Park, Geotechnical Interpretative Report".*
- DEPARTMENT OF NATURAL RESOURCES AND MINES (NRM) "*Planning Guidelines for Water Supply and Sewerage".*
- EPA (December 2005) *"Queensland Water Recycling Guidelines".*
- EPA (2006) "*Queensland Water Quality Guidelines 2006".*
- GARDNER, T., DAVIS, R., (1998), "*MEDLI Version 1.2 Technical Manual".*
- LANDLOCH Pty Ltd (November 2005) "*Laundry Grey Water Potential Impact on Toowomba Soils – Final Report*".
- *"Model for Effluent Disposal Using Land Irrigation (MEDLI), Version 1.3, Feedlot enabled",* developed from collaboration by CRC, DNRM, and DPI&F.
- QLD Department of Emergency Services (December 2006) "*Health Risk Analysis for firefighters using Class A+ recycled water for fire fighting operations".*
- Water Services Association of Australia (WSAA) Guidelines:
  - Water Supply Code of Australia (WSA03 – 2002).
  - Sewerage Code of Australia (WSA02 - 2002).
  - Sewerage Pumping Station Code of Australia (WSA04 - 2005).

Appendix A

Figures

Appendix A

Figures

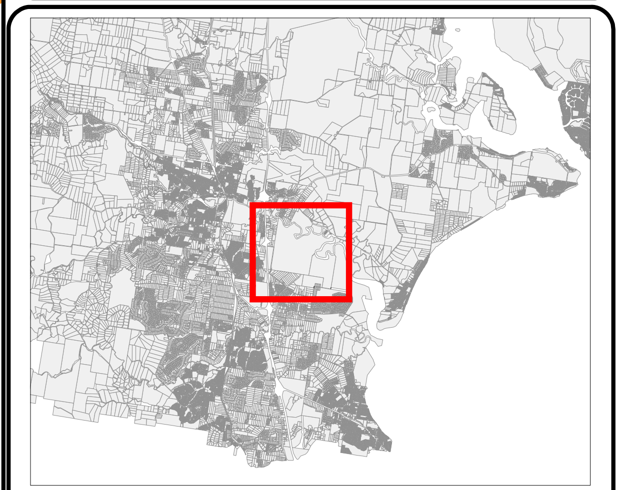


LEGEND

Northeast Business Park Development Area

Roads

Suburb Boundaries



LOCALITY PLAN - CABOOLTURE

0 0.5 1
kilometres

N W E S

• MGA Zone 56 (GDA 94)

NORTHEAST BUSINESS PARK WATER AND WASTEWATER SYSTEMS

GHD MANAGEMENT ENGINEERING ENVIRONMENT

NORTHEAST BUSINESS PARK

FIGURE A1
LOCALITY PLAN

PREPARED BY : L GLASS	*DATE : 05/06/2007*
PHONE :	*NOTES :*

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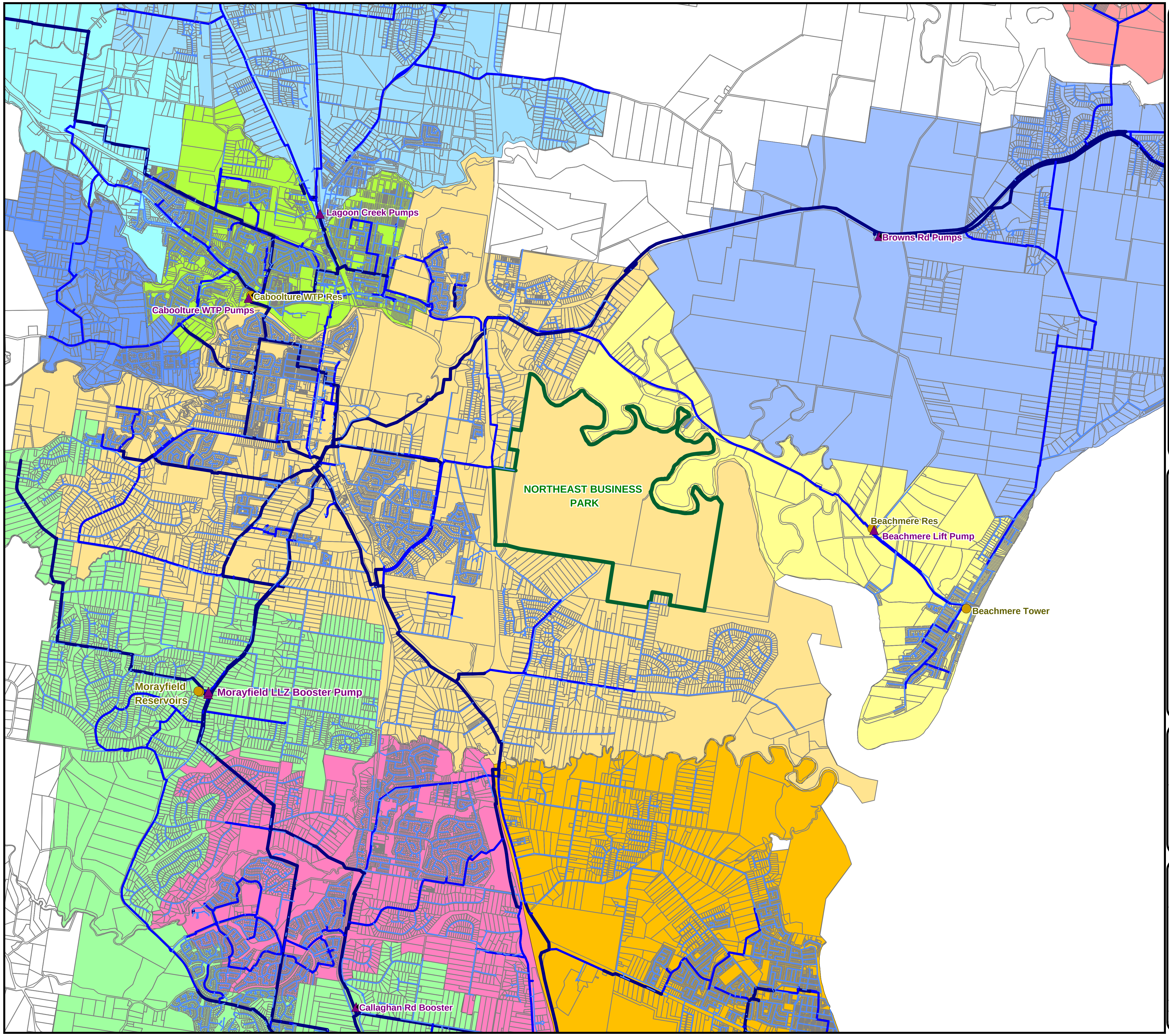
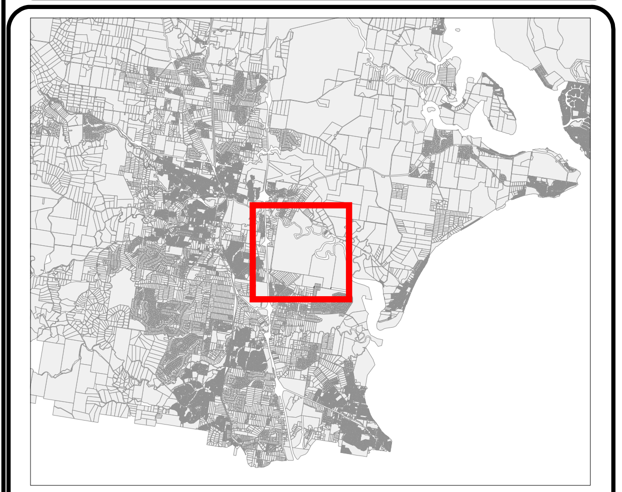


LEGEND

Northeast Business Park Development Boundary

Existing Water Mains (mm)
- > = 375
- 200-300
- 100-150

Caboolture Water Zone
- BEACHMERE
- BELLMERE
- BURPENGARY - NARANGBA
- CABOOLTURE
- DECEPTION BAY
- ELIMBAH
- MORAYFIELD
- NARANGBA-MORAYFIELD HLZ
- NINGI



LOCALITY PLAN - CABOOLTURE

0 1 2
kilometres

N W E S

• MGA Zone 56 (GDA 94)

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NORTHEAST BUSINESS PARK WATER AND WASTEWATER SYSTEMS

NORTHEAST BUSINESS PARK

FIGURE A3
EXISTING WATER NETWORK

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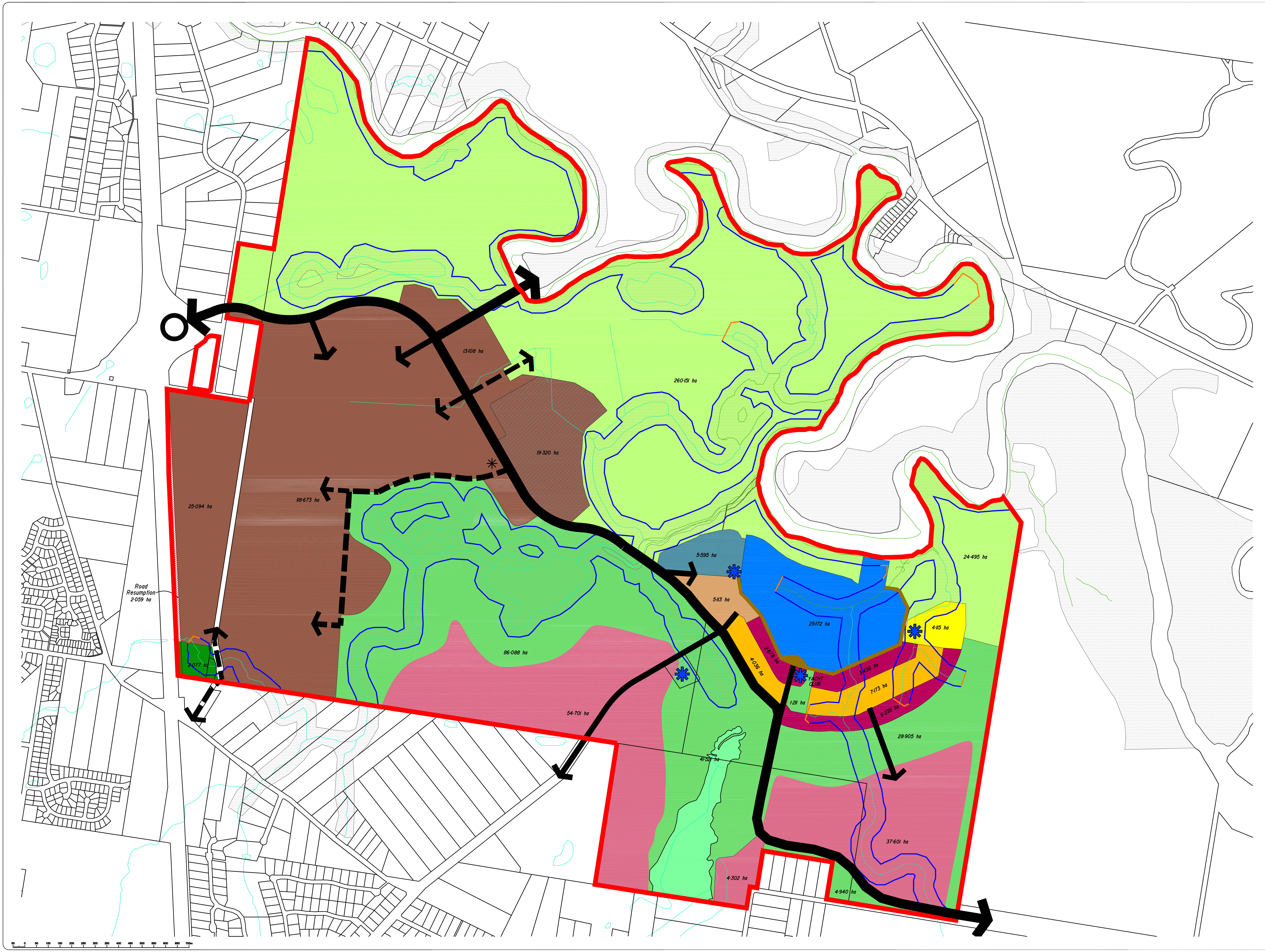

ML Design
architects
planners
interior designers

NOTES

The coastal management district shown is indicative and is derived from EPA Sheets 13.7, 13.8 & 13.11. Specific CMD details apply as listed on the segment tables on those sheets.

Upstream tidal CMD limits are greater of HAT or MHWS + x.

Riparian tidal CMD limits are specified in the segment table.

LEGEND

CATCHMENT PROTECTION
MINOR WATERWAY
MAJOR WATERWAY

COASTAL MANAGEMENT
DISTRICT OVER LAND
HAT UPSTREAM TIDAL LIMIT
MHWS + 40: RIPARIAN TIDAL LIMIT

ENDANGERED VEGETATION TO BE RETAINED
OTHER VEGETATION TO BE RETAINED

MARINA BASIN
BOARDWALK
HOTEL/CONFERENCE
W/F TOWN HOUSES
YACHT CLUB
APARTMENTS
MIXED USE NODE
SHIPYARD
MARINE INDUSTRY
GOLF RESIDENTIAL
RESIDENTIAL
OPEN SPACE incl. GOLF COURSE/COASTAL MGMT
INDUSTRIAL
INDUSTRIAL/COMMERCIAL
GOLF CLUBHOUSE
COMMUNITY NODE
LOCAL COMMUNITY NODE
VIEW CORRIDOR

DISCLAIMER

- Cadastral Boundaries supplied by DNR&W - DCDB 2006
- Aerial Photography supplied by QASCO
- Urban Footprint derived from SEQ Regional Plan - QLD Government Office of Urban Manangement
- Contours supplied by Cardno
- Catchment Protection derived from Caboolture ShirePlan
- Q100 information supplied by Studio Tekton Drawing No: 0304SK34-SD01
- Coastal Management derived from QLD Government - EPA

CLIENT
NORTHEAST BUSINESS PARK

PROJECT
PROPOSED DEVELOPMENT

NOLAN DRIVE
MORAYFIELD
STRUCTURE PLAN

Level Datum

Origin

Date 9 MAY 2007

Surveyed

Comp By. KCH

DWG Name. 20430STRUCTURE

Local Authority CABOOLTURE SHIRE COUNCIL

Job Reference 20430

Scale *1:5000@A0*

Plan Reference **20430-10B**

pmm
a conics company

PMM BRISBANE PTY LTD
A.C.N. 010370448
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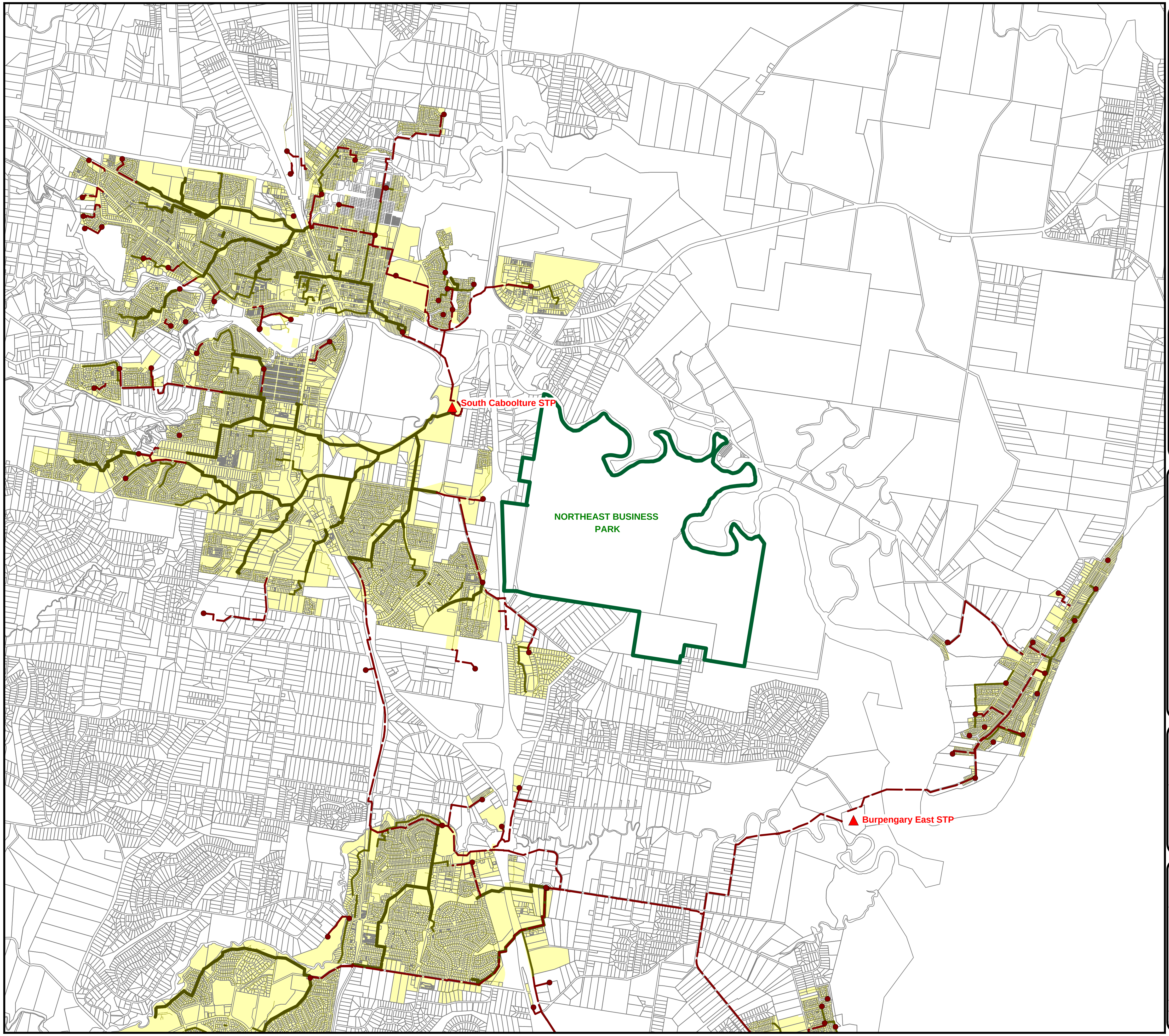
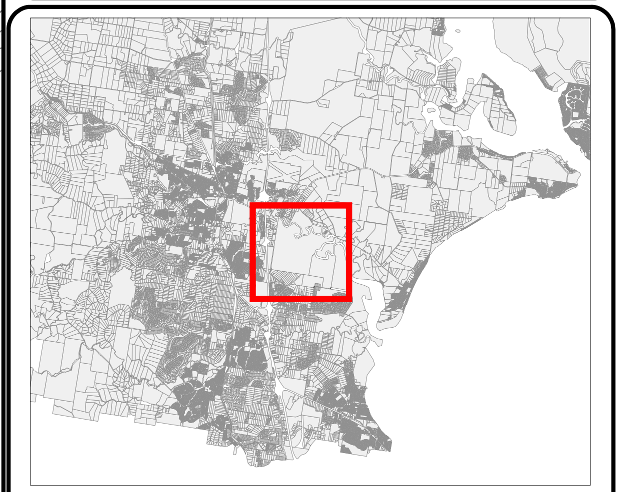


LEGEND

Northeast Business Park Development Boundary

Sewer Gravity Main (mm)
- DN300 and above
- DN225
- DN150

- Sewage Treatment Plant
- Sewage Pump Station
- Sewer Rising Main
- Sewer Catchment Area



LOCALITY PLAN - CABOOLTURE

0 0.5 1
kilometres

N W E S

• MGA Zone 56 (GDA 94)

NORTHEAST BUSINESS PARK WATER AND WASTEWATER SYSTEMS

GHD MANAGEMENT ENGINEERING ENVIRONMENT

NORTHEAST BUSINESS PARK

FIGURE A4
EXISTING SEWERAGE INFRASTRUCTURE

PREPARED BY : L GLASS	DATE : 05/06/2007
PHONE :	NOTES :

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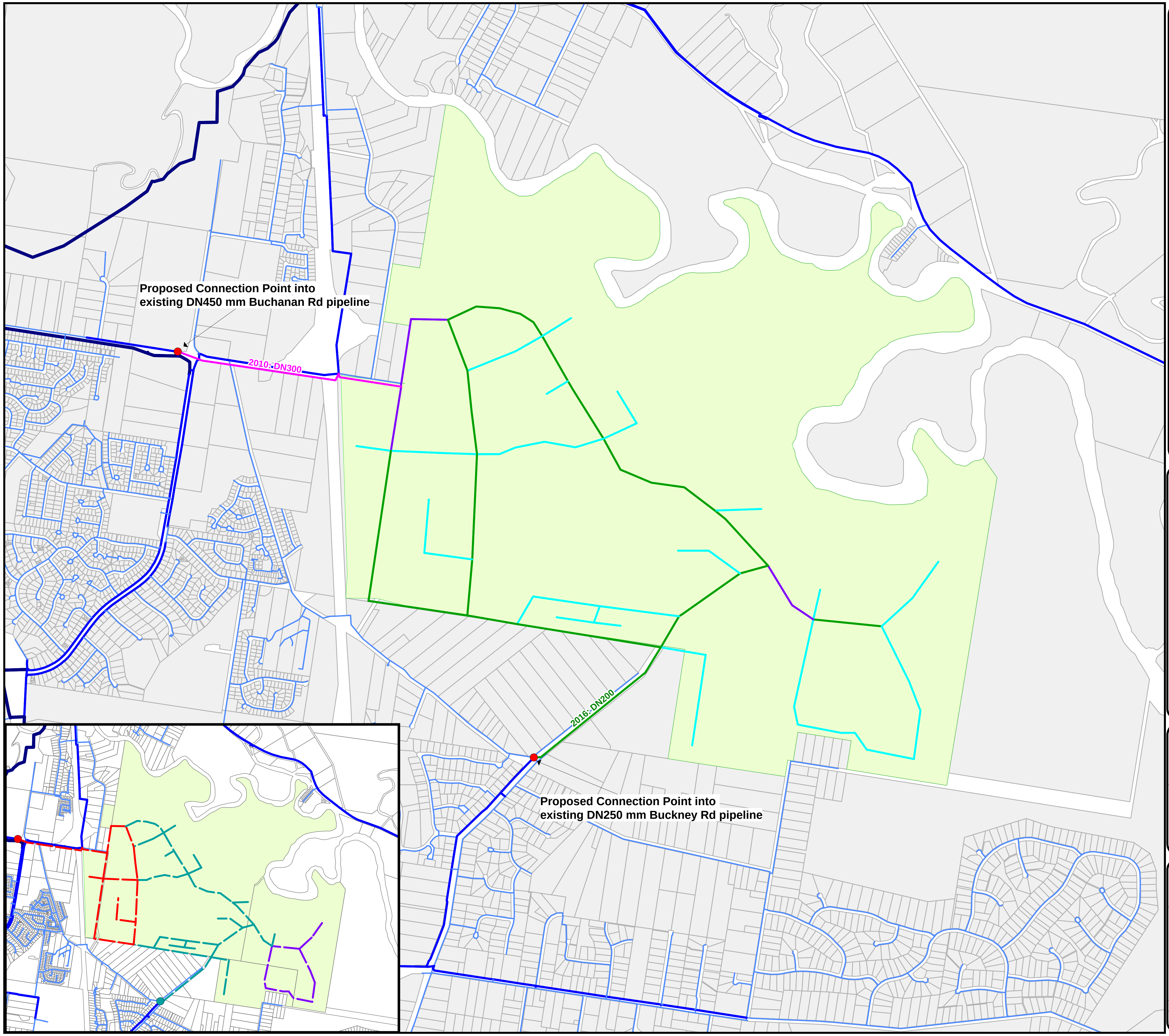

LEGEND

Existing Water Mains (mm)

- > = 375
- 200-300
- 100-150

Proposed Development Layout
Potable Water Pipelines

- 150 mm
- 200 mm
- 250 mm
- 300 mm

Northeast Business Park Development Boundary

INSET MAP

Proposed Infrastructure Staging

- 2016 Connection Point
- 2010 Connection Point
- 2021 Stage 3 Pipelines
- 2016 Stage 2 Pipelines
- 2010 Stage 1 Pipelines

LOCALITY PLAN - CABOOLTURE

0 250 500
metres

N W E S

• MGA Zone 56 (GDA 94)

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**NORTHEAST BUSINESS PARK
WATER AND WASTEWATER
SYSTEMS**

GHD MANAGEMENT ENGINEERING ENVIRONMENT

NORTHEAST BUSINESS PARK

**FIGURE A5
PROPOSED POTABLE
WATER NETWORK**

PREPARED BY : L GLASS	*DATE : 05/06/2007*
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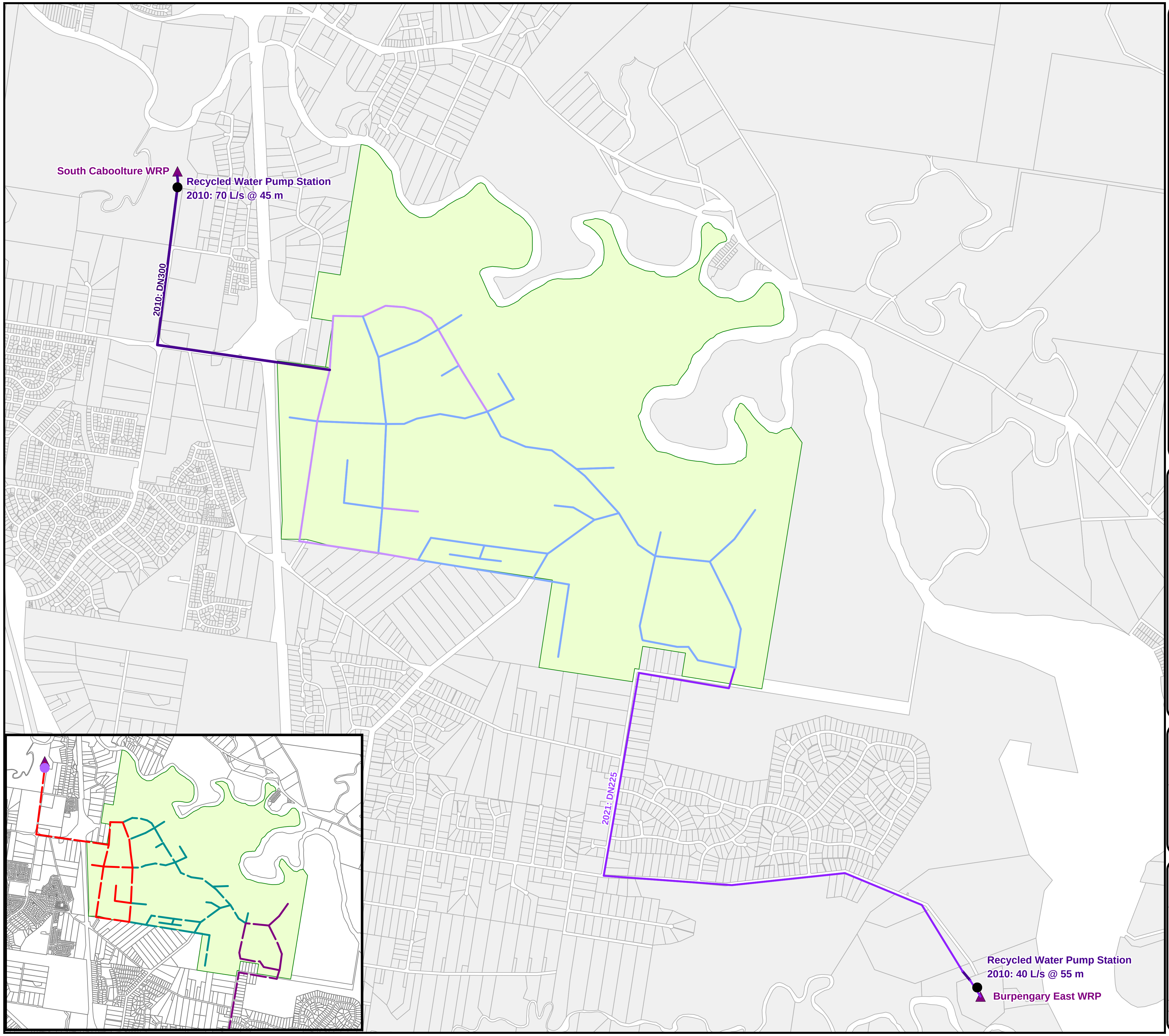


LEGEND

Recycled Water Pipelines
Proposed Layouts

- 150 mm
- 200 mm
- 225 mm
- 300 mm

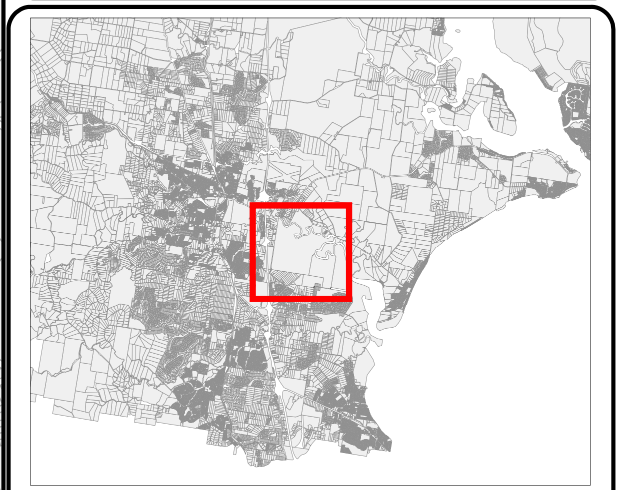
Water Reclamation Plants

Northeast Business Park Development Boundary

INSET MAP

Proposed Infrastructure Staging

- Recycled Water Pump Station
- Stage 3 Pipelines
- Stage 2 Pipelines
- Stage 1 Pipelines



LOCALITY PLAN - CABOOLTURE

0 250 500
metres

N W E S

• MGA Zone 56 (GDA 94)

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NORTHEAST BUSINESS PARK WATER AND WASTEWATER SYSTEMS

GHD MANAGEMENT ENGINEERING ENVIRONMENT

NORTHEAST BUSINESS PARK

FIGURE A6
PROPOSED RECYLCED WATER INFRASTRUCTURE

PREPARED BY : L GLASS	*DATE : 05/06/2007*
PHONE :	*NOTES :*

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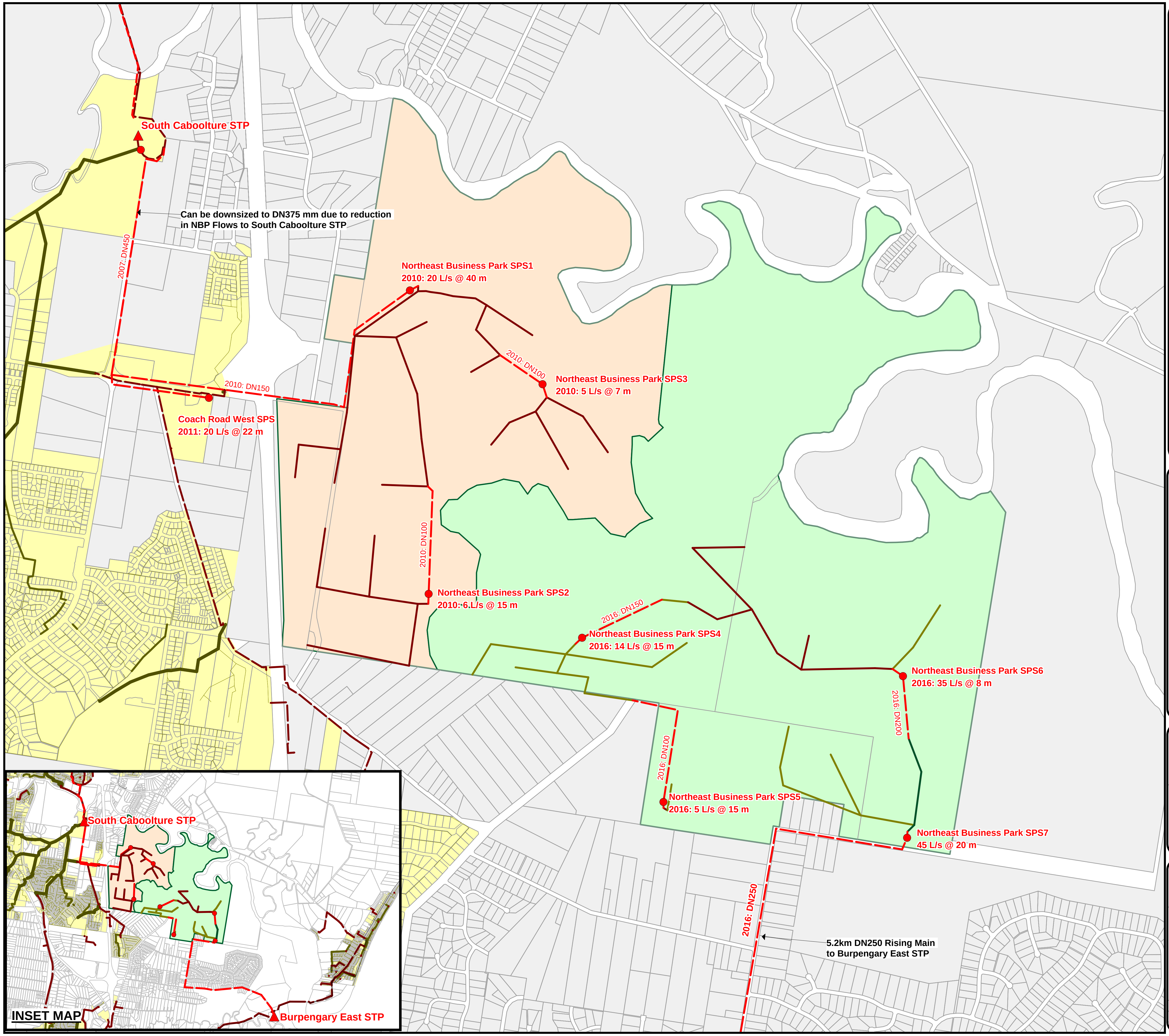


LEGEND

Sewer Gravity Main (mm)

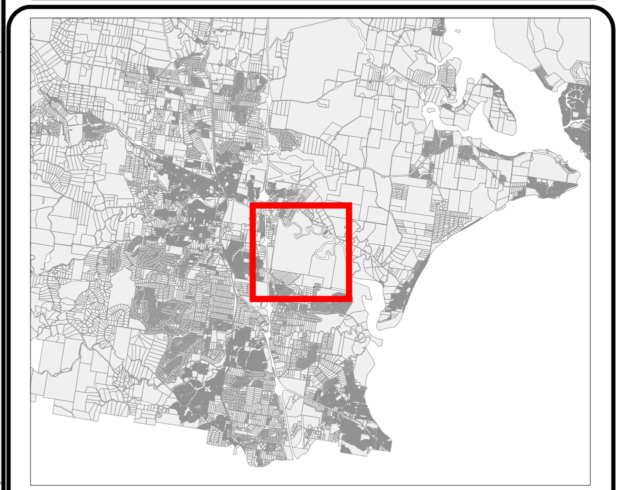
- DN300 and above
- DN225
- DN150
- Existing Sewer Rising Main
- Sewage Treatment Plant
- Proposed Sewer Rising Main
- Proposed Sewer Pump Stations

Development Area Gravity Main (mm)

- DN150 mm
- DN225 mm
- DN300 mm

NBP Sewer Catchment Area

- South Caboolture STP Catchment
- Burpengary East STP Catchment
- Sewer Catchment Area



LOCALITY PLAN - CABOOLTURE

0 250 500
metres

N W E S

• MGA Zone 56 (GDA 94)

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NORTHEAST BUSINESS PARK WATER AND WASTEWATER SYSTEMS

NORTHEAST BUSINESS PARK

FIGURE A7
PROPOSED SEWERAGE INFRASTRUCTURE

PREPARED BY : L GLASS	*DATE : 05/06/2007*
PHONE :	*NOTES :*

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Appendix B

Equivalent Persons (EP) Projections

The following tables outline the Equivalent Persons (EP) associated with the proposed NEBP development.

Water EP

Land Use	Stage 1	Stage 2	Stage 3	Stage 4	Total
Business Park	1000	1170	490		2660
Residential Lots		1750	1260	470	3480
Apartments		400	530	780	1710
Marina Village		390			390
Marina Villas		120	90		210
Marina Berths		110	110	110	330
Golf Villas		90	110		200
Golf Course		80			80
Shipyard		110			110
Yacht Club		30			30
Resort			240		240
Total	1000	4250	2830	1360	9440

Sewer EP

Land Use	Stage 1	Stage 2	Stage 3	Stage 4	Total
Business Park	1000	1170	490		2660
Residential Lots		1810	1300	490	3600
Apartments		400	535	785	1720
Marina Village		390			390
Marina Villas		125	90		215
Marina Berths		110	110	110	330
Golf Villas		95	120		215
Golf Course		80			80
Shipyard		110			110
Yacht Club		40			40
Resort			240		240
Total	1000	4330	2885	1385	9600

Total EP

Totals	Water	Sewer
Residential EP	5840	5990
Industrial	2770	2770
Community	830	840
Total	9440	9600

Appendix C

Soil Profiles

Table 24 Soil Profiles Cited in the Coffey Geotechnics Report[50] and Derived MEDLI Profiles

Land Use	Comment	Area (ha)	Typical Soil Profile cited	Depth to Groundwater	Depth to Bedrock	Simplified MEDLI profile
Business Park	Assumed substantial proportion impervious.	158	0.5 – 1m silt or silty sand 1 – 3m clayey silt	1-1.5m	Between 18 and 30 m depth.	**Profile 1** 0-1m silty sand over groundwater.
Residential Businesses	Assumed substantial proportion impervious.	7.3	0.5 – 1m silt or silty sand 1 – 3m clayey silt	1-1.5m	Between 18 and 30 m depth.	**Profile 1** 0-1m silty sand over groundwater.
Marine Industry	Assumed not irrigated	15				N/A
Shipyard	Assumed not irrigated	4.5				N/A
Commercial/ Retail	Assumed substantial proportion impervious.	5.5	0 - 2.5m or 3m dune sand 3m-6m soft clay 6m – 9m very stiff sandy clay	1.2m – 2m	9m	**Profile 2** 0-1.2m sand over groundwater
Village Residential/ Hotel		5.1	0-2.5, or 3m soft to firm high plasticity clay 3-10m very stiff sandy clay nb: 7m – potentially coffee rock.	0.5m	10m	**Profile 3** 0-0.5m clay over groundwater
Multilevel Residential		8	Western: dune sands over sandy clay Eastern: clay overlying sandy clay.	1.5m	10-11m	Conservatively represented by **Profile 3** and **Profile 2.**
Low Rise – medium density		5.9	Western: dune sands over sandy clay Eastern: clay overlying sandy clay.	1.5m	10-11m	Conservatively represented by **Profile 3** and **Profile 2.**

[50] COFFEY GEOTECHNICS (January 2007), Table 9.1

Land Use	Comment	Area (ha)	Typical Soil Profile cited	Depth to Groundwater	Depth to Bedrock	Simplified MEDLI profile
Golf Course residential		30.7	General soil profile: 0.5 – 1m silt or silty sand 1- 2 clay 2 - 5m sand or silty sand. Coffee rock may be present.	0.5 to 2m		**Profile 4** 0-0.5m sandy silt over groundwater.
Golf Club /leisure facilities		3.1	0.5 - 1m silt or silty sand 1- 2 or 3m clayey silt	1 to 1.5m	15- 20m	**Profile 1** 0-1m silty sand over groundwater.
River view residential		10.7	0-2 m silty clay	Not observed	Not cited	
Dry land residential		46.1	0-1.5m stiff clay 1.5-3.5m sandy clay	Not observed	Not cited	
Golf course and wetland			0.5 – 1 m silty sand dense clayey sand *or* firm to stiff silty clay *or* clay.	1 to 1.5m		**Profile 1** 0-1m silty sand over groundwater.
Recreational/ Environmental/ Leisure (rehabilitated areas).		43.5	0-0.5m sandy clay overlying dense clayey sand	2m	Not cited	**Profile 5** 0-0.5m sandy clay 0.5m – 2m clayey sand over groundwater
Marina basin	Not irrigated.	28.2				
Heritage Precinct	Excluded from MEDLI analysis – assumed not irrigated.	23.4				

Land Use	Comment	Area (ha)	Typical Soil Profile cited	Depth to Groundwater	Depth to Bedrock	Simplified MEDLI profile
Open Space/Rural		58.6	0-8m firm to stiff high plasticity clay. 8-15m very dense clayey sand.	Not observed	Not cited	**Profile 6** 0-4.6m clay
Detention Basin Wetlands	Excluded from MEDLI analysis – assumed not irrigated.	83.8				
Environmental buffer zone	Excluded from MEDLI analysis – assumed not irrigated.	134.7				
Public facilities/ river access	Excluded from MEDLI analysis – assumed not irrigated.	12.7				
Protected wetlands	Not irrigated.	4.4				

Appendix D

Recycled Water Fact Sheet

Recycled Water Fact Sheet

Caboolture - Class A+

Where Is Recycled Water Available In Caboolture?

Recycled water is available from outlets by authorised carriers at the following locations:

- 67 Weier Road, Morayfield
- Bury Street, Caboolture
- The Regional Aquatic Centre and Sports Complex 1305A – 1395A Bruce Highway, Burpengary

There are also opportunities in certain areas of Caboolture for permanent connections to recycled water. Please contact Council's Customer Service Centre on 54 200 100 for further information regarding permanent connections and access to outlets.

What Is Recycled Water?

Recycled water is the purified water produced from the thorough treatment and disinfection of water from the South Caboolture water reclamation plant. This treatment results in a high quality product currently approved for irrigation and non-drinking uses such as toilet flushing and outdoor hosing. Recycled water is clear and looks and smells just like drinking water.

More information on the treatment process and quality of recycled water is provided on the back of this fact sheet.

Is Recycled Water Safe?

Yes. The recycled water from the South Caboolture water reclamation plant is safe, and is produced and monitored to meet stringent quality guidelines set by the State Government's Environmental Protection Agency. The recycled water is classified as Class A+.

The Do's - Approved uses	The Don'ts - Unapproved uses
▪ Gardens ▪ Toilet flushing ▪ Outdoor hosing and washdown ▪ Open space irrigation ▪ Irrigation of human food crops (special authorisation from Council is required for food crops consumed raw or minimally processed) ▪ Irrigation of pasture and fodder crops for dairy animals ▪ Stock watering (except for pigs) ▪ Industrial purposes ▪ Water features and fountains ▪ Fire fighting	▪ Drinking (human and animal consumption) ▪ Cooking or other kitchen purposes ▪ Personal washing, such as baths, showers, bidets and hand basins ▪ Washing clothes ▪ Indoor household cleaning ▪ Filling swimming pools and spas ▪ Recreation activities involving water contact (e.g. children playing under sprinklers)

Precautions For Safe Use

Whilst the recycled water is of the highest quality, it is not approved for drinking purposes. Drinking of recycled water should be avoided; otherwise follow The Do's and The Don'ts, and apply normal hygiene practices.

If you accidentally drink recycled water and if any symptoms such as vomiting or diarrhoea develop, you should seek medical advice. Make sure you advise the doctor how you used the recycled water.

It is also important to ensure that recycled water equipment, taps, pipes, tanks etc are appropriately labeled with "recycled water" or "non-potable", and "not for drinking" and the colour lilac (purple).

If storing recycled water for periods longer than 24 hours, it is recommended that ongoing chlorination be considered (e.g. use of a floating chlorine dispenser).

Environmental Considerations

When using recycled water restrict application rates to avoid ponding of water and minimise runoff from the site into waterways.

Why Is Recycled Water Being Used?

Recycled water will help reduce the impact of urban development and save valuable drinking water for personal use, drinking and hygiene. Its use also helps to reduce the amount of nutrients going into our precious waterways.

Where Else Is Recycled Water Being Used?

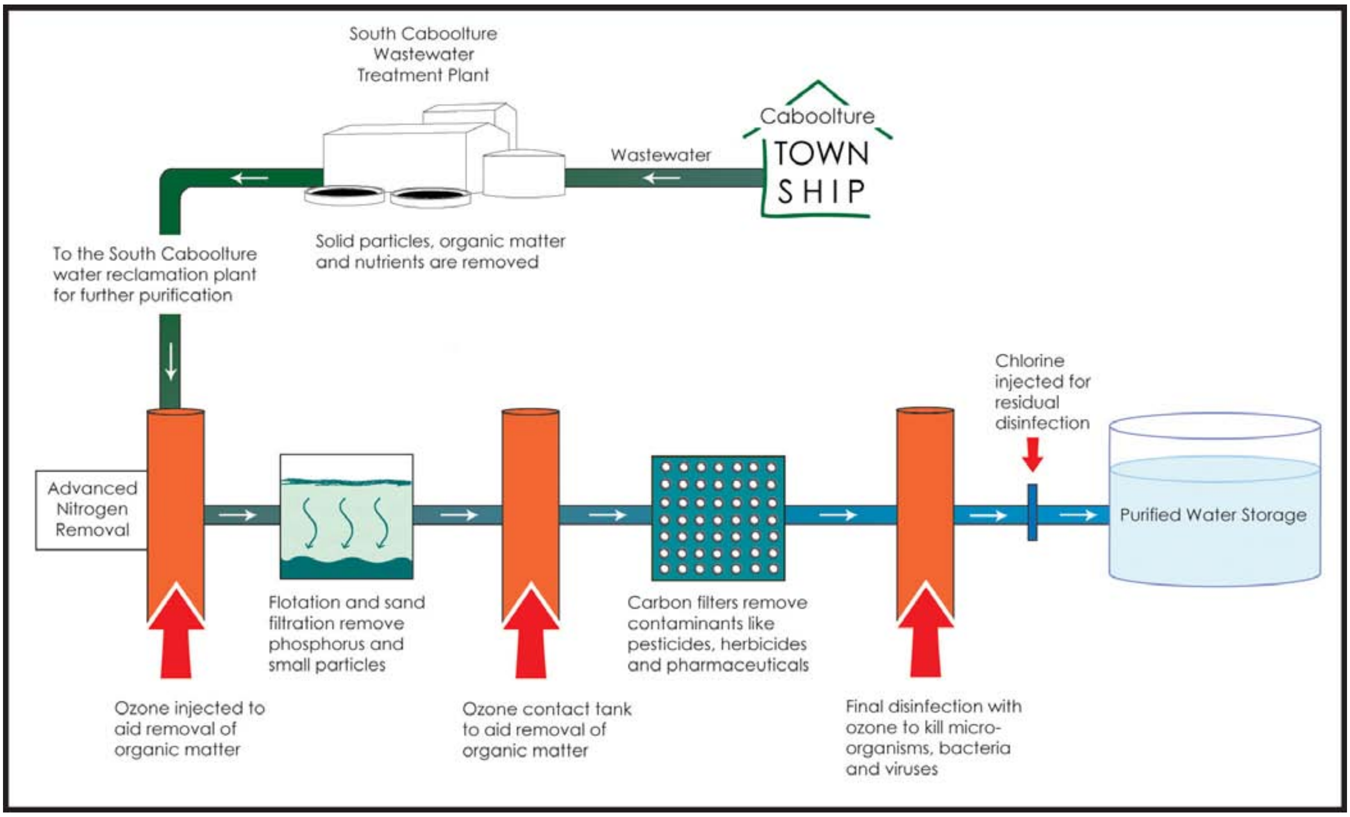
In Caboolture, recycled water is being used for toilet flushing, watering sportsfields and parks, gardens and lawns and dust control and roadworks. Recycled water is used in many parts of Australia for irrigation, in domestic gardens, toilet flushing and industrial uses.

Recycled water is used overseas for similar purposes, and in some places also purposefully helps supply part of raw water supplies such as in Singapore, Orange County and Southern California in the USA. In many cities in the USA and Europe use of recycled water has been occurring for decades and there has been no evidence of negative health effects.

More water recycling is planned where it makes good social, economic and environmental sense.

Recycled Water Fact Sheet

Caboolture - Class A+



A summary of recycled water quality data is provided for information purposes with a comparison against the *Australian Drinking Water Guidelines* and typical drinking water quality. Further data is available from Council if required.

Parameter		South Caboolture Recycled Water (Class A+) Average Value	Australian Drinking Water Guidelines Limits	Typical Caboolture drinking water
pH	Indicates the extent to which it is acidic or alkaline	7.0	6.5 to 8.5	7.5
Conductivity (us/cm)	Helps estimate dissolved salt content	820	1400	260
Total Dissolved Solids (mg/L)	Measures dissolved solids content	580	1000	180
Turbidity (NTU)	Measures cloudiness of water	1	5	0.2
Suspended Solids (mg/L)	Measure of suspended material in water	2	NA	<2
Total Nitrogen (mg/L)	Nitrogen is a nutrient and can be stored in the soil or taken up by plants	1.8	NA	NA
Total Phosphorous (mg/L)	Phosphorus is a nutrient and can be stored in the soil or taken up by plants	<0.3	NA	NA
Thermotolerant coliforms cfu/100ml	Indicator bacteria for assessing the microbiological quality and safety of water	0 (Median Value)	0 in 98% of samples	0

Further Queries?

Please contact Council's Customer Service Centre on 54 200 100

CABOOLTURE SHIRE COUNCIL

CabWater is committed to providing our customers with commercially managed quality water services, protecting community health and the environment

Oct 2006

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