REPORT:

Hamilton Integrated Water Management Plan

March 2020

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Alluvium acknowledges the Traditional Owners and custodians of the lands on which we work.

This project was undertaken in Hamilton, on Gunditjmara Country, and in Naarm (Melbourne), on the lands of the Kulin Nations.

We pay our respects to their elders, and the elders of all Aboriginal and Torres Straight Islander Peoples, past, present, and into the future.

We would like to acknowledge and thank all those who attended consultation and workshop activities that were critical in developing this plan.

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Abbreviations

Alluvium	Alluvium Consulting Australia Pty Ltd
BPEM	Best Practice Environmental Management
CMA	Catchment Management Authority
DELWP	Department of Environment, Land, Water and Planning
GL	Gigalitre
GPT	Gross pollutant trap
GSC	Great South Coast
Ha	Hectare
IWM	Integrated Water Management
LGA	Local Government Area
ML	Megalitre
MUSIC	Model for Urban Stormwater Improvement Conceptualisation
SDS	Strategic Directions Statement
SGSC	Southern Grampians Shire Council
SRW	Southern Rural Water
TN	Total Nitrogen
TP	Total Phosphorus
TSS	Total suspended solids
WSUD	Water sensitive urban design

1 Introduction

Integrated water management (IWM) has been defined as a "collaborative approach to water planning and management that brings together organisations with an interest in all aspects of the water cycle" (DELWP, 2018). The process of developing an IWM plan includes identifying where the objectives of all water cycle stakeholders intersect to enable collaboration in the identification of opportunities and collective leveraging of investment to optimise social, economic and environmental outcomes for the community. The IWM Plan for Hamilton is a strategic plan that will guide Southern Grampians Shire Council (SGSC) to meet future environmental and social challenges so that Hamilton continues to be a great place to live, work and recreate.

The Hamilton IWM plan was identified as a priority project under the Department of Environment, Land, Water and Planning's (DELWP) IWM Forum program. The output of the Forum program is summarised in regional 'Strategic Directions Statements' (SDS). As well as setting out the water cycle context for each region, the SDS lists IWM opportunities identified through a collaborative process involving Council, water authorities, catchment management authorities (CMAs), Southern Rural Water (SRW) and DELWP.

The Hamilton IWM plan is included as a priority project in the SDS for the Great South Coast Region. This plan aligns with the vision, outcomes and objectives defined within the SDS with opportunities and actions concentrating on Council's direct areas of responsibility such as drainage, stormwater management, Council buildings and facilities, public open spaces and streetscapes.

This plan is focussed on the urban centre of Hamilton for the period 2020-2030, and while there are references to the surrounding region and upstream catchments, the opportunities and actions focus on the urban environment.

1.1 Developing the plan

The following elements were critical to the development of this plan:

Engagement: This IWM Plan was informed through consultation with a cross section of Council staff, agency stakeholders, SGSC Councillors and members of the community. Consultation focussed on communicating the plans vision, objectives and outcomes before collaboratively developing project opportunities. These opportunities are likely to rely on ongoing collaboration with partner organisations including Wannon Water, Glenelg Hopkins Catchment Management Authority (GHCMA), SRW and DELWP. Engagement centred around two workshop sessions in November 2019 and February 2020, each with three separate sessions and audiences:

- SGSC staff, agency partners and Great South Coast Forum representatives
- SGSC councillors, and
- local community.

Clear vision, outcomes and objectives: As noted above, the existence of a vision, outcomes and objectives as defined within the Great South Coast Region IWM Forum SDS was an advantage. This provided timely and clear direction for the group regarding the breadth and purpose of the plan.

System understanding: This included a collation of available data and information to enable communication of critical system characteristics and issues that led to the identification of issues and opportunities. In Hamilton the system includes:

- Potable and non-potable networks
- Current water consumption and end uses
- Stormwater quality and management (including current and future land use)
- Natural and recreational values including Lake Hamilton, the Grange Burn, the 'Old Res' bandicoot sanctuary and the town's many open spaces.

1.2 Context

The critical strategic document that supports this plan is the SDS for the Great South Coast Region. Predecessors to that work, including Chapter 5 (*Water's role in resilient and liveable cities and towns*) of *Water for Victoria* (DELWP, 2016), are also relevant along with Council and agency documents that overlap with identified SDS outcomes.

The Great South Coast SDS (IWM Forum, 2019)
The Great South Coast IWM Forum is one of nine regional Forums across Victoria. Their aim is to identify, prioritise and oversee the implementation of collaborative IWM opportunities. The region is characterised by moderate to low population growth across a number of small to medium sized towns, of which Warrnambool is the largest. Predominantly agricultural land, urban areas make up 0.2% of the region by area. Climate change is identified as a key risk across temperature, rainfall and evaporation as well as sea level rise along the coast.

The vision for IWM across the Great South Coast region: *Water is life – we will work together with our communities to deliver integrated water outcomes contributing to the resilience of our environment, culture and economy*.

The seven strategic outcomes within the SDS, that are discussed further below include:

1. Safe secure and affordable supplies in an uncertain future
2. Effective and affordable wastewater systems
3. Avoided or minimized existing and future flood risks
4. Healthy and valued waterways and marine environments
5. Healthy and valued landscapes
6. Community values reflected in place-based planning
7. Jobs, economic growth and innovation.

The SDS also highlights targeting low emissions solutions as an important aspect any projects merits.

Southern Grampians Shire Council (SGSC)
SGSC have prepared a range of Council strategies and plans that provide context for water management generally and this plan specifically. The following briefly summarises where they intersect and how they have provided some context for this plan.

Council plan (2017 – 2021) sets out Council's priorities including *Promot(ing) our Natural Environment*, that notes Council wish to "promote a culture that supports a clean, green and sustainable environment". Objectives under this theme are to:

- promote and support improved biodiversity and the health of waterways, wetlands, soil and air
- balance environmental protection with Council's support for growth
- promote and provide sustainable waste management services
- develop and implement climate change adaptation strategies to prepare for climate change, especially extreme events.

Economic Development Strategy (2011-2021) outlines a framework for Council to support economic development in the Shire with a focus on supporting liveability and amenity within Hamilton. The document highlights the link and importance of good water management to sustainable economic development.

Hamilton Structure Plan (2011) presents a vision for Hamilton as "*a liveable, beautiful, progressive, well planned and sustainable city".* It also highlights service provision for the surrounding region, connection to that region and the value that Hamilton provides to the agricultural and other economic activities within the region.

Grange Burn Masterplan (2005): outlined the waterway's condition and with recommendations for the Grange Burn below the Lake Hamilton Spillway to Digby Road. Issues identified significant infestations of exotic weeds, which blocked views of the river from the path and chocked the in-stream environment as well as point source pollution from stormwater outlets. Since this report, progress on these points has been made, particularly on improving habitat and amenity values.

Lake Hamilton Action Plan (2012): This study responded to recurring incidents of blue green algae and *E.coli* which led to closure of recreational activities on the lake. The results indicated a large load of nutrients entering the lake in runoff, with a store of nutrients in the lake itself. The study presented short to medium term options; however, these are generally expensive or posed risks to the downstream environment. It was found that long term management options would be required with key recommendations including constructing stormwater treatment swales to treat the local urban catchment, supporting the aquatic macrophytes in the Lake, and reducing nutrient inputs from the Grange Burn with large scale catchment management and a wetland. GHCMA have been implementing a catchment management program, and SGSC have constructed some treatment for the urban catchment.

CBD revitalisation plan: A CBD revitalisation plan was identified as part of the Hamilton Structure Plan focussing on the area around Melville Oval to Gray St between Thompson St and Brown St. The master planning process was guided by input from community, businesses, and government, through stakeholder workshops and written submissions. The plan will guide improvements access and linkages, public spaces, landscaping, and parking. These works will enhance the quality, connectivity and character of the CBD, and with it the local economic activity and services.

Sustainable Water Use Plan (2006): The plan assessed the Shire's water use (volume) and identified ways to reduce this into the future, with targets of a 20% reduction over a 10-year period. Objectives of the plan included alleviating stress on local water resources and becoming a community leader in sustainable water use. The plan was developed collaboratively; led by Wannon Water and in partnership with nearby councils, with input from state government, GHCMA, council employees, community, and committees of management. Actions focused on auditing water use, to identify efficiencies, investigating technological improvements and alternative water sources, and educating council staff and the local community on the importance of saving water and ways to achieve this.

Sustainability Strategy (2010): The strategy presents a mission to have "Everyone working co-operatively to develop an environmentally responsible and sustainable Shire: a great place to live, work and visit". The strategy was developed around five key themes: land, water, waste, liveability, and climate. 26 "management objectives" were identified along with prioritised supporting actions.

Under the water theme, the objectives were water conservation, water quality, behavioural change and capacity building, increased re-use of stormwater, sewerage/grey water treatment, and enhancement of significant waterways and wetlands. There are linkages between the other themes and the IWM, in the interconnection between land management and water, and the ways water management can support liveability, adaptation to climate change.

Partner organisations
SGSC have worked closely with Wannon Water, GHCMA and SRW throughout the development of this plan. The key documents that have been referred to include:

Wannon Water Urban Water Strategy (2017-65) that describes the Grampian system that supplies water to Hamilton, as well as considering future supply and demand scenarios over the next 50 years. The plan identifies a combination of medium term (0-5 years) and long term (5-50 year) measures to maintain a balance between demand and supply of urban systems currently and into the future. The strategy shows water in the region is generally reliable and measures to increase supply to Hamilton are not immediately required. The plan does however highlight the potential risks that climate change, through a reduction in streamflow, presents to Hamilton in the medium term. Through this report and past works, Wannon Water have expressed their commitment to IWM as part of a broader approach to servicing townships like Hamilton.

Glenelg Hopkins Regional Catchment Strategy (2013-19) This is the primary planning framework for land, water and biodiversity management within the Glenelg Hopkins region. It sets the direction for how the region's land, water and biodiversity resources should be managed, and is an important building block in improving the condition of those resources over time (GHCMA website). It takes an asset based approached that defines Thematic Asset Classes and Objectives (20-years), Management measures (6-years) and Action plan for each asset class.

From the Hamilton perspective, the CMA has been intrinsic in driving waterway improvements along Grange Burn through revegetation and weed removal works, supported by the Grange Burn Waterway Action Plan (WAP) in 2012.

2 Hamilton's social and biophysical context

2.1 Location

Hamilton is the largest town in Southern Grampians Shire, located in Western Victoria on the traditional lands of the Gunditjmara People. Hamilton is a critical regional and commercial hub at the junction of five major roads as well as being a gateway to the southern sections of the Grampians National Park or Gariwerd (Figure 1). The town is situated on the beloved and highly valued Grange Burn, a tributary of the Wannon River in the Glenelg catchment. Hamilton has a rich agricultural history with wool driving the growth and wealth of the town and region. This is highlighted by 'Sheepvention', an annual sheep and wool convention drawing about 20,000 people to Hamilton annually. Education is also a prominent activity with four secondary schools educating those from across the region.

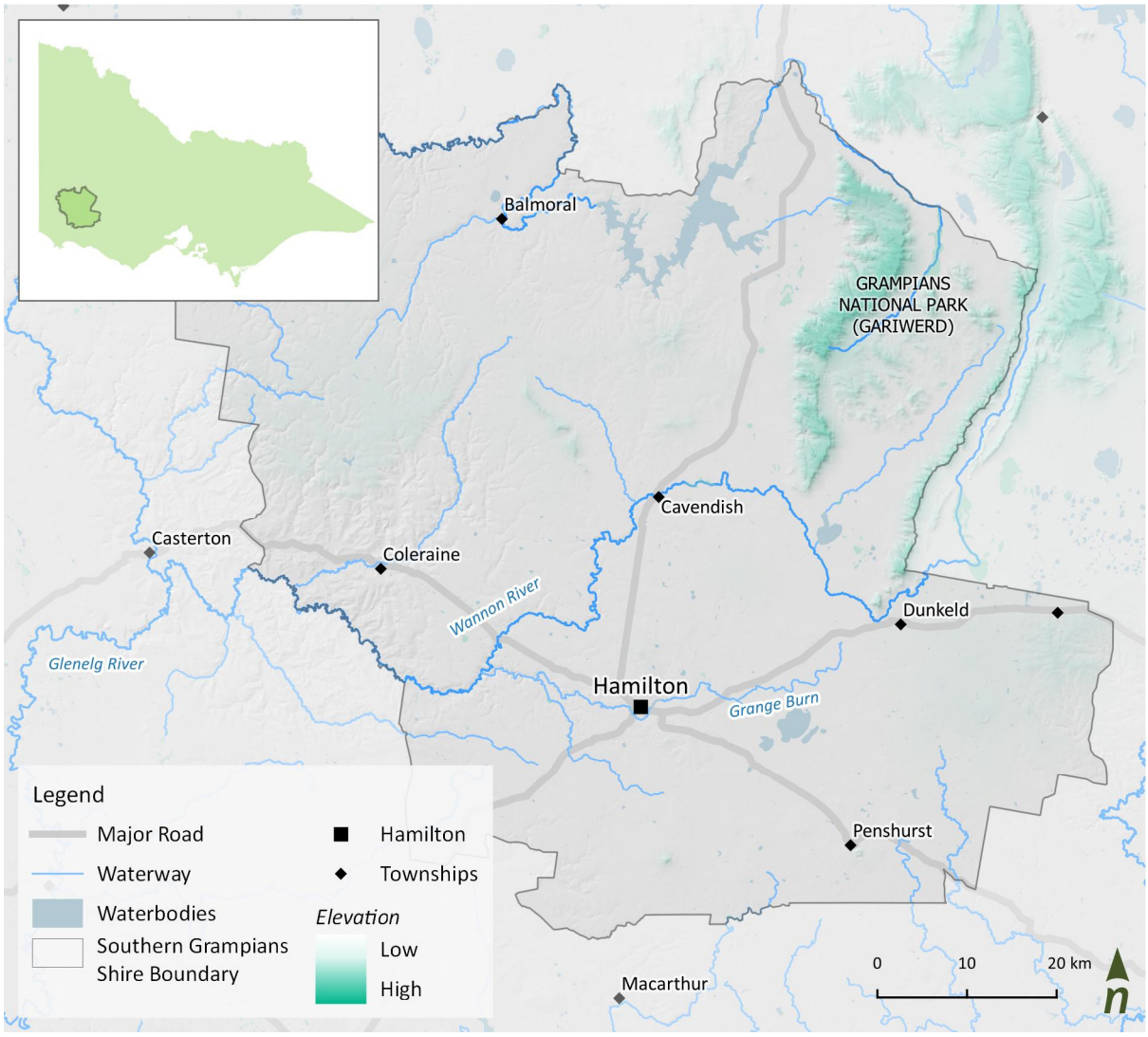


Figure 1. *Hamilton location plan*

Figure 2 highlights the plan's study area, showing the urban and peri-urban areas of Hamilton. The plan shows the course of the Grange Burn and Lake Hamilton, a significant man-made water body to the east of the town centre.

Figure 2. *The study area is focused on the Hamilton township*

2.2 Population

Hamilton is the most populated town in Southern Grampians Shire with approximately 8,900 residents living within the study area (2016 Census, Hamilton UCL). This represents over half of the Shire's total population of about 16,000. Population in the Shire is predicted to decline slightly over time with Figure 3 illustrating the anticipated population trend for Hamilton and the Shire out to 2036.

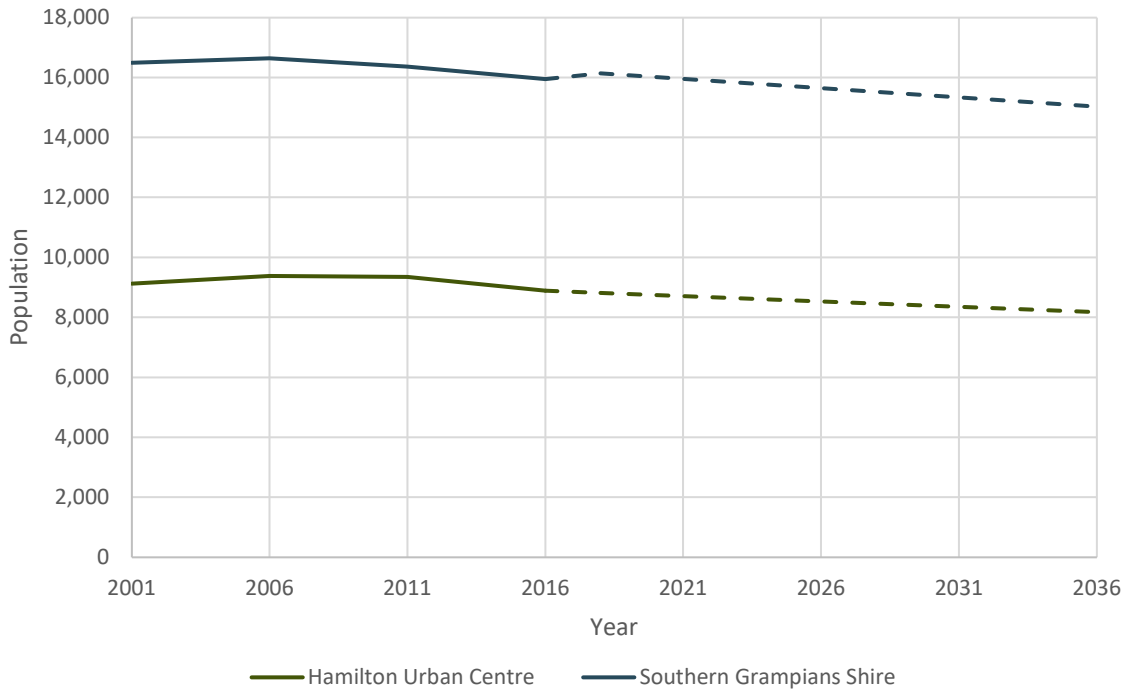


Figure 3. *Population in Hamilton township and Southern Grampians Shire (Census record + DEWLP forecast)*

2.3 Climate

Hamilton has a cool oceanic to warm temperate climate, with a wetter, cooler winter and a warmer, drier summer. Figure 4 shows average monthly rainfall and temperature. Historically, average annual rainfall has been approximately 600mm with relatively reliable winter rains amongst annual variability of rainfall (Figure 5).

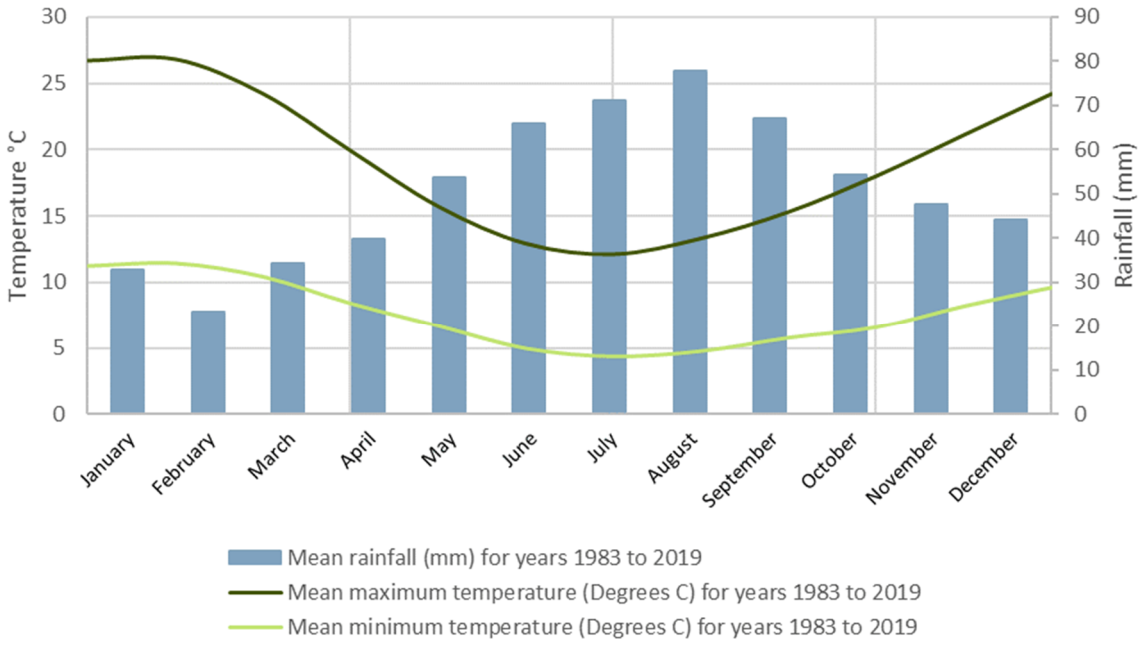


Figure 4. *Monthly average temperature and rainfall at Hamilton Airport, 1983-2019 (Bureau of Meteorology)*

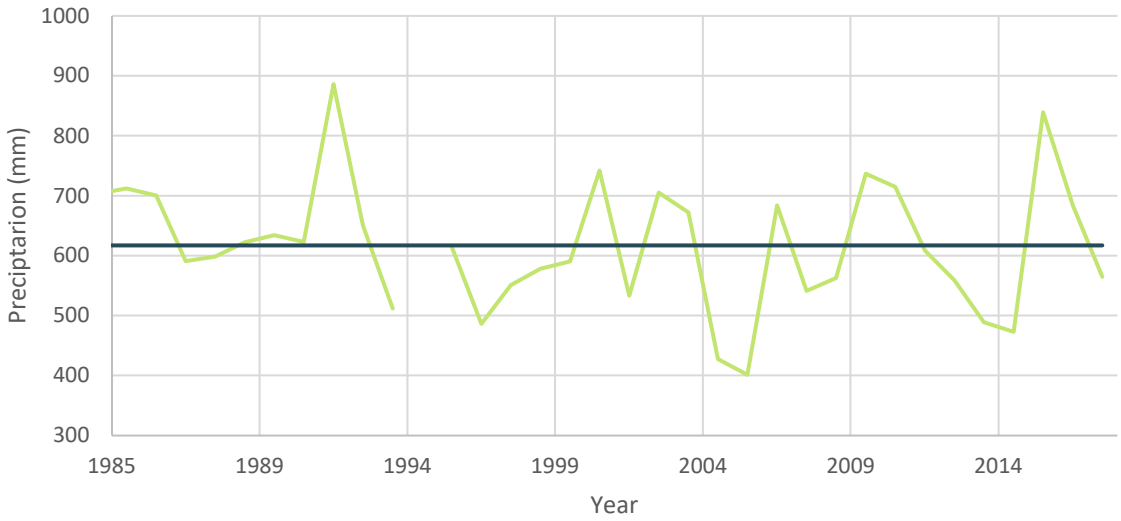


Figure 5. *Yearly Rainfall, Hamilton Airport*

Climate change

Climate change is a significant driver behind the preparation of IWM plans within Hamilton and across the state. Reduced rainfall and increased temperature and evaporation will impact the reliability of surface water supplies across the state, as well as impacting upon the condition of natural assets like waterways and wetlands. Further, the amenity of urban centres like Hamilton will be impacted if open spaces and urban streetscapes cannot be maintained, with healthy vegetation and shade, during hotter, dryer periods.

DELWP's *Guidelines for Assessing the Impact of Climate Change on Water Supplies (2016)* sets out anticipated changes in temperature, rainfall and runoff at 2040 and 2065 for metropolitan and rural catchments. The projected impacts on the Glenelg River Basin are summarised in Table 1*. What is perhaps most notable is the significant reduction in average annual runoff that is anticipated under a high climate change scenario (~60%).

Table 1. *Estimated changes relative to current climate baseline in the Glenelg River Basin (Source: DELWP, 2016)*

	Change relative to baseline	
Criteria	**2040**	**2065**
Temperature change (˚C)		
10th percentile (low)	0.8	1.6
50th percentile (medium)	1.1	2
90th percentile (high)	1.4	2.6
Potential evapotranspiration. 1975-2014 average: 1157 mm / year		
10th percentile (low)	2.60%	5.00%
50th percentile (medium)	3.80%	6.70%
90th percentile (high)	5.70%	10.10%
Rainfall. 1975 – 2014 average: 655 mm / year)		
10th percentile (low)	1.20%	1.40%
50th percentile (medium)	-5.00%	-8.40%
90th percentile (high)	-12.70%	-21.70%
Average annual runoff (mm) 67 (1975 – 2014 average)		
10th percentile (low)	7.60%	-3.40%
50th percentile (medium)	-13.60%	-31.40%
90th percentile (high)	-37.30%	-60.80%

** Please note that the figures below are for the whole Glenelg River Basin and specific to Hamilton.*

2.4 Land use

At Hamilton's heart is the commercial and retail centre, surrounded by residential land and a number of parks, reserves and linear green spaces. Hamilton is well served by green and blue spaces including Lake Hamilton, the Grange Burn, Pedrina Park and the nearby bandicoot reserve, Hamilton Botanic Gardens, and a number of smaller parks and gardens throughout the town.

The town is surrounded by agricultural land, being historically sheep and pasture and recently with increasing areas of horticulture. Hamilton has a rural interface of low density and rural living, and rural industrial zones including nurseries, agricultural supplies and the livestock exchange to the south west of the town centre.

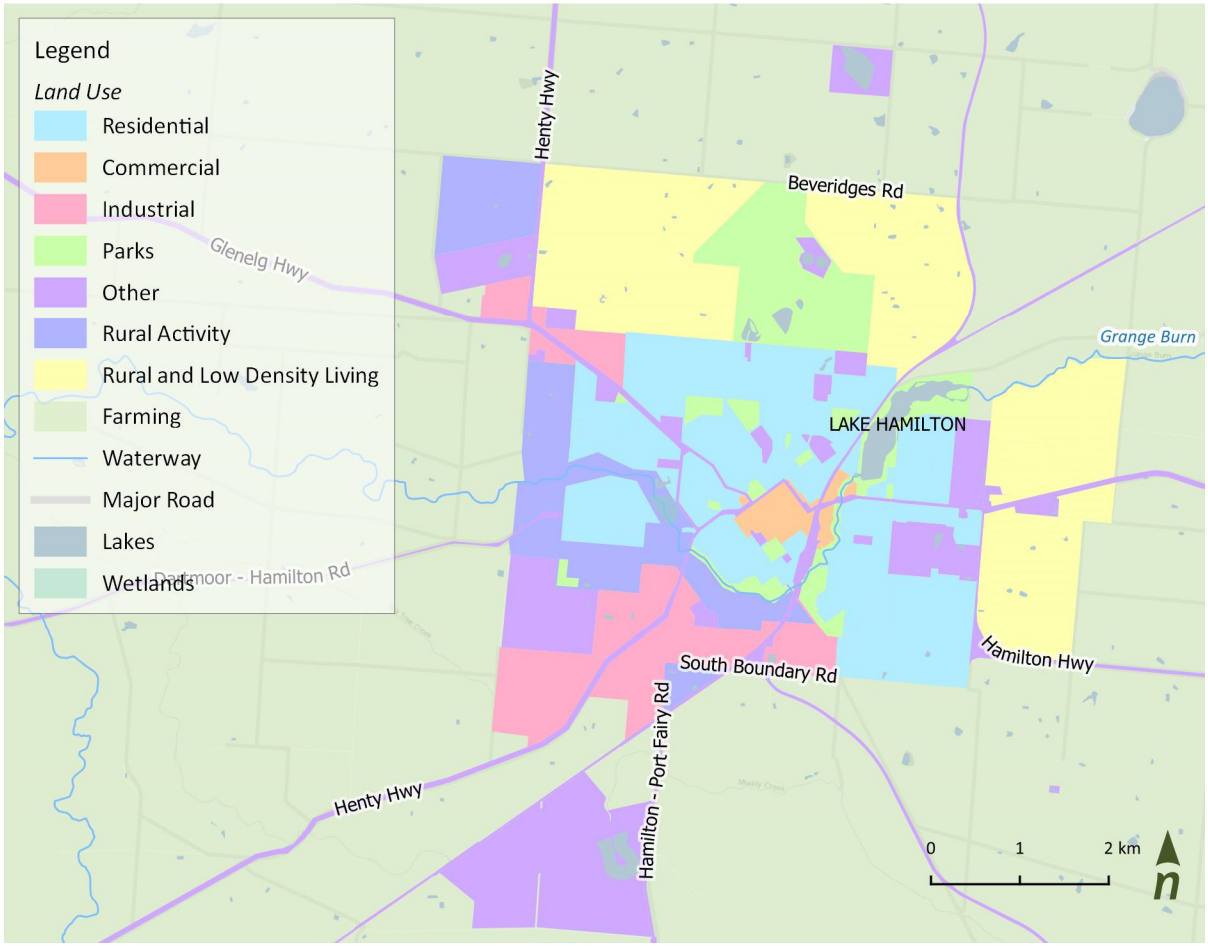


Figure 6. *Township land use*

2.5 Catchments, waterways, lakes, and wetlands

The Grange Burn is Hamilton's main waterway, a tributary to the Wannon River that flows to Lake Hamilton, an artificial lake on the eastern side of town that was created in 1977. It represents a critical recreational asset, and although the catchment and waterway have been substantially modified since Europeans colonisation, the Grange Burn supports a range of native flora and fauna. Substantial weed removal (particularly of woody weeds) and revegetation works has improved the quality of riparian reaches primarily through the '*Grange Burn Restoration Project*', a collaborative project between SGSC, GHCMA, and Wannon Water. The project involves removing pest species, creating habitat corridors, improving biodiversity and river health, and enhancing recreational uses.

The project has also supported a traditional plant use garden with interpretive signage; established with Gunditj Mirring Traditional Owners Corporation and Windamara Aboriginal Corporation. The river provides valuable habitat for threatened native fish including the endangered Variegated Pygmy Perch, Little Galaxias, and Glenelg Spiny Crayfish. It also supports one of the district's healthiest platypus populations and has locations for platypus viewing (The Spectator, 2017; and Glenelg Hopkins CMA, 2017).

Lake Hamilton is also an important recreational and economic asset hosting rowing, fishing boating as well as walking, running and cycling. Lake Hamilton experiences periodic blue green algae blooms and this impacts upon utility and enjoyment. Numerous reports and action plans have looked into this with causes including depth, excess nutrients in urban and rural runoff, a degraded riparian corridor upstream and stock accessing waterways (*per comms*).

The 14 Ha Grange Burn Wetlands was constructed from grazing land that now treats 70% of Hamilton's stormwater before it enters Grange Burn. This has reduced litter and dissolved pollutants entering Grange Burn as well as providing valuable habitat for birds.

The Old Hamilton Reservoir, old Res, could be considered a waterbody that as well as providing a non-potable water source to the town, is also the site of the unique Hamilton Institute of Rural Learning Bandicoot Enclosure with walking trails throughout the enclosure.

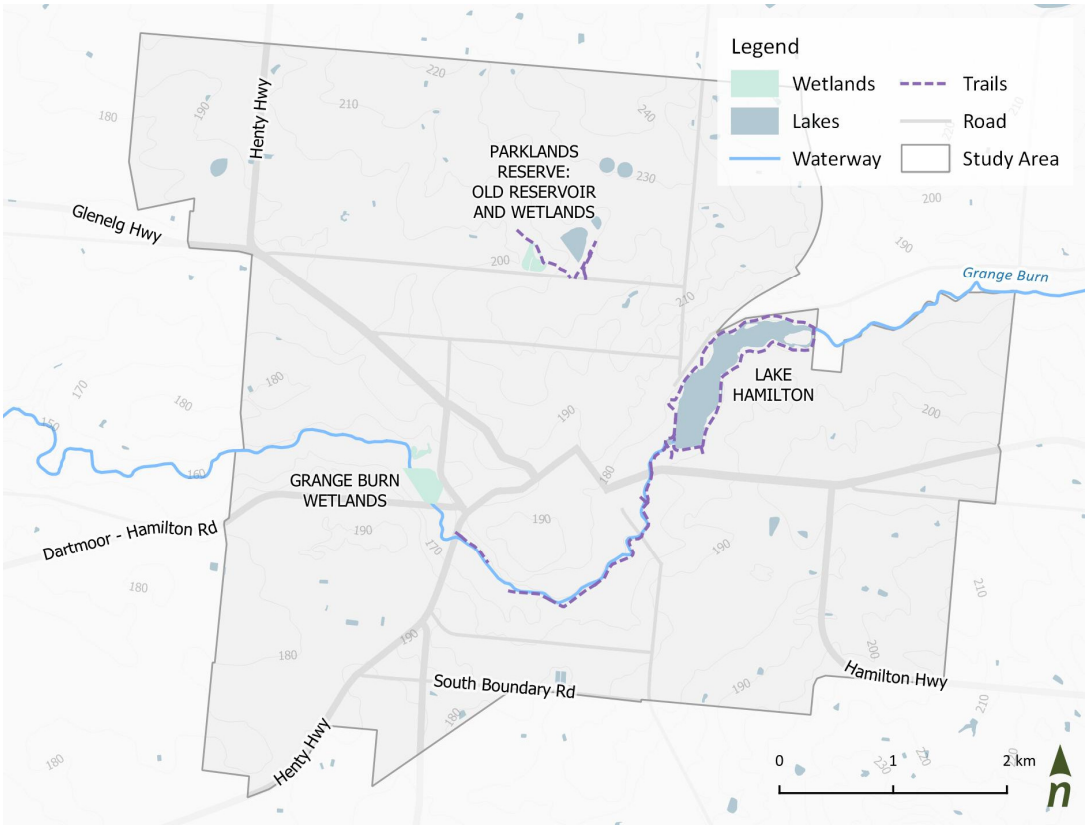


Figure 7. *Waterways, lakes and wetlands in Hamilton*

2.6 Flooding

Hamilton has low-lying areas that are prone to riverine flooding from Grange Burn and other tributaries, as well as some flash flooding following intense rainfall events. The largest recorded flood in Hamilton occurred in 1946 and caused widespread damage throughout the town, with major floods also occurring in 1983, 1984, 2004, 2010 and 2011.

A 2012 flood study conducted by Cardno for GHCMA determined the 1%AEP flood extents for the Grange Burn floodplain and minor tributaries (see Figure 8). The report recommended updating flooding and land subject to inundation overlays, building additional levee walls and additional monitoring.

Figure 8. *Map of 20% and 1% AEP flood overlays for Hamilton (Cardno, 2012)*

2.7 Natural values, health and well being

The natural assets of Hamilton discussed above are a valued part of the townscape directly contributing to the health and wellbeing of locals and tourists alike. Figure 9 illustrates links between water, and physical and mental wellbeing.

In Hamilton, these landscape assets contribute to what can broadly be termed liveability, improving visual amenity and supporting physical health through active recreation opportunities, including rowing, 'parkrun', and walking and cycling trails. In a 2018 survey of the Shire more than 9/10 survey respondents participated at least once in sport, recreation or physical activities in the past 12 months. Most of the popular activities made use of the publicly available open space and natural assets (SGSC Recreation and Leisure Plan, 2019).

Amenity and liveability are intrinsic to a number of the council's plans and strategies. Figure 9, is sourced for the Shire's Economic Development Strategy (2011), highlights the links between amenity and economic prosperity.

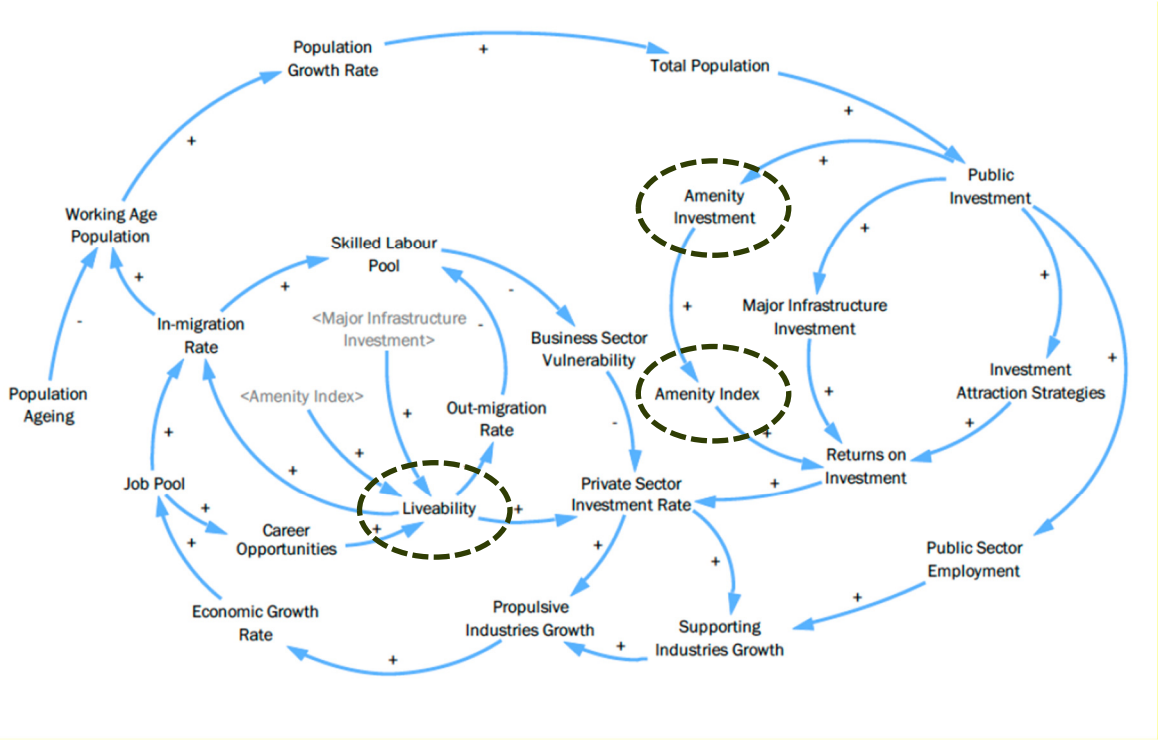


Figure 9. *Amenity and liveability are key parts of Hamilton's future (Economic Development Strategy, 2011)*

Hamilton residents are also passionate about trees. In the urban landscape trees mitigate the urban heat island effect, future-proofing cities against some of the impacts of climate change. Urban forests impact human health and wellbeing in a number of ways; the cooling effect of a healthy urban forest impacts on mortality and morbidity, work productivity, and mental health. Hamilton's urban forest incorporates native and introduced tree species throughout streetscapes and in community spaces like the Botanic Gardens.

3 Hamilton's water cycle

Hamilton's water cycle is unique. Potable water is supplied from the traditionally reliable catchments of the Southern Grampians, with non-potable sources available from a recycled water network and the 'Old Reservoir' network for the irrigation of open space. As noted above, approximately 70% of the urban catchment is treated in a constructed wetland, improving water quality downstream. The town has large scale rainwater harvesting projects as well as a high take up of residential rainwater harvesting.

The following section looks at each aspect of the water cycle to provide context for the identification of opportunities that build on the evident natural advantages of Hamilton's water cycle to realise a vision of environmental, cultural and economic resilience.

3.1 Potable water supply

Hamilton's water is part of the Grampians system, with water sourced from the "western slopes of the Victoria Range in the southern part of the Grampians National Park" (Wannon Water 2017) with water diverted from eight streams and a headworks bore. The main storage at the head of the Grampians system is the 350 GL Rocklands Reservoir. Wannon Water manages the bulk entitlement arrangements for both the stream diversions and extractions from Rocklands.

Water flows from these diversions via approximately 47km of pipeline to supply the Hayes, Cruckoor and Hartwichs storages. Water reaching Hamilton is treated at the Hamilton water treatment plant (WTP) that was adjudged as producing the best tasting tap water in Victoria in 2018. The system that supplies Hamilton also supplies the townships of Tarrington and Dunkeld.

Figure 11 illustrates the relative locations of these assets in the context of the system.

Long term water supply planning

As part of their Urban Water Strategy (2017-2065), Wannon Water undertake population and climate change scenario modelling to understand resilience within the Grampians system and the need for potential upgrades over the longer term. Wannon Water presented this information to stakeholders during the workshop series, highlighting that under a high climate change, high demand scenario, the need for system augmentation may be required as soon as 2031-2036. At this stage, the planned augmentation would include purchasing an increased entitlement from Rocklands.

So, while in the near future Hamilton's water supply is secure, over the longer term, like all towns and cities in Victoria, Hamilton and Wannon Water will need to consider supply security opportunities in the context of a changed climate.

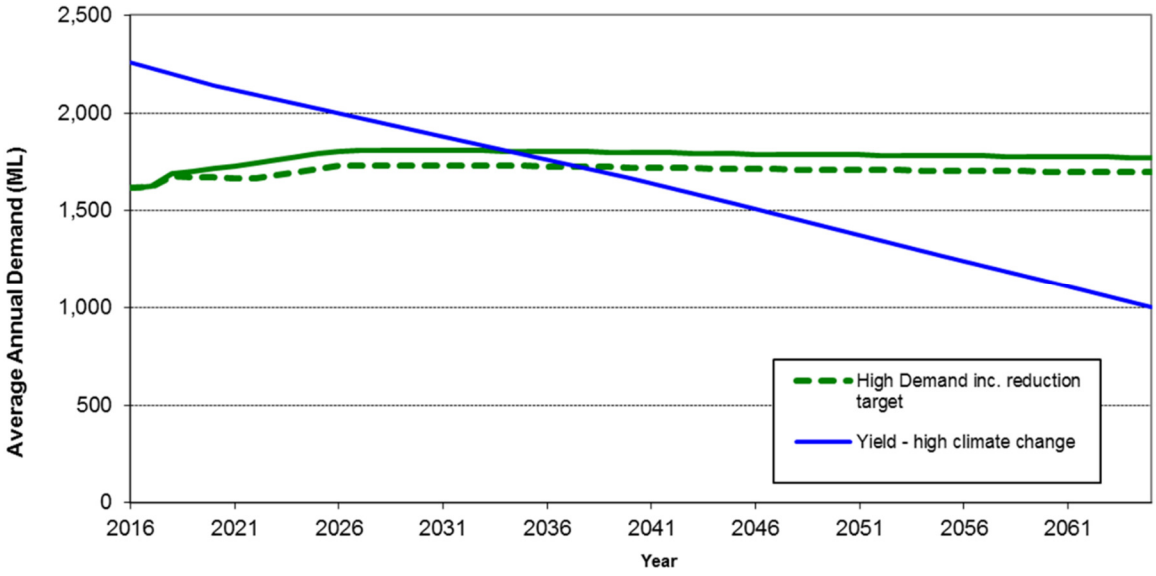


Figure 10. *Grampian system supply and demand (Courtesy Wannon Water)*

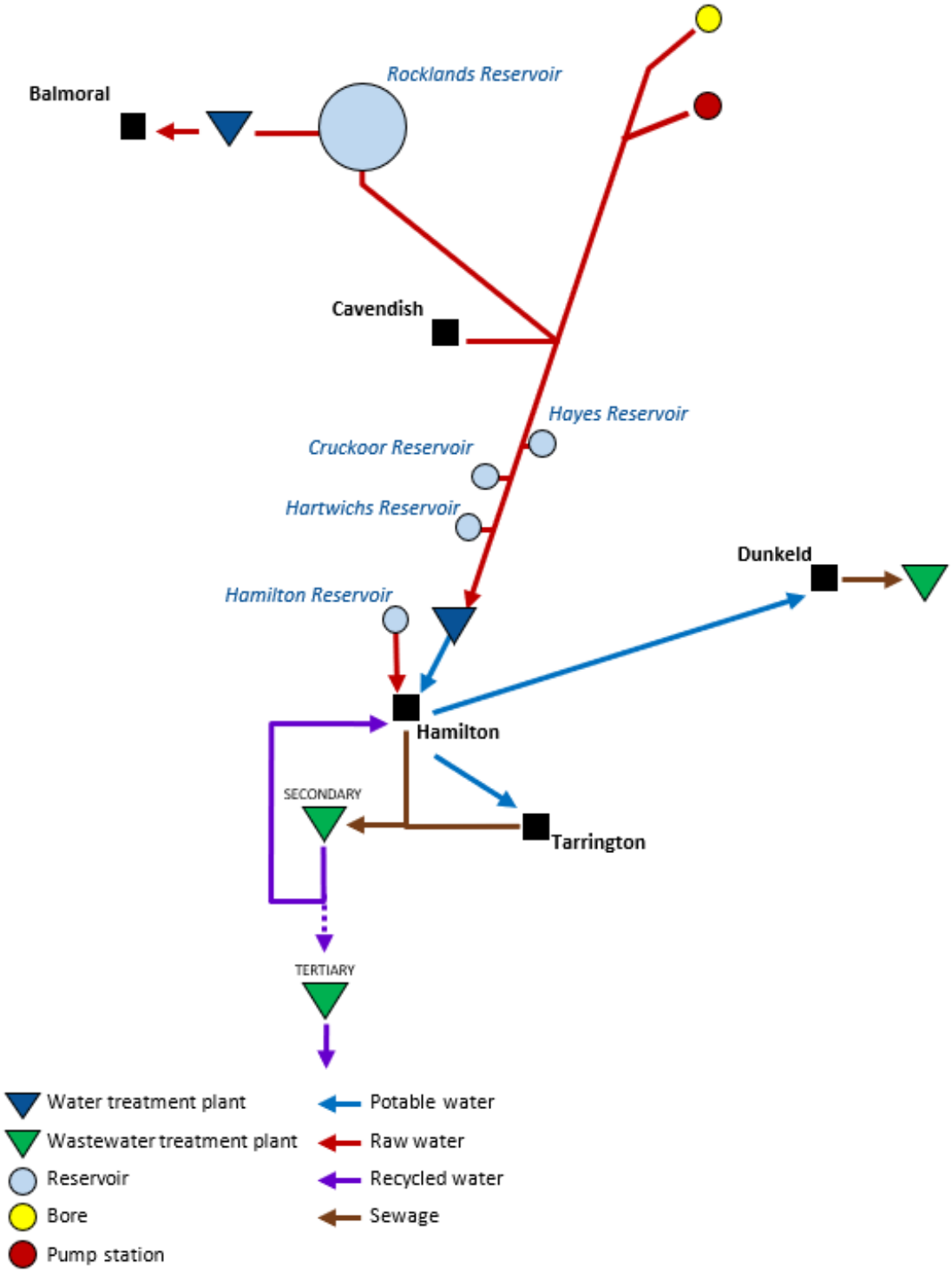


Figure 11. *The Grampians network*

3.2 Potable water consumption

Figure 12 shows the breakdown potable water use in Hamilton. Approximately three quarters goes to residential users, equating to approximately 182 L/person/day (Wannon Water, 2015/16), exceeding 'Target 155' as per DELWPs 'Liveable Cities and Towns' (2016). Non-residential uses were next greatest and Council use is included within this category. Wannon Water's figures also accounted for water supplied directly to open space, which can be seen to be a relatively small with much of that demand accounted for under Council's water use figures.

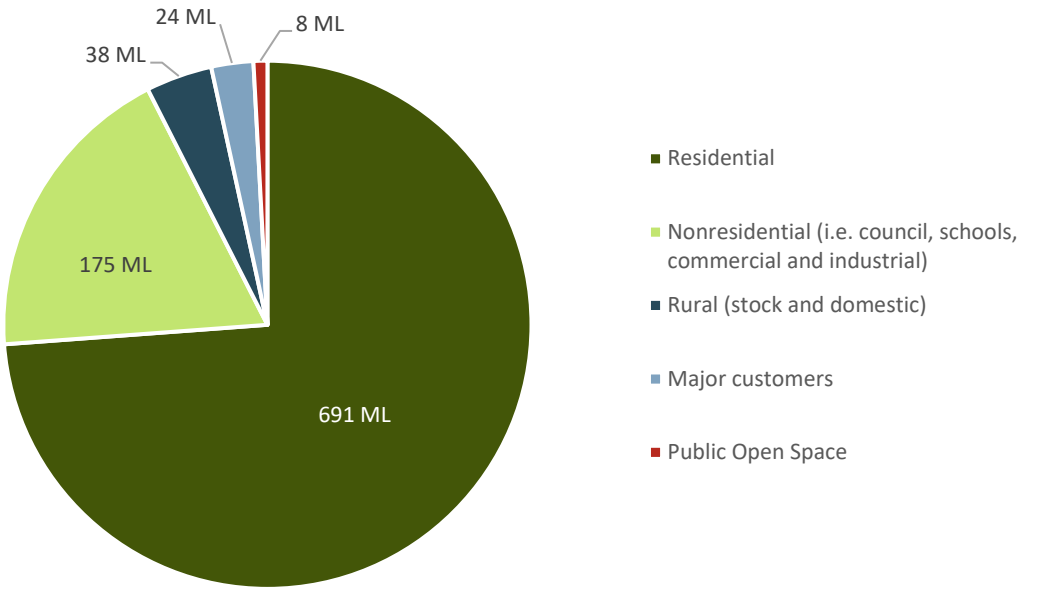


Figure 12. *Water use in Hamilton 2015-16 FY (Wannon Water - Urban Water Strategy, 2017)*

Figure 13 breaks down Southern Grampians Shire Council's (SGSC) water use in Hamilton. Of 34 ML in 2018/19, approximately 10 ML is used for the irrigation of sportsfields and open spaces. This is far less than the typical 70% or more that Council's typically consume for irrigation. It is assumed that this is due to the availability of Class C recycled water and raw water from the 'Old Reservoir' network (discussed further below). Also notable is that the largest individual users are the saleyards and town swimming pools (including HOSP @ 5ML and HILAC @ 5.8ML).

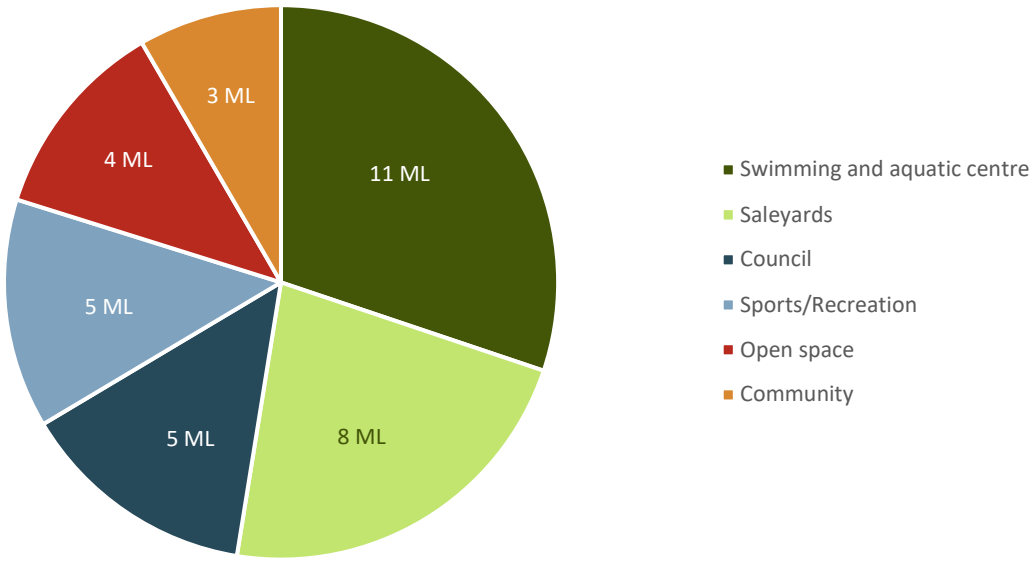


Figure 13. *SGSC Potable water use for Hamilton, 2018-19 FY (total = 34 ML)*

3.3 Wastewater

Wannon Water manages wastewater collection, conveyance and treatment services in Hamilton. Wastewater is treated at the Hamilton wastewater treatment plant (Figure 14), producing Class C recycled water that is suitable, and used for, irrigation (discussed further below). The township also has a Class A treatment plant that was constructed to service the Iluka Resources mineral sands operation that is now closed, and the treatment plant is currently not operational.

Wannon Water, through their Urban Water Strategy advise that there is adequate capacity in the sewerage system to accommodate anticipated growth. An exception may be as proposed new abattoir that could discharge directly to the treatment plant that may present a risk to treatment processes and salinity levels in recycled water. Further, anecdotal evidence suggests that there is an inflow and infiltration issue in the town's wastewater network, with flows spiking during rainfall events.

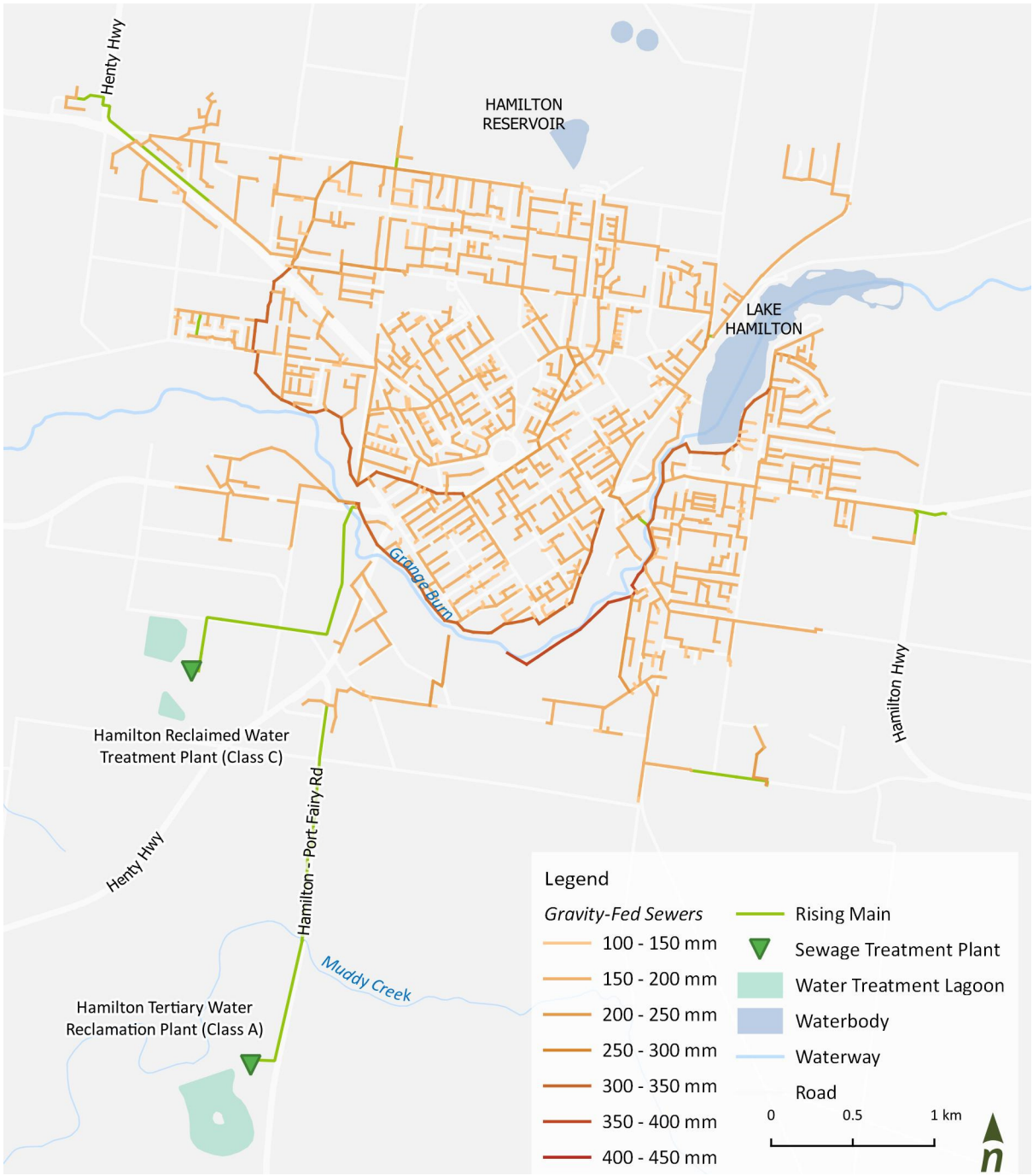


Figure 14. *Hamilton township wastewater infrastructure*

3.4 Alternative water sources

Raw Water – The Old Reservoir

SGSC own and manage the "Old Res" that was constructed in 1880 with a capacity of 125 ML. Today, raw water is still reticulated to the central business district via some of the original wooden reticulation pipes. The Old Res collects water from surrounding catchments, delivering irrigation water to the adjacent Pedrina Park, Hamilton Showgrounds, Hamilton College, Melville Oval and the Hamilton Botanic Gardens, which are connected via the network illustrated in Figure 15. As noted above, the land surrounding the Old Res has been developed as a Bandicoot enclosure providing protection for an endangered species as well as a place for relaxation, fishing and walking for Hamilton's residents.

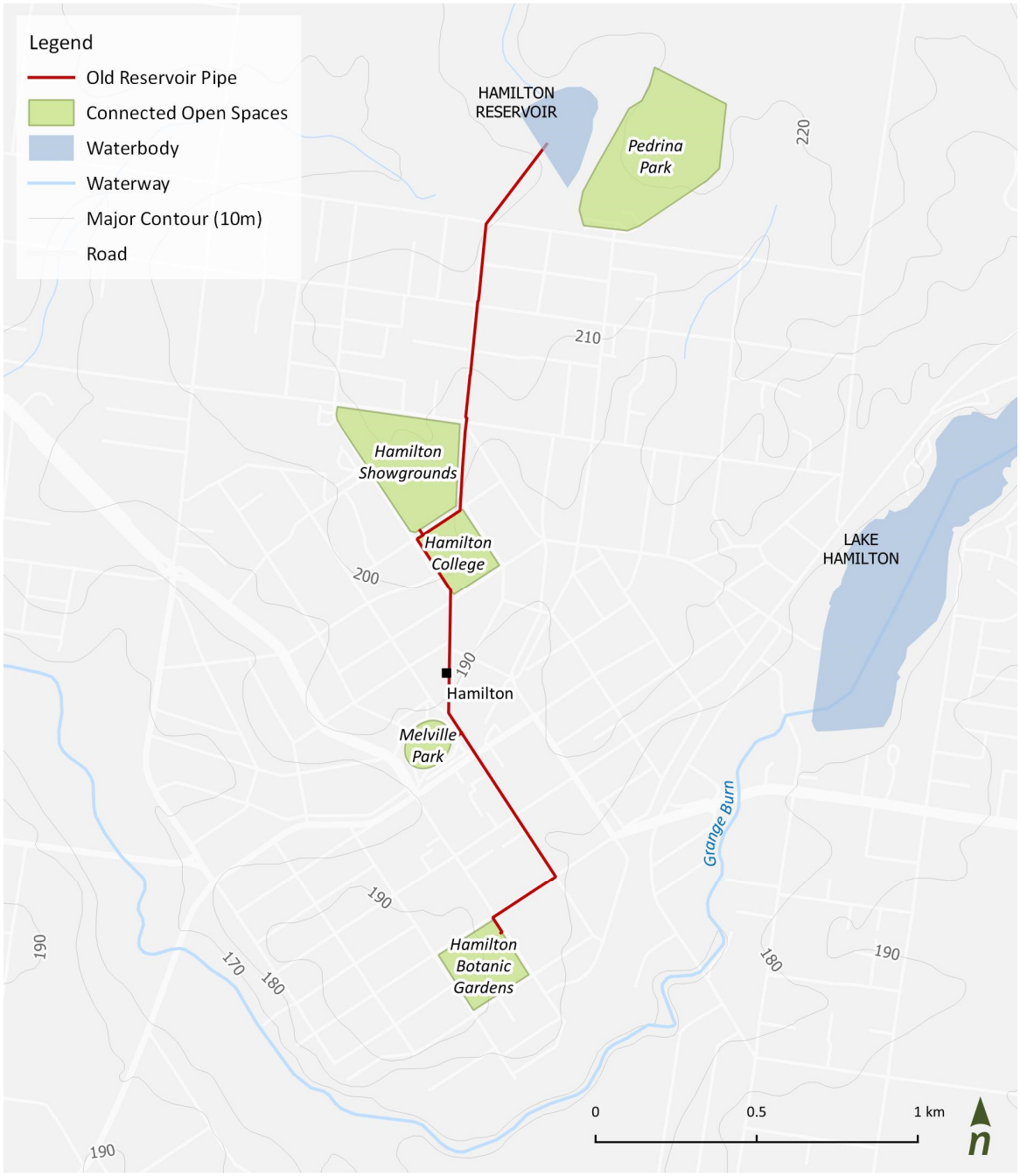
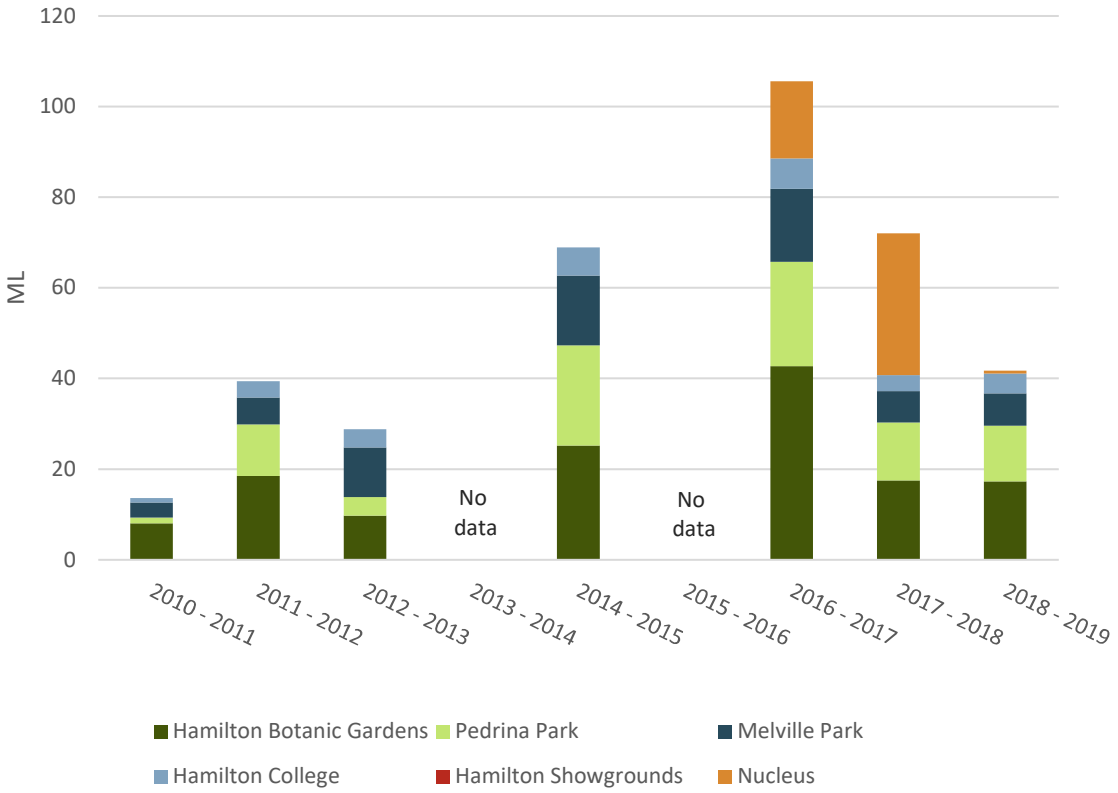


Figure 15. *Hamilton Reservoir and its associated raw water reticulation network*

Usage of raw water from the Old Res varies from year to year, with climate and rainfall typically driving the demand for the irrigation of sites along the network (Figure 16). Very low usage can be observed during the wet years of 2010 – 2012, with irrigation increasing in recent years.



Note: *"Nucleus" demand was associated with a leak.*

Figure 16. *Old Reservoir water consumption*

Figure 17. *Hamilton Reservoir ('Old Res')*

Recycled Water

The Hamilton STP treats approximately 635 ML/year of wastewater (Wannon Water, 2017), producing Class C quality water that is suitable for the irrigation of recreational reserves and pastures. Figure 18 shows the Class C network irrigating the Hamilton Golf Club, ovals, parks, tennis courts, pastures and businesses like Hamilton turf. 100% of treated water is irrigated. Anecdotally, there is excess recycled water available, above current demands. During consultation stakeholders discussed the potential for this water to be directed toward higher value end uses than, for example, irrigating pasture.

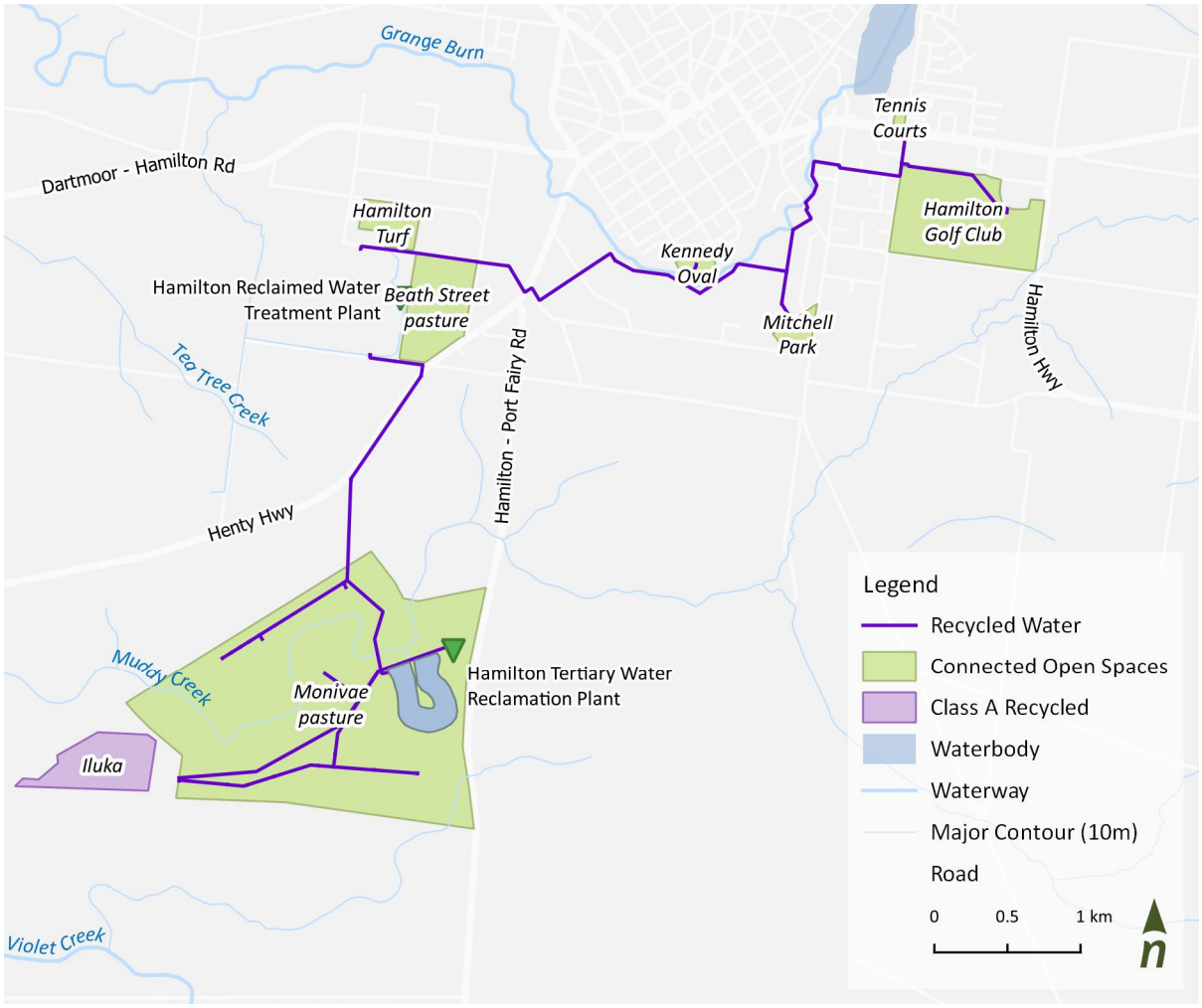


Figure 18. *Class C Recycled Water network*

Rainwater harvesting

The Wannon Water Urban Water Strategy suggests a high level of rainwater tank ownership within the Grampians system, with 58% of households having a rainwater tank. This number is system wide (i.e. beyond just Hamilton) and includes smaller townships and rural properties.

The most notable example of rainwater harvesting within Hamilton however is at the Saleyards. Hamilton's saleyards are one of Victoria's busiest and with a new roof installed in 2015, there was an opportunity to harvest rainwater primarily for truck wash down (noting that the bore water originally used was causing rust). Four 230kL tanks collect water from the saleyards roofs significantly reducing demand on the town's water supply. The scheme also reduces stormwater runoff into receiving waterways.

This precedent highlights the potential for other rainwater harvesting opportunities across town.

3.5 Stormwater and pollutants

Stormwater is generated when rainfall comes into contact with hard, paved surfaces like footpaths, roads and carparks before being directed to the drainage network. Stormwater carries pollutants to receiving environments including nutrients, grease and oils, heavy metals and litter. To protect the Grange Burn, the Grange Burn wetland and improve water quality within Lake Hamilton, stormwater management and treatment is an important aspect of the urban water cycle.

Modelling was undertaken to estimate the stormwater flows and associated pollutant loads typically generated within Hamilton's urban area each year. The model used, MUSIC, specifically focusses on total nitrogen, total phosphorus, total suspended solids and gross pollutants(litter). The rainfall record for 1980 to 1989 was used from the Casterton rainfall station, as this is a representative station with an appropriate timestep.

Scenarios

Two water and pollutant balance scenarios were examined:

- **Current**: the stormwater and pollutant balance under current climate and existing urban development conditions.
- **Future:** based on anticipated land use changes. With no specific timeframe, this scenario assumes all proposed development areas are built out.
- **Climate change:** The impact of climate change was modelled by scaling the historical rainfall data to the median (50th percentile) rainfall and PET changes for 2040 and 2065, as outlined in Section 2.3 above.

Figure 19 illustrates the changes in land use and the fraction of impervious surfaces which could be expected due to projected development as per the existing planning scheme. Modelling outputs are included in Attachment B with a summary of results in Table 2 below.

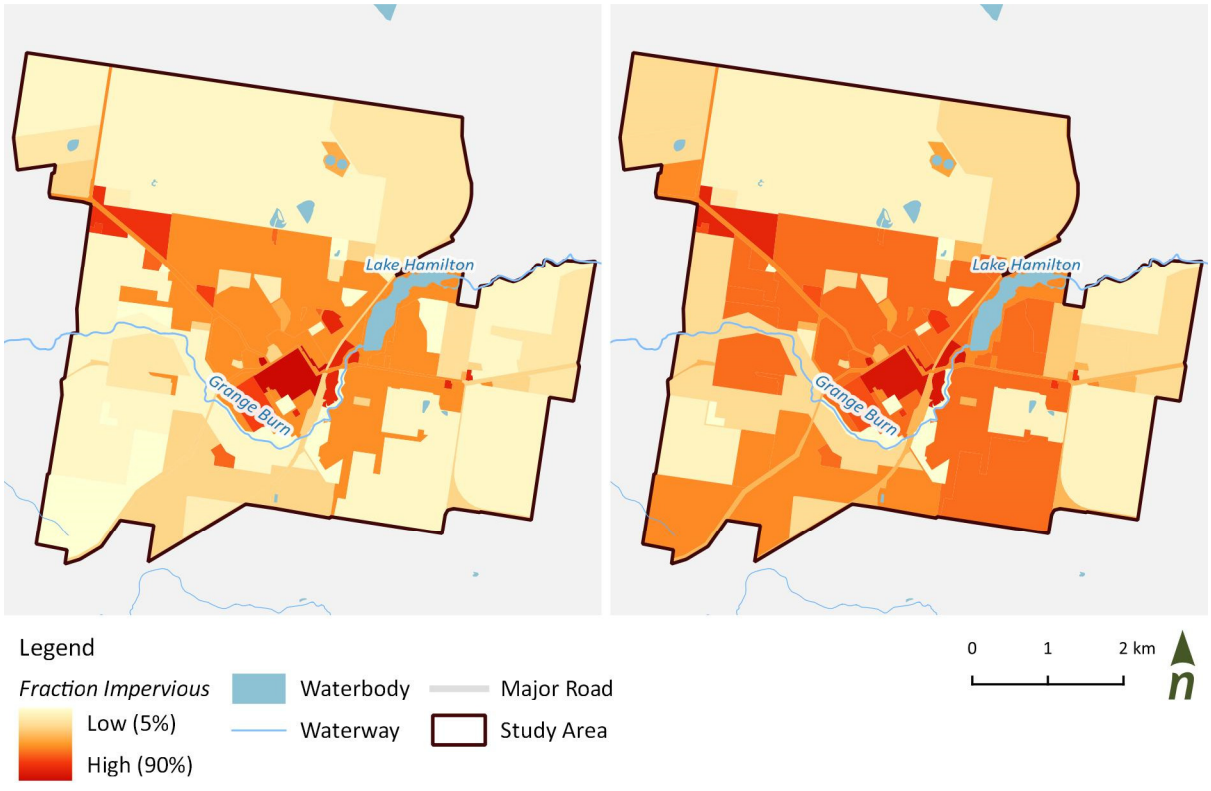


Figure 19. *Land use changes expected in Hamilton based on the planning scheme.*

Table 2. *Stormwater modelling results*

Model#	Land use	Impervious area (ha)	Climate (year)	Precipitation (mm/year)	PET (mm/year)	Stormwater (GL/year)	Nitrogen (tonne/year)
A	Existing	840	1995	595	1200	4.2	11.6
B			2040	565	1245	3.8	10.8
C			2065	545	1280	3.8	10.4
D	Developed	1160	1995	595	1200	5.6	16.4
E			2040	565	1245	5.2	14.7
F			2065	545	1280	5	14.3

Comparing the results of the models for existing and developed landuse scenarios under the current climate (Model A and D) shows that Hamilton can expect changes in stormwater flow rates (36% increase) and pollutant loads (41% increase) that will be roughly in line with increases in impervious surfaces (38% increase). In these examples the same rainfall and climatic data is assumed. Comparing model runs with steady land use (i.e. Model A, B, and C) and changing climates, show anticipated reductions in rainfall expected due to climate change (Table 1 above) will cause some reduction in runoff and pollutant loads. The model results are graphed in Figure 20, which shows the reduction in run off and pollutants due to climate change that does not negate the increase which would come from development.

Climate change will lead to some decreases in runoff and annual nitrogen loading (where nitrogen is used as a proxy for all pollutants). However, because climate change will lead to more intense rainfall events and result in an increase in risk of flash flooding, this reduction in average annual pollutant loading should not be considered a 'benefit' or a reason to overlook efforts to reduce the area of impervious surfaces directly connected to waterways.

the greatest volume of stormwater generated is associated with smaller and more frequent events. Hence water sensitive urban design (WSUD) assets are typically sized to manage and treat 3 – monthly events (i.e. events that are likely to occur four times a year or smaller).

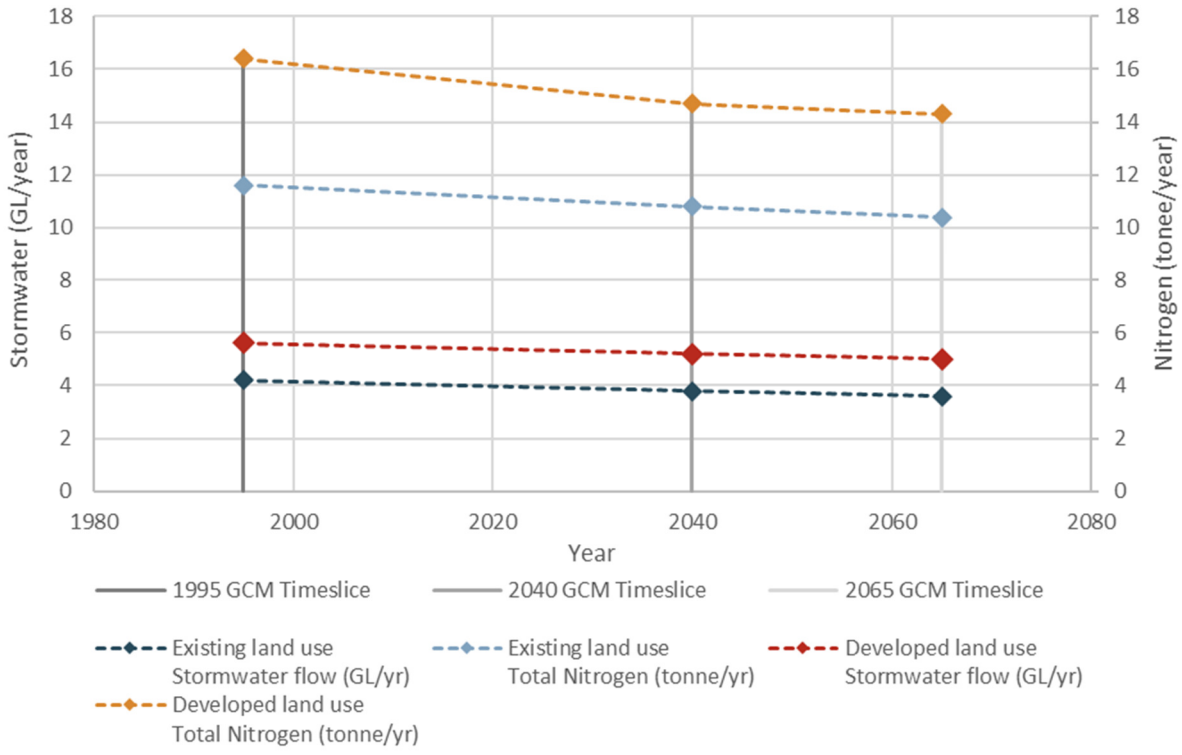


Figure 20. *Climate change and development impact on stormwater and pollutant loads*

3.6 Stormwater Treatment

Hamilton has existing stormwater treatment systems, the most prominent being the aforementioned 14 Ha Grange Brun wetland that treats 70% of the towns stormwater (see 2.5 above). This wetland is shown as two assets adjacent to the Grange Burn in Figure 21 below. This is a significant water quality asset that contributes to the overall uniqueness of Hamilton's water cycle assets.

Figure 21 shows the catchment areas treated by existing WSUD assets including litter traps, biofilters and wetlands. Blue areas show smaller assets adjacent to Lake Hamilton including near Tyers and Grey St on the western side of the lake and along Rippon Rd (at the end of Handbury Boulevard) adjacent to the lake. Based on observation, the effectiveness of the Tyers St asset may require review (Figure 22), while there is confidence that the Rippon Rd asset is functioning well. Further, SGSC have also been trialling litter nets that at the time of visiting were operating effectively, removing litter from the downstream environment (Figure 24).

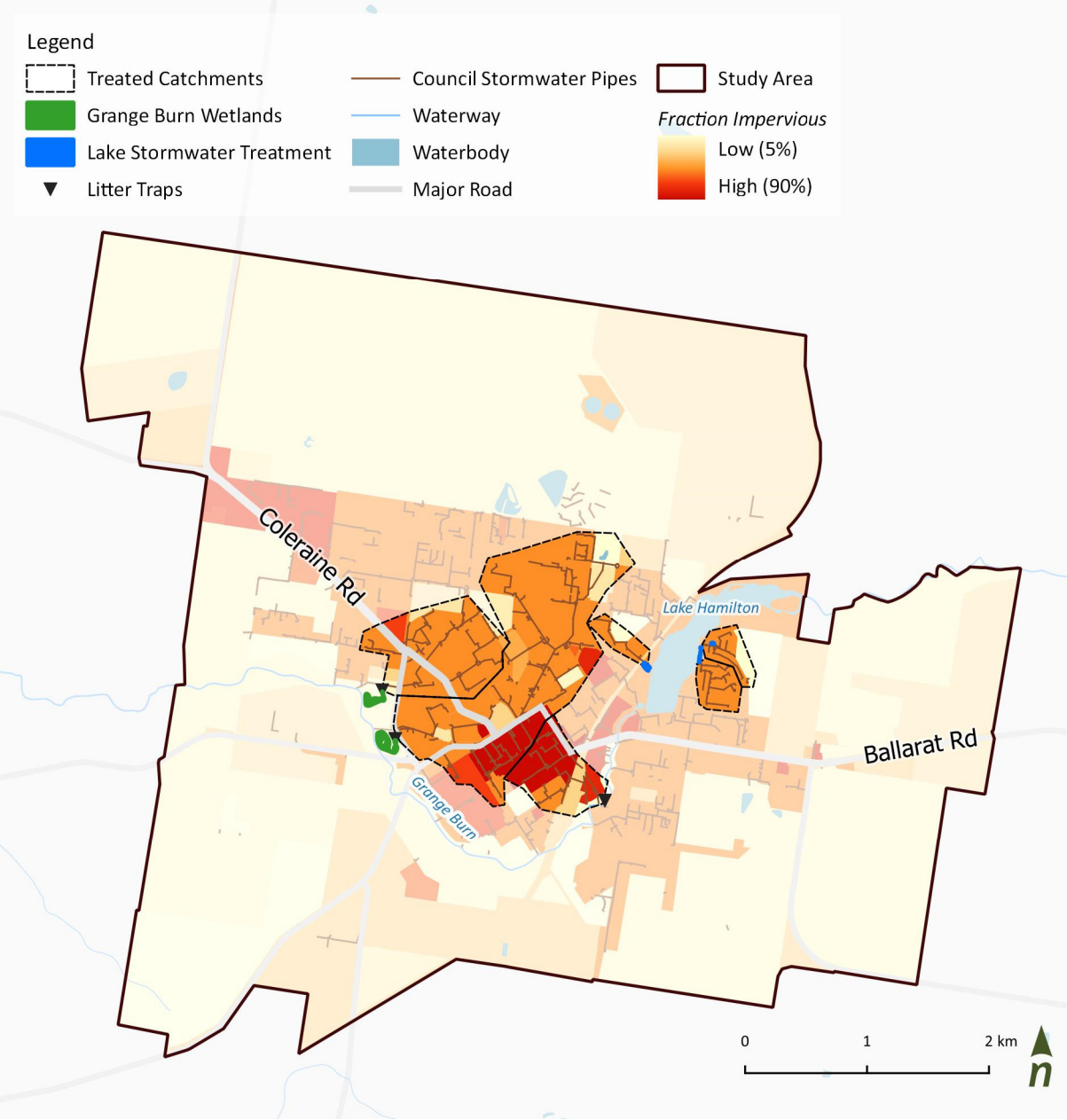


Figure 21. *Existing WSUD treatment assets and catchments in Hamilton*

Figure 22. *Stormwater treatment asset near the corner of Tyers and Gray St*

Figure 23. *The Grange Burn wetlands noting the open water and potential for greater density of emergent macrophytes*

Figure 24. *Installed litter stocks*

3.7 Water cycle summary

The summary above highlights some of the important issues and pressures faced by Hamilton, and also the advantages Hamilton may have in addressing those. In summary:

- Hamilton has access to a high-quality potable water supply network, that has traditionally been highly reliable.
- Wannon Water modelling suggests that under high climate change and demand scenarios augmentations via greater bulk entitlements out of Rockbank Reservoir, could potentially be required by 2036.
- Population drives potable water demand, with about ¾ of total potable demand in Hamilton is residential.

- Hamilton has access to alternative, non-potable water supplies from both a Class C recycled water network and a raw water supply. Both of these networks supply irrigation water for pastures, parks, schools, sportsgrounds and high value community assets including the Hamilton Botanic Gardens.
- Likely due to the availability of non-potable sources, Council's use of potable water for open space irrigation is relatively low when compared with other local government areas.
- Wannon Water's Urban Water Strategy notes approximately 58% of households within the Grampian system have a rainwater tank
- The largest mains water consumption in the township are the pools / aquatic centres and the Saleyards that is home to a significant rainwater harvesting scheme .
- Urban development in Hamilton and the associated increase in imperviousness will increase stormwater runoff and pollutant loads to receiving waterways including Grange Burn and Lake Hamilton, putting pressure on values within those systems, diminishing their condition over time.
- The impact of climate change will reduce rainfall and increase evaporation, reducing total annual runoff. However, heavy storm events will be more frequent, potentially compounding existing flash flooding issues.
- With climate change expected to increase PET by up to 5.7%, decrease rainfall by up to 12.7%, and decrease runoff by up to 37% by 2040 (90th percentile), there is potential for the long-term water security of Hamilton to be impacted.

  Wannon Water has investigated contingencies in this event; however, it does underscore the importance of optimising the use of Hamilton's various non-potable water supplies, across recycled water, raw water, rainwater and stormwater.

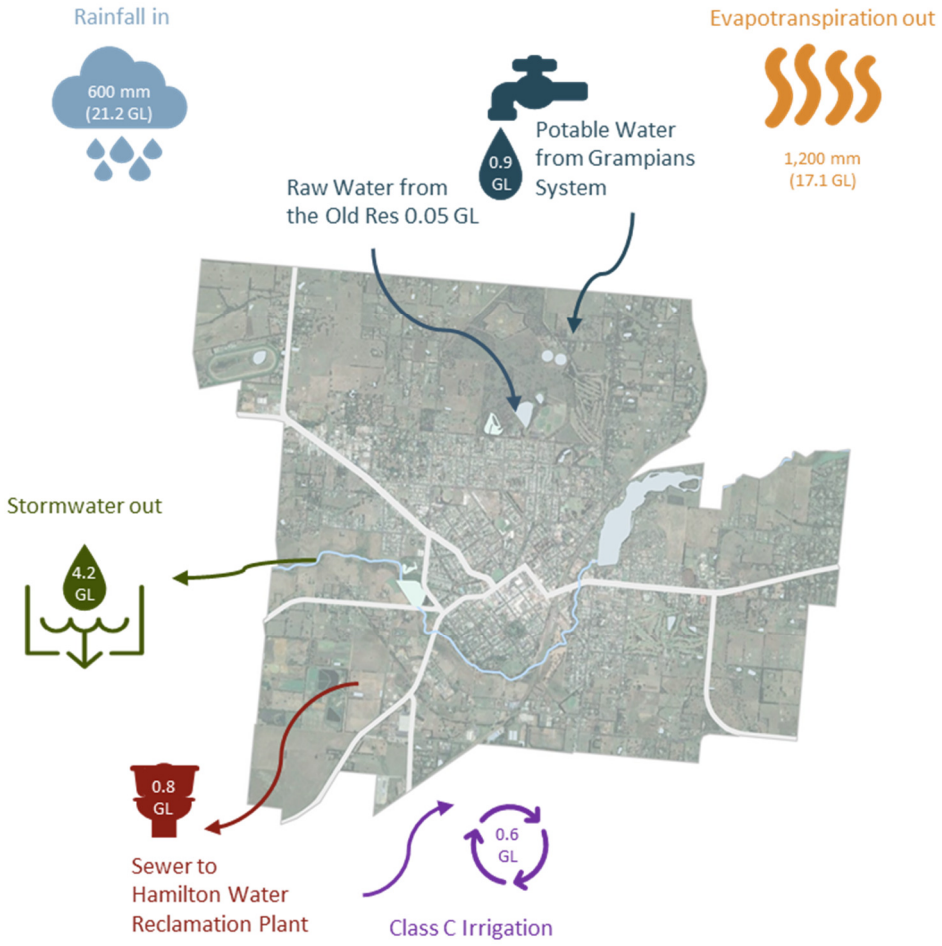


Figure 25. *Hamilton water cycle schematic*

4 Vision, Outcomes, and Objectives

The vision, outcomes and objectives for the Hamilton IWM Plan are drawn from the Great South Coast Region SDS. As SGSC was a part of that forum, and contributed to the development of that framework, adopting these vision and outcomes is logical to ensure consistency with other organisations in the region and with other IWM Forums across the State.

4.1 Vision

The vision for the Great South Coast Region IWM Forum is:

Water is Life Pareeyt Poondee-teeyt
(Dhauwurd Wurrung language group)

We will work together with our communities to deliver integrated water outcomes contributing to the resilience of our environment, culture and economy

This vision emphasises the central role water plays in sustaining community, culture and economy as well as the emphasis on collaboration between organisations to achieve this.

4.2 Outcomes and objectives

The SDS sets out seven outcomes for IWM across the region (Figure 26). Each regional SDS has seven outcomes however the wording associated with each is tailored toward the specific IWM Forum group. They are relatively broad, covering every aspect of the water cycle across water, sewerage, stormwater, waterways and flooding while also extending to community, landscapes and economy. In doing so they open the door for the plan to consider the contribution that water can have on a range of values and activities across Hamilton and on realising the community's aspirations for their town.

The outcomes were used during consultation to frame the identification of issues and opportunities. A full summary of the outcomes and the objectives associated with each, as published within the SDS, is provided in Attachment A.

Figure 26. *Great South Coast Region Strategic Directions Statement outcomes*

5 Issues and opportunities

Having established the water cycle context in Hamilton, a consultation process identified issues and opportunities for this IWM plan to address.

5.1 Opportunity long list

The first workshop series was made up on three sessions

- A council and agency stakeholder workshops (attended by SGSC, Wannon Water, SRW)
- A SGSC Councillors meeting, and
- A community session within the Hamilton library.

The first session sought to understand from those working in the field, the issues and opportunities Hamilton experiences and has under each of the seven outcomes. A short contextual presentation was delivered for each outcome that led to discussion and debate as to what the key takeaways were , whether the data presented reflected actual experience and whether there were additional gaps to be addressed.

At workshop completion a 'long list' of issues and opportunities was reflected back to the group. In the following sessions with Councillors and community, a similar, albeit less formal process was undertaken to understand what each group saw as the key water related issues under the same outcomes. A long list is included in Attachment C.

Figure 27. *Issues and opportunities - Workshop 1.*

5.2 Opportunity short list

Following the first workshop series, the identified opportunities were reviewed by the Project Control Group (PCG) with a short list of 12 opportunities agreed upon for further consideration. The titles of the 12 opportunities are listed below. A more detailed summary is provided below.

- Lake Hamilton: Blue green algae action plan
- Hamilton Showgrounds roof water harvesting for HILAC
- Expansion of the recycled water network
- Irrigation efficiency investigation
- Water for horticulture
- 'Old Res' system investigation
- Environmental and cultural wayfinding
- Grange Burn urban water quality improvement program
- Residential rainwater disconnection
- Wetland condition and stormwater harvesting study
- CBD Streetscape WSUD and greening
- Integrated water networks

5.3 Opportunity assessment

In the second workshop series (a similar three-part structure as the first), the opportunity short list was critically reviewed against a qualitative project assessment framework, using a simple low, medium, high rating against the following criteria:

- cost (both advantages and disadvantages)
- risk
- urgency
- importance.

While this assessment method did prioritise the opportunities, the discussions around them were arguably more important, as attendees critically discussed the merits of each option before reaching a position. At the completion of that process, a further vote was taken to decide which opportunities would be best suited to, and progress through to, concept design. These opportunities were then taken to Councillors and the community for review and to gauge level of support.

During the discussion in workshop 2 it was agreed that:

- *Central business district (CBD) streetscape WSUD and greening* (Opportunity 3) was suitably addressed and progressed in current masterplans and was not required to be addressed in this plan
- *Wetland condition and stormwater harvesting* (Opportunity 8) was not a high priority as Hamilton seeks to optimise the use of existing non-potable water sources (raw and recycled water).
- *Integrated water networks* (Opportunity 11) was sufficiently covered by assessments of recycled and raw water networks as part of other opportunities.

These opportunities were omitted from subsequent discussions.

It is notable that discussions with the community tended to focus upon the health, amenity and utility of natural assets, like Lake Hamilton and the Grange Brun and the importance of recreational activities on and around the water.

Table 3 below summarises the outcomes of the review.

Table 3. *Opportunity assessment summary*

Opportunity	Preliminary assessment method					
	Benefits	Urgency	Importance	Cost (Advantages / Disadvantages	Risk	Concept design votes
Showgrounds roof water harvesting for HILAC	H	L	M	H	H	12
Irrigation efficiency investigation	H	L	L	H	M	6
Environmental and cultural wayfinding	M	L	L	H	H	5
Recycled water for horticulture	H	M	M	H	H	8
Lake Hamilton: Blue green algae action plan	H	M	H	H	h	13
'Old Res' system investigation	H	M	M	H	M	6
Grange Burn urban water quality improvement program	M	L	M	M	M	4
Residential rainwater disconnection	H	H	L	M	M	3

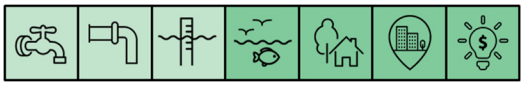
Based on the above rating, votes cast within the workshop and subsequent discussion with the PCG, the following four opportunities were agreed to progress to concept design stage:

1. Lake Hamilton Blue Green Algae Action Plan
2. Showgrounds roof water Harvesting for HILAC
3. Expanding the recycled water network for horticulture
4. Old res system investigation.

The following section provides a summary of each of these opportunities including the SDS outcomes that the opportunity addresses.

5.4 Opportunity summaries

H-1. Lake Hamilton Blue Green Algae Action Plan



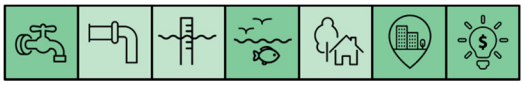
Blue green algae has been a regular occurrence in Lake Hamilton impacting upon the recreational, ecological and aesthetic values of this critical man-made asset. Numerous past reports have identified upstream rural catchments, excess nutrients, waterway erosion and sediment transport and livestock interactions with waterways as key drivers. Urban catchments also contribute nutrient loads and can be influential over summer months.

This opportunity will specifically identify and prioritise a suite of WSUD assets designed to treat urban runoff draining to Lake Hamilton from existing drainage outlets.

Works will include SGSC lead stormwater management and urban community engagement, and GHCMA catchment programs, and investigate structural works on the lake.

Partners	SGSC (lead) GHCMA
Location	Lake Hamilton urban catchment
Timeframe	Concept April 2020 Asset construction ~ 5 years
Scale	Hamilton urban catchment

H-2. Roof water harvesting for HILAC



The Hamilton Indoor Leisure and Aquatic Centre (HILAC), is one of the largest potable water users in Hamilton. HILAC itself and the nearby Showgrounds buildings have large roof areas that could potentially collect and provide large volumes of rainwater for non-potable demands within HILAC. The Showgrounds has limited demand for that water, with potential space for storages (TBC).

The opportunity is to investigate the feasibility of harvesting rainwater from nearby roofs to reduce potable water use within HILAC (as well as other nearby demands).

The investigation would identification of suitable non-potable demands, assessment of storage requirements (and locations), a transfer concept and assessment of potential volumes saved and cost of that water.

This example is seen as replicable in other towns, as well as influencing potential Council policy on broader rainwater harvesting and use.

Partners	SGSC (lead) Wannon Water
Location	Hamilton HILAC and Showgrounds
Timeframe	Concept April 2020 Asset construction ~ 2 years
Scale	Building / precinct

H-3. Irrigation efficiency investigation

Many reserves in Hamilton are irrigated with potable, raw or recycled water. It is the intent of this plan that all water, regardless of source, is used efficiently. While some parks and reserves have automatic sprinkler systems, manual watering is required in some locations and anecdotal evidence suggests that some irrigation infrastructure could be upgraded to improve water use efficiency.

The opportunity is to improve the efficiency of irrigation systems across open spaces in Hamilton.

Partners	SGSC (lead)
Location	Hamilton Parks and Gardens
Timeframe	12 – 24 months
Scale	Township

This could involve:

- Prioritising open spaces and irrigation demand
- Auditing current systems to identify opportunities for irrigation system upgrades
- Explore the use of smart irrigation systems and soil moisture probes (linking to the LoRaWAN network) to improve efficiency of irrigation (currently being trialled in Pedrina Park)
- A cost benefit to understand highest priority works
- Consider drought-tolerant or warm season grasses that can lower irrigation rates

H-4. Recycled water for horticulture

'Class C' recycled water produced at the Hamilton Water Reclamation Plant (WRP) is used for a range of irrigation purposes in Hamilton with excess Class C recycled water irrigated to the 'Monivae' pasture. 100% of recycled water is applied to land via these end uses.

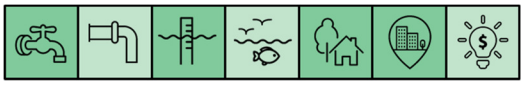
This opportunity would investigate the identification of higher value uses for this recycled water, and specifically to support horticulture through the extension of the Class C network.

The opportunity is to establish of a horticultural trial with irrigation provided by Class C recycled water. The focus will be on understanding the role of the water cycle in expanding economic opportunities within Hamilton.

It will consider the cost per kL, demand, reliability, and crops which could be supported.

Partners	Wannon Water Agriculture Victoria Local growers
Location	Monivae Pasture (TBC)
Timeframe	0-24 months
Scale	Trial

H-5. 'Old Res' system investigation



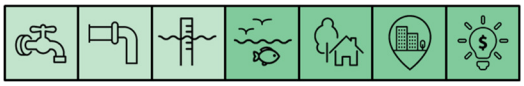
Hamilton's Old Reservoir and its associated distribution network provides untreated raw water for irrigation of parks including Pedrina Park. There is uncertainty about the condition of the network given the materials used (wood, in some cases) and the age of the assets (the Old Reservoir was constructed in 1880).

This opportunity is to improve Council's collective understanding of the Old Res network, condition and capacity with a view to understanding if the Old Res network requires upgrades to improve performance, and where those upgrades should be.

The investigation will include an asset review (based on available information) and a system water balance.

Partners	SGSC (lead) Wannon Water SRW
Location	Old Reservoir and network
Timeframe	1 - 5 years
Scale	Township

H-6. Environmental and cultural wayfinding



Hamilton has a wealth of environmental and cultural assets. One way of protecting natural assets is to get locals and visitors to value them.

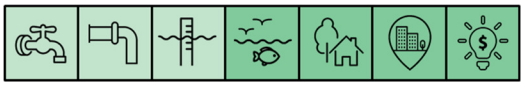
The opportunity is to create a coordinated and consistent wayfinding program that connects the people of Hamilton and visitors to and around the town's natural and cultural assets.

It is proposed that this include Lake Hamilton, Grange Burn, Hamilton botanic gardens, the Old Res bandicoot enclosure, walking and cycling tracks (including along Grange Burn), areas of valuable habitat (platypus observation area) and green corridors (as proposed within the Hamilton structure plan). The signage could also support water literacy and connection of people to the natural environment.

SGSC would work with Gunditj Mirring Traditional Owner Aboriginal Corporation to include cultural and historical landmarks and interpretation.

Partners	Gunditj Mirring Traditional Owner Aboriginal Corporation GHCMA Local Tourism operators
Location	Hamilton wide
Timeframe	12 months
Scale	Township

H-7. Grange Burn urban water quality improvement program



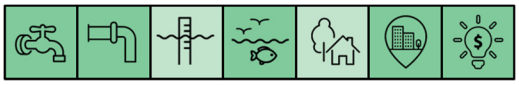
There are a number of untreated point source stormwater discharges that enter the Grange Burn downstream of the Lake Hamilton Spillway.

This opportunity is to improve stormwater quality entering the Grange Burn by improving network understanding and increasing pollution reduction through the identification of WSUD requirements.

This opportunity would investigate urban runoff, document drainage network, investigate potential treatment opportunities and propose concepts for pollution mitigation works. These works would be included in an update of the Grange Burn master plan.

Partners	GHCMA
Location	Grange Burn stormwater catchments between Lake Hamilton and the Grange Burn Wetlands.
Timeframe	0 – 5 years
Scale	Hamilton urban sub-catchments

H-8. Residential rainwater disconnection



Through their network modelling and analysis Wannon Water have identified sewerage catchment with high rates of inflow. This indicates illegal roof and stormwater connections to the sewerage network, creating peaks during rainfall events with stress on the network and pump stations, increasing the risk of sewage spills during wet weather.

This opportunity will seek to identify illegal connections to reduce inflows from illegally connected property drains. This could be combined with an incentive to install rainwater tanks or other onsite water saving assets.

Wannon Water and SGSC would develop a strategy to disconnect household drains from the sewerage network by prioritising catchments, exploring incentives for disconnections or increasing enforcement. Supported by community consultation and education.

Partners	Wannon Water (lead) SGSC
Location	Hamilton
Timeframe	0-10 years
Scale	Hamilton sewerage network

H-9. Wetland condition and stormwater harvesting study

Hamilton's 14 Ha Grange Burn Wetland was constructed in 2005 to treat approximately 70% of Hamilton's urban catchment. Observation indicates large open water sections in the wetland and raising the possibility that the wetland may not be treating stormwater as designed.

This opportunity is to investigate the performance of the Grange Burn wetland and to quantify the potential stormwater harvesting resource that exists .

The investigation will include a condition audit of the existing wetlands, identification of improvement requirements, and an investigation that could quantify the potential for stormwater harvesting.

Partners	SGSC
Location	Grange Burn wetland
Timeframe	0 - 2years
Scale	Wetland

The following provides an action plan to execute the prioritise actions, focussing upon those opportunities nominated for concept design.

6 Action plan

The following action plan sets out the next steps to progress each of the opportunities identified above. The opportunities have been prioritised through this process, so this plan defines the project, timing, and responsibility for each.

Lake Hamilton blue green algae action plan

Action	Sub actions / Description	Notes	Timing	Priority	Responsibility
Concept development (underway)	As part of this IWM plan, prepare a concept design that sets out: • Urban catchments contributing runoff to Lake Hamilton (*plan prepared*) • Identify and map drainage outlets to the lake • Calculate the pollutant loads entering the lake from each catchment and the footprint of a suitable WSUD asset (e.g. biofilter / wetland) to meet or exceed best practice for that catchment • Identify an appropriate or potential location for each asset • Prepare a concept level shape and cost estimate for each asset • Prepare an asset prioritisation based on a $ / kg TN removed	This concept design is to be prepared as part of the scope for the Hamilton IWM Plan See Appendix XX for concept design	April – May 2020	Very high	Alluvium Consulting Australia with IWM Project Control Group
Lake Hamilton WSUD program: design and construction	• Prioritise WSUD assets based on the results of the above analysis (including cost of nitrogen removal and the feasibility / constructability of each asset) • Commission functional and detailed design for the priority asset/s • Continue to construction of highest priority WSUD asset	As part of the functional design incorporate informative community signage explaining the objective and role of the asset It is proposed that the design and construction of the highest priority WSUD asset be completed first, to provide the community with an example of outputs from this plan that they contributed to Design fee estimate at 15% of capital cost = $XX	Functional and detailed design (June – December 2020) Construction (Jan – June 2021)	High	Assets and engineering
	• Prepare budget application to undertake functional and detailed design for the remaining WSUD assets identified within the concept • Complete functional and detailed design for all WSUD assets	Design fee estimate at 15% of capital cost = $XX	July 2021 – June 2022		
	• Prepare an ongoing construction program for the remaining WSUD assets over a 3-5 year capital period, allocating an estimated $XX / year for asset construction • Allocation of a maintenance allowance for upkeep of assets • Combine maintenance funding with capacity building program with Civil Works and Operations staff	Estimate cost of construction at $XX / m^2 (based on Melbourne Water Schedules) Estimated maintenance allowance at $$XX / m^2 (based on Melbourne Water Schedules) Capacity building to be run by designer or through an organisation like Clear Water. Apply for funding support through similar organisations	2022 - 2027	High	Civil works and operations

Catchment scale collaboration	• Collaborate with the GHCMA to support the prioritisation of funding for upstream catchment and waterways improvements that will benefit Lake Hamilton water quality including:
	  ○ Fencing to exclude stock from waterways
	  ○ Revegetating the riparian corridor
	  ○ Removal of exotic weeds
	  ○ Working with landowners to optimise fertiliser application.
		This IWM plan focusses on urban Hamilton
		It is recognised that these urban catchments are one contributor to lake health with significant sediment and nutrient loads being contributed by rural catchments upstream
		This action is about supporting GHCMA in their work to improve upstream conditions over time.
			2020 - 2030	Medium	GHCMA (lead)
					Assets and engineering

Showgrounds rainwater harvesting

Action	Sub actions / Description	Notes	Timing	Priority	Responsibility
Concept development (underway)	As part of this IWM plan, prepare a concept design to: • Identify showground roof catchments available for harvesting and downpipes for disconnection and interception • Identify non-potable demands within HILAC, including toilet, backwash, irrigation, other • Based on a water balance (MUSIC model), estimate a suitable and optimised rainwater storage volume to meet demand (i.e. don't oversize storage for a small gain) • Identify a suitable location for storage either on showgrounds, HILAC land or as part of other nearby construction activities • Identify a transfer arrangement including pump and sub-road pipeline arrangement to a) fill storage b) supply HILAC • Identify all existing underground services • Calculate the potential water saving, capital and operating cost and the cost per kL of water	This concept design is to be prepared as part of the scope for the Hamilton IWM Plan See Appendix XX for concept design Demand numbers e.g. for toilet, likely to be made based on patronage numbers Consider potential to integrate (sub-surface) storage with works associate with the King St / Gordon St roundabout / HILAC carpark or north west corner of the showgrounds	April – May 2020	Very high	Alluvium Consulting Australia with IWM Project Control Group
Functional and detailed design	Assuming that the concept illustrates that the option is feasible, progress the concept design to functional and detailed design to define: • Diversion asset dimensions and alignments for taking rainwater from downpipes to storage • Storage location, footprint and volume, and whether surface or sub-surface • Civil design of rainwater transfer assets including pipe and pump system transferring water from storage to HILAC • Connection of rainwater to the internal plumbing and/or the design of a stand-alone non-potable plumbing network • Internal and external plumbing requirements to supply rainwater with potable back up	Non-potable end uses have been identified Assumed that rainwater is not to be supplied for the swimming pool itself	Mar 2021	High	Assets and engineering
Construction	• Construction or excavation of storage volume • Construction of transfer pump / pipe arrangement from storage to HILAC plumbing (potentially under Gordon / Shakespeare St) • Plumbing to supply rainwater to internal non-potable uses (toilet, backwash, other) • Plumbing to supply rainwater to non-potable external uses (garden irrigation) • Commissioning • Signage within HILAC highlighting the end uses that now rely on rainwater	Ideally construction will be timed to coincide with other construction or upgrade works in the area such as • Car park refurbishment • King St roundabout works • Masterplan, or upgrade works within the showgrounds Ensure promotion of the initiative to the facility users via signage and (if possible) cumulative statistics on water saved)	Sept 2021	High	Civil works and operations

Expanding non-potable water networks to support horticulture

Action	Sub actions / Description	Notes	Timing	Priority	Responsibility
Concept development (underway)	As part of this IWM plan, prepare a concept design that: • Identifies current and future available recycled water resource from the Hamilton recycled water treatment plant • Nominates the site for a horticultural trial with suitable soil, near the recycled water source and owned by Council or Wannon Water (preferably) • Identify suitable crops for the horticultural trial including their water volume demand and water quality requirements • Identify infrastructure requirements to extend (if required) the recycled water network to the nominated site • Confirmation of storage requirements, if any, taking into account existing storages (e.g. as per the Monivae Farm site) • Consider water quality, and particularly salinity concentrations in existing recycled water supply and if 'shandying' with another source is required and an option • Assess the cost (including infrastructure requirements) and potential benefits of the trial	This concept design is to be prepared as part of the scope for the Hamilton IWM Plan See Appendix XX for concept design Options for the trial site include Old Monivae farm and the site south of the existing landfill / transfer station Work with Hugh Koch to define trial scope, location and crops	April – May 2020	Very high	Alluvium Consulting Australia with IWM Project Control Group

Detailed planning	Assuming that the concept illustrates that the option is feasible, progress to a detailed planning phase will commence, including:
	• Support from Council to commence with a trial and establish an MoU with Wannon Water for collaboration in the design and construction of recycled water infrastructure
	• Engage with external commercial, agricultural parties who will (potentially) provide future funding for horticulture expansion
	• Engage with horticultural consultant to assess soil characteristics and suitability
	• Agree most effective crops and scale of the trial (total area and area by crop)
	• Functional and detailed design of
	  ○ the recycled water network extension requirements
	  ○ pumping requirements
	  ○ storage construction or improvement of existing storage (if required)
	  ○ irrigation network
		Propose that functional and detailed design of recycled water related assets including the recycled water network, storage etc to be managed by Wannon Water
		Irrigation infrastructure to be managed by Council
		Soil and impact of recycled water salinity to be assessed prior to detailed asset planning
			June 2020 – December 2021	High	Economic development and Tourism
					Wannon Water
					Assets and engineering

Construction	• Construction of designed assets
	  ○ the recycled water network extension requirements
	  ○ pumping requirements
	  ○ storage construction or improvement of existing storage (if required)
	  ○ irrigation network
	• Commissioning
		This phase focusses on recycled water infrastructure. Other considerations, soil preparation, site drainage, onsite structures like hothouses, have not been considered	January 2022 – Dec 2022	High	Economic development and Tourism
					Wannon Water
					Civil works and operations

Old Reservoir system investigation

Action	Sub actions / Description	Notes	Timing	Priority	Responsibility
Concept development (underway)	As part of this IWM plan, prepare a concept design that: • Prepare a high-level MUSIC water balance model of the system, taking into account storage volume, demands, catchment and historical rainfall, runoff and evaporation • Document the current condition of network assets based on available desktop information • As required undertake service proving and / or CCTV to fill information gaps particularly for critical distribution assets • Document the condition of the network assets including cracks and blockages in mains to make as high-level assessment of asset condition and overall network efficiency • Maps the assets in the network by condition with commentary on potential remaining asset life • Prioritise works based on asset age, condition and criticality to overall network performance • Identify the need for and potential location of any raw water pumping stations to improve delivery to existing end uses • Estimate the capital cost of highest priority assets.	Concept work is to be prepared as part of the scope for the Hamilton IWM Plan See Appendix XX for concept design This concept work is likely to rely upon some service proving or CCTV to understand the condition and age (if possible) of existing assets	May 2020	High	Alluvium Consulting Australia with IWM Project Control Group
Planning and functional design	• Engage a water infrastructure / network designer to prepare functional designs for distribution assets in order of priority (scope to be determined in line with available budget as per concept design estimate) • Commence functional design of assets that are considered critical to the ongoing operation of the network including completion of relevant survey • Confirm method of construction (excavation, boring, pipe cracking etc) and network connections to potential end users. • Ensure new designs can accommodate likely head / pressure of design flow • Prepare functional designs for identified and associated raw water pump stations • Provide capital cost estimate	The program of works will be designed to take advantage of funding opportunities over time. Functional designs expected to be in the range of $10-30k depending on length, connections and additional performance requirements At this stage additional treatment is not required for the whole system but could be considered by end user.	To be confirmed June 2022 -	High	Assets and engineering With Wannon Water
Detailed design and construction	• Upon receipt of funding, complete the detailed design of critical / high priority assets • Complete geotechnical analysis, environmental and cultural studies • Complete construction documentation • Collaborate with Wannon Water to engage construction contractor • Maintain Wannon Water in construction supervisor / support role	Detailed design and construction is intended to be undertaken on an opportunistic basis when internal or external funding becomes available Suggest collaboration with Wannon Water to specify functional and detailed design requirements and construction contract	Dependent upon funding opportunities and streams	High	Civil Works and operations Assets and engineering With Wannon Water

Irrigation efficiency investigation

Action	Sub actions / Description	Notes	Timing	Priority	Responsibility

Initial investigation	• Initiate an audit of irrigated open spaces to understand
	  ○ Volume consumed (on average)
	  ○ Age and condition of irrigation infrastructure
	  ○ Manual handling or automatic irrigation
	• Collate existing information re: constructed irrigation plans and identify gaps
	• Engage with Council's civil works and operations team to review the available data and plans and combine this anecdotal evidence of irrigation conditions and perceived efficiency from the field
	• Undertake a qualitative ranking based on the above to prioritise renewal or upgrade of existing irrigation infrastructure.
	• Conclude with a prioritised list for further investigation
		The aim is to identify the opportunity that will improve water efficiency overall, this may be irrigation infrastructure, grass type or automated operation.
		This investigation could be undertaken in conjunction, or with consideration of, the scope of the Old Res Network investigation, for those open spaces irrigated by the Old Res network.
			Jan – June 2023	Medium / High	Assets and engineering

Detailed planning	For higher priority open spaces identify and document required works focussing on • Irrigation upgrades required to improve irrigation coverage, reduce leaks etc • Identify opportunities for automation (to eliminate need for manual handling and to allow remote operation of key sites) • Review of turf renewal program, and consideration of warm season grasses to reduce long term water consumption • Prepare capital cost estimates for identified works, highlighting potential cost savings associated with reduced labour		June – December 2023	Medium / High	Civil works and operations
Design and construction	• When budget becomes available, implement improvements for highest priority site/s • Engage an irrigation designer to review existing irrigation infrastructure and undertake detailed design for improvements providing a detailed cost estimate. • Engage irrigation construction contractor		2024 onward	Medium / High	

Environmental and cultural wayfinding

Action	Sub actions / Description	Notes	Timing	Priority	Responsibility

Concept development	• Engage with the CMA and Gunditj Mirring to identify cultural and environmental destinations for potential inclusion in a wayfinding plan
	• Collate information and internally (or via external consultant), draft a wayfinding strategy that includes the above information and includes:
	  ○ Identify a hierarchy of signs – including directional signage, indication of routes and distances, and information about specific places at those locations,
	  ○ Wayfinding information in a consistent format
	  ○ Highlights local walking and cycling trails
	  ○ Identifies where signage should be located for maximum visibility and effect
	• Collate to develop a detailed signage plan
		The aim is to have a refreshed wayfinding approach to enable locals and visitors to identify some of the unique natural and cultural assets in Hamilton
		The project should focus on illustrating the major origins and destinations within Hamilton and ways that people can make journeys between places
		The aim should be to encourage more passive modes of transport by providing information regarding distances, times and what you will find there.
		This will include locations as well as walks and trails
		Proposed to be a joint project between the Shire and the CMA
			Sept 2023 – Mar 2024	Medium	Community and leisure services
					Economic development and tourism
					GHCMA

Design and delivery	• Undertake a pilot to test the new signage approach (propose Lake Hamilton) • Expand the program following feedback, to install signage across the identified locations • Update Council website • Undertake a launch, encouraging cycling and walking between locations, with free coffee / BBQ at nominated locations	The aim will be to have consistent information across the town and on the website to direct, particularly visitors, to new locations This may highlight the need for improvements or addressing gaps in walking and cycling paths and may be undertaken in conjunction with that work (if required).	Mar 2024 – Dec 2024	Medium	Community and leisure services Economic development and tourism GHCMA

Grange Burn urban water quality improvement

Action	Sub actions / Description	Notes	Timing	Priority	Responsibility
Concept development	As part of this IWM plan, prepare a concept design that identifies: • Urban catchments contributing stormwater runoff to the Grange Burn, downstream of Lake Hamilton • Identify and map drainage outlets to Grange Burn • Calculate pollutant loads entering the river and the likely footprint of a suitable WSUD asset (being wetland or biofilter) to meet or exceed best practice for that catchment • Identify an appropriate or potential location for each asset • Prepare a concept level cost estimate for each asset • Prepare an asset prioritisation based on a $ / kg TN removed	The approach to this work will be similar to that set out under *Lake Hamilton blue green algae action plan,* however these works are proposed for downstream of the lake It is proposed that this project would be undertaken in partnership with the GHCMA	Jan 2025 – June 2025	Low	Assets and engineering GHCMA
Lake Hamilton WSUD program: design and construction	• Prioritise identified WSUD assets based on estimated cost and asset effectiveness and constructability • Agree budget sharing arrangement with GHCMA to prepare functional and detailed designs for a high priority asset, or a package of equally effective assets • Over time, continue to prepare asset designs • Commence a construction program for prioritised WSUD assets based on available funding • Include an allocation for maintenance • Draw on capacity building learnings from the Lake Hamilton water quality project	As part of the functional design incorporate informative community signage explaining the objective and role of the asset	June 2025 onwards	Low	Assets and engineering Civil works and operations GHCMA

Residential rainwater disconnection

Action	Sub actions / Description	Notes	Timing	Priority	Responsibility

Concept and planning	• Wannon Water to undertake sewerage catchment analysis to identify high inflow catchments that could be the subject of a trial
	• Undertake some background costs analysis to indicate (if possible) what stormwater connections in Hamilton cost Wannon Water including how it might impact the timing of capital upgrades
	• Work with Council's community relations team to communicate with residents within the trial catchment and identify those who would be willing to have their connections investigated
	• Engage the local plumbing fraternity in this process so that they can visit locations and understand the environmental and economic impact of connecting stormwater to sewer
	• At the conclusion of this stage reassess the impact and community response to understand if the program should continue and be rolled up more broadly, based on prioritised catchments as identified by Wannon Water
	• Identify options for individual households including
	  ○ If possible, get works under warranty, or where the plumber can be identified, to have connection repaired
	  ○ Enforcement of repair
	  ○ An alternative incentive program, where things like rainwater tanks and onsite improvements might be offered if the householder repairs their connection
		QAs part of the workshop series this opportunity was not rated highly
		Some of the initial investigations could be undertaken by Wannon Water to understand if there is a catchment that could be an effective case study
		The aim would be to do enough investigation to suggest that there may be reasonable to significant capital or operating cost savings associated with reduced peak flows, and therefore there may be a business case to progress this opportunity.
			Post 2025	Low	Wannon Water
					Assets and engineering

7 Monitoring, evaluation, reporting and improvement (MERI) framework

A Monitoring, Evaluation, Reporting and Improvement (MERI) framework is a conceptual model designed to support Councils monitor the progress of their IWM Plan. This provides a basis for learning, improvement and accountability.

The framework supports the development of metrics by which to monitor and assess change in condition over time; the relative effectiveness, efficiency and appropriateness of different actions and the extent to which an action has an impact on reaching our desired outcome, objective or target.

For this project we will design the MERI against the vision, outcomes and objectives of the Strategic Directions Statement for the Great South Coast Region.

Table 4. MERI definitions and relationships

Framework level	Definition
Vision	A statement of the overall vision for the region and for Hamilton (as per the SDS)
Outcomes	The seven high level outcomes defined within the SDS
Objectives	Number of objectives defined under each of the seven outcomes
Actions	Management actions and physical changes that • lead to a change in condition • inform planning, investment, prioritisation and decision-making These are summarised within the action plan above

The MERI framework makes changes transparent so that all parties can learn, through reflection and discussion, which interventions are most appropriate, effective and efficient.

Action plan
Actions can lead to biophysical, institutional and economic outcomes. The MERI framework supports and informs the action plan, setting out that level at which targets are set and how they should be monitored and reported on.

In the case of this IWM Plan, the action plan has been developed based on an understanding of the most highly prioritised opportunities.

Monitoring
Monitoring determines whether the actions have been achieved. This will be understood by monitoring the progress through the action plan.

- *Monitoring asset condition* describes measuring changes in the state of and trends in the condition of assets at the level of the investment and at higher levels through agreed indicators
- *Monitoring program performance* describes changes in people, organisations, institutions, practices and technologies that create an environment that is conducive to improving asset condition.

For the purposes of this plan, we will be predominantly concerned with monitoring program performance as we monitor completion of actions, level of collaboration and growth in internal capacity.

Evaluation
The evaluation of the project is a periodic assessment of how the program, including actions, is performing against the objectives. The evaluation of the program will ask the following questions:

- *Result:* Was the action completed? How, why and why not?
- *Appropriateness:* Does the action link to the objectives and vision?
- *Impact:* To what extent did the actions result in an improved outcome?
- *Effectiveness:* To what extent was the original condition changed?
- *Efficiency:* What cost and resources are required to implement action? What has been the value of return from investment?
- *Legacy*: Will the impacts be felt beyond the timeframe of the Plan?

Through these questions it is important to understand to identify why the desired change has not occurred.

Reporting
Reporting can occur at all levels of management, and within any timeframe depending on the intention and audience. The purpose of reporting is to communicate progress and performance on outcomes; challenges and learnings; and accountability and transparency to other agencies, the broader community and within Council.

For the purposes of this plan the following reporting regime will be adopted:

1. Reporting on the achievement of individual actions:
    - Annual reporting on the Action Plan to monitor progress towards completing actions within the Plan.
    - Review of the Action Plan every three years to allow Council to revisit emerging trends and changing priorities, and to enable adaptation to new policy positions at the state or national level.
2. Review and update (if required) of the Plan at 5 years.
3. Fully reviewed at nine years. New Plan to be developed by ten years (2030).

Improvement
Improvement involves ongoing review, learning and adaptation based on critical reflection of the program including the effectiveness of actions and activities. Identified improvement actions result in amendment to actions and the plan.

MERI schedule
In finalising the IWM Plan, a MERI Plan should be developed setting out a clear schedule of deliverables:

- Proposed frequency of evaluation and reporting
- Key evaluation questions for intermediate and long-term outcomes
- Key indicators for the intermediate and long-term outcomes
- Reporting audience, public accessibility, frequency and key content.

8 References

TBC

Attachment A
Great South Coast SDS Outcomes and Objectives

Vision and Outcome Areas for the Great South Coast IWM Forum Region

Our Vision

Water is life – we will work together with our communities to deliver integrated water outcomes contributing to the resilience of our environment, culture and economy.

IWM Outcome Areas

The region is seeking to achieve seven key outcomes through IWM. Each of these will have a significant role in shaping the liveability, prosperity and resilience of our cities and towns. These outcome areas provide indicators to assess the effectiveness of the various IWM opportunities, recognising that these outcomes are in themselves co-dependent.

Low-emission solutions

IWM opportunities that minimise the release of greenhouse gas (GHGs) emissions will be considered by the Forum as solutions are evaluated for implementation.

Outcomes						
Safe, secure and affordable supplies in an uncertain future	Effective and affordable wastewater systems	Avoided or minimised existing and future flood risks	Healthy and valued waterways and marine environments	Healthy and valued landscapes	Community values are reflected in place-based planning	Jobs, economic benefits and innovation
Objectives						
Secure water supply for industrial, economic, environmental, cultural and community needs	Meets public health and environmental standards	Communities, properties and infrastructure assets that are resilient to local flood risk	Improved ecological health and biodiversity of our urban waterways, water bodies and beaches	Active and passive recreation supported by sustainable water supply	Diverse urban landscapes that reflect local conditions and community values	Jobs and local economies, including industry, tourism and agriculture, supported by integrated water planning
Well-managed water demand and efficient use of water	Effective wastewater systems to meet the needs of economic and population growth		The economic value of ecosystem services is understood by our communities and recognised in planning processes	Urban landscapes retain moisture for cooler, greener cities and towns	Water sensitive communities that are empowered and engaged	Strong governance and collaboration models that evolve to deliver innovative solutions
A diverse range of water supplies and resources which are fit for purpose	Waste-to-resource opportunities are maximised		The whole-of-catchment context (upstream / downstream) is recognised in decision making.	Waterways and coastal environments accessible as valuable open space	Local water related risks and issues understood and managed by the community	Residents and visitors are attracted to our reliably green region and healthy waterways
Water quality meets regulatory standards and community expectations	Equitable access to effective wastewater systems		Improved connectivity and access for active transport links	Traditional Owner values associated with waterways are protected and enhanced	Traditional Owner values, needs and aspirations associated with water are understood, protected, enhanced and continued	
					Recognise the competing values that exist for community use of public open space	

Figure A 1. *GSC IWM Forum SDS Outcomes and Objectives*

Attachment B
Stormwater Modelling

1 Impervious fraction inputs

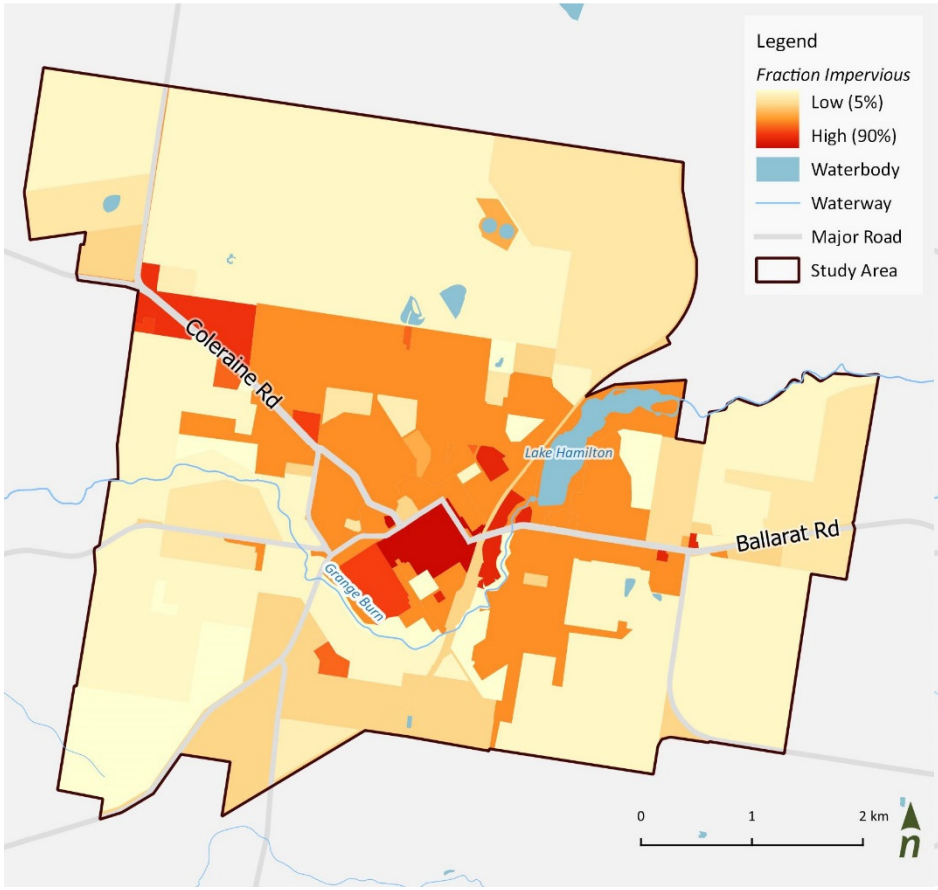


Figure B 1. *Current land use impervious fractions*

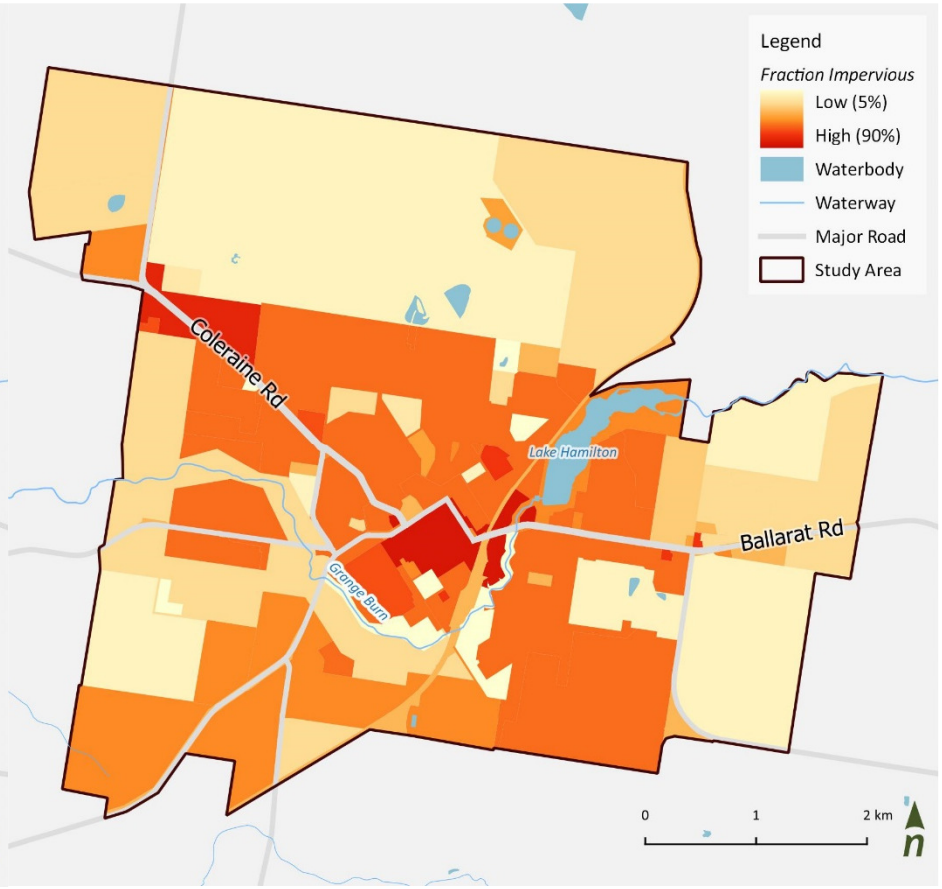


Figure B 2. *Current land use impervious fractions*

2 Model inputs and meteorology

Land use*	GCM "Time slice"	Area (ha)	Impervious area (ha)	Rainfall (mm/year)#	PET (mm/year)#
Existing	1995	3557	840	595	1200
Developed	1995	3557	1160	595	1200
Existing	2040	3557	840	565	1245
Developed	2040	3557	1160	565	1245
Existing	2065	3557	840	545	1280
Developed	2065	3557	1160	545	1280

* Based on planning zones – currently developed vs developed to extent of zones…

current (1995 "time slice") rainfall and PET taken from Casterton, 1980-1989 BOM data (via ewater). Future numbers scaled from this, based on DEWLP median scenarios for Glenelg River Basin, as per Table 1

Table B 1. *MUSIC model inputs*

3 Model results

3.1 Historical climate (1995 Time slice)

Table B 2. *Historical climate model. Pre-1750 land use, current land use, developed land use*

	Runoff (ML/year)	Total Suspended Solids (kg/year)	Total Phosphorus (kg/year)	Total Nitrogen (kg/year)	Gross Pollutants (kg/year)	Rainfall in (ML/year)	ET loss (ML/year)
Forested (pre-1750 land use)	190	1,560	6	150	0	21,220	21,040
Current land use	4,150	828,000	1,790	11,600	223,000	21,220	17,070
Future land use	5,640	1,170,000	2,230	16,400	313,000	21,220	15,580
Change current > future	1,490	342,000	440	4,800	90,000	0	-1,490
	36%	41%	25%	41%	40%	0%	-9%

3.2 2040 median

Table B 3. *2040 median scenario climate model. Pre-1750 land use, current land use, developed land use*

	Runoff (ML/year)	Total Suspended Solids (kg/year)	Total Phosphorus (kg/year)	Total Nitrogen (kg/year)	Gross Pollutants (kg/year)	Rainfall in (ML/year)	ET loss (ML/year)
Forested (pre-1750 land use)	80	660	3	60	0	20,160	20,080
Current land use	3,830	805,000	1,570	10,800	209,000	20,160	16,330
Future land use	5,230	1,110,000	2,150	14,700	295,000	20,160	14,930
Change current > future	1,400	305,000	580	3,900	86,000	0	-1,400
	37%	38%	37%	36%	41%	0%	-9%

3.3 2065 median scenario

Table B 4. *2065 median scenario climate model. Pre-1750 land use, current land use, developed land use*

	Runoff (ML/year)	Total Suspended Solids (kg/year)	Total Phosphorus (kg/year)	Total Nitrogen (kg/year)	Gross Pollutants (kg/year)	Rainfall in (ML/year)	ET loss (ML/year)
Forested (pre-1750 land use)	35	300	1	30	0	19,430	19,400
Current land use	3,630	748,000	1,560	10,400	198,000	19,430	15,810
Future land use	4,980	1,030,000	2,150	14,300	283,000	19,430	14,460
Change current > future	1,350	282,000	590	3,900	85,000	0	-1,350
	37%	38%	38%	38%	43%	0%	-9%

Attachment C
Opportunity Long List

Hamilton Township Integrated Water Management Plan

Opportunities

	IWM Opportunity	Type	Description	Water supply	Wastewater	Flooding	Healthy waterways	Healthy landscapes	Community values	Economic benefit
1	Expansion of the recycled water network	Investigation	Recycled water produced at the Hamilton Water Reclamation Plant (WRP)is used for a range of irrigation purposes in Hamilton. Excess Class C recycled water is irrigated to the Monivae pasture. This is arguably a low value use for that water. Council has also noted that irrigation areas are becoming constrained given the impact of continued irrigation on soil. This opportunity is to investigate supplying recycled water for a higher-value purpose, whether that be social or economic. Possible higher end users include: - Future horticultural activities - Nurseries - Existing playing fields (such as the Croquet Club) - Ballarat Road irrigation area The investigation would involve: - Identifying end users, their demands and water quality requirements - Considering the opportunity for 'shandying' Class C with other sources (Class A, stormwater or potable water) to broaden potential applications - Identifying additional infrastructure needs including transfer and treatment - Identifying potential benefits (particularly economic) - Comparison of a cost per kL across different end use options	✓	✓			✓	✓	✓
2	'Old' Reservoir system investigation and augmentation options analysis	Investigation	Hamilton's Old Reservoir provides untreated or raw water for irrigation of parks, gardens and open spaces throughout Hamilton. The reservoir network transects the township providing potential opportunity for additional end users to tap into the network. This opportunity is to improve the understanding of the Old Res network, its capacity, potential to meet demands and in doing so identify system augmentations. Examples of additional demands or end uses include: - Irrigation of an urban green corridors as proposed within the Hamilton Masterplan (e.g. along Lonsdale St) - Supplying firefighting tanks and CFA competition track at the Hamilton Showgrounds - Irrigation of space around Lake Hamilton	✓		✓		✓	✓	

Opportunities

	IWM Opportunity	Type	Description	Water supply	Wastewater	Flooding	Healthy waterways	Healthy landscapes	Community values	Economic benefit
3	Shadeways / Urban Forest water use plan Streetscape WSUD?	Plan	The Hamilton structure plan shows green corridors throughout the town, with pedestrian and cycle paths shaded by street trees, providing links from the CBD to open spaces and natural areas like Grange Burn. This opportunity is to develop a plan to incorporate water sensitive urban design to support the proposed urban greening program. This would involve: - Identifying where the greening is proposed plus other priority locations (i.e. to provide shading around Lake Hamilton aligned with the Lake Hamilton Masterplan) - Identify opportunities for street-scale urban greening and stormwater treatment infrastructure such as street trees, vegetated swales, and bioretention systems that utilise runoff for irrigation and improve the quality of stormwater flowing into waterways - Identify additional small scale, urban greening opportunities such as green walls, vertical gardens and community gardens. The plan would respond to the existing structure plan, identifying street tree species, their shade benefits and watering requirements, with a preference for native species that have a lower demand and are self-sustaining after initial establishment. The plan would also identify opportunities for small scale stormwater detention infrastructure to mitigate against flash flooding in locations where it is known to occur (refer Hamilton Flood Study).	✓	✓			✓	✓	✓
4	Hamilton Showgrounds roof water harvesting for HILAC	Concept/ project	Hamilton Showground buildings have large roof areas that could potentially collect volumes of rainwater. The site itself has a relatively limited demand for water meaning there is potentially an excess of runoff coming from that site, with space for storage. The showgrounds are directly across from the road from the Hamilton Indoor Leisure and Aquatic Centre (HILAC), one of the largest potable water users in the area. The opportunity is to investigate the feasibility of harvesting rainwater from showground roofs to supplement the current potable demands of the HILAC, as well as other potential users in the vicinity. The investigation would: - identify potential demands (primarily within the aquatic centre) - storage requirements (and location for that storage) based on a water balance model - a potential transfer concept (i.e. how to get water from A to B) - the reliability of a rainwater supply and the potential volume of water saved.	✓			✓		✓	✓

Opportunities

	IWM Opportunity	Type	Description	Water supply	Wastewater	Flooding	Healthy waterways	Healthy landscapes	Community values	Economic benefit
5	Residential rainwater harvesting/sewer inflow investigation	Investigation / options analysis	Hamilton residents have a high rate of domestic rainwater tank ownership according to Wannon Water (58%), primarily for drinking and irrigation of gardens. Due to the seasonal nature of rainfall in Hamilton (experiencing particularly infrequent rain in summer), domestic rainwater tanks are unlikely to meet summer demands, but may be very effective in reducing potable demands over winter. At the same time, a significant number of households in Hamilton have their roofs connected to the sewer network resulting in excess flows to the system during wet weather. Wannon Water advise there is a ~30% increase in flows observed during storm events. This places stress (and additional cost) onto Wannon Water's network and treatment infrastructure to manage that peak. Wannon Water understand the areas of concern. This opportunity is to reduce the excess flow into the sewer from incorrectly connected stormwater pipes and improve the effectiveness of rainwater use by Council and residents. The investigation will consider: - Reviewing opportunities for rainwater harvesting on council buildings and sporting facilities focussing on consistent demands like toilets - Investigate incentives to replumb residential systems to toilet and laundry (particularly in winter when irrigation demands are low) - Potentially combine with community education, and disconnection from sewer opportunities discussed below. - Develop a strategy to identify and systematically disconnect household roofs from the sewerage network - Require residents to connect to stormwater, or offer incentives to connect to rainwater tank to reuse water onsite - The strategy would be supported by community consultation highlighting the impact of this on the Hamilton environment.	✓	✓		✓		✓	✓
6	Irrigation efficiency	Investigation / audit	While some parks and sports reserves have automatic sprinkler systems, manual watering is still required in some locations where irrigation systems don't meet satisfactory irrigation distribution requirements. The opportunity is to improve the efficiency of irrigation systems to support better practice across open spaces in Hamilton. This would involve: - Prioritising open spaces and irrigation demand - Auditing current systems to identify opportunities for irrigation system upgrades - Explore the use of smart irrigation systems and soil moisture probes (linking to the LoRaWAN network) to improve efficiency of irrigation - Undertake a cost benefit to understand highest priority works - At the same time, consider drought-tolerant or warm season grasses that can lower irrigation rates	✓				✓	✓	✓

Hamilton Township Integrated Water Management Plan

Opportunities

	IWM Opportunity	Type	Description	Water supply	Wastewater	Flooding	Healthy waterways	Healthy landscapes	Community values	Economic benefit
7	'WaterWays': environmental and cultural wayfinding route	Project	The opportunity is to create a wayfinding program for Hamilton through maps and signage that directs people to and around the town's natural and cultural assets. This would include Lake Hamilton, waterways, botanic gardens, bandicoot enclosure, walking and cycling tracks (including along Grange Burn), areas of valuable habitat (platypus observation area) and green corridors (as proposed within the Hamilton structure plan). Wayfinding signage could also include Traditional Owner cultural and historical landmarks.				✓	✓	✓	✓
8	Wetland condition audit and stormwater harvesting study	Investigation/audit	Hamilton's Grange Burn Wetland was constructed in 2005 as a showcase community Partnership Project involving rehabilitation of 14 ha of wetlands to treat 70 per cent of Hamilton's stormwater before it enters the Grange Burn. Smaller wetlands have also been constructed on Tyers Street and Rippon Road. This opportunity is to: - undertake an audit of the wetlands to assess condition and performance to confirm that they are providing treatment levels as per its design - identify any additional management or maintenance requirements - identify alternative design options for the litter traps in the wetland - investigate the potential for stormwater harvesting at the Grange Burn Wetland to provide an additional source of water - identify suitable end uses for that water, and how this source might integrate with the recycled water and raw water networks in town - investigate stormwater runoff from the south of the Grange Burn between the spillway and Portland Road and opportunities point source stormwater treatment that also incorporate amenity values	✓			✓	✓	✓	
9	Lake Hamilton: Blue green algae action plan	Plan	Blue green algae is a persistent issue in Lake Hamilton, impacting the ecological, aesthetic and recreational quality of the lake. In 2012, A water quality investigation report was prepared by Alluvium Consulting and an action plan for the improvement of water quality was prepared by ALS Water Sciences Group. These reports provided a number of recommendations. The opportunity is to prioritise these recommendations into a program of works and actions. Additionally, the opportunity would investigate partnering with Wannon Water and Deakin University to adopt eDNA strategies to identify BGA types in both water column and sediment. Communication and knowledge sharing with Wannon Water and the community will be a major component of this opportunity, as there are often misconceptions about the processes driving blue green algae, proposed actions, costs and expected outcomes including timeframes, importantly noting the influence of the lake's large agricultural catchment and that actions can only reduce risk but not stop algal blooms. The option of dredging the lake was raised by the community, the opportunity will consider an investigation into this option and its efficacy in mitigating the proliferation of blue green algae.				✓	✓	✓	✓

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10	Water for horticulture	Plan	Hugh Koch (Southern Grampians Shire), presented to the workshop on horticultural opportunities within Hamilton. While this needs to be better understood by Alluvium, the opportunity is to: - understand the water needs (volumetric and quality) associated with these activities - incorporate this into a water balance - do a feasibility analysis to understand the best way to support economic growth and activity without compromising other essential uses - incorporate a climate change scenario to anticipate future issues.	✓	✓			✓	✓	✓
11	Integrated networks	Plan and concept	Hamilton has a unique water cycle network incorporating potable water, raw water (from the 'Old Res'), Class C recycled water as well as opportunities to source Class A and stormwater. With the LoRaWAN network and smart systems, there is a unique opportunity to look at the integration of this system to increase to overall reliability of the network, and for water to go to its most valued use. For example, smart controls and valving may be able to direct recycled water through the raw water network is Old Res levels are low to ensure that those open spaces are irrigated. When treated stormwater is available at the wetland, the system may decide to use that water for horticultural irrigation, while maintaining raw water within the Old Res for use on another day. The opportunity is: - To investigate the feasibility of an integrated and smart water system for Hamilton that links existing non-potable networks and other opportunities (like stormwater) to improve overall reliability and value to the community - Taking into account the demands listed above (open space, greening Hamilton initiatives, horticulture), and assess the feasibility of an integrated Hamilton water network to meet those demands over wet and dry periods - Investigate the water quality implications of this with Wannon Water (e.g. can raw water and recycled water share a pipe while not compromising community health) - Identify where end users already have access to multiple water supply networks, or where a shared network is feasible, ensuring that cross contamination is avoided - Identify works that are likely to be required to enable that network.	✓	✓		✓	✓	✓	✓
12	Grange Burn Urban Water Quality Improvements	Investigation	There are a number of point source stormwater discharges into the Grange Burn below the Lake Hamilton spillway. There is potential to investigate a higher level of treatment before discharge as part of an updated Grange Burn masterplan. Grange burn The project will investigate urban runoff data – pollutants and hydrology? – to identify key sites for interventions. Reduce ecological stress Improve amenity Investigate urban flash flooding improvements				✓	✓	✓	✓