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# 1 Introduction

## 1.1 What is this Assessment about?

This is the first assessment of water and sanitary services prepared by Council. It is an assessment of the water and sanitary services provided by Council but also by individuals, communities, businesses and other organisations.

Given the importance of water and sanitary services to the public health and well being of the community, the Local Government Act (LGA) 2002 requires all territorial authorities to make assessments of:

### Water Services

- Water supply (drinking water)
- Waste water
- Stormwater

### Sanitary Services

- Cemeteries
- Crematoria
- Public toilets
- Waste disposal (not required by this Council as Solid Waste Management Plan 2003 has already been completed).

This assessment meets the Council's obligation to prepare an assessment under the LGA 2002.

## 1.2 Scope of Assessment

Information covered in this assessment includes:

- provision for drinking water, management of wastewater, stormwater and sanitation services
- assessment of the risks to the community
- assessment of the quality and adequacy of the services
- statement of current and estimated future demands
- statement of the options available to meet current and future demands
- statement of Council's intended role in meeting the current and future demands.

The assessment has been based on various ‘communities’ within Wellington City. The communities considered vary between the services provided. This is covered in the next chapter – Communities.

As required by the LGA 2002, this Assessment has been made after consultation with the Wellington Medical Officer of Health. As part of the consultation process, copies of the draft Assessment were placed in all Council libraries, the Service Centre and on Council’s website. Information about the draft Assessment was contained in The Wellingtonian, the Absolutely Positively Wellington newspaper sent to all city residents and public notices were placed in The Dominion Post newspaper. A public meeting was also held to discuss the Assessment. A presentation was made to the Makara Ohariu Community Board.

Further consultation was carried out with Ngati Toa and the Tenths Trust, Greater Wellington Regional Council (GWRC), Ministry for the Environment (MfE), Hutt City Council (HCC), Porirua City Council (PCC), the Makara, Ohariu Valley, South Karori and Horokiwi Communities and 157 resident and special interest organisations. In addition, the Assessment was included in the consultation material for the draft Annual Plan.

Section 125 of the LGA requires Council to undertake assessments from ‘time to time’. Council anticipates future assessments to be carried out approximately every 3-5 years though the timing of future assessments may be different for each service.



### 1.3 Links to other Council plans and policies

#### 1.3.1 Creative Wellington – Innovation Capital

Council’s vision for Wellington is *Creative Wellington – Innovation Capital*. One core role in achieving this vision is to manage the city's infrastructure efficiently. As Council sees having quality infrastructure as the foundation on which the city's future will be built. Relevant Council outcomes for Wellington are:

STRATEGIC OUTCOMES	THE SERVICES PROVIDED TO ACHIEVE THE OUTCOMES:
Water and energy: Wellington residents have a high quality water supply	Water supply
Reducing waste: Waste is minimised through recycling and reuse	Waste disposal
Sustainable disposal: Waste is disposed of in ways that do not harm the environment	Wastewater Stormwater Waste Disposal
Public health: It's a healthy place to live	Water Wastewater system Public toilets Cemeteries Crematoria

### 1.3.2 Asset Management Plans

Asset management plans (AMP's) are a key component of the Council planning process, being prepared within the context and framework of Council's Long Term Community Council Plan and fed in to the financial plans and service objectives of those documents. AMP's relevant to this assessment are those for water supply, wastewater, stormwater, public conveniences, cemeteries and landfills.

While the more significant information about Council owned assets and services contained in the relevant AMP's are provided in the following assessment, the plans should be referred to for greater detail. More importantly, this assessment provides information about non-Council provided services such as unreticulated wastewater treatment facilities.

### 1.3.3 Wellington City District Plan

In terms of residential growth the policy direction in the current Wellington City District Plan is to generally contain development within the existing urban city boundary. To provide for population growth the focus has been to encourage residential intensification and provide for residential infill in Residential Areas. More recently there has been an acceptance that some degree of 'greenfield' expansion is needed, and this has been addressed via the Northern Growth Development Framework. The framework provides for 'smart' greenfield development in the Northern Growth area and discourages such development elsewhere through urban containment policies.

One of the major benefits of the urban containment policy is that it makes better utilisation of existing infrastructure, as well as supporting public-transport systems, and encouraging reduced reliance on private vehicles. While generally, individual infill buildings do not have any significant effect on the supply of water or flows of wastewater, the gradual incremental increase in water demand and increased wastewater flows from any increase in population could ultimately have a sufficiently significant effect to require the upgrade of existing services.

#### 1.3.4 Development Contributions Policy

To ensure that new development contributes its fair share towards new or upgraded water or sanitary services that might be required as a consequence of development, Council is developing a development contributions policy in 2005. Until it does so the position at law is that the financial contribution provisions of the District Plan/Resource Management Act are unaffected and the LGA 2002 provisions will not be applied.

### 1.4 Population Growth and Development

Wellington City had an estimated usually resident population of 182,600 in June 2004. Medium population projections for the city suggest that this is likely to grow to 193,300 by 2021 (5.8% increase over 16 years).

In June 2001 there were 62,733 occupied dwellings in the city. New houses built between 2000-2004 have been approximately one-third stand-alone dwellings and two-thirds terraces/units or apartments. The greatest proportion of new stand alone dwellings have been located in Churton Park, Newlands, Tawa, Miramar and Karori.

The extra demands on the wastewater and the stormwater systems due to the growth and development of Wellington City at this rate, for the planning period, will not be substantial and will be catered for by the implementation of current projects as detailed in the AMP's.

However, based on current expected growth and demand figures, GWRC research has highlighted the fact that they would be unable to supply sufficient potable water during 1 in 50-year drought conditions as from 2007.

The development potential of the northern suburbs will have an effect on future infrastructure requirements. The adoption of the Northern Growth Management Plan has given certainty to enable the planning of the infrastructure needs in this area.



## 1.5 Work with neighbouring Territorial Authorities

There are several areas where WCC, GWRC and neighbouring councils to work together. These are identified here but discussed at greater depth in the relevant sections:

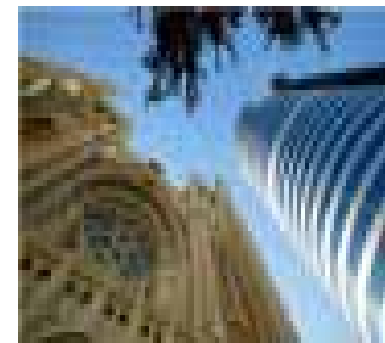
- Wellington receives water from GWRC's bulk supply network
- Wastewater from some Northern suburbs drains naturally towards Porirua and is treated at the Porirua Treatment Plant, jointly owned by Council and PCC. Growth in the northern parts of the city may impact on this in the future
- The sediment content and quality of water received from the Hutt River possibly affects water quality and sediment structure in Wellington Harbour.

## 2 Communities

The LGA 2002 requires assessments to be based on “communities”. However, the term has many definitions in the Act as well as in other legislation.

The Ministry of Health (MoH) consider a community water supply as one with a minimum 25 people resident for at least 60 days. For the purpose of the assessment, the meaning of community may vary depending on circumstances or locations.

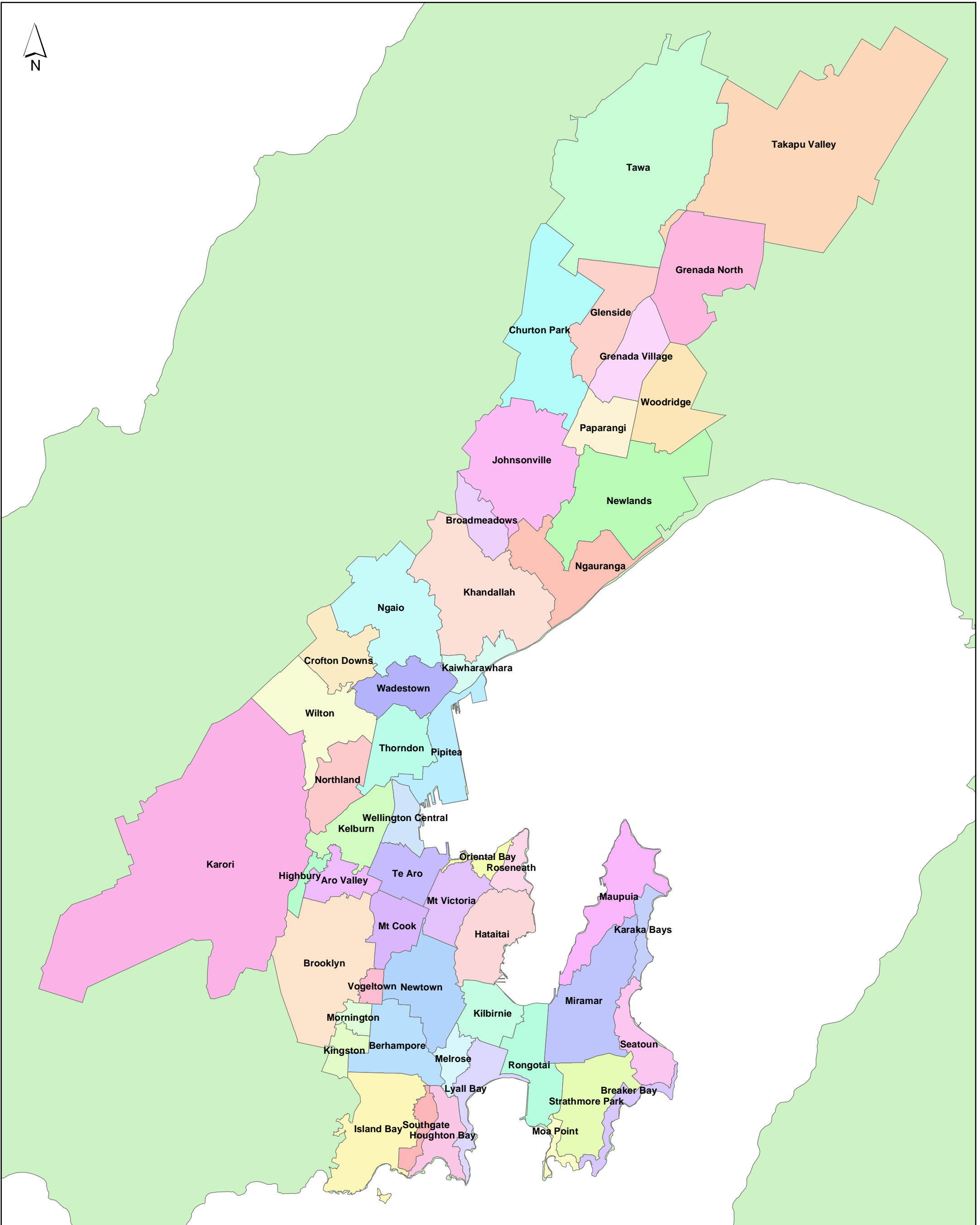
Council has identified different communities depending on the service provided, namely reticulated (Figure 1) and non-reticulated (Figure 2). The reticulated areas are served by the Councils water, wastewater and stormwater system.



### 2.1 Reticulated communities

The residential areas of Wellington City are characterised by low-rise single dwelling houses on individual lots. Marked variations exist in the character of particular neighbourhoods or suburbs. Patterns of residential development range from the more intensive and densely populated inner city areas, developed from the early days of colonial settlement, through to modern subdivisions.

Many of these suburbs provide essential community services; including shops, churches, marae, schools, service stations, daycare centres, kohanga reo and doctors' surgeries. In some areas, facilities such as hospitals, parks or motels have been established to serve wider city or regional populations.

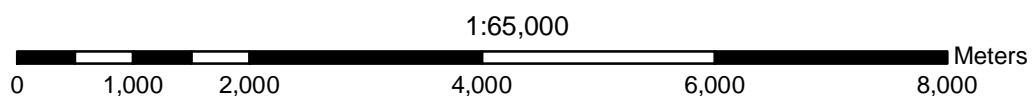


**Figure 1. The reticulated communities served by the Councils water, wastewater and stormwater networks.**

**DATA STATEMENT**  
 Property boundaries  
 Land Information NZ  
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 Accuracy in urban areas: +/- 1m  
 Accuracy in rural areas: +/- 30m

Other data has been  
 compiled from a  
 variety of sources and  
 its accuracy may vary

Colour Orthophotography 1:500  
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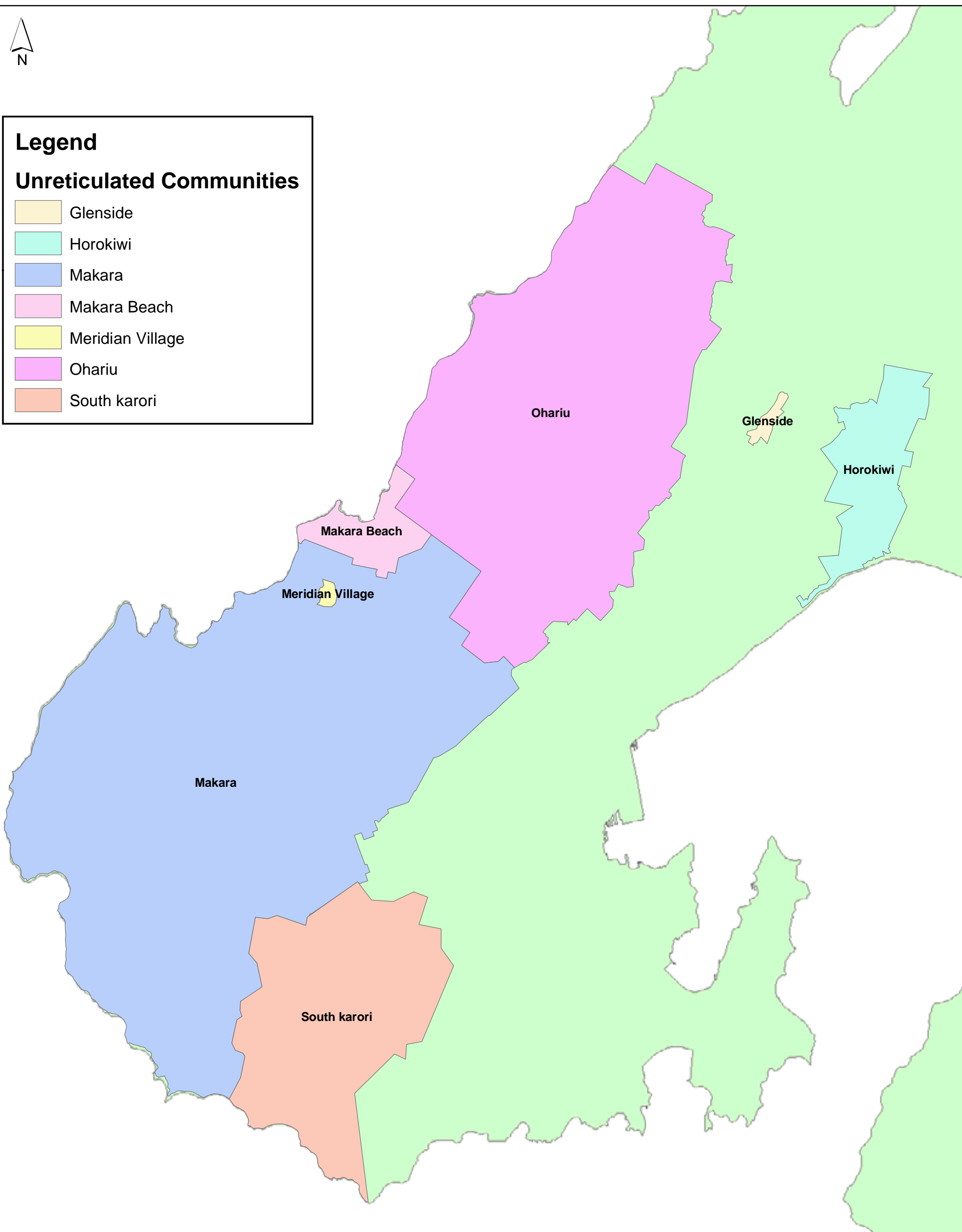




## Legend

### Unreticulated Communities

- Glenside
- Horokiwi
- Makara
- Makara Beach
- Meridian Village
- Ohariu
- South karori



#### DATA STATEMENT

Property boundaries  
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Accuracy in rural areas: +/- 30m

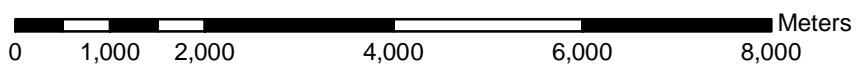
Other data has been  
compiled from a  
variety of sources and  
its accuracy may vary

Any contours displayed  
are only approximate  
and must not be used for  
detailed engineering design

Colour Orthophotography 1:500  
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**Figure 2. The non-reticulated communities.**

1:80,000



For the purpose of the water supply assessment Wellington City has been broken down into Brooklyn, Churton, Eastern Wellington, Johnsonville, Karori, Kelburn, Onslow, Southern Wellington, Wadestown, Tawa and Wellington Central. These are based on the MoH distribution zones in which these communities receive similar quality water from its taps.

There are three main wastewater catchments in the city terminating at the treatment plants at Moa Point, Karori (Western) and in Porirua City. These will be treated as three communities for the wastewater part of this assessment.

There are 42 stormwater catchments, defined by topography, in the Wellington area. These will form the communities for this part of this assessment.

Table 1 shows the water, wastewater and stormwater communities in relation to each other.

In the case of sanitary services, the community has been defined as the entire area of Wellington City.

There are no major facilities (i.e. the hospital, educational institutions or the prisons) that are not owned by Council which have their own water supplies or disposal systems.

## 2.2 Non-reticulated communities

The non-reticulated communities have been separated into the rural communities of Makara, Ohariu Valley, South Karori Horokiwi and the smaller Glenside settlement. Within the Makara community another community can be defined which is the Meridian Village.

Within the first four communities all properties have individual methods of collecting potable water and disposing of waste and stormwater. The Meridian village has a combined water and wastewater system. There are 6 properties in Glenside which rely on unreticulated water supply, though there is uncertainty to which houses are served by the Councils wastewater system.

The Makara area covers the rural land west of the Karori Stream and Te Wharangi Ridge up to Takarau Gorge where it adjoins the area covered by the Ohariu Valley. It includes the settlements of Makara Village and Makara Beach, as well as the largest landholding in Wellington, Terawhiti Station. Makara Beach community consists of 29 houses and a café.

Stormwater	Wastewater		Water
Catchment Name	Treatment Plant	Zones	Reticulated areas
Evans Bay West Culvert	Moa Point		
Houghton Bay culvert			
Lyll Bay West Culvert			
Lyll Bay East			
Grafton/ Rata to Balaena			
Miramar Culvert			
Seatoun			
Cobham Culvert		Houghton Bay	Eastern Wellington
Rongotai Culvert		Eastern suburbs	
Island Bay Culvert		Island Bay	Southern Wellington
Owhiro Stream		Berhampore	
Overseas Passenger Terminal			
Tory Street Culvert		Wellington Central	Wellington Central
Taranaki Street Culvert		Brooklyn	Brooklyn
Waring Taylor Culvert			Kelburn
Davis St		Ngauranga	Wadestown
Thorndon Quay culvert (Aotea Quay)		Ngaio	Onslow
Oriental Bay			
Te Aro Culvert			
Hunter Street			
Harris St Culvert			
Bowen St Culvert			
Ngauranga Stream			
Kaiwharawhara Stream			
	Western	Karori	Karori
Porirua Stream	Porirua	Paparangi	
		Churton Park	Churton
		Tawa	Tawa
		Johnsonville	Johnsonville
		Grenada	
		Glenside	
		Newlands	

Table 1. The reticulated systems of Wellington

The Meridian Village consists of twelve residential dwellings, all occupied, plus three farm dwellings and the farm outbuildings of Makara Farm. The village is on Quartz Hill (total area 991 ha.) which is owned by Meridian Energy and the properties are leased from Meridian Energy.

The communities of Makara Village and Beach and the Meridian Village had a population of 410 in the 2004 census.



The Ohariu Valley Community covers the area spanning all of the land west of the ridgeline between Mount Kau Kau and Council's boundary in the north (just south of Colonial Knob). The southern extent of the Community area is the Takarau Gorge.

In 2004 the population of Ohariu Valley was 275.

The South Karori Community covers the area from the Hawkins Hill/Te Kopahau Ridge to the South Karori Stream. New Zealand Forestry owns a large portion of the land in this community.

Within the South Karori community there are 2 identifiable sub areas; the South Karori Road area, characterised by a large proportion of smaller blocks, and the Southern Coast area. The South Karori Community had a population of 45 in the 2004 census.

The residential population of Horokiwi catchment is comprised of 74 households. The Horokiwi community does not include the quarry.

The communities at Boom Rock Lodge, Country Club Riding Academy, Karori Golf Club, Stony Beach Bistro at Makara Beach and Ohariu Golf Club are registered drinking water supplies and places where the public may come into contact with roof collected rainwater.

Makara Playcentre is the only known establishment in unreticulated parts of Wellington City, where significant numbers of persons may be present, and exposed to the potential health risks from unreticulated water supplies.

All the unreticulated communities lie on land that is zoned rural with some open space in the District Plan. The landscape of the Rural area is rugged and is characterised by steep ridges and deep gullies. The Rural area has important landscape values for the City as a whole, and contains areas of indigenous vegetation and habitat for indigenous fauna. Council intends to maintain the open rural character while recognising that some change will occur over time.

The primary force urging change is the demand for rural/residential living and lifestyle farming blocks. This demand imposes pressures to subdivide existing titles and erect new dwelling houses. The impact of such development is still not fully understood, and Council intends to study the capacity of the Rural Area to accommodate further subdivision.



### 3 Risk

Council is required to make an assessment of risks to the community from the absence, in any area of the district, of either the reticulated water supply or a reticulated wastewater service or both. A risk assessment involves identifying, analysing, evaluating and treating risk.

For the purposes of this assessment Council has not only looked at the risks posed by the lack of a reticulated service but also the provision of a reticulated service is discussed.

Council has a corporate risk management strategy that is applied across the organisation. This covers the provision of both the supply and management of services provided.

There is however a lack of any current documented risk management plans that covers services in the non-reticulated communities of the city, as Council, in most case, does not provide these services. The current Council Public Health Risk Management Plan is the only substantiate document, but is only applied to drinking water.

#### 3.1 Standards

In addition to Council standards, there are several national guidelines and standards on the management of risk there is also a Council standard;

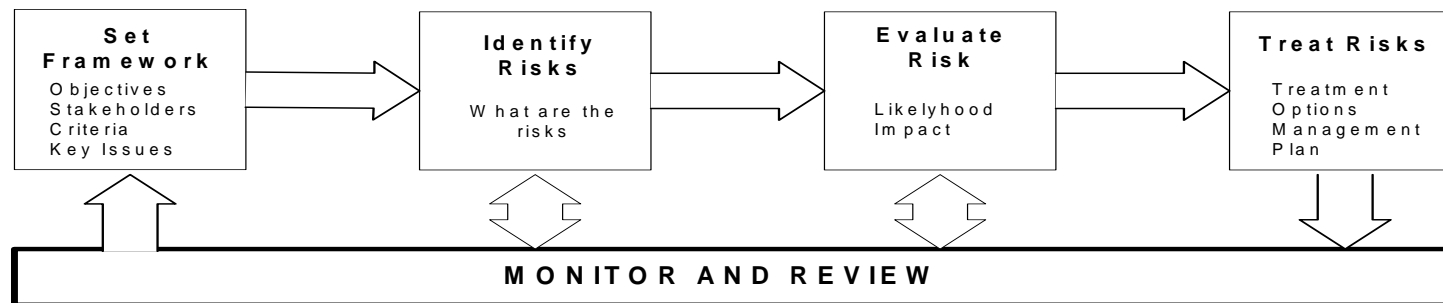
- National Asset Management Guidelines
- AS/NZS 4360 Risk Management
- Council Risk Management Standard

The procedure applied to evaluating and managing risks in both the reticulated and non-reticulated communities closely follows procedures contained in the Joint Australian/ New Zealand Standard AS/NZS 4360:1999 - *Risk Management*.

The management of risk associated with reticulated communities are dealt with through the associated AMP's (water, wastewater, stormwater, cemeteries and public conveniences). These documents are currently available to the public on request and will be placed on Council's website in the future.

The provision of drinking water requires a further level of risk management. Under the Health Act 1956 a public health risk management plan must be produced, this document is also available to the public on request.

These documents manage those risks relevant to the particular service but the over riding principles are the same;



### 3.2 Developing a Risk Management Plan

Establishing the risk management context

The primary objective of the assessments is to look at the adequacy of the water systems and sanitary services and identify the public health risk associated with providing or not providing these services. The context of this assessment of risks is based on the key issues of quality of supply or service and quantity.

Degree of control assumed

Initially, risk is analysed in this procedure assuming an absence of control (mitigation) measures. Whilst in many cases controls are present, this approach facilitates the determination of the costs - benefits of risk mitigation and the adequacy of existing mitigation.

Areas of Impact

It is possible to prioritise risks within a specified area or over several areas and manage them as deemed appropriate. The areas of impact selected are;

- Public Health
- Environmental
- Amenity availability
- Reputation and customer credibility

Sources of Risk

These have been categorised into sources where like aspects are grouped together. This aims to provide a logical framework for identification and analysis that helps ensure significant aspects are not overlooked.

Level	Descriptor	Description	Frequency
A	Almost certain	Is expected to occur in most circumstances	> twice a year
B	Likely	Will probably occur in most circumstances	between once and twice a year
C	Possible	Might occur at some time	between once a year and once every ten years
D	Unlikely	Could Occur at some time	between once every ten years and once every fifty years

Table 2. Measures of likelihood

Risk Analysis

Risk analysis assesses the consequence and likelihood of a risk event occurring.

Risk Evaluation

Risk evaluation involves comparing the level of risk found during the analysis process with established risk criteria.

To evaluate the level of risk associated with water and sanitary services the following criteria and structure have been applied to evaluate the risk;

- Likelihood of an impact occurring (Table 2)
- Consequence of the impact occurring (Table 3)
- Level of risk = likelihood \* consequence (Table 4)

Level	Description	AREAS OF IMPACT			
		Public Health	Amenity Available	Environment	Reputation / customer credibility
1	minor	Minor illness - Gastroenteritis* in one or more household members of affected property	Access available	Contamination affecting one property, related to sewage or stormwater or potable water	No media coverage but up to 5 residents /customers dissatisfied. Unit Manager informed of customer service issues.
2	moderate	Gastroenteritis in > 1 of the affected households. Transmission of illness from the contamination source ongoing	Delay of 1 week in availability	Contamination affecting up to ten properties or to stream or harbour causing health warnings with effect lasting up to one week.	Adverse local media coverage or between 6 and 50 residents / customers dissatisfied. Infrastructure Management Team member informed of customer service issues.
3	major	Gastroenteritis in primarily affected households or people with ongoing transmission. Secondary spread of illness beyond the affected community	Delays of up to 2-3 months in availability	Contamination (1) of land, stream or harbour with major detrimental effect; (2) of potable water affecting > 10 properties or lasting more than one week (3) damaging sewage treatment plant processes lasting < 1 week.	Adverse national media coverage, or > 50 residents / customers dissatisfied. Chief Executive informed of customer service issues.
4	catastrophic	Permanent public health warnings in the affected area. Widespread ongoing gastroenteritis in the affected area and surrounding community. Significant public health control measures required to stop ongoing transmission.	No long term access to amenity	Discharge of a contaminant destroying an ecosystem. Long term loss of a water supply source due to contamination. Damage to sewage treatment plant processes lasting > 1 week.	Adverse international media coverage or widespread public condemnation.

Table 3. Measure of impact

\* Gastroenteritis sudden onset of diarrhoea (3 or more loose bowel motions in 24 hours) and/ or vomiting.

\*\* Note that the level of public health risk may vary depending on the nature of the affected community e.g. the effects are going to be more severe if the affected area is more vulnerable to the effects of dehydration and complication from enteric illness e.g. a long-term care facility for the elderly.

When considering the information in table 3 it is important to consider that the public health level of risk will vary depending on the organism causing the problem. Also it is suggested moving up a public health risk category:

- if there is greater than 1 person hospitalised or a death associated with the contamination event or,
- Regional Public Health advise the infecting organism is likely to cause severe illness.

Table 4. Level of risk analysis matrix

Likelihood	Consequences			
	minor 1	moderate 2	major 3	catastrophic 4
A Almost certain	M	H	E	E
B Likely	M	H	E	E
C Possible	M	H	E	E
D Unlikely	L	M	H	E
E Rare	L	M	H	H

Legend

- E: Extreme risk
- H: High risk
- M: Moderate risk

Risk Treatment

Risk treatment involves identifying the range of options for treating risk, assessing those options, and applying a mitigation plan.

## 4 Water

Council continuously distributes good quality water to Wellington's consumers and in doing so protects public health as required under the Health Act 1956. It does this by ensuring that an adequate supply of water is available to every household in the reticulated area. This includes purchasing bulk water from GWRC, distributing that water through the local reticulation system, managing the reticulation (pipes, pump stations, reservoirs, etc) and by ensuring that only clean drinking water is present in the water mains. The reticulated area is some 5,553ha. Figure 3 shows the Wellington water system.

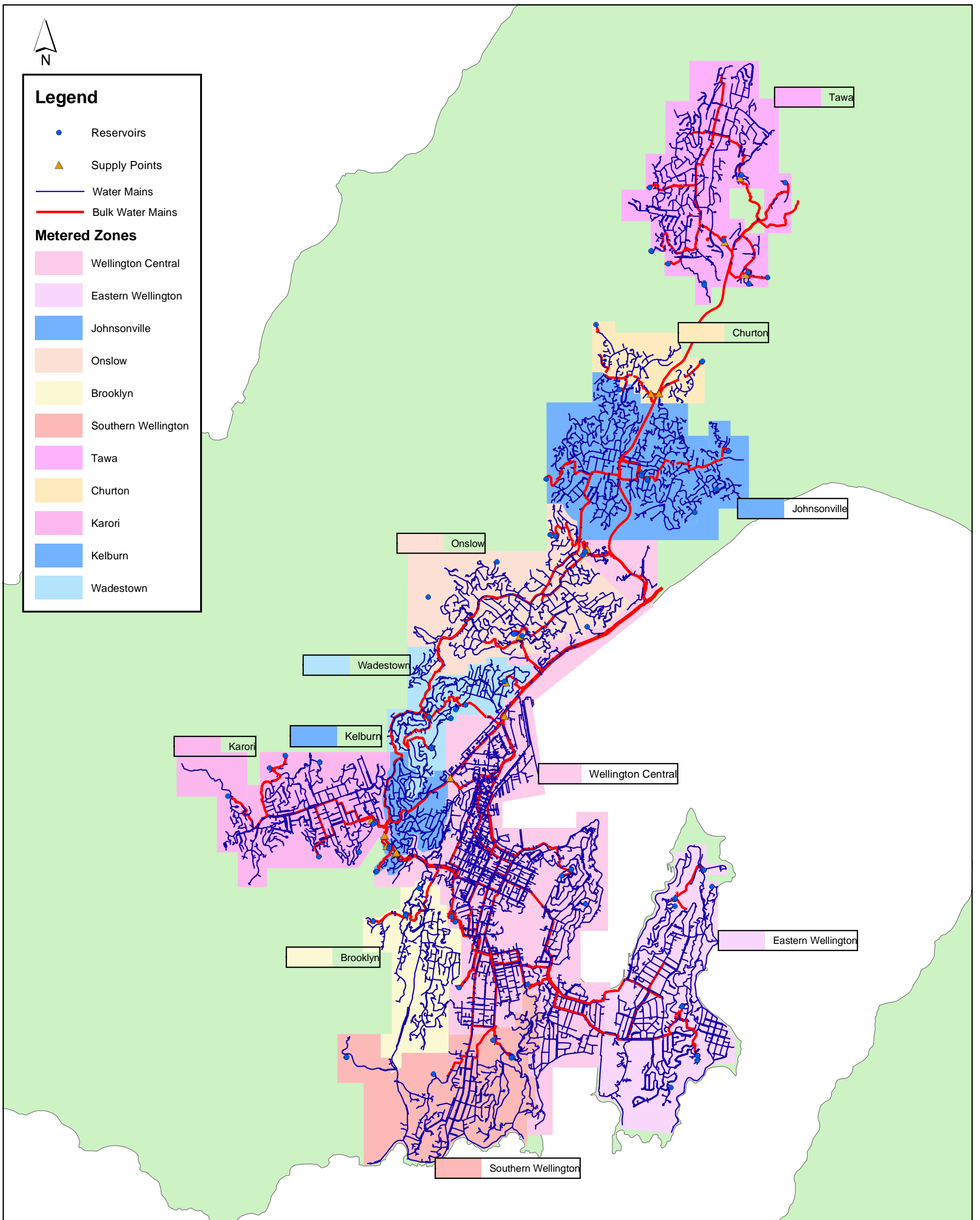
### 4.1 Communities

The communities for the water services assessment are the reticulated area of the city and the non-reticulated communities of Makara, Ohariu, Horokiwi, South Karori and Glenside. The reticulated area of the city has been further broken down into water supply zones. Properties in the non-reticulated communities operate individually, relying on a combination of bore, stream and rainwater, with the exception of the Meridian village which has a combined system of water supply for 25 houses.

### 4.2 Standards

Council provisions for water supply and quality are based on provisions in the following documents;

- Building Act (1991)
- Health Act (1956)
- Drinking Water Standards for New Zealand (2000)
- Long Term Council Community Plan
- Business Plan
- Revenue and Financing Policy
- District Plan



**DATA STATEMENT**

Property boundaries  
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Accuracy in urban areas: +/-1m  
Accuracy in rural areas: +/-30m

Other data has been  
compiled from a  
variety of sources and  
its accuracy may vary

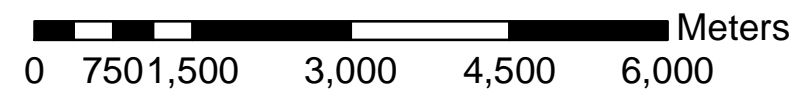
Topographic data:  
Wellington City Council  
WCC copyright reserved  
Accuracy: +/- 30cm

Any contours displayed  
are only approximate  
and must not be used for  
detailed engineering design

Colour Orthophotography 1:500  
flown Feb 2002 owned by  
Terralink International Ltd and  
used under licence by WCC

**Figure 3. Water Supply Network**

Schematic only, Approximate scale 1:70000



## 4.3 Water Supply Infrastructure

### 4.3.1 Reticulated

The basic water supply infrastructure consists of:

#### **Water System**

- 1007 km mains (approx.)
- 75 reservoirs and tanks
- 2 active dams (not reticulated)
- 34 pump stations
- 65,338 domestic connections
- 3,726 commercial and industrial connections
- 20 flow control stations (PRV)
- flow & level monitoring equipment
- 10,484 sluice valves, gate valves, air valves, non-return valves, scour valves and butterfly valves
- 7,921 hydrants
- 3,851 water meters. (3,076 commercial 755 residential)

Water is delivered from GWRC's (who charge Council a bulk water levy to cover costs) 4 treatment plants; Gear Island, Te Marua, Wainuiomata and Waterloo into the Council storage and distribution (reticulation) system at 19 separate supply points. There are two main supply pipeline arteries. One from Te Marua (Upper Hutt) to Wellington, the second from Wainuiomata to Wellington. Under normal conditions, water treated at Te Marua is piped to Wellington suburbs, including Tawa and Johnsonville. Water from the Wainuiomata treatment plant is also piped to Wellington and its suburbs (90% of Wainuiomata head works output). Waterloo and Gear Island Treatment Works also supply into the Wainuiomata- Wellington pipeline. Appendix 1 highlights each community's water source.



There are 77 water reservoirs and tanks in Wellington; Council owns 75 of these. The Richmond Hill residents own the two reservoirs at Richmond Hill, and the pipeline serving them.

#### 4.3.2 Non-reticulated systems

There is no mains water supply to Makara, Ohariu, Horokiwi, South Karori Road communities and some Glenside residents. Instead, domestic dwellings and commercial premises use water collected from roofs and stored in tanks. In a minority of cases, water is drawn from private bores or streams. Makara Beach community is supplemented in summer by tanker-delivered water which is drawn from the town supply. No additional monitoring or testing is carried out on this water.

A small diameter pipe feeds into a supply tank at Makara cemetery from the Council system. This pipe also supplies the community centre, the school and 5 Council houses in Makara village. Spring water tanks also supply the model school in Makara.

All water for the Meridian Village is collected from a stream, pumped to holdings tanks, chlorinated and distributed to the houses.

### 4.4 Issues

#### 4.4.1 Reticulated

##### Asset Stewardship

The supply of water to reticulated communities can be split into distinct supply zones based on the point of supply. The majority of these zones are supplied from local reservoirs owned and operated by Council, but some are supplied directly from the bulk water system. As a result there can be variations in the available flow rate or pressure supplied by Council. Those areas supplied from the bulk water system cannot easily be isolated during emergencies or for programmed or reactive maintenance. This is especially true for the Central Business District (CBD).

Several supply zones in the city lack sufficient storage capacity to continue delivering water after a significant natural disaster. The recommended storage requirement is 300 litres per person per day under emergency conditions (600 litres per person per day in normal conditions). To alleviate this issue Council have a forward works programme linked to new reservoir construction in critical areas.

Recent GWRC research has stated that if the recent rate of population growth continues, as from 2007, they would be unable to supply sufficient potable water during 1 in 50-year drought conditions. This has prompted the call for the preparation of a regional Wellington Water Management Plan to identify the possible options to provide solutions.

With regards to asset management planning there is an identified lack of systematic or co-ordinated action to consult with customers at grassroots level. This does not align with the transparency requirement of the LGA 2002. Council needs clearer definitions of community expectations on the levels of service provision and potentially an increase in public consultation.

#### 4.4.2 Non-reticulated communities

At present there is no long term monitoring data on the quality of water collected for domestic purposes from roofs, bores or streams. This means Council is currently unable to assess whether these water supplies meet current MoH guidelines.

The population totals of Meridian village and Glenside are both less than 25 people. These settlements will be treated as communities for the purpose of this Assessment, however are not sufficient in numbers to be registered as community drinking water suppliers with MoH.

It is unlikely that any treatment is carried out as rainwater is generally directed straight into tanks.

### 4.5 The Present Situation

#### 4.5.1 Reticulated

##### Water Quality

GWRC has a bottom line quality standard of meeting the requirements of the Drinking Water Standards including aesthetic standards, and a supply reliability standard of supplying enough water to meet demand in a drought with a recurrence of up to 50 years. These standards have been agreed with the four customer cities.

Reticulated water is treated before it is transferred to users. Treatment plants remove actual or potential contaminants and ensure that the water delivered is safe to drink. Te Marua and Wainuiomata plants treat river water from the Hutt and Wainuiomata-Orongorongo catchment areas. This water requires a number of processes - coagulation, flocculation,<sup>1</sup> filtration and disinfection - to achieve a high quality drinking water.

At both treatment plants, the filtered water is then disinfected by adding a very small quantity of chlorine. This kills any existing bacteria or viruses and protects against any contamination that may occur between the treatment plant and the tap. Acidity is again reduced to control corrosion and fluoride is added for dental protection. Dirt and pieces of floc removed during treatment are piped to wastewater recovery plants at Te Marua and Wainuiomata. Here, the solid material is separated out and disposed of at a local landfill. The retrieved water is recycled through the treatment process.

Waterloo and Gear Island plants treat aquifer water that is naturally safe to drink, but requires the acidity to be adjusted to minimise corrosion of pipes and fittings. At Council supply points the bulk water from GWRC is monitored for turbidity, FAC (free available chlorine) and pH for compliance with Drinking Water Standards.

A structured water quality control monitoring programme is in place to ensure compliance with the Drinking Water Standards for New Zealand 2000, approved by the MoH. This involves daily microbiological and chemical testing of the main water supplies into the city and weekly testing within the reticulation system, Environmental Laboratory Services (ELS) carry out the monitoring. The Drinking Water Standards stipulate zero *E-Coli* bacteria exceedance. In the last 5 years there has been no incidents of microbiological or chemical contamination.

Microbiological contaminants should be monitored for in all supplies and hence are known as Priority 1 determinands. Second level, Priority 2 determinands, only need monitoring when supplying populations of 100 or more, and the population must be at least 500 before a Priority 2 determinand is officially assigned and appears in the Register of Community Drinking-Water Supplies in New Zealand.

For Wellington in the 2003-printed Register, three Priority 2 determinands were assigned: one determinand (Fluoride) at 4 treatment plants (Gear Island, Te Marua, Wainuiomata and Waterloo) and two determinands to 2 distribution zones (aggressiveness to be resolved- Wadestown and lead- Eastern Wellington).

Te Marua and Wainuiomata water treatment plants are graded 'A' for risk management and water quality (*Completely satisfactory*).

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<sup>1</sup> Coagulation is the process of adding chemicals to water to make dissolved and suspended particles bind together (coagulate) and form larger particles (flocculant) that settle out of the water.

Table 5 shows each identified community and the current public health grading. The public health grading is an evaluation of both the actual water quality and the underlying measures taken to minimise risk.

These measures ensure that the water remains safe and wholesome now and in the future. Table 5 shows that the Source and Plant grading (A to C) which relates to the water as it leaves the treatment plant.

Zone Name	Population	Zone Grading*
Brooklyn	9,765	Bb
Churton	4,446	Aa
Eastern Wellington	16,815	Bd
Johnsonville	18,357	Ba
Karori	13,146	Bb
Kelburn	9,924	Bb
Onslow	11,883	Ba
Southern Wellington	30,024	Bb
Tawa	12,903	Ab
Wadestown	6,789	Ba
Wellington Central	31,074	Ba

Table 5. The MoH public health grading for Wellington supply zones. (Grading explanations in Appendix 2)

Before it enters the reticulation system it only presents a moderate level of risk. The part of the grading for the quality of the water and the systems in place (procedures and reticulation quality) to minimise the risk of unsafe water to the consumer have ‘a’ or ‘b’ status - completely satisfactory with negligible level of risk and demonstrably high quality.

The variation is mainly brought about through sediment, corrosion and slime growths in the pipes. The colour, taste and odour of water is affected by pipe condition, by the build up of deposits and biofilms in the pipes, and the age of the water when it reaches the customer. In the 2003/04 financial year Council received 73 taste and smell complaints out of a total 9,121 water related enquiries.

#### 4.5.2 Non-Reticulated

The preparation of this assessment has highlighted the lack of knowledge regarding drinking water collection methods and treatment practices (if any) of non-reticulated communities. To address this issue Council sent questionnaires (appendix 3) regarding water collection and treatment practices to 260 homes and 4 businesses in the non-reticulated communities. The response rate to the questionnaire was only 26%.

##### Quality

Some supplies that are not connected to the reticulated supply and are accessible to the public are monitored for their water quality and Regional Public Health may take an annual sample at some. Most of these small supplies may have sporadic events where bacteria (i.e. *E-Coli*, *Cryptosporidium*) in the water exceed levels in the Drinking Water Standards for New Zealand. In practice these supplies are allowed no more than 1 positive result in 78-109 samples. The small supply results show a clear difference in water standards compared to the Council supply. An isolated household, or community under 25, does not pose the same public health risk as that of a town. The very small amount of tank water drunk cold does not need to meet the same stringent standards of a town supply, as the public health risk is much lower (Ashworth, 2005).

For domestic water consumption the most common method of potable water collection is channelling water from the roof into large tanks made of various types of material.

Diverting spring and tributary water supply for household use is current practice for water supply in South Karori.

In the Makara many residents tap into and use subsoil water. The public toilets at Makara beach are owned and maintained by Council but are not connected to the reticulated system, their water supply is from a spring.

The Stony Beach Bistro has a holding tank for water which is filled up from a spring. During summer water is occasionally taken from town to keep this tank filled.

Ohariu Golf Club's drinking water was non-compliant with required environmental health annual analysis for *Cryptosporidium*. They now bring in water from the reticulated supply.

At the Meridian village water is collected from a stream, pumped to holdings tanks, filtered (filters are changed every six weeks) chlorinated and then distributed to the houses. This supply is not tested for any microbiological contaminants.

Questionnaires completed by members of these communities indicate satisfaction with their current systems and water quality. However responses to the questions regarding cleaning of guttering, filters and storage tanks demonstrated there could be health risk issues.

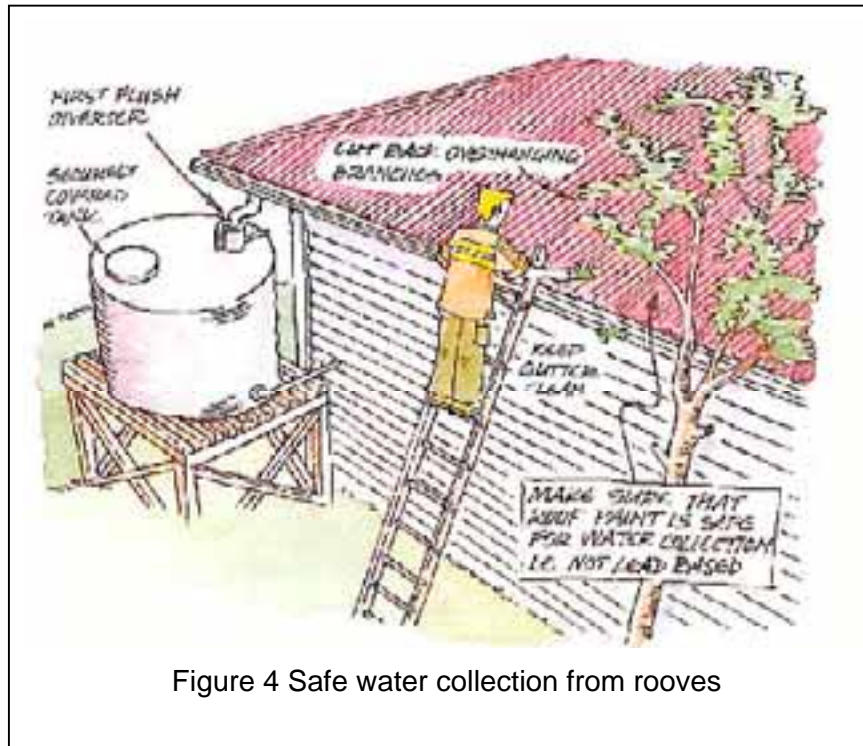


Figure 4 Safe water collection from rooves

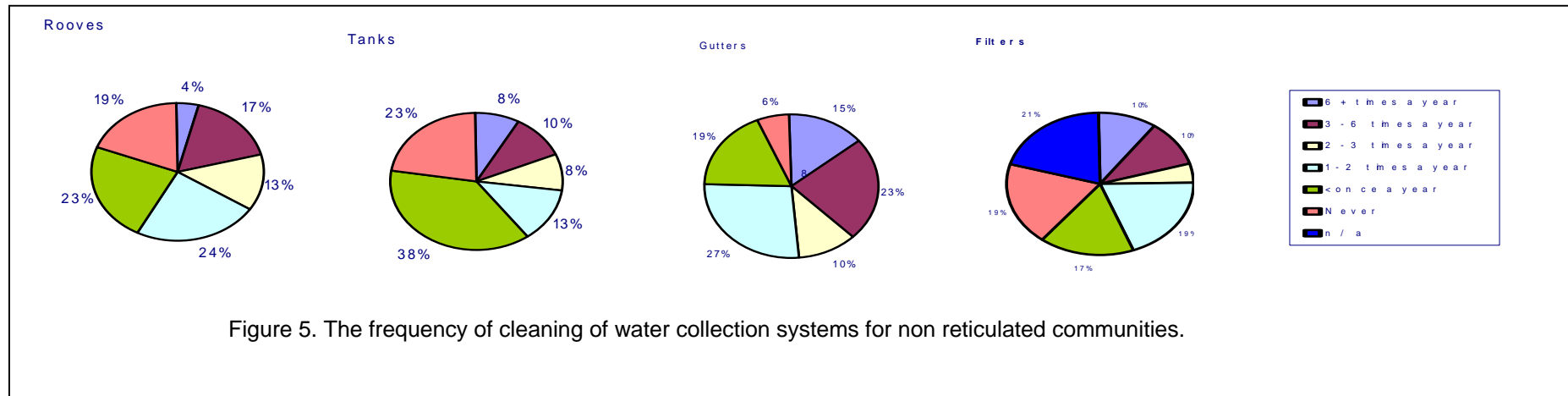
The MoH recommends gutters, tanks, screens, and other components should be inspected/cleaned twice yearly (Figure 4) (MoH publication Water Collection Tanks and Safe Household Water (MOH10148)).

Figure 5 shows the survey responses. Generally one quarter of all respondents cleaned rooves at least twice yearly, though for the cleaning of guttering nearly half of the respondents cleaned guttering twice yearly. Alternatively around half of all respondents clean storage tanks less than twice yearly and one quarter of the respondents do not have filter systems installed.

The MoH advises reticulated drinking water be sampled 10 times a quarter for E-Coli compliance. The Drinking Water Standards 2000 outline E coli requirements for individual household drinking water supplies, though no general sampling recommendations are made. Of the responses 15% annually monitor the biological quality of their drinking water. Only 3% monitor quarterly. This is well below the suggested guidelines. Similarly only 8% annually monitor the chemical quality of water.

The questionnaire asked residents whether they were prepared to let Council sample their drinking water, 80% of respondees agreed they would.

Although there is no direct evidence of problems the questionnaire responses indicate that some tanks would not achieve compliance with NZ Drinking Water Standards 2000; consequently there may be a risk that should be addressed. Greater education of and improved maintenance by dwelling occupants is recommended to improve water quality further also as a sensible safeguard, it is recommended that all new dwellings be required to install first-flush diverters on all roof water feeding to tank(s).



#### Quantity

Tank supplies generally have an adequate quantity of water for the residents, except perhaps where the roof area-to-occupants ratio is low, the tank capacity is small and/or there is a drought. Experience shows that, in practice, residents cope with this situation through the application of stringent water conservation practices (e.g. restricting toilet flushes, taking shorter showers, re-use of greywater for outside uses, etc)

#### 4.6 Risks

Council is aware that the buried infrastructure has inherent risks associated with it. However it is not just the buried infrastructure as there are inherent risks associated with anything subject to natural events, such as earthquakes and rainfall. A risk assessment for the water asset is covered in the Risk Management Plan and the Public Health Risk Management Plan (2004). This is a comprehensive guide to all risks expected to affect Council's water supply. There is an Emergency Management Plan in place to deal with the risks of service failure associated with earthquakes, extreme weather and other events. This section is an overview of the predominant risks.

The following risk tables should be read in conjunction with chapter 3 on Risk.

4.6.1 Reticulated

Quantity	Level of Risk
Council can manage likelihood and impact	
Pump failure at pump station	Moderate
Mains pressure failure anywhere, or high instantaneous demand	Low
Burst supply main	Moderate
Unauthorised access/vandalism/ sabotage	Low
Council can manage only impact	
Natural disaster cutting off supply to Wellington	High
Insufficient supply of raw or post treated water	Low

To mitigate these risks;

- There are duplicate pumps at all pump stations
- Three monthly and annual operation and maintenance checks are carried out at all the pump stations
- A standby generator can be transported to site if required
- Implementation of renewal and upgrade programmes will improve the reliability and stability of the system. Assets are considered for maintenance, rehabilitation or renewal based on the history of the pipe, the material of the pipe and water quality
- Only approved materials as per Water Supply Technical Specification 6<sup>th</sup> Edition 2003 are used in the reticulation system
- Council is developing a programme for reservoir renewals to meet the storage demand



- A network model is being developed to demonstrate the impact development will have on the current situation. It can also be used for the management and prioritising of current issues without major upgrade projects
- Pressure on the system is continuously monitored
- Pressure and demand management plans have been developed which will be more valid when the system model is in place
- Some reservoirs have perimeter fences and all reservoir access points are locked and alarmed
- Auto shut-off valves are installed at reservoirs to stop water leakage following natural disaster
- Investigation for inter-connection of supply zones for emergency purposes
- Water conservation investigations are being carried out with GWRC.

Quality	Level of Risk
Waterborne communicable diseases	Moderate
Backflow	Low
Contaminated groundwater	Moderate
Dissolution, leaching or corrosion from construction materials	Low
Sediment/slime accumulation and release	Low

The risk of supplying inferior quality water is mitigated through;

- Providing safe drinking water and preventing the spread of disease, meeting MoH Guidelines, National Standards and Council obligations
- Treatment and continuous compliance monitoring by GWRC and Council at supply points ensures only high quality water is delivered

- Requiring commercial premises which pose a risk to the reticulated supply, such as dentists and dry cleaners, to install a backflow preventor as stipulated by Local Government regulations and National Standards
- Regular water testing of boreholes supplying drinking water as required under MoH guidelines to give early warning of any sign of contamination
- Compliance with National Standards for pipe material ensures so there are no health risk from inferior quality pipes
- Implementation of upgrade and renewals programmes to improve the reliability, stability and quality of the system
- Dead end flushing, increased water circulation and the efficient management of the system ensure there is no accumulation of sediments or contaminants which has helped increase the water quality significantly
- Low risks from terrorism.

#### 4.6.2 Non-reticulated

Risks of contamination to the supply	Level of Risk
Lack of monitoring	Moderate
Lack of maintenance of collection systems	Moderate
Upstream septic tank failure and/or farming practices	High

Due to the lack of monitoring standards or regulatory requirement there is no current mitigation in place to reduce these risks. Although;

- Common deficiencies by property owners and components of rainwater collection systems include lack of knowledge, lack of maintenance, inadequate disinfection of the water, poorly designed delivery systems and storage tanks, and the failure to adopt physical measures to safeguard the water against contamination

- The individual nature of rainwater collection makes public health control measures extremely difficult. Although a variety of measures are available for improving rainwater quality; a good system design that is properly operated and maintained is the simplest most effective means of ensuring good water quality, while water treatment is mainly appropriate as a remedial action if contamination is suspected. Attempts to introduce water treatment methods, such as on-site chlorination, have met strong resistance, particularly because of taste and concerns of chlorine by-products
- The risk of contamination of roof-collected drinking water with microbiological pathogens can be minimised by modern approaches to water management practices but continues to be a public health concern. Providing the rainwater has little taste or smell and is collected from a well-maintained system it is probably safe and unlikely to cause any illness in most cases. However water which may appear clean and visually free of contamination and from a roof which is free of moss, lichen or other vegetation may be faecally contaminated. Bacterial growth may occur when water in rainwater storage tanks is physically “dirty” and the bacteria have sufficiently nutrients to multiply in the tanks. Sedimentation of small amounts of organic matter entering the tanks could lead to a build up of nutrients at the bottom of storage tanks. Faecal contamination of rainwater can be minimised and even eliminated if a clean impervious roof that is free of any moss, lichen or other vegetation is used for rainwater collection.
- Changing the behaviour of roof-collected rainwater communities will not necessarily be easy. Any expected behavioural changes by the communities will only be effective if it involves very little extra effort and cost to them. It maybe more practical, less time consuming and cheaper to ensure that residents using roof collected rainwater are made aware of and have access to current information on the safe collection and storage of rainwater.
- There are two ways of minimising the risk from upstream contaminants; regular maintenance checks on septic tanks, protecting the catchment and minimising the possibility of pollution. Council will work with GWRC to develop these ideas.

## 4.7 The Future & risk mitigation

### 4.7.1 Reticulated

#### System Upgrades

##### Water conservation and leak detection

Leakage, or water generally unaccounted for can be related to a failure of pipe work in the distribution system, domestic plumbing failures, losses through system fittings and water surreptitiously obtained. Also leakage can be related to pressure, the greater the pressure, the greater the potential for leakage. The current estimate of leakage from the Wellington system is more than 21%. Council consider the accepted leakage from a system is between 10-15% of the total water supplied. Further investigation on this issue is programmed for the 05/06 financial year and has been highlighted in the current Water AMP.

##### Pipelines

A cause of concern is the number of incidents of bursting failure of asbestos cement (AC) mains. AC pipe was first laid in the city system in the late 1930s and comprises 30% of the reticulation system. While the imported, poorer quality pipe is involved with most of the pipe failures, . The water pipe renewals programme is currently working on reducing the length of 100mm AC pipe. When AC mains break, they are repaired with plastic pipes from collar to collar.



There is a need to upgrade, by replacement or relining, all unlined and therefore unprotected steel & iron water mains. These mains were laid from the start of the city's waterworks in 1872 until about 1935, at which time concrete-lined pipes became available

After fixing leaks and bursts a 10-minute flush through of that section of pipe is carried out. Council's Environmental Health Officer (EHO) considers this insufficient and would like to see chlorine dousing and flushing on repaired pipes. The Medical Officer of Health recommends checking Council

Tory Street 450mm water main burst

procedures to determine if chlorine dosing and flushing can be included as per the EHO's recommendation. This will be further investigated.

It is Council policy that reservoirs must have 24 hours of available storage for emergency purposes. Twelve of the current council reservoirs do not provide the required storage under normal conditions of 600 litres/person/day (emergency supplies required are 300 litres per person per day), especially in the older suburbs. The latest census information has been analysed for the 75 reservoirs and the required capacity for each of these has been assessed. This, age, condition and the need to earthquake proof, form the basis for a forward programme for reservoir upgrading.

#### Asset Planning

AMP's are continuously improving by carrying out various investigations and consultation to explore level of service options. AMP's also detail the likely future demands for service and how demands can be met or managed.

#### Water meters

A water meter facilitates payment for the actual water used - a reward for being careful with water. Using water efficiently in the home and garden could lead to a significant reduction in water bills. This will depend on the number of people in a house, whether the household is a high, average or low user and how much is currently being paid on an unmeasured basis through a targeted rate on the capital value of the property.

Being able to accurately determine the rate of water consumption would greatly assist with reducing water losses from the system and better target leakage. Council currently has a voluntary residential metering policy in place where residents may volunteer for a meter of which they cover the cost of the meter and the installation costs and Council then maintain.



All commercial premises are required to have a water meter and pay on a consumption basis per cubic meter.

#### Water Conservation

Current demands show that from 2007, there is a statistical chance that there could be a water shortage in 1 in 50 year drought conditions. The present Council policy includes applying watering restrictions and water conservation measures are publicised regionally by the GWRC. Requesting the public to adopt further conservation measures would have to be politically supported.

The lower reservoir at Te Marua empty during maintenance

A Regional Wellington Water Management Plan is to be prepared by the GWRC. The Plan would provide a unified, integrated approach from the regions local authorities to improve the region's water use efficiency. Essentially the plan would target more sustainable use of the water resource and encompass a conservation awareness programme. Rainwater harvesting, greywater recycling and the requirement for dual flush toilets will be investigated along with other water conservation techniques.

#### 4.7.2 Non-reticulated

Education regarding safe drinking water.

Current information regarding safe rainwater collection and storage may not be reaching the communities. It is believed that none of the publications currently available demonstrate a systematic approach to the design, installation, operation and maintenance of these systems. Council is looking to address this with New Zealand Water and Wastes Association (NZWWA), GWRC and MoH.

Council will investigate introducing a code of practice of private rainwater systems for use as a building compliance guidance document under the potable water requirements of the Building Act.

To help maintain and update the information database Regional Public Health recommend that annual site inspections to determine the status of the non-reticulated supplies be undertaken on an ongoing basis.

The Makara Ohariu Community Board suggested registering on the MoH's Programme of Assistance to drinking-water suppliers. Council and the Makara Ohariu Community Board will investigate this option together. This may require co-operation between community members to act as a small supplier rather than individual property suppliers.

#### National environmental standard

Mfe is working with the MoH to develop and implement a national environmental standard (NES) for human drinking-water sources under the RMA 1991. The NES will require monitoring and reporting of source water in order to inform the community of the quality of their drinking water sources. The qualitative standard is designed to help regional councils and water suppliers manage drinking-water sources better and to take into account water supplies when issuing consents or setting permitted use rules in regional plans which will ultimately lead to better quality drinking water.

The qualitative grading of supplies to communities smaller than 500 people is not considered to be economic, although this threshold may drop over time to include more ‘at-risk’ communities. The proposed standard could be applied to smaller drinking-water supplies, in the same way that existing voluntary guidelines are applied.

Council will work along side MoH to avoid subjecting the public to two tiers level of regulation.

## 4.8 Future growth

### 4.8.1 Reticulated

#### Demand Management

The majority of water use in Wellington is for residential purposes with an estimated usage of 450 litres of water per person, each day. Currently Council purchases around 29,866 mega litres (ML) of water each year from GWRC, at a cost of approximately \$12,000,000.



At present, the region has sufficient water resources to be able to meet the current demand from Council (on average 53% of the GWRC’s water supply is used by Wellington City) and the other three cities, although GWRC was under strain in 2003 during drought conditions. Recent GWRC research has stated that if the recent rate of population growth continues, as from 2007, they would be unable to supply sufficient potable water during 1 in 50-year drought conditions.

GWRC has decided to focus on reducing the demand for water, rather than building new facilities, as the response to any increase in bulk demand, as a new raw water supply infrastructure will cost millions of dollars.

Construction of Aramoana Reservoir

#### Development

Individual infill buildings do not have a significant effect on the peak volumes of required water but the gradual incremental increase can ultimately have a significant effect on levels of service.

There is also an increasing demand on Council to allow developments in areas that do not have sufficient water capacity and pressures. This has been considered carefully and a policy on developer contributions has been adopted by Council to consider developments meeting the cost of any system improvements and so existing customers do not have a reduction in service levels.

A review of the water distribution requirements of the Northern Growth area concluded that three new reservoirs are required to adequately service existing and future development. Construction of these reservoirs would enable a number of small inefficient reservoirs to be replaced.

A new pumping station connected to the bulk main in the motorway would service development to the east and west of the area. A new reservoir of 3,000 cubic metres capacity will be constructed on the eastern side of the motorway to service 900 new and 400 existing lots. From this reservoir water will be pumped to a second new reservoir in Horokiwi with the capacity to service 450 lots. This facility would enable 90% of Horokiwi residents to be connected to reticulated water. A third reservoir with a capacity of 2,200 cubic metres will be constructed in Stebbings Valley to service development.

#### 4.8.2 Non-reticulated

##### Development

Current population levels in the non-reticulated communities mean that current individual systems to collect water are adequate. Future development may require Council to take a role in promoting community schemes because of the potential health risks posed by individual systems and to be more environmentally sustainable. It is recommended that any future subdivisions have clauses in building and resource consents binding the developer to take methods deemed adequate to manage any health risk.

Diverting spring and tributary water supply for household use, thereby reducing the minimum flow level of Karori stream, may be an issue if further development takes place, this will be taken into consideration and the risk assessed by GWRC in the resource consent process linked to subdivisions.



Across all the non-reticulated communities there are particular areas of concern regarding subdivisions. Understandably the community response is that only a slow rate of change should be allowed to occur. Most existing residents considered that the current system to require notified resource consents (in most cases) for subdivision and new housing was acceptable to achieving the wider objective relating to rural character and amenity.

The communities feel in any future development, water and wastewater should be managed adequately on-site and not connected to the reticulated Council supply. A feasibility study conducted in 2003 investigated the validity of reticulating Makara village from Karori West. This estimated the cost at \$0.5 million.

#### 4.9 Outcomes of Consultation for Water

Councillors would like to see information gathered on private water supplies in collaboration with Regional Public Health.

The Medical Officer of Health recommends checking Council procedures to determine if chlorine dosing and flushing can be included as per the EHO's recommendation.

The Medical Officer of Health recommends that Council fully investigate potential public health risks from rainwater harvesting and greywater recycling e.g. cross-contamination with reticulated drinking water supplies. There may be legal implications/barriers to introducing these practices in urban communities. Whilst encouraging future use of greywater systems, RPH want WCC to consider the potential for cross contamination of potable water from poorly designed or managed greywater systems and recommend introducing effective mitigation measures to prevent this occurring.

RPH consider it important that potential health risks to residents using non-reticulated water supplies are minimised. RPH therefore strongly support the recommendation to investigate a code of practice for private rainwater systems, and further recommend that this be extended to all private water systems e.g. sourced from stream water, bores and rainwater. They also support the provision of education on risks associated with non-reticulated water supplies and the gathering of information on non-reticulated supplies.

RPH supports WCC's proposal to contribute to the Wellington Water Management Plan to help conserve water to prevent potential future water shortage issues.

For future Assessments RPH recommend investigating and monitoring of non-reticulated water supplies in tourism and hospitality premises where visitors may be at risk of contaminated supplies.

Glenside Stream Care Group report that non reticulated landowners in Glenside are proud of their spring supplies and want to retain the source and the quality of the water.

#### 4.10 Future Water Recommendations

Contribute to the Wellington Water Management Plan proposed by GWRC to consider water demand issues and water conservation
Seek to gather information on the quality of the non-reticulated water supplies
Undertake education regarding safe drinking water in conjunction with other organisations
Consider introducing a code of practice for private rainwater systems for use as a building compliance guidance document under the potable water requirement of the Building Act
As a safeguard recommend that all new dwellings be required to install first-flush diverters on all roof water feeding to tank(s)
Consider applying the proposed MoH/ MfE national environmental standard for human drinking-water sources to smaller individual drinking-water supplies via mechanisms that would ensure regular monitoring and maintenance of collection systems.
Compile a Council database of all non-reticulated supplies which would include water quality where known.

## 5 Wastewater

Council protects property and public health by safely and efficiently collecting, transporting, treating and disposing of wastewater. This includes managing treatment plants, pumping stations and a physical wastewater pipe system. The latter totals some 1048km.

Since 1840, the wastewater of Wellington found its way into the harbour by means of open drains and watercourses. Reports on the problem of wastewater transport and disposal were received by Council as early as 1877. In the 1890s a major programme of drainage construction was undertaken to improve the sanitary conditions for the city. An extensive system of “intercepting wastewaters” was planned, to operate as far as possible by gravity to minimise pumping costs. The population of the city at that time was 30,000 people. The works were completed in 1898.

The intercepting wastewater system was comprehensively extended and partially duplicated in a major works programme undertaken in 1936. By this time, barely 40 years after the 1890’s programme was completed, the population of the city had reached 95,000 and the drainage infrastructure was in acute need of renovation to increase capacity.

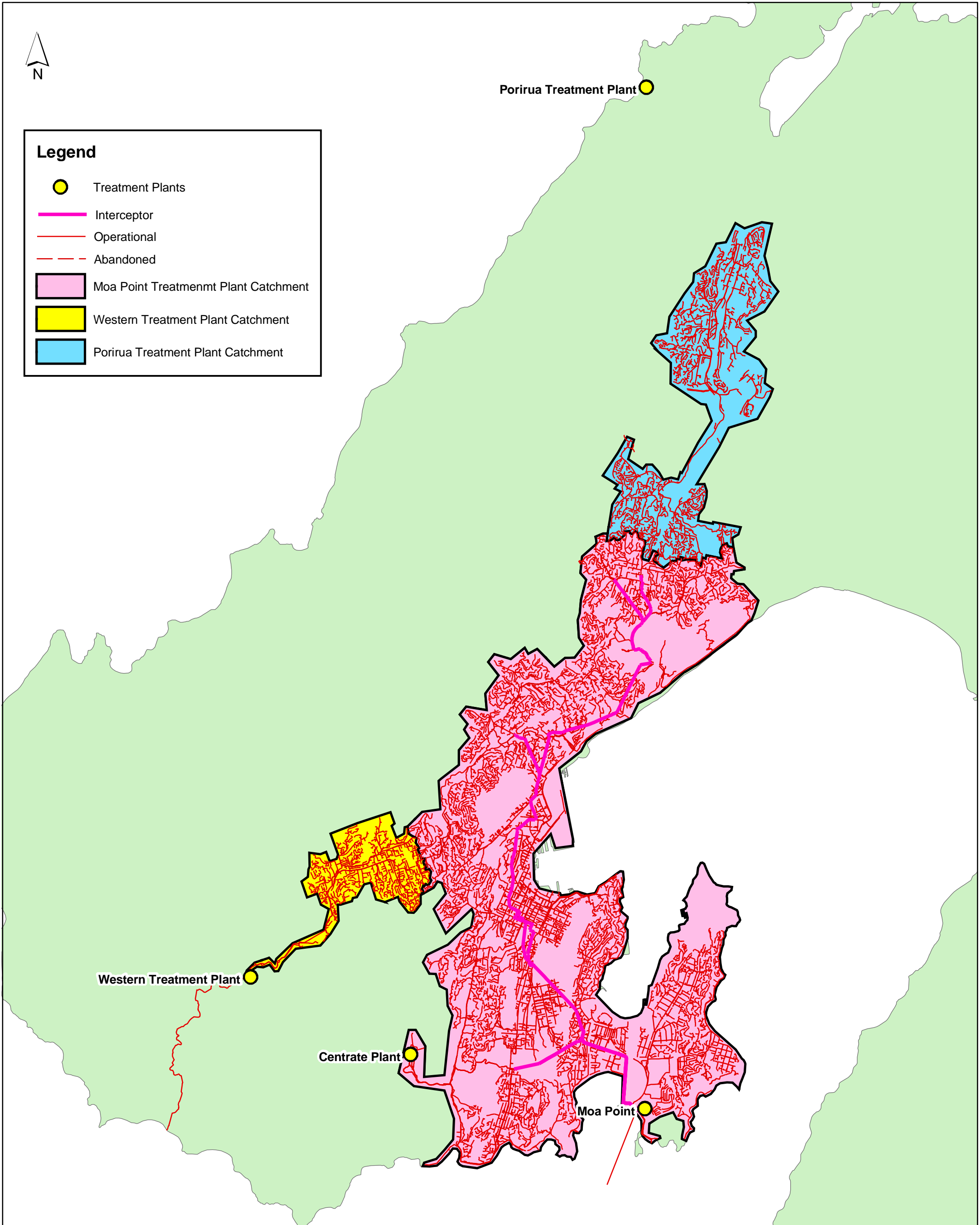
Further work, such as construction of the Kaiwharawhara foothills tunnel (1970’s), the Mount Albert tunnel (1980’s) and Kilbirnie interceptor triplication (1999) has been completed since the 1930’s to give today’s current configuration (Figure 6).

Because residential development post-1945 in the Wellington region has occurred predominantly outside Wellington’s boundaries, the percentage of wastewater pipes 50 years or older is high by average standards in New Zealand. There also tends to be a larger number of smaller diameter pipes in Wellington compared to many cities of similar size due to the steeper topography.

### 5.1 Communities

The communities for the wastewater services assessment have been divided into the reticulated area of the city and the non-reticulated communities of Makara, Ohariu, and Horokiwi.

The reticulated area of the city can be further broken down into which treatment Plant- Moa Point, Western and Porirua- serves that area of the city.



**DATA STATEMENT**

Property boundaries  
Land Information NZ  
Licence WN0853547/2  
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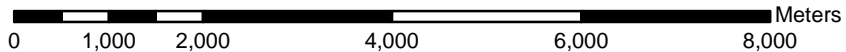
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**Figure 6. The wastewater network showing the main interceptor, Moa Point, Western & Porirua Treatment Plants and Carey's Gully Sludge Plant**

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The non-reticulated communities operate individually with the exception of the Meridian village, within the Makara area, which has a combined system of wastewater disposal and treatment serving 25 houses. In the instance of wastewater, the majority of South Karori Road is connected to the Councils reticulation system.

## 5.2 Standards

Council provisions for wastewater quality and quantity are based on provisions in the following documents;

- Resource Management Act 1991
- Local Government Act 2002
- Land Drainage Act 1908/Soil Conservation and Rivers Control Act 1941
- Building Act 1991
- Health and Safety in Employment Act 1992
- Civil Defence Emergency Management Act 2002
- Health Act 1956

Several by-laws and policies apply to the wastewater service, including:

- Asset Management Plan
- Sewage Pollution Elimination Project
- Drainage Rehabilitation Strategy
- Private Lateral Policy
- Building Over Drains Policy
- Wellington City Council Consolidated Bylaw 1991 (Currently under review)
  - Earthworks

- Watercourses
- Drainage and Plumbing
- Trade Waste Bylaw.

### 5.3 Wastewater infrastructure

#### 5.3.1 Reticulated

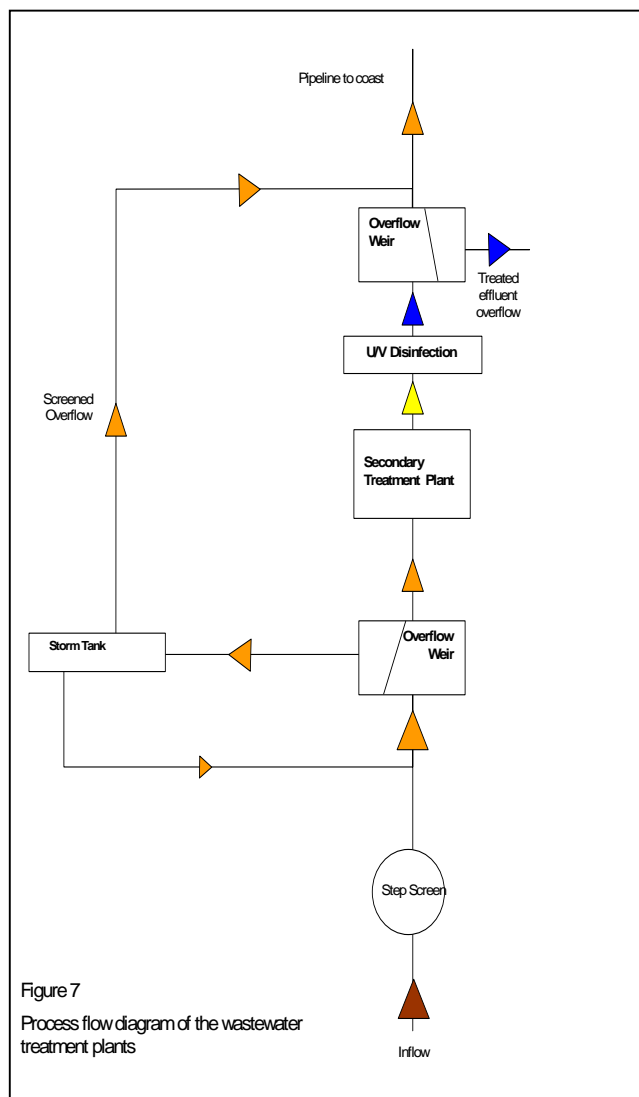
The wastewater drainage system consists of:

#### **Wastewater System**

- 1,048km pipe network
- 62 pumping stations
- Western Treatment plant at Karori.
- Moa Point Treatment Plant
- Carey's Gully Sludge Dewatering Plant
- Porirua Treatment Plant (27.6% share)

#### The Main Interceptor

The main trunk wastewater pipeline (the Interceptor) flows by gravity from Ngauranga Gorge through the central city, beneath Mt Victoria, through the low-lying coastal areas and the eastern suburbs to Moa Point. Wastewater from Island Bay, Brooklyn, Houghton Bay and Berhampore is delivered by gravity and pumped to a major pump station located between Island Bay and Owhiro Bay. Wastewater is pumped from this station back through Island Bay and a tunnel beneath Mount Albert to join the main interceptor at Kilbirnie. This intercepts all wastewaters from the Wellington area, except Karori and the Northern suburbs. Moa Point Treatment Plant serves a population of approximately



130,000. Wastewater from Karori (approximate population 11,000) flows to the Western Treatment Plant and wastewater from the Northern suburbs (approximate population 25,000) flows to the Porirua Treatment Plant.

Sludge from this process is pumped from Moa Point Treatment Plant, and trucked from Western Treatment Plant, to Carey’s Gully Sludge Treatment Plant where it is de-watered (water removed from solids).

### Treatment Plants

#### Moa Point

The Moa Point Treatment Plant was commissioned in 1998. It has an annual inflow of 27,073,088 cumecs. Treated wastewater is discharged through a 1.8km long outfall to the sea. The short outfall that was used prior to the construction of the treatment plant to discharge wastewater to the south coast is still in existence - for emergency discharges should they occur.

At the Treatment Plants, wastewater travels through a series of screens, tanks, bioreactors, clarifiers and ultra violet treatments (Figure 7). Large, non-organic materials such as toilet paper are first removed using screens. This rubbish is washed and compressed and disposed at the Southern Landfill. As wastewater travels through sedimentation tanks, the majority of solids settle out. A series of tanks and bioreactors use a combination of sedimentation and bacteria to decompose almost 70% of effluent material. Remaining liquid effluent is exposed to ultra violet light to destroy any harmful bacteria. The treated liquid is finally discharged in to Cook Strait.

The Treatment Plant and twin sludge pipelines to Carey’s Gully are owned by Council and operated by United Water International (UWI) under contract until 2019.

#### Western Treatment Plant

The Western Treatment Plant was commissioned in 1997. This plant is also operated by UWI

under the same contract as that for the Moa Point plant. It has an annual inflow of 1,762,098 cumecs. The treated wastewater flows by gravity through a trunk main (6.5km) that follows the Karori Stream, to the outfall at the stream mouth on the Southern coast.

#### Porirua Treatment Plant

Wastewater from some Northern suburbs drains naturally towards Porirua and is treated at the Porirua Treatment Plant, jointly owned by Council and PCC. This system manages wastewater from Churton Park, Paparangi, Glenside, Grenada, Tawa and parts of Johnsonville and Newlands. Currently 27.6% of the capacity is allocated to Council and 72.4% to PCC. Council already uses its 27.6% capacity allocation and this current agreement is under review due to the expected growth in the Northern suburbs.

The sludge generated at the Porirua Treatment Plant is currently landfilled at PCC's Spicer Landfill in Ohariu Valley.

The Moa Point and Western Treatment Plants have sufficient capacity to treat current peak dry weather flows and the predicted population growth related flows for the next 20 years. Porirua Treatment Plant needs some minor upgrades to improve capacity. Their design has been optimised to treat a certain percentage of wet weather flow during rain events. Due to financial and performance restraints not all wet weather flows are fully treated, there are occasions where the plants cannot cope and partially treated overflows occur, these events are managed under resource consent conditions administered by the GWRC.

All three Plants also have resource consents governing their day-to-day operation. The Wellington Treatment Plant assets have some of the highest consented performance criteria in the country and continually meet those criteria.

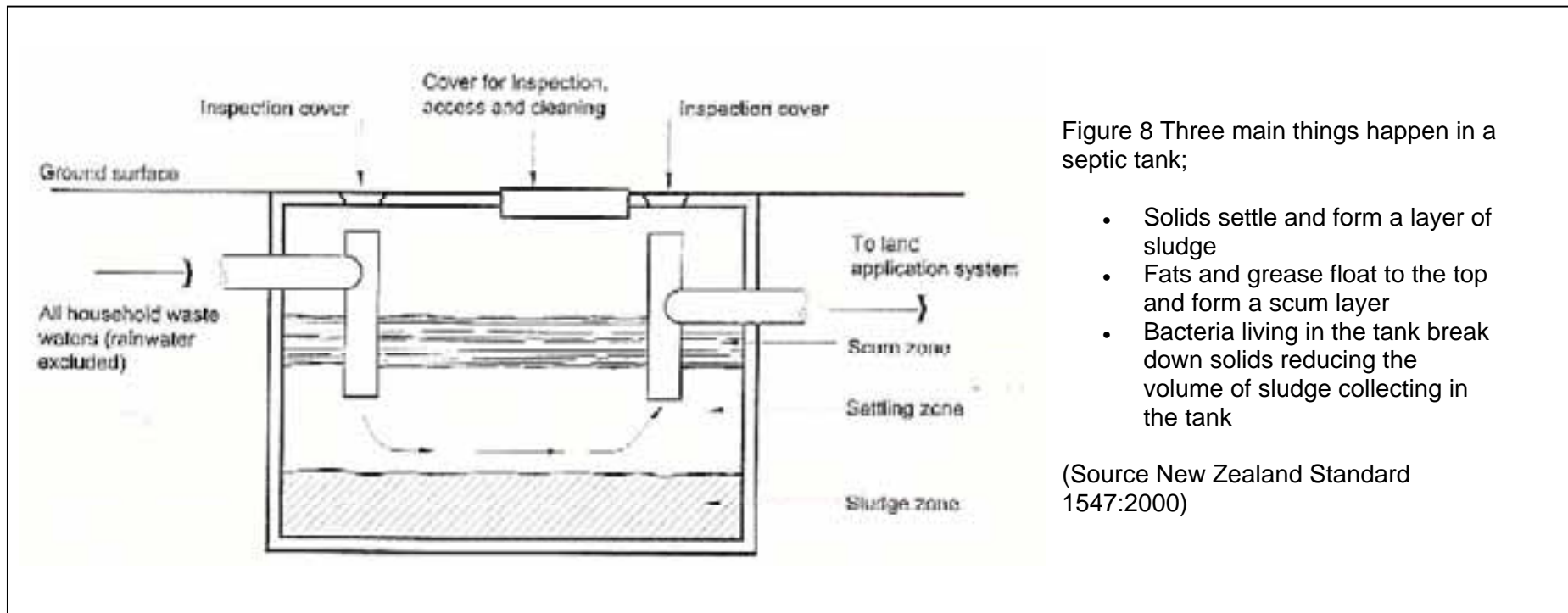
#### 5.3.2 Non-reticulated disposal systems

Low-density rural residential development is currently not required to connect to the city wastewater system and is not provided with a wastewater service unless provided by the developer. The dwellings on these blocks are required to provide their own disposal systems. Council's Building Consents and Licensing Business Unit regulate the approval and installation of these tanks.

##### Individual

In a typical modern system, waste from house plumbing, (kitchen sink, bathroom sink, shower, bath, toilet, laundry) flows through pipes into a two-part system: a septic tank (which retains all solid waste) and a soil absorption system whose job is to permit only liquid clarified effluent





(liquid from the tank) to seep into the soil. In the absorption system bacteria, which occur naturally in the soil, digest septic bacteria and other pathogens so that the liquid is eventually sanitary and does not contaminate the private wells, ponds, or streams. There is some bacterial action in the tank but most of the important action occurs in the soil absorption system. Tanks require periodic cleaning.

#### Combined

The Meridian Village has combined settling ponds and its own private outfall behind the village. This is the only such system in the Wellington area. The septic disposal system is of such a standard that they received a letter of satisfaction from GWRC stating that they will only be checking it every three years to ensure it meets their resource consent requirements.

## 5.4 Issues

### 5.4.1 Reticulated

#### Level of Service

With regards to asset management planning there is an identified lack of systematic or co-ordinated action to consult with customers at grassroots level. This does not align with the transparency requirement of the LGA 2002. Council needs clearer definitions of community expectations on the levels of service provision and an increase in public consultation.

#### The Pipe System

##### Capacity and condition

Parts of the wastewater pipe system lack sufficient capacity to meet Council's current levels of service during wet weather. Lack of capacity of the wastewater asset is manifested by the flow of wastewater above ground or to the stormwater system in heavy rainfall. These overflows are caused by the wastewater system being too small for the actual flows or there being too great a quantity of flow caused by stormwater entering the system (inflow) or groundwater entering wastewater pipes (infiltration).

There is a direct correlation between the severity of any particular rain event and likely occurrence of wastewater overflows. Based on historical records and the use of computerised modelling it is possible to identify this correlation and manage the cause and effects of these overflows (see Wastewater AMP 2004).



The infiltration of groundwater into the wastewater system through cracked and leaking pipes can also result in the deterioration of streams, the Harbour and South Coast water quality through wet weather overflows.

#### Pumping Stations

Occasionally, due to the ingress of inflow and infiltration (I/I), pumping stations are unable to cope with wet weather flows resulting in overflows to the stormwater system.

#### Rising main repair

#### 5.4.2 Non-reticulated

It is not possible at this time to accurately comment on the performance of the non-reticulated wastewater systems operating in the region. This is due to the lack of regulation on the ongoing operation of these systems.

### 5.5 The Present Situation

#### Reticulated

##### Wet Weather Flows

Council is addressing the above issues of wet weather overflows through:

- The Interceptor Upgrade Project, which investigates Wellington's trunk wastewater system with a view to implement solutions to overflow and capacity problems that currently exist
- The Drainage Rehabilitation Policy 1993 ensures the wastewater system is effectively maintained and upgraded as required
- The Lateral Policy 1993. This entails the Council taking responsibility for the structural maintenance of the private laterals located in road reserve. The intention of this policy is to reduce stormwater pollution caused by the wastewater leaking from private laterals
- The Sewage Pollution Elimination Project 1993 (SPE). The project is driven by 11 resource consents for the discharge of wastewater contaminated stormwater into the Harbour and South Coast. The project calls for considerable works to be carried out to reduce overflows, improve wet weather performance and upgrade the wastewater system.

### 5.5.2 Non-reticulated

#### System efficiency

In preparing this assessment the lack of information on septic tank performance in non-reticulated communities was highlighted. To help address this issue Council sent questionnaires (Appendix 3) regarding septic tank use and maintenance to all those properties where no wastewater reticulation existed. According to Council records 264 homes and 5 businesses were identified however only 69 (26%) responses were received.

<b>Septic Tanks</b>	65
<b>BioCycle</b>	1
<b>Greywater soak pits +composting toilet</b>	3
<b>Dimensions</b>	62% unknown
<b>Age</b>	2-40+ yrs
<b>Measured sludge depth</b>	67% never
<b>Measured scum thickness</b>	73% never
<b>Frequency of cleaning and how</b>	17 never
	48 professionally
<b>Experience any problems</b>	None

Table 6. The responses to the questionnaire regarding cleaning and maintenance of septic tanks

Table 6 highlights the responses. All of the houses have individual wastewater systems. Though no responses identified any problems with their tanks, the responses to the question regarding repairs shows problems with blocked pipes, tree roots causing failures and tanks at their optimum capacity. Poorly maintained and operated septic tanks often result in problems with discharges on to land and waterways.

#### Quality

Council is aware of septic tanks in Horokiwi, Makara and Ohariu Valley that may not work efficiently leading to contamination of receiving waters. The effectiveness of septic tanks presents both a public health and environmental risk through contamination of watercourses.

Figures obtained from GWRC indicate that the water quality of Makara Stream is not as good as it could be. In particular *Faecal coliform* counts have been high in recent years. Though it is uncertain where the main source of such contamination is from, potential sources include run off from farms adjacent to the river, and discharge from failing septic tanks.

MfE Microbiological Water Quality Guidelines consider a single freshwater sample greater than 550 *E. coli*/100 mL to represent a public health issue. Table 7 shows the GWRC *Faecal coliform* medians from the last 10 years. Monitoring was for *Faecal coliforms*, but for comparative assessment with MfE guidelines, results have been converted to approximate *E. Coli* counts, based on the average *E. Coli* count being equal to *Faecal coliforms* (S Lewis, Earth Matters *pers com*).

Site	Median <i>Faecal coliforms</i> /100mL (1994-2004)
Ohariu Stream	490
Makara 1 km above mouth	1095
Makara Stream	990
Karori Stream	1000

Table 7. Stream quality data with a view to the influence of failing septic tanks on water quality.

With the exception of Ohariu Stream all these results are twice the MfE action levels for freshwater.

Despite this there is no current evidence of disease or illness due to inadequate disposal of wastewater effluent in these non-reticulated areas, though there is the potential for illness and/ or disease in these non-reticulated areas due to inadequate disposal of wastewater.

It is recommended that an assessment as to how much impact the performance of septic tanks is having on freshwater quality and if the current level of *Faecal coliforms* present in local streams is acceptable be undertaken.

There are currently no ongoing maintenance or monitoring requirements placed on the operation of septic tanks.

### Quantity

The adequacy of existing facilities such as septic soakage levels is unclear due to the lack of information regarding the performance of septic tanks.

GWRC are at present preparing a database of existing septic tanks characteristics. Also the MfE is looking at introducing septic tank “warrants of fitness” legislation. This will require Council to investigate and understand the problems of septic tanks.

## 5.6 Wastewater Risks

Council is aware that buried infrastructure has inherent risks associated with it. However it is not just the buried infrastructure as there are inherent risks associated with natural events, such as earthquakes and rainfall. A risk assessment for the wastewater asset is covered in the Sewerage (Wastewater) AMP (2004). Council has an Emergency Management Plan to deal with the risks of service failure associated with earthquakes, extreme weather and other events. These Plans formulate controls and procedures to deal with these risks. This section is an overview of the predominant risks.

### 5.6.1 Reticulated

Quantity	Level of Risk
Asset failure resulting in overflows	Moderate
Uncontrolled trade waste discharges	Moderate
Treatment plants overloaded- unable to manage inflow	Moderate
Increases in I/I	Moderate

The risk of overloading the wastewater system is being mitigated through:

- Drainage Rehabilitation Strategy (1993) based on the approach of the authoritative United Kingdom Water Research Centre. This includes the Critical Drain Strategy and underpins the maintenance strategy and the decision process for renewals and upgrades

- Trade Waste Bylaw 2004 working toward meeting the requirements of the New Zealand Waste Strategy by decreasing the quantity and pollutant load in trade waste and to ensure that the polluter pays for its treatment
- The SPE project calls for considerable works to be carried out on the wastewater system. The results to date have markedly improved water quality
- The Liquid Waste Management Plan taking into consideration the influences of I&I on wastewater
- Asset Management Planning. Robust asset planning and financial management subject to review by Audit New Zealand ensures best practice when managing wastewater assets
- The implementation of standards for development proposals and works supervision. e.g. ensuring cross connections do not occur.

Quality	Level of Risk
Environmental pollution resulting from overflows	Moderate
Inadequate treatment processes	Low
Lack of regulatory controls	Low
Exposure to untreated wastewater or its products may result in a number of illnesses	Moderate
Heavy metals and public health	Low

The risk of poor quality wastewater and resultant environmental degradation is being responded to by:

- The Liquid Waste Management Plan will take into consideration the influence of wastewater on stormwater and acceptable quality standards for both
- The Moa Point and Western Treatment Plants resource consents require wastewater to be treated to a stipulated standard. These consents include investigation into ways to reduce I/I rates

- The Trade Waste Bylaw, where Council require holders of trade waste permits to have a waste management and minimisation programme in place
- Resource Consent Compliance; Due diligence in ensuring compliance mitigates the chances of poor water quality reaching and leaving the Treatment Plants
- Compliance with the Resource Management Act 1991 for the treatment of all wastewater.
- The SPE project which calls for considerable works to improve water quality in the wastewater system.

Risks of not providing a wastewater service	Level of Risk
Environmental pollution	High
Illness due to contact with wastewater contaminated waters	High
Risk of groundwater contamination	High
Loss of recreational amenities	High

The risk of an inadequate wastewater system is minimised via;

- The SPE project which calls for considerable works to improve water quality thus avoiding environmental damage
- Regular monitoring by United Water International (UWI) and Council ensure that the service provided is highly effective
- Drainage Rehabilitation Strategy and other Council policies carried out under the AMP ensure the risk of contamination is at a minimum.
- Compliance with the RMA 1991 for the treatment of wastewater.



Risks of providing wastewater treatment;	Level of Risk
Failure to comply with resource consents	Low
Loss of reputation	Moderate
Odour from treatment process	Moderate
Environmental degradation from plant failures	Low
Loss of recreational amenities	Moderate
Creation of secondary contaminants (Biosolids)	High

To minimise the risks resultant of providing the wastewater treatment service;

- The Clearwater Project ensures diligence in relation to resource consent compliance
- Councils Best Practice Standards and Service Level agreements ensure a continual high level of service provision
- Council currently contracts Living Earth Limited to beneficially reuse wastewater sludge to produce high-grade garden compost.

#### 5.6.2 Non-reticulated Risks

Risks presented by septic tanks;	Level of Risk
Effluent disposal create a risk to humans or surrounding environment	High
There are health risks associated here with poorly maintained tanks i.e. ingestion of contaminated water	Moderate
Odour from failed tanks process	Low

To minimise risks:

- Monitoring and maintenance standards will need to be determined and implemented to ensure the safe working of individual on-site wastewater treatment processes
- Resource Consents are required for installation of septic tanks, however there is no requirement for monitoring after this
- A close working relationship is required with GWRC staff to determine knowledge, actual effects and best solutions for the septic tank failure
- Regular water quality monitoring and compliance with relevant MfE and Public Health guidelines on freshwater quality

The individual household management of on-site systems has come under increasing scrutiny by agencies (MfE, MoH) concerned about public health. It is common to find that septic tanks and other on-site systems are poorly maintained and operated. There are often consequential problems with discharges on to land and waterways, i.e. the contamination of the water supply. The cause of failure is lack of information about, and absence of incentives for, owners to operate and maintain the systems.

Failure to maintain an on-site system can mean its 'life' is drastically reduced. The homeowner may save money in the short term, but the system may have to be replaced earlier than normal. More scrutiny is likely to force communities who are otherwise comfortable with their on-site systems to review the situation.

## 5.7 The Future and Risk Mitigation

### Reticulated

#### Asset Planning

AMP's are continuously improving by carrying out various investigations and undertaking grassroots consultation to explore level of service options. AMP's also detail the likely future demands for service and how demands can be met or managed.

#### Liquid Waste Management Plan

Council has adopted a Liquid Waste Management Plan to comply with its obligations under the LGA 2002. This plan addresses wastewater and stormwater issues and impinges on water and solid waste issues.



### Island Bay sewer upgrade

An investigation into the Interceptor is currently underway. Initial findings suggest the issue of I/I is not currently being addressed adequately and a more strategic approach, looking across the entire system is necessary, initially focusing on Berhampore, Newtown and the CBD.

#### Containment Policy

The options and costs regarding the frequency and extent of overflows from the wastewater system needs to be evaluated. Part of the associated consultation process will be to establish how many wet weather overflows the community consider acceptable, taking costs into consideration.

#### Trade Waste

Trade wastes are transported to the Treatment Plants and, for example, comprises approximately 10-12% of the total flow to Moa Point with approximately one-third being from the Taylor Preston abattoir.

The potential characteristics of trade waste, as opposed to domestic waste, are the materials that strip the oxygen out of the wastewater and produce unwanted gases, Biological Oxygen Demand (BOD)<sup>2</sup>, suspended solids that block the system, metals, pesticides, insecticides, solvents, grease, oil, fat, etc. These all damage infrastructure, influence the biological treatment process at the treatment plants and present health risks for wastewater workers. Therefore, under Trade Waste resource consents, monitoring is required to ensure consent holders have effective operational control measures.

#### Biosolids

The sludge from the Moa Point and Western Treatment Plants is beneficially reused into compost under contract with Living Earth Limited. Living Earth are continuing to develop markets for this product.

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<sup>2</sup> Biochemical oxygen demand – the quantity of oxygen used in the oxidation of organic matter.

Before the Living Earth contract expires in December 2008 future sludge disposal requires further investigation. As stated in Council's Solid Waste Management Plan 2003 and the Liquid Waste Plan the primary focus is on ensuring the stability and viability of long-term beneficial reuse solutions, rather than on short-term and a significant increase in waste diversion. Potential options for future biosolids use will need to be evaluated taking into account the above considerations but also risks, impact on the environment, Iwi concerns and costs.

Council will review the current bio solid disposal process in 2005 to evaluate options and implement the agreed preferred option.

#### Cultural Effects

Council acknowledges that the discharge of treated and untreated wastewater into water is of particular concern to Maori and consultation with iwi is required.

#### 5.7.2 Non-reticulated

##### Septic Tank Issues

Pollution of Karori Stream from runoff upstream, residential activities, agriculture, wastewater discharge (septic tanks) and transport activities is an ongoing risk. Council will work with GWRC to identify recurring problems with water quality issues and reach solutions.

Under the LGA 2002 requirements, it is necessary to assess the environmental impacts and public health risks of continued use of on-site wastewater systems. This in turn requires assessment of the effectiveness and long-term sustainability of such systems in the non-reticulated communities. Council needs to determine whether there is a public health risk involved in continued on-site wastewater disposal, or whether it is advisable to provide a reticulated wastewater systems to rural communities to mitigate public health risk.

This would involve an assessment of the environmental and site management factors.

##### Regulation

The majority of the community may consider that some regulation of on-site systems is necessary. MfE have written guidelines for the safe and clean operation of septic tanks, these guidelines, in the next couple of years, maybe come a requirement.

Council may need to be more involved in regulating the monitoring and maintenance of these tanks.

Council could consider introducing mechanisms (such as a bylaw) that seeks to ensure that septic tanks and on-site wastewater disposal systems in use are installed and maintained in a manner that ensures effective operation of the system. This would require that sufficient detailed information be provided with a building consent application so that the Council can determine whether or not the disposal system will operate in a satisfactory manner. Property owners would be required to regularly maintain their septic tanks. The purpose of this is to remove the build-up of settled solids from the tank which can reduce the efficiency of the tank's operation.

Council could also make the necessary inspections and investigations to determine the location and condition of wastewater disposal systems and to determine whether the disposal system is operating correctly. In situations where Council believes the disposal system is unlikely to be working correctly Council may require the owner to have the septic tank pumped out or to have the necessary repairs made to the disposal system.

An option is for new subdivisions and or existing residents to choose a centralised system -a collective approach to maintaining systems i.e. a group of houses, all with septic tanks, get together and pay a third party to monitor and maintain these systems for a set price. Capital costs to upgrade and repair a particular septic tank would still be the responsibility of the individual landowner. This approach to operating and maintaining on-site systems would still need the householder to take some responsibility; i.e. making sure that toxic substances do not enter the system.

Such integration can:

- provide for the involvement of professional operation and maintenance servicing, which removes the direct responsibility from the homeowner
- protect the investment in the on-site system hardware and soil treatment capacity by maintaining long-life performance
- bring better environmental and public health results.

This physical technical system may not be necessary if the on-site systems are well managed.

The community and Council may want to clearly indicate the expected standard for any new people settling in the area. A simple way to do this is to require everyone to perform to a certain level. This two-pronged approach may reduce faulty on-site systems.

## 5.8 Future Growth

### 5.8.1 Demand Management

The main drivers of demand on the wastewater system are population growth, development and urban form, economic growth, I/I and (to a small degree) water consumption.

The extra demands on the wastewater system due to the population growth and development of Wellington City will not be substantial in the short term. There are no current significant capacity issues related to population demands.

The presence of I/I creates significant demands on the wastewater system during wet weather. It is proposed that the development of an I/I removal strategy through the Interceptor Upgrade Project would mitigate this demand.

#### The Northern Growth Management Plan

The area in the north of the city, between Churton Park and Tawa, has been identified for urban development. This will have an impact on future demand for services. The wastewater from this area will discharge north to the Porirua Treatment Plant.

The Northern Growth Management Project highlighted the constraints of treatment facilities in the area and discussions are being held with PCC to identify a solution through an increased share in the Porirua treatment plant capacity.

## 5.9 Outcomes of Consultation for wastewater

Councillors were interested in the scope for more “Meridian Village” set ups.

The Medical Officer of Health recommends that the information collected via the questionnaire is incorporated into a Council database of on-site wastewater treatment systems (utilising GWRC data). The missing data could be collected via contacting the outstanding households and businesses. To help maintain and update the information database RPH also recommend annual site inspections to determine the status of the non-reticulated supplies on an ongoing basis.

Regional Public Health would support the introduction of an onsite wastewater treatment/disposal bylaw. And suggest PCCs existing bylaw could be used as an example.

Regional Public Health supports the proposed future wastewater options. They recommend adding another recommendation to provide information on good management/adequate maintenance to existing owners of on-site systems.

### 5.10 Future Wastewater Recommendations

Continue with current Council projects to reduce wastewater overflows and improve performance of wastewater system
In conjunction with GWRC seek to gather information on the operation and maintenance of septic tanks and on-site wastewater disposal systems
Consider mechanisms that would ensure septic tanks and on-site wastewater disposal systems are installed and maintained in a manner that prevents their failure and ensures effective operation. For example systems must meet New Zealand standard 1547 Onsite Domestic Wastewater Management.
Consider implementing the forthcoming MfE guidelines for the safe and clean operation of septic tanks.

## 6 Stormwater

Stormwater is rain which has run off hard, “impervious” surfaces like roads, roofs, car parks and surface water. Traditionally stormwater has been piped away from these hard surfaces and discharged into the nearest waterway (e.g. stream, beach, harbour, wetland). Stormwater is not usually treated in any way.

Council provides a stormwater system that aims to protect property and public health by safely and efficiently collecting, transporting, and disposing of stormwater. This includes managing streams, watercourses and a stormwater pipe system. The latter totals some 683 km of pipes and tunnels.

The system has evolved with the development of the city and ranges from open channels to pipes less than 200 millimeters in diameter.

### 6.1 Communities

The communities for the stormwater assessment have been divided into the reticulated area of the city and the non-reticulated communities of Makara, Ohariu, Horokiwi and South Karori. The reticulated area of the city can be further broken down into 42 stormwater catchments.

### 6.2 Standards

Council provisions for stormwater quality and quantity come from the following documents;

- Ministry for the Environment Marine Recreational Water Guidelines
- GWRC Freshwater Plan
- GWRC Coastal Waters Plan
- Australian and New Zealand Guidelines for Fresh and Marine Water Quality
- Resource Management Act 1991
- Building Act 1991
- District Plan
- Local Government Act 2002



- Long Term Council Community Plan
- Bush and Stream Restoration Plan 2001
- Asset Management Plan.

## 6.3 Stormwater Infrastructure

### 6.3.1 Catchments

A catchment is defined by topography. A main stream and tributaries join together in the catchment to form a water system which drains through a single outlet into the harbour or south coast. Council catchments are generally based upon actual drainage characteristics, but are also affected by management boundaries.

The more urbanised eastern side of the Wellington region has been broken up into 42 individual catchments ranging in size and elevation from rural Kaiwharawhara (1917 ha, 420m) to smaller urban catchments such as Thorndon (12 ha, sea level). The rural western region has not been subdivided into catchments at this time. Figure 9 shows the main stormwater catchments. All these catchments contain a multitude of small watercourses, streams and piped stormwater infrastructure.

The rural streams are generally narrow and restricted channels with over hanging vegetation, compared to the channelised urban streams. Streams have an average grade of 7.25% throughout the region, representing the steep topography associated with most of the Wellington catchments.

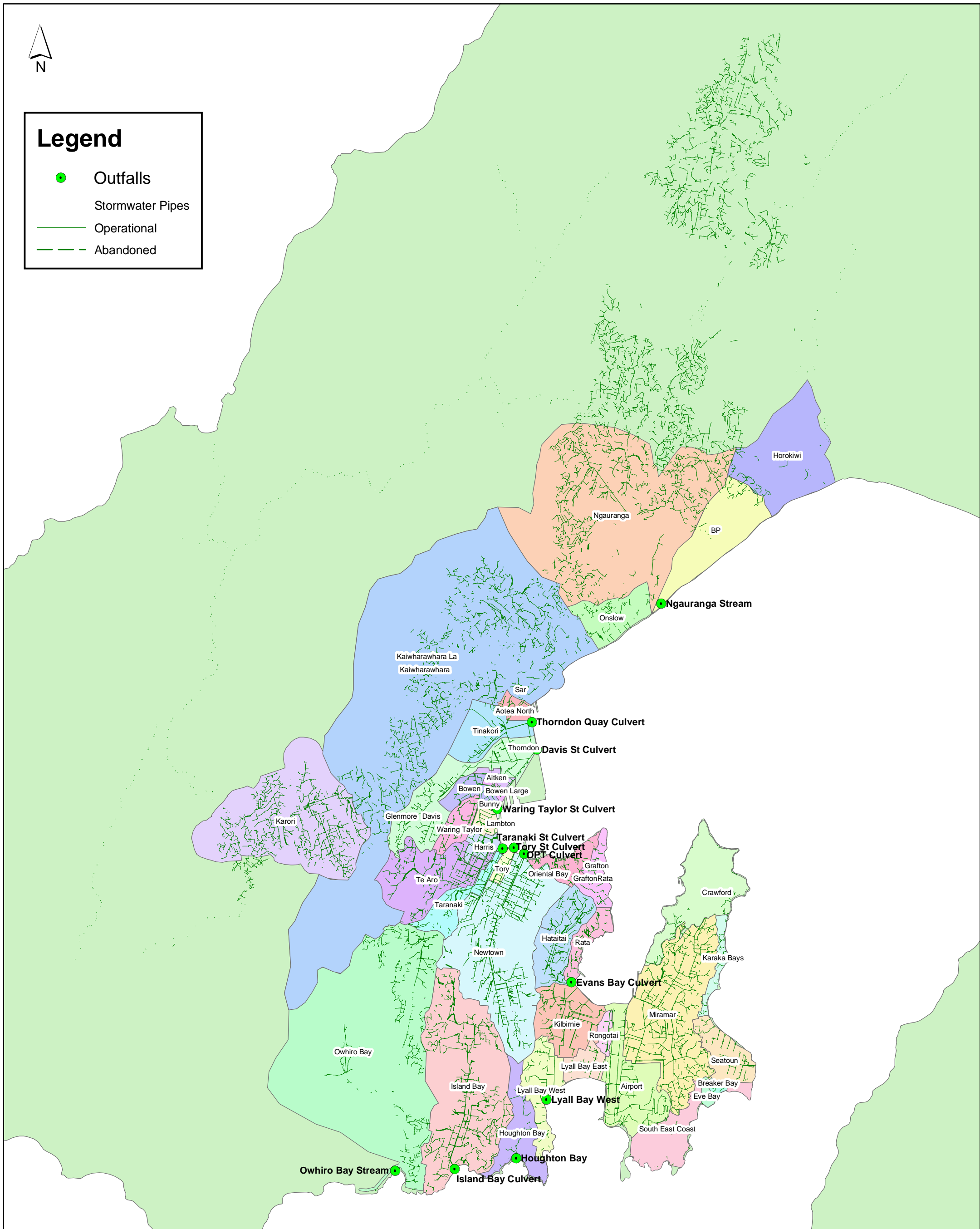
Wellington stormwater from these catchments is discharged directly into the City's streams, harbour and south coast. Eleven of the major discharges to the sea are currently consented under the RMA 1991. The consents for the discharge of wastewater-contaminated stormwater to the coastal marine area were issued in 1994 and require Council to carry out improvement works by 2013. The works are dependent on the individual consent conditions.

In addition to the eleven consented discharges, there are thirteen significant unconsented discharges to the harbour and south coast with varying states of water quality. Appendix 4 lists these consented and unconsented catchments.



# Legend

- Outfalls
- Stormwater Pipes
- Operational
- - - Abandoned



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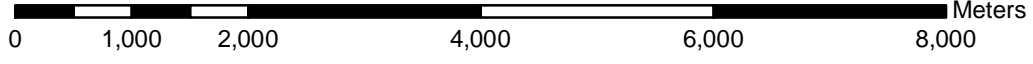
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Figure 9. The stormwater catchments showing the consented outfalls.

1:65,000



As a general rule, the care and maintenance of all watercourses is the responsibility of the landowner. However, GWRC has an agreement with Council that GWRC will manage the following sections of watercourses, along with the detention dams at Seton Nossiter Park and Stebbings Valley and debris arrestor at Glenside, to keep them clear for flood flows:

- 10km of Porirua Stream: From the Wellington City boundary to Seton Nossiter Park
- 1.0 km of Takapu Stream from the Porirua Stream to top of the industrial area,
- Makara and Ohariu Streams and their tributaries, including Makara Stream mouth
- Karori Stream below the urban area,

The agreement does not override the regulatory requirements that apply to all watercourses under the Resource Management Act.

Council funds 33% of all maintenance works on the Porirua Stream.

Council is responsible for the maintenance and operation of the remaining stormwater infrastructure (see Table 8).

### 6.3.2 Reticulated

The reticulated stormwater transportation system is divided in terms of streams and piped infrastructure.

There are some 62,733 residential and 4,450 commercial properties contributing stormwater to the Council reticulated system.

Kerbs and channels, sumps and the sump outlet pipe are also integral in the collection of stormwater. The majority of sumps are constructed with a baffle to trap floatables, debris and silt.

The maintenance of the system, including culverts and drains is carried out by Council in accordance with agreed Service Levels set out in the Stormwater 2004 AMP.

Many of the natural streams in the Wellington City area were piped many years ago. Typically, the larger pipes in the stormwater drainage system are laid along the beds of the original streams (often in private property) with the smaller feeder pipes in legal road.

	Diameter (mm)	Length (km)	Total Length (km)
Pipes and tunnels	100 & 150	76	683
	225	177	
	300, 375 & 450	143	
	450+	117	
	unknown	170	
Outfalls	163 direct to coast		
Open Streams	Porirua, Ngauranga, Kaiwharawhara, Karori, Makara, Ohariu and Owhiro		
Sediment/debris collection facilities	Kaiwharawhara, Ngauranga and Karori		

Table 8. Stormwater Infrastructure

The remaining major streams are still considered part of the reticulated stormwater infrastructure.

### 6.3.3 Non-Reticulated

There are fewer than 100 rural dwellings which are not currently connected to the stormwater system. These properties generally feed stormwater from rooves to water supply tanks.

The tanks provide the primary source of potable water and any other residential needs for these non-reticulated properties. Overflows from the tanks and runoff from other impervious surfaces are generally discharged from each section via appropriate means (soak pits, channels etc) to avoid overland flow flooding the property. These discharges are often direct to any nearby watercourse or stream.

## 6.4 Issues

### 6.4.1 Water Quality

Stormwater quality improvement has been a focus of Council since the introduction of the RMA 1991. This is reflected in the current stormwater discharge consents and the improvement works associated with them.

Stormwater quality can be influenced by the condition of the wastewater assets within the catchment and the presence of other contaminants, e.g. nutrients, sediment, faecal bacteria, heavy metals and hydrocarbons.

These contaminants are carried to streams in stormwater from roofs, roads and industrial areas, although some may come from chemical spills and wastewater-stormwater cross connections.

Current city wide monitoring projects (Beaches and Streams, Baywatch, GWRC's State of the Environment) are carried out to determine the status and trends of water quality in the harbour, sea, streams and culverts. The results are reported annually in hard copy (can be obtained from Council and GWRC) or can be sourced from the internet (MfE or GWRC).



### 6.4.2 Flood Management

The RMA 1991 requires Council to control potential development effects including mitigation of natural hazards. This requires Council to have records of natural hazards i.e. floodplain management plans. The Building Act 1991 also required buildings to be protected from flooding up to a 50-year average return index (ARI, the frequency, on average, a given rain event is expected to recur).

The urbanisation of the city has resulted in more buildings, gardens and roads being flooded more frequently than Council's agreed levels of service and those implied in the Building Act 1991. These flood problems are exacerbated by developments in natural ponding areas and secondary flow paths. The implementation of the Flood Protection Project aims to rectify the flooding risk in the majority of the City.

Flooding in the CBD

Large-scale stormwater flooding has occurred in the recent past in the Harris, Taranaki, Te Aro, Karori, Miramar, Island Bay/Berhampore, Kaiwharawhara catchments and the Tawa Basin due to a combination of mitigating factors, including capacity of existing infrastructure, topography and permeability of the land. Flood hazard maps have been completed for Newtown, Tawa and Miramar. Te Aro and Karori areas are being currently carried out.

Flood assessments have also been carried out for the Karori and Porirua Catchments and an environmental assessment for the Kaiwharawhara Stream, Porirua Stream, Karori Stream, Ngauranga Stream and Makara Stream.

#### 6.4.3 Asset Stewardship

Council adopted a stream management policy entitled “Wet and Wild” Bush and Stream Restoration Plan in October 2001 as part of its wider natural environmental strategy. The plan sets out the guidelines by which Council hope to maintain and enhance this part of our natural environment.

A considerable portion of the stormwater system has insufficient capacity to meet current Council levels of service for flood protection. It has been identified that some >\$85 million of work is required to upgrade the existing pipe works to meet current design flood protection standards. These works are identified in the stormwater 2004 AMP.

Some pipe upgrading works are undertaken as a consequence of pipe renewal. In these cases, although the condition of the pipe is the key driver, the additional cost to upsize and increase the level of flood protection is minor. The pipe diameter required to comply with the Code of Practice is always constructed.

The implementation of upgrading works normally involves the construction of large diameter concrete pipes. When there is a natural stream, serious consideration is given to installing a pipeline for the flood flows but retaining the stream for low flows (in line with Council Wet and Wild policy). This enables the ecological values associated with the stream to be retained.

With regards to asset management planning there is an identified lack systematic or co-ordinated action to consult with customers at grassroots level. This does not align with the transparency requirement of the LGA 2002. Council needs clearer definitions of community expectations on the levels of service provision and an increase in public consultation.

## 6.5 The Present Situation

### 6.5.1 Water Quality

Stormwater quality is currently being improved by:

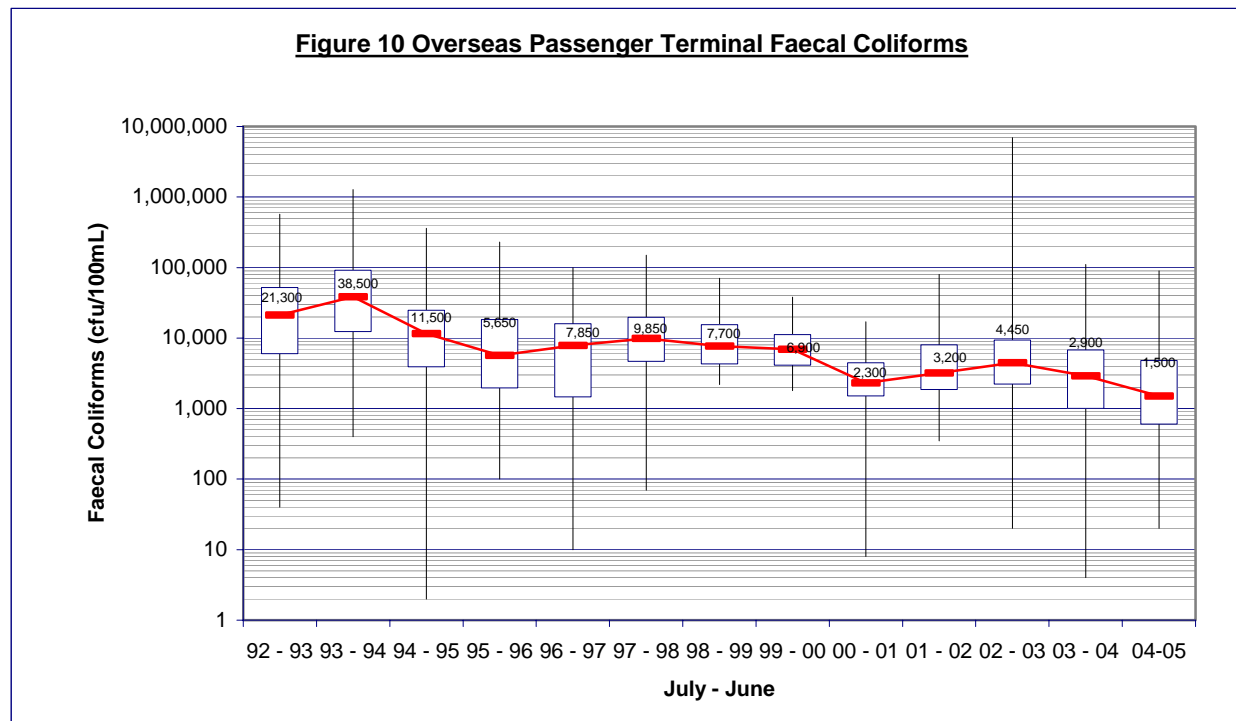
- The SPE project. The project is driven by the 11 resource consents for the discharge of wastewater-contaminated stormwater. The project calls for considerable works to be carried out on the wastewater system. The results to date have markedly improved water quality.
- The Lateral Policy 1993. A lateral is the private connection from a building to the public main. There are two distinct components of the lateral. The upper lateral is in private property, and the lower lateral is in legal public road. Council takes responsibility for the structural maintenance of the private laterals located in road reserve. The intention of this policy is to reduce stormwater pollution from wastewater leaking from private laterals.
- Beaches and Streams monitoring is carried out to determine the status and trends of water quality in the harbour and sea, streams and culverts. Some 80 sites, both fresh water and marine, are sampled on a fortnightly basis throughout the year. The samples are analysed for a variety of environmental performance indicators. These include *Faecal coliforms*, *E-Coli*, *Enterococci* and at some sites, heavy metals. The results of this monitoring form the basis of the pollution investigation work carried out by Council and are reported to the GWRC annually.
- Baywatch monitoring incorporating 22 water samples at 15 sites on Wellington's bathing beaches is conducted on a weekly basis from November to March in keeping with the MfE guidelines. The *Enterococci* results indicate that Wellington's bathing beaches generally meet MfE standards for contact recreation and that stormwater discharges are not having a significant adverse effect on receiving waters in this respect.

The results are assessed using various water quality guidelines for aquatic ecosystem protection, fisheries, and recreational water use. The water quality of the streams is variable, with generally better water quality either in, or in close proximity to, forested or relatively undeveloped catchments. The water quality of many waterways deteriorates progressively downstream as a result of run-off from more intensive land use, stormwater discharges, and localised pollution. In comparison with other urban stream systems Kaiwharawhara Stream ranks as one of the best

as it has significant regenerating bush areas lining it and significant work has been done on the discharges into the stream. Porirua, Makara, Karori, and Ngauranga Streams have the poorest water quality in the region.

Beaches and Streams monitoring has highlighted the improving water quality throughout the city, however a few sites have been identified where stormwater quality has not shown significant improvement. These sites are Overseas Passenger Terminal (OPT), Tory Street Culvert and Ngauranga Stream near the harbour.

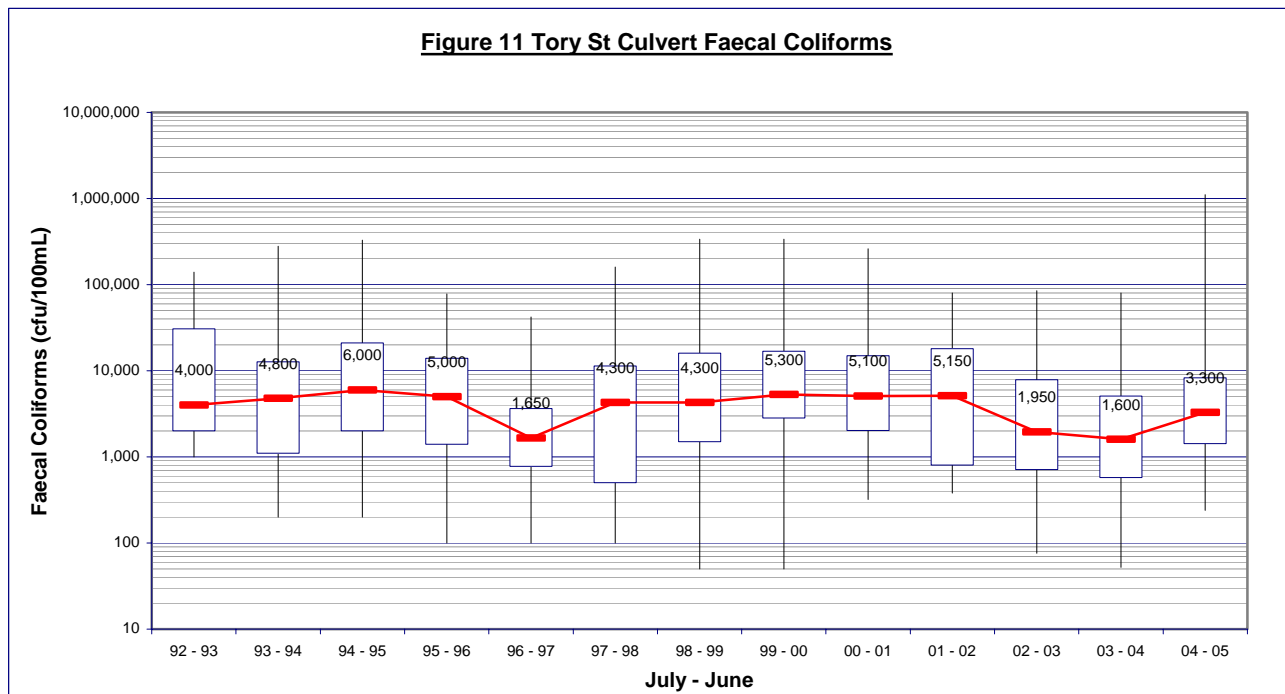
The OPT catchment covers approximately 448 ha of which an estimated 262 ha is impervious, it is heavily urbanised (64%) with some light industry. Heavy traffic loads are carried through the catchment. The monitoring results show a significant improvement over the last 10 years



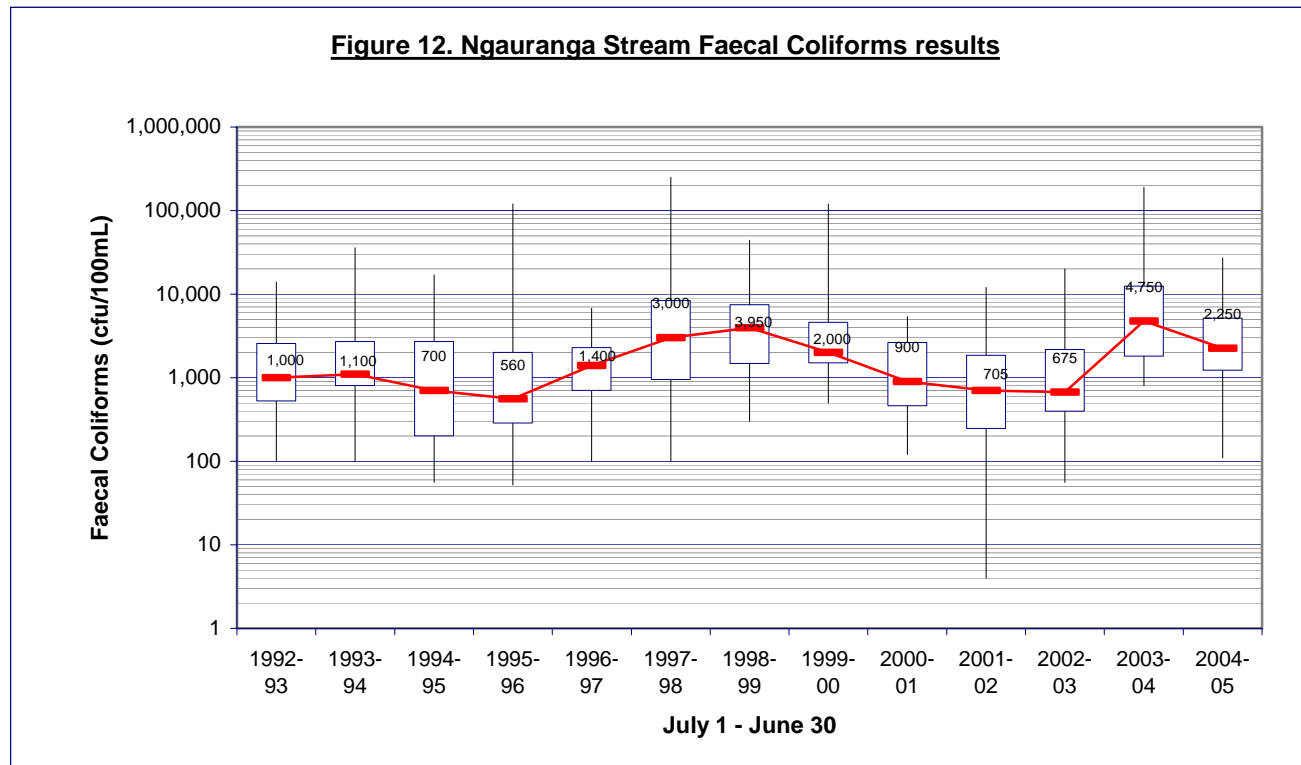


with annual median faecal coliform values reduced from 21,300 cfu/100ml in 1992/93 to 1,500cfu/100ml in 2004/05 (Figure 10). The annual 95-percentile value declined from 128,000 to 31,200 cfu/100ml over the same period. The SPE project has reduced both dry weather leakage and wet weather overflows, although the data indicates that sewage faults remain.

The Tory Street catchment is approximately 70 percent central city area, parts of which carry very high traffic volumes. Commercial and light industrial activity is located throughout. The stormwater collection system covers approximately 44 ha of which an estimated 70 percent is impervious. The results show a significant improvement over the last 10 years with annual median faecal coliform values reduced from 4000 cfu/100ml in 1992/93 to 3300cfu/100ml in 2004/05 (Figure 11). The annual 95-percentile value declined from 79,350 to 21,000 cfu/100ml over the same period. The results show that the SPE works implemented to the end of 2004 had not significantly reduced indicator bacteria numbers.



Ngauranga Stream drains an urban catchment which is predominantly residential, but includes commercial and light industry premises. It covers an area of 840 ha of which an estimated 10% is impervious. The monitoring results show annual median faecal coliform levels have varied over the 1993- 2004 period, but there is no clear increasing or reducing trend (Figure 12).



Other active and proposed stormwater quality improvement works;

- The Trade Waste Bylaw ensures that discharges are analysed, monitored and directed to the wastewater system as appropriate.

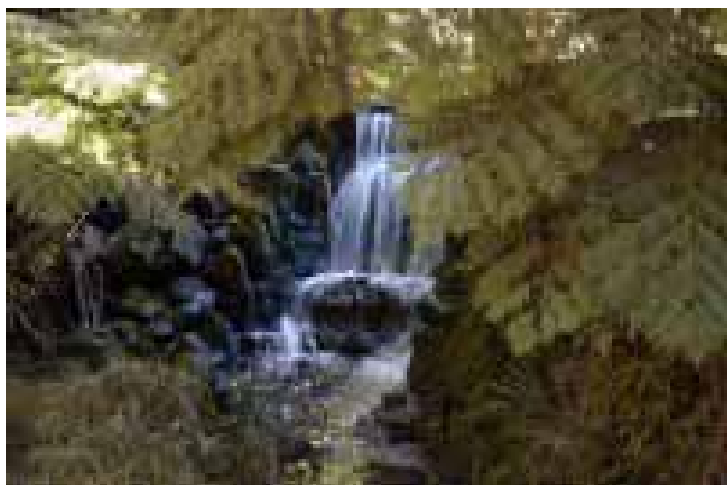
- A Liquid Waste Management Plan taking into consideration the influences on, and of, wastewater and stormwater was adopted by Council in 2005.
- The Code of Practice for Land Development is to be updated to include sediment control measures for land developments.
- The implementation of standards for development proposals and works supervision. e.g. ensuring cross connections do not occur.

A Baseline Assessment of Environmental Effects (BAEE) has been undertaken and shows the presence of various pollutants other than wastewater. Work continues to determine the source, the nature and effect of stormwater pollutants and the best methodology to reduce the presence of these pollutants including;

- Sediment
- Heavy metals and hydrocarbons
- Organic pollutants resulting from malfunctioning septic tanks
- Litter.

The effect and magnitude of these contaminants is not yet fully understood.

Project Kaiwharawhara is a joint venture between Council, GWRC and local community groups working actively to protect the stream and to promote the awareness of the importance of the stream and the surrounding bush ecosystems. Despite the urban land use pressures placed upon



the ecological values of the stream style, Kaiwharawhara Stream retains a relatively good habitat. This is a result of the generally high to good quality of the riparian vegetation is present in reserves and parks, which provides centres of biodiversity and aids restoration activities and rehabilitation. In addition the relatively steep and entrenched nature of the catchment, which has minimised the effects related to sedimentation and channelisation often associated with urban streams.

Leachate from operating and closed landfills is a potential source of contamination to local streams. The Northern, Southern landfills (Carey's Gully), Spicer landfill in Ohariu Valley (operated by PCC) and the closed landfill at Horokiwi are managed under consents to ensure long-term effective containment of contaminants. The landfills present no water quality issues at this current time.

Streams need protection from pollution

The thirty-two known closed landfill sites within Wellington City are continually re-assessed in line with changing conditions and circumstances related to individual landfill sites or development taking place in proximity of a closed landfill site.

### 6.5.2 Floodplain Management

Council adopted a Floodplain Strategy in 1993 this included a procedure for assessing deficiencies in the drainage network and approaches to deal with flooding.

Catchment Management Plans are prepared to provide a strategic framework to protect properties from flooding, evaluate stormwater quality and protect or enhance the ecological health of the receiving waters. It is vital integrated catchment management plans are completed to assess

<b>Asset Knowledge</b>	<ul style="list-style-type: none"> <li>▪ assess flood risk</li> <li>▪ prepare flood hazard maps</li> </ul>
<b>Upgrading</b>	<ul style="list-style-type: none"> <li>▪ provide information to prioritise, plan and budget for flood protection works</li> <li>▪ as a basis for future detailed design of the stormwater system</li> <li>▪ explore options for flood mitigation</li> <li>▪ consider options for mitigating adverse environmental effects, particularly road runoff</li> </ul>
<b>Development Control</b>	<ul style="list-style-type: none"> <li>▪ set floor levels for new developments above flood levels</li> <li>▪ control development on overland flow paths to prevent the blockage of these paths</li> <li>▪ identify catchments where general restrictions on development are needed</li> <li>▪ establish land use controls as appropriate</li> <li>▪ possibly set levies on development to fund works</li> </ul>
<b>Water quality</b>	<ul style="list-style-type: none"> <li>▪ to determine the influences on water quality in streams and receiving waters</li> <li>▪ to determine what mitigation works</li> </ul>

Table 9. Information provided in the Catchment Management Plans

the future environmental and biodiversity effects of building developments in previously undeveloped catchments. The purpose of individual catchment management plans is to provide Council with the information shown in Table 9:

Integral in the preparation of the Catchment Management Plan is a hazard map. These maps are based on a 1 in 50-year storm event and recommended freeboard of 200-300mm on houses in areas prone to flooding, where ponding or secondary flow paths may occur.

To date catchment management plans and flood assessments have been prepared as shown in Table 10:

Catchment name	Flooding assessment	Area (ha)	Ecological assessment
Harris	Yes	15	No
Hunter	Yes	8	No
Island Bay	Yes	480	No
Kaiwharawhara		1867	Yes (stream)
Karori	Yes (pt)	519	Yes (stream)
Kilbirnie	Yes	130	Yes
Miramar	Yes	394	No
Ngauranga		955	Yes (stream)
Newtown (OPT)	Yes	442	No
Owhiro Bay		965	Yes (stream)
Porirua Stream	Yes	5,380	Yes (stream)
Te Aro	Yes	242	No
Waring Taylor	Yes	52	No
<b>TOTAL AREA</b>		<b>17,229</b>	

Table 10. Catchment management plans prepared to date.

There are flooding issues in Makara resulting from unrestricted development and the amount of increased impermeable surface area, hence increasing stormwater runoff. This runoff may lead to increased low land flooding and the erosion of sediments.

## 6.6 Stormwater Risks

A comprehensive Risk Management Plan for the stormwater asset covering statutory compliance, property safety, capacity, future stormwater quality issues, service reliability and responsiveness to customer issues was implemented in July 2002. It also formulated controls and procedures to deal with these risks.

Council is aware that the buried infrastructure has inherent risks associated with it. However it is not just the buried infrastructure as there are risks associated with anything dependent on natural events, such as earthquakes and rainfall.

To mitigate the risk of a decreased level of service associated with a natural event an Emergency Management Plan including a response plan is in place for natural events whose timing is unknown such as storms and earthquakes. In most cases the normal procedure to service fault notifications will cope with rain, overflowing pipes and other events.

These above documents all interrelate to mitigate risk possibilities associated with unexpected situations which could affect the stormwater system

### 6.6.1 Water quality risks

Recreational Water Quality and Public Health Risks	Level of Risk
Enterococci levels can be elevated above contact recreation standards after significant rainfall events	Moderate
Illness due to contact with contaminated stormwater or receiving waters	Low
Loss of access to recreational bathing areas due to poor water quality	Moderate
Consumption of contaminated shellfish	Moderate

The risk to public health through contact with contaminated stormwater is being responded to by:

- Continuing studying the effects of contaminants, especially heavy metals, on the environment. The recently completed BAEE of stormwater discharges to the Harbour and South Coast indicates that more work is required.
- A close working relationship with GWRC staff to determine the actual effects and best solutions to comply with the RMA 1991. Being aware of current national and international information and trends regarding testing, effects and solutions to environmental matters.
- Regular water quality monitoring and compliance with relevant MfE and Public Health guidelines on notification and sampling requirements

Drinking Water Quality	Level of Risk
Treatment and disposal of stormwater poses a risk from contaminated run-off discharging into streams which may be a downstream water supply	Moderate

The presence of heavy metals and other contaminants is documented, but the dominant sources, effects of these and possible solutions are not known at this stage. Investigation is proceeding both by this Council and other agencies.

### 6.6.2 Flooding

Flooding	Level of Risk
Risk of house flooding and the consequential effects	High
Wastewater contamination from overflows	Moderate
Decrease in standard of living due to constant flooding	Moderate
Risk from raging and contaminated floodwaters	Moderate

The risks of flooding are being mitigated in the following ways;

Council adopted a Flood Protection Strategy in May 1993. This outlined a procedure for assessing the deficiencies of the drainage system and dealing with flooding.

The strategy has two levels of flood protection as intervention levels for works:

- A base level which defines an unacceptable level of flood protection and should be corrected in the short term.
- An intermediate level of flooding problems that can be tolerated in the short term but should be targeted for longer term upgrading.

Existing stormwater flooding and the effects of infill housing are dealt with in accordance with the Flood Protection Strategy and prioritised for funding. Localised stormwater capacity issues that are not covered by a Catchment Management Plan will need to be investigated as a basis for managing any future changes.

Upgrade works to decrease flooding risk or improve stormwater quality and include:

- the construction of a new pipe
- the increase in size of an existing pipe
- the construction of new devices such as rain gardens, sand filters, wetlands.
- the construction of attenuation facilities and other non-pipe solutions.

The Drainage Rehabilitation Strategy identifies drains that are defined as ‘critical’. Council has a Critical Drains Policy to deal with ongoing risks of failure to the stormwater asset and reduction in service levels. “Critical Drains” are those where the consequences of failure of the drains for public safety, cost and social disruption.

Council risks a civil claim for negligence or nuisance out of damage or loss caused by flooding. Although it is uncertain how the courts would view Council’s liability to such claims, Council could be found liable for damages where it had created or exacerbated flooding problems by continuing to approve land development, when it was aware a problem existed. A suitably funded and rationally prioritised works programme (encompassed in the stormwater AMP) would be a prerequisite to any successful defence against such charges.



Environmental Consequences	Level of Risk
Deterioration in biodiversity	Moderate
Loss of habitat	Moderate
Erosion from overland flow	Moderate

Work is being carried out across a number of Council units to determine how staff can best apply the principles in “Wet and Wild”.

The erosion risk is being mitigated by

- Building Standards and the Earthworks Bylaw
- Liquid Waste Management Plan which has an objective to decrease the quantity of sediment and silt reaching waterways to a level acceptable to GWRC
- GWRC research.

Risks attributable to the absence of stormwater services	Level of Risk
Flooding	Low
Sediment erosion	Low

## 6.7 The Future and Risk Mitigation

### 6.7.1 Water Quality

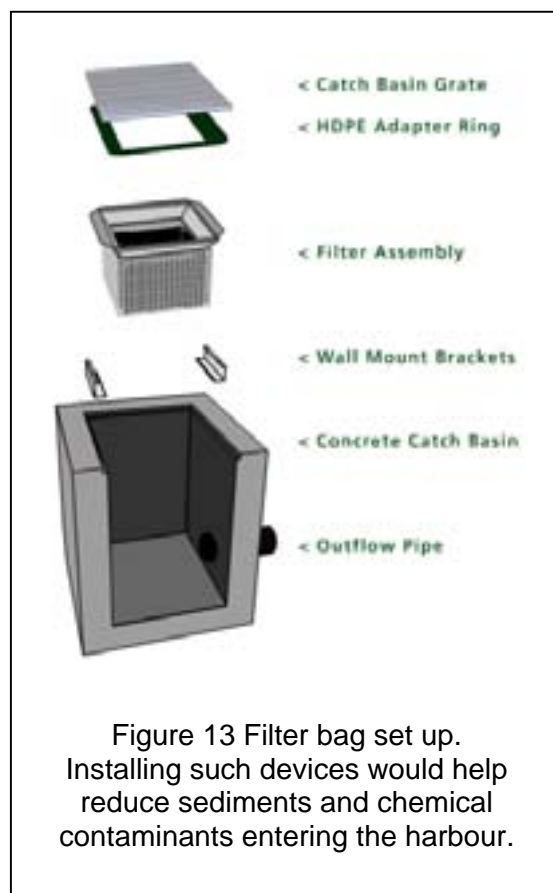
Wellington Harbour stormwater contamination project

The most significant medium to long-term impact of urban stormwater discharges on the Wellington Harbour environment is the accumulation of stormwater-related contaminants in the sediments. This is because the contaminants can, over time, build up to concentrations that are toxic to sediment-dwelling organisms.

Council has commissioned Coastal Marine Ecology Consultants and Diffuse Sources Limited to carry out the initial biological and chemical surveys for a marine sediment monitoring programme in Wellington Harbour. The basis of the sediment chemistry programme will detect long-term trends in the concentrations of chemicals generated by human activities in the bed sediments of Wellington Harbour.

#### Stormwater Treatment

Currently there are investigations being carried out in conjunction with GWRC to determine appropriate water quality standards related to stormwater across the region. This will assist in determining what level of treatment may be required on stormwater discharges.



There are currently some ongoing developments where voluntary treatment options are being considered.

#### Runoff from Roads

Council's Transportation, Traffic and Roothing Quarterly Report stated that over the months from March to June 2005 an average of 45kg/km<sup>2</sup> of material (silts, sand, gravels, glass, organic material, litter etc) was cleared from Wellington's road surfaces (excluding the CBD).

Uncontrolled these sediments and associated contaminants are ending up in streams and ultimately the harbour. Council's Environmental Strategy may propose installing removable filter bags (Figure 13), such as Enviropods, in sumps to remove fine sediments and other debris from road runoff after cost benefit analysis of road sweeping effectiveness and filter bags effectiveness. Any such project would include monitoring of the filter bags effectiveness. In future Council may look at opportunities where runoff from busy roads can be intercepted, especially ones that are likely to generate significant contaminants, and diverted to sand filters or swales to filter any contaminants from the runoff before it enters the receiving waters.

Council will also integrate the findings of the Ministry of Transport's future work regarding how Council policy takes into account the environmental costs of transport.

The Code of Practice for Land Development review

Council's Code of Practice for Land Development is soon to be reviewed. Emphasis will be put on controlling sediment laden run off from worksites and reducing impervious surfaces; whether replacing current surfaces or including impervious materials (such as pebbles, bark or ground cover planting) into designs of infill and subdivisional developments.

Consideration of alternative options such as establishing wetlands, swales and private and communal open spaces that absorb and filter stormwater run off will also be encouraged. On-site stormwater management devices that retain runoff and filter out contaminants and or sediments would be integral to the sustainable stormwater management emphasis in the updated Code of Practice.

#### 6.7.2 Catchment Management Plans

The focus of Catchment Management Plans has shifted from being purely a flood protection exercise to a more holistic plan. As a consequence plans are now prepared to determine possible flood alleviation projects but also to protect water quality and public health.

For future Catchment Management Plans it was decided that an auditable approach was required to decide the next highest priority for investigation. The aspects used in setting the priorities are:

- Flooding
- Environmental risk
- Existing Resource Consent
- Potential Growth.

#### 6.7.3 Environmental Change

Climate Change studies predict an increase in the frequency and intensity of rainstorms and droughts. More intense rain may result in more frequent flooding unless water can be attenuated. However with the rate of flood protection works being carried out, the situation in 50 years time, even with more intense rain, may, overall, be better than it is at present.

The matter of sea level rise is however more troubling. The Intergovernmental Panel on Climate Change (IPCC) indicate a sea-level rise of 0.3 to 0.5 m over this century. This would result in the lower lying areas of the CBD, Newtown, Kilbirnie and Miramar being at greater risk. Future works including stopbanks and pumping systems may be ultimately required. These areas are already too intensely built-up for development controls to be effectively introduced. However when more information is available the alternatives will be considered. The Code of Practice for Land Development has been amended to cater for an expected sea level rise of 0.4m over the next 50 years. Future rainfall intensities are still too vague for inclusion. All available information is being closely monitored and will be included in the design standards as appropriate.

#### 6.7.4 Asset Planning

AMP's are continuously improving by carrying out various investigations and undertaking grassroots consultation to explore level of service options. AMP's also detail the likely future demands for service and how demands can be met or managed.

#### 6.8 Future growth



#### Demand

##### The Northern Growth Management Plan

The Northern Growth Management Plan has addressed the stormwater issues in those areas and has included water treatment issues.

Protection and enhancement of the green (open space and natural areas) and blue (streams and stormwater systems) systems will be central to how the area develops. The Plan suggests;

- Stormwater retention ponds provide a good public amenity whilst providing water quality control for Porirua Stream
- Improve water quality by limiting the impact of urban development on catchments.
- Work with developers, GWRC and PCC on flood and sustainable stormwater management to minimise impacts of flooding on stream and water quality and to protect the water catchment of Porirua Stream.
- Restrict or manage development in some areas so that streams and wetlands are recognised and protected, using if necessary new District Plan policies and appropriate zoning changes.

Glenside Stream Care Group volunteers working on Porirua Stream

As this is an area where Wellington's growth is projected, investment of resources (time, energy, financial) should be directed into the impact earthworks in the Northern Growth area will exhibit to water quality, sedimentation and ecology. Glenside Stream Care Group believes this is a priority.

#### Developer Contributions

The longer-term effects of development must be considered now including implementing suitable controls and establishing a robust, equitable and auditable method of charging financial contributions for effects of development. Developers may carry out works that have a benefit to the performance of the asset. In these instances, Council may contribute toward the cost of the works. At present this contribution is usually limited to the cost of the extra pipe size required to accommodate the flow generated outside the development. Council adopted a Development Contributions Policy in 2005.

#### Low Impact Urban Design

Council has signed up to the Central Government's Urban Design Strategy, which using quality urban design to help towns and cities become, amongst other things, environmentally responsible places that manage all aspects of the environment sustainably.



Council's Code of Practice for Land Development will be reviewed with an emphasis on Sustainable Stormwater Management. Conventional development practices lead to a range of adverse environmental and social impacts and contribute to escalating infrastructure costs. Low Impact Urban Drainage Design (LIUDD) provides an alternative approach, the potential of which is under-exploited. Council has expressed interest in joining a national task force group with Landcare Research, other regional and city council practitioners developers and engineers, to radically improve urban sustainability by making LIUDD mainstream practice. Council intends to integrate natural features, technologies and improved catchment management processes in urban development and to improve the interactions between governance and land use including better guidelines for council plans, engineering codes and incentives for LIUDD.

Waitangi Park development

RPH believe it important that Council implement sustainable urban drainage principles to reduce contaminants such as disease causing micro-organisms reaching receiving environments in which the public come into contact.

The Waitangi Park development has a treatment device included. Some of the water from the piped Waitangi Stream is being pumped to the surface and will flow through a wetland. Although the quantity of water being treated is minimal, it is a means by which the public awareness is raised and can be considered educational.

#### Water Conservation

Council may choose to promote rainwater harvesting systems that collect runoff from a sections roof and other impermeable surfaces for household use in the future. It is more practical to use rainwater indoors (showers, laundry, toilets) and/or for gardening, and reduce a section's runoff. Activities such as gardening or washing the car are ones that treated potable water need not be used. The benefits of rainwater harvesting can include:

- Reduced flood flows
- Reduced topsoil loss
- Improved water quality
- Relief of strain on other water supply
- Increased independence and water security
- Lower water supply cost

Future developments may be encouraged to make use of rainwater harvesting. Council may need to work with developers to promote double plumbing installation needed for rainwater harvesting.

Through innovative projects such as promoting rainwater tanks for gardening and car washing Council would fulfil the creative leadership and sustainable living key principles promoted in its Sustainable Development Framework.

Council anticipates promoting water conservation measures that come out of the Wellington Water Management Plan. This will ensure households take action and save water at home to reduce demand on the public supply and increase security. There are water saving opportunities in each area of a home including repairing and up-dating leaky pipes and equipment i.e. toilets. Dual flush toilets provide the user with two flush options – a full flush that uses 1.6 gallons of water and a partial flush that uses approximately half the water or 0.8 gallons. A family of four would save more than 14,000 gallons of water per year by installing 1.6 gallon per flush toilets and more than 17,000 gallons of water per year by installing dual flush toilets.

## 6.9 Outcomes of Consultation for Stormwater

Councillors want confirmation that options for mitigating run-off will be addressed.

RPH appreciate that stormwater runoff can contaminate aquatic environments therefore see it as important that adequate monitoring of stormwater outlets and adjacent environments such as bathing beaches is continued. They feel this on going monitoring is vital to establish current public health risks and identify any improvements in water quality from stormwater quality improvement initiatives.

RPH recommend that risks from potential cross-contamination need to be considered in the discussion on promotion of double plumbing installation for rainwater harvesting.

Glenside Stream Care Group wants to contribute actively to defining community expectations of and be involved in public consultation

Glenside Stream Care Group feel they have only been able to express views about water quality management through notified resource consent hearings. They suggest a formal workgroup with Councils Urban Design and BCLS (or similar strategic groups) so their concerns can be documented, managed and incorporated into planning and regulatory documents.

## 6.10 Stormwater Summary– Future Quality and Quantity Issues And Options

Continue completing catchment management plans and subsequent upgrade works under the Flood Protection Project to reduce the flooding risk in the city.
Integrate Sustainable Urban Design (SUD) and Low Impact Urban Drainage Design (LIUDD) principles into mainstream development practices.
Maintain investigations in conjunction with GWRC to determine appropriate water quality standards related to stormwater across the region.
Monitor the effects of stormwater contaminants on streams, the harbour and the south coast and investigate ways to reduce any effects. This will assist in determining what level of treatment may be required on future stormwater discharges.
Consult with the community on stormwater quality and the potential environmental impacts.



## **7 Public conveniences**

Council operates and maintains public conveniences for a number of reasons; they contribute towards strategic outcomes by ensuring the maintenance of public health and well being, and they are guided by the LGA 2002 and Health Act 1956.

In practice many of the conveniences are located along old transport routes and in older shopping areas without malls. Council's Parks and Gardens Business Unit is responsible for the management of public conveniences.

### **7.1 Community**

The community will be Wellington as a whole.

### **7.2 Standards**

Council provisions for public conveniences come from the following documents;

Local Government Act 2002

Health Act 1956

Long Term Council Community Plan

Annual Plan

New Zealand Standard for Public Conveniences (NZS 4241:1999)

Business Plan

District Plan

Public Convenience Policy.

### **7.3 Existing Services**

Public Conveniences comprise a total of 51 buildings across the city from Tawa to Island Bay, Makara to Seatoun (Figure 14). These facilities have been divided into the following categories:

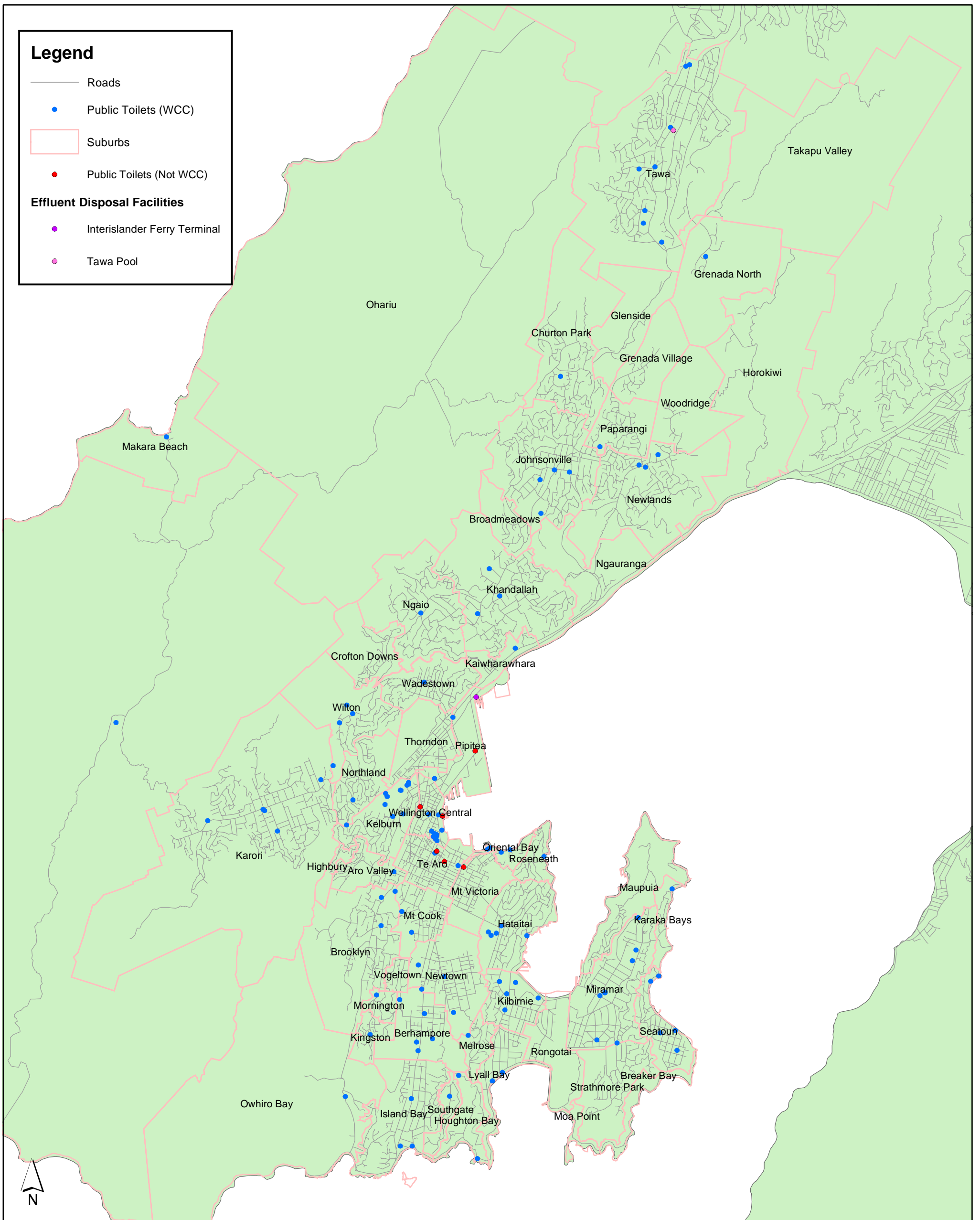
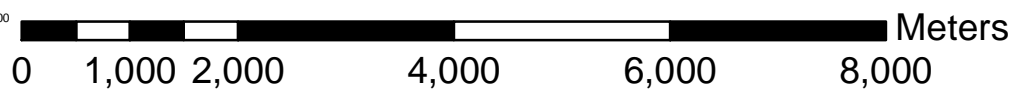


Figure 7. Public Toilets

1:70,000



DATA STATEMENT

Property boundaries  
Land Information NZ  
Licence WN0853547/2  
Crown Copyright reserved  
Accuracy in urban areas: +/-1m  
Accuracy in rural areas: +/-30m

Other data has been  
compiled from a  
variety of sources and  
its accuracy may vary

Topographic data:  
Wellington City Council  
WCC copyright reserved  
Accuracy: +/- 30cm

Any contours displayed  
are only approximate  
and must not be used for  
detailed engineering design

Colour Orthophotography 1:500  
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### Public Conveniences

- 12 Central City
- 14 Beach
- 9 on Parks Estate
- 20 Suburban Shopping Centres
- 2 Marinas

All public conveniences are provided free of charge and most (with the exception of those only accessible by sports groups using the sports ground) are easily accessible for people with disabilities, parents with children and all residents and visitors to Wellington.

Public conveniences on private property assist in protecting public health and reduce the need for Council owned public conveniences. Accordingly privately owned, but accessible public conveniences have been considered. Appendix 5 outlines the current assets register of all (Council and non-Council) public conveniences across Wellington, including location, gender catered for, opening hours and number of available pans and urinals.



In all public conveniences the water available for washing hands is potable. Wastewater is discharged into the wastewater system. There is no requirement for additional treatment. The public conveniences at Makara beach are owned and maintained by Council but are not connected to the reticulated system and wastewater is disposed to a septic tank which is emptied by sump truck.

All Council public conveniences are:

- Robust with impact, weather and graffiti resistant finishes that can be easily cleaned.
- Light and bright with well ventilated interiors. For example, using skylights, vandal proof electric lighting and open construction.
- Non-slip floor surfaces, evenly sloped to assist cleaning/drainage.

Ngaio public conveniences

- Accessible with cubicles and doors a suitable size (preferably lever handles or push open doors rather than ball handles) to allow access for people with disabilities and adults with prams and children.
- Highly visible with entrances facing active spaces.
- Low-level landscaping along exterior walls considered providing a buffer against graffiti. Murals should also be considered on external surfaces.
- Aesthetically pleasing with high quality exterior design or painting to suit the local environment.

#### Effluent Disposal Facilities

Council has a truck and camper van effluent disposal point adjacent to Tawa Swimming Pool, Davies Street and a second located at the bottom of Ngauranga gorge, near the Interislander Ferry Terminal. Effluent is discharged directly into the wastewater system.



#### 7.4 Issues

There have been seasonal issues around the south coast public conveniences which are mostly closed over the winter. Council is looking to raise the service level and have all facilities open all year.

The only risks to human health, known of, are the usual risks associated with human effluent. Other risks include incidence of drug users' needles and violent or difficult members of the public who frequent these places.

#### 7.5 The Present Situation

About four in ten residents (43%) are satisfied with the availability of public conveniences in Wellington and 49% with the standard of public conveniences. There has been a significant decrease in the proportion satisfied with both availability and standard since February 2004.

ANZ public conveniences, Featherston Street

The Council needs to address a number of issues associated with public conveniences and look for ways to improve the service it provides to users of these facilities.

The existing maintenance Service Level Agreement (SLA) between Citi-ops (internal business unit) and Parks & Gardens has not been reviewed for 7 years. It no longer reflects best practice for providing a total package of facility maintenance and management. Parks & Gardens are reviewing the SLA and plan to go to the market in 2005. It is proposed that an increase in maintenance is needed at some facilities, as indications are that the current service is not fulfilling the expectation of the public.

The frequency of servicing the facilities depends on location. The more high profile areas like CBD or suburban centres are serviced up to 3 times per day otherwise servicing is once a day. At the moment there is no real way of tracking the number of users. This is something the Council is looking into at the moment including the possibility of using people counters.

Existing facilities are adequate at meeting demand. As Council upgrades the facilities it does raise the usage due to the perception of cleaner public conveniences. There are no known issues regarding the indiscriminate deposition of human excrement on and into the ground or water bodies on a scale that presents an unacceptable public health risk due to alack and/or poorly located public toilets.

There are no public health issues associated with the effluent disposal facility. There maybe health risks and environmental problems if no such facility were provided.

## 7.6 Public Convenience Risks

A risk assessment for Council owned public conveniences asset is covered in the Parks and Gardens Business Unit's Risk Management Plan and the Public Conveniences and Pavilions AMP (2004). This section is an overview of the predominant risks.

Public conveniences and Public Health Risks	Level of Risk
Availability and Accessibility	Low
Cleanliness and consistent quality	Moderate
Safety	Moderate

These risk are being mitigated through;

- Public conveniences are appropriately located across the city. Special attention is paid to areas with high resident and tourist visitation numbers. Public conveniences are easily accessible for people with disabilities, parents with children and all residents and visitors.
- Public conveniences are available without cost to the user.
- Facilities are well maintained and offer a high standard of cleanliness and hygiene.
- Public conveniences and their surrounding sites are designed or upgraded using Crime Prevention through Environmental Design (CPTED) principles and are maintained to ensure spaces are safe and secure for all users.
- All recently upgraded public conveniences are fitted with fire sprinklers and comply with Building Act specifications.
- Council holds insurance for all the public conveniences against loss, damage or destruction by fire, earthquake and other such risks as deemed necessary or desirable to protect the community's investment.

## 7.7 The Future and Risk Mitigation

### 7.7.1 Demand

Analysis of demand may reveal that current usage has altered or that resources (including physical assets) may be better used elsewhere.

Demand should therefore be monitored continuously to avoid drop in level of service and to ensure the achievement of the Council's community service goals.

There are areas where demand has fallen below a level considered unsustainable and public conveniences are to be closed. There are some conveniences Council want to close because of misuse and others where number counting is proposed to see whether it is justified they remain open.

There are a number of new proposals for the future years, some which still require further investigation. These include:

- **Makara Peak Mountain Bike Park** - Submissions and feedback from local users highlight the need for facilities at this popular recreation site. Further investigation is required around the existing wastewater and water services in the area, and what would be the most appropriate type of convenience and its cost i.e. using the existing Council services or looking at a composting type convenience.
- **Mt Victoria Lookout** - Council is preparing a landscape concept plan for the Mt Victoria Lookout area. As part of Stage 2 of this plan, investigation will be undertaken regarding the possible installation of public conveniences.
- **Te Aro Park** - Te Aro Park is one of Councils most frequently used facilities though also has the highest vandalism rate. Upgrading these facilities into a staffed facility like the ANZ/Lambton Quay facility will greatly reduce the ongoing cost of vandalism as well as increase the public usage. A drop in vandalism will help to offset the costs for staffing.
- **Lyall Bay Integration Project** – As part of this project, new conveniences are planned for the eastern end of Lyall Bay (Surfers Corner). It is planned to situate the new conveniences on the road reserve area opposite the Beach. A pedestrian crossing and appropriate safety measures will be incorporated into the design. It is still to be determined if existing conveniences at the western end of the beach at the junction of Queens Drive are to be renovated or decommissioned.
- **Glover Park** – As part of the upgrade to this park no public conveniences are planned. Instead Council is working with local parties (Global Cafe on corner of Garrett Street and Service Lane and the old Mayfair Hotel on Ghuznee St) who will open out onto the park. Both are amenable for the public to have access to their toilet amenities in their cafes. This option aligns with Councils development strategy for non-ownership options.
- **Owhiro Bay Quarry** – The Owhiro Bay carpark that serves Red Rocks and the South Coast seal colony is to be upgraded. Improvements are likely to include public conveniences. Suggestions and submissions for the area are being sought and Council will be surveying people in the carpark in September 2005.

Other areas that are likely to experience development in the future, and therefore need ongoing assessment, are:

- The Outer Green Belt
- Northern Growth Management Plan Areas

- Te Aro Flat
- The Northern Gateway (Westpac Stadium)

The increase in tourism numbers within the Wellington region also needs to be taken into consideration. Figures from Tourism Research Council for 2003 indicated that in total Wellington received 6.2m visitors (9.8% of the national total). By 2010, total visits to the Wellington region are expected to increase by 12.0% to 6.9m, representing average annual growth of 1.6%. This increase will mainly impact the CBD areas and high profile venues or attractions such as the Mt Victoria Lookout.

The following demand management strategies are appropriate for the provision and rationalisation of the public conveniences:

- Facility Upgrade: For public conveniences there is a clear link between refurbishment work and increased usage.
- Non-Asset Solutions: Council will investigate ways to minimise the impact of ongoing development expenditure within venues through sponsorship, joint ventures and fundraising. In particular, working with the local business community during developments with the intention of having them provide additional facilities for public use.
- Maintenance regime: Undertaking appropriate maintenance regimes.

#### Public Conveniences Upgrades Programme

An upgrade programme for public conveniences was first introduced in 1995. Most of that upgrade programme has been completed but some facilities still need to be reviewed.

A new Asset Upgrade Programme will be developed that determines whether facilities will be replaced, relocated, refurbished or disestablished after comprehensive user and site information has been collected

All new and upgraded conveniences will provide the following fixtures;

- |   |                           |   |
|---|---------------------------|---|
| - Floor mounted porcelain pans and stainless steel basins | - Automatic hand driers   | - Fire sprinklers   |
| - Toilet seats of impervious material                     | - Soap dispensers         | - Exterior cold water tap & drain                                 |
| - Automated flushing system                               | - Coat hooks in cubicles  | - Hot water in attended public conveniences or those with showers |
| - Flushing valves where possible                          | - Mirrors                 | - Foyers will be eliminated                                       |
| - Secure, good quality locks                              | - Sanitary disposal units |   |
|   | - Toilet paper dispensers |   |



### 7.7.2 Asset Planning

AMP's are continuously improving by carrying out various investigations and undertaking grassroots consultation to explore level of service options. AMP's also detail the likely future demands for service and how demands can be met or managed.

Council is looking to raise the service level and have all facilities around the south coast open all year and increase the cleaning frequency of some facilities.

### 7.8 Outcomes of Consultation for Public conveniences

Regional Public Health recommends clarifying the situation with Glover Park and future public conveniences.

It has been suggested through the Consultation process that public toilets are made available 24hours a day and are cleaned more frequently.

The public would like to see public toilets incorporated at bus stops.

### 7.9 Future Recommendations for Public Conveniences

Address ways to improve the service it provides to users of these facilities.
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Seek to gather information number of users for each facility
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## 8 Cemeteries and crematoria

The council has obligations to meet under the Health Act 1956 and the Burials and Cremation Act (BCA) 1964 to ensure that public health is protected.

Since the founding of Wellington City, a number of cemeteries have served the local community. This assessment relates to the two main public cemeteries that are open for burials - Karori and Makara Cemeteries.

Karori Cemetery is New Zealand's second largest burial ground, covering nearly 40 hectares. It is the final resting place of about 75,000 people. The Cemetery has the greatest number of interments of any cemetery in New Zealand and the second highest total number of cremations.

There are other cemeteries not covered by this assessment including Mount Street, Bolton Street, St. Stephen's Cemetery (Tawa), Johnsonville. There are also a number of church cemeteries which are not managed by Council including St Mathew's Church, Holy Trinity Church and the Catholic Church site - all in the Makara and Ohariu Valleys.

### 8.1 Communities

The community will be Wellington City as a whole.

Karori Cemetery has different sections for different cultural, social and spiritual communities including; Catholic, Anglican (Church of England), Public, Jews, Greeks, Russian orthodox and there are groupings of Chinese within the different sections.

### 8.2 Standards

Council provisions for cemeteries and crematoria come from the following documents;

Burials and Cremations Act (1964)

Health Act 1956

Cemetery and Cremation Bylaw

Historic Places Act 1993  
 Resource Management Act 1991  
 Building Act 1991  
 Reserves Act 1977  
 Asset Management Plan

### 8.3 Existing Services

Bolton Street Memorial Park is the original settlers' Bolton Street Cemetery, dating back to the earliest days of the city. The cemetery closed to burials in 1965. The only interments are of cremated remains that number a couple per year.

The Council's functioning cemeteries are Makara and Karori.

Karori cemetery was established in 1891 to replace the overcrowded Bolton Street Cemetery. Karori Cemetery filled quickly and by the 1950s had nearly reached maximum capacity.

Karori Cemetery's crematorium opened in 1909, and was New Zealand's first crematorium. It carries out about 450 cremations a year.

In 1940 the Board of Health required Council to locate another burial site for the Capital's population, as Karori Cemetery edged towards full capacity. Makara was the chosen location and the first burial occurred in 1965. The Cemetery is currently about one third full and has a large amount of undeveloped area available for future burials.

<b>Burials</b>	
Karori Cemetery	79,300
Makara Cemetery	8,700
Bolton Street	8,632
<b>Cremations</b>	
Karori Crematorium	68400

Table 11. Numbers of interments and cremations until 2001

Burial records dating back to 1891 at Karori Cemetery, and 1965 at Makara Cemetery, are available for public viewing at the Karori Cemetery office. The office also holds records dating back to 1849 of interments at Bolton Street Memorial Park. The cemetery holds records for 151,409 people who have been interred or cremated. Historic take up rates for Bolton Street, Karori and Makara are shown in Table 11.

#### 8.4 Issues

Makara Cemetery is one third full there is a need to begin thinking about planning for new areas in terms of planting, road access and services.

One key area that impacts on the level of service experienced by visitors to the Karori Cemetery, and possibly in the future for Makara, is gravesite maintenance. Under Council Bylaws, it is not Council's responsibility to maintain gravesites. This responsibility rests with either the person who has purchased a plot in advance, or representatives or successors in perpetuity of the person buried therein.

Unfortunately a combination of neither party (individuals or Council) carrying out their responsibilities to the necessary extent has led to difficulties with access and loss of gravesite integrity at Karori Cemetery. This is a cause for concern to the community.



Non-maintained vaults, headstones and gravesite structures can be removed by the Council. In situations where there is no 'next-of-kin' there is a gap in terms of maintenance responsibility. In this case the Council accept it has a role to play. It is not appropriate to allow the area to remain overgrown and regenerate to a more natural state.

#### 8.5 Present Situation

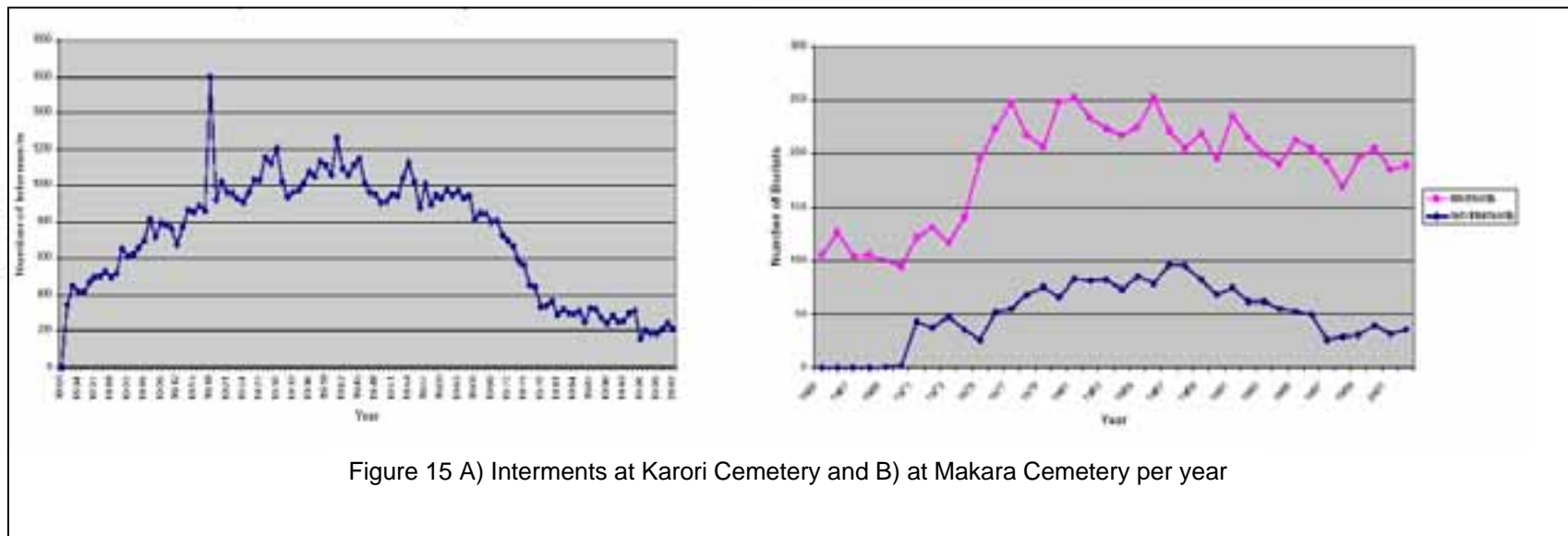
All burials are carried out in accordance with the BCA 1964.

The Cemeteries must approve the casket before cremation. Caskets must be made of combustible material and the contents must comply with Crematorium guidelines to ensure safety and environmental responsibility.

Karori cemetery

The only plots available now at Karori Cemetery are pre-purchased ash or family plots, and children’s plots. If a member of the family is buried at Karori, further interments in the grave are allowed. Potentially thousands of plots could be used in this manner.

Figure 15 shows interments at Karori (1891-2003) and Makara Cemeteries (1965-2003). The decreasing trend for interments over the past 20 years is due to cremation being more socially acceptable, a decrease in the national death rate, many elderly moving away from Wellington to retire and the high proportion of transient people buried at their birthplace outside of Wellington.



Cremation numbers at Karori Cemetery have dropped due to increased competition within the cremation market as funeral directors have opened private cremators (there are two private crematory in Wellington; Harbour City Funeral Home and Lychgate Funeral Service). It is predicted that rates of interment will continue at much the same levels in the immediate future, but will slowly decline due to the finite number of available plots.

At current rates of use Makara Cemetery will cater for demand well into the future.

## 8.6 Cemeteries and Crematoria Risks

A risk assessment for Cemeteries and Crematorium is covered in the Parks and Gardens Business Unit's Risk Management Plan. This section is an overview of the predominant risks.

	Level of Risk
Lack of space	Moderate
Inadequate service	Low
Health risks of not providing service	Moderate
Fire Hazard	Low

These risks are being mitigated through;

- Capacity forecast monitoring ensure the cemeteries have sufficient space for demand
- Effective asset management planning assures levels of service are met
- No further health risks regarding the disposal of the dead in the Wellington area being identified by MoH and undertakers
- A fire suppression plan for each of the cemeteries will be developed to provide for defensible spaces, firebreaks, prioritisation of resources deployment and identification of appropriate suppression tactics.

## 8.7 The Future and Risk Mitigation

### 8.7.1 Demand

The current rates of interment will mean that it is likely that infrastructure and facilities will be required within 5-15 years to expand the capacity of Makara Cemetery within the developed area. Some of this expansion work will occur ahead of time to open up areas for special burial areas.

The availability of gravesites in the Karori Cemetery is dictated by current ownership and whether graves have space within them to accept more burials. When Karori Cemetery does close there are still certain exceptions where people are allowed to be buried within the Cemetery (as set out under the BCA 1964) and memorials and headstones can still be erected providing they meet the normal requirements set out by Cemetery Management.

The crematorium at Karori Cemetery will remain open as long as the following criteria are being met as outlined in the Cemeteries AMP;

- There is a current discharge consent for the crematorium
- There is no substantial upgrade or repair work required
- The crematorium is used on average 3.75 times per week.

If the crematorium fails to meet these criteria a review will be undertaken.

Makara Cemetery is one third full and there is a need to consider plans for opening new areas for burial within the cemetery, which take into account planting, road access and services. Expansion is planned to occur within 5-15 years.

### 8.7.2 Asset Management

There are sections of both cemeteries which could be incorporated into other management areas to allow for more consistent management. For example, some land areas of Karori Cemetery may be better managed as part of the Outer Green Belt. This would also mean it would come under other strategies such as GWRC's Pest Management Strategy and Council's Wet and Wild Policy.



Makara requires a maintenance regime to be established and maintained over future years. Infrastructure planning is also important to ensure the cemetery provides for the future needs. This will involve providing new facilities and services.

#### Options and Suitability

In terms of burial (not including the disposal of ashes which requires less space), Karori Cemetery has a number of plots available for use. As most of these are pre-purchased,

Makara cemetery



Memorials at Makara cemetery

and multiple interments are possible, it is difficult to specify the length of time that this cemetery will be able to cater for demand.

A number of burial options are currently employed;

- Subsequent interments- interment takes place on an existing grave to allow for the burial of other family members within the same plot.
- Disinterment- remains (followed by cremation) or ashes are removed from a grave. Remains are either transferred to another plot or removed from the Cemetery
- Grave re-use- remains are removed from a grave to make room for more family members. The grave is dug deeper and the remains returned. This is done when a plot is full but families wish to continue using it, to keep family members

together.

To extend the lives of both cemeteries there are new services that use less space for interments, which could be employed.

#### Core Drilling

New techniques for interring ashes into monumental plots are offering an increasingly professional service - with the ashes now being interred into the plot without undermining the foundations. The practice in the past was to dig out the front of a plot (in the pathway most often), then the ashes were interred from the front. This often resulted in damage to the path and in some cases erosion. These days the core-drilling machine cuts through concrete and makes a hole about 200mm in diameter. The hole is then capped off with either a concrete plug or a vase holder.

#### Rose Garden Development

Recently Karori Cemeteries memorial rose garden (ash interments) has been extended. An additional eight rose gardens have been added to this area. This has provided an additional 374 plots for interment and 74 plots for ash scatter. At the current rate of 80 interment plots per year and 15 memorial plots per year it is envisaged that the current space will last between three and a half to four years before an expansion to the northern



end of the rose garden area is needed. There are also several other small areas of land which could potentially be developed in a similar method; again this will be dependent on demand.

#### New Technologies and Options for Burial

A growing trend in the United Kingdom is the establishment of a natural burial site. This process involves the body being buried in an environmentally friendly manner with no embalming or casket. The body is enclosed with a shroud or cardboard coffin at a depth of one meter. The site is then covered with compost soil mix and planted with eco-sourced native plants. The overall aim is to restore an area back to native bush/park. These options for natural burial have yet to be approved by Council.

#### Gravesites maintenance

At Karori Cemetery, Council will accept that it needs to take increased responsibility for maintaining the gravesites, however individuals will still be encouraged to assist.

#### Security

At both cemeteries procedures will be implemented to limit damage to gravesites and other assets. This includes automatic gate locking after hours, staff awareness and security patrols when needed.

### 8.8 Outcomes of Consultation for Cemeteries and Crematoria

*There were no submissions directed at Cemeteries and Crematoria*

### 8.9 Future recommendations for Cemeteries and Crematoria

Makara Cemetery is one third full and there is a need to consider plans for opening new areas for burial within the cemetery, which take into account planting, road access and services.
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## **9 Waste Disposal**

The Council Solid Waste Management Plan was adopted by Council in 2003. No further assessment is therefore required.

## 10 Conclusions

### 10.1 Recommendations

Proposed actions relating to water are to:

- Contribute to the Wellington Water Management Plan proposed by GWRC to consider water demand issues and water conservation
- Seek to gather information on the quality of the non-reticulated water supplies
- Undertake education regarding safe drinking water
- Consider introducing a code of practice for private rainwater systems for use as a building compliance guidance document under the potable water requirement of the Building Act
- As a safeguard recommend that all new dwellings be required to install first-flush diverters on all roof water feeding to tank(s).
- Consider applying the proposed Ministry of Health/ Ministry for the Environment national environmental standard for human drinking-water sources to smaller individual drinking-water supplies via mechanisms that would ensure regular monitoring and maintenance of collection systems.

Proposed actions relating to wastewater are to:

- Continue with current Council projects to reduce wastewater overflows and improve performance of the wastewater system
- In conjunction with GWRC seek to gather information on the operation and maintenance of septic tanks and on-site wastewater disposal systems
- Consider mechanisms that would ensure septic tanks and on-site wastewater disposal systems are installed and maintained in a manner that prevents their failure and ensures effective operation
- Consider implementing the forthcoming MfE guidelines for the safe and clean operation of septic tanks.

Proposed Actions relating to stormwater include:

- Continue completing catchment management plans and subsequent upgrade works under the Flood Protection Project to reduce the flooding risk in the city
- Integrate Sustainable Stormwater Management (SSM) including Low Impact Urban Drainage Design (LIUDD) principles into mainstream development practices.

- Maintain investigations in conjunction with GWRC to determine appropriate water quality standards related to stormwater across the region. Monitor the effects and investigate ways to reduce the effects. This will assist in determining what level of treatment may be required on future stormwater discharges
- Consult with the community on stormwater quality and the potential environmental impacts.

Proposed Actions relating to cemeteries include:

- Consider plans for opening new areas within Makara Cemetery for burial the cemetery,
- Take into account planting, road access and services.

Proposed Actions relating to public conveniences include:

- Address ways to improve the service it provides to users of these facilities.
- Seek to gather information number of users for each facility.

## 10.2 Data to be obtained for the next Assessment

The LGA 2002 requires territorial authorities to complete their assessments “from time to time”. Officers propose that the next assessment be completed in four years time to coincide with the LTCCP, but notes that not all services will necessarily be assessed at the same time.

Given the lack of available information on several of the services, it is recommended additional information be collected for the next assessment. This should include:

- Non-reticulated potable water source, treatment and quality.
- The number and type of non-reticulated wastewater treatment facilities and their efficiency.
- The usage level of public conveniences.

Due to this lack of information it is not possible to clearly define the level of public health risk some of these services pose, based on the lack of any significant outbreaks of disease and reported sickness they have been assessed as presenting minimal public health risks. In future when these data gaps have been filled, especially the data on water quality, there may need to be a review of the public health risk.

The LGA 2002 requires consultation with communities on the Assessment to allow the communities presentation of their view of the issues.

The consultation process for this Assessment did not receive substantial feedback from the ‘wider community’. For future Assessments Council needs an improved communication style which stimulates interest and involvement from the wider community as part of an effective consultation process. The next Assessment needs to be more “creative and innovative” in style and layout to appeal to the wider community.

The Assessment produced in 2008 should be more holistic applying issues to the four dimensions required by the LGA 2002 (social, economic, environmental, and cultural) this could be achieved by addressing issues in relation to community and environment health, personal significance and the costings of different approaches to management of the issues.

To increase community participation in decision-making future Assessments should present descriptions of different future environments in terms of resolution or otherwise of each of the identified issues. In a tabulated form offering options of preferred personal actions, personal significance and costings this would provide opportunity for public to consider their preferences and so participate more effectively in consultation processes.

For example demonstrating local land use and land cover changes and the ecological changes that have occurred in the harbour as a result of urban expansion, and highlighting potential future changes, in terms of flooding risk, sedimentation, contamination, and ecological change within streams and the harbour, as a result of urban development and giving the individual, based on personal preferences, the management options and related costs, the quality of the future environment that could be expected as result of these choices in terms of health and quality of the environments.

The Makara and Ohariu Valley Community Boards wish to be actively involved in any discussions and processes involving compliance of Wellington’s non reticulated water supplies and wastewater systems.

**Appendix 1 Water sources for each reticulated community.**

Zone Name	Water source	Population served	Public Health Grading*
Reticulated area of Wellington City		165,126	Ca
Brooklyn	Hutt River, Te Marua Lakes, Big Huia River, George Creek, High Level, George Creek, High Level, George Creek, Low Level, Orongorongo River, Wainuiomata River, Wainuiomata River, Bloomfield Terrace Well, Colin Grove Well, Hautana Street Well, Mahoe Street Well, Penrose St. Well 1, Penrose St. Well 2, Willoughby 2 Well 1, Willoughby 2 Well 2.	9,765	Cb
Churton	Hutt River, Te Marua Lakes	4,446	Aa
Eastern Wellington	Hutt River, Te Marua Lakes, Big Huia River, George Creek, High Level, George Creek, High Level, George Creek, Low Level, Orongorongo River, Wainuiomata River, Wainuiomata River, Bloomfield Terrace Well, Colin Grove Well, Hautana Street Well, Mahoe Street Well, Penrose St. Well 1, Penrose St. Well 2, Willoughby 2 Well 1, Willoughby 2 Well 2.	16,815	Cd
Johnsonville	Hutt River, Te Marua Lakes, Big Huia River, George Creek, High Level, George Creek, High Level, George Creek, Low Level, Orongorongo River, Wainuiomata River, Wainuiomata River, Bloomfield Terrace Well, Colin Grove Well, Hautana Street Well, Mahoe Street Well, Penrose St. Well 1, Penrose St. Well 2, Willoughby 2 Well 1, Willoughby 2 Well 2.	18,357	Ca
Karori	Hutt River, Te Marua Lakes, Big Huia River, George Creek, High Level, George Creek, High Level, George Creek, Low Level, Orongorongo River, Wainuiomata River, Wainuiomata River, Bloomfield Terrace Well, Colin Grove Well, Hautana Street Well, Mahoe Street Well, Penrose St. Well 1, Penrose St. Well 2, Willoughby 2 Well 1, Willoughby 2 Well 2.	13,146	Cb
Kelburn	Hutt River, Te Marua Lakes, Big Huia River, George Creek, High Level, George Creek, High Level, George Creek, Low Level, Orongorongo River, Wainuiomata River, Wainuiomata River, Bloomfield Terrace Well, Colin Grove Well, Hautana Street Well, Mahoe Street Well, Penrose St. Well 1, Penrose St. Well 2, Willoughby 2 Well 1, Willoughby 2 Well 2.	9,924	Cb

Zone Name	Water source	Population served	Public Health Grading*
Onslow	Hutt River, Te Marua Lakes, Big Huia River, George Creek, High Level, George Creek, High Level, George Creek, Low Level, Orongorongo River, Wainuiomata River, Wainuiomata River, Bloomfield Terrace Well, Colin Grove Well, Hautana Street Well, Mahoe Street Well, Penrose St. Well 1, Penrose St. Well 2, Willoughby 2 Well 1, Willoughby 2 Well 2.	11,883	Ca
Southern Wellington	Hutt River, Te Marua Lakes, Big Huia River, George Creek, High Level, George Creek, High Level, George Creek, Low Level, Orongorongo River, Wainuiomata River, Wainuiomata River, Bloomfield Terrace Well, Colin Grove Well, Hautana Street Well, Mahoe Street Well, Penrose St. Well 1, Penrose St. Well 2, Willoughby 2 Well 1, Willoughby 2 Well 2.	30,024	Cb
Tawa	Hutt River, Te Marua Lakes	12,903	Ab
Wadestown	Hutt River, Te Marua Lakes, Big Huia River, George Creek, High Level, George Creek, High Level, George Creek, Low Level, Orongorongo River, Wainuiomata River, Wainuiomata River, Bloomfield Terrace Well, Colin Grove Well, Hautana Street Well, Mahoe Street Well, Penrose St. Well 1, Penrose St. Well 2, Willoughby 2 Well 1, Willoughby 2 Well 2.	6,789	Ca
Wellington Central	Hutt River, Te Marua Lakes, Big Huia River, George Creek, High Level, George Creek, High Level, George Creek, Low Level, Orongorongo River, Wainuiomata River, Wainuiomata River, Bloomfield Terrace Well, Colin Grove Well, Hautana Street Well, Mahoe Street Well, Penrose St. Well 1, Penrose St. Well 2, Willoughby 2 Well 1, Willoughby 2 Well 2.	31,074	Ca

## Appendix 2 Water Grading Explained

Supplies for 500 or more people should have a Public Health Grading.

### The public health grading

The Ministry of Health grading provides an assessment of its confidence in the public health safety of each drinking-water supply serving a community of over 500 people. The grading has two letters. The first letter (in upper case) represents the source and treatment grading, while the second letter (in lower case) grades the water in the distribution zone itself. Gradings containing C or c indicate marginal quality, while lower gradings show that quality or risk management is unsatisfactory.

An ungraded supply is indicated by u in the *Register*.

This consists of a single grading for each treatment plant (eg B) and a combined grading for each distribution zone (eg Ba).

### Distribution Zone Grades

Zone grading (a to e) is based upon the microbiological and chemical quality of the water, along with the condition of the reticulation system and the quality of its care, etc. A zone grading should always be considered with the accompanying plant and source grading.

a	Completely satisfactory, negligible level of risk, demonstrably high quality
b	Satisfactory, low level of risk
c	Marginal, moderate level of risk, may be acceptable in some small communities
d	Unsatisfactory, high level of risk
e	Completely unsatisfactory, very high level of risk
u	Not yet graded (Not yet required if less than 500 people)

### Source and Plant Grading

Plant and source grading is based primarily on the likely health risks to the community arising from bacteria, protozoa (giardia and cryptosporidium) and chemical substances in the source water, and how effectively the treatment plant can act as a barrier to such contaminants passing through to the reticulation. Possible gradings are A1 (best), then A to E. As well as appearing against each plant, each zone inherits the plant grading from the worst plant providing it with water.

A1	Completely satisfactory, negligible level of risk, demonstrably high quality
A	Completely satisfactory, very low level of risk
B	Satisfactory, low level of risk
C	Marginal, moderate level of risk, may be acceptable in some small communities
D	Unsatisfactory, high level of risk
E	Completely unsatisfactory, very high level of risk
u	Ungraded

Zone: (or Distribution Zone) That part of the town or community receiving water of similar quality. For a small supply, that means "everywhere". For larger supplies, it may be only part of a town or city. By definition, parts receiving different water will

Plant: The treatment plant supplying the water. In some situations where no treatment is given, a nominal plant is defined as where the water is pumped from or merely gathered together. In others, the treatment plant will have highly technical operations

Source: The river, groundwater, or other source from which the water is taken. About half of New Zealand's drinking-water is pumped from the ground, with the remainder coming from surface sources.

## Appendix 3 Consultation Questionnaire for Unreticulated Communities

### Wellington City Council Assessment of Water Services

Address \_\_\_\_\_ WCCAWS

#### Water

1) How is your water for domestic consumption collected? \_\_\_\_\_  
\_\_\_\_\_

2) How is your water for domestic consumption stored? \_\_\_\_\_  
\_\_\_\_\_ Volume/ number of tanks \_\_\_\_\_

3) How do you treat collected water? (filter system, chemical disinfection, chlorine, UV, or other point of use treatments) \_\_\_\_\_  
\_\_\_\_\_

4) How frequently do you clean/ inspect (please circle);

a) rooves	6+ times a year	3-6 times a year	2-3 times a year	1-2 times a year	<once a year	Never
b) gutters	6+ times a year	3-6 times a year	2-3 times a year	1-2 times a year	<once a year	Never
c) filters	6+ times a year	3-6 times a year	2-3 times a year	1-2 times a year	<once a year	Never
d) storage tanks	6+ times a year	3-6 times a year	2-3 times a year	1-2 times a year	<once a year	Never

5) For water for domestic consumption do you monitor the (please circle);

			Frequency	How
a) biological quality?	Yes / No	Monthly	Every 2-3 months	Annually _____
b) chemical quality?	Yes / No	Monthly	Every 2-3 months	Annually _____

6) Do you know of any water quality problem, health related issues or risks of contamination to your supply? \_\_\_\_\_  
\_\_\_\_\_

7) Would you be prepared to let wcc sample the quality of your domestic consumption water ? Yes / No



## Appendix 3 Consultation Questionnaire for Unreticulated Communities

### Sewerage

8 a) Do you use a septic tank system to dispose of your domestic wastewater? Yes / No

b) If no how do you dispose of your domestic waste water? \_\_\_\_\_

9 a) Is your septic tank individual or communal to others? \_\_\_\_\_

b) If communal how many properties are connected to it? \_\_\_\_\_

10) Approximate age of your septic tank \_\_\_\_\_ years

11) Approximate dimensions of your septic tank system ( including number of tanks) \_\_\_\_\_

12 How often do you measure the sludge depth?                      Frequently                      Occasionally                      Never

13 How often do you measure scum thickness?                      Frequently                      Occasionally                      Never

14a) Have you ever cleaned (pumped out) your septic tank? Yes / No

b) If yes how often?                      Once                      Twice                      5 times                      Other \_\_\_\_\_

c) How? \_\_\_\_\_

d) How was your septage disposed of? \_\_\_\_\_

15a) Do you pay a third person to monitor and maintain your system? Yes / No

b) If yes who \_\_\_\_\_

16 Has your septic tank system ever failed or needed repair or replacement? If yes please give details \_\_\_\_\_

17 Are you aware of any failures of your system which resulted in environmental or public health -disease or illness- incidents? \_\_\_\_\_

## Appendix 3 Consultation Questionnaire for Unreticulated Communities

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If you would like for further information on **drinking water quality** the Ministry of Health has written information on the safe supply of drinking water to households for those houses not connected to a town supply.

### Household Water Supplies (MOH4602)

Detailed information for people who are not on town water supply is provided in this 18-page book, which addresses the selection, operation, and maintenance of individual household water supplies.

Water Collection Tanks and Safe Household Water (MOH10148) This pamphlet has introductory information on safe drinking water generally, with detailed information on how to keep tank water safe, whether it is collected from rain off the roof, an underground bore, a stream or a lake. Contamination, filtering, tank installation and cleaning, and sources of further information are covered.

### Secure Groundwater Bores and Wells for Safe Household Water (MOH1129)

The leaflet provides information for people whose household water supply comes from a bore or well. Sources of possible contamination are listed, along with other details relating to chemicals, germs, and aquifers, with specific steps to take to secure your well-head and protect your household's health - including where to go for more help or information.

These booklets are available free from Hutt Valley District Health Board, High Street Lower Hutt or phone (04) 570 9002 please quote the MOH reference code.

For information on **septic tank maintenance** Greater Wellington Regional Council have a number of brochures as part of the Sewage Help series;

### 4 helpful hints about looking after on-site sewage systems

It describes four ways you can best maintain your on site sewage system. It outlines how to keep the good bacteria in the tank alive, reduce the liquid load into the tank, reduce solid load on the tank, protect you soakage treatment area, native plants good to plant around the soakage area plus a few other helpful tips.

### What's going on in your sewage system

This describes what's going on in your sewage system by outlining treatment in the tank and the soakage treatment area

### On-site sewage your legal responsibilities

It outlines what kind of permission you need to obtain for your system, subdivisions, what can happen if your system doesn't comply, what if there is a sewer nearby, what if you're a landlord who wants to sell and sludge removal.

If you would like a copy of these free publications please contact the Publications Officer at the Regional Council Centre, 142 Wakefield Street, Wellington or phone (04) 384 5708

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Appendix 4. Descriptions of consented and unconsented stormwater catchments.

Catchment Name	Discharge Point	Area (ha)	Slope %	Dry weather flow rate m <sup>3</sup> s <sup>-1</sup>	Land Use	Receiving Environment	Consent No	Date of Issue	Date of Expiry	Sewage Pollution Elimination Works undertaken in catchment to date	Comment
Lyall Bay West	Lyall Bay West	98	7.5	0.01	Rural 93% Urban 7%	South Coast- high public use	WGN920068	5-Jan-94	30-Jun-10	Rehabilitation of pump station PS22 (1995). Rehabilitation of pump station PS34 (1995). Completion of cross-connection studies/repairs (1997). Rehabilitation of known sewer faults (1995 – 2000).	SPE Project has achieved a dramatic improvement in annual median FC levels. The relatively high 95%ile value indicates that there may still be significant wet weather pollution of stormwater but Figure 4.1 in BAAE Vol 2 indicates that the year 2001-02 result may be an anomaly. The situation should be closely monitored.
Hataitai	Evans Bay Culvert	126	7.6	0.05	Urban-residential	South Coast- high public use	WGN920071	8-Feb-94	30-Jun-10	Completion of cross-connection studies/repairs (1997). Installation of back-up systems to prevent overflows from pump stations 16, 17, (1997-98). Rehabilitation of known sewer faults (2003).	SPE Project appears to have largely eliminated both dry weather leakage and wet weather leakages/overflows into the stormwater system.
Newtown OPT	OPT Culvert	448	3.8	0.15	90% Open space 10% residential	Harbour- high public use	WGN920076	8-Feb-94	30-Jun-13	Completion of cross-connection studies and repairs (90% completed by June 1999). Rehabilitation of known sewer faults causing pollution of stormwater (2002).	SPE Project has significantly reduced both the dry weather leakage and the wet weather leakages/overflows, although both the current median and 95%ile values indicate that sewer faults remain. Constructed overflow at Drummond St has an estimated ARI of 1 in 2.5 years.
Tory St	Tory St Culvert	44	4.2	0.03	Urban	Harbour- high public use	WGN 920070	8-Feb-94	30-Jun-18	Drain rehabilitation works (1993-96)	SPE Project works have not significantly reduced FC numbers. Data indicates continued existence of sewer faults in catchment.
Taranaki St	Taranaki Culvert	69	8	0.025	Urban-residential	Harbour- high public use	WGN920072	8-Feb-94	30-Jun-09	Completion of cross-connection studies/repairs (2003). Rehabilitation of known sewer faults (2003).	SPE Project has achieved a significant improvement
Waring Taylor	Waring Taylor Culvert	50	6.8	0.01	Urban-residential	Operational port area-Low public use	WGN920075	8-Feb-94	30-Jun-11	Completion of cross-connection studies/repairs (2003).Rehabilitation of known sewer faults (2003).	FC levels have been moderately elevated over past ten years, but some indication of a downward trend over past 3 years, possibly caused by recent implementation of SPE Project in this catchment.
Davis	Davis St Culvert	187	4.9	0.05	Urban- central city	Operational port area-Low public use	WGN920074	8-Feb-94	30-Jun-13	Rehabilitation of PS10 and PS21 (2000). Other work, including cross-connection studies and repairs in progress.	SPE Project has achieved significant improvements but it is apparent that the frequency of stormwater monitoring is too low to pick up the known periodic (ARI 3 months) overflows of raw sewage to the Davis St Culvert from the Interceptor at Murphy Street.
Tinakori	Thorndon Quay	99	2.8	0.02	Urban- central city	Operational port area-Low public use	WGN920073	8-Feb-94	30-Jun-13	Some drain rehabilitation works 1997 – 2000. Other works, including cross-connection studies, in progress.	SPE Project has achieved significant improvements.
Ngauranga	Ngauranga Stream	840	5.5	0.15	Urban 88% open space 12%	Harbour- Low public use	WGN920069	8-Feb-94	30-Jun-13	Completion of cross-connection studies/repairs (2003).	SPE Project has not achieved any significant changes in FC content of stream over past 10 years. Results consistent with approx 35% urbanisation of catchment with minimal sewage contamination.
Island Bay	Island Bay Culvert	500	4.5	0.1	Urban-residential	South Coast- high public use	WGN920065	8-Feb-94	30-Jun-09	Installation of backup system to prevent sewage overflows at PS37 (1994).Completion of cross-section studies/ repairs (1996). Rehabilitation of known sewer faults causing pollution of stormwater (1999).Triplification of Kilbirnie Sewer Main (1999).	SPE Project has achieved major improvements over past 9 years. Appears to have significantly reduced both dry weather leakage and wet weather leakages/overflows of sewage into stormwater system.
Houghton Bay	Princess Bay & Houghton Bay	104	8.6	0.002	Parks and reserves	South Coast- low public use	WGN010080 [20836]	27-Feb-01	23-Mar-36	Rehabilitation/overflow prevention PS36 (1994). Completion of cross-connection studies/repairs (1996). Rehabilitation of known sewer faults (1996).	SPE Project appears to have largely eliminated dry weather leakage of sewage but 95% ile FC values indicate that wet weather overflows or leakages may still be occurring.
Owhiro Bay	Owhiro Bay Stream	953	ND	0.1	Open space	South Coast- low public use	WGN92066	5-Jan-94	Expired 30/06/2003	Backup system to prevent sewage overflow PS39 (1995). Completion of cross-connection studies/repairs (1996). Rehabilitation of known sewer faults (1998).	Annual median FC levels relatively consistent over 10 years, ranging from 736 to 1400 cfn/100 mls. The 95% ile shows apparent decline. Results consistent with partially urbanised catchment with no significant sewage leaks or wet weather overflows.
Lyall Bay East	Lyall Bay East	42	1.9	0.01	Urban-residential	South Coast- recreational		Unconsented			
Seatoun	Seatoun	96	11	10 (l/s)	Urban-residential	Harbour - high public use		Unconsented			
Miramar	Miramar Culvert	394	2.5	0.02	Urban-residential	Harbour - high public use		Unconsented		Rehabilitation of pump station PS24 (1999).	SPE Project has achieved some reductions in both dry weather and wet weather contamination, with a notable downward trend in the past 4 years (see section 6 of BAAE Vol 2).
Kilbirnie	Cobham Drive Culvert	130	1.2	ND	Urban-residential	Harbour- Low public use		Unconsented		Rehabilitation of pump station PS17 (1997).Rehabilitation of pump station PS18 (1998).	SPE Project has achieved a reduction in both dry weather and wet weather FC levels but over past 5 years the median FC level has been gradually increasing.
Rongotai	Rongotai Culvert	18	1.8	0.002	Urban-residential	Harbour Low public use		Unconsented			
Grafton/ Rata	Hataitai Beach	84	26.1	ND	Urban-residential	Harbour - high public use		Unconsented			
Oriental Bay	Oriental Bay	51	32.1	0.02	Urban-residential	Harbour- recreational		Unconsented			
Te Aro	Taranaki Culvert	235	8.7	0.025	Urban- central city	Harbour- high public use		Unconsented		Gluznee Street overflow sealed.	Data shows that FC levels have remained relatively low (compared to other urban areas) with annual median values ranging from a minimum of 100 cfu/100 ml in 97/98 to a max of 4,000
Hunter Street	Lambton Culvert	12	ND	ND	Urban- central city	Harbour - high public use		Unconsented			
Harris St	Harris St Culvert	18	2.2	1 (l/s)	Central city	Harbour- high public use		Unconsented			
Bowen St	Bowen St Culvert	62	6.5	0.01	Urban 88% open space 12%	Operational port area- Low public use		Unconsented		Rehabilitation of pump station PS9 (2000).	These results indicate that SPE Project has achieved little in this catchment; it appears that significant sewage faults remain, including dry weather leakage and wet weather overflows.
Kaiwharawhara Stream	Kaiwharawhara Stream	1770	2.8	0.1	Urban-residential	Harbour- high public use		Unconsented			

**Appendix 5. Locations and description of public conveniences (council owned and privately owned with reasonable access).**

Property Address	Suburb	Disability Access	Hours	Caters for	Urinal	No. Pans
<b>Council owned</b>						
Berhampore Golf Links Adelaide Rd/Liardet	Berhampore	No	When Park open	M & F		3
Helston Park	Newlands	No	When Park open	M & F	1	2
Lyndhurst Park, Lyndhurst Rd	Tawa	No	When Park open	M & F	1	3
Alex Moore Park, Moorefield Rd Lower Pavilion	Raroa	No	When Park open	M & F	3	4
Alex Moore Park, Moorefield Rd Upper Pavilion	Raroa	No	When Park open	M & F	2	5
Anderson Park, Glenmore Street (Pavilion)	Kelburn	No	When Park open	M & F	1	4
Ben Burn Park, Campbell Street,	Karori	No	When Park open	M & F	2	4
Centennial Park, Darlington Road	Miramar	Yes (to 1 All Gender only)	When Park open	M & F and 1 All Gender	2	8
Churton Park, Abilene St	Churton Park	No	When Park open	M & F	2	6
Cobham Drive Park, Cobham Drive	Kilbirnie	No	When Park open	M & F	2	5
Crawford Green Park	Strathmore	Yes to public toilets only	When Park open	M & F	3	5
Evans Bay Park	Kilbirnie	No	When Park open	M & F	2	4
Grenada North Park, Jamaica Drive	Grenada Park	No	When Park open	M & F	2	7
Happy Valley Park, Happy Valley Rd,	Happy Valley	No	When Park open	M & F	2	5
Hataitai Park - Softball	Hataitai	No	When Park open	M & F	1	9
Hataitai Park - Tennis/Netball	Hataitai	No	When Park open	M & F	1	3
Hataitai Park - Velodrome	Hataitai	No	When Park open	M & F	3	7
Ian Galloway Park, Curtis St	Karori	No	When Park open	M & F	3	9
Island Bay Surf Club	Island Bay	No	7am - 9pm, closed winter months	M & F	1	3
Kaiwharawhara Park, Nicholson Rd	Kaiwharawhara	No	When Park open	M & F	1	1
Karori Park	Karori	No	When Park open	M & F	3	12
Kelburn Park, Salamanca Rd	Lambton	No	When Park open	M & F	2	4
Kilbirnie Park	Kilbirnie	No	When Park open	M & F	2	4
Linden Park, Gee Street	Linden	No	When Park open	M & F	3	5
Linden Park West	Linden	No	When Park open	M & F	1	3
Lyll Bay Beach Surf Club	Lyll Bay	Yes	7 am - 9 pm (all gender open all yr, 2x changing rooms closed winter months)	All Gender	1	5
Macalister Park (Adelaide Rd)	Berhampore	Yes	When Park open	M & F & 1 All Gender disability	2	3
Macalister Park (Liardet Street)	Berhampore	No	When Park open	M & F	4	4
Martin Luckie Park	Berhampore	No	When Park open	M & F	2	7
Melrose Park, Melrose Cres	Melrose	No	When Park open	M & F	2	4

**Appendix 5. Locations and description of public conveniences (council owned and privately owned with reasonable access).**

Nairn Street Park	Brooklyn	Yes	When Park open	M & F		2
Newlands Park, Newlands Rd	Newlands	No	When Park open	M & F	3	5
Newtown Park Off Mansfield St,	Newtown	Yes (to 1 All Gender only)	When Park open	M & F	3	10
Pinkerton Park, Horokiwi St	Horokiwi	No	When Park open	M & F	2	4
Polo Ground, 20A Park Road, (Pavilion)	Miramar	No	When Park open	M & F	1	2
Prince of Wales Park, Salisbury Tce	Mt Cook	No	When Park open	M & F	2	6
Raroa Park, Burma Rd ( near Onslow College)	Broadmeadows	No	When Park open	M & F	2	4
Redwood Park - Lower Main Rd	Redwood	No	When Park open	M & F	2	5
Redwood Park - Upper Main Rd	Redwood	No	When Park open	M & F	1	3
Scorching Bay Beach Pavilion	Scorching Bay	Yes	7 am - 9 pm (1x all gender open all yr, 2x changing rooms & 2x all gender closed winter months)	All Gender	2	3
Sinclair Park, Houghton Bay Rd	Houghton Bay	No	When Park open	M & F	2	4
Tanera Park	Brooklyn	No	When Park open	M & F	1	3
Vogelmorn Park, The Ridgeway	Mornington	No	When Park open	M & F	1	3
Wakefield Park, The Parade	Island Bay	No	When Park open	M & F	3	10
Wilton Park	Wilton	No	When Park open	M & F	1	3
Miramar Park, 17 Darlington Road, (pavilion and toilet)	Miramar	No	When Park open	M & F	3	6
Seatoun Park, Ludlam Street,	Seatoun	No	When Park Open	M & F	1	3
Botanical Gardens Main Garden, off founders entrance, on William Bramley Drive,	Kelburn	Yes	7am – 9pm	All Gender		4
Botanical Gardens Play Area,	Kelburn	No	7am – 9pm	M & F	1	3
Botanical Gardens Rose Garden, behind the Begonia House,	Kelburn	Yes	7am – 9pm	M & F & 1 All Gender disability	1	5
Otari Wiltons Bush, 160 Wilton Road, (Picnic Area)	Wilton	No	7am - 9pm	M & F	1	2
Botanical Gardens Rose Garden, in the Begonia House,	Kelburn	Yes	7am – 9pm	All Gender		3
Botanical Gardens Treehouse	Kelburn	Yes	7am – 9pm	M & F & 1 All Gender disability	1	4
Otari Wiltons Bush, 160 Wilton Road, (Treehouse)	Wilton	Yes	7am - 9pm	All Gender	1	2
Karori Cemetery, Rosehaugh Road	Karori	No	7am – 9pm	M & F	1	2
Makara Cemetery	Makara	No	8am to dusk	All Gender		1
198 Glenmore Street,	Northland	No	CLOSED	Men only		
Polo Ground, 20A Park Road, (Toilet)	Miramar	No	When Park open	M & F	1	4
23 Dundas St, Seatoun	Seatoun	Yes	24hrs	All Gender	1	1

**Appendix 5. Locations and description of public conveniences (council owned and privately owned with reasonable access).**

33 Luxford St, Berhampore	Berhampore	no	BEING UPGRADED	M & F		
Quebec St	Kingston	No	24hrs	M & F / 1 All Gender	1	4
44 Jefferson St, Brooklyn	Brooklyn	Yes	24hrs	All Gender	1	1
501 Queens Drive	Princess Bay	No	24hrs (closed winter months)	M & F		2
56 Bay Road, Kilbirnie	Kilbirnie	Yes	7am - 9pm	All Gender	1	2
9 Constable Street, Newtown	Newtown	Yes	24hrs	All Gender	1	2
ANZ Toilet, Lambton Quay/ Featherstone Street	Lambton	Yes	7am-5pm M-T-W-T. Fri-7am-7.30pm Sat 8am-5pm Sun-10am-3pm / 1x24hr on Featherstone St side	All Gender		8
Aro St Park, 60 Aro St	Lambton	Yes	9am - 9pm	All Gender	1	1
Bottom of Awa Road	Worser Bay	Yes	24hrs	All Gender	1	1
Balaena Bay, Evans Bay Parade	Evans Bay	No	7am - 9pm, closed winter months	M & F		2
Band Rotunda, Oriental Bay	Oriental Bay	Yes	24hrs	All Gender		1
Bowen St,	Lambton	Yes	24hrs	All Gender	1	2
Broadway,	Strathmore	No	24hrs	M & F	1	3
Broderick Rd,	Johnsonville	Yes	24hrs	All Gender		2
Central Park, 65 Ohiro Road,	Brooklyn	No	7am – 9pm	M & F	1	3
Churchill Park,2 Marine Parade,	Seatoun	Yes	24hrs	All Gender	1	2
Collingwood Street,	Ngaio	Yes	24hrs	M & F	1	3
Courtenay Place, Cambridge Terrace end	Te Aro	Yes	24hrs	All Gender	1	4
Cr Miramar Ave/ Park Road,	Miramar	Yes	7am - 9pm	All Gender		2
Te Aro Park, at the junction of Dixon and Manners Street	Te Aro	Yes	24hrs	All Gender		4
Evans Bay Parade, Hataitai Beach	Hataitai	No	7am – 9pm, closed winter months	M & F		2
Ganges Road,	Khandallah	Yes	24hrs	All Gender		2
Grasslees Reserve, Davies Street,	Tawa	Yes	24hrs	M & F	1	3
Karori Rd (next to Library)	Karori	Yes	7am - 9pm	All Gender		3

**Appendix 5. Locations and description of public conveniences (council owned and privately owned with reasonable access).**

Makara Beach	Makara	Yes	24hrs	All Gender	1	2
Medway St, The Parade,	Island Bay	Yes	24hrs	All Gender	1	1
Miramar Park, 17 Darlington Road, (stand alone)	Miramar	No	When Park open	M & F	1	2
Newland Mall, McMillan Ct,	Newlands	No	7am - 9pm	M & F	1	3
Opposite 278 Thorndon Quay	Thorndon	No	CLOSED	Men only		
Oriental Bay, Freyberg Beach	Oriental Bay	Yes	24 hrs	All Gender		4
Oriental Bay, on Oriental Parade at the junction of Oriental Terrace (by Wishing Well)	Oriental Bay	Yes	24hrs	All Gender		4
Queens Drive	Lyllal Bay	No	24hrs (closed winter months)	M & F	1	3
Randwick Road,	Northland	Yes	8am - 9pm	All Gender		1
Rugby League Park, Hall Street	Newtown	Yes	When Park open	M & F		3
Shorland Park and Play, Park Road,	Island Bay	Yes	24hrs	All Gender	1	3
Taurima St (Transit)/Hataitai	Hataitai	Yes	7am - 9pm	All Gender	1	1
Toilets next to Tawa Library, Cambridge St	Tawa	Yes	7am - 10pm	All Gender		3
Upland Road - top of Cable Car / Skyline Site	Kelburn	Yes	6am - 10pm	All Gender		4
Wadestown Road - Bus turn around	Wadestown	Yes	7am - 9pm	All Gender	1	1
Willowbank Reserve & Play Area, Taylor Road/	Tawa	No	24hrs	M & F	1	3
Khandallah Reserve, Woodmancote Street	Khandallah	No	7am - 9pm	M & F	1	4
Worser Bay Beach Pavillion	Worser Bay	Yes	24hrs (closed winter months)	All Gender	1	2
Anderson Park (Toilets) 2x separate buildings	Kelburn	No	8am - dusk	Mens	1	1
Anderson Park (Toilets) 2x separate buildings	Kelburn	No	8am - dusk	Womens		2
Nairville Park	Ngaio	No	When Park open	M & F	1	2

Privately owned with reasonable access						
Capital E, Civic Square	Te Aro	Yes	During day time opening hours and/or when facilities in use	M & F	ND	ND
Clifton Terrace Car park	Lambton	Yes	Day time only	M & F	ND	ND

**Appendix 5. Locations and description of public conveniences (council owned and privately owned with reasonable access).**

Embassy Theatre, Kent Terrace	Mt Victoria	Yes	During day time opening hours and/or when facilities in use	M & F	ND	ND
James Smith Car Park	Te Aro	Yes	During day time opening hours and/or when facilities in use	M & F	ND	ND
Queens Wharf Evens Centre, Queens Wharf, off Jervis Quay	Lambton	Yes		M & F	ND	ND
The Opera House, Courtenay Place	Te Aro	Yes	During Performance times	M & F	ND	ND
Westpac Stadium, Waterloo Quay	Thorndon	Yes		M & F	ND	ND
Westpac Trust St James Theatre, Courtenay Place	Te Aro	Yes	During day time opening hours and/or when facilities in use	M & F	ND	ND