Environmental

Environmental Well-being

Encompassing factors that relate to the capacity of the natural environment to support, in a sustainable way, the activities that constitute community life.

From the total of 53 data measures collected this year in the environmental category, 30 measures have been selected for detailed comment.

CE8: Total Beach/Lagoon Warning Days

Definition	Measure
Total number of all bathing beach/lagoon warning days due to stormwater or wastewater pollution	Number
Confidence Gradings	Councils only

Monitoring programmes and warnings

Responsible Council	CB16 Beaches/ Lagoons Monitored		CE15 Beaches/ Lagoons Affected		CE16 Beaches/ Lagoons with permanent signs		CE8 Total Warning Days	
	05/06	06/07	05/06	06/07	05/06	06/07	05/06	06/07
Auckland City	17[1]	17	0	2	0	1[1]	0	374
Manukau City	15	9	3	4	3[2]	3[2]	1095	1097
North Shore City	27	27	14	16	1[3]	1[3]	490	438
Waitakere City	19	19	13[4]	15	0	0	325	105
Rodney District	14	14	1	0	0	0	3	0
Papakura District	0	0	0	0	0	0	0	0
Franklin District	5	5	0	0	0	0	0	0

1 Auckland City monitors 10 beaches on the isthmus, 4 on Waiheke Island and 3 on Great Barrier Island. 1 beach, Cox's Bay has a permanent warning sign, accounting for 98% (06/07) of its warning days.
2 Manukau City has permanent warning signs at 3 beaches which are no longer actively monitored: Kawakawa Bay, Weymouth and Mangere which account for all its warning days except two.
3 North Shore City has a permanent warning sign at 1 beach: Wairau outlet north of Milford beach and marina, accounting for 74% (05/06) and 83% (06/07) of its warning days.
4 Waitakere City monitors 4 lagoons, 3 of these were part of the total 13 locations affected in 05/06.

Many of Auckland's beaches and lagoons are monitored for any pollution by the Territorial Local Authority (TLA) responsible. A beach/lagoon 'warning' usually involves public warnings issued in local newspapers and/or warning signs posted at the site for the duration of the pollution event. However each Council has its own form of monitoring. Some will post warning signs as soon as the possibility of a pollution event is suspected while others will wait until a positive result is returned from water tests. Most Councils erect signs after two consecutive events, except Waitakere which does so after just one and will continue to display the sign until the next clear water sample is confirmed. North Shore erects signs directly after sewer overflows, usually caused by significant rainfall, without waiting for monitoring results. Current construction initiatives such as Project CARE (North Shore) and Metrowater's sewer separation programme for Auckland City are progressively reducing the frequency and volume of these overflows. North Shore, Auckland, Manukau, Waitakere and Rodney monitor during summer months only. Papakura does not have any locations classed as bathing beaches and so does not have a monitoring programme.

The measure refers to the total number of days that all beaches/ lagoons in the TLA area were subject to warnings about pollution events, irrespective of the number of separate events. For example if one beach was 'warned' for five days from each of two events, and another beach 'warned' for a total of 10 days from three events, the reported performance would be 10 days in both cases. A location with a permanent sign erected is recorded as having 365 warning days.

Stanmore Bay, Hibiscus Coast one of the region's many beaches which the water industry is working to protect.

Overflow Events and Volumes

Overflow of sewage from the reticulated wastewater pipe system occurs when pipe capacity is exceeded by flow in the system, or when a blockage in the pipe restricts normal capacity. Auckland TLAs and wastewater service providers aim for nil overflows in dry weather and carry out ongoing maintenance of the system to minimise blockages.

Wet weather, however, creates surface flow and raised groundwater levels causing additional water to enter the pipe system through cracks, disjoints and surface inlets such as low gully traps or illegally connected roof down-pipes. This wet weather component, referred to as Infiltration & Inflow (i/i), can increase pipe flows by 10 times their design criteria, leading to overflows from gully traps and manholes to ground level, and through design pressure-release overflow devices to nearby streams and estuaries.

A sewer overflow in the context of this report occurs when untreated sewage spills, surcharges, discharges or otherwise escapes from the wastewater network under the organisation's control to the external environment, in either wet or dry weather conditions. It includes overflows from pumpstations, pipes, manholes and designed overflow structures but does not include those caused by blockages in house branch connections or engineered spills to designed storage facilities where no pollution of the environment occurs e.g. an emergency storage tunnel.

There are two main types of wastewater system operated in the Auckland region - separate and combined. Separate sewer systems provide a dedicated pipe network solely for wastewater transportation, while stormwater from the same area goes to a different pipe system. Combined systems however involve just one pipe network for both wastewater and stormwater transportation. Overflows from combined sewer systems are by nature significantly more dilute than those from separated wastewater systems.

Auckland City owns 296 km (reduced from 321 km in 2003/04) of combined sewers which it classes as a stormwater system containing sewage. Metrowater is tasked with progressively replacing this old combined system with separate wastewater pipes, to minimise the number and volume of overflows to the environment. This frees up the existing combined pipe system to become a stormwater-only pipe system for the separated area. Metrowater also owns and operates 1,591 km of separate sewer systems.

The largest (trunk) combined sewers in the region are owned and operated by Watercare Services Ltd (52 km), which classifies its combined sewers as wastewater systems. Watercare also manages 255 km of separate wastewater trunk sewer.

The relevant data for overflow events and volumes is shown in the following three tables – wet weather, dry weather and pumpstations. While most organisations are able to identify the number of sewer overflow events with high levels of confidence, it is impractical to accurately measure overflow volumes at every location and for any and every rain event. Instead estimation of overflow volumes has become possible and progressively more accurate over the last 20 years with the advent of hydraulic computer models. These are currently used by Metrowater, (Auckland City via Metrowater) North Shore City, Waitakere and Watercare as the basis for reporting wet weather overflow volumes. Other organisations estimate without computer modelling and so are not able to report full information for this measure. With the introduction of the Dry Weather Sewer Overflows Best Management Practice Guide, organisations are progressively looking at ways to estimate the volumes discharged, including where possible by personnel who attend incidents recording this on an Incident Response Form. Organisations are at an early stage of reporting on this basis and confidence levels are generally not high.

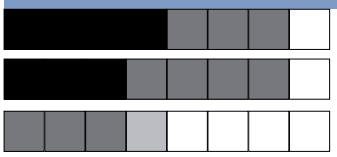
In summary, most of the overflow volume occurs in wet weather and is from the dilute sewage bearing combined system within Watercare's network (64%) or from Auckland City's combined system which Metrowater is progressively separating. The number of dry weather overflow events and the volumes involved are far less than in wet weather, however as these discharges can have wide ranging public health and environmental risks the industry is focused on taking all practical steps to minimise the effects.

Metrowater has the highest annual volume of 195,321 m^3 of separate sewer overflows in wet weather and is working with Auckland City to reduce the high overflow volumes from the combined stormwater/sewerage system. The target is to reduce by 2012 total overflow volume by 35% compared with 2006. North Shore City with 99,000 m^3 has the next highest separate sewer overflow volume. Together Metrowater and North Shore account for 84% of the reported separate sewer overflow volume in wet weather.

Early construction of the now completed and operational Orewa wastewater pumping station and storage facility.

WWE3, WWE10, SWE20, WWE12, WWE11, SWE21, WWE6, WWE13, SWE22: Wet Weather Sewer Overflow Events and Volumes

Definition	Measure
Total number of separate/combined sewer system overflow events from the "Separate/Combined Sewer Length" caused by wet weather WWE3, WWE10, SWE20	Number
Total separate/combined sewer overflow events per 100km of "Separate/Combined Sewer Pipe Length" caused by wet weather WWE12, WWE11, SWE21	Number per 100km
Total estimated volume of separate/combined sewer overflow events from the "Separate/Combined Sewer Length" caused by wet weather WWE6, WWE13, SWE22	Cubic metres
Confidence Gradings	Wastewater Orgns

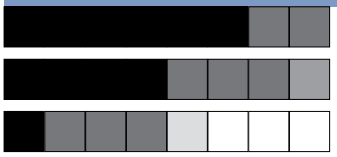


Organisation	Type of System	WWA1 WWA2 SWA21 Total pipe length (km)	WWE3 WWE10 SWE20 Wet Weather O/F Events	WWE12 WWE11 SWE21 Wet Weather O/F Events per 100km length	WWE6 WWE13 SWE22 Wet Weather O/F Volume (m^3)
Auckland City	Combined	296	1,420	478	1,300,000
Metrowater	Separate	1,591	*	*	195,321
Manukau Water	Separate	1,835	23	1.3	*
North Shore City	Separate	1,326	4	0.3	99,000
Waitakere City	Separate	1,051	27	2.6	24,275
Rodney District	Separate	571	10	1.8	*
United Water	Separate	240	0[1]	0	0
Franklin District	Separate	253	9	3.6	*
Watercare Services	Separate	255	49	19.2	31,000
	Combined	52	484	931	968,251
Total for Auckland		**7,475**	**2,026**		**2,617,847**

1 United Water did not record any overflows during wet weather due to insufficient capacity.
* No data submitted for this measure.

WWS64, SWS45, WWS65, SWS46, WWS68, SWS49: Dry Weather Sewer Overflow Events and Volumes

Definition	Measure
Total Number of Dry Weather Sewer Overflows - from separate or combined sewers WWS64, SWS45	Number
Number of Dry Weather Sewer Overflows per 100km of wastewater pipe WWS65, SWS46	Number per 100km
Sum of all estimated total Dry Weather Sewer Overflow volume discharged WWS68, SWS49	Cubic metres
Confidence Gradings	Wastewater Orgns

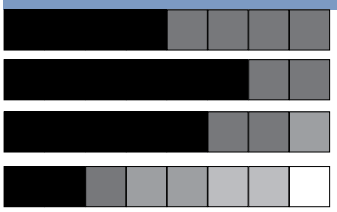


Organisation	Type of system	WWA1 WWA2 SWA21 Total pipe length (km)	WWS64 SWS45 Dry Weather O/F events	WWS65 SWS46 Dry Weather O/F events per 100km length	WWS68 SWS49 Dry Weather O/F Volume (m^3)
Auckland City	Combined	296	13	4.4	*
Metrowater	Separate	1,591	39	2.5	*
Manukau Water	Separate	1,835	19	1.0	*
North Shore City	Separate	1,326	33	2.5	330
Waitakere City	Separate	1,051	74	7.0	500
Rodney District	Separate	571	13	2.3	60
United Water	Separate	240	58[1]	24.2	290
Franklin District	Separate	253	55	21.8	*
Watercare Services	Separate	255	6	2.0	800
	Combined	52			
Total for Auckland		**7,475**	**310**		**1,980**

1 United Water includes overflows during wet weather which were not classed as failure due to insufficient capacity, as dry weather events.
* No data submitted for this measure.

WWE17, WWE14, WWE18, WWE16: Wastewater Pumpstation Overflow Events and Volumes

Definition	Measure
Number of wet weather overflow events from all wastewater pumpstations in the "Total Wastewater Serviced Area" WWE17	Number
Number of dry weather overflow events from all wastewater pumpstations in the "Total Wastewater Serviced Area" WWE14	Number
The total number of Pumpstations where an overflow is known to have occurred WWE18	Number
Total estimated volume of wet and dry weather overflow events from all wastewater Pumpstations in the "Total Wastewater Serviced Area" WWE16	Cubic metres
Confidence Gradings	Wastewater Orgns



Organisation	Type of system	WWA4 WWA5 SWA26 Engineered O/F sites	WWA8 Wastewater Pumpstations	WWE17 Wet weather Pumpstations O/F Events	WWE14 Dry weather Pumpstation O/F Events	WWE18 Number of Pumpstations to O/F	WWE16 Pumpstations O/F Volume (m^3)
Auckland City	Combined	131	0				
Metrowater	Separate	166	83	4	0	3	54
Manukau Water	Separate	17	76	3	0	3	*
North Shore City	Separate	21	89	74	7	23	145,000
Waitakere City	Separate	7	50	0	0	0	0
Rodney District	Separate	4	88	38	0	16	190
United Water	Separate	27	27	0	2	2	10
Franklin District	Separate	2	44	0	3	3	105
Watercare Services	Separate	61	52	60	14	22	86,800
	Combined	40					
Total for Auckland		**476**	**509**	**179**	**26**	**72 (14%)**	**232,159**

* No data available as not all catchments are currently modelled.

CE3: Regional Council Infringement Notices

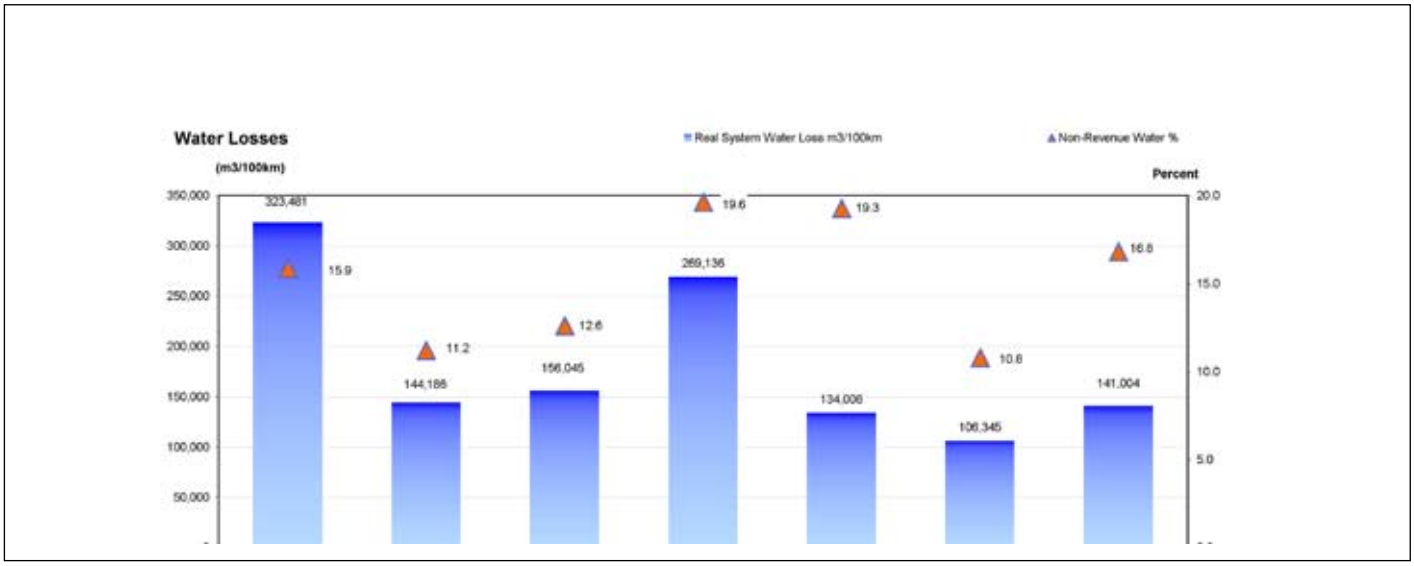
Definition	Measure
Number of Regional Council Environmental Infringement Notices or Abatement Notices received	Number
Confidence Gradings	All Orgns

Under Part XII of the Resource Management Act, Auckland Regional Council or Environment Waikato can issue infringement notices, including enforcement orders and abatement notices, upon any person or organisation that contravenes environmental standards or provisions of the Act.

All 11 organisations reported on this measure. All reported zero infringement notices received during the reporting year.

WSE10, WSE13, WSE15: Non-Revenue Water & Real System Water Loss by Length

Definition	Measure
Volume of bulk water received from WSL and/or own sources minus the billed volume of water supplied to serviced properties (including the volume of water billed via issued water permits) in the "Total Water Serviced Area" WSE10	Cubic metres
"Non-Revenue Water" as a percentage of "Total Bulk Water Supplied" by the wholesaler WSE13	Percent
Estimated real system water losses per 100km of "Total Watermain Length" WSE15	m^3 per 100km
Confidence Gradings	Water Orgns except WSL
WSE10	
WSE13	
WSE15	



Non-Revenue Water is a measure of the volume of water in the water distribution network that is not billed for. The table shows the volume for each organisation but it can also be expressed as a percentage of the Total Bulk Water Supplied (WSB5), as shown in the graph. Among the retail water operators, United Water had the highest proportion of non-revenue water (20%) with Manukau Water and Waitakere City having the lowest proportion (11%).

A related measure Real System Water Loss per 100 km of watermain refers to the volume of treated drinking water that is actually "lost" from the organisation's reticulation system before delivery to customers. Losses can be 'real' i.e. water that escapes from the pipe system through leaks and bursts, or 'apparent' i.e. errors in meter readings, or unauthorised use. Real losses are indicative of the pipe system and associated assets condition. These may result in unnecessary operating costs and are an important environmental and social issue, particularly in periods of drought.

In practice, Real System Water Loss is very difficult to measure. The best assessment for this measure is to deduct a realistic assessment of "apparent losses" such as meter under-registration (generally accepted to be around 1 to 2%), unauthorised consumption, and authorised but unbilled consumption covering water used for maintenance activities such as flushing and use by the Fire Services. A figure of 2.6% of water supplied less than Non-Revenue Water is the generally accepted figure (as per WSAA benchmarking) covering all these categories.

The total volume of treated potable water that is lost from the seven Auckland retail water supply organisations' systems to the environment each year is around 16 million cubic metres, representing 11% of the water volume processed by these organisations annually. The overall loss rate for the seven organisations is 192,750 m3 per 100km length of watermain. For Watercare Services any losses were within the +/-2% accuracy of the bulk meters and so are not reported on.

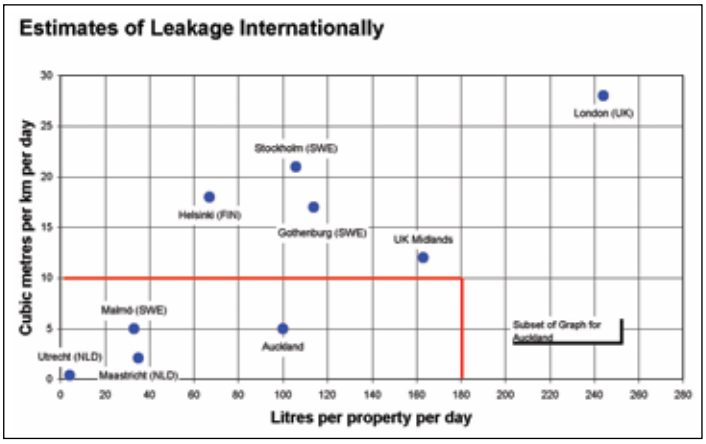
Non Revenue Water and Real System Water Loss

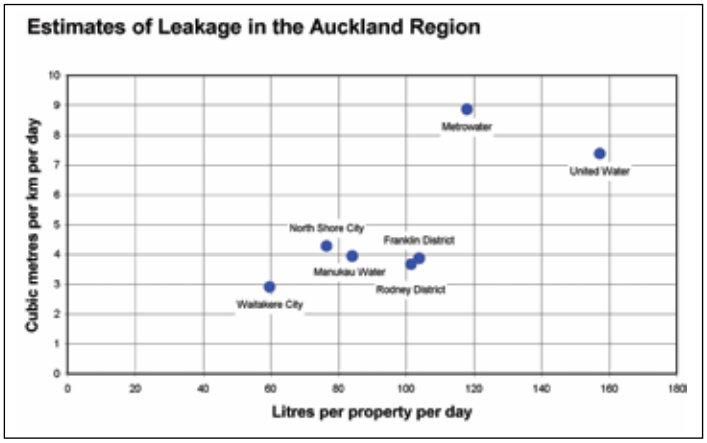
Organisation	Length of Watermain (km)	WSB5 Total Bulk Water Supplied (m^3)	WSB6 Bulk Water Received from WSL (%)	WSE10 Non-Revenue Water (m^3)	WSE14 Real System Water Loss (m^3)
Metrowater	2,221	54,184,877	100	8,593,321	7,184,514
Manukau Water	2,169	36,362,779	100	4,072,820	3,127,388
North Shore City	1,328	20,722,841	100	2,611,078	2,072,284
Waitakere City	1,315	17,054,177	100	1,841,851	1,398,442
Rodney District	496	3,989,794	67	768,416	664,681
United Water	322	5,087,424	100	998,890	866,617
Franklin District	350	3,472,128	0	583,788	493,513
Total	**8,201**	**140,874,020**		**19,470,164**	**15,807,439**

Levels of leakage can be shown different ways, another method involves calculating:

- The quantities that are lost over the total length of pipe in the system – the more pipes there are the harder it can be to find and fix leaks;
- The quantities lost over the number of properties supplied – the greater the number of connections to properties, the higher the leakage is likely to be as experience shows that losses occur at joints. Therefore the higher the number of joints the higher the leakage can be expected to be.

Using these measures to compare with others around the world indicates that Auckland has a better leakage record than many cities.





SWE16, SWE31: Impervious Area as Percentage

Imperviousness is a significant environmental issue caused by urban development.

As previously green areas – natural forests and grasslands – are converted to hard, impervious surface types, such as roofs and roads, a two-fold degradation of the natural environment occurs. Stream baseflows are reduced as the amount of water infiltrating the soil is reduced. At the same time, surface water runoff speed and volume increases, in turn increasing the erosive frequency and magnitude of peak stormwater flows. Added to this is the clearing of natural riparian vegetation that typifies today's intense urban development.

The increasing imperviousness of Auckland's environment is resulting in degradation of natural freshwater and marine habitats by the erosion and deposition of sediment and progressive removal of important riparian habitats. Auckland's clay-based sediments bind well with toxic substances including vehicle-related heavy metals, which further degrade the natural environment. As the ground becomes less pervious, ground and water temperatures continue to increase, further harming water-based ecologies and affecting local climate patterns.

Prior to development (in the mid 1800s) imperviousness in Auckland was less than 15% in terms of impermeable ground surfaces. However, as the graph shows, impervious surfaces today cover two or three times the pre-developed area.

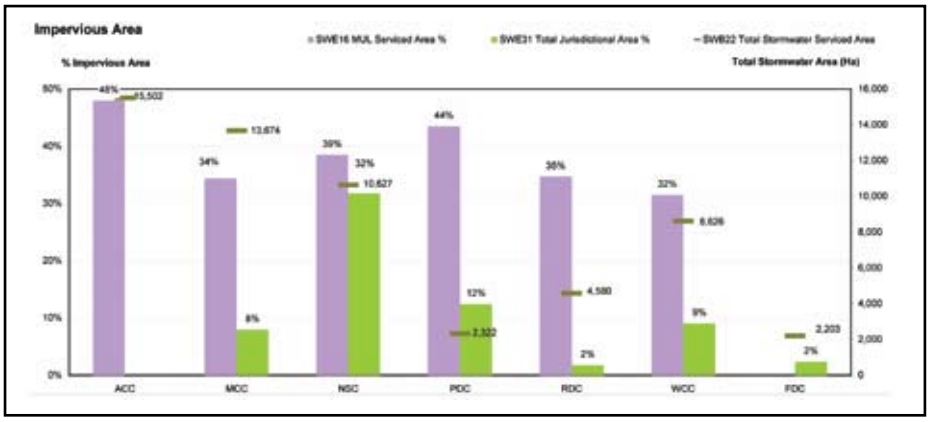
In terms of imperviousness related to the Stormwater Serviced Area within the MUL for each organisation, Auckland City and Papakura District have the highest impervious values at 48.0% and 43.5% respectively. Other values in decreasing order are North Shore City 38.5%, Rodney District 34.7%, Manukau City 34.4% and Waitakere City 31.5%.

Rodney District has the lowest overall % impervious for its Total Jurisdictional Area (SWE31) at just 1.7 %, followed by Franklin District with 2.3%. North Shore City reported the highest overall figure of 31.8% followed by Papakura District 12.4%, Waitakere City 9.1% and Manukau City 8%.

Definition	Measure
Percentage of "Stormwater Serviced Area within the MUL" SWE16 and "Total Jurisdictional Area" SWE31 that is impervious	Percent
Confidence Gradings	Councils only

SWE16

SWE31



Auckland City did not report on SWE31. Franklin District did not report on SWE16 as it lies outside the MUL.