Estimating Water Loss for the Wellington Metropolitan Region

Wellington Water is committed to improving the way we provide water loss data and information to our council owners and the public.

Providing accurate water loss estimates for the Wellington metropolitan region is challenging as residential water use is not metered except for a very small sample of manual-read meters that is too small to be considered representative. To date our estimates of residential water use have relied on this very small sample to estimate an average household usage with a large range of uncertainty.

To provide more accurate and near real-time information for water loss estimates, 16 Small Area Monitors across Metropolitan Wellington were installed during the 2020/2021 financial year to begin monitoring residential night and day water usage.

Since then, we have been collating and analysing the information from the Small Area Monitors, reviewing the methodology used for estimating water loss, and looking at ways we can increase the level of confidence in water loss estimates.

Improved methodology

We now have a good sample of data from the Small Area Monitors, and this, along with our further analysis, shows that the approach we have been using previously underestimated water loss from the network.

Using the information now available from the small area monitors, we are able to estimate water loss with more certainty, and we are applying the improved methodology to this year's water loss figures and for future years. This means that in some cases, some of our councils will see what may seem like a significant increase in reported water loss on their public network compared with previous years, but this is mainly due to the change in methodology rather than an actual significant increase in water loss.

It's important to note that this change only impacts the estimates we provide to Hutt City Council, Wellington City Council, Upper Hutt City Council, Porirua City Council, and the regional water loss estimates we provide.

South Wairarapa District Council are not impacted as they already have residential meters installed on their network and our estimates for their district is based on their annual meter readings.

Similarly, we have not changed the methodology we've used for Greater Wellington Regional Council to measure their bulk drinking water usage in the network as this is also metered.

Why we've changed the methodology

Wellington Water is committed to providing water loss estimates to our client councils and the public that are as accurate as possible with the technology and information available to us. Therefore, we are always looking for ways we can improve our approach and our quality of information.

The changes and improvements we have made in methodology used to calculate estimated water loss means we now have significantly increased (effectively doubled) the confidence in the estimates we provide our councils.

The application of this methodology has been independently reviewed and is aligned with international best practice for measuring water losses in networks without universal metering.

However, it is important to note that these figures are still estimates and more accurate assessment is not possible without implementing universal metering across the region.

Updated estimates for water loss for the Wellington metropolitan region

The following table shows the estimated figures we have provided to councils previously for the 21/22 FY using the old methodology, and the updated estimates for the 22/23 FY when the new methodology is applied.

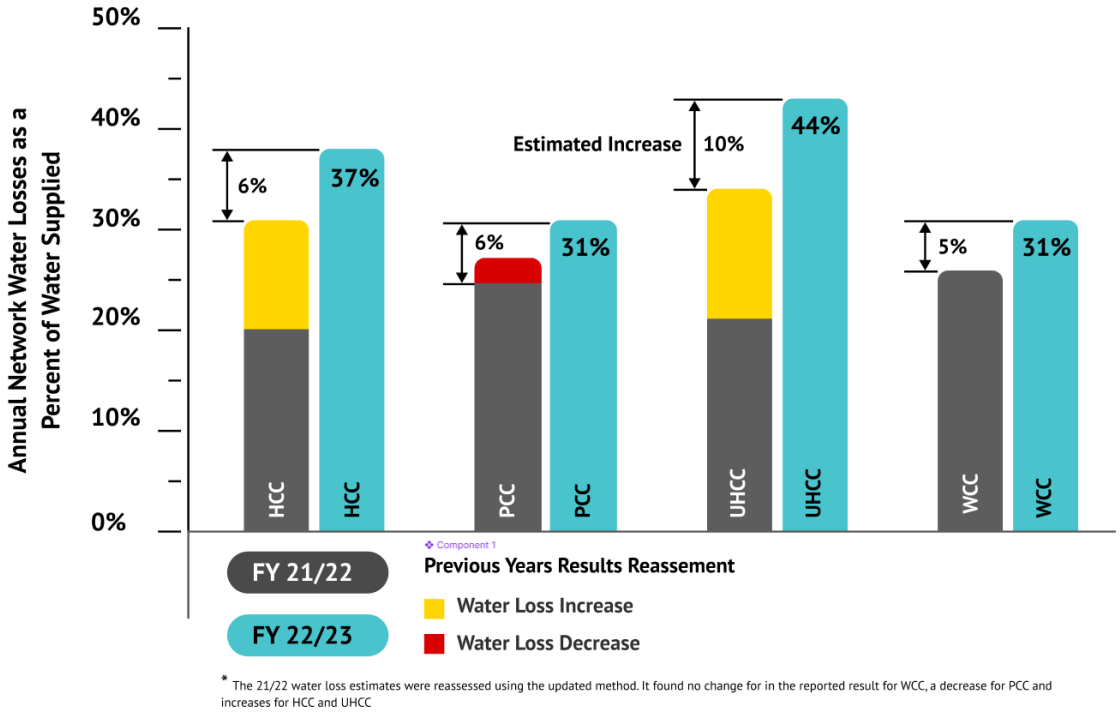
Council	Estimated public network water loss % FY2022/23 (improved methodology)	Estimated water loss % for both the public network and private properties FY2022/23 (improved methodology)
HCC	37%	46%
WCC	31%	41%
UHCC	44%	52%
PCC	31%	41%
Metropolitan Wellington (combined)	34%	44%
SWDC	46%*	N/A*

*The methodology we've used to estimate water loss in metropolitan Wellington is not applicable for SWDC which has universal metering in place (meters read once annually only). The methodology used for metropolitan Wellington to estimate water loss is aligned with international best practice for measuring water losses in networks that don't have universal metering.

As noted above, this means that for some councils there will be what seems like a significant increase in reported water loss in the public network compared with previous years, but this is mainly due to the change in methodology rather than an actual significant increase in water loss. An estimate of the increase in water loss compared to the previous year is provided below.

Applying the new methodology to previous year's estimates

To show the actual estimated increase in water loss from the previous year we have applied the improved methodology retrospectively to the FY2021/22 data, and this is shown in the graph below. The difference in estimates on the previous year's reported figures when the new methodology is applied is shown in yellow (for those councils who saw an increase) and red (for councils who saw a slight decrease).



* The 21/22 water loss estimates were reassessed using the updated method. It found no change for in the reported result for WCC, a decrease for PCC and increases for HCC and UHCC

* Due to the way data was analysed for the FY 21/22 reporting period, PCC has seen a slight decrease in reported figures for FY21/22 when the improved methodology has been applied.

Frequently Asked Questions

Is the new methodology credible?

Yes. Wellington Water's approach has been independently reviewed and audited. It is in line with international best practices for measuring water losses in networks without universal metering, which is what we have in the Wellington metropolitan region.

Our approach is also based on UK reporting guidance where this approach has been used for over 20 years.

How does the improved methodology work?

The improved method measures the water usage in an area when usage is at its lowest – typically overnight, between the hours of 1 am and 4 am.

The minimum hourly average measured over this period is referred to as the minimum night flow. A portion of this flow includes legitimate use from residential properties and non-residential properties and leakage. The non-water loss components are then subtracted off from the minimum night flow to gauge the level of water loss in each council area.

The Small Area Monitors now provide us with more representative samples of water usage at night for residential areas.

Why haven't we done this earlier?

At least a year's worth of data from the small area monitors is needed to allow us to calculate water loss estimates with any real confidence. We now have a good sample of data and therefore we were able to make the necessary improvements to our methodology.

What is a Small Area Monitor?

A Small Area Monitor tracks water usage via a high frequency flow meter in a small area, typically covering between 25 and 200 residential properties. 16 Small Area Monitors were installed in specific locations in the public network. This has allowed for an accurate assessment of residential usage.

Why has water loss increased so much?

We now have a good sample of data from the small area monitors, and this, along with our further analysis, shows that the approach we have been using previously underestimated water loss from the network.

Now that we have applied the new methodology to this year's estimates some of our councils will see what may seem like a significant increase in reported water loss on their public network compared with previous years, but this is mainly due to the change in methodology rather than an actual large jump in water loss figures.

However, this doesn't mean that there hasn't been any increase in water loss. There has been a genuine increase in water loss across most of our councils compared to last year and the level of increase varies from council to council.

Water loss increases are primarily due to aging infrastructure as a result of historical underinvestment. The two key factors are:

- An increasing number of leaks occurring due to the region's aging network and increasing backlog of work to renew / replace assets in the network.
- An increased backlog of open leaks, as shown in the graph below.

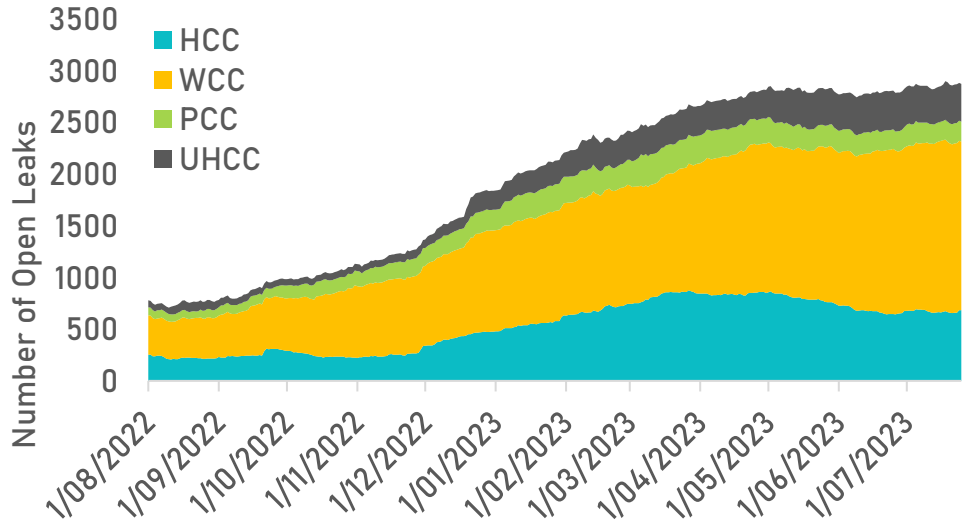


Figure 1: The open leaks backlog tracking for the past 12 months in the metropolitan councils.

What is the confidence level in the new estimates?

It is important to note that the water loss figures we provide councils are still estimates and more accurate information is not possible without implementing universal metering across the region.

As with all estimates there is an associated level of uncertainty. Our goal is to provide information with as little uncertainty as possible. Our improved methodology roughly halves the uncertainty for the metropolitan city council networks but there is still a range of uncertainty that we need to consider with this year's estimates. What we can say is that we have a high level of confidence that the actual leakage that occurred in the past year across all city councils is in the upper range of what was previously estimated for water loss.

Would a more accurate estimate be achievable if we installed more Small Area Monitors and had a larger sample set?

This comes down to a cost benefit trade off. The additional benefit from more Small Area Monitors is not considered to be significant enough to warrant a wider roll out. A significant further improvement would only be achieved through implementing full universal metering across the networks.