Kapiti Coast strategic asset forecast

Confident planning in a changing world

When change is a constant, what are the key steps needed to build a reliable plan for the future? MWH water network specialist **Ben Davies** outlines the Kapiti Coast experience.

Kapiti Coast District Council (KCDC) needed a plan for long-term water network investment, but rapid development and the introduction of universal metering meant its existing model and data were quickly going out of date.

How can you plan for the future when all you know about the present is that things are changing? This article outlines the key steps taken to build a reliable plan for the future in the shifting sands of the present.

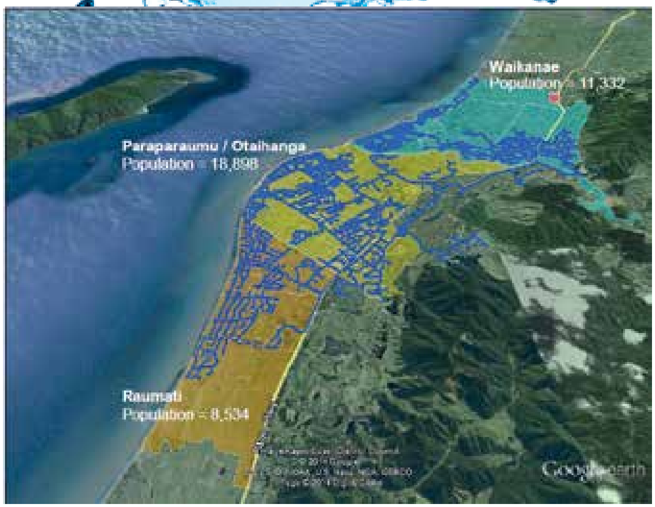
The Kapiti Coast water supply network model was old. Built in the early 2000s, it was updated and verified against field data by MWH in 2009/10. It was used to great effect over the following years to identify and eliminate network restrictions, assess the supply to new developments and design District Metered Areas (leakage monitoring zones). But time never stands still.

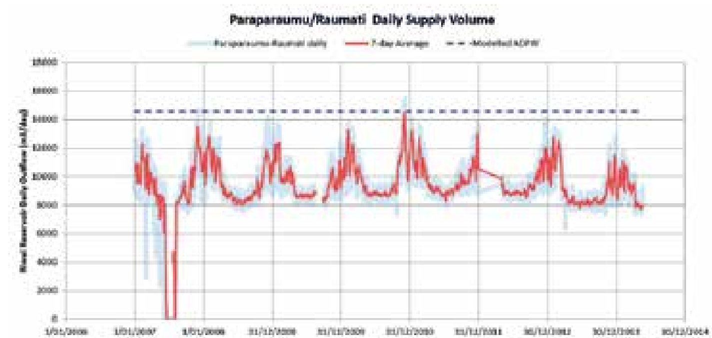
The MacKays to Peka Peka Expressway and Transmission Gully are looming, along with the associated increase in Wellington commuters, and development pressure is increasing. KCDC needed to look urgently at its capital investment requirements for the future, but they had to be sure the model was giving them the right answers. In 2015, MWH was once again engaged to review the existing model, and to see what was needed to bring the model to the point where reliable plans for the future could be made.

PHASE 1: DATA AND MODEL REVIEW

The first task was to assess the general location and density of network upgrades since 2010. The most up-to-date network information was captured in an InfoNet database, but this held no common GIS reference with the old model. Recent network changes were therefore identified and this showed that there had been a lot of small extensions spread relatively evenly across the network, which was consistent with the ongoing housing intensification.

In terms of hydraulics, this meant that although there were now more customers, the patterns of flow across the network should not be affected too much.



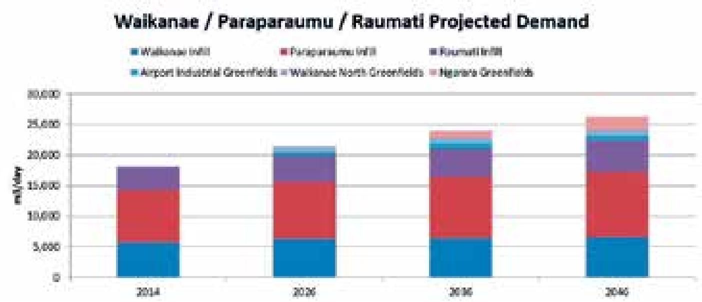


Telemetry flows and pressures appeared to support that changes were spread evenly across the system. At all flow monitoring points, the overall volume of water consumed appeared to have reduced since 2010. This was the case even before the universal metering had been implemented, and despite increasing population.

Additionally, since 2010 there had been a significant drop in evening use as opposed to morning use, right across the network. Evening use commonly relates to discretionary use (eg, watering the garden), as opposed to the more essential uses (eg, showers) in the mornings.

It was theorised that these changes could be due to increased awareness of water conservation as the communications around the introduction of water metering intensified. Regardless of the cause, MWH came to two conclusions:

- The per-property demand in the model was overestimated compared to current demand.
- It was likely that further changes in demand could occur as the effects of the recently implemented universal metering took hold.



PHASE 2: MASTER PLANNING WITH CONFIDENCE

With this knowledge, MWH looked at KCDC's requirements in terms of long-term asset planning: while the demand had reduced over the past few years, predicted population growth looked set to reverse that trend. To ensure the long-term plan contained provision for capital network development, KCDC needed to know where and when network development would occur. The Council had three options:

1. Use the existing model with its flaws;
2. Adjust the existing model to be more representative of existing demand; or
3. Carry out a full model update.

With time pressure to undertake the work, a full model update was not feasible. Universal metering had just been implemented – it would be a year before it produced enough customer meter data to make a reliable assessment of demand.

So why not adjust demands in the model to match current system flows as observed in telemetry? After some discussion, it was considered that adjusting the demand before the full effects of universal metering were known would give the impression of accuracy, but that there was no reason to think this would be a more accurate reflection of future demand than what the existing model provided.

It was concluded that although the existing model was known to require improvement, it could be used so long as its limitations were understood and acknowledged. After all, no model is perfect, all models are based on assumptions, and are simplified representations of the real world. In this case, the review had shown that the existing model reflected the distribution of demand reasonably well, if not the quantity.

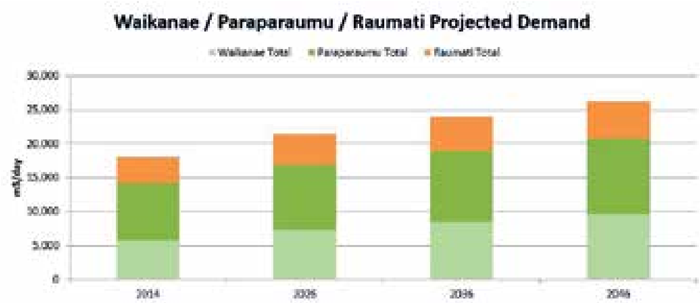
It was agreed that in the short term, a high-level "Strategic Asset Forecast" should be developed. This would identify likely network upgrades required over the next 30 years, but would clearly indicate that the timing and detail of these upgrades would be dependent on the outcomes of universal metering and would be reviewed once the model had been fully updated.

From this point onward, the methodology was more similar to a standard master-planning project: based on Statistics New Zealand projections, the demands of greenfields developments were calculated and added to the model, and the demand relating to the remaining increase in population was spread evenly across the existing network as infill.

Locations where pressures were below levels of service were identified, and upgrades to address these deficiencies were proposed.

When preparing the final outputs, care was taken to ensure the preliminary nature of the study was clear to all. In upgrade plans, greenfields developments were represented only as potato-like shapes on the map. The required upgrades were shown as broad arrows representing water transfer from one part of the network to another rather than detailed pipe alignments. These representations leave the viewer in no doubt that further refinement is required.

The outputs were graphically elegant and simple to understand, conveying the appropriate degree of accuracy of the study. This process clearly identified the key points where the network would come under stress in the coming years, and provided high-level sums to be included in the long-term upgrades plan to address the issues.



PHASE 3: FULL MODEL UPDATE / CALIBRATION / WATER NETWORK DEVELOPMENT PLAN

With the long-term plan in place, attention returned to the model update. In mid-2016, a full year of demand data was available from the fleet of approximately 23,500 customer meters in Otaki, Waikanae, Paraparaumu, Raumati and Paekakariki. This data had been previously identified as the main requirement to construct a new model, representative of current use.

The update then began in earnest. Customer billing data was used together with data from bulk-flow meters to develop new demand sets reflecting average annual demand and peak summer demand. The network was rebuilt from asset data taken from InfoNet. Pump and reservoir controls were rebuilt based on operational manuals, knowledge and construction records.

Future demand scenarios were once again built from Statistics New Zealand area unit information and Council knowledge of upcoming greenfields developments.

The model is now ready for calibration, which is to be undertaken in the summer of 2016/17. Once calibrated, the model will be used to carry out a full Water Network Development Plan (WNDP). This will seek to reproduce the findings of the Strategic Asset Forecast, and more accurately predict the timing and detail of the required upgrades.

The interim Strategic Asset Forecast, with its bold simplicity and clarity of purpose, will no longer be required, but it will stand as an example of what can be achieved with imperfect tools – so long as the limits of the tools are known. WNZ