IMPLEMENTING RUBBISH AND RECYCLING COLLECTION
ROUTE CHANGES TO CREATE RESOURCE OPTIMISATION

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ABSTRACT

From 25 November 2013, the Palmerston North City Council implemented major changes to its rubbish and recycling collection routes affecting approximately 75% of the 28,000 properties from which rubbish and recycling is collected on a weekly basis.

The previous routes had been designed for rubbish collection only as recycling collections had only been introduced on a large scale in July 2010. Moreover, the City had grown in an asymmetric fashion, and a boundary change occurred on 1 July 2012 whereby a part of Manawatu District Council had been incorporated into the City. These changes had resulted in sub-optimal routes with collections ranging between 5,000 properties on some days and 8,000 properties on other days. The uneven nature of the collections resulted in inefficient use of collection vehicles adding unnecessary costs to the collection activity. In addition, methods utilised by the Council for collecting rubbish and, more particularly recycling had changed significantly so the new routes required careful design to match the new collection methods.

Introduction of the route changes immediately followed a period where a number of other minor changes to the rubbish and recycling activity had occurred that had affected certain users in different ways, resulting in considerable uncertainty in the community about rubbish and recycling collections.

Successful change, affecting a large number of residents requires significant pre-planning and communication effort.
This paper describes the processes used to design the new routes, communication of the change with users of the service, discusses many of the transitional issues that occurred during the change in routes and finally reviews the efficiency gains made as result of the change.

**KEYWORDS**

Collection Routes, Route Changes, Resource Optimisation, Resource Efficiency

1 **INTRODUCTION**

Palmerston North City Council has been collecting rubbish and recycling from the kerbside for quite some time. Rubbish collections have occurred for decades now, while kerbside recycling collections were introduced in 1999. Over the intervening years aspects of the service have changed to meet the evolving needs and expectations of the community.

For rubbish collection, there was originally a rates funded annual delivery of 52 paper bags. This then transitioned to a rates funded coupon system which entitled ratepayers to 52 bags, dropping to 26 bags, and then finally to the present full user pays system – whereby users purchase council approved rubbish bags for collection.

Rates funded recycling collections began in 1999, with residents placing their recyclables out for collection in supermarket bags on the same day as their rubbish collection; these were sorted into plastics (1’s and 2’s only), paper and cardboard, tins and cans; and glass.

In July 2010 Council introduced a 240L wheelie bin for comingled recyclables (plastic containers 1 to 7, paper and cardboard, tins and cans) and a 45L crate for glass recycling. Recycling is still rates funded and is collected weekly on the same day as the rubbish collection, alternating between the wheelie bin one week and glass crate the next.
Coinciding with the introduction of the wheelie bins and glass crates, the vehicles collecting the 240L wheelie bins were updated to automated side lift for the wheelie bins to allow single driver operation.

Subsequent to the introduction of the wheelie bins and glass crates, the glass recycling and rubbish fleet were updated to Low Entry Vehicles which allowed operation by one driver/operator. Glass collections now employ specialist glass recycling trucks and rubbish collection vehicles are side loading.

The entire fleet has been fitted with GPS to allow real time tracking, reversing cameras for safety, and cameras to assist and monitor the recycling wheelie bins during collection.

These changes resulted in real efficiencies and related cost savings in delivering the rubbish and recycling collection services. However, the one thing which remained unchanged for many years was the days on which collections took place for City residents.

2 INCREASING EFFICIENCIES

The need to become more efficient when undertaking collections had been evident for some time. Collection areas were historical, and collections were added on an ad hoc basis to accommodate the City as it grew. This resulted in uneven collection days with no allowance for further urban growth. Some collection days were not contiguous – all culminating in increasing efficiencies that were exacerbated as the City grew.

With a fresh set of eyes on the problem these inefficiencies soon became evident. Even installing GPS units in the collection vehicles did not really allow staff to ascertain the extent of the issues, let alone fix the issue by ‘tweaking’ the collection routes.

Due to the irregular run sizes, Council had a constant flow of casual labour to ensure collections occurred, these staff required management and training. This made it very difficult to maintain any form of consistency of staffing, which in turn meant that it was
difficult to enforce standards of collection. Additionally there were varying numbers of trucks on the road and the work hours required on any given day varied – all resulting in increased administration time to manage the casual labour.

Having the GPS units in the trucks allowed some detailed analysis of what was happening and it was realised that inexperienced drivers were taking inefficient routes to complete their run. Additionally it was noted that the collections team were missing sections of streets or cul-de-sacs, or covering ground for a second time. Often this was related to complaints about missed bags, bins or crates, and again increased staff administration time dealing with the resultant queries.

3 PLANNING

The initial intention was to undertake a few minor adjustments to the existing collection routes, effectively shuffling the collections, thus affecting as few residents as possible. However it soon became apparent that this was going to give a less than optimal result. Analysis by Councils GIS team showed that more benefits could be gained by taking a ‘starting from scratch’ approach – a somewhat daunting prospect!

Staff from across Council worked for months preparing for the largest change to the rubbish and recycling collection routes in over 20 years, producing a number of technical difficulties. Firstly, planning the physical layout of the new collection areas using map based property, size and travel distance equalisation. Secondly, taking into account access points into various areas and subdivisions, as well as balancing both urban and rural collections across the days.

Data from Councils GIS team was used to determine the length of streets and number of serviced property’s to compare the run size of each area. Using simple maths to multiply the number of properties by the stop time at each one and adding the street/road length by the average speed, we were able to estimate the collection time for each area. Although not necessarily an exact science, it did provide a basis for comparison. Analysis of SmarTrak
(GPS software) data was used to estimate the values; (13 seconds for stops, 17 km/hr for urban travel and 40 km/hr for rural travel).

Once this first draft was determined we sought feedback from the collections team; taking their feedback into consideration this process was iteratively refined. It was important to include the collections team in the process to ensure we had their support, in fact they were extremely supportive and invaluable insight into the collections was gained from their input into the process. An additional benefit was a sense of pride and ownership of the routes by the collections team. Input shared from the collections team included knowledge around traffic densities and optimal time for collection, information on school zones, and locations that could or could not support U-turns – a situation this process was trying to minimise.

Monday collections were made 10 – 15% smaller, allowing for team meetings, training, vehicle maintenance, etc. Future growth was accommodated by reducing other days by 5%; hopefully future proofing Councils new optimised collection routes for quite some time.

Lastly the runs were split into two giving the full collection area for Councils rubbish fleet. The runs were further split into week 1 and week 2 for Councils recycling collections – as these are collected on alternate weeks.

When each run was confirmed, with a balanced number of properties and travel distance, the GIS Team developed an algorithm to optimise collection times, reduce fuel consumption and maximise the number of left hand turns where possible to enhance safety. Maps were prepared and trialled to ensure that the algorithm had organised the runs in a logical sequence.

4 MODELLING

GIS modelling techniques were used to equalize daily collections, plan ideal routes and document zones for drivers. Optimising high density collection routes presents a number of
challenges to current technology as the algorithm used must process each delivery point and select the sequence based on a numeric score.

The problem of optimal rubbish and recycling collections is an interesting one, originally known as the Seven Bridges of Königsberg, a historically notable problem in mathematic. In this problem there are a number of potential solutions but no complete or easy answer. In the context of rubbish and recycling collections this simply means a truck has to turn down every street without major backtracking.

This project utilised ESRI’s Network Analyst extension and a time based transport network to solve the problem using a cost value. The idea was to manage the routing based on a variety of factors such as avoiding schools at set times by applying a cost/time penalty to transit routes.

5 COMMUNICATION

After the new routes were determined, the next step was communicating this change to the residents affected. In all, approximately 75% (23,000 properties) of the City was affected by the new optimised routes, through either a:

- Change of collection day for their rubbish and recycling
- Change of collection week for their recycling
- Change of collection day for their rubbish and recycling and change of collection week for their recycling
The issue faced was; how do we do this effectively making sure that the message is received. There are so many ways of communicating these days; ranging from traditional letter drops, public notices, media advertising, councils website and social media. Each has their own merits and target demographics. On balance, it was decided that a multi-media approach was required to ensure that the changes reached the maximum number of residents.

As this change was fairly significant it was decided that the primary communication methodology would be a traditional letter to the actual occupier of each household – rather than being sent to the ratepayer (who may not live at the house). A letter addressed to each household detailed how the changes affected their particular household. Included within the letters were new stickers for the property’s recycling wheelie bin and glass crates, as well as recycling calendars. The individual letters were supplemented with media releases, radio advertising and social media updates.

Delivery of the letters was staggered over a period of two weeks. The first group of letters went out about three weeks before the changeover date.

Additionally, a ‘recycling hotline’ was published to allow residents to call the Council over any queries relating to the changes. Temporary staff were employed in Council’s call centre to answer the expected increase in calls related to this project.

6 IMPLEMENTATION

On implementation day, printed and colour coded maps were prepared for each run. Although the first day was successful, there were a few glitches and issues; bearing in mind the collections team had 10 ‘First Days’ as each area was covered for the first time. Some of the team are excellent map readers, and coped very well. Others however got a little confused and tended to fall back to the old way of doing things.
Close monitoring on SmarTrak enabled the team to be redirected or alerted as required. It was a big effort and huge change for the collections team; however this effort was rewarded with consistent completion times throughout all the runs.

The collections team picked up some necessary changes to the routing that was based on their experience and not always obvious from the maps; routes were further refined based on this input.

7 OUTCOMES

Generally the changeover went smoothly. Understandably with a project that affected a large percentage Councils City residents there were some glitches.

Most of the queries received to Councils call centre were residents confirming how the changes affected them, or asking why they had not received a letter. Generally this was because they were not affected by the change, or that the letters for their particular area were still to arrive.

A vast majority of residents got it right and placed out their rubbish and recycling for collection on the new days...although as indicated above there were few a fun glitches:

- Due to an oversight, 318 properties at the Linton Army Camp were not sent letters informing them that their collection day was changing from Friday to Thursday. This was spotted by the collections team when they arrived on Thursday to find no rubbish bags or glass crates out for collection. An additional collection was arranged for Friday and Council staff immediately contacted the Camp Housing Liaison Officer to rectify the problem.
- Some of the letters addressed to the ‘Householder’ were returned as ‘not known at this address’
- One morning the recycling collections team uplifted the wrong maps, therefore found the wrong recycling placed out for collection. This was quickly rectified.
• The collections team found groups of properties where they had presumably followed their neighbours, who had got it wrong and everyone else had followed suit.

Through a combination of planning, analysis and effective communication Council implemented significant changes to its rubbish and recycling collection routes which are delivering fuel savings, time efficiencies and enhanced safety; at the same time we have allowed for future growth of City.

8 NEXT STEPS

The next project that it is the initial planning phase is to introduce RFID technology to Councils Recycling Wheelie Bin Service. This project is currently scheduled in Councils LTP to roll out in 2017/2018.

It is anticipated that the use of RFID technology will result in:

• Reduced expenditure on replacement of lost/stolen recycling bins
• Reduced expenditure on contamination monitoring in recycling bins by electronically recording the bin number when contamination is noted by the collections team
• Increased data collection – allowing Council to record in real time bin presentation (set out) and participation rates
• Reduced administration time related to ‘missed’ collections and quicker response times to these queries
• Identifying recycling bins in service that are receiving a collection service but not currently being rated to receive that service.