CARLISE WATER
CONSERVATION PROGRAM
2004

Submitted to:
The City of Hamilton Water Distribution Division
Hamilton Ontario

Submitted by:
NEPTUNE

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EXECUTIVE SUMMARY

In 2003, the City of Hamilton contracted Neptune Technology Group to undertake a Peak Demand Study in Carlisle, ON. The competed study indicated that a relatively small percentage of the population was using a disproportionate amount of water.

Neptune then proposed an incentive program targeted to the highest water users. A number of incentives – including rain sensors and a soil topdressing – were to be offered to the highest water users in an attempt to motivate them to reduce consumption. A new meter reading technology was to be used to monitor results.

The Challenges
The program eventually offered to Carlisle residents in spring/summer 2004 was a generalized public education program, and the incentives were available to all residents. The highest water users were not specifically targeted. In addition, there were challenges in attracting customers to the program due, in part, to changes in a proposed direct mail campaign.

Initially, Neptune had hoped to send letters to the highest water users, showing their water consumption compared to the Carlisle average. The idea was that the information would convince some of the higher water users to participate in the proposed program. Neptune was unable to send these letters and as a result, the customers who eventually signed up to receive the incentives were already efficient water users.

The generalized public education program did not appear to be effective in reaching the highest water users. Although the program did generate considerable awareness about the need to conserve water in Carlisle, it did not motivate the high water users to take any action. They did not apply to participate in the program.

The Results
Nevertheless, 2004 water consumption data clearly demonstrates that top dressing a lawn with organic material (as opposed to high nitrogen fertilizer) is an effective way to help soil retain moisture, resulting in less frequent watering. Those participants who top dressed consumed 216% less water than the high water user group, none of whom top dressed.

The new meter reading technology demonstrated that detailed water consumption data can assist in developing a water conservation program. The technology test showed how the new meters can identify high water users, and customers who may have leaks.

The conclusion is that a generalized education approach is not an effective way to motivate the highest water users to reduce their consumption. It is recommended that a more focused program targeted specifically to the highest water users be developed for 2005.
1.0 INTRODUCTION

This report contains information about the Carlisle Peak Demand study carried out in 2004 by Neptune Technology Group on behalf of the City of Hamilton.

The initial goals of the Peak Demand study were:

1) To develop a general water conservation program for all Carlisle Residents;
2) To develop an incentive program targeted to Carlisle's highest water users;
3) To analyze 2004 water consumption in Carlisle;
4) To compare 2004 water consumption data with 2002 and 2003 data; and
5) To identify the highest water user group for 2004 and make comparisons to high water users from 2002 and 2003.

To help monitor the results of these efforts, Neptune piloted the new Fixed Network Data Collection System called the EZNet Data Collector, the high resolution E-Coder Water Meters and the R900 Radio Frequency Transmitter.

This system consists of a digital water meter connected to a remote device mounted on the outside wall of the home. This device sends meter reads every 15 minutes to a centrally located monitoring system. Data from the monitoring system is sent through a cellular telephone connection to a computer.

Hamilton currently reads water meters on a bi-monthly basis. The meter reads document how much water was consumed over that two month period, but little else. The EZNet system allows for more current water consumption. It can document not only how much water was consumed on a given day, but what time of day the water was used.

In addition, the meter features leak detection and reverse flow detection technology. This allowed Neptune to contact customers within days if there was reverse flow or a leak. With a traditional meter reading system, it could take months to detect some of these issues, which is costly to the municipality and homeowners.

Thirty homes were initially targeted to receive the incentives. Due to changing circumstances, only 11 residents actually applied for and received an incentive. An E-Coder meter and R900 transmitter was installed at each home.

When it became apparent that not enough customers had signed up for the incentives, the focus of the study shifted. An additional 15 homes received E-Coders and R900s, and the water consumption was monitored to track trends.
2.0 BACKGROUND

2.1 Carlisle, Ontario

Carlisle is located approximately 18 km northeast of downtown Hamilton with access off of Highway 6. The community is primarily residential and the communal well system has some 434 metered water connections servicing approximately 1,300 people (based on 2002 meter reading data).

2.2 The Water Distribution System

Carlisle is serviced by four wells and a water tower providing approximately 1,400 m³ of storage. In the summer of 2004 there were 504 connections to the Carlisle water distribution system (based on meter read data for 2004).

Wells FDC01 and FDC02 operate dependently while wells FDC03 and FDC04 operate independently. The wells are metered and water pumping is tracked through SCADA (Supervisory Control and Data Acquisition).

SCADA provides continuous monitoring of critical components of the Carlisle Communal Well System. Recent piping upgrades have reduced the impact of bottlenecks at the FDC03 pump house.

2.3 Water Distribution Challenges

In summer months the water distribution system is stressed by the high volume of water being utilized for irrigation purposes. When water consumption is extremely high on any given day, coupled with the use of automated sprinkler systems programmed for night time operation, the storage does not have an opportunity to recover to meet the demands for the next day. As a result, residents face water shortages, poor water pressure, and watering bans.

2.4 Specific Problem Areas within Carlisle

Water meter data indicates that the Palomino Estates area has the highest water users in Carlisle. The subdivision is characterized by large property sizes (relative to the average property size in Hamilton), relatively new houses with extensive sod coverage and automatic irrigation systems.

In April 2003, The City of Hamilton's Water Distribution Division contracted Neptune Technology Group to undertake a Peak Demand Study in Carlisle, Ontario. The purpose of the study was to analyze residential water consumption during summer months, identify trends that contribute to peak demand, and make recommendations on how to implement a public education program to address the trends.

The final report concluded that a relatively small percentage of Carlisle residents use a disproportionate amount the total water consumed. 2002 water consumption data revealed that 76 of the 434 homes connected to the communal well system based on 2002 water meter read data used 44% of the water.

![Water Consumption: June and July 2002](image)

This trend suggested that a concentrated effort on helping those 76 homes reduce their water consumption could have more impact than a general water conservation effort targeted to all Carlisle residents.

Surveys and interviews with Carlisle residents along with visual observations by Neptune staff indicated the following contributors to peak demand:

- Lack of public education
- Large landscaped lots
- High number of automatic irrigation systems being used inefficiently
- Excessive watering when it was not necessary
- Extensive use of high nitrogen fertilizers, which require excessive watering

Based on these findings, Neptune made a series of recommendations that were designed into a customized program proposal for the City of Hamilton in the 2003 Peak Demand Report entitled “A Program For You.” This proposal was based on Neptune’s experience in Kelowna, BC in developing effective education/incentive programs to reduce peak demand. Following is the proposed program:

1) A newsletter to all residents of Carlisle explaining the education plan for 2004. This newsletter would include information on organic topsoil, indoor and outdoor water conservation, a section on how to “grow” a healthy lawn, a description of the Carlisle Communal Water Distribution System, how to participate in the Water Wise Carlisle program and information on Public Information Sessions.

2) A mail out to the 76 high water users explaining goals of the Water Wise Carlisle program and why we feel it is necessary to work with them in reducing their consumption habits.

3) Incentive Program – we would initially pilot the program with 50 homes. This program would include detailed assessments of each property and automatic irrigation systems to determine if there was another cause of high water consumption unrelated to behavior.
4) One of three incentives would be offered with 10 incentive participants receiving a water audit, 10 receiving Top-dressing for their lawn, 10 receiving Mini-click Rain Sensors, 10 receiving all of the above and 10 non-incentive participants that would receive none of the above. All 50 homes would receive the E-Coder Water Meter and the R900 Transmitter at no cost to the homeowner.

5) Reward program for residents who conserve water based on their meter read data. The reward package would consist of a Water Wise lawn sign and Terra Gardens Gift Certificate. The reward package would be given out to households that observe watering bans and the odd/even watering policy and to those households who at the end of the summer have showed a significant decrease in water usage between 2003 and 2004.

6) More frequent meter reading of the 50 homes in order to more closely monitor water consumption.

In March 2004 the City of Hamilton's Water Distribution Division contracted Neptune Technology Group to implement "A Program For You."
3.0 OBJECTIVES AND SCOPE

The 2004 public education program differed slightly from the program that was recommended in 2003. The program was entitled “Water Wise Carlisle”. Similar to the 2003 proposal, Water Wise Carlisle took a two-pronged approach:

- The first prong was a general water conservation program targeted to all Carlisle residents.
- The second prong was a specific incentive program targeted to the 76 high water users.

To aid in measuring the results of the program, Neptune installed new e-coder water meters at 33 homes and an EZ-Gate unit on top of the pumping station located on Acredale Road. The E-Coder meters send readings in 15 minute intervals to the EZNet unit. This allowed Neptune to provide a daily analysis of water consumption for any home with an E-Coder installed.

Water meters are read bi-monthly in Carlisle. The reading indicates how much water was used every two months, but this reading schedule does not tell you which days the most water was used, or the time of day it was used. One application of the EZNet system is to track when water is used and use the data to track any trends.

3.1 General Water Conservation Program

The general water conservation program included the following elements:

a) A water conservation newsletter that was distributed to 800 Carlisle homes in April 2004.

b) A partnership with landscaping companies in order to ensure that Carlisle residents did not set their timers to oppose the watering time restrictions set by the City of Hamilton. In addition, the landscaping companies would aid in the installation of rain sensors on automatic irrigation systems.

c) A rewards program to celebrate those Carlisle residents that conserved water. The rewards package consisted of a gift certificate and a lawn sign.

d) Water observation that consisted of Neptune staff carried out 60 patrols through Carlisle neighborhoods looking for inefficient water use.

e) A public information session at the Carlisle Community Centre in Carlisle on May 15, 2004.

3.2 Incentive Program

The incentive program included the following elements:

a) 50 E-Coder water meters and R900 transmitters at selected houses

b) More frequent meter readings to identify when and how water was being used

c) Pilot Program using incentives to help customers reduce water consumption

The incentives were chosen based upon Neptune’s successful Peak Demand Program in Kelowna BC and specific issues relating to Carlisle. The incentives were explained in the Water Wise Newsletter and residents were encouraged to call and apply to receive one of the following incentives:

Incentive #1 - Topdressing Rebate and Water Audit:

The soil in Carlisle tends to be sandy and it does not retain water very well. As a result, many residents feel the need to irrigate more frequently to maintain green grass. Applying organic topdressing to sandy soil creates aggregates, which help the soil retain water, resulting in lower water requirements to maintain turf. Twenty residents were offered a $200 rebate on the purchase of organic topdressing. The recommended top dressing was Triple Mix from Millgrove Garden Supplies.
Incentive #2 – Rain Sensor and Water Audit:

Previous studies conducted by Neptune have revealed that many customers with automatic irrigation systems do not adjust their timers for cooler, wet weather. There seems to be a "set it and forget it" mentality with the result that many irrigation systems continue to operate when it is raining. Twenty residents were offered a $50 rebate towards the purchase and installation of a rain sensor of their choice.

Incentive #3 – Water Audit:

The water audit consisted of an indoor and outdoor assessment of water efficiency. Specifically, Neptune checked automatic irrigation system timers to ensure that they were set in compliance with City Hamilton watering restrictions and taught the incentive group how to use the water budget feature on their automatic irrigation system timers. This feature allows the homeowner to reduce the output of the irrigation system by any percentage (i.e. by 50% after a rainfall). In addition, Neptune made recommendations for landscaping according to the microclimate of the yard (i.e. plant sun-loving flowers where the yard is in full sun for most of the day). Thatch identification and prevention was also a part of the water audit.

For the indoor water audit, Neptune checked all the fixtures and toilets to ensure that they were low-flow. If they were no low-flow devices installed, Neptune referred the incentive participant to the City of Hamilton or Home Depot.

Incentive #4 – All Three: Topdressing + Rain Sensor + Irrigation System Inspection:

Residents were offered both the topdressing and rain sensor rebates along with a water audit. Previous studies conducted by Neptune have indicated that many automatic irrigation systems do not operate at maximum efficiency, and that simple adjustments can significantly reduce water consumption.

In addition to promoting the incentives through the newsletter, letters were sent to the 76 homes identified as the highest water users in the 2003 Peak Demand Study. The idea was to specifically encourage these residents to participate in the program. The reasoning was that if those 76 residents could reduce their water consumption by 25%, it would have a bigger impact on the communal water system than if lower water users reduced their consumption by the same percentage.
Before reviewing the results of the 2004 Water Wise Program, it should be noted that a number of unanticipated challenges arose during program implementation. Some of these challenges had a major impact in attracting residents to participate in the program which, in turn, impacted the final results.

4.1 Attracting the customers

The original intention was to target the incentive program directly to those customers who contribute the most to peak demand (the "high water users" group). When there are limited resources it is logical to spend them on helping high water users reduce a lot rather than helping low water users reduce a little. That was the idea behind approaching the 76 highest water users.

When the program was launched it was decided by the City of Hamilton to open up the incentives to any resident who wanted to participate. Of the 26 residents who expressed interest in the program after reading the newsletter, none of them were among the 76 highest users.

Neptune studies in Kelowna indicate that many high water users do not know they are high water users or, if they do, they don't perceive their high use as a problem. These customers are either unaware of the need to change their behaviour, or they are aware of the need but they are unwilling to make changes. Offering incentives is a proven social marketing technique used to modify behaviour of these kinds of customers. That was the basis of the program.

When a social marketing program such as this one is presented to the general public as opposed to a select target group, the people to jump on board first are usually the people who are already taking major steps to reduce their water consumption. This was observed in Carlisle. Our initial efforts did not attract the high water user residents we wanted to attract.

4.2 Initial Contact Letter to the High Water User Group

The initial plan was to send letters to each of the 76 highest water users. The intention was to compare each individual customer’s water consumption to the Carlisle average. It was hoped that this would convince some of the customers to participate in the program. This approach has been used with much success in the Kelowna program.

However, due to privacy issues, it was not possible to send such letters to the highest water users. Instead, a "softer" approach was used. The letters sent to the 76 highest water users simply described the program and its benefits. This approach did not generate the expected interest. Without having Carlisle average consumption as a benchmark, it is likely the 76 highest water users remained unaware that their consumption was a major contributor to peak demand. Therefore, they had little motivation to participate in the program.

4.3 Canvassing and Telemarketing

In an attempt to attract more participants to the program, Neptune undertook a canvassing and telemarketing campaign. The area of highest water consumption was canvassed three times and multiple telephone calls were made to 54 Carlisle residents (based on high water user group and available phone numbers). These efforts resulted in signing up 1 additional participant to the program. The canvassing and telemarketing efforts also yielded a number of reasons residents did not want to participate in the program:

- 46 residents believed they were already doing enough to conserve water
- 20 residents were just not interested
- 10 residents explained they already receive a similar service
- 5 residents perceived the program as "too much work"
4 residents felt that the program is inconvenient
- 4 residents wanted to consult with their spouse

It is interesting to note that the main reasons residents gave for not participating is because they felt they were already doing enough to conserve water, or that they just were not interested in the program. If a customer could see that their water consumption was, say, 50% higher than the average in their area, they would realize that they were not, in fact, doing enough to conserve water. The information in the letter may have generated the interest needed to motivate them to participate as it did in Kelowna BC.

4.4 The Weather

After two years of drought and high summer temperatures, the spring of 2004 was unusually wet and cool. This may have resulted in customers believing that water conservation was no longer necessary. While total rainfall in 2004 was lower than in 2003, the program was launched during the spring rainy period. Customers may not have been interested in participating in the program because of the weather. Also, because of the wet spring, many residents did not even start up their automatic systems until early summer. Therefore a water audit offered in the spring may have been deemed by customers as unnecessary.
5.0 WATER WISE PROGRAM RESULTS

5.1 Detailed Precipitation Analysis

Before looking at the results of the 2004 program it is necessary to take a more detailed look at precipitation, and how it affected changes in water consumption between 2003 and 2004.

As previously stated, the spring of 2004 was wetter and cooler than the previous summers of 2002 and 2003. This may have affected interest in the program because residents were not concerned about the appearance of their lawns in spring when the program was launched. The volume of rain and the number of rain days negated the need to water the lawn.

The figure below compares the total precipitation, the number of rain days and the average water consumption for Carlisle from April to September for 2002 to 2004.

Graph 2: Precipitation, 2002, 2003, 2004

There are two ways to analyze precipitation data as it relates to changes in water consumption. The first is to examine total precipitation over a certain period. The figure above shows that total precipitation in spring/summer 2004 was lower than in 2003. However, no hard conclusions can be drawn from this because total precipitation does not tell us how frequently the rain fell.

For example, if all of July’s precipitation fell on one day, it would have very little effect on water consumption because the rest of the month was dry. Conversely, if that same volume of precipitation was spread across several days in July, we would expect to see a drop in consumption because the month would be perceived as wet.

That is why the second way of analyzing precipitation data – looking at the number or rain days – gives us a more accurate picture of how precipitation affects water consumption.

In summer 2003, total rain was 517.8 mm, the number of rain days was 65 and average consumption was 232 Cubic Metres.

In summer 2004 the total rain was 440.3 mm, the number of rain days was 71 and average consumption was 220 Cubic Meters.
One might expect that average consumption in 2004 would be higher in 2003 because there was less total precipitation. However, there were 6 more rain days in 2004 over 2003, with the end result that there was actually a 5.2% decrease in 2004 average water consumption.

This decrease can be attributed to the higher number of rain days combined with the general water conservation efforts.

5.2 GENERAL WATER CONSERVATION PROGRAM RESULTS

5.2.1 Newsletter

By all accounts, the Water Wise newsletter was well-received in the community. An informal survey of 31 residents taken while canvassing indicated that 28 of them had read the newsletter and were aware of the program. The newsletter resulted in 26 inquiries into the program. However, none of these participants were from the high water user group.

5.2.2 Other Publicity

Public relations efforts resulted in newspaper articles in the Hamilton Spectator and the Flamborough Review. Both articles described the challenges facing the Carlisle water system and detailed the efforts being made by the City of Hamilton to ensure adequate supply.

Here are some quotes from Gary Brown (who received a water audit) from the article in the Flamborough Review:

“If you have a compromise, that’s good. If you have a system that allows you to conserve, I think that’s great.”

“I take a lot of pride in my lawn,” said Brown. Which is one reason he found the water audit educational.

“If I can do anything that can help ease up a bit, I’m willing,” said Brown. “I don’t want people to think ‘those people in Carlisle are sucking up all the water.’ We all need to take some responsibility.”

5.2.3 Partnership with Landscape Company

Neptune partnered with Select Sprinklers to help enlist participants to the program. Specifically, they were the recommended supplier for the rain sensors (discussed in more detail in section 5.8). A representative from the company was present at the public information session. The partnership resulted in just one participant signing up for the program.

Neptune contacted six other irrigation system companies that work in the Carlisle area. However, the timing (early spring, their busiest time) prevented these companies from making a commitment to the program.

5.2.4 Rewards Program

Rewards were offered to residents who consumed less water than the 2003 Carlisle average and who incorporated native or drought tolerant plants into their landscaping. 80 residents received the award, which included a Certificate of Appreciation and a $10 gift certificate to Terra Green Houses.

5.2.5 Water Patrols

The water wise team patrolled Carlisle neighborhoods on about 60 separate occasions – 30 times between the hours of 10:00 AM and 2:00 PM, and 30 times between the hours of 2:00 PM and 6:00 PM. During these patrols no inefficient watering was observed.
5.2.6 Public Information Session

The Public Information Session took place at the Carlisle Community Centre on May 15, 2004. In attendance was Lisa DeAngelis from the City of Hamilton, Steve Dramnitzke, Shannon Ali and Stacey Kenzaki from Neptune Technology Group and Harry Hutton from Select Sprinklers. The public information session was attended by 15 Carlisle residents. In addition, 1 resident expressed interest in the Carlisle Water Wise Program and 3 residents requested more information on xeriscaping their properties.

5.2.7 Analysis of 2003 and 2004 Community Wide Water Consumption

The graph below summarizes average residential water use from May 20 to September 20 in 2003 and 2004. This consumption data includes all Carlisle residents connected to the communal water distribution system.

Graph 3: Average Carlisle Water Consumption, 2003/2004, based on bi-monthly readings

This graph clearly shows that average water consumption in 2004 was below that of 2003. However, total water consumption was about the same in 2003 and 2004. This is because there were 45 additional homes connected to the system in 2004. The 10% increase in the number of homes negated the average decrease in water consumption.

5.2.8 Who is using The Water

As reported in the 2003 study, a relatively small number of houses use a disproportionate amount of water. The 2003 study identified 76 homes that consumed 44% of Carlisle's total water use. The average water consumption among the top 76 users in 2003 was 515 Cubic Meters over the summer period.

This trend continued in 2004. The highest 76 water users consumed an average 523 Cubic Meters of water, or 36% of total Carlisle water use. While average Carlisle water consumption was down 5.2% in 2004, average water consumption among the highest water users was up 2% in 2004.

This suggests that the changes in the weather and the general water conservation program had little effect on the highest water users, as was expected.
5.3 INCENTIVE PROGRAM RESULTS

5.3.1 The Participants

The goal was to have 20 topdressing participants, 20 rain sensor participants, and 10 participants to receive both the topdressing and rain sensors along with a detailed irrigation system assessment. The Water Wise Carlisle Program was originally targeted to 4 groups of participants:

- **Carlisle Residents**: This group includes all Carlisle residents connected to the communal water distribution system. These were the customers who received the general water conservation information.

- **Incentive Participants**: These are the customers who volunteered to receive an incentive based on the publicity generated by the general water conservation program. Efforts were made to attract the 76 high water users identified in the 2003 report; however, none of these customers applied for the program.

- **Non-Incentive Participants**: These are the customers who received the E-Coder water meter and R900 transmitter but no additional incentive. They are mainly residents from a subdivision with higher water consumption in the Carlisle area.

- **High Water Users**: The high water users were identified in the 2003 Peak Demand Report. The high water user group used more than the Carlisle average and were in the top 25 percentile for water consumption.

Several attempts were made to attract participants to the program. These included the newsletter, a letter sent by Neptune targeted to high water users, canvassing and telemarketing. When it became clear that not enough participants were signing up for the program, a registered letter was sent by the City of Hamilton to the 35 highest water users.

An additional 15 participants signed up as a result of this letter. These additional participants received the E-coder meter but no other incentive. The results for these customers will be examined in section 7.0.

The table below indicates that the number of customers who participated in the program was well below the number that was originally targeted. The reasons for this have already been discussed.

<table>
<thead>
<tr>
<th></th>
<th>Top Dressing</th>
<th>Sensor</th>
<th>Audit</th>
<th>All Three</th>
<th>E-Coders</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incentive Participants</td>
<td>11</td>
<td>1</td>
<td>3</td>
<td>0</td>
<td>9</td>
</tr>
<tr>
<td>Non-Incentive Participants</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>15</td>
</tr>
</tbody>
</table>
5.3.2 The Results – Top Dressing & Water Audit

The following graph shows that water consumption among participants who received the top dressing and water audit incentive remained unchanged between 2003 and 2004.

Graph 4: Changes in participant water consumption between 2003 and 2004

Graph #5 (below) shows that the water consumption in 2004 among the incentive participants was slightly lower than the average water consumption among Carlisle residents in 2004.

Graph 5: 2004 participant average water consumption compared to Carlisle average water consumption.

The graph above shows that the incentive participants did use less water than the Carlisle average, but it does not tell the whole story. It's worth noting that most of the participants who received the incentives live in neighborhoods where the lots are much larger than the averaged size lot in Carlisle.
That means that participants who received the incentives used less water than the Carlisle average to maintain much larger lawns and gardens than the Carlisle average. This suggests that the incentive participants were watering more efficiently than most Carlisle residents prior to and during the 2004 study.

Most of the participants who took advantage of the top dressing program were customers who have top dressed in the past, and would have done so again in 2004 regardless of the rebate program. The fact that their average summer consumption is relatively low suggests that the top dressing actually does increase the moisture holding capacity of the soil, allowing the customer to water less frequently.

It also suggests something far more significant. Consider that the average Incentive Participant water consumption in summer 2004 was 114 Cubic Metres. Most of these participants have large lots in the same neighborhoods as the 76 highest water users. Yet over the same period, the 76 high water users consumed an average 523 Cubic Metres.

The customers who top dress use 216% less water to maintain similar sized lawns and gardens. It also reinforces the need to target specifically and educate the highest water users.

The table below shows the dramatic difference between Participant average water consumption and the average consumption of customers living on the same streets with the same sized lots.

<table>
<thead>
<tr>
<th>Address</th>
<th>May – Sep 2003</th>
<th>May – Sept 2004</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participant Average Water Consumption</td>
<td>110</td>
<td>114</td>
</tr>
<tr>
<td>Parkshore Place Average Water Consumption</td>
<td>224</td>
<td>209</td>
</tr>
<tr>
<td>Tansley Terrace Average Water Consumption</td>
<td>214</td>
<td>173</td>
</tr>
<tr>
<td>Appaloosa Trail Average Water Consumption</td>
<td>206</td>
<td>178</td>
</tr>
<tr>
<td>Acredale Road Average Water Consumption</td>
<td>211</td>
<td>189</td>
</tr>
<tr>
<td>Gwyneth Road Average Water Consumption</td>
<td>231</td>
<td>243</td>
</tr>
</tbody>
</table>

### 5.3.3 Water Audits

While each participant received a water audit, only one customer had their irrigation system timings adjusted by Neptune staff at the time of the audit. The remaining participants likely adjusted their timings themselves following the audit. The customer who had their system adjusted by Neptune consumed 258 Cubic Metres of water in 2003, and only 196 Cubic Metres following the system adjustment in spring 2004.

Here are some general observations from the water audits:

- In general all newer houses in Carlisle were all equipped with low-flow toilets and had fixtures with built in aerators.
- Many customers have their timers set for 40 minutes per zone. These customers were informed that most soils become saturated after 20 minutes, making any additional watering unnecessary.
- At least three of the properties that received water audits showed lawns with excessive thatch and shallow roots, both of which indicate over-watering.
- Many home-owners had set their timings regardless of microclimates. These customers were informed that shady areas require less water than sunny areas.
- Some systems use rotating sprinkler heads to water shrubs and hedges that border their property. These homeowners were informed that a drip irrigation system would be far more water efficient.
6.0 THE EZNET SYSTEM

Neptune installed an EZNet fixed network system to obtain profile consumption data that could be used to help determine future peak demand initiatives. The program included the installation E-Coder solid state absolute encoder register at 24 homes in Carlisle. The E-Coder was used to provide high-resolution data and the capability to record 15-minute interval data. The E-Coder also provides additional data such as leak, backflow and tamper detection.

6.1 Watering During Restricted Times

With the ability to record meter readings every 15 minutes, the system is able to track trends in water use. The following graph shows heavy use between midnight and 4:00 a.m.

Graph 6: Data showing heavy water use, most likely irrigation, recorded during restricted times.
6.2 Leak Detection

Continuous low flow usually indicates a leak. A report generated from the EZNet software identified a possible leak occurring at 7 Oldenburg Road. The following graph shows continuous low consumption throughout the day, which is most visible at 1:00 AM.

Graph 7: Data showing low consumption throughout the day.

Upon proactive notification, the homeowner determined that they had a leak in their refrigerator water line. They were able to repair the leak and eliminate this water waste.

The E-Coder and EZNet system can provide tools that will increase customer satisfaction and help promote water conservation initiatives. This can be achieved by providing:

- Proactive Customer Care through early notification of leak detection posted directly on customer bills and/or e-mail, or phone call by a CIS department representative.
- Quicker response in handling high water bill complaints through CIS screens that identify type of leak and number of days of leak state.
6.3 No Flow

The EZNet and E-Coder system can also identify no-flow occurrences. A no-flow report generated from the E-Coder identified the following location at [redacted] as shown in the following graph:

Graph 8: Data showing several days of no consumption.

This no-flow is most likely because the homeowner was on vacation for 12-14 days. However, it could also indicate that the meter stopped, or it could even be an instance where the homeowner tampered with the meter. The system can provide the utility with the tool to increase operational efficiencies by providing:

- Operational reports that identify residential and commercial leaks, type of leak, number of days of leak state, number of continuous days of no-flow and reverse flow occurrences by account.
- Proactive response to potential fraud scenarios.
- Proactive meter maintenance
- Water loss management and maximum revenue generation.
7.0 CONCLUSIONS

Many of the observations of the 2004 program echo the observations of the 2003 Peak Demand report. The key observation is that a small group of high water users continue to be the biggest contributors to peak demand.

7.1 General Conservation Program

- Water consumption was lower in 2004 than in 2003. This is likely due to the weather.
- While the water conservation program generated some publicity and Carlisle residents were aware of the program, this awareness did not necessarily result in action on the part of the highest water users.
- A relatively small group of high water users continue to consume a disproportionate volume of water.
- A generalized water conservation program is not likely to change the behavior of these high water users.

7.2 Incentive Program

- Customers with large lots obviously consume more water than customers with smaller lots.
- Customers with large lots who top dress their lawns use considerably less water than customers with similar sized lots who do not top dress.
- Offering incentives to all customers (as opposed to just the high water users) attracts those customers who are already water conscious.
- The highest water users in Carlisle do not see themselves as high water users. Using average Carlisle water consumption as a benchmark may have motivated more customers to participate.

7.3 EZNet system

- The EZNet system can provide valuable information about the patterns or residential water use including:
  a) What time of day water is being used
  b) If the customer has any leaks
  c) If the customer has any no-consumption days
8.0 RECOMMENDATIONS

If the City of Hamilton wishes to reduce peak demand in Carlisle it is clear that the efforts must be focused on those customers who are the greatest contributors to peak demand. While a “generalized” water conservation program can motivate some customers to reduce their water consumption, the approach does not seem to attract the highest water users.

Research into Social Marketing indicates that there are three basic ways to motivate a customer to change their behavior. Based on our findings in 2003 and 2004, we make the following recommendations centered on the three methods of affecting behavior change.

1) **Make the old behavior inconvenient (or make the new behavior more convenient).** To achieve this, we recommend:
   - Continue to offer some form of top-dressing incentive program in 2005
   - Target this program only to those high water users
   - Use E-Coder, R900 and/or EZNet technology to monitor program results

2) **Make the old behavior more expensive (or make the new behavior less expensive).** To achieve this, we recommend:
   - More diligence in assessing fines for breaking watering bans and/or watering during restricted times.
   - An inclining block rate for water
   - Use EZNet technology to track trends in water usage.

3) **Make the old behavior socially unacceptable (or make the new behavior socially acceptable).** To achieve this, we recommend:
   - Continue to reward those customers who demonstrate water efficiency, especially in those neighborhoods where the highest water users also live.
   - Allow a direct mail program in 2005 that will let the highest water using customers see their consumption in context with the average on their street.

Neptune’s Peak Demand program continues to be successful in Kelowna, BC. In 2004, the soil amendment program resulted in an average reduction of 25% among the city’s 300 highest water users. These efforts, along with our targeted approach, have helped average per capita water consumption to drop steadily since 1996 (when Neptune began working with Kelowna). The result is that Kelowna has been able to eliminate or defer $24 million in infrastructure expansions over the next 20 years.

A focused, targeted approach could help achieve similar results in Carlisle.