

University of Southern Queensland
Faculty of Engineering and Surveying

**Ipswich City Council Water Supply
Infrastructure Capacity**
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**High Water Usage and Water Meter
Accuracy**

A dissertation submitted by

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Abstract

South East Queensland is currently in one of the worst droughts on record with dam levels at historical lows. The introduction of Water Restrictions campaign signifies the severity of the water crisis. One way in which Ipswich water losses may be decreased is by identifying properties that use a seemingly excessive amount of water and then investigating these properties.

Ipswich City Council (ICC) have installed and maintain over 54 000 water meters throughout the Ipswich region ensuring that residential, commercial and industrial customers pay only for the water they have consumed; making water meters the vital tool for monitoring and understanding water usage.

This project aims to research into the accuracy of water meters and then develop a practical audit system that identifies the high water consumers by analysing consumption data from all the standard 13–20mm water meters within Ipswich.

Data analysis of ICC water consumption readings, from the standard 13–20 mm water meters, between years 2003 – 2007, determined that properties over a recommended adopted water consumption volume per day value can be deemed a high water consumer and further investigation is required (for example due to leakage, wear and tear on meter, excessive water usage or inappropriate meter sizing).

Water is a precious resource and it is necessary that all water utilities take responsibility for the water consumptions and try to determine ways which they can limit water loss in their community.

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**ENG4111 Research Project Part 1 &
ENG4112 Research Project Part 2**

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Signature

Date

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1.0 Introduction

1.1 Background

Ipswich (Figure 1.1) is Queensland's oldest provincial city and comprises an area of 1207 square kms and has a population of 145,000 people (Ipswich City Council, 2007a). South East Queensland is a rapidly expanding area with population numbers expected to double by 2026 (Ipswich City Council, 2007b).

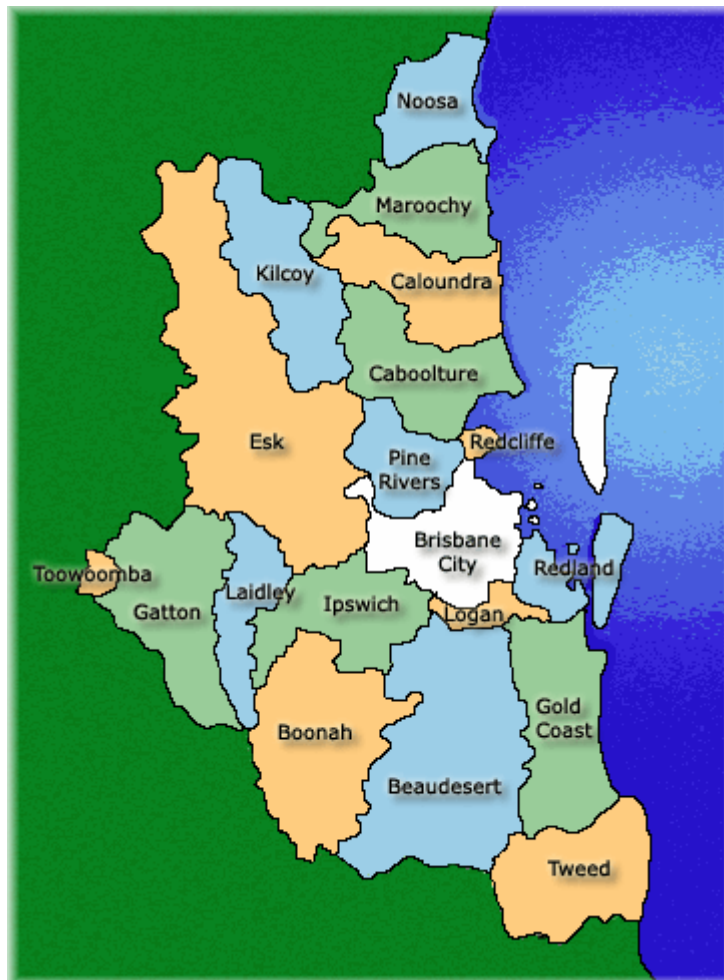


Figure 1.1 South East Queensland Councils Regional Boundaries

Ipswich City Council (ICC) supplies many services to the Ipswich region, with water delivery being a vital service. Ipswich Water (IW), a division of ICC, was developed in 1998 to provide cost-effective and high quality water supply to the people of Ipswich; this service is essential in preserving and enhancing the lifestyle and public health of our communities (Ipswich Water, 2007a). Overall IW provides water to more than

54,000 residential, commercial and industrial customers across Ipswich with 25,545 mega litres of water used per year, though a network of 27 reservoirs and 1415 kms of water mains.

Ipswich obtains its water by purchasing raw water from the South East Water Corporation who own and operative both Wivenhoe and Somerset Dams (Ipswich Water, 2007e). The untreated water is treated by the Brisbane City Council (Brisbane Water Division) owned Mount Crosby Treatment Plants. The cost to Ipswich Water, for purchase and treatment of water, is approximately \$7 million dollars annually; 25,000 mega litres annually or over 500 litres per person consumed per day (Ipswich Water, 2007e).

IW install, manage and maintain over 54,000 water meters, ensuring residential, commercial and industrial customers pay only for the water they have consumed (Ipswich Water, 2007c). "Water meters are vital tools for monitoring and understanding your household water usage & allow you to detect hidden leaks within your water system that are costing you money on your water bill" (Ipswich Water, 2007d).

At present South East Queensland is experiencing one of the worst droughts on record with dam levels at historical lows. The level of total dam storage has dropped below 20% which has seen the introduction of Level 5 Water Restrictions signifying the severity of the water crisis and emphasising the preciousness of water (Ipswich Water, 2007b). For residents, Level 5 Water Restrictions have brought major change to their water usage; for example residents may only water their lawns and gardens via buckets on specified days, new home owners/buyers are not permitted to fill new or renovated pools and residents may no longer even wash their entire car with water from a bucket (Queensland Water Commission, 2007a).

In an effort to reduce residential water consumption the Queensland Water Commission has introduced a campaign called "Target 140" to cut individual water consumption from the average of 155 litres per day to 140 litres per day through simple measures as spending less than four minutes in the shower (Queensland Water Commission, 2007b).

Only through the use of water meters are we able to audit water consumption and identify and investigate those residences with seemingly high water consumption.

1.2 Project Aim

Water is an essential resource that is extremely precious to South East Queensland and water saving strategies are continually on the rise. It is necessary that all water organisations take responsibility for water consumption and try to determine ways in which they can limit water loss in their community.

One way in which residential water loss may be decreased, is by identifying the individual properties that use a seemingly excessive amount of water and then investigating these properties further to ensure the accuracy of the water meter is adequate and in accordance with ICC guidelines.

This project aims to develop a practical audit system that identifies these high water consumption residences by analysing consumption data from all the standard 13-20mm water meters and provide recommendations on how to save on water consumption.

The following study aims are taken from the Project Specification (Appendix A).

Collect all standard 13-20mm water meter consumption readings from the Ipswich region for the past five years, from 2003 – 2007.

This will involve gathering existing Ipswich City Council records using the Ipswich City Council's computer program 'PATHWAYS'.

Investigate the characteristics of Ipswich water meters.

Develop a comprehensive data base detailing:

- Residential or Commercial water meters
- Age of meters
- Type of Meters
- Pipe size of meters
- Location of meter
- Quarterly reading consumption

Analyse the collected data to highlight high water consumers.

Analysing the results from the data collected and categorizes the high water consumers from the data base.

Illustrate results through use of graphs and tables.

Graphs and tables will give a visual illustration of the high water consumer's.

1.3 Project Objectives

Investigate and outline factors affecting the results from the meters.

Results from the research, field inspections and data analysis will determine any errors that may be causing inaccurate results.

Time permitting, prepare an audit program investigating liaison with customers and field inspections of properties of concern.

Using the results obtained from the data analysis to develop a practical audit program that will automatically highlight any 13-20mm water meter that has a higher than average water consumption and will therefore require further investigation.

2.0 Literature Review

A quantity of existing literature was reviewed regarding:

- Water meters; types & sizes, problems, accuracy & maintainence.
- Australian Standards for residential water meters.
- Managing apparent losses.

2.1 Definitions

All definitions, unless otherwise referenced, are quoted word-for-word from the Queensland Environmental Protection Agency & Wide Bay Water Corporation, 2005, “Manual 7, Managing Apparent Losses”.

Apparent Losses: Systematic inaccuracies associated with production metering & customer metering, and unauthorized consumption (theft or illegal use).

Authorised consumption: The annual volume of metered and/or un-metered water taken by registered customers, the water utility and others who are implicitly or explicitly authorised to do so by the water utility, for residential, commercial and industrial purposes.

Consumption: A volume of water taken from a water supply main into a customer’s installation.

Domestic Meter: Standard 20mm meter used mainly for a single residence.

Metered consumption: The quantity of water registered on a customers’ meter.

Non-Revenue Water: Water that does not generate revenue for the water utility. It includes unbilled authorised consumption, apparent losses and real losses.

Property: Building premises or structure that is occupied by a customer and separately identified for billing purposes.

Real losses: Physical water losses from the pressurised system, up to the point of customer metering. The annual volume lost through all types of leaks, bursts and overflows depends of frequencies, flow rates, and average durations of individual leaks.

Service Pipe: A portion of a pipe that supplies water from a main to a premises or household. It includes the section known as the communication pipe and the private supply pipe.

Supply: The amount of water made available to satisfy demand equaling the system input volume.

Unauthorised consumption: Water theft or illegal use. It can be abuse of authorised consumption and is usually not metered. The volume of water consumed is not known.

Unbilled authorised consumption: Water used with the implicit or explicit permission of the water utility and is not charged for.

Water audit: A method of accounting for all water in a system.

Water losses: The sum of real losses and apparent losses.

Water meter: A water meter is a physical device used for measuring and registering the amount of water that passes through a pipe or other outlet (usually for billing purpose) by counting the number of turns made by a small reaction turbine moved by the water as it flows through it (Rodriguez, 2005).

2.2 Water Distribution System

The water distribution system includes the entire water network from the water source (dams/lakes) to the residential and commercial properties for use. The total water consumption can be categorised into authorised metered consumption, authorized un-metered consumption, real losses and apparent losses (terms as described in the glossary above).

Apparent losses are of particular importance to this project as they consist of inaccuracies associated with metering (Queensland Environmental Protection Agency and Wide Bay Water Corporation, 2005). “If apparent losses are reduced, more revenue will be generated by the water utility. In the longer term, increased revenue can mean, reduced water charges and financial savings for the customer”. (Queensland Environmental Protection Agency and Wide Bay Water Corporation, 2005, p 10)

2.3 Water Meters

Every water utility strives to ensure that water meters (devices used to measure water usage) are installed at every residence and commercial premises for billing purposes and so they can account for water consumption (Wikipedia, 2007).

Water meters are also found at the water source (lakes/dams) so that all total water usage is accounted for, and water meters are also found throughout a specific water system to determine flow through that portion of the system (Wikipedia, 2007). Water meters (Figure 2.1) measure and display water usage in gallons, cubic feet or cubic metres on a mechanical or electric register, with water consumption in Australia being measured in kilolitres (Ipswich Water, 2007c).



Figure 2.1 A Typical Residential QLD Water Meter (Chris Martin, 2007)

Water meters have been around for just over 150 years with the first water meter dating back to England 1852 when Sir William Siemens' invented his 'fluid meter'. There are many kinds of water meters used for various circumstances but the water meter of importance to this study is the standard 13-20mm diameter water meter.

2.4 Types of Water Meters

The two basic types of water meters are the positive displacement and velocity water meters. In the positive displacement water meter (Figure 2.2), “a known volume of liquid in a tiny compartment moves with the flow of water; positive displacement operates by repeatedly filling and emptying these compartments” (Satterfield & Bhardwaj, 2005). The flow rate is then calculated based on the number of times the compartments are filled and emptied; the movement of a disc or piston drives gears that registers and records the volume of liquid departing the meter (Satterfield & Bhardwaj, 2005).



Figure 2.2 Positive Displacement Meter (Ipswich Water, 2002)

“Velocity meters have a rotating element that turns with the flow of water; volume of water is measured by the number of revolutions by the rotar” (Satterfield & Bhardwaj, 2005). Velocity meters (Figure 2.3) are available in sizes of two inches and larger and come in many types including turbine, multi-jet, propeller, ultrasonic, venture and orifice meters.

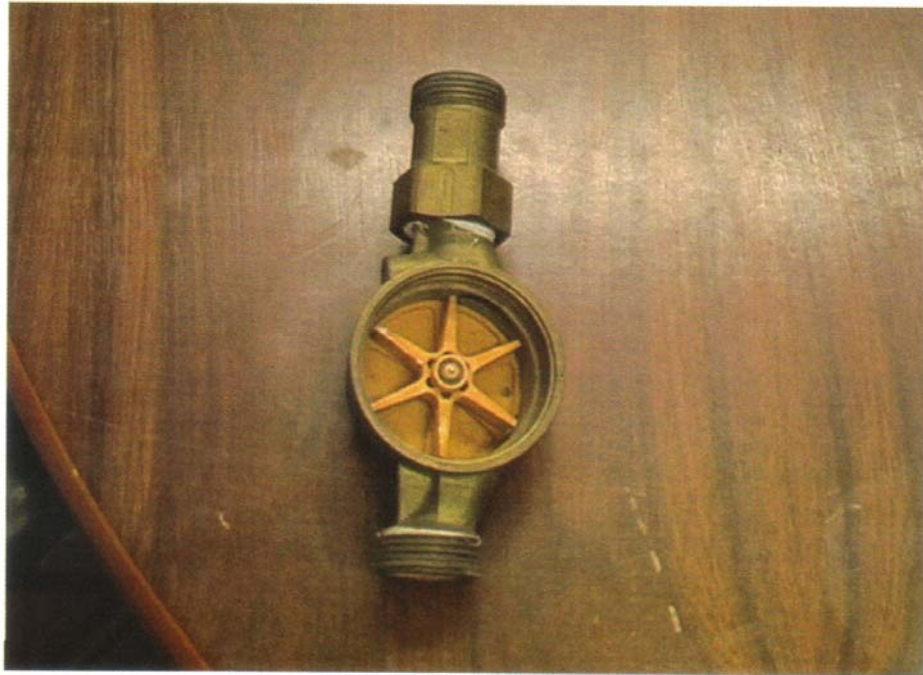


Figure 2.3 Velocity Water Meter (Ipswich Water, 2002)

Compound water meters, another form of water meters, are a combination of both positive displacement meter and velocity meter installed together (Satterfield & Bhardwaj, 2005); however these meters are of a larger size and are used for recording consumptions of great volume.

It is impossible to determine what brand of residential water meters are currently in use through out Ipswich as there is no record of what brand each meter was upon installation (Egbars C 2007 pers. comm., 20 April). There is however, Australian Standards that must be obeyed when installing water meters.

Water meters in Ipswich have been installed either above ground or below ground and outside or inside the property boundary (Ipswich Water, 2007c). Water meters previously installed above ground are progressively being reinstalled below ground.

Water meters are read quarterly, with the black letter on the meter representing kilolitres and the red numbers representing litres (Figure 2.4). Currently the installation and maintenance of water meters and supply is the responsibility of the Ipswich City Council (Ipswich Water).



Figure 2.4 How to read your water meter (ActewAGL Always, 2007)

2.5 Australian Standards™

Australian Standards are prepared by Standards Australia (an independent company made of committees containing industry experts, governments, consumers and other sources) and are published requirements or recommendations reflecting the latest scientific and industry experience (Standards Australia, 2004).

The Australian Standard series AS 3565 is for all ‘Meters for water supply’ with this project based only on the following two sections: ‘Part 1: Cold water meters’ and ‘Part 4: In-service compliance testing’. These standards are responsible for standards relating to water meters, and details the requirements and standards which Ipswich Water (Ipswich City Council) abide by. These standards relate to all facets of the standard 13-20mm diameter water meters from pre-installation to compliance testing.

2.6 National Measurement Institute

Local government, including water utilities, must practice according to Australian Standards, which in term must be in accordance with the National Measurement Institution (NMI) guidelines.

The NMI is a division within the Australia Government's Department of Industry, Tourism and Resources; a body which under the 1960 National Measurement Act is responsible for coordinating Australia's units and standards of measurement (National Measurement Institute, 2007).

The guidelines pertinent to this project are NMI R 49- 1 Water Meters Intended for the Metering of Cold Potable Water; Part 1: Metrological and Technical Requirements. Whenever ICC test water meters they need to ensure that they undertake the task according to these guidelines.

2.7 Problems of Accuracy

Water meters are a means of determining water consumption, water usage charges, assessing non-revenue water levels and most importantly managing water loss (Queensland Environmental Protection Agency and Wide Bay Water Corporation, 2005). Therefore it is imperative that water meters are accurate.

Regardless of the water meter type, all water meters have limitations and are not capable of recording the exact amount of water consumed (Arregui et al, 2005). Furthermore there are non-water meter reasons for inaccuracy. Reasons for inaccuracy are discussed below.

2.7.1 Consumption Volume & Meter Age

Both the positive displacement and turbine (a velocity water meter) water meters have moving internal parts that are susceptible to wear and tear (Queensland Environmental Protection Agency and Wide Bay Water Corporation, 2005). The rate and degree of wear and tear seems to be directly related to the volume of water consumed and

recorded by the meter; for an average meter with typical consumption patterns the intervention point for programmed replacement is three to four mega litres of consumption or a meter age of eleven years (Queensland Environmental Protection Agency and Wide Bay Water Corporation, 2005). “The wear and tear of the moving parts tends to increase the friction torque on the sensing element in any instrument increasing the error at low flows” (Arregui et al, 2005, p. 3).

2.7.2 Incorrect Meter Installation

There are many instances of incorrect flow-meter installation that result in inaccuracy. In most cases of incorrect installation the consequence is the creation of turbulence. Direct causes of turbulence include deviation of installation in the field compared to the manufacturers testing of water meters in long straight pipes with standard flow rates, incorrect placement of bends in the supply line too close to the meter or vertical installation of the water meter rather than horizontal (Queensland Environmental Protection Agency and Wide Bay Water Corporation, 2005). Other examples of installation effects on accuracy are: differences in pipe characteristics such as material & texture, proximity of fittings that are not present in testing, differences in fluid and ambient temperature, bore of the pipe differs to that of the meter, flow rate differences and there may be sedimentation or calcification in the network (Queensland Environmental Protection Agency and Wide Bay Water Corporation, 2005).

Incorrect mounting (Figure 2.5(a) & (b)) of the water meter also increases friction of the moving parts leading to degradation of the meter, the effect of which is noticeable at periods of low flow (Arregui et al, 2005). The standard water meter for a domestic household is design to be at a horizontal level so the internal parts of the water meter can correctly register the water consumption, however when the meter is inappropriately installed, (not horizontal) the internal parts are not positioned correctly resulting in higher wear and tear of the meter.



Figure 2.5(a) Incorrect installation of an above ground water meter (Chris Martin, 2007)



Figure 2.5 (b) Unnecessary bends around the water meter (Queensland Environmental Protection Agency and Wide Bay Water Corporation, 2005).

2.7.3 Class or Type of Meter

According to Australian water authorities there are certain qualities or standards that water meters must uphold. The initial Australian Standards AS 3565.1-1998 of 1998 recognised four categories (Class 1 – Class 4) within the accuracy range of all 15mm and 20mm must fall; with the higher the class, the more accurate the meter (Queensland Environmental Protection Agency and Wide Bay Water Corporation, 2005) . This standard was updated in 2004 by AS 3565.1-2004 which only recognises the new Class

2 which relates only to 20mm water meters. The New Class 2 requires +/- 5% accuracy at 20 litres/hour & +/- 2% accuracy at flow rates between 32 litres/hour and 4000 litres/hour (Queensland Environmental Protection Agency and Wide Bay Water Corporation, 2005). The implication is that if there are Class 1 water meters remaining in the Ipswich water distribution systems, they do not have the accuracy of the new Class 2 standard and need replacement. However the problem with this is that information on the historic water meters were never recorded therefore the classes are not available.

2.7.4 Inappropriate Meter Size

It is very important that water meters are placed according to their expected use as most meters tend to under-register at low-flow rates (Queensland Environmental Protection Agency and Wide Bay Water Corporation, 2005). “The measuring error will be significant, even from the first day of installation” (Arregui et al, 2005, p. 8).

Therefore, if the water meter is too large, consumption flow rates will be low for the meter, and the measuring error will be significant even from the first day installation. On the contrary, if the water meter is too small, the accuracy degradation rate will be much higher. However, in a short period of time, the mobile parts or the pieces in contact with them will break down leading to significant metering errors.

The sizing difficulties appear with non-domestic users (commercial or Industrial), as the flow rates are difficult to predict in advance. Therefore it is not surprising to find a high percentage of commercial & industrial meters that are not properly sized.

The majority of residential water meters within the Ipswich water distribution system are sized between 13-20mm which therefore should not be an accuracy issue. Any new residential meters installed are to be a 20mm diameter meter in accordance with Ipswich City Council and the Australian Standard AS3565.

2.7.5 Water Quality

Water quality is determined in terms of the presence of suspended sediment and water hardness. If the water is of poor quality this leads to encrustation of the meter (Figure 2.6), resulting in a loss of accuracy and premature failure of the water meter itself (Queensland Environmental Protection Agency and Wide Bay Water Corporation, 2005). There is evidence to suggest that positive displacement water meters are better suited to dirty water conditions (less prone to failure in these conditions) (Queensland Environmental Protection Agency and Wide Bay Water Corporation, 2005). Suspended solids and depositions also can significantly affect water quality; with positive displacements meters coming to a stop when a particle is bigger than the spare space between the piston/disc and chamber, and depositions can cause over registration at medium to high flows or under registration at low flows (Arregui et al, 2005).



Figure 2.6 Limescale built-up in the inside of a single jet water meter housing (Arregui, 2005).

2.7.6 Water Pressure & Air Surges

Positive displacement meters and velocity meters can both be affected by a sudden surge of air by mistaking the air as water (Figure 2.7) and registering the air as water consumption (Queensland Environmental Protection Agency & Wide Bay Water Corporation, 2005). An inferential water meter (velocity meter) will also provide inaccurate water meter consumption readings as the turbine spins at high speeds when small jets of water spurt up and cause it to spin (Queensland Environmental Protection Agency & Wide Bay Water Corporation, 2005).



Figure 2.7 This installation is almost certain to result in trapped air causing air surges (Queensland Environmental Protection Agency and Wide Bay Water Corporation, 2005).

The readings for properties affected by water pressure and air surges shall produce higher consumption readings than their actual consumption. This problem is normally only found if the property owner of the water meter is concerned about their consumption. The use of Pressure Reduction Valves (PRV) within the water distribution network helps to reduce the water pressure within the mains, therefore limiting the over reading within water meters due to high water pressure.

2.7.7 Data Errors

It is also important to consider that human and technological errors can occur when reading water meter consumption and when in-putting the data into water utility computer systems. Such errors would be hard to minimise further; for example employing two water utility personnel to obtain water meter readings (to double check) would be costly and timely. Ways to decrease human error are currently being developed such as the electronic ‘Smart Capture System’ and ‘Wide Area Network System’ which does not require humans to obtain the water meter reading (Queensland Environmental Protection Agency & Wide Bay Water Corporation, 2005). The use of automated meters as found overseas, also eliminate the need to obtain readings directly from the meter therefore improving efficiency and lowering the cost of meter reading (Tuscon Water, 2004). The automated meter reading involves electronically scanning the water meters’ odometer wheels and then transferring the data via a transformer, to

an operator with a handheld reader (Queensland Environmental Protection Agency & Wide Bay Water Corporation, 2005). The latest technology emulates the human eye to give a near perfect accuracy, and therefore should greatly speed up the meter reading process.

2.7.8 Theft & Illegal Use

Inaccuracies in water consumption can also be attributed to illegal access to water hydrants, illegal use of un-metered fire hose reels and illegal water connections (Figure 2.8(a), (b) & (c)), however these areas will not be discussed as they do not affect this project which aims to address high consumption levels relating to water meter registered consumption.



Figure 2.8(a) A bypass is cleverly concealed within a concrete slab (Queensland Environmental Protection Agency and Wide Bay Water Corporation, 2005).



Figure 2.8(b) The illegal meter bypass encased in concrete (Queensland Environmental Protection Agency and Wide Bay Water Corporation, 2005).



Figure 2.8(c) The illegal domestic meter bypass (Queensland Environmental Protection Agency and Wide Bay Water Corporation, 2005).

2.8 Maintenance and Trouble Shooting

As there is a growing need to save every drop of water, the following are strategies devised to help minimise the loss of water from the standard domestic water meter.

2.8.1 Meter Replacement Programs

Water meter replacement programs replace water meters or the measuring element within the water meter. A meter replacement program is generally the best and most cost effective method for standard water meters due to the lack of manpower, equipment and expertise (Dailey, No Date).

The interval at which water meters are replaced is based upon either time-in-service or maximum total integrated flow through the meter; whichever level is first reached (PowerWater, 2006). The replacement of water meters is both economical and practical due to the cost of replacing the meter versus loss of revenue incurred with continued use of the old meter (Dailey, No Date).

Ipswich Water's current approach is based on an economical water meter replacement strategy. Water meters are looked at based on the lost revenue of the meter from existing data calculations, obtained previously, from the batch testing of the water meters.

2.8.2 Water Meter Testing

Many Council's within Australia offer the opportunity for the customer to have their water meter tested if they feel the meter is reading incorrectly. The process for elective testing in the Ipswich region is outlined below (Ipswich Water, 2007d).

- Forward the completed 'Request for Water & Sewerage Services Application Form' to Ipswich Water.
- Pay the associated fee from the 'Council's Register of Fees and Charges'; currently \$210.00 for a standard residential 20mm water meter.

- Ipswich Water staff will arrange for the meter to be tested by the independent NATA certified laboratory.
- If the meter is not accurate to within +5% of actual consumption, the Standard Fee and Additional water usage charges associated with the faulty meter will be reimbursed.

All meters that are tested will be replaced with a new meter regardless of if they have failed testing or not, as reinstalling an old meter (once removed, tested and transported around) can damage the meter itself. Plus the testing process will take time so a new meter is required to be installed to ensure the property owner has a supply of water.

Ipswich Water has only tested one meter by enquiry within the last 18 months as property owners currently seem happy with their consumption.

2.8.3 Water Meter Repair

Repairing meters is an option that may be economical for larger systems that have the equipment and expertise for such a program. Meter repair work is not considered acceptable if repaired meters do not register 90 percent on the test. Most modern meters have sealed registers and easily changeable measuring chambers. These meters are usually maintained and repaired by the water utility. Older style meters with heads that must be worked on should be returned to the manufacturer for maintenance and repair if they are not to be replaced (Dailey, No Date).

This process is not recommended within Ipswich as the costs and time involved are high, considering that a lot of the meter brands installed over the years were not registered; therefore obtaining the manufacturers guidelines for maintenance is a very long process which will affect the residents involved enormously.

2.9 Recording of Water Meter Data

ICC has used electronic handheld devices (Figure 2.9) since 1994 for obtaining water readings. Prior to that data collection was conducted manually via pen and paper. Currently, Ipswich City Council Meter Readers use the Itron Handheld Field Collector 200 to manually input each meter reading. The use of the FC200 commenced operation with ICC recently in February 2007.



Figure 2.9 Meter reading with small handheld computers (Queensland Environmental Protection Agency and Wide Bay Water Corporation, 2005).

2.9.1 Itron Handheld Technology

This powerful software device - FC200 Handheld (Figure 2.10) has the following features (Itron Australasia, 2007):

- full colour display,
- flexible configuration options (including GPRS for wireless data transfer),
- touch screen providing a range of entry options,
- is rugged to withstand drop/shock/wind/dust/wide temperature range and water intrusion,

- has a durable alpha-numeric keyboard
- is ergonomically shaped and light weight,
- fast processing with 128 MB of SDRAM,
- additional storage 128 MB user-accessible Compact Flash card,
- a 2800mAH Lithium-ion battery that can be swapped in the field if needed
- has a variety of desk dock options and
- vehicle dock contains battery charger.

2.9.2 Potential Problems in Obtaining Accurate Water Meter Readings

Whilst the Handheld technology is rugged, powerful and ergonomic there is always the opportunity for an individual Handheld to fail despite being made to endure environmental extremes. Therefore there is always a chance an individual Handheld will fail under drop/shock, vibration, water or dust intrusion. Furthermore there is always the chance that the battery provided is faulty.

Multiple human errors also exist that can lead to inaccurate or poor data collection of the water meter readings. These human errors may include:

- Not docking the handheld,
- Not carrying additional storage into the field,
- Inadequate training of the handheld use,
- Not taking additional batteries into the field, and most importantly
- Not accurately manually inputting the data into the handheld.

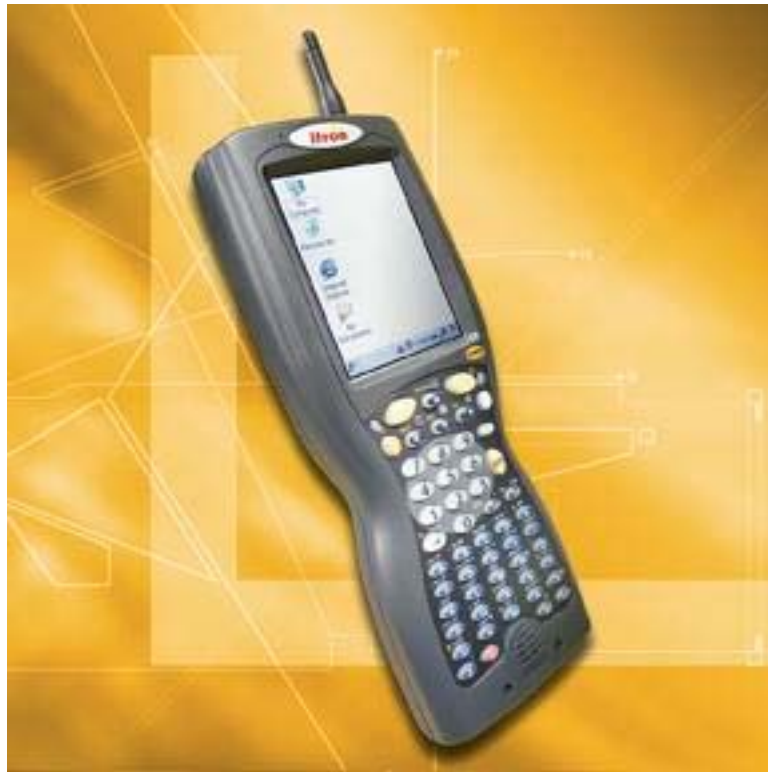


Figure 2.10 Itron FC200 Handheld (Itron Australasia, 2007).

2.10 Summary

Water meters are essential to both the property and the water utility. They ensure individuals pay only for the water their property has consumed and allows the property owners to monitor their water consumption and evaluate their efforts to limit their water usage in this age of drought. Water meters enable the utility to charge for water usage, evaluate and predict water demand and supply, also enabling the utility to evaluate the community's measures and efforts to conserve water.

Water meters have limitations and so do the water utilities that supply, read and maintain them. Knowing this it is essential to at least be able to attempt to fix just one of the many problems of excess water consumption; being able to identify and address properties that exhibit high water consumption rates so that those particular situations can be investigated. This can be done by developing a simple and practical auditing system which flags residences which have higher than average water consumption.

3.0 Methodology

3.1 Introduction

Water has become a precious resource in South East Queensland, with wise management of every drop counting more than ever. As South East Queensland suffers one of the worst droughts on record, the constantly rising population adds increasing pressure on our Council's ability to effectively manage our water supply; to ensure we have an adequate water supply for today and for the future.

It is important that water saving strategies are devised, addressed and implemented by council and government alike, to minimise all actual and potential wastage of the limited amount of precious water we currently have in our dams. It is also important that all water saving strategies devised are utilised appropriately and then governed.

Water can be lost at various locations throughout the water network and three simple ways to help reduce water loss is by ensuring that the standard 13-20mm water meters, used on properties within the community are; accurately reading the amount of water being consumed, that the water meter is in good condition and that the water meter is the adequate size for the water supply that each individual premises demands.

All water meters have measuring limitations and quite often part of the water consumed will not be registered as consumed (Arregui et al, 2005). An area of particular concern are the high water consumers within my target region of Ipswich, as the higher consumption volume by the water meter the quicker the wear and tear on the moving parts therefore leading to greater inaccuracy (Arregui et al, 2005). Outlined within this chapter is the methodology of the work project.

3.2 Understanding Water Meters

A water meter is simply a mechanical device measuring the volumetric flow of water, displaying the consumption value in gallons, cubic feet, cubic meters or kilolitres (within Australia). Water meters are placed within different sections of the water distribution network of a community; for example; at a dam out-take site, at various locations through out the water distribution network and at the entrance to each individual property. Therefore water meters vary in size and type depending on the read function that the meter has to perform.

Within the Ipswich region there are currently about 54,000 water meters installed to individual properties. Their main function is to individually register and record water consumption so that ICC can monitor their consumption volume and thus charge each premises for their water usage. The size of the water meter is dependent upon the volume of water consumption required at each particular property; for example an industrial property requires a greater volume of water than a residential property. The consumption reading taken from each water meter is then converted into set water charges (\$ per kL) for the property for the proportion of water consumed per quarter (year) or month.

As majority (approximately 51,000) of water meters within the Ipswich region are within the standard size of 13-20mm, this report will concentrate only on water meters of the standard size 13-20mm to ensure they are serving their appropriate function.

3.3 Numerical Data

Within the Ipswich region the consumption for each individual 13-20mm water meter is read quarterly. The water consumption volume, in kilolitres, is collected from the field by meter readers and these results are then imported into Ipswich City Council's (ICC) computer database system 'PATHWAYS'. PATHWAYS is a comprehensive program, detailing every aspect of every water meter within Ipswich. The main aspects of water meters are detailed below:

- Local Government Code (Industrial, Commercial and Residential)
- Address of meter

- Serial Number
- Installation date
- Status
- Description/make of meter
- Pipe size of meter
- Total Consumption
- Quarterly reading consumption

The aspect of most importance to this project is the consumption volume for each quarter.

The quarterly consumption data was collected between the periods of May 2003 to May 2007. This period provides a great amount of data that will include water consumption levels before the water restrictions (Level 1-5) were implemented and water consumption levels post implementation of water restrictions, which shall hopefully illustrate a steady decrease in the consumption flow, despite a growing population.

All the data aspects of each water meter were exported from PATHWAYS into an Excel spreadsheet for the data analysis to proceed.

3.4 Sorting of Information

The transferring of PATHWAYS data into an excel database resulted in a huge database of every water meter within Ipswich. Certain criterion was established to remove the water meters that will not be required for this project:

- All meters outside the range of 13-20mm pipe size
- All meters that had a total of 0kL consumption volume
- Only current water meters (no historic water meters)

This resulted in a detailed database of all standard 13-20mm water meters in the Ipswich region.

It was identified within the literature review that water meters may suffer problems that result in an inaccurate meter read. These problems can be related to:

- Consumption volume,
- Age of meter,
- Incorrect Installation,
- Class or type of meter,
- Inappropriate meter size,
- Water Quality,
- Water Pressure & air surges,
- Data Errors, and
- Theft & illegal Use.

With all these factors possibly working at once it can result in the under-registration of the consumption that the standard 13-20mm water consumes. Therefore through research, tests and field experience on water meters over the years the best way to maintain the accuracy levels of the water meter is through the use of a replacement program. A basic meter replacement program is a program in which water meters are to be replaced once it has reaches a certain consumption volume (kL) or age (years), which ever comes first. Throughout Australia the different water service providers have adopted different values for the consumption volume and age to maintain the accuracy of their water metering devices. From testing a batch of water meters IW determined that their replacement criteria was determined as 6000kL or 15 years which ever come first.

So by taking these pre-determined values, we find that the standard 13-20mm water meter should have an average consumption of 1100Lper day (calculations detailed below).

$$6,000\text{kL} / 15 \text{ Years} = 400\text{kL}/\text{year},$$

$$400\text{kL} / 365 \text{ days} = 1095.89\text{L}/\text{day}$$

Therefore rounded up to

1100L/day or 100kL/Quarter

Additionally the consumption volumes taken over this period will illustrate the water meters that are of an extreme high level of consumption for the standard 13-20mm water meter service.

3.5 Outcomes

Using the results obtained from the data analysis, a practical audit program was developed that automatically highlight any residential water meters that have a higher than average water consumption and will therefore require further investigation and/or recommendation to remedy the problems. Additionally other problems that arise will also be illustrated and further investigation and/or recommendation provided.

4.0 Data

4.1 Introduction

The ability to register water consumption is the main purpose and most important aspect of the water meter. As discussed in the literature review the water meter itself is prone, at times, to inaccurate registering of water consumption volume but this chapter focuses on other water meter aspects, data collection and human/information technological errors affecting data accuracy.

Ipswich City Council (ICC) provided me with all the data used for this project; the data was exported from the ICC computer database 'PATHWAYS'. 'PATHWAYS' is a mammoth database containing a multitude of facets (e.g. development, waste, sewer, rates, size, owner etc) on each individual property within the entire Ipswich region. One facet relates directly to each individual water meter; aspects within this facet are water meter size, type of meter, consumption readings, installation date, and serial number etc.

4.2 Water Meter Data

ICC's database system 'PATHWAYS' has many different categories of water meter information for each individual water meter. A full list of every water meter that is registered on 'PATHWAYS' has the following information:

- Area Description
- Run number
- Location of meter
- Owner
- Address
- Status
- Installation Date
- Meter Make
- Size
- Imperial or Metric
- Serial Number

- Rate code
- Total of last read
- Consumption read per Quarter or Month
- Local Government Code

However a lot of the above information does not have any importance within this project, and below is a list of the main categories that require a better understanding and are important in the assessment of water meters.

4.2.1 Consumption

As previously mentioned the water meter's key role is registering consumption volumes of water. The consumption volume recorded is the amount of water consumed by the property which is read in kilolitres (kL) per quarter or month. The quarterly or monthly consumption volume is simply calculated as the difference between the new consumption volume and previous consumption volume; this value obtained is then multiplied by the water consumption charge (dollars per kilolitre) that is currently in place to calculate the total consumption charge (in dollars) for each property. This processes for calculating consumption volume for financial revenue needed explanation as the water meter reading (on the actual water meter) is not cleared at each monthly/quarterly reading, the counter just continues.

The consumption volumes need to be accurate as the under registered consumption volume leads to a loss of water revenue for ICC and the over registering consumption volume leads to the consumer being over charged. Accuracy is also vital in today's water shortage for obvious reasons.

For this project the water consumption values will be taken from May 2003 to May 2007. The five year consumption readings will give a good understanding of the consumption patterns before and during the water restrictions that came into place in early 2005. It is hoped that water consumption values will decrease with the introduction of the water restrictions (Levels 1 to 5) despite an increasing population.

4.2.2 Water Meter Pipe Size

The water meter size is not classified by the measuring device but by the pipe diameter that is fed off the water distribution network, which feeds into the property. The measuring device simply connects onto the specified pipe diameter. The size of a water meter can vary from 13mm to above 300mm and the water meter is sized specifically to the amount of water consumed. For example; the greater the water volume consumed the greater the pipe size needed. Currently a residential property will have a 20mm diameter water meter and a commercial property will have a water meter from 20mm up to 300mm and above.

Within Ipswich there are meters that range from 13mm to 300mm that record the consumption of water for each individual property, with the majority of the meters within the 13-20mm zone.

4.2.3 Installation Date

The installation date of a water meter is the date that the meter is installed to service the individual property. It is very important to have the installation date recorded as it will give a clear indication of the age of the water meter, as over time water meters deteriorate with age. The installation date is necessary for replacement programs to be efficient. The date is collected by Council's qualified tradesmen or a recommended consultant when they install the meter.

4.2.4 Serial Number

Every water meter is labelled with a serial number which is linked to the address of the property. This number is engraved onto the meter either at the top of the meter (Figure 4.1) or on the reading face of the meter. The serial numbers consist of numbers and letters; for example 002478A. It is of importance that when the meter reader records consumption they double check the address and serial number match, ensuring the correct property is being charged for the correct consumption.



Figure 4.1 Engraving of serial number on water meter

4.2.5 Local Government Code

Under local government code every property is labelled Residential, Vacant, Industrial or Commercial etc. It is important all properties are labelled to ensure the most suitably sized water meter is installed for the particular property type. For example commercial businesses often have greater water consumption volumes and therefore will require a larger water meter. Correct water meter size is very important “as any discrepancies in actual water consumption for high usage customers can involve large sums of money” (Queensland Environmental Protection Agency and Wide Bay Water Corporation, 2005)

4.3 Obtaining the Data

The data that is collected and imported into ‘PATHWAYS’ must go through two processes: field data and computer data.

4.3.1 Field Data

This data is the first step of gathering all the information required for the property owners to be billed for their consumption of water. Council employs four Water Meter Readers whose main purpose is visit each property to read the water meter and record the volume consumed. Each of the Water Meter Readers has a set run area (region with Ipswich) that they collect the data from. The water meter reading is an obviously an ongoing process to cover the entire Ipswich region.

The Meter Readers gather the data with the use of the electronic handheld FC200 Itron product which is discussed in the Literature Review and illustrated on Figure 2.10.

While the data is being inputted into the electronic handheld system, the meter readers conduct additional checks on meters such as the previously mentioned check to ensure the water meter serial number and the property address matches with the data on the handheld device. If the Water Meter Reader discovers a property with consumption volume reading that is 100kL greater than the previous reading further checks need to be conducted. The Water Meter Reader needs to double check the reading, serial number and property address then inputs a confirmation that the meter read is okay. This then lets the ICC officers in the rates department know that the reading has been doubled checked and the property owner will be notified with a letter of high consumption.

Once the data is collected the electronic handheld devices are taken back to the office where the data is uploaded from the handheld device into PATHWAYS.

4.4 Accuracy of Obtaining Water Meter Data for the Project.

It is assumed that the data collected from Ipswich City Councils database PATHWAYS is reasonably accurate given that water meter data is collected either quarterly (four times a year) or monthly (twelve times a year) and large obvious errors should be easily identified within the data. However there were a few errors that occurred within the data that affected the progress of the project.

In May 2007 when obtaining the water meter data from PATHWAYS the 2007/4 quarter reading produced some dramatic errors. Out of the 49000 water meters within Ipswich approximately 2000 water meters, for this period, produced an obviously overly high consumption volume of 1,000kL to 9,999,999kL. This data was noticeable when calculating the average consumption for each quarterly period as there was a rapid jump in the 2007/4 period. The data was downloaded again which reduced the errors but was time consuming as I had to individually check that all the previous errors had not returned.

4.4.1 Water Meter Installation Date

Some water meters were missing an installation date as in previous years this was not seen as a piece of important information that needed recording. Therefore the age of the water meter in some instances can only be assumed. This issue becomes quite important in Water Meter Replacement Programs discussed in the methodology chapter.

4.4.2 PATHWAYS Deficit

PATHWAYS is never going to be 100% 'up to date' as there are only four Meter Readers (who work full time) to gather the field information. So while information is uploaded daily to PATHWAYS the data for the complete Ipswich region is never going to be 100% current. I have tried to make allowances for this by spanning this project over five years (May 2002 to May 2007).

And as mentioned in the literature review the field data is manually recorded by the meter readers so open to human error and technological problems can occur with the hand-held electronic device, ICC computers and PATHWAYS software. All these factors can affect data accuracy.

4.5 Conclusion

Overall the data obtained is assumed to be accurate, as the properties of Ipswich have been billed according to this data, however we need to be aware that there are many factors that may have affected the data accuracy and bear this in mind.

5.0 Existing Method for Maintaining Water Meter Accuracy

5.1 Introduction

Through the past years there have been multiple methods within Ipswich Water and other Australian water utilities to maintain water meter accuracy. These methods are summarised and reviewed to help in determining the process I adopted to categorize high water consumers within Ipswich.

Therefore through research, tests and field experience on water meters over the years the best way to maintain the accuracy levels of the water meter is through the use of the methods described below, to help minimise the loss of water from the 13 -20mm water meter.

5.2 Replacement Programs

5.2.1 Consumption and Age Replacement Program

Throughout Australia water utilities have devised various practices to maintain accuracy of their water metering devices. Most water utilities determined the best way to obtain accuracy in their water meters was to setup a Water Meter Replacement Program. Water Meter Replacement Programs are programs which strive to replace individual water meters once they reach a certain consumption volume or age in years, whichever comes first.

Meter replacement strategies vary from countries, states and local water utilities. However majority of the water utilities have similar age criteria (for example 10 to 15 years in age) but vastly differ on the cumulative volume criteria. Listed below are a few broad examples that are used throughout Australia for 20mm diameter water meters (Marsden Jacob Associates, 2007).

Water Supply Provider	Cumulative Volume (kL)	Maximum Age (years)
20mm diameter water meters		
Sydney Water	10	2400
NT PowerWater	10	7000
Gold Coast Water	12	3600
SA Water	12	3600
Shoalhaven Water	10	3500
Barwon Water	13	5000

Table 5.1 Replacement strategies in other areas (Marsden Jacob Associates, 2007).

All these values of volume and age are obtained through the batch testing of water meters over time. Water meters have different errors at different flow rates due to the amount of water passing through without activating the registration mechanism; a phenomenon known as ‘Meter Slip’ (Tennakoon & Egbar, 2003). This slipping is dependant on a number of factors which is highlighted within the literature review chapter. As the meter increases in cumulative volume and age the higher the slippage occurs (Tennakoon & Egbar, 2003).

Each meter will be tested under different flow rates and in accordance with the relevant Australian Standard (currently AS3565.4-2007). The error of the meter is then calculated by adding the weighted average errors at the number of test flow rates (Tennakoon & Egbar, 2003) therefore determining the error percentage for each meter tested. This data is then imported into a graph illustrating the cumulative volume vs error and age vs error. A regression line of best fit will illustrate the error percentage of best fit. The water utilities will determine an error percentage (over time or volume) that produces a loss of revenue, which will determine the age and cumulative volume for replacement.

Some water utilities will adopt a replacement cumulative volume and age from their one off selection of batch water meters for testing, however other water utilities will continue to test water meters from the replaced water meters for future comparative analysis e.g. five percent of each replacement batch.

ICC used to base their replacement program on the criteria of 6000kL or 15 years which ever come first. This was determined by batch tests on a selected quantity of water meters varying in cumulative volume and age. The test results then determined the cumulative volume and age as stated above.

5.2.2 Economical Replacement

Ipswich Water's current approach is based on economics. The meters are replaced based upon the calculation of potential lost revenue, associated with increasing inaccuracy, compared to the cost of meter replacement at a point in time. Local revenue is related to the water that a meter is predicted not to account for, which total registration increases with usage (a regression line of accuracy vs registration established from testing of in-service meters). All the meters are then grouped in accordance with their relevant meter run zones and average annual lost revenue per meter per run zone determined for the purposes of prioritising replacements.

This replacement model used all the data obtained previously from the batch testing of the water meters and is still currently in use.

5.3 Conclusion

The above methods are reasonable approaches to the replacement of water meters and are working beneficially within each water utilities region. The water meter replacement processes illustrate the main purpose to ensure that water is not lost and maximum revenue is obtained. In particular, Ipswich Water has adopted the economical approach to help ensure maximum revenue.

However as this project is concentrating on the high water users the information used to determine the replacement strategy used in Ipswich will assist in the categorization of the high water users. The values of major importance will be the use of the previous adopted values for the meter replacement (6000kL and 15 years) these values will help determine how we categorize the higher water users.

6.0 Method and Data Analysis

6.1 Introduction

This chapter outlines the processes that were followed in the determination of the categorization of the high water users. This chapter explores and evaluates the information obtained from the literature review and the data obtained from Ipswich City Council's (ICC) PATHWAYS computer database. Much of the background and influencing factors have already been mentioned in the Literature Review.

6.2 Set-up of Database

Every aspect (e.g. installation date, serial number, age etc.) of each individual water meter, within the Ipswich region, was exported from PATHWAYS into an Excel spreadsheet. This resulted in an enormous database as every aspect of all 54,000 water meters was illustrated. Certain criteria had to be determined to remove all water meters that are not relevant to the project, from the database. The criteria determined to expel irrelevant water meters from the database are as follows:

- All meters outside the range of 13-20mm pipe size (as this assignment focuses only on the common 13-20mm water meters)
- All meters that had a total of 0 kL consumption volume as these water meters are either brand new or situated on vacant premises.
- No historic water meters.

After applying the exclusion criteria 49,000 water meters remained.

6.3 Data Sorting

Findings from previous studies, research and field testing of water meters from all different water utilities has shown that once a water meter has reached a recommended age or total consumption volume the water meter starts to under-register the consumption flow resulting in a great loss in water revenue for the water utility. To

ensure the water utilities get the maximum usage from a water meter, it is hoped that the meter reaches its cumulative volume by the time it reaches its recommended age. Therefore by adopting the replacement cumulative volume and age it can be determined what the average consumption per year, quarter, month or day to help control the high water users.

Within the Ipswich Region it was determined that ICC has previously adopted a water meter replacement program for water meters between the sizes of 13-20mm. The replacement values adopted by this replacement program were a consumption value of 6000kL and a water meter age of 15 years. The determination of these values is highlighted within Existing Method for Maintaining Water Meter Accuracy - chapter 5.

Therefore using the adopted values of 6000kL and 15 years we find that the 13-20mm diameter water meter within Ipswich should have an average consumption of 1100L/day (calculations detailed below).

$$\begin{aligned} 6,000\text{kL} / 15 \text{ Years} &= 400\text{kL/year}, \\ 400\text{kL} / 365 \text{ days} &= 1095.89\text{L/day} \end{aligned}$$

Therefore rounded up to

1100L/day or 100kL/Quarter

Further recommendation for the adopted value for high water users is that:

- We are currently under Level 5 Water Restriction with a Target of 140 L per person per day per household;
- All residential water meter consumptions greater than 800 L per day are categorized as high water users.
- Additionally outlined below replacement programs from 5 out of the 6 water utilities have a lower average L/day (replacement values outlined in Table 5.1).

$$\text{Sydney Water} = 2400\text{kL} / 10 \text{ Years} = 660\text{L/day}$$

$$\text{NT PowerWater} = 7000\text{kL} / 10 \text{ Years} = 1920\text{L/day}$$

$$\text{Gold Coast Water} = 3600\text{kL} / 12 \text{ Years} = 820\text{L/day}$$

$$\text{SA Water} = 3600\text{kL} / 12 \text{ Years} = 820\text{L/day}$$

$$\text{Shoalhaven Water} = 3500\text{kL} / 10 \text{ Years} = 960\text{L/day}$$

Barwon Water = 5000kL / 13 Years = 1050L/day

Therefore adopting a consumption value over the 1100L/day to the average registered consumption volume of the last four quarter readings (2007 period – most current) is a suitable indication of properties with high water usage.

A final database was then set up which highlights all the 13-20mm water meters that are above the 1100L/day (Appendix B). The database includes all the information on the water meter as specified within Chapter 4 – Data, with the most important aspects being quarterly consumption, age and local government code.

From the database created to highlight high water users it was obvious that further criteria needed to be established to highlight properties with extremely high levels of water consumption.

6.4 Outcome of Results

The value of (greater than or equal to) 1100L/day should be adopted to identify high water consumption properties within all 13-20mm water meters with the Ipswich region. Further more the value of (greater than or equal to) 4000L/day should be adopted to identify properties with extremely high water consumption. These properties need further investigation by the water utility by way of water meter inspection, letter to the property owners and highlighting in the database for re-examination at the next quarterly or monthly water meter reading.

6.5 Conclusion

Using vital information provided by PATHWAYS a database was established enabling analysis of water consumption of all premises within Ipswich with a 13-20mm water meter. This database will greatly assist the minimisation of loss of revenue and loss of the resource of water by highlighting all properties with high water consumption. Through highlighting these properties and through subsequent investigations technical problems can be remedied or owners can be reproached.

7.0 Recommendations

7.1 Introduction

This chapter briefly discusses the main findings of the project and possible recommendations for the future. From the data gathered (provided on the entire water meter between 13-20mm diameters over the five year period of May 2003 to May 2007) a trial process was conducted using the adopted high water user's value of 1100L/day. The trial highlighted a number of concerns and possible recommendations were then provided. The proposed recommendations below should be trialed and tested to see if these recommendations are beneficial.

Please note that the individual premises that are found to have high water consumption rates will not be identified as the information is confidential and the premises' privacy needs to be maintained. This project aims only to use that data (litres per residence) to illustrate water consumption averages so that future high or extremely high water users can be identified and investigated. If further investigations are undertaken (of these properties) this will be done by the ICC who has the authority to investigate and practice with professional confidentiality.

The analysis on all the 13-20mm diameter water meters that have consumption rates above the high use volume of 1100L/day are highlighted within Appendix B. From the analysis the following findings were evident:

1. Some single residential properties consumed a greater volume of water than; a multi-residential, a commercial site working as a nursery production unit, a hotel/tavern and even a rural property working as a beef cattle farm.
2. Some properties which were highlighted under the Local Government Code as being Vacant consumed high volumes of water.
3. Some residential, commercial and rural properties had extremely high levels of water consumption.

4. The increase in water consumption in the 2007 period was greater than previous years, even though water restrictions had been introduced.

Found below are illustrations of the project's findings and recommendations to improve these problems.

7.2 High Water Users

The outcome established in Chapter 6 – Method and Data Analysis, illustrated all water meters consuming over the 1100L/day; this is approximately 5% of all water meters and has been shown graphically in Figure 7.1. This is only a small percentage of the overall number of water meters but these meters are consuming such a great amount of water they may be creating huge water wastage and is therefore significant and needs to be investigated.

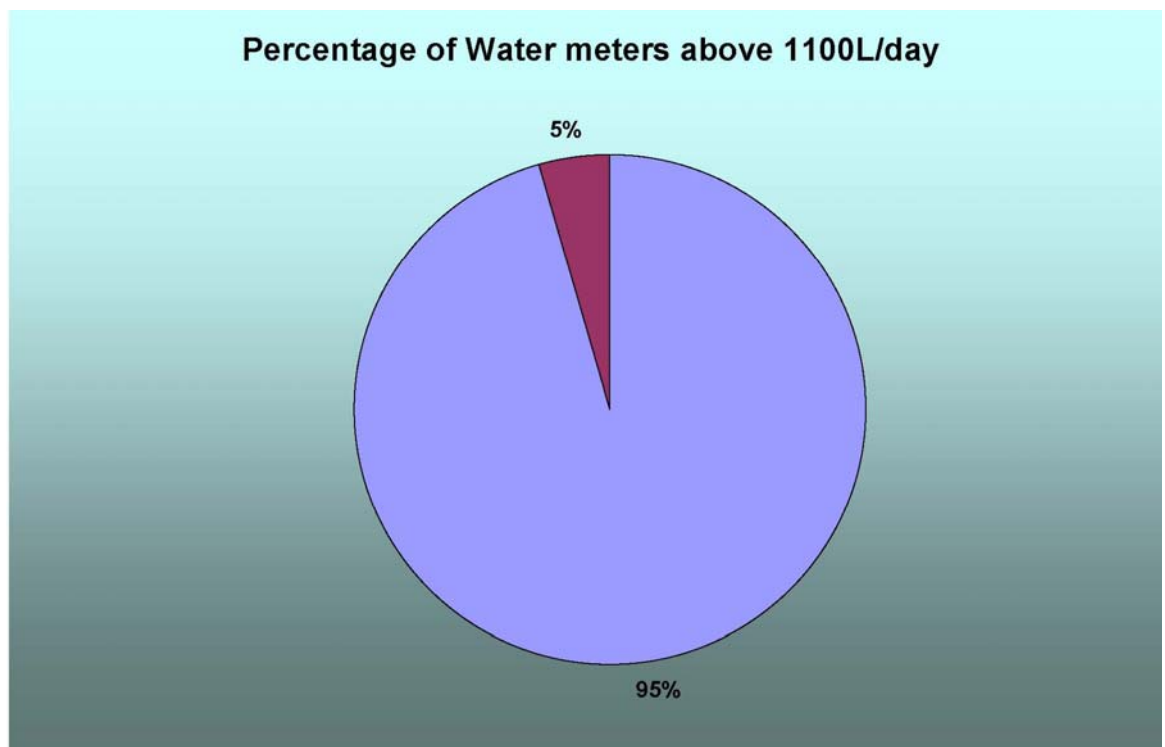


Figure 7.1 Percentage of water meters above 1100L/day

For all the properties that are over the adopted value of 1100L/per day the following procedures set in place:

- The high water consumption properties shall be highlighted within the field import devices so that once the meter readers come to input the consumption volume they are informed to double check the consumption value on the meter, check the condition of the meter and check for any leaks which may be noticeable surrounding the meter itself. The meter reader will then confirm electronically that the meter is okay or they shall make a note of any errors that they notice.
- Additionally the high water consumption properties shall have letters sent to the property owners informing them of their consumption volume. Within the letter the owner will be educated on the use of water saving strategies and how to check for leaks.
- Further to the letters, a door knock to high water consumption properties will be conducted by qualified council employees who will inform the owners of water saving strategies and answer question in person to ensure the owner is fully educated on water usage. It will also be useful if the property is residential, to assess how many persons live within the property as the water consumption may be put into context and not actually be high (based on the number of people residing there).

7.3 Extremely High Water Users

After conducting the categorization of the high water users it was found that we adopted an extreme high water use volume of 4000L/day. Additionally we calculated the average consumption of the water meter over the past five years and compared it to the last four quarterly reading and the average consumption for all 13-20mm water meter throughout the Ipswich region. As clearly shown on Figure 7.2 it illustrates that the consumption volumes for some water meters have increased dramatically in the 2007 period which raises concerns, as this is a period where water restriction Level 4 and Level 5 were introduced which should have resulted in a decrease in consumption.

Comparison of consumption averages for the extremely high water users

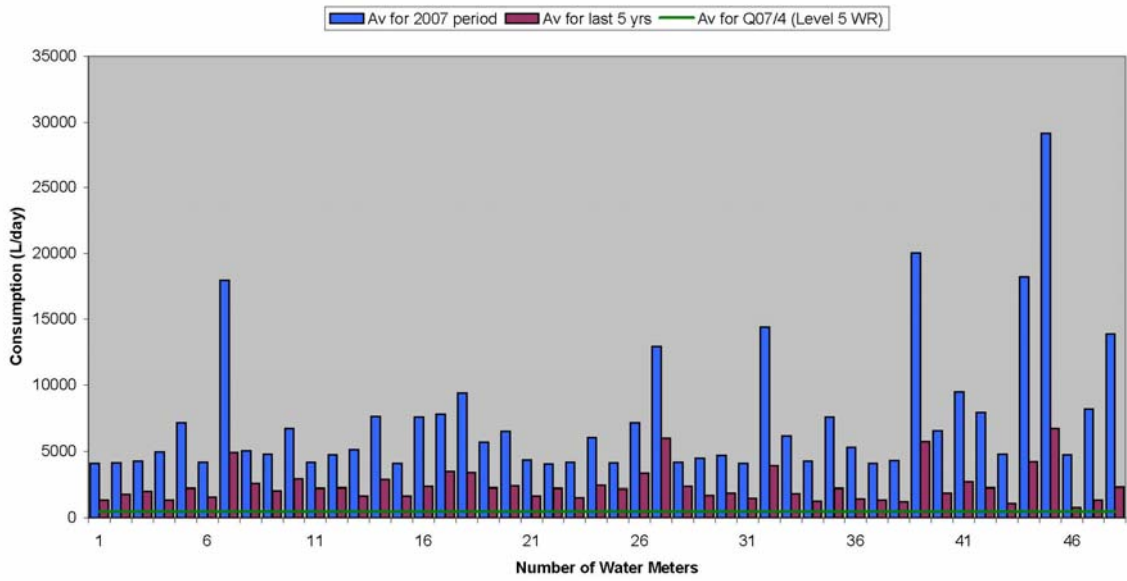


Figure 7.2 Comparison of consumption averages for the extremely high water users

Further to this Figure 7.3 illustrates the consumption volume of water for each quarter reading over the period when water restrictions have come into place. This figure clearly illustrates the water consumption increasing not decreasing.

Consumption patterns of three water meters over the 4000L/day

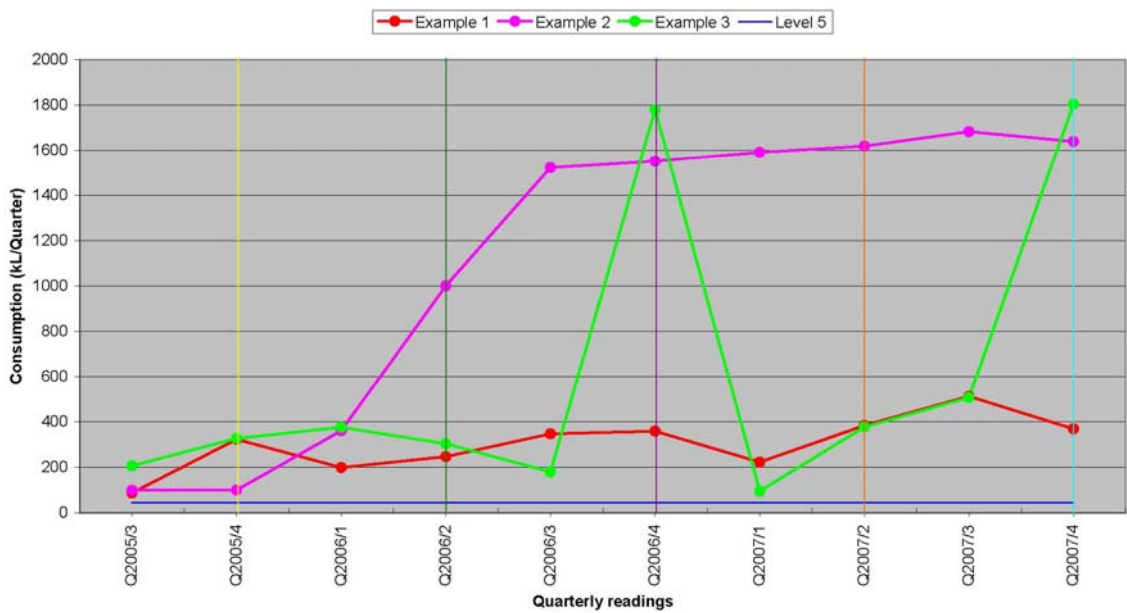


Figure 7.3 Consumption patterns of three water meters over 4000L/day.

For all the properties that are zoned as industrial or commercial and have a daily consumption volume over the adopted value of 4000L/per day will be highlighted for further investigation to ensure the correct water meter size is installed. Council will be required to research into obtaining a system or use manufactures guidelines in determining the correct meter size from the consumption patterns.

Properties that are zoned as residential and have a daily consumption volume over the adopted value of 4000L/day may be home businesses, for example florist, nursery, dog wash etc. These properties will be highlighted and door knocks will be required as stated above. Additionally further research will be into adding another category under the Home Based Activities Code which is located within councils planning scheme. Examples are residential properties also used as home businesses and their consumption volume exceeds a maximum limit; then they will be charged a higher consumption charge rate.

7.4 Properties Classified Vacant

Some properties that are classified as Vacant under the Local Government Code system are actually consuming water and some in volumes that highlights them as high water consumers. It is recommended that ICC conduct further research into this issue to ensure that the properties have been occupied and the local government code changed (residential dwelling, commercial shed etc), as these properties may be a source of illegal water supply. These vacant properties which have a water consumption and especially those that are over the high water consumption volume will be highlighted within the field import devices allowing the meter reader to conduct an assessment at the premise.

8.0 Conclusion

Australia is a very lucky country as everyone has access to clear, healthy water. This may not always be the case and we need to ensure we nurture our precious resource and treat its use with wisdom and respect.

The rise in population within the south east Queensland region continually demands more water will be required to service this increasing population. So to keep water available long term, we need to conserve every last drop and minimise wastage.

With the Ipswich region being the focus of my study, I was granted access to its water utility, Ipswich Water (a division of Ipswich City Council), and was privileged to acquire access to Ipswich City Council's database PATHWAYS; a database detailing all aspects of Ipswich's water distribution network.

This study analysed all 13–20 mm water meters within Ipswich and determined recommended values that should be installed by the local council to highlight premises that have high or extremely high water consumption rates. The values calculated are 1100L/day for high water consumers or 4000L/day for extremely high water consumers. The proposal then recommended is a three step follow-up plan to investigate these premises and determine cause for the high water usage and act accordingly. The three steps in brief include:

1. Highlighting the property on the external hand-held device used by the meter readers to flag the property as a high consumer at the subsequent reading,
2. Letter to premises asking for cause of the high water consumption level and provision of water saving strategies and water restriction guidelines and
3. Personal investigation of the premise by both inspection of the meter to assess for fault and by door-knock to speak with the premise owners.

Depending on the outcome of the investigation various courses of action can be taken or recommended to the premise. For example:

- Change of water meter to a more suitable size,
- Replacement of the water meter,
- Changing of local government code classification,

- Repair of faulty plumbing, and
- Premise owner education of water saving strategies,

While this study aims to determine possible water wastage for sustainability, it is important that water is not wasted as it is a form of revenue for the local council. As for the consumer, they want to ensure that they are only paying for the water consumed.

8.1 Further Work

This project has determined a procedure and has highlighted all Ipswich high water consumption properties that have water meters within the 13-20 mm diameter size. As these water meters have only been highlighted, further investigation by the local government to adopt an action plan, such as the one determined in this study, to ensure that water is being conserved. Each day more and more water will be wasted if nothing is done. Further ways water meters can be used to ensure minimal water wastage and accurate recording of consumption are as follows.

8.1.1 Australian Standard

The Australia Standard (AS 3565.4-2007) Meters for Water Supply – Part 4: In-service Compliance Testing was published in May 2007. This Standard has been updated to help ensure that meter accuracy is maintained. This standard has a procedure in place for testing water meters. Ipswich City Council should conduct further research into adopting the testing procedure from AS3565.4-2007

8.1.2 Meter Replacement

Each year certain funding is supplied for the replacement of the inaccurate water meters, once these meters are replaced the old meters are disposed of. Ipswich City Council should select a batch for testing eg 5% of the replaced meters. These meters shall then be further tested for future comparative analysis.

8.2.3 Surrounding Councils

Discuss with surrounding Councils on sharing data from either testing procedures or their replacement programs. This will increase the knowledge on water meters to help ensure water is saved.

8.2.4 Larger Meters

The similar processes set in place to ensure that water meters that are of a larger size (greater than 20mm) have a audit system set up to ensure that they are sized correctly, as some properties may have meter too large or too small for their consumption volumes.

8.2.5 The Condition of Meters

Many existing meters are not in the best condition for the meter readers to read and record the information accurately. These meters can be full of soil, ant nests, insects, covered by gardens, grass cover growing over the meter box etc. Appendix C illustrates the condition that many water meters are in. These factors interrupt in the recording of accurate water consumption. It is proposed that Council could instill a Work for the Dole program in which these citizens can, every quarterly or half yearly, clean out the meter boxes so the meter readers can gather the data easily and efficiently.

8.2.6 Technology

With technology improving daily there are always new and improved metering devices coming onto the market which could be a worthwhile investment. If new technologies are adopted by ICC, they should ensure the technology is trialed and tested technology before full adoption.

The introduction of new water meter technology will eliminate a lot of errors. New technology will reduce under registration, enhance meter longevity and eliminate human error, so that water losses in the future should become smaller and smaller.

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APPENDIX A

Project Specifications

**UNIVERSITY OF SOUTHERN QUEENSLAND
FACULTY OF ENGINEERING AND SURVEYING**

**ENG4111/ENG4112 RESEARCH PROJECT
PROJECT SPECIFICATION**

Student: Chris Martin
Project Topic: Ipswich City Council Water Supply Infrastructure Capacity
- High Water Usage Consumers and Meter Accuracy
Supervisor: David Thorpe -Senior Lecturer, USQ
Chris Egbars - A/Manager Strategic Asset Manager, Ipswich Water
Project Aim: This project aims to analyse all the 13-20mm sized water meters, within Ipswich, to allow development of a practical audit system that unearths properties that have an excessive water consumption rate.


Programme: Issue B – 6 September 2007


1. Research and undertake literature review of the background information relating to 13-20mm diameter water meters and their usage.
2. Data collection and sorting of Ipswich property consumptions and meter characteristics from Council's customer database (Pathways).
3. Analyse usage data and categorise the high water users taking account of likely meter inaccuracy.
4. Tabulate the results into graphs and tables to visually illustrate the consumers of concern, related under-reading of meters and possible savings that can be achieved for reasonable levels of water use.
5. Investigate and outline factors affecting the results from the meters.
6. Preparation of the project report.

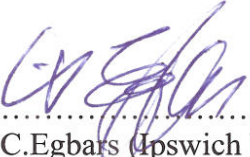
As time permits -

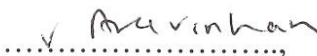
7. Prepare an audit program incorporating liaison with customers and field inspections of properties of concern.

Agreed:


.....(Student)
C. Martin
Date 6/9/07


....., (Supervisor)
D. Thorpe (USQ)
Date 12/9/07


..... (Supervisor)
C.Egbars (Ipswich Water)
Date 6/9/07


.....
Assistant Examiner
Date

APPENDIX B

Database of Water Meters above 1100kL/day

96	Quarterly Reports	7/02/19/03/Current	20	76	107	101	107	160	115	120	105	92	114	114	12	156	116	128	132	137	142,27	2372	118,80	1303,30	1409,54	Residential	Dwelling
97	Quarterly Reports	8/02/19/03/Current	20	89	108	108	126	111	147	124	130	131	189	161	152	159	141	119	129	141	14,27	2664	133,20	1463,74	1495,04	Residential	Dwelling
98	Quarterly Reports	9/02/19/03/Current	20	76	117	124	99	88	299	309	146	114	218	100	192	194	133	118	184	118	14,27	3012	165,90	1654,95	1691,99	Residential	Dwelling
99	Quarterly Reports	10/02/19/03/Current	20	38	45	219	206	56	52	42	63	98	60	356	74	92	195	156	104	100	14,26	2281	114,05	1233,30	1115,35	Residential	Dwelling
100	Quarterly Reports	11/02/19/03/Current	20	41	92	174	246	96	83	176	125	169	183	165	265	139	161	78	250	90	14,26	2798	139,90	1537,36	1439,56	Residential	Dwelling
101	Quarterly Reports	12/02/19/03/Current	20	61	92	174	246	96	83	176	125	169	183	165	265	139	161	78	250	90	14,26	2798	139,90	1537,36	1439,56	Residential	Dwelling
102	Quarterly Reports	1/02/19/03/Current	20	41	92	174	246	96	83	176	125	169	183	165	265	139	161	78	250	90	14,26	2798	139,90	1537,36	1439,56	Residential	Dwelling
103	Quarterly Reports	2/02/19/03/Current	20	38	45	219	206	56	52	42	63	98	60	356	74	92	195	156	104	100	14,26	2281	114,05	1233,30	1115,35	Residential	Dwelling
104	Quarterly Reports	3/02/19/03/Current	20	38	45	219	206	56	52	42	63	98	60	356	74	92	195	156	104	100	14,26	2281	114,05	1233,30	1115,35	Residential	Dwelling
105	Quarterly Reports	4/02/19/03/Current	20	68	105	112	75	91	158	127	94	103	175	140	159	90	116	140	116	116	14,25	2268	110,40	1213,19	1233,56	Residential	Dwelling
106	Quarterly Reports	5/02/19/03/Current	20	27	82	122	57	63	78	67	60	445	107	85	145	107	85	145	107	85	14,24	1844	92,20	1013,19	1033,54	Residential	Dwelling
107	Quarterly Reports	6/02/19/03/Current	20	108	87	105	111	117	133	117	120	65	87	84	140	122	125	146	116	116	14,24	2317	115,85	1273,08	1299,46	Residential	Dwelling
108	Quarterly Reports	7/02/19/03/Current	20	83	125	127	125	131	143	121	122	121	124	124	124	124	124	124	124	124	14,23	2480	99,40	1382,84	1435,61	Residential	Dwelling
109	Quarterly Reports	8/02/19/03/Current	20	64	91	106	73	70	82	43	32	48	75	74	74	74	74	74	74	74	14,23	1380	69,40	1382,84	1435,61	Residential	Dwelling
110	Quarterly Reports	9/02/19/03/Current	20	135	67	94	121	101	126	105	98	109	124	130	171	140	92	138	97	95	14,23	4261	122,65	1346,70	1453,86	Residential	Dwelling
111	Quarterly Reports	10/02/19/03/Current	20	47	67	80	64	70	95	166	65	100	126	115	139	120	116	100	119	109	14,23	2077	103,35	1141,21	1153,97	Residential	Dwelling
112	Quarterly Reports	11/02/19/03/Current	20	102	118	110	22	53	87	104	148	181	205	210	178	147	166	140	127	144	14,22	2859	146,85	1614,84	1676,82	Commercial	Stops Single
113	Quarterly Reports	12/02/19/03/Current	20	20	56	110	22	53	87	104	148	181	205	210	178	147	166	140	127	144	14,22	2859	146,85	1614,84	1676,82	Commercial	Stops Single
114	Quarterly Reports	1/02/19/03/Current	20	116	108	122	112	120	111	124	111	128	122	111	124	111	128	122	111	124	14,22	2538	113,80	1228,57	1258,99	Residential	Dwelling
115	Quarterly Reports	2/02/19/03/Current	20	86	73	75	85	97	127	122	112	120	111	124	111	128	122	111	124	111	14,22	2538	113,80	1228,57	1258,99	Residential	Dwelling
116	Quarterly Reports	3/02/19/03/Current	20	79	220	238	141	137	143	159	173	189	176	192	200	174	181	191	204	174	14,19	2719	133,95	1463,96	1514,84	Residential	Dwelling
117	Quarterly Reports	4/02/19/03/Current	20	59	64	101	88	75	82	86	103	105	383	148	76	83	103	104	82	105	14,18	2315	115,75	1271,96	1305,49	Residential	Dwelling
118	Quarterly Reports	5/02/19/03/Current	20	107	221	261	84	54	105	24	149	153	139	288	84	113	121	38	91	117	14,18	2674	143,70	1579,12	1601,65	Residential	Dwelling
119	Quarterly Reports	6/02/19/03/Current	20	74	93	134	92	74	160	145	97	138	23	39	61	177	138	161	176	166	14,19	2326	116,30	1278,02	1300,00	Residential	Dwelling
120	Quarterly Reports	7/02/19/03/Current	20	273	215	249	224	259	139	164	87	64	123	104	76	102	208	244	166	122	14,20	3106	165,30	1706,99	1835,71	Residential	Dwelling
121	Quarterly Reports	8/02/19/03/Current	20	42	69	70	72	50	56	62	46	49	53	53	52	70	116	71	45	107	14,19	1465	70,25	771,66	791,37	Residential	Dwelling
122	Quarterly Reports	9/02/19/03/Current	20	140	107	164	113	103	180	146	136	166	146	97	179	174	150	175	162	108	14,19	2784	139,20	1520,67	1619,27	Rural	Dwelling
123	Quarterly Reports	10/02/19/03/Current	20	76	60	55	56	56	57	58	61	55	58	66	70	82	71	94	92	103	14,19	1532	76,60	841,76	871,62	Residential	Dwelling
124	Quarterly Reports	11/02/19/03/Current	20	79	220	238	141	137	143	159	173	189	176	192	200	174	181	191	204	174	14,19	2719	133,95	1463,96	1514,84	Residential	Dwelling
125	Quarterly Reports	12/02/19/03/Current	20	79	220	238	141	137	143	159	173	189	176	192	200	174	181	191	204	174	14,19	2719	133,95	1463,96	1514,84	Residential	Dwelling
126	Quarterly Reports	1/03/19/03/Current	20	82	250	344	153	113	138	207	311	333	100	253	175	161	165	145	148	143	14,18	3277	163,85	1800,95	1856,04	Rural	Dwelling
127	Quarterly Reports	2/03/19/03/Current	20	23	24	26	29	21	1	0	9	7	1	0	0	0	0	0	0	0	14,18	992	49,60	545,05	551,43	Residential	Dwelling
128	Quarterly Reports	3/03/19/03/Current	20	88	90	79	90	126	79	113	105	125	115	116	111	114	107	98	138	109	14,18	2115	105,75	1162,09	1189,96	Residential	Dwelling
129	Quarterly Reports	4/03/19/03/Current	20	96	98	109	90	83	92	86	93	86	93	86	93	86	93	86	93	86	14,18	2115	105,75	1162,09	1189,96	Residential	Dwelling
130	Quarterly Reports	5/03/19/03/Current	20	31	21	28	30	32	41	41	67	62	104	99	96	104	99	96	104	99	14,17	1519	75,05	834,02	850,30	Residential	Dwelling
131	Quarterly Reports	6/03/19/03/Current	20	96	98	109	90	83	92	86	93	86	93	86	93	86	93	86	93	86	14,17	2697	131,35	1443,41	1479,67	Residential	Dwelling
132	Quarterly Reports	7/03/19/03/Current	20	115	122	124	124	124	124	124	124	124	124	124	124	124	124	124	124	124	14,16	4629	1100,15	1100,15	1100,15	Residential	Dwelling
133	Quarterly Reports	8/03/19/03/Current	20	48	58	67	43	47	53	40	46	40	44	45	45	39	44	39	44	39	14,16	1967	97,45	1075,27	1125,49	Residential	Dwelling
134	Quarterly Reports	9/03/19/03/Current	20	48	58	67	43	47	53	40	46	40	44	45	45	39	44	39	44	39	14,16	1967	97,45	1075,27	1125,49	Residential	Dwelling
135	Quarterly Reports	10/03/19/03/Current	20	88	113	100	104	104	104	104	104	104	104	104	104	104	104	104	104	104	14,15	2583	64,45	704,95	725,42	Residential	Strap Title - Residential
136	Quarterly Reports	11/03/19/03/Current	20	88	113	100	104	104	104	104	104	104	104	104	104	104	104	104	104	104	14,15	2583	64,45	704,95	725,42	Residential	Strap Title - Residential
137	Quarterly Reports	12/03/19/03/Current	20	88	113	100	104	104	104	104	104	104	104	104	104	104	104	104	104	104	14,15	2583	64,45	704,95	725,42	Residential	Strap Title - Residential
138	Quarterly Reports	1/04/19/03/Current	20	51	80	81	240	84	244	156	152	161	259	149	254	185	125	138	100	97	14,14	3062	65,10	1680,44	1736,37	Residential	Dwelling
139	Quarterly Reports	2/04/19/03/Current	20	36	50	39	51	48	61	48	51	69	102	103	64	52	39	44	68	137	14,14	1726	66,40	840,35	877,06	Residential	Dwelling
140	Quarterly Reports	3/04/19/03/Current	20	75	92	101	89	49	26	84	168	91	53	66	53	67	66	70	66	66	14,14	2327	103,35	1156,92	1200,89	Rural	Vacant Land
141	Quarterly Reports	4/04/19/03/Current	20	115	120	143	120	96	113	87	81	78	69	46	30	65	76	96	148	92	14,13	1809	95,45	1048,90	1101,65	Rural	Cattle Breeding/Altering
142	Quarterly Reports	5/04/19/03/Current	20	60	126	212	124	124	124	124	124	124	124	124	124	124	124	124	124	124	14,13	3162	159,60	1743,85	1815,54	Residential	Dwelling
143	Quarterly Reports	6/04/19/03/Current	20	103	224	169	78	113	148	100	206	144	210	206	144	118	129	109	113	143	14,13	2666	133,30	1464,84	1581,46	Residential	Dwelling
144	Quarterly Reports	7/04/19/03/Current	20	51	80	81	240	84	244	156	152	161	259	149	254	185	125	138	100	97	14,12	3062	65,10	1680,44	1736,37	Residential	Dwelling
145	Quarterly Reports	8/04/19/03/Current	20	3	11	23	158	124	160	255	313	343	383	407	661	269	160	103	537	140	14,12	5198	269,30	2626,04	330,25	Residential	Dwelling
146	Quarterly Reports	9/04/19/03/Current	20	116	268	394	174	174	163	108	145	165	179	171	174	138	144	145	145	145	14,12	428	159,45	1752,20	1770,33	Residential	Dwelling
147	Quarterly Reports	10/04/1																									

Table with columns: Parcel ID, Property Description, Area, Value, Tax, and other metrics. The table lists numerous parcels, many of which are 'Current' or 'Under Review'.

568	Quarterly Reports	13/08/1934	Current	20	89	94	91	81	96	119	112	120	134	145	133	144	261	580	121	102	83	12.93	2858	142.30	1570.33	886	24.34.07	Residential	Dwelling
569	Quarterly Reports	13/08/1934	Current	20	88	97	144	124	93	101	136	117	124	122	120	101	94	95	108	100	88	12.21	2286	114.30	1526.04	450	12.36.26	Residential	Dwelling
570	Quarterly Reports	14/08/1934	Current	20	412	892	171	143	119	103	114	603	533	407	99	102	111	97	117	117	123	12.52	2475	123.75	1359.89	415	14.01.11	Residential	Dwelling
571	Quarterly Reports	14/08/1934	Current	20	2	5	3	4	3	4	3	3	4	3	4	3	4	3	4	3	4	12.61	3372	68.60	733.85	403	11.07.14	Residential	Dwelling
572	Quarterly Reports	14/08/1934	Current	20	41	69	80	53	62	63	53	42	57	106	103	77	103	107	116	103	77	12.61	3179	105.80	1160.44	424	11.64.84	Residential	Dwelling
573	Quarterly Reports	15/08/1934	Current	20	130	147	160	170	137	144	123	166	209	164	150	235	217	162	148	138	93	12.1	3179	158.95	1746.70	472	11.96.70	Residential	Dwelling
574	Quarterly Reports	15/08/1934	Current	20	130	147	160	170	137	144	123	166	209	164	150	235	217	162	148	138	93	12.1	3179	158.95	1746.70	472	11.96.70	Residential	Dwelling
575	Quarterly Reports	20/08/1934	Current	20	178	265	243	67	60	95	142	112	102	125	144	201	194	146	146	146	146	12.30	3485	103.25	1033.36	645	11.14.75	Residential	Dwelling
576	Quarterly Reports	20/08/1934	Current	20	80	88	148	129	81	95	99	88	81	92	111	97	93	106	114	110	126	12.80	2057	1130.22	1130.22	428	11.97.80	Residential	Dwelling
577	Quarterly Reports	22/08/1934	Current	20	40	55	224	243	215	202	264	154	154	154	154	154	154	154	154	154	154	12.80	3701	685.05	2033.52	450	23.35.13	Residential	Dwelling
578	Quarterly Reports	22/08/1934	Current	20	40	55	224	243	215	202	264	154	154	154	154	154	154	154	154	154	154	12.80	3701	685.05	2033.52	450	23.35.13	Residential	Dwelling
579	Quarterly Reports	25/08/1934	Current	20	71	90	109	107	60	100	122	115	139	132	135	118	148	148	148	148	148	12.89	1724	85.20	947.25	488	11.58.13	Residential	Dwelling
580	Quarterly Reports	25/08/1934	Current	20	71	90	109	107	60	100	122	115	139	132	135	118	148	148	148	148	148	12.89	1724	85.20	947.25	488	11.58.13	Residential	Dwelling
581	Quarterly Reports	26/08/1934	Current	20	76	93	78	67	77	92	114	103	135	96	150	157	167	167	167	167	167	12.89	2271	113.85	1251.10	448	12.31.19	Residential	Dwelling
582	Quarterly Reports	26/08/1934	Current	20	59	99	130	114	85	260	214	131	120	142	136	257	265	194	125	132	108	12.88	2875	143.75	1479.67	409	11.23.63	Residential	Dwelling
583	Quarterly Reports	26/08/1934	Current	20	52	60	95	116	85	101	118	106	110	94	116	146	167	167	167	167	167	12.88	1765	106.64	1063.78	439	11.05.64	Residential	Dwelling
584	Quarterly Reports	30/08/1934	Current	20	76	149	172	64	43	124	173	81	119	152	117	85	72	141	160	203	75	14.0	2833	113.15	1243.41	421	11.56.89	Residential	Dwelling
585	Quarterly Reports	30/08/1934	Current	20	165	144	356	513	200	163	243	249	212	264	268	176	141	161	160	177	84	12.87	3814	190.70	2056.60	429	11.76.57	Residential	Dwelling
586	Quarterly Reports	2/07/1934	Current	20	96	221	250	212	90	190	150	133	177	103	119	91	101	101	101	101	101	12.87	2588	147.90	1628.27	462	14.43.36	Residential	Dwelling
587	Quarterly Reports	2/07/1934	Current	20	96	221	250	212	90	190	150	133	177	103	119	91	101	101	101	101	101	12.87	2588	147.90	1628.27	462	14.43.36	Residential	Dwelling
588	Quarterly Reports	4/07/1934	Current	20	65	90	116	90	88	87	102	108	115	105	113	110	125	125	125	125	125	12.86	1982	99.60	1094.51	408	11.20.26	Residential	Dwelling
589	Quarterly Reports	5/07/1934	Current	20	190	205	301	240	119	212	203	210	208	249	303	301	268	213	226	286	272	12.7	4447	222.35	2443.41	661	11.15.93	Residential	Dwelling
590	Quarterly Reports	5/07/1934	Current	20	190	205	301	240	119	212	203	210	208	249	303	301	268	213	226	286	272	12.7	4447	222.35	2443.41	661	11.15.93	Residential	Dwelling
591	Quarterly Reports	6/07/1934	Current	20	134	220	274	307	76	66	95	259	179	198	102	74	73	462	56	101	82	12.86	4089	204.40	2246.15	1390	24.11.90	Residential	Dwelling
592	Quarterly Reports	6/07/1934	Current	20	134	220	274	307	76	66	95	259	179	198	102	74	73	462	56	101	82	12.86	4089	204.40	2246.15	1390	24.11.90	Residential	Dwelling
593	Quarterly Reports	6/07/1934	Current	20	81	103	108	168	158	63	118	136	160	119	126	164	150	108	120	125	105	12.85	2524	126.20	1338.51	426	11.16.35	Residential	Dwelling
594	Quarterly Reports	6/07/1934	Current	20	81	103	108	168	158	63	118	136	160	119	126	164	150	108	120	125	105	12.85	2524	126.20	1338.51	426	11.16.35	Residential	Dwelling
595	Quarterly Reports	10/07/1934	Current	20	114	146	174	138	121	134	140	130	137	145	142	159	117	117	117	117	117	12.85	2584	1403.30	1477.47	421	11.56.89	Residential	Dwelling
596	Quarterly Reports	10/07/1934	Current	20	94	173	87	88	84	141	145	128	141	145	142	159	117	117	117	117	117	12.85	2584	1403.30	1477.47	421	11.56.89	Residential	Dwelling
597	Quarterly Reports	11/07/1934	Current	20	94	173	87	88	84	141	145	128	141	145	142	159	117	117	117	117	117	12.85	2584	1403.30	1477.47	421	11.56.89	Residential	Dwelling
598	Quarterly Reports	11/07/1934	Current	20	94	173	87	88	84	141	145	128	141	145	142	159	117	117	117	117	117	12.85	2584	1403.30	1477.47	421	11.56.89	Residential	Dwelling
599	Quarterly Reports	13/07/1934	Current	20	134	140	167	163	68	252	148	74	265	189	166	144	166	165	165	165	165	12.84	3224	90.20	1771.43	595	11.54.62	Multiple Residential Dwelling - Flats	Dwelling
600	Quarterly Reports	13/07/1934	Current	20	134	140	167	163	68	252	148	74	265	189	166	144	166	165	165	165	165	12.84	3224	90.20	1771.43	595	11.54.62	Multiple Residential Dwelling - Flats	Dwelling
601	Quarterly Reports	15/07/1934	Current	20	77	110	103	115	115	99	142	140	126	136	158	158	158	158	158	158	158	12.83	2480	124.00	1362.94	480	11.46.19	Residential	Dwelling
602	Quarterly Reports	15/07/1934	Current	20	77	110	103	115	115	99	142	140	126	136	158	158	158	158	158	158	158	12.83	2480	124.00	1362.94	480	11.46.19	Residential	Dwelling
603	Quarterly Reports	17/07/1934	Current	20	111	134	223	53	56	114	112	110	112	110	112	110	112	110	112	110	112	12.83	2830	141.95	1559.60	703	11.51.52	Residential	Dwelling
604	Quarterly Reports	17/07/1934	Current	20	111	134	223	53	56	114	112	110	112	110	112	110	112	110	112	110	112	12.83	2830	141.95	1559.60	703	11.51.52	Residential	Dwelling
605	Quarterly Reports	19/07/1934	Current	20	146	182	321	201	175	248	268	135	225	242	280	337	218	158	160	115	92	12.8	3838	191.90	2108.79	429	11.78.79	Residential	Dwelling
606	Quarterly Reports	19/07/1934	Current	20	146	182	321	201	175	248	268	135	225	242	280	337	218	158	160	115	92	12.8	3838	191.90	2108.79	429	11.78.79	Residential	Dwelling
607	Quarterly Reports	20/07/1934	Current	20	70	129	130	86	70	87	90	87	93	113	119	103	129	126	127	126	126	12.82	2523	131.15	1431.54	452	11.31.57	Residential	Dwelling
608	Quarterly Reports	20/07/1934	Current	20	70	129	130	86	70	87	90	87	93	113	119	103	129	126	127	126	126	12.82	2523	131.15	1431.54	452	11.31.57	Residential	Dwelling
609	Quarterly Reports	22/07/1934	Current	20	8	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12.81	4218	60.30	689.23	495	11.59.69	Residential	Dwelling
610	Quarterly Reports	22/07/1934	Current	20	8	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12.81	4218	60.30	689.23	495	11.59.69	Residential	Dwelling
611	Quarterly Reports	23/07/1934	Current	20	19	32	5	80	101	88	21	133	121	111	116	135	149	184	205	218	188	12.81	2737	136.85	1503.85	665	11.26.92	Residential	Dwelling
612	Quarterly Reports	23/07/1934	Current	20	19	32	5	80	101	88	21	133	121	111	116	135	149	184	205	218	188	12.81	2737	136.85	1503.85	665	11.26.92	Residential	Dwelling
613	Quarterly Reports	24/07/1934	Current	20	47	21	122	112	53	71	69	76	81	81	77	65	84	84	100	117	100	12.81	1854	91.70	1007.89	465	11.77.47	Residential	Dwelling
614	Quarterly Reports	24/07/1934	Current	20	47	21	122	112	53	71	69	76	81	81	77	65	84	84	100	117	100	12.81	1854	91.70	1007.89	465	11.77.47	Residential	Dwelling
615	Quarterly Reports	26/07/1934	Current	20	66	68	33	18	7	21	261	205	112	90	6	26	35	53	88	85	86	12.80	1588	74.45	873.68	425	11.51.67	Residential	Dwelling
616	Quarterly Reports</																												

880	Quarterly Reports	3/04/1935	Current	20	102	207	172	147	186	165	154	161	134	220	218	180	159	132	113	118	147	103	71	12.12	3074	163.70	1689.01	1406.04	Residential	Dwelling
881	Quarterly Reports	3/04/1935	Current	20	81	207	172	147	186	165	154	161	134	220	218	180	159	132	113	118	147	103	71	12.12	3074	163.70	1689.01	1406.04	Residential	Dwelling
882	Quarterly Reports	4/04/1935	Current	13	196	155	207	318	211	163	218	252	205	122	128	127	119	119	122	121	120	127	120	12.12	3143	157.15	1738.52	1540.86	Residential	Dwelling
883	Quarterly Reports	6/04/1935	Current	20	100	119	154	126	132	138	164	145	146	142	154	127	113	128	139	139	111	114	104	12.11	2620	131.00	1439.56	1504.55	Residential	Dwelling
884	Quarterly Reports	6/04/1935	Current	20	85	118	148	145	129	162	118	185	153	173	202	144	122	144	122	144	122	111	104	12.11	2821	141.05	1550.00	1184.07	Residential	Dwelling
885	Quarterly Reports	7/04/1935	Current	20	64	94	137	117	42	94	164	160	131	142	173	163	97	54	127	91	3	92	115	12.10	2344	117.20	1167.85	1101.85	Residential	Dwelling
886	Quarterly Reports	8/04/1935	Current	20	90	147	165	159	108	101	149	159	165	136	156	136	122	102	136	137	14	43	132	12.10	4056	208.60	2434.55	1107.86	Residential	Dwelling
887	Quarterly Reports	10/04/1935	Current	20	203	371	538	472	529	484	249	249	249	249	249	249	249	249	249	249	249	249	12.10	4056	208.60	2434.55	1107.86	Residential	Dwelling	
888	Quarterly Reports	11/04/1935	Current	20	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12.09	1875	90.85	1207.14	1490.55	Residential	Dwelling	
889	Quarterly Reports	12/04/1935	Current	20	55	91	117	137	88	65	91	103	124	100	90	100	90	122	118	134	140	131	117	12.09	2024	109.85	1207.14	1490.55	Residential	Dwelling
890	Quarterly Reports	1/04/1935	Current	20	29	70	153	62	40	55	64	115	93	107	163	88	120	114	122	142	76	48	12.09	2024	109.85	1207.14	1490.55	Residential	Dwelling	
891	Quarterly Reports	2/04/1935	Current	20	44	114	122	152	47	96	93	189	113	89	285	237	161	126	108	105	102	102	12.09	2024	109.85	1207.14	1490.55	Residential	Dwelling	
892	Quarterly Reports	3/04/1935	Current	20	64	114	122	152	47	96	93	189	113	89	285	237	161	126	108	105	102	102	12.09	2024	109.85	1207.14	1490.55	Residential	Dwelling	
893	Quarterly Reports	4/04/1935	Current	20	44	114	122	152	47	96	93	189	113	89	285	237	161	126	108	105	102	102	12.09	2024	109.85	1207.14	1490.55	Residential	Dwelling	
894	Quarterly Reports	5/04/1935	Current	20	59	105	125	96	101	107	91	106	106	106	106	106	106	106	106	106	106	106	12.08	2279	113.95	1526.20	1107.14	Residential	Dwelling	
895	Quarterly Reports	6/04/1935	Current	20	49	127	88	79	122	125	125	125	125	125	125	125	125	125	125	125	125	125	12.08	1737	86.45	1526.20	1107.14	Residential	Dwelling	
896	Quarterly Reports	7/04/1935	Current	20	101	147	128	86	79	122	125	125	125	125	125	125	125	125	125	125	125	125	12.08	1737	86.45	1526.20	1107.14	Residential	Dwelling	
897	Quarterly Reports	8/04/1935	Current	20	96	174	195	103	103	103	103	103	103	103	103	103	103	103	103	103	103	103	12.08	2692	142.60	1507.35	1074.75	Residential	Dwelling	
898	Quarterly Reports	9/04/1935	Current	20	176	202	183	145	119	165	181	129	138	226	154	121	111	111	124	121	115	118	118	12.07	2807	145.35	1597.25	1516.83	Residential	Dwelling
899	Quarterly Reports	10/04/1935	Current	20	67	265	42	44	23	62	114	51	128	168	149	254	166	125	126	164	126	122	103	12.07	2617	133.85	1437.81	1123.63	Residential	Dwelling
900	Quarterly Reports	11/04/1935	Current	20	31	41	138	104	139	207	464	788	72	193	158	176	161	135	105	101	91	91	12.06	3587	178.55	1959.89	1436.81	Residential	Dwelling	
901	Quarterly Reports	12/04/1935	Current	20	177	203	176	163	157	173	155	157	155	150	141	141	135	163	141	144	149	144	12.06	2628	148.40	1608.79	1340.66	Residential	Dwelling	
902	Quarterly Reports	1/04/1936	Current	20	31	41	138	104	139	207	464	788	72	193	158	176	161	135	105	101	91	91	12.06	3587	178.55	1959.89	1436.81	Residential	Dwelling	
903	Quarterly Reports	2/04/1936	Current	20	191	259	357	177	163	269	321	297	211	306	289	397	162	189	138	107	112	120	137	12.06	4339	216.95	2384.07	1543.41	Residential	Dwelling
904	Quarterly Reports	3/04/1936	Current	20	64	114	122	152	47	96	93	189	113	89	285	237	161	126	108	105	102	102	12.06	2866	148.40	1608.79	1340.66	Residential	Dwelling	
905	Quarterly Reports	4/04/1936	Current	20	64	114	122	152	47	96	93	189	113	89	285	237	161	126	108	105	102	102	12.06	2866	148.40	1608.79	1340.66	Residential	Dwelling	
906	Quarterly Reports	5/04/1936	Current	20	106	135	188	144	106	135	188	144	106	135	188	144	106	135	188	144	106	135	12.05	5682	322.60	1457.14	1511.54	Residential	Dwelling	
907	Quarterly Reports	6/04/1936	Current	13	63	85	129	112	79	82	114	139	150	101	110	125	113	96	98	76	151	114	123	12.04	2173	108.85	1193.96	1587.14	Residential	Dwelling
908	Quarterly Reports	7/04/1936	Current	20	163	144	155	63	110	157	185	166	206	267	122	161	119	107	167	163	351	306	264	12.04	3869	182.95	2010.44	1084	Residential	Dwelling
909	Quarterly Reports	8/04/1936	Current	20	55	47	125	70	157	137	162	195	150	127	148	196	157	144	117	137	135	107	108	12.04	2644	132.20	210.44	1429.91	Residential	Dwelling
910	Quarterly Reports	9/04/1936	Current	20	55	47	125	70	157	137	162	195	150	127	148	196	157	144	117	137	135	107	108	12.04	2644	132.20	210.44	1429.91	Residential	Dwelling
911	Quarterly Reports	10/04/1936	Current	20	20	42	41	37	55	41	40	39	39	44	40	39	44	40	39	44	40	39	12.03	5487	283.86	8613.81	1636.56	Residential	Dwelling	
912	Quarterly Reports	11/04/1936	Current	20	103	664	170	132	117	154	161	157	165	219	198	224	118	114	156	151	117	116	106	12.03	2920	146.00	1604.40	1535.16	Residential	Dwelling
913	Quarterly Reports	12/04/1936	Current	20	109	336	132	141	142	147	131	132	150	138	157	154	130	113	114	124	110	118	114	12.03	2920	146.00	1604.40	1535.16	Residential	Dwelling
914	Quarterly Reports	1/04/1937	Current	20	89	93	103	101	101	101	101	101	101	101	101	101	101	101	101	101	101	101	101	12.03	2920	146.00	1604.40	1535.16	Residential	Dwelling
915	Quarterly Reports	2/04/1937	Current	20	82	92	96	53	87	76	89	89	75	67	71	71	71	71	71	71	71	71	12.02	2984	1408.79	4408.79	1500.95	Residential	Dwelling	
916	Quarterly Reports	3/04/1937	Current	20	58	146	505	99	67	63	82	73	68	74	87	72	68	74	70	90	121	100	134	12.02	1793	89.65	305.16	447	Residential	Dwelling
917	Quarterly Reports	4/04/1937	Current	20	69	119	102	95	76	108	83	113	83	92	96	107	82	94	72	82	81	92	139	12.02	2085	103.25	1134.62	1222.83	Residential	Dwelling
918	Quarterly Reports	5/04/1937	Current	20	45	177	173	103	126	188	141	162	133	138	141	135	127	131	127	131	127	131	127	12.01	2864	149.85	1620.86	1197.80	Residential	Multiple Residential Dwelling - Flats
919	Quarterly Reports	6/04/1937	Current	20	48	177	173	103	126	188	141	162	133	138	141	135	127	131	127	131	127	131	12.01	2864	149.85	1620.86	1197.80	Residential	Multiple Residential Dwelling - Flats	
920	Quarterly Reports	7/04/1937	Current	20	120	157	147	93	96	118	138	86	81	100	114	86	86	76	79	83	83	101	103	12.01	2111	105.55	1159.89	1539.01	Residential	Dwelling
921	Quarterly Reports	8/04/1937	Current	20	67	109	113	111	66	157	121	121	109	113	100	132	72	90	96	219	341	350	44	12.01	2645	145.30	1453.30	1453.30	Residential	Dwelling
922	Quarterly Reports	9/04/1937	Current	20																										

1174	Quantity Reads	2/20/1936	Current	20	141	190	185	100	104	184	131	138	214	188	169	146	109	133	98	136	78	135	138	2838	14130	1598.24	517	Residential	Dwelling	1429.33	
1175	Quantity Reads	2/20/1936	Current	20	77	85	188	160	62	131	154	157	142	166	165	147	103	126	102	85	123	108	92	1131	2859	527.95	1406.04	Residential	Dwelling	1196.89	
1176	Quantity Reads	2/20/1936	Current	20	121	162	152	132	157	150	142	135	170	173	147	147	103	103	106	100	1131	1131	2914	4433	467.00	1601.10	Residential	Dwelling	1517.93		
1177	Quantity Reads	2/20/1936	Current	20	151	144	204	57	92	142	126	131	172	203	111	203	114	105	118	103	83	121	111	2684	531.70	1447.25	425	Residential	Dwelling	1167.55	
1178	Quantity Reads	2/20/1936	Current	20	97	98	114	77	50	102	95	121	117	202	114	145	144	144	144	144	144	144	144	2682	1462.84	784	Residential	Dwelling	2183.85		
1179	Quantity Reads	2/20/1936	Current	20	129	134	167	206	169	185	161	159	151	163	217	177	144	144	144	144	144	144	144	3181	1539.05	1747.80	527	Residential	Dwelling	1747.80	
1180	Quantity Reads	2/20/1936	Current	20	90	135	268	146	112	114	127	124	134	148	139	150	128	128	128	128	128	128	128	2738	1163.80	1638.90	442	Residential	Dwelling	1185.54	
1181	Quantity Reads	2/20/1936	Current	20	82	188	268	146	112	114	127	124	134	148	139	150	128	128	128	128	128	128	128	3402	488.00	5940.66	437	Residential	Dwelling	1500.55	
1182	Quantity Reads	2/20/1936	Current	20	3	98	132	83	66	112	74	33	53	65	36	32	34	30	107	128	110	129	1532	76.60	841.76	435	Residential	Dwelling	1195.05		
1183	Quantity Reads	2/20/1936	Current	20	108	169	231	106	61	105	111	149	137	165	135	168	135	135	304	211	199	237	4892	77.98	74.24	451	Residential	Dwelling	2612.64		
1184	Quantity Reads	2/20/1936	Current	20	150	157	244	124	105	111	149	137	165	135	168	135	135	304	211	199	237	4892	77.98	74.24	451	Residential	Dwelling	2612.64			
1185	Quantity Reads	2/20/1936	Current	20	130	157	244	124	105	111	149	137	165	135	168	135	135	304	211	199	237	4892	77.98	74.24	451	Residential	Dwelling	2612.64			
1186	Quantity Reads	2/20/1936	Current	20	76	119	123	86	96	118	122	113	136	141	162	146	141	128	138	166	166	166	166	2610	133.00	1461.54	651	Residential	Dwelling	1786.46	
1187	Quantity Reads	2/20/1936	Current	20	158	208	277	219	186	192	180	161	178	162	225	147	162	147	211	311	311	311	311	3652	182.80	2068.93	741	Residential	Dwelling	2635.71	
1188	Quantity Reads	2/20/1936	Current	20	64	120	213	112	156	142	145	116	145	156	144	164	156	144	144	144	144	144	144	2640	132.00	1430.55	486	Residential	Dwelling	1515.42	
1189	Quantity Reads	2/20/1936	Current	20	57	89	138	50	155	153	177	103	83	80	40	35	117	7	44	115	130	181	95	1714	85.70	941.76	511	Residential	Dwelling	1403.83	
1190	Quantity Reads	2/20/1936	Current	20	113	182	242	72	78	67	65	105	114	127	100	118	107	98	84	104	120	108	1128	1715	85.75	942.31	426	Residential	Dwelling	1170.33	
1191	Quantity Reads	2/20/1936	Current	20	80	117	148	101	113	128	141	100	128	108	93	107	116	103	103	103	103	103	103	403	2229	113.45	1107.14	403	Residential	Dwelling	1107.14
1192	Quantity Reads	2/20/1936	Current	20	119	178	180	158	144	144	144	144	144	144	144	144	144	144	144	144	144	144	144	2765	138.25	1519.23	512	Residential	Dwelling	1406.65	
1193	Quantity Reads	2/20/1936	Current	20	90	131	127	107	79	81	161	125	114	143	154	152	100	108	175	154	169	202	205	2963	143.15	1573.08	765	Residential	Dwelling	2101.63	
1194	Quantity Reads	2/20/1936	Current	20	134	168	248	178	151	183	171	222	208	196	209	249	200	172	129	165	128	110	140	3465	173.25	1903.85	484	Residential	Dwelling	1529.87	
1195	Quantity Reads	2/20/1936	Current	20	126	165	189	136	137	153	147	147	147	147	147	147	147	147	147	147	147	147	147	2625	131.25	1442.31	411	Residential	Dwelling	1125.12	
1196	Quantity Reads	2/20/1936	Current	20	69	111	115	70	73	70	123	142	111	115	95	157	169	132	144	144	144	144	144	2348	117.40	1230.11	440	Residential	Dwelling	1125.12	
1197	Quantity Reads	2/20/1936	Current	20	76	110	129	112	117	122	149	256	301	214	141	141	111	119	139	219	134	104	126	112	2938	146.90	1614.23	476	Residential	Dwelling	1507.69
1198	Quantity Reads	2/20/1936	Current	20	152	188	251	198	186	192	180	161	178	162	225	147	162	147	211	311	311	311	311	311	3652	182.80	2068.93	741	Residential	Dwelling	2635.71
1199	Quantity Reads	2/20/1936	Current	20	152	188	251	198	186	192	180	161	178	162	225	147	162	147	211	311	311	311	311	311	3652	182.80	2068.93	741	Residential	Dwelling	2635.71
1200	Quantity Reads	2/20/1936	Current	20	152	188	251	198	186	192	180	161	178	162	225	147	162	147	211	311	311	311	311	311	3652	182.80	2068.93	741	Residential	Dwelling	2635.71
1201	Quantity Reads	2/20/1936	Current	20	152	188	251	198	186	192	180	161	178	162	225	147	162	147	211	311	311	311	311	311	3652	182.80	2068.93	741	Residential	Dwelling	2635.71
1202	Quantity Reads	2/20/1936	Current	20	152	188	251	198	186	192	180	161	178	162	225	147	162	147	211	311	311	311	311	311	3652	182.80	2068.93	741	Residential	Dwelling	2635.71
1203	Quantity Reads	2/20/1936	Current	20	152	188	251	198	186	192	180	161	178	162	225	147	162	147	211	311	311	311	311	311	3652	182.80	2068.93	741	Residential	Dwelling	2635.71
1204	Quantity Reads	2/20/1936	Current	20	152	188	251	198	186	192	180	161	178	162	225	147	162	147	211	311	311	311	311	311	3652	182.80	2068.93	741	Residential	Dwelling	2635.71
1205	Quantity Reads	2/20/1936	Current	20	152	188	251	198	186	192	180	161	178	162	225	147	162	147	211	311	311	311	311	311	3652	182.80	2068.93	741	Residential	Dwelling	2635.71
1206	Quantity Reads	2/20/1936	Current	20	152	188	251	198	186	192	180	161	178	162	225	147	162	147	211	311	311	311	311	311	3652	182.80	2068.93	741	Residential	Dwelling	2635.71
1207	Quantity Reads	2/20/1936	Current	20	152	188	251	198	186	192	180	161	178	162	225	147	162	147	211	311	311	311	311	311	3652	182.80	2068.93	741	Residential	Dwelling	2635.71
1208	Quantity Reads	2/20/1936	Current	20	152	188	251	198	186	192	180	161	178	162	225	147	162	147	211	311	311	311	311	311	3652	182.80	2068.93	741	Residential	Dwelling	2635.71
1209	Quantity Reads	2/20/1936	Current	20	152	188	251	198	186	192	180	161	178	162	225	147	162	147	211	311	311	311	311	311	3652	182.80	2068.93	741	Residential	Dwelling	2635.71
1210	Quantity Reads	2/20/1936	Current	20	152	188	251	198	186	192	180	161	178	162	225	147	162	147	211	311	311	311	311	311	3652	182.80	2068.93	741	Residential	Dwelling	2635.71
1211	Quantity Reads	2/20/1936	Current	20	166	234	319	295	148	211	253	227	247	343	214	245	150	155	118	162	165	140	128	1122	3883	186.05	2160.99	508	Residential	Dwelling	1385.86
1212	Quantity Reads	2/20/1936	Current	20	95	124	135	131	171	189	162	162	162	162	162	162	162	162	162	162	162	162	162	162	4331	193.95	1438.91	608	Residential	Dwelling	1517.35
1213	Quantity Reads	2/20/1936	Current	20	76	124	135	131	171	189	162	162	162	162	162	162	162	162	162	162	162	162	162	162	4331	193.95	1438.91	608	Residential	Dwelling	1517.35
1214	Quantity Reads	2/20/1936	Current	20	212	374	476	297	401	505	166	162	162	162	162	162	162	162	162	162	162	162	162	162	4840	232.00	2549.45	658	Residential	Dwelling	1607.66
1215	Quantity Reads	2/																													

1272	Quantity Reads	2/10/19/196	Current	20	118	192	263	230	154	182	124	213	162	184	120	230	188	167	137	139	141	101	86	81	1105	3331	168.55	1830.22	409	142.63	Residential	Dwelling	
1273	Quantity Reads	2/10/19/196	Current	20	118	241	268	173	125	234	182	164	131	166	211	202	234	183	137	135	142	139	142	152	1104	3386	169.30	1860.44	453	119.56	Residential	Dwelling	
1274	Quantity Reads	3/10/19/196	Current	20	0	116	147	53	141	120	137	0	0	0	36	0	36	59	8	8	198	293	179	156	1104	1932	86.00	2776.37	865	276.37	Residential	Dwelling	
1275	Quantity Reads	2/05/19/196	Current	20	85	105	270	524	180	164	147	172	125	135	150	138	164	147	208	211	272	226	150	1104	3172	158.80	1742.86	582	158.80	Residential	Dwelling		
1276	Quantity Reads	3/05/19/196	Current	20	78	222	199	159	126	210	186	150	162	177	123	275	192	149	81	105	81	104	119	1103	3105	165.25	1706.04	409	112.63	CMV Services	Educational/School/Childcare		
1277	Quantity Reads	4/05/19/196	Current	20	79	221	199	159	126	210	186	150	162	177	123	275	192	149	81	105	81	104	119	1103	2849	165.25	1706.04	406	122.75	Residential	Dwelling		
1278	Quantity Reads	5/05/19/196	Current	20	87	241	199	159	126	210	186	150	162	177	123	275	192	149	81	105	81	104	119	1103	2849	165.25	1706.04	406	122.75	Residential	Dwelling		
1279	Quantity Reads	6/05/19/196	Current	20	78	222	199	159	126	210	186	150	162	177	123	275	192	149	81	105	81	104	119	1103	3124	165.25	1706.04	406	122.75	Residential	Dwelling		
1280	Quantity Reads	7/05/19/196	Current	20	78	222	199	159	126	210	186	150	162	177	123	275	192	149	81	105	81	104	119	1103	3124	165.25	1706.04	406	122.75	Residential	Dwelling		
1281	Quantity Reads	8/05/19/196	Current	20	78	222	199	159	126	210	186	150	162	177	123	275	192	149	81	105	81	104	119	1103	3124	165.25	1706.04	406	122.75	Residential	Dwelling		
1282	Quantity Reads	9/05/19/196	Current	20	59	92	87	79	40	76	36	84	84	113	46	54	46	36	101	121	117	97	89	57	1102	1887	93.35	1025.82	473	129.45	Residential	Dwelling	
1283	Quantity Reads	10/05/19/196	Current	20	72	138	72	39	71	87	85	88	114	118	134	203	152	105	100	104	1102	2047	124.73	1102	1102	2047	102.35	1124.73	448	129.77	Residential	Dwelling	
1284	Quantity Reads	11/05/19/196	Current	20	61	93	258	188	154	148	154	112	93	112	93	258	188	154	112	93	112	93	112	93	1101	2695	144.75	1500.68	588	161.35	Residential	Dwelling	
1285	Quantity Reads	12/05/19/196	Current	20	81	93	258	188	154	148	154	112	93	112	93	258	188	154	112	93	112	93	112	93	1101	2695	144.75	1500.68	588	161.35	Residential	Dwelling	
1286	Quantity Reads	1/06/19/196	Current	20	74	69	94	102	122	125	122	64	75	105	117	105	114	77	105	117	97	105	101	1101	4933	96.65	1062.09	406	115.36	Residential	Dwelling		
1287	Quantity Reads	2/06/19/196	Current	20	114	164	122	102	122	125	122	64	75	105	117	105	114	77	105	117	97	105	101	1101	4933	96.65	1062.09	406	115.36	Residential	Dwelling		
1288	Quantity Reads	3/06/19/196	Current	20	114	164	122	102	122	125	122	64	75	105	117	105	114	77	105	117	97	105	101	1101	4933	96.65	1062.09	406	115.36	Residential	Dwelling		
1289	Quantity Reads	4/06/19/196	Current	20	114	164	122	102	122	125	122	64	75	105	117	105	114	77	105	117	97	105	101	1101	4933	96.65	1062.09	406	115.36	Residential	Dwelling		
1290	Quantity Reads	5/06/19/196	Current	20	113	157	131	176	183	148	128	175	128	168	226	242	278	269	167	166	331	176	103	35	1100	3355	187.75	1830.22	433	189.58	Residential	Dwelling	
1291	Quantity Reads	6/06/19/196	Current	20	62	68	131	83	26	84	96	39	62	108	115	234	84	96	147	151	145	172	193	221	1089	2421	121.05	1330.22	752	208.24	Residential	Dwelling	
1292	Quantity Reads	7/06/19/196	Current	20	83	184	151	100	160	171	166	184	156	148	234	207	198	141	146	117	119	108	229	190	1037	2601	133.05	1791.75	546	150.00	Residential	Dwelling	
1293	Quantity Reads	8/06/19/196	Current	20	83	184	151	100	160	171	166	184	156	148	234	207	198	141	146	117	119	108	229	190	1037	2601	133.05	1791.75	546	150.00	Residential	Dwelling	
1294	Quantity Reads	9/06/19/196	Current	20	31	81	211	109	93	95	127	130	125	126	144	126	122	117	317	228	195	188	93	152	110	1034	2634	133.05	1791.75	546	150.00	Residential	Dwelling
1295	Quantity Reads	10/06/19/196	Current	20	31	81	211	109	93	95	127	130	125	126	144	126	122	117	317	228	195	188	93	152	110	1034	2634	133.05	1791.75	546	150.00	Residential	Dwelling
1296	Quantity Reads	11/06/19/196	Current	20	112	129	236	96	36	43	0	3	50	38	134	205	138	159	212	224	138	153	91	37	1088	2291	114.55	1295.79	417	114.55	Residential	Dwelling	
1297	Quantity Reads	12/06/19/196	Current	20	57	114	128	47	56	62	61	47	73	75	85	107	51	51	144	115	113	95	113	95	1088	1733	86.65	982.20	436	119.00	Residential	Dwelling	
1298	Quantity Reads	1/07/19/196	Current	20	136	170	176	130	100	94	97	54	0	0	0	0	0	0	131	165	165	162	108	108	1088	2111	105.95	1159.63	566	165.15	Residential	Dwelling	
1299	Quantity Reads	2/07/19/196	Current	20	55	83	57	128	18	30	50	10	37	5	76	58	72	38	263	322	116	492	216	1087	1145	2126	106.25	1169.63	1145	114.55	Residential	Dwelling	
1300	Quantity Reads	3/07/19/196	Current	20	49	58	41	53	67	62	72	79	78	74	59	26	52	47	70	86	102	113	94	1087	1394	69.70	765.83	405	112.64	Residential	Dwelling		
1301	Quantity Reads	4/07/19/196	Current	20	86	164	151	100	160	171	166	184	156	148	234	207	198	141	146	117	119	108	229	190	1037	2601	133.05	1791.75	546	150.00	Residential	Dwelling	
1302	Quantity Reads	5/07/19/196	Current	20	86	164	151	100	160	171	166	184	156	148	234	207	198	141	146	117	119	108	229	190	1037	2601	133.05	1791.75	546	150.00	Residential	Dwelling	
1303	Quantity Reads	6/07/19/196	Current	20	105	118	201	131	107	127	120	125	126	144	126	122	117	317	228	195	188	93	152	110	1034	3016	150.80	1687.14	543	161.76	Residential	Vacant Land	
1304	Quantity Reads	7/07/19/196	Current	20	61	68	87	75	172	243	120	156	108	148	200	159	162	108	204	263	276	322	295	168	1086	3613	180.85	1985.16	1061	2514.84	Residential	Dwelling	
1305	Quantity Reads	8/07/19/196	Current	20	230	234	241	395	302	293	241	315	330	248	225	244	222	265	293	293	293	293	293	293	5014	5014	260.70	2754.95	771	2116.13	Residential	Other Residential Care Services	
1306	Quantity Reads	9/07/19/196	Current	20	124	195	205	274	210	262	276	208	250	260	213	286	176	164	170	188	174	156	144	152	1085	1140	207.00	2274.73	620	1103.30	Residential	Dwelling	
1307	Quantity Reads	10/07/19/196	Current	20	124	195	205	274	210	262	276	208	250	260	213	286	176	164	170	188	174	156	144	152	1085	1140	207.00	2274.73	620	1103.30	Residential	Dwelling	
1308	Quantity Reads	11/07/19/196	Current	20	86	91	223	86	76	88	69	92	128	141	128	171	121	133	139	126	126	122	98	81	1085	1680	84.00	923.08	752	205.83	Residential	Dwelling	
1309	Quantity Reads	12/07/19/196	Current	20	82	270	333	172	143	174	148	184	164	146	174	111	139	110	112	102	132	91	93	117	1084	3683	151.95	1605.48	409	112.63	Residential	Dwelling	
1310	Quantity Reads	1/08/19/196	Current	20	82	270	333	172	143	174	148	184	164	146	174	111	139	110	112	102	132	91	93	117	1084	3683	151.95	1605.48	409	112.63	Residential	Dwelling	
1311	Quantity Reads	2/08/19/196	Current	20	97	113	150	169	128	142	119	121	126	179	121	147	126	179	121	126	207	36	37	268	202	1034	487.86	5381.07	607	167.58	Residential	Dwelling	
1312	Quantity Reads	3/08/19/196	Current	20	79	97	92	117	76	133	134	146	127	126	121	153	156	135	116	131	114	114	104	1084	2487	152.84	171.98	498	152.84	Residential	Dwelling		
1313	Quantity Reads	4/08/19/196	Current	20	91	107	113	113	69	67	62	62	59	78	81	75	87	81	106	103	113	110	106	103	1084	1960	86.67	932.88	421	116.99	Residential	Dwelling	
1314	Quantity Reads	5/08/19/196	Current	20	82	146	145	74	62	73	160	247	142	169	64	72	73	78	107	86	135	91	100	130	1083	2132	115.10	1264.94	441	161.54	Residential	Dwelling	
1315	Quantity Reads	6/08/19/196	Current	20	41	58	61	40	65	74	69	71	59	66	72	73	78	107	86	135	91	100	130	1083	1741	87.05	996.99	656	160.20	Commercial	Restaurant		
1316	Quantity Reads	7/08/19/196	Current	20	98	130	132	115	105	125	129	144	138	153	169	169	169																

1370	Quantity Reads	4/08/1936	Current	20	58	89	90	61	62	57	61	61	104	184	352	234	243	246	222	77	143	203	160	1078	3025	115,25	162,09	573	1674,18	Residential	Dwelling	
1371	Quantity Reads	5/05/1936	Current	20	55	91	79	63	52	63	104	88	117	147	520	77	127	140	144	122	112	112	85	1078	2807	115,35	1267,95	459	1260,99	Residential	Dwelling	
1372	Quantity Reads	6/08/1936	Current	20	71	62	154	132	127	215	114	114	142	120	142	164	164	154	119	107	110	107	1078	3200	115,35	1267,95	459	1260,99	Residential	Dwelling		
1373	Quantity Reads	8/08/1936	Current	20	45	107	159	129	114	112	133	138	135	122	135	151	111	96	136	107	112	117	1078	2361	118,05	1267,25	449	1533,52	Residential	Dwelling		
1374	Quantity Reads	9/08/1936	Current	20	59	264	347	312	615	212	226	208	238	242	135	127	114	97	91	134	105	111	116	1078	4010	100,20	2203,30	704	1834,07	Residential	Dwelling	
1375	Quantity Reads	10/08/1936	Current	20	59	109	107	62	65	89	112	109	112	109	102	89	112	109	112	109	112	109	112	1078	2004	100,20	1103,30	439	1706,94	Residential	Dwelling	
1376	Quantity Reads	12/08/1936	Current	20	7	36	21	45	84	62	49	51	67	50	42	225	38	33	33	33	33	33	1078	1188	118,8	609,30	462	1315,45	Residential	Dwelling		
1377	Quantity Reads	13/08/1936	Current	20	58	77	61	67	55	50	62	51	50	50	50	46	46	164	90	78	35	35	1078	1344	134,4	738,45	427	1173,84	Residential	Dwelling		
1378	Quantity Reads	14/08/1936	Current	20	52	53	60	99	98	83	145	98	99	102	154	94	102	126	105	113	97	115	126	1078	1989	99,90	1097,80	445	1222,83	Residential	Dwelling	
1379	Quantity Reads	15/08/1936	Current	20	109	204	187	143	188	185	170	185	227	217	243	191	188	185	227	217	243	191	188	1078	3811	100,85	1984,07	603	1956,99	Residential	Dwelling	
1380	Quantity Reads	16/08/1936	Current	20	180	347	311	217	130	137	168	144	164	159	187	141	112	134	114	96	159	65	1074	3447	172,35	933,36	428	1167,09	Residential	Dwelling		
1381	Quantity Reads	18/08/1936	Current	20	56	64	86	74	80	137	104	47	45	72	41	62	110	112	106	114	96	159	65	1074	1655	165,5	809,34	436	1162,09	Residential	Dwelling	
1382	Quantity Reads	19/08/1936	Current	20	85	117	106	89	113	144	142	108	128	136	150	4	178	160	165	167	142	102	111	1074	2659	132,80	469,34	512	1406,94	Residential	Dwelling	
1383	Quantity Reads	21/08/1936	Current	20	86	111	177	105	111	128	200	117	122	168	132	160	130	146	152	116	106	146	106	1074	2624	131,20	441,34	456	1410,74	Residential	Dwelling	
1384	Quantity Reads	23/08/1936	Current	20	147	196	274	218	148	173	280	200	163	203	191	207	144	140	118	138	129	137	118	1073	3478	173,80	1907,80	527	1647,80	Residential	Dwelling	
1385	Quantity Reads	24/08/1936	Current	20	415	407	160	140	158	145	142	138	132	135	128	181	142	112	107	140	120	120	1073	7262	151,83	1828,57	479	2152,93	Residential	Dwelling		
1386	Quantity Reads	26/08/1936	Current	20	147	213	312	217	151	203	237	185	190	130	139	139	139	139	139	139	139	139	1073	3483	174,15	1913,24	538	1672,53	Residential	Dwelling		
1387	Quantity Reads	27/08/1936	Current	20	10	135	115	69	79	94	102	97	101	115	115	90	111	142	100	105	114	105	1074	1956	97,80	1074,73	405	1124,64	Residential	Dwelling		
1388	Quantity Reads	28/08/1936	Current	20	117	91	212	153	140	166	162	136	132	136	136	136	136	136	136	136	136	136	1073	2502	145,10	1694,51	484	1597,14	Residential	Dwelling		
1389	Quantity Reads	30/08/1936	Current	20	67	39	36	35	25	41	67	175	62	92	48	74	100	112	112	112	112	112	1071	2335	116,75	1282,97	437	1505,15	Residential	Dwelling		
1390	Quantity Reads	31/08/1936	Current	20	123	629	301	55	69	368	63	51	122	112	97	114	85	114	92	86	101	75	78	160	2805	140,25	1541,21	414	1137,36	Community Organisations	Veget Land	
1391	Quantity Reads	2/09/1936	Current	20	103	123	151	93	134	103	138	89	101	102	95	103	101	105	128	128	128	128	1070	2162	119,60	1314,29	471	1533,98	Residential	Dwelling		
1392	Quantity Reads	4/09/1936	Current	20	167	147	208	178	129	180	156	148	140	176	216	239	188	177	125	132	131	101	140	115	3200	160,00	1758,24	487	1537,81	Residential	Dwelling	
1401	Quantity Reads	5/09/1936	Current	20	126	157	237	202	88	145	145	166	163	179	183	214	160	148	140	140	140	140	140	1078	3000	154,50	1987,80	442	1514,29	Residential	Dwelling	
1402	Quantity Reads	6/09/1936	Current	20	129	653	167	188	163	166	168	161	161	180	182	175	181	197	118	112	128	116	116	1069	2985	149,75	1645,80	484	1547,25	Residential	Dwelling	
1403	Quantity Reads	8/09/1936	Current	20	85	153	165	166	166	166	166	166	166	166	166	166	166	166	166	166	166	166	166	1078	1688	143,70	1645,80	484	1547,25	Residential	Dwelling	
1404	Quantity Reads	9/09/1936	Current	20	86	155	165	166	166	166	166	166	166	166	166	166	166	166	166	166	166	166	166	1078	1688	143,70	1645,80	484	1547,25	Residential	Dwelling	
1405	Quantity Reads	10/09/1936	Current	20	212	285	474	355	154	285	339	275	354	302	424	546	384	296	83	116	81	87	85	84	1068	5240	28,70	2879,12	437	1500,85	Residential	Dwelling
1406	Quantity Reads	11/09/1936	Current	20	100	144	240	289	271	329	358	229	256	234	274	341	104	107	79	100	123	100	123	1068	3869	189,90	2182,31	409	1723,63	Residential	Dwelling	
1407	Quantity Reads	12/09/1936	Current	20	273	378	474	383	175	302	435	343	312	348	403	435	312	254	330	229	229	229	229	1068	4452	232,80	3545,05	463	2161,13	Residential	Dwelling	
1408	Quantity Reads	13/09/1936	Current	20	165	280	247	249	151	271	311	206	230	259	260	273	164	172	87	164	263	71	70	82	1067	3865	198,25	2178,87	486	1535,16	Residential	Dwelling
1409	Quantity Reads	14/09/1936	Current	20	217	228	387	245	123	268	311	195	307	421	420	202	320	109	105	182	107	122	127	1067	4826	211,30	2541,76	538	1478,02	Residential	Dwelling	
1410	Quantity Reads	15/09/1936	Current	20	179	371	401	291	109	284	345	195	310	481	532	479	173	181	109	105	125	77	106	127	1067	4448	252,40	2941,76	439	1778,97	Residential	Dwelling
1411	Quantity Reads	16/09/1936	Current	20	94	122	185	110	102	158	131	108	122	122	122	122	122	122	122	122	122	122	1078	2013	100,65	1108,34	478	1515,10	Residential	Dwelling		
1412	Quantity Reads	18/09/1936	Current	20	101	207	111	239	102	158	131	108	122	122	122	122	122	122	122	122	122	122	1078	2013	100,65	1108,34	478	1515,10	Residential	Dwelling		
1413	Quantity Reads	19/09/1936	Current	20	201	260	338	274	126	342	359	160	294	273	362	307	219	156	249	139	140	103	103	1066	4888	244,40	2636,01	824	2483,74	Residential	Dwelling	
1414	Quantity Reads	20/09/1936	Current	20	126	157	237	202	88	145	145	166	163	179	183	214	160	148	140	140	140	140	140	1078	3000	154,50	1987,80	442	1514,29	Residential	Dwelling	
1415	Quantity Reads	21/09/1936	Current	20	129	653	167	188	163	166	168	161	161	180	182	175	181	197	118	112	128	116	116	1069	2985	149,75	1645,80	484	1547,25	Residential	Dwelling	
1416	Quantity Reads	22/09/1936	Current	20	85	153	165	166	166	166	166	166	166	166	166	166	166	166	166	166	166	166	166	1078	1688	143,70	1645,80	484	1547,25	Residential	Dwelling	
1417	Quantity Reads	23/09/1936	Current	20	86	155	165	166	166	166	166	166	166	166	166	166	166	166	166	166	166	166	166	1078	1688	143,70	1645,80	484	1547,25	Residential	Dwelling	
1418	Quantity Reads	24/09/1936	Current	20	212	285	474	355	154	285	339	275	354	302	424	546	384	296	83	116	81	87	85	84	1068	5240	28,70	2879,12	437	1500,85	Residential	Dwelling
1419	Quantity Reads	25/09/1936	Current	20	100	144	240	289	271	329	358	229	256	234	274	341	104	107	79	100	123	100	123	1068	3869	189,90	2182,31	409	1723,63	Residential	Dwelling	
1420	Quantity Reads	26/09/1936	Current	20	273	378	474	383	175	302	435	343	312	348	403	435	312	254	330	229	229	229	229	1068	4452	232,80	3545,05	463	2161,13	Residential	Dwelling	
1421	Quantity Reads	27/09/1936	Current	20	165	280	247	249	151	271	311	206	230	259	260	273	164	172	87	164	263	71	70	82	1067	3865	198,25	2178,87	486	1535,16	Residential	Dwelling
1422	Quantity Reads	28/09/1936	Current	20	217	228	387	245	123	268	311	195	307	421	420	202	320	109	105	182	107	122	127	1067	4826	211,30	2541,76	538	1478,02	Residential	Dwelling	
1423	Quantity Reads	29/09/1936	Current	20	179	371	401	291	109	284	345	195	310	481	532</																	

1488	Quarterny Reads	11/11/1936	Current	20	138	185	191	90	168	175	238	165	97	249	211	161	163	163	182	113	105.1	309.2	151,630	16,055.83	469	1498.46	Residential	Dwelling
1489	Quarterny Reads	11/11/1936	Current	20	165	263	199	187	214	269	305	297	286	202	239	211	210	206	256	182	122	157	125	125	586	1609.89	Residential	Dwelling
1490	Quarterny Reads	12/11/1936	Current	20	194	252	177	198	178	215	228	193	197	162	192	162	153	128	128	110	100	105.1	3159	187.95	438	1500.30	Residential	Dwelling
1491	Quarterny Reads	14/11/1936	Current	20	62	120	131	94	83	166	188	171	97	183	163	131	115	114	111	128	125	127	75	468	1535.16	Residential	Dwelling	
1492	Quarterny Reads	15/11/1936	Current	20	121	185	129	106	115	136	141	171	164	161	156	210	169	162	148	112	107	89	52	403	1107.14	Residential	Dwelling	
1493	Quarterny Reads	15/11/1936	Current	20	102	167	164	122	122	179	118	117	112	112	97	113	104	99	101	139	89	92	50	248	1177.30	Residential	Dwelling	
1494	Quarterny Reads	15/11/1936	Current	20	85	144	102	92	77	105	102	102	91	103	102	102	96	103	115	119	104	104.9	1156.16	438	1534.65	Residential	Dwelling	
1495	Quarterny Reads	16/11/1936	Current	20	85	144	102	92	77	105	102	102	91	103	102	102	96	103	115	119	104	104.9	1156.16	438	1534.65	Residential	Dwelling	
1496	Quarterny Reads	16/11/1936	Current	20	85	144	102	92	77	105	102	102	91	103	102	102	96	103	115	119	104	104.9	1156.16	438	1534.65	Residential	Dwelling	
1497	Quarterny Reads	20/11/1936	Current	20	148	156	171	171	142	146	149	130	165	100	210	159	142	116	91	106	154	86	408	1515.83	1497.50	1194.92	Residential	Vacant Land
1498	Quarterny Reads	20/11/1936	Current	20	10	12	13	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	406	1116.38	Rural	Dwelling	
1499	Quarterny Reads	23/11/1936	Current	20	144	217	168	119	116	104	95	123	116	103	116	103	95	108	95	113	79	118	92	462	1104.40	Residential	Dwelling	
1500	Quarterny Reads	23/11/1936	Current	20	86	207	188	119	116	104	95	123	116	103	116	103	95	108	95	113	79	118	92	462	1104.40	Residential	Dwelling	
1501	Quarterny Reads	25/11/1936	Current	20	40	66	63	62	43	47	47	50	44	43	50	58	71	77	150	165	83	104	76	408	1129.12	Community Organizations	Dwelling	
1502	Quarterny Reads	25/11/1936	Current	20	40	66	63	62	43	47	47	50	44	43	50	58	71	77	150	165	83	104	76	408	1129.12	Community Organizations	Dwelling	
1503	Quarterny Reads	25/11/1936	Current	20	40	66	63	62	43	47	47	50	44	43	50	58	71	77	150	165	83	104	76	408	1129.12	Community Organizations	Dwelling	
1504	Quarterny Reads	6/12/1936	Current	20	144	274	342	459	311	412	264	299	430	374	431	376	444	356	459	344	402	341	440	2445	1617.03	Rural	Dwelling	
1505	Quarterny Reads	6/12/1936	Current	20	103	145	312	212	155	160	184	178	199	162	120	128	119	108	111	108	109	106	93	416	1142.88	Residential	Dwelling	
1506	Quarterny Reads	6/12/1936	Current	20	102	142	178	145	109	141	129	141	126	121	120	128	119	108	111	108	109	106	93	416	1142.88	Residential	Dwelling	
1507	Quarterny Reads	6/12/1936	Current	20	222	334	338	297	143	165	215	225	170	224	216	211	197	185	172	144	132	100	91	433	1134.62	Residential	Dwelling	
1508	Quarterny Reads	7/12/1936	Current	20	177	140	176	196	176	331	431	266	177	178	224	207	234	211	169	331	110	95	102	97	404	1109.93	Residential	Dwelling
1509	Quarterny Reads	11/12/1936	Current	20	100	251	342	224	144	214	264	173	169	281	394	387	251	245	250	209	200	169	104	628	2274.73	Residential	Dwelling	
1510	Quarterny Reads	13/12/1936	Current	20	69	226	183	151	71	65	416	325	248	219	354	297	204	76	137	166	169	87	87	411	444	1191.76	Residential	Dwelling
1511	Quarterny Reads	13/12/1936	Current	20	57	167	167	167	167	167	167	167	167	167	167	167	167	167	167	167	167	167	167	437	1016.56	Residential	Dwelling	
1512	Quarterny Reads	15/12/1936	Current	20	76	167	167	167	167	167	167	167	167	167	167	167	167	167	167	167	167	167	167	437	1016.56	Residential	Dwelling	
1513	Quarterny Reads	15/12/1936	Current	20	48	147	121	41	21	32	33	25	22	33	30	37	41	35	44	39	231	64	474	1612.20	Residential	Dwelling		
1514	Quarterny Reads	17/12/1936	Current	20	44	115	75	54	57	74	24	21	9	33	105	82	83	89	82	79	83	106	139	168	508	1300.11	Residential	Dwelling
1515	Quarterny Reads	18/12/1936	Current	20	20	63	241	131	138	129	150	162	157	143	174	209	146	146	136	113	105	98	117	463	1107.47	Residential	Dwelling	
1516	Quarterny Reads	20/12/1936	Current	20	217	358	243	203	203	203	203	203	203	203	203	203	203	203	203	203	203	203	203	748	1614.36	Residential	Dwelling	
1517	Quarterny Reads	20/12/1936	Current	20	49	122	225	98	147	157	158	138	148	147	162	167	165	140	149	176	151	119	150	576	1682.42	Residential	Dwelling	
1518	Quarterny Reads	23/12/1936	Current	20	76	166	235	92	87	226	224	191	128	306	467	459	340	112	116	105	180	137	231	695	1699.24	Residential	Dwelling	
1519	Quarterny Reads	23/12/1936	Current	20	68	148	150	122	103	103	102	127	111	108	103	110	107	112	116	105	104	102	104	418	1481.33	Residential	Dwelling	
1520	Quarterny Reads	23/12/1936	Current	20	68	148	150	122	103	103	102	127	111	108	103	110	107	112	116	105	104	102	104	418	1481.33	Residential	Dwelling	
1521	Quarterny Reads	30/11/1937	Current	20	67	217	238	246	176	149	136	107	163	162	172	156	200	162	134	135	141	111	138	502	1576.12	Residential	Dwelling	
1522	Quarterny Reads	30/11/1937	Current	20	67	213	142	95	139	160	156	148	125	117	156	168	169	144	103	99	109	107	138	534	1467.03	Residential	Dwelling	
1523	Quarterny Reads	4/01/1937	Current	20	75	146	179	124	120	164	167	166	124	172	137	147	109	146	129	92	106	106	106	433	1189.86	Residential	Dwelling	
1524	Quarterny Reads	5/01/1937	Current	20	19	240	333	353	303	352	305	351	322	270	345	325	276	323	310	282	310	309	306	437	1510.41	Residential	Dwelling	
1525	Quarterny Reads	5/01/1937	Current	20	60	128	122	103	116	126	115	154	161	126	141	136	141	111	111	111	111	111	138	502	1576.12	Residential	Dwelling	
1526	Quarterny Reads	7/01/1937	Current	20	80	128	122	103	116	126	115	154	161	126	141	136	141	111	111	111	111	111	138	502	1576.12	Residential	Dwelling	
1527	Quarterny Reads	8/01/1937	Current	20	153	185	170	124	122	174	181	117	141	176	131	149	95	127	191	146	111	108	154	163	536	1672.83	Residential	Dwelling
1528	Quarterny Reads	9/01/1937	Current	20	179	282	331	232	214	289	302	295	298	364	298	271	190	193	123	163	107	117	133	496	2217.00	Residential	Dwelling	
1529	Quarterny Reads	11/01/1937	Current	20	36	160	206	114	91	114	116	89	105	162	209	203	260	162	208	156	147	106	87	406	1115.31	Residential	Dwelling	
1530	Quarterny Reads	12/01/1937	Current	20	119	225	308	213	143	268	249	251	217	196	277	196	277	196	277	196	277	196	277	673	1648.90	Residential	Dwelling	
1531	Quarterny Reads	13/01/1937	Current	20	48	125	153	59	70	62	116	69	72	121	71	65	88	109	204	218	313	208	232	985	2768.04	Residential	Dwelling	
1532	Quarterny Reads	13/01/1937	Current	20	62	187	190	166	166	166	166	166	166	166	166	166	166	166	166	166	166	166	166	166	462	1534.65	Residential	Dwelling
1533	Quarterny Reads	15/01/1937	Current	20	67	166	317	317	317	317	317	317	317	317	317	317	317	317	317	317	317	317	317	452	1534.65	Residential	Dwelling	
1534	Quarterny Reads	16/01/1937	Current	20	66	302	368	275	212	133	82	189	109	93	168	120	123	96	102	101	116	104	113	434	1192.31	Residential	Dwelling	
1535	Quarterny Reads	17/01/1937	Current	20	26	138	175	153	60	118	174	86	142	144	168	153	108	128	128	108	79	130	123	434	1203.30	Residential	Dwelling	
1536	Quarterny Reads	18/01/1937	Current	20	15	40	63	54	45	85	65	35	258	96	51	31	32	39	26	25	26	54	168	670	1640.86	Residential	Dwelling	
1537	Quarterny Reads	18/01/1937	Current	20	74	63	178	138	171	156	283	183	282	153	492	281	154	183	353	353	353	353	353	729	2107.75	Residential	Dwelling	
1538	Quarterny Reads	20/01/1937	Current	20	0	5	7	107	94	153	137	129	137	141	114	151	163	102	69	71	138	103	406	1115.36	Residential	Dwelling		
1539	Quarterny Reads	23/01/1937	Current	20	70	121	72	25	44	66	51	60	138	95	57	74	73	41	26	60	108	80	127	459	1533.62	Residential	Dwelling	
1540	Quarterny Reads	30/01/1937	Current	20	77	119	171	151	1																			

1564	Quarryy Reas	17/02/1997	Current	20	85	107	124	163	164	178	188	165	145	164	174	174	174	241	231	221	144	102.25	3309	165.45	1818.13	707	Residential	Dwelling	1642.31			
1565	Quarryy Reas	18/02/1997	Current	20	142	298	265	197	199	174	189	205	181	170	219	222	174	141	143	141	142	152	118	106.24	3528	176.40	1938.46	478	Residential	Dwelling	1515.19	
1566	Quarryy Reas	19/02/1997	Current	20	44	111	113	104	124	128	164	139	106	89	94	81	81	81	92	95	92	105	102.24	1008.5	171.96	444	149.76	171.96	444	Residential	Dwelling	1515.19
1567	Quarryy Reas	20/02/1997	Current	20	28	65	65	50	52	53	132	133	144	176	188	176	134	138	122	144	140	120	136	144	2343	1358.59	558	Residential	Dwelling	1517.55		
1571	Quarryy Reas	21/02/1997	Current	20	41	60	99	74	102	142	149	165	144	146	214	127	99	104	97	104	144	124	102.23	2161	113.74	1749.86	488	Residential	Dwelling	1285.71		
1572	Quarryy Reas	22/02/1997	Current	20	1	105	99	91	102	142	149	165	144	146	214	127	99	104	97	104	144	124	102.23	2161	113.74	1749.86	488	Residential	Dwelling	1285.71		
1573	Quarryy Reas	23/02/1997	Current	20	0	14	16	94	97	130	108	88	10	14	18	14	18	14	18	14	18	14	102.23	2987	167.21	1727.99	608	Residential	Dwelling	1703.30		
1574	Quarryy Reas	24/02/1997	Current	20	0	14	16	94	97	130	108	88	10	14	18	14	18	14	18	14	18	14	102.23	2987	167.21	1727.99	608	Residential	Dwelling	1703.30		
1575	Quarryy Reas	25/02/1997	Current	20	0	14	16	94	97	130	108	88	10	14	18	14	18	14	18	14	18	14	102.23	2987	167.21	1727.99	608	Residential	Dwelling	1703.30		
1576	Quarryy Reas	26/02/1997	Current	20	111	317	288	219	181	237	210	243	268	296	244	210	217	217	217	217	217	217	102.22	2258	118.74	1304.80	438	Residential	Dwelling	1203.30		
1577	Quarryy Reas	27/02/1997	Current	20	62	404	293	203	183	271	332	332	271	332	271	332	271	332	271	332	271	332	102.22	4731	236.85	2596.45	1017	Residential	Dwelling	1783.86		
1578	Quarryy Reas	28/02/1997	Current	20	0	14	16	94	97	130	108	88	10	14	18	14	18	14	18	14	18	14	102.22	1258	65.05	714.98	421	Residential	Dwelling	1158.99		
1579	Quarryy Reas	29/02/1997	Current	20	2	12	114	126	124	143	179	148	158	193	155	110	96	126	118	110	96	114	102.21	2347	118.26	1298.60	466	Residential	Dwelling	1115.38		
1580	Quarryy Reas	30/02/1997	Current	20	136	179	194	158	207	138	131	101	85	66	77	79	82	64	107	115	109	109	102.21	2588	125.88	1381.15	442	Residential	Dwelling	1214.29		
1581	Quarryy Reas	31/03/1997	Current	20	158	149	199	166	164	111	109	117	101	85	66	77	79	82	64	107	115	109	102.21	2588	125.88	1381.15	442	Residential	Dwelling	1214.29		
1582	Quarryy Reas	31/03/1997	Current	20	421	233	193	166	141	177	244	250	467	314	246	467	314	246	467	314	246	467	102.20	3674	188.31	2007.95	477	Residential	Dwelling	1510.44		
1583	Quarryy Reas	31/03/1997	Current	20	158	149	199	166	164	111	109	117	101	85	66	77	79	82	64	107	115	109	102.20	3674	188.31	2007.95	477	Residential	Dwelling	1510.44		
1584	Quarryy Reas	7/03/1997	Current	20	86	256	83	113	135	140	86	70	106	103	84	102	76	80	117	130	116	178	101.9	2782	169.02	601	Residential	Dwelling	1651.10			
1585	Quarryy Reas	7/03/1997	Current	20	27	81	76	75	81	110	72	28	105	74	76	82	76	80	117	130	116	178	101.9	1692	89.05	978.60	529	Residential	Dwelling	1651.10		
1586	Quarryy Reas	7/03/1997	Current	20	34	83	78	85	81	123	104	106	122	114	96	122	114	96	122	114	96	122	101.9	2082	109.98	1197.58	428	Residential	Dwelling	1651.10		
1587	Quarryy Reas	7/03/1997	Current	20	158	149	199	166	164	111	109	117	101	85	66	77	79	82	64	107	115	109	102.20	3674	188.31	2007.95	477	Residential	Dwelling	1510.44		
1588	Quarryy Reas	10/03/1997	Current	20	52	527	365	185	360	314	274	473	473	387	351	174	184	218	152	176	114	101.8	4680	208.95	3285.14	700	Residential	Dwelling	1923.05			
1589	Quarryy Reas	11/03/1997	Current	20	74	482	356	186	300	374	327	359	300	407	495	268	224	262	268	211	177	245	102.18	5692	299.98	3292.08	893	Residential	Dwelling	2183.30		
1590	Quarryy Reas	12/03/1997	Current	20	62	404	293	203	183	271	332	332	271	332	271	332	271	332	271	332	271	332	102.22	4731	236.85	2596.45	1017	Residential	Dwelling	1783.86		
1591	Quarryy Reas	12/03/1997	Current	20	213	292	293	203	183	271	332	332	271	332	271	332	271	332	271	332	271	332	102.22	4731	236.85	2596.45	1017	Residential	Dwelling	1783.86		
1592	Quarryy Reas	14/03/1997	Current	20	417	453	348	248	272	271	203	326	326	207	194	210	162	189	172	163	164	163	101.7	4683	205.95	2612.81	711	Commercial	Home/Avem	1615.30		
1593	Quarryy Reas	14/03/1997	Current	20	134	186	132	108	137	150	111	94	73	60	107	79	21	118	118	109	102	146	101.7	2058	118.85	1182.51	417	Commercial	Home/Avem	1146.60		
1594	Quarryy Reas	16/03/1997	Current	20	2	113	75	88	123	120	90	86	148	118	84	87	86	103	86	95	98	114	127	101.6	1865	98.16	1078.68	434	Residential	Dwelling	1192.31	
1595	Quarryy Reas	17/03/1997	Current	20	90	65	60	64	73	86	79	81	117	76	84	99	109	108	128	126	126	126	101.6	1828	106.05	1059.52	533	Residential	Dwelling	1192.31		
1596	Quarryy Reas	17/03/1997	Current	20	90	65	60	64	73	86	79	81	117	76	84	99	109	108	128	126	126	126	101.6	1828	106.05	1059.52	533	Residential	Dwelling	1192.31		
1597	Quarryy Reas	19/03/1997	Current	20	151	303	303	64	264	344	256	155	380	182	225	184	112	486	425	174	64	85	108	101.8	3016	208.11	2284.89	434	Residential	Dwelling	1192.31	
1598	Quarryy Reas	20/03/1997	Current	20	228	366	218	199	263	325	368	402	357	324	175	151	119	119	119	119	119	119	101.5	4408	231.89	2548.23	482	Residential	Dwelling	1524.18		
1599	Quarryy Reas	21/03/1997	Current	20	42	202	199	164	127	162	170	144	132	154	114	110	127	131	117	112	115	100	81	101.4	2786	138.30	1519.78	408	Residential	Dwelling	1120.89	
1600	Quarryy Reas	21/03/1997	Current	20	156	302	194	170	179	240	186	169	176	194	203	143	107	134	135	148	150	100	101.4	3026	168.31	1847.37	498	Residential	Dwelling	1546.66		
1601	Quarryy Reas	24/03/1997	Current	20	282	290	152	168	127	178	168	198	164	262	239	132	117	156	129	115	100	99	101.4	3086	171.44	1884.00	443	Residential	Dwelling	1517.03		
1602	Quarryy Reas	24/03/1997	Current	20	227	281	151	175	227	178	168	198	164	262	239	132	117	156	129	115	100	99	101.4	3086	171.44	1884.00	443	Residential	Dwelling	1517.03		
1603	Quarryy Reas	25/03/1997	Current	20	8	131	185	208	282	288	187	103	103	131	131	124	124	135	135	135	135	135	101.4	2899	149.60	1637.38	583	Residential	Dwelling	1601.83		
1604	Quarryy Reas	25/03/1997	Current	20	20	89	155	119	138	151	177	136	126	117	112	142	107	140	138	126	117	112	101.3	2599	132.86	1458.91	423	Residential	Dwelling	1178.57		
1605	Quarryy Reas	28/03/1997	Current	20	89	155	119	138	151	177	136	126	117	112	142	107	140	138	126	117	112	101.3	2599	132.86	1458.91	423	Residential	Dwelling	1178.57			
1606	Quarryy Reas	28/03/1997	Current	20	89	155	119	138	151	177	136	126	117	112	142	107	140	138	126	117	112	101.3	2599	132.86	1458.91	423	Residential	Dwelling	1178.57			
1607	Quarryy Reas	29/03/1997	Current	20	68	71	49	47	68	115	116	102	105	108	131	103	93	93	95	94	93	94	101.3	1885	99.21	1090.23	477	Residential	Dwelling	1510.44		
1608	Quarryy Reas	30/03/1997	Current	20	68	71	49	47	68	115	116	102	105	108	131	103	93	93	95	94	93	94	101.3	1885	99.21	1090.23	477	Residential	Dwelling	1510.44		
1609	Quarryy Reas	30/03/1997	Current	20	68	71	49	47	68	115	116	102	105	108	131	103	93	93	95	94	93	94	101.3	1885	99.21	1090.23	477	Residential	Dwelling	1510.44		
1610	Quarryy Reas	30/03/1997	Current	20	68	71	49	47	68	115	116	102	105	108	131	103	93	93	95	94	93	94	101.3	1885	99.21	1090.23	477	Residential	Dwelling	1510.44		
1611	Quarryy Reas	30/03/1997	Current	20	32	536	536	240	872	320	473	265	326	268	268	268	268	268	268	268	268	268	101.2	8642	206.95	3083.15	487	Residential	Dwelling - Flats	1537.81		
1612	Quarryy Reas	30/03/1997	Current	20	2	140	127	103	116	110	101	98	102	97	91	82	82	92	108	109	98	102	101.2	2463	142.92	1424.52	489	Residential	Dwelling	1537.81		
1613	Quarryy Reas	30/03/1997	Current																													

1762	Quarterly Reads	3/10/1997	Current	20	20	141	278	148	163	80	76	105	103	109	124	104	92	102	97.1	1782	110.13	12,10.16	412	1431.87	Residential	Dwelling		
1763	Quarterly Reads	1/09/1997	Current	20	1	191	270	141	125	155	148	80	103	109	124	114	114	119	123	97.1	1833	122.20	13,42.86	517	1420.33	Residential	Dwelling	
1764	Quarterly Reads	2/09/1997	Current	20	1	194	168	159	130	35	63	93	71	89	99	103	107	108	93.0	1531	117.31	12,31.50	411	1129.12	Residential	Dwelling		
1765	Quarterly Reads	3/09/1997	Current	20	1	197	168	159	130	35	63	93	71	89	99	103	107	108	93.0	1531	117.31	12,31.50	411	1129.12	Residential	Dwelling		
1766	Quarterly Reads	4/09/1997	Current	20	1	193	170	162	136	117	114	101	119	154	133	110	107	97.0	1730	147.2	10,78.36	447	1236.02	Residential	Dwelling			
1767	Quarterly Reads	5/09/1997	Current	20	4	24	45	61	75	52	51	76	62	42	76	92	113	170	58.0	1013	101.3	17,43.00	443	1217.02	Residential	Dwelling		
1768	Quarterly Reads	6/09/1997	Current	20	4	24	45	61	75	52	51	76	62	42	76	92	113	170	58.0	1013	101.3	17,43.00	443	1217.02	Residential	Dwelling		
1769	Quarterly Reads	7/09/1997	Current	20	0	165	241	221	162	206	197	222	194	162	194	162	194	162	94	9.69	2603	173.63	19,06.96	532	1611.54	Residential	Dwelling	
1770	Quarterly Reads	8/09/1997	Current	20	0	165	241	221	162	206	197	222	194	162	194	162	194	162	94	9.69	2603	173.63	19,06.96	532	1611.54	Residential	Dwelling	
1771	Quarterly Reads	9/09/1997	Current	20	5	93	139	244	94	145	141	203	31	108	158	161	152	151	133	8.69	1850	153.62	12,90.89	413	1154.62	Residential	Dwelling	
1772	Quarterly Reads	10/09/1997	Current	20	9	53	65	51	70	54	75	61	28	9	16	85	164	111	46	8.68	427	263.69	233.27	408	1116.38	Residential	Dwelling	
1773	Quarterly Reads	11/09/1997	Current	20	4	6	4	6	4	36	149	104	71	96	113	104	91	104	37	8.68	1124	70.25	771.86	410	1116.38	Residential	Dwelling	
1774	Quarterly Reads	12/09/1997	Current	20	4	6	4	6	4	36	149	104	71	96	113	104	91	104	37	8.68	1124	70.25	771.86	410	1116.38	Residential	Dwelling	
1775	Quarterly Reads	13/09/1997	Current	20	169	360	205	348	143	139	280	196	232	184	261	372	300	333	82	8.67	5541	358.07	30,12.82	2762	1637.81	Residential	Dwelling	
1776	Quarterly Reads	14/09/1997	Current	20	38	360	208	348	143	139	280	196	232	184	261	372	300	333	82	8.67	5541	358.07	30,12.82	2762	1637.81	Residential	Dwelling	
1777	Quarterly Reads	15/09/1997	Current	20	210	335	287	234	169	165	155	119	126	120	154	134	92	93	91	9.67	2484	166.27	1827.11	410	1126.37	Residential	Dwelling	
1778	Quarterly Reads	16/09/1997	Current	20	446	377	303	250	177	164	148	109	126	120	154	134	92	93	91	9.67	2484	166.27	1827.11	410	1126.37	Residential	Dwelling	
1779	Quarterly Reads	17/09/1997	Current	20	46	77	62	54	44	36	54	44	36	54	44	36	54	44	36	8.65	1450	108.27	10,82.27	407	1105.16	Residential	Dwelling	
1780	Quarterly Reads	18/09/1997	Current	20	186	236	177	178	209	188	244	191	207	125	135	109	123	136	144	8.66	2583	172.87	18,96.63	503	1581.87	Residential	Dwelling	
1781	Quarterly Reads	19/09/1997	Current	20	104	136	130	155	205	143	168	121	125	135	109	123	136	144	3.66	1562	141.13	15,95.02	507	1592.86	Multiple Residential Dwelling - Units	Dwelling		
1782	Quarterly Reads	20/09/1997	Current	20	933	848	889	177	211	439	213	157	211	111	110	110	110	110	8.65	2658	197.27	21,67.77	478	1513.19	Residential	Dwelling		
1783	Quarterly Reads	21/09/1997	Current	20	27	99	97	110	115	104	111	107	108	113	138	115	123	85	84	8.65	1532	112.34	11,22.34	407	1116.13	Residential	Dwelling	
1784	Quarterly Reads	22/09/1997	Current	20	207	207	206	169	169	210	197	167	167	167	167	167	167	167	111	100	8.64	2458	163.87	18,00.73	446	1229.27	Residential	Dwelling
1785	Quarterly Reads	23/09/1997	Current	20	1786	Quarterly Reads	24/09/1997	Current	20	144	137	145	147	147	147	147	147	147	147	8.64	2189	145.93	16,03.86	517	1420.33	Residential	Dwelling	
1786	Quarterly Reads	25/09/1997	Current	20	112	168	120	163	197	133	163	117	164	168	91	122	6	130	111	8.64	1902	126.90	13,93.41	464	1174.71	Residential	Dwelling	
1787	Quarterly Reads	26/09/1997	Current	20	0	15	150	134	80	107	109	112	99	115	108	124	213	122	103	100	8.63	1494	99.60	10,94.51	407	1118.13	Residential	Dwelling
1788	Quarterly Reads	27/09/1997	Current	20	0	5	48	317	127	152	137	159	169	166	147	159	114	114	9.62	1974	104.93	11,83.11	500	1173.63	Residential	Dwelling		
1789	Quarterly Reads	28/09/1997	Current	20	0	5	48	317	127	152	137	159	169	166	147	159	114	114	9.62	1974	104.93	11,83.11	500	1173.63	Residential	Dwelling		
1790	Quarterly Reads	29/09/1997	Current	20	216	125	108	117	144	132	247	260	136	138	145	169	141	71	85	9.61	2320	164.37	16,99.63	468	1106.52	Commercial	Commercial	
1791	Quarterly Reads	30/09/1997	Current	20	47	124	128	166	155	52	80	106	211	174	172	178	134	127	172	103	9.61	2104	121.67	13,37.00	512	1406.89	Residential	Dwelling
1792	Quarterly Reads	1/10/1997	Current	20	74	122	139	131	157	147	137	158	228	115	128	175	146	146	8.60	2622	194.70	14,49.37	463	1446.70	Commercial	Stops Single		
1793	Quarterly Reads	2/10/1997	Current	20	20	182	128	135	142	159	148	128	168	119	109	125	128	114	132	103	8.60	1936	129.07	14,18.32	477	1150.44	Commercial	Stops Single
1794	Quarterly Reads	3/10/1997	Current	20	273	697	709	789	845	201	166	151	165	203	278	243	171	178	138	8.60	5237	349.13	30,36.63	731	2038.24	Commercial	Stops Single	
1803	Quarterly Reads	11/10/1997	Current	20	0	58	65	53	54	135	275	263	136	144	76	80	162	156	164	9.54	1808	129.14	14,19.15	552	1143.96	Residential	Dwelling	
1804	Quarterly Reads	12/10/1997	Current	20	894	122	105	128	109	198	233	183	149	145	229	110	110	9.54	1945	138.93	14,95.89	475	1104.96	Residential	Dwelling			
1805	Quarterly Reads	13/10/1997	Current	20	116	144	145	148	164	137	176	165	168	212	204	179	162	163	163	9.54	2260	150.00	16,48.36	460	1165.74	Residential	Dwelling	
1806	Quarterly Reads	14/10/1997	Current	20	20	57	62	227	252	206	208	167	167	190	162	162	162	162	9.54	1846	131.86	14,48.86	605	1662.09	Residential	Dwelling		
1807	Quarterly Reads	15/10/1997	Current	20	147	147	181	170	166	157	129	160	116	122	106	102	84	9.54	1867	135.90	14,89.71	414	1137.36	Residential	Dwelling			
1808	Quarterly Reads	16/10/1997	Current	20	208	205	202	202	202	142	173	137	136	136	136	136	136	136	9.54	1867	135.90	14,89.71	414	1137.36	Residential	Dwelling		
1809	Quarterly Reads	17/10/1997	Current	20	29	0	86	85	143	95	62	116	135	200	86	85	60	219	116	9.57	1484	108.00	11,84.84	483	1536.82	Residential	Dwelling	
1811	Quarterly Reads	19/10/1997	Current	20	155	262	191	202	207	94	207	155	136	145	152	122	140	150	9.57	2416	172.87	18,96.39	564	1649.45	Residential	Dwelling		
1812	Quarterly Reads	20/10/1997	Current	20	813	571	594	200	305	228	308	227	332	224	348	104	113	179	95	9.54	2724	194.57	17,38.15	738	2027.47	Residential	Dwelling	
1813	Quarterly Reads	21/10/1997	Current	20	268	384	64	54	70	110	118	132	97	115	121	104	101	104	111	9.54	2422	173.03	16,70.14	420	1155.65	Residential	Dwelling	
1815	Quarterly Reads	23/10/1997	Current	20	0	14	279	219	258	208	193	142	168	147	160	122	122	122	9.54	2124	151.71	16,67.19	504	1844.82	Residential	Dwelling		
1816	Quarterly Reads	24/10/1997	Current	20	513	453	300	401	108	86	102	116	268	458	304	301	106	120	9.54	3725	266.07	20,23.86	1413	3813.87	Residential	Dwelling		
1817	Quarterly Reads	25/10/1997	Current	20	0	148	148	148	148	148	148	148	148	148	148	148	148	148	9.54	1484	148.00	14,84.00	483	1536.82	Residential	Dwelling		
1818	Quarterly Reads	26/10/1997	Current	20	0	148	148	148	148	148	148	148	148	148	148	148	148	148	9.54	1484	148.00	14,84.00	483	1536.82	Residential	Dwelling		
1819	Quarterly Reads	27/10/1997	Current	20	0	148	148	148	148	148	148	148	148	148	148	148	148	148	9.54	1484	148.00	14,84.00	483	1536.82	Residential	Dwelling		
1820	Quarterly Reads	28/10/1997	Current	20	891	378	404	457	434	401	500	402	404	421	383	336	351	371	9.55	7628	544.88	50,67.44	2846	7618.63	Rural	Dairy - Cattle Milk		
1821	Quarterly Reads	29/10/1997	Current	20	91	804	625	448	513	371	156	319	125	686	261	427	117	109	9.54	7422	536.14	50,25.75	3427	9414.84	Residential	Dwelling		
1822	Quarterly Reads	30/10/1997	Current	20	0	116	159	188	237	332	224	224	224	224	224	224	224	224	9.54	2147	153.36	16,85.24	480	1685.24	Residential	Dwelling		
1823	Quarter																											

1860	Quarterly Reads	7/12/1997	Current	20	74	64	66	91	188	118	108	944	1248	104,00	1142,86	453	1444,81	Residential	Dwelling					
1861	Quarterly Reads	8/12/1997	Current	20	35	25	15	126	121	95	95	944	1160	104,00	1142,86	453	1444,81	Residential	Dwelling					
1862	Quarterly Reads	9/12/1997	Current	20	3	18	3	6	57	85	129	112	103	73,84	803,11	426	1170,33	Residential	Dwelling					
1863	Quarterly Reads	10/12/1997	Current	20	1	7	1	10	10	10	10	10	10	10	10	10	10	Residential	Dwelling					
1864	Quarterly Reads	11/12/1997	Current	20	1	7	1	122	101	104	101	102	108	80,32	853,58	401	1101,65	Residential	Dwelling					
1865	Quarterly Reads	12/12/1997	Current	20	206	509	189	144	311	141	141	138	119	137	134	292	2,82	181,69	Residential	Dwelling				
1866	Quarterly Reads	1/12/1997	Current	20	159	269	198	214	209	141	159	173	289	142	112	59	9,42	2,95	184,23	Residential	Dwelling			
1867	Quarterly Reads	2/12/1997	Current	20	201	363	270	216	217	141	201	210	279	157	136	78	2,52	213,50	Residential	Dwelling				
1868	Quarterly Reads	3/12/1997	Current	20	201	363	270	216	217	141	201	210	279	157	136	78	2,52	213,50	Residential	Dwelling				
1869	Quarterly Reads	4/12/1997	Current	20	201	363	270	216	217	141	201	210	279	157	136	78	2,52	213,50	Residential	Dwelling				
1870	Quarterly Reads	5/12/1997	Current	20	58	96	83	79	143	83	78	95	113	233	154	188	8,41	1,84	107,23	Residential	Dwelling			
1871	Quarterly Reads	6/12/1997	Current	20	0	14	19	5	7	7	0	2	2	122	0	0	0	1,89	115,23	Commercial	Class (Hospitality)			
1872	Quarterly Reads	7/12/1997	Current	20	0	7	0	0	0	0	0	0	0	0	0	0	0	1,89	115,23	Commercial	Class (Hospitality)			
1873	Quarterly Reads	8/12/1997	Current	20	0	2	15	29	44	118	146	123	104	116	79	106	113	8,40	1,096	91,33	Residential	Dwelling		
1874	Quarterly Reads	9/12/1997	Current	20	17	357	291	339	454	261	259	243	241	184	192	192	3,40	3,263	2,749	79,74	Residential	Dwelling		
1875	Quarterly Reads	10/12/1997	Current	20	26	492	687	576	629	378	498	374	233	233	197	179	9,40	4,897	3,813	410,19	Residential	Dwelling		
1876	Quarterly Reads	11/12/1997	Current	20	0	0	0	0	0	0	0	0	0	0	0	0	0	1,65	106,92	106,92	Residential	Dwelling		
1877	Quarterly Reads	12/12/1997	Current	20	0	0	0	0	0	0	0	0	0	0	0	0	0	1,65	106,92	106,92	Residential	Dwelling		
1878	Quarterly Reads	1/12/1997	Current	20	247	280	308	321	312	312	308	221	68	58	68	3,39	3,500	2,617	3,205	13	415	Residential	Dwelling	
1879	Quarterly Reads	2/12/1997	Current	20	482	580	348	325	399	254	179	176	144	131	201	168	2,676	2,033	2,033	64	644	Residential	Dwelling	
1880	Quarterly Reads	3/12/1997	Current	20	98	174	210	216	217	141	201	210	279	157	136	78	2,52	213,50	213,50	478	478	Residential	Dwelling	
1881	Quarterly Reads	4/12/1997	Current	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Residential	Dwelling	
1882	Quarterly Reads	5/12/1997	Current	20	5	249	308	418	409	311	203	418	338	416	799	838	4,785	3,987,5	4,381	87	2,569	Industrial	Iron Smelting and Steel Manufacturing	
1883	Quarterly Reads	6/12/1997	Current	20	2	204	185	211	212	183	194	163	205	185	142	162	161	2,209	1,692	1,692	650	650	Residential	Dwelling
1884	Quarterly Reads	7/12/1997	Current	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Residential	Dwelling	
1885	Quarterly Reads	8/12/1997	Current	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Residential	Dwelling	
1886	Quarterly Reads	9/12/1997	Current	20	213	272	264	406	281	272	257	185	137	158	136	117	9,37	2,641	2,038	2,038	505	505	Residential	Dwelling
1887	Quarterly Reads	10/12/1997	Current	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Residential	Dwelling	
1888	Quarterly Reads	11/12/1997	Current	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Residential	Dwelling	
1889	Quarterly Reads	12/12/1997	Current	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Residential	Dwelling	
1890	Quarterly Reads	1/12/1998	Current	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Residential	Dwelling	
1891	Quarterly Reads	2/12/1998	Current	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Residential	Dwelling	
1892	Quarterly Reads	3/12/1998	Current	20	111	236	278	246	141	168	217	311	168	156	209	205	9,35	2,506	2,033	2,033	738	738	Residential	Dwelling
1893	Quarterly Reads	4/12/1998	Current	20	66	109	103	174	233	70	39	66	252	56	35	161	9,35	2,370	1,979	1,979	506	506	Residential	Dwelling
1894	Quarterly Reads	5/12/1998	Current	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Residential	Dwelling	
1895	Quarterly Reads	6/12/1998	Current	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Residential	Dwelling	
1896	Quarterly Reads	7/12/1998	Current	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Residential	Dwelling	
1897	Quarterly Reads	8/12/1998	Current	20	1	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Residential	Dwelling	
1898	Quarterly Reads	9/12/1998	Current	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Residential	Dwelling	
1899	Quarterly Reads	10/12/1998	Current	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Residential	Dwelling	
1900	Quarterly Reads	11/12/1998	Current	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Residential	Dwelling	
1901	Quarterly Reads	12/12/1998	Current	20	4	88	110	103	75	33	101	134	145	130	59	98	9,33	11,001	9,167	10,07	33	432	Residential	Dwelling
1902	Quarterly Reads	1/12/1999	Current	20	0	7	87	164	158	163	164	143	147	115	106	110	116,75	14,401	11,675	12,82	37	518	Residential	Dwelling - Large Homesite
1903	Quarterly Reads	2/12/1999	Current	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Residential	Dwelling	
1904	Quarterly Reads	3/12/1999	Current	20	0	10	76	916	381	246	178	246	273	159	30	28	2,665	5,135	2,135	2,348	30	479	Residential	Rural
1905	Quarterly Reads	4/12/1999	Current	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Residential	Dwelling	
1906	Quarterly Reads	5/12/1999	Current	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Residential	Dwelling	
1907	Quarterly Reads	6/12/1999	Current	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Residential	Dwelling	
1908	Quarterly Reads	7/12/1999	Current	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Residential	Dwelling	
1909	Quarterly Reads	8/12/1999	Current	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Residential	Dwelling	
1910	Quarterly Reads	9/12/1999	Current	20	9	4	99	224	197	128	59	75	76	117	323	172	9,30	14,477	12,305	12,47	75	411	Residential	Dwelling
1911	Quarterly Reads	10/12/1999	Current	20	4	2	107	152	169	194	148	118	121	116	111	116	9,33	1,399	1,165	1,165	468	468	Residential	Dwelling
1912	Quarterly Reads	11/12/1999	Current	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Residential	Dwelling	
1913	Quarterly Reads	12/12/1999	Current	20	107	146	136	126	126	126	126	126	126	126	126	126	126	126	126	126	126	126	Residential	Dwelling
1914	Quarterly Reads	1/12/2000	Current	20	49	74	61	54	110	40	171	131	102	110	96	95	9,29	1,190	991,7	1,088	74	405	Residential	Shops Single
1915	Quarterly Reads	2/12/2000	Current	20	98	197	195	177	132	127	146	131	129	142	121	106	3,299	1,975	1,442	1,442	492	492	Residential	Dwelling
1916	Quarterly Reads	3/12/2000	Current	20	222	252	252	252	252	252	252	252	252	252	252	252	252	252	252	252	252	252	Residential	Dwelling
1917	Quarterly Reads	4/12/2000	Current	20	0	66	39	53	26	32	106	106	148	138	99	88	9,23	932	751,7	826	01	471	Residential	Dwelling - Single
1918	Quarterly Reads	5/12/2000	Current	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Residential	Dwelling	
1919	Quarterly Reads	6/12/2000	Current	20	8	12	7																	

APPENDIX C

Photographs



Figure C1 Silt covering the consumption volume on the water meter



Figure C2 Water meter full of debris (Seeds, grass and soil)



Figure C3 Fence lines on properties built up to or over the water meter



Figure C4 Property owners covering the water meter (copper logs for garden)



Figure C5 Silt/Soil covering the entire water meter



Figure C6 Property owners tampering with the water meter



Figure C7 Gardens built around the water meter



Figure C8 Ant nest within the water meter box



Figure C9 A rock garden placed over an above ground water meter