

# ORC MINIMUM REQUIREMENTS FOR THE MEASUREMENT AND REPORTING OF WATER TAKES



Version No.: 7

Latest Revision date: 1 September 2017

Prepared by: Rachel Brennan

Position: Team Leader Environmental Compliance

Reviewed by: Martin King  
Marc Ettema

Position: Manager Environmental Monitoring  
Senior Environmental Data Officer

ORC Reference: A461096 (Word Version)  
A625919 (Pdf Version)

## Table of Contents

1.0	Introduction .....	5
1.1	Purpose .....	5
1.2	Scope .....	5
1.3	Background .....	5
1.4	Definitions .....	6
1.5	Water Exemptions .....	7
1.6	Council Contact and Supply of Information .....	7
2.0	Open Channel .....	8
2.1	Site Assessment .....	8
2.2	Flow Verification .....	8
2.3	Verification Frequency .....	9
2.4	Inspection Frequency .....	9
2.5	Open channel measurement using Flume Meters .....	10
3.0	Full Pipes .....	11
3.1	Water Meter Requirements .....	11
3.2	Water Meter Installation .....	11
3.2	Flow Verification Frequency .....	11
3.3	Flow Verification .....	12
3.3.1	Verification of Flows <5 l/s .....	12
3.3.2	Verification of Flows >5 l/s .....	12
3.3.2.1	Verification using Ultrasonic Clamp on Meter .....	12
3.3.2.2	Verification of Magflow Meters .....	13
3.4	General Inspection .....	14
3.5	Verification Report .....	14
4.0	Data Supply & Management .....	15
4.1	Datalogger Requirements .....	15
4.2	Telemetry Requirements .....	15
4.3	Metadata .....	15
4.4	Data Not Being Measured or Recorded .....	16
4.5	Multiple Permits One Meter/Point of Take .....	16
Appendix A	ORC Requirements for Transfer of Data for Water meter via Telemetry .....	17
A.1	Transfer Format for Water Meter Data .....	17
A.2	Data Format .....	17
A.3	Time Zones .....	19
A.4	Logger Styles .....	19
A.5	Separate Elements for Timestamp and Value .....	19
A.6	Multiple Meters .....	20
A.7	Comments for Telemetry Data .....	21

A.8	File Names.....	21
Appendix B	Water Metering Services Relationships and Expectations.....	22
B.1	Water Metering Service Categories .....	22
B.2	Relationships and Expectations.....	22
B.3	Water Measurement/Verification Fast Facts.....	23
Appendix C	RS1 Piped Takes - Water Meter & Datalogger Installation/Commissioning & Verification Form. ....	24
Appendix D	RS2 Open Channel - Water Measuring Device Installation/Commissioning & Verification Form. ....	25
Appendix E	RS4 Piped Takes - Non-Standard Installation Approval Form.....	26
Appendix F	Form 24 – Application for Exemption to measure near rather than at the point of take. ....	27

## 1.0 Introduction

### 1.1 Purpose

The purpose of this document is to clarify for service providers the minimum requirements for the installation, verification and supply of data with respect to the Resource Management (Measurement and Reporting of Water Takes) Regulations 2010 (the Regulations) and consent conditions in the Otago Region. It is intended to be complementary to the Irrigation New Zealand “Bluetick” Guidelines for the Measurement and Reporting of Water Takes.

This document has been developed due to the unique situation and challenges presented in the Otago Region, specifically with respect to open channel water takes and mining privileges.

### 1.2 Scope

This document provides guidance as to how water permit holders via installers and service providers, are to meet their obligations under the Regulations. This document is divided into three sections:

- Open Channel
- Full pipe systems
- Data requirements

### 1.3 Background

The Regulations came into effect on 10 November 2010. They were established to provide a tool to aid in the planning, monitoring and management of New Zealand’s water resources. Transitional provisions of the Regulations provide a lead-in time for the holders of permits granted prior to 10 November 2010 to implement any work necessary to become compliant. Compliance with the Regulations is dependant on the allowable rate of take specified in the permit. If a permit does not specify any rate at all, for the purposes of the regulations, these permits are to be treated as if they specify a rate of 20 litres/second. Deadlines for compliance with the regulations are:

- 20 litres/second or more: from 10 November 2012
- 10 litres/second or more, but less than 20 litres/second: from 10 November 2014
- 5 litres/second or more, but less than 10 litres/second: from 10 November 2016.

All holders of permits issued after 10 November 2010 are required to comply with the Regulations from the first day of exercise of the permit.

In general the requirements of the Regulations will prevail over consent requirements, however there instances where the requirements of a consent will be more stringent particularly with respect to the supply of data. It is recommended that in all cases, a copy of the consent is sought prior to the selection and installation of any water measuring devices. These can be obtained by contacting the Council’s Data Team ([watermetering@orc.govt.nz](mailto:watermetering@orc.govt.nz)).

## 1.4 Definitions

**Accuracy** refers to the qualitative description of the closeness of the measurement to the true value, based on the measurement uncertainty which is quantitative.

**Calibration** refers to the process of regularly checking and standardising the measurement of the water metering device or system against another measurement of known accuracy.

**Deemed Permit** refers to a mining licence or substituted mining licence that was current on 1 Oct 1991 and deemed to be a water permit subject to sections 413-417 of the RMA.

**Exemption** refers to a written notice (that must be applied for by the consent holder before any device is installed) from the Regional Council which approves an alternative location for the measuring device, when the device cannot be installed at the point of take.

**Full pipe flow** refers to flow in a closed pipe or conduit that is full of water.

**Mining Privilege/Right** refers to a mining licence granted in accordance with the Mining Act 1926 for the right to take water from a creek, river or race.

**Open channel flow** refers to flow driven by gravity, exposed to the atmosphere and in a conduit such as a canal, flume, ditch or race.

**Partially full pipe flow** refers to flow driven by gravity in a closed conduit where the conduit is not full and the flow has a free surface subject to atmospheric pressure.

**Permit/Consent**, in relation to a permit holder, means the water permit/consent held by the permit holder

**Permit holder** means the person or persons who hold a water permit, including deemed permits and mining privileges, to which the Regulations apply.

**Suitably qualified hydrologist** refers to a hydrologist with relevant practical experience, in the opinion of the Otago Regional Council, and trained in the practice aspects of open channel flow measurement.

**Validation** refers to formal inspection of the system to establish that the water metering device has been installed according to manufacturers' specifications.

**Verification** refers to formal inspection and testing of the water metering device or system to prove and document that it meets the accuracy requirements of the Regulations.

**Water meter or water measurement system** refers to all components of the measurement configuration that measures and records the volumetric flow rate of water that passes through the conduit.

**Water year** for a water permit, means a period during the term of the permit

- starting on 1 July or, for the permit's first water year, starting on the first day on which these regulations apply to the permit; and
- ending on the next 30 June or, for the permit's last water year, ending on the last day on which these regulations apply to the permit

## 1.5 Water Exemptions

If a water measuring device cannot be installed within 100 metres of the consented point of take (at the location provided with the consent application and as described on the consent), an exemption (WEX) to measure “near, rather than at” the point of take **must** be completed and accepted by the Council **before** the device is installed.

Clear and valid reasons must be given in the application as to why the device cannot be installed at the point of take. To apply for an exemption, complete Form 24, available on the Council’s water metering section of the website and in the appendix of this document. The form needs to be completed in full with accurate GPS references given in NZTM format.

A WEX is a separate legal document which is “attached” to the consent, and is transferred to any subsequent replacement consents. A note is placed on the consent to signify that a WEX (water exemption) has been granted.

Exemptions have been granted for remote takes, takes where there is no cell reception so the meter needs to be relocated to allow for telemetry reception, or if the location of the take is subject to flooding, debris flows or other potential damage to water measuring equipment.

In some instances a retrospective WEX may be required when older consents are audited and found not to comply with the Water Measuring Regulations with respect to the location of measuring.

## 1.6 Council Contact and Supply of Information

The Council has a dedicated email address for the supply of water metering data, installation/verification forms, notifications such as notification of malfunctions to meters, dataloggers or telemetry. Water metering suppliers can also request copies of consents to ensure the appropriate equipment is installed to comply with the consent.

When supplying information it is essential to quote the consent number(s) to which the information relates. In some cases it may be necessary to also quote the condition number of the consent to which the information relates.

Otago Regional Council water metering email: [watermetering@orc.govt.nz](mailto:watermetering@orc.govt.nz)

## 2.0 Open Channel

### 2.1 Site Assessment

Open channel flow measurement is generally more complex than full pipe flow measurement. Factors to consider when choosing a site include, but are not limited to:

- Channel gradient and shape
- The range of expected flow rates
- The impact of backwater effects (other water bodies or structures affecting water level)
- Expected sediment/debris load (eg branches, silt etc.)
- Expected weed and algal growth
- Flood/debris flows
- Radio and/or cellular reception
- Possible ice/snow
- Accessibility of the site

An exemption will be required for any open channel take where measurement is not possible at the point of take. This must be applied for and approved **before** any measuring equipment is installed.

### 2.2 Flow Verification

Verification is the process by which the measurement system is checked to ensure it is recording flow accurately to +/-10%. This should include, but not be limited to; verifying the theoretical level to flow relationship of the structure is true, the water level sensor is reading the level correctly and the derived flow is correct.

**All flow measurement structures are to be verified in situ** initially after commissioning, but before the end of the first water year.

Flow verification is to be carried out using an independent method, usually velocity-area method (current meter) for flows in excess of 10l/s. For lesser flows the volumetric measurement should be used.

**Three** measurements over a range of flow rates are to be carried out. These shall be spaced to give confidence that the range of flows expected to be measured by the structure will be accurate. Zero flow shall be verified as part of the station verification process.

If the measurement system is found not to comply with the accuracy requirements (+/-10%) of the Regulations further measurements may be required with the flow rating adjusted accordingly or remedial work undertaken to realign the structure to the flow rating at the time of commissioning

Calibration and Verification can be combined for structures that have an undefined or poorly defined initial rating. The number of calibration flow measurements for structures in this category should be greater than the minimum of 3 stipulated in the INZ Guidelines. The actual number will depend on the closeness of fit to any pre-determined rating and the hydrologist's experience.

## 2.3 Verification Frequency

Verification shall be annual where specified by ORC consent condition otherwise the default of 5 yearly as stipulated in the Regulations must apply. To ensure the measuring device is reading accurately, best practice is to conduct verifications on several occasions over the season particularly after significant rain events. Channels with no bed control structure will require extensive flow gauging to build the rating and continual gaugings at regular intervals (2 to 4 weekly) to check for rating changes.

Verification documentation (Form RS2) should be submitted to the Council **within one month** of each verification being undertaken. This applies if several verifications are to be conducted over a season and should be noted in the relevant comments section of the verification form.

## 2.4 Inspection Frequency

This is the process by which the measurement system is maintained to ensure it is accurately recording flow to +/-10% as commissioned. The inspection should comprise as a minimum the following actions;

- Check the structure, approach channel and exit channel for blockage, erosion and damage.
- Check the sensor is reading the correct water level. This is to be done by reference to a staff gauge or by using high quality ruler to measure the water level from the stage reference point and comparing that with the water level measured by the sensor.
- Log the inspection specifically noting the date, time and level measurement and record any corrective actions. This should be supplied to ORC under consent condition where specified and can be supplied electronically in conjunction with the flow measurement data.
- Flow calibration check (for stations without channel control structures)

The frequency of inspection will depend on a number of factors. These factors are;

- Nature of the channel control (weir/flume or uncontrolled)
- The reliable accuracy of the measurement sensor
- The volatility/stability of the channel.

For a well designed structure with a high quality sensor a minimum inspection frequency of 2 months should be adopted.

Structures with poor quality sensors that have an inherent stability inaccuracy should be inspected every 4 weeks.

Sites without a good quality control will need to be inspected and calibrated (gauged) every 4 weeks or more frequently throughout the season to ensure the stage to flow rating is capable of calculating flows to +/-10%.

Service providers need to allow for inspections throughout the season to ensure flows are measured accurately and to the best possible standard. Small errors in level measurement can result in measurement system not meeting the +/-10% criteria.

## 2.5 Open channel measurement using Flume Meters

Flume meters use acoustic array flow measurement technology combined with water level measurement which provides measurement accuracy consistent with those used for full pipes (generally infield accuracy of +/-5% or better). Flume meters have the advantage of being able to accurately measure flows even when the meter is partially full thus reducing the need for additional infrastructure. Flume meters can be used in instances where;

- Flows vary over a wide range
- Water is affected by high turbulence or debris
- Head loss needs to be minimised
- Traditional requirements for straight channel upstream and downstream of the meter cannot be met

As flume meters measure instantaneous flow rate and total volume, they do not require the same stage to flow relationship to be established as traditional open channel measurement systems require. Additionally, as the technology used in flume meters is highly accurate and self calibrating, the only requirement in terms of verification of these devices is (at a minimum) **one independent flow measurement** to be carried out at or close to the nominal flow rate annually to ascertain any gross inaccuracies. The above inspection regime should also be used.

## 3.0 Full Pipes

### 3.1 Water Meter Requirements

For full pipe water take systems, the Regulations state that a water meter must measure the volume of water taken to within +/-5% of the actual volume taken. The meter used for monitoring the take **must be suited** to the qualities of the water that it is measuring.

- The meter and any essential external components are required under the Regulations to be **sealed and as secure** against tampering as practical.
- The meter is required to be **located at the point of take**. If it cannot be located at the point of take, an exemption to measure near rather than at the point of take is required.
- The **water meter must have an onsite display** to provide a visual indication of the real time measurement display for verification purposes. It must be capable of displaying the cumulative volume in cubic metres (m<sup>3</sup>) and the rate of take in litres per second (l/s).
- The water meter must be capable of output to a datalogger and/or telemetry unit.

### 3.2 Water Meter Installation

Standardisation of installations is necessary to facilitate verification. Therefore the following framework has been adopted to achieve this:

- The water meter must be installed as per the manufacture's specifications, or as below.
- New and retrofit installations are to have a minimum 10 diameters of pipe above the meter and 5 diameters below (unless approval is given by the ORC for a non-standard installation);
- Where mechanical meters are operated an unobstructed length of pipe 15 diameters length must be provided for verification meters.
- Ultrasonic and electromagnetic meters in most cases are considered non-obstructive in the pipe run and therefore the 10:5 installation will provide the required 15 diameter lengths; and
- Where an existing installation occurs, and on verification it meets the required minimum +/-5% accuracy threshold, then the pipe head works do not need to be changed to meet the required 10:5 diameter lengths.
- Variations from standard installation requirements must be approved in writing, on the non standard installation approval form, by the Regional Council **before** proceeding.

### 3.2 Flow Verification Frequency

Verification is a snap-shot of meter performance: it does not guarantee ongoing accuracy within the required 5% margin, particularly in highly variable conditions. **All flow measurement devices are to be verified in situ** initially after commissioning, but before the end of the first water year, or as otherwise specified in a consent.

Many factors can cause a water measuring device to lose accuracy, including:

- The buildup of deposits, minerals, oils, and solvents.
- Wearing, breakage, or failure of internal mechanical parts

- Electronic drift.
- Improper installation.
- Modified pipe configurations.

The installed meter must be independently verified initially after installation, then every 5 years as stipulated in the Regulations unless consent conditions specify otherwise. Where mechanical meters are installed consent conditions usually specify that the meter is verified annually.

### 3.3 Flow Verification

Best practice denotes that the equipment used for verification must be suitable for the use of verifying the accuracy of water meters. The verification device must have a greater or equal accuracy to the meter being verified.

Verifications should be conducted for the typical flow rate of the system. If practicable it is also recommended that the verification be undertaken for a range of different flow rates (low, typical, high). If it is not possible to test at the different flow rates, a minimum of three replicates of the verification test must be performed at the same flow rate.

#### 3.3.1 Verification of Flows <5 l/s

This can be undertaken using the volumetric method by measuring how much time  $\Delta t$  it takes to fill a container of known volume, and calculate  $V = V / \Delta t$  and compare with this with that recorded by the flow meter.

#### 3.3.2 Verification of Flows >5 l/s

There are a number of methods available for verifying flow meter accuracy for flows greater than 5l/s however verification using an ultrasonic clamp on meter is the preferred method for the Otago Region. Other methods will be considered by the Council when and if they become available. Should an installer be able to provide an alternative method, approval must be sought from the Council prior to its use.

##### 3.3.2.1 Verification using Ultrasonic Clamp on Meter

The ultrasonic clamp on flow meter is a non invasive device used to measure full pipe flow in closed conduits. These meters are unique in their ability to measure flow with little or no modification to existing pipe configuration. They are used extensively in the water industry to provide measurements where there is no permanently installed meter and to verify the accuracy of permanently installed meters. Verification using ultrasonic meters:

- Must be at a location where the pipe is new or free of imperfections and unlined and where accurate pipe dimension data is available.
- Best practice requires 10 straight diameters of pipe free of obstructions upstream and at least 5 straight diameters free of obstructions downstream from the meter.
- Should not be used on downward flowing vertical pipes.
- Apply sufficient gel to ensure good signal transmission between pipe surface and transducer.
- Avoid positioning transducers at the top or bottom of the pipe as air or debris may be present.
- Mark position of transducers to reduce repeatability error for subsequent tests.

The ultrasonic clamp on method has numerous advantages, making it the common choice for many full pipe meter installations. However it also has disadvantages, the three key potential sources of error are:

- The pipes internal diameter
- The flow velocity profile (turbulent flow)
- Acoustic interference (caused by sediment or other build up in the pipe)

If these are carefully managed, this method is the quickest, easiest and the most cost effective full pipe verification method available.

Service providers conducting verifications using a reference meter must supply a calibration certification to the Regional Council **annually**.

### 3.3.2.2 Verification of Magflow Meters

Magflow meters are inherently accurate. They do not have moving parts in the flow stream, are not easily damaged by water of poor quality, there is no (or very little) head loss across the meter, and the meters can be used on a wide range of pipe sizes. The main disadvantage of magflow meters is that they can be sensitive to ‘electrical noise’ therefore careful attention needs to be made during installation and subsequent inspections.

Meter specific portable testing and verification devices (‘Black Box’) are slowly becoming available in New Zealand and are acceptable to the ORC. These devices are easy to handle and enable complete functionality and accuracy verification of electromagnetic flowmeter’s flow head, converter and cables without removal from the pipeline. The precision of electromagnetic flow meters is not only a function of accuracy of electric data, but is also dependant on the mechanical installation of the flowhead and converter. **Faulty installation**, either mechanical and/or electrical, **may not be detected** by these devices therefore it is critical that the device is installed correctly to the manufacturers specifications or better (10/5 diameters recommended).

Best practice states that the verification device must have a greater or equal accuracy to the meter being verified. This would require a meter of greater accuracy than that of a magflow meter to conduct a verification. As meter specific portable testing and verification devices for magflow meters are not widely available and are currently cost prohibitive, the following methods for verifying a magflow meter are acceptable to the ORC.

- In situ verification using a portable ultrasonic flow meter
- Other meter specific portable testing & verification devices (eg Krohne MagCheck, Siemens Sitrans FM Verificator, ABB CalMaster2)

Any other methods are to be approved by the Council prior to use.

The meter’s calibration certificate should be submitted with the relevant commissioning verification documentation.

### **3.4 General Inspection**

In addition to best practice, many permits issued by the Otago Regional Council require annual inspections of the water meter. In many cases this can be conducted in conjunction with a verification. To ensure the meter measurements are reliable it is recommended that (at a minimum) the following be checked annually:

- That the meter is used in an appropriate manner
- That the totaliser is non-resettable
- Maintenance records are current
- That the readings on the display are clearly visible and unambiguous
- Check for evidence of interruption of signal transfer between the measurement component and the recording component
- That the power supply is reliable
- That the tamper proof seals are in place and unbroken
- That there are no leaks that bypass the measuring point
- That earthing and lightning arrestors are installed and are sound
- Check for scaling or build-up of calcium, iron oxide or iron bacteria
- That filters/screens are clean
- That the meter and all external components are sufficiently protected from environmental elements.

### **3.5 Verification Report**

A verification report shall be issued by the installer/verifier to the consent holder with a copy supplied to the Regional Council. To ensure the relevant information is recorded The Otago Regional Council requires that verification information be supplied on the relevant ORC form. Verification forms (and any supporting information) should be supplied to the Council within one month of the verification taking place ([watermetering@orc.govt.nz](mailto:watermetering@orc.govt.nz)).

Verification forms are available from the ORC website and are included in the appendix of this document.

## **4.0 Data Supply & Management**

### **4.1 Datalogger Requirements**

Dataloggers must be capable of:

- Recording continuous measurements.
- Providing data output in a form suitable for electronic storage.
- Appropriately recording information to meet the consent conditions.
- Output to telemetry (if required by a consent condition).

Data from the datalogger must be supplied annually (unless telemetered) to the Otago Regional Council for the relevant water year by 31 July. It is preferred that the data is provided in an excel spreadsheet in CSV format. Data headings must be clearly labelled with the following:

- Consent number(s) relevant to the site
- Time (15 minute intervals)
- Date
- Year
- Units the data is recorded

As dataloggers can be susceptible to battery failure it is best practice to check the datalogger initially at the beginning of the season, and at regular intervals throughout the year/season to ensure it is still recording data. It is also advisable to download data more frequently than once a year to ensure there is no loss of data.

### **4.2 Telemetry Requirements**

Telemetry is not a requirement of the Regulations however it is a common ORC consent requirement. Additionally many consent holders are opting for telemetry in order to provide assurances that their data is being recorded, that any issues with their meter are picked up quickly and they can monitor their take to ensure they meet other consent requirements such as minimum flow or groundwater level cut off requirements.

It is expected that all telemetry data be provided to the Council on a daily basis. This includes data from consent holders who have opted for telemetry (these consent holders will have a condition which allows the Council to ask for data “on request”, therefore the request which has been put in writing to consent holders is that telemetry data be supplied daily).

The format required for telemetry data is specified in the Appendix of this document.

### **4.3 Metadata**

Comments shall be supplied when data are missing or is not compliant with water meter regulations. It is also useful to comment on unusual features or events in the record particularly with respect to open channel flow sites. Comments are to be provided electronically.

#### 4.4 Data Not Being Measured or Recorded

In instances where water take data is not being measured or recorded it is expected that the Council is notified as soon as practicable ([watermetering@orc.govt.nz](mailto:watermetering@orc.govt.nz)). The following information should be supplied:

- Reason why water take data is not being measured or recorded
- Period to which the non-measurement/recording applies
- Action taken to remedy this
- Date of when measurement/recording is expected to restart.

Annual water take submission should include comments when there is missing data within the metadata (as above).

The Council will accept the following reasons for not measuring or recording a water take

- **Winterising** Shutting down the measuring and/or recording device for winter
- **Faulty Equipment** Equipment malfunction resulting in no measuring and/or recording

Many consents have a condition which requires the consent holder to notify the council whenever there is an equipment malfunction resulting in no measuring and/or recording. Where possible comments should be added to the data to explain any issues with non-recording of data (see Appendix A.7).

##### Example Condition

*The consent holder shall ensure the full operation of the water meter and datalogger at all times during the exercise of this consent. All malfunctions of the water meter and/or datalogger during the exercise of this consent shall be reported to the Consent Authority within 5 working days of observation and appropriate repairs shall be performed within 5 working days. Once the malfunction has been remedied, a Water Measuring Device Verification Form completed with photographic evidence must be submitted to the Consent Authority within 5 working days of the completion of repairs*

#### 4.5 Multiple Permits One Meter/Point of Take

There may be instances where one point of take exists for several different permits which can be exercised at the same time. Assessment of compliance with individual consented rates and volumes of take is virtually impossible in these cases. If for instance, a consent holder has three separate permits and uses the one rate and one device, Council is requesting a variation to the permits to allow for "total abstraction for permits X, Y and Z shall not exceed....." This allows the permits to reference each other and a practical method of assessing compliance with rates and volumes of take. Should a service provider encounter situations such as this, it is recommended that the water metering team is contacted to establish whether or not a variation is required.

It is also important to remember that all permits that are subject to the Regulations are required to measure, record, submit data and provide verification, therefore it is vital that all permit numbers relating to the meter are quoted with the provision of verification and data.

## Appendix A ORC Requirements for Transfer of Data for Water meter via Telemetry

- Measurement SiteName will be that of the **WM number** assigned to the metering site (enquire with the Data Team regarding specific WM numbers for each consent/transfer). WM numbers have a two-letter, 4-digit format:
  - Eg. **WM1234**
- DataSource Name will be “**Flow Meter**” for all Water Meter Data
- Flows should be in cumecs m<sup>3</sup>/s
- ORC works in **New Zealand Standard Time (NZST)** therefore we would accept data only in that time zone
- XML (Hilltop format) is preferred but CSV (Comma Separated Value) format is accepted as well.
- Contact ORC – Environmental Data Team
  - They will allocate a username, password and address which will take you to a private directory on the ORC network server. The FTP site for ORC is <ftp.orc.govt.nz>
  - When saving data, it is best to use the date and time as the file name, in case the software is stopped for a period and to avoid you overwriting the data when exporting on to the FTP site.
    - WM0010\_20090512\_0915.xml
    - WM0010\_20090513\_0915.xml
  - You can add multiple sites in one XML file, just repeat the site info
  - Some providers may wish to batch their data before sending it, and files may become quite large. Hilltop will accept a .zip file and will extract the data from the compressed file. The zip file must have a filename extension of “.zip”, but does not have to have a particular name. There can be one or more files inside the zip file, with any name, but these files must contain the filename extension of “.xml”.

### Please note:

When transferring data for consents that are required to provide data pursuant to the (Measurement and Reporting of Water Takes) Regulations 2010, please set up as follows:

- Records not more frequent than every 15 minutes but at least every hour unless you use event data that should then record at a similar interval at around the consented flow rate.
- Date, time, flow format;
- Sent once daily

### A.1 Transfer Format for Water Meter Data

The XML schema described is that used by Hilltop programs. This means you can use Hilltop Manager to write an XML file, or use the DataInput or DataCopy objects in HydroLib. The trick is to write to a data file with a filename extension of ".xml" or ".zip". The easiest way to describe the XML schema is through a worked example. A farmer has a water meter installed on his pump and the data logger creates a record every 10 cubic-metres. The data in XML format would be:

```
<?xml version="1.0"?>
<Hilltop>
<Agency>YourBusiness</Agency>
<Measurement SiteName="WM1234">
```

```

<DataSource Name="Abstraction Volume" NumItems="1">
<Interpolation>Incremental</Interpolation>
</DataSource>
<Data DateFormat="Calendar">
<V>10-Apr-2008 11:06:15 10</V>
<V>10-Apr-2008 11:25:56 10</V>
<V>10-Apr-2008 11:46:02 10</V>
<V>10-Apr-2008 12:05:15 10</V>
</Data>
</Measurement>
</Hilltop>

```

OR line 5

```

<DataSource Name="Flow" NumItems="1">

```

The SiteName attribute on the Measurement element is a unique identifier for the water meter and the site name will be supplied by council staff. The information in the DataSource node tells the XML reader about the data it is going to read, and you must provide the elements and attributes shown in the example.

Alternatively, you can use your own site identifiers but then you have to use the ‘Agency’ line 3 and provide us with a list of consent numbers and sites you have named so we can add that to the site name transfer list for automatic processing.

## A.2 Data Format

The Data node has the actual data and is more like a CSV format than XML. Each data value element has a date, time and value, separated by one or more spaces. The DateFormat attribute specifies how you are sending the date and time, and the "Calendar" value means you are sending the date and time in a readable form. The example shows a particular style of dates and times, but you can choose a format convenient to you. Valid formats for the date are:

Format	Example	Format	Example
dd/mm/yy	01/03/02	dd/mm/yyyy	01/03/2002
yyyy/mm/dd	2002/3/1	dd/mmm/yyyy	1/Mar/2002
dd-mmm-yy	1-mar-02	dd-mmm-yyyy	1-Mar-2002 (preferred)
dd-mm-yy	1-03-02	dd-mm-yyyy	1-03-2002
yyyy-mm-dd	2002-03-02		
Yyyymmdd	1020301	Yyyymmdd	20020301

Two digit years are put into the 21st century if the number is between 0 and 49 inclusive, and the 20th century if the number is greater than or equal to 50. We prefer 4 digit years to avoid any confusion, as that cut off will change in the next decade or two.

Valid time of day formats are:

Format	Example
hh:mm	14:15
hh:mm:ss	14:15:00
Hhmmss	141500

It is assumed that times are given in a 24 hour format. However, the software will check for the presence of "a.m.", or "p.m." after the time, and so accept a 12 hour clock.

You can combine the date and time into a single string using the ISO 8601 format and this is useful when extracting data from SQL Server. There are two formats and these are:

Format	Example
yyyymmddThhmmss	20020301T141500
yyyy-mm-ddThh:mm:ss	2002-03-01T14:15:00

### A.3 Time Zones

The Calendar date format assumes the date and time are in New Zealand Standard Time. It is not good practice to allow the dataloggers to change to daylight time, but you will get manual readings from farmers in daylight time during the summer. The XML parser will accept two other date formats to indicate the time zone.

The DateFormat="Local" attribute tells the parser the date and time will be in local time (i.e. clock time), and it will convert the date and time to NZST as it reads the data. The DateFormat="UTC" attribute tells the parser the date and time are in UTC (i.e. Greenwich Mean Time), and it will add 12 hours to the date and time to get to NZST. UTC does not have the concept of daylight time, so the software always adds 12 hours.

### A.4 Logger Styles

There are a number of different data loggers in use, and the Hilltop Schema can accept data from these loggers without undue data manipulation. The example showed a logger/meter combination where by a time stamp was generated every 10 cubic metres (this is the so called 'Event' logging). Hilltop can accept any such combination, so it is possible to provide a timestamp every cubic metre or intermediate totals of say five cubic metres. The data value element has the date and time, and then the number of cubic metres assigned to that time stamp.

Some loggers total the volume over a period and then store the total at a regular interval. In this case, the data value element has the date and time of the end of the interval, plus the amount of water pumped during the interval.

Harvest loggers run a counter which is incremented each time the meter gives a pulse. The counter is like the dials on the meter and represents the total amount of water pumped since the unit was commissioned. A Harvest unit running with its default settings will store the value of the counter every 10 minutes. It is necessary to compute the difference between the counter values in order to compute the volume pumped in the ten minute period. Hilltop can accept the actual counter value without having to perform the difference calculation. The method is to use a DataSource name of "Meter Reading" and then write the actual counter values. An example is:

```
<?xml version="1.0"?>
<Hilltop>
<Agency>YourBusiness</Agency>
<Measurement SiteName="WM0123">
<DataSource Name="Meter Reading" NumItems="1">
<Interpolation>Incremental</Interpolation>
</DataSource>
<Data DateFormat="Calendar">
<V>10-Apr-2008 11:00 24779</V>
<V>10-Apr-2008 11:10 24782</V>
<V>10-Apr-2008 11:20 24785</V>
```

```
</Data>
</Measurement>
</Hilltop>
```

The software reading the data can cope with the counter overflow.

## A.5 Separate Elements for Timestamp and Value

The <V> data value element is simple to produce if you have software which is translating the raw data from a logger and writing the results to the XML file. The combination of timestamp and value is more problematic if you have already stored the data in a relational database because the database table will have one field for the timestamp and one for the value.

The Hilltop parser can accept separate elements. The date and time are in the <T> element and the value is in the <I1> element. The element names are kept short to keep the file size down, and the name "I1" refers to the fact that Hilltop can accept multiple data items at a time stamp, and the volume is therefore "Item 1". An example data node with separate elements is:

```
<Data DateFormat="Calendar">
<T>10-Apr-2008 11:00</T><I1>24779</I1>
<T>10-Apr-2008 11:10</T><I1>24782</I1>
<T>10-Apr-2008 11:20</T><I1>24785</I1>
</Data>
```

## A.6 Multiple Meters

Many farms have more than one meter, and the transfer format can cope with this. Repeat the entire measurement node for the second meter and give the correct site name. The same applies for data processed by third party agents and there is no need to produce an XML file for each farmer. An XML document with two meters in it is:

```
<?xml version="1.0"?>
<Hilltop>
<Agency>YourBusiness</Agency>
<Measurement SiteName="WM0001">
<DataSource Name="Abstraction Volume" NumItems="1">
<Interpolation>Incremental</Interpolation>
</DataSource>
<Data DateFormat="Calendar">
<V>10-Apr-2008 11:06:15 10</V>
<V>10-Apr-2008 11:25:56 10</V>
</Data>
</Measurement>
<Measurement SiteName="WM0002">
<DataSource Name="Abstraction Volume" NumItems="1">
<Interpolation>Incremental</Interpolation>
</DataSource>
<Data DateFormat="Calendar">
<V>10-Apr-2008 11:46:02 10</V>
<V>10-Apr-2008 12:05:15 10</V>
</Data>
</Measurement>
</Hilltop>
```

## A.7 Comments for Telemetry Data

Comments can also be added to the data set; this is set up as a different data source, but delivered in the same manner as the water meter data.

DataSource Name will be “**Water Meter Comment**”

```
<?xml version="1.0"?>
<Hilltop>
<Measurement SiteName="WM1234">
<DataSource Name="Water Meter Comment" NumItems="1">
<Interpolation>Discrete</Interpolation>
</DataSource>
<Data DateFormat="Calendar">
<V>10-Apr-2013 11:06:15 Water meter shows high spikes due to power spike</V>
<V>15-Mar-2013 11:25:56 High values as pump meter is broken</V>
<V>18-Jun-2013 10:46:02 Missing record due to battery failure</V>
<V>10-Apr-2014 12:05:15 High values due to heavy rainfall event</V>
</Data>
</Measurement>
</Hilltop>
```

## A.8 File Names

Otago Regional Council will issue you a user name and password for their FTP site and this will take you to a private directory on their server. Any file with a filename extension of ".xml" will be read by the telemetry system and new data will be loaded into the archive. The data file will then be copied into another directory on their system and the filename changed to include a timestamp of when the file was processed. The file on the FTP server is then deleted. This system means you can choose a file name and use the same name for each data transfer.

There is an issue with always sending the data with the same file name in that the Council's software must read the file before you send the next lot of data. Data sent weekly will be fine, but it would be best if files sent daily or less than daily have a sequence number or the date built into the filename. That way, all the files will be available if the data processing software stops for a short period.

Third party providers may wish to batch their data before sending it, and the files may get quite large. Hilltop will accept a zip file and will extract the data from the compressed file. The zip file must have a filename extension of ".zip", but does not have to have a particular name. There can be one or more files inside the zip file, and these can also have any name, but must have a filename extension of ".xml".

## **Appendix B Water Metering Services Relationships and Expectations**

### **B.1 Water Metering Service Categories**

1. Supply of Technology
2. Installation Services
3. Supply of data hosting and compliance reporting services

### **B.2 Relationships and Expectations**

- The Otago Regional Council (ORC) will inform Consent Holders of the requirements with respect to the Resource Management (Measuring and Reporting of Water Takes) Regulations 2010, and their consent conditions.
- The consent holder will contact the Service Provider and arrange for the service.
- All flow structures/devices must be verified insitu initially after commissioning, but before the end of the first water year, or as otherwise stipulated in a consent condition.
- The service provider will become responsible for any ongoing relationship with the consent holder and provide excellent customer service exercised with the degree of skill, care and diligence and ongoing support reasonably expected of suitably qualified and experienced service providers in similar circumstances.
- The expectation is that the service provider will become responsible for ensuring that the water measuring devices, specifications and installations comply with the ORC's consent requirements and relevant regulations.
- All authorised service providers will be subject to performance Audits from time to time. The ORC will at its sole discretion assess the results of the audits as part of the process of determining the service delivery performance.
- Variations from standard installation requirements must be approved in writing by the Regional Council before proceeding, on the non standard installation approval form.
- The Service provider is expected to assume responsibility for the ongoing service relationship. It is the responsibility of the Consent Holder to ensure that all work(s) undertaken is satisfactory.
- All installations must enable monitoring of compliance with all consent conditions.
- Service providers should allow for an opportunity to communicate with the ORC to ensure familiarity with their services to help and appropriately identify any issues in regard to technologies and/or installation.
- Consent Holders may contact the Service Providers for more information and to view product examples

Service providers, who have completed the Irrigation New Zealand “Blue Tick” Accreditation Program for Service Providers, can demonstrate appropriate field experience and/or have the appropriate skills and qualifications in a suitable field may be considered “suitably qualified in Council’s opinion” to undertake verification of measuring equipment. Suitably qualified service providers must also meet the requirements of ORC consent conditions and the requirements of the Resource Management (Measurement and Reporting of Water takes) Regulations 2010.

### **B.3 Water Measurement/Verification Fast Facts**

- All flow structures/devices must be verified insitu initially after commissioning, but before the end of the first water year, or as otherwise stipulated in a consent condition.
- Water measuring devices must be accurate to +/- 5% for full pipe takes.
- Water measuring devices/structures must be accurate to +/- 10% for open channels or partially full pipes.
- Inspections of open channel measurement structures are expected at least every 1-2 months to ensure the system is accurately recording flow to +/- 10%.
- Verification shall be annual where specified by ORC consent conditions, otherwise the default 5 yearly as stipulated in the Regulations.
- Verification documentation must be submitted to the Council within one month of the verification being carried out.
- Verifications must be carried out by a trained/certified verification provider (in the opinion of Council).

**Appendix C RS1 Piped Takes - Water Meter & Datalogger  
Installation/Commissioning & Verification Form.**

**Appendix D RS2 Open Channel - Water Measuring Device  
Installation/Commissioning & Verification Form.**

**Appendix E RS4 Piped Takes - Non-Standard Installation  
Approval Form.**

**Appendix F Form 24 - Application for Exemption to measure near rather than at the point of take.**