[redacted]

From: Michael Turnell [redacted]
Sent: Friday, 23 August 2019 3:47 PM
To: Wright, Robert [redacted] Shirvill, Natasha
[redacted]
Subject: HPE CM: MI letter: MACE meters

Dear Robert and Natasha

Following our teleconference on 29 July 2019, please find attached our letter.

I will wait to hear from you regarding suitable times for a follow up teleconference.

Kind regards

Michael Turnell | Legal Advisor | **MI** Murrumbidgee Irrigation

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23 August 2019

Mr Robert Wright
General Manager, Insurance, Water and Wirelines Markets
Australian Competition and Consumer Commission
Level 17, 2 Lonsdale Street
Melbourne VIC 3000

By email: [redacted]
CC:

Dear Mr Wright

Request for information about meter accuracy concerns within the Murrumbidgee Irrigation area

Following our meeting with you by phone on 29 July 2019 please find attached a technical note that we have prepared on the MACE Doppler meter and its standard installation practice at MI. It has been an extremely worthwhile exercise reviewing the historical information to ascertain the real details of how the meters were assessed and set up. I am pleased with the outcome of this review and the facts it has clarified as it mainly shows the excellent work completed by the people involved at the time of the original change to the MACE Doppler meters.

In summary, the note describes in Q & A format the background and justification for MI's conservative use of a "recommended" rather than "actual" pipe diameter in the configuration of the MACE meters. Specifically, it identifies this as good practice based on the variability in internal pipe diameters of the concrete insert tubes. Further, a review of the combined impacts of the flow accuracy (MHL work) and the use of a recommend diameter indicates that less than 1% of customers with a MACE meter will receive a measurement that is outside the +/- 5% standard, and that no customer will be exceeding the +5% standard.

We note that this work further supports our reliance position regarding the previous statements made in that the meters as configured were within the original NMI parameters at the time. The joint probability analysis shows that the setup of meters creates a -1.9 to -2.4% bias to the customer, which is better than the previously stated 5%, however needs to be addressed as per our conversations regarding the current meter replacement program.

In response to this information we are proposing a modification to the customer information approach discussed in our meeting. We would like to propose the development of a general fact sheet based on the technical note attached and posted to all metered customers with a cover letter from myself. We would also publish the fact sheet on our website on our fact sheets page.

Additionally, we propose that as part of all future meter replacements we provide a copy of the fact sheet and MDBA "*Availability of Pattern Approved 'non-urban' Water Meters*" paper, a copy of which is enclosed

with this letter. These documents would assist metered customers in understanding the difference between meters and confirm that the meter measuring their water use is a pattern approved meter.

The fact sheet would outline the different types of meters used at MI and include information about their pattern approval (or not), any installation standards that we have applied (like use of recommended rather than actual diameter) and their implications.

We feel this approach is more appropriate given that only a small number of customers attend our AGM and the mail out will reach customers prior to the AGM hence allowing for any shareholder attending the AGM to ask any specific questions.

We would like to discuss this response with you and share the proposed fact sheet and cover letter with you for comment prior to publication.

You also asked for information regarding the quantum and timeframe for replacement of the remaining MACE Doppler fleet. When we first responded to your inquiries in March, we advised that there were still 1,356 MACE meters in service. As a result of our winter modernisation program this number has reduced to 1,169 meters in service. As discussed, the time frame for complete replacement is dependent on our success in securing additional government funding under the Murray Darling Basin Water Infrastructure Program (**MDBWIP**). If we receive MDBWIP funding, we anticipate a full replacement of the MACE fleet within 3 to 4 years. In the absence of this funding the replacement program will extend to double that period.

I have asked Michael Turnell to contact your team to arrange a suitable time for a follow up phone conference and look forward to discussing these matters with you then.

Yours sincerely

Brett Jones
Chief Executive Officer

TECHNICAL NOTE – MACE DOPPLER METERS

Glossary

Design diameter	The internal diameter of a pipe that is manufactured by design
Actual diameter	The average internal diameter of a pipe as measured using the method described by AS4139:2003
Nominal diameter	The internal diameter of a pipe provided by an industry based non-specific set of standard pipe sizes
Recommended diameter	The internal diameter of a pipe recommended to be used in the MACE Doppler flow calculation by MI
MACE Doppler meter	The Doppler ultrasonic insert velocity sensor and AgriFlo control system manufactured by MACE Water Monitoring Solutions
FRC	Fibre reinforced concrete
MHL	Manly Hydraulics Laboratory

MI has previously reported to the ACCC that the MACE Doppler meters were purposely biased to under-report by 5%. Is this true and, if so, why was this done?

MI did not purposely bias the MACE Doppler meters to under read by -5%, but a bias of -1.9 to -2.4% occurred as a result of a conservative application of the manufacturer's tolerance on the fibre reinforced concrete (FRC) pipes of different nominal diameters that are used in the flow tubes. This bias occurred because a recommended diameter was used to calculate the cross-sectional area of the flow tube rather than the measured internal diameter. The recommended diameter is a conservative estimate of the actual diameter that favours the customer. MI made this recommendation as the flow tube diameter can vary during manufacture but is never less than the nominal diameter. In a dispute with a customer in relation to perceived over-charging, MI took a conservative position that produced zero probability that the meter was biased in MI's favour.

How does the MACE Doppler meter operate?

The MACE Doppler meter operates by measuring the average velocity of fine particles suspended and moving with the water inside a flow tube using the principle of Doppler Shift. This measurement is then combining in software with an estimate of the cross-sectional area of the tube to calculate the volumetric flow rate.

Why was the recommended internal diameter of the flow tube used rather than the measured internal diameter?

In 2002 MI undertook an investigation on a range of pipes that could be used as flow tubes in a MACE Doppler meter installation (Table 1). The pipes were measured and compared with their *nominal diameter* and *design diameter* to provide data for a *recommended diameter* for use in the MACE Doppler meter software. The study demonstrated that the actual internal diameter of PVC pipes vary as the manufacturer controls the tolerance on their outer diameter and the design pressure rating, but not their internal diameter. This fact excluded the use of PVC pipes as flow tubes in most installations. However, FRC pipes have tolerances applied to their internal diameter and therefore they were recommended as the material for flow tubes. A standard design was then developed.

FRC pipes are manufactured to AS4139:2003 and in that standard the permissible tolerance on the design diameter of pipes of nominal size ranges of >300 mm and <=600 mm is +-5 mm. This tolerance allows the manufacturer to vary the design diameter of their pipe, however customers of pipes on occasions apply an added tolerance to the manufacture; *that the design diameter shall not be less than the nominal diameter*. Manufacturers therefore respond by designing their pipes to be slightly larger than nominal by the accepted tolerance. Hence in Table 1 for FRC pipes the actual diameter is greater than nominal, but never less.

Given that FRC pipes vary between manufacturers and, potentially, between production runs, it was recommended to adopt the nominal diameter of the pipe as the value to be used in the calculation of the cross-sectional area in the all MACE Doppler series meters. This gave MI a conservative position in a dispute with a customer over perceived over-charging as any bias would always be in the customer's favour.

Why did MI not just measure the diameter rather than use a standard value given by the nominal diameter?

AS4139:2003 describes a procedure for measuring the internal diameter of FRC pipes. The method calls for two measurements to be made orthogonally 200 mm in from each end of the pipe and the four values averaged. MI does not consider that this procedure is practical in a field installation situation. Further, meter installers are not equipped or trained with suitably accurate instruments to complete this procedure, so the use of nominal diameter was considered best practice.

Laboratory flow tests on MACE Doppler meters show that the accuracy is within the maximum permissible error, but if the reading was biased by -1.9 to -2.4% as a result of applying the nominal diameter in the flow calculations, then how many customers could be supplied with meters that are outside the NMI tolerance of +-5%?

The probability of any customers being supplied by a meter that is outside the NMI tolerance of +5% is zero and for -5% it is 0.015. For 1,000 customers that use the MACE Doppler the number of customers that have a meter that over-reads are zero and the number of customers that have a meter that under-reads is 15. This statement can be demonstrated by utilising the results of flow meter testing and the allowable tolerances of FRC pipes in a probability analysis as follows:

Figure 1 shows a standard probability distribution overlaid on the measurements made by Manly Hydraulics Laboratory (MHL) test on the MACE Doppler meter in March 2012. In this test the flow tube used was stainless steel with an exact internal diameter of 300 mm. This diameter was input into the MACE software and the tests did not examine the effects of other tubes materials with a range of manufacturing tolerances. Hence, the testing was primarily done to confirm that the meter average *velocity* was within limits. Note that all the measurements made by MHL were within the required NMI tolerance of +-2.5%. Figure 3 shows the probability density of errors in cross-section for an FRC pipe of 450 mm nominal diameter. This distribution is skewed to 97.7% by the bias that occurred as a result of the conservative use on nominal diameter and has a standard error of 0.6% which is related to the +-5mm tolerance on FRC pipes.

When the probability density of area and velocity are combined then a joint probability can be calculated for the flow-rate, i.e. the probability of a customer having a meter that over-reads the flow can be calculated. To do this the data in Figures 1 & 2 are permutated to produce a third probability density (Figure 3).

To obtain the probability that a meter is outside the NMI standards, the sum of the errors in velocity and cross-sectional area must be outside the standard (Figure 4). By overlaying the data in Fig. 4 with the probability density data in Fig. 3 and integrating gives the result described above. This procedure can be thought of simply as calculating the volume of the peak in Fig.3 that is within the blue or green zone of Fig.4.

MI has been conservative with application of the manufacturer's tolerance for FRC pipes. Does the pipe diameter really vary by +-5 mm for pipes of nominal size ranges of >300 mm and <=600 mm and how does this relate to the number of customers that were supplied with meters that outside the NMI tolerance of +-5mm?

Measurements on FRC pipes, both new and used were made by MI in August 2019 using the method described in AS4139:2003. These measurements show that the internal diameter of FRC pipes of the sampled pipes was within limits and less than +-5 mm (Table 2 & Plate 1). The standard deviation of the

measurements was 0.6 mm which implies that the tolerance on James Hardie 450 mm nominal diameter pipes is approximately +-2mm. Applying the probability analysis above shows that the probability of any customers being supplied by a meter that is outside the NMI tolerance of +5% is zero and for -5% it is 0.0097. For 1,000 customers that use the MACE Doppler the number of customers that have a meter that over-reads are zero and the number of customers that have a meter that under-reads is 10. The latter implies that less than 1% of customers are supplied with a MACE Doppler meter that does not comply with the NMI standard.

Table 1 The diameter of the flow tube recommended to be applied into the MACE Doppler II meter software.

PVC Class 6

Nominal Diameter	Actual Diameter	Recommended Diameter	Error in area of pipe
250	272	270	1.5%
300	327	325	1.2%
375	405	400	2.5%

PVC Class 9

Nominal Diameter	Actual Diameter	Recommended Diameter	Error in area of pipe
250	265	265	0.0%
300	318	315	1.9%
375	394	390	2.1%

PVC Class 12

Nominal Diameter	Actual Diameter	Recommended Diameter	Error in area of pipe
250	258	255	2.4%
300	310	310	0.0%
375	384	380	2.1%

Concrete

Nominal Diameter	Actual Diameter	Recommended Diameter	Error in area of pipe
300	305	300	3.4%
375	381	375	3.2%
450	457	450	3.1%
525	533	520	5.1%
600	610	595	5.1%

FRC

Nominal Diameter	Actual Diameter	Recommended Diameter	Error in area of pipe
300	304	300	2.7%
375	380	375	2.7%
450	456	450	2.7%

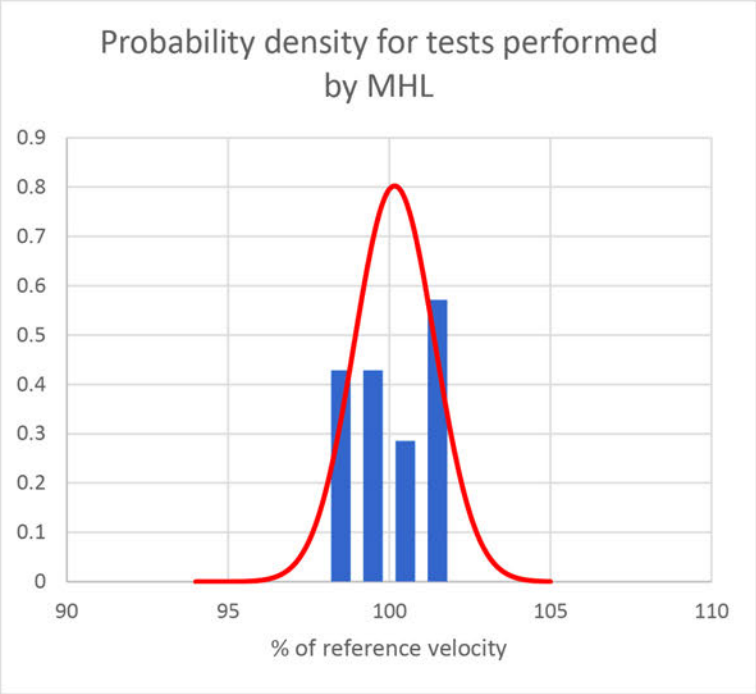

Figure 1 Standard probability distribution applied to the performance of the meter as tested by MHL in March 2012

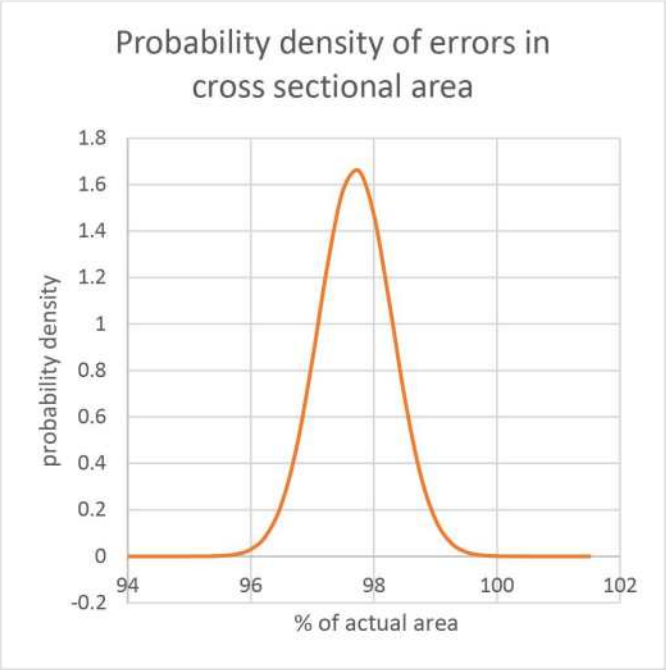

Figure 2 The probability density of cross-sectional area

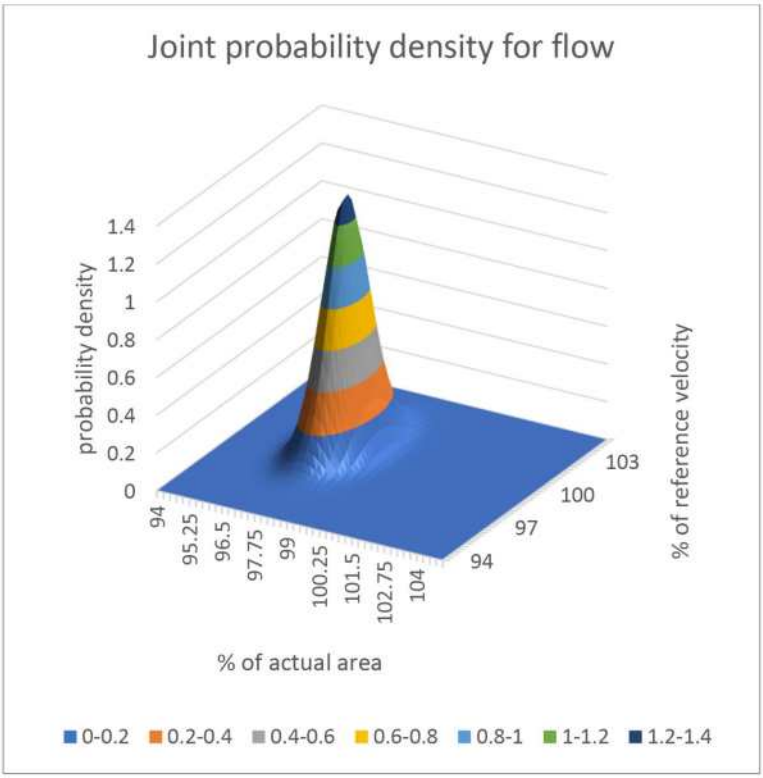

Figure 3 The combined probability density for velocity and area

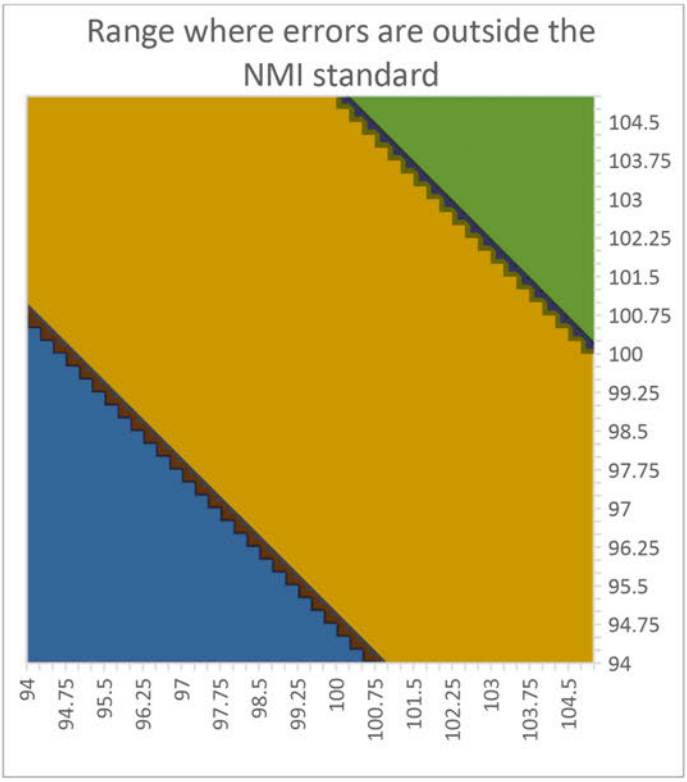

Figure 4 The overlay applied to the combined probability density to obtain the probability of a meter being outside the NMI limit. Blue show the region where the error in below the limit and green is where the limit is above; the region in yellow complies.

Nominal Diameter [mm]	300	450	450	525	600
Manufacturer	JH	JH	Supertite	JH	B'Alton
New/Old	Old	Old	Old	Old	New
1	304	455	456	531	598
2	302	455	456	532	597
3	302	454	454	532	596
4	304	454	455	531	598
5	304	454	454	531	598
Average	303.2	454.4	455.0	531.4	597.4
SD	1.1	0.5	1.0	0.5	0.9

Table 2. The nominal and actual diameter of 6 FRC pipes both old and new. Each pipe was measured 5 times using the method described by AS4139:2003. JH=James Hardie, B'Alton = Bruno Alton.

Figure 5. A used James Hardie 450 mm nominal diameter pipe being measured. The MACE Doppler sensor is shown.

Australian Government

MURRAY–DARLING BASIN AUTHORITY

Availability of Pattern Approved 'non-urban' Water Meters

Including indicative metering requirements for the Basin

April 2019

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Acknowledgement of the Traditional Owners of the Murray–Darling Basin
The Murray–Darling Basin Authority pays respect to the Traditional Owners and their Nations of the Murray–Darling Basin. We acknowledge their deep cultural, social, environmental, spiritual and economic connection to their lands and waters.

The guidance and support received from the Murray Lower Darling Rivers Indigenous Nations, the Northern Basin Aboriginal Nations and our many Traditional Owner friends and colleagues is very much valued and appreciated.

Aboriginal people should be aware that this publication may contain images, names or quotations of deceased persons.

Version control			
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Purpose

In June 2018 the Australian Government and the Murray–Darling Basin states agreed to the Murray–Darling Basin Compliance Compact which describes actions to strengthen compliance with water management rules in the Basin. The availability and use of water meters that meet the requirements of the relevant Australian Standard is particularly important if the community is to have confidence in water compliance arrangements.

Part three of the Compliance Compact describes actions related to Metering and Measurement, which include the commitment to publish metering policies and implementation plans addressing meter accuracy, coverage, transmission of data, and a timetable for installation, auditing and maintenance of the meter fleet. It also includes a commitment to report annually on progress with their implementation plans.

This report is published in support of the requirement of 3.8 of the Compliance Compact:

3.8	The Australian Government and Basin States will work with each other, jurisdictions, testing laboratories, meter manufacturers and industry to set a timetable for delivering a comprehensive range of pattern approved meters.

For Australia there are a number of pattern approved meters currently available. More pattern approved meters are expected on the market in the near future. The Murray–Darling Basin Authority has consulted with meter manufacturers to compile a list of meters being considered for pattern approval. The National Measurement Institute has provided a list of current pattern approved meters. Together these lists are a comprehensive compilation of current and potential pattern approved meters.

This document also provides a compilation of the pattern approved metering requirements for the Basin. This information has been provided by the states and territories.

What is a pattern approved meter?

The National Measurement Institute of Australia checks non-urban water meters for compliance with the Australian Pattern Approval Standards for Non-Urban water meters. Pattern approved compliance status is provided for meters which meet specific requirements for closed conduit meters (NMI-M10); or which meet specific requirements for open channel meters (NMI-M11); or equivalent overseas standards.

A pattern approved meter complies with these requirements within the operating range specified by the meter manufacturer.

Which pattern approved non-urban water meters are available?

Table 1. Closed Conduit Meters

Certificate of Approval Number	Meter Model	Approved sizes (DN = internal pipe diameter in millimetres)	Approved maximum continuous flowrates (Q3)
		PATTERN APPROVED	
14/3/21	Krohne Waterflux 3070	DN25 – DN600	10 m^3/h – 6,300 m^3/h
14/3/24	Siemens MAG8000	DN50 – DN1200	63 m^3/h – 12,500 m^3/h
14/3/29	Arad Octave DN50	DN50 – DN200	40 m^3/h – 400 m^3/h
14/3/30	ABB AquaMaster3 FEV2	DN40 – DN200	40 m^3/h – 1,000 m^3/h
14/3/32	Aquamonix / Pentair I500	DN50 – DN600 Provisional approval: DN700 – DN1035	36 m^3/h – 7027 m^3/h
14/3/34	Sensus WP-Dynamic	DN40 – DN400	25 m^3/h – 2,000 m^3/h
14/3/36	Euromag MUT 2200 EL	DN40 – DN1000	25 m^3/h – 3,600 m^3/h
P14/3/42	Rubicon Sonaray Pipe Meter	Provisional approval: DN600	42 m^3/h – 1313 m^3/h
		METERS BEING CONSIDERED FOR PATTERN APPROVAL	
	MACE AgriFlo XCi	not provided	not provided
	Flexim F501IP with K Transducers	DN100 – DN2400	Transit time clamp-on ultrasonics have a very large turndown, and are not limited by flow rate
	Krohne Optiflux 2300	DN25 - DN1800	16 m^3/h – 25,000 m^3/h
	ABB AquaMaster4	DN40 – DN600	not provided
	Siemens MAG5100W (Mains powered)	DN50 – DN2000	63 m^3/h – 40,000 m^3/h
	Bermad / Euromag MUT 2200 EL	DN600 - DN1000	not provided
	Arad Octave	DN250 - DN300	1,000 m^3/h – 1,000 m^3/h
	Arad WSTsb	DN50 – DN300	63 m^3/h – 1,000 m^3/h

Note – Some Q3 units have been converted to cubic meters per hour (m^3/h) for consistency.

Table 2. Open Channel Meters

Certificate of Approval Number	Meter Model	Approved sizes (Channel dimensions)	Approved maximum continuous flowrates (Q3)
PATTERN APPROVED			
There are currently no pattern approved open channel meters			
METERS BEING CONSIDERED FOR PATTERN APPROVAL			
	Accusonic 8510+ Multiple Path Transit-Time Flowmeter	N/A	N/A
	Rubicon SlipMeter	600mm wide gate	42 m^3/h – 1313 m^3/h

Note – Some Q3 units have been converted to cubic meters per hour (m^3/h) for consistency.

Correct as at 17/4/2019

Note: The list of pattern approved meters can also be found at the National Measurement Institute's website (noting that the NMI list includes urban and non-urban meters) www.measurement.gov.au/Publications/CertificateOfApproval/OtherInstruments/Water_utility_Meters

Indicative metering requirements for the Murray–Darling Basin States

The supply of accurate non-urban water meters for water users within the Murray–Darling Basin will facilitate improvements in water accountability. The Australian Standard for non-urban water meters (AS4747) applies for meters in most Australian jurisdictions and similar metrological requirements apply for those jurisdictions that have not yet placed the Australian Standard in their regulatory requirements.

The following indicative metering requirements are provided by New South Wales, Victoria, Queensland and South Australia. The Murray–Darling Basin Authority makes no claims about the accuracy of the jurisdictional information but notes that the metering requirements suggest an expanding market for meters which comply with the AS4747 pattern approval requirements.

For further information about the Non-urban water meter requirements please contact the appropriate state agency.

NEW SOUTH WALES

Agency: New South Wales Department of Industry

The estimated number and infrastructure sizes of works requiring meters under the new NSW metering framework for surface water and groundwater are in the following tables. These figures are indicative, based on best available data.

Number of works requiring a meter in Stage 1

Stage 1 – Largest Users		
Meter size (mm)	Currently metered	Works to be metered under new requirements
500–549	118	182
550–599	2	5
600–649	408	538
650–699	248	349
700–749	6	10
750–899	43	73
900–999	31	50
100–1,200	22	32
>1,200	9	18
TOTAL	**887**	**1257**

Number of surface water works in each region that will need to be metered in Stages 2–4

Meter size (mm)	Stage 2 – Northern inland		Stage 3—Southern inland		Stage 4—Coast	
	Currently metered	Works to be metered under new requirements	Currently metered	Works to be metered under new requirements	Currently metered	Works to be metered under new requirements
0–49	6	9	19	33	13	42
50–99	58	156	151	255	155	572
100–149	271	1,147	530	1,306	693	2,280
150–199	149	434	396	718	106	295
200–249	81	162	299	513	32	79
250–299	48	107	306	519	9	23
300–349	70	153	456	727	15	30
350–399	53	86	213	322	0	9
400–449	153	246	180	257	0	5
450–499	19	48	55	73	1	3
TOTAL	**908**	**2,548**	**2,605**	**4,723**	**1,024**	**3,338**

Stage 1 includes only pumps of 500 mm or larger.
For stages 2–4, multiple works on a single licence, work approval or landholding that meet the metering thresholds are included.

Number of groundwater works in each region that will need to be metered in Stages 2–4

Meter size (mm)	Stage 2 – Northern inland		Stage 3—Southern inland		Stage 4—Coast	
	Currently metered	Works to be metered under new requirements	Currently metered	Works to be metered under new requirements	Currently metered	Works to be metered under new requirements
<50	20	57	106	275	1	360
50–99	1	7	13	28	0	1
100–199	137	826	161	536	18	53
200–299	441	1,391	336	673	13	785
300–399	424	982	369	564	4	123
400–499	210	404	189	252	3	31
500–599	150	239	68	104	0	4
600–699	23	53	47	72	0	8
700–799	4	28	14	24	0	6
800–899	5	8	7	15	0	0
900–999	16	88	8	23	1	22
1,000–1,199	40	151	1	8	0	71
>=1,200	202	651	7	32	16	934
Excavations	24	168	13	49	0	259
TOTAL	**1,697**	**5,053**	**1,339**	**2,655**	**56**	**2,663**

Works smaller than 50 mm include spear points, which will require a meter under the new framework.
Many of the works that are larger than 1,200 mm are wells.
The size of groundwater works is based on the outside diameter specified on the drilling certificate (Form A).
While the requirement to have a meter is based on the authorised work, the meter installed may be smaller, depending on other aspects of the infrastructure (e.g. pipe or pump size).

VICTORIA

Agency: Victorian Department of Environment, Land, Water and Planning

Victoria has comprehensive non-urban water metering. Victoria's rural water corporations manage around 47,000 meters, which are replaced at the end of their operational life. The following table is based on best available data provided in good faith by these water corporations. This information is preliminary, and subject to verification by the Victorian Department of Environment, Land Water and Planning in 2019.

Victoria is reviewing and updating its state-wide non-urban water metering policy and implementation plan in response to the Basin Compliance Compact. Changes to this policy and/or implementation plan may change the requirements for pattern approved meters. Victoria has committed to implementing the Basin Compliance Compact in accordance with principles of best practice regulation, so that the updated policy and implementation plan will be effective and proportional to the issues being addressed, and result in the greatest improvement in compliance at the least cost.

Number of non-urban water meters in Victoria

Meter type/ size	Unregulated system	Regulated system
Open Channel > 5000 ML/Yr.	0	1
Closed Conduit > 5000 ML/Yr.	7	37
Open Channel	0	2,611
Closed Conduit	3,842	35,967
Ground Water	4,454	2
Total	**8,303**	**38,618**

QUEENSLAND

Agency: Queensland Department of Natural Resources, Mines and Energy

Queensland is currently reviewing its water measurement (including non-urban water meters) policy and is determining the scope and extent of water metering that will be required across the state. While the Queensland Murray–Darling Basin is a priority, the development of a new water measurement policy is being considered in the context of Queensland's state-wide needs.

Gaps in the market for Queensland requirements:

- Pattern approved mechanical meters for <=300mm in diameter.
- Pattern approved ultrasonic meters for meters >300mm in diameter.
- Pattern approved channel meters

Meter fleet – Queensland state-wide requirements (approx.)

Queensland has around 5,000 non-urban meters in-service. Of these, around 1,400 meters are in the Queensland part of the Murray–Darling Basin. It is estimated that 15 000 new and replacement meters will be required for Queensland over the next 10 years.

Meter size (mm)	Current number of meters	Potential new meters
<100	2,500	6,000
101-200	2,000	5,400
201-300	150	1,000
301-450	100	900
451-600	100	700
>601, and including channel meters	150	1,000
TOTAL	**5,000**	**15,000**

SOUTH AUSTRALIA

Agency: South Australian Department for Environment and Water

The majority of off-takes in the South Australian portion of the Murray–Darling Basin are metered and these meters are expected to be grandfathered until the end of their operational life.

Mechanical type meters constitute a very large portion of the South Australian meter fleet and are largely considered fit-for-purpose. From the South Australian perspective, the current pattern approval list has a gap for mechanical type meters up to 300mm in diameter (there are currently no pattern approved meters for 'non potable' use that are mechanical). An example of a meter commonly used in South Australia that is considered fit-for-purpose is the mechanical type *ARAD IRT* meter.

The South Australian Implementation Plan for meters anticipates a gradual implementation of new non-urban water meters. Except where they fail beforehand, meters installed across South Australia will be replaced with AS4747 compliant meters after 30 June 2019 as they progressively come to the end of their operational life.

The following metering requirements table contains information prepared in 2008. The *Meters to be installed* row of the table refers to meters in the Eastern and Western Mount Lofty Ranges which were installed between 2012 and 2014. Considering an average meter life of 15 years, it is likely that South Australian's entire meter fleet (over 13,700 meters) will be refreshed with AS4747 compliant meters by 2034.

Meter size (mm)	Ground water	Surface water (Murray)	Meters to be installed	Meters within irrigation districts	Max flow rate (KL/h)	Max flow rate (ML/d)
<50	471	68	595	4552	<16	<0.4
50-100	3285	485	7230	477	25-100	0.6-2.4
101-200	2160	671	270	2488	150-400	3.7-9.5
201-375	408	207	0	3	500-1400	12-33
376-499	4	21	0	1	1600-2000	38-50
>=500	0	16	0	0	>2500	>60
Unknown sizes	75	0	5	780	N/A	N/A
TOTAL	**6403**	**1468**	**8100**	**8301**		

Office locations
Adelaide
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