ORIGINAL

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**ARICOR**
**Water Solutions**

Phoenix, Arizona 85063

Direct: (623) 341-4771
Fax: (623) 582-5160

January 31, 2012

***Via Hand-Delivery***

Brian Bozzo, Compliance Manager
Compliance Section
Utilities Division
Arizona Corporation Commission
1200 West Washington Street
Phoenix, Arizona 85007

**Re: Compliance Filing of Aubrey Water Company – January 2012 Water Loss Progress Report; January 2012 Water Loss Monitoring Report Docket No. W-03476A-06-0425**

Dear Mr. Bozzo:

Pursuant to Arizona Corporation Commission Decision Nos. 69379 (March 22, 2007) and 71284 (October 7, 2009) in the above-referenced docket, Aubrey Water Company hereby submits the following in compliance with the Decisions:

- January 2012 Water Loss Progress Report for the period 7/1/2011 – 12/31/2011
- January 2012 Water Loss Monitoring Report for the period 1/1/2011 – 12/31/2011

Please contact me should you have any questions.

Sincerely,

Ray L. Jones
Consultant for Aubrey Water Company

Enclosure
cc: Blaine Bilderback (via e-mail)
John Kennedy (via e-mail)
Katherine Szczygiel (via e-mail)

Arizona Corporation Commission
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# AUBREY WATER COMPANY

**P.O. Box 85160**
**Tucson, AZ 85754**

January 31, 2012

Arizona Corporation Commission
Utilities Division
1200 West Washington
Phoenix, Arizona 85007

***Re: Aubrey Water Company's January 2012 Water Loss Progress Report and January 2012 Water Loss Monitoring Report Docket No. W-03476A-06-0425***

## January 2012 Water Loss Progress Report

In regard to the above-referenced docket number, Aubrey Water Company ("Aubrey") hereby submits this Water Loss Progress Report for the period July 1, 2011 through December 31, 2011.

**1) DATA INTEGRITY**

**a) Install meter at Transfer Pump Station - COMPLETE**

The Transfer Pump Station and associated water losses have been eliminated from Aubrey's water supply system, eliminating all data integrity issues. A meter is no longer necessary or feasible and will not be installed.

**b) Verify leakage in transmission line - COMPLETE**

Leak testing of the transmission line was completed on January 5, 2011.

**c) Evaluate and modify the 8" master meter installation (transmission line) - COMPLETE**

As a part of the Town Tank and Booster Station project, Aubrey installed new 6" magnetic flow meter on the transmission main at the Town Tank and Booster Station site. The new 6" meter will be used to track transmission line output rather than the 8" master meter.

**d) Evaluate billing procedure and equipment - COMPLETE**

The evaluation of billing procedures was conducted during calendar year 2011. A memorandum dated December 29, 2011 documents the evaluation and implemented improvements and is attached as Exhibit 2.

e) **Evaluate reporting procedures - COMPLETE**
The evaluation of reporting procedures was conducted during calendar year 2011. A memorandum dated December 29, 2011 documents the evaluation and implemented improvements and is attached as Exhibit 3.

f) **Verify meter data - ONGOING**
Operating personnel have been completing verification of meter data on an ongoing basis. Aubrey is continuing to evaluate the completeness of the operational verification and is considering projects to accelerate completion of the meter data.

2) **APPARENT LOSSES**

g) **Water meter replacement program – ONGOING PROGRAM COMPONENT**
Aubrey replaced 18 water meters during the reporting period.

h) **Perform engineering evaluation and modification of the commercial standpipe meters – Modifications PENDING**
An engineering evaluation the commercial standpipe meter installation was completed on December 29, 2011. The technical memorandum is attached as Exhibit 4. The evaluation recommends replacing the current 6" saddle meters with 3" turbo meters. The project will be scheduled a funds permit.

i) **Removal of out-of-service meters – ONGOING PROGRAM COMPONENT**
Aubrey removed two (2) out of service meters during the reporting period.

j) **Implement meter relocation (to the property line) program - ONGOING PROGRAM COMPONENT**
Aubrey did not relocate any meters during the reporting period.

3) **REAL LOSSES**

k) **Replace Transfer Pump Station - COMPLETE**
Aubrey completed a project to eliminate the Transfer Pump Station (rather than replace the Transfer Pump Station) in March of 2010.

l) **Inspection of water distribution system - ONGOING PROGRAM COMPONENT**
Aubrey continues to conduct regular inspection of its water system. The inspections include the use of pipe locating equipment and observation of plant growth. During the reporting period, Aubrey identified the need for several repairs and replacements during the reporting period.

- Five (5) main line leaks were identified and repaired.
- Two (2) main line valves were determined to be leaking and were repaired.

m) **Replace failing water main (approximately 1,300 feet of 4-inch steel water main)**
During September, 220' of the 4-inch diameter steel water main located on the south side of Chino St. was replaced. This section of piping was replaced due to specifically

identified leaks in this section of piping. This section of piping had been repaired multiple times in the past and is believed to be the most deteriorated section of the targeted 1,300 foot piping section. In accordance with Decision No. 69379 as amended by Decision No. 71284, before proceeding with additional replacement of this segment of piping, Aubrey will reevaluate the need to replace the water main after completing items (a) through (l).

## January 2012 Monitoring Report

The January 2012 Monitoring Report is attached as Exhibit 1 and contains information covering the period January 1, 2011 through December 31, 2011.

# EXHIBIT 1

**AUBREY WATER COMPANY**
**P.O. BOX 85160**
**TUCSON, ARIZONA 85754**
**(520) 623-5172**

# WATER LOSS REPORT
**2011**

## SYSTEM INPUT

| South Well-Gallons Pumped PER MONTH | Year: 2011 GALLONS |
|---|---|
| 1/2/11-2/1/11 | 578,900 |
| 2/2/11-3/1/11 | 796,400 |
| 3/2/11-4/1/11 | 1,209,600 |
| 4/2/11-5/1/11 | 1,852,100 |
| 5/2/11-6/1/11 | 667,500 |
| 6/2/11-7/1/11 | 3,921,800 |
| 7/2/11-8/1/11 | 4,263,500 |
| 8/2/11-9/1/11 | 166,800 |
| 9/1/11-10/1/11 | 2,506,600 |
| 10/2/11-11/1/11 | 2,872,400 |
| 11/2/11-12/1/11 | 1,660,300 |
| 12/2/11-1/1/12 | 0 |
| | |
| TOTAL | 20,495,900 |

| North Well-Gallons Pumped PER MONTH | Year: 2011 GALLONS |
|---|---|
| 1/2/11-2/1/11 | 2,343,400 |
| 2/2/11-3/1/11 | 1,766,300 |
| 3/2/11-4/1/11 | 1,960,100 |
| 4/2/11-5/1/11 | 2,085,000 |
| 5/2/11-6/1/11 | 3,449,100 |
| 6/2/11-7/1/11 | 1,280,500 |
| 7/2/11-8/1/11 | 1,070,400 |
| 8/2/11-9/1/11 | 5,889,000 |
| 9/1/11-10/1/11 | 2,171,100 |
| 10/2/11-11/1/11 | 31,100 |
| 11/2/11-12/1/11 | 1,030,500 |
| 12/2/11-1/1/12 | 2,839,100 |
| | |
| TOTAL | 25,915,600 |

| TOTAL GALLONS PUMPED | Year: 2011 GALLONS |
|---|---|
| 1/2/11-2/1/11 | 2,922,300 |
| 2/2/11-3/1/11 | 2,562,700 |
| 3/2/11-4/1/11 | 3,169,700 |
| 4/2/11-5/1/11 | 3,937,100 |
| 5/2/11-6/1/11 | 4,116,600 |
| 6/2/11-7/1/11 | 5,202,300 |
| 7/2/11-8/1/11 | 5,333,900 |
| 8/2/11-9/1/11 | 6,055,800 |
| 9/1/11-10/1/11 | 4,677,700 |
| 10/2/11-11/1/11 | 2,903,500 |
| 11/2/11-12/1/11 | 2,690,800 |
| 12/2/11-1/1/12 | 2,839,100 |
| | |
| TOTAL | 46,411,500 |

## BILLED AUTHORIZED CONSUMPTION

| TOTAL GALLONS SOLD INDIVIDUAL READINGS | YEAR 2011 |
|---|---|
| 1/2/11-2/1/11 | 1,435,820 |
| 2/2/11-3/1/11 | 1,511,340 |
| 3/2/11-4/1/11 | 2,508,185 |
| 4/2/11-5/1/11 | 2,491,877 |
| 5/2/11-6/1/11 | 2,800,650 |
| 6/2/11-7/2/11 | 3,890,130 |
| 7/2/11-8/1/11 | 3,799,684 |
| 8/2/11-9/1/11 | 4,221,900 |
| 9/1/11-10/1/11 | 3,469,504 |
| 10/2/11-11/1/11 | 2,027,662 |
| 11/2/11-12/1/11 | 2,250,390 |
| 12/2/11-1/1/12 | 2,199,741 |
| | |
| TOTAL | 32,606,883 |

| TOTAL GALLONS SOLD QUARTER MACHINE | YEAR 2011 |
|---|---|
| 1/2/11-2/1/11 | 200,670 |
| 2/2/11-3/1/11 | 242,400 |
| 3/2/11-4/1/11 | 290,000 |
| 4/2/11-5/1/11 | 343,690 |
| 5/2/11-6/1/11 | 409,750 |
| 6/2/11-7/1/11 | 502,860 |
| 7/2/11-8/1/11 | 480,330 |
| 8/2/11-9/1/11 | 525,130 |
| 9/1/11-10/1/11 | 437,260 |
| 10/2/11-11/1/11 | 322,140 |
| 11/2/11-12/1/11 | 296,310 |
| 12/2/11-1/1/12 | 244,760 |
| | |
| TOTAL | 4,295,300 |

| TOTAL GALLONS SOLD | YEAR 2011 |
|---|---|
| 1/2/11-2/1/11 | 1,636,490 |
| 2/2/11-3/1/11 | 1,753,740 |
| 3/2/11-4/1/11 | 2,798,185 |
| 4/2/11-5/1/11 | 2,835,567 |
| 5/2/11-6/1/11 | 3,210,400 |
| 6/2/11-7/1/11 | 4,392,990 |
| 7/2/11-8/1/11 | 4,280,014 |
| 8/2/11-9/1/11 | 4,747,030 |
| 9/1/11-10/1/11 | 3,906,764 |
| 10/2/11-11/1/11 | 2,349,802 |
| 11/2/11-12/1/11 | 2,546,700 |
| 12/2/11-1/1/12 | 2,444,501 |
| | |
| TOTAL | 36,902,183 |

## Authorized Non-Revenue Uses

Water Used for System Flushing and Fire Protection

| TOTAL GALLONS | YEAR 2011 |
|---|---|
| 1/2/11-2/1/11 | 40,000 |
| 2/2/11-3/1/11 | 1,000 |
| 3/2/11-4/1/11 | 24,500 |
| 4/2/11-5/1/11 | 20,500 |
| 5/2/11-6/1/11 | 40,500 |
| 6/2/11-7/2/11 | 67,000 |
| 7/2/11-8/1/11 | 60,600 |
| 8/2/11-9/1/11 | 32,600 |
| 9/1/11-10/1/11 | 32,000 |
| 10/2/11-11/1/11 | 7,600 |
| 11/2/11-12/1/11 | 2,000 |
| 12/2/11-1/1/12 | 2,000 |
| | |
| TOTAL | 330,300 |

## Water Losses

[System Input] - [Billed Authorized Consumption] - [Authorized Non-Revenue Uses]

| TOTAL GALLONS | YEAR 2011 |
|---|---|
| 1/2/11-2/1/11 | 1,245,810 |
| 2/2/11-3/1/11 | 807,960 |
| 3/2/11-4/1/11 | 347,015 |
| 4/2/11-5/1/11 | 1,081,033 |
| 5/2/11-6/1/11 | 865,700 |
| 6/2/11-7/2/11 | 742,310 |
| 7/2/11-8/1/11 | 993,286 |
| 8/2/11-9/1/11 | 1,276,170 |
| 9/1/11-10/1/11 | 738,936 |
| 10/2/11-11/1/11 | 546,098 |
| 11/2/11-12/1/11 | 142,100 |
| 12/2/11-1/1/12 | 392,599 |
| | |
| TOTAL | 9,179,017 |

## PERFORMANCE INDICATORS

Water Loss Percentage

| Date | % |
|---|---|
| 1/2/11-2/1/11 | 42.63% |
| 2/2/11-3/1/11 | 31.53% |
| 3/2/11-4/1/11 | 10.95% |
| 4/2/11-5/1/11 | 27.46% |
| 5/2/11-6/1/11 | 21.03% |
| 6/2/11-7/2/11 | 14.27% |
| 7/2/11-8/1/11 | 18.62% |
| 8/2/11-9/1/11 | 21.07% |
| 9/1/11-10/1/11 | 15.80% |
| 10/2/11-11/1/11 | 18.81% |
| 11/2/11-12/1/11 | 5.28% |
| 12/2/11-1/1/12 | 13.83% |
| | |
| Calendar Year 2011 | 19.78% |

Quarter meter out of servcie for portion of Feb. and Mar. Sales estimated based on collected revenue.

# EXHIBIT 2

# Memorandum

ARICOR
Water Solutions
25213 North 49th Drive
Phoenix, AZ 85083

Phone: 623.341.4771
Fax: 623.582.5160
Email: ray.jones@aricor.com

**To:** **Blaine Bilderback**
**Aubrey Water Company**

**From:** Ray L. Jones, P.E.

**Date:** December 29, 2011

**Re:** Evaluation of Billing Procedures and Equipment

## Background

On July 16, 2009, ARCOR Water Solutions completed a Water Loss Assessment to support Aubrey's ongoing efforts to comply with the water loss requirements of Arizona Corporation Commission (ACC) Decision No. 69379. On May 13, 2009, Aubrey filed a Petition to Amend Decision No. 69379. The July 16, 2009 Water Loss Assessment was provided to the ACC in support of Aubrey's Petition to Amend Decision No. 69379. On October 7, 2009, the ACC issued Decision No. 71284 amending Decision No. 69379 requiring Aubrey to implement recommendations to improve data integrity, apparent losses, real losses, and reporting, including evaluating billing procedures and equipment.

Aubrey conducts operations and billing activities using two independent contractors. On-site operations related activities are handled by John Kennedy (On-Site Representative). Administrative, billing and financial functions are handled by Southwestern Utility Management (SUM) from a remote office. During 2011, ARICOR Water Solutions, the On-Site Representative and SUM have periodically evaluated and improved billing procedures as required by Decision No. 71284. This Memorandum summarizes Aubrey's billing evaluation process, including documenting implemented improvements, current billing procedures and any recommendations.

## Customer Meter Reading

The On-Site Representative maintains a listing of all meters and accounts in the water system. The listing is maintained on the On-Site Representatives personal computer in a text file. At the beginning of the monthly customer meter reading cycle, the On-Site Representative prints the meter and account listing and records meter readings and the meter read date for all customer meters in the system. The meter readings are manually recorded on the printed sheets. Once meter reading is complete the On-Site Representative updates the computer file by manually entering data from the manual recorded readings. Once the computer file is updated, it is emailed to SUM.

Once the meter reads are received by SUM, the customer meter readings manually entered into the billing system and checked over for any reads that appear incorrect. A reread list is created and the list is emailed to the On-Site Representative for verification. The On-Site Representative re-checks the meter reads and emails his response to SUM. The corrected reads are entered into the billing system and the customers are billed.

SUM and the On-Site Representative have worked to refine these procedures throughout 2011 and report that Aubrey's meter reading process, although somewhat labor intensive, works well with customers being billed accurately and on a timely basis. SUM believes the use of a hand held meter reading device would be faster and more accurate. Implementing the hand held meter reading

device would require the purchase of new computer for the On-Site Representative and purchase of the hand held meter reading device. In addition significant training would be required for the On-Site Representative to master performing upload and download of meter reading files and using the hand held device. A complicating issue is the lack of high speed internet access in Seligman. Since the current meter reading process is working well, Aubrey will continue to use the manual process rather than attempt to implement the use of hand held meter reading device at this time. SUM and the On-Site Representative will continue to monitor the metering reading process and will reconsider implementation of the use a hand held meter reading should meter reading issues appear.

## Operational Meter Reading

The on-site representative maintains a log in which readings for the wells, the transmission main master meter, tank inlet meter, booster station outlet meter and coin standpipe meter (Operations Meters) approximately three times per week. At the beginning of the customer meter reading cycle, the On-Site Representative records month-end readings for the Operations Meters and provides those readings to SUM by email. SUM inputs the meter readings into an excel spreadsheet for reporting purposes. The Operational Meter Reading process is working effectively and requires no further improvement at this time.

## Billing and Collection Process

SUM uses Continental Utility Solutions Inc.'s (CUSI) billing system to bill Aubrey's customers. SUM prints the customer bills and mails them to Aubrey's customers. SUM has implemented process improvements in 2011 to insure that all Aurbrey customer accounts, including temporary construction users, are billed in the CUSI billing system. In addition, SUM has adopted procedures to insure that all out of cycle billings and usage adjustments are processed in the CUSI billing system. These improvements have improved tracking of Aubrey's water sales and improved the tracking of water losses.

Customers pay their bills by mail. The payments are directed to a lockbox in Dallas, TX. If a customer mails a billing to SUM's Tucson office, checks are forwarded by SUM to the Dallas lockbox. Every few days SUM logs onto the bank website to pull the latest bank deposit transactions ( noting the check number, customer account number(s), and dollar amounts ) and creates a list of deposits to be hand entered into CUSI to various customer bills. Each month, in accordance with ACC rules, disconnect notices are mailed to customers with delinquent accounts. The notice is generated by the CUSI billing system. A list of past due customers is emailed to the On-Site Representative who reminds customers that they "need to pay their bill". Five days later, the On-Site Representative turn's off customers who have not paid. If any payments are collected by the On-Site Representative prior to shut-off, the On-Site Representative calls SUM to advise of the payment and mails the payment to SUM.

The Aubrey billing and collection process is currently working well and requires no further improvement at this time.

## Customer Service Orders

During 2011 procedures were modified to require customers to initiate all services orders by telephoning SUM (as opposed to contacting the On-Site Representative). This includes all requests for new service, requests to terminate service and all other customer inquiries. The customer

request is input into the CUSI billing system and a service order is generated. The service order is email to the On-Site Representative for action. The On-Site Representative completes the wok order and emails the completed work order to SUM for closing. The revised process has resulting in improved customer records and consistent customer services. No further improvements are required at this time.

# EXHIBIT 3

# Memorandum

ARICOR
Water Solutions
25213 North 49th Drive
Phoenix, AZ 85083

Phone: 623.341.4771
Fax: 623.582.5160
Email: ray.jones@aricor.com

**To:** **Blaine Bilderback**
**Aubrey Water Company**

**From:** Ray L. Jones, P.E.

**Date:** December 29, 2011

**Re:** Evaluation of Reporting Procedures

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## Background

On July 16, 2009, ARCOR Water Solutions completed a Water Loss Assessment to support Aubrey's ongoing efforts to comply with the water loss requirements of Arizona Corporation Commission (ACC) Decision No. 69379. On May 13, 2009, Aubrey filed a Petition to Amend Decision No. 69379. The July 16, 2009 Water Loss Assessment was provided to the ACC in support of Aubrey's Petition to Amend Decision No. 69379. On October 7, 2009, the ACC issued Decision No. 71284 amending Decision No. 69379 requiring Aubrey to implement recommendations to improve data integrity, apparent losses, real losses, and reporting, including evaluating reporting procedures.

Aubrey conducts operations and reporting activities using two independent contractors. On-site operations related activities are handled by John Kennedy (On-Site Representative). Administrative, billing and financial functions are handled by Southwestern Utility Management (SUM) from a remote office. During 2010 and 2011, ARICOR Water Solutions, the On-Site Representative and SUM have periodically evaluated and improved reporting procedures as required by Decision No. 71284. This Memorandum summarizes Aubrey's reporting procedures evaluation process, including documenting implemented improvements, current reporting procedures and any recommendations.

## Production and Master Meter Data

The on-site representative maintains a log in which readings for the wells, the 8" transmission main master meter, 6" transmission main to tank inlet master meter, booster station outlet meter and coin standpipe meter (Operations Meters) approximately three times per week. At the beginning of the customer meter reading cycle, the On-Site Representative records month-end readings for the Operations Meters and provides those readings to SUM by email.

SUM has replaced hand calculation of well production data with the direct input of meter readings into Excel spreadsheets. The Excel spreadsheets calculate the production for each well and automatically populate production data for reporting of system production and water losses.

A review of data performed by ARICOR Water Solutions indicated that two errant well meter readings were reported and entered into the system during 2011, causing a minor error in monthly production data (data for the year was correct). The error was easily corrected by referring to the On-Site Operator's log of meter readings.

The 8" diameter transmission main master meter was determined to be improperly sized and subject to inaccuracy. As a part of the Town Tank and Booster Station project, Aubrey installed a new 6" magnetic flow meter on the transmission main at the Town Tank and Booster Station site

immediately prior to the tank inlet. The 6" meter is now used as the master meter for monitoring transmission main output.

On balance, the collection and reporting of production data worked well throughout 2011. For 2012, the Excel spreadsheets have been updated to begin tracking of newly operational 6" master meter and booster station output meters.

## Water Sales Data

The On-Site Operator reads all customer meters on and monthly basis and SUM uses Continental Utility Solutions Inc.'s (CUSI) billing system to bill Aubrey's customers[1]. SUM has implemented process improvements in 2011 to insure that all Aubrey customer accounts, including temporary construction users, are billed in the CUSI billing system. In addition, SUM has adopted procedures to insure that all out of cycle billings and usage adjustments are processed in the CUSI billing system. SUM prints a monthly Usage Report from the CUSI billing system and enters the reported water sales into the Excel reporting spreadsheets for reporting purposes.

ARICOR Water Solutions conducted a review of calendar year 2011 raw data from the CUSI billing system and compared the billed water sales to the water sales reported by SUM. ARICOR found the water sales to be accurately reported with all out of cycle bills and usage adjustments properly accounted for.

Since coin standpipe sales are not billed in the CUSI billing system, coin sales must be tracked separately. The On-Site Operator reports month-end coin standpipe meter readings to SUM by email (with all other Operational Meter Readings). SUM enters the meter readings into the Excel spreadsheets. The Excel spreadsheets calculate the coin standpipe sales and combine those sales with the customer meter sales from the CUSI billing system and automatically populate water sales data into spreadsheets for reporting of water sales and water losses.

The improvements implemented in 2011 have resulted in accurate tracking and reporting of Aubrey's water sales and water losses. No further improvements are required at this time.

## Water Loss Data

Tracking and reporting water losses requires tracking and comparing production to authorized uses of water. Authorized uses of water include both billed and unbilled authorized uses. As fully explained above, Aubrey has effective procedures in place for tracking and reporting of production and billed authorized uses. Unbilled authorized uses include water used for system flushing and fire protection. On a monthly basis, the On-Site Operator estimates water used for flushing and fire protection and reports these unbilled authorized uses to SUM along with the monthly meter readings. SUM enters the unbilled authorized usage into the Excel spreadsheet.

The Excel spreadsheet is used reported system production, billed authorized usage and unbilled authorized usage to calculate and report water losses in both total gallons and on a percentage

[1] See separate memorandum reporting Aubrey's evaluation of billing procedures for a detailed description of the meter reading and billing process.

basis. In July and January, the water losses for the previous six months are reviewed by ARICOR Water Solutions, SUM and the On-Site Operator and reported to the ACC.

The improvements implemented in 2011 have resulted in accurate tracking and reporting of Aubrey's water losses. For 2012 reporting spreadsheets have been updated to report water losses on both a system wide basis as required by the ACC and separating water losses between the well transmission system and the distribution system to provide supplemental operational data. No further improvements are required at this time.

# Memorandum


**ARICOR**
**Water Solutions**
**25213 North 49th Drive**
**Phoenix, AZ 85083**

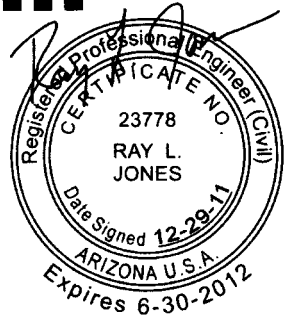
**Phone: 623.341.4771**
**Fax: 623.582.5160**
**Email: ray.jones@aricor.com**


**To:** **Blaine Bilderback**
**Aubrey Water Company**

**From:** Ray L. Jones, P.E.

**Date:** December 29, 2011

**Re:** Engineering Evaluation
Commercial Standpipe Meters




## 1.0 Introduction

On July 16, 2009, ARCOR Water Solutions completed a Water Loss Assessment to support Aubrey's ongoing efforts to comply with the water loss requirements of Arizona Corporation Commission (ACC) Decision No. 69379. On May 13, 2009, Aubrey filed a Petition to Amend Decision No. 69379. The July 16, 2009 Water Loss Assessment was provided to the ACC in support of Aubrey's Petition to Amend Decision No. 69379. On October 7, 2009, the ACC issued Decision No. 71284 amending Decision No. 69379 requiring Aubrey to implement recommendations to improve data integrity, apparent losses, real losses, and reporting, including completing an engineering evaluation of the commercial standpipe meters before scheduling the meters for replacement. This Technical Memorandum presents the result of the required engineering evaluation.

## 2.0 Background

Aubrey supplies water at a standpipe sales station to support significant water hauling to rural development located outside of the Aubrey's service area. To meet this demand, Aubrey has installed a four-station dedicated commercial standpipe for use by large commercial haulers and Yavapai County.

The dedicated commercial standpipe is equipped with four valves and four meters feeding a common standpipe. Each valve and meter is assigned to a customer who locks the valve to prevent usage by other haulers. When a hauler arrives he unlocks and opens his valve to fill the tank truck. The meter records the flow and is billed monthly along with all other customer accounts.

## 3.0 Standpipe Evaluation and Recommendations

The meters installed at this site are six-inch Badger saddle meters. The exact age of the meter installation is unknown. It is believed that the meter installation was installed in the early 1990s, making the meters are approximately 20 years old. A test of the metering station determined that the accuracy of the meters may be as low as 88% and that the meters are in need of replacement.

Figure 1 provides a schematic and pictures of the current metering arrangement. Adequate runs of straight pipe upstream and downstream of the meters have been provided. However, the manual control valves used to throttle standpipe flow are approximately 60-inches upstream of the meters creating the potential for inaccuracy caused by vortexing. In addition, 6" saddle meters are oversized for the application, possibly contributing to metering inaccuracy.

The following recommendations are made for replacement of the commercial standpipe meters:

- The existing 6" saddle meters should be replaced with 3" turbo meters with integral strainers. A Badger Meter Turbo 450 or equivalent meter is recommended (see Attachment 1 for technical details).

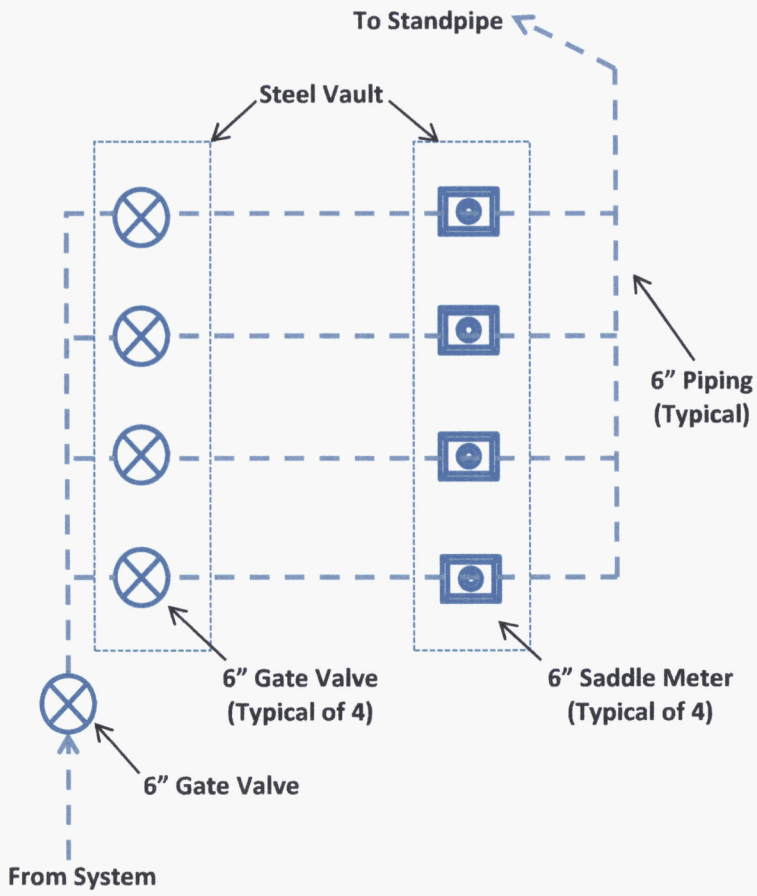
- The existing 6" gate valves with extension stems used for flow control should be relocated to the downstream side of the meters to avoid the potential for vortexing.

- 6" diameter piping and valves should be replaced with 3" diameter piping and valves with allowances made for proper lengths of straight piping before and after the 3" turbo meter. Figure 2 provides a detail of the suggested modifications.

- Maximum flow through the meters should be limited to 400 gallons per minute. Flow should regulated by partially closing the 6" gate valve located on the commercial standpipe riser. The position of the regulating valve should be fixed by lock and chain to prevent tampering by water haulers. Note: the 3" gate valves upstream of the meter should not be used to regulate flow and must remain fully open to insure accurate metering.

# FIGURES

ARICOR
Water Solutions



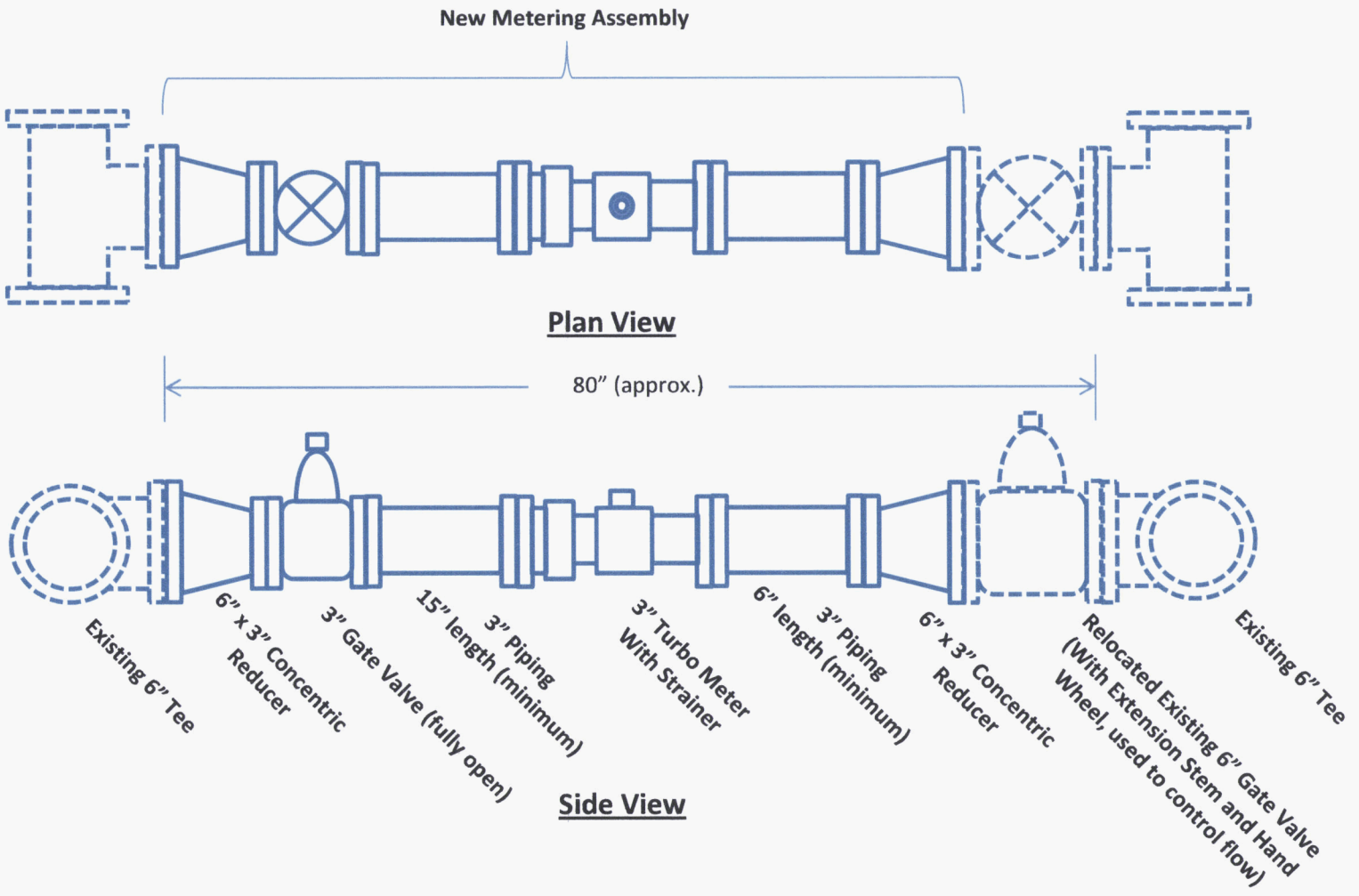

ARICOR Water Solutions

# Schematic – Existing Bulk Water Standpipe

## Aubrey Water Company

FIGURE: 1

DATE: 12-29-11




| | | |
|---|---|---|
| ARICOR Water Solutions | **Bulk Water Standpipe Metering Assembly Suggested Modifications** | FIGURE: 2 |
| | **Aubrey Water Company** | DATE: 12-29-11 |

# ATTACHMENT 1

ARICOR
Water Solutions

| Cold Water Recordall® Turbo 450 Meter with Integral Strainer | Size 3" (DN 80 mm) | Technical Brief |
|---|---|---|

## DESCRIPTION

Badger Meter offers the 3" Turbo Series meter with Integral Strainer in Cast Bronze and a Low Lead Alloy. The Low Lead Alloy (Trade Designation: Turbo Series LL-NS (with Integral Strainer)) version complies with NSF/ANSI Standard 61, Annex G and carries the NSF-61 Mark on the product.

**APPLICATIONS:** For use in measurement of potable cold water in commercial and industrial services where flow is in one direction only.

**OPERATION:** Water flows into the meter's measuring element contacting the multi-vaned rotor. Flow readings are obtained by rotor revolutions transmitted by magnetic drive coupling through the meter's cover plate to the sealed register. Magnetic drive is achieved by a right angle worm drive, coupling the rotor to a vertical transmission spindle, driving a gear set rotating the magnet carrier. A ceramic magnet in a carrier rotates around a vertical axis. Through the magnetic coupling, rotor rotation is transmitted to a follower magnet which transmits rotation to the register gearing.

The turbo measuring element is designed to greatly reduce wear by reducing friction potential between the moving parts of the rotor and bearing system. Less wear, in this critical area of the design, provides the utility manager with a lower life cycle cost for meter application. Throughout the normal operating range of the meter, the rotor floats between the thrust bearing system.

**OPERATING PERFORMANCE:** The Badger® Recordall Turbo 450 meter meets and exceeds registration accuracy for the low flow rate, normal operating flow rate, and maximum continuous operation flow rate as specifically stated in AWWA Standard C701.

**CONSTRUCTION:** The Badger Recordall Turbo 450 meter construction which complies with ANSI and AWWA C701 standards, consists of three basic components: meter housing, interchangeable measuring element and permanently sealed register. The housing is bronze, with round flanges. The measuring element consists of the transmission coupling, measuring element insert, rotor, inlet and outlet straightening vanes with nose cones, and calibration ring assembly. The unique inlet and outlet straightening vanes minimize swirl from piping arrangements upstream as well as downstream.

To simplify maintenance, the register and measuring element can be removed without removing the meter housing from the installation. No change gears are required for accuracy calibration. Interchangeability of certain parts between 1 1/2" - 4" like-sized meters also minimizes spare parts inventory investment.

**MAGNETIC DRIVE:** Direct magnetic drive, through the use of high-strength magnets, provides positive, reliable and dependable register coupling for straight-reading, remote or automatic meter reading options.

**SEALED REGISTER:** The standard register consists of a straight-reading odometer-type totalization display, 360° test circle with center sweep hand and flow finder to detect leaks. Register gearing consists of self-lubricating thermoplastic gears to minimize friction and provide long life. Permanently sealed; dirt, moisture, tampering and lens fogging problems are eliminated. Multi-position register simplifies meter installation and reading. Automatic meter reading and close proximity systems are available for all Recordall Turbo meters. (See back of sheet for additional information.) All reading options are removable from the meter without disrupting water service.

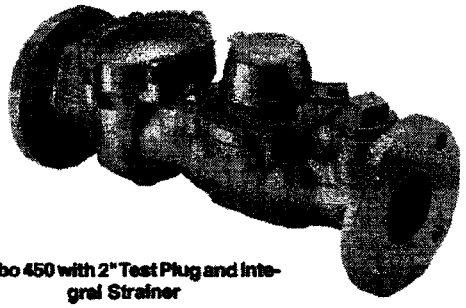
**TAMPER-RESISTANT FEATURES:** Customer removal of the register to obtain free water can be prevented when the option tamper detection seal wire screw or TORX® tamper resistant seal screw is added to the meter. Both can be installed at the meter site or at the factory. A tamper resistant calibration plug seal provides protection from unauthorized personnel.

**STRAINER:** The meter is designed with an integral stainless steel strainer screen built into its inlet end. A removeable cover plate permits easy access to the strainer for routine cleaning.

**MAINTENANCE:** Badger Recordall Turbo meters are designed and manufactured to provide long-term service with minimal maintenance. When maintenance is required, it can be performed easily either at the meter installation or at any other convenient location. As an alternative to repair by the utility, Badger offers various maintenance and meter component exchange programs to fit the needs of the utility.

**CONNECTIONS:** Companion flanges for installation of meters on various pipe types and sizes are available in cast iron or bronze as an option.

**TEST PLUG:** An 2" NPT test plug puts an end to removing and reinstalling meters during field accuracy and pressure testing.



**Turbo 450 with 2" Test Plug and Integral Strainer**

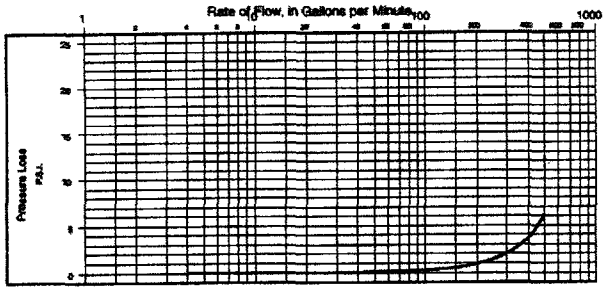
## SPECIFICATIONS

| | |
|---|---|
| **Typical Operating Range (100% ± 1.5%)** | 5 - 550 GPM (1.1 to 124.9 m³/h) |
| **Maximum Continuous Operation** | 450 GPM (102.2 m³/h) |
| **Maximum Intermittent Flow** | 550 GPM (124.9 m³/h) |
| **Typical Low Flow (Min. 95%)** | 4 GPM (0.9 m³/h) |
| **Pressure Loss at Maximum Continuous Operation** | 5.0 PSI (.43 bar at 102.2 m³/h) |
| **Maximum Operating Temperature** | 120°F (49°C) |
| **Maximum Operating Pressure** | 150 PSI (10 bar) |
| **Meter Flanges** | 3" Round<br>AWWA 125 pound class |
| **Register** | Straight reading, permanently sealed magnetic drive standard.<br>Automatic Meter Reading and Close Proximity units optional. |
| **Registration** | 100,000,000 Gallons<br>100 gallons/sweep hand revolution.<br>10,000,000 Cubic Feet<br>10 cubic ft./sweep hand revolution.<br>1,000,000 m³<br>1 m³/sweep hand revolution.<br>100,000,000 Imperial Gallons<br>100 Imperial Gallons/sweep hand revolution. |

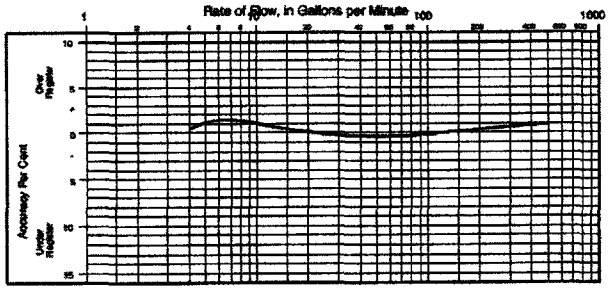
## MATERIALS

| | |
|---|---|
| **Housing** | Cast Bronze (B81), Low Lead Alloy |
| **Turbo Head** | Cast Bronze (B81), Low Lead Alloy |
| **Nose Cone and Straightening Vanes** | Thermoplastic |
| **Rotor** | Thermoplastic |
| **Rotor Radial Bearings** | Lubricated Thermoplastic |
| **Rotor Thrust Bearings** | Sapphire Jewels |
| **Rotor Bearing Pivots** | Passivated 316 Stainless Steel |
| **Calibration Mechanism** | Stainless Steel and Thermoplastic |
| **Magnet** | Ceramic |
| **Register Lid and Shroud** | Thermoplastic, Bronze |
| **Trim** | Stainless Steel |

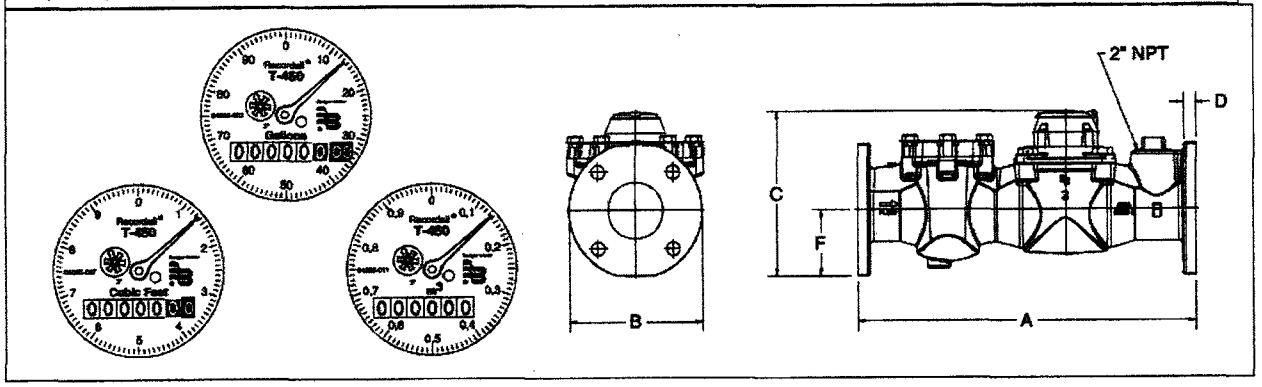
PRESSURE LOSS CHART




ACCURACY CHART

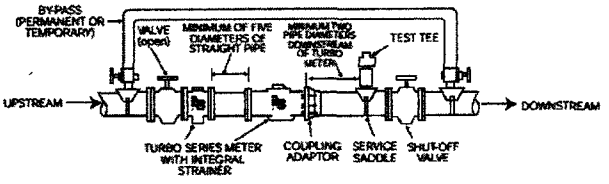



| Meter & Pipe Size | DIMENSIONS | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Length | Width | Height | Flange | Bolt Circle | Centerline | No. | Net | Shipping |
| | A | B | C | D | E | F | Bolts | Weight | Weight |
| 3" RD | 19" | 7 1/2" | 8 15/16" | 27/32" | 6" | 3 19/32" | 4 | 49 lb. | 55 lb. |
| (DN 80) | (483mm) | (191mm) | (227mm) | (21mm) | (152mm) | (91mm) | | (22kg) | (25 kg) |




**PROPER INSTALLATION:** The following installation guidelines will insure optimum field performance and reliability when installing a Badger Turbo meter.

1. For Turbo meters with a strainer, a minimum of five (5) pipe diameters of straight pipe upstream of the meter is recommended.
2. ONLY full-open gate valves should be used immediately upstream of the meter. Butterfly valves MUST be five (5) pipe diameters or more upstream of the meter. Full-open gate or butterfly valves can be used downstream.
3. DO NOT install pressure reducing devices or check valves upstream of the meter.
4. Unweighted check valves MUST be located at least three (3) pipe diameters downstream of the meter.
5. Pressure reducing devices and externally weighted check valves MUST be located at least five (5) pipe diameters downstream of the meter.






ISO 9001

Please see our website at
**www.badgermeter.com**
for specific contacts.



Due to continuous research, product improvements and enhancements, Badger Meter reserves the right to change product or system specifications without notice, except to the extent an outstanding contractual obligation exists.

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