

METER ERROR REPORT**FINAL**

Reconcile?	Y
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Safety Issue?	N
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Thesis Report No.	
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1. EXECUTIVE SUMMARY

SITE NAME	Leamington	
LDZ		
START DATE (actual)	11 th October 2017	
LAST GOOD DATE	10 th October 2017	
END DATE	15 th January 2019	
SIZE OF ERROR (No reconciliation required if under 0.1%)	Overread in volume by 0.33587% (-0.33474% error of original measured volume) (-132967.8 sm ³ / -1.43 GWh)	
ESTIMATE – Y/N?	N	
ROOT CAUSE	Incorrect K factors	
ANALYSIS		
METER TYPE	Turbine	
AUTHOR	Will van Woerden	
CHECKED BY	Piers Eldridge	
ACCEPTED BY CADENT NETWORK		
RECONCILIATION	Distribution	Transportation

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The calculation for the overall error is taken as the volume error caused by the incorrect K factors being in use for meter MT1, divided by the total flowrate as measured by the station (calculated as the Station 24hr Volume Flow value at the end of the analysis period minus Station 24hr Volume Flow value at the start of the analysis period, which accounts for flow when both MT1 and MT2 were in use).

The overall error calculated is an overread in volume of 0.33587% for the period analysed (-0.33474% on the original measured volume)

2. BACKGROUND

Gas is supplied to part of the Cadent network at Leamington FWACV offtake. The site meter system comprises of one metering system with two turbine meter streams, MT1 and MT2, in 2 x 100% configuration.

On 15th January 2019, it was discovered that the K factors in use on MT1 had not been updated following the turbine meter recalibration on 11th October 2017, the K factors were updated correctly on the day of discovery at 11:00am.

3. ERROR QUANTIFICATION AND IMPACT

Flow and conditions data were requested for the period impacted, from 11th October 2017 when MT1 was recalibrated, to 15th January 2019 at approximately 11:00am when the K factors were updated to the correct values. The error has occurred for turbine meter MT1 only, and MT2 is not affected. When MT1 was recalibrated, the K factors were not updated and therefore operation continued using the pre-recalibration K factors for the period identified.

Table 1 compares pre and post recalibration K factors.

Table 1 Pre and post recalibration K Factors

(In use) pre-recalibration K Factor	(In use) pre-recalibration Frequency	Post-recalibration K Factor	Post-recalibration Frequency
3837.37	28		
3836.6	56	3837.769	55
3838.52	107	3838.265	108
3835.07	262	3847.819	269
3833.15	419	3851.381	431

3834.3	747	3844.223	748
3834.69	1066	3840.687	1059

For each data cycle, occurring every 4-5 minutes, the flowrate was recalculated using the frequency data provided and by interpolating the K factor from the post-recalibration K factor set. This adjusted flowrate was compared to the non-adjusted flowrate calculated using the K factor as provided. The difference between the uncorrected and corrected flowrates are added to the station flowrate. A correction factor is also calculated and applied to the difference between subsequent volumetric integrator readings. Gas day correction factors are summarised in Table 2.

4. CAUSES

The flow error has been caused by the failure to update K factors on the site flow computer following a flow meter recalibration.

5. RECOMMENDATIONS AND LEARNING

The configurations saved after the meter is recalibrated should be checked against the meter calibration certificate.

REFERENCES

1. Leamington MER Final V1.xlsx

VERSION HISTORY

<i>Version</i>	<i>Changes</i>	<i>Author</i>	<i>Date</i>
1	<i>First Issue</i>	W. van Woerden	27/07/2020
2	<i>Cadent comments included</i>		14/09/2020

APPENDIX

The table below gives the daily correction factors which should be used to reconcile the error.

Where there is a short period of missing data a correction has been applied equal to the mean correction factor for the previous and subsequent days. This applies for Gas Days where fewer than 294 data points were recorded. Because the error is not similarly distributed across the data period, the default correction factor as detailed in MER guidance is not used.

Table 2 Daily Correction Factors

Gas Day	Daily Volume (scm)	Daily Error (scm)	Daily Correction Factor
11/10/2017	1403	-1.414494187	0.998992
26/10/2017	5973	-7.535516361	0.998738
30/10/2017	15593	-35.60913683	0.997716
31/10/2017	165476	-569.8928294	0.996556
01/11/2017	182722	-641.7672291	0.996488
02/11/2017	187855	-682.8681579	0.996365
03/11/2017	169346	-563.4999208	0.996672
04/11/2017	175768	-588.7110389	0.996651
05/11/2017	174253	-567.1554807	0.996745
06/11/2017	164567	-507.0023525	0.996919
07/11/2017	159068	-461.7841081	0.997097
08/11/2017	167174	-517.6868639	0.996903
09/11/2017	147964	-400.3478339	0.997294
10/11/2017	143401	-370.0217197	0.997420
11/11/2017	137287	-329.3788548	0.997601
12/11/2017	150693	-408.4142271	0.997290
13/11/2017	139526	-480.2390923	0.996558
14/11/2017	111975	-247.8504525	0.997787
15/11/2017	128376	-268.430441	0.997909
16/11/2017	155181	-434.4000007	0.997201
17/11/2017	172145	-560.4306575	0.996744
18/11/2017	155231	-450.0394873	0.997101
19/11/2017	153155	-433.767953	0.997168

20/11/2017	126377	-347.6591527	0.997249
21/11/2017	104819	-227.4751827	0.997830
22/11/2017	91692	-166.4083585	0.998185
23/11/2017	161326	-478.6648823	0.997033
24/11/2017	181448	-617.3916902	0.996597
25/11/2017	191788	-692.9711899	0.996387
26/11/2017	191858	-691.980022	0.996393
27/11/2017	183333	-635.3446974	0.996534
28/11/2017	188582	-671.2798799	0.996440
29/11/2017	197773	-730.2113132	0.996308
30/11/2017	212556	-811.3329464	0.996183
01/12/2017	206921	-780.3380552	0.996229
02/12/2017	185742	-654.1098384	0.996478
03/12/2017	180455	-609.7467799	0.996621
04/12/2017	172912	-586.4423529	0.996608
05/12/2017	111202	-346.6480335	0.996883
06/12/2017	88758	-205.0542369	0.997690
07/12/2017	90771	-199.1866683	0.997806
08/12/2017	51447	-93.36888374	0.998185
09/12/2017	87059	-208.9260802	0.997600
10/12/2017	105167	-305.9720404	0.997091
11/12/2017	170727	-553.4170617	0.996758
12/12/2017	201087	-752.1997476	0.996259
13/12/2017	194163	-715.6277078	0.996314
14/12/2017	188863	-682.5120803	0.996386
15/12/2017	189824	-690.6313612	0.996362
16/12/2017	191455	-704.7149447	0.996319
17/12/2017	175898	-602.4723833	0.996575
18/12/2017	192885	-702.3074521	0.996359
19/12/2017	198070	-732.9316337	0.996300
20/12/2017	160502	-1438.396571	0.991038
25/12/2017	139531	-340.6231658	0.997559
26/12/2017	166908	-526.9562539	0.996843
27/12/2017	194329	-719.1727039	0.996299
28/12/2017	193924	-718.439773	0.996295
29/12/2017	184783	-664.5376449	0.996404
30/12/2017	142172	-388.5537212	0.997267
31/12/2017	122880	-356.0413752	0.997103
01/01/2018	163410	-519.2104977	0.996823
02/01/2018	171631	-577.2149719	0.996637
03/01/2018	166296	-546.4791395	0.996714
04/01/2018	194107	-713.9774851	0.996322
05/01/2018	217167	-864.1315578	0.996021
06/01/2018	222584	-900.578314	0.995954
07/01/2018	198200	-753.8872665	0.996196

08/01/2018	200200	-762.772485	0.996190
09/01/2018	51174	-691.5875263	0.996183
10/01/2018	196647	-752.1336404	0.996175
11/01/2018	204994	-724.9660039	0.996463
12/01/2018	42112	-781.5356174	0.996415
13/01/2018	195891	-711.8881548	0.996366
14/01/2018	202434	-756.1584139	0.996265
15/01/2018	196109	-712.391272	0.996367
16/01/2018	212738	-814.1698141	0.996173
17/01/2018	214347	-815.1320679	0.996197
18/01/2018	201031	-745.1754925	0.996293
19/01/2018	212675	-810.2312109	0.996190
20/01/2018	213130	-832.9819662	0.996092
21/01/2018	215348	-854.9460113	0.996030
22/01/2018	190080	-674.1893453	0.996453
23/01/2018	177679	-590.5478942	0.996676
24/01/2018	182516	-624.8794657	0.996576
25/01/2018	197914	-727.1265055	0.996326
26/01/2018	216238	-841.7760059	0.996107
27/01/2018	207102	-790.8633386	0.996181
28/01/2018	181825	-617.819725	0.996602
29/01/2018	199317	-741.6494133	0.996279
30/01/2018	204884	-765.7939986	0.996262
31/01/2018	198219	-732.1626998	0.996306
01/02/2018	198125	-729.970451	0.996316
02/02/2018	193752	-702.3888924	0.996375
03/02/2018	194409	-710.7292735	0.996344
04/02/2018	195997	-722.5589005	0.996313
05/02/2018	203489	-758.5736215	0.996272
06/02/2018	212879	-814.6365742	0.996173
07/02/2018	210622	-794.7105552	0.996227
08/02/2018	204451	-764.4904278	0.996261
09/02/2018	200509	-743.2566665	0.996293
10/02/2018	199472	-742.4721203	0.996278
11/02/2018	198313	-734.6158762	0.996296
12/02/2018	189967	-666.8744877	0.996490
13/02/2018	199724	-740.8066313	0.996291
14/02/2018	208097	-790.5866343	0.996201
15/02/2018	176170	-589.1741055	0.996656
16/02/2018	186876	-654.2572008	0.996499
17/02/2018	178550	-601.8043666	0.996629
18/02/2018	167924	-537.2786464	0.996800
19/02/2018	156600	-463.088911	0.997043
20/02/2018	155987	-453.7160192	0.997091
21/02/2018	166655	-527.4163445	0.996835

22/02/2018	193547	-704.0267322	0.996363
23/02/2018	201454	-746.1834075	0.996296
24/02/2018	191827	-689.7697142	0.996404
25/02/2018	204386	-772.5909474	0.996220
26/02/2018	187454	-770.7849367	0.996266
27/02/2018	196605	-725.2262299	0.996311
28/02/2018	173591	-1032.221104	0.972056
01/03/2018	19788	-1032.923009	0.947801
02/03/2018	331215	-1276.819867	0.996145
03/03/2018	299515	-1231.228962	0.995889
04/03/2018	257656	-1090.382666	0.995768
05/03/2018	212571	-801.5017613	0.996229
06/03/2018	182025	-622.1405318	0.996582
07/03/2018	184310	-634.0214805	0.996560
08/03/2018	191835	-687.5051226	0.996416
09/03/2018	187325	-660.7974492	0.996472
10/03/2018	153241	-429.5981172	0.997197
11/03/2018	155929	-448.5407472	0.997123
12/03/2018	172393	-562.8041769	0.996735
13/03/2018	167626	-522.6528688	0.996882
14/03/2018	170767	-547.4821808	0.996794
15/03/2018	151890	-427.0706465	0.997188
16/03/2018	142344	-360.3753717	0.997468
17/03/2018	162502	-596.0914677	0.996332
18/03/2018	41298	-924.701851	0.996353
19/03/2018	149980	-801.2162763	0.996353
20/03/2018	194768	-706.1103352	0.996375
21/03/2018	170616	-549.1347166	0.996781
22/03/2018	160419	-489.5020412	0.996949
23/03/2018	144861	-390.1720027	0.997307
24/03/2018	138625	-370.8769965	0.997325
25/03/2018	124540	-257.8954216	0.997929
26/03/2018	135652	-328.1188518	0.997581
27/03/2018	153958	-437.189005	0.997160
28/03/2018	165822	-518.0992187	0.996876
29/03/2018	183395	-641.052893	0.996505
30/03/2018	131104	-458.7298394	0.996501
31/03/2018	144827	-416.3881188	0.997125
01/04/2018	147071	-409.1398738	0.997218
02/04/2018	149781	-414.0076355	0.997236
03/04/2018	139317	-341.9716295	0.997545
04/04/2018	149592	-403.4660457	0.997303
05/04/2018	147692	-399.2130119	0.997297
06/04/2018	136551	-328.8910117	0.997591
07/04/2018	145098	-378.5343252	0.997391

08/04/2018	150559	-408.9749312	0.997284
09/04/2018	39783	-141.2857187	0.996449
13/08/2018	43908	-87.03765379	0.998018
20/08/2018	20702	-12.62413366	0.999390
21/08/2018	29664	-82.40222723	0.997222
22/09/2018	22466	-6.835974431	0.999696
23/09/2018	113472	-172.6051796	0.998479
24/09/2018	111955	-181.2092727	0.998381
25/09/2018	85255	-156.5722884	0.998163
04/10/2018	698	-0.013201104	0.999981
29/10/2018	69473	-172.3116551	0.997520
30/10/2018	117409	-247.4438805	0.997892
31/10/2018	139003	-399.2430785	0.997128
01/11/2018	125294	-311.0962498	0.997517
02/11/2018	136578	-357.8134777	0.997380
03/11/2018	102991	-339.2394302	0.996706
04/11/2018	142	-0.012894684	0.999909
19/11/2018	99462	-276.5048317	0.997220
20/11/2018	201440	-761.8968103	0.996218
21/11/2018	209028	-808.1856077	0.996134
22/11/2018	214259	-832.4717132	0.996115
23/11/2018	195493	-728.2050439	0.996275
24/11/2018	182215	-639.2577133	0.996492
25/11/2018	188233	-680.5754247	0.996384
26/11/2018	198686	-745.8158607	0.996246
27/11/2018	206587	-793.6968165	0.996158
28/11/2018	167491	-566.2521579	0.996619
29/11/2018	167016	-551.8467601	0.996696
30/11/2018	165690	-544.9427449	0.996711
01/12/2018	163665	-542.0657574	0.996688
02/12/2018	158707	-505.2838496	0.996816
03/12/2018	180030	-631.4254767	0.996493
04/12/2018	205868	-792.7666586	0.996149
05/12/2018	188047	-694.8111894	0.996305
06/12/2018	177095	-616.4935856	0.996519
07/12/2018	185245	-649.0585356	0.996496
08/12/2018	181648	-648.0268125	0.996433
09/12/2018	182757	-652.682637	0.996429
10/12/2018	195296	-735.4076424	0.996234
11/12/2018	200827	-764.2862292	0.996194
12/12/2018	215440	-861.2660381	0.996002
13/12/2018	239953	-982.1492644	0.995907
14/12/2018	238033	-947.9403321	0.996018
15/12/2018	206446	-797.0083432	0.996139
16/12/2018	169128	-561.5491247	0.996680

17/12/2018	166492	-546.0756249	0.996720
18/12/2018	160821	-510.238331	0.996827
19/12/2018	156465	-476.8849481	0.996952
20/12/2018	157881	-490.3600088	0.996894
21/12/2018	142729	-397.4435231	0.997215
22/12/2018	117074	-319.8085234	0.997268
23/12/2018	91127	-206.7447709	0.997731
24/12/2018	150351	-403.5938336	0.997316
25/12/2018	174104	-579.1424589	0.996674
26/12/2018	160588	-488.2840821	0.996959
27/12/2018	162809	-504.4856338	0.996901
28/12/2018	157985	-476.1462659	0.996986
29/12/2018	152382	-430.3018174	0.997176
30/12/2018	132438	-572.0039025	0.997045
01/01/2019	163314	-504.0064636	0.996914
02/01/2019	173962	-593.1434158	0.996590
03/01/2019	191484	-699.3289732	0.996348
04/01/2019	213510	-834.1040068	0.996093
05/01/2019	194536	-721.2674391	0.996292
06/01/2019	171234	-560.6073615	0.996726
07/01/2019	171506	-565.3676817	0.996704
08/01/2019	173551	-580.278584	0.996656
09/01/2019	198771	-732.3928535	0.996315
10/01/2019	207067	-777.0027929	0.996248
11/01/2019	179307	-610.1442747	0.996597
12/01/2019	121741	-595.564856	0.996857
13/01/2019	154857	-446.3906721	0.997117
14/01/2019	170062	-543.5375244	0.996804
15/01/2019	53039	-205.5034734	0.996125