

**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	Royston	
LDZ		
START DATE (actual)	5 <sup>th</sup> November 2019	
LAST GOOD DATE	4 <sup>th</sup> November 2019	
END DATE	9 <sup>th</sup> June 2020	
SIZE OF ERROR (No reconciliation required if under 0.1%)	-0.14683% error on original volume (Overread by 0.14705%) (35003 sm <sup>3</sup> / 0.38GWh)	
ESTIMATE – Y/N?	N	
ROOT CAUSE	Incorrect K Factors	
ANALYSIS	Recalculation of volume using correct K factors.	
METER TYPE	Turbine	
AUTHOR	Will van Woerden	
CHECKED BY	Piers Eldridge	
ACCEPTED BY CADENT NETWORK		
RECONCILIATION	Distribution	Transportation

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 Instantaneous Net Volume Totaliser (sm<sup>3</sup>) value at the end of the analysis period minus Instantaneous Net Volume Totaliser (sm<sup>3</sup>) 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 0.14705% for the period analysed.

## 2. BACKGROUND

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

It was discovered on 9<sup>th</sup> June 2020 that on 5<sup>th</sup> November 2019, the K factors on the flow computer configuration for MT1 were inadvertently changed to K factors from a previous meter calibration. This was corrected on the date of discovery.

## 3. ERROR QUANTIFICATION AND IMPACT

Flow and conditions data were requested for the period impacted, from 5<sup>th</sup> November 2019 when K factors for MT1 were inadvertently changed, to 9<sup>th</sup> June 2020 when the K factors were updated to the correct values. The error has occurred for turbine meter MT1 only, and MT2 is not affected.

For the period identified, meter MT1 was in operation using the incorrect K factors.

Table 1 Incorrect (in use) and correct K factors for MT1.

**Table 1 Incorrect (in use) and correct K factors**

<b>(In Use) Incorrect Frequency</b>	<b>(In Use) Incorrect K Factor</b>	<b>Correct Frequency</b>	<b>Correct K Factor</b>
61	2737.14	63	2743.601
121	2740.45	123	2745.14
299	2740	304	2744.143
480	2739.19	481	2743.841
866	2740.19	873	2743.876
1211	2735.54	1235	2743.513

For each data cycle, occurring every 4-5 minutes, the flowrate was recalculated using the frequency data provided and by interpolating the K

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factor from the correct 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 **Error! Reference source not found..**

#### 4. CAUSES

The flow error has been caused by the MT1 K factors being inadvertently changed to values from a previous meter calibration.

#### 5. RECOMMENDATIONS AND LEARNING

The configurations saved after making changes should be checked against the current meter calibration certificate.

#### REFERENCES

1. Royston MER Final V2.xlsx

#### VERSION HISTORY

<i>Version</i>	<i>Changes</i>	<i>Author</i>	<i>Date</i>
1	<i>First Issue</i>	W. van Woerden	03/08/2020
2	<i>Cadent comments included, start date changed from 06/11/19 to 05/11/19.</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 320 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**

<b>Gas Day (scm)</b>	<b>Daily Error (scm)</b>	<b>Daily Volume (scm)</b>	<b>Daily Correction Factor</b>
06/12/2019	-197.6199847	119887	0.998352
07/12/2019	-191.5728382	115409	0.998340
08/12/2019	-202.3678929	123343	0.998359
09/12/2019	-227.7794088	142298	0.998399
10/12/2019	-223.1553353	138497	0.998389
11/12/2019	-228.0049268	142412	0.998399
12/12/2019	-229.7331676	143027	0.998394
13/12/2019	-223.6332366	139087	0.998392
14/12/2019	-230.0900995	144256	0.998405
15/12/2019	-222.6644135	138660	0.998394
16/12/2019	-220.9975339	137098	0.998388
17/12/2019	-221.6132429	137988	0.998394
18/12/2019	-221.0354395	136644	0.998382
19/12/2019	-198.3154378	120004	0.998347
20/12/2019	-205.2903256	125741	0.998367
21/12/2019	-206.1505596	125841	0.998362
22/12/2019	-204.720522	125144	0.998364
23/12/2019	-214.3398078	132102	0.998377
24/12/2019	-196.1565193	118304	0.998342
25/12/2019	-203.5888501	124141	0.998360
26/12/2019	-210.9431804	129006	0.998365
27/12/2019	-200.9809434	121541	0.998346
28/12/2019	-203.973996	124247	0.998358
29/12/2019	-205.2448177	125660	0.998367
30/12/2019	-211.1289136	129902	0.998375
31/12/2019	-203.598304	110350	0.998374
01/01/2020	-213.0014131	130975	0.998374
02/01/2020	-210.8819887	129193	0.998368
03/01/2020	-213.2838728	131689	0.998380
04/01/2020	-217.5288458	134082	0.998378
05/01/2020	-209.5516945	128310	0.998367

06/01/2020	-216.6326309	134186	0.998386
07/01/2020	-207.0394592	126123	0.998358
08/01/2020	-189.3540847	113338	0.998329
09/01/2020	-191.7027088	115946	0.998347
10/01/2020	-214.0516721	132560	0.998385
11/01/2020	-207.2350791	126649	0.998364
12/01/2020	-201.0058956	122542	0.998360
13/01/2020	-215.4601831	133168	0.998382
14/01/2020	-200.6214312	124494	0.998389
15/01/2020	-205.767267	126013	0.998367
16/01/2020	-209.4846031	128074	0.998364
17/01/2020	-213.7574661	132297	0.998384
18/01/2020	-230.4640106	144315	0.998403
19/01/2020	-235.052255	147736	0.998409
20/01/2020	-231.4681618	144582	0.998399
21/01/2020	-231.899453	145111	0.998402
22/01/2020	-218.1526142	135005	0.998384
23/01/2020	-214.1648702	132079	0.998379
24/01/2020	-209.5207681	127677	0.998359
25/01/2020	-210.971066	129217	0.998367
26/01/2020	-207.9239312	127114	0.998364
27/01/2020	-216.3977883	133979	0.998385
28/01/2020	-237.016707	148543	0.998404
29/01/2020	-224.648145	138862	0.998382
30/01/2020	-386.5644551	126676	0.996948
31/01/2020	-14.7207	119236	0.999877
01/02/2020	-193.6702199	117021	0.998345
02/02/2020	-196.1261186	118513	0.998345
03/02/2020	-206.7648607	127393	0.998377
04/02/2020	-227.4826714	142079	0.998399
05/02/2020	-226.4762882	141068	0.998395
06/02/2020	-223.3908436	138940	0.998392
07/02/2020	-219.1922935	135521	0.998383
08/02/2020	-198.2567864	120530	0.998355
09/02/2020	-200.4748845	121959	0.998356
10/02/2020	-222.0406695	137928	0.998390
11/02/2020	-244.2539873	153026	0.998404
12/02/2020	-235.426753	147070	0.998399
13/02/2020	-218.3283153	135677	0.998391
14/02/2020	-213.7629304	131404	0.998373
15/02/2020	-191.352713	114496	0.998329
16/02/2020	-201.4718914	122836	0.998360
17/02/2020	-215.4648294	133478	0.998386
18/02/2020	-223.8284743	139546	0.998396
19/02/2020	-225.3637714	140178	0.998392
20/02/2020	-219.8157632	136753	0.998393

21/02/2020	-225.4184616	140487	0.998395
22/02/2020	-195.4025114	118153	0.998346
23/02/2020	-192.9527144	116757	0.998347
24/02/2020	-207.4691991	126819	0.998364
25/02/2020	-216.0693387	134045	0.998388
26/02/2020	-228.6293489	142934	0.998400
27/02/2020	-238.2062556	149502	0.998407
28/02/2020	-433.7930056	148667	0.997082
29/02/2020	-21.16366001	132713	0.999841
01/03/2020	-214.7414552	132885	0.998384
02/03/2020	-219.1433484	135688	0.998385
03/03/2020	-230.9388917	144287	0.998399
04/03/2020	-223.1768544	138687	0.998391
05/03/2020	-232.3027731	145608	0.998405
06/03/2020	-215.9560779	133778	0.998386
07/03/2020	-203.2295469	123965	0.998361
08/03/2020	-186.8960276	112678	0.998341
09/03/2020	-208.8906156	128369	0.998373
10/03/2020	-177.7004283	105581	0.998317
11/03/2020	-180.3703293	108209	0.998333
12/03/2020	-201.5360417	122686	0.998357
13/03/2020	-202.8243629	124058	0.998365
14/03/2020	-190.5832699	114472	0.998335
15/03/2020	-190.9344424	115107	0.998341
16/03/2020	-196.3941658	118828	0.998347
17/03/2020	-185.0598824	110526	0.998326
18/03/2020	-181.2763822	108011	0.998322
19/03/2020	-206.1441982	126177	0.998366
20/03/2020	-205.6131927	126265	0.998372
21/03/2020	-201.4509248	123420	0.998368
22/03/2020	-198.3305323	120961	0.998360
23/03/2020	-199.9853053	121974	0.998360
24/03/2020	-190.3884899	115245	0.998348
25/03/2020	-188.907957	114583	0.998351
26/03/2020	-193.630022	117739	0.998355
27/03/2020	-190.5759295	115154	0.998345
28/03/2020	-196.9179295	120450	0.998365
29/03/2020	-215.0842302	132806	0.998380
30/03/2020	-384.4767119	124132	0.996903
31/03/2020	-23.17058186	110688	0.999791
01/04/2020	-208.5141288	126529	0.998352
02/04/2020	-178.0780794	104746	0.998300
03/04/2020	-171.311877	100003	0.998287
04/04/2020	-148.5519057	82994	0.998210
05/04/2020	-130.7535011	69095	0.998108
06/04/2020	-132.4370281	71056	0.998136

07/04/2020	-138.3063566	75039	0.998157
08/04/2020	-128.6331885	67815	0.998103
09/04/2020	-109.8844354	53006	0.997927
10/04/2020	-107.6272975	51335	0.997903
11/04/2020	-100.6818843	46860	0.997851
12/04/2020	-102.7913391	46686	0.997798
13/04/2020	-132.1543519	70968	0.998138
14/04/2020	-142.1116414	78655	0.998193
15/04/2020	-130.8460573	69322	0.998112
16/04/2020	-124.5446565	64257	0.998062
17/04/2020	-129.3463341	68008	0.998098
18/04/2020	-140.418227	77259	0.998183
19/04/2020	-128.2097398	67471	0.998100
20/04/2020	-128.4181171	67710	0.998103
21/04/2020	-125.7824059	65168	0.998070
22/04/2020	-120.4236543	60554	0.998011
23/04/2020	-112.924596	54837	0.997941
24/04/2020	-112.7418738	54387	0.997927
25/04/2020	-120.7266646	61890	0.998049
26/04/2020	-111.7081632	53976	0.997930
27/04/2020	-115.9311337	57740	0.997992
28/04/2020	-149.6516857	84606	0.998231
29/04/2020	-294.3381343	81046	0.996368
30/04/2020	-2.087124725	82907	0.999975
01/05/2020	-136.8238301	74761	0.998170
02/05/2020	-122.9260433	63080	0.998051
03/05/2020	-127.6472295	67109	0.998098
04/05/2020	-137.2913691	75868	0.998190
05/05/2020	-147.1842843	83202	0.998231
06/05/2020	-141.3571149	78378	0.998196
07/05/2020	-128.4040783	67634	0.998101
08/05/2020	-111.7579485	53867	0.997925
09/05/2020	-111.0934803	51997	0.997863
10/05/2020	-134.2351089	72186	0.998140
11/05/2020	-162.3123575	94628	0.998285
12/05/2020	-159.6280243	92420	0.998273
13/05/2020	-162.0701623	94881	0.998292
14/05/2020	-151.2365954	86385	0.998249
15/05/2020	-116.2709256	58314	0.998006
16/05/2020	-113.1227305	56030	0.997981
17/05/2020	-119.0195605	59460	0.997998
18/05/2020	-119.1433007	59823	0.998008
19/05/2020	-120.6538002	60736	0.998013
20/05/2020	-109.024124	51739	0.997893
21/05/2020	-103.1138088	47260	0.997818
22/05/2020	-112.1755579	53422	0.997900

23/05/2020	-114.1635607	54824	0.997918
24/05/2020	-113.2377089	54134	0.997908
25/05/2020	-109.9538831	51621	0.997870
26/05/2020	-118.5160456	58260	0.997966
27/05/2020	-119.6245922	59324	0.997984
28/05/2020	-121.1708487	61041	0.998015
29/05/2020	-118.8605242	58895	0.997982
30/05/2020	-117.098678	57341	0.997958
31/05/2020	-117.7947291	47206	0.997964
01/06/2020	-118.0557609	58161	0.997970
02/06/2020	-114.5456599	55090	0.997921
03/06/2020	-253.7708135	60542	0.995808
04/06/2020	-124.219829	64809	0.998083
05/06/2020	-128.6979684	69108	0.998138
06/06/2020	-137.570697	76426	0.998200
07/06/2020	-135.395242	74323	0.998178
08/06/2020	-138.5732413	77526	0.998213
09/06/2020	-49.628992	28266	0.998244