

**METER ERROR REPORT****Final**

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

SITE NAME	Asselby	
LDZ	NO	
START DATE (actual)	25 <sup>th</sup> October 2010	
LAST GOOD DATE		
END DATE	4 <sup>th</sup> November 2010	
SIZE OF ERROR (No reconciliation required if under 0.1%)	~17.414% under-registration (280 kscm or 3.142 GWh)	
ESTIMATE – Y/N?	Y	
ROOT CAUSE	Rupture of 7 barg pipeline and subsequent intermittent turbine meter failure.	
ANALYSIS	The rupture was modelled and the volumes were corrected for the intermittent failure.	
METER TYPE	Turbine	
AUTHOR	B. Kirkman	
CHECKED BY	S. Kimpton	
ACCEPTED BY NGN NETWORK	B. Hanley	
RECONCILIATION	Distribution	Transportation

## 2. BACKGROUND

The metering at Asselby consists of two turbine meters with a gas tracker used for volume correction.

On 25<sup>th</sup> October 2010 at 15:32 the 7 barg, 250 mm, HDPE pipeline from Asselby AGI was struck near Hemingbrough. This was caused by a third party mechanical trenching machine that was carrying out drainage works. As there was no other supply to the downstream network the release of gas continued until repairs were completed at 19:40 on 26<sup>th</sup> October 2010.

The increased flow rates caused the turbine meter to go over range and damage was caused which led to subsequent intermittent failures. The standby meter had recently been removed for repair and replaced by a spool piece.

The meter was removed for repair and replaced with a working meter on 4<sup>th</sup> November 2010.

## 3. ERROR QUANTIFICATION AND IMPACT

### Stage 1 - Rupture

Calculations of the mass flow rate through the hole in the damaged pipeline have been undertaken using the GL Noble Denton model PBREAK. The model PBREAK simulates the flow in a pipeline immediately following a sudden failure of the pipeline. In PBREAK the gas is modelled as a real gas with account taken of friction effects from the pipeline wall. The pipeline is modelled as a single straight pipe and for this calculation a pressure boundary was assumed to be 2.5 km from the failure position. The hole was modelled as being circular with a diameter of 82 mm. The pipeline was 250 mm (external diameter) HDPE with a 23 mm wall. It has been assumed that the pipeline was at 7 bar and that gas was being released into free air, a discharge coefficient of 0.8 has been assumed.

The results of the calculations indicate that the maximum initial flowrate would have been approximately 5.6 kg/s falling to a steady state flow rate of 4.8 kg/s after about 2 minutes. For the purposes of estimating the mass of gas lost 4.8 kg/s should be assumed for the duration of the release. During the 28.13 hours the calculation shows that 486,144 kg (or 618,504 scm) of gas was released.

	Calculated Volume (scm)	Measured Volume (scm)
25 <sup>th</sup> October 2010 06:00 to 15:27	54,756	54,756
25 <sup>th</sup> October 2010 15:28 to 05:59	319,511	243,559
26 <sup>th</sup> October 2010 06:00 to 19:40	300,458	221,822
26 <sup>th</sup> October 2010 19:40 to 05:59	26,934	26,934

Table 2 – Calculation of Error due to Rupture

### Stage 2 – Intermittent Failure

The turbine meter frequency data was not available for this period because of a problem in the configuration of the RBD data so the LGT flow rate was used. Where this flow rate was 151 scm/h (default) or significantly lower than the surrounding points the flow rate was assumed to be in error. A corrected flow rate was interpolated from the surrounding data and integrated to give a corrected volume.

	Calculated Volume (scm)	Measured Volume (scm)
27 <sup>th</sup> October 2010	97,640	97,640
28 <sup>th</sup> October 2010	92,315	92,315
29 <sup>th</sup> October 2010	95,038	94,845
30 <sup>th</sup> October 2010	74,352	72,697
31 <sup>st</sup> October 2010	86,770	45,757
1 <sup>st</sup> November 2010	132,098	32,481
2 <sup>nd</sup> November 2010	145,852	3,624
3 <sup>rd</sup> November 2010	132,894	23,386
4 <sup>th</sup> November 2010 06:00 to 12:37	30,093	27,884
4 <sup>th</sup> November 2010 12:38 to 05:59	69,935	63,475

Table 2 – Calculation of Error due to Intermittent Failure

A correction was estimated for some of the Gemini daily volumes. The calculated daily correction factors are based on these Gemini daily volumes.

#### 4. CAUSES

Pipe rupture caused by 3<sup>rd</sup> party not following utility identification guidance given in HSG47 during drainage works.

#### 5. RECOMMENDATIONS AND LEARNING

It is recommended that the total error, an overall under-registration of ~17.414% (280 kscm or 3.142 GWh), should be reconciled using the daily correction factors in Appendix A.

**REFERENCES**

- 1 Northern Gas Networks Incident Report (INC10137)
- 2 Asselby\_Data.xls - Calculation Spreadsheet
- 3 Asselby\_Summary.xls - Summary Spreadsheet

**VERSION HISTORY**

<i>Version</i>	<i>Changes</i>	<i>Author</i>	<i>Date</i>
0	Original	B Kirkman	16/02/11
1	GWh error included	B Kirkman	18/02/11
2	NGN Formatting	B. Hanley	28/02/11
3	Ammendments following review by NG	B. Hanley	11/03/14

**DISTRIBUTION**

Northern Gas Networks

**APPENDIX A**

<b>Gas Day</b>	<b>Gemini Volume (Mscm)</b>	<b>Calculated Volume (Mscm)</b>	<b>Daily Correction Factor</b>
25-Oct-10	0.37023	0.435267	1.175666
26-Oct-10	0.29137	0.413214	1.322689
27-Oct-10			No Error
28-Oct-10			No Error
29-Oct-10	0.13556	0.137038	1.010903
30-Oct-10	0.12024	0.117352	0.975981
31-Oct-10	0.119	0.13177	1.107311
01-Nov-10	0.14531	0.177098	1.218760
02-Nov-10	0.14752	0.188852	1.280179
03-Nov-10	0.14514	0.179894	1.239452
04-Nov-10	0.1342	0.136028	1.013621