

METER ERROR REPORT**FINAL**

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

SITE NAME	Gilwern	
LDZ	WS	
START DATE (actual)	28 th August 2007	
LAST GOOD DATE		
END DATE	11 th July 2008	
SIZE OF ERROR (No reconciliation required if under 0.1%)	4.670532 Mscm under-registration (0.642%)	
ESTIMATE – Y/N?		
ROOT CAUSE	Intermittent erroneous values from pressure transmitter and offset introduced by pressure calibrator	
ANALYSIS	Volumes recalculated using effective meter pressure based on inlet pressure.	
METER TYPE	Orifice Plate	
AUTHOR	B Kirkman	
CHECKED BY	A Niazi	
ACCEPTED BY UKD NETWORK		
RECONCILIATION	Distribution	Transportation

2. BACKGROUND

Gilwern is a single orifice plate meter stream with a gas chromatograph for CV determination and PTZ correction.

On 29th April 2008 an engineer attended site and confirmed that the pressure transmitter was intermittently giving readings which were significantly lower than the adjacent upstream pressure transmitter P1.

As a temporary measure a representative fixed value for the site was determined and entered into the flow computer until the transmitter was replaced the following day (30th April 2008). The new transmitter was calibrated using a certified portable pressure calibrator (Haven PC33) which appeared to correct the problem but has subsequently proven to have introduced a bias causing the meter to over register.

Calibration of both Pm and P1 transmitters was undertaken on 11th July 2008 using a Dead Weight Tester. The P1 transmitter was demonstrated to be functioning correctly whilst the Pm required adjustment. It was later discovered that the fault on the pressure transmitter first occurred on 28th August 2007.

3. ERROR QUANTIFICATION AND IMPACT

In the period before the Pm transmitter was replaced, the meter pressure was intermittently below the correct value by ~5 bar. Following the replacement of the transmitter the meter pressure was constantly above the correct value by ~1 bar. This can be seen by comparing the meter pressure to the inlet pressure which remained correct for the entire period.

An effective meter pressure was calculated based on the inlet pressure and the known pressure drop between the inlet and meter. This pressure drop was calculated from the average pressure drop in the period between 15:14 on 11th July 2008 and 07:50 on 14th July 2008. At the start of this period both transmitters were newly calibrated and the average pressure drop for the period was 64.808 mbar.

Two sets of results were calculated, one using the recorded meter pressure and the other using the effective meter pressure (as above). The daily correction factor to be applied is the ratio of these two values.

4. CAUSES

Shortly after the July 2007 validation of the meter system the meter pressure (Pm) transmitter developed an intermittent fault which resulted in the under registration of gas through the offtake meter system.

A replacement transmitter was installed on 30th April 2008 and calibrated with a portable pressure calibrator which introduced a systematic bias resulting in over registration of gas through the offtake meter system.

The graphs in Appendix B demonstrate that the fault developed on the 28th August 2007 and remained until the 11th July 2008.

5. RECOMMENDATIONS AND LEARNING

Pressure transmitters employed at NTS Offtakes should be calibrated with certified deadweight testers. The use of a portable pressure calibrator at this site introduced a systematic bias causing the meter to over register.

The total error of 4.670532 Mscm under registration should be reconciled using the daily correction factors in Appendix A.

REFERENCES

HPMIS database

'Gilwern PT Fault Data.zip'

Containing: 'P1vsPm.xls' – Pressure comparison spreadsheet;
'OrifRunPm_0707_0907.xls', 'OrifRunPm_1007_1207.xls',
'OrifRunPm_0108_0308.xls' and 'OrifRunPm_0408_0708.xls'
– Recalculation of volumes using recorded meter pressure;
'OrifRunP1_0707_0907.xls', 'OrifRunP1_1007_1207.xls',
'OrifRunP1_0108_0308.xls' and 'OrifRunP1_0408_0708.xls'
– Recalculation of volumes using effective meter pressure;
'Totals_0707_0907.xls', 'Totals_1007_1207.xls',
'Totals_0108_0308.xls' and 'Totals_0408_0708.xls'
– Daily volume totals using recorded and effective meter pressures;
'DVols.xls' – Daily volume comparison with error and daily correction factor calculation.

APPENDIX A – Daily Correction Factors

Gas Day	HPMIS Daily Volume (scm)	Daily Correction Factor	Error (scm)
28-Aug-07	1145788	1.015147	17354.7
29-Aug-07	1300750	1.013675	17788.1
30-Aug-07	1505763	1.005364	8077.3
31-Aug-07	1483790	0.997848	-3193.4
01-Sep-07	1429555	0.998233	-2526.4
02-Sep-07	1376370	0.998667	-1834.8
03-Sep-07	1388682	1.002820	3915.6
04-Sep-07	1297311	1.013148	17056.9
05-Sep-07	1293187	1.015680	20276.7
06-Sep-07	1411038	1.007872	11107.9
07-Sep-07	1147782	1.008020	9204.7
08-Sep-07	1426164	1.000587	837.8
09-Sep-07	1393459	1.014623	20375.9
10-Sep-07	1274496	1.018091	23056.5
11-Sep-07	1331151	1.020352	27091.6
12-Sep-07	1484033	0.999751	-369.6
13-Sep-07	1526883	0.999635	-557.5
14-Sep-07	1518419	1.006838	10382.6
15-Sep-07	1135828	1.016109	18297.6
16-Sep-07	1401349	1.017314	24262.6
17-Sep-07	1384391	1.012296	17022.4
18-Sep-07	1886397	1.006622	12491.4
19-Sep-07	1591247	1.020361	32399.8
20-Sep-07	1440263	1.004899	7055.5
21-Sep-07	1612972	0.999624	-606.2
22-Sep-07	1255494	0.999326	-846.0
23-Sep-07	1618815	0.999749	-406.1
24-Sep-07	1693518	1.010677	18082.0
25-Sep-07	1915061	1.016851	32270.7
26-Sep-07	1870087	1.013322	24914.0
27-Sep-07	2032228	1.009727	19768.1
28-Sep-07	1849720	1.022611	41824.7
29-Sep-07	1568521	1.019923	31249.6
30-Sep-07	1607766	1.008391	13491.4
01-Oct-07	2088806	1.001409	2942.4
02-Oct-07	1877579	1.000650	1220.9
03-Oct-07	1788626	1.001626	2908.7
04-Oct-07	1681273	1.006279	10556.8
05-Oct-07	1559780	1.022413	34960.0
06-Oct-07	1595059	1.021744	34682.8
07-Oct-07	1592107	1.007282	11593.9
08-Oct-07	1626576	1.001754	2852.5
09-Oct-07	1520625	1.001429	2173.3
10-Oct-07	1700250	1.001696	2883.3
11-Oct-07	1943347	1.001843	3581.4
12-Oct-07	1658783	1.000996	1651.8
13-Oct-07	1312138	1.000829	1087.5
14-Oct-07	1315213	1.000815	1071.8
15-Oct-07	1655652	1.001670	2764.8

Gas Day	HPMIS Daily Volume (scm)	Daily Correction Factor	Error (scm)
16-Oct-07	1826889	1.004050	7399.4
17-Oct-07	1853134	1.016522	30617.4
18-Oct-07	1997572	1.019685	39321.5
19-Oct-07	2220181	1.015979	35476.4
20-Oct-07	2232821	1.016715	37321.8
21-Oct-07	2189616	1.019624	42969.1
22-Oct-07	2604893	1.022005	57320.1
23-Oct-07	2431342	1.021964	53402.9
24-Oct-07	2937070	1.022638	66489.7
25-Oct-07	2620768	1.003619	9483.4
26-Oct-07	2448302	1.001457	3568.3
27-Oct-07	2231719	1.001613	3599.8
28-Oct-07	2029371	1.001401	2842.2
29-Oct-07	2271211	1.000901	2046.7
30-Oct-07	2291754	1.001642	3763.5
31-Oct-07	2172187	1.001737	3773.2
01-Nov-07	1839233	1.001790	3292.3
02-Nov-07	2090906	1.000693	1448.8
03-Nov-07	2252209	1.000142	319.3
04-Nov-07	2318322	1.001597	3702.2
05-Nov-07	2401782	1.002692	6466.1
06-Nov-07	2322094	1.031624	73433.5
07-Nov-07	2283126	1.027958	63831.2
08-Nov-07	2495790	1.000268	667.8
09-Nov-07	2749207	1.000492	1351.5
10-Nov-07	2096685	1.001022	2142.5
11-Nov-07	2648919	1.002359	6247.5
12-Nov-07	2820219	0.999812	-531.3
13-Nov-07	2875588	1.000446	1282.6
14-Nov-07	3250202	1.015898	51672.9
15-Nov-07	2948210	1.009416	27759.2
16-Nov-07	3081969	1.020902	64418.5
17-Nov-07	2627942	1.020335	53439.1
18-Nov-07	2856892	1.005768	16478.5
19-Nov-07	3094849	1.000918	2839.7
20-Nov-07	2942195	1.008075	23757.8
21-Nov-07	2868939	1.000848	2434.1
22-Nov-07	2625445	1.017667	46383.9
23-Nov-07	3068419	1.010237	31411.6
24-Nov-07	2996357	1.000918	2749.8
25-Nov-07	2650865	1.000888	2354.9
26-Nov-07	2818178	1.001092	3076.5
27-Nov-07	2820462	1.000915	2579.7
28-Nov-07	2707331	1.000459	1241.4
29-Nov-07	2688901	1.008004	21521.7
30-Nov-07	2738734	1.021287	58299.5
01-Dec-07	2527236	1.003227	8155.0
02-Dec-07	2560531	1.001677	4294.5
03-Dec-07	2862264	1.008077	23119.5
04-Dec-07	2822077	1.001169	3299.2
05-Dec-07	2525520	1.000923	2331.0

Gas Day	HPMIS Daily Volume (scm)	Daily Correction Factor	Error (scm)
06-Dec-07	2381746	1.000862	2053.6
07-Dec-07	2690425	1.010229	27519.6
08-Dec-07	2640333	0.999986	-37.9
09-Dec-07	2584192	1.000213	549.3
10-Dec-07	3080650	1.000159	490.0
11-Dec-07	3327872	1.000861	2865.0
12-Dec-07	3378952	1.001304	4405.1
13-Dec-07	3358206	1.002591	8699.7
14-Dec-07	3222658	1.008245	26569.7
15-Dec-07	3418228	1.005464	18677.1
16-Dec-07	3696926	0.999521	-1769.2
17-Dec-07	3609822	1.001599	5770.8
18-Dec-07	3567001	1.015462	55153.8
19-Dec-07	3616214	1.001697	6136.1
20-Dec-07	3474758	0.999570	-1492.8
21-Dec-07	3483301	1.001103	3841.0
22-Dec-07	3105898	1.001185	3679.0
23-Dec-07	3068613	1.003645	11184.4
24-Dec-07	2224364	1.000416	925.0
25-Dec-07	2128990	0.999910	-192.5
26-Dec-07	2300354	1.003018	6943.4
27-Dec-07	2219566	1.000544	1207.2
28-Dec-07	2410216	1.000443	1068.8
29-Dec-07	2592410	1.002014	5221.2
30-Dec-07	2554878	1.000597	1526.3
31-Dec-07	2302578	1.000311	716.4
01-Jan-08	2475296	1.000930	2300.9
02-Jan-08	3405403	1.004388	14943.2
03-Jan-08	3224418	1.014374	46347.4
04-Jan-08	2993994	1.007059	21134.1
05-Jan-08	3274378	1.003336	10924.3
06-Jan-08	3066374	1.009459	29003.5
07-Jan-08	3098377	1.017074	52900.8
08-Jan-08	3091777	1.006549	20248.0
09-Jan-08	3097631	1.003614	11194.6
10-Jan-08	3121602	1.000523	1632.5
11-Jan-08	3345130	1.011195	37447.6
12-Jan-08	2753846	1.015521	42743.8
13-Jan-08	2844835	1.000695	1976.3
14-Jan-08	3216627	1.000506	1626.0
15-Jan-08	3005010	1.004165	12515.7
16-Jan-08	2989452	1.009556	28565.7
17-Jan-08	3102466	1.000055	169.3
18-Jan-08	2826691	1.000639	1805.4
19-Jan-08	2394445	1.000934	2237.6
20-Jan-08	2334523	1.000114	266.7
21-Jan-08	2732344	1.000104	284.3
22-Jan-08	3269366	1.000712	2326.7
23-Jan-08	2614146	1.000865	2262.3
24-Jan-08	2680805	1.000726	1947.0
25-Jan-08	2929631	1.000259	760.2

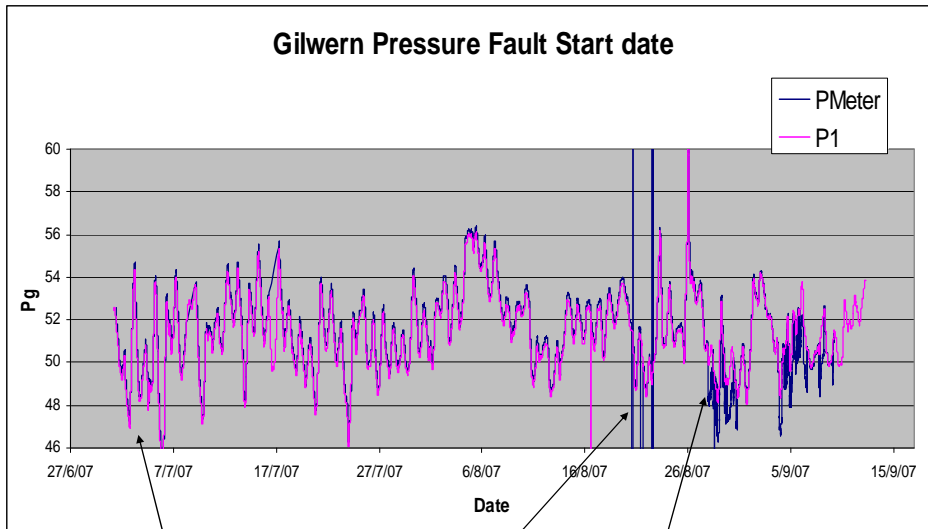
Gas Day	HPMIS Daily Volume (scm)	Daily Correction Factor	Error (scm)
26-Jan-08	2917441	0.999920	-233.4
27-Jan-08	2815262	1.005279	14862.3
28-Jan-08	3043656	1.002539	7729.2
29-Jan-08	2801076	1.001131	3169.1
30-Jan-08	3161375	1.001908	6032.2
31-Jan-08	3286342	1.005418	17806.3
01-Feb-08	3273494	1.008458	27685.9
02-Feb-08	3105472	0.999620	-1180.9
03-Feb-08	3042252	0.999453	-1665.4
04-Feb-08	3204461	0.999614	-1236.2
05-Feb-08	2844962	0.999951	-140.8
06-Feb-08	2866621	1.000947	2716.1
07-Feb-08	2641918	1.001217	3215.7
08-Feb-08	2808980	1.015723	44165.5
09-Feb-08	2692251	1.023096	62181.1
10-Feb-08	2954257	1.013373	39506.9
11-Feb-08	2899861	1.004998	14492.6
12-Feb-08	2759224	1.015430	42575.4
13-Feb-08	3033398	1.027345	82949.0
14-Feb-08	3218650	1.001052	3386.8
15-Feb-08	3384093	1.000153	518.1
16-Feb-08	3150301	0.999422	-1819.6
17-Feb-08	3335508	0.999704	-987.4
18-Feb-08	3525257	1.000407	1436.4
19-Feb-08	3486454	1.000702	2445.9
20-Feb-08	3249052	1.000103	334.5
21-Feb-08	2905343	0.999444	-1615.4
22-Feb-08	3009167	1.000214	645.0
23-Feb-08	2300477	1.000237	544.6
24-Feb-08	2489382	0.999865	-336.0
25-Feb-08	3084359	1.000554	1707.7
26-Feb-08	2732949	0.999777	-610.5
27-Feb-08	2847907	1.018146	51678.8
28-Feb-08	2786524	1.027129	75595.4
29-Feb-08	3045423	1.000742	2261.0
01-Mar-08	2447968	1.000267	652.6
02-Mar-08	2602088	1.000370	963.4
03-Mar-08	3162363	1.000056	175.9
04-Mar-08	2766223	0.999502	-1377.0
05-Mar-08	2920949	0.999634	-1070.1
06-Mar-08	2817382	0.999798	-568.1
07-Mar-08	2630468	1.010574	27815.0
08-Mar-08	2485652	0.999544	-1133.7
09-Mar-08	2708155	1.012602	34127.3
10-Mar-08	3047665	1.003517	10719.9
11-Mar-08	2861210	1.010806	30918.1
12-Mar-08	2738233	1.008450	23137.6
13-Mar-08	2638011	1.024112	63607.6
14-Mar-08	2544106	1.027582	70170.6
15-Mar-08	2457028	1.048512	119194.6
16-Mar-08	2680548	1.035706	95712.9

Gas Day	HPMIS Daily Volume (scm)	Daily Correction Factor	Error (scm)
17-Mar-08	2841589	1.022420	63708.6
18-Mar-08	3008976	1.012185	36664.9
19-Mar-08	2631143	1.014883	39158.4
20-Mar-08	2715210	0.999133	-2354.7
21-Mar-08	2711011	1.004451	12067.9
22-Mar-08	2939482	1.001017	2988.8
23-Mar-08	2753279	1.012128	33391.3
24-Mar-08	2763493	1.007020	19398.5
25-Mar-08	2746294	1.014582	40047.3
26-Mar-08	2510381	1.022651	56862.6
27-Mar-08	2459362	1.030216	74311.4
28-Mar-08	2192164	1.015209	33341.6
29-Mar-08	2587246	1.002321	6004.6
30-Mar-08	2231525	1.029396	65598.3
31-Mar-08	2142769	1.041110	88088.9
01-Apr-08	2173089	1.052227	113494.9
02-Apr-08	2162978	1.042550	92035.8
03-Apr-08	1700656	1.049331	83895.4
04-Apr-08	1929398	1.048039	92686.3
05-Apr-08	2138649	1.025831	55242.6
06-Apr-08	2534806	1.019564	49590.5
07-Apr-08	2809446	1.015340	43095.6
08-Apr-08	2984182	1.026403	78792.2
09-Apr-08	2965564	1.022264	66025.6
10-Apr-08	2711387	1.018676	50638.9
11-Apr-08	2722542	1.016195	44092.2
12-Apr-08	2292039	1.021592	49490.2
13-Apr-08	2354970	1.023692	55794.0
14-Apr-08	2542396	1.020211	51384.2
15-Apr-08	2638934	1.018742	49458.5
16-Apr-08	2507240	1.027012	67724.3
17-Apr-08	2421878	1.014160	34294.2
18-Apr-08	2942396	1.023075	67896.4
19-Apr-08	2793787	1.034775	97153.3
20-Apr-08	2443442	1.042922	104878.2
21-Apr-08	2289771	1.041398	94792.3
22-Apr-08	2178792	1.037134	80907.0
23-Apr-08	2061421	1.042592	87800.6
24-Apr-08	1788368	1.031227	55845.5
25-Apr-08	1917749	1.043652	83714.0
26-Apr-08	1677949	1.042453	71234.6
27-Apr-08	1752160	1.051091	89519.1
28-Apr-08	2040043	1.038927	79413.7
29-Apr-08	2445865	0.988053	-29220.0
30-Apr-08	2445695	0.990249	-23847.4
01-May-08	1988614	0.991907	-16094.6
02-May-08	1719764	0.991863	-13993.5
03-May-08	1947813	0.991751	-16067.5
04-May-08	1716782	0.991819	-14045.5
05-May-08	1660773	0.991910	-13435.9
06-May-08	1486177	0.991972	-11930.9

Gas Day	HPMIS Daily Volume (scm)	Daily Correction Factor	Error (scm)
07-May-08	1533719	0.991933	-12372.8
08-May-08	1425887	0.992003	-11402.7
09-May-08	1592297	0.992012	-12720.0
10-May-08	1312897	0.991838	-10716.2
11-May-08	1334146	0.991763	-10990.0
12-May-08	1309492	0.991875	-10639.9
13-May-08	1493888	0.992039	-11893.2
14-May-08	1435394	0.992043	-11421.3
15-May-08	1665600	0.991539	-14092.3
16-May-08	1970292	0.991910	-15939.1
17-May-08	2056728	0.990356	-19834.7
18-May-08	1752537	0.992090	-13861.9
19-May-08	1921214	0.992136	-15109.3
20-May-08	1839252	0.992345	-14079.9
21-May-08	1714423	0.992233	-13316.1
22-May-08	1763639	0.992165	-13818.1
23-May-08	1547215	0.992034	-12324.9
24-May-08	1510264	0.992107	-11920.1
25-May-08	1845835	0.992440	-13954.5
26-May-08	2191306	0.992737	-15915.2
27-May-08	2000301	0.992338	-15326.4
28-May-08	2162966	0.992529	-16159.0
29-May-08	1630812	0.991851	-13289.4
30-May-08	1700742	0.991903	-13771.4
31-May-08	1584390	0.991633	-13257.0
01-Jun-08	1548901	0.991713	-12835.6
02-Jun-08	1849852	0.992061	-14686.6
03-Jun-08	1443112	0.992333	-11064.7
04-Jun-08	1545098	0.991995	-12368.5
05-Jun-08	1533095	0.991961	-12324.9
06-Jun-08	1333567	0.991683	-11091.9
07-Jun-08	1320251	0.991640	-11037.4
08-Jun-08	1141376	0.991563	-9629.4
09-Jun-08	1211312	0.991617	-10154.5
10-Jun-08	1334083	0.991550	-11272.5
11-Jun-08	1461691	0.991765	-12036.9
12-Jun-08	1322143	0.991667	-11017.0
13-Jun-08	1590729	0.991971	-12772.6
14-Jun-08	1617899	0.991831	-13216.8
15-Jun-08	1505083	0.991878	-12224.9
16-Jun-08	1534927	0.992031	-12231.2
17-Jun-08	1643309	0.992003	-13141.1
18-Jun-08	1994909	0.992232	-15497.1
19-Jun-08	1485883	0.991887	-12055.6
20-Jun-08	1626155	0.991714	-13473.7
21-Jun-08	1481876	0.991833	-12102.0
22-Jun-08	1618261	0.991892	-13120.3
23-Jun-08	1650753	0.991702	-13697.6
24-Jun-08	1467383	0.991655	-12245.3
25-Jun-08	1274017	0.991685	-10593.2
26-Jun-08	1452483	0.991893	-11775.1

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27-Jun-08	1407552	0.991697	-11686.6
28-Jun-08	1477971	0.991917	-11946.4
29-Jun-08	1547430	0.991882	-12562.4
30-Jun-08	1644055	0.991512	-13955.5
01-Jul-08	1657359	0.991724	-13716.2
02-Jul-08	1514126	0.991857	-12328.9
03-Jul-08	1395326	0.991445	-11937.6
04-Jul-08	1500604	0.991951	-12079.1
05-Jul-08	1517275	0.991387	-13068.6
06-Jul-08	1525969	0.992105	-12047.1
07-Jul-08	1529800	0.991712	-12678.4
08-Jul-08	1644988	0.992054	-13070.3
09-Jul-08	1490044	0.992201	-11621.4
10-Jul-08	1608833	0.992115	-12686.2
11-Jul-08	1484929	0.976513	-34876.6
TOTAL (Mscm)	728.040520		4.670532 (0.642%)

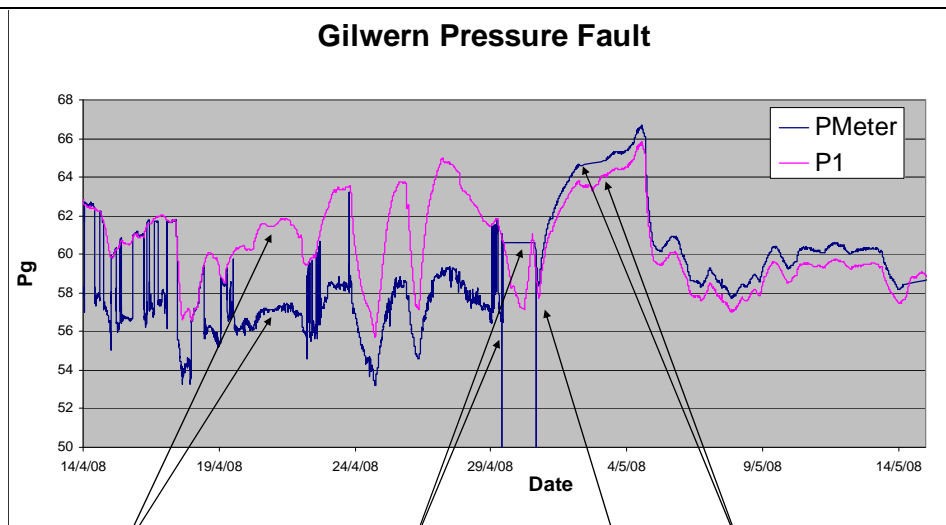
APPENDIX B – Comparison between Pm and P1



Note correlation of P1 and Pmeter prior to error

Validation on 20th and 22nd Aug 07

First occurrence of Pmeter failing occurs on 28/8/07



Pmeter intermittently failing and reading up to 4bar below P1

Technician called out to site and fixed value applied 29th April 08

Meter pressure transmitter changed 30th April 08

Pmeter now reads greater than the upstream P1

