



Part IV Environment Act 1995

Detailed Assessment of nitrogen dioxide – (August 2014)

In fulfillment of Part IV of the
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Local Air Quality Management

Date (August 2014)

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Air Quality

DETAILED ASSESSMENT OF NITROGEN DIOXIDE – (July 2014)

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SUMMARY

This document has been produced in response to the requirements of the Welsh Government for review and assessment of air quality. The 2012 interim Detailed Assessment of air quality concluded that a further Detailed Assessment was necessary at Victoria Gardens, Neath.

The detailed assessment shows that neither the annual averaged Air Quality Objective ($40 \mu\text{g}/\text{m}^3$) nor the hourly averaged AQO ($200\mu\text{g}/\text{m}^3$) for nitrogen dioxide were exceeded at sites near Victoria Gardens, Neath. Although, a property at 1, Victoria Gardens ($39.8 \mu\text{g}/\text{m}^3$) was close to, but did not exceed the annual averaged AQO when NO_2 levels were calculated with the "distance from roads spreadsheet".

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Introduction

The Government and Devolved Administrations have adopted two Air Quality Objectives for nitrogen dioxide. An annual mean concentration of $40 \mu\text{g}/\text{m}^3$ and a 1-hour mean concentration of $200 \mu\text{g}/\text{m}^3$ not to be exceeded more than 18 times per year. Both objectives are to be achieved by the end of 2005.

In addition, the first Air Quality Daughter Directive also sets limit values for nitrogen dioxide, which have been translated into UK legislation. A 1-hour limit of $200 \mu\text{g}/\text{m}^3$ applies, not to be exceeded by more than 18 times per year. An annual mean limit value of $40 \mu\text{g}/\text{m}^3$ also applies, both to be achieved by the 1st January 2010.

Summary of recent investigations and developments

The 2010 Air Quality Progress Report identified that a detailed assessment was required for nitrogen dioxide (NO_2) at Pontardawe Post Office and at Victoria Gardens, Neath.

The 2011 detailed assessment was carried out using more diffusion tubes and this confirmed a potential problem at both locations. As a consequence of these findings it was decided that continuous analysers would be deployed to provide more reliable data for a decision on whether a declaration of AQMAs needed to be made. Both analysers were deployed in July 2012.

It was not possible to site the continuous analyser at the frontage of the Post Office due to a lack of space and health & safety considerations. The nearest location where this could be located was the nearby old bus stop, which is less than 5 metres from the diffusion tube on the frontage of the Post Office. It became clear that results at the continuous monitor were significantly lower than those at the frontage of the Post Office. Consequently, diffusion tubes were deployed in triplicate on the monitor.

It was impossible to locate the analyser at the frontage of 1, Victoria Gardens, given the very narrow pavement. An attempt was therefore made to set up the instrument in the front garden of No. 3 next door. However the owner of the property withdrew permission for use of the garden shortly after the equipment was deployed, so another site had to be found. The location on the pavement near the lights had sufficient room and had no safety issues.

In order to try to avoid the need for declaration of an AQMA at Pontardawe, steps were taken to try to reduce pollution levels at the Post Office. The bus stop was relocated approximately 55 metres further up the hill beyond the houses at 10 & 12 Swansea Road. Pollution from buses can be considerable and there were also reports of buses idling so relocation of the bus stop was aimed at reducing pollution levels at the Post Office.

At the same time, double yellow lines were extended outside the Post Office. The aim was to discourage parking outside, which tends to cause tailbacks and congestion as the road is not wide enough for vehicles to pass parked cars if there is queuing at the lights.

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An extra two parking spaces were provided off road at the new bus stop with the further goal of reducing congestion. All of these works were completed in March 2013.

In addition, the sequencing of the traffic lights was reviewed in October 2011 in order to try to reduce queuing up Swansea Road past the Post Office.

The Council has not use modelling to determine pollution levels as it is less accurate than monitoring. Instead diffusion tubes have been deployed at relevant locations and a local bias adjustment factor has been employed based upon three continuous analysers co-located with diffusion tubes.

The interim 2012 detailed assessment showed that the neither the annual averaged Air Quality Objective ($40 \mu\text{g}/\text{m}^3$) nor the hourly averaged AQO ($200\mu\text{g}/\text{m}^3$) for nitrogen dioxide were exceeded at sites near Pontardawe Post Office.

Continuous measurements of NO_2 at Victoria Gardens, Neath showed that the hourly averaged AQO was complied with. The annual averaged AQO was also complied with at all sites where diffusion tubes were deployed. However, a property at 1, Victoria Gardens ($41.7 \mu\text{g}/\text{m}^3$) was predicted to exceed the annual averaged AQO when NO_2 levels were calculated with the "distance from roads spreadsheet". However, the exceedance was quite marginal and was based upon less than a year's worth of data. It was considered that bias adjustment factors would have been less reliable than would have been the case for a full year of data. Consequently an AQMA was not declared at that stage. Rather, a detailed assessment would be repeated with a full year's worth of data.

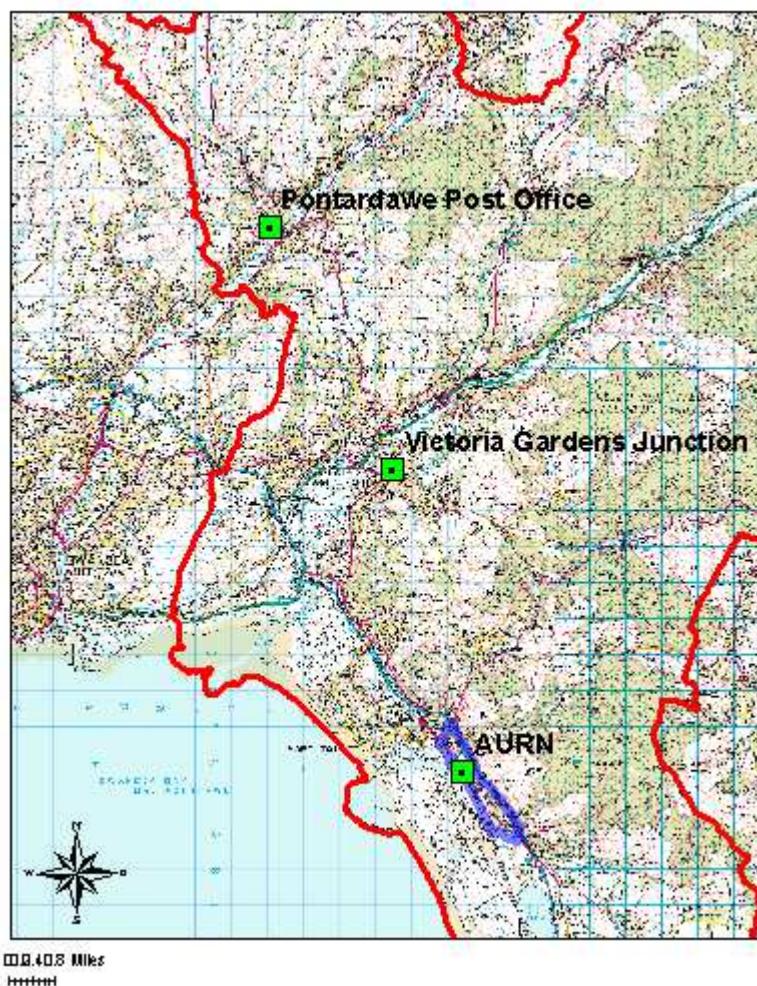
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Monitoring sites

Automatic monitoring sites

Nitrogen dioxide is continuously measured at Pontardawe Post Office, at Victoria Gardens in Neath and at Margam Fire Station (AURN).

Figure 1. Nitrogen dioxide monitoring locations



However, this detailed assessment deals only with data from Neath as NO₂ levels at the other locations have not necessitated a detailed assessment.

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Table 1. NO₂ monitoring station details

Site ID	Site Name	Site Type	X OS Grid Reference	Y OS Grid Reference	Inlet Height (m)	Pollutants Monitored	In AQMA?	Monitoring Technique	Relevant Exposure? (Y/N with distance (m) from monitoring site to relevant exposure)	Distance to Kerb of Nearest Road (m) (N/A if not applicable)	Does this Location Represent Worst-Case Exposure?
VG2	Victoria Gardens	Roadside	275471	197183	1.4	NO ₂	N	Chemiluminescence	Y (21)	1	N

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Figure 2 - NOx analyser on Cimla Road



NOx
analyser

Figure 3 – View across junction to Victoria Gardens



3 Victoria
Gardens

1 Victoria
Gardens

Detailed assessment of nitrogen dioxide

Diffusion tube monitoring sites

Nitrogen dioxide is measured at a variety of locations using passive diffusion tubes. The tubes are exposed for one month and are provided and analysed by ESG at Didcot. The tubes are prepared using acetone:triethanolamine (50:50) and are subject to intercomparison quality assurance tests as part of the Workplace Analysis Scheme for Proficiency (WASP).

This report deals only the sites in the vicinity of Victoria Gardens, Neath.

Figure 4 Location of NO₂ diffusion tubes in Neath



0.00510.02 Miles
+++++

Table 2. Details of Non- Automatic Monitoring Sites

Site ID	Site Name	Site Type	X OS Grid Reference	Y OS Grid Reference	Site Height (m)	Pollutants Monitored	In AQMA?	Is Monitoring Co-located with a Continuous Analyser (Y/N)	Relevant Exposure? (Y/N with distance (m) from monitoring site to relevant exposure)	Distance to Kerb of Nearest Road (m) (N/A if not applicable)	Does this Location Represent Worst-Case Exposure?
4	8 Victoria Gardens, Neath	Roadside	275494	197272	2.5	NO ₂	N	N	Y (2m)	4.5 m	N
5	28 Eastland Road, Neath	Roadside	275420	197161	2.5	NO ₂	N	N	Y (0m)	4 m	N
12	34 Eastland Road, Neath	Roadside	275427	197139	2.5	NO ₂	N	N	Y (0m)	4 m	N
13	40 Eastland Road, Neath	Roadside	275415	197110	2.5	NO ₂	N	N	Y (0m)	4 m	N

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Site ID	Site Name	Site Type	X OS Grid Reference	Y OS Grid Reference	Site Height (m)	Pollutants Monitored	In AQMA?	Is Monitoring Co-located with a Continuous Analyser (Y/N)	Relevant Exposure? (Y/N with distance (m) from monitoring site to relevant exposure)	Distance to Kerb of Nearest Road (m) (N/A if not applicable)	Does this Location Represent Worst-Case Exposure?
14	32 Eastland Road, Neath	Roadside	275431	197149	2.5	NO ₂	N	N	Y (0m)	4 m	N
15	30 Eastland Road, Neath	Roadside	275434	197157	2	NO ₂	N	N	Y (0m)	4 m	N
16	5 Victoria Gardens, Neath	Roadside	275464	197230	2.5	NO ₂	N	N	Y (0m)	3.5 m	Y
17	1 Greenway Road, Neath	Roadside	275455	197211	2.5	NO ₂	N	N	Y (0m)	1 m	Y

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Site ID	Site Name	Site Type	X OS Grid Reference	Y OS Grid Reference	Site Height (m)	Pollutants Monitored	In AQMA?	Is Monitoring Co-located with a Continuous Analyser (Y/N)	Relevant Exposure? (Y/N with distance (m) from monitoring site to relevant exposure)	Distance to Kerb of Nearest Road (m) (N/A if not applicable)	Does this Location Represent Worst-Case Exposure?
20	3 Victoria Gardens, Neath	Roadside	275463	197223	2	NO ₂	N	N	Y (0m)	3.5 m	Y
21	50 Greenway Road, Neath	Roadside	275452	197195	2.5	NO ₂	N	N	Y (0m)	1 m	Y
23	4 Victoria Gardens, Neath	Roadside	275482	197227	2.5	NO ₂	N	N	Y (0m)	3.5 m	Y
34	Lights at Cimla Junction	Roadside	275472	197185	1.4	NO ₂	N	Y	Y (20m)	1.5 m	N

Detailed assessment of nitrogen dioxide

Comparison of Monitoring Results with Air Quality Objectives

The following table shows the annualised annual mean concentrations at both continuous monitoring stations. The short to long term calculations are shown in Appendix A.

Table 3 Results of Automatic Monitoring for NO₂: Comparison with Annual Mean Objective

Site ID	Site Type	Within AQMA?	Valid Data Capture for Monitoring Period % ^a	Valid Data Capture 2012 % ^b	Annual Mean Concentration (µg/m ³)
					2013 ^c
VG2	Roadside	N	99	99	42

In bold, exceedence of the NO₂ annual mean AQS objective of 40µg/m³

^a i.e. data capture for the monitoring period, in cases where monitoring was only carried out for part of the year

^b i.e. data capture for the full calendar year (e.g. if monitoring was carried out for six months the maximum data capture for the full calendar year would be 50%)

^c Means should be “annualised” [as in Box 3.2 of TG\(09\)](#) (<http://laqm.defra.gov.uk/technical-guidance/index.html?d=page=38>), if valid data capture is less than 75%

* Annual mean concentrations for previous years are optional

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Table 4 Results of Automatic Monitoring for NO₂: Comparison with 1-hour Mean Objective

Site ID	Site Type	Within AQMA?	Valid Data Capture for Monitoring Period % ^a	Valid Data Capture 2012 % ^b	Number of Hourly Means > 200µg/m ³
					2013 ^c
VG2	Roadside	N	99	99	0

In bold, exceedence of the NO₂ hourly mean AQS objective (200µg/m³ – not to be exceeded more than 18 times per year)

^a i.e. data capture for the monitoring period, in cases where monitoring was only carried out for part of the year

^b i.e. data capture for the full calendar year (e.g. if monitoring was carried out for six months the maximum data capture for the full calendar year would be 50%)

^c If the data capture for full calendar year is less than 90%, include the 99.8th percentile of hourly means in brackets

* Number of exceedences for previous years is optional

Note:

The maximum hourly average concentrations of NO₂ at the Victoria Gardens site was 159 µg/m³.

Table 5 Results of NO₂ Diffusion Tubes 2013

Site ID	Location	Site Type	Within AQMA?	Triplicate or Co-located Tube	Full Calendar Year Data Capture 2013 (Number of Months or %) ^a	2013 Annual Mean Concentration (µg/m ³)
3	11 College Green, Margam, Port Talbot	Urban background	Y	N	12	15.7
4	8 Victoria Gardens, Neath	Roadside	N	N	12	28.9
5	28 Eastland Road, Neath	Roadside	N	N	12	30.0
12	34 Eastland Road, Neath	Roadside	N	N	12	31.0
13	40 Eastland Road, Neath	Roadside	N	N	11	29.7
14	32 Eastland Road, Neath	Roadside	N	N	12	31.3
15	30 Eastland Road, Neath	Roadside	N	N	12	30.6

Detailed assessment of nitrogen dioxide

Site ID	Location	Site Type	Within AQMA?	Triplicate or Co-located Tube	Full Calendar Year Data Capture 2013 (Number of Months or %) ^a	2013 Annual Mean Concentration ($\mu\text{g}/\text{m}^3$)
16	5 Victoria Gardens, Neath	Roadside	N	N	11	33.7
17	1 Greenway Road, Neath	Roadside	N	N	12	32.9
19	Port Talbot Fire Station	Industrial	Y	Triplicate and Co-located	12	24.8 ^c
20	3 Victoria Gardens, Neath	Roadside	N	Triplicate	12	34.4
21	50 Greenway Road, Neath	Roadside	N	N	12	30.8
23	4 Victoria Gardens, Neath	Roadside	N	N	12	30.6
34	Lights at Cimla Junction	Roadside	N	Triplicate and Co-located	12	62.3^c

In bold, exceedence of the NO₂ annual mean AQS objective of 40 $\mu\text{g}/\text{m}^3$

Underlined, annual mean > 60µg/m³, indicating a potential exceedence of the NO₂ hourly mean AQS objective

^a Means should be “annualised” as in Box 3.2 of TG(09)(<http://laqm.defra.gov.uk/technical-guidance/index.html?d=page=38>), if full calendar year data capture is less than 75%

^b If an exceedence is measured at a monitoring site not representative of public exposure, NO₂ concentration at the nearest relevant exposure should be estimated based on the “NO₂ fall-off with distance” calculator (<http://laqm.defra.gov.uk/tools-monitoring-data/no2-falloff.html>), and results should be discussed in a specific section. The procedure is also explained in Box 2.3 of Technical Guidance LAQM.TG(09) (<http://laqm.defra.gov.uk/technical-guidance/index.html?d=page=30>).

^c These sites were used to create local bias adjustment factors for other nearby sites.

Table 6 Results of NO₂ Diffusion Tubes (2008 to 2012)

Site ID	Site Type	Within AQMA?	Annual Mean Concentration (µg/m ³) - Adjusted for Bias ^a				
			2009 (Bias Adjustment Factor = 0.82)	2010 (Bias Adjustment Factor = 0.85)	2011 (Bias Adjustment Factor = 0.83)	2012 (Bias Adjustment Factors as per previous table)	2013 (Bias Adjustment Factor = 0.75)
3	Urban background	Y	18.2	19.3	17.0	16.9	15.7
4	Roadside	N	33.3	-	32	28.0	28.9
5	Roadside	N	34.1	36.2	34	31.9	30.0
12	Roadside	N	34.2	37.4	35	31.8	31.0
13	Roadside	N	28.0	33.7	30	29.3	29.7
14	Roadside	N	35.5	37.0	34	32.2	31.3
15	Roadside	N	34.2	37.5	36	32.7	30.6
16	Roadside	N	40.0	39.5	41	35.2	33.7
17	Roadside	N	37.5	38.8	35	31.0	32.9
20	Roadside	N	36.2	41.9	42	36.0	34.4
21	Roadside	N	33.8	34.8	34	30.4	30.8
23	Roadside	N	38.1	35.1	36	31.4	30.6
34	Roadside	N	No data	No data	No data	46.6	62.3^c

In bold, exceedence of the NO₂ annual mean AQS objective of 40µg/m³

Underlined, annual mean > 60µg/m³, indicating a potential exceedence of the NO₂ hourly mean AQS objective

^a Means should be “annualised” [as in Box 3.2 of TG\(09\) \(http://laqm.defra.gov.uk/technical-guidance/index.html?d=page=38\)](http://laqm.defra.gov.uk/technical-guidance/index.html?d=page=38), if full calendar year data capture is less than 75%

^c These sites were used to create local bias adjustment factors for other nearby sites.

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Nitrogen dioxide levels at diffusion tube sites at Victoria Gardens were a little lower than at Pontardawe. It was not possible to monitor using diffusion tubes at No.1 Victoria Gardens due to Health & Safety concerns. Therefore it is necessary to estimate the pollution level at this property using the “NO₂ with distance from roads calculator” spreadsheet.

The results from No.3 Victoria Gardens were used to calculate levels at No.1 next door. No. 3 is set back approximately 3.5 metres from the kerb, whereas the frontage at No. 1 faces directly onto the pavement.

The data entered into the spreadsheet is shown below:

Figure 9. Screenshot of NO₂ with distance calculator spreadsheet

Enter data into the yellow cells

Step 1	How far from the KERB was your measurement made (in metres)? (Note 1)	3.5	metres
Step 2	How far from the KERB is your receptor (in metres)? (Note 1)	1	metres
Step 3	What is the local annual mean background NO ₂ concentration (in µg/m ³)? (Note 2)	18.4	µg/m ³
Step 4	What is your measured annual mean NO ₂ concentration (in µg/m ³)? (Note 2)	34.4	µg/m ³
Result	The predicted annual mean NO ₂ concentration (in µg/m ³) at your receptor (Note 3)	39.8	µg/m ³

This shows that the annual averaged air quality objective at 1 Victoria Gardens was just in compliance with the air quality objective i.e. 39.8 µg/m³.

Monitoring has been carried out at several properties in the vicinity of the junction, therefore dispersion modelling is considered to be unnecessary for purposes of identifying the geographical area of any potential exceedance.

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Conclusion

Continuous measurements of NO₂ at Victoria Gardens, Neath showed that the hourly averaged AQO was easily complied with. The annual averaged AQO was also complied with at all sites where diffusion tubes were deployed. A property at 1, Victoria Gardens (39.8 µg/m³) was close to, but did not exceed the annual averaged AQO when NO₂ levels were calculated with the “distance from roads spreadsheet”.

Appendix A: QA:QC Data

Diffusion Tube Bias Adjustment Factors

NO₂ diffusion tubes are sourced from Environmental Scientifics Group and are prepared using 50% TEA in acetone. The bias adjustment factor of 0.75 was used for 2013 as derived from the average of three sites where diffusion tubes were co-located with continuous analysers.

Factor from Local Co-location Studies (if available)

Diffusion tubes were co-located with continuous analysers at the following locations:

Table 7. Diffusion tube local bias adjustment factors.

Month	Pontardawe Post Office			Victoria Gardens			Port Talbot Fire Station		
	Cm	Dm	A (Cm/Dm)	Cm	Dm	A (Cm/Dm)	Cm	Dm	A (Cm/Dm)
Jan	33.1	31.1	1.064	47.8	68.2	0.701	23.5	34.8	0.675
Feb	29.6	33	0.897	46.4	61.6	0.753	22.1	31.7	0.697
Mar	30.3	34.8	0.871	43.1	57.4	0.751	16.9	27.5	0.615
Apr	20.9	24.6	0.850	41.5	62.2	0.667	14.4	25.3	0.569
May	16.8	21.1	0.796	33.1	61.2	0.541	12.1	17.9	0.676
Jun	16.4	21.5	0.763	32.7	61.2	0.534	11.3	18.2	0.621
Jul	17.4	19	0.916	38.1	63.4	0.601	14.6	16.3	0.896
Aug	17.8	18.6	0.957	34.7	59.9	0.579	13	18.6	0.699
Sep	21.4	22.8	0.939	36.5	60.9	0.599	15.2	19.4	0.784
Oct	18.9	24.6	0.768	43.7	62	0.705	16.5	26.3	0.627
Nov	27.9	26.1	1.069	52.6	63.6	0.827	24.3	28.4	0.856
Dec	26	27.8	0.935	49.8	65.9	0.756	19.2	32.8	0.585
Year	23	25.4	0.9	41.6	62.3	0.668	16.9	24.8	0.682

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QA/QC of Automatic Monitoring

NO_x analysers

The analysers are polled on an hourly basis by Ricardo-AEA. The data acquisition system applies automatic validation flags to the data depending on the status of the instrument. Data is also automatically scaled according to the latest calibration values, prior to dissemination on the Welsh Air Quality Forum website.

The analysers are MCERTS certified and are calibrated on an approximately fortnightly basis using a nitrogen monoxide calibration cylinder. The instruments are audited by Ricardo-AEA twice per year. Ratification of the data is also conducted by Ricardo-AEA. Data is regularly polled by Ricardo-AEA and disseminated on the Welsh Air Quality Forum website.

All equipment is covered by service and maintenance contracts with suppliers. These contracts provide for 6 monthly servicing and emergency callouts.

Data was downloaded from the Welsh Air Quality Forum website:

<http://www.welshairquality.co.uk/index.php>

QA/QC of diffusion tube monitoring

Diffusion tubes are exposed for one month and are provided and analysed by ESG at Didcot. The tubes are prepared using acetone:triethanolamine (50:50) and are subject to intercomparison quality assurance tests as part of the Workplace Analysis Scheme for Proficiency (WASP).

[http://laqm.defra.gov.uk/documents/LAQM-WASP-Rounds-115-122-\(October-2011--September-2013\)-NO2-report.pdf](http://laqm.defra.gov.uk/documents/LAQM-WASP-Rounds-115-122-(October-2011--September-2013)-NO2-report.pdf)