



The Use of Tyres as a Substitute Fuel at Rugby Cement Plant

Draft Report for Consultation

CEMEX UK Cement Limited

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1.0 Introduction

The objective of this report is to give the Environment Agency (EA) sufficient information to enable it to permit CEMEX to use chipped tyres on a permanent basis at a rate of 6 tonnes per hour (tph) in combination with the normal fuels used on site.

In August 2001 CEMEX (then Rugby Limited) applied to the Environment Agency (EA) for a PPC Permit for the Rugby Cement Plant to replace its IPC Authorisation. That application included a request to use chipped tyres as a partial substitute for the other fuels authorised. At the Agency's request CEMEX later supplied additional information to supplement the application.

A PPC Permit was issued by the Environment Agency in August 2003 and this included permission to carry out trials with chipped tyres for a period of six months. The trial was conducted in 2005 to a maximum substitution rate of 3 tph, and a trial report was submitted to the EA in October 2006. The use of tyres as a substitute fuel to a rate of 3 tph was permitted by the EA in February 2007.

Following the success of the trial at a rate of 3 tph, an application to vary the Permit to conduct a trial to increase the substitution rate of tyres to 6 tph was submitted in July 2007. A variation to the Permit to allow the trial to commence was given in November 2007.

The permit variation contained criteria called Critical Success Factors (CSFs). The purpose of these was to set in advance of the trials stringent criteria against which the success of the trials could be judged. In other words, a demonstration of compliance with all the CSFs would be expected to lead to the granting of permanent authorisation for use of the chipped tyres at no more than the maximum rate demonstrated in the trials.

The purpose of this report is to give a comprehensive set of information relating to the trials and to demonstrate how all CSFs have been complied with.

The EA has published a Substitute Fuels Protocol (SFP) for use on cement processes. The trials were carried out in accordance with this document. The SFP sets out the minimum information to be included in this report.

The baseline trial was conducted at 3tph of tyres substitution between September 2007 and November 2007.

The increased tyre-burning section of the trials took place from December 2007 to January 2008. Chipped tyres were used at 6 tonnes an hour and all tests required were carried out. The other fuel used was South African coal.

The results of the baseline trials and increased rate tyre burning trials are set out in the remainder of this report.

Section 3.0 sets out the CSFs and shows how each was complied with.

Section 4.0 gives a summary of the emissions to air during the baseline trials and increased rate chipped tyre burning trials. Based on this, section 9.0 gives a numerical assessment of the effect of the impact of these on the environment using a methodology employed by the Environment Agency.

Section 5.0 describes the continuous emission monitors (CEMs) used and the checks made on them, and section 7.0 details the comparison between CEMs and check monitoring.

The results of chemical analyses carried out on all fuels used, the raw materials inputs, and the product and waste coming from the process is given in Section 8.0.

The conclusions are given in Section 10.0.

2.0 Executive Summary

CEMEX applied to the Environment Agency (EA) for permission to vary the existing permit to increase the use of chipped tyres at its Rugby Cement Plant. The EA has given permission for this subject to trials during which specific conditions applied.

The trials have been completed. The tests carried out consisted of a baseline trial using 3 tonnes an hour of chipped tyres, and a formal trial using 6 tonnes an hour of chipped tyres. CEMEX is therefore requesting chipped tyres to be used up to this maximum rate.

The EA set five Critical Success Factors (CSFs) for the trials as part of variation XP3834MR to the Permit, which also apply to the tyre trial. Compliance with these would deem the trials a success and this would be expected to lead to permission for use of chipped tyres to be given.

One CSF was for CEMEX to receive an acceptable assessment by EA Officers. It is CEMEX understanding that this assessment was acceptable but explicit confirmation of this has not been received from the EA.

This report shows how the other four CSFs have been met, as follows.

- a) During the trials there were no breaches of existing emission limit values caused by using tyres.
- b) The amount of process waste produced did not increase due to the use of tyres.
- c) The overall environmental impact of the plant was lower when burning chipped tyres. This was assessed using a methodology specified by the EA. The major factor involved was the significant reduction in NO_x emissions from the plant when burning chipped tyres.
- d) Operation of the plant was stable with no increase in abnormal operations caused by tyre burning.

This report gives full details justifying the claim that the above CSFs have been met. It gives,

- Summaries of emissions data
- Details of check monitoring
- Details of periodic tests
- Details of continuous emissions monitors (CEMs) used
- Chemical analyses of inputs and outputs to and from the process
- A numerical assessment of the comparative environmental impact

Following completion of the trial with chipped tyres at the Rugby Cement Plant, CEMEX hereby requests permission to allow the continued use a partial replacement for the currently authorised fuels at a rate of up to 6 tonnes per hour.

3.0 Performance against Critical Success Factors (CSF)

The following describes performance against each of the critical success factors identified in variation XP3834MR of PPC Permit BL7248.

- 1. There will be no breaches of existing emission limit values caused by using the substitute fuel(s) in question, that indicate longer-term compliance with the limits will be a problem.*

During the trial, emission limit values (ELVs) were identical to those used in normal operation at Rugby Plant. Emission limit values are expressed either as hourly or daily averages or in some cases both and are as displayed below.

Table 1: Emission limit values

Determinant	Hourly Average ELV (mg/Nm ³)	Daily Average ELV (mg/Nm ³)
Particulates	55	30
CO	600	--
NO _x	--	800
SO ₂	600	250
TOC	75	50
HCl	--	10

Note: Expressed at reference conditions of 10% oxygen, dry gas.

Control was maintained through strict operating procedures and logging mechanisms, which remained the same as the current operation at 3tph rate.

During the baseline one schedule one submission occurred on the 21st November relating to a breach of the Permit limit on Cadmium and Thallium. Investigations with the emissions contractor are ongoing but other tests on the same day used in this report show levels below Permitted limits, therefore it is expected that this is a sampling anomaly. A schedule one part C was submitted on the 23rd November for a CEMs failure for 25 minutes whilst tyres were in use. The failure of the CEM was not related to the use of tyres. During the tyre trial there were no schedule one submissions.

On this basis it is concluded that CSF 1 has been met.

- 2. The amount of process waste produced as a result of burning the substitute fuel(s) will not increase significantly and will be within normal variations. The waste in this case includes materials recycled and reworked clinker.*

During the days of the baseline and the tyre trial the average energy efficiencies of the kiln were comparable with a difference of only 20 kcal/kg. This is less than 2% variation and is within the accuracy of measurements of specific energy consumption.

In the baseline period, the amount of material classified as reject clinker was 0.7% of clinker made and during the tyre trial 0.5% was classified as reject. All material was utilised without reworking, recycling or requiring any additional energy input and hence there was no decline in the efficiency of cement production.

During the baseline and tyre trial period there was no finished product rejected and no material recalled or quarantined.

Bypass dust production was comparable during the baseline and tyre trials with 1.22% by mass of clinker produced during the baseline and 1.31% during the tyre trial. Of the 1,140 tonnes of bypass dust produced during the baseline, 139 tonnes (12%) were sent to landfill. During the tyre trial 671 of 1,215 tonnes (55%) were landfilled.

The greater proportion of landfilling during the tyre trial when compared to the baseline is the result of planned shutdown periods on two cement mills during December and January. This meant that bypass dust which would normally be re-used in the cement making process had to be diverted to landfill. This is part of normal operations and was not related to the increased tyre usage.

On this basis it is concluded that there was no loss of process efficiency experienced whilst burning used tyres and hence CSF 2 has been met.

3. *There will be no net environmental detriment (barring any material change in the economics of the sector) to the local environment resulting from substitute fuel(s) burning. This assessment will be based on the methodology in H1 and will take into account other benchmark criteria established to protect the environment and human health.*

See the Assessment of Net Environmental Impact Section on page 26, within which it is demonstrated that CSF 3 has been met.

4. *Inspections by Environment Agency Officers of the substitute burning operations will all receive acceptable assessments in line with current Environment Agency compliance assessment methodologies.*

These are Environment Agency assessments and need to be confirmed by the Environment Agency.

CEMEX has had extensive contact with the Environment Agency throughout the baseline and tyre trial periods, including many site visits and inspections, and has not been informed of any issues that would lead to unacceptable assessments. It is reasonable to assume therefore that CSF 4 has been met. However the Environment Agency would need to confirm this point.

5. *There will be no increase in abnormal operations caused by substitute fuel burning.*

a) Reportable Incidents

During the baseline period there was one schedule one related to a breach of the cadmium and thallium limit in the Permit. Other tests carried out on the same day did not show a breach and therefore it is concluded that the result is spurious. In addition a schedule one part C was submitted relating to a CEMS failure for 25 minutes whilst using tyres. During the tyre trial there were no reportable incidents.

As there were no reportable incidents during the trial, there was no increase in abnormal operations.

b) Complaints

During the baseline period the plant received a total of 11 complaints. Of these:

- Four related to dust on cars/property or potential for dust release and none of these were substantiated
- One related to noise and which was not substantiated
- Five related to odour, and of these none were substantiated (four of these related to the Ufton landfill fire)
- One further unsubstantiated complaint was received which related to the lack of birds on a bird feeder.

During the tyre trial only one complaint was received, and this was unsubstantiated. It related to a complaint of a fence which required repair after tree works that were actually the responsibility of Rugby Borough Council. There were no complaints received for dust, noise or odour.

In summary, no substantiated complaints were receive in either the baseline or main trial periods, indicating that there was no increase in abnormal operations.

It is therefore concluded that CSF 5 has been met.

4.0 Main Stack Emissions Monitoring

4.1. Continuous Emissions Monitoring During Baseline and Tyre Trials

A graphical representation, and explanation of the trends can be found in Section 6.0. The following provides a comparison of Continuous Emission Monitoring (CEMs) performance during the baseline and tyre trial periods. All results are reported corrected for moisture, temperature and pressure and to 10% O₂. All values are in mg/Nm³ after removal of any confidence intervals for reporting.

Table 2: Summary of CEMs monitoring – main stack

Substance	Baseline Average	Tyre Trial Average	ELV (mg/Nm ³)
Particulates	2	4	55 (hourly) 30 (daily)
Nitrogen Oxides	469	349	800 (daily)
Carbon Monoxide	86	82	600 (hourly)
Sulphur Dioxide	12	35	600 (hourly) 250 (daily)
Total Organic Carbon	6	5.7	75 (hourly) 50 (daily)
Hydrogen Chloride	0.3	0.4	10 (daily)

4.2. Check monitoring and Periodic Results During Baseline and Tyre Trials

A full breakdown of results can be found in Appendix 1 and Appendix 2. The following is a comparative summary of the results during the baseline and tyre trial. All results are reported corrected for moisture, temperature and pressure and to 10% O₂. All values are in mg/Nm³ before the confidence limit for the test is removed (except where stated). Where there are results below the limit of detection, the value is assumed to be at the limit of detection to present a 'worst case' scenario.

Table 3: Summary of check and periodic monitoring – main stack

Substance	Baseline Result	Tyre Trial Result	Periodic ELV (mg/Nm ³)
Particulates	8.8	15.5	55
Nitrogen Oxides	718	342	800
Carbon Monoxide	43	77	200
Sulphur Dioxide	6.0	31	600
Total Organic Carbon	9.6	7.3	75
Hydrogen Chloride	3.75	3.65	10
Hydrogen Fluoride	0.07	0.04	1
Dioxins and Furans as ITEQ 2 (ng/Nm ³)	0.002	0.0013	0.1
Dioxins and Furans as WHO-TEQ 2 (ng/Nm ³) Humans & Mammals	0.002	0.0015	0.1 ng/Nm ³
Dioxins and Furans as WHO-TEQ 2 (ng/Nm ³) Birds	0.0034	0.002	0.1 ng/Nm ³
Dioxins and Furans as WHO-TEQ 2 (ng/Nm ³) Fish	0.002	0.0015	0.1 ng/Nm ³
Total PCBs	0.0001	0.000009	--
Total PAHs (as measured)	0.0026	0.0021	--
Cadmium & thallium	0.023	0.011	0.05
Total Metals	0.16	0.1	0.5
Mercury	0.0006	0.00032	0.05
Benzene	0.1	0.0000004	--
1,3 Butadiene	0.15	0.004	--

Note: The last column gives the ELV from the permit.

5.0 Methods and Standards for Testing of Solids and Gases

5.1. Primary CEMs

A list of the primary CEMs utilised for monitoring of emissions from the main stack can be found in Table 5 overleaf. All monitors are MCERTS accredited.

To allow emission measurements to be converted to reference conditions, continuous temperature, pressure, oxygen and moisture measurements were also taken and used to provide the corrected results shown in the relevant sections of this report.

The continuous emission monitors are serviced periodically in accordance with internal procedures and manufacturers' recommendations. Each primary monitor is calibrated in line with the standards BS EN 14181. This standard involves a detailed calibration testing regime, followed by an annual surveillance test in order to check that the CEMs continue to operate in line with their calibration. The original calibration to BS EN 14181 was carried out in January 2007 and the annual surveillance tests (ASTs) were completed in April 2008. The ASTs show that the monitors continue to operate within the range originally quoted for the standard. In addition the monitors have been checked by the manufacturer to ensure they operate correctly.

5.2. Check Monitoring and Periodic Measurements

The sampling and analytical techniques used can be found below in Table 6. Detailed method statements have been supplied by CEMEX's emissions contractors and are available for inspection as required. This includes details of all pitot and temperature traverses taken before, during and after sampling along with gas flow rate results. Any deviations from the standards employed and details on calculation of the uncertainty of measurement can be found in Appendix 6.

5.3. Sampling of Inputs, Products and Materials

Samples of chalk, raw meal, clinker, coals, bypass dust and tyres were collected as part of the site quality system. During the trials these samples were aggregated to form a bulk sample that was representative for each trial period.

Table 4: Solids Sample Points

Material	Sample Point Location
Chalk	Sample point in feed pipe to kiln
Raw meal	Air slide after extraction from the homogenising silo
Coals	Feed belts from coal hoppers
Tyre Chips	From the on site stockpile
Clinker	Sample point underneath the clinker cooler
Bypass Dust	Sample point after the bypass filter.

Table 5: Information on Primary CEMs

Parameter	Symbol or units	Manufacturer	Model	Type	Instrument Range	Tolerance (+/-)	ppm to mg/N m ³	Specific determinant of interest	Limits of Detection	Sensitivity Drift	Response Times	Operating Standard	MCERT/TUV approval
Nitrogen oxide	NO	ABB	FTIR NT	Hot extractive infra-red multi-component gas analyser	0 to 1400	56	1.34	Yes	14mg	<4% in 6 months	<150s	ASTM-P6348-03	MCERTS
Nitrogen Dioxide	NO ₂				0 to 125	5	2.05	Yes	1mg	<4% in 6 months	<150s	ASTM-P6348-03	MCERTS
Nitrogen Oxides	NO _x						2.05	Yes	18mg	<4% in 6 months	<150s	ASTM-P6348-03	MCERTS
Carbon Monoxide	CO				0 to 600	24	1.25	Yes	12mg	<4% in 6 months	<150s	ASTM-P6348-03	MCERTS
Hydrogen Chloride	HCl				0 to 30	1	1.64	Yes	0.6mg	<4% in 6 months	<150s	ASTM-P6348-03	MCERTS
Oxygen	O ₂				0 to 25	1	-	Yes	0.2%	<4% in 6 months	<150s	ISO12039	MCERTS
Moisture	H ₂ O				0 to 40	2	-	Yes	0.01%	<4% in 6 months	<150s	ASTM-P6348-03	MCERTS
Total Organic Carbon	TOC	ABB	FID	Extractive flame ionisation detector	0 to 50	2	1.97	Yes	0.25mg	<4% in 6 months	<150s	EN12619	MCERTS
Particulates	mg/Nm ³	Erwin Sick	RM210	Backscattered light particulate monitor	0 to 165	7	-	Yes	0.02mg	0.02	0.1-200s	ISO10155	MCERTS
Temperature	°C	ABB	TTF300	Field mounted temperature transmitter	0-250	0.35	N/A	Yes		0.05°C per year		N/A	
Flow	m/s	EPI Eldridge	Flowline	In-Situ Thermal mass flowmeter	0 to 22	1	-	Yes			0.1m/s	BS6069	
Pressure	mbar	ABB	ASD800	Differential pressure transmitter	+/- 2.5 mbar	¼ %	N/A	N/A		¼% of range	<1s	N/A	

Table 6: Check Monitoring and Periodic Testing Methods

Determinant	Contractor Method	Reference Method	Description	MCERTS Accred.
Particulates PM10 PM 2.5	A54	US EPA 201A	A representative sample is extracted from the gas stream under isokinetic conditions. The particulate matter is trapped by either a cyclone or a cascade impactor.	Y
CEN Particulates	A55	BS EN 13284-1	A representative sample is extracted from the gas stream under isokinetic conditions. The particulate matter is trapped by a quartz filter.	Y
Metals	A61	BS EN 14385	A representative sample is extracted from the gas stream under isokinetic conditions. Particulate matter is trapped by a quartz filter and vapour phase metallic components are absorbed into relevant solutions.	Y
Mercury	A59	BS EN 13211	A representative sample is extracted from the gas stream under isokinetic conditions. A Quartz filter traps particulate matter and vapour phase mercury components are absorbed into acidified dichromate solution.	Y
Hydrogen Chloride	A48	BS EN 1911	A representative sample is extracted from the gas stream and particulate matter is trapped by a quartz filter. Vapour phase Hydrogen Chloride components are collected into relevant absorbing solutions.	Y
Hydrogen Fluoride	A52	US EPA 26A	A representative sample is extracted from the gas stream under isokinetic conditions. Particulate matter is trapped by a quartz filter and vapour phase Hydrogen Halide components are collected into relevant absorbing solutions.	Y
Volatile Organic Compounds (VOCs)	A57	BS EN 12619	Direct measurement of VOC is obtained using a Signal 3030P Total Hydrocarbon (THC) Analyser with a Flame Ionisation Detector (FID).	Y

Determinant	Contractor Method	Reference Method	Description	MCERTS Accred.
Dioxins and Furans & PCBs	A47	BS EN 1948	A representative sample is extracted from the gas stream under isokinetic conditions. The Dioxins and Furans are collected in an absorbent trap containing XAD-2 resin. To avoid contamination the adsorbent trap and XAD-2 resin are prepared by our organic laboratory prior to going to site. This involves, cleaning, drying and spiking with surrogate standards.	Y
PAHs	A46	BS ISO 11338-1	A representative sample is extracted from the gas stream under isokinetic conditions. The PAHs are collected in an absorbent trap containing XAD-2 resin. To avoid contamination the adsorbent trap and XAD-2 resin are prepared by Marchwood Scientifics prior to going to site.	Y
1,3 Butadiene	A7	BS EN 13649	A sample of the stack gas is drawn through a thermal desorption sorbent tube.	N
Benzene	A7	BS EN 13649	A sample of the stack gas is drawn through a sorbent tube.	Y
Oxygen	A32	ISO 12039	Direct measurement of the concentration of oxygen in the gas stream.	Y
Oxides of Nitrogen (NOx)	A44	ISO 10849	Direct measurement of NOx using a chemiluminescence analyser with readings logged every minute.	Y
Carbon Monoxide	A44	ISO 12039	Direct measurement of carbon monoxide using infra-red analyser with readings logged every minute.	Y
Sulphur Dioxide	A44	BS 6069-4.4	Direct measurement of sulphur dioxide using infra-red analysers with readings logged every minute.	Y

6.0 CEM Data – Detailed Comparison of Results

Continuous emissions monitoring data was recorded for both the baseline and tyre trial periods and is outlined below in Figures 1-6. A summary of the data from the primary CEMs for the baseline and trial periods was given in Section 4.0 and is reproduced below for convenience.

Table 7: Summary of CEMs monitoring – main stack

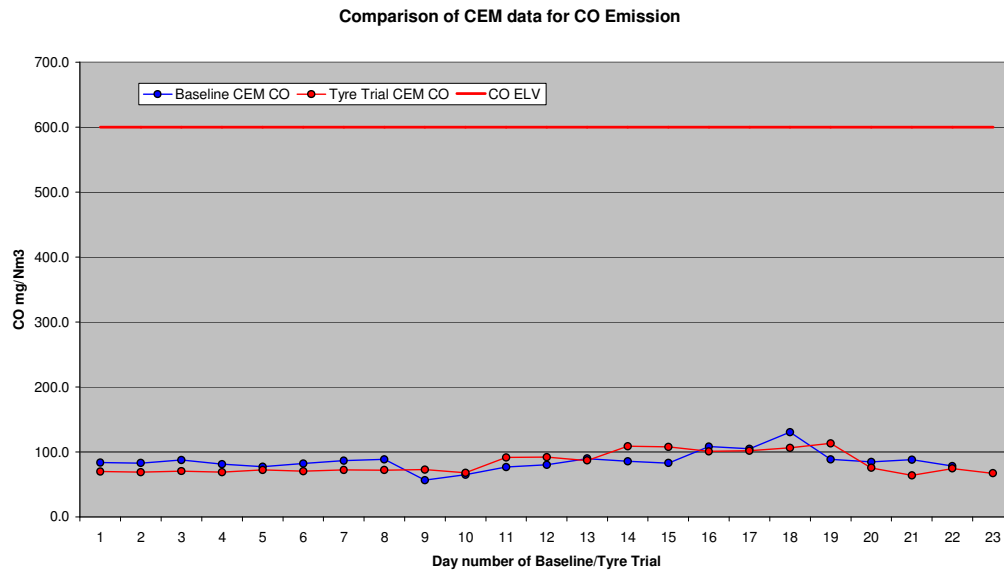
Substance	Baseline Average	Tyre Trial Average	ELV (mg/Nm ³)
Particulates	2	4	55 (hourly) 30 (daily)
Nitrogen Oxides	469	349	800 (daily)
Carbon Monoxide	86	82	600 (hourly)
Sulphur Dioxide	12	35	600 (hourly) 250 (daily)
Total Organic Carbon	6	6	75 (hourly) 50 (daily)
Hydrogen Chloride	0.3	0.4	10 (daily)

The purpose of this section is to give a detailed commentary on the variation in emission levels of each pollutant between the baseline and trial periods.

Instrumentation used within the trial was an ABB FTIR for HCl, NO_x, SO₂ and CO, an ABB FID for TOC and an Erwin Sick RM210 for particulates. All instruments are MCERTS accredited and appropriately calibrated, as detailed in Section 5.0.

Carbon Monoxide (CO)

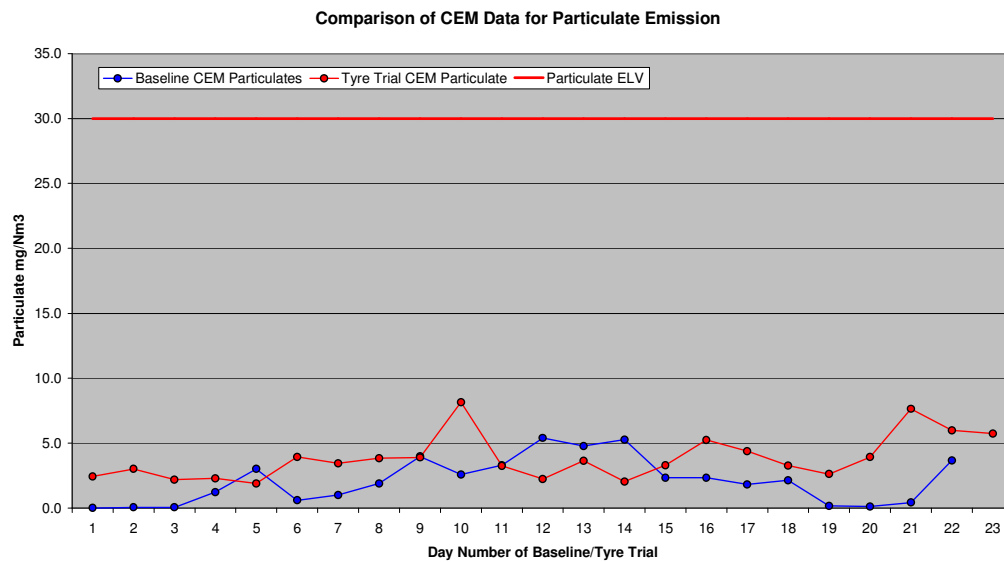
Figure 1: Comparison of CEM data for CO emissions



The emission levels during both periods are comparable and well below the authorised emission limit. The average value for the baseline and tyre trial respectively were 86mg/Nm³ and 82mg/Nm³.

Particulates

Figure 2: Comparison of CEM data for particulate emissions

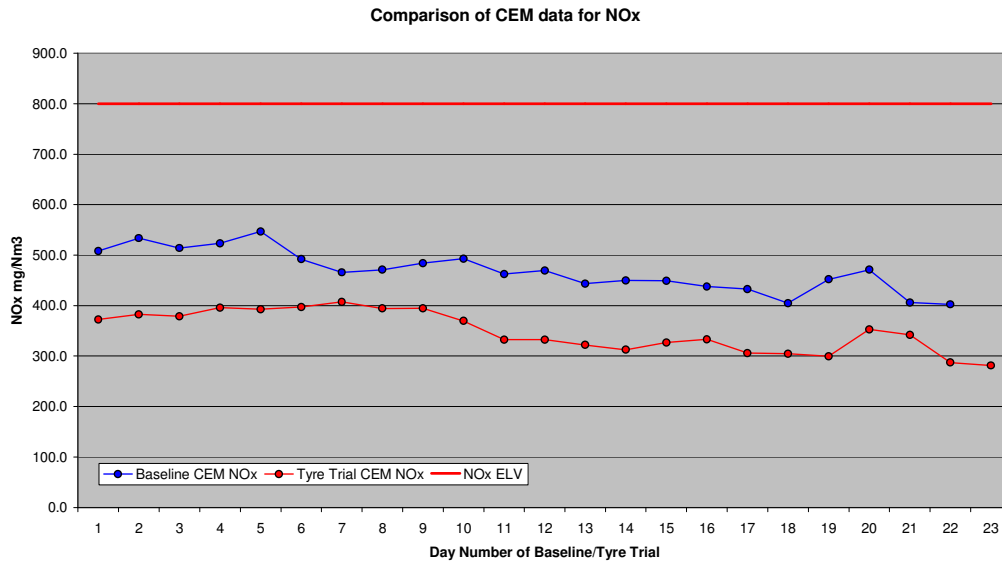


The emission levels during both periods are comparable and well below the authorised emission limit. The average value for the baseline and tyre trial respectively were 2 mg/Nm³ and 4 mg/Nm³. These extremely low emissions

are a reflection of the significant investment made by CEMEX to further minimise main stack emissions.

Oxides of Nitrogen (NO_x) expressed as NO₂ Equivalent

Figure 3: Comparison of CEM data for NO_x emissions

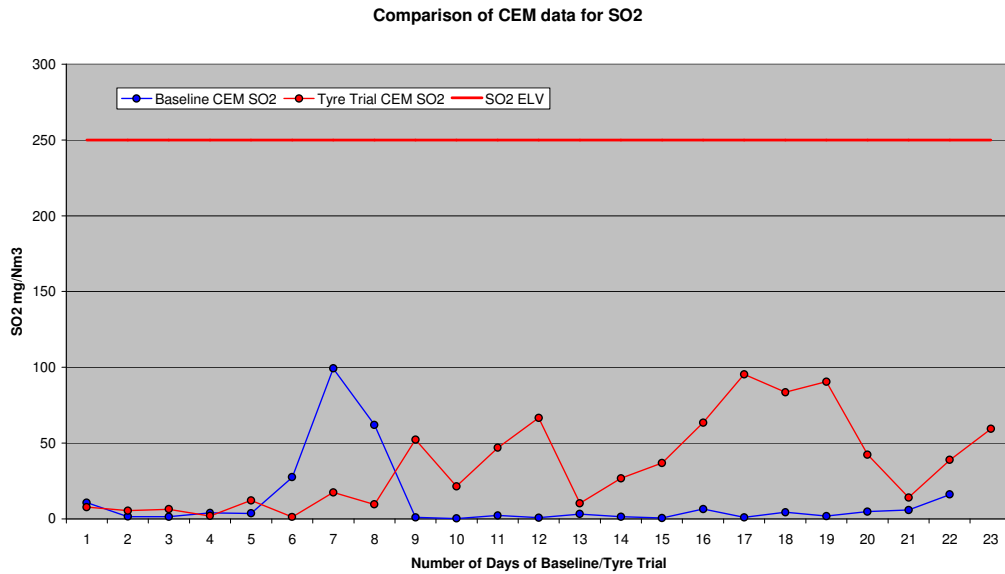


The emission levels during the increased rate tyre trial are significantly reduced and allow the plant (when burning chipped tyres at a high enough rate) to meet the current authorised emission limit, and allow the plant to meet improvement condition 9.1.1.04 of the Permit on a permanent basis. The average value for the baseline and tyre trial respectively were 469mg/Nm³ and 349mg/Nm³. This represents a significant reduction in emissions from the main stack.

NO_x is the pollutant with the greatest significance for the environment, and is perhaps the main criterion on which the trial should be judged.

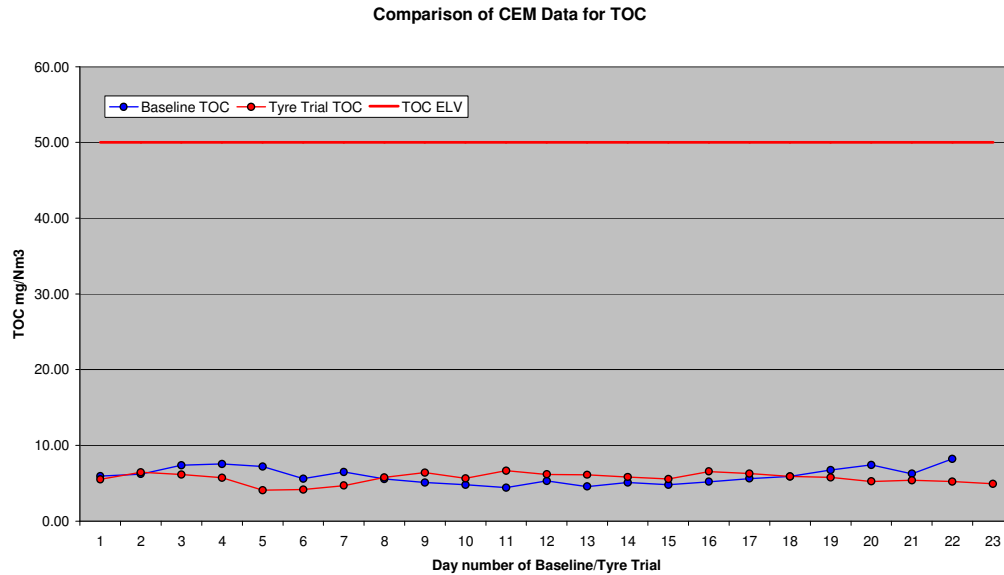
Sulphur Dioxide (SO₂)

Figure 4: Comparison of CEM data for SO₂ emissions



The emission levels during both periods well below the authorised emission limit. The average value for the baseline and tyre trial respectively were 12mg/Nm³ and 35mg/Nm³. Whilst this is a small increase in concentration, it is not significant compared with the Permit limits. It should be borne in mind that SO₂ emissions are extremely low from the process due to the unique approach CEMEX takes on minimising SO₂ emissions.

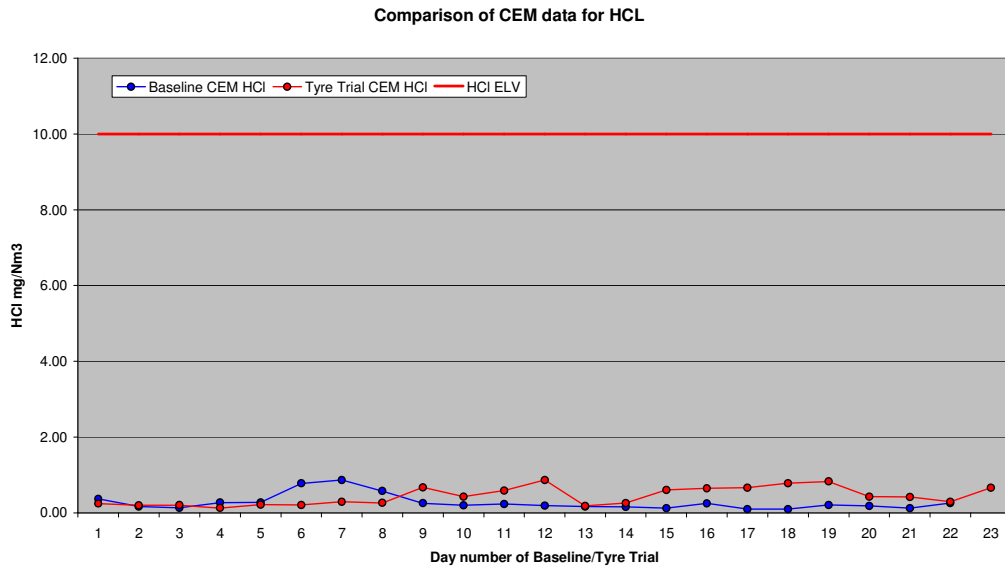
Total Organic Carbon (TOC)
Figure 5: Comparison of CEM data for TOC emissions



The emission levels during both periods are comparable and well below the authorised emission limit. The average value for the baseline and tyre trial respectively were 6mg/Nm³ and 6mg/Nm³.

Hydrogen Chloride (HCl)

Figure 6: Comparison of CEM data for HCl emissions



The emission levels during both periods are comparable and well below the authorised emission limit. The average value for the baseline and tyre trial respectively were 0.3mg/Nm³ and 0.4mg/Nm³.

7.0 CEMs – Check Monitoring Results

In order to assess the accuracy of the continuous emissions monitors used at Rugby Plant, a number of check monitoring tests were carried out during the baseline and the increased rate tyre trial. Full results can be found in Appendix 1 and Appendix 2.

In accordance with variation CP3636UX of the Permit, the gases NO_x (NO and NO₂), SO₂, TOC and CO, were to be monitored continuously. Check monitoring was carried out for these gases.

Each test monitored minute averages of NO_x (NO and NO₂), SO₂, TOC and CO over a twelve hour period using continuous monitoring techniques and were carried out by MCERTS accredited testing contractors.

The comparisons are shown in Appendix 4. The CEM data presented in this section has had the appropriate BS EN 14181 calibration factor applied but is presented before the removal of the appropriate confidence interval for the parameter. All other emissions information is reported as it would be to the Environment Agency, i.e. with calibration factors and confidence intervals applied.

For NO_x (as NO₂), TOC and CO the comparisons are generally very good with the plant monitors agreeing with the extractive gas monitoring. Two periods of conflicting data occurred during the trials:

- 1) 18/09/07 SO₂ average – the lack of movement in the data of the contractors results in comparison with the site CEM would indicate that this the contractor's instrument was in fault at the time of the test. Two further SO₂ tests were carried out on 22nd October using an extractive rather than a continuous testing method and this returned results of 0.66 and 0.76 against CEM readings of 0.11 and 0.78, indicating that the CEM is monitoring correctly.
- 2) 10/01/08 TOC average – the TOC levels in the contractor's data shows erratic results that are not consistent with the operation of the fuel mill (the origin of TOC emissions). The fuel mill operated during that period between 19:00 and 19:36 and from 19:51 for the remainder of the monitoring period. This corresponds with the data from the CEM but not the contractor's data, indicating this is an erroneous result.

In general, the good correlations reported corroborate the choice of the CEMs used and the standard of their calibration.

8.0 Testing of Inputs, Products and Material Collected in Abatement Equipment.

As required by variation CP3535UX, samples of all feeds, fuels and products were collected under baseline and substitution conditions. Bypass dust was collected as it is a by-product collected in abatement equipment, but dust from the main electrostatic precipitator was not as 100% of this material is returned to the process.

Samples were taken daily during each set of tests. The samples were bulked and subdivided into representative samples for analysis following standard quality control procedures. Full results can be found in Appendix 3.

The analysis shows that there is no significant difference in the feeds used in the baseline and tyre trial, chalk and raw meal. Within the chalk, most of the metals were below the level of detection, the only significant metals being manganese, occurring in similar concentrations through both periods. In raw meal there were more determinants present but again they were present in similar concentrations through both periods. The dominant metal was manganese again and sulphur occurred in high concentration as expected due to the natural source, primarily from the clay.

Coal analysis was stable throughout the baseline and tyre trial and was comparable in composition and in calorific value.

Bypass dust analysis was comparable between the baseline and the tyre trial with a small increase in sulphur consistent with the additional sulphur entering the process due to the increased tyre usage.

Clinker analysis was comparable between the two periods although an increase in zinc concentration was observed. The additional zinc entered the kiln through the addition of more tyres but it was locked into the clinker, and not released into the environment.

Bypass dust showed a negligible increase in concentration of dioxins and furans during the tyre trial, but again these compounds are fixed within the product and occur only in fractions of nano-grams (10^{-9} of a gram). The emissions of dioxins and furans from the main stack, already very small, actually decreased during the increased addition rate tyre trial.

During the analysis of the bypass dust and clinker samples for dioxins and furans, many of the isomers are below the level of detection which ranges from 0.01 to 0.9 ng/kg.

Tyre chips were sampled and tested at the same frequency as the feeds, fuels and products, although not required by the Tyres Protocol. The analysis showed that the sulphur level remained below the 2% limit as set out in the permit with a maximum recorded sulphur content of 1.36%. The only trace metals above the limit of detection were copper, manganese and zinc, with

only zinc being significant in concentration. As discussed in the paragraph above, this additional zinc input became part of the product.

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9.0 Assessment of Environmental Impact

An assessment of the emissions from the plant has been made using a method based upon the Environment Agency's Horizontal Guidance Note H1.

The tyres report uses H1 methodology but not the Environment Agency H1 software tool. This compares emissions whilst using tyres and emissions during the baseline against long term air quality objectives or environmental assessment levels.

This has been undertaken by the use of a long term (annual) dispersion factor from accurate dispersion modelling rather than a dispersion factor from the Environment Agency H1 software tool which assumes an effective stack height for scoping purposes. The dispersion factor has been calculated from the main stack using the United States Environmental Protection Agency (US EPA) AERMOD Prime dispersion model (US EPA Version 04079). This model is used extensively in the UK for assessing air quality impacts and is consistent with that used by CEMEX previously.

In the dispersion modelling exercise, data has been used which is considered representative and consistent with other air quality assessments undertaken for the installation. This includes temperature of emissions, flow rates and velocity.

The dispersion modelling exercise used representative meteorological data from the Meteorological Office at Coleshill and incorporates information relating to surrounding topography and building heights.

The annual dispersion factor was undertaken by modelling an emission concentration of $1\text{mg}/\text{Nm}^3$ at reference conditions dry and 10% oxygen to show the predicted maximum ground level concentration.

The predicted maximum ground level concentration modelled for $1\text{ mg}/\text{Nm}^3$ ($1000\text{ }\mu\text{g}/\text{m}^3$) was $0.0014\text{ }\mu\text{g}/\text{m}^3$.

The dispersion factor is the ratio of emission concentration to ground level concentration:

Dispersion factor = emission concentration/ ground level concentration.

The modelled dispersion factor is therefore = 714286

The dispersion factor can then be used to calculate the predicted ground level concentration from the actual emission concentration monitored during the different trial scenarios. This in turn allows a comparison of the predicted ground level concentration against the environmental assessment level (EAL) to show the impact of a substance, sometimes referred to as environmental quotient.

The individual impacts for substances can then be added together to give an overall environmental index.

c) Baseline Assessment

Table 8: Baseline Assessment

LONG TERM Baseline

<i>Parameter</i>	<i>mg/Nm³</i> <i>(10%O₂ dry)</i>	<i>Dispersion</i> <i>Factor</i> <i>(Annual max)</i>	<i>Max. GLC.</i> <i>(µg/m³)</i>	<i>Long-term</i> <i>EAL</i>	<i>GLC</i> <i>of EAL</i>
NOx	469	714286	0.656600	40	0.0164
SO2	12	714286	0.016800	50	0.0003
CO	86	714286	0.120400	350	0.00034
TOC	6	714286	0.008400	16.25	0.00052
HCL	0.27	714286	0.000378	20	0.00002
HF	0.07	714286	0.000098	16	0.00001
Particulates	2.1	714286	0.002940	40	0.00007
Dioxins (ITEQ 2)	0.000002	714286	0.000000		
Cadmium	0.017	714286	0.000024	0.005	0.004760
Thallium	0.0072	714286	0.000010	1	0.000010
Mercury	0.001	714286	0.000001	0.25	0.0000056
Antimony	0.0023	714286	0.000003	5	0.00000644
Arsenic	0.0013	714286	0.000002	0.006	0.00030333
Chromium	0.074	714286	0.000104	5	0.0000207
Cobalt	0.019	714286	0.000027	0.2	0.0001330
Copper	0.018	714286	0.000025	10	0.00000252
Lead	0.008	714286	0.000011	0.5	0.0000224
Manganese	0.015	714286	0.000021	1	0.0000210
Nickel	0.016	714286	0.000022	0.02	0.0011200
Vanadium	0.0016	714286	0.000002	5	0.0000004
Benzene	0.1	714286	0.000140	16.25	0.0000086
1,3 Butadiene	0.15	714286	0.000210	2.25	0.0000933

ENVIRONMENTAL INDEX :

0.0242

From the above it can be seen that the Environmental Index during the baseline was 0.0242.

*d) Tyre Trial Assessment***Table 9: Tyre trial assessment**

Parameter	mg/Nm³ <i>(10%O₂ dry)</i>	Dispersion Factor (Annual max)	Max. GLC. (µg/m³)	Long- term EAL	GLC of EAL
NO _x	349	714286	0.488600	40	0.0122
SO ₂	35	714286	0.049000	50	0.0010
CO	82	714286	0.114800	350	0.00033
TOC	6	714286	0.008400	16.25	0.00052
HCL	0.44	714286	0.000616	20	0.00003
HF	0.04	714286	0.000056	16	0.00000
Particulates	4	714286	0.005600	40	0.00014
Dioxins	0.000001	714286	0.000000		
Cadmium	0.002	714286	0.000003	0.005	0.000560
Thallium	0.0085	714286	0.000012	1	0.000012
Mercury	0.00033	714286	0.000000	0.25	0.0000018
Antimony	0.0019	714286	0.000003	5	0.00000532
Arsenic	0.0021	714286	0.000003	0.006	0.00049000
Chromium	0.039	714286	0.000055	5	0.0000109
Cobalt	0.0012	714286	0.000002	0.2	0.0000084
Copper	0.007	714286	0.000010	10	0.0000098
Lead	0.007	714286	0.000010	0.5	0.0000196
Manganese	0.03	714286	0.000042	1	0.0000420
Nickel	0.013	714286	0.000018	0.02	0.0009100
Vanadium	0.0025	714286	0.000003	5	0.0000007
Benzene	0.0000004	714286	0.000000	16.25	0.0000000
1,3 Butadiene	0.004	714286	0.000006	2.25	0.0000025

ENVIRONMENTAL INDEX :**0.0163**

The table above shows that the Environmental Index during the tyre trial is 0.0163 compared with 0.0242 during the baseline. This shows a reduction in the most significant emission NO_x, and confirms no net environmental detriment is incurred by the use of tyres as fuel.

10.0 Conclusions and Recommendations

CEMEX Rugby Cement Plant has completed the baseline and increased tyre trial study on number 7 kiln over the period from September 2007 until January 2008. The Baseline was completed in between September and November 2007 over 22 days and the tyre trial was completed in December and January over 23 days.

The monitoring within the increased tyre trial period was all carried out at the maximum achieved substitution rate of 6tph, equating to an energy replacement of around 22% and replacing more than the equivalent tonnes of fossil fuel

The report has shown that all of the critical success factors as listed in Section 10 of the Permit have been met, subject to confirmation from the Environment Agency on CSF 4:

- Compliance with emission limit values
- Process efficiency
- Improved overall environmental impact
- Acceptable assessment by Environment Agency Officers
- Stable operations
- Stability between fuel changes
- Quality assured data

The report has gone on to demonstrate that the use of tyre chips at 6 tonnes per hour not only demonstrates compliance with emission limit values it has also further reduced significantly the impact of emissions on the environment. The environmental index was reduced by 33%. This reduction was due mostly to a significant reduction in NO_x emissions observed of 26%.

The completed tyre trial has shown a significant environmental benefit by reducing emissions of oxides of nitrogen by about 26% and the use of fossil fuels by up to 12%. Since the start of tyre use as a fuel at the Rugby works, emissions of oxides of nitrogen have been reduced by around 40% and the use of fossil fuels reduced by 24%.

The use of alternative fuels is an extremely important element in enabling the Rugby installation and CEMEX to remain competitive in a global market. It is also an essential part of making our operations more sustainable through reducing emissions, reusing otherwise redundant materials, preserving finite resources and avoiding landfill.

In view of the above factors CEMEX requests the Environment Agency to allow the use on a permanent basis of chipped tyres at a rate of up to 6 tonnes per hour.

Appendix 1: Check Monitoring and Periodic Results Summary

Baseline

NOx as NO2

NOx as NO2 concentration Dry @ 10% O2 (mg/Nm3)					
DATE	NOx	Uncertainty (+/-)	% H2O	%O2	CEM Analysis
18/09/2007	718	5.0	18.8	12.7	684

SO2

SO2 concentration Dry @ 10% O2 (mg/Nm3)					
DATE	SO2	Uncertainty (+/-)	% H2O	%O2	CEM Analysis
18/09/2007	<6.0	n/a	18.8	12.7	4.8

CO

CO concentration Dry @ 10% O2 (mg/Nm3)					
DATE	CO	Uncertainty (+/-)	% H2O	%O2	CEM Analysis
18/09/2007	43.0	39.0	18.8	12.7	83

VOC's

TOC concentration Dry @ 10% O2 (mg/Nm3)					
DATE	VOC's	Uncertainty (+/-)	% H2O	%O2	CEM Analysis
18/09/2007	9.6	29.0	18.8	12.7	11.0

HF

	HF concentration Dry @ 10% O2 (mg/Nm3)		% H2O	%O2
DATE	Run	Uncertainty (+/-)	Run	Run
14/09/2007	<0.042	51.00	22.1	12.0
14/09/2007	<0.045	54.00	19.6	11.6
23/10/2007	<0.19	15.78	20.8	11.2
21/11/2007	<0.04	n/a	26.5	12.9
21/11/2007	<0.037	n/a	19.1	12.4
21/11/2007	<0.04	n/a	23.2	11.6

<LOD=0	<LOD=LOD
Value	Value
0.000	0.042
0.000	0.045
0.000	0.19
0.000	0.04
0.000	0.037
0.000	0.04

CEM Analysis
Average
0.190
0.190
0.450
0.400
0.430
0.390

Average

0.000	0.066
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0.342

HCl

	HCl concentration Dry @ 10% O2 (mg/Nm3)		% H2O	%O2
DATE	Run	Uncertainty (+/-)	Run	Run
14/09/2007	3.1	3.10	16.5	12.1

<LOD=0	<LOD=LOD
Value	Value
N/A	3.1

CEM Analysis
Average
1.45

Particulates (Measured to EPA 201A)

		Particulates concentration Dry @ 10% O2 (mg/Nm3)		% H2O	%O2	<LOD=0	<LOD=LOD	CEM Analysis
DATE	Run	Uncertainty (+/-)		Run	Run	Value	Value	Average
20/09/2007	8.2	11.00		15.6	12.1	N/A	8.2	2.4
20/09/2007	1.0	14.00		17.7	11.3	N/A	1.0	2.2
<u>Average</u>						N/A	4.6	2.3

Particulates >PM10

		>PM10 concentration Dry @ 10% O2 (mg/Nm3)		% H2O	%O2	<LOD=0	<LOD=LOD
DATE	Run	Uncertainty (+/-)		Run	Run	Value	Value
20/09/2007	5.3	11.00		15.6	12.1	N/A	5.3
20/09/2007	0.1	14.00		17.7	11.3	N/A	0.1
<u>Average</u>						N/A	2.7

Particulates <PM10 & >PM2.5

		<PM10 & >PM2.5 concentration Dry @ 10% O2 (mg/Nm3)		% H2O	%O2	<LOD=0	<LOD=LOD
DATE	Run	Uncertainty (+/-)		Run	Run	Value	Value
20/09/2007	1.7	11.00		15.6	12.1	N/A	1.7
20/09/2007	0.6	14.00		17.7	11.3	N/A	0.6
<u>Average</u>						N/A	1.2

Particulates <PM2.5

	<PM2.5 concentration Dry @ 10% O2 (mg/Nm3)		% H2O	%O2
DATE	Run	Uncertainty (+/-)	Run	Run
20/09/2007	1.2	11.00	15.6	12.1
20/09/2007	<0.21	14.00	17.7	11.3

<LOD=0	<LOD=LOD
Value	Value
N/A	1.2
0.000	0.21

<u>Average</u>	0.0	0.7
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Benzene

	Benzene concentration Dry @ 10% O2 (mg/Nm3)		% H2O	%O2
DATE	Run	Uncertainty (+/-)	Run	Run
19/09/2007	<0.00035	n/a	13.8	11.7
24/10/2007	<0.20	20.00	20.6	12.1

<LOD=0	<LOD=LOD
Value	Value
0.000	0.00035
0.000	0.20

<u>Average</u>	0.00	0.10
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1,3-Butadiene

	1,3-Butadiene concentration Dry @ 10% O2 (mg/Nm3)		% H2O	%O2
DATE	Run	Uncertainty (+/-)	Run	Run
19/09/2007	<0.0035	n/a	13.8	11.7
24/10/2007	<0.29	21.03	20.6	11.7

<LOD=0	<LOD=LOD
Value	Value
0.000	0.0035
0.000	0.29

<u>Average</u>	0.00	0.15
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PAH's as measured

	PAH's concentration Dry @ 10% O2 (mg/Nm3)		% H2O	%O2
DATE	Run	Uncertainty (+/-)	Run	Run
19/09/2007	0.0022	22.0	17.1	11.9
20/09/2007	0.0029	23.00	13.4	11.8

<LOD=0 Value	<LOD=LOD Value
N/A	0.0022
N/A	0.0029

Average I

N/A	0.0026
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PAH's as benzo(a)pyrene

	PAH's concentration Dry @ 10% O2 (mg/Nm3)		% H2O	%O2
DATE	Run	Uncertainty (+/-)	Run	Run
19/09/2007	0.0044	22.0	17.1	11.9
20/09/2007	0.0057	23.00	13.4	11.8

<LOD=0 Value	<LOD=LOD Value
N/A	0.004
N/A	0.006

Average

N/A	0.0051
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PCB's As Measured

DATE	PCB's concentration Dry @ 10% O2 (ng/Nm3)		% H2O	%O2
	Run	Uncertainty (+/-)	Run	Run
18/09/2007	0.000040	27.00	14.6	12.1
19/09/2007	0.0000037	27.00	13.8	11.7
23/10/2007	0.00017	22.35	21.0	11.2
19/11/2007	0.0000061	27.00	20.8	13.0
20/11/2007	0.0000034	27.00	19.8	12.1
21/11/2007	0.00043	27.00	21.1	10.8

<LOD=0	<LOD=LOD
Value	Value
N/A	0.00004
N/A	0.00000
N/A	0.00017
N/A	0.00001
N/A	0.00000
N/A	0.00043

Average	N/A	0.00011
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Mercury

DATE	Mercury concentration Dry @ 10% O2 (mg/Nm3)		% H2O	%O2
	Run	Uncertainty (+/-)	Run	Run
21/09/2007	0.00022	39.00	19.1	12.4
22/10/2007	<0.0026	15.38	21.0	11.4
23/10/2007	0.0027	14.81	21.0	10.4
21/11/2007	0.000065	163.00	29.7	12.5
21/11/2007	0.00021	40.00	24.2	11.0
21/11/2007	0.000041	184.00	18.6	11.2

<LOD=0	<LOD=LOD
Value	Value
0.000	0.00022
0.000	0.0026
N/A	0.00270
N/A	0.00007
N/A	0.00021
N/A	0.00004

Average	0.0001	0.0006
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Cadmium & Thallium

	Cadmium & Thallium concentration Dry @ 10% O2 (mg/Nm3)		% H2O	%O2
DATE	Run	Uncertainty (+/-)	Run	Run
21/09/2007	0.010	24.00	19.1	12.4
21/09/2007	0.057	22.00	18.7	11.9
22/10/2007	0.004	25.00	21.0	11.4
23/10/2007	0.010	20.00	21.0	10.4
21/11/2007	0.049	15.10	24.2	11.0
21/11/2007	0.007	17.40	18.6	11.2

<LOD=0 Value	<LOD=LOD Value
N/A	0.01000
N/A	0.05700
N/A	0.00390
N/A	0.01000
N/A	0.04900
N/A	0.00700

Average

N/A	0.023
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Group III Metals

	Group III Metals concentration Dry @ 10% O2 (mg/Nm3)		% H2O	%O2
DATE	Run	Uncertainty (+/-)	Run	Run
21/09/2007	0.26	15.00	19.1	12.4
21/09/2007	0.19	15.00	18.7	11.9
22/10/2007	0.11	18.18	21.0	11.4
23/10/2007	0.07	14.29	21.0	10.4
21/11/2007	0.17	16.50	24.2	11.0
21/11/2007	0.14	33.30	18.6	11.2

<LOD=0 Value	<LOD=LOD Value
N/A	0.26000
N/A	0.19000
N/A	0.11000
N/A	0.06600
N/A	0.17000
N/A	0.14000

Average

N/A	0.16
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Particulates (Measured to CEN 13284)

	Particulates concentration Dry @ 10% O2 (mg/Nm3)		% H2O	%O2
DATE	Run	Uncertainty (+/-)	Run	Run
14/09/2007	8.8	19.00	19.6	11.6

<LOD=0	<LOD=LOD
Value	Value
N/A	8.8

CEM Analysis
Result
0.5

Dioxins and Furans ITEQ 1 (<LOD = 0)

	Dioxins & Furans concentration Dry @ 10% O2 (ng/Nm3)		% H2O	%O2
DATE	Run	Uncertainty (+/-)	Run	Run
18/09/2007	0.00073	41.00	14.6	12.1
19/09/2007	0.00013	69.00	13.8	11.7
23/10/2007	0.00026	30.59	21.0	11.20
19/11/2007	0.00310	27.00	20.8	13.0
20/11/2007	0.00024	27.00	19.8	12.1
21/11/2007	0.00160	27.00	21.1	10.8

Average	0.00101
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Dioxins and Furans ITEQ 2 (<LOD = LOD)

	Dioxins & Furans concentration Dry @ 10% O2 (ng/Nm3)		% H2O	%O2
DATE	Run	Uncertainty (+/-)	Run	Run
18/09/2007	0.00210	41.00	14.6	12.1
19/09/2007	0.00110	69.00	13.8	11.7
23/10/2007	0.0017	30.59	21.0	11.2
19/11/2007	0.00410	27.00	20.8	13.0
20/11/2007	0.00091	27.00	19.8	12.1
21/11/2007	0.00190	27.00	21.1	10.8

Average 0.0020

Dioxins and Furans WHO-TEQ 1 (<LOD = 0)

	Dioxins & Furans concentration Dry @ 10% O2 (ng/Nm3)				% H2O	%O2
DATE	Humans/ Mammals	Birds	Fish	Uncertainty (+/-)	Run	Run
18/09/2007	0.00072	0.00040	0.00040	41.00	14.6	12.1
19/09/2007	0.00012	0.00008	0.00008	69.00	13.8	11.7
23/10/2007	0.00026	0.00260	0.00013	33.50	21.0	11.2
19/11/2007	0.00310	0.00600	0.00340	27.00	20.8	13.0
20/11/2007	0.00024	0.00089	0.00020	27.00	19.8	12.1
21/11/2007	0.00210	0.00198	0.00190	27.00	21.1	10.8

Average 0.00109 0.00199 0.00102

Dioxins and Furans WHO-TEQ 2 (<LOD = LOD)

	Dioxins & Furans concentration Dry @ 10% O2 (ng/Nm3)				% H2O	%O2
DATE	Humans/ Mammals	Birds	Fish	Uncertainty (+/-)	Run	Run
18/09/2007	0.00240	0.00270	0.00230	41.00	14.6	12.1
19/09/2007	0.00130	0.00170	0.00130	69.00	13.8	11.7
23/10/2007	0.00200	0.00450	0.00200	33.50	21.0	11.2
19/11/2007	0.00430	0.00720	0.00450	27.00	20.8	13.0
20/11/2007	0.00100	0.00180	0.00110	27.00	19.8	12.1
21/11/2007	0.00230	0.00250	0.00230	27.00	21.1	10.8

<u>Average</u>	0.0022	0.0034	0.0023
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PAH Speciated Data Dry @ 10% O2 (mg/Nm3) original data

19/09/2007	Run	
	As measured	As benzo(a)pyrene
naphthalene	0.0022	0.0044
anthanthrene	<0.00032	<0.00052
benzo(b)naphtho(2,1-d)thiophene	<0.00032	<0.00052
benzo(c)phenanthrene	<0.00032	<0.00052
Cholanthrene	<0.00032	<0.00052
cyclopenta(c,d)pyrene	<0.00032	<0.00052
fluoranthene	<0.00032	<0.00052
benz(a)anthracene	<0.00032	<0.00052
chrysene	<0.00032	<0.00052
benzo(b)fluoranthene	<0.00032	<0.00052
benzo(k)fluoranthene	<0.00032	<0.00052
benzo(a)pyrene	<0.00032	<0.00052
indeno(1,2,3-cd)pyrene	<0.00032	<0.00052
dibenz(a,h)anthracene	<0.00032	<0.00052
benzo(ghi)perylene	<0.00032	<0.00052
Total PAH (max value)	0.0022	0.0044
Total <LOD = LOD	0.007	0.012

PAH Speciated Data Dry @ 10% O2 (mg/Nm3) original data

20/09/2007	Run	
	As measured	As benzo(a)pyrene
naphthalene	0.0029	0.0057
anthanthrene	<0.00030	<0.00043
benzo(b)naphtho(2,1-d)thiophene	<0.00030	<0.00033
benzo(c)phenanthrene	<0.00030	<0.00033
Cholanthrene	<0.00030	<0.00030
cyclopenta(c,d)pyrene	<0.00030	<0.00033
fluoranthene	<0.00030	<0.00038
benz(a)anthracene	<0.00030	<0.00033
chrysene	<0.00030	<0.00033
benzo(b)fluoranthene	<0.00030	<0.00030
benzo(k)fluoranthene	<0.00030	<0.00030
benzo(a)pyrene	<0.00030	<0.00030
indeno(1,2,3-cd)pyrene	<0.00030	<0.00028
dibenz(a,h)anthracene	<0.00030	<0.00027
benzo(ghi)perylene	<0.00030	<0.00028
Total PAH (max value)	0.0029	0.0057
Total <LOD = LOD	0.007	0.010

PCB's Speciated Data Dry @ 10% O2 (ng/Nm3) As measured

	18/09/2007					
	WHO/TEQ (1) Humans/Mammals	WHO/TEQ (2) Humans/Mammals	WHO/TEQ (1) Birds	WHO/TEQ (2) Birds	WHO/TEQ (1) Fish	WHO/TEQ (2) Fish
PCB 105	0.0000036	0.0000036	0.0000036	0.0000036	0.00000018	0.00000018
PCB 114	0.0000072	0.0000072	ND	<0.000000034	ND	<0.000000034
PCB 118	ND	<0.00000034	0.00000072	<0.00000072	0.00000036	0.00000036
PCB 123	ND	<0.0000017	ND	<0.00000034	ND	<0.000000017
PCB 156	0.000027	0.000027	0.0000053	0.00000534	0.00000027	0.00000027
PCB 157	ND	<0.0000017	ND	<0.00000034	ND	<0.000000017
PCB 167	ND	<0.000000034	ND	<0.000000034	ND	<0.000000017
PCB 189	ND	<0.00000034	ND	<0.000000034	ND	<0.000000017
PCB 81	ND	<0.00000034	ND	<0.00034	ND	<0.0000017
PCB 77	0.0000023	0.0000023	0.0012000	0.0012000	0.0000023	0.0000023
PCB 126	ND	<0.00034	ND	<0.00034	ND	<0.000017
PCB 169	ND	<0.000034	ND	<0.0000034	ND	<0.00000171
Total PCB's	0.000040	0.000040	0.001200	0.001200	0.0000031	0.0000031

Total <LOD = LOD	0.00008	0.00042	0.00241	0.00189	0.00001	0.00002
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	19/09/2007					
	WHO/TEQ (1) Humans/Mammals	WHO/TEQ (2) Humans/Mammals	WHO/TEQ (1) Birds	WHO/TEQ (2) Birds	WHO/TEQ (1) Fish	WHO/TEQ (2) Fish
PCB 105	0.00000089	0.00000095	0.00000089	0.00000095	0.000000044	0.000000048
PCB 114	0.0000019	0.0000002	ND	<0.00000033	ND	<0.000000016
PCB 118	ND	<0.00000033	0.0000002	0.0000002	0.000000095	0.0000001
PCB 123	ND	<0.0000016	ND	<0.000000033	ND	<0.000000016
PCB 156	ND	<0.0000016	ND	<0.00000033	ND	<0.000000016
PCB 157	ND	<0.0000016	ND	<0.00000033	ND	<0.000000016
PCB 167	ND	<0.00000033	ND	<0.000000033	ND	<0.000000016
PCB 189	ND	<0.00000033	ND	<0.000000033	ND	<0.000000016
PCB 81	ND	<0.00000033	ND	<0.00033	ND	<0.0000016
PCB 77	0.00000092	0.0000010	0.0004600	0.0004900	0.0000009	0.0000010
PCB 126	ND	<0.00033	ND	<0.00033	ND	<0.00002
PCB 169	ND	<0.000033	ND	<0.0000033	ND	<0.00000016
Total PCB's	0.000004	0.000002	0.000046	0.000460	0.000001	0.000001
Total <LOD = LOD	0.00001	0.00037	0.00051	0.00116	0.000002	0.00002

	23/10/2007					
	WHO/TEQ (1) Humans/Mammals	WHO/TEQ (2) Humans/Mammals	WHO/TEQ (1) Birds	WHO/TEQ (2) Birds	WHO/TEQ (1) Fish	WHO/TEQ (2) Fish
PCB 105	0.000005	0.000005	0.000005	0.000005	0.0000025	0.0000025
PCB 114	0.0000028	0.0000028	0.0000056	0.0000056	0.00000028	0.00000028
PCB 118	0.000032	0.000032	0.0000032	0.0000032	0.0000016	0.0000016
PCB 123	0.0000037	0.0000037	0.0000	0.0000	0.0000	0.0000
PCB 156	0.000024	0.000024	0.000005	0.000005	0.000000	0.000000
PCB 157	0.0000037	0.00000370	0.0000075	0.0000075	0.00000004	0.00000004
PCB 167	0.00000024	0.00000024	0.00000024	0.00000024	0.00000012	0.00000012
PCB 189	0.00000047	0.00000047	0.00000005	0.00000005	0.00000002	0.00000002
PCB 81	0.0000011	0.00000110	0.00110000	0.00110000	0.00000570	0.00000570
PCB 77	0.0000019	0.0000019	0.0009700	0.0009700	0.0000019	0.0000019
PCB 126	ND	0.000087	ND	0.000	ND	0.000
PCB 169	ND	0.00000870	ND	0.00000087	ND	0.00000004
Total PCB's	0.000075	0.000171	0.002085	0.002173	0.000010	0.000053
Total <LOD = LOD	0.00015	0.00017	0.00417	0.0022	0.00002	0.00005

	19/11/2007					
	WHO/TEQ (1) Humans/Mammals	WHO/TEQ (2) Humans/Mammals	WHO/TEQ (1) Birds	WHO/TEQ (2) Birds	WHO/TEQ (1) Fish	WHO/TEQ (2) Fish
PCB 105	0.0000019	0.0000019	0.0000019	0.0000019	0.000000094	0.000000094
PCB 114	ND	<0.00000048	ND	<0.00000048	ND	<0.000000024
PCB 118	ND	<0.00000048	ND	<0.00000048	ND	<0.000000024
PCB 123	ND	<0.00000024	ND	<0.00000048	ND	<0.000000024
PCB 156	0.0000027	0.000003	0.000001	0.000001	0.000000	0.000000
PCB 157	ND	<0.0000024	ND	<0.00000048	ND	<0.000000024
PCB 167	ND	<0.000000048	ND	<0.000000048	ND	<0.000000024
PCB 189	ND	<0.00000048	ND	<0.000000048	ND	<0.000000024
PCB 81	ND	<0.00000048	ND	<0.00048	ND	<0.0000024
PCB 77	0.0000016	0.0000016	0.0008000	0.0008000	0.0000016	0.0000016
PCB 126	ND	<0.00048	ND	<0.00048	ND	<0.000024
PCB 169	ND	<0.000048	ND	<0.0000048	ND	<0.000000241
Total PCB's	0.000006	0.000006	0.000802	0.000802	0.0000017	0.0000017
Total <LOD = LOD	0.00001	0.001	0.00160	0.002	0.000003	0.00003

	20/11/2007					
	WHO/TEQ (1) Humans/Mammals	WHO/TEQ (2) Humans/Mammals	WHO/TEQ (1) Birds	WHO/TEQ (2) Birds	WHO/TEQ (1) Fish	WHO/TEQ (2) Fish
PCB 105	0.00000073	0.00000078	0.00000073	0.00000078	0.000000036	0.000000039
PCB 114	0.0000019	0.000002	ND	<0.00000043	ND	<0.000000022
PCB 118	ND	<0.00000043	0.00000019	0.0000002	0.000000095	0.0000001
PCB 123	ND	<0.0000022	ND	<0.00000043	ND	<0.000000022
PCB 156	ND	<0.0000022	ND	<0.00000043	ND	<0.000000022
PCB 157	ND	<0.0000022	ND	<0.00000043	ND	<0.000000022
PCB 167	ND	<0.00000043	ND	<0.000000043	ND	<0.000000022
PCB 189	ND	<0.00000043	ND	<0.000000043	ND	<0.000000022
PCB 81	ND	<0.00000043	ND	<0.00043	ND	<0.0000022
PCB 77	0.00000081	0.0000009	0.0004000	0.0004300	0.0000008	0.0000009
PCB 126	ND	<0.00043	ND	<0.00043	ND	<0.000022
PCB 169	ND	<0.000043	ND	<0.0000043	ND	<0.00000022
Total PCB's	0.000003	0.000004	0.000401	0.000431	0.00000094	0.00000101
Total <LOD = LOD	0.00001	0.00048	0.00080	0.001	0.000002	0.00003

	21/11/2007					
	WHO/TEQ (1) Humans/Mammals	WHO/TEQ (2) Humans/Mammals	WHO/TEQ (1) Birds	WHO/TEQ (2) Birds	WHO/TEQ (1) Fish	WHO/TEQ (2) Fish
PCB 105	0.00000061	0.00000068	0.00000061	0.00000068	0.00000003	0.000000034
PCB 114	0.0000017	0.0000019	ND	<0.00000038	ND	<0.000000019
PCB 118	ND	<0.00000038	0.0000002	0.0000002	0.000000083	0.000000093
PCB 123	ND	<0.0000019				
PCB 156	ND	<0.0000019	ND	<0.00000038	ND	<0.000000019
PCB 157	ND	<0.0000019	ND	<0.00000038	ND	<0.000000019
PCB 167	ND	<0.0000000	ND	<0.000000038	ND	<0.000000019
PCB 189	ND	<0.00000038	ND	<0.000000038	ND	<0.000000019
PCB 81	ND	<0.00000038	ND	<0.00038	ND	<0.0000019
PCB 77	0.00000064	0.0000007	0.0003200	0.0003600	0.0000006	0.0000007
PCB 126	ND	<0.00038	ND	<0.00038	ND	<0.00002
PCB 169	ND	<0.000038	ND	<0.0000038	ND	<0.00000019
Total PCB's	0.000003	0.000003	0.000321	0.000361	0.000001	0.000001
Total <LOD = LOD	0.00001	0.00043	0.00064	0.001	0.000002	0.00002

Dioxins Data Dry @ 10% O2 (mg/Nm3)

18/09/2007	ITEQ (1)	ITEQ (2)	WHO/TEQ (1) Humans/Mammals	WHO/TEQ (2) Humans/Mammals	WHO/TEQ (1) Birds	WHO/TEQ (2) Birds	WHO/TEQ (1) Fish	WHO/TEQ (2) Fish
2,3,7,8-TCDF	ND	0.000051	ND	0.000051	ND	0.000051	ND	0.000025
2,3,7,8-TCDD	ND	0.000050	ND	0.000050	ND	0.000050	ND	0.000050
1,2,3,7,8-PeCDF	ND	0.000022	ND	0.000022	ND	0.000044	ND	0.000022
2,3,4,7,8-PeCDF	ND	0.00002	ND	0.00002	ND	0.000041	ND	0.000022
1,2,3,7,8-PeCDD	ND	0.000036	ND	0.000072	ND	0.000072	ND	0.000072
1,2,3,4,7,8-HxCDF	0.00013	0.000128	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013
1,2,3,6,7,8-HxCDF	ND	0.000024	ND	0.000024	ND	0.000024	ND	0.000024
2,3,4,6,7,8,-HxCDF	0.0002	0.0002	0.0002	0.0002	0.000197	0.0002	0.000197	0.0002
1,2,3,7,8,9-HxCDF	ND	0.000029	ND	0.000029	ND	0.000029	ND	0.000029
1,2,3,4,7,8-HxCDD	ND	0.000069	ND	0.000069	ND	0.000035	ND	0.000350
1,2,3,6,7,8-HxCDD	0.00026	0.00026	0.00026	0.00026	0.000026	0.000026	0.000026	0.000026
1,2,3,7,8,9-HxCDD	ND	0.000069	ND	0.00007	ND	0.000069	ND	0.000069
1,2,3,4,6,7,8-HpCDF	0.000032	0.000032	0.000032	0.000032	0.000032	0.000032	0.000032	0.000032
1,2,3,4,7,8,9-HpCDF	ND	0.0000017	ND	0.0000017	ND	0.0000017	ND	0.0000017
1,2,3,4,6,7,8-HpCDD	0.000099	0.0001	0.000099	0.000099	0.0000099	0.0000099	0.0000099	0.0000099
OCDF	0.0000021	0.0000021	0.00000021	0.00000021	0.00000021	0.00000021	0.00000021	0.00000021
OCDD	0.0000086	0.0000086	0.00000086	0.00000086	0.00000086	0.00000086	0.00000086	0.00000086
Total Dioxins/Furans	0.0007	0.0021	0.0007	0.0024	0.0004	0.0027	0.0004	0.0021

19/09/2007	ITEQ (1)	ITEQ (2)	WHO/TEQ (1) Humans/Mammals	WHO/TEQ (2) Humans/Mammals	WHO/TEQ (1) Birds	WHO/TEQ (2) Birds	WHO/TEQ (1) Fish	WHO/TEQ (2) Fish
2,3,7,8-TCDF	ND	0.000035	ND	0.000035	ND	0.000349	ND	0.000017
2,3,7,8-TCDD	ND	0.00032	ND	0.00032	ND	0.00032	ND	0.00032
1,2,3,7,8-PeCDF	ND	0.000018	ND	0.000035	ND	0.000035	ND	0.000018
2,3,4,7,8-PeCDF	ND	0.00016	ND	0.00033	ND	0.00033	ND	0.00016
1,2,3,7,8-PeCDD	ND	0.0002	ND	0.00041	ND	0.00041	ND	0.00041
1,2,3,4,7,8-HxCDF	ND	0.00002	ND	0.00002	ND	0.00002	ND	0.00002
1,,2,3,6,7,8-HxCDF	0.000058	0.000058	0.000058	0.000058	0.000058	0.000058	0.000058	0.000058
2,3,4,6,7,8-HxCDF	ND	0.00002	ND	0.00002	ND	0.00002	ND	0.00002
1,2,3,7,8,9-HxCDF	ND	0.000024	ND	0.000024	ND	0.000024	ND	0.000024
1,2,3,4,7,8-HxCDD	ND	0.000049	ND	0.000049	ND	0.000024	ND	0.000240
1,2,3,6,7,8-HxCDD	ND	0.000044	ND	0.000044	ND	0.0000044	ND	0.0000044
1,2,3,7,8,9HxCDD	ND	0.00004	ND	0.00004	ND	0.00004	ND	0.000004
1,2,3,4,6,7,8- HpCDF	0.000018	0.000018	0.000018	0.000018	0.000018	0.000018	0.000018	0.000018
1,2,3,4,7,8,9- HpCDF	ND	0.00000092	ND	0.00000092	ND	0.00000092	ND	0.00000092
1,2,3,4,6,7,8- HpCDD	0.000045	0.000045	0.000045	0.000045	0.0000045	0.0000045	0.0000045	0.0000045
OCDF	ND	0.00000031	ND	0.000000031	ND	0.000000031	ND	0.000000031
OCDD	0.0000043	0.0000043	0.00000043	0.00000043	0.00000043	0.00000043	0.00000043	0.00000043
Total Dioxins/Furans	0.0001	0.0011	0.0001	0.0014	0.000081	0.0017	0.000081	0.0013

23/10/07	ITEQ (1)	ITEQ (2)	WHO/TEQ (1) Humans/Mammals	WHO/TEQ (2) Humans/Mammals	WHO/TEQ (1) Birds	WHO/TEQ (2) Birds	WHO/TEQ (1) Fish	WHO/TEQ (2) Fish
2,3,7,8-TCDF	0.00026	0.00026	0.00026	0.00026	0.0026	0.0026	0.00013	0.00013
2,3,7,8-TCDD	ND	0.00052	ND	0.00052	ND	0.00052	ND	0.00052
1,2,3,7,8-PeCDF	ND	0.000026	ND	0.000026	ND	0.0000052	ND	0.000026
2,3,4,7,8-PeCDF	ND	0.00026	ND	0.00026	ND	0.00052	ND	0.00026
1,2,3,7,8-PeCDD	ND	0.00026	ND	0.00052	ND	0.00052	ND	0.00052
1,2,3,4,7,8-HxCDF	ND	0.000052	ND	0.000052	ND	0.000052	ND	0.000052
1,2,3,6,7,8-HxCDF	ND	0.000052	ND	0.000052	ND	0.000052	ND	0.000052
2,3,4,6,7,8-HxCDF	ND	0.000052	ND	0.00005	ND	0.000052	ND	0.00005
1,2,3,7,8,9-HxCDF	ND	0.000052	ND	0.000052	ND	0.000052	ND	0.000052
1,2,3,4,7,8-HxCDD	ND	0.000052	ND	0.000052	ND	0.000026	ND	0.000260
1,2,3,6,7,8-HxCDD	ND	0.000052	ND	0.000052	ND	0.0000052	ND	0.0000052
1,2,3,7,8,9-HxCDD	ND	0.000052	ND	0.000052	ND	0.000052	ND	0.0000052
1,2,3,4,6,7,8- HpCDF	ND	0.0000052	ND	0.0000052	ND	0.000052	ND	0.0000052
1,2,3,4,7,8,9- HpCDF	ND	0.0000052	ND	0.0000052	ND	0.0000052	ND	0.0000052
1,2,3,4,6,7,8- HpCDD	ND	0.0000052	ND	0.0000052	ND	0.0000052	ND	0.0000005
OCDF	ND	0.00000052	ND	0.000000052	ND	0.000000052	ND	0.000000052
OCDD	ND	0.00000052	ND	0.000000052	ND	ND	ND	ND
Total Dioxins/Furans	0.0003	0.0017	0.0003	0.0020	0.00260	0.00452	0.00013	0.00194

19/11/2007	ITEQ (1)	ITEQ (2)	WHO/TEQ (1) Humans/Mammals	WHO/TEQ (2) Humans/Mammals	WHO/TEQ (1) Birds	WHO/TEQ (2) Birds	WHO/TEQ (1) Fish	WHO/TEQ (2) Fish
2,3,7,8-TCDF	0.00023	0.00023	0.00023	0.00023	0.0023	0.0023	0.00011	0.00011
2,3,7,8-TCDD	ND	0.00045	ND	0.00045	ND	0.00045	ND	0.00045
1,2,3,7,8-PeCDF	0.00011	0.00011	0.00011	0.00011	0.00022	0.00022	0.00011	0.00011
2,3,4,7,8-PeCDF	0.0012	0.0012	0.0012	0.0012	0.0024	0.0024	0.0012	0.0012
1,2,3,7,8-PeCDD	ND	0.00028	ND	0.00055	ND	0.00055	ND	0.00055
1,2,3,4,7,8-HxCDF	0.00048	0.00048	0.00048	0.00048	0.00048	0.00048	0.00048	0.00048
1,2,3,6,7,8-HxCDF	0.00038	0.00038	0.00038	0.00038	0.00038	0.00038	0.00038	0.00038
2,3,4,6,7,8-HxCDF	ND	0.00005	ND	0.00005	ND	0.00005	ND	0.00005
1,2,3,7,8,9-HxCDF	ND	0.000062	ND	0.000062	ND	0.000062	ND	0.000062
1,2,3,4,7,8-HxCDD	0.00019	0.000190	0.00019	0.000190	0.000100	0.000100	0.000950	0.000950
1,2,3,6,7,8-HxCDD	0.00032	0.00032	0.00032	0.00032	0.000032	0.000032	0.000032	0.000032
1,2,3,7,8,9-HxCDD	ND	0.000085	ND	0.000085	ND	0.000085	ND	0.000085
1,2,3,4,6,7,8-HxCDF	0.000078	0.000078	0.000078	0.000078	0.000078	0.000078	0.000078	0.000078
1,2,3,4,7,8,9-HpCDF	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025
1,2,3,4,5,7,8-HpCDD	0.0001	0.0001	0.0001	0.0001	0.00001	0.00001	0.00001	0.00001
OCDF	ND	0.00000048	ND	0.00000048	ND	0.00000048	ND	0.00000048
OCDD	0.0000193	0.0000193	0.0000019	0.0000019	0.0000019	0.0000019	0.0000019	0.0000019
Total Dioxins/Furans	0.0031	0.0041	0.0031	0.0043	0.0060	0.0072	0.0034	0.0045

20/11/2007	ITEQ (1)	ITEQ (2)	WHO/TEQ (1) Humans/Mammals	WHO/TEQ (2) Humans/Mammals	WHO/TEQ (1) Birds	WHO/TEQ (2) Birds	WHO/TEQ (1) Fish	WHO/TEQ (2) Fish
2,3,7,8-TCDF	0.000072	0.000072	0.000072	0.000072	0.00072	0.00072	0.000036	0.000036
2,3,7,8-TCDD	ND	0.00018	ND	0.00018	ND	0.00018	ND	0.00018
1,2,3,7,8-PeCDF	ND	0.000015	ND	0.000015	ND	0.00003	ND	0.000015
2,3,4,7,8-PeCDF	ND	0.00014	ND	0.00014	ND	0.00029	ND	0.00014
1,2,3,7,8-PeCDD	ND	0.00012	ND	0.00025	ND	0.00025	ND	0.00025
1,2,3,4,7,8-HxCDF	ND	0.000024	ND	0.000024	ND	0.000024	ND	0.000024
1,2,3,6,7,8-HxCDF	ND	0.000024	ND	0.000024	ND	0.000024	ND	0.000024
2,3,4,6,7,8-HxCDF	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013
1,2,3,7,8,9-HxCDF	ND	0.00003	ND	0.00003	ND	0.00003	ND	0.00003
1,2,3,4,7,8-HxCDD	ND	0.000041	ND	0.000041	ND	0.000020	ND	0.000200
1,2,3,6,7,8-HxCDD	ND	0.00004	ND	0.00004	ND	0.000004	ND	0.000004
1,2,3,7,8,9-HxCDD	ND	0.000038	ND	0.000038	ND	0.000038	ND	0.0000038
1,2,3,4,6,7,8- HpCDF	0.000029	0.000029	0.000029	0.000029	0.000029	0.000029	0.000029	0.000029
1,2,3,4,7,8,9- HpCDF	0.0000081	0.0000081	0.0000081	0.0000081	0.0000081	0.0000081	0.0000081	0.0000081
1,2,3,4,6,7,8HpCDD	ND	0.0000061	ND	0.0000061	ND	0.0000061	ND	0.0000061
OCDF	ND	0	ND	0	ND	0	ND	0
OCDD	0.0000065	0.0000065	0.0000065	0.0000065	0.0000065	0.0000065	0.0000065	0.0000065
Total Dioxins/Furans	0.0002	0.0009	0.0002	0.0010	0.0009	0.0018	0.0002	0.0011

21/11/2007	ITEQ (1)	ITEQ (2)	WHO/TEQ (1) Humans/Mammals	WHO/TEQ (2) Humans/Mammals	WHO/TEQ (1) Birds	WHO/TEQ (2) Birds	WHO/TEQ (1) Fish	WHO/TEQ (2) Fish
2,3,7,8-TCDF	ND	0.00002	ND	0.00002	ND	0.0002	ND	0.00001
2,3,7,8-TCDD	0.00012	0.00012	0.00012	0.00012	0.00012	0.00012	0.00012	0.00012
1,2,3,7,8-PeCDF	0.000074	0.000074	0.000074	0.000074	0.00015	0.00015	0.000074	0.000074
2,3,4,7,8-PeCDF	ND	0.000141	ND	0.00014	ND	0.00028	ND	0.00014
1,2,3,7,8-PeCDD	0.00043	0.00043	0.00086	0.00086	0.00086	0.00086	0.000861	0.00086
1,2,3,4,7,8-HxCDF	0.00028	0.00028	0.00028	0.00028	0.00028	0.00028	0.000282	0.00028
1,2,3,6,7,8-HxCDF	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.000251	0.00025
2,3,4,6,7,8-HxCDF	0.00019	0.00019	0.00019	0.00019	0.00019	0.00019	0.00019	0.00019
1,2,3,7,8,9-HxCDF	0.000096	0.000096	0.000096	0.000096	0.000096	0.000096	0.000096	0.000096
1,2,3,4,7,8-HxCDD	ND	0.000046	ND	0.000046	ND	0.000023	ND	0.000230
1,2,3,7,8-HxCDD	0.00012	0.00012	0.00012	0.00012	0.000012	0.000012	0.000012	0.000012
1,2,3,7,8,9-HxCDD	ND	0.000044	ND	0.000044	ND	0.000044	ND	0.0000044
1,2,3,4,6,7,8- HpCDF	0.0000061	0.0000061	0.0000061	0.0000061	0.0000061	0.0000061	0.0000061	0.0000061
1,2,3,4,7,8,9- HpCDF	0.000011	0.000011	0.000011	0.000011	0.000011	0.000011	0.000011	0.000011
1,2,3,4,6,7,8- HpCDD	0.000039	0.000039	0.000039	0.000039	0.0000039	0.0000039	0.0000039	0.0000039
OCDF	0.0000041	0.0000041	0.00000041	0.00000041	0.00000041	0.00000041	0.00000041	0.00000041
OCDD	0.0000061	0.0000061	0.00000061	0.00000061	0.00000061	0.00000061	0.00000061	0.00000061
Total Dioxins/Furans	0.0016	0.0019	0.0020	0.0023	0.0020	0.0025	0.0019	0.0023

6tph Tyre Trial Data

NOx as NO2

NOx as NO2 concentration Dry @ 10% O2 (mg/Nm3)					
DATE	NOx	Uncertainty (+/-)	% H2O	%O2	CEM Analysis
10/01/2008	342	48.0	19.0	11.4	398

SO2

SO2 concentration Dry @ 10% O2 (mg/Nm3)					
DATE	SO2	Uncertainty (+/-)	% H2O	%O2	CEM Analysis
10/01/2008	31	13.0	19.0	11.4	43

CO

CO concentration Dry @ 10% O2 (mg/Nm3)					
DATE	CO	Uncertainty (+/-)	% H2O	%O2	CEM Analysis
10/01/2008	77	6.0	19.0	11.4	119

VOC's

TOC concentration Dry @ 10% O2 (mg/Nm3)					
DATE	VOC's	Uncertainty (+/-)	% H2O	%O2	CEM Analysis
10/01/2008	7.3	1.5	19.0	11.4	6.1

Particulates (Measured to CEN 13284)

	Particulates concentration Dry @ 10% O2 (mg/Nm3)		% H2O	%O2
DATE	Run	Uncertainty (+/-)	Run	Run
13/12/2007	15.5	2.7	17.7	12.5

<LOD=0	<LOD=LOD
Value	Value
N/A	15.5

CEM Analysis
Value
2.7

HF

	HF concentration Dry @ 10% O2 (mg/Nm3)		% H2O	%O2
DATE	Run	Uncertainty (+/-)	Run	Run
13/12/2007	<0.041	n/a	18.1	12.2
13/12/2007	<0.046	n/a	17.7	12.5
18/12/2007	<0.039	n/a	17.3	12.9
18/12/2007	<0.035	n/a	19.2	13.3
19/12/2007	<0.036	n/a	21.7	12.9
08/01/2008	<0.039	n/a	16.1	12.7

<LOD=0	<LOD=LOD
Value	Value
0.000	0.041
0.000	0.046
0.000	0.039
0.000	0.035
0.000	0.036
0.000	0.039

CEM Analysis
Value
0.510
0.390
0.600
0.580
0.450
0.740

Average

0.000	0.039
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0.545

HCl

	HCl concentration Dry @ 10% O2 (mg/Nm3)		% H2O	%O2
DATE	Run	Uncertainty (+/-)	Run	Run
11/12/2007	4.4	0.59	19.3	12.5

<LOD=0	<LOD=LOD
Value	Value
N/A	4.400

CEM Analysis
Value
0.330

Particulates (Measured to EPA 201A)

	Particulates concentration Dry @ 10% O2 (mg/Nm3)		% H2O	%O2
DATE	Run	Uncertainty (+/-)	Run	Run
07/01/2008	24.2	2.5	18.7	12.8
07/01/2008	5.0	0.5	18.7	12.8

<LOD=0	<LOD=LOD
Value	Value
N/A	24.2
N/A	5.0

CEM Analysis
Value
2.60
3.92

Average

N/A	14.6
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3.3

Particulates >PM10

	>PM10 concentration Dry @ 10% O2 (mg/Nm3)		% H2O	%O2
DATE	Run	Uncertainty (+/-)	Run	Run
07/01/2008	18.1	2.5	18.7	12.8
07/01/2008	3.2	0.5	18.7	12.8

<LOD=0	<LOD=LOD
Value	Value
N/A	18.1
N/A	3.2

Average

N/A	10.6
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Particulates <PM10 & >PM2.5

	<PM10 % >PM2.5 concentration Dry @ 10% O2 (mg/Nm3)		% H2O	%O2
DATE	Run	Uncertainty (+/-)	Run	Run
07/01/2008	0.5	2.5	18.7	12.8
07/01/2008	1.4	0.5	18.7	12.8

<LOD=0	<LOD=LOD
Value	Value
N/A	0.520
N/A	1.390

Average

N/A	1.0
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Particulates <PM2.5

	<PM2.5 concentration Dry @ 10% O2 (mg/Nm3)		% H2O	%O2
DATE	Run	Uncertainty (+/-)	Run	Run
07/01/2008	5.6	2.5	18.7	12.8
07/01/2008	0.4	0.5	18.7	12.8

<LOD=0	<LOD=LOD
Value	Value
N/A	5.630
N/A	0.360

Average

N/A	3.0
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Benzene

	Benzene concentration Dry @ 10% O2 (mg/Nm3)		% H2O	%O2
DATE	Run	Uncertainty (+/-)	Run	Run
08/01/2008	<0.00000037	n/a	19.0	11.4
08/01/2008	<0.00000037	n/a	19.0	11.4

<LOD=0	<LOD=LOD
Value	Value
0.000	0.00000037
0.000	0.00000037

Average

0.0000	0.00000037
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1,3-Butadiene

	1,3-Butadiene concentration Dry @ 10% O2 (mg/Nm3)		% H2O	%O2
DATE	Run	Uncertainty (+/-)	Run	Run
08/01/2008	<0.0037	n/a	19.0	11.4
08/01/2008	<0.0037	n/a	19.0	11.4

<LOD=0	<LOD=LOD
Value	Value
0.000	0.0037
0.000	0.0037

Average

0.000	0.004
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PAH's as measured

	PAH's concentration Dry @ 10% O2 (mg/Nm3)		% H2O	%O2
DATE	Run	Uncertainty (+/-)	Run	Run
08/01/2008	0.00041	0.00047	19.6	12.2
09/01/2008	0.00380	0.00083	17.8	12.6

<LOD=0	<LOD=LOD
Value	Value
N/A	0.0004
N/A	0.0038

<u>Average</u>	N/A	0.0021
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PAH's as benzo(a)pyrene

	PAH's concentration Dry @ 10% O2 (mg/Nm3)		% H2O	%O2
DATE	Run	Uncertainty (+/-)	Run	Run
08/01/2008	0.00080	0.00047	19.6	12.2
09/01/2008	0.00750	0.00083	17.8	12.6

<LOD=0	<LOD=LOD
Average	Average
N/A	0.0008
N/A	0.0075

<u>Average</u>	N/A	0.0042
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PCB's As Measured

	PCB's concentration Dry @ 10% O2 (ng/Nm3)		% H2O	%O2
DATE	Run	Uncertainty (+/-)	Run	Run
12/12/2007	0.000078	0.00007	19.9	11.8
18/12/2007	0.000022	0.00007	19.4	12.7
19/12/2007	0.000039	0.00007	20.3	12.3
20/12/2007	0.000015	0.00006	19.9	12.6
10/01/2008	0.000011	0.00006	16.6	12.3
15/01/2008	0.0000370	0.00006	20.2	12.6

<LOD=0	<LOD=LOD
Value	Value
N/A	0.000008
N/A	0.000002
N/A	0.000004
N/A	0.000002
N/A	0.000001
N/A	0.000037

Average

N/A	0.000009
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Mercury

	Mercury concentration Dry @ 10% O2 (mg/Nm3)		% H2O	%O2
DATE	Run	Uncertainty (+/-)	Run	Run
08/01/2008	0.0006	0.00020	20.1	12.1
08/01/2008	0.0002	0.00009	18.9	12.2
09/01/2008	0.0003	0.00010	20.1	12.5
09/01/2008	0.0003	0.00010	21.4	12.3
10/01/2008	0.0003	0.00011	21.6	11.1
10/01/2008	0.0003	0.00009	20.7	11.4

<LOD=0	<LOD=LOD
Value	Value
N/A	0.00060
N/A	0.00024
N/A	0.00026
N/A	0.00025
N/A	0.00034
N/A	0.00025

Average

N/A	0.00032
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Cadmium & Thallium

	Cadmium & Thallium concentration Dry @ 10% O2 (mg/Nm3)		% H2O	%O2
DATE	Run	Uncertainty (+/-)	Run	Run
08/01/2008	0.013	0.0027	20.1	12.1
08/01/2008	0.008	0.0019	18.9	12.2
09/01/2008	0.011	0.0024	20.1	12.5
09/01/2008	0.014	0.0032	21.4	12.3
10/01/2008	0.012	0.0031	21.6	11.1
10/01/2008	0.005	0.0013	20.7	11.4

<LOD=0	<LOD=LOD
Value	Value
N/A	0.013000
N/A	0.008000
N/A	0.011000
N/A	0.014000
N/A	0.012000
N/A	0.005100

Average

N/A	0.011
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Group III Metals

	Group III Metals concentration Dry @ 10% O2 (mg/Nm3)		% H2O	%O2
DATE	Run	Uncertainty (+/-)	Run	Run
08/01/2008	0.09	0.015	20.1	12.1
08/01/2008	0.08	0.000	18.9	12.2
09/01/2008	0.14	0.019	20.1	12.5
09/01/2008	0.14	0.020	21.4	12.3
10/01/2008	0.07	0.013	21.6	11.1
10/01/2008	0.07	0.011	20.7	11.4

<LOD=0	<LOD=LOD
Value	Value
N/A	0.089000
N/A	0.079000
N/A	0.140000
N/A	0.140000
N/A	0.065000
N/A	0.072000

Average

N/A	0.0975
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Dioxins and Furans ITEQ 1 (<LOD = 0)

	Dioxins & Furans concentration Dry @ 10% O2 (ng/Nm3)		% H2O	%O2
DATE	Humans/ Mammals	Uncertainty (+/-)	Run	Run
12/12/2007	0.00113	0.00062	19.9	11.8
18/12/2007	0.00000	0.00064	19.4	12.7
19/12/2007	0.00022	0.00061	20.3	12.3
20/12/2007	0.00003	0.00056	19.9	12.6
10/01/2008	0.00009	0.00062	16.6	12.3
15/01/2008	0.00000	0.00062	20.2	12.6

Average

0.00025

Dioxins and Furans ITEQ 2 (<LOD = LOD)

	Dioxins & Furans concentration Dry @ 10% O2 (ng/Nm3)		% H2O	%O2
DATE	Humans/ Mammals	Uncertainty (+/-)	Run	Run
12/12/2007	0.00170	0.00062	19.9	11.8
18/12/2007	0.00120	0.00064	19.4	12.7
19/12/2007	0.00100	0.00061	20.3	12.3
20/12/2007	0.00040	0.00056	19.9	12.6
10/01/2008	0.00130	0.00062	16.6	12.3
15/01/2008	0.00240	0.00062	20.2	12.6

Average

0.0013

Dioxins and Furans WHO-TEQ 1 (<LOD = 0)

DATE	Dioxins & Furans concentration Dry @ 10% O2 (ng/Nm3)				% H2O	%O2
	Humans/ Mammals	Birds	Fish	Uncertainty (+/-)	Run	Run
12/12/2007	0.00113	0.00198	0.00102	0.00062	19.9	11.8
18/12/2007	0.00025	0.00005	0.00005	0.00064	19.4	12.7
19/12/2007	0.00021	0.00015	0.00015	0.00061	20.3	12.3
20/12/2007	0.00002	0.00000	0.00000	0.00056	19.9	12.6
10/01/2008	0.00009	0.00003	0.00003	0.00062	16.6	12.3
15/01/2008	0.00000	0.00000	0.00000	0.00062	20.2	12.6

Average	0.00028	0.00037	0.00021
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Dioxins and Furans WHO-TEQ 2 (<LOD = LOD)

DATE	Dioxins & Furans concentration Dry @ 10% O2 (ng/Nm3)				% H2O	%O2
	Humans/ Mammals	Birds	Fish	Uncertainty (+/-)	Run	Run
12/12/2007	0.00190	0.00260	0.00190	0.00062	19.9	11.8
18/12/2007	0.00140	0.00150	0.00140	0.00064	19.4	12.7
19/12/2007	0.00110	0.00140	0.00120	0.00061	20.3	12.3
20/12/2007	0.00040	0.00060	0.00040	0.00056	19.9	12.6
10/01/2008	0.00140	0.00160	0.00150	0.00062	16.6	12.3
15/01/2008	0.00270	0.00400	0.00260	0.00062	20.2	12.6

Average	0.0015	0.0020	0.0015
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PAH Speciated Data Dry @ 10% O2 (mg/Nm3) original data

08/01/2008	Run
	As As benzo(a)pyrene

	measured	
naphthalene	4E-04	0.0008

anthanthrene	<0.00041	<0.00037
benzo(b)naphtho(2,1-d)thiophene	<0.00041	<0.00044
benzo(c)phenanthrene	<0.00041	<0.00045
Cholanthrene	<0.00041	<0.00041
cyclopenta(c,d)pyrene	<0.00041	<0.00045
fluoranthene	<0.00041	<0.00051
benz(a)anthracene	<0.00041	<0.00045
chrysene	<0.00041	<0.00045
benzo(b)fluoranthene	<0.00041	<0.00041
benzo(k)fluoranthene	<0.00041	<0.00041
benzo(a)pyrene	<0.00041	<0.00041
indeno(1,2,3-cd)pyrene	<0.00041	<0.00037
dibenz(a,h)anthracene	<0.00041	<0.00037
benzo(ghi)perylene	<0.00041	<0.00037
Total PAH (max value)	0.0004	0.0008

Total <LOD = LOD	0.006	0.007
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PAH Speciated Data Dry @ 10% O2 (mg/Nm3) original data

09/01/2008	Run
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	As measured	As benzo(a)pyrene
naphthalene	0.0038	0.0075
anthanthrene	<0.00042	<0.00038
benzo(b)naphtho(2,1-d)thiophene	<0.00042	<0.00045
benzo(c)phenanthrene	<0.00042	<0.00046
Cholanthrene	<0.00042	<0.00042
cyclopenta(c,d)pyrene	<0.00042	<0.00046
fluoranthene	<0.00042	<0.00052
benz(a)anthracene	<0.00042	<0.00046
chrysene	<0.00042	<0.00046
benzo(b)fluoranthene	<0.00042	<0.00042
benzo(k)fluoranthene	<0.00042	<0.00042
benzo(a)pyrene	<0.00042	<0.00042
indeno(1,2,3-cd)pyrene	<0.00042	<0.00038
dibenz(a,h)anthracene	<0.00042	<0.00038
benzo(ghi)perylene	<0.00042	<0.00038
Total PAH (max value)	0.0038	0.0075

Total <LOD = LOD	0.010	0.014
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PCB's Speciated Data Dry @ 10% O2 (ng/Nm3) As measured

	12/12/2007
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	WHO/TEQ (1) Humans/Mammals	WHO/TEQ (2) Humans/Mammals	WHO/TEQ (1) Birds	WHO/TEQ (2) Birds	WHO/TEQ (1) Fish	WHO/TEQ (2) Fish
PCB 105	0.0000016	0.0000016	0.0000016	0.0000016	0.00000008	0.00000008
PCB 114	ND	<0.0000014	ND	<0.00000028	ND	<0.000000014
PCB 118	0.0000037	0.0000037	0.0000037	<0.00000037	0.00000018	0.00000018
PCB 123	ND	<0.00000028	ND	<0.000000028	ND	<0.000000014
PCB 156	0.000003	0.00000100	0.00000050	0.00000028	0.00000003	0.00000001
PCB 157	ND	<0.0000014	ND	<0.00000028	ND	<0.000000014
PCB 167	ND	<0.000000028	ND	<0.000000028	ND	<0.000000014
PCB 189	ND	<0.00000028	ND	<0.000000028	ND	<0.000000014
PCB 81	ND	<0.00000028	ND	<0.00028	ND	<0.0000014
PCB 77	ND	0.0000003	ND	0.0001	ND	0.0000003
PCB 126	ND	<0.00028	ND	<0.00028	ND	<0.000014
PCB 169	ND	<0.000028	ND	<0.0000028	ND	<0.000000141
Total PCB's	0.000008	0.000007	0.000002	0.000102	0.000000	0.000001

Total <LOD = LOD	0.00002	0.00032	0.000005	0.00067	0.000001	0.00002
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	18/12/2007					
	WHO/TEQ (1) Humans/Mammals	WHO/TEQ (2) Humans/Mammals	WHO/TEQ (1) Birds	WHO/TEQ (2) Birds	WHO/TEQ (1) Fish	WHO/TEQ (2) Fish
PCB 105	ND	0.00000031	ND	0.00000031	ND	0.000000016
PCB 114	ND	<0.0000016	ND	<0.00000031	ND	<0.000000016
PCB 118	0.0000022	0.0000022	0.0000002	0.0000002	0.000000108	0.00000011
PCB 123	ND	<0.00000031	ND	<0.000000031	ND	<0.000000016
PCB 156	ND	<0.0000016	ND	<0.00000031	ND	<0.000000016
PCB 157	ND	<0.0000016	ND	<0.00000031	ND	<0.000000016
PCB 167	ND	<0.000000031	ND	<0.000000031	ND	<0.000000016
PCB 189	ND	<0.00000031	ND	<0.000000031	ND	<0.000000016
PCB 81	ND	<0.00000031	ND	<0.00031	ND	<0.0000016
PCB 77	ND	0.0000003	ND	0.00016	ND	0.00000031
PCB 126	ND	<0.00031	ND	<0.00031	ND	<0.00002
PCB 169	ND	<0.000031	ND	<0.00000031	ND	<0.00000016
Total PCB's	0.000002	0.000003	0.000000	0.000161	0.000000	0.000000
Total <LOD = LOD	0.00000	0.00035	0.0000004	0.00078	0.0000002	0.00002

	19/12/2007					
	WHO/TEQ (1) Humans/Mammals	WHO/TEQ (2) Humans/Mammals	WHO/TEQ (1) Birds	WHO/TEQ (2) Birds	WHO/TEQ (1) Fish	WHO/TEQ (2) Fish
PCB 105	0.00000099	0.00000102	0.00000099	0.00000102	0.00000005	0.000000051
PCB 114	ND	0.0000015				
PCB 118	0.0000029	0.000003	0.0000003	0.0000003	0.000000146	0.000000151
PCB 123	ND	0.0000	ND	0.00000003	ND	0.000000015
PCB 156	ND	0.00000150	ND	0.0000003	ND	0.000000015
PCB 157	ND	0.00000150	ND	0.0000003	ND	0.000000015
PCB 167	ND	0.00000003	ND	0.00000003	ND	0.000000015
PCB 189	ND	0.00000030	ND	0.00000003	ND	0.000000015
PCB 81	ND	0.00000030	ND	0.0003	ND	0.0000015
PCB 77	ND	0.0000003	ND	0.00015	ND	0.0000003
PCB 126	ND	0.000	ND	0.0003	ND	0.0000015
PCB 169	ND	0.00003000	ND	0.000003	ND	0.00000015
Total PCB's	0.000004	0.000340	0.000001	0.000755	0.000000	0.000017
Total <LOD = LOD	0.00001	0.00034	0.0000026	0.001	0.0000004	0.00002

	20/12/2007					
	WHO/TEQ (1) Humans/Mammals	WHO/TEQ (2) Humans/Mammals	WHO/TEQ (1) Birds	WHO/TEQ (2) Birds	WHO/TEQ (1) Fish	WHO/TEQ (2) Fish
PCB 105	ND	0.0000003	ND	0.0000003	ND	0.00000001
PCB 114	ND	<0.0000013	ND	<0.00000027	ND	<0.000000013
PCB 118	0.0000015	0.0000015	0.00000015	<0.00000015	0.00000008	0.00000008
PCB 123	ND	<0.00000027	ND	<0.000000027	ND	<0.000000013
PCB 156	ND	0.00000100	ND	0.00000027	ND	0.00000001
PCB 157	ND	<0.0000013	ND	<0.00000027	ND	<0.000000013
PCB 167	ND	<0.000000027	ND	<0.00000027	ND	<0.000000013
PCB 189	ND	<0.00000027	ND	<0.00000027	ND	<0.000000013
PCB 81	ND	<0.00000027	ND	<0.00027	ND	<0.0000013
PCB 77	ND	0.0000003	ND	0.0001	ND	0.0000003
PCB 126	ND	<0.00027	ND	<0.00027	ND	<0.000013
PCB 169	ND	<0.000027	ND	<0.0000027	ND	<0.000000135
Total PCB's	0.000002	0.000003	0.000000	0.000101	0.000000	0.000000
Total <LOD = LOD	0.000003	0.0003	0.0000003	0.001	0.0000002	0.000015

	10/01/2008					
	WHO/TEQ (1) Humans/Mammals	WHO/TEQ (2) Humans/Mammals	WHO/TEQ (1) Birds	WHO/TEQ (2) Birds	WHO/TEQ (1) Fish	WHO/TEQ (2) Fish
PCB 105	ND	0.00000026	ND	0.00000026	ND	0.000000013
PCB 114	ND	<0.0000013	ND	<0.00000026	ND	<0.000000013
PCB 118	0.0000011	0.0000007	0.0000001	0.0000001	0.000000055	0.00000004
PCB 123	ND	<0.00000026	ND	<0.000000026	ND	<0.000000013
PCB 156	ND	<0.0000013	ND	<0.00000026	ND	<0.000000013
PCB 157	ND	<0.0000013	ND	<0.00000026	ND	<0.000000013
PCB 167	ND	<0.000000026	ND	<0.000000026	ND	<0.000000013
PCB 189	ND	<0.00000026	ND	<0.000000026	ND	<0.000000013
PCB 81	ND	<0.00000026	ND	<0.00026	ND	<0.0000013
PCB 77	ND	0.0000003	ND	0.00013	ND	0.00000026
PCB 126	ND	<0.00026	ND	<0.00026	ND	<0.00001
PCB 169	ND	<0.000026	ND	<0.0000026	ND	<0.00000013
Total PCB's	0.000001	0.000001	0.000000	0.000130	0.000000	0.000000
Total <LOD = LOD	0.000002	0.000029	0.0000002	0.001	0.0000001	0.00001

	15/01/2008					
	WHO/TEQ (1) Humans/Mammals	WHO/TEQ (2) Humans/Mammals	WHO/TEQ (1) Birds	WHO/TEQ (2) Birds	WHO/TEQ (1) Fish	WHO/TEQ (2) Fish
PCB 105	0.00000497	0.00000295	0.00000497	0.00000295	0.000000248	0.000000148
PCB 114	ND	0.00000134	ND	0.000000268	ND	0.000000013
PCB 118	0.0000131	0.0000078	0.0000013	0.0000008	0.000000655	0.000000389
PCB 123	ND	0.0000	ND	0.000000027	ND	0.000000013
PCB 156	0.000013	0.00000780	0.00000260	0.00000156	0.00000013	0.000000078
PCB 157	0.0000032	0.00000190	0.00000060	0.00000038	0.00000003	0.000000019
PCB 167	0.000000095	0.00000006	0.00000010	0.000000056	0.00000005	0.000000028
PCB 189	ND	0.00000027	ND	0.000000027	ND	0.000000013
PCB 81	0.0000006	0.00000038	0.00060000	0.00038	0.00000300	0.0000019
PCB 77	0.00000167	0.0000010	0.0008400	0.0005	0.0000017	0.00000099
PCB 126	ND	0.000	ND	0.00027	ND	0.000013
PCB 169	ND	0.00002700	ND	0.0000027	ND	0.00000013
Total PCB's	0.000037	0.000321	0.001450	0.001159	0.000006	0.000017
Total <LOD = LOD	0.00007	0.00032	0.0028991	0.0023175	0.0000116	0.0000334

12/12/07 Run	ITEQ (1)	ITEQ (2)	WHO/TEQ (1) Humans/Mammals	WHO/TEQ (2) Humans/Mammals	WHO/TEQ (1) Birds	WHO/TEQ (2) Birds	WHO/TEQ (1) Fish	WHO/TEQ (2) Fish
2,3,7,8-TCDF	0.000057	0.000057	0.000057	0.000057	0.000568	0.000057	0.000028	0.000028
2,3,7,8-TCDD	0.000233	0.00023	0.000233	0.00023	0.00023	0.00023	0.00023	0.00023
1,2,3,7,8-PeCDF	ND	0.00002	ND	0.00002	ND	0.000041	ND	0.00002
2,3,4,7,8-PeCDF	0.000419	0.00042	0.000419	0.00042	0.000837	0.00084	0.000419	0.00042
1,2,3,7,8-PeCDD	ND	0.00022	ND	0.00044	ND	0.00044	ND	0.00044
1,2,3,4,7,8-HxCDF	0.00016	0.000155	0.00016	0.00016	0.00016	0.00016	0.00016	0.00016
1,2,3,6,7,8-HxCDF	0.000129	0.000129	0.000129	0.000129	0.000129	0.000129	0.000129	0.000129
2,3,4,6,7,8,-HxCDF	ND	0.00002	ND	0.00002	ND	0.00002	ND	0.00002
1,2,3,7,8,9-HxCDF	ND	0.000019	ND	0.000019	ND	0.000019	ND	0.000019
1,2,3,4,7,8-HxCDD	ND	0.000075	ND	0.000075	ND	0.000037	ND	0.000370
1,2,3,6,7,8-HxCDD	ND	0.00009	ND	0.00009	ND	0.00009	ND	0.00009
1,2,3,7,8,9-HxCDD	ND	0.000077	ND	0.00008	ND	0.000077	ND	0.000077
1,2,3,4,6,7,8-HpCDF	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038
1,2,3,4,7,8,9-HpCDF	0.000008	0.0000084	0.000008	0.0000084	0.000008	0.0000084	0.000008	0.0000084
1,2,3,4,6,7,8-HpCDD	0.000094	0.00009	0.000094	0.000094	0.000094	0.000094	0.000094	0.000094
OCDF	ND	0.0000000	ND	0.00000000	ND	0.00000000	ND	0.00000000
OCDD	ND	0.0000003	ND	0.00000003	ND	0.00000003	ND	0.00000003
Total Dioxins/Furans	0.0011	0.0016	0.0011	0.0019	0.0020	0.0026	0.0010	0.0019

18/12/07 Run	ITEQ (1)	ITEQ (2)	WHO/TEQ (1) Humans/Mammals	WHO/TEQ (2) Humans/Mammals	WHO/TEQ (1) Birds	WHO/TEQ (2) Birds	WHO/TEQ (1) Fish	WHO/TEQ (2) Fish
2,3,7,8-TCDF	ND	0.00002	ND	0.00002	ND	0.000203	ND	0.00001
2,3,7,8-TCDD	ND	0.00040	ND	0.00040	ND	0.00040	ND	0.00040
1,2,3,7,8-PeCDF	ND	0.000016	ND	0.000016	ND	0.000033	ND	0.000016
2,3,4,7,8-PeCDF	ND	0.00015	ND	0.00015	ND	0.00029	ND	0.00015
1,2,3,7,8-PeCDD	ND	0.00017	ND	0.00033	ND	0.00033	ND	0.00033
1,2,3,4,7,8-HxCDF	ND	0.000016	ND	0.000016	ND	0.000016	ND	0.000016
1,2,3,6,7,8-HxCDF	ND	0.000015	ND	0.000015	ND	0.000015	ND	0.000015
2,3,4,6,7,8-HxCDF	ND	0.000015	ND	0.000015	ND	0.000015	ND	0.000015
1,2,3,7,8,9-HxCDF	ND	0.000018	ND	0.000018	ND	0.000018	ND	0.000018
1,2,3,4,7,8-HxCDD	ND	0.000070	ND	0.000070	ND	0.000035	ND	0.000350
1,2,3,6,7,8-HxCDD	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.000013	0.000013
1,2,3,7,8,9-HxCDD	ND	0.000056	ND	0.000056	ND	0.000056	ND	0.000056
1,2,3,4,6,7,8-HpCDF	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027
1,2,3,4,7,8,9-HpCDF	ND	0.00000212	ND	0.00000212	ND	0.00000212	ND	0.00000212
1,2,3,4,6,7,8-HpCDD	0.000095	0.000095	0.000095	0.000095	0.0000095	0.0000095	0.0000095	0.0000095
OCDF	ND	0.0000000	ND	0.0000000	ND	0.0000000	ND	0.0000000
OCDD	0.000013	0.000013	0.0000013	0.0000013	0.0000013	0.0000013	0.0000013	0.0000013
Total Dioxins/Furans	0.0003	0.0012	0.0003	0.0014	0.0002	0.0016	0.0001	0.0014

19/12/08 Run	ITEQ (1)	ITEQ (2)	WHO/TEQ (1) Humans/Mammals	WHO/TEQ (2) Humans/Mammals	WHO/TEQ (1) Birds	WHO/TEQ (2) Birds	WHO/TEQ (1) Fish	WHO/TEQ (2) Fish
2,3,7,8-TCDF	ND	0.000019	ND	0.000019	ND	0.00019	ND	0.00001
2,3,7,8-TCDD	ND	0.00032	ND	0.00032	ND	0.00032	ND	0.00032
1,2,3,7,8-PeCDF	ND	0.000016	ND	0.000016	ND	0.000032	ND	0.000016
2,3,4,7,8-PeCDF	ND	0.000146	ND	0.000146	ND	0.000291	ND	0.000146
1,2,3,7,8-PeCDD	ND	0.000138	ND	0.000277	ND	0.000277	ND	0.000277
1,2,3,4,7,8-HxCDF	ND	0.000014	ND	0.000014	ND	0.000014	ND	0.000014
1,2,3,6,7,8-HxCDF	ND	0.000013	ND	0.000013	ND	0.000013	ND	0.000013
2,3,4,6,7,8-HxCDF	0.00009	0.00009	0.00009	0.00009	0.00009	0.00009	0.00009	0.00009
1,2,3,7,8,9-HxCDF	0.00003	0.00003	0.00003	0.00003	0.00003	0.00003	0.00003	0.00003
1,2,3,4,7,8-HxCDD	ND	0.000043	ND	0.000043	ND	0.000021	ND	0.000214
1,2,3,6,7,8-HxCDD	ND	0.000044	ND	0.000044	ND	0.000004	ND	0.000004
1,2,3,7,8,9-HxCDD	ND	0.000039	ND	0.000039	ND	0.000039	ND	0.000004
1,2,3,4,6,7,8-HpCDF	0.000021	0.000021	0.000021	0.000021	0.000021	0.000021	0.000021	0.000021
1,2,3,4,7,8,9-HpCDF	ND	0.000001	ND	0.000001	ND	0.000001	ND	0.000001
1,2,3,4,6,7,8HpCDD	0.000065	0.000065	0.000065	0.000065	0.000006	0.000006	0.000006	0.000006
OCDF	0.000002	0.0000020	0	0.00000000	0.00000000	0.0000000 0	0.00000000	0.00000000
OCDD	0.000011	0.000011	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001
Total Dioxins/Furans	0.0002	0.0010	0.0002	0.0011	0.0001	0.0014	0.0001	0.0012

20/12/08 Run	ITEQ (1)	ITEQ (2)	WHO/TEQ (1) Humans/Mammals	WHO/TEQ (2) Humans/Mammals	WHO/TEQ (1) Birds	WHO/TEQ (2) Birds	WHO/TEQ (1) Fish	WHO/TEQ (2) Fish
2,3,7,8-TCDF	ND	0.000015	ND	0.000015	ND	0.00015	ND	0.000008
2,3,7,8-TCDD	ND	0.00016	ND	0.00016	ND	0.00016	ND	0.00016
1,2,3,7,8-PeCDF	ND	0.000004	ND	0.000004	ND	0.000008	ND	0.000004
2,3,4,7,8-PeCDF	ND	0.00004	ND	0.00004	ND	0.00008	ND	0.00004
1,2,3,7,8-PeCDD	ND	0.00004	ND	0.00009	ND	0.00009	ND	0.00009
1,2,3,4,7,8-HxCDF	ND	0.000012	ND	0.00001	ND	0.00001	ND	0.00001
1,2,3,6,7,8-HxCDF	ND	0.000011	ND	0.000011	ND	0.000011	ND	0.000011
2,3,4,6,7,8-HxCDF	ND	0.00001	ND	0.00001	ND	0.00001	ND	0.00001
1,2,3,7,8,9-HxCDF	ND	0.000016	ND	0.000016	ND	0.000016	ND	0.000016
1,2,3,4,7,8-HxCDD	ND	0.000010	ND	0.000010	ND	0.000005	ND	0.000050
1,2,3,6,7,8-HxCDD	ND	0.00001	ND	0.00001	ND	0.000001	ND	0.000001
1,2,3,7,8,9-HxCDD	ND	0.00001	ND	0.00001	ND	0.00001	ND	0.000001
1,2,3,4,6,7,8-HpCDF	ND	0.000001	ND	0.000001	ND	0.000001	ND	0.000001
1,2,3,4,7,8,9-HpCDF	ND	0.0000011	ND	0.0000011	ND	0.0000011	ND	0.0000011
1,2,3,4,6,7,8-HpCDD	0.000016	0.00002	0.000016	0.000016	0.0000016	0.0000016	0.0000016	0.0000016
OCDF	ND	0.0000000	ND	0.0000000	ND	0.0000000 0	ND	0.0000000
OCDD	0.0000105	0.0000105	0.00000105	0.00000105	0.00000105	0.0000010 5	0.00000105	0.00000105
Total Dioxins/Furans	0.0000	0.0004	0.0000	0.0004	0.0000	0.0006	0.0000	0.0004

10/01/08 Run	ITEQ (1)	ITEQ (2)	WHO/TEQ (1) Humans/Mammals	WHO/TEQ (2) Humans/Mammals	WHO/TEQ (1) Birds	WHO/TEQ (2) Birds	WHO/TEQ (1) Fish	WHO/TEQ (2) Fish
2,3,7,8-TCDF	ND	0.000018	ND	0.000018	ND	0.00018	ND	0.000009
2,3,7,8-TCDD	ND	0.00068	ND	0.00068	ND	0.00068	ND	0.00068
1,2,3,7,8-PeCDF	ND	0.000017	ND	0.000017	ND	0.000034	ND	0.000017
2,3,4,7,8-PeCDF	ND	0.00015	ND	0.00015	ND	0.00031	ND	0.00015
1,2,3,7,8-PeCDD	ND	0.00014	ND	0.00028	ND	0.00028	ND	0.00028
1,2,3,4,7,8-HxCDF	ND	0.000014	ND	0.000014	ND	0.000014	ND	0.000014
1,2,3,6,7,8-HxCDF	ND	0.000013	ND	0.000013	ND	0.000013	ND	0.000013
2,3,4,6,7,8-HxCDF	ND	0.000014	ND	0.000014	ND	0.000014	ND	0.000014
1,2,3,7,8,9-HxCDF	ND	0.000016	ND	0.000016	ND	0.000016	ND	0.000016
1,2,3,4,7,8-HxCDD	ND	0.000053	ND	0.000053	ND	0.000027	ND	0.000270
1,2,3,6,7,8-HxCDD	ND	0.00005	ND	0.00005	ND	0.000005	ND	0.000005
1,2,3,7,8,9-HxCDD	ND	0.000044	ND	0.000044	ND	0.000044	ND	0.000044
1,2,3,4,6,7,8-HpCDF	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002
1,2,3,4,7,8,9-HpCDF	ND	0.00000164	ND	0.00000164	ND	0.00000164	ND	0.00000164
1,2,3,4,6,7,8-HpCDD	0.000066	0.000066	0.000066	0.000066	0.0000066	0.0000066	0.0000066	0.0000066
OCDF	0.000001	0.0000012	0	0.00000012	0.00000012	0.00000012	0.00000012	0.00000012
OCDD	0.0000061	0.0000061	0.00000061	0.00000061	0.00000061	0.00000061	0.00000061	0.00000061
Total Dioxins/Furans	0.0001	0.0013	0.0001	0.0014	0.0000	0.0016	0.0000	0.0015

15/01/08 Run	ITEQ (1)	ITEQ (2)	WHO/TEQ (1) Humans/Mammals	WHO/TEQ (2) Humans/Mammals	WHO/TEQ (1) Birds	WHO/TEQ (2) Birds	WHO/TEQ (1) Fish	WHO/TEQ (2) Fish
2,3,7,8-TCDF	ND	0.000131	ND	0.000131	ND	0.001314	ND	0.000066
2,3,7,8-TCDD	ND	0.00153	ND	0.00153	ND	0.00153	ND	0.00153
1,2,3,7,8-PeCDF	ND	0.00002	ND	0.00002	ND	0.00004	ND	0.00002
2,3,4,7,8-PeCDF	ND	0.000195	ND	0.000195	ND	0.00039	ND	0.000195
1,2,3,7,8-PeCDD	ND	0.000263	ND	0.000526	ND	0.000526	ND	0.000526
1,2,3,4,7,8-HxCDF	ND	0.000024	ND	0.000024	ND	0.000024	ND	0.000024
1,2,3,6,7,8-HxCDF	ND	0.000023	ND	0.000023	ND	0.000023	ND	0.000023
2,3,4,6,7,8-HxCDF	ND	0.000023	ND	0.000023	ND	0.000023	ND	0.000023
1,2,3,7,8,9-HxCDF	ND	0.000028	ND	0.000028	ND	0.000028	ND	0.000028
1,2,3,4,7,8-HxCDD	ND	0.000035	ND	0.000035	ND	0.000018	ND	0.000176
1,2,3,6,7,8-HxCDD	ND	0.000035	ND	0.000035	ND	0.000004	ND	0.000004
1,2,3,7,8,9-HxCDD	ND	0.000033	ND	0.000033	ND	0.000033	ND	0.000003
1,2,3,4,6,7,8-HpCDF	ND	0.000002	ND	0.000002	ND	0.000002	ND	0.000002
1,2,3,4,7,8,9-HpCDF	ND	0.000003	ND	0.000003	ND	0.000003	ND	0.000003
1,2,3,4,6,7,8-HpCDD	ND	0.000005	ND	0.000005	ND	0.000005	ND	0.000005
OCDF	ND	0.0000000	ND	0.00000000	ND	0.0000000 0	ND	0.00000000
OCDD	ND	0	ND	0	ND	0	ND	0
Total Dioxins/Furans	0.0000	0.0024	0.0000	0.0027	0.0000	0.0040	0.0000	0.0026

Appendix 2: Individual metals emissions

Baseline (mg/Nm³ Dry at 10% O₂)

Metals	21/09/2007	21/09/2007	22/10/2007	23/10/2007	21/11/2007	21/11/2007
	Run 1	Run 2	Run 1	Run 1	Run 1	Run 2
	Total	Total	Total	Total	Total	Total
Antimony	0.0024	0.00140	0.00470	0.0025	0.0015	0.0014
Arsenic	<0.00070	<0.00064	0.00250	0.0028	<0.00066	<0.00063
Chromium	0.0720	0.07900	0.06300	0.0260	0.1200	0.0840
Cobalt	0.0640	0.04600	<0.0015	<0.0014	<0.00038	0.0004
Copper	0.0390	0.01600	0.02700	0.0055	0.0085	0.0130
Lead	0.0150	0.00750	0.00430	<0.0062	0.0087	0.0052
Manganese	0.0210	0.01500	0.00840	0.0160	0.0100	0.0220
Nickel	0.0440	0.01700	<0.0048	<0.0042	0.0100	0.0128
Thallium	0.0099	0.00850	<0.0061	0.0052	0.0073	0.0063
Vanadium	0.0030	0.00140	0.00160	0.0016	0.0011	0.0006
Cadmium	0.0004	0.04800	0.0026	0.0069	0.0420	<0.00027

Metals	21/09/2007	21/09/2007	22/10/2007	23/10/2007	21/11/2007	21/11/2007
	Run 1	Run 2	Run 1	Run 1	Run 1	Run 2
	Total	Total	Total	Total	Total	Total
Mercury	0.00022	0.00021	<0.0026	0.0027	0.00021	0.000041

Tyre Trial (mg/Nm³ Dry at 10% O₂)

Metals	08/01/2008	08/01/2008	09/01/2008	09/01/2008	10/01/2008	10/01/2008
	Run 1	Run 2	Run 1	Run 2	Run 1	Run 2
	Total	Total	Total	Total	Total	Total
Antimony	0.0018	0.00160	0.00200	0.0016	0.0020	0.0022
Arsenic	<0.00084	<0.0008	<0.0008	<0.00084	0.0013	<0.00076
Chromium	0.0150	0.01700	0.08230	0.0570	0.0150	0.0464
Cobalt	0.0010	0.00100	0.00090	0.0020	0.0020	<0.00048
Copper	0.0070	0.00500	0.00680	0.0080	0.0080	0.0045
Lead	0.0100	0.00830	0.00710	0.0070	0.0032	0.0027
Manganese	0.0310	0.02900	0.02470	0.0390	0.0250	0.0077
Nickel	0.0180	0.01400	0.01540	0.0200	0.0050	0.0056
Thallium	0.0107	0.00620	0.00730	0.0117	0.0107	0.0044
Vanadium	0.0033	0.00220	0.00230	0.0035	0.0028	0.0011
Cadmium	0.0019	0.00200	0.00400	0.00230	0.0010	0.0007

Metals	08/01/2008	08/01/2008	09/01/2008	09/01/2008	10/01/2008	10/01/2008
	Run 1	Run 2	Run 1	Run 2	Run 1	Run 1
	Total	Total	Total	Total	Total	Total
Mercury	0.0006	0.00024	0.0003	0.00025	0.00034	0.00025

Appendix 3: Solids Analysis

Baseline

Sample No.	1
Sampling Dates	14/09/07-21/09/07, 18/10/07-24/10/07, 19/11/07-21/11/07

Chalk Analysis

Sample No.	1
Antimony, Sb (ppm)	<10
Arsenic, As (ppm)	<10
Cadmium, Cd (ppm)	<10
Chromium, Cr (ppm)	<10
Cobalt, Co (ppm)	<10
Copper, Cu (ppm)	25
Lead, Pb (ppm)	<10
Manganese, Mn (ppm)	225
Mercury, Hg (ppm)	<1
Nickel, Ni (ppm)	<10
Thallium, Tl (ppm)	<10
Vanadium, Va (ppm)	<10
Zinc, Zn (ppm)	40
Total S as SO ₃ (%)	0.14
F (%)	0.03
Cl (%)	<0.01
Br (%)	<0.01
I (%)	<0.01

Raw Meal Analysis

Sample No.	1
Antimony, Sb (ppm)	<10
Arsenic, As (ppm)	10
Cadmium, Cd (ppm)	<10
Chromium, Cr (ppm)	75
Cobalt, Co (ppm)	20
Copper, Cu (ppm)	35
Lead, Pb (ppm)	30
Manganese, Mn (ppm)	595
Mercury, Hg (ppm)	<10
Nickel, Ni (ppm)	45
Thallium, Tl (ppm)	<10
Vanadium, Va (ppm)	80
Zinc, Zn (ppm)	50
Total S as SO ₃ (%)	2.86
F (%)	0.06
Cl (%)	<0.01
Br (%)	<0.01
I (%)	<0.01

South African Coal Analysis

Sample No.	1
Antimony, Sb (ppm)	<10
Arsenic, As (ppm)	<10
Cadmium, Cd (ppm)	<10
Chromium, Cr (ppm)	<10
Cobalt, Co (ppm)	<10
Copper, Cu (ppm)	<10
Lead, Pb (ppm)	<10
Manganese, Mn (ppm)	70
Mercury, Hg (ppm)	<10
Nickel, Ni (ppm)	<10
Thallium, Tl (ppm)	<10
Vanadium, Va (ppm)	<10
Zinc, Zn (ppm)	15
Total S as SO ₃ (%)	7.56
F (%)	0.02
Cl (%)	<0.01
Br (%)	<0.01
I (%)	<0.01
Gross CV (kJ/kg)	25721
Net CV (kJ/kg)	24796

Bypass Dust Analysis

Sample No.	1
Antimony, Sb (ppm)	<10
Arsenic, As (ppm)	<10
Cadmium, Cd (ppm)	<10
Chromium, Cr (ppm)	35
Cobalt, Co (ppm)	15
Copper, Cu (ppm)	45
Lead, Pb (ppm)	50
Manganese, Mn (ppm)	370
Mercury, Hg (ppm)	<10
Nickel, Ni (ppm)	20
Thallium, Tl (ppm)	<10
Vanadium, Va (ppm)	35
Zinc, Zn (ppm)	190
Total S as SO ₃ (%)	9.96
F (%)	0.06
Cl (%)	0.52
Br (%)	0.03
I (%)	<0.01
Dioxin & Furans (ng/kg I-TEQ)	0.048
free lime content of leachate (%)	15.2
alkalinity of leachate (mg/l)	2800
pH of leachate	12.5
Total PCBs (ngg ⁻¹)	<0.2

Clinker Analysis

Sample No.	1
Antimony, Sb (ppm)	<10
Arsenic, As (ppm)	<10
Cadmium, Cd (ppm)	<10
Chromium, Cr (ppm)	45
Cobalt, Co (ppm)	15
Copper, Cu (ppm)	40
Lead, Pb (ppm)	15
Manganese, Mn (ppm)	490
Mercury, Hg (ppm)	<10
Nickel, Ni (ppm)	25
Thallium, Tl (ppm)	<10
Vanadium, Va (ppm)	45
Zinc, Zn (ppm)	175
Total S as SO ₃ (%)	1.47
F (%)	0.05
Cl (%)	<0.01
Br (%)	<0.01
I (%)	<0.01
Dioxin & Furans (ng/kg I-TEQ)	0.092
Total PCBs (ngg ⁻¹)	<0.2

Tyres Analysis

Sample No.	1
Antimony, Sb (ppm)	<10
Mercury, Hg (ppm)	<10
Arsenic, As (ppm)	<10
Lead, Pb (ppm)	<10
Chromium, Cr (ppm)	<10
Copper, Cu (ppm)	<10
Cobalt, Co (ppm)	<10
Vanadium, Va (ppm)	<10
Cadmium, Cd (ppm)	<10
Thallium, Tl (ppm)	<10
Nickel, Ni (ppm)	<10
Manganese, Mn (ppm)	<10
Zinc, Zn (ppm)	395
Total S as SO ₃ (%)	1.36
F (%)	0.01
Cl (%)	<0.01
Br (%)	<0.01
I (%)	<0.01
Gross CV (kJ/kg)	37855
Net CV (kJ/kg)	36305

Tyre Trial

Sample No.	1
Sampling Dates	11-20/12/07, 07-15/01/08, 21-24/01/08

Chalk Analysis

Sample No.	1
Antimony, Sb (ppm)	<10
Arsenic, As (ppm)	<10
Cadmium, Cd (ppm)	<10
Chromium, Cr (ppm)	<10
Cobalt, Co (ppm)	15
Copper, Cu (ppm)	<10
Lead, Pb (ppm)	<10
Manganese, Mn (ppm)	225
Mercury, Hg (ppm)	<10
Nickel, Ni (ppm)	<10
Thallium, Tl (ppm)	<10
Vanadium, Va (ppm)	<10
Zinc, Zn (ppm)	15
Total S as SO ₃ (%)	0.14
F (%)	0.03
Cl (%)	<0.01
Br (%)	<0.01
I (%)	<0.01

Raw Meal Analysis

Sample No.	1
Antimony, Sb (ppm)	<10
Arsenic, As (ppm)	10
Cadmium, Cd (ppm)	<10
Chromium, Cr (ppm)	70
Cobalt, Co (ppm)	25
Copper, Cu (ppm)	45
Lead, Pb (ppm)	30
Manganese, Mn (ppm)	640
Mercury, Hg (ppm)	<10
Nickel, Ni (ppm)	35
Thallium, Tl (ppm)	<10
Vanadium, Va (ppm)	85
Zinc, Zn (ppm)	45
Total S as SO ₃ (%)	2.89
F (%)	0.05
Cl (%)	<0.01
Br (%)	<0.01
I (%)	<0.01

South African Coal Analysis

Sample No.	1
Antimony, Sb (ppm)	<10
Arsenic, As (ppm)	<10
Cadmium, Cd (ppm)	<10
Chromium, Cr (ppm)	<10
Cobalt, Co (ppm)	<10
Copper, Cu (ppm)	10
Lead, Pb (ppm)	<10
Manganese, Mn (ppm)	60
Mercury, Hg (ppm)	<10
Nickel, Ni (ppm)	<10
Thallium, Tl (ppm)	<10
Vanadium, Va (ppm)	20
Zinc, Zn (ppm)	10
Total S as SO ₃ (%)	6.63
F (%)	0.02
Cl (%)	<0.01
Br (%)	<0.01
I (%)	<0.01
Gross CV (kJ/kg)	27060
Net CV (kJ/kg)	26163

Bypass Dust Analysis

Sample No.	1
Antimony, Sb (ppm)	<10
Arsenic, As (ppm)	<10
Cadmium, Cd (ppm)	<10
Chromium, Cr (ppm)	25
Cobalt, Co (ppm)	10
Copper, Cu (ppm)	20
Lead, Pb (ppm)	80
Manganese, Mn (ppm)	360
Mercury, Hg (ppm)	<10
Nickel, Ni (ppm)	20
Thallium, Tl (ppm)	<10
Vanadium, Va (ppm)	35
Zinc, Zn (ppm)	300
Total S as SO ₃ (%)	13.6
F (%)	0.05
Cl (%)	0.33
Br (%)	0.04
I (%)	<0.01
Dioxin & Furans (ng/kg I-TEQ)	0.078
free lime content of leachate (%)	24.85
alkalinity of leachate (mg/l)	2900
pH of leachate	12.4
Total PCBs (ngg ⁻¹)	<0.2

Clinker Analysis	
Sample No.	1
Antimony, Sb (ppm)	<10
Arsenic, As (ppm)	<10
Cadmium, Cd (ppm)	<10
Chromium, Cr (ppm)	35
Cobalt, Co (ppm)	25
Copper, Cu (ppm)	35
Lead, Pb (ppm)	15
Manganese, Mn (ppm)	555
Mercury, Hg (ppm)	<10
Nickel, Ni (ppm)	20
Thallium, Tl (ppm)	<10
Vanadium, Va (ppm)	50
Zinc, Zn (ppm)	370
Total S as SO ₃ (%)	1.26
F (%)	0.02
Cl (%)	0.01
Br (%)	<0.01
I (%)	<0.01
Dioxin & Furans (ng/kg I-TEQ)	0.091
Total PCBs (ngg ⁻¹)	<0.2
Tyres Analysis	
Sample No.	1
Antimony, Sb (ppm)	<10
Mercury, Hg (ppm)	<10
Arsenic, As (ppm)	<10
Lead, Pb (ppm)	<10
Chromium, Cr (ppm)	<10
Copper, Cu (ppm)	35
Cobalt, Co (ppm)	<10
Vanadium, Va (ppm)	<10
Cadmium, Cd (ppm)	<10
Thallium, Tl (ppm)	<10
Nickel, Ni (ppm)	<10
Manganese, Mn (ppm)	80
Zinc, Zn (ppm)	300
Total S as SO ₃ (%)	1.07
F (%)	0.02
Cl (%)	<0.01
Br (%)	<0.01
I (%)	<0.01
Gross CV (kJ/kg)	37846
Net CV (kJ/kg)	36275

Appendix 4: CEMs vs. Continuous Extractive Gas Analysis

Figure 7 : Baseline Comparison

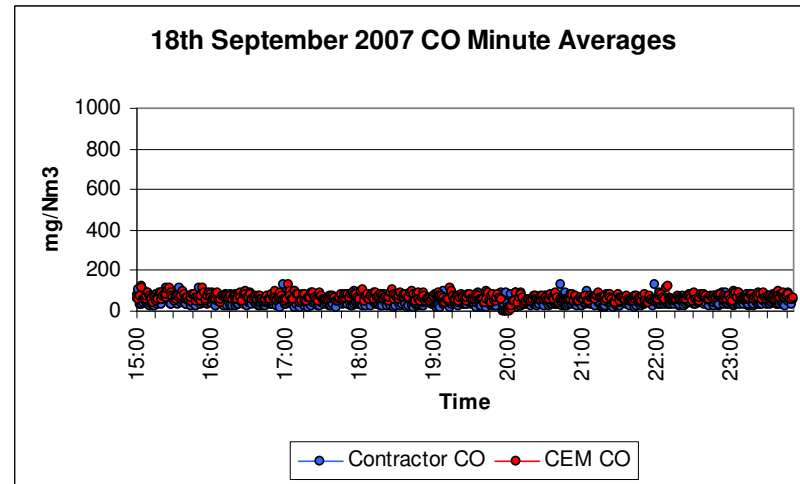
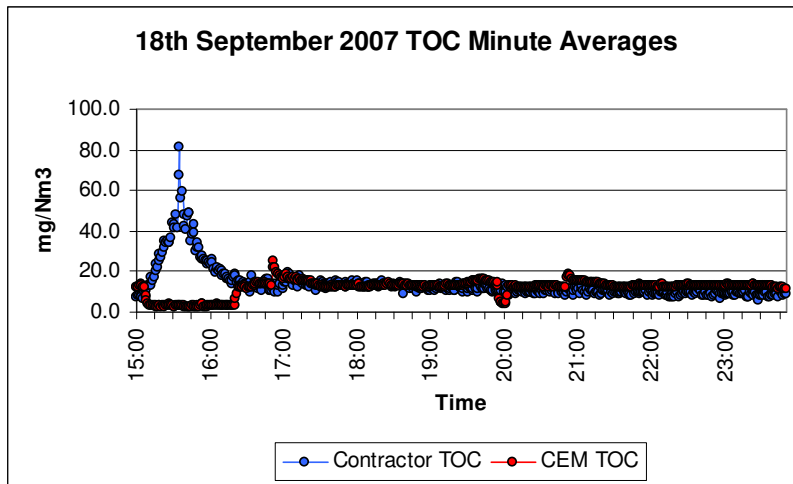
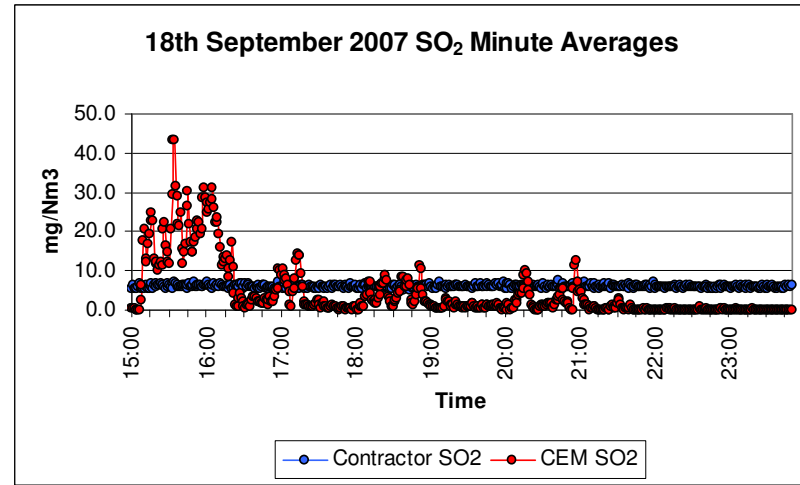
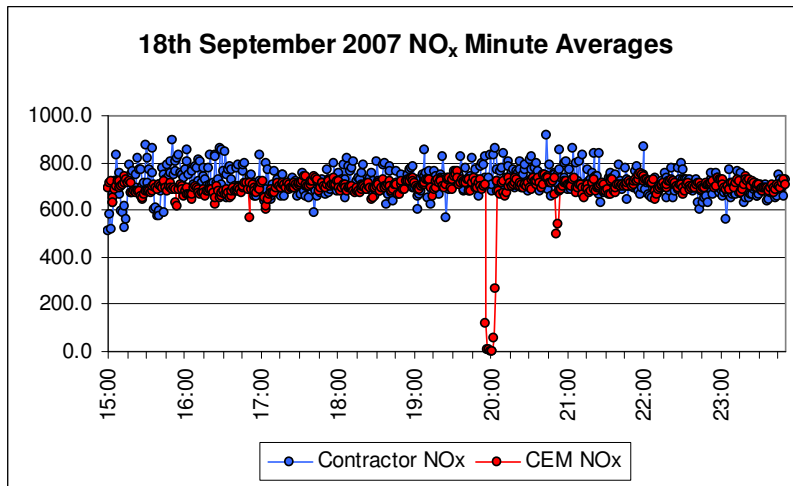
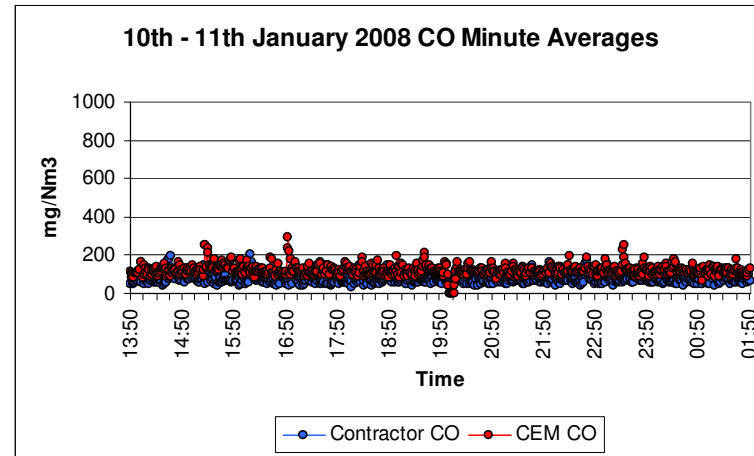
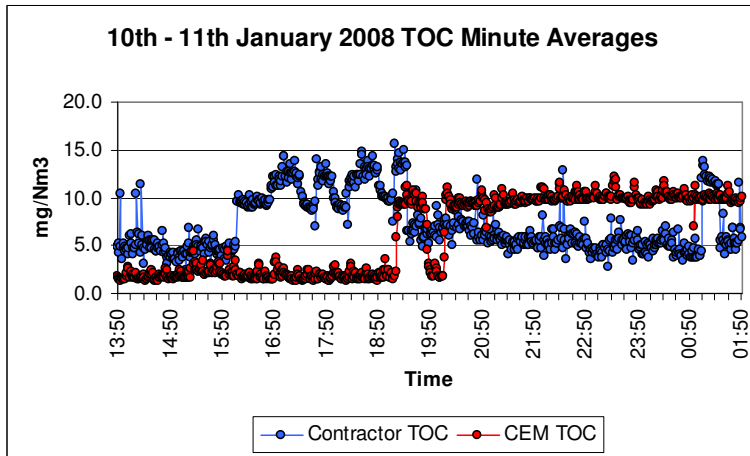
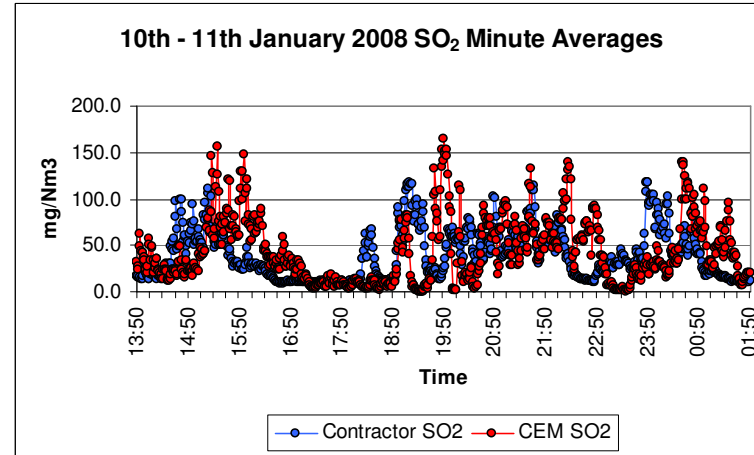
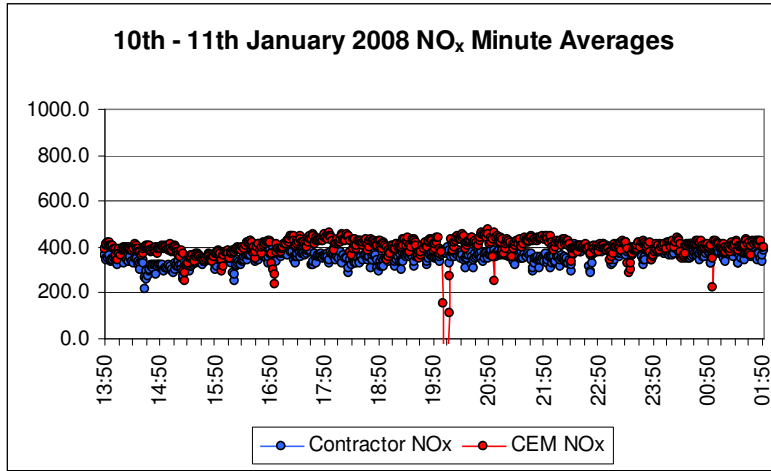


Figure 8: 6tph Tyre Trial Comparison



Appendix 6: Check Monitoring and Periodic Testing – Deviations and Monitoring Uncertainty

Note. N/A means not applicable

3tph Baseline

Emission Point Reference	Substance Deviations	Monitoring Deviations	Other Relevant Issues
Mainstack	Particulates, Dioxins, PAH's, HF, Heavy Metals and Mercury	A 0.6cm nozzle or higher is recommended for isokinetic testing in BS EN 13284-1, however a 0.46cm and 0.41cm nozzle was required	N/A
Mainstack	Heavy Metals	The impinger absorption efficiency for group 3 metals is 95% in the first two Acid H ₂ O ₂ Solution Impingers, and 5% in the third Acid H ₂ O ₂ Solution Impinger. The efficiency was not met for Run 1, Run 2 and Run 3	N/A
Mainstack	HCl	A 95% impinger efficiency was not met for runs 1 & 2 for the HCl extractive tests	N/A

6 tph Tyre Trial

Emission Point Reference	Substance Deviations	Monitoring Deviations	Other Relevant Issues
Mainstack	Particulates, Dioxins, PAH's, HF, Heavy Metals and Mercury	A 0.6cm nozzle or higher is recommended for isokinetic testing in BS EN 13284-1, however a 0.42cm and 0.48cm nozzle was required	N/A
Mainstack	HCl	A 95% impinger efficiency was not met for runs 1 & 2 for the HCl extractive tests	N/A

Uncertainty of Measurement

Each quoted result includes an estimation of uncertainty which takes into account all significant identified uncertainties in the measurement and testing/calibration process, including those attributable to measuring equipment, reference standards, staff operating equipment, test facilities, measurement procedures, sampling and environmental conditions, internal and external quality control schemes. Where a result is determined as being less than the measurement uncertainty value associated with that result, the result is reported as less than the value of the measurement uncertainty. Generally, the uncertainty error tends to reduce from 100% to 10-20% as the measured value increases beyond the detection limit. The measurement uncertainty does not take into account variables associated with the process being measured.

Appendix 7: Sampling Point Details

The sampling point for the baseline and tyre trial was the main stack A1 in a vertical, straight piece of ducting which is of constant shape and cross sectional area and positioned so that it is free from potential disturbance of gas flow. There are 4 sample points at 90 degrees from each other, all 4" BSP.

The sample plane criteria are met if there are five hydraulic diameters of straight duct upstream of the sampling plane and two hydraulic diameters downstream. The duct has a hydraulic diameter of 4.2m and the distances up and downstream of the sampling plane are given 31.5m and 13.6m respectively meaning that sample plane criteria are satisfied.

BS6069 additionally requires the sample plane to be a minimum distance of five hydraulic diameters from the stack inlet, at least one hydraulic diameter from a bend or junction, at least three hydraulic diameters from a partial closed damper and at least four from the discharge of a fan. All of these criteria are satisfied by the sampling point

Environment Agency guidance note M1 states that the angle of gas flow should be $\leq \pm 15^\circ$ from the stack longitudinal axis, with no negative flow. The ratio of highest to lowest local gas velocities must be less than 3:1. Additionally BS 6069 specifies the temperature (in Kelvin) must be $\leq \pm 5\%$ from the mean temperature at any point. Compliance was ascertained through a preliminary velocity survey by external consultants before the first use of the sampling planes, as suggested in M1 section 2.1.4 and 2.1.5. No unacceptable characteristics were identified.

The number of sampling points on the sampling plane for the main stack has been determined by the diameter of the stack in accordance of Table 2.3 of M1. The sampling plane for the main stack has been divided into equal areas and is carried out from points in the centres of these areas. The position of these sampling points was determined in accordance with Table 2.5 of M1.

Sampling must be carried out from a sampling position where the gases are homogeneous and there is positive flow. This was established through the initial exploratory survey carried out on the main stack. Homogeneity has been established as specified in ISO 10396 by external emissions contractors.

The probe should be positioned between one-third and half way into the stack according to ISO 10396. Compliance is maintained by using an insertion depth of 2m inside a 4.2m diameter stack