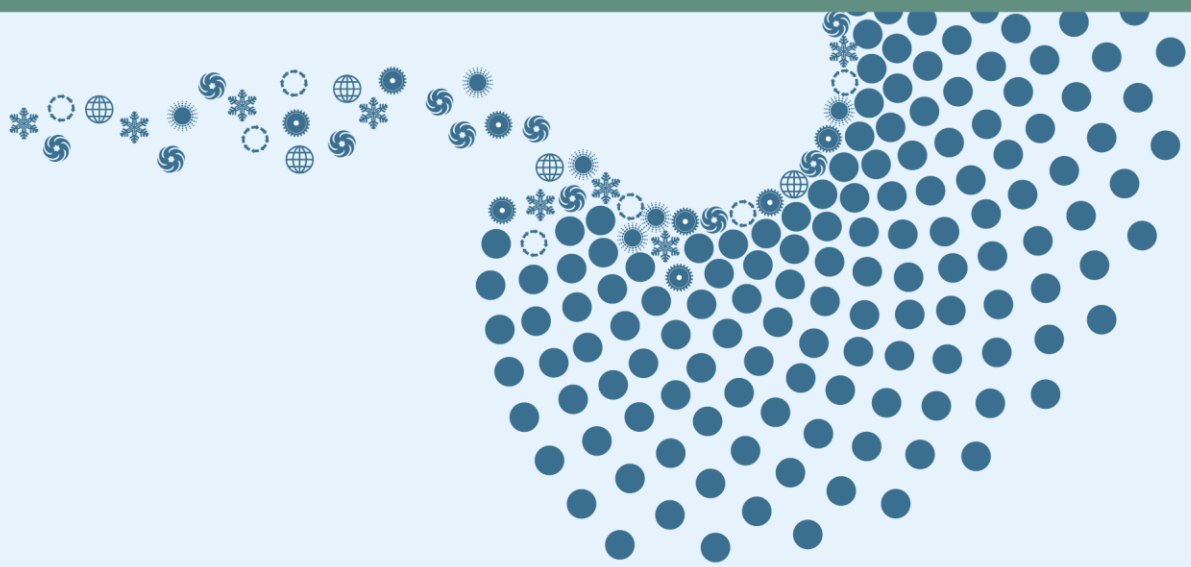
Statens forurensningstilsyn
Norwegian Pollution Control Authority

URBAN BACKGROUND LEVELS OF DIOXIN AND PCB IN OSLO

2453
2008



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Urban Background Levels of Dioxin and PCB in Oslo

Report
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Preface

In this report NILU presents and discusses measurements of air concentrations of dioxins and PCB. These measurements were performed from October to January 2007/2008 at Sofienbergparken in Oslo on an assignement from SFT.

We acknowledge the possibility to use Oslo community's background air quality measurement station (Sofienbergparken Oslo kommune, Helse- og Velferdsetaten) for these measurements.

Furthermore, we thank Harold McIness, Franck Dauge, Dana Rango, Christin Bråten, and Hans Gundersen from NILU for sampling, sample preparation and chemical analysis.

SFT, Oslo, December 2008

Martin Schlabach
Senior scientist, NILU

Contents

1. Summary

Urban areas have been identified as major sources for airborne dioxins and PCB, two important members of the family of halogenated organic compounds. These compounds have been shown to bioaccumulate in humans and wildlife due to their lipophilic properties, and are known teratogens, mutagens, and carcinogens. Direct uptake from contaminated air to the human body is only a very minor pathway and the main reason for studying air concentrations is the importance of atmospheric long-range transport from source areas to areas of agriculture or marine food production. In such areas bioaccumulation magnifies the concentration of dioxins and PCB in food to the extent that the concentrations in same cases reach levels of environmental or human health concern.

Since there are no recent measurements of airborne dioxins and only few of PCB, measurements of these compound groups were initiated by SFT in late 2007 at Sofienbergparken, Oslo. The study was designed in a way which should allow to identify episodes with and without wood burning.

The average dioxin concentration of the 19 samples was 28,2 TE(WHO) fg/m^3. The lowest concentration, 4,80 TE(WHO) fg/m^3, was measured in sample 7 from 07.-08.12.2007 and the highest concentration, 86,5 TE(WHO) fg/m^3 or 20-fold higher, in sample 13 from 19.-20.12.2007.

The average PCB-7 concentration of the 19 samples was 31,8 pg/m^3. The lowest concentration, 15,3 pg/m^3, was measured in sample 19 from 04.-05.01.2008 and the highest concentration, 61,9 pg/m^3 or4-fold higher, in sample 5 from 04.-05.12.2007.

The air concentrations of dioxins and PCB measured at Sofienbergparken are in the same range as measured at other urban background stations around the world. There is a remarkable reduction of the dioxins concentrations from 1989 to 2007 with 3 times lower concentrations today. This reduction is attributed to the ban of leaded gasoline and a general reduction of the major dioxins emissions to air.

The huge variability of the dioxins concentration which correlates strongly with reverse temperature, is a strong indication that wood burning for household heating is a major source for airborne dioxins. Traffic related emissions and atmospheric long range transport do not seem to contribute significantly to the dioxins level at this station. This conclusion agrees very well with the findings of Statistics Norway which calculated that household heating stands for about 20 % of the total Norwegian dioxin emission to air (7 g of about 34 g in 2000). However, these numbers were estimated to be very uncertain because the type of fuel (clean wood, impregnated wood, coloured newspapers or milk cartons) will change the emission factors extremely (1 µg I-TE/t fuel (clean wood) and 500 µg I-TE/t fuel (impregnated wood)). With other words, in order to reduce the emissions of dioxins from household heating it is essential to use clean firewood only. Burning of newspapers, milk cartons, plastic, and especially impregnated wood must be avoided.

Due to the limited data set and to the short measurement period, a quantification of the different sources and an estimation of the strength of the minor sources are not possible. Therefore it is not possible to exclude traffic completely as a source of dioxins emissions.

The PCB concentrations is, compared to dioxin concentrations, less variable and do not correlate to any of the measured meteorological parameter. This fact indicates that the emission sources for PCB are spread and diverse and not as dependent on temperature as for dioxins. Due to the limited data set and to the short measurement period, a quantification of the different source and an estimation of the strength of the minor sources are not possible. Therefore it is not possible to exclude household heating completely as a source of PCB emissions.

2. Norsk sammendrag (Norwegian summary)

Byer og tettsteder er kjent som områder med forhøyete dioksin- og PCB-konsentrasjoner i luft. Disse to substansgrupper er de mest kjente klorerte organiske miljøgifter. Disse forbindelser har i lengre tid vært i fokus på grunn av toksisitet, bioakkumulering (anrikning i både mennesker og dyr) og persistens (vanskelig nedbrytbarhet). Direkte menneskelig opptak fra kontaminert byluft er av marginal betydning. Hovedargumentet for å studere byluft er derimot at her forventer man viktige kilder for dioksiner og PCB. Disse stoffer kan så transporteres med luftstrømninger til jordbruksområder og havområder hvor de gjennom avsetning, opptak og bioakkumulering kan komme opp i konsentrasjoner som i noen tilfeller er grunn til bekymring for både helste og miljø. For å kunne sette i gang reduserende tiltak må man kjenne til alle relevante kilder.

Det finns ingen nyere dioksinmålinger i luft og bare begrenset med PCB-målinger fra norske byer. På slutten av 2007 SFT satt derfor i gang en undersøkelse av disse stoffer i Oslo. Prøvene blir tatt i perioder med begrenset og med utpreget grad av vedfyring for å studere effekten av vedfyring.

Det blir totalt tatt 19 prøver og gjennomsnittet av dioksinkonsentrasjon i luft var 28,2 TE(WHO) fg/m^3. Lavest konsentrasjon, 4,80 TE(WHO) fg/m^3, ble målt i prøve 7 fra perioden 07.-08.12.2007 og høyest konsentrasjon, 86,5 TE(WHO) fg/m^3 eller 20-ganger høyere, ble målt i prøve-13 fra perioden 19.-20.12.2007.

Gjennomsnittet av luftkonsentrasjon av de 7 indikator PCB (28, 52, 101, 118, 138, 153 og 180) var 31,8 pg/m^3. Lavest konsentrasjon, 15,3 pg/m^3, ble målt i prøve 19 fra perioden 04.-05.01.2008 og høyest konsentrasjon, 61,9 pg/m^3 eller 4 ganger høyere, i prøven 5 fra perioden 04.-05.12.2007.

Luftkonsentrasjonene av dioksiner og PCB målt i Sofienbergparken in Oslo ligger i samme konsentrasjonsområde som målt i andre urbane bakgrunnsområder i resten av verden. Dioksinkonsentrasjoner målt i 2007 er cirka 3 ganger lavere enn det som ble målt i Oslo i 1989. Denne reduksjonen tilskrives hovedsakelig utfasing av blyholdig bensin og en generell reduksjon av andre viktige dioksinkilder.

Den store variabiliteten av dioksinnivået som korrelerer utpreget med temperatur, er et sterkt indisium for at vedfyring i forbindelse med boligoppvarming er en betydelig kilde for dioksiner i luft. Trafikkrelaterte utslipp og atmosfærisk langtransport ser ikke ut til å bidra vesentlig til dioksinnivået ved denne stasjonen. Denne konklusjonen stemmer veldig godt overens med beregninger som Statistisk sentralbyrå (SSB) har foretatt for 2000. Disse viser at vedfyring i husholdninger bidrar med cirka 20 % til det totale dioksinutslippet til luft. Det hefter imidlertid stor usikkerhet ved dette estimatet, da dioksinutslippet varierer sterkt med varierende brenselsammensetning fra 1 µg I-TE per ton ren ved til 500 µg I-TE per ton impregnert ved og fyringsvanene er dårlig kartlagt. For å redusere dioksinutslippet fra vedfyring mest mulig er det nødvendig å fyre utelukkende med ren ved og unngå all brenning av avispapir, melkekartonger, plastikk eller impregnert/malt trematerial.

På grunn av det begrensete datasetet og den korte måleperioden er det ikke mulig å kvanifisere betydning av de forskjellige kilder og betydningen av de mindre kilder kan ikke bestemmes. Det er derfor heller ikke mulig å fullstendig utelukke trafikkutslipp som dioksinkilde.

PCB-nivået er mye mindre variabelt sammenlignet med dioksinnivået og PCB-konsentrasjonene korrelerer ikke med noen av de målte meteorologiske parametre. Dette tyder på at sammensetning av PCB-kildene er adskillige mer heterogent og spredt og ikke så avhengig av temperatur. På grunn av det begrensete datasetet og den korte måleperioden er det ikke mulig å kvanifisere betydning av de forskjellige kilder og betydningen av de mindre kilder kan ikke bestemmes. Det er derfor heller ikke mulig å fullstendig utelukke vedfyring som PCB-kilde.

3. Introduction

Polychlorinated dibenzodioxins (PCDD) and polychlorinated dibenzofurans (PCDF), commonly often simply denoted as dioxins, are, together with polychlorinated biphenyls (PCB), important members of the family of halogenated organic compounds (Benestad, 1994). These compounds have been shown to bioaccumulate in humans and wildlife due to their lipophilic properties, and are known teratogens, mutagens, and carcinogens.

The sampling station "Sofienbergparken" is located a few kilometers north of downtown Oslo (Figure 1). It is characterized as an urban background station. During winter time it is expected that this location is mainly influenced by wood burning and partly by traffic related emissions.

The sources for dioxins are unintentional by-products of thermal processes and chloro-chemical processes. Municipal waste incineration, hazardous waste incineration, metal industry, car traffic, and cable burning are identified as important sources and and measures were taken to reduce their emissions. Due to the reduction of these sources, the relative contribution of wood burning for house heating and accidential fire in PVC or PCB-containing constructions are probably increasing.

In contrast to dioxins, PCB was intentionally produced and sold for use in a lot of different industrial and other applications as in transformers and capacitors, hydraulic fluids, sealants, adhesives, wood floor finishes, and paints.

Direct uptake from contaminated air to the human body is only a very minor pathway () and the main reason for studying air concentrations is the importance of atmospheric long-range transport from source areas to areas of agriculture or marine food production. In such areas bio-accumulation magnifies the concentration of dioxins and PCB to the extent that the concentrations in some cases reach levels of environmental or human health concern.

Urban areas have been identified as major source for airborne dioxins and PCB. Since there are no recent measurements of airborne dioxins and only few of PCB, measurements of these compound groups were initiated by SFT in late 2007. The study was designed in a way which should allow to identify episodes with and without wood burning.

4. Sampling station and sampling

4.1. Målestasjon: Sofienbergparken

The sampling station "Sofienbergparken" is located a few kilometers north of downtown Oslo (Figure 1). It is characterized as an urban background station. During winter time it is expected that this location is mainly influenced by wood burning and partly by traffic related emissions. At this site PM_{10} is measured during the whole year.

Figure 1: Location of "Sofienbergparken" urban background measurement station.

4.2. Sampling method

For sampling a modified Digitel High Volume sampler was used equipped with a combination of a filter holder and a glass tube holder for polyurethane foam plugs. , a combination of glass fiber filter and two polyurethane foam (PUF) plugs (25 kg/m^3, 7,5×5 cm) was used (e.g. Thrane and Mikalsen, 1981). Flow rate was set to 30 m3/h. Sampling was started at 9 a.m. the first day and stopped at 9 a.m. the second day, 24 h in total, which gives a total sample volume of about 700 m^3.

Before sampling, the glass fiber filter was cleaned by heating to 450 for 8 h. The PUFs were pre-extracted with acetone and toluene for 8 h using Soxhlet extraction and then dried under vacuum.

4.3. Samples and meteorological data

The date and time for sampling start and stop are given in Table 1.
In addition the most important meteorological parameters measured at the Meteorological Institute, Blindern, Oslo are given.

Table 1: Sampling date and time and the most important meteorological data measured at Blindern.

Sample ID	Start date	Time	Stop date	Time	Temperature [°C]	Wind speed [m/s]	Precipitation [mm]
1	18.10.2007	15:46	19.10.2007	15:46	4,5	2,6	.
2	22.10.2007	08:25	23.10.2007	08:25	7,8	3,2	0,0
3	23.10.2007	08:32	24.10.2007	08:32	5,9	1,2	0,0
4	03.12.2007	10:42	04.12.2007	10:42	2,5	3,8	2,4
5	04.12.2007	11:10	05.12.2007	11:10	-1,0	0,9	0,3
6	05.12.2007	11:20	06.12.2007	11:20	4,4	1,8	5,4
7	07.12.2007	09:22	08.12.2007	09:22	3,9	1,7	4,5
8	10.12.2007	10:23	11.12.2007	10:23	2,1	2,8	0,3
9	11.12.2007	10:29	12.12.2007	10:29	0,4	3,8	0,0
10	13.12.2007	13:47	14.12.2007	13:47	-6,6	1,5	.
11	17.12.2007	08:52	18.12.2007	08:52	-7,1	0,5	.
13	19.12.2007	09:09	20.12.2007	09:09	-9,2	1,0	.
15	21.12.2007	09:16	22.12.2007	09:16	-8,8	0,7	.
16	27.12.2007	09:23	28.12.2007	09:23	5,6	5,2	0,0
17	28.12.2007	09:26	29.12.2007	09:26	2,6	2,1	0,4
18	02.01.2008	09:41	03.01.2008	09:41	0,4	3,7	1,1
19	04.01.2008	09:01	05.01.2008	09:01	-2,3	4,5	0,9

4.4. Analytical methods

After sampling the exposed filter and PUFs were sent to the laboratory for analysis. A mix of ^{13}C-isotope-labeled standards of dioxins and PCBs was added to filter and PUFs and they were Soxhlet extracted using toluene.

For the determination of PCDD/Fs the following procedure was used: A column was filled with 650 ml cyclohexane/dichloromethane 1 + 1. The sample was passed through column 1 (30 g of silica, and 30 g of KOH-coated silica, bottom to top) and column 2 (20 g KOH-coated silica and 30 g silica, bottom to top) and eluted into column 3 (activated charcoal (AX21) suspended on glass fibres). The PCB-fraction and undesired matrix compounds were removed from column 3 with 75 ml cyclohexane/dichloromethane 1 + 1 and 75 ml dichloromethane. PCDD/PCDF were eluted with 40 ml toluene in reverse flow direction. A final clean-up was performed on two small columns (Pasteur pipettes) filled with sulphuric acid coated silica and aluminium oxide. The dissolved sample was placed on the first column and the PCDD/F-fraction was eluted into the aluminium oxide layer with hexane. The second pipette was first eluted with 5 ml hexane/DCM 98 + 2 (waste) and then with 5 ml hexane/DCM 1 + 1 (PCDD/F). Just before quantification the extract was spiked with a recovery control standard.

The isomer identification and quantification of dioxins was done with GC/MS using a Hewlett-Packard 5890II gas chromatograph coupled to a VG AutoSpec mass spectrometer. The separation of the PCDD and PCDF congeners was carried out on a 30 m × 0.25 mm × 0.11 μm DB-5ms fused silica column. For samples of crab and mussel PCDD, PCDF and non-ortho PCB were separated on a 30 m × 0.25 mm × 0.11 μm Rtx-2330 fused silica column. The detection and quantification was done using high resolution mass spectrometry (res > 10 000) with electron impact ionisation. Two masses were monitored for each isomer group. The added 13C-labelled congeners were used as internal standard for each group. Additionally, the recovery of the added internal standard compounds were determined.

The PCB-fraction was pre-concentrated and 2 ml concentrated sulphuric acid was added in order to eliminate other non-persistent components. The organic phase was then cleaned using a silica column (4 g silica) eluted with n-hexane/diethyl ether. The sample was further concentrated by applying a gentle stream of purified nitrogen. After volume reduction to approximately 0.1 ml, tetrachloronaphthalene was added as a recovery standard. The isomer identification and quantification was done with GC/MS using a Hewlett-Packard 5890II (1990–2003) or 6890 (2003–2006) gas chromatograph coupled to an AutoSpec mass spectrometer (Micromass Waters, Manchester, UK). The high-resolution gas chromatographic conditions were as follows: separation on a 50m×0.22mm inner diameter fused silica capillary coated with 0.15µm of HT-8; carrier gas, He, at a flow of 35–40 cm/s (90°C) splitless injection of 1µL; splitless time 2 min; injector temperature 280_C; temperature program 90_C for 2 min, then 25°C/min to 170°C, and 3°C/min to 300°C, finally 3 min isothermal.

The detection and quantification was done using high resolution mass spectrometry (resolution >10 000) with electron impact ionization. Two masses were monitored for each isomer group. Compounds with certified purity (±98%) were used as reference standards. A rigorous quality control concept for the determination of organic compounds in air based on the requirements in the European quality norm NS-EN ISO/IEC 17025 was applied. Before each new series of samples the blank values of the complete clean-up and quantification procedures are determined. Clean-up of samples has only started when a sufficiently low blank value was obtained (not detectable or at least 10 times lower than the lowest expected results).

Criteria for quantification were: The retention of the ^{12}C compound must not be later than 3 s compared to the corresponding ^{13}C-labeled isomer and the isotope ratio of the two monitored masses must be within ±20% of the theoretical value. For quantification the signal/noise ratio must be higher than 3/1 and recovery of the added ^{13}C labelled internal standards must be within 40 to 130% (trichlor PCBs 20–130%).

5. Results

In Table 2 the results of the determination of dioxins and PCB in 17 air samples taken at Sofienbergparken, Oslo are shown in a summarized way. The compound group dioxins includes 210 single compounds. In most cases the 17 most toxic compounds are determined and the toxic equivalent (TE), as a weighted sum, is calculated. This parameter together with the sum of 7 indicator PCB (PCB-7) and the sum of all detected PCBs (Sum PCB) is shown in the table below. The results of all determined dioxins and PCB congeners are shown in the appendix.

The average dioxins concentration of the 19 samples was 28,2 TE(WHO) fg/m^3. The lowest concentration, 4,80 TE(WHO) fg/m^3, was measured in sample 7 from 07.-08.12.2007 and the highest concentration, 86,5 TE(WHO) fg/m^3 or 20-fold higher, in sample 13 from 19.-20.12.2007.

The average PCB-7 concentration of the 19 samples was 31,8 pg/m^3. The lowest concentration, 15,3 pg/m^3, was measured in sample 19 from 04.-05.01.2008 and the highest concentration, 61,9 pg/m^3 or 4-fold higher, in sample 5 from 04.-05.12.2007.

Table 2: Results of the determination of dioxins and PCB in 17 air samples taken at Sofienbergparken, Oslo.

Sample ID	Dioxins	PCB-7	Sum PCB
	[TE(WHO) fg/gm^3]	[pg/m^3]	[pg/m^3]
1	6,90	50,5	229
2	10,6	31,3	132
3	13,7	40,5	173
4	10,3	43,6	201
5	48,1	61,9	257
6	6,03	41,2	172
7	4,80	22,4	96,5
8	10,8	20,3	80,5
9	28,7	22,1	101
10	48,6	19,9	98,7
11	72,7	28,0	132
13	86,5	29,7	129
15	68,3	27,8	129
16	5,11	27,0	126
17	17,2	42,1	188
18	11,8	16,5	71,7
19	30,1	15,3	156
Average	**28,2**	**31,8**	**145**
Min	4,80	15,3	71,7
Max	86,5	61,9	257

fg: femtogram or 10-15 g;
pg: pictogram or 10^{-12} g;
TE(WHO): The different dioxins congeners show very different toxicity. Therefore dioxins are normally presented not as a simple sum of all measured concentrations but as a sum of the toxic equivalents (TE) of the different congeners.
PCB-7: Sum of the 7 indicator PCB-28, 52, 101, 118, 138, 153, and 180.
Sum PCB: Sum of all detected PCB.
Average: Average of in total 19 24h-samples taken in the period 19.10.2007 to 05.01.2008.

6. Discussion

6.1. Concentration levels

6.1.1. Dioxins

Airborne dioxins have not been measured in Oslo for nearly 20 years. In 1991 Oehme et al. published dioxins measurements from Vålerenga and from the center of Oslo with concentrations ranging from 40 to 200 fg TE(Nordic)/m^3 and an average of about 100 fg TE(Nordic)/m^3. The average concentration in this study from 2007 was about 30 TE(WHO) fg/m^3. The difference in the two TE calculation systems, Nordic contra WHO, are neglectible. The difference between 1989 and 2007 reflects a real reduction of dioxin air concentrations. This reduction is also traceable in other cities and in a lot of other environmental samples and is attributed to the ban of leaded gasoline and a general reduction of the major dioxins emissions to air. The reason for traffic related dioxins formation was the use chlorinated scavengers in leaded gasoline in order to protect for lead depositions in the engine. A similar reduction has also been calculated by Statistics Norway. The emission factor for gasoline driven cars were estimated to be 1,32 ng I-TE/kg fuel for 1990 and 0,1 ng I-TE/kg fuel for 2000 (Finstad et al., 2002).

Recent measurements in other comparably cities are scarce and most of the measurements are coming from highly contaminated Asian cities. A short selection of measurements are shown in Table 3.

Table 3: Comparison of dioxins concentration i Urban air samples from different locations.

Location and Year	Dioxin concentration Average, (Min. - Max.) [TE fg/m^3]	Reference
Sofienbergparken, 2007	28,2 (4,80 - 86,5)	This study
Vålerenga, 1989	100 (40/200)	Oehme et al. 1991
Athens, 2000	(42 – 73)	Mandalakis et al. 2002
Roma, 2001	46,9 (4,4 - 245)	Turrio-Baldassarri et al. 2005
Beijing, 2006	268 (18 - 644)	Li et al. 2008

The measured dioxins concentrations are quite variable and span over a remarkable huge range with the maximum level (86,5 TE fg/m^3) nearly a factor of 20 higher than the lowest concentration (4,8 TE fg/m^3). This variation is much higher for dioxins than for PCB with a factor of 4 only.

6.1.2. PCB

From December 2001 to October 2002 10 monthly air samples were taken at Sjursjøya in the Oslo harbor. The average concentration measured in this campaign was 54 pg/m^3 PCB-7 which is slightly higher than the average PCB-7 in this study with 32 pg/m^3. It is not possible to prove that this difference is real. Possible explanations would be a decreasing time trend or a higher exposure due to the vicinity to the highly contaminated Oslo harbor basin. A short selection of measurements are shown in Table 3.

Table 4: Comparison of dioxins concentration in urban air samples from different locations.

Location and Year	PCB-7 Concentration Average, (Min. - Max.) [pg/m3]	Reference
Sofienbergparken, 2007	31,8 (15,3 - 61,9)	This study
Sjursjøya, 2002	54	Breivik et al.
Athens, 2000	41,7	Mandalakis et al. 2002
Seoul, 1999	42,2	Yeo et al. 2004

6.2. Congener pattern

Both PCDD/PCDF and PCB are mixtures of maximal 210 different chemical substances.The single compounds are often termed as congeners. Different sources of PCDD and PCDF can often be identified by their destinct relative contribution of the single PCDD and PCDF congeners (pattern). By the specific pattern the most prominent source of PCDD/PCDF emission in Norway, Hydros magnesium plant located close to Porsgrunn, could be traced all along the south coast of Norway.

In
Figure 2 the relative contribution of the 17 different 2378-chlorosubstituted dioxins congeners of the samples with lowest and highest concentrations are shown. The pattern of both samples are very similar. This indicates that the major sources for the dioxins contamination in these samples are identical and only varying in strength.

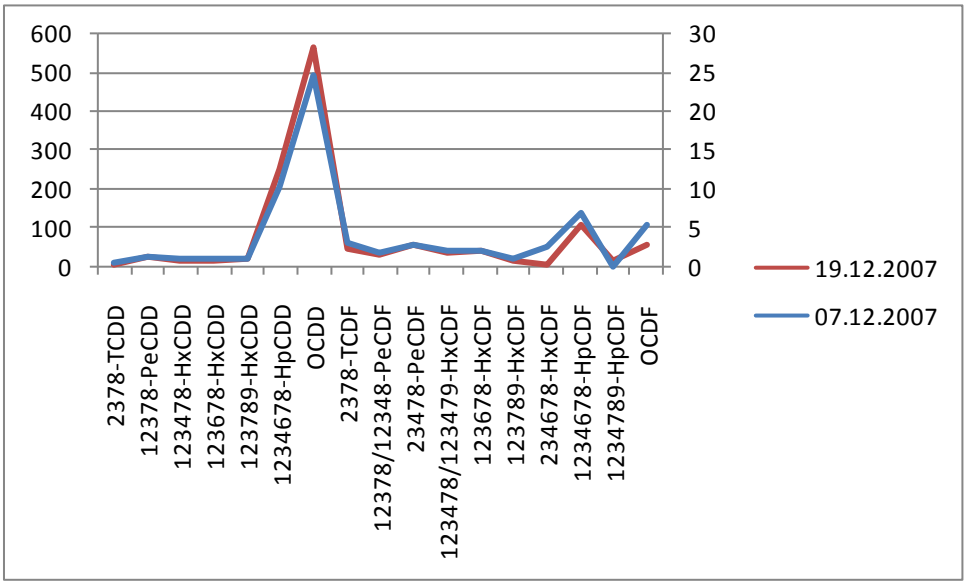

Figure 2: Relative contribution of the 17 different 2378-chlorosubstituted dioxins congeners. The samples with lowest and highest concentration are shown.

A similar picture could be drawn for the PCB congeners.

6.3. Correlation to meteorological conditions

The correlation between the measured dioxins and PCB air concentrations and some meteorological parameters measured at Blindern or Valle Hovin were tested. The correlation coefficients are shown in Table 5.

Table 5: Correlation coefficient between air concentrations and some meteorological parameters measured at Blindern or Valle Hovin.

Parameter combination	Correlation coefficient
dioxins [TE fg/m3] and Temperature [°C]	-0,926
dioxins [TE fg/m3] and Stability ΔT [°C]	-0,307
Sum PCB [pg/m3] and Temperature [°C]	0,197
Sum PCB [pg/m3] and Stability ΔT [°C]	0,358
Sum PCB [pg/m3] and Wind speed [m/s]	-0,174
Sum PCB [pg/m3] and Precipitation [mm]	0,012

The only significant correlation is observed for the combination of dioxin air concentrations and the temperature. The negative correlation coefficient means that with decreasing temperature there is an increasing chance to measure high dioxin concentrations. For all other parameters there are only weak or no correlations.

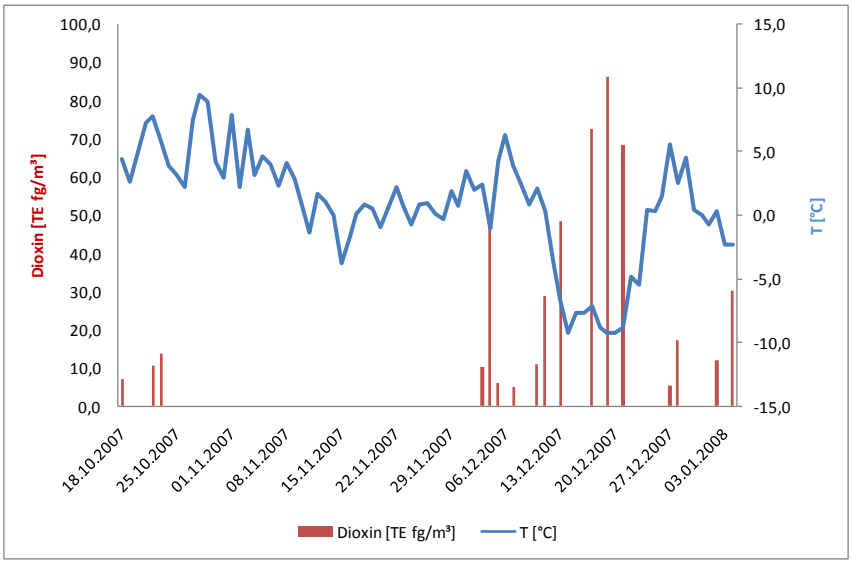

Figure 3: dioxins [TE fg/m3] air concentrations (Sofienbergparken) correlated to temperature [°C] (Blindern) for mid October 2007 to early January 2008.

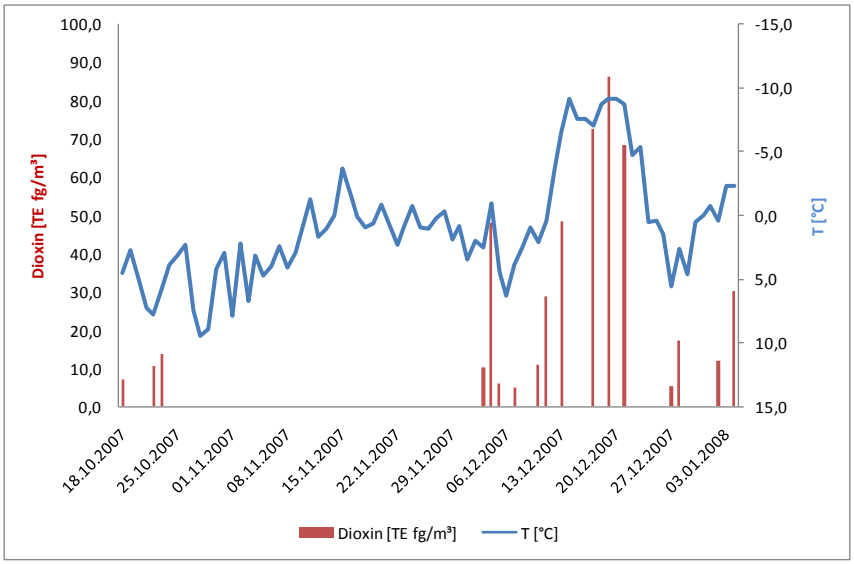

Figure 4: dioxins [TE fg/m3] air concentrations (Sofienbergparken) correlated to temperature [°C] (Blindern) for mid October 2007 to early January 2008 (Remark: Reverse temperature scale!).

7. Conclusions

The air concentrations of dioxins and PCB measured in Sofienbergparken are in the same range as measured at other urban stations around the world. There is a remarkable reduction of the dioxins concentrations from 1989 to 2007, with 3 times lower concentrations today. This reduction is attributed to the ban of leaded gasoline and a general reduction of the major dioxins emissions to air.

The huge variability of the dioxin concentrations which correlates strongly with temperature, is a strong indication that household heating is a major source for airborne PCDD/F. Traffic related emissions and atmospheric long range transport do not seem to contribute significantly to the dioxin levels at this station. Due to the limited data set and to the short measurement period, a quantification of the different source and an estimation of the strength of the minor sources are not possible. Therefore it is not possible to exclude traffic completely as a source of dioxin emissions.

This conclusion agrees very well with the findings of Statistics Norway. Finstad et al. (2002) calculated the total Norwegian dioxin emission to air to be about 34 g for 2000. Household heating was estimated to contribute with about 7 g per year. However, these numbers were estimated to be very uncertain because the type of fuel (clean wood, impregnated wood, coloured newspapers or milk cartons) will change the emission factors extremely (1 µg I-TE/t fuel (clean wood) and 500 µg I-TE/t fuel (impregnated wood)). With other words in order to reduce the contribution of dioxins from household heating it is essential to use clean firewood only. Burning of newspapers, milk cartons, plastic, and especially impregnated wood must be avoided.

The PCB concentrations are, compared to dioxin concentrations, less variable and do not correlate to any of the measured meteorological parameter. This fact indicates that the emission sources are spread and diverse and not as dependent on temperature as PCDD/F. Due to the limited data set and to the short measurement period, a quantification of the different sources and an estimation of the strength of the minor sources are not possible. Therefore, it is not possible to exclude household heating completely as a source of PCB emissions.

8. References

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Appendix A

Results of PCB Analysis

Encl. to measuring report: O-4932
NILU-Sample number: 07/1710
Customer: SFT
Customers sample ID: Sofienberg 1
: 18-19.10.07, 15:46-15:46
Sample type: Luft
Sample amount: 695 m3
Concentration units: pg/m3
Data files: DI081

Compound Structure	IUPAC-no.	Concentration pg/m3		Recovery %	TE (WHO) fg/ m3
PeCB		3,56		24	
HCB		60,5		24	
2,2',5-TriCB	18	33,0			
2,4,4'-TriCB	**28**	**16,9**		44	
2,4',5-TriCB	31	17,2			
2',3,4-TriCB	33	10,5			
3,4,4'-TriCB	37	< 0,02			
Sum-TriCB		***120***			
2,2',4,4'-TetCB	47	13,3			
2,2',5,5'-TetCB	**52**	**17,6**		47	
2,3',4,4'-TetCB	66	2,48			
2,4,4',5-TetCB	74	1,94			
Sum-TetCB		***66,9***			
2,2',4,4',5-PenCB	99	2,40			
2,2',4,5,5'-PenCB	**101**	**8,43**		49	
2,3,3',4,4'-PenCB	105	0,74		49	0,07
2,3,4,4',5-PenCB	114	0,09		52	0,04
2,3',4,4',5-PenCB	**118**	**2,41**		53	0,24
2'3,3',4,5-PenCB	122	0,03			
2',3,4,4',5-PenCB	123	0,05		52	0,01
Sum-PenCB		***24,5***			
2,2',3,3',4,4'-HexCB	128	0,34			
2,2',3,4,4',5'-HexCB	**138**	**1,90**		51	
2,2',3,4,5,5'-HexCB	141	0,55			
2,2',3,4',5',6-HexCB	149	3,16			
2,2',4,4',5,5'-HexCB	**153**	**2,58**		40	
2,3,3',4,4',5-HexCB	156	0,17		53	0,09
2,3,3',4,4',5'-HexCB	157	0,05		52	0,02
2,3',4,4',5,5'-HexCB	167	0,07		52	0,00
Sum-HexCB		***15,1***			
2,2',3,3',4,4',5-HepCB	170	0,27			
2,2',3,4,4',5,5'-HepCB	**180**	**0,73**		40	
2,2',3,4,4',5',6-HepCB	183	0,22			
2,2',3,4',5,5',6-HepCB	187	0,52			
2,3,3',4,4',5,5'-HepCB	189	< 0,02		48	0,00
Sum-HepCB		***2,28***			
2,2',3,3',4,4',5,5'-OctCB	194	0,04	i		
2,2',3,3',4,4',5,5',6-NonCB	206	0,04			
DecaCB	209	0,10		58	
Sum 7 PCB		**50,5**			
Sum PCB		***229***			**0,48**

Sum 7 PCB: PCB(28+52+101+118+138+153+180)
Sum PCB: Sum of observed PCB (mono- and di-CB are not included)
<: Lower than detection limit at signal-to-noise 3 to 1
i: Isotope ratio deviates more than 20 % from theoretical value.
This may be due to instrumental noise or/and chemical interference
b: Lower than 10 times method blank.
g: Recovery is not according to NILUs quality criteria
TE (WHO): 2378-TCDD toxicity equivalents of the mono-ortho PCB according to the WHO model (M. Van den Berg et al., 1998)

14. versjon 22.09.2006 GSK

Results of PCB Analysis

Encl. to measuring report: O-4932
NILU-Sample number: 07/1725
Customer: SFT
Customers sample ID: Sofienberg 2
: 22-23.10.07, 08:24-08:25
Sample type: Luft
Sample amount: 694 m3
Concentration units: pg/m3
Data files: DI081

Compound Structure	IUPAC-no.		Concentration pg/m3	Recovery %	TE (WHO) fg/ m3
PeCB			6,22	27	
HCB			50,9	26	
2,2',5-TriCB	18		13,0		
2,4,4'-TriCB	**28**		**8,22**	47	
2,4',5-TriCB	31		8,16		
2',3,4-TriCB	33		5,22		
3,4,4'-TriCB	37	<	0,02		
Sum-TriCB			***52,7***		
2,2',4,4'-TetCB	47		8,45		
2,2',5,5'-TetCB	**52**		**9,03**	48	
2,3',4,4'-TetCB	66		2,30		
2,4,4',5-TetCB	74		1,48		
Sum-TetCB			***42,7***		
2,2',4,4',5-PenCB	99		1,98		
2,2',4,5,5'-PenCB	**101**		**6,57**	48	
2,3,3',4,4'-PenCB	105		0,74	52	0,07
2,3,4,4',5-PenCB	114		0,07	55	0,03
2,3',4,4',5-PenCB	**118**		**2,28**	56	0,23
2'3,3',4,5-PenCB	122	<	0,02		
2',3,4,4',5-PenCB	123	<	0,02	55	0,00
Sum-PenCB			***21,9***		
2,2',3,3',4,4'-HexCB	128		0,33		
2,2',3,4,4',5'-HexCB	**138**		**2,01**	55	
2,2',3,4,5,5'-HexCB	141		0,59		
2,2',3,4',5',6-HexCB	149		3,11		
2,2',4,4',5,5'-HexCB	**153**		**2,62**	47	
2,3,3',4,4',5-HexCB	156		0,18	59	0,09
2,3,3',4,4',5'-HexCB	157		0,04	56	0,02
2,3',4,4',5,5'-HexCB	167		0,08	57	0,00
Sum-HexCB			***13,0***		
2,2',3,3',4,4',5-HepCB	170		0,23		
2,2',3,4,4',5,5'-HepCB	**180**		**0,57**	48	
2,2',3,4,4',5',6-HepCB	183		0,23		
2,2',3,4',5,5',6-HepCB	187		0,47		
2,3,3',4,4',5,5'-HepCB	189	<	0,02	g	0,00
Sum-HepCB			***1,93***		
2,2',3,3',4,4',5,5'-OctCB	194	<	0,02		
2,2',3,3',4,4',5,5',6-NonCB	206	<	0,03		
DecaCB	209	<	0,01	40	
Sum 7 PCB			**31,3**		
Sum PCB			***132***		**0,45**

Sum 7 PCB: PCB(28+52+101+118+138+153+180)
Sum PCB: Sum of observed PCB (mono- and di-CB are not included)
<: Lower than detection limit at signal-to-noise 3 to 1
i: Isotope ratio deviates more than 20 % from theoretical value.
This may be due to instrumental noise or/and chemical interference
b: Lower than 10 times method blank.
g: Recovery is not according to NILUs quality criteria
TE (WHO): 2378-TCDD toxicity equivalents of the mono-ortho PCB according to the WHO model (M. Van den Berg et al., 1998)

14. versjon 22.09.2006 GSK

Results of PCB Analysis

Encl. to measuring report: O-4932
NILU-Sample number: 07/1823
Customer: SFT
Customers sample ID: Sofienberg 3
: 23-24.10.2007
Sample type: Luft
Sample amount: 695 m3
Concentration units: pg/m3
Data files: DI081

Compound		Concentration	Recovery	TE (WHO)
Structure	IUPAC-no.	pg/m3	%	fg/ m3
PeCB		6,99	29	
HCB		55,5	27	
2,2',5-TriCB	18	21,5		
2,4,4'-TriCB	**28**	**13,5**	50	
2,4',5-TriCB	31	13,2		
2',3,4-TriCB	33	8,15		
3,4,4'-TriCB	37	< 0,02		
Sum-TriCB		***85,5***		
2,2',4,4'-TetCB	47	6,59		
2,2',5,5'-TetCB	**52**	**12,8**	48	
2,3',4,4'-TetCB	66	2,48		
2,4,4',5-TetCB	74	1,78		
Sum-TetCB		***49,4***		
2,2',4,4',5-PenCB	99	1,91		
2,2',4,5,5'-PenCB	**101**	**7,04**	47	
2,3,3',4,4'-PenCB	105	0,58	53	0,06
2,3,4,4',5-PenCB	114	0,08	54	0,04
2,3',4,4',5-PenCB	**118**	**1,96**	55	0,20
2'3,3',4,5-PenCB	122	< 0,02		
2',3,4,4',5-PenCB	123	0,04	55	0,00
Sum-PenCB		***20,8***		
2,2',3,3',4,4'-HexCB	128	0,28		
2,2',3,4,4',5'-HexCB	**138**	**1,81**	53	
2,2',3,4,5,5'-HexCB	141	0,59		
2,2',3,4',5',6-HexCB	149	3,27		
2,2',4,4',5,5'-HexCB	**153**	**2,62**	43	
2,3,3',4,4',5-HexCB	156	0,13	54	0,06
2,3,3',4,4',5'-HexCB	157	0,04	53	0,02
2,3',4,4',5,5'-HexCB	167	0,06	54	0,00
Sum-HexCB		***14,4***		
2,2',3,3',4,4',5-HepCB	170	0,26		
2,2',3,4,4',5,5'-HepCB	**180**	**0,75**	42	
2,2',3,4,4',5',6-HepCB	183	0,26		
2,2',3,4',5,5',6-HepCB	187	0,55		
2,3,3',4,4',5,5'-HepCB	189	< 0,02	g	0,00
Sum-HepCB		***2,37***		
2,2',3,3',4,4',5,5'-OctCB	194	< 0,02		
2,2',3,3',4,4',5,5',6-NonCB	206	< 0,03		
DecaCB	209	< 0,01	g	
Sum 7 PCB		**40,5**		
Sum PCB		***173***		**0,38**

Sum 7 PCB: PCB(28+52+101+118+138+153+180)
Sum PCB: Sum of observed PCB (mono- and di-CB are not included)
<: Lower than detection limit at signal-to-noise 3 to 1
i: Isotope ratio deviates more than 20 % from theoretical value.
This may be due to instrumental noise or/and chemical interference
b: Lower than 10 times method blank.
g: Recovery is not according to NILUs quality criteria
TE (WHO): 2378-TCDD toxicity equivalents of the mono-ortho PCB according to the WHO model (M. Van den Berg et al., 1998)

14. versjon 22.09.2006 GSK

Results of PCB Analysis

Encl. to measuring report: O-4932
NILU-Sample number: 07/2140
Customer: SFT
Customers sample ID: Sofienberg
: 3-4/12/07
Sample type: Luft
Sample amount: 685 m3
Concentration units: pg/m3
Data files: DI093

Compound Structure	IUPAC-no.	Concentration pg/m3	Recovery %	TE (WHO) fg/ m3
PeCB		16,5	18	
HCB		66,9	g	
2,2',5-TriCB	18	26,8		
2,4,4'-TriCB	**28**	**14,0**	37	
2,4',5-TriCB	31	13,4		
2',3,4-TriCB	33	8,54		
3,4,4'-TriCB	37	< 0,02		
Sum-TriCB		***95,6***		
2,2',4,4'-TetCB	47	17,0		
2,2',5,5'-TetCB	**52**	**15,7**	g	
2,3',4,4'-TetCB	66	2,42		
2,4,4',5-TetCB	74	1,77		
Sum-TetCB		***68,6***		
2,2',4,4',5-PenCB	99	1,91		
2,2',4,5,5'-PenCB	**101**	**7,08**	47	
2,3,3',4,4'-PenCB	105	0,66	46	0,07
2,3,4,4',5-PenCB	114	0,08	46	0,04
2,3',4,4',5-PenCB	**118**	**2,17**	41	0,22
2'3,3',4,5-PenCB	122	0,02		
2',3,4,4',5-PenCB	123	0,03	44	0,00
Sum-PenCB		***21,3***		
2,2',3,3',4,4'-HexCB	128	0,36		
2,2',3,4,4',5'-HexCB	**138**	**1,64**	59	
2,2',3,4,5,5'-HexCB	141	0,58		
2,2',3,4',5',6-HexCB	149	2,69		
2,2',4,4',5,5'-HexCB	**153**	**2,45**	50	
2,3,3',4,4',5-HexCB	156	0,13	45	0,06
2,3,3',4,4',5'-HexCB	157	0,02	45	0,01
2,3',4,4',5,5'-HexCB	167	0,06	41	0,00
Sum-HexCB		***13,1***		
2,2',3,3',4,4',5-HepCB	170	0,19		
2,2',3,4,4',5,5'-HepCB	**180**	**0,59**	62	
2,2',3,4,4',5',6-HepCB	183	0,20		
2,2',3,4',5,5',6-HepCB	187	0,53		
2,3,3',4,4',5,5'-HepCB	189	< 0,01	36	0,00
Sum-HepCB		***2,40***		
2,2',3,3',4,4',5,5'-OctCB	194	0,07		
2,2',3,3',4,4',5,5',6-NonCB	206	< 0,01		
DecaCB	209	0,02	62	
Sum 7 PCB		**43,6**		
Sum PCB		***201***		**0,40**

Sum 7 PCB: PCB(28+52+101+118+138+153+180)
Sum PCB: Sum of observed PCB (mono- and di-CB are not included)
<: Lower than detection limit at signal-to-noise 3 to 1
i: Isotope ratio deviates more than 20 % from theoretical value.
This may be due to instrumental noise or/and chemical interference
b: Lower than 10 times method blank.
g: Recovery is not according to NILUs quality criteria
TE (WHO): 2378-TCDD toxicity equivalents of the mono-ortho PCB according to the WHO model (M. Van den Berg et al., 1998)

14. versjon 22.09.2006 GSK

Results of PCB Analysis

Encl. to measuring report: O-4932
NILU-Sample number: 07/2141
Customer: SFT
Customers sample ID: Sofienberg
: 4-5.12.07 11:10-11:10
Sample type: Luft
Sample amount: 688 m3
Concentration units: pg/m3
Data files: DI093

Compound Structure	IUPAC-no.	Concentration pg/m3	Recovery %	TE (WHO) fg/ m3
PeCB		14,1	24	
HCB		66,3	26	
2,2',5-TriCB	18	29,5		
2,4,4'-TriCB	**28**	**19,5**	42	
2,4',5-TriCB	31	19,0		
2',3,4-TriCB	33	9,18		
3,4,4'-TriCB	37	0,21		
Sum-TriCB		***118***		
2,2',4,4'-TetCB	47	11,4		
2,2',5,5'-TetCB	**52**	**20,9**	46	
2,3',4,4'-TetCB	66	4,74		
2,4,4',5-TetCB	74	3,26		
Sum-TetCB		***81,9***		
2,2',4,4',5-PenCB	99	2,52		
2,2',4,5,5'-PenCB	**101**	**9,29**	71	
2,3,3',4,4'-PenCB	105	1,07	78	0,11
2,3,4,4',5-PenCB	114	0,13	79	0,06
2,3',4,4',5-PenCB	**118**	**3,10**	78	0,31
2'3,3',4,5-PenCB	122	0,03		
2',3,4,4',5-PenCB	123	0,05	78	0,01
Sum-PenCB		***27,8***		
2,2',3,3',4,4'-HexCB	128	0,54		
2,2',3,4,4',5'-HexCB	**138**	**3,11**	78	
2,2',3,4,5,5'-HexCB	141	0,99		
2,2',3,4',5',6-HexCB	149	4,41		
2,2',4,4',5,5'-HexCB	**153**	**3,99**	75	
2,3,3',4,4',5-HexCB	156	0,30	73	0,15
2,3,3',4,4',5'-HexCB	157	0,05	76	0,02
2,3',4,4',5,5'-HexCB	167	0,12	78	0,00
Sum-HexCB		***22,1***		
2,2',3,3',4,4',5-HepCB	170	0,64		
2,2',3,4,4',5,5'-HepCB	**180**	**1,96**	65	
2,2',3,4,4',5',6-HepCB	183	0,52		
2,2',3,4',5,5',6-HepCB	187	1,27		
2,3,3',4,4',5,5'-HepCB	189	0,03	53	0,00
Sum-HepCB		***6,80***		
2,2',3,3',4,4',5,5'-OctCB	194	0,20		
2,2',3,3',4,4',5,5',6-NonCB	206	0,10		
DecaCB	209	0,02	65	
Sum 7 PCB		**61,9**		
Sum PCB		***257***		**0,66**

Sum 7 PCB: PCB(28+52+101+118+138+153+180)
Sum PCB: Sum of observed PCB (mono- and di-CB are not included)
<: Lower than detection limit at signal-to-noise 3 to 1
i: Isotope ratio deviates more than 20 % from theoretical value.
This may be due to instrumental noise or/and chemical interference
b: Lower than 10 times method blank.
g: Recovery is not according to NILUs quality criteria
TE (WHO): 2378-TCDD toxicity equivalents of the mono-ortho PCB according to the WHO model (M. Van den Berg et al., 1998)

14. versjon 22.09.2006 GSK

Results of PCB Analysis

Encl. to measuring report: O-4932
NILU-Sample number: 07/2159
Customer: SFT
Customers sample ID: Sofienberg
: 05-06/12/07 11:20-11:20
Sample type: Luft
Sample amount: 676 m3
Concentration units: pg/m3
Data files: DI093

Compound Structure	IUPAC-no.	Concentration pg/m3	Recovery %	TE (WHO) fg/ m3
PeCB		4,55	27	
HCB		35,2	20	
2,2',5-TriCB	18	14,8		
2,4,4'-TriCB	**28**	**10,2**	49	
2,4',5-TriCB	31	9,51		
2',3,4-TriCB	33	5,92		
3,4,4'-TriCB	37	0,03		
Sum-TriCB		***61,2***		
2,2',4,4'-TetCB	47	10,7		
2,2',5,5'-TetCB	**52**	**12,3**	48	
2,3',4,4'-TetCB	66	4,00		
2,4,4',5-TetCB	74	2,57		
Sum-TetCB		***58,3***		
2,2',4,4',5-PenCB	99	2,76		
2,2',4,5,5'-PenCB	**101**	**8,53**	59	
2,3,3',4,4'-PenCB	105	1,06	62	0,11
2,3,4,4',5-PenCB	114	0,11	59	0,05
2,3',4,4',5-PenCB	**118**	**3,49**	58	0,35
2'3,3',4,5-PenCB	122	0,03		
2',3,4,4',5-PenCB	123	0,07	58	0,01
Sum-PenCB		***30,1***		
2,2',3,3',4,4'-HexCB	128	0,40		
2,2',3,4,4',5'-HexCB	**138**	**2,43**	70	
2,2',3,4,5,5'-HexCB	141	0,89		
2,2',3,4',5',6-HexCB	149	4,87		
2,2',4,4',5,5'-HexCB	**153**	**3,75**	45	
2,3,3',4,4',5-HexCB	156	0,14	69	0,07
2,3,3',4,4',5'-HexCB	157	0,02	70	0,01
2,3',4,4',5,5'-HexCB	167	0,06	66	0,00
Sum-HexCB		***20,4***		
2,2',3,3',4,4',5-HepCB	170	0,19		
2,2',3,4,4',5,5'-HepCB	**180**	**0,54**	71	
2,2',3,4,4',5',6-HepCB	183	0,22		
2,2',3,4',5,5',6-HepCB	187	0,54		
2,3,3',4,4',5,5'-HepCB	189	< 0,01	68	0,00
Sum-HepCB		***2,08***		
2,2',3,3',4,4',5,5'-OctCB	194	< 0,01		
2,2',3,3',4,4',5,5',6-NonCB	206	< 0,01		
DecaCB	209	0,03	78	
Sum 7 PCB		**41,2**		
Sum PCB		***172***		**0,60**

Sum 7 PCB: PCB(28+52+101+118+138+153+180)
Sum PCB: Sum of observed PCB (mono- and di-CB are not included)
<: Lower than detection limit at signal-to-noise 3 to 1
i: Isotope ratio deviates more than 20 % from theoretical value.
This may be due to instrumental noise or/and chemical interference
b: Lower than 10 times method blank.
g: Recovery is not according to NILUs quality criteria
TE (WHO): 2378-TCDD toxicity equivalents of the mono-ortho PCB according to the WHO model (M. Van den Berg et al., 1998)

14. versjon 22.09.2006 GSK

Results of PCB Analysis

Encl. to measuring report: O-4932
NILU-Sample number: 07/2166
Customer: SFT
Customers sample ID: Sofienberg 07-08.12.07
: 0922-0922
Sample type: Luft
Sample amount: 677 m3
Concentration units: pg/m3
Data files: DI097B

Compound Structure	IUPAC-no.	Concentration pg/m3		Recovery %	TE (WHO) fg/ m3
PeCB		7,68		32	
HCB		59,8		27	
2,2',5-TriCB	18	12,9			
2,4,4'-TriCB	**28**	**7,34**		51	
2,4',5-TriCB	31	7,05			
2',3,4-TriCB	33	4,48			
3,4,4'-TriCB	37	< 0,01			
Sum-TriCB		***47,0***			
2,2',4,4'-TetCB	47	5,03			
2,2',5,5'-TetCB	**52**	**7,02**		51	
2,3',4,4'-TetCB	66	1,94			
2,4,4',5-TetCB	74	1,25			
Sum-TetCB		***29,6***			
2,2',4,4',5-PenCB	99	1,15			
2,2',4,5,5'-PenCB	**101**	**3,86**		65	
2,3,3',4,4'-PenCB	105	0,39		77	0,04
2,3,4,4',5-PenCB	114	0,04		77	0,02
2,3',4,4',5-PenCB	**118**	**1,25**		77	0,12
2'3,3',4,5-PenCB	122	< 0,01			
2',3,4,4',5-PenCB	123	< 0,01		77	0,00
Sum-PenCB		***11,2***			
2,2',3,3',4,4'-HexCB	128	0,16			
2,2',3,4,4',5'-HexCB	**138**	**0,98**		80	
2,2',3,4,5,5'-HexCB	141	0,30			
2,2',3,4',5',6-HexCB	149	1,59			
2,2',4,4',5,5'-HexCB	**153**	**1,59**		80	
2,3,3',4,4',5-HexCB	156	0,07		77	0,03
2,3,3',4,4',5'-HexCB	157	0,02	b	72	0,01
2,3',4,4',5,5'-HexCB	167	0,03		75	0,00
Sum-HexCB		***7,30***			
2,2',3,3',4,4',5-HepCB	170	0,14			
2,2',3,4,4',5,5'-HepCB	**180**	**0,39**		77	
2,2',3,4,4',5',6-HepCB	183	0,14			
2,2',3,4',5,5',6-HepCB	187	0,36			
2,3,3',4,4',5,5'-HepCB	189	< 0,01		74	0,00
Sum-HepCB		***1,36***			
2,2',3,3',4,4',5,5'-OctCB	194	0,04			
2,2',3,3',4,4',5,5',6-NonCB	206	< 0,01			
DecaCB	209	< 0,01		80	
Sum 7 PCB		**22,4**			
Sum PCB		***96,5***			**0,23**

Sum 7 PCB: PCB(28+52+101+118+138+153+180)
Sum PCB: Sum of observed PCB (mono- and di-CB are not included)
<: Lower than detection limit at signal-to-noise 3 to 1
i: Isotope ratio deviates more than 20 % from theoretical value.
This may be due to instrumental noise or/and chemical interference
b: Lower than 10 times method blank.
g: Recovery is not according to NILUs quality criteria
TE (WHO): 2378-TCDD toxicity equivalents of the mono-ortho PCB according to the WHO model (M. Van den Berg et al., 1998)

14. versjon 22.09.2006 GSK

Results of PCB Analysis

Encl. to measuring report: O-4932
NILU-Sample number: 07/2169
Customer: SFT
Customers sample ID: Sofienberg 10-11.12.07
: 1023-1023
Sample type: Luft
Sample amount: 688 m3
Concentration units: pg/m3
Data files: DI097B

Compound Structure	IUPAC-no.	Concentration pg/m3		Recovery %	TE (WHO) fg/ m3
PeCB		7,36		31	
HCB		47,3		29	
2,2',5-TriCB	18	10,4			
2,4,4'-TriCB	**28**	**5,94**		62	
2,4',5-TriCB	31	5,59			
2',3,4-TriCB	33	3,62			
3,4,4'-TriCB	37	0,02	b		
Sum-TriCB		***38,1***			
2,2',4,4'-TetCB	47	3,37			
2,2',5,5'-TetCB	**52**	**6,00**		63	
2,3',4,4'-TetCB	66	1,38			
2,4,4',5-TetCB	74	0,95			
Sum-TetCB		***22,9***			
2,2',4,4',5-PenCB	99	1,12			
2,2',4,5,5'-PenCB	**101**	**3,54**		61	
2,3,3',4,4'-PenCB	105	0,39		87	0,04
2,3,4,4',5-PenCB	114	0,06		88	0,03
2,3',4,4',5-PenCB	**118**	**1,29**		87	0,13
2'3,3',4,5-PenCB	122	< 0,01			
2',3,4,4',5-PenCB	123	0,03		85	0,00
Sum-PenCB		***10,3***			
2,2',3,3',4,4'-HexCB	128	0,17			
2,2',3,4,4',5'-HexCB	**138**	**1,14**		91	
2,2',3,4,5,5'-HexCB	141	0,33			
2,2',3,4',5',6-HexCB	149	1,49			
2,2',4,4',5,5'-HexCB	**153**	**1,85**		84	
2,3,3',4,4',5-HexCB	156	0,08		89	0,04
2,3,3',4,4',5'-HexCB	157	0,02	b	88	0,01
2,3',4,4',5,5'-HexCB	167	0,05		86	0,00
Sum-HexCB		***7,50***			
2,2',3,3',4,4',5-HepCB	170	0,14			
2,2',3,4,4',5,5'-HepCB	**180**	**0,50**		92	
2,2',3,4,4',5',6-HepCB	183	0,16			
2,2',3,4',5,5',6-HepCB	187	0,38			
2,3,3',4,4',5,5'-HepCB	189	0,01	b	68	0,00
Sum-HepCB		***1,66***			
2,2',3,3',4,4',5,5'-OctCB	194	0,05			
2,2',3,3',4,4',5,5',6-NonCB	206	0,03			
DecaCB	209	0,02	b	87	
Sum 7 PCB		**20,3**			
Sum PCB		***80,5***			**0,26**

Sum 7 PCB: PCB(28+52+101+118+138+153+180)
Sum PCB: Sum of observed PCB (mono- and di-CB are not included)
<: Lower than detection limit at signal-to-noise 3 to 1
i: Isotope ratio deviates more than 20 % from theoretical value.
This may be due to instrumental noise or/and chemical interference
b: Lower than 10 times method blank.
g: Recovery is not according to NILUs quality criteria
TE (WHO): 2378-TCDD toxicity equivalents of the mono-ortho PCB according to the WHO model (M. Van den Berg et al., 1998)

14. versjon 22.09.2006 GSK

Results of PCB Analysis

Encl. to measuring report: O-4932
NILU-Sample number: 07/2204
Customer: SFT
Customers sample ID: Sofienberg 11-12.12.07
: 1029-1029
Sample type: Luft
Sample amount: 706 m3
Concentration units: pg/m3
Data files: VB419D

Compound		Concentration		Recovery	TE (WHO)
Structure	IUPAC-no.	pg/m3		%	fg/ m3
PeCB		13,3		13	
HCB		58,8		16	
2,2',5-TriCB	18	14,1			
2,4,4'-TriCB	**28**	**8,45**		36	
2,4',5-TriCB	31	7,90			
2',3,4-TriCB	33	5,43			
3,4,4'-TriCB	37	0,06			
Sum-TriCB		***55,5***			
2,2',4,4'-TetCB	47	4,23			
2,2',5,5'-TetCB	**52**	**7,04**		40	
2,3',4,4'-TetCB	66	1,38			
2,4,4',5-TetCB	74	1,01			
Sum-TetCB		***27,4***			
2,2',4,4',5-PenCB	99	0,82			
2,2',4,5,5'-PenCB	**101**	**3,34**		54	
2,3,3',4,4'-PenCB	105	0,30		68	0,03
2,3,4,4',5-PenCB	114	0,08		66	0,04
2,3',4,4',5-PenCB	**118**	**0,90**		64	0,09
2'3,3',4,5-PenCB	122	0,04			
2',3,4,4',5-PenCB	123	0,05		64	0,00
Sum-PenCB		***9,64***			
2,2',3,3',4,4'-HexCB	128	0,15			
2,2',3,4,4',5'-HexCB	**138**	**0,79**		76	
2,2',3,4,5,5'-HexCB	141	0,31			
2,2',3,4',5',6-HexCB	149	1,30			
2,2',4,4',5,5'-HexCB	**153**	**1,24**		61	
2,3,3',4,4',5-HexCB	156	0,09		80	0,05
2,3,3',4,4',5'-HexCB	157	0,05	b	79	0,02
2,3',4,4',5,5'-HexCB	167	0,06		76	0,00
Sum-HexCB		***6,59***			
2,2',3,3',4,4',5-HepCB	170	0,15			
2,2',3,4,4',5,5'-HepCB	**180**	**0,37**		80	
2,2',3,4,4',5',6-HepCB	183	0,12			
2,2',3,4',5,5',6-HepCB	187	0,29			
2,3,3',4,4',5,5'-HepCB	189	0,04		77	0,00
Sum-HepCB		***1,36***			
2,2',3,3',4,4',5,5'-OctCB	194	0,05			
2,2',3,3',4,4',5,5',6-NonCB	206	0,04			
DecaCB	209	0,06		88	
Sum 7 PCB		**22,1**			
Sum PCB		***101***			**0,24**

Sum 7 PCB: PCB(28+52+101+118+138+153+180)
Sum PCB: Sum of observed PCB (mono- and di-CB are not included)
<: Lower than detection limit at signal-to-noise 3 to 1
i: Isotope ratio deviates more than 20 % from theoretical value.
This may be due to instrumental noise or/and chemical interference
b: Lower than 10 times method blank.
g: Recovery is not according to NILUs quality criteria
TE (WHO): 2378-TCDD toxicity equivalents of the mono-ortho PCB according to the WHO model (M. Van den Berg et al., 1998)

14. versjon 22.09.2006 GSK

Results of PCB Analysis

Encl. to measuring report: O-4932
NILU-Sample number: 07/2210
Customer: SFT
Customers sample ID: Sofienberg 13-14.12.07
: 1347-1347
Sample type: Luft
Sample amount: 716 m3
Concentration units: pg/m3
Data files: VB414

Compound Structure	IUPAC-no.		Concentration pg/m3		Recovery %	TE (WHO) fg/ m3
PeCB			18,2		15	
HCB			41,9		17	
2,2',5-TriCB	18		15,1			
2,4,4'-TriCB	**28**		**8,22**		40	
2,4',5-TriCB	31		7,84			
2',3,4-TriCB	33		4,29			
3,4,4'-TriCB	37		0,02	bi		
Sum-TriCB			***55,6***			
2,2',4,4'-TetCB	47		4,95			
2,2',5,5'-TetCB	**52**		**5,36**		g	
2,3',4,4'-TetCB	66		1,50			
2,4,4',5-TetCB	74		1,03			
Sum-TetCB			***27,1***			
2,2',4,4',5-PenCB	99		0,58			
2,2',4,5,5'-PenCB	**101**		**2,36**		49	
2,3,3',4,4'-PenCB	105		0,22		67	0,02
2,3,4,4',5-PenCB	114		0,04		64	0,02
2,3',4,4',5-PenCB	**118**		**0,70**		64	0,07
2'3,3',4,5-PenCB	122	<	0,01			
2',3,4,4',5-PenCB	123		0,02	i	62	0,00
Sum-PenCB			***6,61***			
2,2',3,3',4,4'-HexCB	128		0,18			
2,2',3,4,4',5'-HexCB	**138**		**0,98**		71	
2,2',3,4,5,5'-HexCB	141		0,33			
2,2',3,4',5',6-HexCB	149		1,23			
2,2',4,4',5,5'-HexCB	**153**		**1,33**		59	
2,3,3',4,4',5-HexCB	156		0,12		80	0,06
2,3,3',4,4',5'-HexCB	157		0,03	b	77	0,01
2,3',4,4',5,5'-HexCB	167		0,04	i	74	0,00
Sum-HexCB			***6,52***			
2,2',3,3',4,4',5-HepCB	170		0,46			
2,2',3,4,4',5,5'-HepCB	**180**		**0,94**		70	
2,2',3,4,4',5',6-HepCB	183		0,16			
2,2',3,4',5,5',6-HepCB	187		0,38			
2,3,3',4,4',5,5'-HepCB	189		0,02	bi	71	0,00
Sum-HepCB			***2,75***			
2,2',3,3',4,4',5,5'-OctCB	194		0,12			
2,2',3,3',4,4',5,5',6-NonCB	206	<	0,02			
DecaCB	209	<	0,01		58	
Sum 7 PCB			**19,9**			
Sum PCB			***98,7***			**0,19**

Sum 7 PCB: PCB(28+52+101+118+138+153+180)
Sum PCB: Sum of observed PCB (mono- and di-CB are not included)
<: Lower than detection limit at signal-to-noise 3 to 1
i: Isotope ratio deviates more than 20 % from theoretical value.
This may be due to instrumental noise or/and chemical interference
b: Lower than 10 times method blank.
g: Recovery is not according to NILUs quality criteria
TE (WHO): 2378-TCDD toxicity equivalents of the mono-ortho PCB according to the WHO model (M. Van den Berg et al., 1998)

14. versjon 22.09.2006 GSK

Results of PCB Analysis

Encl. to measuring report: O-4932
NILU-Sample number: 07/2216
Customer: SFT
Customers sample ID: Sofienberg 17-18.12.07
: 0852-0852
Sample type: Luft
Sample amount: 714 m3
Concentration units: pg/m3
Data files: VB414

Compound Structure	IUPAC-no.	Concentration pg/m3		Recovery %	TE (WHO) fg/ m3
PeCB		25,2		21	
HCB		62,8		18	
2,2',5-TriCB	18	16,2			
2,4,4'-TriCB	**28**	**10,5**		45	
2,4',5-TriCB	31	9,95			
2',3,4-TriCB	33	5,34			
3,4,4'-TriCB	37	< 0,02			
Sum-TriCB		***65,4***			
2,2',4,4'-TetCB	47	10,1			
2,2',5,5'-TetCB	**52**	**8,88**		g	
2,3',4,4'-TetCB	66	2,26			
2,4,4',5-TetCB	74	1,60			
Sum-TetCB		***45,6***			
2,2',4,4',5-PenCB	99	1,06			
2,2',4,5,5'-PenCB	**101**	**3,93**		53	
2,3,3',4,4'-PenCB	105	0,37		71	0,04
2,3,4,4',5-PenCB	114	0,08		69	0,04
2,3',4,4',5-PenCB	**118**	**1,16**		68	0,12
2'3,3',4,5-PenCB	122	< 0,02			
2',3,4,4',5-PenCB	123	0,02	i	67	0,00
Sum-PenCB		***10,6***			
2,2',3,3',4,4'-HexCB	128	0,19			
2,2',3,4,4',5'-HexCB	**138**	**1,08**		72	
2,2',3,4,5,5'-HexCB	141	0,42			
2,2',3,4',5',6-HexCB	149	1,84			
2,2',4,4',5,5'-HexCB	**153**	**1,78**		63	
2,3,3',4,4',5-HexCB	156	0,12		79	0,06
2,3,3',4,4',5'-HexCB	157	0,02	bi	76	0,01
2,3',4,4',5,5'-HexCB	167	0,05		73	0,00
Sum-HexCB		***8,11***			
2,2',3,3',4,4',5-HepCB	170	0,24			
2,2',3,4,4',5,5'-HepCB	**180**	**0,68**		66	
2,2',3,4,4',5',6-HepCB	183	0,21			
2,2',3,4',5,5',6-HepCB	187	0,55			
2,3,3',4,4',5,5'-HepCB	189	0,03	b	63	0,00
Sum-HepCB		***2,07***			
2,2',3,3',4,4',5,5'-OctCB	194	0,07			
2,2',3,3',4,4',5,5',6-NonCB	206	0,07	i		
DecaCB	209	0,04	i	54	
Sum 7 PCB		**28,0**			
Sum PCB		***132***			**0,27**

Sum 7 PCB: PCB(28+52+101+118+138+153+180)
Sum PCB: Sum of observed PCB (mono- and di-CB are not included)
<: Lower than detection limit at signal-to-noise 3 to 1
i: Isotope ratio deviates more than 20 % from theoretical value.
This may be due to instrumental noise or/and chemical interference
b: Lower than 10 times method blank.
g: Recovery is not according to NILUs quality criteria
TE (WHO): 2378-TCDD toxicity equivalents of the mono-ortho PCB according to the WHO model (M. Van den Berg et al., 1998)

14. versjon 22.09.2006 GSK

Results of PCB Analysis

Encl. to measuring report: O-4932
NILU-Sample number: 07/2230
Customer: SFT
Customers sample ID: Sofienberg 19-20.12.07
: 0908-0908
Sample type: Luft
Sample amount: 713 m3
Concentration units: pg/m3
Data files: VB419

Compound Structure	IUPAC-no.	Concentration pg/m3		Recovery %	TE (WHO) fg/ m3
PeCB		22,4		15	
HCB		42,7		23	
2,2',5-TriCB	18	13,8			
2,4,4'-TriCB	**28**	**10,1**		46	
2,4',5-TriCB	31	9,84			
2',3,4-TriCB	33	7,16			
3,4,4'-TriCB	37	0,23			
Sum-TriCB		***61,7***			
2,2',4,4'-TetCB	47	6,56			
2,2',5,5'-TetCB	**52**	**8,59**		46	
2,3',4,4'-TetCB	66	2,52			
2,4,4',5-TetCB	74	1,72			
Sum-TetCB		***40,5***			
2,2',4,4',5-PenCB	99	1,12			
2,2',4,5,5'-PenCB	**101**	**4,36**		79	
2,3,3',4,4'-PenCB	105	0,53		92	0,05
2,3,4,4',5-PenCB	114	0,08		82	0,04
2,3',4,4',5-PenCB	**118**	**1,48**		100	0,15
2'3,3',4,5-PenCB	122	0,04			
2',3,4,4',5-PenCB	123	0,03		92	0,00
Sum-PenCB		***12,9***			
2,2',3,3',4,4'-HexCB	128	0,26			
2,2',3,4,4',5'-HexCB	**138**	**1,75**		96	
2,2',3,4,5,5'-HexCB	141	0,51			
2,2',3,4',5',6-HexCB	149	1,95			
2,2',4,4',5,5'-HexCB	**153**	**2,35**		89	
2,3,3',4,4',5-HexCB	156	0,18		102	0,09
2,3,3',4,4',5'-HexCB	157	0,04	b	90	0,02
2,3',4,4',5,5'-HexCB	167	0,09		99	0,00
Sum-HexCB		***10,3***			
2,2',3,3',4,4',5-HepCB	170	0,45			
2,2',3,4,4',5,5'-HepCB	**180**	**1,08**		87	
2,2',3,4,4',5',6-HepCB	183	0,28			
2,2',3,4',5,5',6-HepCB	187	0,63			
2,3,3',4,4',5,5'-HepCB	189	0,04		101	0,00
Sum-HepCB		***3,64***			
2,2',3,3',4,4',5,5'-OctCB	194	0,14			
2,2',3,3',4,4',5,5',6-NonCB	206	0,06			
DecaCB	209	0,06		113	
Sum 7 PCB		**29,7**			
Sum PCB		***129***			**0,36**

Sum 7 PCB: PCB(28+52+101+118+138+153+180)
Sum PCB: Sum of observed PCB (mono- and di-CB are not included)
<: Lower than detection limit at signal-to-noise 3 to 1
i: Isotope ratio deviates more than 20 % from theoretical value.
This may be due to instrumental noise or/and chemical interference
b: Lower than 10 times method blank.
g: Recovery is not according to NILUs quality criteria
TE (WHO): 2378-TCDD toxicity equivalents of the mono-ortho PCB according to the WHO model (M. Van den Berg et al., 1998)

14. versjon 22.09.2006 GSK

Results of PCB Analysis

Encl. to measuring report: O-4932
NILU-Sample number: 08/12
Customer: SFT
Customers sample ID: Sofienberg 21-22.12.07
: 0916-0716
Sample type: Luft
Sample amount: 708 m3
Concentration units: pg/m3
Data files: VB414

Compound Structure	IUPAC-no.	Concentration pg/m3		Recovery %	TE (WHO) fg/ m3
PeCB		16,8		21	
HCB		47,0		23	
2,2',5-TriCB	18	14,2			
2,4,4'-TriCB	**28**	**10,1**		41	
2,4',5-TriCB	31	9,71			
2',3,4-TriCB	33	4,52			
3,4,4'-TriCB	37	0,08	i		
Sum-TriCB		***60,2***			
2,2',4,4'-TetCB	47	8,31			
2,2',5,5'-TetCB	**52**	**8,68**		g	
2,3',4,4'-TetCB	66	2,58			
2,4,4',5-TetCB	74	1,72			
Sum-TetCB		***44,4***			
2,2',4,4',5-PenCB	99	1,08			
2,2',4,5,5'-PenCB	**101**	**3,95**		64	
2,3,3',4,4'-PenCB	105	0,44		84	0,04
2,3,4,4',5-PenCB	114	0,09		83	0,05
2,3',4,4',5-PenCB	**118**	**1,22**		84	0,12
2'3,3',4,5-PenCB	122	0,03			
2',3,4,4',5-PenCB	123	0,03	i	82	0,00
Sum-PenCB		***11,7***			
2,2',3,3',4,4'-HexCB	128	0,23			
2,2',3,4,4',5'-HexCB	**138**	**1,27**		88	
2,2',3,4,5,5'-HexCB	141	0,43			
2,2',3,4',5',6-HexCB	149	1,75			
2,2',4,4',5,5'-HexCB	**153**	**1,74**		80	
2,3,3',4,4',5-HexCB	156	0,14		93	0,07
2,3,3',4,4',5'-HexCB	157	0,05	bi	92	0,02
2,3',4,4',5,5'-HexCB	167	0,08		93	0,00
Sum-HexCB		***9,08***			
2,2',3,3',4,4',5-HepCB	170	0,33			
2,2',3,4,4',5,5'-HepCB	**180**	**0,89**		86	
2,2',3,4,4',5',6-HepCB	183	0,22			
2,2',3,4',5,5',6-HepCB	187	0,51			
2,3,3',4,4',5,5'-HepCB	189	0,03	b	83	0,00
Sum-HepCB		***2,92***			
2,2',3,3',4,4',5,5'-OctCB	194	0,10			
2,2',3,3',4,4',5,5',6-NonCB	206	0,05			
DecaCB	209	0,04	i	75	
Sum 7 PCB		**27,8**			
Sum PCB		***129***			**0,31**

Sum 7 PCB: PCB(28+52+101+118+138+153+180)
Sum PCB: Sum of observed PCB (mono- and di-CB are not included)
<: Lower than detection limit at signal-to-noise 3 to 1
i: Isotope ratio deviates more than 20 % from theoretical value.
This may be due to instrumental noise or/and chemical interference
b: Lower than 10 times method blank.
g: Recovery is not according to NILUs quality criteria
TE (WHO): 2378-TCDD toxicity equivalents of the mono-ortho PCB according to the WHO model (M. Van den Berg et al., 1998)

14. versjon 22.09.2006 GSK

Results of PCB Analysis

Encl. to measuring report: O-4932
NILU-Sample number: 08/13
Customer: SFT
Customers sample ID: Sofienberg 27-28.12.07
: 0923-0923
Sample type: Luft
Sample amount: 686 m3
Concentration units: pg/m3
Data files: VB414

Compound		Concentration		Recovery	TE (WHO)
Structure	IUPAC-no.	pg/m3		%	fg/ m3
PeCB		6,81		20	
HCB		47,8		16	
2,2',5-TriCB	18	9,85			
2,4,4'-TriCB	**28**	**7,63**		38	
2,4',5-TriCB	31	7,18			
2',3,4-TriCB	33	4,51			
3,4,4'-TriCB	37	0,03	b		
Sum-TriCB		***45,2***			
2,2',4,4'-TetCB	47	11,2			
2,2',5,5'-TetCB	**52**	**8,46**		g	
2,3',4,4'-TetCB	66	2,98			
2,4,4',5-TetCB	74	1,94			
Sum-TetCB		***50,8***			
2,2',4,4',5-PenCB	99	1,88			
2,2',4,5,5'-PenCB	**101**	**5,89**		46	
2,3,3',4,4'-PenCB	105	0,50		53	0,05
2,3,4,4',5-PenCB	114	0,08		51	0,04
2,3',4,4',5-PenCB	**118**	**1,64**		52	0,16
2'3,3',4,5-PenCB	122	0,02			
2',3,4,4',5-PenCB	123	0,02	i	52	0,00
Sum-PenCB		***18,6***			
2,2',3,3',4,4'-HexCB	128	0,20			
2,2',3,4,4',5'-HexCB	**138**	**1,08**		56	
2,2',3,4,5,5'-HexCB	141	0,41			
2,2',3,4',5',6-HexCB	149	2,40			
2,2',4,4',5,5'-HexCB	**153**	**1,89**		53	
2,3,3',4,4',5-HexCB	156	0,08		53	0,04
2,3,3',4,4',5'-HexCB	157	0,02	b	49	0,01
2,3',4,4',5,5'-HexCB	167	0,03	i	50	0,00
Sum-HexCB		***10,2***			
2,2',3,3',4,4',5-HepCB	170	0,10			
2,2',3,4,4',5,5'-HepCB	**180**	**0,35**		54	
2,2',3,4,4',5',6-HepCB	183	0,15			
2,2',3,4',5,5',6-HepCB	187	0,35			
2,3,3',4,4',5,5'-HepCB	189	< 0,02		48	0,00
Sum-HepCB		***1,29***			
2,2',3,3',4,4',5,5'-OctCB	194	< 0,02			
2,2',3,3',4,4',5,5',6-NonCB	206	< 0,04			
DecaCB	209	< 0,01		47	
Sum 7 PCB		**27,0**			
Sum PCB		***126***			**0,31**

Sum 7 PCB: PCB(28+52+101+118+138+153+180)
Sum PCB: Sum of observed PCB (mono- and di-CB are not included)
<: Lower than detection limit at signal-to-noise 3 to 1
i: Isotope ratio deviates more than 20 % from theoretical value.
This may be due to instrumental noise or/and chemical interference
b: Lower than 10 times method blank.
g: Recovery is not according to NILUs quality criteria
TE (WHO): 2378-TCDD toxicity equivalents of the mono-ortho PCB according to the WHO model (M. Van den Berg et al., 1998)

14. versjon 22.09.2006 GSK

Results of PCB Analysis

Encl. to measuring report: O-4932
NILU-Sample number: 08/14
Customer: SFT
Customers sample ID: Sofienberg 28-29.12.07
: 0926-0926
Sample type: Luft
Sample amount: 680 m3
Concentration units: pg/m3
Data files: VB419D

Compound		Concentration		Recovery	TE (WHO)
Structure	IUPAC-no.	pg/m3		%	fg/ m3
PeCB		4,74		17	
HCB		53,8		19	
2,2',5-TriCB	18	18,9			
2,4,4'-TriCB	**28**	**12,4**		36	
2,4',5-TriCB	31	12,2			
2',3,4-TriCB	33	8,43			
3,4,4'-TriCB	37	0,02	bi		
Sum-TriCB		***80,1***			
2,2',4,4'-TetCB	47	13,3			
2,2',5,5'-TetCB	**52**	**13,4**		g	
2,3',4,4'-TetCB	66	3,52			
2,4,4',5-TetCB	74	2,34			
Sum-TetCB		***63,8***			
2,2',4,4',5-PenCB	99	2,36			
2,2',4,5,5'-PenCB	**101**	**8,03**		55	
2,3,3',4,4'-PenCB	105	0,80		71	0,08
2,3,4,4',5-PenCB	114	0,15		65	0,07
2,3',4,4',5-PenCB	**118**	**2,49**		66	0,25
2'3,3',4,5-PenCB	122	0,03			
2',3,4,4',5-PenCB	123	0,05		66	0,00
Sum-PenCB		***24,9***			
2,2',3,3',4,4'-HexCB	128	0,33			
2,2',3,4,4',5'-HexCB	**138**	**2,09**		75	
2,2',3,4,5,5'-HexCB	141	0,65			
2,2',3,4',5',6-HexCB	149	3,15			
2,2',4,4',5,5'-HexCB	**153**	**3,04**		67	
2,3,3',4,4',5-HexCB	156	0,15		78	0,07
2,3,3',4,4',5'-HexCB	157	0,04	b	80	0,02
2,3',4,4',5,5'-HexCB	167	0,08		76	0,00
Sum-HexCB		***15,9***			
2,2',3,3',4,4',5-HepCB	170	0,26			
2,2',3,4,4',5,5'-HepCB	**180**	**0,73**		79	
2,2',3,4,4',5',6-HepCB	183	0,24			
2,2',3,4',5,5',6-HepCB	187	0,61			
2,3,3',4,4',5,5'-HepCB	189	0,02	b	80	0,00
Sum-HepCB		***2,82***			
2,2',3,3',4,4',5,5'-OctCB	194	0,06			
2,2',3,3',4,4',5,5',6-NonCB	206	0,02			
DecaCB	209	0,04		82	
Sum 7 PCB		**42,1**			
Sum PCB		***188***			**0,50**

Sum 7 PCB: PCB(28+52+101+118+138+153+180)
Sum PCB: Sum of observed PCB (mono- and di-CB are not included)
<: Lower than detection limit at signal-to-noise 3 to 1
i: Isotope ratio deviates more than 20 % from theoretical value.
This may be due to instrumental noise or/and chemical interference
b: Lower than 10 times method blank.
g: Recovery is not according to NILUs quality criteria
TE (WHO): 2378-TCDD toxicity equivalents of the mono-ortho PCB according to the WHO model (M. Van den Berg et al., 1998)

14. versjon 22.09.2006 GSK

Results of PCB Analysis

Encl. to measuring report: O-4932
NILU-Sample number: 08/24
Customer: SFT
Customers sample ID: Sofienberg 02-03.01.08
: 0941-0941
Sample type: Luft
Sample amount: 702 m3
Concentration units: pg/m3
Data files: VB416

Compound		Concentration			Recovery	TE (WHO)
Structure	IUPAC-no.		pg/m3		%	fg/ m3
PeCB			9,94		24	
HCB			95,3		49	
2,2',5-TriCB	18		9,57			
2,4,4'-TriCB	**28**		**5,90**		51	
2,4',5-TriCB	31		5,59			
2',3,4-TriCB	33		3,58			
3,4,4'-TriCB	37		0,06	i		
Sum-TriCB			***37,6***			
2,2',4,4'-TetCB	47		3,94			
2,2',5,5'-TetCB	**52**		**4,79**		79	
2,3',4,4'-TetCB	66		0,96			
2,4,4',5-TetCB	74		0,69			
Sum-TetCB			***20,2***			
2,2',4,4',5-PenCB	99		0,73			
2,2',4,5,5'-PenCB	**101**		**2,97**		46	
2,3,3',4,4'-PenCB	105		0,29		55	0,03
2,3,4,4',5-PenCB	114		0,04		57	0,02
2,3',4,4',5-PenCB	**118**		**0,91**		57	0,09
2'3,3',4,5-PenCB	122	<	0,02			
2',3,4,4',5-PenCB	123		0,02	i	59	0,00
Sum-PenCB			***8,56***			
2,2',3,3',4,4'-HexCB	128		0,14	i		
2,2',3,4,4',5'-HexCB	**138**		**0,73**		58	
2,2',3,4,5,5'-HexCB	141		0,20			
2,2',3,4',5',6-HexCB	149		1,07			
2,2',4,4',5,5'-HexCB	**153**		**0,96**		87	
2,3,3',4,4',5-HexCB	156		0,07		50	0,04
2,3,3',4,4',5'-HexCB	157	<	0,02		52	0,01
2,3',4,4',5,5'-HexCB	167	<	0,03		51	0,00
Sum-HexCB			***4,51***			
2,2',3,3',4,4',5-HepCB	170		0,06	i		
2,2',3,4,4',5,5'-HepCB	**180**		**0,26**		68	
2,2',3,4,4',5',6-HepCB	183		0,08			
2,2',3,4',5,5',6-HepCB	187		0,21			
2,3,3',4,4',5,5'-HepCB	189	<	0,01		65	0,00
Sum-HepCB			***0,76***			
2,2',3,3',4,4',5,5'-OctCB	194		0,04			
2,2',3,3',4,4',5,5',6-NonCB	206	<	0,02			
DecaCB	209	<	0,01		55	
Sum 7 PCB			**16,5**			
Sum PCB			***71,8***			**0,19**

Sum 7 PCB: PCB(28+52+101+118+138+153+180)
Sum PCB: Sum of observed PCB (mono- and di-CB are not included)
<: Lower than detection limit at signal-to-noise 3 to 1
i: Isotope ratio deviates more than 20 % from theoretical value.
This may be due to instrumental noise or/and chemical interference
b: Lower than 10 times method blank.
g: Recovery is not according to NILUs quality criteria
TE (WHO): 2378-TCDD toxicity equivalents of the mono-ortho PCB according to the WHO model (M. Van den Berg et al., 1998)

14. versjon 22.09.2006 GSK

Results of PCB Analysis

Encl. to measuring report: O-4932
NILU-Sample number: 08/72
Customer: SFT
Customers sample ID: Sofienberg 04-05.01.08
: 0901-0901
Sample type: Luft
Sample amount: 702 m3
Concentration units: pg/m3
Data files: M_29_02_08

Compound Structure	IUPAC-no.		Concentration pg/m3		Recovery %	TE (WHO) fg/ m3
PeCB			40,3		37	
HCB			299		36	
2,2',5-TriCB	18		54,3			
2,4,4'-TriCB	**28**		**4,64**		57	
2,4',5-TriCB	31		4,61			
2',3,4-TriCB	33		18,8			
3,4,4'-TriCB	37		0,13			
Sum-TriCB			***103***			
2,2',4,4'-TetCB	47		4,25			
2,2',5,5'-TetCB	**52**		**3,75**		53	
2,3',4,4'-TetCB	66		6,14			
2,4,4',5-TetCB	74		0,62			
Sum-TetCB			***26,6***			
2,2',4,4',5-PenCB	99		0,47			
2,2',4,5,5'-PenCB	**101**		**1,49**		80	
2,3,3',4,4'-PenCB	105		1,08		80	0,11
2,3,4,4',5-PenCB	114	<	0,03		83	0,02
2,3',4,4',5-PenCB	**118**		**3,58**		84	0,36
2'3,3',4,5-PenCB	122		0,16			
2',3,4,4',5-PenCB	123		0,08		88	0,01
Sum-PenCB			***11,2***			
2,2',3,3',4,4'-HexCB	128		0,69			
2,2',3,4,4',5'-HexCB	**138**		**0,61**		84	
2,2',3,4,5,5'-HexCB	141		1,05			
2,2',3,4',5',6-HexCB	149		5,11			
2,2',4,4',5,5'-HexCB	**153**		**0,88**		75	
2,3,3',4,4',5-HexCB	156		0,39		84	0,20
2,3,3',4,4',5'-HexCB	157	<	0,03		82	0,01
2,3',4,4',5,5'-HexCB	167		0,20		74	0,00
Sum-HexCB			***11,9***			
2,2',3,3',4,4',5-HepCB	170		1,20			
2,2',3,4,4',5,5'-HepCB	**180**		**0,37**		79	
2,2',3,4,4',5',6-HepCB	183		0,50			
2,2',3,4',5,5',6-HepCB	187		1,14			
2,3,3',4,4',5,5'-HepCB	189		0,01	b	83	0,00
Sum-HepCB			***3,72***			
2,2',3,3',4,4',5,5'-OctCB	194	<	0,01			
2,2',3,3',4,4',5,5',6-NonCB	206		0,11			
DecaCB	209		0,02	b	78	
Sum 7 PCB			**15,3**			
Sum PCB			***156***			**0,70**

Sum 7 PCB: PCB(28+52+101+118+138+153+180)
Sum PCB: Sum of observed PCB (mono- and di-CB are not included)
<: Lower than detection limit at signal-to-noise 3 to 1
i: Isotope ratio deviates more than 20 % from theoretical value.
This may be due to instrumental noise or/and chemical interference
b: Lower than 10 times method blank.
g: Recovery is not according to NILUs quality criteria
TE (WHO): 2378-TCDD toxicity equivalents of the mono-ortho PCB according to the WHO model (M. Van den Berg et al., 1998)

14. versjon 22.09.2006 GSK

Results of
PCDD/PCDF and nonortho-PCB Analysis

Encl. to measuring report: O-4916
NILU sample number: 07/1710
Customer: SFT
Customers sample ID: Sofienberg - 1
: 18-19/10-07, 15:46 - 15:46
Sample type: Air
Sample amount: 695 m3 Total sample amount:
Concentration units: fg/m3
Data files: M_16-11-07_diox.2

Compound	Concentration			Recovery		TE(nordic)	i-TE	TE (WHO)
		fg/m3		%		fg/m3	fg/m3	fg/m3
Dioxins								
2378-TCDD	<	0,95		64		0,95	0,95	0,95
12378-PeCDD	<	1,22		70		0,61	0,61	1,22
123478-HxCDD	<	0,88		76		0,09	0,09	0,09
123678-HxCDD	<	0,81		74		0,08	0,08	0,08
123789-HxCDD		3,60				0,36	0,36	0,36
1234678-HpCDD		59,4		74		0,59	0,59	0,59
OCDD		193		67		0,19	0,19	0,02
SUM PCDD						**2,87**	**2,87**	**3,31**
Furanes								
2378-TCDF		5,46		68		0,55	0,55	0,55
12378/12348-PeCDF	<	0,69			*	0,01	0,03	0,03
23478-PeCDF		4,14		70		2,07	2,07	2,07
123478/123479-HxCDF		3,58		70		0,36	0,36	0,36
123678-HxCDF		3,33		79		0,33	0,33	0,33
123789-HxCDF	<	0,75			*	0,07	0,07	0,07
234678-HxCDF	<	0,60		69		0,06	0,06	0,06
1234678-HpCDF		10,5		73		0,10	0,10	0,10
1234789-HpCDF		1,27			*	0,01	0,01	0,01
OCDF		17,3		78		0,02	0,02	0,00
SUM PCDF						**3,58**	**3,61**	**3,59**
SUM PCDD/PCDF						**6,45**	**6,48**	**6,90**
nonortho - PCB								
33'44'-TeCB (PCB-77)		100		69				0,01
344'5-TeCB (PCB-81)		6,84						0,00
33'44'5-PeCB (PCB-126)	<	1,32		70				0,13
33'44'55'-HxCB (PCB-169)	<	0,01		86				0,00
SUM TE-PCB								**0,14**

TE(nordic) : 2378-TCDD toxicity equivalents according to the nordic model (Ahlborg et al., 1988)
i-TE : 2378-TCDD toxicity equivalents according to the international model (Nato/CCMS, 1989)
TE (WHO) : 2378-TCDD toxicity equivalents according to the WHO model (M. Van den Berg et al., 1998)
< : Lower than detection limit at signal-to-noise 3 to 1
i : Isotope ratio deviates more than 20 % from theoretical value.
This may be due to instrumental noise or/and chemical interference
b : Lower than 10 times method blank
g : Recovery is not according to NILUs quality criteria
* : Samplingstandard NS-EN 1948

7. versjon 13.03.2006 GSK

Results of
PCDD/PCDF and nonortho-PCB Analysis

Encl. to measuring report: O-4916
NILU sample number: 07/1725
Customer: SFT
Customers sample ID: Sofienberg - 2
: 23-23/10-07, 08:24 - 08:25
Sample type: Air
Sample amount: 694 m3 Total sample amount:
Concentration units: fg/m3
Data files: M_16-11-07_diox.2

Compound	Concentration			Recovery		TE(nordic)	i-TE	TE (WHO)
		fg/m3		%		fg/m3	fg/m3	fg/m3
Dioxins								
2378-TCDD	<	1,47		49		1,47	1,47	1,47
12378-PeCDD	<	2,20		63		1,10	1,10	2,20
123478-HxCDD	<	1,39		71		0,14	0,14	0,14
123678-HxCDD	<	1,33		68		0,13	0,13	0,13
123789-HxCDD	<	1,36				0,14	0,14	0,14
1234678-HpCDD		60,1		67		0,60	0,60	0,60
OCDD		192		53		0,19	0,19	0,02
SUM PCDD						**3,77**	**3,77**	**4,70**
Furanes								
2378-TCDF		3,95		54		0,39	0,39	0,39
12378/12348-PeCDF	<	1,24			*	0,01	0,06	0,06
23478-PeCDF		6,04		61		3,02	3,02	3,02
123478/123479-HxCDF		5,09		64		0,51	0,51	0,51
123678-HxCDF		5,24		64		0,52	0,52	0,52
123789-HxCDF	<	1,08			*	0,11	0,11	0,11
234678-HxCDF		10,0		64		1,00	1,00	1,00
1234678-HpCDF		25,9		70		0,26	0,26	0,26
1234789-HpCDF	<	0,95			*	0,01	0,01	0,01
OCDF		54,0		64		0,05	0,05	0,01
SUM PCDF						**5,89**	**5,94**	**5,90**
SUM PCDD/PCDF						**9,66**	**9,71**	**10,6**
nonortho - PCB								
33'44'-TeCB (PCB-77)		103		49				0,01
344'5-TeCB (PCB-81)		9,00						0,00
33'44'5-PeCB (PCB-126)	<	2,66		58				0,27
33'44'55'-HxCB (PCB-169)	<	1,09		77				0,01
SUM TE-PCB								**0,29**

TE(nordic) : 2378-TCDD toxicity equivalents according to the nordic model (Ahlborg et al., 1988)
i-TE : 2378-TCDD toxicity equivalents according to the international model (Nato/CCMS, 1989)
TE (WHO) : 2378-TCDD toxicity equivalents according to the WHO model (M. Van den Berg et al., 1998)
< : Lower than detection limit at signal-to-noise 3 to 1
i : Isotope ratio deviates more than 20 % from theoretical value.
This may be due to instrumental noise or/and chemical interference
b : Lower than 10 times method blank
g : Recovery is not according to NILUs quality criteria
* : Samplingstandard NS-EN 1948

7. versjon 13.03.2006 GSK

Results of
PCDD/PCDF and nonortho-PCB Analysis

Encl. to measuring report: O-4916
NILU sample number: 07/1823
Customer: SFT
Customers sample ID: Sofienberg - 3
: 23-24/10-07
Sample type: Air
Sample amount: 695 m3 Total sample amount:
Concentration units: fg/m3
Data files: M_16-11-07_diox.2

Compound	Concentration			Recovery		TE(nordic)	i-TE	TE (WHO)
		fg/m3		%		fg/m3	fg/m3	fg/m3
Dioxins								
2378-TCDD	<	1,34		58		1,34	1,34	1,34
12378-PeCDD	<	1,20		60		0,60	0,60	1,20
123478-HxCDD		6,55		71		0,66	0,66	0,66
123678-HxCDD		5,80		71		0,58	0,58	0,58
123789-HxCDD		4,25				0,42	0,42	0,42
1234678-HpCDD		60,8		65		0,61	0,61	0,61
OCDD		174		51		0,17	0,17	0,02
SUM PCDD						**4,39**	**4,39**	**4,83**
Furanes								
2378-TCDF		6,03		60		0,60	0,60	0,60
12378/12348-PeCDF		6,62			*	0,07	0,33	0,33
23478-PeCDF		8,69		60		4,35	4,35	4,35
123478/123479-HxCDF		9,33		67		0,93	0,93	0,93
123678-HxCDF		8,86		70		0,89	0,89	0,89
123789-HxCDF	<	0,90			*	0,09	0,09	0,09
234678-HxCDF		11,9		63		1,19	1,19	1,19
1234678-HpCDF		40,0		64		0,40	0,40	0,40
1234789-HpCDF		4,43			*	0,04	0,04	0,04
OCDF		53,4		63		0,05	0,05	0,01
SUM PCDF						**8,61**	**8,87**	**8,82**
SUM PCDD/PCDF						**13,0**	**13,3**	**13,7**
nonortho - PCB								
33'44'-TeCB (PCB-77)		108		58				0,01
344'5-TeCB (PCB-81)		8,19						0,00
33'44'5-PeCB (PCB-126)	<	1,86		60				0,19
33'44'55'-HxCB (PCB-169)	<	0,70		75				0,01
SUM TE-PCB								**0,20**

TE(nordic) : 2378-TCDD toxicity equivalents according to the nordic model (Ahlborg et al., 1988)
i-TE : 2378-TCDD toxicity equivalents according to the international model (Nato/CCMS, 1989)
TE (WHO) : 2378-TCDD toxicity equivalents according to the WHO model (M. Van den Berg et al., 1998)
< : Lower than detection limit at signal-to-noise 3 to 1
i : Isotope ratio deviates more than 20 % from theoretical value.
This may be due to instrumental noise or/and chemical interference
b : Lower than 10 times method blank
g : Recovery is not according to NILUs quality criteria
* : Samplingstandard NS-EN 1948

7. versjon 13.03.2006 GSK

Results of
PCDD/PCDF and nonortho-PCB Analysis

Encl. to measuring report: O-5041
NILU sample number: 07/2140
Customer: SFT
Customers sample ID: Sofienberg
: 3-4/12-07
Sample type: Air
Sample amount: 685 m3 Total sample amount:
Concentration units: fg/m3
Data files: M_24-01-08_diox-2

Compound	Concentration		Recovery		TE(nordic)	i-TE	TE (WHO)
		fg/m3	%		fg/m3	fg/m3	fg/m3
Dioxins							
2378-TCDD		0,92	54		0,92	0,92	0,92
12378-PeCDD		2,90	68		1,45	1,45	2,90
123478-HxCDD		0,96	63		0,10	0,10	0,10
123678-HxCDD		2,25	65		0,22	0,22	0,22
123789-HxCDD	<	0,25			0,03	0,03	0,03
1234678-HpCDD		20,6	54		0,21	0,21	0,21
OCDD		106	40		0,11	0,11	0,01
SUM PCDD					**3,02**	**3,02**	**4,38**
Furanes							
2378-TCDF		6,78	57		0,68	0,68	0,68
12378/12348-PeCDF		4,00		*	0,04	0,20	0,20
23478-PeCDF		6,72	64		3,36	3,36	3,36
123478/123479-HxCDF		4,34	59		0,43	0,43	0,43
123678-HxCDF		3,98	68		0,40	0,40	0,40
123789-HxCDF		1,84		*	0,18	0,18	0,18
234678-HxCDF		5,36	55		0,54	0,54	0,54
1234678-HpCDF		12,7	58		0,13	0,13	0,13
1234789-HpCDF	<	0,35		*	0,00	0,00	0,00
OCDF		13,4	44		0,01	0,01	0,00
SUM PCDF					**5,78**	**5,94**	**5,92**
SUM PCDD/PCDF					**8,80**	**8,96**	**10,3**
nonortho - PCB							
33'44'-TeCB (PCB-77)		114	49				0,01
344'5-TeCB (PCB-81)		8,94					0,00
33'44'5-PeCB (PCB-126)		8,02	58				0,80
33'44'55'-HxCB (PCB-169)		1,09	84				0,01
SUM TE-PCB							**0,83**

TE(nordic) : 2378-TCDD toxicity equivalents according to the nordic model (Ahlborg et al., 1988)
i-TE : 2378-TCDD toxicity equivalents according to the international model (Nato/CCMS, 1989)
TE (WHO) : 2378-TCDD toxicity equivalents according to the WHO model (M. Van den Berg et al., 1998)
< : Lower than detection limit at signal-to-noise 3 to 1
i : Isotope ratio deviates more than 20 % from theoretical value.
This may be due to instrumental noise or/and chemical interference
b : Lower than 10 times method blank
g : Recovery is not according to NILUs quality criteria
* : Samplingstandard NS-EN 1948

7. versjon 13.03.2006 GSK

Results of
PCDD/PCDF and nonortho-PCB Analysis

Encl. to measuring report: O-5041
NILU sample number: 07/2141
Customer: SFT
Customers sample ID: Sofienberg
: 4-5/12-07
Sample type: Air
Sample amount: 688 m3 Total sample amount:
Concentration units: fg/m3
Data files: M_24-01-08_diox-2

Compound	Concentration fg/m3		Recovery %		TE(nordic) fg/m3	i-TE fg/m3	TE (WHO) fg/m3
Dioxins							
2378-TCDD	3,02		63		3,02	3,02	3,02
12378-PeCDD	13,3		68		6,64	6,64	13,3
123478-HxCDD	9,28		70		0,93	0,93	0,93
123678-HxCDD	13,2		73		1,32	1,32	1,32
123789-HxCDD	10,2				1,02	1,02	1,02
1234678-HpCDD	156		60		1,56	1,56	1,56
OCDD	421		40		0,42	0,42	0,04
SUM PCDD					**14,9**	**14,9**	**21,2**
Furanes							
2378-TCDF	25,3		63		2,53	2,53	2,53
12378/12348-PeCDF	14,7			*	0,15	0,73	0,73
23478-PeCDF	31,3		67		15,6	15,6	15,6
123478/123479-HxCDF	19,1		64		1,91	1,91	1,91
123678-HxCDF	16,6		85		1,66	1,66	1,66
123789-HxCDF	9,14			*	0,91	0,91	0,91
234678-HxCDF	29,2		62		2,92	2,92	2,92
1234678-HpCDF	61,2		74		0,61	0,61	0,61
1234789-HpCDF	5,73			*	0,06	0,06	0,06
OCDF	33,1		46		0,03	0,03	0,00
SUM PCDF					**26,4**	**27,0**	**27,0**
SUM PCDD/PCDF					**41,3**	**41,9**	**48,1**
nonortho - PCB							
33'44'-TeCB (PCB-77)	178		53				0,02
344'5-TeCB (PCB-81)	12,2						0,00
33'44'5-PeCB (PCB-126)	23,5		67				2,35
33'44'55'-HxCB (PCB-169)	4,76		85				0,05
SUM TE-PCB							**2,42**

TE(nordic) : 2378-TCDD toxicity equivalents according to the nordic model (Ahlborg et al., 1988)
i-TE : 2378-TCDD toxicity equivalents according to the international model (Nato/CCMS, 1989)
TE (WHO) : 2378-TCDD toxicity equivalents according to the WHO model (M. Van den Berg et al., 1998)
< : Lower than detection limit at signal-to-noise 3 to 1
i : Isotope ratio deviates more than 20 % from theoretical value.
This may be due to instrumental noise or/and chemical interference
b : Lower than 10 times method blank
g : Recovery is not according to NILUs quality criteria
* : Samplingstandard NS-EN 1948

7. versjon 13.03.2006 GSK

Results of
PCDD/PCDF and nonortho-PCB Analysis

Encl. to measuring report: O-5041
NILU sample number: 08/2159
Customer: SFT
Customers sample ID: Sofienberg
: 05-06/12-07
Sample type: Air
Sample amount: 676 m3 Total sample amount:
Concentration units: fg/m3
Data files: M_24-01-08_diox-2

Compound	Concentration			Recovery		TE(nordic)	i-TE	TE (WHO)
		fg/m3		%		fg/m3	fg/m3	fg/m3
Dioxins								
2378-TCDD	<	0,44		60		0,44	0,44	0,44
12378-PeCDD		1,51		64		0,76	0,76	1,51
123478-HxCDD	<	0,69		54		0,07	0,07	0,07
123678-HxCDD	<	0,58		56		0,06	0,06	0,06
123789-HxCDD	<	0,62				0,06	0,06	0,06
1234678-HpCDD		18,5		40		0,19	0,19	0,19
OCDD		47,5		g		0,05	0,05	0,00
SUM PCDD						**1,62**	**1,62**	**2,33**
Furanes								
2378-TCDF		6,18		60		0,62	0,62	0,62
12378/12348-PeCDF		3,10			*	0,03	0,15	0,15
23478-PeCDF		4,27		60		2,13	2,13	2,13
123478/123479-HxCDF		2,48		51		0,25	0,25	0,25
123678-HxCDF	<	0,31		68		0,03	0,03	0,03
123789-HxCDF	<	0,60			*	0,06	0,06	0,06
234678-HxCDF		3,59		51		0,36	0,36	0,36
1234678-HpCDF		8,88		47		0,09	0,09	0,09
1234789-HpCDF	<	0,62			*	0,01	0,01	0,01
OCDF		5,58		g		0,01	0,01	0,00
SUM PCDF						**3,58**	**3,71**	**3,70**
SUM PCDD/PCDF						**5,20**	**5,32**	**6,03**
nonortho - PCB								
33'44'-TeCB (PCB-77)		174		59				0,02
344'5-TeCB (PCB-81)		10,6						0,00
33'44'5-PeCB (PCB-126)		10,2		65				1,02
33'44'55'-HxCB (PCB-169)		1,14		81				0,01
SUM TE-PCB								**1,05**

TE(nordic) : 2378-TCDD toxicity equivalents according to the nordic model (Ahlborg et al., 1988)
i-TE : 2378-TCDD toxicity equivalents according to the international model (Nato/CCMS, 1989)
TE (WHO) : 2378-TCDD toxicity equivalents according to the WHO model (M. Van den Berg et al., 1998)
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This may be due to instrumental noise or/and chemical interference
b : Lower than 10 times method blank
g : Recovery is not according to NILUs quality criteria
* : Samplingstandard NS-EN 1948

7. versjon 13.03.2006 GSK

Results of
PCDD/PCDF and nonortho-PCB Analysis

Encl. to measuring report: O-5041
NILU sample number: 07/2166
Customer: SFT
Customers sample ID: Sofienberg
: 07-08/12-07
Sample type: Air
Sample amount: 677 m3 Total sample amount:
Concentration units: fg/m3
Data files: M_05-02-08_diox-2

Compound	Concentration fg/m3		Recovery %		TE(nordic) fg/m3	i-TE fg/m3	TE (WHO) fg/m3
Dioxins							
2378-TCDD		0,43	61		0,43	0,43	0,43
12378-PeCDD		1,24	65		0,62	0,62	1,24
123478-HxCDD		0,95	64		0,10	0,10	0,10
123678-HxCDD		1,01	68		0,10	0,10	0,10
123789-HxCDD		0,97			0,10	0,10	0,10
1234678-HpCDD		10,3	59		0,10	0,10	0,10
OCDD		24,8	51		0,02	0,02	0,00
SUM PCDD					**1,48**	**1,48**	**2,07**
Furanes							
2378-TCDF		3,21	60		0,32	0,32	0,32
12378/12348-PeCDF		1,79		*	0,02	0,09	0,09
23478-PeCDF		2,92	64		1,46	1,46	1,46
123478/123479-HxCDF		2,14	61		0,21	0,21	0,21
123678-HxCDF		2,04	63		0,20	0,20	0,20
123789-HxCDF		1,14		*	0,11	0,11	0,11
234678-HxCDF		2,51	59		0,25	0,25	0,25
1234678-HpCDF		6,94	58		0,07	0,07	0,07
1234789-HpCDF	<	0,34		*	0,00	0,00	0,00
OCDF		5,46	54		0,01	0,01	0,00
SUM PCDF					**2,66**	**2,73**	**2,73**
SUM PCDD/PCDF					**4,14**	**4,21**	**4,80**
nonortho - PCB							
33'44'-TeCB (PCB-77)		107	59				0,01
344'5-TeCB (PCB-81)		6,89					0,00
33'44'5-PeCB (PCB-126)		4,50	65				0,45
33'44'55'-HxCB (PCB-169)		0,47	74				0,00
SUM TE-PCB							**0,47**

TE(nordic) : 2378-TCDD toxicity equivalents according to the nordic model (Ahlborg et al., 1988)
i-TE : 2378-TCDD toxicity equivalents according to the international model (Nato/CCMS, 1989)
TE (WHO) : 2378-TCDD toxicity equivalents according to the WHO model (M. Van den Berg et al., 1998)
< : Lower than detection limit at signal-to-noise 3 to 1
i : Isotope ratio deviates more than 20 % from theoretical value.
This may be due to instrumental noise or/and chemical interference
b : Lower than 10 times method blank
g : Recovery is not according to NILUs quality criteria
* : Samplingstandard NS-EN 1948

7. versjon 13.03.2006 GSK

Results of
PCDD/PCDF and nonortho-PCB Analysis

Encl. to measuring report: O-5041
NILU sample number: 07/2169
Customer: SFT
Customers sample ID: Sofienberg
: 10-11/12-07
Sample type: Air
Sample amount: 688 m3 Total sample amount:
Concentration units: fg/m3
Data files: M_05-02-08_diox-2

Compound	Concentration fg/m3		Recovery %		TE(nordic) fg/m3	i-TE fg/m3	TE (WHO) fg/m3
Dioxins							
2378-TCDD	1,01		64		1,01	1,01	1,01
12378-PeCDD	2,41		65		1,21	1,21	2,41
123478-HxCDD	1,41		63		0,14	0,14	0,14
123678-HxCDD	2,80		69		0,28	0,28	0,28
123789-HxCDD	1,94				0,19	0,19	0,19
1234678-HpCDD	24,0		58		0,24	0,24	0,24
OCDD	56,4		51		0,06	0,06	0,01
SUM PCDD					**3,13**	**3,13**	**4,28**
Furanes							
2378-TCDF	4,56		62		0,46	0,46	0,46
12378/12348-PeCDF	3,87			*	0,04	0,19	0,19
23478-PeCDF	7,04		62		3,52	3,52	3,52
123478/123479-HxCDF	6,33		60		0,63	0,63	0,63
123678-HxCDF	4,92		70		0,49	0,49	0,49
123789-HxCDF	2,92			*	0,29	0,29	0,29
234678-HxCDF	6,51		57		0,65	0,65	0,65
1234678-HpCDF	23,0		56		0,23	0,23	0,23
1234789-HpCDF	3,93			*	0,04	0,04	0,04
OCDF	15,5		49		0,02	0,02	0,00
SUM PCDF					**6,37**	**6,52**	**6,51**
SUM PCDD/PCDF					**9,49**	**9,65**	**10,8**
nonortho - PCB							
33'44'-TeCB (PCB-77)	57,1		62				0,01
344'5-TeCB (PCB-81)	4,17						0,00
33'44'5-PeCB (PCB-126)	4,99		67				0,50
33'44'55'-HxCB (PCB-169)	0,97		75				0,01
SUM TE-PCB							**0,52**

TE(nordic) : 2378-TCDD toxicity equivalents according to the nordic model (Ahlborg et al., 1988)
i-TE : 2378-TCDD toxicity equivalents according to the international model (Nato/CCMS, 1989)
TE (WHO) : 2378-TCDD toxicity equivalents according to the WHO model (M. Van den Berg et al., 1998)
< : Lower than detection limit at signal-to-noise 3 to 1
i : Isotope ratio deviates more than 20 % from theoretical value.
This may be due to instrumental noise or/and chemical interference
b : Lower than 10 times method blank
g : Recovery is not according to NILUs quality criteria
* : Samplingstandard NS-EN 1948

7. versjon 13.03.2006 GSK

Results of
PCDD/PCDF and nonortho-PCB Analysis

Encl. to measuring report: O-5041
NILU sample number: 07/2204
Customer: SFT
Customers sample ID: Sofienberg
: 11-12/12-07
Sample type: Air
Sample amount: 706 m3 Total sample amount:
Concentration units: fg/m3
Data files: M_05-02-08_diox-2

Compound	Concentration fg/m3		Recovery %		TE(nordic) fg/m3	i-TE fg/m3	TE (WHO) fg/m3
Dioxins							
2378-TCDD	1,32		57		1,32	1,32	1,32
12378-PeCDD	9,67		59		4,84	4,84	9,67
123478-HxCDD	6,42		59		0,64	0,64	0,64
123678-HxCDD	6,61		64		0,66	0,66	0,66
123789-HxCDD	7,13				0,71	0,71	0,71
1234678-HpCDD	70,5		54		0,70	0,70	0,70
OCDD	103		49		0,10	0,10	0,01
SUM PCDD					**8,98**	**8,98**	**13,7**
Furanes							
2378-TCDF	11,0		54		1,10	1,10	1,10
12378/12348-PeCDF	12,5			*	0,12	0,62	0,62
23478-PeCDF	16,2		57		8,12	8,12	8,12
123478/123479-HxCDF	14,1		56		1,41	1,41	1,41
123678-HxCDF	14,8		59		1,48	1,48	1,48
123789-HxCDF	5,93			*	0,59	0,59	0,59
234678-HxCDF	12,5		51		1,25	1,25	1,25
1234678-HpCDF	38,1		52		0,38	0,38	0,38
1234789-HpCDF	5,67			*	0,06	0,06	0,06
OCDF	14,5		48		0,01	0,01	0,00
SUM PCDF					**14,5**	**15,0**	**15,0**
SUM PCDD/PCDF					**23,5**	**24,0**	**28,7**
nonortho - PCB							
33'44'-TeCB (PCB-77)	54,7		55				0,01
344'5-TeCB (PCB-81)	5,27						0,00
33'44'5-PeCB (PCB-126)	7,81		61				0,78
33'44'55'-HxCB (PCB-169)	2,18		68				0,02
SUM TE-PCB							**0,81**

TE(nordic) : 2378-TCDD toxicity equivalents according to the nordic model (Ahlborg et al., 1988)
i-TE : 2378-TCDD toxicity equivalents according to the international model (Nato/CCMS, 1989)
TE (WHO) : 2378-TCDD toxicity equivalents according to the WHO model (M. Van den Berg et al., 1998)
< : Lower than detection limit at signal-to-noise 3 to 1
i : Isotope ratio deviates more than 20 % from theoretical value.
This may be due to instrumental noise or/and chemical interference
b : Lower than 10 times method blank
g : Recovery is not according to NILUs quality criteria
* : Samplingstandard NS-EN 1948

7. versjon 13.03.2006 GSK

Results of
PCDD/PCDF and nonortho-PCB Analysis

Encl. to measuring report: O-5041
NILU sample number: 07/2210
Customer: SFT
Customers sample ID: Sofienberg
: 13-14/12-07
Sample type: Air
Sample amount: 716 m3 Total sample amount:
Concentration units: fg/m3
Data files: M_05-02-08_diox-2

Compound	Concentration fg/m3		Recovery %		TE(nordic) fg/m3	i-TE fg/m3	TE (WHO) fg/m3
Dioxins							
2378-TCDD	3,47		50		3,47	3,47	3,47
12378-PeCDD	14,6		52		7,31	7,31	14,6
123478-HxCDD	8,58		53		0,86	0,86	0,86
123678-HxCDD	12,0		55		1,20	1,20	1,20
123789-HxCDD	8,64				0,86	0,86	0,86
1234678-HpCDD	100		48		1,00	1,00	1,00
OCDD	212		41		0,21	0,21	0,02
SUM PCDD					**14,9**	**14,9**	**22,0**
Furanes							
2378-TCDF	24,5		50		2,45	2,45	2,45
12378/12348-PeCDF	18,4			*	0,18	0,92	0,92
23478-PeCDF	31,7		51		15,9	15,9	15,9
123478/123479-HxCDF	18,1		51		1,81	1,81	1,81
123678-HxCDF	19,4		51		1,94	1,94	1,94
123789-HxCDF	7,90			*	0,79	0,79	0,79
234678-HxCDF	22,4		47		2,24	2,24	2,24
1234678-HpCDF	49,1		48		0,49	0,49	0,49
1234789-HpCDF	5,41			*	0,05	0,05	0,05
OCDF	19,3		42		0,02	0,02	0,00
SUM PCDF					**25,8**	**26,6**	**26,5**
SUM PCDD/PCDF					**40,7**	**41,5**	**48,6**
nonortho - PCB							
33'44'-TeCB (PCB-77)	65,0		49				0,01
344'5-TeCB (PCB-81)	7,14						0,00
33'44'5-PeCB (PCB-126)	18,3		54				1,83
33'44'55'-HxCB (PCB-169)	4,55		60				0,05
SUM TE-PCB							**1,89**

TE(nordic) : 2378-TCDD toxicity equivalents according to the nordic model (Ahlborg et al., 1988)
i-TE : 2378-TCDD toxicity equivalents according to the international model (Nato/CCMS, 1989)
TE (WHO) : 2378-TCDD toxicity equivalents according to the WHO model (M. Van den Berg et al., 1998)
< : Lower than detection limit at signal-to-noise 3 to 1
i : Isotope ratio deviates more than 20 % from theoretical value.
This may be due to instrumental noise or/and chemical interference
b : Lower than 10 times method blank
g : Recovery is not according to NILUs quality criteria
* : Samplingstandard NS-EN 1948

7. versjon 13.03.2006 GSK

Results of
PCDD/PCDF and nonortho-PCB Analysis

Encl. to measuring report: O-5041
NILU sample number: 07/2216
Customer: SFT
Customers sample ID: Sofienberg
: 17-18/12-07
Sample type: Air
Sample amount: 714 m3 Total sample amount:
Concentration units: fg/m3
Data files: M_05-02-08_diox-2

Compound	Concentration fg/m3		Recovery %		TE(nordic) fg/m3	i-TE fg/m3	TE (WHO) fg/m3
Dioxins							
2378-TCDD	3,53		64		3,53	3,53	3,53
12378-PeCDD	15,5		67		7,73	7,73	15,5
123478-HxCDD	8,81		67		0,88	0,88	0,88
123678-HxCDD	18,1		75		1,81	1,81	1,81
123789-HxCDD	10,8				1,08	1,08	1,08
1234678-HpCDD	140		63		1,40	1,40	1,40
OCDD	300		57		0,30	0,30	0,03
SUM PCDD					**16,7**	**16,7**	**24,2**
Furanes							
2378-TCDF	30,0		61		3,00	3,00	3,00
12378/12348-PeCDF	25,0			*	0,25	1,25	1,25
23478-PeCDF	49,3		63		24,6	24,6	24,6
123478/123479-HxCDF	42,9		63		4,29	4,29	4,29
123678-HxCDF	37,3		67		3,73	3,73	3,73
123789-HxCDF	27,1			*	2,71	2,71	2,71
234678-HxCDF	63,8		58		6,38	6,38	6,38
1234678-HpCDF	217		56		2,17	2,17	2,17
1234789-HpCDF	33,3			*	0,33	0,33	0,33
OCDF	155		55		0,15	0,15	0,02
SUM PCDF					**47,7**	**48,7**	**48,5**
SUM PCDD/PCDF					**64,4**	**65,4**	**72,7**
nonortho - PCB							
33'44'-TeCB (PCB-77)	92,9		50				0,01
344'5-TeCB (PCB-81)	11,6						0,00
33'44'5-PeCB (PCB-126)	26,5		68				2,65
33'44'55'-HxCB (PCB-169)	8,44		74				0,08
SUM TE-PCB							**2,75**

TE(nordic) : 2378-TCDD toxicity equivalents according to the nordic model (Ahlborg et al., 1988)
i-TE : 2378-TCDD toxicity equivalents according to the international model (Nato/CCMS, 1989)
TE (WHO) : 2378-TCDD toxicity equivalents according to the WHO model (M. Van den Berg et al., 1998)
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This may be due to instrumental noise or/and chemical interference
b : Lower than 10 times method blank
g : Recovery is not according to NILUs quality criteria
* : Samplingstandard NS-EN 1948

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Results of
PCDD/PCDF and nonortho-PCB Analysis

Encl. to measuring report: O-5041
NILU sample number: 07/2230
Customer: SFT
Customers sample ID: Sofienberg
: 19-20/12-07
Sample type: Air
Sample amount: 713 m3 Total sample amount:
Concentration units: fg/m3
Data files: M_05-02-08_diox-2

Compound	Concentration fg/m3		Recovery %		TE(nordic) fg/m3	i-TE fg/m3	TE (WHO) fg/m3
Dioxins							
2378-TCDD	6,08		67		6,08	6,08	6,08
12378-PeCDD	26,9		72		13,5	13,5	26,9
123478-HxCDD	16,1		72		1,61	1,61	1,61
123678-HxCDD	14,5		82		1,45	1,45	1,45
123789-HxCDD	18,6				1,86	1,86	1,86
1234678-HpCDD	251		73		2,51	2,51	2,51
OCDD	564		68		0,56	0,56	0,06
SUM PCDD					**27,6**	**27,6**	**40,5**
Furanes							
2378-TCDF	46,6		64		4,66	4,66	4,66
12378/12348-PeCDF	31,4			*	0,31	1,57	1,57
23478-PeCDF	57,8		68		28,9	28,9	28,9
123478/123479-HxCDF	34,5		68		3,45	3,45	3,45
123678-HxCDF	39,0		66		3,90	3,90	3,90
123789-HxCDF	16,9			*	1,69	1,69	1,69
234678-HxCDF	5,40		64		0,54	0,54	0,54
1234678-HpCDF	108		66		1,08	1,08	1,08
1234789-HpCDF	15,9			*	0,16	0,16	0,16
OCDF	54,8		69		0,05	0,05	0,01
SUM PCDF					**44,7**	**46,0**	**45,9**
SUM PCDD/PCDF					**72,3**	**73,5**	**86,5**
nonortho - PCB							
33'44'-TeCB (PCB-77)	135		35				0,01
344'5-TeCB (PCB-81)	12,3						0,00
33'44'5-PeCB (PCB-126)	32,3		67				3,23
33'44'55'-HxCB (PCB-169)	6,72		77				0,07
SUM TE-PCB							**3,31**

TE(nordic) : 2378-TCDD toxicity equivalents according to the nordic model (Ahlborg et al., 1988)
i-TE : 2378-TCDD toxicity equivalents according to the international model (Nato/CCMS, 1989)
TE (WHO) : 2378-TCDD toxicity equivalents according to the WHO model (M. Van den Berg et al., 1998)
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7. versjon 13.03.2006 GSK

Results of
PCDD/PCDF and nonortho-PCB Analysis

Encl. to measuring report: O-5041
NILU sample number: 08/12
Customer: SFT
Customers sample ID: Sofienberg
: 21-22/12-07
Sample type: Air
Sample amount: 708 m3 Total sample amount:
Concentration units: fg/m3
Data files: M_05-02-08_diox-2

Compound	Concentration fg/m3		Recovery %		TE(nordic) fg/m3	i-TE fg/m3	TE (WHO) fg/m3
Dioxins							
2378-TCDD		4,22	48		4,22	4,22	4,22
12378-PeCDD		20,7	52		10,4	10,4	20,7
123478-HxCDD		11,4	54		1,14	1,14	1,14
123678-HxCDD		19,5	59		1,95	1,95	1,95
123789-HxCDD		15,4			1,54	1,54	1,54
1234678-HpCDD		195	53		1,95	1,95	1,95
OCDD		432	45		0,43	0,43	0,04
SUM PCDD					**21,6**	**21,6**	**31,6**
Furanes							
2378-TCDF		33,2	48		3,32	3,32	3,32
12378/12348-PeCDF		23,7		*	0,24	1,19	1,19
23478-PeCDF		42,7	50		21,3	21,3	21,3
123478/123479-HxCDF		26,4	52		2,64	2,64	2,64
123678-HxCDF		25,2	57		2,52	2,52	2,52
123789-HxCDF		12,4		*	1,24	1,24	1,24
234678-HxCDF		35,4	50		3,54	3,54	3,54
1234678-HpCDF		84,8	50		0,85	0,85	0,85
1234789-HpCDF		10,4		*	0,10	0,10	0,10
OCDF	<	0,01			0,00	0,00	0,00
SUM PCDF					**35,8**	**36,7**	**36,7**
SUM PCDD/PCDF					**57,4**	**58,3**	**68,3**
nonortho - PCB							
33'44'-TeCB (PCB-77)		96,0	32 g				0,01
344'5-TeCB (PCB-81)		11,2					0,00
33'44'5-PeCB (PCB-126)		22,6	50				2,26
33'44'55'-HxCB (PCB-169)		4,59	56				0,05
SUM TE-PCB							**2,31**

TE(nordic) : 2378-TCDD toxicity equivalents according to the nordic model (Ahlborg et al., 1988)
i-TE : 2378-TCDD toxicity equivalents according to the international model (Nato/CCMS, 1989)
TE (WHO) : 2378-TCDD toxicity equivalents according to the WHO model (M. Van den Berg et al., 1998)
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7. versjon 13.03.2006 GSK

Results of
PCDD/PCDF and nonortho-PCB Analysis

Encl. to measuring report: O-5041
NILU sample number: 08/13
Customer: SFT
Customers sample ID: Sofienberg
: 27-28/12-07
Sample type: Air
Sample amount: 686 m3 Total sample amount:
Concentration units: fg/m3
Data files: M_05-02-08_diox-2

Compound	Concentration			Recovery		TE(nordic)	i-TE	TE (WHO)
		fg/m3		%		fg/m3	fg/m3	fg/m3
Dioxins								
2378-TCDD		0,97		42		0,97	0,97	0,97
12378-PeCDD		1,30		44		0,65	0,65	1,30
123478-HxCDD	<	0,49		41		0,05	0,05	0,05
123678-HxCDD		1,77		50		0,18	0,18	0,18
123789-HxCDD		1,65				0,16	0,16	0,16
1234678-HpCDD		22,5		41		0,22	0,22	0,22
OCDD		60,9		31 g		0,06	0,06	0,01
SUM PCDD						**2,29**	**2,29**	**2,89**
Furanes								
2378-TCDF		3,72		41		0,37	0,37	0,37
12378/12348-PeCDF		1,51			*	0,02	0,08	0,08
23478-PeCDF		2,20		43		1,10	1,10	1,10
123478/123479-HxCDF		1,69		44		0,17	0,17	0,17
123678-HxCDF		1,28		57		0,13	0,13	0,13
123789-HxCDF		0,77			*	0,08	0,08	0,08
234678-HxCDF		2,27		43		0,23	0,23	0,23
1234678-HpCDF		6,77		43		0,07	0,07	0,07
1234789-HpCDF	<	0,47			*	0,00	0,00	0,00
OCDF	<	0,59		36 g		0,00	0,00	0,00
SUM PCDF						**2,16**	**2,22**	**2,22**
SUM PCDD/PCDF						**4,46**	**4,52**	**5,11**
nonortho - PCB								
33'44'-TeCB (PCB-77)		100		41				0,01
344'5-TeCB (PCB-81)		8,59						0,00
33'44'5-PeCB (PCB-126)		5,74		45				0,57
33'44'55'-HxCB (PCB-169)		0,67		51				0,01
SUM TE-PCB								**0,59**

TE(nordic) : 2378-TCDD toxicity equivalents according to the nordic model (Ahlborg et al., 1988)
i-TE : 2378-TCDD toxicity equivalents according to the international model (Nato/CCMS, 1989)
TE (WHO) : 2378-TCDD toxicity equivalents according to the WHO model (M. Van den Berg et al., 1998)
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g : Recovery is not according to NILUs quality criteria
* : Samplingstandard NS-EN 1948

7. versjon 13.03.2006 GSK

Results of
PCDD/PCDF and nonortho-PCB Analysis

Encl. to measuring report: O-5041
NILU sample number: 08/14
Customer: SFT
Customers sample ID: Sofienberg
: 28-29/12-07
Sample type: Air
Sample amount: 680 m3 Total sample amount:
Concentration units: fg/m3
Data files: M_05-02-08_diox-2

Compound	Concentration fg/m3		Recovery %		TE(nordic) fg/m3	i-TE fg/m3	TE (WHO) fg/m3
Dioxins							
2378-TCDD	1,09		47		1,09	1,09	1,09
12378-PeCDD	4,77		47		2,38	2,38	4,77
123478-HxCDD	2,29		45		0,23	0,23	0,23
123678-HxCDD	5,28		54		0,53	0,53	0,53
123789-HxCDD	4,24				0,42	0,42	0,42
1234678-HpCDD	54,4		41		0,54	0,54	0,54
OCDD	159		33	g	0,16	0,16	0,02
SUM PCDD					**5,35**	**5,35**	**7,60**
Furanes							
2378-TCDF	9,73		45		0,97	0,97	0,97
12378/12348-PeCDF	6,60			*	0,07	0,33	0,33
23478-PeCDF	10,5		47		5,26	5,26	5,26
123478/123479-HxCDF	7,68		47		0,77	0,77	0,77
123678-HxCDF	6,09		58		0,61	0,61	0,61
123789-HxCDF	2,89			*	0,29	0,29	0,29
234678-HxCDF	10,6		45		1,06	1,06	1,06
1234678-HpCDF	24,4		46		0,24	0,24	0,24
1234789-HpCDF	4,20			*	0,04	0,04	0,04
OCDF	14,9		40		0,01	0,01	0,00
SUM PCDF					**9,33**	**9,59**	**9,58**
SUM PCDD/PCDF					**14,7**	**14,9**	**17,2**
nonortho - PCB							
33'44'-TeCB (PCB-77)	139		45				0,01
344'5-TeCB (PCB-81)	10,2						0,00
33'44'5-PeCB (PCB-126)	10,1		50				1,01
33'44'55'-HxCB (PCB-169)	1,27		54				0,01
SUM TE-PCB							**1,04**

TE(nordic) : 2378-TCDD toxicity equivalents according to the nordic model (Ahlborg et al., 1988)
i-TE : 2378-TCDD toxicity equivalents according to the international model (Nato/CCMS, 1989)
TE (WHO) : 2378-TCDD toxicity equivalents according to the WHO model (M. Van den Berg et al., 1998)
< : Lower than detection limit at signal-to-noise 3 to 1
i : Isotope ratio deviates more than 20 % from theoretical value.
This may be due to instrumental noise or/and chemical interference
b : Lower than 10 times method blank
g : Recovery is not according to NILUs quality criteria
* : Samplingstandard NS-EN 1948

7. versjon 13.03.2006 GSK

Results of
PCDD/PCDF and nonortho-PCB Analysis

Encl. to measuring report: O-5041
NILU sample number: 08/24
Customer: SFT
Customers sample ID: Sofienberg
: 02-03/1-08
Sample type: Air
Sample amount: 702 m3 Total sample amount:
Concentration units: fg/m3
Data files: M_05-02-08_diox-2

Compound	Concentration		Recovery	TE(nordic)	i-TE	TE (WHO)
	fg/m3		%	fg/m3	fg/m3	fg/m3
Dioxins						
2378-TCDD	0,75		56	0,75	0,75	0,75
12378-PeCDD	2,90		59	1,45	1,45	2,90
123478-HxCDD	1,49		58	0,15	0,15	0,15
123678-HxCDD	2,89		67	0,29	0,29	0,29
123789-HxCDD	2,08			0,21	0,21	0,21
1234678-HpCDD	19,5		56	0,19	0,19	0,19
OCDD	34,4		50	0,03	0,03	0,00
SUM PCDD				**3,08**	**3,08**	**4,50**
Furanes						
2378-TCDF	7,28		57	0,73	0,73	0,73
12378/12348-PeCDF	5,49		*	0,05	0,27	0,27
23478-PeCDF	8,35		59	4,17	4,17	4,17
123478/123479-HxCDF	5,52		58	0,55	0,55	0,55
123678-HxCDF	4,96		73	0,50	0,50	0,50
123789-HxCDF	1,87		*	0,19	0,19	0,19
234678-HxCDF	7,07		56	0,71	0,71	0,71
1234678-HpCDF	17,0		57	0,17	0,17	0,17
1234789-HpCDF	2,28		*	0,02	0,02	0,02
OCDF	9,95		50	0,01	0,01	0,00
SUM PCDF				**7,10**	**7,32**	**7,31**
SUM PCDD/PCDF				**10,2**	**10,4**	**11,8**
nonortho - PCB						
33'44'-TeCB (PCB-77)	66,7		56			0,01
344'5-TeCB (PCB-81)	5,82					0,00
33'44'5-PeCB (PCB-126)	6,55		58			0,65
33'44'55'-HxCB (PCB-169)	0,84		65			0,01
SUM TE-PCB						**0,67**

TE(nordic) : 2378-TCDD toxicity equivalents according to the nordic model (Ahlborg et al., 1988)
i-TE : 2378-TCDD toxicity equivalents according to the international model (Nato/CCMS, 1989)
TE (WHO) : 2378-TCDD toxicity equivalents according to the WHO model (M. Van den Berg et al., 1998)
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b : Lower than 10 times method blank
g : Recovery is not according to NILUs quality criteria
* : Samplingstandard NS-EN 1948

7. versjon 13.03.2006 GSK

Results of
PCDD/PCDF and nonortho-PCB Analysis

Encl. to measuring report: O-5041
NILU sample number: 08/72
Customer: SFT
Customers sample ID: Sofienberg 04-05/01/08
: 09:01 - 09:01
Sample type: Air
Sample amount: 702 m3 Total sample amount:
Concentration units: fg/m3
Data files: VB423_28-02-08_DIOX

Compound	Concentration fg/m3		Recovery %		TE(nordic) fg/m3	i-TE fg/m3	TE (WHO) fg/m3
Dioxins							
2378-TCDD	5,21		64		5,21	5,21	5,21
12378-PeCDD	6,61		g		3,31	3,31	6,61
123478-HxCDD	5,85		70		0,59	0,59	0,59
123678-HxCDD	7,57		65		0,76	0,76	0,76
123789-HxCDD	7,96				0,80	0,80	0,80
1234678-HpCDD	32,3		68		0,32	0,32	0,32
OCDD	75,3		69		0,08	0,08	0,01
SUM PCDD					**11,0**	**11,0**	**14,3**
Furanes							
2378-TCDF	10,2		65		1,02	1,02	1,02
12378/12348-PeCDF	23,9			*	0,24	1,20	1,20
23478-PeCDF	16,2		g		8,12	8,12	8,12
123478/123479-HxCDF	14,6		68		1,46	1,46	1,46
123678-HxCDF	12,4		67		1,24	1,24	1,24
123789-HxCDF	9,51			*	0,95	0,95	0,95
234678-HxCDF	14,3		63		1,43	1,43	1,43
1234678-HpCDF	32,5		67		0,32	0,32	0,32
1234789-HpCDF	9,48			*	0,09	0,09	0,09
OCDF	32,8		66		0,03	0,03	0,00
SUM PCDF					**14,9**	**15,9**	**15,8**
SUM PCDD/PCDF					**26,0**	**26,9**	**30,1**
nonortho - PCB							
33'44'-TeCB (PCB-77)	51,6		65				0,01
344'5-TeCB (PCB-81)	8,43						0,00
33'44'5-PeCB (PCB-126)	19,9		67				1,99
33'44'55'-HxCB (PCB-169)	11,9	i	g				0,12
SUM TE-PCB							**2,11**

TE(nordic) : 2378-TCDD toxicity equivalents according to the nordic model (Ahlborg et al., 1988)
i-TE : 2378-TCDD toxicity equivalents according to the international model (Nato/CCMS, 1989)
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7. versjon 13.03.2006 GSK

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	Avdeling i SFT Seksjon for miljøøkonomi og samferdsel (LMS)	TA-nummer 2453/2008

Oppdragstakers prosjektansvarlig Martin Schlabach	År 2008	Sidetall 51	SFTs kontraktnummer 3008068

Utgiver Norsk institutt for luftforskning OR 81/2008	Prosjektet er finansiert av SFT

Forfatter(e) Martin Schlabach and Dag Tønnessen
Tittel - norsk og engelsk Urbane bakgrunns nivåer av dioxin og PCB i Oslo Urban Background Levels of Dioxin and PCB in Oslo

Urban areas have been identified as major sources for airborne dioxins and PCB. Since there are no recent measurements of airborne dioxins and only few of PCB, measurements of these compound groups were initiated by SFT in late 2007 at in Sofienbergparken.
The average dioxin concentration of 19 samples was 28,2 TE(WHO) fg/m^3 (4,80 -86,5 TE(WHO) fg/m^3). The average PCB-7 concentration of 19 samples was 31,8 pg/m^3 (15,3 - 61,9 pg/m^3).
The air concentrations of dioxins and PCB measured at Sofienbergparken are in the same range as measured at other urban background stations around the world. There is a remarkable reduction of the dioxins concentrations from 1989 to 2007 with 3 times lower concentrations today.
The huge variability of the dioxins concentration which correlates strongly with reverse temperature, is a strong indication that wood burning for household heating is a major source for airborne dioxins. Traffic related emissions and atmospheric long range transport do not seem to contribute significantly to the dioxins level at this station. This conclusion agrees very well with the findings of Statistics Norway which calculated that household heating stands for about 20 % of the total Norwegian dioxin emission to air (7 g of about 34 g in 2000). In order to reduce the emissions of dioxins from household heating it is essential to use clean firewood only. Burning of newspapers, milk cartons, plastic, and especially impregnated wood must be avoided.
The PCB concentrations is, compared to dioxin concentrations, less variable and do not correlate to any of the measured meteorological parameter. This fact indicates that the emission sources for PCB are spread and diverse and not as dependent on temperature as for dioxins.

4 emneord Dioxin, PCB, urbane, Sofienbergparken	4 subject words Dioxin, PCB, urban, Sofienbergparken

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Statens forurensningstilsyn (SFT) ble opprettet i 1974 som et direktorat under miljøverndepartementet.
SFT skal bidra til å skape en bærekraftig utvikling. Vi arbeider for at forurensning, skadelige produkter og avfall ikke skal føre til helseskade, gå ut over trivselen eller skade naturens evne til produksjon og selvfornyelse.

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