

Organic Environmental Contaminants in the 2012 Total Diet Study Samples

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Opinions and interpretations are outside the scope of UKAS accreditation. The following reported analyses fall within the scope of UKAS accreditation: PAHs, PCDDs, PCDFs, PCBs, PBDDs, PBDFs, PBBs and PBDEs (apart from deca-BDE, deca-BB).

Glossary of Main Terms

Term or Acronym	General Meaning Of Term
BFR	Brominated Flame Retardant
BTBPE	Bis(2,4,6-tribromophenoxy)ethane
DBDPE	Decabromodiphenylethane
HBB	Hexabromobenzene
PAHs	Polycyclic aromatic hydrocarbons
PAH 4 Sum	Sum of 4 PAHs (beno[a]pyrene, benz[a]anthracene, benzo[b]fluoranthene, chrysene)
PCB	Polychlorinated biphenyl
Ortho-PCB	Ortho-substituted PCB (non planar)
Non-ortho-PCB	Non-ortho-substituted PCB (co-planar)
Dioxins	Collective name for chlorinated Dioxins & Furans
PCDD/F	Polychlorinated dibenzo- <i>p</i> -dioxin/ polychlorinated dibenzofuran
TEF	Toxic Equivalency Factor – toxicity expressed for each dioxin-like compound relative to 2,3,7,8-TCDD (2,3,7,8-TCDD = 1).
TEQ	Toxic Equivalence – product of the congener concentration and the TEF
Total TEQ	Total of the Sum of all the Toxic Equivalences (TEQs) for each group of compounds
Sum of ICES 6	Sum of PCB28, PCB52, PCB101, PCB138, PCB153 and PCB180
fat weight	Values relevant to the assessed fat content of the sample
whole weight	Values based on the sample as received ‘whole’ or wet
WHO-TEQ 2005	World Health Organisation - TEQ based on values as set in 2005
HBCD	Hexabromocyclododecane
HPLC-MS/MS	LC-MS in multiple reaction monitoring mode
Lower bound	assumes values at less than the limit of detection are zero (e.g.<0.01=0)
Upper bound	assumes values at less than the limit of detection are equal to the limit of detection (e.g. <0.07=0.07)
PBDD/F	Polybrominated dibenzo- <i>p</i> -dioxin/ furan
PCN	Polychlorinated naphthalene
PFAS	Perfluoroalkyl substances e.g. PFOS – perfluorooctane sulphonate
PXDD/F, PXB	Polybromo-chloro dibenzo- <i>p</i> -dioxin/dibenzofuran, Polybromo-chloro biphenyl
TBBPA	Tetrabromo Bisphenol A
ng/kg	Nanogram per kilogram (x10 ⁻⁹ / part per trillion)
µg/kg	Microgram per kilogram (x 10 ⁻⁶ / part per billion)
HPLC-MS/MS	LC-MS in multiple reaction monitoring mode
HRGC-HRMS	High resolution gas chromatography - high resolution mass spectrometry
HRGC-LRMS	High resolution gas chromatography – unit resolution mass spectrometry

Executive Summary

The purpose of this study was to investigate the occurrence of a range of regulated and near regulated organic environmental contaminants in the various food groups that make up the total diet study (TDS).

986 individual food samples were collected in 14 locations across the UK, and prepared (cooked where required) as normal for consumption. They were composited into 19 of the food groups (group 17 – beverages is not included) that make up the TDS.

The composites were analysed for the following contaminants:

Polychlorinated dibenzo-p-dioxins and dibenzofurans (PCDD/Fs, dioxins)

Polychlorinated biphenyls (PCBs)

Polycyclic aromatic hydrocarbons (PAHs)

Polychlorinated naphthalenes (PCNs)

Polybrominated biphenyls (PBBs)

Polybrominated dibenzo-p-dioxins and dibenzofurans (PBDD/Fs)

Polybrominated diphenylethers (PBDEs)

Hexabromocyclododecane (HBCD) and Tetrabromobisphenol A (TBBPA)

Hexabromobenzene (HBB), bis 2,4,6-tribromophenoxy ethane (BTBPE) and decabromodiphenyl ethane (DBDPE)

Mixed halogenated dibenzo-p-dioxins, dibenzofurans and biphenyls (PXDD/Fs and PXBs)

Perfluoroalkyl substances (PFAs)

The analytical methodologies used for the analyses of the regulated contaminants were UKAS accredited to the ISO 17025 standard and follow EU Commission regulations for data quality criteria. Similar criteria were used for the other contaminants which use published methodologies that have also been used in previous FSA projects.

In general terms, the results of the analysis of the 2012 TDS samples monitoring study for PCDD/Fs and PCBs, PAHs and brominated contaminants are broadly consistent with the data generated for earlier studies, and for some contaminants, such as the BFRs, they show a downward trend in concentrations for some of the food groups. In the case of regulated contaminants (PCDD/Fs, PCBs and PAHs) contaminant concentrations were all below the regulatory maximum levels (Regulation (EU) No. 1259/2011 and Regulation (EC) No. 208/2005) and are thus unlikely to pose a risk to public health.

1. Study Background

The UK Total Diet Studies (TDS) are carried out in order to gain an overview of consumer (the general population and different sub-groups of this population) exposure to contaminants in food, to establish trends and current levels of contamination and to establish baselines for newly emerging contaminants for which knowledge of dietary exposure is poorly defined. These studies are an essential aid to verifying that average exposure to these contaminants does not give cause for health concerns to the general public. Additionally, they can also be an aid in the assessment of the effectiveness of pollution control measures that have been introduced to limit the releases of these contaminants.

Specified retail food samples are purchased at regular intervals from different locations in the UK, prepared for consumption, and combined to form 20 food groups (the 17th group representing beverages is not included in this study) representing their relevant importance in the UK diet. Analysis of these combined samples ensures that a large diverse base of individual samples, sourced from across the UK are included, and composite samples represent average national dietary habits.

The contaminants selected for this study are a wide range of established/regulated contaminants such as polycyclic aromatic hydrocarbons (PAHs), polychlorinated dibenzo-p-dioxins and dibenzofurans (PCDD/Fs, dioxins), polychlorinated biphenyls (PCBs) and polybrominated diphenylethers (PBDEs), and other contaminants more recently recognised to be of emerging concern such as PFAs, (perfluoroalkyl substances) brominated and mixed halogenated dioxins and biphenyls (PXDD/Fs and PXBs), polychlorinated naphthalenes (PCNs) other brominated flame retardants such as hexabromocyclododecane (HBCD) and tetrabromobisphenol A (TBBPA), and those prioritised by EFSA as requiring further investigation - hexabromobenzene (HBB), bis 2,4,6-tribromophenoxy ethane (BTBPE) and decabromodiphenyl ethane (DBDPE). For some of the established contaminants, earlier TDS data exists, which will allow trend studies, for example TDS data on the dioxins, PCBs and PAHs (Food Standards Agency 2002, 2003), whilst for other contaminants such as PCNs, PXDD/Fs, PXBs and the EFSA prioritised BFRs there is just a single set of data on individual foods.

This information is summarised below for the selected contaminants, all of which are recognised to be persistent, bio-accumulative and toxic, with the potential to undergo long-range transport.

PCDD/Fs and PCBs are recognised environmental contaminants that are regulated within the EU. The major route of human exposure is via food. Among the various different types of foods, fish/shellfish and offal tend to show a relatively higher occurrence of these contaminants. The last TDS study that investigated PCDD and PCB, was carried out on samples taken in 2001 and in comparison to earlier TDS, showed a declining trend in food concentrations and dietary exposure (Food Standards Agency 2003). However, the relative contribution of PCBs to the TEQ showed a gradual increase, suggesting that these were declining at a lower rate than PCDD/Fs (Fernandes et al 2004).

Brominated dioxins and biphenyls - PBDD/Fs and PBBs have physico-chemical and toxicological properties that are similar to their chlorinated analogues. The PBDD/Fs originate from similar anthropogenic sources as chlorinated dioxins, such as incineration, particularly of bromine containing waste, or chemical manufacture, whereas PBBs were produced commercially as flame retardants chemicals (BFRs) long before the large volume production of the more familiar BFRs such as PBDEs and HBCD. Their occurrence in food in the UK has been confirmed in earlier studies funded by the FSA, including a TDS investigation on samples taken in 2003 (FSA 2006). The studies show a greater frequency of occurrence of PBDFs and a tendency for these contaminants to occur in certain types of foods such as fish and offal, whilst PBBs generally showed very low occurrence. Although a later study on individual foods was carried out (Fernandes et al 2009) trend studies were not possible due to the different types of sampling used for the studies.

PBDEs are mass produced brominated flame retardants (BFRs) that were incorporated into a number of commonly used commercial materials such as plastics, rubbers, textiles and electronic components. As these are open-ended applications, the BFRs are available to diffuse out of materials into the environment, and this can occur over the lifetime of the material - during manufacture, use, and disposal. Emerging toxicological data shows that PBDEs can cause liver and neurodevelopmental toxicity and affect thyroid hormone levels. Additionally, they may be particularly harmful during a critical window of brain development during pregnancy and early childhood (Rose and Fernandes 2012). Their occurrence in food has been investigated in the same studies as mentioned earlier for PBDD/Fs and PBBs (FSA 2006, Fernandes et al 2009) but unlike these contaminants, they show more frequent and abundant occurrence. Although studies on trends in human exposure (Lignell et al 2009, Schecter et al 2005) have been carried out in other countries, similar studies on food concentrations are less common.

Polycyclic aromatic hydrocarbons (PAHs) occur naturally in coal, crude oil and tar deposits, and can be inadvertently produced as by-products of incomplete fossil fuel or biomass combustion. Some PAH compounds have been identified as genotoxic carcinogens, mutagens and teratogens.

They are also lipophilic with poor aqueous solubility and unless metabolised, tend to occur in the lipid rich tissues of plants, fish and animals. The FSA has carried out a number of studies on PAHs over the last few years, and these have usually been targeted towards certain foods such as shellfish, cereals and dried and smoked products which may be expected to show the presence of PAHs due to processing. The last TDS study on PAHs was carried out on samples taken in 2000 (Food Standards Agency 2002) and show a decline in PAH exposure compared to an earlier TDS in 1979. Data from the current study should help determine whether the downward trend continues.

Polychlorinated naphthalenes (PCNs) also show properties of stability, high bio-accumulative potential and persistence coupled with the similarity in structural configuration to planar PCDD/Fs. Some congeners can contribute to dioxin-like toxicity and have shown a combination of toxic responses such as mortality, embryotoxicity, hepatotoxicity, immunotoxicity, dermal lesions, teratogenicity and carcinogenicity (Behnisch et al 2003, Blankenship et al 1999, 2000). There have been a few recent studies confirming occurrence in food and human exposure, including a single study in the UK on a limited number of food samples (Fernandes et al 2010) and the current study will provide the baseline for occurrence of these contaminants in TDS samples.

The commercially produced BFR, hexabromocyclododecane (HBCD), is a complex mixture of different configurations of the chemical, and primarily consists of three diastereomers α-, β-, and γ-HBCD. As each of the diasteriomic configurations have unique properties, it is desirable to have diastereomer-selective data rather than the sum HBCD. An EU risk assessment (European commission 2008) on HBCD concluded that it may cause reproductive and long term toxicity, but neuroendocrine effects and developmental disturbances from exposure in early developmental childhood have also been reported. In an earlier TDS in 2003 (FSA 2006) HBCD was detected at concentrations ranging from 0.02 to 0.3 µg/kg with αHBCD being the predominant diastereoisomer in fish and meat. A later study of individual UK foods (Fernandes et al 2009) confirmed that αHBCD was the most frequently detected diasteriomer, with wide ranging concentrations of <0.01 to 25 µg/kg whole weight. Most of the higher concentrations were recorded for fish and fish products.

The three BFRs - Hexabromobenzene (HBB), Bis(2,4,6-tribromophenoxy)ethane (BTBPE), and Decabromodiphenylethane (DBDPE) - have been identified by EFSA as emerging contaminants that should be included in monitoring programmes. Very little is known regarding production volumes, occurrence in food and feed, persistence in the environment and toxicity of these compounds. There have been two structured studies on food, one of them on UK foods, (Fernandes et al 2009). HBB and DBDPE were not detected in any foods, whilst BTBPE occurred

in some samples mostly fish, meat and offal. The current study will provide the baseline for occurrence of these emerging contaminants in food.

Perfluoroalkyl substances (PFAS) which include the most widely used product, perfluorooctane sulphonate (PFOS) are industrial chemicals that are now understood to be persistent organic pollutants (POPs). These compounds were widely used in the production of non-stick coatings, in water repellent and stain resistant coatings for fabrics and furnishings, in fire fighting foams and other applications. PFAS may bioaccumulate up the food chain through utilisation or disposal routes, or enter directly into food through primary contamination events. PFCs were investigated in a 2004 TDS in the UK which allowed an initial exposure assessment (Food Standards Agency 2006B). Individual foods have also since been investigated (Clarke et al 2010). This study will allow a trend to be investigated and allow a risk evaluation in light of the tolerable daily intake.

PXDD/F and PXBs are bromo/chloro analogues of PCDD/F and PCBs and share the same sources and toxicological properties as the other analogues, except that PXBs were never intentionally produced. Analysis of these is complex due to the large numbers of possible compounds (4600 PXDD/Fs and 9180 PXBs) and the potential for false positive detection during mass spectrometric measurement, as these compounds share ions with other more abundant and less toxic contaminants. There has been only a single study carried out to date on the occurrence of these contaminants in individual foods (Fernandes et al 2011) and the current study will provide the baseline for occurrence of these contaminants in TDS samples.

2. Experimental

2.1 Sample Collection and Preparation

986 individual food samples were collected in 14 locations across the UK, and prepared (cooked where required) as normal for consumption. They were composited into 19 of the food groups (group 17 – beverages was not included) that make up the TDS.

On receipt at the laboratory each prepared sample was given a unique laboratory reference number and the sample details were logged into a database. The samples were re-homogenised and composited by food group using equal quantities of each prepared sample within a food group. The composites were thoroughly homogenised and aliquots taken for PAH and PFAS analysis, prior to freeze-drying where required. Freeze-dried sample powders were re-homogenised and aliquots of these were used for the other analyses.

Details on the collection of the samples are given in the sampling contractors report (Ventress Technical Services, 2012), and a description of the composited samples and identification are given in Table 1.

2.2 Contaminants measured – Specific Analytes

The following analytes were determined: Regulated contaminants are highlighted in **bold**.

Dioxins - **all 17, 2378-Cl substituted PCDDs and PCDFs**.

Dioxin-like PCBs - **IUPAC numbers 77, 81, 105, 114, 118, 123, 126, 156, 157, 167, 169, and 189.**

Non Dioxin-like PCBs - IUPAC numbers 18, **28, 31, 47, 49, 51, 52, 99, 101, 128, 138, 153, 180,** 33, 41, 44, 60, 61, 74, 66, 87, 110, 129, 141, 149, 151, 170, 183, 185, 187, 191, 193, 194, 201, 202, 203, 206, 208 and 209.

Brominated dioxins - 2,3,7-T₃BDD, 2,3,8-T₃BDF, 2,3,7,8-Br substituted PBDD/Fs: and 10 tetra – hexa brominated congeners (note that this includes only 1 hexa-furan as no standards were available for the other 3 congeners)

PBDE congeners: IUPAC numbers 17, 28, 47, 49, 66, 71, 77, 85, 99, 100, 119, 126, 138, 153, 154, 183 and 209.

PBB congeners: IUPAC numbers 15, 49, 52, 77, 101, 126, 169, 153 and 209.

PAHs - acenaphthene, acenaphthylene, fluorene, phenanthrene, anthracene, fluoranthene, benzo[c]fluorene, pyrene, benzo[e]pyrene, benzo[b]naphtho[2,1-d]thiophene, anthanthrene, coronene, benzo[ghi]fluoranthene, **benz[a]anthracene**, **chrysene**, **benzo[b]fluoranthene**, benzo[j]fluoranthene, benzo[k]fluoranthene, **benzo[a]pyrene**, cyclopenta[c,d]pyrene, indeno[123cd]pyrene, dibenzo[ah]anthracene, benzo[ghi]perylene, dibenzo[al]pyrene, dibenzo[ae]pyrene, dibenzo[ai]pyrene, dibenzo[ah]pyrene and the substituted PAH, 5-methylchrysene

PCNs - PCN-52/60, 53, 66/67, 68, 69, 71/72, 73, 74, & 75

α -HBCD, β -HBCD and γ - HBCD, PBCD and TBBPA

EFSA prioritised BFRs - HBB, BTBPE and DBDPE

PFAS - Perfluorooctanesulfonamide (PFOSA), Perfluorobutane sulfonate (PFBSH), Perfluorohexane sulfonate (PFHxS), Perfluorooctane sulfonate (PFOS), Perfluorohexanoic acid (PFHxA), Perfluoroheptanoic acid (PFHpA), Perfluorooctanoic acid (PFOA), Perfluorononanoic acid(PFNA), Perfluorodecanoic acid (PFDeA), Perfluoroundecanoic acid (PFUnA) and Perfluorododecanoic acid (PFDoA).

Mixed halogenated dioxins and biphenyls (PXDD/F and PXBs) - 13, tri - hexa halogenated DDs/DFs and 6 coplanar and mono-ortho substituted biphenyls. This includes one tri-brominated compound, 4 di-brominated compounds and 14 mono-brominated compounds (Fernandes et al 2011B).

2.3 PCDD/Fs, PCBs, PBDD/Fs, PBBs and PBDEs - Analytical Methodology

The method used for the preparation, extraction and analysis of samples has been reported previously (Fernandes et al 2004; 2008) and forms part of the CEN method – EN16215:2012 for PCDD/F and PCB analysis. In brief, samples were fortified with ^{13}C -labelled analogues of target compounds and exhaustively extracted using mixed organic solvents. PBDEs and ortho substituted PCBs/PBBs were separated from non-ortho substituted PCBs/PBBs, PCDD/Fs and PBDD/Fs by fractionation on activated carbon. The two fractions were further purified using adsorption chromatography on alumina. Analytical measurement was carried out using high resolution gas chromatography-high resolution mass spectrometry (HRGC-HRMS) for all analytes apart from the non-ortho substituted PCBs which were analysed by high resolution gas chromatography-unit resolution mass spectrometry (HRGC-LRMS).

The analysis is accredited (UKAS) to ISO 17025 standards, with the inclusion of a reference material (FAPAS TO645) and method blanks which were evaluated prior to reporting of sample

data. Further quality assurance measures included the successful participation in available international inter-comparison exercises such as FAPAS, Dioxins in Food-2011 to 2012, on dioxins and dioxin-like PCBs and PBDEs. Additionally, quality control evaluation for the accompanying data follows the criteria specified for chlorinated dioxins and PCBs (Commission Regulation 252/2012).

2.4 PAHs - Analytical Methodology

The analytical methodology for the PAHs has been published (Rose et al, 2007) and reported before in detail to the FSA (Fernandes et al 2011). The methodology is based on internal standardisation (¹³Carbon) with GC-MS measurement. An aliquot of the homogenised sample was fortified with ¹³C-labelled analogues of target compounds and saponified with methanolic potassium hydroxide. The extracted PAH solutions were purified in two stages with a DMF/cyclohexane partition followed by adsorption chromatography on activated silica. Purified extracts were sensitivity standardised and measured using high resolution gas chromatography-unit resolution mass spectrometry.

The analytical procedure for PAHs is UKAS accredited to the ISO 17025 standard and includes the assessment of method blanks and reference materials, (RM0648, PAHs in palm oil – FAPAS 2011) for compliance with the accreditation criteria. The methodology also meets the criteria required for evaluating data against the maximum permitted limits for benzo[a]pyrene as specified in EU Commission Regulations. Additionally, FERA has also participated in recent international inter-comparison exercises (JRC-IRMM 2010 FAPAS 2011, 2012) where results reported by the laboratory were in good agreement with consensus data.

2.5 PCNs - Analytical Methodology

A full description of the reagents, reference standards and procedures used for the extraction and analysis has been reported earlier (Fernandes et al. 2010). In brief, samples were fortified with ¹³C-labelled analogues of target compounds and exhaustively extracted using mixed organic solvents. PCNs were chromatographically fractionated from potential interferants such as PCBs, using activated carbon. The extract was further purified using adsorption chromatography on alumina. Analytical measurement was carried out using high resolution gas chromatography coupled to high resolution mass spectrometry (HRGC-HRMS). Additional control was provided by the inclusion of methods blanks and a reference material.

The quality control criteria used for evaluating data are very similar to the accredited methodology used for the chlorinated dioxins and PCBs, and validation data including method performance parameters have been reported before (Fernandes et al 2010). There are no available reference materials (RMs) specific to PCNs, but the use of CRM 350 (Griepink et al. 1988), which was found to contain appreciable amounts of PCNs has been reported in an earlier study (Fernandes et al. 2010). Aliquots of CRM 350 which is a mackerel oil, was analysed during the course of this work and the results showed good consistency and agreement with the established values (Fernandes et al. 2010) which typically range from 25 ng kg⁻¹ to 200 ng kg⁻¹.

2.6 HBCD/TBBPA - Analytical Methodology

As reported previously (Harmer et al 2007) the analyses were carried out in duplicate and additionally with an overspike. Sample aliquots including a procedural blank and a reference material were fortified with ¹³Carbon labelled analogues of each of the 4 analytes (TBBPA, αHBCD, βHBCD, and γHBCD), allowed to stabilise, blended with hexane:dichloromethane, 60:40 (v/v) and the matrix hydrolysed using acid modified silica. The extract recovered from this process was filtered, washed, concentrated and solvent exchanged to a methanol:water solvent system prior to analysis by HPLC-MS/MS in the multiple reaction monitoring mode (MRM) mode.

The parameters used for evaluating data quality, were similar to those used for other analyses. Method limits of detection, evaluated through method blank determinations were typically <0.01µg/kg whole weight and analytical recoveries were generally within the range of 60 - 120%. There are no certified reference materials available for HBCD or TBBPA analysis in food matrices. However, aliquots of all the samples analysed were fortified with native analytes and the concentrations of recovered analytes measured, were in good agreement with fortification levels. Additionally a fortified in-house reference material was also analysed regularly with the samples and returned values that were in good agreement with fortification levels.

The presence of pentabromocyclododecene (PBCD) which can occur as a metabolite or degradation product of HBCD was investigated using the above methodology, but the absence of a full set of standards (there is only a single native congener and no ¹³C surrogates) for this analyte make this measurement qualitative/semi-quantitative.

2.7 HBB, BTBPE and DBDPE - Analytical Methodology

The methodology for the analysis of these flame retardants has been reported before (Fernandes et al, 2010) In brief, aliquots of the freeze dried (where required) and homogenised material were fortified with known amounts of surrogate (¹³C₁₂-labelled) analogues of the target analytes and exhaustively extracted using mixed organic solvents. The food matrix was simultaneously hydrolysed using acid modified silica. The extracts were concentrated and purified using adsorption chromatography on activated Florisil™. Purified extracts were sensitivity standardised and analysed by high resolution mass spectrometry (HRGC-HRMS). Additional control was provided by the inclusion of methods blanks and a reference material.

Similar quality control criteria were used for evaluating data, to the accredited methodology used for the chlorinated dioxins and PCBs and validation data, including method performance parameters have been reported before (Fernandes et al 2010B). Method limits of detection were typically of the order of ~0.01 µg/kg for HBB and BTBPE and 0.05 µg/kg for DBDPE on a whole weight basis and analytical recoveries for HBB, BTBPE and DBDPE, based on the incurred ¹³Carbon labelled surrogates, were typically within the range 35-80%, which reflects the lability of highly brominated organic molecules. Concentrations reported here are of course, corrected for recovery. The in-house reference material (fortified sunflower oil) investigated during the course of this work yielded data that was consistent with expected levels.

2.8 PFAS - Analytical Methodology

This procedure has been described elsewhere in more detail (Clarke et al 2010). Briefly, replicate portions (5 g) of food were weighed out, into Falcon tubes (50 mL). These are fortified with the appropriate unlabelled standard addition and labelled internal standards (¹³C₄-PFOA, ¹³C₄-PFOS, ¹³C₂-PFHxA, ¹³C₄-PFOA, ¹³C₅-PFNA, ¹³C₂-PFDeA, ¹³C₂-PFUnA, ¹⁸O₂-PFHxS and D₃-n-M-FOSAA), then homogenised in methanol, making up to (35 mL). Samples were agitated overnight (16 h), centrifuged (15 min, 5,000 rpm). The supernatant methanol extract was dried under a nitrogen stream (80 °C) to incipient dryness and the residues re-dissolved in aqueous KOH (25 mL, 0.01 M, sonicate 10 min). Aqueous extracts were re-centrifuged (15 min, 5,000 rpm) and the supernatant poured in one continuous gentle movement [to avoid disturbing sediment] into a funnel connected onto the top of a preconditioned SPE cartridge (weak anion exchange). After loading, cartridges were washed with ammonium acetate (2 x 6 mL, 25 mMol, pH 4.5) and eluted with basic methanol (4 mL, 0.1% ammonia). Eluent is dried under nitrogen (30 °C), until dry and the residues taken up in methanol (400 µL, sonicate 10 min). PFCs were not accurately quantifiable by external

calibration, so a standard addition (SA) approach was used. Six replicate portions were prepared, two unspiked and four over spiked. $^{13}\text{C}_4$ -labelled PFOS, $^{13}\text{C}_2\text{-PFHxA}$, $^{13}\text{C}_4\text{-PFOA}$, $^{13}\text{C}_5\text{-PFNA}$, $^{13}\text{C}_2\text{-PFDeA}$, $^{13}\text{C}_2\text{-PFUnA}$, $^{18}\text{O}_2\text{-PFHxS}$ and $\text{D}_3\text{-n-M-FOSAA}$ were used as isotope dilution internal standards.

Measurement was undertaken by LC-MS/MS. An Agilent HTS CTC injector and a 1290 LC were coupled to an Agilent 6490 triple quadrupole mass spectrometer. An injection volume (5 μl on a 20 μl loop) was injected onto a Fluorosep RP Octyl phase HPLC column (5 μm , 60 \AA , 2.1 x 150 mm, held at 40 °C) with guard cartridge (C_8). The mobile phase gradient programme (methanol/aqueous ammonium formate, 5 mM, pH 4) started at 10% methanol (0.3 ml/min) increasing by a linear gradient to 100% (10 mins) and returning to 10% (20 mins). The MS detector in MRM mode was used for quantitative analysis using one transition for internal standards and two transitions for the individual PFC analytes.

The use of LC-MS/MS in multiple MRM mode contributes much to the specificity of the measurement process for these compounds. Determination is aided by the use of ^{13}C arbon labelled and deuterated PFC compounds as internal standards. Each food sample was analysed in duplicate throughout the entire extraction method to ensure that advantageous point contamination was not mistaken for the presence of any native PFC. For a specific analyte to be considered present in a sample extract the following criteria must be met: i) the relative retention times of the analyte must be comparable to those of a retention time marker, an internal standard, and to authentic analytical standards of each analyte; ii) the peak must have the correct mass transition, maximising at the correct retention time; iii) the signal to noise ratio of any peak must be greater than 3:1. In order to prove the absence of a given PFC, the internal standard must be present in all extracts, the blank extract must show no signal at the retention time of the target PFC, whilst the overspiked extracts must show a peak for the target PFC at the required retention time.

2.9 PXDD/Fs and PXBs - Analytical Methodology

The analytical methodology for determining PXDD/Fs and PXBs is based on internal standardisation with ^{13}C arbon labelled surrogates, dual carbon column fractionation and analysis by HRGC-HRMS (Fernandes et al 2011B). Sample aliquots along with a blank and a reference material were internally standardised, and extracted with dichloromethane:hexane, on a acid/base modified silica column, eluting directly onto activated carbon. Mono-ortho PXBs were removed from the direct eluate, and the reverse eluted fraction was re-chromatographed on activated carbon to yield the non-ortho PXBs and PXDD/FS. Both fractions were purified by adsorption

chromatography on alumina, concentrated, sensitivity standardised and analysed by HRGC-HRMS at a resolution of 13500-15000.

In very general terms, the purification and measurement methodology described here is an extension and a refinement of the methodology previously used for PCDD/Fs, PCBs and PBDD/Fs (Fernandes et al 2004; 2008) and exploits the common physical and chemical properties of these mixed halogenated compounds. The use of these techniques has been accredited and peer-reviewed, and the methodology has been used successfully over many years for the measurement of PBDD/Fs, PCDD/Fs, PCBs and PBDEs, as evidenced by successful participation in international inter-comparison trials (Dioxins in food 2011, 2012). Analytical recoveries typically range from 60-90%, with generally lower recoveries (~ 40%) for the more volatile tri-halogenated compounds. The average method limit of detection (MLOD) is of the order of ~5 fg/g fat which is similar to sensitivities for the measurement of PCDD/Fs and PBDD/Fs. As there are no formal acceptance criteria for data quality for PXDD/Fs and PXBs, the quality control for the accompanying data has followed the criteria currently used for PCDD/Fs and PCBs.

Table 1: Overview of samples

Fera sample No.	TDS group	MATRIX	No. of sub-samples	Fat content %
20657	Group 1	Bread	29	4.14
20646	Group 2	Cereals	40	9.42
20645	Group 3	Carcass Meat	51	14.41
20661	Group 4	Offal	85	9.92
20664	Group 5	Meat Products	123	14.86
20660	Group 6	Poultry	51	7.32
20663	Group 7	Fish	140	9.31
20648	Group 8	Fats & Oils	84	73.80
20647	Group 9	Eggs	34	9.55
20665	Group 10	Sugar & Preserves	30	6.05
20655	Group 11	Green Vegetables	23	0.29
20656	Group 12	Potatoes	23	5.19
20649	Group 13	Other Vegetables	40	5.46
20653	Group 14	Canned Vegetables	15	0.53
20654	Group 15	Fresh Fruit	23	0.21
20652	Group 16	Fruit Products	15	0.42
20635	Group 18	Milk	44	1.97
20662	Group 19	Milk & Dairy Products	102	23.31
20658	Group 20	Nuts	34	41.84

3. Results

Analyte concentrations are presented in Tables 3.1 to 3.13. Concentration units reflect current convention either as required by regulation, or as reported in recent literature for the emerging contaminants. The reporting limits (quoted as “<”) for most analytes are estimated as a dynamic parameter and are therefore the limits of determination that prevail during the course of the measurement. For the regulated contaminants, PCDD/Fs, PCBs, and PAHs, the limits are consistent with the requirements of EU regulations, but for all reported contaminants, the limits are generally either better than or similar to those reported in current literature. Data on the reference materials that were analysed concurrently with the samples and for the regulated contaminants are presented in Tables 3.14 to 3.16. In general the results of analysis of available reference materials for other analytes such as PCNs PBDEs, PXDD/Fs and PXBs, were within established acceptable limits (Tables 3.15, 3.16). Estimates of measurement uncertainty are included in the concentration tables for the different contaminant groups. In particular, for the regulated contaminants, these are given for each reported concentration.

In addition to the concentration of individual congeners, the dioxin-like toxicity of the samples arising from PCDD/Fs and dioxin-like PCBs has also been reported as a toxic equivalent (WHO-TEQ), as required by regulation. The World Health Organisation (WHO) defined a set of TEFs in 1998 (Van den berg et al 1998) for the calculation of TEQs, but conducted a review and revised some of the values in 2005 (Van den berg et al 2006). The TEQs are presented in terms of the 2005 TEFs, but in order to allow comparison with earlier years, the 1998 TEQs have also been included. Additionally as per the requirements of Regulation 1259/2011, the sum of the ICES-6 PCBs is also provided. In keeping with the reporting of earlier TDS data, the results have been reported on a fat weight basis, but the fat contents of the samples are included in relevant tables, allowing easy conversion to whole weight data. Fat weight basis reporting has been extended to all analytes, except PFAS, and PAHs (as per Regulation (EU) No 835/2011) which are reported on a whole weight basis. Additionally, as per the regulation, PAHs are also reported in terms of the sum of the 4 PAHs (benz[a]anthracene, chrysene, benzo[b]fluoranthene, benzo[a]pyrene). TEQ values have also been included for the PBDD/F and non-ortho PBB analytes. As in previous studies, TEFs associated with the analogous chlorinated compounds have been used to compute these TEQs, as there is no universally recognised TEF scheme for these compounds.

PCDD/Fs and PCBs were detected in all food groups at varying concentrations. The data are broadly consistent with the results of monitoring studies over the last decade, and with the last TDS study (Food Standards Agency 2003). Many food groups (e.g. poultry, offal) show a reduction in detected concentration, but other groups (e.g. green vegetables) show some elevation in levels.

However, the detected concentrations are comfortably below the regulatory limits (European Commission 2011B) for PCDD/F and dioxin-like PCB TEQ, and the ICES-6 PCBs. For most food groups (fish is a notable exception), PCDD/Fs makes a greater contribution to the TEQ than PCBs.

The frequency of positive detection for BFRs such as PBDEs and HBCD/TBBPA remained similar despite improvements in measurement sensitivity, which suggests a downward trend in concentration levels for most food groups, apart from sugars and preserves. In common with other recent studies on food, including the last TDS (Food Standards Agency 2006) the most frequently occurring PBDE congeners remain BDE-47, 49, 99, 100, 153, 154, 183 and 209. Similarly alpha-HBCD remained the most frequently detected HBCD diasteriomer. Brominated biphenyls were rarely detected which is consistent with their low utilisation in the UK. An attempt was made to estimate the concentrations of pentabromocyclododecene (PBCD), which the literature suggests, is a breakdown product or metabolite of HBCD. The estimated concentrations have been reported, but the data remains qualitative/semi-quantitative and no positive identifications were made at concentration ranges that were similar or marginally higher than the HBCD diasteriomers. The frequency of detection for the EFSA prioritised compounds HBB, BTBPE and DBDPE, was also very low.

Improvements in the limits of detection have resulted in more sensitive data for the PBDD/Fs since the last TDS (Food Standards Agency 2006), with a resulting lower limit of reporting. This has resulted in a greater frequency of positive detection in comparison with the last TDS. The data also confirm a higher prevalence of PBDFs as observed in other recent studies. In common with the PCDD/Fs and PCBs, there are some elevations and some reductions in food group concentrations relative to the last TDS, although some of the reductions may be attributable to better measurement sensitivity (e.g. milk shows an ~ 5 fold decrease on an upper bound fat basis, but >3 fold increase on a lower bound fat basis).

In some food groups, e.g. canned vegetables, eggs and milk, PAHs were not detected at all. A direct comparison with the last TDS (Food Standards Agency 2002) is partially restricted because fewer compounds were measured in the 2001 study. However, a comparison of the 4 regulated PAH compounds indicates broadly similar reported levels in both studies, apart from sugars and preserves, and other vegetables, which return higher values for the current study. The concentrations of benzo[a]pyrene and the PAH 4 compounds detected in the samples did not exceed the maximum limits specified in EU regulations (European Commission 2011).

PCNs were detected in all food groups at varying concentrations. The sum of the 12 reported PCNs ranged from just under 1 ng/kg fat for nuts to 70 ng/kg fat for fish. This compares to a

previous study on individual UK foods (Fernandes et al 2010) where the sum of the 12 ranged from ~3 ng/kg fat for a fish oil supplement and some cheese samples to 320 ng/kg fat for a sample of farmed salmon. Although a direct comparison is not possible because of the differences in sampling procedure, it is clear that fish generally show the highest concentrations among the different food groups.

A significant improvement in the measurement sensitivity of PFAS since the last TDS study has resulted in near universal detection of all targeted analytes in this study. The fish and offal groups show generally higher concentrations of most PFAS relative to the other foods. Comparison with the (only) previous TDS study (Food Standards Agency 2006B) is limited because of the very different reporting levels, which resulted in most analytes remaining undetected in the earlier work. However, the range of concentrations (1-10 µg/kg) observed in the potato group in the last study compare with 0.03 -0.85 µg/kg in the current TDS.

Apart from canned vegetables, at least one PXDD/F congener was detected in all the food groups, albeit at low concentrations relative to PCDD/Fs. The fish group showed the highest frequency of detection for PXDD/Fs and the highest concentrations of PXBs. In general, the frequency of detection was similar to that observed in an earlier study on foods (Fernandes et al 2011B) and followed the order PXBs>PXDFs>PXDDs. Also, in common with the earlier study, it is very likely that some of the additional signals observed in the mass chromatograms for some samples (e.g. offal, meat products, other vegetables, etc.) arise from the presence of non-targeted congeners. Identification and quantification of these is difficult without reference standards. However, the presence of these signals does imply that the toxicological burden associated with the limited number of congeners measured here, is likely to be an underestimate.

4. Conclusions

In general terms the 2012 TDS study on organic environmental contaminants provides data that are broadly consistent with other currently available studies.

With respect to the individual compounds that are regulated, contaminant concentrations were comfortably below the regulatory maximum levels, and would thus indicate no risk to public health.

Although a thorough analysis of the data has not been carried out, the concentrations of some analytes such as HBCD and PBDEs generally show a downward trend. The trend is more difficult to characterise for some of the other analytes such as chlorinated and brominated dioxins and PCBs. This may be due to a reduced rate of decline in the concentrations of these contaminants but could also be related to the composition of the food groups which reflect current consumption patterns. For some other analytes such as the PXDD/Fs, PXBs and PCNs, the study provides a useful concentration baseline from which future studies can be assessed.

The data will allow dietary intake estimations of the various contaminants, refining and updating the existing risk assessments of the human exposure to these contaminants.

Table 3.1 PCDD/F concentrations – ng/kg fat weight

OEC Sample No.	20657	20646	20645	20661				
FERA LIMS No.	S12-019415	S12-018687	S12-018663	S12-027468				
Sample Details:	Group 1 Bread	Group 2 Cereals	Group 3 Carcase meat	Group 4 Offal				
Fat content (%)	4.14	9.42	14.41	9.92				
ng/kg fat weight	% U	% U	% U	% U				
2,3,7,8-TCDD	<0.04	202	<0.03	202	0.04	56	0.07	38
1,2,3,7,8-PeCDD	<0.05	201	<0.03	201	0.12	29	0.21	26
1,2,3,4,7,8-HxCDD	<0.03	202	<0.01	202	0.07	38	0.29	27
1,2,3,6,7,8-HxCDD	0.07	173	0.04	201	0.14	37	0.37	26
1,2,3,7,8,9-HxCDD	<0.04	202	<0.04	202	0.05	84	0.16	29
1,2,3,4,6,7,8-HpCDD	0.43	24	0.23	107	0.35	42	3.09	24
OCDD	2.92	24	3.51	84	1.50	102	16.59	24
2,3,7,8-TCDF	0.15i	27	<0.04	201	0.03	135	0.07	37
1,2,3,7,8-PeCDF	0.07	37	0.04	152	<0.01	201	0.03	71
2,3,4,7,8-PeCDF	0.10	122	0.05	84	0.24	25	2.20	24
1,2,3,4,7,8-HxCDF	<0.04	201	0.03	201	0.14	28	1.26	24
1,2,3,6,7,8-HxCDF	0.06	168	0.04	103	0.07	37	1.11	24
1,2,3,7,8,9-HxCDF	<0.04	201	<0.03	201	<0.01	201	<0.01	201
2,3,4,6,7,8-HxCDF	0.06	41	<0.03	201	0.08	35	1.15	24
1,2,3,4,6,7,8-HpCDF	0.14	75	<0.08	201	0.40	31	3.13	24
1,2,3,4,7,8,9-HpCDF	<0.05	201	<0.02	201	0.02	103	0.19	26
OCDF	0.19	98	0.14	159	0.11	112	0.87	24
WHO-TEQ uncertainty lower limit	0.049	0.020	0.270	1.354				
WHO TEQ (ng/kgfat) lower	0.073	0.031	0.298	1.451				
WHO-TEQ uncertainty upper limit	0.097	0.042	0.326	1.548				
WHO-TEQ uncertainty lower limit	0.119	0.070	0.271	1.355				
WHO TEQ (ng/kgfat) upper	0.178	0.107	0.299	1.452				
WHO-TEQ uncertainty upper limit	0.237	0.144	0.327	1.549				
WHO-TEQ uncertainty lower limit	0.002	0.002	0.031	0.111				
WHO TEQ (ng/kgWhole) lower	0.003	0.003	0.043	0.144				
WHO-TEQ uncertainty upper limit	0.004	0.004	0.055	0.177				
WHO-TEQ uncertainty lower limit	0.005	0.006	0.031	0.111				
WHO TEQ (ng/kgWhole) upper	0.007	0.010	0.043	0.144				
WHO-TEQ uncertainty upper limit	0.010	0.014	0.055	0.177				

i- indicative

OEC Sample No.	20664	20660	20663	20648				
FERA LIMS No.	S12-027460	S12-027572	S12-027570	S12-018862				
Sample Details:	Group 5 Meat products	Group 6 Poultry	Group 7 Fish	Group 8 Fats & oils				
Fat content (%)	14.86	7.32	9.31	73.80				
ng/kg fat weight		%U	%U	%U				
2,3,7,8-TCDD	0.02	103	<0.01	202	0.13	30	<0.02	202
1,2,3,7,8-PeCDD	0.02	103	0.03i	71	0.37	25	0.03	135
1,2,3,4,7,8-HxCDD	0.02	103	0.02	103	0.11	31	<0.01	202
1,2,3,6,7,8-HxCDD	0.06	41	0.06	71	0.28	28	0.02	201
1,2,3,7,8,9-HxCDD	0.02	103	0.01	202	0.08	36	<0.02	202
1,2,3,4,6,7,8-HpCDD	0.29	25	0.66	24	0.45	24	0.13	95
OCDD	2.35	24	3.72	24	2.74	24	4.05	45
2,3,7,8-TCDF	0.10	31	0.10	31	2.25	24	0.02	201
1,2,3,7,8-PeCDF	0.01	201	0.04	55	0.41	24	<0.02	201
2,3,4,7,8-PeCDF	0.11	30	0.05	84	1.44	24	0.05	47
1,2,3,4,7,8-HxCDF	0.07	37	0.04	55	0.23	26	0.02	201
1,2,3,6,7,8-HxCDF	0.05	47	0.03	71	0.16	27	0.02	103
1,2,3,7,8,9-HxCDF	<0.01	201	<0.01	201	<0.01	201	<0.02	201
2,3,4,6,7,8-HxCDF	0.06	41	0.02i	103	0.28	25	0.02	201
1,2,3,4,6,7,8-HpCDF	0.20	26	0.37	25	0.21	26	<0.05	201
1,2,3,4,7,8,9-HpCDF	0.01	201	0.02	103	0.02	103	<0.01	201
OCDF	0.07	62	0.39	26	0.08	55	0.07	173
WHO-TEQ uncertainty lower limit	0.097		0.067		1.212		0.040	
WHO TEQ (ng/kgfat) lower	0.117		0.086		1.291		0.058	
WHO-TEQ uncertainty upper limit	0.137		0.105		1.370		0.076	
WHO-TEQ uncertainty lower limit	0.098		0.075		1.213		0.059	
WHO TEQ (ng/kgfat) upper	0.118		0.097		1.292		0.084	
WHO-TEQ uncertainty upper limit	0.138		0.119		1.371		0.109	
WHO-TEQ uncertainty lower limit	0.011		0.004		0.093		0.031	
WHO TEQ (ng/kgWhole) lower	0.017		0.006		0.120		0.043	
WHO-TEQ uncertainty upper limit	0.023		0.009		0.147		0.054	
WHO-TEQ uncertainty lower limit	0.011		0.004		0.093		0.045	
WHO TEQ (ng/kgWhole) upper	0.018		0.007		0.120		0.062	
WHO-TEQ uncertainty upper limit	0.024		0.010		0.147		0.079	

i- indicative

OEC Sample No.	20647	20665	20655	20656				
FERA LIMS No.	S12-018741	S12-027622	S12-019343	S12-019362				
Sample Details:	Group 9 Eggs	Group 10 Sugar and Preserves	Group 11 Green vegetables	Group 12 Potatoes				
Fat content (%)	9.55	6.05	0.29	5.19				
ng/kg fat weight	%U	%U	%U	%U				
2,3,7,8-TCDD	0.05	84	0.08	56	0.40	84	<0.02	202
1,2,3,7,8-PeCDD	0.09	50	0.15	47	0.38	88	0.07	62
1,2,3,4,7,8-HxCDD	0.07	38	0.14	29	0.14	117	0.03	71
1,2,3,6,7,8-HxCDD	0.16	35	0.27	38	0.41	100	0.08	79
1,2,3,7,8,9-HxCDD	0.11	45	0.10	48	0.26	156	<0.04	202
1,2,3,4,6,7,8-HpCDD	0.65	32	1.23	24	2.13i	66	0.45	50
OCDD	2.80	63	12.22	24	15.98	102	6.27	45
2,3,7,8-TCDF	0.24	29	0.65	24	0.83	54	0.05	122
1,2,3,7,8-PeCDF	0.13	39	0.43	24	0.49	70	<0.02	201
2,3,4,7,8-PeCDF	0.13	28	0.75	26	0.57	45	0.08	55
1,2,3,4,7,8-HxCDF	0.20	31	0.46	26	0.34	97	0.06	71
1,2,3,6,7,8-HxCDF	0.14	28	0.34	30	0.22	112	0.03	135
1,2,3,7,8,9-HxCDF	<0.02	201	0.04i	103	<0.16	201	<0.02	201
2,3,4,6,7,8-HxCDF	0.08	55	0.27	25	0.36	92	0.05	84
1,2,3,4,6,7,8-HpCDF	0.29	42	0.59	26	1.23	80	0.09	157
1,2,3,4,7,8,9-HpCDF	0.03	71	0.06	103	<0.11	201	<0.04	201
OCDF	0.18	71	0.32	45	3.97	39	0.13	141
WHO-TEQ uncertainty lower limit	0.260		0.656		1.051		0.101	
WHO TEQ (ng/kgfat) lower	0.293		0.717		1.261		0.131	
WHO-TEQ uncertainty upper limit	0.326		0.778		1.471		0.161	
WHO-TEQ uncertainty lower limit	0.262		0.656		1.065		0.122	
WHO TEQ (ng/kgfat) upper	0.295		0.717		1.278		0.158	
WHO-TEQ uncertainty upper limit	0.328		0.778		1.491		0.194	
WHO-TEQ uncertainty lower limit	0.018		0.030		0.002		0.004	
WHO TEQ (ng/kgWhole) lower	0.028		0.043		0.004		0.007	
WHO-TEQ uncertainty upper limit	0.038		0.057		0.005		0.009	
WHO-TEQ uncertainty lower limit	0.018		0.030		0.002		0.005	
WHO TEQ (ng/kgWhole) upper	0.028		0.043		0.004		0.008	
WHO-TEQ uncertainty upper limit	0.038		0.057		0.005		0.011	

OEC Sample No.	20649	20653	20654	20652				
FERA LIMS No.	S12-018863	S12-019279	S12-019327	S12-019278				
Sample Details:	Group 13 Other vegetables	Group 14 Canned Vegetables	Group 15 Fresh Fruit	Group 16 Fruit products				
Fat content (%)	5.46	0.53	0.21	0.42				
ng/kg fat weight		%U	%U	%U				
2,3,7,8-TCDD	0.06	71	<0.07	202	<0.32	202	<0.19	202
1,2,3,7,8-PeCDD	0.13	39	<0.1	201	<0.32	201	0.29	181
1,2,3,4,7,8-HxCDD	0.09	34	0.07	63	<0.16	202	<0.1	202
1,2,3,6,7,8-HxCDD	0.13	39	<0.12	201	<0.4	201	<0.32	201
1,2,3,7,8,9-HxCDD	0.07	63	<0.07	202	<0.4	202	<0.19	202
1,2,3,4,6,7,8-HpCDD	0.61	36	0.29	25	1.76	151	0.52	24
OCDD	2.72	77	2.27	24	19.68	165	6.53	24
2,3,7,8-TCDF	1.18	24	0.14	28	0.64	127	0.42	24
1,2,3,7,8-PeCDF	0.68	25	0.07	37	0.40	162	0.48	24
2,3,4,7,8-PeCDF	0.72	24	0.14	173	0.44	107	0.78	85
1,2,3,4,7,8-HxCDF	0.44	26	0.12	119	0.40	162	0.65	63
1,2,3,6,7,8-HxCDF	0.46	24	<0.1	201	0.36	135	0.39	135
1,2,3,7,8,9-HxCDF	0.03i	135	<0.07	201	<0.32	201	<0.19	201
2,3,4,6,7,8-HxCDF	0.25	29	0.11	44	<0.32	201	0.55	32
1,2,3,4,6,7,8-HpCDF	0.60	31	0.22	94	<0.94	201	1.36	45
1,2,3,4,7,8,9-HpCDF	0.08	35	<0.1	201	<0.23	201	<0.26	201
OCDF	0.40	42	0.28	124	1.44	170	0.71	129
WHO-TEQ uncertainty lower limit	0.640		0.063		0.201		0.528	
WHO TEQ (ng/kgfat) lower	0.705		0.094		0.308		0.760	
WHO-TEQ uncertainty upper limit	0.770		0.125		0.415		0.992	
WHO-TEQ uncertainty lower limit	0.640		0.201		0.732		0.718	
WHO TEQ (ng/kgfat) upper	0.705		0.301		1.120		1.033	
WHO-TEQ uncertainty upper limit	0.770		0.401		1.508		1.348	
WHO-TEQ uncertainty lower limit	0.026		<0.001		<0.001		0.002	
WHO TEQ (ng/kgWhole) lower	0.038		<0.001		0.001		0.003	
WHO-TEQ uncertainty upper limit	0.051		0.001		0.001		0.004	
WHO-TEQ uncertainty lower limit	0.026		0.001		0.001		0.003	
WHO TEQ (ng/kgWhole) upper	0.038		0.002		0.002		0.004	
WHO-TEQ uncertainty upper limit	0.051		0.002		0.003		0.006	

i- indicative

OEC Sample No.	20635	20662	20658	
FERA LIMS No.	S12-018091	S12-027481	S12-019486	
Sample Details:	Group 18 Milk	Group 19 Milk & Dairy products	Group 20 Nuts	
Fat content (%)	1.97	23.31	41.84	
ng/kg fat weight		%U	%U	%U
2,3,7,8-TCDD	0.04	103	0.03	71
1,2,3,7,8-PeCDD	0.09	50	0.07	37
1,2,3,4,7,8-HxCDD	0.05	48	0.04	56
1,2,3,6,7,8-HxCDD	0.12	55	0.12	29
1,2,3,7,8,9-HxCDD	0.04	152	0.05	48
1,2,3,4,6,7,8-HpCDD	0.29	67	0.24	25
OCDD	1.25	178	0.52	24
2,3,7,8-TCDF	0.05	122	0.02	103
1,2,3,7,8-PeCDF	0.03	135	0.02	103
2,3,4,7,8-PeCDF	0.19	32	0.23	26
1,2,3,4,7,8-HxCDF	0.11	44	0.11	30
1,2,3,6,7,8-HxCDF	0.10	47	0.09	33
1,2,3,7,8,9-HxCDF	<0.02	201	<0.01	201
2,3,4,6,7,8-HxCDF	0.09	50	0.09	33
1,2,3,4,6,7,8-HpCDF	0.11	112	0.08	35
1,2,3,4,7,8,9-HpCDF	0.02	201	<0.01	201
OCDF	<0.08	201	0.02	103
WHO-TEQ uncertainty lower limit	0.213	0.202	0.004	
WHO TEQ (ng/kgfat) lower	0.248	0.225	0.006	
WHO-TEQ uncertainty upper limit	0.283	0.248	0.008	
WHO-TEQ uncertainty lower limit	0.214	0.203	0.023	
WHO TEQ (ng/kgfat) upper	0.250	0.226	0.036	
WHO-TEQ uncertainty upper limit	0.286	0.249	0.049	
WHO-TEQ uncertainty lower limit	0.003	0.039	0.002	
WHO TEQ (ng/kgWhole) lower	0.005	0.052	0.003	
WHO-TEQ uncertainty upper limit	0.007	0.066	0.003	
WHO-TEQ uncertainty lower limit	0.003	0.039	0.009	
WHO TEQ (ng/kgWhole) upper	0.005	0.053	0.015	
WHO-TEQ uncertainty upper limit	0.007	0.066	0.021	

Table 3.2 Non-ortho substituted PCB concentrations – ng/kg fat weight

OEC Sample No.	20657	20646	20645	20661				
FERA LIMS No.	S12-019415	S12-018687	S12-018663	S12-027468				
Sample Details:	Group 1 Bread	Group 2 Cereals	Group 3 Carcase meat	Group 4 Offal				
Fat content (%)	4.14	9.42	14.41	9.92				
ng/kg fat weight		%U	%U	%U				
PCB77	12.32	24	4.03	77	1.07	146	1.85	24
PCB81	0.67	24	0.18	114	0.20	55	0.24	25
PCB126	0.85	24	0.21	107	1.91	25	4.29	24
PCB169	0.28	25	<0.09	201	1.13	25	1.22	24
WHO-TEQ uncertainty lower limit	0.094		0.020		0.223		0.462	
WHO TEQ (ng/kgfat) lower	0.095		0.021		0.225		0.466	
WHO-TEQ uncertainty upper limit	0.096		0.022		0.227		0.470	
WHO-TEQ uncertainty lower limit	0.094		0.023		0.223		0.462	
WHO TEQ (ng/kgfat) upper	0.095		0.024		0.225		0.466	
WHO-TEQ uncertainty upper limit	0.096		0.025		0.227		0.470	
WHO-TEQ uncertainty lower limit	0.004		0.002		0.032		0.046	
WHO TEQ (ng/kgWhole) lower	0.004		0.002		0.032		0.046	
WHO-TEQ uncertainty upper limit	0.004		0.002		0.033		0.047	
WHO-TEQ uncertainty lower limit	0.004		0.002		0.032		0.046	
WHO TEQ (ng/kgWhole) upper	0.004		0.002		0.032		0.046	
WHO-TEQ uncertainty upper limit	0.004		0.002		0.033		0.047	

OEC Sample No.	20664	20660	20663	20648
FERA LIMS No.	S12-027460	S12-027572	S12-027570	S12-018862
Sample Details:	Group 5 Meat products	Group 6 Poultry	Group 7 Fish	Group 8 Fats & oils
Fat content (%)	14.86	7.32	9.31	73.80
ng/kg fat weight		% U	% U	% U
PCB77	2.50	24	2.63	24
PCB81	0.12	29	0.19	26
PCB126	0.71	24	0.44	24
PCB169	0.30	25	0.11	30
WHO-TEQ uncertainty lower limit	0.079		0.048	2.029
WHO TEQ (ng/kgfat) lower	0.080		0.048	2.045
WHO-TEQ uncertainty upper limit	0.081		0.048	2.061
WHO-TEQ uncertainty lower limit	0.079		0.048	2.029
WHO TEQ (ng/kgfat) upper	0.080		0.048	2.045
WHO-TEQ uncertainty upper limit	0.081		0.048	2.061
WHO-TEQ uncertainty lower limit	0.012		0.003	0.189
WHO TEQ (ng/kgWhole) lower	0.012		0.004	0.190
WHO-TEQ uncertainty upper limit	0.012		0.004	0.192
WHO-TEQ uncertainty lower limit	0.012		0.003	0.189
WHO TEQ (ng/kgWhole) upper	0.012		0.004	0.190
WHO-TEQ uncertainty upper limit	0.012		0.004	0.192

OEC Sample No.	20647	20665	20655	20656				
FERA LIMS No.	S12-018741	S12-027622	S12-019343	S12-019362				
Sample Details:	Group 9 Eggs	Group 10 Sugar and Preserves	Group 11 Green vegetables	Group 12 Potatoes				
Fat content (%)	9.55	6.05	0.29	5.19				
ng/kg fat weight		% U	% U	% U				
PCB77	6.96	34	34.42i	24	22.27	78	1.84	139
PCB81	0.52	33	2.84	24	2.02	60	0.10	162
PCB126	1.41	25	1.66	24	2.57	52	0.23	82
PCB169	0.49	31	0.27	25	0.55	176	<0.07	201
WHO-TEQ uncertainty lower limit	0.156		0.177		0.269		0.022	
WHO TEQ (ng/kgfat) lower	0.157		0.178		0.276		0.023	
WHO-TEQ uncertainty upper limit	0.158		0.179		0.283		0.024	
WHO-TEQ uncertainty lower limit	0.156		0.177		0.269		0.024	
WHO TEQ (ng/kgfat) upper	0.157		0.178		0.276		0.025	
WHO-TEQ uncertainty upper limit	0.158		0.179		0.283		0.026	
WHO-TEQ uncertainty lower limit	0.015		0.011		0.001		0.001	
WHO TEQ (ng/kgWhole) lower	0.015		0.011		0.001		0.001	
WHO-TEQ uncertainty upper limit	0.015		0.011		0.001		0.001	
WHO-TEQ uncertainty lower limit	0.015		0.011		0.001		0.001	
WHO TEQ (ng/kgWhole) upper	0.015		0.011		0.001		0.001	
WHO-TEQ uncertainty upper limit	0.015		0.011		0.001		0.001	

i- indicative

OEC Sample No.	20649	20653	20654	20652
FERA LIMS No.	S12-018863	S12-019279	S12-019327	S12-019278
Sample Details:	Group 13 Other vegetables	Group 14 Canned Vegetables	Group 15 Fresh Fruit	Group 16 Fruit products
Fat content (%)	5.46	0.53	0.21	0.42
ng/kg fat weight		%U	%U	%U
PCB77	10.76	31	6.81	24
PCB81	1.37	26	0.42	24
PCB126	2.39	25	0.78	24
PCB169	0.43	37	0.19	26
WHO-TEQ uncertainty lower limit	0.251		0.345	0.728
WHO TEQ (ng/kgfat) lower	0.253		0.357	0.734
WHO-TEQ uncertainty upper limit	0.255		0.369	0.740
WHO-TEQ uncertainty lower limit	0.251		0.373	0.728
WHO TEQ (ng/kgfat) upper	0.253		0.386	0.734
WHO-TEQ uncertainty upper limit	0.255		0.399	0.740
WHO-TEQ uncertainty lower limit	0.014		<0.001	0.003
WHO TEQ (ng/kgWhole) lower	0.014		0.001	0.003
WHO-TEQ uncertainty upper limit	0.014		<0.001	0.003
WHO-TEQ uncertainty lower limit	0.014		<0.001	0.003
WHO TEQ (ng/kgWhole) upper	0.014		0.001	0.003
WHO-TEQ uncertainty upper limit	0.014		<0.001	0.003

OEC Sample No.	20635	20662	20658
FERA LIMS No.	S12-018091	S12-027481	S12-019486
Sample Details:	Group 18 Milk	Group 19 Milk & Dairy products	Group 20 Nuts
Fat content (%)	1.97	23.31	41.84

ng/kg fat weight		%U	%U	%U
PCB77	1.42	162	0.90	24
PCB81	0.21	80	0.23	26
PCB126	1.52	26	2.05	24
PCB169	0.36	46	0.38	25
WHO-TEQ uncertainty lower limit	0.161		0.215	0.006
WHO TEQ (ng/kgfat) lower	0.163		0.217	0.006
WHO-TEQ uncertainty upper limit	0.165		0.219	0.006
WHO-TEQ uncertainty lower limit	0.161		0.215	0.007
WHO TEQ (ng/kgfat) upper	0.163		0.217	0.007
WHO-TEQ uncertainty upper limit	0.165		0.219	0.007
WHO-TEQ uncertainty lower limit	0.003		0.050	0.002
WHO TEQ (ng/kgWhole) lower	0.003		0.051	0.003
WHO-TEQ uncertainty upper limit	0.003		0.051	0.003
WHO-TEQ uncertainty lower limit	0.003		0.050	0.003
WHO TEQ (ng/kgWhole) upper	0.003		0.051	0.003
WHO-TEQ uncertainty upper limit	0.003		0.051	0.003

Table 3.3 Ortho substituted PCB concentrations –fat weight basis

OEC Sample No.	20657	20646	20645	20661				
FERA LIMS No.	S12-019415	S12-018687	S12-018663	S12-027468				
Sample Details:	Group 1 Bread	Group 2 Cereals	Group 3 Carcase meat	Group 4 Offal				
Fat content (%)	4.14	9.42	14.41	9.92				
ug/kg fat weight		%U	%U	%U				
PCB18	0.13	28	0.06	71	0.02	103	0.05	47
PCB28	0.36	24	0.16	35	0.04	55	0.07	37
PCB31	0.31	25	0.15	36	0.02	103	0.06	41
PCB33	0.22i	25	0.12	41	0.04	55	0.03	71
PCB41	0.17	27	0.05	83	0.01	201	0.02	103
PCB44	0.14	28	0.04	55	0.01	201	0.02	103
PCB47	0.08	35	0.04	103	0.02	103	0.03	71
PCB49	0.10	31	0.04	55	<0.01	201	0.02	103
PCB51	0.02	103	<0.01	201	<0.01	201	<0.01	201
PCB52	0.16	27	0.18	33	0.02	103	0.03	71
PCB56/60	0.15	27	0.04	103	0.01	201	0.01	201
PCB61/74	0.09	33	0.03	135	0.04	55	0.03	71
PCB66	0.20	26	0.07	62	0.03	71	0.02	103
PCB99	0.04	55	0.02	103	0.10	31	0.10	31
PCB101	0.07	37	0.03	71	0.02	103	0.02	103
PCB87	0.03	71	0.01	201	0.01	201	0.02	103
PCB105	0.02	103	0.01	201	0.04	55	0.03	71
PCB110	0.05	47	0.03	135	0.01	201	0.01	201
PCB114	<0.01	201	<0.01	201	<0.01	201	<0.01	201
PCB118	0.04	55	0.03	71	0.16	27	0.14	28
PCB123	<0.01	201	<0.01	201	<0.01	201	<0.01	201
PCB128	<0.01	201	<0.01	201	0.03	71	0.03	71
PCB129	<0.01	201	<0.01	201	<0.01	201	<0.01	201
PCB138	0.08	35	0.03	71	0.33	25	0.39	24
PCB156	<0.01	201	<0.01	201	0.04i	55	0.02	103
PCB157	<0.01	201	<0.01	201	0.01	201	<0.01	201
PCB167	<0.01	201	<0.01	201	0.01	201	<0.01	201
PCB141	0.02	103	<0.01	201	<0.01	201	<0.01	201
PCB149	0.07	37	0.02	103	0.02	103	0.03	71
PCB151	<0.01	201	<0.01	201	<0.01	201	<0.01	201
PCB153	0.08	35	0.03	135	0.55	24	0.72	24

i- indicative

OEC Sample No.	20657	20646	20645	20661				
FERA LIMS No.	S12-019415	S12-018687	S12-018663	S12-027468				
Sample Details:	Group 1 Bread	Group 2 Cereals	Group 3 Carcase meat	Group 4 Offal				
PCB170	<0.06	201	0.01	201	0.14i	28	0.13i	28
PCB180	0.05	47	0.01	201	0.23	25	0.22	25
PCB183	<0.02	201	<0.01	201	0.05	47	0.09	33
PCB185	<0.01	201	<0.01	201	<0.01	201	<0.01	201
PCB187	0.06	41	<0.02	201	0.11	30	0.11	30
PCB189	<0.01	201	<0.01	201	0.05i	47	0.01i	201
PCB191	<0.01	201	<0.01	201	0.01	201	<0.01	201
PCB193	<0.01	201	<0.01	201	<0.01	201	<0.01	201
PCB194	<0.01	201	<0.01	201	0.05	47	0.05	47
PCB201	<0.01	201	<0.01	201	0.02	103	0.02	103
PCB202	<0.01	201	<0.01	201	<0.01	201	<0.01	201
PCB203	0.04	55	<0.01	201	0.03	71	0.06	41
PCB206	<0.09	201	<0.02	201	<0.01	201	<0.03	201
PCB208	<0.05	201	<0.02	201	<0.01	201	<0.01	201
PCB209	<0.02	201	<0.01	201	0.04	55	0.02	103
WHO-TEQ uncertainty lower limit	0.002		0.001		0.009		0.006	
WHO TEQ (ng/kgfat) lower	0.002		0.001		0.009		0.006	
WHO-TEQ uncertainty upper limit	0.002		0.001		0.009		0.006	
WHO-TEQ uncertainty lower limit	0.004		0.003		0.010		0.007	
WHO TEQ (ng/kgfat) upper	0.004		0.003		0.010		0.007	
WHO-TEQ uncertainty upper limit	0.004		0.003		0.010		0.007	
WHO-TEQ uncertainty lower limit	<0.001		<0.001		0.001		0.001	
WHO TEQ (ng/kgWhole) lower	<0.001		<0.001		0.001		0.001	
WHO-TEQ uncertainty upper limit	<0.001		<0.001		0.001		0.001	
WHO-TEQ uncertainty lower limit	<0.001		<0.001		0.001		0.001	
WHO TEQ (ng/kgWhole) upper	<0.001		<0.001		0.001		0.001	
WHO-TEQ uncertainty upper limit	<0.001		<0.001		0.001		0.001	

i- indicative

OEC Sample No.	20664	20660	20663	20648
FERA LIMS No.	S12-027460	S12-027572	S12-027570	S12-018862
Sample Details:	Group 5 Meat products	Group 6 Poultry	Group 7 Fish	Group 8 Fats & oils
Fat content (%)	14.86	7.32	9.31	73.80
ug/kg fat weight		%U	%U	%U
PCB18	0.02	103	0.03	71
PCB28	0.03	71	0.07	37
PCB31	0.03	71	0.04	55
PCB33	0.02	103	0.02	103
PCB41	0.01	201	0.02	103
PCB44	0.01	201	0.01	201
PCB47	0.03	71	0.03	71
PCB49	0.01	201	0.01	201
PCB51	<0.01	201	<0.01	201
PCB52	0.03	71	0.02	103
PCB56/60	0.01	201	0.01	201
PCB61/74	0.03	71	0.02	103
PCB66	0.02	103	0.04	55
PCB99	0.07	37	0.02	103
PCB101	0.03	71	0.01	201
PCB87	0.02	103	<0.01	201
PCB105	0.02	103	0.01	201
PCB110	0.02	103	0.01	201
PCB114	<0.01	201	<0.01	201
PCB118	0.09	33	0.04	55
PCB123	<0.01	201	<0.01	201
PCB128	0.02	103	<0.01	201
PCB129	<0.01	201	<0.01	201
PCB138	0.21	26	0.08	35
PCB156	0.02	103	<0.01	201
PCB157	<0.01	201	<0.01	201
PCB167	<0.01	201	<0.01	201
PCB141	<0.01	201	<0.01	201
PCB149	0.04	55	0.02	103
PCB151	<0.01	201	<0.01	201
PCB153	0.24	25	0.09	33
			9.26	24
				0.07
				37

OEC Sample No.	20664	20660	20663	20648				
FERA LIMS No.	S12-027460	S12-027572	S12-027570	S12-018862				
Sample Details:	Group 5 Meat products	Group 6 Poultry	Group 7 Fish	Group 8 Fats & oils				
PCB170	0.05i	47	0.04	55	1.36	24	<0.03	201
PCB180	0.09	33	0.06	41	2.25	24	0.06i	41
PCB183	0.03	71	0.01	201	0.79	24	<0.01	201
PCB185	<0.01	201	<0.01	201	0.09	33	<0.01	201
PCB187	0.08	35	0.06	41	5.82	24	<0.01	201
PCB189	0.01i	201	<0.01	201	0.19	26	<0.04	201
PCB191	<0.01	201	<0.01	201	0.25	25	<0.02	201
PCB193	<0.01	201	<0.01	201	0.04	55	0.07	37
PCB194	0.02	103	0.02	103	0.50	24	<0.01	201
PCB201	0.02	103	<0.01	201	0.50	24	<0.01	201
PCB202	<0.01	201	<0.01	201	0.28	25	<0.01	201
PCB203	0.03	71	0.02	103	0.59	24	<0.02	201
PCB206	0.23	25	<0.04	201	0.80	24	<0.03	201
PCB208	<0.01	201	<0.04	201	0.05	47	<0.02	201
PCB209	0.06	41	0.02	103	0.23	25	<0.06	201
WHO-TEQ uncertainty lower limit	0.004		0.002		0.162		0.002	
WHO TEQ (ng/kgfat) lower	0.004		0.002		0.162		0.002	
WHO-TEQ uncertainty upper limit	0.004		0.002		0.162		0.002	
WHO-TEQ uncertainty lower limit	0.005		0.003		0.162		0.004	
WHO TEQ (ng/kgfat) upper	0.005		0.003		0.162		0.004	
WHO-TEQ uncertainty upper limit	0.005		0.003		0.162		0.004	
WHO-TEQ uncertainty lower limit	0.001		<0.001		0.015		0.001	
WHO TEQ (ng/kgWhole) lower	0.001		<0.001		0.015		0.001	
WHO-TEQ uncertainty upper limit	0.001		<0.001		0.015		0.001	
WHO-TEQ uncertainty lower limit	0.001		<0.001		0.015		0.003	
WHO TEQ (ng/kgWhole) upper	0.001		<0.001		0.015		0.003	
WHO-TEQ uncertainty upper limit	0.001		<0.001		0.015		0.003	

i- indicative

OEC Sample No.	20647	20665	20655	20656				
FERA LIMS No.	S12-018741	S12-027622	S12-019343	S12-019362				
Sample Details:	Group 9 Eggs	Group 10 Sugar and Preserves	Group 11 Green vegetables	Group 12 Potatoes				
Fat content (%)	9.55	6.05	0.29	5.19				
ug/kg fat weight	%U	%U	%U	%U				
PCB18	0.02	103	0.73	24	0.24	95	0.05i	83
PCB28	0.17	27	2.47	24	0.35	67	0.07i	62
PCB31	0.03	71	2.37	24	0.31	63	0.07	37
PCB33	0.02	103	1.63	24	0.24	95	<0.04	201
PCB41	0.02	103	0.88	24	0.22	121	0.03	135
PCB44	<0.01	201	0.73	24	0.19	88	0.02	103
PCB47	0.06	41	0.65	24	0.16	152	0.03	135
PCB49	0.01	201	0.66	24	0.16	55	0.02	103
PCB51	<0.01	201	0.11	30	<0.08	201	<0.01	201
PCB52	0.02	103	0.83	24	0.29	66	0.03	71
PCB56/60	0.03	71	0.57	24	0.18	114	0.02	103
PCB61/74	0.06	41	0.40	24	<0.14	201	<0.02	201
PCB66	0.13	28	0.83	24	0.29	80	0.03	135
PCB99	0.16	27	0.22	25	0.16	67	0.01	201
PCB101	0.02	103	0.44	24	0.38	48	0.02	103
PCB87	0.02	103	0.26	25	0.16	103	<0.01	201
PCB105	0.07	37	0.20	26	0.10	83	0.01	201
PCB110	0.02	103	0.47	24	0.32	61	0.02	103
PCB114	<0.01	201	<0.01	201	<0.03	201	<0.01	201
PCB118	0.22	25	0.47	24	0.21	80	0.04	55
PCB123	<0.01	201	<0.01	201	<0.02	201	<0.01	201
PCB128	0.05	47	0.08	35	0.06	135	<0.01	201
PCB129	<0.01	201	0.03	71	<0.02	201	<0.01	201
PCB138	0.43	24	0.47	24	0.41	46	0.04	55
PCB156	0.03	71	0.05	47	0.07	89	<0.01	201
PCB157	<0.01	201	0.02	103	<0.02	201	<0.01	201
PCB167	0.01	201	0.02	103	0.05	83	<0.01	201
PCB141	<0.01	201	0.06	41	0.08	79	<0.01	201
PCB149	0.08	35	0.29	25	0.42	45	0.02	103
PCB151	<0.01	201	<0.01	201	<0.01	201	<0.01	201
PCB153	0.52	24	0.34	24	0.42	53	0.04	55

i- indicative

OEC Sample No.	20647	20665	20655	20656
FERA LIMS No.	S12-018741	S12-027622	S12-019343	S12-019362
Sample Details:	Group 9 Eggs	Group 10 Sugar and Preserves	Group 11 Green vegetables	Group 12 Potatoes
PCB170	0.11	30	<0.04	201
PCB180	0.19	26	0.10	31
PCB183	0.05	47	0.03	71
PCB185	<0.01	201	<0.01	201
PCB187	0.30	25	0.10	31
PCB189	<0.01	201	<0.01	201
PCB191	0.02	103	<0.01	201
PCB193	<0.01	201	<0.01	201
PCB194	0.05	47	0.04	55
PCB201	0.03	71	<0.02	201
PCB202	<0.01	201	<0.01	201
PCB203	0.06	41	<0.01	201
PCB206	<0.02	201	<0.04	201
PCB208	<0.01	201	<0.05	201
PCB209	<0.01	201	<0.03	201
WHO-TEQ uncertainty lower limit	0.010		0.023	0.014
WHO TEQ (ng/kgfat) lower	0.010		0.023	0.014
WHO-TEQ uncertainty upper limit	0.010		0.023	0.014
WHO-TEQ uncertainty lower limit	0.011		0.024	0.016
WHO TEQ (ng/kgfat) upper	0.011		0.024	0.016
WHO-TEQ uncertainty upper limit	0.011		0.024	0.016
WHO-TEQ uncertainty lower limit	0.001		0.001	<0.001
WHO TEQ (ng/kgWhole) lower	0.001		0.001	<0.001
WHO-TEQ uncertainty upper limit	0.001		0.001	<0.001
WHO-TEQ uncertainty lower limit	0.001		0.001	<0.001
WHO TEQ (ng/kgWhole) upper	0.001		0.001	<0.001
WHO-TEQ uncertainty upper limit	0.001		0.001	<0.001

OEC Sample No.	20649	20653	20654	20652			
FERA LIMS No.	S12-018863	S12-019279	S12-019327	S12-019278			
Sample Details:	Group 13 Other vegetables	Group 14 Canned Vegetables	Group 15 Fresh Fruit	Group 16 Fruit products			
Fat content (%)	5.46	0.53	0.21	0.42			
ug/kg fat weight		%U	%U	%U	%U	%U	%U
PCB18	0.13i	28	0.16i	27	0.57	81	<0.17
PCB28	0.18	26	0.23	25	0.95i	52	0.57
PCB31	0.15	27	0.17	27	0.89	49	0.47
PCB33	0.09i	33	0.13i	28	0.54	88	0.31
PCB41	0.06i	71	0.09	33	0.47	113	<0.14
PCB44	0.05	47	0.07	37	0.49	70	0.11
PCB47	0.03	135	0.09	33	0.34	149	0.27
PCB49	0.04	55	0.06	41	0.38	53	0.19
PCB51	<0.01	201	<0.01	201	<0.15	201	<0.02
PCB52	0.09	33	0.11	30	1.17	40	0.27
PCB56/60	0.05	47	<0.05	201	0.43	96	<0.07
PCB61/74	0.03	135	0.06	41	<0.28	201	0.17
PCB66	0.07	37	0.11	30	0.61	79	0.32
PCB99	0.03	71	0.06	41	0.26	81	0.09
PCB101	0.18	26	0.08	35	0.62	60	0.11
PCB87	0.05	47	<0.03	201	0.20	152	0.05
PCB105	0.03	71	0.03	71	0.11	165	0.06
PCB110	0.11	30	0.06	41	0.45	83	0.21
PCB114	<0.01	201	<0.01	201	<0.06	201	<0.02
PCB118	0.11	30	0.10	31	0.44	81	0.15
PCB123	<0.01	201	<0.01	201	<0.05	201	<0.01
PCB128	0.05	47	0.02	103	<0.09	201	0.04
PCB129	<0.01	201	<0.01	201	<0.04	201	<0.04
PCB138	0.50	24	0.14	28	0.56	65	0.20
PCB156	0.04	55	<0.01	201	<0.06	201	0.03
PCB157	<0.01	201	<0.01	201	<0.02	201	<0.05
PCB167	0.02	103	<0.01	201	<0.03	201	<0.05
PCB141	0.07	37	<0.01	201	0.10	122	<0.02
PCB149	0.33	25	0.05	47	0.48	71	0.19
PCB151	<0.01	201	<0.01	201	<0.01	201	<0.01
PCB153	0.62	24	0.16	27	0.59	72	0.18

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OEC Sample No.	20649	20653	20654	20652
FERA LIMS No.	S12-018863	S12-019279	S12-019327	S12-019278
Sample Details:	Group 13 Other vegetables	Group 14 Canned Vegetables	Group 15 Fresh Fruit	Group 16 Fruit products
PCB170	<0.03	201	0.12i	29
PCB180	0.40	24	0.22	25
PCB183	0.10	31	<0.01	201
PCB185	0.02	103	<0.04	201
PCB187	0.22	25	<0.01	201
PCB189	<0.01	201	<0.03	201
PCB191	0.01	201	<0.03	201
PCB193	0.02	103	<0.01	201
PCB194	0.06	41	<0.02	201
PCB201	0.02	103	<0.02	201
PCB202	<0.01	201	<0.01	201
PCB203	0.06	41	<0.01	201
PCB206	<0.03	201	<0.05	201
PCB208	<0.01	201	<0.05	201
PCB209	0.03	71	<0.05	201
WHO-TEQ uncertainty lower limit	0.006		0.017	0.007
WHO TEQ (ng/kgfat) lower	0.006	0.004	0.017	0.007
WHO-TEQ uncertainty upper limit	0.006		0.017	0.007
WHO-TEQ uncertainty lower limit	0.007		0.029	0.011
WHO TEQ (ng/kgfat) upper	0.007	0.006	0.029	0.011
WHO-TEQ uncertainty upper limit	0.007		0.029	0.011
WHO-TEQ uncertainty lower limit	<0.001		<0.001	<0.001
WHO TEQ (ng/kgWhole) lower	<0.001	<0.001	<0.001	<0.001
WHO-TEQ uncertainty upper limit	<0.001		<0.001	<0.001
WHO-TEQ uncertainty lower limit	<0.001		<0.001	<0.001
WHO TEQ (ng/kgWhole) upper	<0.001	<0.001	<0.001	<0.001
WHO-TEQ uncertainty upper limit	<0.001		<0.001	<0.001

OEC Sample No.	20635	20662	20658		
FERA LIMS No.	S12-018091	S12-027481	S12-019486		
Sample Details:	Group 18 Milk	Group 19 Milk & Dairy products	Group 20 Nuts		
Fat content (%)	1.97	23.31	41.84		
ug/kg fat weight	%U	%U	%U		
PCB18	<0.02	201	<0.01	201	0.03
PCB28	0.04	55	0.02	103	0.04
PCB31	0.03	71	0.01	201	0.04
PCB33	0.05	83	<0.01	201	0.02
PCB41	<0.02	201	<0.01	201	0.02
PCB44	0.01	201	<0.01	201	0.02
PCB47	0.08	55	0.12	29	0.02
PCB49	0.01	201	<0.01	201	0.01
PCB51	0.01	201	0.02	103	<0.01
PCB52	0.02	103	<0.01	201	0.02
PCB56/60	0.02	103	0.01	201	0.01
PCB61/74	0.06	71	0.05	47	<0.01
PCB66	0.05	83	0.03	71	0.02
PCB99	0.09	33	0.11	30	<0.01
PCB101	0.02	103	<0.01	201	0.01
PCB87	0.01	201	<0.01	201	<0.01
PCB105	0.04	55	0.05	47	<0.01
PCB110	0.02	103	<0.01	201	<0.01
PCB114	<0.01	201	<0.01	201	<0.01
PCB118	0.16	27	0.19	26	<0.01
PCB123	<0.01	201	<0.01	201	<0.01
PCB128	0.03	71	0.03	71	<0.01
PCB129	<0.01	201	<0.01	201	<0.01
PCB138	0.22	25	0.29	25	<0.01
PCB156	0.02	103	0.02	103	<0.01
PCB157	<0.01	201	<0.01	201	<0.01
PCB167	<0.01	201	0.01	201	<0.01
PCB141	<0.01	201	<0.01	201	<0.01
PCB149	0.02	103	0.01	201	<0.01
PCB151	<0.01	201	<0.01	201	<0.01
PCB153	0.26	25	0.34	24	<0.01

OEC Sample No.	20635	20662	20658		
FERA LIMS No.	S12-018091	S12-027481	S12-019486		
Sample Details:	Group 18 Milk	Group 19 Milk & Dairy products	Group 20 Nuts		
PCB170	0.09i	33	0.08	35	<0.01
PCB180	0.11	30	0.13	28	<0.01
PCB183	0.04	55	0.04	55	<0.01
PCB185	<0.01	201	<0.01	201	<0.01
PCB187	0.01	201	0.02	103	<0.01
PCB189	<0.01	201	0.01i	201	<0.01
PCB191	0.01	201	<0.01	201	<0.01
PCB193	<0.01	201	<0.01	201	<0.01
PCB194	0.11i	30	0.02	103	<0.01
PCB201	<0.01	201	<0.01	201	<0.01
PCB202	<0.01	201	<0.01	201	<0.01
PCB203	0.02i	103	0.03	71	<0.01
PCB206	<0.02	201	0.06	41	<0.01
PCB208	<0.02	201	<0.01	201	<0.01
PCB209	<0.01	201	<0.01	201	<0.01
WHO-TEQ uncertainty lower limit	0.007		0.008		<0.001
WHO TEQ (ng/kgfat) lower	0.007		0.008		<0.001
WHO-TEQ uncertainty upper limit	0.007		0.008		<0.001
WHO-TEQ uncertainty lower limit	0.008		0.009		0.002
WHO TEQ (ng/kgfat) upper	0.008		0.009		0.002
WHO-TEQ uncertainty upper limit	0.008		0.009		0.002
WHO-TEQ uncertainty lower limit	<0.001		0.002		<0.001
WHO TEQ (ng/kgWhole) lower	<0.001		0.002		<0.001
WHO-TEQ uncertainty upper limit	<0.001		0.002		<0.001
WHO-TEQ uncertainty lower limit	<0.001		0.002		0.001
WHO TEQ (ng/kgWhole) upper	<0.001		0.002		0.001
WHO-TEQ uncertainty upper limit	<0.001		0.002		0.001

i- indicative

Table 3.4 PCDD/Fs and PCBs : WHO-TEQ and ICES-6, upper bound summary

OEC Sample No.	20657	20646	20645	20661
FERA LIMS No.	S12-019415	S12-018687	S12-018663	S12-027468
Sample Details:	Group 1 Bread	Group 2 Cereals	Group 3 Carcase meat	Group 4 Offal
Fat content (%)	4.14	9.42	14.41	9.92
WHO TEQ 2005 ng/kg WHOLE				
Dioxin (PCDD/F)	0.007	0.010	0.043	0.144
non ortho-PCB	0.004	0.002	0.032	0.046
ortho-PCB	<0.001	<0.001	0.001	0.001
WHO-TEQ uncertainty lower limit	0.009	0.009	0.065	0.157
Sum of WHO TEQs (upper)	0.011	0.013	0.077	0.191
WHO-TEQ uncertainty upper limit	0.014	0.016	0.089	0.225
WHO TEQ 2005 ng/kg FAT				
Dioxin (PCDD/F)	0.178	0.107	0.299	1.452
non ortho-PCB	0.095	0.024	0.225	0.466
ortho-PCB	0.004	0.003	0.010	0.007
WHO-TEQ uncertainty lower limit	0.217	0.096	0.504	1.824
Sum of WHO TEQs (upper)	0.277	0.134	0.534	1.925
WHO-TEQ uncertainty upper limit	0.337	0.172	0.564	2.026
SUM-ICES 6 µg/kg WHOLE (upper)	0.03	0.04	0.17	0.14
SUM - ICES 6 µg/kg FAT (upper)	0.80	0.44	1.19	1.45
<hr/>				
WHO TEQ 1998 ng/kg WHOLE				
Dioxin	0.008	0.011	0.050	0.187
non ortho-PCB	0.004	0.002	0.029	0.044
ortho-PCB	0.001	0.002	0.008	0.004
Sum of WHO TEQs (upper)	0.013	0.015	0.087	0.235
WHO TEQ 1998 ng/kg FAT				
Dioxin	0.199	0.117	0.347	1.889
non ortho-PCB	0.089	0.022	0.202	0.441
ortho-PCB	0.023	0.021	0.056	0.039
Sum of WHO TEQs (upper)	0.311	0.160	0.605	2.369

OEC Sample No.	20664	20660	20663	20648
FERA LIMS No.	S12-027460	S12-027572	S12-027570	S12-018862
Sample Details:	Group 5 Meat products	Group 6 Poultry	Group 7 Fish	Group 8 Fats & oils
Fat content (%)	14.86	7.32	9.31	73.80

WHO TEQ 2005 ng/kg WHOLE

Dioxin (PCDD/F)	0.018	0.007	0.120	0.062
non ortho-PCB	0.012	0.004	0.190	0.027
ortho-PCB	0.001	<0.001	0.015	0.003
WHO-TEQ uncertainty lower limit	0.024	0.008	0.297	0.074
Sum of WHO TEQs (upper)	0.030	0.011	0.326	0.092
WHO-TEQ uncertainty upper limit	0.036	0.014	0.354	0.109

WHO TEQ 2005 ng/kg FAT

Dioxin (PCDD/F)	0.118	0.097	1.292	0.084
non ortho-PCB	0.080	0.048	2.045	0.036
ortho-PCB	0.005	0.003	0.162	0.004
WHO-TEQ uncertainty lower limit	0.183	0.126	3.404	0.098
Sum of WHO TEQs (upper)	0.203	0.148	3.499	0.124
WHO-TEQ uncertainty upper limit	0.223	0.170	3.594	0.150

SUM-ICES 6 µg/kg WHOLE (upper)	0.09	0.02	2.30	0.18
SUM - ICES 6 µg/kg FAT (upper)	0.63	0.33	24.72	0.25

WHO TEQ 1998 ng/kg WHOLE

Dioxin	0.021	0.008	0.148	0.069
non ortho-PCB	0.011	0.003	0.181	0.025
ortho-PCB	0.005	0.002	0.069	0.018
Sum of WHO TEQs (upper)	0.037	0.013	0.398	0.112

WHO TEQ 1998 ng/kg FAT

Dioxin	0.140	0.107	1.588	0.093
non ortho-PCB	0.074	0.045	1.945	0.034
ortho-PCB	0.033	0.022	0.746	0.025
Sum of WHO TEQs (upper)	0.247	0.174	4.279	0.152

OEC Sample No.	20647	20665	20655	20656
FERA LIMS No.	S12-018741	S12-027622	S12-019343	S12-019362
Sample Details:	Group 9 Eggs	Group 10 Sugar and Preserves	Group 11 Green vegetables	Group 12 Potatoes
Fat content (%)	9.55	6.05	0.29	5.19

WHO TEQ 2005 ng/kg WHOLE

Dioxin (PCDD/F)	0.028	0.043	0.004	0.008
non ortho-PCB	0.015	0.011	0.001	0.001
ortho-PCB	0.001	0.001	<0.001	<0.001
WHO-TEQ uncertainty lower limit	0.034	0.042	0.003	0.007
Sum of WHO TEQs (upper)	0.044	0.056	0.005	0.010
WHO-TEQ uncertainty upper limit	0.055	0.069	0.006	0.013

WHO TEQ 2005 ng/kg FAT

Dioxin (PCDD/F)	0.295	0.717	1.278	0.158
non ortho-PCB	0.157	0.178	0.276	0.025
ortho-PCB	0.011	0.024	0.016	0.003
WHO-TEQ uncertainty lower limit	0.428	0.856	1.349	0.149
Sum of WHO TEQs (upper)	0.463	0.919	1.570	0.186
WHO-TEQ uncertainty upper limit	0.498	0.982	1.791	0.223

SUM-ICES 6 µg/kg WHOLE

(upper)	0.13	0.28	0.01	0.01
SUM - ICES 6 µg/kg FAT (upper)	1.35	4.65	2.01	0.22

WHO TEQ 1998 ng/kg WHOLE

Dioxin	0.031	0.053	0.004	0.009
non ortho-PCB	0.014	0.010	0.001	0.001
ortho-PCB	0.005	0.007	<0.001	0.001
Sum of WHO TEQs (upper)	0.050	0.070	0.005	0.011

WHO TEQ 1998 ng/kg FAT

Dioxin	0.323	0.874	1.398	0.173
non ortho-PCB	0.147	0.172	0.265	0.024
ortho-PCB	0.056	0.109	0.097	0.022
Sum of WHO TEQs (upper)	0.526	1.155	1.760	0.219

OEC Sample No.	20649	20653	20654	20652
FERA LIMS No.	S12-018863	S12-019279	S12-019327	S12-019278
Sample Details:	Group 13 Other vegetables	Group 14 Canned Vegetables	Group 15 Fresh Fruit	Group 16 Fruit products
Fat content (%)	5.46	0.53	0.21	0.42
WHO TEQ 2005 ng/kg WHOLE				
Dioxin (PCDD/F)	0.038	0.002	0.002	0.004
non ortho-PCB	0.014	<0.001	0.001	0.003
ortho-PCB	<0.001	<0.001	<0.001	<0.001
WHO-TEQ uncertainty lower limit	0.040	0.001	0.002	0.006
Sum of WHO TEQs (upper)	0.053	0.002	0.003	0.007
WHO-TEQ uncertainty upper limit	0.065	0.003	0.004	0.009
WHO TEQ 2005 ng/kg FAT				
Dioxin (PCDD/F)	0.705	0.301	1.120	1.033
non ortho-PCB	0.253	0.085	0.386	0.734
ortho-PCB	0.007	0.006	0.029	0.011
WHO-TEQ uncertainty lower limit	0.898	0.291	1.134	1.458
Sum of WHO TEQs (upper)	0.965	0.392	1.535	1.778
WHO-TEQ uncertainty upper limit	1.032	0.493	1.936	2.098
SUM-ICES 6 µg/kg WHOLE (upper)				
SUM - ICES 6 µg/kg FAT (upper)	0.11	0.01	0.01	0.01
	1.97	0.94	4.08	1.47

WHO TEQ 1998 ng/kg WHOLE				
Dioxin	0.047	0.002	0.003	0.005
non ortho-PCB	0.013	<0.001	0.001	0.003
ortho-PCB	0.003	<0.001	<0.001	<0.001
Sum of WHO TEQs (upper)	0.063	0.002	0.004	0.008

WHO TEQ 1998 ng/kg FAT				
Dioxin	0.862	0.330	1.211	1.197
non ortho-PCB	0.245	0.081	0.366	0.710
ortho-PCB	0.046	0.032	0.150	0.074
Sum of WHO TEQs (upper)	1.153	0.443	1.727	1.981

OEC Sample No.	20635	20662	20658
FERA LIMS No.	S12-018091	S12-027481	S12-019486
Sample Details:	Group 18 Milk	Group 19 Milk & Dairy products	Group 20 Nuts
Fat content (%)	1.97	23.31	41.84

WHO TEQ 2005 ng/kg WHOLE

Dioxin (PCDD/F)	0.005	0.053	0.015
non ortho-PCB	0.003	0.051	0.003
ortho-PCB	<0.001	0.002	0.001
WHO-TEQ uncertainty lower limit	0.006	0.091	0.013
Sum of WHO TEQs (upper)	0.008	0.105	0.019
WHO-TEQ uncertainty upper limit	0.010	0.120	0.025

WHO TEQ 2005 ng/kg FAT

Dioxin (PCDD/F)	0.250	0.226	0.036
non ortho-PCB	0.163	0.217	0.007
ortho-PCB	0.008	0.009	0.002
WHO-TEQ uncertainty lower limit	0.384	0.427	0.031
Sum of WHO TEQs (upper)	0.421	0.452	0.045
WHO-TEQ uncertainty upper limit	0.458	0.477	0.059

SUM-ICES 6 µg/kg WHOLE

(upper)	0.01	0.19	0.04
SUM - ICES 6 µg/kg FAT (upper)	0.67	0.80	0.10

WHO TEQ 1998 ng/kg WHOLE

Dioxin	0.006	0.063	0.016
non ortho-PCB	0.003	0.049	0.003
ortho-PCB	0.001	0.011	0.008
Sum of WHO TEQs (upper)	0.010	0.123	0.027

WHO TEQ 1998 ng/kg FAT

Dioxin	0.289	0.272	0.038
non ortho-PCB	0.156	0.209	0.007
ortho-PCB	0.042	0.046	0.019
Sum of WHO TEQs (upper)	0.487	0.527	0.064

Table 3.5 PBDEs and ortho-substituted PBBs - µg/kg fat weight

OEC Sample No.	20657	20646	20645	20661			
FERA LIMS No.	S12-019415	S12-018687	S12-018663	S12-027468			
Sample Details:	Group 1 Bread	Group 2 Cereals	Group 3 Carcase meat	Group 4 Offal			
Fat content (%)	4.14	9.42	14.41	9.92			
ug/kg fat weight							
PBDEs		%U	%U	%U	%U		
BDE-17	0.002	200	<0.001	200	<0.001	200	<0.001
BDE-28	<0.018	200	0.005	81	0.003	67	<0.005
BDE-47	0.13	55	0.067	61	0.124	19	0.074
BDE-49	0.014	186	0.012	35	0.003	67	<0.003
BDE-66	<0.013	200	0.013	33	0.004	51	<0.003
BDE-71	<0.001	200	<0.001	200	<0.001	200	<0.001
BDE-77	<0.001	200	<0.001	200	<0.001	200	<0.001
BDE-85	0.006	35	0.005	160	0.004	101	<0.001
BDE-99	0.138	35	0.081	43	0.156	16	0.089
BDE-100	0.020	41	0.009	46	0.036	12	0.022
BDE-119	<0.004	200	<0.001	200	0.001	200	<0.001
BDE-126	<0.002	200	<0.002	200	<0.001	200	<0.001
BDE153	0.040	71	0.022	47	0.049	16	0.030
BDE138	<0.009	200	<0.006	200	<0.001	200	<0.003
BDE 154	0.013	62	<0.006	200	0.023	28	0.016
BDE-183	0.232	11	0.008	175	0.023	36	0.025
PBBs							
PBB-15	<0.009	202	<0.018	202	<0.01	202	<0.006
PBB-49	<0.001	202	<0.001	202	<0.001	202	<0.001
PBB-52	<0.001	202	<0.001	202	<0.001	202	<0.001
PBB-80	<0.001	202	<0.001	202	<0.001	202	<0.001
PBB-101	<0.001	202	<0.001	202	<0.001	202	<0.001
PBB-153	<0.004	202	<0.003	202	0.002i	104	<0.008

OEC Sample No.	20664	20660	20663	20648			
FERA LIMS No.	S12-027460	S12-027572	S12-027570	S12-018862			
Sample Details:	Group 5 Meat products	Group 6 Poultry	Group 7 Fish	Group 8 Fats & oils			
Fat content (%)	14.86	7.32	9.31	73.80			
ug/kg fat weight							
PBDEs	%U	%U	%U	%U			
BDE-17	<0.001	200	<0.001	200	0.020	14	<0.001
BDE-28	0.004	200	<0.005	200	0.084	14	0.003
BDE-47	0.119	16	0.073	27	1.443	11	0.050
BDE-49	0.007	86	0.004	150	0.464	11	0.003
BDE-66	0.006	101	<0.003	200	0.065	14	0.003
BDE-71	<0.001	200	<0.001	200	0.003	67	<0.001
BDE-77	<0.001	200	<0.001	200	0.003	67	<0.001
BDE-85	<0.001	200	0.003	67	0.028	13	<0.002
BDE-99	0.129	13	0.080	18	0.244	12	0.047
BDE-100	0.023	14	0.021	14	0.542	10	0.006
BDE-119	0.002	101	<0.001	200	0.038	12	<0.001
BDE-126	<0.001	200	<0.001	200	<0.001	200	<0.001
BDE153	0.027	25	0.019	43	0.076	13	0.011
BDE138	0.003i	134	0.002	200	<0.002	200	<0.001
BDE 154	0.013	19	0.010	23	0.237	11	0.004i
BDE-183	0.017	16	0.034	12	0.017	16	0.005
PBBs							
PBB-15	<0.001	202	<0.002	202	<0.011	202	<0.01
PBB-49	<0.001	202	<0.001	202	0.007	40	<0.001
PBB-52	<0.001	202	<0.001	202	0.021	30	<0.001
PBB-80	<0.001	202	<0.001	202	<0.001	202	<0.001
PBB-101	<0.001	202	<0.001	202	0.006	44	<0.001
PBB-153	0.002i	104	0.004i	58	0.012	33	<0.002

i- indicative

OEC Sample No.	20647	20665	20655	20656
FERA LIMS No.	S12-018741	S12-027622	S12-019343	S12-019362
Sample Details:	Group 9 Eggs	Group 10 Sugar and Preserves	Group 11 Green vegetables	Group 12 Potatoes
Fat content (%)	9.55	6.05	0.29	5.19

ug/kg fat weight

PBDEs		%U		%U		%U		%U
BDE-17	<0.001	200	0.056	13	0.010	160	<0.001	200
BDE-28	0.002	101	0.194	16	0.043	48	0.002	101
BDE-47	0.134	19	1.997	11	0.530	43	0.090	39
BDE-49	0.008	27	0.375	11	0.057	43	0.006	67
BDE-66	0.002	101	0.260	12	0.055	45	0.005	81
BDE-71	<0.001	200	0.022	14	<0.004	200	<0.001	200
BDE-77	<0.001	200	0.010	23	<0.006	200	<0.001	200
BDE-85	<0.002	200	0.038	12	<0.02	200	<0.003	200
BDE-99	0.170	16	1.027	11	0.510	38	0.100	30
BDE-100	0.041	12	0.137	11	0.091	24	0.019	24
BDE-119	<0.001	200	0.012	35	<0.008	200	<0.001	200
BDE-126	<0.002	200	<0.002	200	<0.012	200	<0.002	200
BDE153	0.052	16	0.117	19	0.055i	102	0.013	62
BDE138	<0.002	200	0.014	86	<0.008	200	<0.001	200
BDE 154	0.04i	23	0.052	13	0.065i	111	0.005i	200
BDE-183	0.020	41	0.035	20	0.099	81	0.008	150

PBBs

PBB-15	<0.01	202	<0.005	202	<0.103	202	<0.016	202
PBB-49	<0.001	202	<0.001	202	<0.004	202	<0.001	202
PBB-52	<0.001	202	<0.001	202	<0.008	202	<0.001	202
PBB-80	<0.001	202	<0.001	202	<0.004	202	<0.001	202
PBB-101	<0.001	202	<0.003	202	<0.008	202	<0.001	202
PBB-153	<0.002	202	<0.002	202	<0.016	202	<0.002	202

i- indicative

OEC Sample No.	20649	20653	20654	20652				
FERA LIMS No.	S12-018863	S12-019279	S12-019327	S12-019278				
Sample Details:	Group 13 Other vegetables	Group 14 Canned Vegetables	Group 15 Fresh Fruit	Group 16 Fruit products				
Fat content (%)	5.46	0.53	0.21	0.42				
ug/kg fat weight								
PBDEs	%U	%U	%U	%U				
BDE-17	0.002	101	<0.005	200	<0.016	200	<0.013	200
BDE-28	0.008	27	<0.035	200	0.028	143	<0.094	200
BDE-47	0.094	32	0.122	112	0.583	77	0.297	124
BDE-49	0.028	13	<0.025	200	0.048	101	<0.068	200
BDE-66	0.031	12	<0.025	200	0.044	110	<0.068	200
BDE-71	0.002	101	0.005	81	<0.008	200	<0.006	200
BDE-77	0.003	67	<0.002	200	<0.011	200	<0.006	200
BDE-85	0.006	67	<0.002	200	<0.04	200	<0.019	200
BDE-99	0.142	20	0.089	102	0.435	88	0.236	103
BDE-100	0.017	16	0.011	128	0.068	63	0.029	131
BDE-119	0.002	101	<0.005	200	<0.016	200	<0.013	200
BDE-126	<0.001	200	<0.005	200	<0.024	200	<0.013	200
BDE153	0.025	26	<0.026	200	0.116i	97	0.097	147
BDE138	0.003i	67	<0.017	200	<0.036	200	<0.045	200
BDE 154	0.009	90	<0.007	200	<0.072	200	0.023	166
BDE-183	0.015	67	<0.01	200	0.196	82	<0.026	200
PBBs								
PBB-15	<0.013	202	<0.098	202	<0.208	202	<0.071	202
PBB-49	<0.001	202	<0.002	202	<0.008	202	<0.006	202
PBB-52	<0.001	202	<0.001	202	<0.016	202	<0.003	202
PBB-80	<0.001	202	<0.002	202	<0.008	202	<0.006	202
PBB-101	<0.001	202	<0.002	202	<0.016	202	<0.023	202
PBB-153	<0.002	202	<0.007	202	<0.032	202	<0.019	202

i- indicative

OEC Sample No.	20635	20662	20658
FERA LIMS No.	S12-018091	S12-027481	S12-019486
Sample Details:	Group 18 Milk	Group 19 Milk & Dairy products	Group 20 Nuts
Fat content (%)	1.97	23.31	41.84

ug/kg fat weight

PBDEs

		%U		%U	%U
BDE-17	<0.001	200	<0.001	200	<0.001
BDE-28	0.003	67	<0.003	200	<0.001
BDE-47	0.091	35	0.099	15	0.014
BDE-49	0.004	101	0.002	200	0.002
BDE-66	0.006	67	0.003	134	<0.001
BDE-71	<0.001	200	<0.001	200	<0.001
BDE-77	<0.001	200	<0.001	200	<0.001
BDE-85	<0.003	200	0.002	101	<0.002
BDE-99	0.099	28	0.109	12	0.011
BDE-100	0.014	18	0.018	15	0.002
BDE-119	0.001	200	<0.001	200	<0.001
BDE-126	0.002	200	<0.001	200	<0.001
BDE153	0.025	34	0.025	19	0.003
BDE138	<0.003	200	<0.001	200	<0.001
BDE 154	0.010	101	0.010	23	<0.003
BDE-183	0.014	72	0.010	23	<0.003

PBBs

PBB-15	<0.014	202	<0.001	202	<0.008	202
PBB-49	<0.001	202	<0.001	202	<0.001	202
PBB-52	<0.001	202	<0.001	202	<0.001	202
PBB-80	<0.001	202	<0.001	202	<0.001	202
PBB-101	<0.003	202	<0.001	202	<0.001	202
PBB-153	<0.002	202	0.002	104	<0.001	202

Table 3.6 Non-ortho-substituted PBB concentrations - fat weight basis

OEC Sample No.	20657	20646	20645	20661				
FERA LIMS No.	S12-019415	S12-018687	S12-018663	S12-027468				
Sample Details:	Group 1 Bread	Group 2 Cereals	Group 3 Carcase meat	Group 4 Offal				
Fat content (%)	4.14	9.42	14.41	9.92				
ng/kg fat weight		% U	% U	% U				
PBB-77	0.20	192	<0.11	201	<0.06	201	0.06	168
PBB-126	<0.14	201	<0.08	201	<0.03	201	0.26	39
PBB-169	<0.14	201	<0.08	201	<0.04	201	<0.04	201
TEQ uncertainty lower limit		<0.001	<0.001	<0.001		0.025		
TEQ (ng/kgfat) lower		<0.001	<0.001	<0.001		0.026		
TEQ uncertainty upper limit		<0.001	<0.001	<0.001		0.027		
TEQ uncertainty lower limit		0.014	0.008	0.003		0.025		
TEQ (ng/kgfat) upper		0.015	0.009	0.003		0.026		
TEQ uncertainty upper limit		0.016	0.010	0.003		0.027		
TEQ uncertainty lower limit		<0.001	<0.001	<0.001		0.002		
TEQ (ng/kgWhole) lower		<0.001	<0.001	<0.001		0.003		
TEQ uncertainty upper limit		<0.001	<0.001	<0.001		0.003		
TEQ uncertainty lower limit		0.001	0.001	<0.001		0.003		
TEQ (ng/kgWhole) upper		0.001	0.001	<0.001		0.003		
TEQ uncertainty upper limit		0.001	0.001	<0.001		0.003		

OEC Sample No.	20664	20660	20663	20648				
FERA LIMS No.	S12-027460	S12-027572	S12-027570	S12-018862				
Sample Details:	Group 5 Meat products	Group 6 Poultry	Group 7 Fish	Group 8 Fats & oils				
Fat content (%)	14.86	7.32	9.31	73.80				
ng/kg fat weight	% U	% U	% U	% U				
PBB-77	<0.04	201	<0.05	201	0.08	127	<0.06	201
PBB-126	0.03i	201	<0.04	201	<0.03	201	<0.03	201
PBB-169	<0.03	201	<0.04	201	<0.03	201	<0.04	201
TEQ uncertainty lower limit	0.002		<0.001		<0.001		<0.001	
TEQ (ng/kgfat) lower	0.003		<0.001		<0.001		<0.001	
TEQ uncertainty upper limit	0.004		<0.001		<0.001		<0.001	
TEQ uncertainty lower limit	0.003		0.004		0.003		0.003	
TEQ (ng/kgfat) upper	0.003		0.004		0.003		0.003	
TEQ uncertainty upper limit	0.003		0.004		0.003		0.003	
TEQ uncertainty lower limit	<0.001		<0.001		<0.001		<0.001	
TEQ (ng/kgWhole) lower	<0.001		<0.001		<0.001		<0.001	
TEQ uncertainty upper limit	<0.001		<0.001		<0.001		<0.001	
TEQ uncertainty lower limit	<0.001		<0.001		<0.001		0.002	
TEQ (ng/kgWhole) upper	<0.001		<0.001		<0.001		0.002	
TEQ uncertainty upper limit	<0.001		<0.001		<0.001		0.002	

i- indicative

OEC Sample No.	20647	20665	20655	20656				
FERA LIMS No.	S12-018741	S12-027622	S12-019343	S12-019362				
Sample Details:	Group 9 Eggs	Group 10 Sugar and Preserves	Group 11 Green vegetables	Group 12 Potatoes				
Fat content (%)	9.55	6.05	0.29	5.19				
ng/kg fat weight	%U	%U	%U	%U				
PBB-77	0.09	135	0.15	162	0.67	187	<0.09	201
PBB-126	<0.04	201	<0.09	201	<0.36	201	<0.05	201
PBB-169	<0.04	201	<0.08	201	<0.57	201	<0.07	201
TEQ uncertainty lower limit	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
TEQ (ng/kgfat) lower	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
TEQ uncertainty upper limit	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
TEQ uncertainty lower limit	0.004	0.009	0.039	0.006				
TEQ (ng/kgfat) upper	0.004	0.010	0.042	0.006				
TEQ uncertainty upper limit	0.004	0.011	0.045	0.006				
TEQ uncertainty lower limit	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
TEQ (ng/kgWhole) lower	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
TEQ uncertainty upper limit	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
TEQ uncertainty lower limit	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
TEQ (ng/kgWhole) upper	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
TEQ uncertainty upper limit	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

OEC Sample No.	20649	20653	20654	20652				
FERA LIMS No.	S12-018863	S12-019279	S12-019327	S12-019278				
Sample Details:	Group 13 Other vegetables	Group 14 Canned Vegetables	Group 15 Fresh Fruit	Group 16 Fruit products				
Fat content (%)	5.46	0.53	0.21	0.42				
ng/kg fat weight		%U	%U	%U				
PBB-77	0.09	179	<0.37	201	<1.26	201	<1.0	201
PBB-126	<0.04	201	<0.26	201	<0.72	201	<0.71	201
PBB-169	<0.05	201	<0.22	201	<0.88	201	<0.58	201
TEQ uncertainty lower limit	<0.001		<0.001		<0.001		<0.001	
TEQ (ng/kgfat) lower	<0.001		<0.001		<0.001		<0.001	
TEQ uncertainty upper limit	<0.001		<0.001		<0.001		<0.001	
TEQ uncertainty lower limit	0.005		0.026		0.075		0.071	
TEQ (ng/kgfat) upper	0.005		0.028		0.081		0.077	
TEQ uncertainty upper limit	0.005		0.030		0.087		0.083	
TEQ uncertainty lower limit	<0.001		<0.001		<0.001		<0.001	
TEQ (ng/kgWhole) lower	<0.001		<0.001		<0.001		<0.001	
TEQ uncertainty upper limit	<0.001		<0.001		<0.001		<0.001	
TEQ uncertainty lower limit	<0.001		<0.001		<0.001		<0.001	
TEQ (ng/kgWhole) upper	<0.001		<0.001		<0.001		<0.001	
TEQ uncertainty upper limit	<0.001		<0.001		<0.001		<0.001	

i- indicative

OEC Sample No.	20635	20662	20658
FERA LIMS No.	S12-018091	S12-027481	S12-019486
Sample Details:	Group 18 Milk	Group 19 Milk & Dairy products	Group 20 Nuts
Fat content (%)	1.97	23.31	41.84

ng/kg fat weight		%U	%U	%U
PBB-77	<0.09	201	<0.03	201
PBB-126	<0.05	201	<0.02	201
PBB-169	<0.06	201	<0.02	201
TEQ uncertainty lower limit	<0.001		<0.001	<0.001
TEQ (ng/kgfat) lower	<0.001		<0.001	<0.001
TEQ uncertainty upper limit	<0.001		<0.001	<0.001
TEQ uncertainty lower limit	0.006		0.002	0.003
TEQ (ng/kgfat) upper	0.006		0.002	0.003
TEQ uncertainty upper limit	0.006		0.002	0.003
TEQ uncertainty lower limit	<0.001		<0.001	<0.001
TEQ (ng/kgWhole) lower	<0.001		<0.001	<0.001
TEQ uncertainty upper limit	<0.001		<0.001	<0.001
TEQ uncertainty lower limit	<0.001		<0.001	0.001
TEQ (ng/kgWhole) upper	<0.001		<0.001	0.001
TEQ uncertainty upper limit	<0.001		<0.001	0.001

i- indicative

Table 3.7 PBBD/F concentrations - fat weight basis

OEC Sample No.	20657	20646	20645	20661
FERA LIMS No.	S12-019415	S12-018687	S12-018663	S12-027468
Sample Details:	Group 1 Bread	Group 2 Cereals	Group 3 Carcase meat	Group 4 Offal
Fat content (%)	4.14	9.42	14.41	9.92
ng/kg fat weight		%U	%U	%U
237-TriBDD	<0.06	202	0.03	202
2378-TetraBDD	<0.06	201	<0.03	201
12378-PentaBDD	<0.1	202	<0.06	202
123478/123678-HexaBDD	<0.15	201	<0.09	201
123789-HexaBDD	<0.17	202	<0.09	202
238-TriBDF	0.30	155	0.19	149
2378-TetraBDF	0.12	87	0.07	201
12378-PentaBDF	<0.12	201	<0.05	201
23478-PentaBDF	<0.11	201	0.28i	82
123478-HexaBDF	<0.32	201	0.26	88
1234678-HeptabromoBDF	18.74	30	7.21	30
TEQ uncertainty lower limit	0.193		0.216	0.151
TEQ (ng/kgfat) lower	0.199		0.245	0.207
TEQ uncertainty upper limit	0.205		0.274	0.263
				0.293
				0.397
				0.501
TEQ uncertainty lower limit	0.170		0.186	0.160
TEQ (ng/kgfat) upper	0.484		0.356	0.254
TEQ uncertainty upper limit	0.798		0.526	0.348
				0.239
				0.437
				0.635
TEQ uncertainty lower limit	0.008		0.020	0.025
TEQ (ng/kgWhole) lower	0.008		0.023	0.030
TEQ uncertainty upper limit	0.008		0.027	0.035
				0.036
				0.039
				0.043
TEQ uncertainty lower limit	0.009		0.014	0.015
TEQ (ng/kgWhole) upper	0.020		0.034	0.037
TEQ uncertainty upper limit	0.031		0.053	0.058
				0.024
				0.043
				0.063

i- indicative

OEC Sample No.	20664	20660	20663	20648
FERA LIMS No.	S12-027460	S12-027572	S12-027570	S12-018862
Sample Details:	Group 5 Meat products	Group 6 Poultry	Group 7 Fish	Group 8 Fats & oils
Fat content (%)	14.86	7.32	9.31	73.80
ng/kg fat weight		%U	%U	%U
237-TriBDD	0.01	202	<0.02	202
2378-TetraBDD	0.01	201	<0.02	201
12378-PentaBDD	<0.02	202	<0.03	202
123478/123678-HexaBDD	<0.03	201	<0.04	201
123789-HexaBDD	<0.03	202	<0.05	202
238-TriBDF	0.08	127	0.10	122
2378-TetraBDF	0.03	71	0.08	35
12378-PentaBDF	<0.02	201	<0.03	201
23478-PentaBDF	0.08i	35	<0.02	201
123478-HexaBDF	0.11	112	<0.09	201
1234678-HeptabromoBDF	1.40	53	3.28	36
TEQ uncertainty lower limit	0.052		0.040	0.107
TEQ (ng/kgfat) lower	0.078		0.041	0.113
TEQ uncertainty upper limit	0.104		0.042	0.119
TEQ uncertainty lower limit	0.048		0.043	0.079
TEQ (ng/kgfat) upper	0.105		0.120	0.173
TEQ uncertainty upper limit	0.162		0.197	0.267
TEQ uncertainty lower limit	0.007		0.003	0.007
TEQ (ng/kgWhole) lower	0.012		0.003	0.011
TEQ uncertainty upper limit	0.016		0.003	0.014
TEQ uncertainty lower limit	0.007		0.004	0.008
TEQ (ng/kgWhole) upper	0.016		0.009	0.016
TEQ uncertainty upper limit	0.024		0.014	0.025

i- indicative

OEC Sample No.	20647	20665	20655	20656				
FERA LIMS No.	S12-018741	S12-027622	S12-019343	S12-019362				
Sample Details:	Group 9 Eggs	Group 10 Sugar and Preserves	Group 11 Green vegetables	Group 12 Potatoes				
Fat content (%)	9.55	6.05	0.29	5.19				
ng/kg fat weight		%U	%U	%U				
237-TriBDD	<0.02	202	0.12	71	0.22	148	<0.02	202
2378-TetraBDD	<0.02	201	<0.04	201	0.20	162	0.02	201
12378-PentaBDD	<0.04	202	<0.06	202	<0.38	202	<0.04	202
123478/123678-HexaBDD	<0.05	201	1.03	31	<0.51	201	<0.08	201
123789-HexaBDD	<0.05	202	<0.11	202	<0.43	202	<0.07	202
238-TriBDF	0.10	162	3.12	26	1.40	113	0.17	143
2378-TetraBDF	0.11	77	0.54	26	0.93	89	0.07	173
12378-PentaBDF	<0.07	201	0.51	39	<0.26	201	0.17	34
23478-PentaBDF	0.12i	103	0.45	30	<0.6	201	0.19i	98
123478-HexaBDF	<0.1	201	3.16	27	4.23	38	0.44	51
1234678-HeptabromoBDF	1.70	51	84.59	24	53.05	28	<0.6	201
TEQ uncertainty lower limit	0.075		1.519		0.884		0.095	
TEQ (ng/kgfat) lower	0.088		1.569		1.247		0.175	
TEQ uncertainty upper limit	0.101		1.619		1.610		0.255	
TEQ uncertainty lower limit	0.089		0.842		1.059		0.125	
TEQ (ng/kgfat) upper	0.172		1.680		2.034		0.236	
TEQ uncertainty upper limit	0.255		2.518		3.009		0.347	
TEQ uncertainty lower limit	0.005		0.087		0.003		0.004	
TEQ (ng/kgWhole) lower	0.008		0.095		0.004		0.009	
TEQ uncertainty upper limit	0.012		0.103		0.004		0.014	
TEQ uncertainty lower limit	0.006		0.058		0.002		0.004	
TEQ (ng/kgWhole) upper	0.016		0.102		0.006		0.012	
TEQ uncertainty upper limit	0.027		0.146		0.010		0.020	

i- indicative

OEC Sample No.	20649	20653	20654	20652				
FERA LIMS No.	S12-018863	S12-019279	S12-019327	S12-019278				
Sample Details:	Group 13 Other vegetables	Group 14 Canned Vegetables	Group 15 Fresh Fruit	Group 16 Fruit products				
Fat content (%)	5.46	0.53	0.21	0.42				
ng/kg fat weight	%U	%U	%U	%U				
237-TriBDD	0.04	103	<0.12	202	<0.32	202		
2378-TetraBDD	<0.02	201	<0.12	201	0.36	179	<0.32	201
12378-PentaBDD	<0.03	202	<0.19	202	<0.56	202	<0.52	202
123478/123678-HexaBDD	<0.06	201	<0.29	201	<1.04	201	<0.78	201
123789-HexaBDD	<0.05	202	<0.34	202	<0.88	202	<0.9	202
238-TriBDF	0.25	84	<0.46	201	<1.56	201	1.33	187
2378-TetraBDF	0.06	168	0.12	168	<0.8	201	<0.26	201
12378-PentaBDF	0.31i	27	<0.24	201	<0.6	201	1.87	74
23478-PentaBDF	<0.07	201	<0.12	201	<1.21	201	0.90i	75
123478-HexaBDF	0.33	54	<0.62	201	11.82	32	3.98	88
1234678-HeptabromoBDF	2.96	40	9.37	73	37.77	47	197.47	26
TEQ uncertainty lower limit	0.081	0.097	0.748	2.623				
TEQ (ng/kgfat) lower	0.084	0.106	1.920	2.916				
TEQ uncertainty upper limit	0.087	0.115	3.092	3.209				
TEQ uncertainty lower limit	0.087	0.210	1.675	2.105				
TEQ (ng/kgfat) upper	0.180	0.613	3.387	3.950				
TEQ uncertainty upper limit	0.273	1.016	5.099	5.795				
TEQ uncertainty lower limit	0.004	0.001	0.004	0.012				
TEQ (ng/kgWhole) lower	0.005	0.001	0.004	0.012				
TEQ uncertainty upper limit	0.005	0.001	0.004	0.013				
TEQ uncertainty lower limit	0.003	0.001	0.002	0.008				
TEQ (ng/kgWhole) upper	0.010	0.003	0.007	0.016				
TEQ uncertainty upper limit	0.016	0.005	0.012	0.025				

i- indicative

OEC Sample No.	20635	20662	20658
FERA LIMS No.	S12-018091	S12-027481	S12-019486
Sample Details:	Group 18 Milk	Group 19 Milk & Dairy products	Group 20 Nuts
Fat content (%)	1.97	23.31	41.84

		%U	%U	%U
237-TriBDD	0.04	103	<0.01	202
2378-TetraBDD	<0.02	201	<0.01	201
12378-PentaBDD	<0.04	202	<0.01	202
123478/123678-HexaBDD	<0.07	201	<0.02	201
123789-HexaBDD	<0.06	202	<0.03	202
238-TriBDF	0.15	149	0.04	152
2378-TetraBDF	0.05	201	0.03	71
12378-PentaBDF	<0.02	201	<0.02	201
23478-PentaBDF	0.27	64	0.14	28
123478-HexaBDF	0.22	85	0.06i	168
1234678-HeptabromoBDF	1.78	63	1.37	42
TEQ uncertainty lower limit	0.162		0.086	0.008
TEQ (ng/kgfat) lower	0.180		0.093	0.008
TEQ uncertainty upper limit	0.198		0.100	0.008
TEQ uncertainty lower limit	0.135		0.066	0.037
TEQ (ng/kgfat) upper	0.254		0.119	0.080
TEQ uncertainty upper limit	0.373		0.172	0.123
TEQ uncertainty lower limit	0.004		0.018	0.003
TEQ (ng/kgWhole) lower	0.004		0.022	0.003
TEQ uncertainty upper limit	0.004		0.025	0.003
TEQ uncertainty lower limit	0.002		0.015	0.011
TEQ (ng/kgWhole) upper	0.005		0.028	0.033
TEQ uncertainty upper limit	0.008		0.041	0.056

i- indicative

Table 3.8 PAH concentrations - µg/kg whole weight

OEC Sample No.	20657	20646	20645	20661				
FERA LIMS No.	S12-019415	S12-018687	S12-018663	S12-027468				
Description	1) Bread Group	2) Cereals Group	3) Carcass Meat Group	4) Offal Group				
ug/kg whole weight								
acenaphthylene	<0.27	201	<0.31	201	<0.21	201	<0.20	201
acenaphthene	0.46	98	0.23	175	<0.25	201	<0.33	201
fluorene	0.57	73	0.42	102	<0.27	201	<0.30	201
phenanthrene	1.53	40	1.37	43	0.41	158	<0.39	201
anthracene	<0.16	201	0.18	31	0.05	83	<0.23	201
fluoranthene	0.49	53	0.41	86	<0.22	201	<0.18	201
benzo[c]fluorene	0.02	102	0.02	102	<0.01	201	<0.01	201
pyrene	0.46	56	0.31	169	<0.32	201	<0.19	201
benzo[ghi]fluoranthene	0.07	33	0.05	121	<0.04	201	<0.01	201
benz (a) anthracene	0.12	23	0.09	27	<0.01	201	0.03	69
benzo[b]naphtho[2,1-d]thiophene	0.03	69	0.02	101	<0.01	201	<0.01	201
cyclopenta[c,d]pyrene	0.04	52	0.04	52	<0.01	201	<0.01	201
chrysene	0.14	59	0.11	74	<0.04	201	<0.05	201
5-methylchrysene	<0.01	201	<0.01	201	<0.01	201	<0.01	201
benzo[b]fluoranthene	0.14	46	0.09	48	<0.03	201	<0.04	201
benzo[j]fluoranthene	0.08	30	0.05	43	<0.01	201	0.01	201
benzo[k]fluoranthene	0.07	33	0.04	53	<0.01	201	0.01	201
benzo[e]pyrene	0.13	23	0.09	28	<0.04	201	0.02	101
benzo[a]pyrene	0.14	60	0.09	90	<0.05	201	<0.06	201
indeno[1,2,3-cd]pyrene	0.13	35	0.07	59	<0.02	201	<0.03	201
dibenz[ah]anthracene	<0.03	201	<0.02	201	<0.02	201	<0.03	201
benzo-[g,h,i]perylene	0.14	21	0.11	24	<0.01	201	0.02	101
anthanthrene	<0.1	201	<0.1	201	<0.1	201	<0.1	201
dibenzo[a,l]pyrene	<0.1	201	<0.1	201	<0.1	201	<0.1	201
dibenzo[a,e]pyrene	<0.1	201	<0.1	201	<0.1	201	<0.1	201
dibenzo[a,i]pyrene	<0.1	201	<0.1	201	<0.1	201	<0.1	201
dibenzo[a,h]pyrene	<0.1	201	<0.1	201	<0.1	201	<0.1	201
coronene	<0.1	201	<0.1	201	<0.1	201	<0.1	201
PAH 4 Sum Lower ug/kg	0.54		0.38		<0.01		0.03	
PAH 4 Sum Upper ug/kg	0.54		0.38		0.13		0.18	

OEC Sample No.	20664	20660	20663	20648				
FERA LIMS No.	S12-027460	S12-027572	S12-027570	S12-018862				
Description	5) Meat Products Group	%U	6) Poultry Group	%U	7) Fish Group	%U	8) Fats & Oils Group	%U
ug/kg whole weight								
acenaphthylene	<0.87	201	<0.27	201	2.29i	27	<0.49	201
acenaphthene	<0.33	201	<0.27	201	0.49i	136	<0.60	201
fluorene	0.57	107	<0.25	201	1.69i	41	<0.64	201
phenanthrene	2.37	39	0.37	180	4.95	26	<0.76	201
anthracene	0.35	133	<0.20	201	1.12	46	<0.07	201
fluoranthene	0.73	54	<0.15	201	1.52	32	<0.52	201
benzo[c]fluorene	0.04	54	<0.01	201	0.07	35	<0.01	201
pyrene	0.67	60	<0.16	201	1.19	38	<0.77	201
benzo[ghi]fluoranthene	0.08	30	<0.01	201	0.20	19	<0.10	201
benz (a) anthracene	0.12	23	<0.01	201	0.25	18	0.10	43
benzo[b]naphtho[2,1-d]thiophene	0.01	201	<0.01	201	<0.03	201	<0.03	201
cyclopenta[c,d]pyrene	0.04	52	<0.01	201	0.08	30	0.02	101
chrysene	0.16	52	<0.03	201	0.29	32	0.12	134
5-methylchrysene	<0.01	201	<0.01	201	<0.01	201	<0.01	201
benzo[b]fluoranthene	0.06	134	<0.03	201	0.19	45	0.14	101
benzo[j]fluoranthene	0.04	53	<0.01	201	0.10	26	0.08	30
benzo[k]fluoranthene	0.02	101	<0.01	201	0.09	28	0.07	60
benzo[e]pyrene	0.06	37	<0.01	201	0.15	22	0.15	32
benzo[a]pyrene	0.06	201	<0.05	201	0.12	101	0.15	174
indeno[1,2,3-cd]pyrene	<0.05	201	<0.03	201	<0.09	201	<0.15	201
dibenz[ah]anthracene	<0.03	201	<0.03	201	<0.03	201	<0.06	201
benzo-[g,h,i]perylene	0.04	52	<0.01	201	0.09	27	0.15	21
anthanthrene	<0.1	201	<0.1	201	<0.1	201	<0.1	201
dibenzo[a,l]pyrene	<0.1	201	<0.1	201	<0.1	201	<0.1	201
dibenzo[a,e]pyrene	<0.1	201	<0.1	201	<0.1	201	<0.1	201
dibenzo[a,i]pyrene	<0.1	201	<0.1	201	<0.1	201	<0.1	201
dibenzo[a,h]pyrene	<0.1	201	<0.1	201	<0.1	201	<0.1	201
coronene	<0.1	201	<0.1	201	<0.1	201	<0.1	201
PAH 4 Sum Lower ug/kg	0.40		<0.01		0.85		0.51	
PAH 4 Sum Upper ug/kg	0.40		0.12		0.85		0.51	

i- indicative

OEC Sample No.	20647	20665	20655	20656
FERA LIMS No.	S12- 018741	S12-027622	S12-019343	S12-019362

Description	9) Eggs Group	%U	10) Sugars & Preserves Group	%U	11) Green Vegetables Group	%U	12) Potatoes Group	%U
ug/kg whole weight								
acenaphthylene	<0.24	201	<0.28	201	<0.16	201	<0.16	201
acenaphthene	<0.30	201	<0.32	201	<0.20	201	<0.20	201
fluorene	<0.32	201	<0.29	201	0.22	192	<0.21	201
phenanthrene	<0.38	201	1.79	48	0.80	68	0.39	135
anthracene	<0.03	201	<0.23	201	0.03	135	<0.03	201
fluoranthene	<0.26	201	0.99	42	0.34	102	<0.18	201
benzo[c]fluorene	<0.01	201	0.07	35	<0.02	201	<0.01	201
pyrene	<0.38	201	0.85	49	<0.26	201	<0.26	201
benzo[ghi]fluoranthene	<0.05	201	0.15	21	<0.03	201	<0.03	201
benz (a) anthracene	<0.01	201	0.26	18	0.02	101	0.02	101
benzo[b]naphtho[2,1-d]thiophene	<0.01	201	<0.07	201	<0.01	201	<0.01	201
cyclopenta[c,d]pyrene	<0.01	201	0.02	101	<0.01	201	<0.01	201
chrysene	<0.04	201	0.27	34	0.07	87	<0.03	201
5-methylchrysene	<0.01	201	<0.01	201	<0.01	201	<0.01	201
benzo[b]fluoranthene	<0.03	201	0.25	36	0.03	134	0.02	201
benzo[j]fluoranthene	<0.01	201	0.15	22	0.02	101	0.01	201
benzo[k]fluoranthene	<0.01	201	0.10	26	0.01	201	<0.01	201
benzo[e]pyrene	<0.01	201	0.23	19	0.02	101	0.02	101
benzo[a]pyrene	<0.06	201	0.25	51	<0.04	201	<0.04	201
indeno[1,2,3-cd]pyrene	<0.03	201	0.21	33	<0.03	201	<0.02	201
dibenz[ah]anthracene	<0.03	201	<0.05	201	<0.02	201	<0.02	201
benzo-[g,h,i]perylene	<0.01	201	0.25	18	0.02	101	0.02	101
anthanthrene	<0.1	201	<0.1	201	<0.1	201	<0.1	201
dibenzo[a,l]pyrene	<0.1	201	<0.1	201	<0.1	201	<0.1	201
dibenzo[a,e]pyrene	<0.1	201	<0.1	201	<0.1	201	<0.1	201
dibenzo[a,i]pyrene	<0.1	201	<0.1	201	<0.1	201	<0.1	201
dibenzo[a,h]pyrene	<0.1	201	<0.1	201	<0.1	201	<0.1	201
coronene	<0.1	201	0.11i	183	<0.1	201	<0.1	201
PAH 4 Sum Lower ug/kg	<0.01		1.03		0.12		0.04	
PAH 4 Sum Upper ug/kg	0.14		1.03		0.16		0.11	

OEC Sample No.	20649	20653	20654	20652				
FERA LIMS No.	S12-018863	S12-019279	S12-019327	S12-019278				
Description	13) Other Vegetables Group	%U	14) Canned Vegetable Group	%U	15) Fresh Fruit Group	%U	16) Fruit Products Group	%U
ug/kg whole weight								
acenaphthylene	<0.64	201	<0.13	201	<0.16	201	<0.13	201
acenaphthene	0.24	168	<0.22	201	<0.20	201	<0.22	201
fluorene	1.01	47	<0.20	201	0.24	176	<0.20	201
phenanthrene	4.20	24	<0.26	201	1.61	39	0.77	71
anthracene	0.34	24	<0.16	201	0.06	70	<0.16	201
fluoranthene	1.50	31	<0.12	201	0.31	112	0.38	67
benzo[c]fluorene	0.07	35	<0.01	201	<0.01	201	0.02	102
pyrene	1.11i	51	<0.12	201	<0.26	201	0.35i	72
benzo[ghi]fluoranthene	0.18	37	<0.01	201	<0.03	201	0.05	43
benz (a) anthracene	0.22	18	<0.01	201	<0.01	201	0.07	33
benzo[b]naphtho[2,1-d]thiophene	0.11	24	<0.01	201	<0.01	201	<0.02	201
cyclopenta[c,d]pyrene	0.08	30	<0.01	201	<0.01	201	<0.01	201
chrysene	0.33	24	<0.03	201	<0.03	201	0.15	43
5-methylchrysene	<0.01	201	<0.01	201	<0.01	201	<0.01	201
benzo[b]fluoranthene	0.22	25	<0.03	201	<0.02	201	0.05	121
benzo[j]fluoranthene	0.13	23	<0.01	201	<0.01	201	0.03	69
benzo[k]fluoranthene	0.10	26	<0.01	201	<0.01	201	0.02	101
benzo[e]pyrene	0.17	21	<0.04	201	<0.01	201	0.03	69
benzo[a]pyrene	0.15	56	<0.04	201	<0.04	201	<0.04	201
indeno[1,2,3-cd]pyrene	0.13	35	<0.02	201	<0.02	201	<0.03	201
dibenz[ah]anthracene	<0.03	201	<0.02	201	<0.02	201	<0.02	201
benzo-[g,h,i]perylene	0.13	22	<0.01	201	<0.01	201	0.02	101
anthanthrene	<0.1	201	<0.1	201	<0.1	201	<0.1	201
dibenzo[a,l]pyrene	<0.1	201	<0.1	201	<0.1	201	<0.1	201
dibenzo[a,e]pyrene	<0.1	201	<0.1	201	<0.1	201	<0.1	201
dibenzo[a,i]pyrene	<0.1	201	<0.1	201	<0.1	201	<0.1	201
dibenzo[a,h]pyrene	<0.1	201	<0.1	201	<0.1	201	<0.1	201
coronene	<0.1	201	<0.1	201	<0.1	201	<0.1	201
PAH 4 Sum Lower ug/kg	0.92		<0.01		<0.01		0.27	
PAH 4 Sum Upper ug/kg	0.92		0.11		0.10		0.31	

i- indicative

OEC Sample No.	20635	20662	20658
FERA LIMS No.	S12-018091	S12-027481	S12-019486

Description	18) Mik Group	%U	19) Milk & Dairy Products Group	%U	20) Nuts Group	%U
ug/kg whole weight						
acenaphthylene	<0.16	201	<0.20	201	<0.86	201
acenaphthene	<0.20	201	<0.32	201	0.75	83
fluorene	<0.21	201	<0.29	201	1.18	58
phenanthrene	<0.25	201	<0.39	201	2.53	37
anthracene	<0.02	201	<0.23	201	0.25	32
fluoranthene	<0.17	201	<0.17	201	0.50	106
benzo[c]fluorene	<0.01	201	<0.01	201	<0.03	201
pyrene	<0.26	201	0.33i	111	<0.39	201
benzo[ghi]fluoranthene	<0.03	201	0.03	69	<0.05	201
benz (a) anthracene	<0.01	201	0.01	201	0.07	33
benzo[b]naphtho[2,1-d]thiophene	<0.01	201	<0.01	201	<0.02	201
cyclopenta[c,d]pyrene	<0.01	201	<0.01	201	0.03	69
chrysene	<0.03	201	<0.04	201	0.10	82
5-methylchrysene	<0.01	201	<0.01	201	<0.01	201
benzo[b]fluoranthene	<0.02	201	<0.04	201	0.05	121
benzo[j]fluoranthene	<0.01	201	<0.01	201	0.03	69
benzo[k]fluoranthene	<0.01	201	<0.01	201	0.03	69
benzo[e]pyrene	<0.01	201	<0.01	201	0.04	53
benzo[a]pyrene	<0.04	201	<0.06	201	<0.06	201
indeno[1,2,3-cd]pyrene	<0.02	201	<0.03	201	<0.05	201
dibenz[ah]anthracene	<0.02	201	<0.03	201	<0.03	201
benzo-[g,h,i]perylene	<0.01	201	<0.01	201	0.04	52
anthanthrene	<0.1	201	<0.1	201	<0.1	201
dibenzo[a,l]pyrene	<0.1	201	<0.1	201	<0.1	201
dibenzo[a,e]pyrene	<0.1	201	<0.1	201	<0.1	201
dibenzo[a,i]pyrene	<0.1	201	<0.1	201	<0.1	201
dibenzo[a,h]pyrene	<0.1	201	<0.1	201	<0.1	201
coronene	<0.1	201	<0.1	201	<0.1	201
PAH 4 Sum Lower ug/kg	<0.01		0.01		0.22	
PAH 4 Sum Upper ug/kg	0.10		0.15		0.28	

Table 3.9 PCN concentrations - ng/kg fat weight

OEC Sample No.	20657	20646	20645	20661	20664	20660	20663	20648	20647	20665
FERA LIMS No.	S12-019415	S12-018687	S12-018663	S12-027468	S12-027460	S12-027572	S12-027570	S12-018862	S12-018741	S12-027622
Sample Details:	Group 1 Bread	Group 2 Cereals	Group 3 Carcase meat	Group 4 Offal	Group 5 Meat products	Group 6 Poultry	Group 7 Fish	Group 8 Fats & oils	Group 9 Eggs	Group 10 Sugar and Preserves
Fat content	4.14	9.42	14.41	9.92	14.86	7.32	9.31	73.80	9.55	6.05
ng/kg fat										
PCN 52/60	<4.92	1.08	0.69	<1.38	<1.06	1.70	47.52	0.53	5.40	10.05
PCN 53	2.01	1.21	0.51	0.93	0.55	1.23	7.55	0.44	1.11	6.73
PCN 66/67	<0.56	<0.24	1.85	6.80	0.57	0.24	6.11	0.23	0.85	2.49
PCN 68	<0.31	<0.20	<0.07	0.11	0.07	0.24	2.00	<0.06	0.62	1.36
PCN 69	<0.71	<0.37	<0.13	<0.20	0.15	0.36	2.78	<0.11	0.88	1.24
PCN 71/72	0.43	<0.17	0.09	<0.10	0.11	0.39	3.33	0.10	0.53	1.13
PCN 73	<0.31	<0.20	0.52	3.30	0.16	0.12	0.75	0.08	0.48i	1.41
PCN 74	<0.31	<0.19	<0.07	<0.09	<0.07	<0.07	0.25	<0.06	<0.06	0.43
PCN 75	<0.64	<0.36	<0.13	<0.18	<0.14	<0.15	<0.17	<0.11	<0.11	0.28
Sum PCN lwr bound	2.44	2.29	3.66	11.14	1.61	4.28	70.29	1.38	9.87	25.12
Sum PCN upr bound	10.20	4.02	4.06	13.09	2.88	4.50	70.46	1.72	10.04	25.12

i- indicative value

OEC Sample No.	20655	20656	20649	20653	20654	20652	20635	20662	20658	measurement uncertainty %
FERA LIMS No.	S12-019343	S12-019362	S12-018863	S12-019279	S12-019327	S12-019278	S12-018091	S12-027481	S12-019486	
Sample Details:	Group 11 Green vegetables	Group 12 Potatoes	Group 13 Other vegetables	Group 14 Canned Vegetables	Group 15 Fresh Fruit	Group 16 Fruit products	Group 18 Milk	Group 19 Milk & Dairy products	Group 20 Nuts	
Fat content (%)	0.29	5.19	5.46	0.53	0.21	0.42	1.97	23.3	41.8	
ng/kg fat weight										
PCN 52	13.75	1.00	12.62	<10.4	9.56	<23.3	1.02	<0.63	0.21	78
PCN 53	11.70	1.03	1.87	1.71	10.25	3.17	<0.31	0.11	<0.16	81
PCN 66/67	3.11	<0.17	2.18	<1.18	<2.13	<2.67	1.06	1.48	<0.07	31
PCN 68	1.30	<0.14	0.74	<0.66	<1.76	<1.48	<0.10	0.12	<0.05	78
PCN 69	<1.67	<0.25	0.50	<1.5	<3.27	<3.39	<0.19	0.12	<0.10	96
PCN 71/72	1.89	0.19	0.28	<0.73	1.77	<1.65	<0.09	0.04	<0.05	89
PCN 73	2.13	<0.14	0.66	<0.66	<1.76	<1.48	0.64	0.77	<0.05	45
PCN 74	<0.86	<0.13	0.18	<0.66	<1.69	<1.48	<0.10	<0.04	<0.05	101
PCN 75	1.97	<0.25	0.55	<1.34	<3.16	<3.02	<0.19	<0.08	<0.10	126
Sum PCN lwr bound	35.85	2.22	19.58	1.71	21.58	3.17	2.72	2.64	0.21	
Sum PCN upr bound	38.38	3.30	19.58	18.84	35.35	41.64	3.70	3.39	0.84	

i-Indicative value,

* Uncertainty for concentrations at, or approaching the LOD, is typically ~200%

Table 3.10 HBCD and TBBPA concentrations

OEC Sample No.	20657	20646	20645	20661	20664	20660	20663	20648	20647	20665
FERA LIMS No.	S12-019415	S12-018687	S12-018663	S12-027468	S12-027460	S12-027572	S12-027570	S12-018862	S12-018741	S12-027622
Sample Details:	Group 1 Bread	Group 2 Cereals	Group 3 Carcass meat	Group 4 Offal	Group 5 Meat products	Group 6 Poultry	Group 7 Fish	Group 8 Fats & oils	Group 9 Eggs	Group 10 Sugar and Preserves
Fat content (%)	4.14	9.42	14.41	9.92	14.86	7.32	9.31	73.80	9.55	6.05
µg/kg whole weight										
Alpha-HBCD	0.03i	0.03	0.25	0.03	0.10	<0.01	0.08	0.16	<0.01	<0.02
Beta-HBCD	<0.02	<0.02	<0.01	<0.01	0.02i	<0.01	<0.01	<0.03	<0.01	<0.01
Gamma-HBCD	0.03i	<0.02	<0.01	<0.01	<0.02	<0.01	<0.01	<0.05	<0.01	<0.02
TBBPA	<0.02	<0.01	<0.02	<0.02	<0.01	<0.01	<0.01	0.02	<0.01	<0.01
*PBCD	<0.22	<0.4	<0.14	<0.12	<0.25	<0.01	<0.01	<0.01	<0.07	<0.36
µg/kg fat weight										
Alpha-HBCD	0.72i	0.32	1.73	0.30	0.67	<0.14	0.86	0.22	<0.1	<0.33
Beta-HBCD	<0.48	<0.21	<0.07	<0.1	0.13i	<0.14	<0.11	<0.04	<0.1	<0.17
Gamma-HBCD	0.72i	<0.21	<0.07	<0.1	<0.13	<0.14	<0.11	<0.07	<0.1	<0.33
TBBPA	<0.48	<0.11	<0.14	<0.2	<0.07	<0.14	<0.11	0.03	<0.1	<0.17
*PBCD	<5.31	<4.25	<0.97	<1.21	<1.68	<0.14	<0.11	<0.01	<0.73	<5.95

*Qualitative/semi-quantitative estimate i- indicative

Typical measurement uncertainty:- α-HBCD 19%, β-HBCD 17%, γ-HBCD 19%, TBBPA 22%

OEC Sample No.	20655	20656	20649	20653	20654	20652	20635	20662	20658
FERA LIMS No.	S12-	S12-	S12-	S12-	S12-	S12-	S12-	S12-	S12-
Sample Details:	019343	019362	018863	019279	019327	019278	018091	027481	019486
	Group 11 Green vegetables	Group 12 Potatoes	Group 13 Other vegetables	Group 14 Canned Vegetables	Group 15 Fresh Fruit	Group 16 Fruit products	Group 18 Milk	Group 19 Milk & Dairy products	Group 20 Nuts
Fat content (%)	0.29	5.19	5.46	0.53	0.21	0.42	1.97	23.31	41.8

µg/kg whole weight

Alpha-HBCD	0.01	<0.01	<0.01	<0.01	<0.01	<0.04	<0.01	0.03	<0.06
Beta-HBCD	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	0.02i	<0.10
Gamma-HBCD	<0.01	<0.01	<0.01	<0.01	<0.01	<0.03	<0.01	<0.02	0.06i
TBBPA	<0.01	0.01i	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02
*PBCD	<0.03	<0.03	<0.04	<0.02	<0.03	<0.03	<0.02	<0.09	<0.6

µg/kg fat weight

Alpha-HBCD	3.45	<0.19	<0.18	<1.89	<4.76	<9.52	<0.51	0.13	<0.14
Beta-HBCD	<3.45	<0.19	<0.18	<1.89	<4.76	<4.76	<0.51	0.09i	<0.24
Gamma-HBCD	<3.45	<0.19	<0.18	<1.89	<4.76	<7.14	<0.51	<0.09	0.14i
TBBPA	<3.45	0.19i	<0.18	<1.89	<4.76	<2.38	<0.51	<0.04	<0.05
*PBCD	<10.3	<0.58	<0.73	<3.77	<14.3	<7.14	<1.0	<0.39	<1.43

*Qualitative/semi-quantitative estimate i- indicative

Typical measurement uncertainty:- α-HBCD 19%, β-HBCD 17%, γ-HBCD 19%, TBBPA 22%

Table 3.11 Concentrations of HBB, BTBPE, DBDPE, BDE-209 and PBB-209

OEC Sample No.	20657	20646	20645	20661	20664	20660	20663	20648	20647	20665
FERA LIMS No.	S12-019415	S12-018687	S12-018663	S12-027468	S12-027460	S12-027572	S12-027570	S12-018862	S12-018741	S12-027622
Sample Details:	Group 1 Bread	Group 2 Cereals	Group 3 Carcass meat	Group 4 Offal	Group 5 Meat products	Group 6 Poultry	Group 7 Fish	Group 8 Fats & oils	Group 9 Eggs	Group 10 Sugar and Preserves
Fat content (%)	4.14	9.42	14.41	9.92	14.86	7.32	9.31	73.80	9.55	6.05
µg/kg whole weight										
HBB	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.06i
BTBPE	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
DBDPE	<0.22	<0.21	<0.14	<0.14	<0.15	<0.09	0.23	<0.44	<0.08	<0.11
BDE209	<0.2	<0.19	<0.13	<0.12	<0.14	0.22	0.17	<0.39	0.09i	1.95i
PBB209	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.04i
µg/kg fat weight										
HBB	<0.24	<0.11	<0.07	<0.1	<0.07	<0.14	<0.11	<0.01	<0.1	0.99i
BTBPE	<0.24	<0.11	<0.07	<0.1	<0.07	<0.14	<0.11	<0.01	<0.1	<0.17
DBDPE	<5.32	<2.23	<0.97	<1.41	<1.01	<1.23	2.47	<0.6	<0.84	<1.82
BDE209	<4.83	<2.02	<0.9	<1.21	<0.94	3.01	1.83	<0.53	0.94i	32.2i
PBB209	<0.24	<0.11	<0.07	<0.1	<0.07	<0.14	<0.11	<0.01	<0.1	0.66i

Typical uncertainty - 40% for HBB and PBB209, 120% for BTBPE, DBDPE and BDE209

i- indicative

Typical uncertainty at LOD - 100% for HBB and PBB209, 250% for BTBPE, DBDPE and BDE209

OEC Sample No.	20655	20656	20649	20653	20654	20652	20635	20662	20658
FERA LIMS No.	S12-019343	S12-019362	S12-018863	S12-019279	S12-019327	S12-019278	S12-018091	S12-027481	S12-019486
Sample Details:	Group 11 Green vegetables	Group 12 Potatoes	Group 13 Other vegetables	Group 14 Canned Vegetables	Group 15 Fresh Fruit	Group 16 Fruit products	Group 18 Milk	Group 19 Milk & Dairy products	Group 20 Nuts
Fat content (%)	0.29	5.19	5.46	0.53	0.21	0.42	1.97	23.31	41.8
µg/kg whole weight									
HBB	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
BTBPE	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
DBDPE	<0.03	<0.06	<0.07	<0.04	<0.04	<0.07	<0.03	<0.11	<0.26
BDE209	0.05	0.05	0.05i	0.02	0.14	0.03	0.12	0.02	0.1
PBB209	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
µg/kg fat weight									
HBB	<3.46	<0.19	<0.18	<1.9	<4.82	<2.4	<0.51	<0.04	<0.02
BTBPE	<3.46	<0.19	<0.18	<1.9	<4.82	<2.4	<0.51	<0.04	<0.02
DBDPE	<10.39	<1.16	<1.28	<7.58	<19.29	<16.79	<1.52	<0.47	<0.62
BDE209	17.32	0.96	0.92i	3.79	67.51	7.19	6.09	0.09	0.24
PBB209	<3.46	<0.19	<0.18	<1.9	<4.82	<2.4	<0.51	<0.04	<0.02

Typical uncertainty - 40% for HBB and PBB209, 120% for BTBPE, DBDPE and BDE209

i- indicative

Typical uncertainty at LOD - 100% for HBB and PBB209, 250% for BTBPE, DBDPE and BDE209

Table 3.12 Concentrations of PFAS - µg/kg whole weight

OEC Sample No	20657	20646	20645	20661	20664	20660	20663	20648	20647	20665
LIMS No	S12-019415	S12-018687	S12-018663	S12-027468	S12-027571	S12-027460	S12-027570	S12-018862	S12-018741	S12-027622
Description	Bread	Cereals	Carcass Meat	Offal	Meat products	Poultry	Fish	Fats and Oils	Eggs	Sugars and Preserves
PFHxA	1.19	1.42	NQ	0.79	0.5	0.23	1.85	0.04	0.16	1.01
PFHpA	1.89	0.18	NQ	2.45	0.88	0.43	3.89	0.03	0.32	0.63
PFOA	0.54	0.37	0.17	0.62	0.2	0.21	1.51	<0.05	0.11	0.48
PFNA	0.73	0.37	0.18	0.44	0.22	0.23	0.6	0.42	0.21	1.21
PFDeA	1.27	0.26	0.31	0.98	0.16	0.23	0.81	0.77	0.17	0.19
PFUnA	0.42	0.05	0.17	1.75	0.34	0.56	1.24	0.28	0.71	1.18
PFDoA	1.71	0.32	0.15	0.75	0.2	0.08	1.31	0.15	0.28	0.11
PFBSH	0.02	0.03	0.04	0.95	0.16	0.28	2.47	0.31	0.1	0.05
PFHxSH	0.07	0.12	0.13	1.3	0.23	0.25	2.41	0.22	0.1	0.16
PFOS	0.1	0.09	0.22	2.66	0.17	0.16	0.96	0.15	0.31	0.08
PFOSA	0.07	0.07	0.05	0.64	0.03	0.24	1.33	0.04	0.05	<0.05
ΣPFSA	0.2	0.2	0.4	4.9	0.6	0.7	5.8	0.7	0.5	0.3
ΣPFCA	7.8	3	1	7.8	2.5	2	11.2	1.7	2	4.8
Total PFCs	8	3.3	1.4	13.3	3.1	2.9	18.4	2.4	2.5	5.1

NQ- not quantifiable

OEC Sample No	20655	20656	20649	20653	20654	20652	20635	20662	20658
LIMS No	S12-019343	S12-019362	S12-018863	S12-019279	S12-019327	S12-019278	S12-018091	S12-027481	S12-019486
Description	Green Vegetables	Potatoes	Other Vegetables	Canned Vegetables	Fresh Fruit	Fruit products	Milk	Milk and Dairy	Nuts
PFHxA	2.8	0.41	1.13	0.16	1.74	0.76	0.14	0.54	0.86
PFHpA	1.27	0.85	0.12	0.19	1.05	0.98	0.38	1.22	0.59
PFOA	0.22	0.12	0.18	0.2	0.2	0.17	0.03	0.08	0.54
PFNA	0.25	0.12	0.17	0.15	1.1	0.17	0.01	0.08	0.72
PFDeA	0.36	0.09	0.14	0.15	0.21	0.1	0.02	0.06	0.22
PFUnA	0.27	0.05	0.22	0.13	0.23	0.48	0.04	0.18	0.56
PFDoA	0.21	0.05	0.11	0.07	0.06	0.07	0.01	0.12	0.12
PFBSH	0.07	0.04	0.05	0.03	0.08	0.03	<0.05	0.04	0.16
PFHxSH	0.17	0.07	0.1	0.03	0.18	0.08	0.02	0.06	0.09
PFOS	0.1	0.05	0.04	0.03	0.07	0.02	0.05	0.06	0.1
PFOSA	0.1	0.03	0.06	0.02	0.01	0.03	<0.05	0.08	0.05
ΣPFSA	0.3	0.2	0.2	0.1	0.3	0.1	0.1	0.7	0.4
ΣPFCA	5.4	1.7	2.1	1	4.6	2.7	0.6	2.3	3.6
Total PFCs	5.8	1.9	2.3	1.2	5	2.9	0.7	2.5	4

Table 3.13 Concentrations of PXDD/Fs and PXBs – ng/kg fat

OEC Sample No.	20657	20646	20645	20661	20664	20660	20663	20648	20647	20665
FERA LIMS No.	S12-019415	S12-018687	S12-018663	S12-027468	S12-027460	S12-027572	S12-027570	S12-018862	S12-018741	S12-027622
Sample Details:	Group 1 Bread	Group 2 Cereals	Group 3 Carcase meat	Group 4 Offal	Group 5 Meat products	Group 6 Poultry	Group 7 Fish	Group 8 Fats & oils	Group 9 Eggs	Group 10 Sugar and Preserves
Fat content (%)	4.14	9.42	14.41	9.92	14.86	7.32	9.31	73.80	9.55	6.05
PXDD/Fs	ng/kg fat weight									
2-B-7,8-CDD	<0.016	<0.008	<0.005	0.008	<0.005	<0.005	0.078	<0.005	<0.005	<0.011
2-B-3,7,8-CDD	<0.017	<0.008	<0.005	<0.005	<0.005	<0.005	0.015	<0.005	<0.005	<0.012
2,3-B-7,8-CDD	0.027	0.019	0.007	<0.005	<0.005	<0.005	0.012	<0.005	<0.005	<0.011
1-B-2,3,7,8-CDD	<0.017	0.018	<0.005	0.008	0.006	<0.005	0.008	<0.005	<0.005	0.027
2-B-1,3,7,8-CDD	<0.017	<0.008	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.012
2-B-3,6,7,8,9-CDD	<0.025	<0.012	0.009	0.021	0.009	<0.007	0.017	<0.008	<0.006	<0.016
2-B-7,8-CDF	0.044	0.020	<0.005	<0.006	<0.005	0.009	0.016	<0.007	<0.005	0.106
3-B-2,7,8-CDF	<0.01	<0.005	<0.005	0.007	<0.005	0.009	0.016	<0.005	0.007	0.038
2-B-6,7,8-CDF	<0.02	<0.009	<0.005	<0.005	<0.005	0.008	0.015	<0.006	0.013	<0.013
2,3-B-7,8-CDF	<0.019	<0.009	<0.005	0.007	<0.005	0.010	0.008	0.009	0.010	0.028
1-B-2,3,7,8-CDF	<0.02	<0.009	<0.005	<0.005	<0.005	<0.005	<0.005	<0.006	<0.005	<0.013
4-B-2,3,7,8-CDF	<0.024	<0.011	0.014i	0.053	0.015	0.014	0.021	<0.007	0.009	<0.016
1,3-B-2,7,8-CDF	<0.025	<0.012	<0.005	<0.007	<0.005	<0.007	<0.006	<0.008	<0.006	<0.016
PXBs										
4'-B-3,3',4,5-CB (PXB126)	0.024	<0.01	0.019i	0.047	0.011i	<0.006	0.029	0.007	0.01	0.033
3,4-B-3',4',5'-CB (PXB126 di-Br)	<0.012	<0.006	<0.005	0.011	<0.005	<0.005	<0.005	<0.005	<0.005	<0.008
3',4',5'-B-3,4-CB (PXB126 tri-Br)	<0.009	<0.005	<0.005	0.014	<0.005	<0.005	<0.005	<0.005	<0.005	<0.006
4'-B-2,3',4,5-CB (PXB 118)	0.046	<0.018	0.049	0.058	0.066i	0.031	0.450	0.024	0.035	<0.026
4'-B-2,3,3',4-CB (PXB 105)	<0.031	<0.015	0.035	0.037	0.016	<0.008	0.160	<0.01	0.030	<0.021
4'-B-2,3,3',4,5-CB (PXB 156)	<0.028	<0.013	0.018	<0.007	0.009	0.030	0.072	<0.009	<0.006	<0.019

i-Indicative value

OEC Sample No.	20655	20656	20649	20653	20654	20652	20635	20662	20658	*Measurement uncertainty %
FERA LIMS No.	S12-019343	S12-019362	S12-018863	S12-019279	S12-019327	S12-019278	S12-018091	S12-027481	S12-019486	
Sample Details:	Group 11 Green vegetables	Group 12 Potatoes	Group 13 Other vegetables	Group 14 Canned Vegetables	Group 15 Fresh Fruit	Group 16 Fruit products	Group 18 Milk	Group 19 Milk & Dairy products	Group 20 Nuts	
Fat content (%)	0.29	5.19	5.46	0.53	0.21	0.42	1.97	23.31	41.8	
PXDD/Fs	ng/kg fat weight									
2-B-7,8-CDD	0.159	<0.012	<0.007	<0.059	<0.126	0.322	<0.007	<0.005	<0.006	108
2-B-3,7,8-CDD	<0.085	<0.016	0.018	<0.08	<0.17	<0.179	<0.01	0.005	<0.008	71
2,3-B-7,8-CDD	0.116	<0.005	0.006	<0.021	<0.044	<0.047	<0.005	<0.005	<0.005	112
1-B-2,3,7,8-CDD	<0.069	<0.013	<0.007	<0.065	<0.139	<0.146	<0.008	<0.005	<0.007	133
2-B-1,3,7,8-CDD	<0.044	<0.008	<0.005	<0.042	<0.088	<0.093	<0.005	<0.005	<0.005	112
2-B-3,6,7,8,9-CDD	<0.063	<0.012	<0.007	<0.059	<0.126	<0.133	<0.007	<0.005	<0.006	88
2-B-7,8-CDF	0.214	<0.014	0.07	<0.071	<0.151	0.293	0.01	<0.005	<0.007	49
3-B-2,7,8-CDF	<0.05	<0.009	0.01i	<0.048	<0.101	<0.106	<0.006	<0.005	<0.005	100
2-B-6,7,8-CDF	<0.025	<0.005	0.015	<0.024	<0.05	<0.053	<0.005	<0.005	<0.005	53
2,3-B-7,8-CDF	0.116	0.02	0.009	<0.062	0.186	<0.139	<0.008	<0.005	0.008	139
1-B-2,3,7,8-CDF	<0.066	<0.012	<0.007	<0.062	<0.133	<0.14	<0.008	<0.005	<0.007	173
4-B-2,3,7,8-CDF	0.129i	<0.018	0.015	<0.089	<0.189	<0.199	0.02	<0.005	<0.009	137
1,3-B-2,7,8-CDF	<0.031	<0.006	<0.005	<0.03	<0.063	<0.066	<0.005	<0.005	<0.005	120
PXBs										
4'-B-3,3',4,5-CB (PXB126)	<0.074	0.018	0.027i	<0.07	<0.148	<0.156	0.01	0.008	0.017	142
3,4-B-3',4',5'-CB (PXB126 di-Br)	<0.031	<0.006	<0.005	<0.03	<0.063	<0.066	<0.005	<0.005	<0.005	80
3',4',5'-B-3,4-CB (PXB126 tri-Br)	<0.066	<0.012	0.01	<0.062	<0.133	<0.14	<0.008	<0.005	<0.007	131
4'-B-2,3',4,5-CB (PXB 118)	0.121	0.023	0.068	0.507	0.265	<0.199	0.05	0.076	<0.009	41
4'-B-2,3,3',4-CB (PXB 105)	0.101	<0.017	0.035	<0.086	<0.183	<0.193	0.012	0.037	<0.009	73
4'-B-2,3,3',4,5-CB (PXB 156)	<0.035	<0.006	0.043i	<0.033	0.079	<0.073	0.014	0.008	<0.005	62

i-Indicative value, * Uncertainty for concentrations at, or approaching the LOD, is typically ~200%

Table 3.14 Results of Reference material analysis

PCBs and PCDD/Fs

T0645 Cod Liver Oil Reference Material													
	Units	Mean	RANGE	Batch	RM			Units	Mean	RANGE	Batch	RM	
PCBs				22300	22334	Dioxins and Furans					22300	22334	
28	ug/kg	0.9	0.7-1.1	0.93	0.91								
52	ug/kg	2.3	1.8-2.8	2.23	2.27	2,3,7,8-TCDD	ng/kg	0.53	0.43-0.63	0.57	0.50		
101	ug/kg	10.0	5.0-15.1	11.33	11.27	1,2,3,7,8-PeCDD	ng/kg	0.24	0.16-0.32	0.26	0.27		
105	ug/kg	4.7	3.3-6.0	4.98	4.89	1,2,3,6,7,8-HxCDD	ng/kg	0.70	0.47-0.93	0.72	0.66		
118	ug/kg	13.1	9.3-16.9	14.66	14.35	1,2,3,7,8,9-HxCDD	ng/kg	0.12	0.02-0.21	0.13	0.12		
138	ug/kg	26.6	20.2-33.0	29.92	29.97								
153	ug/kg	32.9	27.4-38.5	34.16	33.33	2,3,7,8-TCDF	ng/kg	4.92	4.04-5.81	5.01	5.00		
156	ug/kg	2.0	1.6-2.5	2.16	2.28	1,2,3,7,8-PeCDF	ng/kg	1.51	1.23-1.79	1.70	1.67		
180	ug/kg	10.4	8.1-12.8	10.69	10.68	2,3,4,7,8-PeCDF	ng/kg	2.41	1.97-2.86	2.53	2.51		
						1,2,3,4,7,8-HxCDF	ng/kg	0.34	0.25-0.43	0.38	0.37		
77	ng/kg	106.9	74.5-139	109.36	105.16	1,2,3,6,7,8-HxCDF	ng/kg	0.61	0.43-0.80	0.76	0.59		
126	ng/kg	77.8	66.9-88.6	86.23	83.73	2,3,4,6,7,8-HxCDF	ng/kg	0.48	0.31-0.64	0.53	0.51		
169	ng/kg	20.6	16.1-25.1	24.76	24.07	1,2,3,4,6,7,8-HpCDF	ng/kg	0.22	0.02-0.46	0.19	0.09		

Figures in italics are indicative

Table 3.15 Results of Reference material analysis

PBDEs and PCNs

T0645 Cod Liver Oil Reference Material					
	Units	Mean	RANGE	Batch RM	
PBDEs				22300	22334
BDE-28	ug/kg	0.17	0.16-0.18	0.16	0.17
BDE-47	ug/kg	5.37	5.1-5.6	5.32	5.16
BDE-49	ug/kg	1.40	1.2-1.6	1.35	1.40
BDE-66	ug/kg	0.14	0.12-0.16	0.14	0.12
BDE-99	ug/kg	0.41	0.34-0.49	0.40	0.39
BDE-100	ug/kg	1.30	1.1-1.5	1.25	1.30
BDE153	ug/kg	0.10	0.09-0.11	0.11	0.10
BDE 154	ug/kg	0.83	0.79-0.87	0.84	0.83

CRM-350 reference material					
PCN congener	Units	Mean	RANGE		Batch RM
	ng/kg				1338
PCN52		999	920-1080		1019
PCN53		223	170-280		175
PCN66/67		134	120-150		140
PCN68		59	51-68		61
PCN69		48	37-60		49
PCN71/72		60	41-79		60
PCN73		25	15-36		20

Table 3.16 Results of Reference material analysis

PXDD/Fs and PXBs
IHRM – fortified fish oil

Congener	Fortification level	Acceptable Range	Measured levels	Measured levels
	ng/kg whole		B26	B27
ng/kg				
2Br78ClDx	3.3	3.2 - 3.8	3.28	3.27
2Br378ClDx	3.7	3.4 - 5.3	4.27	4.38
23Br78ClDx	3.7	3.5 - 4.1	3.84	3.87
1Br2378ClDx	3.7	3.1 - 4.7	4.01	4.03
2Br1378ClDx	3.3	2.8 - 4.1	3.53	3.61
2Br36789ClDx	3.3	2.7 - 4.0	3.50	3.27
8Br78ClDf	3.7	3.4 - 3.9	3.65	3.65
3Br278ClDf	3.3	2.8 - 3.7	3.32	3.15
2Br678ClDf	3.7	3.0 - 4.8	3.58	3.47
1Br2378ClDf	3.7	3.2 - 3.8	3.63	3.5
4'Br33'45Cl PXB126	2.2	2.0 - 2.3	2.10	2.32
34Br3'4'5'Cl PXB126 di-Br	2.2	1.8 - 3.0	2.28	2.59
3'4'5'Br34Cl PXB126 tri-Br	2.2	1.9 - 3.0	2.24	2.40
4'Br23'45Cl PXB-118	2.2	3.1 - 3.9	3.55	3.5
4'Br233'4Cl PXB-105	2.2	2.2 - 4.1	3.34	3.2
4'Br233'45Cl PXB-156	2.2	2.3 - 2.9	2.59	2.6

PAHs

Compound	T0648 Palm oil Reference Material			
	Assigned Value (ug/kg)	Acceptable Range ug/kg	Batch RM	
	px9217	px9219		
benz (a) anthracene	1.51	1.18-1.84	1.63	1.54
benzo[b]fluoranthene	1.14	0.89-1.39	1.19	1.14
benzo[a]pyrene	0.99	0.77-1.21	1.07	1.03
indeno[1,2,3-cd]pyrene	0.88	0.69-1.07	0.89	0.93
benzo-[g,h,i]perylene	0.91	0.71-1.11	0.99	0.99

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