



Statlig program for forurensningsovervåking

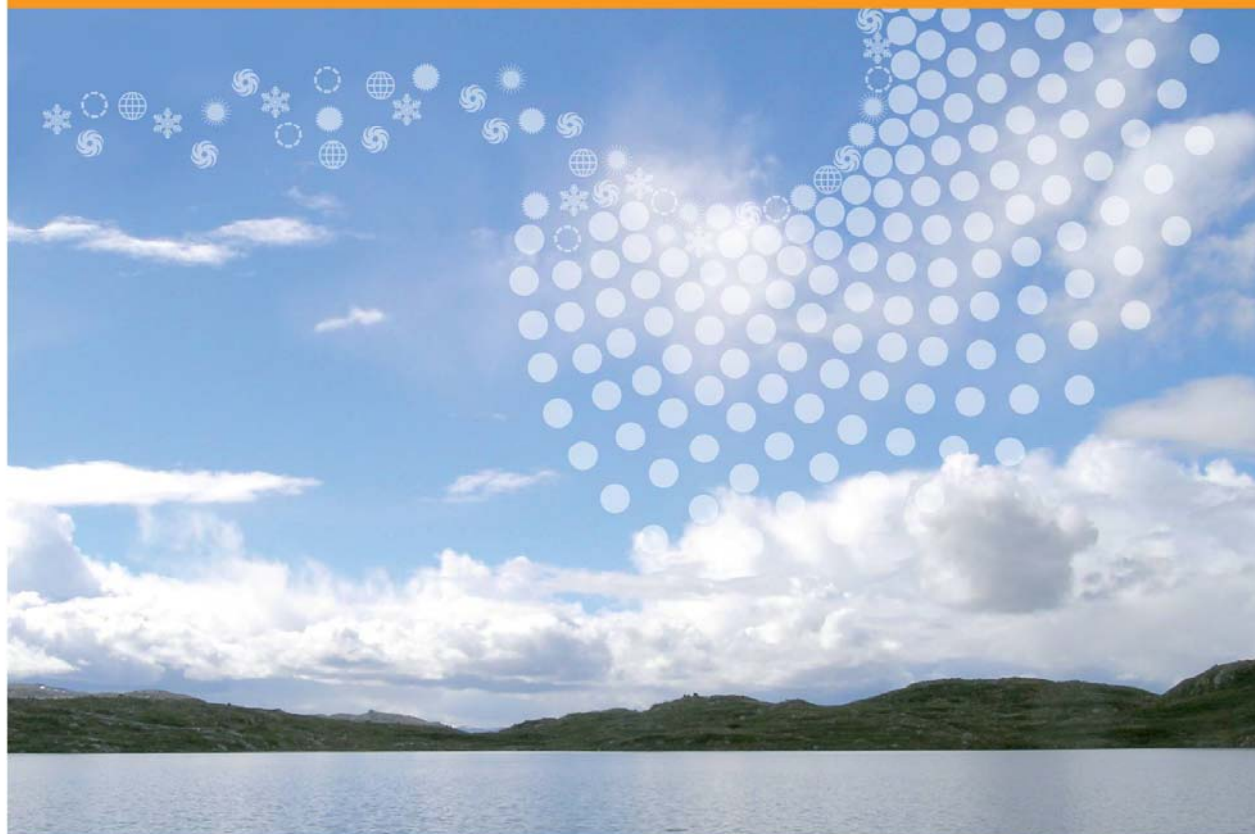
Long-term monitoring of environmental quality in Norwegian coastal waters.

Joint Assessment and Monitoring Programme (JAMP).

OVERVIEW OF NORWEGIAN ANALYTICAL METHODS 1981-2007

1016

2008







**Long-term monitoring of environmental quality in  
Norwegian coastal waters**

Joint Assessment and Monitoring Programme (JAMP)

SPFO-report: 1016/2008

TA-2370/2008

ISBN 978-82-577-5298-9

Client: Norwegian Pollution Control Authority (SFT)

Contractor: Norwegian Institute for Water Research (NIVA)

: Overview of Norwegian  
analytical methods 1981-2007

Report  
1016/2008



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NIVA report no. 5563-2008



**O-27106**

**JOINT ASSESSMENT AND MONITORING PROGRAMME (JAMP)**

**Overview of Norwegian analytical methods  
1981-2007**



## ***Foreword***

*This report presents the method overview and brief descriptions of chemical analyses used for 1981-2006 Norwegian investigations (analysed during the period 1981-2007) for the Joint Monitoring and Assessment Programme (JAMP). JAMP is administered by the Oslo and Paris Commissions (OSPAR) and their Environmental Assessment and Monitoring Committee (ASMO). JAMP receives guidance from the International Council for the Exploration of the Sea (ICES). ASMO has delegated implementation of part of the programme to the Working Group on Concentrations, Trends and Effects of Substances in the Marine Environment (SIME). The Norwegian 2006 investigations are directed to particular JAMP issues relating to contaminants and implemented by SIME. JAMP replaced Joint Monitoring Programme (JMP) in 1995 and has been an integral part of OSPAR's Coordinated Environmental Monitoring Programme (CEMP) since 1998.*

*The Norwegian JAMP was carried out by the Norwegian Institute for Water Research (NIVA) by contract from the Norwegian Pollution Control Authority (SFT), (NIVA contracts O-80106, O-25106, O-26106, O-27106).*

*Information for this report was compiled by the Norwegian Institute for Water Research (NIVA) by contract from the Norwegian State Pollution Control Authority (SFT). The report is an updated version of information reported earlier that concerned 1981-2000 (Green et al. 2001).*

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*Oslo, 22 May 2008.*

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# Contents

|   |           |
|---|-----------|
| <b>1. Introduction</b>  | <b>1</b>  |
| <b>2. Method overview</b>                                     | <b>2</b>  |
| 2.1 Medium and method code                                    | 2         |
| 2.2 Comment on detection limit                                | 6         |
| <b>3. Method descriptions</b>                                 | <b>7</b>  |
| 3.1 Sea water   | 7         |
| 3.1.1 Sample collection                                       | 7         |
| 3.1.2 Metal analyses  | 8         |
| 3.2 Sediments   | 10        |
| 3.2.1 Sample collection, storage and pretreatment             | 10        |
| 3.2.2 Metal analyses  | 11        |
| 3.2.3 Organic analyses  | 15        |
| 3.2.4 Organic carbon  | 19        |
| 3.3 Marine biota  | 20        |
| 3.3.1 Metal analyses  | 20        |
| 3.3.2 Organic analyses  | 27        |
| 3.3.3 Fat   | 39        |
| <b>4. References</b>  | <b>40</b> |
| <b>Appendix A Abbreviations</b>                               | <b>43</b> |
| <b>Appendix B Participation in intercalibration exercises</b> | <b>51</b> |
| <b>Appendix C Analytical overview - sediment</b>              | <b>55</b> |
| <b>Appendix D Analytical overview - biota</b>                 | <b>63</b> |



# 1. Introduction

Oslo-Paris convention (OSPAR) was established in 1992 and represents a union between the Oslo commission, established in 1972 and the Paris commission initiated in 1974. The aim of OSPAR is to protect the marine environment against anthropogenic contamination in the North east Atlantic. Administered by OSPAR and advised by the International Council for the Exploration of the Sea (ICES), OSPAR carries out the *Joint Assessment and Monitoring Programme* (JAMP, earlier the *Joint Monitoring Programme* JMP). JAMP was started in 1996. It is based largely on the Joint Monitoring Programme (JMP) initiated in November 1980. Since 1998, JAMP been an integral part of OSPAR's Coordinated Environmental Monitoring Programme (CEMP). JAMP is implemented by contract from the Norwegian Pollution Control Authority (SFT).

Data collected for JAMP is submitted to ICES with corresponding codes for the analytical methods used. This report defines these codes and gives an outline of the analytical methods employed by JAMP in Norway 1981-2007 for the analyses of contaminants in sea water, sediment and marine biota samples collected 1981-2006.

This report is largely based on information filed at the International Council for the Exploration of the Sea (ICES) (OSPAR 1984; Green 1988, Green 1993, Green *et al.* 2001). It includes updated and extended information but retains, for the most part, the same codes and abbreviations. Chapter 2 summarises the analytical methods employed sorted in various ways for convenient reference. Chapter 3 gives a brief description of each method.

## 2. Method overview

### 2.1 Medium and method code

An overview of analytical methods for trace metals, chlorinated hydrocarbons and other substances in the marine environment is shown in **Table 1** (water), **Table 2** (sediment) and **Table 3** (biota).

**Table 1.** An overview of analytical methods for trace metals, chlorinated hydrocarbons and other substances for sea water and sediment as employed by JAMP. (Parameter codes are defined in Appendix A).

| Medium    | method code | institute code | contaminant(s) etc. | sampling year(s) |
|-----------|-------------|----------------|---------------------|------------------|
| Sea water | 320         | SIIF           | Hg                  | 84               |
|           | 322         | SERI           | Hg                  | 84-86            |
|           | 330         | SIIF           | Cd                  | 83               |
|           | 331         | NIVA           | Cu,Zn               | 85-90            |
|           | 331         | NIVA           | Cd,Pb               | 84-90            |
|           | 331         | NIVA           | Fe,Ni,Co            | 86               |
|           | 332         | NIVA           | Hg                  | 86-90            |

**Table 2.** An overview of analytical methods for trace metals, chlorinated hydrocarbons and other substances for marine sediment as employed by JAMP. (Method and parameter group codes (PRGRP) codes are defined in Appendix A).

| Count of PRGRP<br>METHOD<br>CODE | Parameter<br>code? | RLAB | YEAR |      |      |      |      |      |      |      |      | Grand<br>Total |
|----------------------------------|--------------------|------|------|------|------|------|------|------|------|------|------|----------------|
|                                  |                    |      | 1986 | 1987 | 1990 | 1992 | 1994 | 1996 | 1997 | 2004 | 2006 |                |
| 350                              | I-MET              | NIVA | 1    | 1    | 1    | 1    | 1    | 1    | 1    |      |      | 7              |
|                                  | OC-HC              | NIVA |      |      |      |      |      |      |      | 1    | 1    | 2              |
| 351                              | I-MET              | NIVA | 2    | 2    | 2    | 2    | 2    | 2    | 2    |      |      | 14             |
| 352                              | I-MET              | NIVA | 2    | 3    | 1    |      |      |      |      |      |      | 6              |
| 353                              | I-MET              | NIVA |      |      | 5    | 3    | 5    | 3    | 3    |      |      | 19             |
|                                  | OC-DN              | NIVA |      |      |      |      |      |      |      | 1    | 1    | 2              |
| 354                              | I-MET              | NIVA |      |      |      |      | 1    |      |      |      |      | 1              |
| 355                              | BE                 | NIVA |      |      |      |      |      |      |      | 1    | 1    | 2              |
|                                  | I-MET              | NIVA |      |      |      |      |      |      |      | 3    | 3    | 6              |
|                                  | O-MAJ              | NIVA |      |      |      |      |      |      |      | 2    | 2    | 4              |
|                                  | PAH                | NIVA |      |      |      |      |      |      |      | 3    | 3    | 6              |
| 360                              | OC-CB              | NIVA |      |      |      | 10   | 10   | 10   | 10   | 10   | 9    | 59             |
|                                  | OC-CL              | NIVA |      |      |      | 3    | 3    | 3    | 3    | 2    | 2    | 16             |
|                                  | OC-DD              | NIVA |      |      |      | 2    | 2    | 3    | 3    | 2    | 3    | 15             |
|                                  | OC-DN              | NIVA |      |      |      |      |      |      |      | 1    | 1    | 2              |
|                                  | OC-HC              | NIVA |      |      |      | 2    | 2    | 2    | 2    | 2    | 1    | 11             |
| 369                              | BE                 | NIVA |      |      |      |      |      |      |      | 1    | 1    | 2              |
|                                  | I-MET              | NIVA |      |      |      | 1    | 1    | 1    | 1    | 3    | 3    | 10             |
|                                  | OC-BB              | NIVA |      |      |      |      |      |      |      |      | 1    | 1              |
|                                  | OC-DN              | NIVA |      |      |      |      |      |      |      | 1    | 1    | 2              |
|                                  | OC-DX              | NIVA |      |      |      |      |      |      |      |      | 2    | 2              |
|                                  | PAH                | NIVA |      |      |      | 25   | 23   | 31   | 31   | 21   | 20   | 151            |
| 370                              | O-MET              | NIVA |      |      |      |      |      |      |      | 6    | 6    | 12             |
| 390                              | I-MET              | NIVA |      |      |      |      |      |      |      | 1    | 1    | 2              |
|                                  | I-NUT              | NIVA |      |      |      |      | 1    | 1    | 1    |      |      | 3              |
|                                  | O-MAJ              | NIVA | 1    | 1    | 1    | 1    | 2    | 2    | 2    |      |      | 10             |
|                                  | PAH                | NIVA |      |      |      |      |      |      |      | 1    | 1    | 2              |
| 392                              | P-PHY              | NIVA | 1    | 1    | 2    | 2    | 2    | 2    | 1    | 2    | 2    | 15             |
| 650                              | I-RNC              | VKID |      |      | 1    | 1    | 1    | 1    | 1    |      |      | 5              |
| 652                              | P-PHY              | VKID |      |      |      |      |      | 1    | 1    |      |      | 2              |
| 654                              | P-PHY              | VKID |      |      |      |      |      | 1    | 1    |      |      | 2              |
| 760                              | OC-CB              | IMRN |      |      | 13   |      |      |      |      |      |      | 13             |
|                                  | OC-CL              | IMRN |      |      | 1    |      |      |      |      |      |      | 1              |
|                                  | OC-DD              | IMRN |      |      | 6    |      |      |      |      |      |      | 6              |
|                                  | OC-DN              | IMRN |      |      | 1    |      |      |      |      |      |      | 1              |
|                                  | OC-HC              | IMRN |      |      | 3    |      |      |      |      |      |      | 3              |
| 769                              | I-MET              | IMRN |      |      | 1    |      |      |      |      |      |      | 1              |
|                                  | PAH                | IMRN |      |      | 24   |      |      |      |      |      |      | 24             |
| Grand Total                      |                    |      | 7    | 8    | 62   | 53   | 56   | 64   | 63   | 64   | 65   | 442            |

**Table 3.** An overview of analytical methods for trace metals, chlorinated hydrocarbons and other substances for marine organisms as employed by JAMP. (Parameter codes and group codes are defined in Appendix A).

| Count of PRGRP METHO | PRGRP | RLAB | YEAR |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      | Tot. |      |      |     |
|----------------------|-------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|-----|
|                      |       |      | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 |      | 2005 | 2006 |     |
| 110                  | OC-CB | SIIF | 2    |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      | 2    |     |
| 111                  | OC-CB | SIIF |      | 1    | 1    | 1    | 1    | 1    | 1    | 4    | 14   | 8    | 8    | 8    |      |      |      |      |      |      |      |      |      |      |      |      |      |      | 47   |     |
|                      | OC-CL | SIIF |      |      | 1    | 1    | 1    | 1    | 1    | 2    | 1    | 1    | 1    |      |      |      |      |      |      |      |      |      |      |      |      |      |      | 10   |      |     |
|                      | OC-DD | SIIF |      |      | 1    | 1    | 1    | 1    | 1    | 2    | 1    | 1    | 1    |      |      |      |      |      |      |      |      |      |      |      |      |      |      | 10   |      |     |
|                      | OC-HC | SIIF |      |      |      |      |      |      | 1    | 1    |      | 1    | 1    | 1    |      |      |      |      |      |      |      |      |      |      |      |      |      | 5    |      |     |
| 120                  | I-MET | SIIF | 2    | 1    | 1    | 1    | 1    |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      | 6    |      |     |
| 130                  | I-MET | SIIF | 3    | 1    | 4    | 3    | 2    |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      | 13   |      |     |
| 131                  | I-MET | SIIF |      |      | 1    |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      | 1    |      |     |
| 132                  | I-MET | SIIF |      |      |      | 2    | 2    |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      | 4    |      |     |
| 210                  | OC-CB | VETN |      | 1    | 1    | 1    | 1    |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      | 4    |      |     |
|                      | OC-CL | VETN |      |      | 1    | 1    | 1    |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      | 3    |      |     |
|                      | OC-DD | VETN |      | 1    | 1    | 1    | 1    |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      | 4    |      |     |
| 211                  | OC-CB | VETN |      | 1    | 1    | 1    | 1    |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      | 4    |      |     |
|                      | OC-CL | VETN |      |      | 1    |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      | 1    |      |     |
|                      | OC-DD | VETN |      |      | 1    |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      | 1    |      |     |
| 220                  | I-MET | VETN |      | 2    | 1    | 1    | 1    |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      | 5    |      |     |
| 230                  | I-MET | VETN |      | 1    | 1    | 1    | 1    |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      | 4    |      |     |
| 240                  | I-MET | VETN |      | 2    |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      | 2    |      |     |
| 309                  | PAH   | NIVA |      |      |      |      |      |      |      | 1    |      |      | 50   |      |      | 33   | 27   | 31   | 31   | 31   | 31   | 31   | 31   | 31   | 31   | 31   | 28   | 27   | 27   | 410 |
| 310                  | I-MET | NIVA | 1    | 1    |      |      |      |      | 1    | 1    | 1    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 3    | 2    | 2    | 2    | 1    | 1    | 1    | 1    | 38   |      |     |
| 311                  | I-MET | NIVA | 2    | 2    |      |      |      |      | 4    | 4    | 4    | 6    | 6    | 6    | 6    | 6    | 6    | 6    | 6    | 6    | 6    | 6    |      |      |      |      |      | 94   |      |     |
| 312                  | I-MET | NIVA | 2    | 2    |      |      |      |      | 4    | 4    | 4    | 6    | 6    | 6    | 8    | 6    | 6    | 6    | 6    | 6    | 6    | 6    |      |      |      |      |      | 106  |      |     |
| 315                  | I-MET | NIVA |      |      |      |      |      |      |      |      |      |      |      |      |      | 1    |      |      |      |      |      |      | 12   | 8    | 14   | 12   | 12   | 59   |      |     |
| 320                  | O-MET | NIVA |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      | 6    | 6    | 12   | 6    | 6    | 6    | 6    | 6    | 6    | 6    | 66   |      |     |
| 340                  | OC-CB | NIVA |      |      |      |      |      |      |      | 1    |      |      | 8    | 10   | 10   | 10   | 10   | 10   | 10   | 10   | 10   | 10   | 10   | 10   | 10   | 10   | 10   | 169  |      |     |
|                      | OC-CL | NIVA |      |      |      |      |      |      |      |      |      | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 51   |      |     |
|                      | OC-DD | NIVA |      |      |      |      |      |      |      |      |      | 1    | 3    | 3    | 3    | 3    | 3    | 4    | 4    | 4    | 4    | 4    | 4    | 4    | 4    | 4    | 4    | 59   |      |     |
|                      | OC-HC | NIVA |      |      |      |      |      |      |      |      |      | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 34   |      |     |
| 341                  | OC-CB | NIVA |      |      |      |      |      |      |      |      |      | 8    | 10   | 10   | 10   | 10   | 10   | 10   | 10   | 10   | 10   | 10   | 10   | 10   | 10   | 10   | 10   | 168  |      |     |
|                      | OC-CL | NIVA |      |      |      |      |      |      |      |      |      | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 51   |      |     |
|                      | OC-DD | NIVA |      |      |      |      |      |      |      |      |      | 1    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 34   |      |     |
|                      | OC-HC | NIVA |      |      |      |      |      |      |      |      |      | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 34   |      |     |

JAMP Methods 1981-2007 – Norway (SFT report TA 2370/2008)

| Count of PRGRP<br>METHO<br>D | PRGRP | RLAB | YEAR |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      | Tot. |
|------------------------------|-------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
|                              |       |      | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |      |
| 401                          | I-MET | FIER |      |      |      | 1    |      |      | 1    |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      | 2    |      |
| 402                          | I-MET | FIER |      |      |      | 1    |      |      | 1    |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      | 2    |      |
| 403                          | I-MET | FIER |      |      |      |      |      |      | 1    |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      | 1    |      |
| 404                          | I-MET | FIER |      |      |      |      |      |      | 1    |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      | 1    |      |
| 405                          | I-MET | FIER |      |      |      |      |      |      | 1    |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      | 1    |      |
| 510                          | OC-CB | NACE |      |      |      |      |      |      | 1    | 1    | 8    |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      | 10   |      |
|                              | OC-CL | NACE |      |      |      |      |      | 1    | 1    | 1    | 1    |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      | 4    |      |
|                              | OC-DD | NACE |      |      |      |      |      | 2    | 2    | 2    | 2    |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      | 8    |      |
|                              | OC-HC | NACE |      |      |      |      |      | 1    | 1    | 1    | 1    |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      | 4    |      |
| 511                          | OC-CB | NACE |      |      |      |      |      | 2    | 1    | 1    | 1    |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      | 5    |      |
| 605                          | OC-CL | SIIF |      |      |      |      |      | 1    | 1    | 1    | 2    | 1    | 1    |      |      |      |      |      |      |      |      |      |      |      |      |      |      | 7    |      |
| 607                          | OC-CL | IFEN |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      | 1    | 1    |      |      |      |      |      |      | 1    |      | 3    |      |
| 609                          | OC-CL | SIIF |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      | 1    | 1    |      |      |      |      | 2    |      |
| 610                          | OC-CL | NACE |      |      |      |      |      | 1    | 1    | 1    | 1    |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      | 4    |      |
| 615                          | OC-CL | NIVA |      |      |      |      |      |      |      |      |      | 1    | 1    |      |      |      |      |      |      |      |      |      |      |      |      |      |      | 2    |      |
| 730                          | OC-BB | NIVA |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      | 6    | 15   | 15   | 36   |
| 740                          | PFOS  | NIVA |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      | 6    | 15   | 15   | 36   |
| 775                          | O-MET | GALG |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      | 4    |      |      |      |      | 4    |      |
| 777                          | O-MET | EFDH |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      | 4    |      |      |      | 4    |      |
| 830                          | OC-BB | NILU |      |      |      |      |      |      |      |      |      |      |      |      |      |      | 2    |      |      |      |      |      | 14   | 3    |      |      |      | 19   |      |
| 840                          | OC-DD | NILU |      |      |      |      |      |      |      |      |      |      |      |      |      |      | 1    |      |      |      |      |      |      | 1    |      |      |      | 2    |      |
| 841                          | OC-CB | NILU |      |      |      |      |      |      |      |      |      |      |      |      |      |      | 4    | 8    |      |      |      |      |      | 4    | 4    | 4    | 4    | 4    | 32   |
|                              | OC-DX | NILU |      |      |      |      |      |      |      |      |      |      |      |      |      |      | 27   | 54   |      |      |      |      |      | 27   | 17   | 17   | 17   | 17   | 176  |
| 842                          | OC-CL | NILU |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      | 4    |      |      |      |      |      |      |      |      |      | 4    |      |
| 843                          | OC-BB | NILU |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      | 3    |      |      |      |      |      | 20   | 9    |      |      | 32   |      |
| 850                          | OC-BB | NILU |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      | 2    |      |      |      | 2    |      |
| Grand Total                  |       |      | 12   | 16   | 17   | 17   | 14   | 21   | 31   | 35   | 41   | 55   | 62   | 103  | 49   | 49   | 114  | 162  | 89   | 89   | 95   | 89   | 129  | 137  | 104  | 114  | 119  | 119  | 1882 |

Overview of chemical analyses for sea water 1981-1990 is shown in **Table 4**. A more detailed overview of chemical analyses for sediment and biota 1981-2007 is given in Appendix C and Appendix D. Intercalibration codes (and in some cases laboratory codes) are given to distinguish different ICES exercises.

**Table 4.** An overview of detection limits relating to analyses of contaminants in sea water for the years 1981-1990 (Parameter codes are defined in Appendix A).

| medium    | parameter | detection limit (ppb <sup>1</sup> ) | institute | sample year | method code | Intercalibration |
|-----------|-----------|-------------------------------------|-----------|-------------|-------------|------------------|
| Sea water | Cr        | 200                                 | NIVA      | 87          | 331         | -                |
|           | Mn        | 500                                 | NIVA      | 87          | 331         | -                |
|           | Fe        | 50                                  | NIVA      | 87          | 331         | -                |
|           | Co        | 5                                   | NIVA      | 87          | 331         | -                |
|           | Ni        | 10                                  | NIVA      | 87          | 331         | -                |
|           | Cu        | 10                                  | NIVA      | 86-90       | 331         | 4I               |
|           |           | 50                                  | NIVA      | 85          | 331         | 4Z               |
|           | Zn        | 70                                  | NIVA      | 85          | 331         | 4Z               |
|           |           | 10                                  | NIVA      | 86-90       | 331         | 4I               |
|           | Cd        | 1                                   | NIVA      | 85          | 331         | 4Z               |
|           |           | 0.5                                 | NIVA      | 86-90       | 331         | 4I               |
|           |           | 5                                   | NIVA      | 84          | 331         | 4Z               |
|           |           | 100                                 | SIIF      | 83          | 330         | 4F               |
|           | Hg        | 0.02                                | SERI      | 84-85       | 322         | 4H               |
|           |           | 0.02                                | SERI      | 86-90       | 322         | 4I               |
|           |           | 2                                   | NIVA      | 86          | 332         | 4I               |
|           |           | 10                                  | SIIF      | 84          | 320         | 4F               |
|           | Pb        | 6                                   | NIVA      | 86-90       | 331         | 4Z               |

1) note definition in Appendix A

A detailed overview of chemical analyses employed by JAMP 1981-2007 in Norway for trace metals, chlorinated hydrocarbons and other substances in sediment biota can be found in Appendix C and Appendix D, respectively.

## 2.2 Comment on detection limit

The detection limits given here are approximations based on 3 times the standard deviation of the 'blank' or near zero concentration of a solution. However, day-to-day variations in the analytical instrument may lead to minor variation in detection limits.



## 3. Method descriptions

The following descriptions focus on the principles involved and hence are not intended as detailed specifications. The descriptions vary in detail and may apply to specific time periods (cf., **Table 4**, Appendix C and Appendix D). Hence, they may not necessarily reflect methods currently practised by the contributing institutes.

### 3.1 Sea water

#### 3.1.1 Sample collection

*code*      *description*

*Samplers for sea water*

- |   |  |
|---|--|
| 1 | Hydrobios hydrographical water sampler |
| 2 | Ruttner industrial water sampler       |
| 3 | Ultracleaned polyethylene flask        |
| 4 | Ultracleaned glass Erlenmeyer flask    |

*Sampler deployment for sea water*

- |   |                             |
|---|-----------------------------|
| 1 | 2 nylon lines               |
| 2 | Nylon line, brass messenger |
| 3 | By plastic-gloved hands     |

*Methods of pretreatment of sea water samples*

- |   |                 |
|---|-----------------|
| 0 | None            |
| 1 | Membrane filter |

*Methods of preservation of sea water samples*

- |   |                                   |
|---|-----------------------------------|
| 0 | None                              |
| 1 | Nitric acid addition              |
| 2 | Freezing                          |
| 3 | Nitric acid addition and freezing |

### 3.1.2 Metal analyses

*code*      *description*

**320**      **Mercury in sea water (SIIF)**

Reference: Omang 1971.

**322**      **Mercury in sea water (SERI)**

Reference: Iverfeldt 1984.

Abstract (cf. Iverfeldt 1984)

The 0.5-litre glass Erlenmeyer sampling bottles are specially cleaned: first filled with 6M HCl for 7 days, then 7M HNO<sub>3</sub> for 7 days and finally with deionized water with 1 mL conc. HNO<sub>3</sub>/litre sample for 7 days. The bottles are rinsed extensively between each stage. After sampling, 1 mL conc. HNO<sub>3</sub>/litre sample is added to achieve a pH of 1-2.

Mercury is preconcentrated on a gold trap after being reduced and volatilised by NaBH<sub>4</sub> from an all quartz glass reduction vessel. Mercury free nitrogen gas is used for purging.

The gold trap is constructed as gold grains in layers separated by SiO<sub>2</sub> glass pieces. All gold traps used are individually calibrated and give the same response.

The gold traps are analysed by a double amalgamation step; i.e. the mercury is transferred by heating, to about 800°C, to a second gold trap. This gold trap is analysed using a helium direct current-plasma emission spectrometer (DCPAES). A Keithley 427 Current Amplifier and a Shimadzu Chromatopac C-R2AX Integrator are used. The system is optimized for the mercury line at 253.65 nm using a Hg(0) diffusion tube.

The stable sensitivity of the DCPAES instrument is ensured by a check before and after every sample determination.

Standard solutions are prepared from commercial stock solutions of CH<sub>3</sub>HgCl (1000 ppm, Alfa Products) and mercuric nitrate (1 mL = 1 mg Hg, BDH Spectrosol).

This combination resulted in the extremely low detection limit of 0.02 ng/litre with 5% reproducibility (Cossa & Courau 1984).

**330**      **Cadmium in sea water (SIIF)**

Reference: Paus 1973.

**331**      **Cadmium, copper, zinc, lead, iron, nickel, cobalt in sea water (NIVA)**

The 1-litre polyethylene sampling bottles are specially cleaned: first filled with 6M HCl for 7 days, then 7M HNO<sub>3</sub> for 7 days and finally with deionized water with 1 mL conc. HNO<sub>3</sub>/litre sample for 7 days. The bottles are rinsed extensively between each stage. After sampling, 1 mL conc. HNO<sub>3</sub>/liter sample is added to achieve a pH of 1-2.

The analysis uses chelation with APDC (ammonium-pyrrolidine dithio-carbamate) and DDTC (diethylammonium-N,N-diethyl- dithio-carbamate) extraction with freon, reversed extraction back into water acidified with HNO<sub>3</sub> and reading using a graphite furnace atomic absorption electrothermal spectrometry or GFAAS.

50-250 mL of the acidified sample is transferred to a separator funnel, buffer is added to pH=4.75 and 20 mL of freon. The mixture is vigorously shaken for 120 seconds. After separation of the phases, the organic one is transferred to a 50 mL plastic bottle. The extraction is repeated with further 10 mL of freon, and the organic phase added to the first 20 mL after separation. 0.1 mL concentrated nitric acid is added to the organic phase. The bottle is vigorously shaken and let to stand at least 5 minutes. 4.9 mL deionized water is added and the solution is shaken; this process is repeated after 30 minutes. More acid and water are used for back-extraction if a greater volume of the solution is necessary for the determination.

Apparatus: Perkin Elmer 2380 AAS, HGA 500 (Perkin Elmer graphite furnace), AS 40 (Perkin Elmer autosampler), HCL (hollow cathode lamp).

*Since 1999:* Perkin Elmer Analyst 700.

### **332 Mercury in sea water (NIVA)**

Sample-bottle preparation and sampling is the same procedure as 331.

SnCl<sub>2</sub> is added to 250 mL of acidified sample. The liberated mercury is driven off with air as carrier gas through a gold trap onto which the mercury is amalgamated. CVAAS (cold-vapour atomic absorption spectrometry) is used to quantify the sample. When all the mercury is trapped, the gold is heated to at least 500°C, and the mercury is driven off by the carrier gas into a quartz cell where the atomic absorption signal is measured at 253.7 nm. Apparatus: Perkin Elmer 300SG AAS converted with gold trap.

*Since 1988:* a maximum of 100 mL sample used, diluted if Hg >50 ng/l; Perkin Elmer 1100 B with gold trap used, helium replaced air as carrier gas and lowest signal was 2.5 ng/l.

*Since 1994:* Perkin Elmer FIMS 400 with gold trap, lowest signal 1.0 ng/L. Argon was used as carrier gas.

## 3.2 Sediments

### 3.2.1 Sample collection, storage and pretreatment

| <i>code</i> | <i>description</i>  |
|-------------|---|
|             | <b>Sampling of sediment</b>   |
| GC          | Gravity corer (can include Niemistö corer)  |
| GN          | <u>Reference</u> : Niemistö 1974. Gravity corer with inner diameter of 50 mm.   |
| GS          | Grab sampler  |
| GE          | Gemini twin sampler. Gravity corer with inner diameter of 80 mm for each core.  |
|             | <b>Methods of storage/preservation of sediment samples</b>  |
| 01          | Frozen (prior to inorganic analyses) and freeze dried (prior to organic analyses)   |
|             | <b>Methods of grain size analysis of sediment</b>   |
| 01          | Dry sieving   |
|             | <b>Methods of structural analysis of sediment</b>   |
| 01          | Visual observation through clear plastic cores  |
|             | <b>Methods of sediment extraction</b>   |
| HFO         | 'Total' digestion with mineral acids including hydrofluoric acid (HF), in open vessels, evaporation of excess HF before analysis.                               |
| HNO         | (outdated code = HNO1 3)<br>Extraction with 1:1 HNO <sub>3</sub> (suprapur) for inorganic analyses on "fresh" (i.e., frozen) material.                          |
| EXN         | (outdated code = EXN1 2)<br>Extraction of (organic) contaminants by shaking with non-polar solvents cyclohexane/isopropanol (1:1 v/v) on freeze dried material. |

### 3.2.2 Metal analyses

*code*      *description*

**350**      **Mercury in sediment (NIVA)**

Sample preparation

Samples are freeze dried, homogenated and digested in autoclave. (Freezing-drying of sediment has been practised since 1983).

Extraction (oxidation)

Approximately 1g of the sample is accurately weighed in Pyrex flasks, 20 mL 7N (concentrated) nitric acid (suprapur) is added and the solution heated 120°C for 30 min in an autoclave. The solution is transferred to a 100 mL volumetric flask and diluted to the mark with deionized water.

Determination

*Prior to 1988:* Mercury is determined by CVAAS (cold-vapour atomic absorption spectrometry), using the instrument Coleman Model MAS-50. 50 mL of the sample solution is transferred to the aeration flask. The lowest signal detectable corresponds to 0.03 µg mercury.

*Since 1988:* a maximum of 30 mL sample used, Perkin Elmer 1100 B with gold trap used, and helium replaced air as carrier gas and lowest signal was 0.010 µg/g (1g/100 mL)

*Since 1994:* FIMS 400 (Perkin Elmer) without gold trap, lowest signal 0.005 µg/g (1g/100 mL) Argon has been used as carrier gas.

**351**      **Aluminium, cadmium, cobalt, lead, lithium, chromium, copper, iron, manganese, nickel and zinc in sediment (NIVA)**

Same procedure as 350: #1-2, Drying and nitric acid Extraction.

*Prior to 1992 (1990-91 JMP samples)* 'total' extraction (HFO): Approximately 0.1g of the sample is accurately weighed in, 2 mL of hydrofluoric acid and 6 mL of concentrated nitric acid ('aqua regia') is added and the solution heated in a microwave oven. The solution is transferred to a 100 mL volumetric flask and diluted to the marked with deionized water.

*Since 1992* 'total' extraction (HFO): 0.2g of freeze dried homogenated sample is digested in Teflon vessels with 1 mL 'aqua regia' plus 6 mL hydrofluoric acid neutralised with boric acid and diluted to 100 mL. (cf., Loring D.H., Rantala, R.T.T., 1992. ICES manual for the geochemical analyses of marine sediment and suspended particulate matter).

Determinations by flame atomic absorption spectrometry using acetylene/air flame. Instrument: *Prior to 1986* a Perkin Elmer model 2380 was used. *During 1986-1989* a Perkin Elmer 560 has been used. *Since 1999* a Perkin Elmer Analyst 700 has been used. For determinations of low concentrations (below detection limits) the flameless method (352) is used. The following table shows detection limits in extract solution ( $\mu\text{g/l}$ ) and for the sediment sample ( $\mu\text{g/g}$ ) using 0.2 g :

|           | <b>Element</b>   | <b>extract<br/><math>\mu\text{g/l}</math></b> | <b>sample<br/><math>\mu\text{g/g}</math><br/>(0.2g sample)</b> |
|-----------|------------------|---|--|
| <b>Al</b> | <b>aluminium</b> | 1000  | 500  |
| <b>Cr</b> | <b>chromium</b>  | 50  | 25   |
| <b>Cu</b> | <b>copper</b>    | 100   | 50   |
| <b>Fe</b> | <b>iron</b>      | 200   | 100  |
| <b>Li</b> | <b>lithium</b>   | 10  | 5  |
| <b>Mn</b> | <b>manganese</b> | 50  | 25   |
| <b>Ni</b> | <b>nickel</b>    | 100   | 50   |
| <b>Pb</b> | <b>lead</b>      | 10  | 5  |

**352 Aluminium, cadmium, chromium, cobalt, copper, iron, lead, lithium, manganese and nickel in marine sediment (NIVA)**

Graphite furnace absorption is used for low concentrations.

Same procedure as 350: #1-2, Drying and Extraction, otherwise same as procedure 351.

Concentrations are determined by graphite furnace atomic absorption, electrothermal spectrometry or GFAAS, using a hollow cathode lamp (HCL) or an electrodeless discharge lamp (EDL) as a light source. *Prior to 1986* a Perkin Elmer model 560 with HGA-500 graphite furnace was used. *During 1986-1999* a Perkin Elmer 2380 has been used. *Since 1999* Perkin Elmer Analyst 700 and P.E. Zeeman 4100 has been used.

A 20  $\mu\text{l}$  portion of extract, treated with  $\text{HNO}_3$ , is injected into graphite tube. The sample is then heated electrothermally in a stepwise manner through drying, ashing and atomisation by a programme designed for each element. The programme which controls the ramp time, holding time and temperature for each phase is often adjusted to achieve optimal results.

The elements analysed and approximated limits of detection in extract solution ( $\mu\text{g/l}$ ) and for the sediment sample ( $\mu\text{g/g}$ ) using 0.2 g are shown in the table below:

|           | Element          | extract<br>$\mu\text{g/l}$ | sample<br>$\mu\text{g/g}$<br>(0.2g sample) |
|-----------|------------------|----------------------------|--|
| <b>Al</b> | <b>aluminium</b> | 5                          | 2.5  |
| <b>Cd</b> | <b>cadmium</b>   | 0.1                        | 0.05                                       |
| <b>Co</b> | <b>cobalt</b>    | 5                          | 2.5  |
| <b>Cr</b> | <b>chromium</b>  | 0.5                        | 0.25                                       |
| <b>Cu</b> | <b>copper</b>    | 0.5                        | 0.25                                       |
| <b>Fe</b> | <b>iron</b>      | 5                          | 2.5  |
| <b>Li</b> | <b>lithium</b>   | 10                         | 5  |
| <b>Mn</b> | <b>manganese</b> | 0.5                        | 0.25                                       |
| <b>Ni</b> | <b>nickel</b>    | 5                          | 5  |
| <b>Pb</b> | <b>lead</b>      | 0.5                        | 0.25                                       |

**353 Cadmium, chromium, nickel and lead in marine sediment (NIVA)**

As 352 but *since 1992* the L'vov platform technique is used for these metals.

**354 Arsenic (NIVA)**

Graphite furnace absorption is used for low concentrations.

**355 Aluminium, arsenic, cadmium, chromium, copper, lead, lithium, manganese, nickel and zinc in sediment (NIVA) *Since 2003***

Extraction: same procedure as 351 (since 1992)

Determination

Determination by Inductively Coupled Atomic Emission Spectroscopy (ICP-AES). An aerosol of sample is passed into a plasma of very high temperature. The resulting atoms and ions are emitting radiation which are separated into their different wavelengths in a spectrometer. The light is detected using a Charged-Coupled Device (CCD) and converted into concentration. The determination is done by using internal standards and a Perkin Elmer 4300DV.

Approximated limit of detection in the samples are in some cases higher than for GFAAS (method 352) and are:

|           | <b>Element</b>   | <b>sample<br/>µg/g<br/>(0.2 g sample)</b> | <b>GFAAS (352) sample<br/>µg/g (0.2g sample)</b> |
|-----------|------------------|---|--|
| <b>Al</b> | <b>Aluminum</b>  | 10  | 2.5  |
| <b>As</b> | <b>arsenic</b>   | 15  |  |
| <b>Cd</b> | <b>cadmium</b>   | 1.5                                       | 0.05   |
| <b>Co</b> | <b>cobolt</b>    |   | 2.5  |
| <b>Cr</b> | <b>chromium</b>  | 1.5                                       | 0.25   |
| <b>Cu</b> | <b>copper</b>    | 1   | 0.25   |
| <b>Fe</b> | <b>iron</b>      |   | 2.5  |
| <b>Li</b> | <b>lithium</b>   | 1   | 5  |
| <b>Mn</b> | <b>manganese</b> | 0.25                                      | 0.25   |
| <b>Ni</b> | <b>nickel</b>    | 2   | 5  |
| <b>Pb</b> | <b>lead</b>      | 10  | 0.25   |
| <b>Zn</b> | <b>zinc</b>      | 5   |  |

#### 650 **Pb-210 dating (FORC)**

Reference: Pheiffer-Madsen & Sørensen 1979.

Excerpt (Larsen & Jensen 1989): "The determination of time- dependent sediment parameters is based on the vertical distribution of the natural radioactive isotope lead-210 [=  $^{210}\text{Pb}$ ]. The content of unsupported lead-210, that lead-210 not produced in the sediment) decreases regularly downwards in undisturbed and steadily deposited sediment owing to radioactive decay. Departures from this predictable lead-210 profile in the topmost sediment column permit an assessment of mixing and/or intermittent erosion."

Dried slices of sediment are analysed.



### 3.2.3 Organic analyses

*code*      *description*

**360**      **PCB, QCB, OCS, HCB, DDTEP (p,p'DDE + p,p'DDT), HCHA, (a HCH), HCHG (g HCH = g BHC) in sediment (NIVA)**

*Prior to 1990:* the method is similar to SIIF method JAMP code 110.

#### Cleaning of chemicals and equipment

The equipment is washed with soap and water, rinsed first in water, then in distilled water and then with acetone. Finally, the glass equipment is heated to 550°C.

The equipment is washed with soap and water, then rinsed in 1:5 mixture of HNO<sub>3</sub> and H<sub>2</sub>SO<sub>4</sub>, respectively. Finally, the equipment is rinsed with acetone and cyclohexane.

All solvents are distilled in a special room for this purpose. Distilled water is shaken twice with distilled cyclohexane before use. Sodium sulphate is washed twice with distilled cyclohexane and heated to 550°C.

#### Extraction

10 g freeze dried, homogenised material is extracted twice with a mixture of the non-polar solvents cyclohexane/isopropanol (1:1 v/v). The two hour extraction is performed in a continuously shaken Erlenmeyer flask with 200 mL solvent mixture. The extraction is repeated with half solvent volume. The two extracts are combined and the cyclohexane phase separated by addition of 150+ mL distilled water (excess water relative to isopropanol). The isopropanol/water phase is decanted and the cyclohexane phase washed once with distilled water (several times if also determination of total persistent organic chlorine). The extract is dried over sodium sulphate and then weighed.

#### Clean-up of extract

2 mL cyclohexane extract is shaken vigorously with 2 mL concentrated sulphuric acid and then centrifuged. This process is repeated.

#### Gas chromatographic condition

Carlo Erba 2350 with Electron-Capture Detector (ECD). Splitless injection at 70°C and then programmed temperature raise with 7°/min to 230°C. Column: 30mx0.259 mm (inner diameter), 0.25 µ DB-5 fused silica capillary column. Carrier gas: H<sub>2</sub>, 0.8 bar.

#### Identification and quantification

The sample is quantified using 4-5 dominant peaks in the Clophen A60 standard.

*Since 1990* the principle is the same but details have been altered as followed.

*Since 1992:* Samples are processed by NIVA method H3-1 and analysis follow NIVA method H3-3.

### Cleaning of chemicals and equipment

The equipment is washed in soap and water, then rinsed in water and finally with acetone. The air-dried glass equipment is heated to 550°C.

All solvents are either distilled in a special room for this purpose or if the quality is satisfactory commercial solutions are used. Distilled water is shaken with distilled cyclohexane before use. Sodium sulphate is washed with distilled cyclohexane and heated to 550°C.

*Since 1995* all solvents and chemicals are commercial and used as delivered.

### Extraction

*Since 1991/1992*, 0.5–5 g freeze dried, homogenised material, with internal standards added, is disintegrated/extracted twice with an ultrasonic disintegrator, and with acetone and cyclohexane (15:20) as the solvent. The two extracts are combined and the acetone/cyclohexane-extraction is washed twice with ion exchanged water.

*Since 2001*, 0.5-5g freeze dried or 5-12g wet, homogenised material is mixed with hydromatrix, added internal standards and extracted with dicloromethane and cyclohexane (1:1) using accelerated solvent extraction technique (ASE). Extraction conditions are: 2000psi, 100°C, and 3 static extractions.

### Clean-up of extract

2 mL cyclohexane extract is shaken by whirl mixer with 6 mL concentrated sulphuric acid and then centrifuged. This process is repeated.

*Since 1992*

After extraction the samples are evaporated and filtrated using dichloromethane before clean-up using gel permeation chromatography (GPC). After the clean-up the sample solvent is changed back to cyclohexane again and the volume adjusted to 2 mL. The extract is then shaken twice with concentrated sulphuric acid and the organic phase isolated by centrifuging. Before analysis the sample volume is adjusted by evaporation with N<sub>2</sub>.

### Gas chromatographic condition

Analysis is performed using a HP 5890 Series II gas chromatograph with Electron-Capture Detector (ECD). Samples are injected in a splitless mode at 90°C and then the oven temperature is raised by 3°/min to 280°C. The column used is a 60m x 0.25 mm ID fused silica column with 0.25 µm phase thickness, the phase is 5% phenyl 95% dimethyl siloxane. H<sub>2</sub> at a flow of 1-2 mL/min is used as carrier.

### Identification and quantification

The individual PCB-congeners are identified by their retention times and chromatographic pattern and quantified using internal standards and an eight-level calibration curve in the concentration range of the CBs in the solution to be analysed.

## **369 PAH in sediment (NIVA)**

### Extraction

Deuterated internal standards are added to about 0.5-5g of freeze dried sediment and the sample is extracted in Soxhlet with dichloromethane. The extract is then cleaned with DMF:water, or by silica gel, or both, if the extraction requires it. All the filtrated extractions are rinsed with GPC, and the eluent is now dichloromethane. Afterwards the solvent is changed back to cyclohexane. Finally, the sample is evaporated to a small volume before GC analysis.

### Determination by GC

PAHs are determined on GC coupled to mass-selective detector. The compounds are detected by their respective molecular ions and retention time and quantified by using National Institute for Standards and Technology (NIST) Certified Reference Material (CRM) numbers 1491 and 1941a. Coronene and Dibenzopyrene are quantified with the help of in house standards.

*Since 2001*

Extraction: 0.5-5g freeze dried or 5-12g wet, homogenised material is mixed with hydromatrix, added internal standards and extracted with dichloromethane and cyclohexane (1:1) using accelerated solvent extraction technique (ASE). Extraction conditions are: 2000psi, 100°C, 3 static extractions.

Determination by GC: as before however, Coronene is not determined.

## **370 TBT in sediment (NIVA)**

Reference: Følsvik *et al.* 1999.

Pretreatment: An internal standard is added to the samples. The samples are extracted under acidic conditions. The samples' pH are then adjusted before derivatization with NaBEt<sub>4</sub>. n-hexane is added simultaneously to extract the derivatized organotin compounds. The derivatization/extraction procedure is repeated once and followed by clean-up of the combined organic phase with AL-B SPE-column.

Chemical analysis: Analysis of organotin compounds is carried out by means of a HP 5890A gas chromatograph equipped with a HP 5921A atomic emission detector. The samples are routinely analysed on a 30 m x 0.32 mm x 0.25 µm crosslinked 5 % phenyl methyl siloxane capillary column. The column is maintained at 50 °C for 5 min and the temperature is then increased by 15 °C/min to 230 °C. Emission intensities for tin (271 nm) and carbon (248 nm) are measured by the photodiode array detector and chromatograms recorded by a HP 35920A GC-AED ChemStation.

*Since 2004*

Chemical analysis: The extracts are analysed by GC/MS. The MS detector was operated in selected ion monitoring mode (SIM), and the analyte concentrations in the standard solutions are in the range 1-3000 ng/ml. The GC was equipped with a 30 m column with a stationary phase of 5% phenyl polysiloxane (0.25 mm i.d. and 0.25 µm film thickness), and an inlet operated in the splitless mode. The initial column temperature was 50°C, which after two minutes was raised to 230°C at a rate of 10°C/min and

thereafter raised to 310°C at a rate of 50°C/min. The injector temperature was 280°C, the transfer line temperature was 280°C, the MS source temperature was 230°C and the column flow rate was 1.0 ml/min. Quantification of individual components was performed by using the internal standard method.

Limit of analytical detection is 1 µg/kg dry weight.

#### **760 PCB in sediment (IMRN)**

PCBs in total sediment (50 g) are extracted 3 times by acetone and hexane: Acetone (3:1) using repeated ultrasonication and agitation (Jensen *et al.* 1977).

Sulphur is removed with metallic mercury.

A florisil column (100-230 mesh, 30 cm x 6 mm ID) is used for the separation of the extract into 3 fractions. The first fraction eluted with 2 mL pentane is discarded; the second fraction eluted with 6.5 mL pentane contained PCB, HCB, aldrin, o,p-DDE, p,p-DDE and o,p-DDT; and the third fraction eluted with 10mL pentane:acetone (9:1) contained, alpha-HCH, beta-HCH, gamma-HCH (Lindane), o,p-DDD, p,p-DDD, o,p-DDT (20%) and p,p-DDT.

The third fraction needed further clean up on a neutral alumina column (30 cm x 6 mm ID; deactivated with 6% water). The chlorinated pesticides are eluted with 18 mL pentane. Beta-HCH is not eluted using this method.

A few samples (1990 sediment stations 15S-67S) are cleaned up before separation on the florisil column. A short silica column (10 cm x 6 mm ID) is used, followed by a alumina column (10 cm x 6 mm ID, acidic Al<sub>2</sub>O<sub>3</sub>). Pentane:dichloromethane (4:1) is used for elution of the compounds.

The chlorinated compounds are quantified on a GC with ECD using two different columns: SE-54 CB, fused silica, 50 m x 0.20 mm, 0.11 µm; SP-2330, fused silica, 60 m x 0.25 mm, 0.20 µm.

**769 PAH in sediment (IMRN)**

Ca.50 g of total sediment (< 2 mm) are extracted three times with acetone and hexane:acetone (3:1) using ultrasonication and agitation.

The clean-up of the extract is carried out on a short silica column (10 cm x 6 mm ID) using pentane:dichloromethane (9:1) as eluent. GC/MS equipped with a SE-54 fused silica capillary column (50 m x 0.20 mm ID, 0.11 µm film thickness) is used for the analysis of 2-6 ring aromatic hydrocarbons.

### **3.2.4 Organic carbon**

*code description*

**390 Total organic nitrogen and organic carbon (CORG) in sediment (NIVA)**

5-8 mg of freeze dried sample is weighed in a tin-foiled capsule and heated to over 1800 °C in an oven. The carbon in the gas is analysed in a C-N 1106 Carlo-Erba element analyser. Detection limit for C is 1 µg/mg and N is 1 µg/mg.

### 3.3 Marine biota

#### 3.3.1 Metal analyses

*code*      *description*

**120**      **Mercury in biota (SIIF)**

Representative samples are homogenised in a whirlmixer. 1.0g sample is weighed into a special digestion apparatus with reflux (Bethge apparatus). 10 mL conc. HNO<sub>3</sub> and 1 mL 47% HBr is added and the solution boiled for approximately 30 min. under reflux. The solution is cooled down to room temperature and diluted to volume into a 50 mL volumetric flask with distilled water.

Mercury is determined with CVAAS (cold-vapour atomic absorption spectrometry). Mercury is reduced with SnCl<sub>2</sub>.

*Mercury in shellfish*

A special procedure is used for shellfish. This is the same procedure as above, but bomb digestion (pressurised decomposition) with HNO<sub>3</sub> at 160°C is used instead of pretreatment with HNO<sub>3</sub> and HBr.

**130**      **Cadmium, lead, copper and nickel in biota (SIIF)**

Representative samples are homogenised in a whirlmixer. 1g freeze dried sample is weighed into a vitrosil vessel and dried at 110°C to constant weight to determine the total water content. The vessel is then placed in a cold muffle furnace and the temperature increased slowly to 450°C. The vessel is removed from the furnace and cooled down to room temperature. After wetting the ash with 1 mL conc. HNO<sub>3</sub> and approximately 2 mL H<sub>2</sub>O, gentle heating is performed on a hot plate. The final solution is diluted to volume into a 50 mL volumetric flask with distilled water.

The metals are determined with flame atomic absorption spectrometry after extraction with APDC and MIBK (ammonium-pyrrolidine-dithio-carbamate and methylisobutylketon).

**131**      **Zinc in biota (SIIF)**

Same procedure as 130 but without extraction with APDC/MIBK.

**132 Zinc and manganese in biota (SIIF)**

Same procedure as 131 but quantified by ICP.

**220 Mercury and selenium in fish (VETN)**

Samples are digested in a mixture of nitric and perchloric acid and the mercury content is determined by CVAAS (cold- vapour atomic absorption spectrometry).

Reference: Haugen *et al.* 1985.

Abstract (Haugen *et al.* 1985)

Tissue samples are digested in a mixture of nitric and perchloric acid in a temperature controlled aluminium block. Maximum temperatures for the mercury and selenium determinations are 180 and 225°C, respectively. After reduction of hexavalent selenium with hydrochloric acid and dilution, the samples are transferred to a programmable sample changer. Both elements are determined with hydride generator producing a continuous, integratable signal. The precision at an absorbance reading of 0.4 is better than 1% and the quantification limit is better than 0.02 µg/g, when using a 1.0 g sample. Good agreement has been obtained when compared with other methods. Seven determinations of selenium in NBS bovine liver (1577a) gave an average of 0.71 µg Se/g, which is equivalent to the certified value.

**230 Cadmium in fish (VETN)**

Samples are digested by boiling with concentrated nitric acid (Suprapur) during several hours. The metal content is recorded by graphite furnace atomic absorption spectrometry. Quantification is based on standard addition to the digested samples.

**240 Selenium in biota (VETN)**

Reference: Norheim & Nymoene 1981.

Abstract (Norheim & Nymoene 1981)

The fluorimetric method is used, employing 2,3- diaminonaphtalene (DAN) as a complexing agent. The method uses 5 g of material in an automatic wet digestion procedure with 17 mL of 3+7 mixture of perchloric and nitric acid. The solution is heated slowly (225°C) in a thermostatically controlled aluminium block to distil off the nitric acid without charring. After digestion the hexavalent selenium is reduced with hydrochloric acid. EDTA (ethylenediaminetetraacetic acid) is added and aminoacetic acid is used as buffer. The pH is adjusted to 2.4 using a 35cm long electrode. DAN is added and the solution is heated at 60°C for 1hr. Finally, the solution is extracted with cyclohexane and the selenium content is measured fluorometrically on a Perkin Elmer Model 1000 filter instrument. The detection limit is 10 ppb wet weight.

**310 Mercury in biota (NIVA)**

Large samples (e.g., fish fillet) are homogenised by Tedal Quick Foodmaster Holberth silent cutter with stainless steel blades. For smaller samples (e.g., liver) a Silverson 4R Homogeniser is used.

Drying procedure

*Prior to 1991:* An accurately weighed sample of approximately 1g is freeze dried until constant weight. If the sample has excessive fat content (e.g., fish liver) and therefore, can not be freeze-dried the sample is dried at 105°C for one hour. The samples are cooled in a desiccator for one hour before weighing. Normally, mercury is determined on wet samples and the water content is determined in a subsample.

*Since 1991 (1990 JMP samples:* extracts have been made from wet (fresh) samples.

Extraction (oxidation)

*Prior to 1991:* 50-200 mg freeze-dried sample is weighed in Teflon vessels, 2 mL concentrated nitric acid (suprapur) is added and capped loosely. The solution is heated for about 2 hrs. at 50°C in a thermostatically controlled aluminium block until foaming ceases. The temperature is raised to 110°C and kept there for 6-8 hrs. The solution is then cooled. For samples with high fat content (e.g., liver) 2 mL of 30% H<sub>2</sub>O<sub>2</sub> is added and the solution is heated again to 110°C for 3-4hrs. After cooling the solution is diluted to 25 mL. For mercury, samples of approximately 200 mg material is used and the solution is diluted to 100 mL.

*Since 1991:* extracts are made from 0.2-0.5g dried or 1-2.5g wet sample. For wet samples, two alternative methods are used:

1) if mercury concentrations are to be determined along with other metals (e.g. blue mussel samples): 2-2.5g wet sample + 20 mL 1:1 HNO<sub>3</sub> to 100 mL in Pyrex vessels, or

2) else, 1-2g wet sample + 10 mL 1:1 HNO<sub>3</sub> to 50 mL, digested for 30 min in autoclave and then diluted to 50 mL in Teflon vessels.

If there is excessive fat in the sample 2 mL 30% hydrogen Peroxide (H<sub>2</sub>O<sub>2</sub>) is added.

*Since 1994:* microwave digestion if mercury is determined together with other elements. 0.5-1.5g wet sample and 5 mL concentrated HNO<sub>3</sub> - dilute to 50 mL.

Determination

*Prior to 1988:* Mercury is determined by CVAAS (cold-vapour atomic absorption spectrometry), using the instrument Coleman Model MAS-50. 50 mL of the sample solution is transferred to the aeration flask. Tin chloride is added as a reducing agent.

*Since 1988:* a maximum of 30 mL sample is used, up to concentrations 1.5 µg/l, and diluted if Hg in the solution is more than 1.5 µg/l. A PERKIN ELMER 1100 B with gold trap is used with helium as carrier gas.

*Since 1994:* FIMS 400 (Perkin Elmer) without gold trap. Lowest signal 0.005 µg/g. Argon is used as carrier gas.



**311 Copper, iron and zinc in biota (NIVA)**

(Same homogenising, drying and extraction procedure as 310.)

Determinations by flame atomic absorption spectrometry using acetylene/air flame. Instrument: *Prior to 1986* a Perkin Elmer model 2380 was used and *since 1986* the Perkin Elmer 560 has been used. For determinations of low concentrations (below detection limits) the flameless method (352) is used. The following are elements often analysed by flame and their respective detection limits in extract solution and sample:

| Element   |               | extract<br>µg/l | sample<br>µg/g<br>(0.5-1.5g sample) |
|-----------|---------------|-----------------|-------------------------------------|
| <b>Cu</b> | <b>copper</b> | 50              | 1.7 - 5                             |
| <b>Fe</b> | <b>iron</b>   | 200             | 6.7 - 20                            |
| <b>Zn</b> | <b>zinc</b>   | 10              | 0.3 - 1                             |

**312 Cadmium, chromium, lead and nickel in biota (NIVA)**

Homogenising, drying and extraction procedures as in 310.

Determination

Concentrations are determined by graphite furnace atomic absorption electrothermal spectrometry or GFAAS using a hollow cathode lamp (HCL) or an electrodeless discharge lamp (EDL) as a light source. *Prior to 1986* a Perkin Elmer model 560 with HGA-500 graphite furnace was used. *Since 1986* a Perkin Elmer 2380 has been used with the HGA-500 graphite furnace. *Since 1992* the GFAAS with Zeeman correction (Perkin Elmer Zeeman 4100) has been used for determination of cadmium and lead.

A 20 µl portion of extract, treated with HNO<sub>3</sub>, is injected into graphite tube. The sample is then heated electrothermally in a stepwise manner through drying, ashing and atomisation by a programme designed for each element. The programme which controls the ramp time, holding time and temperature for each phase is adjusted to achieve optimal results.

The limits of detection for the extract and sediment sample are:

| Element   |                 | extract<br>µg/l | sample<br>µg/g<br>(0.5-1.5g sample) |
|-----------|-----------------|-----------------|-------------------------------------|
| <b>Cd</b> | <b>cadmium</b>  | 0.1             | 0.003 – 0.01                        |
| <b>Cr</b> | <b>chromium</b> | 0.5             | 0.017 – 0.05                        |
| <b>Ni</b> | <b>nickel</b>   | 5               | 0.167 – 0.5                         |
| <b>Pb</b> | <b>lead</b>     | 0.5             | 0.017 – 0.05                        |

**315 Arsen, cadmium, chromium, cobalt, copper, lead, manganese, nickel, silver and zinc in biota (NIVA) Since october 2002**

Same homogenising, drying and extraction procedure as 310.

### Determination

Since October 2002, Cd, Cu, Pb and Zn are determined in biota by Inductively Coupled Plasma Mass Spectrometry (ICP-MS). An aerosol of sample is passed into a plasma of very high temperature. The resulting ions are extracted into a vacuum system via a pair of “cones”. Electrostatic lenses focus the stream of ions into a chamber where the mass spectrometer and detector are housed. The masses are separated by a quadrupole mass analyzer and detected by an electron multiplier detector. The determinations are done by using internal standards. Instrument: Perkin Elmer Elan 6000. The detection limit is largely determined by the purity of the blank samples, and to a lesser degree by the amount of material weighed in. The approximated limit of detection in the samples are:

|           | <b>Element</b>   | <b>µg/g</b> |
|-----------|------------------|-------------|
| <b>As</b> | <b>arsenic</b>   | 0.05        |
| <b>Ag</b> | <b>silver</b>    | 0.005       |
| <b>Cd</b> | <b>cadmium</b>   | 0.001       |
| <b>Co</b> | <b>cobolt</b>    | 0.0005      |
| <b>Cr</b> | <b>chromium</b>  | 0.1         |
| <b>Cu</b> | <b>copper</b>    | 0.03        |
| <b>Mn</b> | <b>manganese</b> | 0.02        |
| <b>Ni</b> | <b>nickel</b>    | 0.02        |
| <b>Pb</b> | <b>lead</b>      | 0.02        |
| <b>Zn</b> | <b>zinc</b>      | 0.1         |

#### **401 Mercury in biota (FIER)**

References: Eliann & Julshamn 1978; Julshamn *et al.* 1982.

Abstract (Eliann & Julshamn 1978; Julshamn *et al.* 1982)

Representative samples are homogenised in a whirlmixer. About 1g of sample tissue is dried at 95°C for 24 hrs. 0.5 g sample is weighed into a special digestion apparatus with reflux (Bethge apparatus). 10 mL conc. HNO<sub>3</sub>/H<sub>2</sub>SO<sub>4</sub> (1+1) + V<sub>2</sub>O<sub>5</sub> (0.1% w/v) are added. The solution is boiled for approximately 30 min under reflux. The solution is cooled down to room temperature and diluted to volume into a 50 mL volumetric flask with distilled water and MnO<sub>4</sub>.

Mercury is determined by CVAAS (cold-vapour atomic absorption spectrometry), EDL (electrodeless discharge lamp), wavelength = 253.6 nm, Perkin Elmer 370 AAS, Perkin Elmer mercury analysis system (303-0830 and 303-0832). Mercury is reduced with SnCl<sub>2</sub> to avoid interference with iodine.

Quantification is based on standard curves. Detection limit: dry weight sample. 5 ng/g.

#### **402 Cadmium in biota (FIER)**

References: Julshamn & Brækkan 1975; Julshamn 1977; Julshamn & Andersen 1983.

Abstract (Julshamn & Brækkan 1975; Julshamn 1977; Julshamn & Andersen 1983)

Representative samples are homogenised in a whirlmixer. 1 g of sample tissue is dried at 95°C for 24 hr. 0.1 g sample is weighed into a Sovirel test-tube (20 mL). 2 mL conc. HNO<sub>3</sub>/HClO<sub>4</sub> (9:1) is added and is boiled under pressure. The solution is cooled down to room temperature and diluted to volume into a 10 mL volumetric flask with distilled water.

Concentrations are determined by graphite furnace atomic absorption electrothermal spectrometry or GFAAS, hollow cathode lamp (HCL), Perkin Elmer 5000 AAS, HGA 500 (Perkin Elmer graphite furnace), AS 50 (Perkin Elmer autosampler) and wavelength = 228.8 nm. Matrix modification reagent is (NH<sub>4</sub>)<sub>2</sub>HPO<sub>4</sub>.

Quantification is based on standard addition to the digested samples: Amount added in the analyses: 1 ng Cd /mL. Detection limit for dry tissue sample: 0.5 ng/g.

**403 Lead in biota (FIER)**

(Same procedure as 402: par.#1 and #3-5).

Concentrations are determined by graphite furnace atomic absorption electrothermal spectrometry or GFAAS, EDL (electrodeless discharge lamp) Perkin Elmer 5000 AAS, HGA 500 (Perkin Elmer graphite furnace), AS 50 (Perkin Elmer autosampler) and wavelength = 283.3 nm. Matrix modification reagent is (NH<sub>4</sub>)<sub>2</sub>HPO<sub>4</sub>.

Quantification is based on standard addition to the digested samples: amount added in the analysis Pb 10 ng/mL. Detection limit for wet tissue sample: 10 ng/g.

**404 Copper in biota (FIER)**

With high Cu content (> 1.5 ppm d.w.):

Same procedure as 402: par.#1-5. Concentrations are determined by flame AAS (atomic absorption spectrometry), HCL (hollow-cathode lamp, Perkin Elmer 370 AAS and wavelength = 324.7 nm without background correction.

With low Cu content (< 1.5 ppm d.w.):

Same procedure as 402: par.#1-5. Concentrations are determined by graphite furnace atomic absorption electrothermal spectrometry or GFAAS, HCL (hollow cathode lamp, Perkin Elmer 5000 AAS, HGA 500 (PERKIN ELMER graphite furnace), AS 50 (Perkin Elmer autosampler) and wavelength = 324.7 nm. No matrix modification reagent is used.

Quantification is based on standard addition to the digested samples: 10 ng/mL.

**405 Zinc in biota (FIER)**

Same procedure as 402: par.#1-5. Concentrations are determined by flame AAS (atomic absorption spectrometry), HCL (hollow-cathode lamp, Perkin Elmer 370 AAS and wavelength = 213.9 nm without background correction.

Quantification is based on standard curves.

**406 Arsenic in biota (FIER)**

Same procedure as 402: par.#4-5. Concentrations are determined by graphite furnace atomic absorption electrothermal spectrometry or GFAAS, HCL (hollow- cathode lamp) Perkin Elmer 5000 AAS, HGA 500 (Perkin Elmer graphite furnace) with a conventional tube without platform, AS 50 (Perkin Elmer autosampler) and wavelength = 193.7 nm. Matrix modification reagent is a Ni-solution.

### 3.3.2 Organic analyses

| <i>code</i> | <i>description</i>  |
|-------------|---|
| 110         | <b>PCB, HCB, DDTEP (p,p'DDE + p,p'DDT), HCHG (gHCH = gBHC) in fish and shellfish (SIIF)</b> |

#### Cleaning of chemicals and equipment

All solvents are distilled in a special room for this purpose. Distilled water is shaken twice with distilled cyclohexane before use. Sodium sulphate is washed twice with distilled cyclohexane and heated in the same way as the glass equipment.

#### Extraction

10 g wet, homogenised material is extracted twice with a mixture of cyclohexane/isopropanol (1:1 v/v). The two hour extraction is performed in a continuously shaken Erlenmeyer flask with 200 mL solvent mixture. The extraction is repeated with half solvent volume. The two extracts are combined and the cyclohexane phase separated by addition of 150+ mL distilled water (excess water relative to isopropanol). The isopropanol/water phase is decanted and the cyclohexane phase washed once with distilled water (several times if also determination of total persistent organic chlorine). The extract is dried over sodium sulphate and then weighed.

#### Determination of fat

A part of the cleaned and dried cyclohexane extract is evaporated in an oven to constant weight at 100°C.

Alternatively, the extract is evaporated to constant weight in a flask with Vigreux column in oil bath at 1 atm., 110°C and reflux or in vacuum, 50°C, reflux and weak N<sub>2</sub>-stream.

The results are corrected for loss of cyclohexane. Cyclohexane output is calculated as sum cyclohexane extracts from first and second extraction (grams) minus fat in the same extract.

The precision of the fat determinations is roughly  $\pm 10\%$ . Determinations are given to 0.1% fat. The two methods give comparable results.

#### Clean-up of extract

0.2 g fat is dissolved in 2 mL cyclohexane, shaken vigorously with 2 mL concentrated sulphuric acid and then centrifuged. For further clean-up about 1 mL of the sulphuric acid treated extract is treated with a solution of KOH.

#### Gas chromatographic condition

Hewlett-Packard 5730A with ECD. Splitless injection at 60°C and then programmed temperature raise with 8°/min to 230°C. Column: 50m x 0.3 mm (inner diameter), 0.15  $\mu$  SE-54 glass capillary column. Carrier gas: He, 20 psi.

Identification and quantification

By comparing the whole pattern with various commercial standard mixtures, it has been found that Clophen A60 is in best accordance with the sample types. Some of the isomers in the PCB pattern are selected by comparison with standards of specific isomers and these are used for quantification:

| SIIF code | CB code     | Structure (-biphenyl) | name          |
|-----------|-------------|-----------------------|---------------|
| <b>3</b>  | <b>95</b>   | 2,3,6,2',5'           | Pentachlorine |
| <b>4</b>  | <b>101</b>  | 2,4,5,2',5'           | Pentachlorine |
| <b>9/</b> | <b>149/</b> | 2,4,5,2',3',6'/       | Hexachlorine  |
| <b>10</b> | <b>118</b>  | 2,4,5,3',4,           | Pentachlorine |
| <b>14</b> | <b>138</b>  | 2,3,4,2',4',5'        | Hexachlorine  |
| <b>15</b> | <b>128</b>  | 2,3,4,2',3',4'        | Hexachlorine  |
| <b>16</b> | <b>180</b>  | 2,3,4,5,2',4',5'      | Heptachlorine |

By the GC conditions used it has not been possible to separate isomers 9 and 10.

HCB, HCHG (gHCH=gBHC) and DDTEP (p,p'DDE + p,p'DDT) is determined by multi-level calibration curve. HCHG is identified and quantified by the breakdown product of HCHG (three trichlorobenzene peaks) after treatment with sodium hydroxide (NaOH)

**111 PCB, HCB, DDTEP (p,p'DDE + p,p'DDT), HCHG (gHCH = gBHC) in fish and shellfish (SIIF)**

Same procedure as 110, except that the organochlorine standard is Arochlor 1254 instead of Clophen A60 which is used earlier. The detection limit given for 1982 JMP data for this method is erroneously low. Corrected limits are given in the 1983 JMP data submitted.

The detection limit is dependant on sample quantity. For example the detection limit for HCHG is approximately: 0.1 ppb with 10 g dry weight material, 0.03 ppb with 25 g and 0.01 ppb with 80 g.

*Since 1991* CB204 has been used as an internal standard.

**210 PCB, HCB, DDEPP in fish liver samples (VETN)**

References: Bjerk & Sundby 1970; Norheim 1978.

Abstract (Norheim, 1978)

Extraction: 0.5 g of sample is homogenised in a mortar with 2.5 g of anhydrous sodium sulphate and 2.5 g purified sand and allowed to stand overnight in the dark. After being mixed with 2 g magnesium sulphate, the dry powder is transferred to a short chromatographic column (20 mm x 10 cm) equipped with ground glass stoppers and elutriated with 2 x 10 mL diethyl ether. The column is carefully rotated to release air bubbles and the ether is allowed to stand for 2 hrs in the column before elutriation. The ether is evaporated in centrifuge tubes and the residue dissolved in 1.0 mL n-heptane. The extract is finally treated with 2.0 mL concentrated sulphuric acid for about 1 hour. 5 µl n-heptane is injected into the gas chromatograph.

Quantification: Phenoelcor DP6 is used as standard. The peak height of 2,4,5-2',4',5' hexachlorobiphenyl is used to quantify PCB.

**211 PCB in fish filet samples (VETN)**

Reference: Norheim & Økland 1980.

Abstract (Norheim & Økland, 1980)

Apparatus: A Carlo Erba 2100 gas chromatograph equipped with a nickel-63 electron-capture detector and a 2 m x 3 mm (inner diameter) glass column is used. The column material is 1.5% SP-2250 - 15.9% SP-2401 on 100-120-mesh Supelcon AW DMCS. The column, injector and detector temperatures are 200, 250 and 275°C, respectively. Argon-methane (95+5) is used as the carrier gas, the flow-rate being 55/mL/min. The electrometer attenuation is x128.

Reagents: Sulphuric acid, 95-97%, is pro analysi grade (Merck). Heptane, is pro analysi grade (Merck). Hexachlorobenzene, is pract. grade (Fluka). Octachlorostyrene, is supplied from Norsk Hydro.

Standard solutions: Amounts of 100 mg each of hexachlorobenzene and octachlorostyrene are dissolved in 100 mL of heptane and the mixture is diluted 1 + 50 000 with heptane.

Procedure: A 0.5 g amount of sample is accurately weighed into a 10 mL Soveril glass tube fitted with a screw-cap, and 6 mL of concentrated sulphuric acid are measured into the tube. The tube is placed in a thermostatically controlled oven at 60°C for 4 hr, during which time it is shaken lightly a few times to ensure complete solubilisation of the sample. After cooling, 1.0 mL of heptane is pipetted into the tube, the screw-cap put on and the tube shaken for about 3 min. Finally, the tube is centrifuged with the screw-cap on, after which the sample is ready for gas chromatography. An injection volume of 5 µl is used.

Quantification: The same standard and isomer as in 210 are used to quantify the sample.

**309 PAH in biota (NIVA)**

Extraction

Deuterated internal standards are added to about 10-20g (dependent on available material) of homogenised wet sample, and the sample is then saponified with KOH/methanol. After filtrating through a glass filter, the solution is extracted with n-pentane. The extract is sometimes then cleaned with partition with DMF:water, or by silica gel, or both, if the extraction requires it. All the filtrated extractions are rinsed with GPC, and the eluent is now dichloromethane. Afterwards the solvent is changed back to cyclohexane, and finally, the sample is evaporated to a small volume before GC analysis. GPC was first introduced in 1992.

An aliquot if the homogenised sample is used for dry weight determination.

Determination by GC

PAHs are determined on GC coupled to mass-selective detector. The compounds are detected by their respective molecular ions and retention time and quantified by using National Institute for Standards and Technology (NIST) Certified Reference Material (CRM) number 1491 and number SRM 2974 for blue mussel samples. Coronene and Dibenzopyrenes are quantified with the help of in house standards.

*Since 2001*

Determination by GC, however, Coronene is not determined.

*Since 2003*

SRM 2974 is replaced by SRM2977.

**320 TBT in biota (NIVA)**

Reference: Følsvik *et al.* 1999.

Pretreatment: An internal standard is added to the samples. The samples are extracted under basic conditions. The samples' pH are then adjusted before derivatization with NaBEt<sub>4</sub>, n-hexane is added simultaneously to extract the derivatized organotin compounds. The derivatization/extraction procedure is repeated once and followed by clean-up of the combined organic phase with AL-B SPE-column.

Chemical analysis: Analysis of organotin compounds is carried out by means of a HP 5890A gas chromatograph equipped with a HP 5921A atomic emission detector. The samples are routinely analysed on a 30 m x 0.32 mm x 0.25 µm crosslinked 5 % phenyl methyl siloxane capillary column. The column is maintained at 50 °C for 5 min and the temperature is then increased by 15 °C/min to 230 °C. Emission intensities for tin (271 nm) and carbon (248 nm) are measured by the photodiode array detector and chromatograms recorded by a HP 35920A GC-AED ChemStation.

*Since 2004*

Chemical analysis: The extracts are analysed by gas chromatograph with mass spectrometry (GC-MS). The MS detector is operated in selected ion monitoring mode (SIM), and the analyte concentrations in the standard solutions are in the range 1-3000 ng/ml. The GC is equipped with a 30 m column with a stationary phase of 5% phenyl polysiloxane (0.25 mm i.d. and 0.25 µm film thickness), and an inlet operated in the splitless mode. The initial column temperature is 50°C, which after two minutes is raised to 230°C at a rate of 10°C/min and thereafter raised to 310°C at a rate of 50°C/min. The injector temperature is 280°C, the transfer line temperature is 280°C, the MS source temperature is 230°C and the column flow rate is 1.0 ml/min. Quantification of individual components is performed by using the internal standard method.

Limit of analytical detection is 1 µg/kg wet weight.

**340 PCB, QCB, OCS, HCB, DDTEP (p,p'DDE + p,p'DDT), HCHB, (b HCH), HCHG (g HCH = g BHC) in fish liver (NIVA)**

*Prior to 1991 (1987 JMP NIVA samples)*: Equivalent to method 111 (SIIF) with the following exception:

Determination of fat

The extract is evaporated to constant weight in a flask with Vigreux column in oil bath at 1 atm., 110°C and reflux or in vacuum, 50°C, reflux and weak N<sub>2</sub>-stream.



The results are corrected for loss of cyclohexane. Cyclohexane output is calculated as sum cyclohexane extracts from first and second extraction (grams) minus fat in the same extract.

*Since 1991 (1990 JAMP samples):*

#### Cleaning of chemicals and equipment

The equipment is washed in soap and water, then rinsed in water and finally with acetone. The air-dried glass equipment is heated to 550°C.

All solvents are distilled in a special room for this purpose or if the quality is satisfactory commercial solutions are used. Sodium sulphate is washed twice with distilled cyclohexane and heated to 550°C.

*Since 1995* all solvents and chemicals are commercial and used as delivered. Ion exchanged water is shaken with cyclohexane before use, if it is supposed to blend with the extraction solvent.

#### Extraction

About 2 g (depending on species/tissue) of wet, homogenised material is extracted twice by ultrasonic disintegration with a mixture of cyclohexane:acetone (20:15).

#### Determination of dry weight

The percent dry weight in sediments and biological material is determined by drying an accurately weighed sample (2-5 g) at 105 °C over night (until dryness). The sample is cooled in a desiccator and weighed again.

#### Determination of fat

The cyclohexane extract is evaporated in an oven to constant weight at 105°C.

The precision of the fat determinations is roughly  $\pm 10\%$ . Determinations are reported in % wet weight. (?) with two significant figures.

*Since 2005*

The cyclohexane extract is evaporated in an oven to constant weight at 60°C.

#### Clean-up of extract

About 0.1g fat is dissolved in 2 mL cyclohexane, shaken with 6 mL concentrated sulphuric acid and then centrifuged. For further clean-up about 1 mL of the sulphuric acid treated extract may be treated with a solution of KOH.

*Since 1994*

Internal standards is added to an exact amount of fat, then dissolved in dichloromethane, and the filtrated extract is rinsed with GPC. Afterwards the solvent is changed back to cyclohexane and the volume adjusted to 2 mL. The extract is then shaken twice by whirlmixer with concentrated sulphuric acid and centrifuged. Finally, the sample is evaporated to a small volume before GC analysis.

#### Gas chromatographic condition

*Since 1992*

Analysis is performed using a HP 5890 Series II gas chromatograph with Electron-Capture Detector (ECD). Samples are injected in a splitless mode at 90°C and then the oven temperature is raised by 3°/min to 280°C. The column used is a 60 m x 0.25 mm ID fused silica column with 0.25 µm phase thickness, the phase is 5% phenyl 95% dimethyl siloxane. H<sub>2</sub> at a flow of 1-2 mL/min is used as carrier.

Identification and quantification

The individual PCB-congeners are identified by their retention times and chromatographic pattern, and quantified using internal standards and a eight-level calibration curve in the concentration range of the CBs in the solution to be analysed.

Detection limits: 1-5 µg/kg, 0.05 µg/kg for fillet and 0.1 µg/kg for blue mussels (cf. no. 341)

**341 PCB, QCB, OCS, HCB, DDTEP (p,p'DDE + p,p'DDT), HCHA, (a HCH), HCHG (g HCH = g BHC) in shellfish and fish fillet (NIVA)**

Same procedure as 340: except that the internal standards are added before the extraction procedure, and the detection limits are different from fish liver samples.

Detection limits: 0.05 µg/kg for fillet, 0.1 µg/kg for blue mussels and 1-5 µg/kg for liver samples (cf. no. 340)

**510 PCB, HCB, DDEPP (p,p'DDE), DDTPP (p,p'DDT), HCHG (g HCH = g BHC) in fish liver (NACE)**

Pretreatment and fat determinations: Samples are homogenised in a Waring blender. Homogenised liver samples are ground in a mortar with sea sand and anhydrous sodium sulphate and allowed to stand overnight. The samples are mixed with magnesium-sulphate, transferred to a glass column with sintered glass frit and extracted with diethyl ether. The ether is collected in pre-weighed tubes, evaporated and the amount of fat determined by weighing.

The fat extract is dissolved in hexane for pesticide analyses and treated with concentrated sulphuric acid with gentle agitation. After centrifugation the hexane phase is used for gas chromatography (GC) analysis for pesticides and PCBs. An aliquot of the hexane phase is also treated with sodium alcoholate to convert p,p'DDT to p,p'DDE for the determination of DDT by the increase in DDE.

Moisture content: samples are dried in an oven overnight (16hr) at 105°C, equilibrated in a desiccator for 1hr and re-weighed. Filet samples are also dried for 72hr at 45°C for later determination of mercury.

GC analyses: a Perkin Elmer 8500 GC equipped with an auto-sampler and an Electron-Capture Detector (ECD) (Ni-63) and connected to a 7500 computer with Chrom 3 software is used. The column is a glass 2 m x 1/4", 2 mm (inner diameter) packed with 1.5% SP-2250/1.95% SP-2400 on Suplecoport 100/120. The carrier gas is argon with 5% methane at a flow rate of 40 mL/min. The oven temperature is 210°C, with the injector at 250°C and the detector at 300°C. The amount of sample injected is 2 µl and the flow-through (?) time is 40 min.

Reference standards: commercially available Aroclor 1242, Aroclor 1254, Aroclor 1260 and Supelco's CP pesticide mix are used in addition to a special mixture containing Phenoclor DPG (60% chlorination), hexachlorobenzene (HCB), octachlorostyrene (OCS), p,p'-DDE and decachlorobiphenyl (DCB).

Quantification: response factors are calculated from the integrated areas for each component and the amount injected. The corresponding peaks for the samples are integrated and the concentrations calculated from the area and the response factor. A simplified method for the calculation of the concentrations of PCBs is used. This is based on using the area for the peak in the Phenoclor standard corresponding to 2,4,5,2',4',5'-hexachlorobiphenyl and the total amount of PCB components injected. The concentrations for samples are calculated from the area of the peak corresponding to that used in the standard. This requires that the pattern of PCB components in the sample corresponds to that of the Phenoclor standard.

Detection limits: the minimum detectable amount corresponds to 0.01 µg/g wet weight for liver samples. This gives minimum quantification limits of 0.04 µg/g for PCB.

#### **511 PCB in fish filet (NACE)**

Same procedure as 510: par.#3-6.

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Pretreatment: Homogenised filet samples are treated with concentrated sulphuric acid for 4hr at 60°C and PCBs extracted with hexane. After centrifugation the hexane phase is used for gas chromatography (GC) analysis.

Detection limits: the minimum detectable amount corresponds to 0.005 µg/g wet weight for liver samples. This gives minimum quantification limits of 0.02 µg/g.

**605 EPOCl in shellfish (SIIF)**

The cyclohexane extract from chlorinated hydrocarbon analysis is reduced in volume (by evaporation) and treated with concentrated H<sub>2</sub>SO<sub>4</sub> until the extract is clear. An aliquot exposed to neutron bombardment in a JEEP II atomic reactor at the Institute for Energy Technology (Kjeller, Norway). The radioactivity of the persistent chlorine isotope is measured and quantified against a complete procedural blank.

The detection limit is 5 ppb wet weight.

**610 EPOCl in fish liver (NACE)**

Same procedure as 605.

The detection limit is 800 ppb wet weight.

**615 EPOCl in fish liver (NIVA)**

Same procedure as 605.

The detection limit is 40 ppb wet weight.

**730 PBDE in fish liver (NIVA)**

Extraction and clean-up.

0.1-0.2g fat (produced in the PCB extraction) is mixed with hydromatrix, added internal standard and extracted with isohexane using accelerated solvent extraction technique (ASE). The extraction cell is packed with 20g aluminium oxide deactivated with 5% water. Extraction conditions: Pressure=1500psi, temperature=60°C, number of static cycles=2. For further clean-up the extract is shaken with concentrated sulphuric acid.

Gas chromatographic conditions

The analysis is performed using a HP 6980 Plus gas chromatograph with 5973 mass selective detector operated in negative chemical ionization mode (selected ion monitoring at molecular mass / ion charge (m/z) 79 and 81), chemical ionisation gas is methane. The samples are injected in pulsed splitless mode at 120°C (2 min) and the temperature is raised by 15°C/min to 200°C and then raised by 6°C/min to 330°C (3min). The column type used is a DB-5, 30m x 0.25mm i.d. and 0.25µm film thickness.

Identification and quantification

The compounds are identified by retention time and fragment ions and quantified using internal standard and calibration curve.

Detection limits

The detection limits (on wet weight bases) are dependent on the fat content of the sample, sample amount, individual responses and blanks and can vary from 0.04 µg/kg to 3 µg/kg among the different compounds.

**740 PFAS in fish liver (NIVA)**

Extraction and clean-up

Wet material (1g) is added internal standard and extracted with a mixture of 2ml water, 2 ml 0.25M Na<sub>2</sub>CO<sub>3</sub> and 1ml 0.5M TBA using ultrasonic bath (30min). The pH is adjusted to 3 with sulphuric acid and the sample extracted twice with diethyl ether. The ether

extract is evaporated and the sample is dissolved in 1ml MeOH (methanol) before the liquid-chromatography / mass spectrometry (LC/MS)-analysis.

#### LC/MS/MS Analysis

Analysis of perfluorinated compounds is performed by LC/MS coupled to mass spectrometry (LC/MS/MS). Separation used an Aquity UPLC BEH C18 column (1.7  $\mu\text{m}$ , 2.1 mm id, 50 mm) with a C18 security column (4 x 2.0 mm) with a flow rate of 0.2 ml  $\text{min}^{-1}$  and a column temperature of 60°C. The gradient elution program is presented in Table 1, with 4 mM ammonium acetate in water (mobile phase A) and 4 mM ammonium acetate in methanol (mobile phase B).

Table 1. Mobile phase elution program

| Time | Mobile phase A % | Mobile phase B % |
|------|------------------|------------------|
| 0    | 90               | 10               |
| 2    | 90               | 10               |
| 4    | 65               | 35               |
| 11   | 5                | 95               |
| 12   | 0                | 100              |
| 17   | 0                | 100              |
| 18   | 90               | 10               |
| 20   | 90               | 10               |

The mass spectrometer is operated in electro-spray-injector (ESI) negative mode using multiple reaction monitoring. The cone gas used is nitrogen at a flow rate of 47 l  $\text{hr}^{-1}$  and the collision gas is argon at a flow rate of 600 L  $\text{hr}^{-1}$  operating at a pressure of  $4.9 \times 10^{-3}$  mbar with a source temperature of 120°C, a desolvation gas temperature of 350°C and a capillary voltage of 2 kv.

#### Identification and quantification

The compounds are identified by retention time and daughter ions and quantified using internal standard and calibration curve.

#### Detection limits

The detection limits (wet weight bases) are dependent on the fat content of the sample, sample amount, individual responses and blanks and can vary from 1-10  $\mu\text{g}/\text{kg}$  among the different compounds.

#### Quality control

A liver sample spiked with the PFOS compounds is analysed together with the samples as a part of the quality assurance.

**775 TBT in biota (GALG)**

Pretreatment: An internal standard is added to the samples. Sample is extracted with methanolic hydrochloric acid. The sample's pH is then adjusted before derivatization with NaBEt<sub>4</sub> followed by extraction of the tetraalkyltin-compounds with hexane. The extract is concentrated by rotation-evaporation.

Chemical analysis: Analysis of organotin compounds is carried out by means of a gas chromatograph equipped with a atomic emission detector (GC-AED).

Identification and quantification

The compounds are identified by retention time and atomic emission at specific wavelengths using internal standard and calibration curve.

**777 TBT in biota (EFDH)**

Same procedure as 775 but the analysis is done on a gas chromatograph with a mass spectrometry (GC-MS).

**830 PBDE in fish liver and shellfish (NILU)**

Cleaning of chemicals and equipment

The equipment is washed in soap and water, then rinsed in water and finally with acetone. The air-dried glass equipment is heated to 550°C.

Sodium sulphate is heated to 550°C.

All solvents and chemicals are commercial and used as delivered.

Extraction

Samples are weighed, homogenized, and spiked with <sup>13</sup>C-labelled analogs of the analytes. Biological samples are further homogenized with sodium sulphate. Sediments are extracted with acetone and cyclohexane on a soxhlet. Biological samples are filled into a glass column of suitable size and eluted with cyclohexane/ethylacetate.

Determination of dry weight

The percent dry weight in sediments is determined by drying an accurately weighed sample (2-5 g) at 105 °C over night (until dryness). The sample is cooled in a desiccator and weighed again.

Determination of fat

The cyclohexane extract is evaporated in an oven to constant weight at 105°C.

The precision of the fat determinations is roughly ±10%. Determinations are reported with two significant figures.

Clean up of extract

For most of the samples, most of the sample matrix is removed with size exclusion chromatography (GPC) followed by cleanup on silica and alox columns. Just before quantification, the samples are spiked with a recovery control standard.

Gas chromatographic condition

The cleaned samples are analysed by gas chromatography/mass spectrometry (GC/MS) where the capillary column is a HP Ultra-2, 25 m x 0.20 mm x 0.11 µm; the carrier gas is He, 110 kPa (1.1 bar, 15 psi); the GC-temperature program involves a 1 µl injected

splitless (autoinjector or "hot needle" injection) at 60°C, 2 min. at 60°C, 60–150°C with 20 °/min., 150–230°C with 4 °/min. and 230–280 with 25 C/min and 275°C for 5 min. isothermally.

Identification and quantification

GC/MS analyses are carried out on high resolution GC/MS instrument equipped with a high resolution gas chromatograph, an autosampler and a data system for instrument control, data acquisition and processing.

Ionisation of the sample is performed under electron impact (EI) conditions using 31 eV electrons with a filament emission current of 0.5 mA. The source temperature is set to 270 °C. The components are detected by monitoring the two most abundant ions of the molecular ion chlorine isotope cluster of both native and <sup>13</sup>C<sup>12</sup>-labelled surrogates and the recovery standards. The dwell time and inter-channel time are 50 ms and 10 ms, respectively, for each channel. The ions to be analysed are divided into several groups of 6 to 10 ions each (depending on the column type, excluding the lock mass ion). These groups are consecutively activated by the data system during time intervals that parallel the elution regions of the compounds of interest.

The quantification of the components is made by using internal standard. A calibration is performed with a standard mixture containing known concentrations of the components to be measured and one or more components not contained in the sample (internal standards). The calibration is followed by injection of the sample containing known amounts of internal standards. Quantification is relative to the internal standard. In this way, the sample extract volume will not be included in the calculations, and it is not necessary to accurately determine the final sample volume after evaporation or the injection volume.

Detection limits

Detection limits are very variable and depending mainly on sample amount. Other factors with influence on detection limits are the volume of the final extract, purity of the final extract, recovery, and instrument sensitivity.

**840 DDTTP (NILU)**

Same procedure as 830.

**841 Dioxins, and non-ortho and co-planer PCB compounds (NILU)**

Cleaning of chemicals and equipment

Same procedure as 830.

Extraction

Same procedure as 830.

Determination of dry weight

Same procedure as 830.

Determination of fat

Same procedure as 830.

Clean up of extract

Most of the sample matrix is removed with multicolumn chromatography using different types of silica gel and activated charcoal. A final treatment is done using sulphuric acid, coated silica and aluminium oxide. Prior to analysis, the samples are spiked with a recovery control standard.

Gas chromatographic condition

Isomer specific PCDD/PCDF analysis: 30 m x 0,25 mm Rtx 2330 2), fused silica capillary column, film thickness 0.1 µm. Samples are injected in the splitless mode (2 µl) at an injector port temperature of 270 °C. The injector liner contains a deactivated glass wool plug of 1 cm length placed just above the inlet end of the column. Columns are directly inserted into the source of the mass spectrometer. The GC/MS interface temperature is 250 °C. Helium is used as the carrier gas with a mean linear velocity through the column of 33 cm/s at a column temperature of 200 °C. Separations are performed with the following temperature programming: 70 °C (1') – 25 °C/min – 200 °C (0') – 3 °C/min – 275 °C (4')

Identification and quantification

Same procedure as 830.

Detection limits

See procedure 830.

**842 Toxaphene and chlordane (NILU)**

Same procedure as 830.

**843 Polybrominated biphenyls [PPB], Bromodiphenyl ethers, triboromanisol (NILU)**

Same procedure as 830.

**850 Short Chained Chlorinated Paraffins [SCCP]**

Same procedure as 830.



### **3.3.3 Fat**

| <i>code</i> | <i>description</i>   |
|-------------|--|
| A           | Weight of extracted solids during chlorinated hydrocarbon determinations: procedure 110 (SIIF).          |
| B           | Weight of extracted solids during chlorinated hydrocarbon determinations: procedure 510 (NACE and VETN). |
| C           | Weight of extracted solids from freeze dried material using ethyl acetate (FIER).                        |
| D           | Weight of extracted solids during chlorinated hydrocarbon determinations: procedure 340 (NIVA).          |

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# **Appendix A**

## **Abbreviations**



| Abbreviation <sup>1</sup>    | English                           | Norwegian                                    | Param. group |
|------------------------------|-----------------------------------|--|--------------|
| <b>ELEMENTS</b>              |                                   |  |              |
| Al                           | aluminium                         | <i>aluminium</i>                             | I-MET        |
| As                           | arsenic                           | <i>arsen</i>                                 | I-MET        |
| Cd                           | cadmium                           | <i>kadmium</i>                               | I-MET        |
| Co                           | cobalt                            | <i>kobolt</i>                                | I-MET        |
| Cr                           | chromium                          | <i>krom</i>                                  | I-MET        |
| Cu                           | copper                            | <i>kobber</i>                                | I-MET        |
| Fe                           | iron                              | <i>jern</i>                                  | I-MET        |
| Hg                           | mercury                           | <i>kvikksølv</i>                             | I-MET        |
| Li                           | lithium                           | <i>litium</i>                                | I-MET        |
| Mn                           | manganese                         | <i>mangan</i>                                | I-MET        |
| Ni                           | nickel                            | <i>nikkel</i>                                | I-MET        |
| Pb                           | lead                              | <i>bly</i>                                   | I-MET        |
| Pb210                        | lead-210                          | <i>bly-210</i>                               | I-RNC        |
| Se                           | selenium                          | <i>selen</i>                                 | I-MET        |
| Ti                           | titanium                          | <i>titan</i>                                 | I-MET        |
| Zn                           | zinc                              | <i>sink</i>                                  | I-MET        |
| <b>METAL COMPOUNDS</b>       |                                   |  |              |
| TBT                          | tributyltin                       | <i>tributyltinn</i>                          | O-MET        |
| MBTIN                        | monobutyltin                      | <i>monobutyltinn</i>                         | O-MET        |
| DBTIN                        | dibutyltin                        | <i>dibutyltinn</i>                           | O-MET        |
| TBTIN                        | tributyltin                       | <i>tributyltinn</i>                          | O-MET        |
| MPTIN                        | monophenyltin                     | <i>monofenyltinn</i>                         | O-MET        |
| DPTIN                        | diphenyltin                       | <i>difenyltinn</i>                           | O-MET        |
| TPTIN                        | triphenyltin                      | <i>trifenyltinn</i>                          | O-MET        |
| <b>PAHs</b>                  |                                   |  |              |
| PAH                          | polycyclic aromatic hydrocarbons  | <i>polysykliske aromatiske hydrokarboner</i> |              |
| <b>ACNE</b> <sup>3</sup>     |                                   |  |              |
| ACNE                         | acenaphthene                      | <i>acenaften</i>                             | PAH          |
| <b>ACNLE</b> <sup>3</sup>    |                                   |  |              |
| ACNLE                        | acenaphthylene                    | <i>acenaftylen</i>                           | PAH          |
| <b>ANT</b> <sup>3</sup>      |                                   |  |              |
| ANT                          | anthracene                        | <i>antracen</i>                              | PAH          |
| <b>BAA</b> <sup>3, 4</sup>   |                                   |  |              |
| BAA                          | benzo[a]anthracene                | <i>benzo[a]antracen</i>                      | PAH          |
| <b>BAP</b> <sup>3, 4</sup>   |                                   |  |              |
| BAP                          | benzo[a]pyrene                    | <i>benzo[a]pyren</i>                         | PAH          |
| <b>BBF</b> <sup>3, 4</sup>   |                                   |  |              |
| BBF                          | benzo[b]fluoranthene              | <i>benzo[b]fluoranten</i>                    | PAH          |
| <b>BBJKF</b> <sup>3, 4</sup> |                                   |  |              |
| BBJKF                        | benzo[b,j,k]fluoranthene          | <i>benzo[b,j,k]fluoranten</i>                | PAH          |
| <b>BBJKF</b> <sup>3, 4</sup> |                                   |  |              |
| BBJKF                        | benzo[b+j,k]fluoranthene          | <i>benzo[b+j,k]fluoranten</i>                | PAH          |
| <b>BBKF</b> <sup>3, 4</sup>  |                                   |  |              |
| BBKF                         | benzo[b+k]fluoranthene            | <i>benzo[b+k]fluoranten</i>                  | PAH          |
| <b>BEP</b>                   |                                   |  |              |
| BEP                          | benzo[e]pyrene                    | <i>benzo[e]pyren</i>                         | PAH          |
| <b>BGHIP</b> <sup>3</sup>    |                                   |  |              |
| BGHIP                        | benzo[ghi]perylene                | <i>benzo[ghi]perylen</i>                     | PAH          |
| <b>BIPN</b> <sup>2</sup>     |                                   |  |              |
| BIPN                         | biphenyl                          | <i>bifenyl</i>                               | PAH          |
| <b>BJKF</b> <sup>3, 4</sup>  |                                   |  |              |
| BJKF                         | benzo[j,k]fluoranthene            | <i>benzo[j,k]fluorantren</i>                 | PAH          |
| <b>BKF</b> <sup>3, 4</sup>   |                                   |  |              |
| BKF                          | benzo[k]fluoranthene              | <i>benzo[k]fluorantren</i>                   | PAH          |
| <b>CHR</b> <sup>3, 4</sup>   |                                   |  |              |
| CHR                          | chrysene                          | <i>chrysen</i>                               | PAH          |
| <b>CHRTR</b> <sup>3, 4</sup> |                                   |  |              |
| CHRTR                        | chrysene+triphenylene             | <i>chrysen+trifenylen</i>                    | PAH          |
| <b>COR</b>                   |                                   |  |              |
| COR                          | coronene                          | <i>coronen</i>                               | PAH          |
| <b>DBAHA</b> <sup>3, 4</sup> |                                   |  |              |
| DBAHA                        | dibenz[a,h]anthracene             | <i>dibenz[a,h]antracen</i>                   | PAH          |
| <b>DBA3A</b> <sup>3, 4</sup> |                                   |  |              |
| DBA3A                        | dibenz[a,c/a,h]anthracene         | <i>dibenz[a,c/a,h]antracen</i>               | PAH          |
| <b>DBP</b> <sup>4</sup>      |                                   |  |              |
| DBP                          | dibenzopyrenes                    | <i>dibenzopyren</i>                          | PAH          |
| <b>DBT</b>                   |                                   |  |              |
| DBT                          | dibenzothiophene                  | <i>dibenzothiofen</i>                        | PAH          |
| <b>DBTC1</b>                 |                                   |  |              |
| DBTC1                        | C <sub>1</sub> -dibenzothiophenes | <i>C<sub>1</sub>-dibenzotiofen</i>           | PAH          |
| <b>DBTC2</b>                 |                                   |  |              |
| DBTC2                        | C <sub>2</sub> -dibenzothiophenes | <i>C<sub>2</sub>-dibenzotiofen</i>           | PAH          |
| <b>DBTC3</b>                 |                                   |  |              |
| DBTC3                        | C <sub>3</sub> -dibenzothiophenes | <i>C<sub>3</sub>-dibenzotiofen</i>           | PAH          |
| <b>FLE</b> <sup>3</sup>      |                                   |  |              |
| FLE                          | fluorene                          | <i>fluoren</i>                               | PAH          |
| <b>FLU</b> <sup>3</sup>      |                                   |  |              |
| FLU                          | fluoranthene                      | <i>fluoranten</i>                            | PAH          |
| <b>ICDP</b> <sup>3, 4</sup>  |                                   |  |              |
| ICDP                         | indeno[1,2,3-cd]pyrene            | <i>indeno[1,2,3-cd]pyren</i>                 | PAH          |
| <b>NAP</b> <sup>2</sup>      |                                   |  |              |
| NAP                          | naphthalene                       | <i>naftalen</i>                              | PAH          |
| <b>NAPC1</b> <sup>2</sup>    |                                   |  |              |
| NAPC1                        | C <sub>1</sub> -naphthalenes      | <i>C<sub>1</sub>-naftalen</i>                | PAH          |
| <b>NAPC2</b> <sup>2</sup>    |                                   |  |              |
| NAPC2                        | C <sub>2</sub> -naphthalenes      | <i>C<sub>2</sub>-naftalen</i>                | PAH          |
| <b>NAPC3</b> <sup>2</sup>    |                                   |  |              |
| NAPC3                        | C <sub>3</sub> -naphthalenes      | <i>C<sub>3</sub>-naftalen</i>                | PAH          |
| <b>NAP1M</b> <sup>2</sup>    |                                   |  |              |
| NAP1M                        | 1-methylnaphthalene               | <i>1-metylnaftalen</i>                       | PAH          |
| <b>NAP2M</b> <sup>2</sup>    |                                   |  |              |
| NAP2M                        | 2-methylnaphthalene               | <i>2-metylnaftalen</i>                       | PAH          |

| Abbreviation <sup>1</sup> | English   | Norwegian   | Param. group |
|---------------------------|---|---|--------------|
| <b>NAPD2</b> <sup>2</sup> | 1,6-dimethylnaphthalene   | <i>1,6-dimetylnaftalen</i>  | PAH          |
| <b>NAPD3</b> <sup>2</sup> | 1,5-dimethylnaphthalene   | <i>1,5-dimetylnaftalen</i>  | PAH          |
| <b>NAPDI</b> <sup>2</sup> | 2,6-dimethylnaphthalene   | <i>2,6-dimetylnaftalen</i>  | PAH          |
| <b>NAPT2</b> <sup>2</sup> | 2,3,6-trimethylnaphthalene  | <i>2,3,6-trimetylnaftalen</i>   | PAH          |
| <b>NAPT3</b> <sup>2</sup> | 1,2,4-trimethylnaphthalene  | <i>1,2,4-trimetylnaftalen</i>   | PAH          |
| <b>NAPT4</b> <sup>2</sup> | 1,2,3-trimethylnaphthalene  | <i>1,2,3-trimetylnaftalen</i>   | PAH          |
| <b>NAPTM</b> <sup>2</sup> | 2,3,5-trimethylnaphthalene  | <i>2,3,5-trimetylnaftalen</i>   | PAH          |
| <b>NPD</b>                | Collective term for naphthalenes, phenanthrenes and dibenzothiophenes       | <i>Sammebetegnelse for naftalen, fenantren og dibenzotiofens</i>                | PAH          |
| <b>PA</b> <sup>3</sup>    | phenanthrene  | <i>fenantren</i>  | PAH          |
| <b>PAC1</b>               | C <sub>1</sub> -phenanthrenes   | <i>C<sub>1</sub>-fenantren</i>  | PAH          |
| <b>PAC2</b>               | C <sub>2</sub> -phenanthrenes   | <i>C<sub>2</sub>-fenantren</i>  | PAH          |
| <b>PAC3</b>               | C <sub>3</sub> -phenanthrenes   | <i>C<sub>3</sub>-fenantren</i>  | PAH          |
| <b>PAM1</b>               | 1-methylphenanthrene  | <i>1-metylfenantren</i>   | PAH          |
| <b>PAM2</b>               | 2-methylphenanthrene  | <i>2-metylfenantren</i>   | PAH          |
| <b>PADM1</b>              | 3,6-dimethylphenanthrene  | <i>3,6-dimetylfenantren</i>   | PAH          |
| <b>PADM2</b>              | 9,10-dimethylphenanthrene   | <i>9,10-dimetylfenantren</i>  | PAH          |
| <b>PER</b>                | perylene  | <i>perylen</i>  | PAH          |
| <b>PYR</b> <sup>3</sup>   | pyrene  | <i>pyren</i>  | PAH          |
| <b>DI-Σn</b>              | sum of "n" dicyclic "PAH"s (footnote 2)                                     | <i>sum "n" disykliske "PAH" (fotnote 2)</i>                                     |              |
| <b>P-Σn / P_S</b>         | sum "n" PAH (DI-Σn not included, footnote 3)                                | <i>sum "n" PAH (DI-Σn ikke inkludert, fotnot 3)</i>                             |              |
| <b>PK-Σn / PK_S</b>       | sum carcinogen PAHs (footnote 4)  | <i>sum kreftfremkallende PAH (fotnote 4)</i>                                    |              |
| <b>PAHΣΣ</b>              | DI-Σn + P-Σn etc.   | <i>DI-Σn + P-Σn mm..</i>  |              |
| <b>SPAH</b>               | "total" PAH, specific compounds not quantified (outdated analytical method) | <i>"total" PAH, spesifikk forbindelser ikke kvantifisert (foreldret metode)</i> |              |
| <b>BAP_P</b>              | % BAP of PAHΣΣ  | <i>% BAP av PAHΣΣ</i>   |              |
| <b>BAPPP</b>              | % BAP of P-Σn   | <i>% BAP av P-Σn</i>  |              |
| <b>BPK_P</b>              | % BAP of PK-Σn  | <i>% BAP av PK-Σn</i>   |              |
| <b>PKn_P</b>              | % PK-Σn of PAHΣΣ  | <i>% PK-Σn av PAHΣΣ</i>   |              |
| <b>PKnPP</b>              | % PK-Σn of P-Σn   | <i>% PK-Σn av P-Σn</i>  |              |
| <b>PCBs</b>               |   |   |              |
| <b>PCB</b>                | polychlorinated biphenyls   | <i>polyklorete bifenyler</i>  |              |
| <b>CB</b>                 | individual chlorobiphenyls (CB)   | <i>enkelte klorobifenyl</i>   |              |
| <b>CB28</b>               | CB28 (IUPAC)  | <i>CB28 (IUPAC)</i>   | OC-CB        |
| <b>CB31</b>               | CB31 (IUPAC)  | <i>CB31 (IUPAC)</i>   | OC-CB        |
| <b>CB44</b>               | CB44 (IUPAC)  | <i>CB44 (IUPAC)</i>   | OC-CB        |
| <b>CB52</b>               | CB52 (IUPAC)  | <i>CB52 (IUPAC)</i>   | OC-CB        |
| <b>CB77</b> <sup>5</sup>  | CB77 (IUPAC)  | <i>CB77 (IUPAC)</i>   | OC-CB        |
| <b>CB81</b> <sup>5</sup>  | CB81 (IUPAC)  | <i>CB81 (IUPAC)</i>   | OC-CB        |
| <b>CB95</b>               | CB95 (IUPAC)  | <i>CB95 (IUPAC)</i>   | OC-CB        |
| <b>CB101</b>              | CB101 (IUPAC)   | <i>CB101 (IUPAC)</i>  | OC-CB        |
| <b>CB105</b>              | CB105 (IUPAC)   | <i>CB105 (IUPAC)</i>  | OC-CB        |
| <b>CB110</b>              | CB110 (IUPAC)   | <i>CB110 (IUPAC)</i>  | OC-CB        |
| <b>CB118</b>              | CB118 (IUPAC)   | <i>CB118 (IUPAC)</i>  | OC-CB        |
| <b>CB126</b> <sup>5</sup> | CB126 (IUPAC)   | <i>CB126 (IUPAC)</i>  | OC-CB        |
| <b>CB128</b>              | CB128 (IUPAC)   | <i>CB128 (IUPAC)</i>  | OC-CB        |
| <b>CB138</b>              | CB138 (IUPAC)   | <i>CB138 (IUPAC)</i>  | OC-CB        |
| <b>CB149</b>              | CB149 (IUPAC)   | <i>CB149 (IUPAC)</i>  | OC-CB        |
| <b>CB153</b>              | CB153 (IUPAC)   | <i>CB153 (IUPAC)</i>  | OC-CB        |
| <b>CB156</b>              | CB156 (IUPAC)   | <i>CB156 (IUPAC)</i>  | OC-CB        |
| <b>CB169</b> <sup>5</sup> | CB169 (IUPAC)   | <i>CB169 (IUPAC)</i>  | OC-CB        |
| <b>CB170</b>              | CB170 (IUPAC)   | <i>CB170 (IUPAC)</i>  | OC-CB        |
| <b>CB180</b>              | CB180 (IUPAC)   | <i>CB180 (IUPAC)</i>  | OC-CB        |
| <b>CB194</b>              | CB194 (IUPAC)   | <i>CB194 (IUPAC)</i>  | OC-CB        |
| <b>CB209</b>              | CB209 (IUPAC)   | <i>CB209 (IUPAC)</i>  | OC-CB        |
| <b>CB-Σ7</b>              | CB:<br>28+52+101+118+138+153+180  | <i>CB: 28+52+101+118+138+153+180</i>  |              |
| <b>CB-ΣΣ</b>              | sum of CBs, includes CB-Σ7  | <i>sum CBer, inkluderer CB-Σ7</i>   |              |



| Abbreviation <sup>1</sup> | English  | Norwegian   | Param. group |
|---------------------------|--|---|--------------|
| <b>TECBW</b>              | Sum of CB-toxicity equivalents after WHO model, see <b>TEQ</b>             | <i>Sum CB- toksitets ekvivalenter etter WHO modell, se <b>TEQ</b></i>             |              |
| <b>TECBS</b>              | Sum of CB-toxicity equivalents after SAFE model, see <b>TEQ</b>            | <i>Sum CB-toksitets ekvivalenter etter SAFE modell, se <b>TEQ</b></i>             |              |
| <b>DIOXINS</b>            |  |   |              |
| <b>TCDD</b>               | 2, 3, 7, 8-tetrachloro-dibenzo dioxin                                      | <i>2, 3, 7, 8-tetrakloro-dibenzo dioksin</i>                                      | OC-DX        |
| <b>CDDST</b>              | Sum of tetrachloro-dibenzo dioxins   | <i>Sum tetrakloro-dibenzo dioksiner</i>   |              |
| <b>CDD1N</b>              | 1, 2, 3, 7, 8-pentachloro-dibenzo dioxin                                   | <i>1, 2, 3, 7, 8-pentakloro-dibenzo dioksin</i>                                   | OC-DX        |
| <b>CDDSN</b>              | Sum of pentachloro-dibenzo dioxins   | <i>Sum pentakloro-dibenzo dioksiner</i>   |              |
| <b>CDD4X</b>              | 1, 2, 3, 4, 7, 8-hexachloro-dibenzo dioxin                                 | <i>1, 2, 3, 4, 7, 8-heksakloro-dibenzo dioksin</i>                                | OC-DX        |
| <b>CDD6X</b>              | 1, 2, 3, 6, 7, 8-hexachloro-dibenzo dioxin                                 | <i>1, 2, 3, 6, 7, 8-heksakloro-dibenzo dioksin</i>                                | OC-DX        |
| <b>CDD9X</b>              | 1, 2, 3, 7, 8, 9-hexachloro-dibenzo dioxin                                 | <i>1, 2, 3, 7, 8, 9-heksakloro-dibenzo dioksin</i>                                | OC-DX        |
| <b>CDDSX</b>              | Sum of hexachloro-dibenzo dioxins  | <i>Sum heksakloro-dibenzo dioksiner</i>   |              |
| <b>CDD6P</b>              | 1, 2, 3, 4, 6, 7, 8-heptachloro-dibenzo dioxin                             | <i>1, 2, 3, 4, 6, 7, 8-heptakloro-dibenzo dioksin</i>                             | OC-DX        |
| <b>CDDSP</b>              | Sum of heptachloro-dibenzo dioxins   | <i>Sum heptakloro-dibenzo dioksiner</i>   |              |
| <b>CDDO</b>               | Octachloro-dibenzo dioxin  | <i>Oktakloro-dibenzo dioksin</i>  | OC-DX        |
| <b>PCDD</b>               | Sum of polychlorinated dibenzo-p-dioxins                                   | <i>Sum polyklorinaterte-dibenzo-p-dioksiner</i>                                   |              |
| <b>CDF2T</b>              | 2, 3, 7, 8-tetrachloro-dibenzofuran  | <i>2, 3, 7, 8-tetrakloro-dibenzofuran</i>   | OC-DX        |
| <b>CDFST</b>              | Sum of tetrachloro-dibenzofurans   | <i>Sum tetrakloro-dibenzofuraner</i>  |              |
| <b>CDFDN</b>              | 1, 2, 3, 7, 8/1, 2, 3, 4, 8-pentachloro-dibenzofuran                       | <i>1, 2, 3, 7, 8/1, 2, 3, 4, 8-pentakloro-dibenzofuran</i>                        | OC-DX        |
| <b>CDF2N</b>              | 2, 3, 4, 7, 8-pentachloro-dibenzofuran                                     | <i>2, 3, 4, 7, 8-pentakloro-dibenzofuran</i>                                      | OC-DX        |
| <b>CDFSN</b>              | Sum of pentachloro-dibenzofurans   | <i>Sum pentakloro-dibenzofuraner</i>  |              |
| <b>CDFDX</b>              | 1, 2, 3, 4, 7, 8/1, 2, 3, 4, 7, 9-hexachloro-dibenzofuran                  | <i>1, 2, 3, 4, 7, 8/1, 2, 3, 4, 7, 9-heksakloro-dibenzofuran</i>                  | OC-DX        |
| <b>CDF6X</b>              | 1, 2, 3, 6, 7, 8-hexachloro-dibenzofuran                                   | <i>1, 2, 3, 6, 7, 8-heksakloro-dibenzofuran</i>                                   | OC-DX        |
| <b>CDF9X</b>              | 1, 2, 3, 7, 8, 9-hexachloro-dibenzofuran                                   | <i>1, 2, 3, 7, 8, 9-heksakloro-dibenzofuran</i>                                   | OC-DX        |
| <b>CDF4X</b>              | 2, 3, 4, 6, 7, 8-hexachloro-dibenzofuran                                   | <i>2, 3, 4, 6, 7, 8-heksakloro-dibenzofuran</i>                                   | OC-DX        |
| <b>CDFSX</b>              | Sum of hexachloro-dibenzofurans  | <i>Sum heksakloro-dibenzofuraner</i>  |              |
| <b>CDF6P</b>              | 1, 2, 3, 4, 6, 7, 8-heptachloro-dibenzofuran                               | <i>1, 2, 3, 4, 6, 7, 8-heptakloro-dibenzofuran</i>                                | OC-DX        |
| <b>CDF9P</b>              | 1, 2, 3, 4, 7, 8, 9-heptachloro-dibenzofuran                               | <i>1, 2, 3, 4, 7, 8, 9-heptakloro-dibenzofuran</i>                                | OC-DX        |
| <b>CDFSP</b>              | Sum of heptachloro-dibenzofurans   | <i>Sum heptakloro-dibenzofuraner</i>  | OC-DX        |
| <b>CDFO</b>               | Octachloro-dibenzofurans   | <i>Octakloro-dibenzofuran</i>   | OC-DX        |
| <b>PCDF</b>               | Sum of polychlorinated dibenzofurans                                       | <i>Sum polyklorinated dibenzo-furaner</i>   |              |
| <b>CDDFS</b>              | Sum of PCDD and PCDF   | <i>Sum PCDD og PCDF</i>   |              |
| <b>TCDNN</b>              | Sum of TCDD-toxicity equivalents after Nordic model, see <b>TEQ</b>        | <i>Sum TCDD- toksitets ekvivalenter etter Nordisk modell, se <b>TEQ</b></i>       |              |
| <b>TCDDI</b>              | Sum of TCDD-toxicity equivalents after international model, see <b>TEQ</b> | <i>Sum TCDD-toksitets ekvivalenter etter internasjonale modell, se <b>TEQ</b></i> |              |
| <b>PESTICIDES</b>         |  |   |              |
| <b>ALD</b>                | aldrin   | <i>aldrin</i>   | OC-DN        |
| <b>DIELD</b>              | dieldrin   | <i>dieldrin</i>   | OC-DN        |
| <b>ENDA</b>               | endrin   | <i>endrin</i>   | OC-DN        |
| <b>CCDAN</b>              | cis-chlordane (=α-chlordane)   | <i>cis-klordan (=α-klordan)</i>   | OC-DN        |
| <b>TC DAN</b>             | trans-chlordane (=γ-chlordane)   | <i>trans-klordan (=γ-klordan)</i>   | OC-DN        |
| <b> OCDAN</b>             | oxy-chlordane  | <i>oksy-klordan</i>   | OC-DN        |
| <b>TNONC</b>              | trans-nonachlor  | <i>trans-nonaklor</i>   | OC-DN        |

| Abbreviation <sup>1</sup> | English   | Norwegian  | Param. group |
|---------------------------|---|--|--------------|
| <b>TCDAN</b>              | trans-chlordane   | <i>trans-klordan</i>   | OC-DN        |
| <b>OCS</b>                | octachlorostyrene   | <i>oktaklorstyren</i>  | OC-CL        |
| <b>QCB</b>                | pentachlorobenzene  | <i>pentaklorbenzen</i>   | OC-CL        |
| <b>DDD</b>                | dichlorodiphenyldichloroethane<br>1,1-dichloro-2,2-bis-(4-chlorophenyl)ethane   | <i>diklordifenyldikloretan</i><br><i>1,1-dikloro-2,2-bis-(4-klorofenyl)etan</i>  | OC-DD        |
| <b>DDE</b>                | dichlorodiphenyldichloroethylene<br>(principle metabolite of DDT)<br>1,1-dichloro-2,2-bis-(4-chlorophenyl)ethylene*             | <i>diklordifenyldikloretylen</i><br><i>(hovedmetabolitt av DDT)</i><br><i>1,1-dikloro-2,2-bis-(4-klorofenyl)etylen</i>                     | OC-DD        |
| <b>DDT</b>                | dichlorodiphenyltrichloroethane<br>1,1,1-trichloro-2,2-bis-(4-chlorophenyl)ethane   | <i>diklordifenyltrikloretan</i><br><i>1,1,1-trikloro-2,2-bis-(4-klorofenyl)etan</i>  | OC-DD        |
| <b>DDEOP</b>              | o,p'-DDE  | <i>o,p'-DDE</i>  | OC-DD        |
| <b>DDEPP</b>              | p,p'-DDE  | <i>p,p'-DDE</i>  | OC-DD        |
| <b>DDTOP</b>              | o,p'-DDT  | <i>o,p'-DDT</i>  | OC-DD        |
| <b>DDTPP</b>              | p,p'-DDT  | <i>p,p'-DDT</i>  | OC-DD        |
| <b>TDEPP</b>              | p,p'-DDD  | <i>p,p'-DDD</i>  | OC-DD        |
| <b>DDTEP</b>              | p,p'-DDE + p,p'-DDT   | <i>p,p'-DDE + p,p'-DDT</i>   | OC-DD        |
| <b>DD-nΣ</b>              | sum of DDT and metabolites,<br>n = number of compounds  | <i>sum DDT og metabolitter,</i><br><i>n = antall forbindelser</i>  | OC-DD        |
| <b>HCB</b>                | hexachlorobenzene   | <i>heksaklorbenzen</i>   | OC-CL        |
| <b>HCHG</b>               | Lindane<br>$\gamma$ HCH = gamma<br>hexachlorocyclohexane<br>( $\gamma$ BHC = gamma<br>benzenehexachloride, outdated<br>synonym) | <i>Lindan</i><br>$\gamma$ HCH = gamma<br><i>heksaklorsykloheksan</i><br>( $\gamma$ BHC = gamma benzenheksaklorid,<br>foreldret betegnelse) | OC-HC        |
| <b>HCHA</b>               | $\alpha$ HCH = alpha HCH  | <i><math>\alpha</math> HCH = alpha HCH</i>   | OC-HC        |
| <b>HCHB</b>               | $\beta$ HCH = beta HCH  | <i><math>\beta</math> HCH = beta HCH</i>   | OC-HC        |
| <b>HC-nΣ</b>              | sum of HCHs, n = count  | <i>sum av HCHs, n = antall</i>   |              |
| <b>EOCI</b>               | extractable organically bound<br>chlorine   | <i>ekstraherbart organisk bundet klor</i>  | OC-CL        |
| <b>EPOCI</b>              | extractable persistent organically<br>bound chlorine  | <i>ekstraherbart persistent organisk<br/>bundet klor</i>   | OC-CL        |
| <b>PBDEs</b>              |   |  |              |
| <b>PBDE</b>               | polybrominated diphenyl ethers  | <i>polybromerte difenyletere</i>   | OC-BB        |
| <b>BDE</b>                | brominated diphenyl ethers  |  | OC-BB        |
| <b>BDE-28</b>             | 2,4,4'-tribromodiphenyl ether   | <i>2,4,4'-tribromdifenyleter</i>   | OC-BB        |
| <b>BDE-47</b>             | 2,2',4,4'-tetrabromodiphenyl ether  | <i>2,2',4,4'-tetrabromdifenyleter</i>  | OC-BB        |
| <b>BDE-49*</b>            | 2,2',4,5'- tetrabromodiphenyl ether   | <i>2,2',4,5'- tetrabromdifenyleter</i>   | OC-BB        |
| <b>BDE-66*</b>            | 2,3',4',6- tetrabromodiphenyl ether   | <i>2,3',4',6- tetrabromdifenyleter</i>   | OC-BB        |
| <b>BDE-71*</b>            | 2,3',4',6- tetrabromodiphenyl ether   | <i>2,3',4',6- tetrabromdifenyleter</i>   | OC-BB        |
| <b>BDE-77</b>             | 3,3',4,4'-tetrabromodiphenyl ether  | <i>3,3',4,4'-tetrabromdifenyleter</i>  | OC-BB        |
| <b>BDE-85</b>             | 2,2',3,4,4'-pentabromodiphenyl<br>ether   | <i>2,2',3,4,4'-pentabromdifenyleter</i>  | OC-BB        |
| <b>BDE-99</b>             | 2,2',4,4',5-pentabromodiphenyl<br>ether   | <i>2,2',4,4',5-pentabromdifenyleter</i>  | OC-BB        |
| <b>BDE-100</b>            | 2,2',4,4',6-pentabromodiphenyl<br>ether   | <i>2,2',4,4',6-pentabromdifenyleter</i>  | OC-BB        |
| <b>BDE-119</b>            | 2,3',4,4',6-pentabromodiphenyl<br>ether   | <i>2,3',4,4',6-pentabromdifenyleter</i>  | OC-BB        |
| <b>BDE-138</b>            | 2,2',3,4,4',5'-hexabromodiphenyl<br>ether   | <i>2,2',3,4,4',5'-heksabromdifenyleter</i>   | OC-BB        |
| <b>BDE-153</b>            | 2,2',4,4',5,5'-hexabromodiphenyl<br>ether   | <i>2,2',4,4',5,5'-heksabromdifenyleter</i>   | OC-BB        |
| <b>BDE-154</b>            | 2,2',4,4',5,6'-hexabromodiphenyl<br>ether   | <i>2,2',4,4',5,6'-heksabromdifenyleter</i>   | OC-BB        |
| <b>BDE-183</b>            | 2,2',3,4,4',5',6-<br>heptabromodiphenyl ether   | <i>2,2',3,4,4',5',6-heptabromdifenyleter</i>   | OC-BB        |
| <b>BDE-205</b>            | 2,2',3,3',4,4',5,5',6'-<br>nonabromodiphenyl ether  | <i>2,2',3,3',4,4',5,5',6'-<br/>nonabromdifenyleter</i>   | OC-BB        |
| <b>BDE-209</b>            | Decabromodiphenyl ether   | <i>Dekabromdifenyleter</i>   | OC-BB        |

| Abbreviation <sup>1</sup> | English  | Norwegian   | Param. group |
|---------------------------|--|---|--------------|
| <b>PFAS</b>               | perfluorinated alkylated substances  | perfluoralkylertestoffer  |              |
| <b>PFBS</b>               | perfluorobutane sulfonate  | perfluorbutan sulfonat  | PFAS         |
| <b>PFHxA</b>              | perfluorohexanoic acid   | perfluorhexansyre   | PFAS         |
| <b>PFHpA</b>              | perfluoroheptanoic acid  | perfluorheptansyre  | PFAS         |
| <b>PFOA</b>               | perfluorooctanoic acid   | perfluoroktansyre   | PFAS         |
| <b>PFNA</b>               | perfluorononanoic acid   | perfluornonansyre   | PFAS         |
| <b>PFOS</b>               | perfluorooctanoic sulfonate  | perfluoroktansulfonat   | PFAS         |
| <b>NTOT</b>               | total organic nitrogen   | <i>total organisk nitrogen</i>  | I-NUT        |
| <b>CTOT</b>               | total organic carbon   | <i>total organisk karbon</i>  | O-MAJ        |
| <b>CORG</b>               | organic carbon   | <i>organisk karbon</i>  | O-MAJ        |
| <b>GSAMT</b>              | grain size   | <i>kornfordeling</i>  | P-PHY        |
| <b>MOCON</b>              | moisture content   | <i>vanninnhold</i>  | P-PHY        |
| <b>INSTITUTES</b>         |  |   |              |
| <b>EFDH</b>               | Eurofins [DK]  | <i>Eurofins [DK]</i>  |              |
| <b>FIER</b>               | Institute for Nutrition, Fisheries Directorate   | <i>Fiskeridirektoratets Ernæringsinstitutt</i>  |              |
| <b>FORC</b>               | FORCE Institutes, Div. for Isotope Technique and Analysis [DK]   | <i>FORCE Institutterne, Div. for Isotopteknik og Analyse [DK]</i>   |              |
| <b>GALG</b>               | GALAB Laboratories GmbH [D]  | <i>GALAB Laboratories GmbH [D]</i>  |              |
| <b>IFEN</b>               | Institute for Energy Technology  | <i>Institutt for energiteknikk</i>  |              |
| <b>IMRN</b>               | Institute of Marine Research (IMR)   | <i>Havforskningsinstituttet</i>   |              |
| <b>NACE</b>               | Nordic Analytical Center   | <i>Nordisk Analyse Center</i>   |              |
| <b>NILU</b>               | Norwegian Institute for Air Research   | <i>Norsk institutt for luftforskning</i>  |              |
| <b>NIVA</b>               | Norwegian Institute for Water Research   | <i>Norsk institutt for vannforskning</i>  |              |
| <b>SERI</b>               | Swedish Environmental Research Institute   | <i>Institutionen för vatten- och luftvårdsforskning</i>   |              |
| <b>SIIF</b>               | Fondation for Scientific and Industrial Research at the Norwegian Institute of Technology - SINTEF (a division, previously: Center for Industrial Research SI) | <i>Stiftelsen for industriell og teknisk forskning ved Norges tekniske høyskole- SINTEF (en avdeling, tidligere: Senter for industriforskning SI)</i> |              |
| <b>VETN</b>               | Norwegian Veterinary Institute   | <i>Veterinærinstituttet</i>   |              |
| <b>VKID</b>               | Water Quality Institute [DK]   | <i>Vannkvalitetsinstitutt [DK]</i>  |              |

- 1) After: ICES Environmental Data Reporting Formats. International Council for the Exploration of the Sea. July 1996 and supplementary codes related to non-ortho and mono-ortho PCBs and "dioxins" (ICES pers. comm.)
  - 2) Indicates "PAH" compounds that are dicyclic and not truly PAHs typically identified during the analyses of PAH, include naphthalenes and "biphenyls".
  - 3) Indicates the sum of tri- to hexacyclic PAH compounds named in EPA protocol 8310 minus naphthalene (dicyclic), so that the SFT classification system can be applied
  - 4) Indicates PAH compounds potentially cancerogenic for humans according to IARC (1987, updated 14.August 2007 at <http://monographs.iarc.fr/ENG/Classification/crthgr01.php>), i.e., categories 1, 2A, and 2B (are, possibly and probably carcinogenic). NB.: the update includes Chrysene as cancerogenic and hence, KPAH with Chrysene should not be used in SFT's classification system for this sum-variable (Molvær *et al.* 1997).
  - 5) Indicates non ortho- co-planer PCB compounds i.e., those that lack Cl in positions 1, 1', 5, and 5'
- \*) The Pesticide Index, second edition. The Royal Society of Chemistry, 1991.

**Other abbreviations andre forkortelser**

|             | English  | Norwegian  |
|-------------|--|--|
| <b>TEQ</b>  | "Toxicity equivalency factors" for the most toxic compounds within the following groups:   | " <i>Toxisitetsequivivalentfaktorer</i> " for de giftigste forbindelsene innen følgende grupper.   |
|             | <ul style="list-style-type: none"> <li>polychlorinated dibenzo-p-dioxins and dibenzofurans (<b>PCDD/PCDFs</b>).<br/>Equivalents calculated after Nordic model (Ahlborg 1989)<sup>1</sup> or international model (Int./EPA, cf. Van den Berg <i>et al.</i>, 1998)<sup>2</sup></li> <li>non-ortho and mono-ortho substituted chlorobiphenyls after WHO model (Ahlborg <i>et al.</i>, 1994)<sup>3</sup> or Safe (1994, cf. NILU pers. comm.)</li> </ul> | <ul style="list-style-type: none"> <li><i>polykloreerte dibenzo-p-dioksiner og dibenzofuraner (PCDD/PCDF)</i>.<br/><i>Ekvivalentberegning etter nordisk modell (Ahlborg 1989)<sup>1</sup> eller etter internasjonal modell (Int./EPA, cf. Van den Berg et al. 1998)<sup>2</sup></i></li> <li><i>non-orto og mono-orto substituerte klorobifenylar etter WHO modell (Ahlborg et al., 1994)<sup>3</sup> eller Safe (1994, cf. NILU pers. medd.)</i></li> </ul> |
| <b>ppm</b>  | parts per million, mg/kg   | <i>deler pr. milliondeler, mg/kg</i>   |
| <b>ppb</b>  | parts per billion, µg/kg   | <i>deler pr. milliarddeler, µg/kg</i>  |
| <b>ppp</b>  | parts per trillion, ng/kg  | <i>deler pr. tusen-milliarddeler, ng/kg</i>  |
| <b>d.w.</b> | dry weight basis   | <i>tørrvekt basis</i>  |
| <b>w.w.</b> | wet weight or fresh weight basis   | <i>våtvpekt eller friskvekt basis</i>  |

<sup>1</sup>) Ahlborg, U.G., 1989. Nordic risk assessment of PCDDs and PCDFs. *Chemosphere* 19:603-608.

<sup>2</sup>) Van den Berg, Birnbaum, L, Bosveld, A. T. C. and co-workers, 1998. Toxic equivalency factors (TEFs) for PCBs, PCDDs, PCDFs for humans and wildlife. *Environ Hlth. Perspect.* 106:775-792.

<sup>3</sup>) Ahlborg, U.G., Becking G.B., Birnbaum, L.S., Brouwer, A, Derks, H.J.G.M., Feely, M., Golor, G., Hanberg, A., Larsen, J.C., J.C., Liem, A.K.G., Safe, S.H., Schlatter, C., Wärn, F., Younes, M., Yrjänheikki, E., 1994. Toxic equivalency factors for dioxin-like PCBs. Report on a WHO-ECEH and IPSC consultation , December 1993. *Chemosphere* 28:1049-1067.

## **Appendix B**

# **Participation in intercalibration exercises**



## Participation in intercalibration exercises

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**General:** NIVA which has participated in all QUASIMEME exercises relevant to the parameter and tissues monitored. The laboratories at NIVA, both the chemical, microbiological and the ecotoxicological laboratories, are accredited in 1993 for quality assurance system by the National Measurement Service - Norwegian Accreditation and based on European Standard EN45000. NIVA has reference number P009.

### Sea water:

- 4H ICES/JMG Fifth Round Intercalibration on Trace Metals in Sea Water - Section 4, analysis for Hg - 1983 - (5/TM/SW:4).
- 4I JMG Sixth Intercalibration on Trace Metals in Estuarine Waters - 1986 - (6/TM/SW).
- 4Z Intercalibration exercise for SIIF/SERI (Cd) and NIVA/IAMK (IAMK=Chalmers Inst., Göteborg) - 1985.

### Seabed sediment:

- 7E ICES, First Intercalibration Exercise on Trace metals in Marine Sediments - 1984 - (1/TM/MS).
- 8B ICES/OSPAR, First Intercomparison Exercise on Organochlorines (individual chlorobiphenyl congeners) in Marine Sediments - Phase 1, analysis of standard solutions - 1989 - (1/OC/MS:1).
- 8C ICES/OSPAR, First Intercomparison Exercise on Organochlorines (individual chlorobiphenyl congeners) in Marine Sediments - Phase 2, analysis of standard solutions - 1991 - (1/OC/MS:2).
- 8B ICES/IOC/OSPAR Intercomparison Programme on the Analysis of Chlorobiphenyls in Marine Media - Step 1 - (analysis of standard solutions) - 1989 - (1/OC/MS-1).
- 8C ICES/IOC/OSPAR Intercomparison Programme on the Analysis of Chlorobiphenyls in Marine Media - Step 2 - 1990 - (1/OC/MS-2).
- 8D ICES/IOC/OSPAR Intercomparison Programme on the Analysis of Chlorobiphenyls in Marine Media - Step 3a (1/OC/MS-3a) 1991.
- 8E ICES/IOC/OSPAR Intercomparison Programme on the Analysis of Chlorobiphenyls in Marine Media - Step 3b - (1/OC/MS-3b) 1992.
- 8F ICES/IOC/OSPAR Intercomparison Programme on the Analysis of Chlorobiphenyls in Marine Media - Step 4 - (1/OC/MS-4) 1993.

### Marine biota:

- 1E ICES, Fifth Intercalibration Exercise on Trace Metals in Biological Tissues - 1978 - (5/TM/BT).
- 1F ICES, Sixth Intercalibration Exercise on Trace Metals (Cadmium and Lead only) in Biological Tissues - 1979 - (6/TM/BT).
- 1G ICES, Seventh Intercalibration Exercise on Trace Metals in Biological Tissues - Part A - 1983 - (7/TM/BT).

- 1H ICES, Seventh Intercalibration Exercise on Trace Metals in Biological Tissues - Part B - 1985 - (7/TM/BT) (preliminary report 1987).
- 1Z VETN Interlabcalibration exercise with VETN and SIIF 1983, mercury and cadmium in cod filet and liver.
- 1Z NIVA Interlabcalibration exercise with VETN, NACE and NIVA 1986 (Hg, Cd, Cu, Pb and Zn in 6 samples).
- 2D ICES Fourth Intercalibration Exercise on Organochlorines (mainly PCBs) in Biological Tissues (Sample No.5) - 1979 - (4/OC/BT).
- 2E ICES Fifth Intercalibration Exercise on Organochlorines (PCBs only) in Biological Tissues - 1982 - (5/OC/BT).
- 2G ICES/IOC/OSPAR Intercomparison Programme on the Analysis of Chlorobiphenyls in Marine Media - Step 1 - (analysis of standard solutions) - 1989 - (7/OC/BT-1).
- 2H ICES/IOC/OSPAR Intercomparison Programme on the Analysis of Chlorobiphenyls in Marine Media - Step 2 - 1990 - (7/OC/BT-2).
- 2I ICES/IOC/OSPAR Intercomparison Programme on the Analysis of Chlorobiphenyls in Marine Media - Step 3a - (7/OC/BT-3a) 1991.
- 2J ICES/IOC/OSPAR Intercomparison Programme on the Analysis of Chlorobiphenyls in Marine Media - Step 3b - (7/OC/BT-3b) 1992.
- 2K ICES/IOC/OSPAR Intercomparison Programme on the Analysis of Chlorobiphenyls in Marine Media - Step 4 - (7/OC/BT-4) 1993.
- 2Z VETN Interlabcalibration exercise with VETN among others, 1983, PCB and HCB in cod liver.
- 2Z NACE Interlabcalibration exercise with NACE, VETN and SIIF 1986 (PCB (all labs), DDE, OCS, HCB and DCB (NACE and VETN)).



## **Appendix C**

### **Analytical overview - sediment**

**Sorted by:**

**- Contaminant, year, laboratory, intercalibration**

**x**

|                             |  |
|-----------------------------|--|
| <b>Contamin.</b>            | <b>Contaminant. Abbreviations are defined in Appendix A</b>  |
| <b>Mon. Year</b>            | <b>Monitoring year</b>   |
| <b>Lab.</b>                 | <b>Analytical lab (cf.Appendix A)</b>  |
| <b>Intercalibr. +basis</b>  | <b>Intercalibration exercise (see Appendix B) and analytical basis where D = dry weight basis.</b> |
| <b>Detect. limit</b>        | <b>"Normal" analytical detection limit.</b>  |
| <b>Total value count</b>    | <b>Total number of analyses</b>  |
| <b>Count below d.lim</b>    | <b>Number of analyses below detection limit</b>  |
| <b>N (&lt;) above d.lim</b> | <b>Number of analyses with higher detection limit than "normal"</b>                                |



### Analytical overview – sediment

| Contamin. | Mon. Year | Lab.      | Inter-calibr. +basis | wet/dry | Analys method code | Detect. limit (ppb) | Total value count | Count below d.lim | N (<) above d.lim | N (<) below d.lim |
|-----------|-----------|-----------|----------------------|---------|--------------------|---------------------|-------------------|-------------------|-------------------|-------------------|
| ACNE      | 1992-NIVA |           |                      | D       | 369                | 1                   | 23                |                   |                   |                   |
|           | 1994-NIVA |           |                      | D       | 369                | 1                   | 24                | 23                |                   | 21                |
|           | 1996-NIVA |           |                      | D       | 369                | 1                   | 10                |                   |                   |                   |
|           | 1997-NIVA |           |                      | D       | 369                | 1                   | 18                |                   |                   |                   |
| ACNE      | 2004-NIVA |           | QW                   | D       | 369                | 1                   | 156               | 1                 | 44                |                   |
|           | 2006-NIVA |           | R44_Ex701_MS-3       | D       | 369                | 1                   | 20                |                   | 19                |                   |
| ACNLE     | 1992-NIVA |           |                      | D       | 369                | 1                   | 23                |                   |                   |                   |
|           | 1994-NIVA |           |                      | D       | 369                | 1                   | 24                | 23                |                   | 20                |
|           | 1996-NIVA |           |                      | D       | 369                | 1                   | 10                |                   |                   |                   |
|           | 1997-NIVA |           |                      | D       | 369                | 1                   | 18                |                   |                   |                   |
|           | 2004-NIVA |           | QW                   | D       | 369                | 1                   | 156               | 1                 | 56                | 1                 |
|           | 2006-NIVA |           | R44_Ex701_MS-3       | D       | 369                | 1                   | 20                |                   | 20                |                   |
| AL        | 1987-NIVA |           |                      | D       | 352                | 2500                | 28                |                   |                   |                   |
|           | 1990-NIVA |           |                      | D       | 352                | 2500                | 128               |                   |                   |                   |
| AL        | 2004-NIVA |           | QT                   | D       | 355                | 10000               | 173               |                   |                   |                   |
|           | 2006-NIVA |           | R44_Ex699_MS-1       | D       | 355                | 10000               | 30                |                   |                   |                   |
| ALD       | 1990-IMRN |           |                      | D       | 760                | 0.05                | 14                | 5                 |                   |                   |
| ANT       | 1990-IMRN |           |                      | D       | 769                | 1                   | 14                |                   |                   |                   |
|           | 1992-NIVA |           |                      | D       | 369                | 1                   | 24                |                   |                   |                   |
|           | 1994-NIVA |           |                      | D       | 369                | 1                   | 24                | 22                |                   | 19                |
|           | 1996-NIVA |           |                      | D       | 369                | 1                   | 10                |                   |                   |                   |
|           | 1997-NIVA |           |                      | D       | 369                | 1                   | 18                |                   |                   |                   |
|           | 2004-NIVA |           |                      | D       | 369                | 1                   | 156               |                   | 27                |                   |
| ANT       | 2006-NIVA |           | R44_Ex701_MS-3       | D       | 369                | 1                   | 20                |                   | 15                |                   |
|           | AS        | 1994-NIVA |                      | D       | 354                | 500                 | 12                |                   |                   |                   |
| AS        | 2004-NIVA |           | QT                   | D       | 355                | 15000               | 172               | 21                |                   | 4                 |
|           | 2006-NIVA |           |                      | D       | 355                | 15000               | 30                | 29                |                   | 25                |
| BAP       | 1990-IMRN |           |                      | D       | 769                | 1                   | 14                |                   |                   |                   |
|           | 1992-NIVA |           |                      | D       | 369                | 1                   | 23                |                   |                   |                   |
|           | 1994-NIVA |           |                      | D       | 369                | 1                   | 24                | 12                |                   | 12                |
|           | 1996-NIVA |           |                      | D       | 369                | 1                   | 10                |                   |                   |                   |
|           | 1997-NIVA |           |                      | D       | 369                | 1                   | 18                |                   |                   |                   |
|           | 2004-NIVA |           | QW                   | D       | 369                | 1                   | 156               |                   | 2                 |                   |
| BAP       | 2006-NIVA |           | R44_Ex701_MS-3       | D       | 369                | 1                   | 20                |                   | 3                 |                   |
|           | BBF       | 1992-NIVA |                      | D       | 369                | 1                   | 23                |                   |                   |                   |
| 1994-NIVA |           |           |                      | D       | 369                | 1                   | 24                | 9                 |                   | 8                 |
| BBF       | 2004-NIVA |           | QW                   | D       | 369                | 0.5                 | 156               |                   |                   |                   |
| BBJF      | 2006-NIVA |           |                      | D       | 369                | miss                | 20                |                   |                   |                   |
| BBJKF     | 1996-NIVA |           |                      | D       | 369                | 1                   | 10                |                   |                   |                   |
|           | 1997-NIVA |           |                      | D       | 369                | 1                   | 18                |                   |                   |                   |
| BBKF      | 1990-IMRN |           |                      | D       | 769                | 1                   | 14                |                   |                   |                   |
| BEP       | 1990-IMRN |           |                      | D       | 769                | 1                   | 14                |                   |                   |                   |
|           | 1992-NIVA |           |                      | D       | 369                | 1                   | 23                |                   |                   |                   |
|           | 1994-NIVA |           |                      | D       | 369                | 1                   | 24                | 8                 |                   | 8                 |
|           | 1996-NIVA |           |                      | D       | 369                | 1                   | 10                |                   |                   |                   |
|           | 1997-NIVA |           |                      | D       | 369                | 1                   | 18                |                   |                   |                   |
|           | 2006-NIVA |           | R44_Ex701_MS-3       | D       | 369                | miss                | 20                |                   |                   |                   |
| BGHIP     | 1990-IMRN |           |                      | D       | 769                | 1                   | 14                |                   |                   |                   |
|           | 1992-NIVA |           |                      | D       | 369                | 1                   | 24                |                   |                   |                   |
|           | 1994-NIVA |           |                      | D       | 369                | 1                   | 24                | 9                 |                   | 6                 |
|           | 1996-NIVA |           |                      | D       | 369                | 1                   | 10                |                   |                   |                   |
|           | 1997-NIVA |           |                      | D       | 369                | 1                   | 18                |                   |                   |                   |
|           | 2004-NIVA |           | QW                   | D       | 369                | 1                   | 156               |                   |                   |                   |
|           | 2006-NIVA |           | R44_Ex701_MS-3       | D       | 369                | 1                   | 20                |                   |                   |                   |
|           | BIPN      | 1992-NIVA |                      |         | D                  | 369                 | 1                 | 23                |                   |                   |
| BJKF      | 1994-NIVA |           |                      | D       | 369                | 1                   | 24                | 21                |                   | 19                |
|           | 1996-NIVA |           |                      | D       | 369                | 1                   | 10                |                   |                   |                   |
|           | 1997-NIVA |           |                      | D       | 369                | 1                   | 18                |                   |                   |                   |
|           | 1992-NIVA |           |                      | D       | 369                | 1                   | 14                |                   |                   |                   |
| BJKF      | 1994-NIVA |           |                      | D       | 369                | 1                   | 24                | 11                |                   | 11                |
|           | 2004-NIVA |           |                      | D       | 369                | 0.5                 | 92                |                   | 1                 |                   |
| BKF       | 2006-NIVA |           | R44_Ex701_MS-3       | D       | 369                | miss                | 20                |                   |                   |                   |
| BAA       | 1990-IMRN |           |                      | D       | 769                | 1                   | 14                |                   |                   |                   |
|           | 1992-NIVA |           |                      | D       | 369                | 1                   | 24                |                   |                   |                   |
|           | 1994-NIVA |           |                      | D       | 369                | 1                   | 24                | 11                |                   | 11                |
|           | 1996-NIVA |           |                      | D       | 369                | 1                   | 10                |                   |                   |                   |
|           | 1997-NIVA |           |                      | D       | 369                | 1                   | 18                |                   |                   |                   |
|           | 2004-NIVA |           | QW                   | D       | 369                | 1                   | 156               |                   | 3                 |                   |
| BAA       | 2006-NIVA |           | R44_Ex701_MS-3       | D       | 369                | 1                   | 20                |                   | 3                 |                   |
|           | CB101     | 1990-IMRN |                      | 8B      | D                  | 760                 | 0.05              | 14                |                   |                   |
| 1992-NIVA |           |           | 8C                   | D       | 360                | 0.05                | 24                |                   | 24                |                   |
| 1994-NIVA |           |           | 8Z                   | D       | 360                | 0.05                | 24                |                   | 12                |                   |
| 1996-NIVA |           |           |                      | D       | 360                | 0.2                 | 10                |                   |                   |                   |
| 1997-NIVA |           |           |                      | D       | 360                | 0.2                 | 18                |                   |                   |                   |
| 2004-NIVA |           |           | QV                   | D       | 360                | 0.2                 | 152               |                   | 1                 |                   |
| 2006-NIVA |           |           | R44_Ex700_MS-2       | D       | 360                | 0.2                 | 20                |                   | 20                |                   |
| CB105     |           | 1990-IMRN |                      |         | D                  | 760                 | 0.05              | 14                |                   |                   |
|           | 1992-NIVA |           | 8C                   | D       | 360                | 0.05                | 24                |                   | 24                |                   |



| Contamin. | Mon. Year | Lab. Inter-calibr. +basis | wet/dry | Analys method code | Detect. limit (ppb) | Total value count | Count below d.lim | N (<) above d.lim | N (<) below d.lim |
|-----------|-----------|---------------------------|---------|--------------------|---------------------|-------------------|-------------------|-------------------|-------------------|
|           | 1987-NIVA |                           | D       | 390                | 1000000             | 28                |                   |                   |                   |
|           | 1990-NIVA |                           | D       | 390                | 200000              | 128               |                   |                   |                   |
|           | 1992-NIVA |                           | D       | 390                | 200000              | 107               |                   |                   |                   |
|           | 1994-NIVA |                           | D       | 390                | 200000              | 114               |                   |                   |                   |
|           | 1996-NIVA |                           | D       | 390                | 200000              | 23                |                   |                   |                   |
|           | 1997-NIVA |                           | D       | 390                | 200000              | 27                |                   |                   |                   |
| CORG      | 2004-NIVA |                           | D       | 390                | 200000              | 173               |                   |                   |                   |
|           | 2006-NIVA | R44_Ex699_MS-1            | D       | 390                | 200000              | 30                |                   |                   |                   |
| CR        | 1994-NIVA | 7Z                        | D       | 353                | 250                 | 12                |                   |                   |                   |
| CR        | 2004-NIVA | QT                        | D       | 355                | 1500                | 173               |                   |                   |                   |
|           | 2006-NIVA | R44_Ex699_MS-1            | D       | 355                | 1500                | 30                |                   |                   |                   |
| CTOT      | 1994-NIVA |                           | D       | 390                | 1000000             | 12                |                   |                   |                   |
|           | 1996-NIVA |                           | D       | 390                | 1000000             | 23                |                   |                   |                   |
|           | 1997-NIVA |                           | D       | 390                | 1000000             | 27                |                   |                   |                   |
| CU        | 1986-NIVA | 7C                        | D       | 351                | 10                  | 24                |                   |                   |                   |
|           | 1987-NIVA | 7C                        | D       | 351                | 10                  | 28                |                   |                   |                   |
|           | 1990-NIVA | 7E                        | D       | 351                | 10                  | 128               |                   |                   |                   |
|           | 1992-NIVA | 7E                        | D       | 351                | 10                  | 107               |                   |                   |                   |
|           | 1994-NIVA | 7Z                        | D       | 351                | 10                  | 114               |                   |                   |                   |
|           | 1996-NIVA |                           | D       | 351                | 10                  | 23                |                   |                   |                   |
|           | 1997-NIVA |                           | D       | 351                | 10                  | 27                |                   |                   |                   |
| CU        | 2004-NIVA | QT                        | D       | 355                | 1000                | 173               |                   |                   |                   |
|           | 2006-NIVA | R44_Ex699_MS-1            | D       | 355                | 1000                | 30                |                   |                   |                   |
| DBA3A     | 1992-NIVA |                           | D       | 369                | 1                   | 24                |                   |                   |                   |
|           | 1994-NIVA |                           | D       | 369                | 1                   | 23                | 11                |                   | 11                |
|           | 1996-NIVA |                           | D       | 369                | 1                   | 10                |                   |                   |                   |
|           | 1997-NIVA |                           | D       | 369                | 1                   | 18                |                   |                   |                   |
|           | 2004-NIVA | QW                        | D       | 369                | 1                   | 156               |                   | 20                |                   |
|           | 2006-NIVA | R44_Ex700_MS-2            | D       | 369                | 1                   | 20                |                   | 20                |                   |
| DBAHA     | 1990-IMRN |                           | D       | 769                | 1                   | 14                |                   |                   |                   |
| DBP       | 1992-NIVA |                           | D       | 369                | 1                   | 24                |                   |                   |                   |
| DBT       | 1990-IMRN |                           | D       | 769                | 1                   | 14                |                   |                   |                   |
|           | 1996-NIVA |                           | D       | 369                | 1                   | 10                |                   |                   |                   |
|           | 1997-NIVA |                           | D       | 369                | 1                   | 18                |                   |                   |                   |
| DBT       | 2004-NIVA | QW                        | D       | 369                | 1                   | 156               |                   | 40                |                   |
|           | 2006-NIVA |                           | D       | 369                | 1                   | 20                |                   | 17                |                   |
| DBTC1     | 1990-IMRN |                           | D       | 769                | 1                   | 14                |                   |                   |                   |
|           | 2004-NIVA |                           | D       | 369                | 0.5                 | 156               |                   | 50                |                   |
|           | 2006-NIVA |                           | D       | 369                | 0.5                 | 20                |                   | 19                |                   |
| DBTC2     | 1990-IMRN |                           | D       | 769                | 1                   | 14                |                   |                   |                   |
|           | 2004-NIVA |                           | D       | 369                | 0.5                 | 156               |                   | 57                |                   |
|           | 2006-NIVA |                           | D       | 369                | 0.5                 | 20                |                   | 18                |                   |
| DBTC3     | 1990-IMRN |                           | D       | 769                | 1                   | 14                |                   |                   |                   |
|           | 2004-NIVA |                           | D       | 369                | 0.5                 | 156               |                   | 63                |                   |
|           | 2006-NIVA |                           | D       | 369                | 0.5                 | 20                |                   | 18                |                   |
| DBTIN     | 2004-NIVA |                           | D       | 370                | 0.26                | 141               |                   | 23                |                   |
|           | 2006-NIVA |                           | D       | 370                | 0.26                | 30                |                   | 26                |                   |
| DDEOP     | 1990-IMRN |                           | D       | 760                | 0.05                | 14                |                   |                   |                   |
| DDEPP     | 1990-IMRN |                           | D       | 760                | 0.05                | 14                |                   |                   |                   |
|           | 1992-NIVA |                           | D       | 360                | 0.05                | 24                |                   | 22                |                   |
|           | 1994-NIVA | 8Z                        | D       | 360                | 0.05                | 24                |                   | 12                |                   |
|           | 1996-NIVA |                           | D       | 360                | 0.05                | 10                |                   |                   |                   |
|           | 1997-NIVA |                           | D       | 360                | 0.05                | 18                |                   |                   |                   |
|           | 2004-NIVA | QV                        | D       | 360                | 0.05                | 151               |                   | 99                |                   |
|           | 2006-NIVA | R44_Ex700_MS-2            | D       | 360                | 0.05                | 20                |                   | 20                |                   |
| DDTOP     | 1990-IMRN |                           | D       | 760                | 0.05                | 14                | 2                 |                   |                   |
| DDTPP     | 1990-IMRN |                           | D       | 760                | 0.05                | 14                |                   |                   |                   |
|           | 1996-NIVA |                           | D       | 360                | 0.7                 | 10                |                   | 5                 |                   |
|           | 1997-NIVA |                           | D       | 360                | 0.7                 | 18                |                   | 3                 |                   |
|           | 2006-NIVA |                           | D       | 360                | miss                | 20                |                   | 20                |                   |
| DPTIN     | 2004-NIVA |                           | D       | 370                | 0.22                | 128               |                   | 64                |                   |
|           | 2006-NIVA |                           | D       | 370                | 0.22                | 30                |                   | 30                |                   |
| FLE       | 1990-IMRN |                           | D       | 769                | 1                   | 14                |                   |                   |                   |
|           | 1992-NIVA |                           | D       | 369                | 1                   | 24                |                   |                   |                   |
|           | 1994-NIVA |                           | D       | 369                | 1                   | 24                | 23                |                   | 18                |
|           | 1996-NIVA |                           | D       | 369                | 1                   | 10                |                   |                   |                   |
|           | 1997-NIVA |                           | D       | 369                | 1                   | 18                |                   |                   |                   |
| FLE       | 2004-NIVA | QW                        | D       | 369                | 1                   | 156               |                   | 32                |                   |
|           | 2006-NIVA | R44_Ex701_MS-3            | D       | 369                | 1                   | 20                |                   | 17                |                   |
| FLU       | 1990-IMRN |                           | D       | 769                | 1                   | 14                |                   |                   |                   |
|           | 1992-NIVA |                           | D       | 369                | 1                   | 24                |                   |                   |                   |
|           | 1994-NIVA |                           | D       | 369                | 1                   | 24                | 10                |                   | 10                |
|           | 1996-NIVA |                           | D       | 369                | 1                   | 10                |                   |                   |                   |
|           | 1997-NIVA |                           | D       | 369                | 1                   | 18                |                   |                   |                   |
| FLU       | 2004-NIVA | QW                        | D       | 369                | 1                   | 156               |                   | 1                 |                   |
|           | 2006-NIVA | R44_Ex701_MS-3            | D       | 369                | 1                   | 20                |                   |                   |                   |
| GSAMT     | 1986-NIVA |                           | D       | 392                | miss                | 24                |                   |                   |                   |
|           | 1987-NIVA |                           | D       | 392                | miss                | 28                |                   |                   |                   |
|           | 1990-NIVA |                           | D       | 392                | miss                | 197               |                   |                   |                   |
|           | 1992-NIVA |                           | D       | 392                | miss                | 187               |                   |                   |                   |
|           | 1994-NIVA |                           | D       | 392                | miss                | 204               |                   |                   |                   |
|           | 1996-NIVA |                           | D       | 392                | miss                | 31                |                   |                   |                   |

| Contamin. | Mon. Year | Lab. Inter-calibr. +basis | wet/dry | Analys method code | Detect. limit (ppb) | Total value count | Count below d.lim | N (<) above d.lim | N (<) below d.lim |
|-----------|-----------|---------------------------|---------|--------------------|---------------------|-------------------|-------------------|-------------------|-------------------|
|           | 1996-VKID |                           | D       | 652                | miss                | 35                |                   |                   |                   |
|           | 1997-NIVA |                           | D       | 392                | miss                | 45                |                   |                   |                   |
|           | 1997-VKID |                           | D       | 652                | miss                | 47                |                   |                   |                   |
|           | 2004-NIVA |                           | D       | 392                | miss                | 344               |                   |                   |                   |
|           | 2006-NIVA |                           | D       | 392                | miss                | 60                |                   |                   |                   |
| HCB       | 1990-IMRN |                           | D       | 760                | 0.05                | 14                |                   |                   |                   |
|           | 1992-NIVA |                           | D       | 360                | 0.05                | 24                |                   | 18                |                   |
|           | 1994-NIVA | 8Z                        | D       | 360                | 0.05                | 24                |                   | 10                |                   |
|           | 1996-NIVA |                           | D       | 360                | 0.1                 | 10                |                   |                   |                   |
|           | 1997-NIVA |                           | D       | 360                | 0.1                 | 18                |                   |                   |                   |
| HCB       | 2004-NIVA |                           | D       | 360                | 0.1                 | 141               |                   | 116               |                   |
|           | 2006-NIVA | R44_ Ex700_MS-2           | D       | 360                | 0.1                 | 20                |                   | 20                |                   |
| HCHA      | 1990-IMRN |                           | D       | 760                | 0.05                | 14                | 4                 |                   |                   |
|           | 1992-NIVA |                           | D       | 360                | 0.05                | 24                |                   | 24                |                   |
|           | 1994-NIVA | 8Z                        | D       | 360                | 0.05                | 24                |                   | 23                |                   |
|           | 1996-NIVA |                           | D       | 360                | 0.2                 | 10                | 2                 |                   | 1                 |
|           | 1997-NIVA |                           | D       | 360                | 0.2                 | 18                | 1                 |                   | 1                 |
| HCHA      | 2004-NIVA |                           | D       | 360                | 0.2                 | 148               |                   | 4                 |                   |
|           | 2006-NIVA | R44_ Ex700_MS-2           | D       | 360                | 0.2                 | 20                |                   | 20                |                   |
| HCHB      | 1990-IMRN |                           | D       | 760                | 0.05                | 14                | 3                 |                   |                   |
| HCHG      | 1990-IMRN |                           | D       | 760                | 0.05                | 14                | 4                 |                   |                   |
|           | 1992-NIVA |                           | D       | 360                | 0.05                | 24                |                   | 24                |                   |
|           | 1994-NIVA | 8Z                        | D       | 360                | 0.05                | 24                |                   | 15                |                   |
|           | 1996-NIVA |                           | D       | 360                | 0.2                 | 10                | 1                 |                   | 1                 |
|           | 1997-NIVA |                           | D       | 360                | 0.2                 | 18                | 1                 |                   | 1                 |
| HCHG      | 2004-NIVA | QV                        | D       | 360                | 0.2                 | 149               |                   | 7                 |                   |
| HG        | 1986-NIVA | 7C                        | D       | 350                | 10                  | 24                |                   |                   |                   |
|           | 1987-NIVA | 7C                        | D       | 350                | 10                  | 28                |                   |                   |                   |
|           | 1990-NIVA | 7E                        | D       | 350                | 10                  | 128               |                   |                   |                   |
|           | 1992-NIVA | 7E                        | D       | 350                | 10                  | 107               |                   |                   |                   |
|           | 1994-NIVA | 7Z                        | D       | 350                | 10                  | 114               | 2                 |                   |                   |
|           | 1996-NIVA |                           | D       | 350                | 10                  | 23                |                   |                   |                   |
|           | 1997-NIVA |                           | D       | 350                | 10                  | 27                |                   |                   |                   |
| HG        | 2004-NIVA |                           | D       | 350                | 10                  | 173               | 7                 |                   |                   |
|           | 2006-NIVA | R44_ Ex699_MS-1           | D       | 350                | 10                  | 30                | 2                 |                   |                   |
| ICDP      | 1990-IMRN |                           | D       | 769                | 1                   | 14                |                   |                   |                   |
|           | 1992-NIVA |                           | D       | 369                | 1                   | 24                |                   |                   |                   |
|           | 1994-NIVA |                           | D       | 369                | 1                   | 24                | 12                |                   | 9                 |
|           | 1996-NIVA |                           | D       | 369                | 1                   | 10                |                   |                   |                   |
|           | 1997-NIVA |                           | D       | 369                | 1                   | 18                |                   |                   |                   |
| ICDP      | 2004-NIVA | QW                        | D       | 369                | 1                   | 156               |                   |                   |                   |
|           | 2006-NIVA | R44_ Ex701_MS-3           | D       | 369                | 1                   | 20                |                   |                   |                   |
| LI        | 1990-NIVA | 7E                        | D       | 353                | 5000                | 14                |                   |                   |                   |
|           | 1992-NIVA | 7E                        | D       | 353                | 5000                | 107               |                   |                   |                   |
|           | 1994-NIVA | 7E                        | D       | 353                | 5000                | 114               |                   |                   |                   |
|           | 1996-NIVA |                           | D       | 353                | 5000                | 23                |                   |                   |                   |
|           | 1997-NIVA |                           | D       | 353                | 5000                | 27                |                   |                   |                   |
| LI        | 2004-NIVA | QT                        | D       | 355                | 1000                | 173               |                   |                   |                   |
|           | 2006-NIVA | R44_ Ex699_MS-1           | D       | 355                | 1000                | 30                |                   |                   |                   |
| MBTIN     | 2004-NIVA |                           | D       | 370                | 0.34                | 142               |                   | 32                |                   |
|           | 2006-NIVA |                           | D       | 370                | 0.34                | 30                |                   | 23                |                   |
| MN        | 2004-NIVA | QT                        | D       | 355                | 300                 | 172               |                   |                   |                   |
|           | 2006-NIVA | R44_ Ex699_MS-1           | D       | 355                | 300                 | 30                |                   |                   |                   |
| MOCON     | 1990-NIVA |                           | D       | 392                | 1000000000          | 117               |                   |                   |                   |
|           | 1992-NIVA |                           | D       | 392                | 1000000000          | 56                |                   |                   |                   |
|           | 1994-NIVA |                           | D       | 392                | 1000000000          | 62                |                   |                   |                   |
|           | 1996-NIVA |                           | D       | 392                | 1000000000          | 31                |                   |                   |                   |
|           | 1996-VKID |                           | D       | 654                | 1000000000          | 35                |                   |                   |                   |
|           | 1997-VKID |                           | D       | 654                | 1000000000          | 47                |                   |                   |                   |
|           | 2004-NIVA |                           | D       | 392                | 1000000000          | 173               |                   |                   |                   |
|           | 2006-NIVA |                           | D       | 392                | 1000000000          | 20                |                   |                   |                   |
| MPTIN     | 2004-NIVA |                           | D       | 370                | 0.3                 | 118               |                   | 65                |                   |
|           | 2006-NIVA |                           | D       | 370                | 0.3                 | 30                |                   | 30                |                   |
| NAP       | 1990-IMRN |                           | D       | 769                | 1                   | 14                |                   |                   |                   |
|           | 1992-NIVA |                           | D       | 369                | 1                   | 23                |                   |                   |                   |
|           | 1994-NIVA |                           | D       | 369                | 1                   | 24                | 18                |                   | 18                |
|           | 1996-NIVA |                           | D       | 369                | 1                   | 10                |                   |                   |                   |
|           | 1997-NIVA |                           | D       | 369                | 1                   | 18                |                   |                   |                   |
| NAP       | 2004-NIVA | QW                        | D       | 369                | 1                   | 154               |                   | 27                |                   |
|           | 2006-NIVA | R44_ Ex701_MS-3           | D       | 369                | 1                   | 20                |                   | 1                 |                   |
| NAP1M     | 1992-NIVA |                           | D       | 369                | 1                   | 23                |                   |                   |                   |
|           | 1994-NIVA |                           | D       | 369                | 1                   | 24                | 19                |                   | 16                |
|           | 1996-NIVA |                           | D       | 369                | 1                   | 10                |                   |                   |                   |
|           | 1997-NIVA |                           | D       | 369                | 1                   | 18                |                   |                   |                   |
| NAP2M     | 1992-NIVA |                           | D       | 369                | 1                   | 23                |                   |                   |                   |
|           | 1994-NIVA |                           | D       | 369                | 1                   | 24                | 17                |                   | 16                |
|           | 1996-NIVA |                           | D       | 369                | 1                   | 10                |                   |                   |                   |
|           | 1997-NIVA |                           | D       | 369                | 1                   | 18                |                   |                   |                   |
| NAPC1     | 1990-IMRN |                           | D       | 769                | 1                   | 14                |                   |                   |                   |
|           | 2004-NIVA |                           | D       | 369                | 2                   | 156               |                   | 15                |                   |
|           | 2006-NIVA |                           | D       | 369                | 2                   | 20                |                   | 20                |                   |
| NAPC2     | 1990-IMRN |                           | D       | 769                | 1                   | 14                |                   |                   |                   |

| Contamin. | Mon. Year | Lab. Inter-calibr. +basis | wet/dry | Analys method code | Detect. limit (ppb) | Total value count | Count below d.lim | N (< above d.lim | N (< below d.lim |
|-----------|-----------|---------------------------|---------|--------------------|---------------------|-------------------|-------------------|------------------|------------------|
|           | 2004-NIVA |                           | D       | 369                |                     | 2                 | 156               | 40               |                  |
|           | 2006-NIVA |                           | D       | 369                |                     | 2                 | 20                | 10               |                  |
| NAPC3     | 1990-IMRN |                           | D       | 769                |                     | 1                 | 14                |                  |                  |
|           | 2004-NIVA |                           | D       | 369                |                     | 2                 | 156               | 28               |                  |
|           | 2006-NIVA |                           | D       | 369                |                     | 2                 | 20                | 9                |                  |
| NAPD2     | 1996-NIVA |                           | D       | 369                |                     | 1                 | 10                |                  |                  |
|           | 1997-NIVA |                           | D       | 369                |                     | 1                 | 18                |                  |                  |
| NAPD3     | 1996-NIVA |                           | D       | 369                |                     | 1                 | 10                |                  |                  |
|           | 1997-NIVA |                           | D       | 369                |                     | 1                 | 18                |                  |                  |
| NAPDI     | 1992-NIVA |                           | D       | 369                |                     | 1                 | 23                |                  |                  |
|           | 1994-NIVA |                           | D       | 369                |                     | 1                 | 24                | 18               | 15               |
|           | 1996-NIVA |                           | D       | 369                |                     | 1                 | 10                |                  |                  |
|           | 1997-NIVA |                           | D       | 369                |                     | 1                 | 18                |                  |                  |
| NAPT2     | 1996-NIVA |                           | D       | 369                |                     | 1                 | 10                |                  |                  |
|           | 1997-NIVA |                           | D       | 369                |                     | 1                 | 18                |                  |                  |
| NAPT3     | 1996-NIVA |                           | D       | 369                |                     | 1                 | 10                |                  |                  |
|           | 1997-NIVA |                           | D       | 369                |                     | 1                 | 18                |                  |                  |
| NAPT4     | 1996-NIVA |                           | D       | 369                |                     | 1                 | 10                |                  |                  |
|           | 1997-NIVA |                           | D       | 369                |                     | 1                 | 18                |                  |                  |
| NAPTM     | 1992-NIVA |                           | D       | 369                |                     | 1                 | 23                |                  |                  |
|           | 1994-NIVA |                           | D       | 369                |                     | 1                 | 24                | 24               | 24               |
|           | 1996-NIVA |                           | D       | 369                |                     | 1                 | 10                |                  |                  |
|           | 1997-NIVA |                           | D       | 369                |                     | 1                 | 18                |                  |                  |
| NI        | 1994-NIVA | 7Z                        | D       | 353                | 5000                | 12                |                   |                  |                  |
| NI        | 2004-NIVA | QT                        | D       | 355                | 2000                | 173               |                   |                  |                  |
|           | 2006-NIVA | R44_Ex699_MS-1            | D       | 355                | 2000                | 30                |                   |                  |                  |
| NTOT      | 1994-NIVA |                           | D       | 390                | 1000000             | 114               |                   |                  |                  |
|           | 1996-NIVA |                           | D       | 390                | 1000000             | 23                |                   |                  |                  |
|           | 1997-NIVA |                           | D       | 390                | 1000000             | 27                |                   |                  |                  |
| NTOT      | 2004-NIVA |                           | D       | 390                | 1000000             | 173               |                   |                  |                  |
|           | 2006-NIVA |                           | D       | 390                | 1000000             | 30                |                   |                  |                  |
| OCS       | 1992-NIVA |                           | D       | 360                | 0.05                | 24                |                   | 24               |                  |
|           | 1994-NIVA |                           | D       | 360                | 0.05                | 24                |                   | 24               |                  |
|           | 1996-NIVA |                           | D       | 360                | 0.1                 | 10                |                   |                  |                  |
|           | 1997-NIVA |                           | D       | 360                | 0.1                 | 18                | 1                 | 1                | 1                |
| OCS       | 2004-NIVA |                           | D       | 360                | 0.1                 | 152               |                   | 142              |                  |
|           | 2006-NIVA |                           | D       | 360                | 0.1                 | 17                |                   | 16               |                  |
| PA        | 1990-IMRN |                           | D       | 769                |                     | 1                 | 14                |                  |                  |
|           | 1992-NIVA |                           | D       | 369                |                     | 1                 | 24                |                  |                  |
|           | 1994-NIVA |                           | D       | 369                |                     | 1                 | 24                | 11               | 8                |
|           | 1996-NIVA |                           | D       | 369                |                     | 1                 | 10                |                  |                  |
|           | 1997-NIVA |                           | D       | 369                |                     | 1                 | 18                |                  |                  |
| PA        | 2004-NIVA | QW                        | D       | 369                |                     | 1                 | 156               | 2                |                  |
|           | 2006-NIVA | R44_Ex701_MS-3            | D       | 369                |                     | 1                 | 20                |                  |                  |
| PAC1      | 1990-IMRN |                           | D       | 769                |                     | 1                 | 14                |                  |                  |
| PAC1      | 2004-NIVA |                           | D       | 369                |                     | 2                 | 156               | 14               |                  |
|           | 2006-NIVA |                           | D       | 369                |                     | 2                 | 20                | 5                |                  |
| PAC2      | 1990-IMRN |                           | D       | 769                |                     | 1                 | 14                |                  |                  |
| PAC2      | 2004-NIVA |                           | D       | 369                |                     | 2                 | 156               | 28               |                  |
|           | 2006-NIVA |                           | D       | 369                |                     | 2                 | 20                | 18               |                  |
| PAC3      | 2004-NIVA |                           | D       | 369                |                     | 2                 | 156               | 55               |                  |
|           | 2006-NIVA |                           | D       | 369                |                     | 2                 | 20                | 16               |                  |
| PADM1     | 1996-NIVA |                           | D       | 369                |                     | 1                 | 10                |                  |                  |
|           | 1997-NIVA |                           | D       | 369                |                     | 1                 | 18                |                  |                  |
| PADM2     | 1996-NIVA |                           | D       | 369                |                     | 1                 | 10                |                  |                  |
|           | 1997-NIVA |                           | D       | 369                |                     | 1                 | 18                |                  |                  |
| PAM1      | 1992-NIVA |                           | D       | 369                |                     | 1                 | 24                |                  |                  |
|           | 1994-NIVA |                           | D       | 369                |                     | 1                 | 24                | 17               | 9                |
|           | 1996-NIVA |                           | D       | 369                |                     | 1                 | 10                |                  |                  |
|           | 1997-NIVA |                           | D       | 369                |                     | 1                 | 18                |                  |                  |
| PAM2      | 1996-NIVA |                           | D       | 369                |                     | 1                 | 10                |                  |                  |
|           | 1997-NIVA |                           | D       | 369                |                     | 1                 | 18                |                  |                  |
| PB        | 1986-NIVA | 7C                        | D       | 352                | 250                 | 24                |                   |                  |                  |
|           | 1987-NIVA | 7C                        | D       | 352                | 250                 | 28                |                   |                  |                  |
|           | 1990-NIVA |                           | D       | 353                | 250                 | 14                |                   |                  |                  |
|           | 1990-NIVA | 7E                        | D       | 353                | 250                 | 114               |                   |                  |                  |
|           | 1992-NIVA | 7E                        | D       | 353                | 250                 | 107               |                   |                  |                  |
|           | 1994-NIVA | 7Z                        | D       | 353                | 250                 | 114               |                   |                  |                  |
|           | 1996-NIVA |                           | D       | 353                | 250                 | 23                |                   |                  |                  |
|           | 1997-NIVA |                           | D       | 353                | 250                 | 27                |                   |                  |                  |
| PB        | 2004-NIVA | QT                        | D       | 355                | 10000               | 173               |                   |                  |                  |
|           | 2006-NIVA | R44_Ex699_MS-1            | D       | 355                | 10000               | 30                | 2                 | 1                |                  |
| PB210     | 1990-VKID |                           | D       | 650                | -1                  | 70                | 26                |                  |                  |
|           | 1992-VKID |                           | D       | 650                | -1                  | 56                | 15                |                  |                  |
|           | 1994-VKID |                           | D       | 650                | -1                  | 62                | 25                |                  |                  |
|           | 1996-VKID |                           | D       | 650                | -1                  | 11                |                   |                  |                  |
|           | 1997-VKID |                           | D       | 650                | -1                  | 21                | 3                 |                  |                  |
| PER       | 1990-IMRN |                           | D       | 769                |                     | 1                 | 14                |                  |                  |
|           | 1992-NIVA |                           | D       | 369                |                     | 1                 | 23                |                  |                  |
|           | 1994-NIVA |                           | D       | 369                |                     | 1                 | 24                | 3                | 2                |
|           | 1996-NIVA |                           | D       | 369                |                     | 1                 | 10                |                  |                  |
|           | 1997-NIVA |                           | D       | 369                |                     | 1                 | 18                |                  |                  |

JAMP Methods 1981-2007 – Norway (SFT report TA 2370/2008)

| Contamin.     | Mon. Year | Lab. Inter-calibr. +basis | wet/dry | Analys method code | Detect. limit (ppb) | Total value count | Count below d.lim | N (<) above d.lim | N (<) below d.lim |
|---------------|-----------|---------------------------|---------|--------------------|---------------------|-------------------|-------------------|-------------------|-------------------|
| PER           | 2006-NIVA | R44_ Ex701_MS-3           | D       | 369                | miss                | 20                |                   | 3                 |                   |
| PYR           | 1990-IMRN |                           | D       | 769                | 1                   | 14                |                   |                   |                   |
|               | 1992-NIVA |                           | D       | 369                | 1                   | 24                |                   |                   |                   |
|               | 1994-NIVA |                           | D       | 369                | 1                   | 24                | 12                |                   | 10                |
|               | 1996-NIVA |                           | D       | 369                | 1                   | 10                |                   |                   |                   |
|               | 1997-NIVA |                           | D       | 369                | 1                   | 18                |                   |                   |                   |
| PYR           | 2004-NIVA | QW                        | D       | 369                | 1                   | 156               |                   | 1                 |                   |
|               | 2006-NIVA | R44_ Ex701_MS-3           | D       | 369                | 1                   | 20                |                   | 5                 |                   |
| QCB           | 1992-NIVA |                           | D       | 360                | 0.05                | 24                |                   | 22                |                   |
|               | 1994-NIVA |                           | D       | 360                | 0.05                | 24                |                   | 22                |                   |
|               | 1996-NIVA |                           | D       | 360                | 0.05                | 10                |                   |                   |                   |
|               | 1997-NIVA |                           | D       | 360                | 0.05                | 18                |                   |                   |                   |
| QCB           | 2004-NIVA |                           | D       | 360                | 0.05                | 142               |                   | 100               |                   |
|               | 2006-NIVA |                           | D       | 360                | 0.05                | 20                |                   | 20                |                   |
| SPAH          | 1990-IMRN |                           | D       | 769                | 1                   | 14                |                   |                   |                   |
| TBTIN         | 2004-NIVA |                           | D       | 370                | 0.2                 | 142               |                   | 28                |                   |
|               | 2006-NIVA |                           | D       | 370                | 0.2                 | 30                |                   | 30                |                   |
| TDEOP         | 1990-IMRN |                           | D       | 760                | 0.05                | 14                |                   |                   |                   |
| TDEPP         | 1990-IMRN |                           | D       | 760                | 0.05                | 14                |                   |                   |                   |
|               | 1992-NIVA |                           | D       | 360                | 0.05                | 24                |                   | 22                |                   |
|               | 1994-NIVA | 8Z                        | D       | 360                | 0.05                | 24                |                   | 21                |                   |
|               | 1996-NIVA |                           | D       | 360                | 0.2                 | 10                |                   |                   |                   |
|               | 1997-NIVA |                           | D       | 360                | 0.2                 | 18                |                   |                   |                   |
|               | 2004-NIVA |                           | D       | 360                | 0.2                 | 155               |                   | 38                |                   |
|               | 2006-NIVA | R44_ Ex700_MS-2           | D       | 360                | 0.2                 | 20                |                   | 20                |                   |
| TPTIN         | 2004-NIVA |                           | D       | 370                | 0.17                | 141               |                   | 69                |                   |
|               | 2006-NIVA |                           | D       | 370                | 0.17                | 30                |                   | 29                |                   |
| ZN            | 1986-NIVA | 7C                        | D       | 351                | 100                 | 24                |                   |                   |                   |
|               | 1987-NIVA | 7C                        | D       | 351                | 100                 | 28                |                   |                   |                   |
|               | 1990-NIVA | 7E                        | D       | 351                | 10000               | 128               |                   |                   |                   |
|               | 1992-NIVA | 7E                        | D       | 351                | 100                 | 107               |                   |                   |                   |
|               | 1994-NIVA | 7Z                        | D       | 351                | 100                 | 114               |                   |                   |                   |
|               | 1996-NIVA |                           | D       | 351                | 100                 | 23                |                   |                   |                   |
|               | 1997-NIVA |                           | D       | 351                | 100                 | 27                |                   |                   |                   |
| ZN            | 2004-NIVA | QT                        | D       | 355                | 5000                | 173               |                   |                   |                   |
|               | 2006-NIVA | R44_ Ex699_MS-1           | D       | 355                | 5000                | 30                |                   |                   |                   |
| Sum of counts |           |                           |         |                    |                     | 20409             | 539               | 2816              | 341               |

- > converting to ppb ignored, due to missing unit



## **Appendix D**

### **Analytical overview - biota**

**Sorted by:**

**- Contaminant, year, laboratory, intercalibration**

|                             |   |
|-----------------------------|---|
| <b>Contamin.</b>            | <b>Contaminant. Abbreviations are defined in Appendix A</b>   |
| <b>Mon. Year</b>            | <b>Monitoring year</b>  |
| <b>Lab.</b>                 | <b>Analytical lab (cf. Appendix A)</b>  |
| <b>Intercalibr. +basis</b>  | <b>Intercalibration exercise (cf. Appendix B) and analytical basis where D = dry weight basis and W = wet weight basis.</b> |
| <b>Detect limit</b>         | <b>"Normal" analytical detection limit.</b>   |
| <b>Total value count</b>    | <b>Total number of analyses</b>   |
| <b>Count below d.lim</b>    | <b>Number of analyses below detection limit</b>   |
| <b>N (&lt;) above d.lim</b> | <b>Number of analyses with higher detection limit than "normal"</b>   |

















| Tissue      |                |                      |     | Fish liver  |             |             |             |             | Fish fillet, Shrimp tail, Mussel, Other |                    |                   |             |    |     |                   |                   |
|-------------|----------------|----------------------|-----|-------------|-------------|-------------|-------------|-------------|---|--------------------|-------------------|-------------|----|-----|-------------------|-------------------|
| Contaminant | Mon. Year      | Inter-calibr. +basis | W   | Analyt      |             | Detect      |             |             | Analyt method code                      | Detect limit (ppb) | Total value count | Count       |    |     | N (<) below d.lim | N (<) above d.lim |
|             |                |                      |     | method code | limit (ppb) | value count | below d.lim | below d.lim |   |                    |                   | above d.lim |    |     |                   |                   |
|             | 2004-NIVA      | R1                   | W   | 340         | 3           | 282         | 2           |             | 341                                     | 0.05               | 241               |             |    |     |                   |                   |
|             | 2005-NIVA      | D!                   | W   | 340         | 3           | 282         | 2           |             | 341                                     | 0.05               | 252               |             |    |     |                   |                   |
|             | 2006-NIVA      | R44_EX704_BT-3       | W   | 340         | 3           | 280         | 1           |             | 341                                     | 0.05               | 221               |             |    |     |                   |                   |
| CB156       | 1991-NIVA      | 2H                   | W   | 340         | 1           | 87          |             | 15          | 341                                     | 0.05               | 47                |             |    |     | 5                 |                   |
|             | 1992-NIVA      |                      | W   | 340         | 5           | 192         | 3           | 3           | 341                                     | 0.1                | 146               |             |    |     |                   |                   |
|             | 1993-NIVA      | QM                   | W   | 340         | 4           | 212         | 31          | 14          | 341                                     | 0.1                | 138               |             |    |     |                   |                   |
|             | 1994-NIVA      | 2Z                   | W   | 340         | 3           | 300         | 24          | 2           | 1                                       | 341                | 0.05              | 167         | 73 | 60  |                   |                   |
|             | 1995-NIVA      |                      | W   | 340         | 3           | 317         | 27          | 3           | 341                                     | 0.05               | 231               | 68          | 39 |     |                   |                   |
|             | 1996-NIVA      |                      | W   | 340         | 3           | 332         | 48          | 6           | 341                                     | 0.05               | 243               | 62          | 37 |     |                   |                   |
|             | 1997-NIVA      |                      | W   | 340         | 3           | 260         | 46          | 4           |   |                    |                   |             |    |     |                   |                   |
|             | 1997-NIVA      | AJ                   | W   |             |             |             |             |             | 341                                     | 0.05               | 221               | 9           | 4  | 10  |                   |                   |
|             | 1998-NIVA      |                      | W   | 340         | 3           | 284         | 52          | 21          | 70                                      |                    |                   |             |    |     |                   |                   |
|             | 1998-NIVA      | CH                   | W   |             |             |             |             |             | 341                                     | 0.05               | 209               | 37          | 26 | 47  |                   |                   |
|             | 1999-NIVA      |                      | W   | 340         | 3           | 249         | 39          | 15          | 2                                       |                    |                   |             |    |     |                   |                   |
|             | 1999-NIVA      | EG                   | W   |             |             |             |             |             | 341                                     | 0.05               | 231               | 12          | 9  | 139 |                   |                   |
|             | 2000-NIVA      |                      | W   | 340         | 3           | 230         | 71          | 29          | 5                                       |                    |                   |             |    |     |                   |                   |
|             | 2000-NIVA      | GU                   | W   |             |             |             |             |             | 341                                     | 0.05               | 186               | 28          | 24 | 95  |                   |                   |
|             | 2001-NIVA      |                      | W   | 340         | 3           | 250         | 82          | 17          | 3                                       |                    |                   |             |    |     |                   |                   |
|             | 2001-NIVA      | IO                   | W   |             |             |             |             |             | 341                                     | 0.05               | 211               | 9           | 8  | 134 |                   |                   |
|             | 2002-NIVA      |                      | W   | 340         | 3           | 249         | 99          | 39          |   | 341                | 0.05              | 210         |    |     | 102               |                   |
|             | 2003-NIVA      |                      | W   | 340         | 3           | 236         | 60          | 21          |   |                    |                   |             |    |     |                   |                   |
|             | 2003-NIVA      | MO                   | W   |             |             |             |             |             | 341                                     | 0.05               | 183               |             |    | 83  |                   |                   |
|             | 2004-NIVA      |                      | W   | 340         | 3           | 272         | 127         | 42          |   |                    |                   |             |    |     |                   |                   |
| 2004-NIVA   | R1             | W                    |     |             |             |             |             | 341         | 0.05                                    | 241                |                   |             | 7  |     |                   |                   |
| 2005-NIVA   |                | W                    | 340 | 3           | 282         | 140         | 39          |             |   |                    |                   |             |    |     |                   |                   |
| 2005-NIVA   | C!             | W                    |     |             |             |             |             | 341         | 0.05                                    | 241                |                   |             |    |     |                   |                   |
| 2006-NIVA   | R44_EX704_BT-3 | W                    | 340 | 3           | 279         | 176         | 131         |             | 341                                     | 0.05               | 221               |             |    |     |                   |                   |
| CB169       | 1995-NILU      |                      | W   |             |             |             |             |             | 841                                     | 2E-05              | 6                 |             |    |     |                   |                   |
|             | 1996-NILU      |                      | W   | 841         | 0           | 4           |             |             | 841                                     | 1E-04              | 18                | 2           | 1  |     |                   |                   |
|             | 2002-NILU      |                      | W   |             |             |             |             |             | 841                                     | 1E-04              | 12                |             |    |     |                   |                   |
|             | 2003-NILU      |                      | W   |             |             |             |             |             | 841                                     | 1E-04              | 12                | 1           | 1  | 1   |                   |                   |
|             | 2004-NILU      |                      | W   |             |             |             |             |             | 841                                     | 1E-04              | 1                 |             |    |     |                   |                   |
|             | 2005-NILU      |                      | W   |             |             |             |             |             | 841                                     | 1E-04              | 11                |             |    |     |                   |                   |
| CB180       | 1987-SIIF      |                      | W   |             |             |             |             |             | 111                                     | 0.2                | 21                |             | 6  |     |                   |                   |
|             | 1988-SIIF      |                      | D   |             |             |             |             |             | 111                                     | 0.1                | 6                 |             |    |     |                   |                   |
|             | 1988-SIIF      |                      | W   |             |             |             |             |             | 111                                     | 0.1                | 22                |             |    |     |                   |                   |
|             | 1989-NACE      |                      | W   | 510         | 20          | 93          | 1           | 1           |   |                    |                   |             |    |     |                   |                   |
|             | 1989-SIIF      |                      | W   |             |             |             |             |             | 111                                     | 0.1                | 36                |             |    |     |                   |                   |
|             | 1990-NIVA      | 2G                   | W   | 340         | 1           | 169         |             |             | 341                                     | 0.05               | 58                |             |    |     |                   |                   |
|             | 1990-SIIF      | 2G                   | W   |             |             |             |             |             | 111                                     | 0.2                | 41                | 8           |    |     |                   |                   |
|             | 1991-NIVA      | 2H                   | W   | 340         | 1           | 179         |             |             | 341                                     | 0.05               | 68                |             |    |     |                   |                   |
|             | 1991-SIIF      | 2H                   | W   |             |             |             |             |             | 111                                     | 0.2                | 35                |             |    |     |                   |                   |
|             | 1992-NIVA      | 2J                   | W   | 340         | 5           | 192         | 3           | 1           | 341                                     | 0.1                | 146               |             |    |     |                   |                   |
|             | 1993-NIVA      | 2K                   | W   | 340         | 4           | 212         | 15          |             | 341                                     | 0.1                | 138               |             |    |     |                   |                   |
|             | 1994-NIVA      | 2Z                   | W   | 340         | 3           | 300         | 3           |             | 341                                     | 0.05               | 167               | 49          | 28 |     |                   |                   |
|             | 1995-NIVA      |                      | W   | 340         | 3           | 318         | 5           | 1           | 341                                     | 0.05               | 231               | 22          | 7  |     |                   |                   |
|             | 1996-NIVA      |                      | W   | 340         | 3           | 332         | 14          |             | 341                                     | 0.05               | 243               | 25          | 9  |     |                   |                   |
|             | 1997-NIVA      |                      | W   | 340         | 3           | 260         | 18          |             |   |                    |                   |             |    |     |                   |                   |
|             | 1997-NIVA      | AJ                   | W   |             |             |             |             |             | 341                                     | 0.05               | 221               | 1           | 1  | 1   |                   |                   |
|             | 1998-NIVA      |                      | W   | 340         | 3           | 284         | 20          | 3           | 14                                      |                    |                   |             |    |     |                   |                   |
|             | 1998-NIVA      | CH                   | W   |             |             |             |             |             | 341                                     | 0.05               | 209               | 19          | 9  | 44  |                   |                   |
|             | 1999-NIVA      |                      | W   | 340         | 3           | 249         | 7           | 1           |   |                    |                   |             |    |     |                   |                   |
|             | 1999-NIVA      | EG                   | W   |             |             |             |             |             | 341                                     | 0.05               | 232               | 2           | 1  | 78  |                   |                   |
| 2000-NIVA   |                | W                    | 340 | 3           | 230         | 15          | 1           |             |   |                    |                   |             |    |     |                   |                   |
| 2000-NIVA   | GU             | W                    |     |             |             |             |             | 341         | 0.05                                    | 186                | 15                | 7           | 83 |     |                   |                   |







| Tissue      |           | Fish liver          |                    |             |             |             | Fish fillet, Shrimp tail, Mussel, Other |             |                    |                    |                   |             |             |                   |
|-------------|-----------|---------------------|--------------------|-------------|-------------|-------------|---|-------------|--------------------|--------------------|-------------------|-------------|-------------|-------------------|
| Contaminant | Mon. Year | Inter-calibr.+basis | W                  | Detect      |             |             | Total                                   |             |                    | N (<)              |                   |             |             |                   |
|             |           |                     | Analys method code | limit (ppb) | value count | below d.lim | N (<) d.lim                             | above d.lim | Analys method code | Detect limit (ppb) | Total value count | below d.lim | N (<) d.lim | N (<) above d.lim |
| Contaminant | 2002-NILU |                     | W                  |             |             |             |   |             | 841                | 2E-05              | 12                |             |             | 2                 |
|             | 2003-NILU |                     | W                  |             |             |             |   |             | 841                | 2E-05              | 12                |             |             | 6                 |
|             | 2004-NILU |                     | W                  |             |             |             |   |             | 841                | 2E-05              | 13                |             |             | 5                 |
|             | 2005-NILU |                     | W                  |             |             |             |   |             | 841                | 2E-05              | 11                |             |             | 1                 |
|             | 2006-NILU |                     | W                  |             |             |             |   |             | 841                | 2E-05              | 12                |             |             | 2                 |
|             | 2002-NILU |                     | W                  |             |             |             |   |             | 841                | 2E-05              | 12                |             |             | 2                 |
| CDD6P       | 1995-NILU |                     | W                  |             |             |             |   |             | 841                | 2E-05              | 6                 |             |             |                   |
|             | 1996-NILU |                     | W                  | 841         | 0           | 4           |   |             | 841                | 4E-05              | 18                |             |             |                   |
|             | 2002-NILU |                     | W                  |             |             |             |   |             | 841                | 4E-05              | 12                | 1           |             |                   |
|             | 2003-NILU |                     | W                  |             |             |             |   |             | 841                | 4E-05              | 12                |             |             | 2                 |
|             | 2004-NILU |                     | W                  |             |             |             |   |             | 841                | 4E-05              | 13                |             |             |                   |
|             | 2005-NILU |                     | W                  |             |             |             |   |             | 841                | 4E-05              | 11                |             |             |                   |
|             | 2006-NILU |                     | W                  |             |             |             |   |             | 841                | 4E-05              | 12                |             |             |                   |
| CDD6X       | 1995-NILU |                     | W                  |             |             |             |   |             | 841                | 2E-05              | 6                 |             |             | 1                 |
|             | 1996-NILU |                     | W                  | 841         | 0           | 4           |   |             | 841                | 2E-05              | 18                |             |             | 1                 |
|             | 2002-NILU |                     | W                  |             |             |             |   |             | 841                | 2E-05              | 12                | 2           |             | 1                 |
|             | 2003-NILU |                     | W                  |             |             |             |   |             | 841                | 2E-05              | 12                |             |             | 6                 |
|             | 2004-NILU |                     | W                  |             |             |             |   |             | 841                | 2E-05              | 13                |             |             | 5                 |
|             | 2005-NILU |                     | W                  |             |             |             |   | 1           | 841                | 2E-05              | 11                | 1           | 1           |                   |
|             | 2006-NILU |                     | W                  |             |             |             |   |             | 841                | 2E-05              | 12                |             |             | 2                 |
| CDD9X       | 1995-NILU |                     | W                  |             |             |             |   |             | 841                | 2E-05              | 6                 | 2           |             | 1                 |
|             | 1996-NILU |                     | W                  | 841         | 0           | 3           |   | 1           | 841                | 2E-05              | 18                |             |             | 1                 |
|             | 2002-NILU |                     | W                  |             |             |             |   |             | 841                | 2E-05              | 12                | 2           |             | 2                 |
|             | 2003-NILU |                     | W                  |             |             |             |   |             | 841                | 2E-05              | 12                |             |             | 8                 |
|             | 2004-NILU |                     | W                  |             |             |             |   |             | 841                | 2E-05              | 13                |             |             | 7                 |
|             | 2005-NILU |                     | W                  |             |             |             |   |             | 841                | 2E-05              | 11                |             |             |                   |
|             | 2006-NILU |                     | W                  |             |             |             |   |             | 841                | 2E-05              | 12                |             |             | 1                 |
| CDDFS       | 1996-NILU |                     | W                  | 844         | miss        | 4           |   |             |                    |                    |                   |             |             |                   |
| CDDO        | 1995-NILU |                     | W                  |             |             |             |   |             | 841                | 2E-05              | 6                 |             |             |                   |
|             | 1996-NILU |                     | W                  | 841         | 0           | 4           |   |             | 841                | 1E-04              | 18                |             |             |                   |
|             | 2002-NILU |                     | W                  |             |             |             |   |             | 841                | 1E-04              | 12                |             |             |                   |
|             | 2003-NILU |                     | W                  |             |             |             |   |             | 841                | 1E-04              | 12                |             |             |                   |
|             | 2004-NILU |                     | W                  |             |             |             |   |             | 841                | 1E-04              | 13                |             |             |                   |
|             | 2005-NILU |                     | W                  |             |             |             |   |             | 841                | 1E-04              | 11                |             |             |                   |
|             | 2006-NILU |                     | W                  |             |             |             |   |             | 841                | 1E-04              | 12                |             |             |                   |
| CDDSN       | 1995-NILU |                     | W                  |             |             |             |   |             | 841                | 2E-05              | 5                 |             |             |                   |
|             | 1996-NILU |                     | W                  | 841         | 0           | 3           |   |             | 841                | 1E-05              | 18                |             |             | 3                 |
|             | 2002-NILU |                     | W                  |             |             |             |   |             | 841                | 1E-05              | 10                |             |             |                   |
| CDDSP       | 1995-NILU |                     | W                  |             |             |             |   |             | 841                | 2E-05              | 6                 |             |             |                   |
|             | 1996-NILU |                     | W                  | 841         | 0           | 4           |   |             | 841                | 4E-05              | 18                |             |             |                   |
|             | 2002-NILU |                     | W                  |             |             |             |   |             | 841                | 4E-05              | 11                | 1           |             |                   |
| CDDST       | 1995-NILU |                     | W                  |             |             |             |   |             | 841                | 2E-05              | 6                 |             |             |                   |
|             | 1996-NILU |                     | W                  | 841         | 0           | 4           |   |             | 841                | 1E-05              | 18                |             |             |                   |
|             | 2002-NILU |                     | W                  |             |             |             |   |             | 841                | 1E-05              | 12                |             |             |                   |
| CDDSX       | 1995-NILU |                     | W                  |             |             |             |   |             | 841                | 2E-05              | 5                 |             |             |                   |
|             | 1996-NILU |                     | W                  | 841         | 0           | 3           |   |             | 841                | 2E-05              | 18                |             |             | 2                 |
|             | 2002-NILU |                     | W                  |             |             |             |   |             | 841                | 2E-05              | 11                |             |             |                   |
| CDF2N       | 1995-NILU |                     | W                  |             |             |             |   |             | 841                | 2E-05              | 6                 |             |             |                   |
|             | 1996-NILU |                     | W                  | 841         | 0           | 4           |   |             | 841                | 1E-05              | 18                |             |             | 1                 |
|             | 2002-NILU |                     | W                  |             |             |             |   |             | 841                | 1E-05              | 12                |             |             |                   |
|             | 2003-NILU |                     | W                  |             |             |             |   |             | 841                | 1E-05              | 12                |             |             | 3                 |
|             | 2004-NILU |                     | W                  |             |             |             |   |             | 841                | 1E-05              | 12                |             |             |                   |
|             | 2005-NILU |                     | W                  |             |             |             |   |             | 841                | 1E-05              | 11                |             |             |                   |
|             | 2006-NILU |                     | W                  |             |             |             |   |             | 841                | 1E-05              | 12                |             |             |                   |
| CDF2T       | 1995-NILU |                     | W                  |             |             |             |   |             | 841                | 2E-05              | 6                 |             |             |                   |
|             | 1996-NILU |                     | W                  | 841         | 0           | 4           |   |             | 841                | 1E-05              | 18                |             |             |                   |
|             | 2002-NILU |                     | W                  |             |             |             |   |             | 841                | 1E-05              | 12                |             |             |                   |

| Tissue Contaminant |           |                      | Fish liver         |                    |                   |                   |                   | Fish fillet, Shrimp tail, Mussel, Other |                    |                    |                   |                   |                   |                   |
|--------------------|-----------|----------------------|--------------------|--------------------|-------------------|-------------------|-------------------|---|--------------------|--------------------|-------------------|-------------------|-------------------|-------------------|
|                    |           |                      | Analys method code | Detect limit (ppb) | Total value count | Count below d.lim | N (<) below d.lim | N (<) above d.lim                       | Analys method code | Detect limit (ppb) | Total value count | Count below d.lim | N (<) below d.lim | N (<) above d.lim |
| Contaminant        | Mon. Year | Inter-calibr. +basis |                    |                    |                   |                   |                   |   |                    |                    |                   |                   |                   |                   |
|                    | 2003-NILU |                      | W                  |                    |                   |                   |                   | 841                                     | 1E-05              | 12                 |                   |                   |                   |                   |
|                    | 2004-NILU |                      | W                  |                    |                   |                   |                   | 841                                     | 1E-05              | 13                 |                   |                   |                   |                   |
|                    | 2005-NILU |                      | W                  |                    |                   |                   |                   | 841                                     | 1E-05              | 11                 |                   |                   |                   |                   |
|                    | 2006-NILU |                      | W                  |                    |                   |                   |                   | 841                                     | 1E-05              | 12                 |                   |                   |                   |                   |
| CDF4X              | 1995-NILU |                      | W                  |                    |                   |                   |                   | 841                                     | 2E-05              | 6                  |                   |                   |                   |                   |
|                    | 1996-NILU |                      | W                  | 841                | 0                 | 4                 |                   | 841                                     | 2E-05              | 18                 |                   |                   |                   | 1                 |
|                    | 2002-NILU |                      | W                  |                    |                   |                   |                   | 841                                     | 2E-05              | 12                 | 4                 |                   |                   |                   |
|                    | 2003-NILU |                      | W                  |                    |                   |                   |                   | 841                                     | 2E-05              | 12                 | 1                 | 1                 |                   | 3                 |
|                    | 2004-NILU |                      | W                  |                    |                   |                   |                   | 841                                     | 2E-05              | 13                 | 1                 | 1                 |                   |                   |
|                    | 2005-NILU |                      | W                  |                    |                   |                   |                   | 841                                     | 2E-05              | 11                 |                   |                   |                   |                   |
|                    | 2006-NILU |                      | W                  |                    |                   |                   |                   | 841                                     | 2E-05              | 12                 |                   |                   |                   |                   |
| CDF6P              | 1995-NILU |                      | W                  |                    |                   |                   |                   | 841                                     | 2E-05              | 6                  |                   |                   |                   |                   |
|                    | 1996-NILU |                      | W                  | 841                | 0                 | 4                 |                   | 841                                     | 4E-05              | 18                 | 2                 |                   |                   | 1                 |
|                    | 2002-NILU |                      | W                  |                    |                   |                   |                   | 841                                     | 4E-05              | 12                 | 3                 |                   |                   |                   |
|                    | 2003-NILU |                      | W                  |                    |                   |                   |                   | 841                                     | 4E-05              | 12                 | 1                 | 1                 |                   | 2                 |
|                    | 2004-NILU |                      | W                  |                    |                   |                   |                   | 841                                     | 4E-05              | 13                 |                   |                   |                   |                   |
|                    | 2005-NILU |                      | W                  |                    |                   |                   |                   | 841                                     | 4E-05              | 11                 |                   |                   |                   |                   |
|                    | 2006-NILU |                      | W                  |                    |                   |                   |                   | 841                                     | 4E-05              | 12                 |                   |                   |                   |                   |
| CDF6X              | 1995-NILU |                      | W                  |                    |                   |                   |                   | 841                                     | 2E-05              | 6                  |                   |                   |                   |                   |
|                    | 1996-NILU |                      | W                  | 841                | 0                 | 4                 |                   | 841                                     | 2E-05              | 18                 |                   |                   |                   | 1                 |
|                    | 2002-NILU |                      | W                  |                    |                   |                   |                   | 841                                     | 2E-05              | 12                 |                   |                   |                   | 1                 |
|                    | 2003-NILU |                      | W                  |                    |                   |                   |                   | 841                                     | 2E-05              | 12                 | 1                 |                   |                   | 2                 |
|                    | 2004-NILU |                      | W                  |                    |                   |                   |                   | 841                                     | 2E-05              | 13                 | 1                 | 1                 |                   | 1                 |
|                    | 2005-NILU |                      | W                  |                    |                   |                   |                   | 841                                     | 2E-05              | 11                 | 1                 | 1                 |                   |                   |
|                    | 2006-NILU |                      | W                  |                    |                   |                   |                   | 841                                     | 2E-05              | 12                 |                   |                   |                   |                   |
| CDF9P              | 1995-NILU |                      | W                  |                    |                   |                   |                   | 841                                     | 2E-05              | 6                  | 2                 | 2                 |                   | 1                 |
|                    | 1996-NILU |                      | W                  | 841                | 0                 | 4                 |                   | 841                                     | 8E-05              | 17                 | 3                 | 2                 |                   | 1                 |
|                    | 2002-NILU |                      | W                  |                    |                   |                   |                   | 841                                     | 8E-05              | 12                 | 2                 |                   |                   | 2                 |
|                    | 2003-NILU |                      | W                  |                    |                   |                   |                   | 841                                     | 8E-05              | 12                 | 3                 | 3                 |                   | 4                 |
|                    | 2004-NILU |                      | W                  |                    |                   |                   |                   | 841                                     | 8E-05              | 13                 | 8                 | 7                 |                   |                   |
|                    | 2005-NILU |                      | W                  |                    |                   |                   |                   | 841                                     | 8E-05              | 11                 | 5                 | 2                 |                   |                   |
|                    | 2006-NILU |                      | W                  |                    |                   |                   |                   | 841                                     | 8E-05              | 12                 | 7                 | 6                 |                   |                   |
| CDF9X              | 1995-NILU |                      | W                  |                    |                   |                   |                   | 841                                     | 2E-05              | 6                  | 3                 | 3                 |                   | 1                 |
|                    | 1996-NILU |                      | W                  | 841                | 0                 | 4                 |                   | 841                                     | 2E-05              | 18                 |                   |                   |                   | 1                 |
|                    | 2002-NILU |                      | W                  |                    |                   |                   |                   | 841                                     | 2E-05              | 12                 |                   |                   |                   | 3                 |
|                    | 2003-NILU |                      | W                  |                    |                   |                   |                   | 841                                     | 2E-05              | 12                 |                   |                   |                   | 7                 |
|                    | 2004-NILU |                      | W                  |                    |                   |                   |                   | 841                                     | 2E-05              | 13                 | 8                 | 8                 |                   |                   |
|                    | 2005-NILU |                      | W                  |                    |                   |                   |                   | 841                                     | 2E-05              | 11                 | 5                 | 3                 |                   |                   |
|                    | 2006-NILU |                      | W                  |                    |                   |                   |                   | 841                                     | 2E-05              | 12                 | 5                 | 3                 |                   |                   |
| CDFDN              | 1995-NILU |                      | W                  |                    |                   |                   |                   | 841                                     | 2E-05              | 6                  |                   |                   |                   |                   |
|                    | 1996-NILU |                      | W                  | 841                | 0                 | 4                 |                   | 841                                     | 1E-05              | 18                 |                   |                   |                   | 1                 |
|                    | 2002-NILU |                      | W                  |                    |                   |                   |                   | 841                                     | 1E-05              | 12                 |                   |                   |                   |                   |
|                    | 2003-NILU |                      | W                  |                    |                   |                   |                   | 841                                     | 1E-05              | 12                 |                   |                   |                   | 1                 |
|                    | 2004-NILU |                      | W                  |                    |                   |                   |                   | 841                                     | 1E-05              | 13                 |                   |                   |                   | 1                 |
|                    | 2005-NILU |                      | W                  |                    |                   |                   |                   | 841                                     | 1E-05              | 11                 |                   |                   |                   |                   |
|                    | 2006-NILU |                      | W                  |                    |                   |                   |                   | 841                                     | 1E-05              | 12                 |                   |                   |                   | 1                 |
| CDFDX              | 1995-NILU |                      | W                  |                    |                   |                   |                   | 841                                     | 2E-05              | 6                  |                   |                   |                   |                   |
|                    | 1996-NILU |                      | W                  | 841                | 0                 | 4                 |                   | 841                                     | 2E-05              | 18                 |                   |                   |                   | 1                 |
|                    | 2002-NILU |                      | W                  |                    |                   |                   |                   | 841                                     | 2E-05              | 12                 |                   |                   |                   | 1                 |
|                    | 2003-NILU |                      | W                  |                    |                   |                   |                   | 841                                     | 2E-05              | 12                 | 1                 |                   |                   | 4                 |
|                    | 2004-NILU |                      | W                  |                    |                   |                   |                   | 841                                     | 2E-05              | 13                 | 1                 | 1                 |                   |                   |
|                    | 2005-NILU |                      | W                  |                    |                   |                   |                   | 841                                     | 2E-05              | 11                 | 1                 | 1                 |                   |                   |
|                    | 2006-NILU |                      | W                  |                    |                   |                   |                   | 841                                     | 2E-05              | 12                 | 1                 | 1                 |                   |                   |
| CDFO               | 1995-NILU |                      | W                  |                    |                   |                   |                   | 841                                     | 2E-05              | 6                  |                   |                   |                   | 1                 |
|                    | 1996-NILU |                      | W                  | 841                | 0                 | 4                 |                   | 841                                     | 1E-04              | 18                 | 3                 | 2                 |                   | 1                 |
|                    | 2002-NILU |                      | W                  |                    |                   |                   |                   | 841                                     | 1E-04              | 11                 | 1                 |                   |                   |                   |
|                    | 2003-NILU |                      | W                  |                    |                   |                   |                   | 841                                     | 1E-04              | 12                 | 1                 |                   |                   | 2                 |

| Tissue      |           |                      | Fish liver         |                    |                   |                   |                   | Fish fillet, Shrimp tail, Mussel, Other |                    |                    |                   |                   |                   |                   |
|-------------|-----------|----------------------|--------------------|--------------------|-------------------|-------------------|-------------------|---|--------------------|--------------------|-------------------|-------------------|-------------------|-------------------|
| Contaminant | Mon. Year | Inter-calibr. +basis | Analys method code | Detect limit (ppb) | Total value count | Count below d.lim | N (<) below d.lim | N (<) above d.lim                       | Analys method code | Detect limit (ppb) | Total value count | Count below d.lim | N (<) below d.lim | N (<) above d.lim |
|             | 2004-NILU |                      | W                  |                    |                   |                   |                   |   | 841                | 1E-04              | 13                | 1                 | 1                 | 1                 |
|             | 2005-NILU |                      | W                  |                    |                   |                   |                   |   | 841                | 1E-04              | 11                | 1                 | 1                 |                   |
|             | 2006-NILU |                      | W                  |                    |                   |                   |                   |   | 841                | 1E-04              | 12                | 1                 | 1                 |                   |
| CDFSN       | 1995-NILU |                      | W                  |                    |                   |                   |                   |   | 841                | 2E-05              | 6                 |                   |                   |                   |
|             | 1996-NILU |                      | W                  | 841                | 0                 | 4                 |                   |   | 841                | 1E-05              | 18                |                   |                   | 1                 |
|             | 2002-NILU |                      | W                  |                    |                   |                   |                   |   | 841                | 1E-05              | 12                |                   |                   |                   |
| CDFSP       | 1995-NILU |                      | W                  |                    |                   |                   |                   |   | 841                | 2E-05              | 6                 |                   |                   |                   |
|             | 1996-NILU |                      | W                  | 841                | 0                 | 4                 |                   |   | 841                | 8E-05              | 18                | 6                 |                   | 1                 |
|             | 2002-NILU |                      | W                  |                    |                   |                   |                   |   | 841                | 8E-05              | 12                | 4                 |                   |                   |
| CDFST       | 1995-NILU |                      | W                  |                    |                   |                   |                   |   | 841                | 2E-05              | 6                 |                   |                   |                   |
|             | 1996-NILU |                      | W                  | 841                | 0                 | 4                 |                   |   | 841                | 1E-05              | 18                |                   |                   |                   |
|             | 2002-NILU |                      | W                  |                    |                   |                   |                   |   | 841                | 1E-05              | 12                |                   |                   |                   |
| CDFSX       | 1995-NILU |                      | W                  |                    |                   |                   |                   |   | 841                | 2E-05              | 6                 |                   |                   |                   |
|             | 1996-NILU |                      | W                  | 841                | 0                 | 4                 |                   |   | 841                | 2E-05              | 18                |                   |                   | 1                 |
|             | 2002-NILU |                      | W                  |                    |                   |                   |                   |   | 841                | 2E-05              | 12                | 1                 |                   |                   |
| CHR         | 1992-NIVA |                      | W                  | 309                | 0.2               | 8                 |                   |   | 309                | 0.2                | 44                |                   |                   |                   |
|             | 1995-NIVA |                      | W                  |                    |                   |                   |                   |   | 309                | 0.2                | 56                |                   |                   |                   |
|             | 1996-NIVA |                      | W                  |                    |                   |                   |                   |   | 309                | 0.2                | 65                |                   |                   | 3                 |
|             | 2005-NIVA | FI                   | W                  |                    |                   |                   |                   |   | 309                | 0.5                | 51                |                   |                   |                   |
|             | 2006-NIVA | R44_EX705_BT-4       | W                  |                    |                   |                   |                   |   | 309                | 0.5                | 48                |                   |                   |                   |
| CHRTR       | 1995-NIVA |                      | W                  |                    |                   |                   |                   |   | 309                | 0.2                | 15                |                   |                   | 2                 |
|             | 1997-NIVA |                      | W                  |                    |                   |                   |                   |   | 309                | 0.5                | 36                |                   |                   |                   |
|             | 1998-NIVA |                      | W                  |                    |                   |                   |                   |   | 309                | 0.5                | 39                |                   |                   |                   |
|             | 1999-NIVA |                      | W                  |                    |                   |                   |                   |   | 309                | 0.5                | 34                |                   |                   |                   |
|             | 2000-NIVA |                      | W                  |                    |                   |                   |                   |   | 309                | 0.5                | 39                |                   |                   |                   |
|             | 2001-NIVA |                      | W                  |                    |                   |                   |                   |   | 309                | 0.5                | 42                |                   |                   |                   |
|             | 2002-NIVA |                      | W                  |                    |                   |                   |                   |   | 309                | 0.5                | 43                |                   |                   |                   |
|             | 2003-NIVA |                      | W                  |                    |                   |                   |                   |   | 309                | 0.5                | 56                |                   |                   |                   |
|             | 2004-NIVA |                      | W                  |                    |                   |                   |                   |   | 309                | 0.5                | 58                |                   |                   |                   |
| CO          | 1996-NIVA |                      | D                  |                    |                   |                   |                   |   | 312                | 330                | 18                |                   |                   |                   |
|             | 1996-NIVA |                      | W                  |                    |                   |                   |                   |   | 312                | 330                | 3                 | 3                 |                   |                   |
|             | 2004-NIVA |                      | W                  |                    |                   |                   |                   |   | 315                | 0.5                | 28                |                   |                   |                   |
|             | 2005-NIVA |                      | W                  |                    |                   |                   |                   |   | 315                | 0.5                | 21                |                   |                   |                   |
|             | 2006-NIVA |                      | W                  |                    |                   |                   |                   |   | 315                | 0.5                | 20                |                   |                   |                   |
| COR         | 1992-NIVA |                      | W                  | 309                | 0.2               | 8                 |                   |   | 309                | 0.2                | 46                |                   |                   |                   |
| CR          | 1992-NIVA |                      | W                  |                    |                   |                   |                   |   | 312                | 10                 | 6                 |                   |                   |                   |
|             | 1996-NIVA |                      | D                  |                    |                   |                   |                   |   | 312                | 10                 | 18                |                   |                   |                   |
|             | 1996-NIVA |                      | W                  |                    |                   |                   |                   |   | 312                | 10                 | 3                 |                   |                   |                   |
|             | 2004-NIVA |                      | W                  |                    |                   |                   |                   |   | 315                | 100                | 28                |                   |                   |                   |
|             | 2005-NIVA | AI                   | W                  |                    |                   |                   |                   |   | 315                | 100                | 21                |                   |                   |                   |
|             | 2006-NIVA | R44_EX702_BT-1       | W                  |                    |                   |                   |                   |   | 315                | 100                | 20                |                   |                   |                   |
| CU          | 1981-NIVA |                      | D                  |                    |                   |                   |                   |   | 311                | 150                | 3                 |                   |                   |                   |
|             | 1982-NIVA |                      | D                  |                    |                   |                   |                   |   | 311                | 150                | 3                 |                   |                   |                   |
|             | 1983-SIIF | 1G                   | W                  |                    |                   |                   |                   |   | 130                | 10                 | 12                |                   |                   |                   |
|             | 1984-SIIF | 1G                   | W                  |                    |                   |                   |                   |   | 130                | 10                 | 27                |                   |                   |                   |
|             | 1986-NIVA | 1H                   | D                  | 311                | 150               | 56                |                   |   | 311                | 150                | 20                |                   |                   |                   |
|             | 1987-FIER | 1G                   | W                  | 404                | 50                | 37                |                   |   |                    |                    |                   |                   |                   |                   |
|             | 1987-NIVA | 1H                   | D                  | 311                | 150               | 57                |                   |   | 311                | 150                | 42                |                   |                   |                   |
|             | 1988-NIVA | 1H                   | D                  | 311                | 150               | 61                |                   |   | 311                | 150                | 55                |                   |                   |                   |
|             | 1989-NIVA | 1H                   | D                  | 311                | 150               | 135               |                   |   | 311                | 150                | 3                 |                   |                   |                   |
|             | 1989-NIVA | 1H                   | W                  |                    |                   |                   |                   |   | 311                | 150                | 36                |                   |                   |                   |
|             | 1990-NIVA | 1H                   | D                  |                    |                   |                   |                   |   | 311                | 150                | 6                 |                   |                   |                   |
|             | 1990-NIVA | 1H                   | W                  | 311                | 150               | 189               |                   |   | 311                | 150                | 77                |                   |                   |                   |
|             | 1991-NIVA | 1H                   | D                  |                    |                   |                   |                   |   | 311                | 50                 | 6                 |                   |                   |                   |
|             | 1991-NIVA | 1H                   | W                  | 311                | 50                | 193               | 2                 |   | 311                | 50                 | 67                |                   |                   |                   |
| 1992-NIVA   | 1H        | D                    |                    |                    |                   |                   |                   | 311                                     | 10                 | 6                  |                   |                   |                   |                   |

| Tissue      |                |                      | Fish liver         |             |             |                   |                   | Fish fillet, Shrimp tail, Mussel, Other |                    |                    |                   |                   |                   |             |
|-------------|----------------|----------------------|--------------------|-------------|-------------|-------------------|-------------------|---|--------------------|--------------------|-------------------|-------------------|-------------------|-------------|
| Contaminant | Mon. Year      | Inter-calibr. +basis | Analys method code | Detect      |             | Count below d.lim | N (<) below d.lim | N (<) above                             | Analys method code | Detect limit (ppb) | Total value count | Count below d.lim | N (<) below d.lim | N (<) above |
|             |                |                      |                    | limit (ppb) | value count |                   |                   |   |                    |                    |                   |                   |                   |             |
|             |                |                      |                    | W           | D           | W                 | D                 | W                                       |                    |                    |                   |                   |                   |             |
|             | 1992-NIVA      | 1H                   | 311                | 10          | 191         |                   |                   |   | 311                | 10                 | 111               |                   |                   |             |
|             | 1993-NIVA      | 1H                   | D                  |             |             |                   |                   |   | 311                | 10                 | 5                 |                   |                   |             |
|             | 1993-NIVA      | 1H                   | 311                | 10          | 221         |                   |                   |   | 311                | 10                 | 79                |                   |                   |             |
|             | 1994-NIVA      | 1Z                   | D                  |             |             |                   |                   |   | 311                | 10                 | 5                 |                   |                   |             |
|             | 1994-NIVA      | 1Z                   | 311                | 10          | 302         |                   |                   |   | 311                | 10                 | 81                |                   |                   |             |
|             | 1995-NIVA      |                      | D                  |             |             |                   |                   |   | 311                | 10                 | 6                 |                   |                   |             |
|             | 1995-NIVA      |                      | 311                | 10          | 318         |                   |                   |   | 311                | 10                 | 124               |                   |                   |             |
|             | 1996-NIVA      | V1                   | D                  |             |             |                   |                   |   | 311                | 10                 | 21                |                   |                   |             |
|             | 1996-NIVA      | V1                   | W                  |             |             |                   |                   |   | 311                | 10                 | 113               |                   |                   |             |
|             | 1996-NIVA      | V2                   | 311                | 10          | 368         |                   |                   |   |                    |                    |                   |                   |                   |             |
|             | 1997-NIVA      |                      | 311                | 5000a       | 287         | 1                 |                   |   |                    |                    |                   |                   |                   |             |
|             | 1997-NIVA      | AH                   | D                  |             |             |                   |                   |   | 311                | 10                 | 6                 |                   |                   |             |
|             | 1997-NIVA      | AH                   | W                  |             |             |                   |                   |   | 311                | 10                 | 96                |                   |                   |             |
|             | 1998-NIVA      |                      | 311                | 10          | 285         |                   |                   |   |                    |                    |                   |                   |                   |             |
|             | 1998-NIVA      | CF                   | D                  |             |             |                   |                   |   | 311                | 10                 | 6                 |                   |                   |             |
|             | 1998-NIVA      | CF                   | W                  |             |             |                   |                   |   | 311                | 10                 | 72                |                   |                   |             |
|             | 1999-NIVA      |                      | 311                | 10          | 235         |                   |                   |   |                    |                    |                   |                   |                   |             |
|             | 1999-NIVA      | EF                   | D                  |             |             |                   |                   |   | 311                | 10                 | 6                 |                   |                   |             |
|             | 1999-NIVA      | EF                   | W                  |             |             |                   |                   |   | 311                | 10                 | 120               |                   |                   |             |
|             | 2000-NIVA      |                      | 311                | 10          | 227         |                   |                   |   |                    |                    |                   |                   |                   |             |
|             | 2000-NIVA      | GS                   | D                  |             |             |                   |                   |   | 311                | 10                 | 7                 |                   |                   |             |
|             | 2000-NIVA      | GS                   | W                  |             |             |                   |                   |   | 311                | 10                 | 70                |                   |                   |             |
|             | 2001-NIVA      |                      | 311                | 10          | 261         |                   |                   |   |                    |                    |                   |                   |                   |             |
|             | 2001-NIVA      | IM                   | D                  |             |             |                   |                   |   | 311                | 10                 | 6                 |                   |                   |             |
|             | 2001-NIVA      | IM                   | W                  |             |             |                   |                   |   | 311                | 10                 | 72                |                   |                   |             |
| 2002-NIVA   |                | 315                  | 10                 | 230         |             |                   |                   |   |                    |                    |                   |                   |                   |             |
| 2002-NIVA   | LH             | D                    |                    |             |             |                   |                   | 315                                     | 10                 | 6                  |                   |                   |                   |             |
| 2002-NIVA   | LH             | W                    |                    |             |             |                   |                   | 315                                     | 10                 | 86                 |                   |                   |                   |             |
| 2003-NIVA   |                | 315                  | 10                 | 233         |             |                   |                   |   |                    |                    |                   |                   |                   |             |
| 2003-NIVA   | MM             | W                    |                    |             |             |                   |                   | 315                                     | 10                 | 71                 |                   |                   |                   |             |
| 2004-NIVA   |                | 315                  | 10                 | 249         |             |                   |                   | 315                                     | 10                 | 122                |                   |                   |                   |             |
| 2005-NIVA   | B!             | W                    |                    |             |             |                   |                   | 315                                     | 10                 | 123                |                   |                   |                   |             |
| 2006-NIVA   | R44_EX702_BT-1 | W                    |                    |             |             |                   |                   | 315                                     | 10                 | 100                |                   |                   |                   |             |
| DBA3A       | 1992-NIVA      |                      | 309                | 0.2         | 8           |                   |                   |   | 309                | 0.2                | 46                |                   |                   |             |
|             | 1995-NIVA      |                      | W                  |             |             |                   |                   |   | 309                | 0.2                | 71                |                   |                   | 48          |
|             | 1996-NIVA      |                      | W                  |             |             |                   |                   |   | 309                | 0.2                | 65                |                   |                   | 53          |
|             | 1997-NIVA      |                      | W                  |             |             |                   |                   |   | 309                | 0.5                | 36                |                   |                   |             |
|             | 1998-NIVA      |                      | W                  |             |             |                   |                   |   | 309                | 0.5                | 39                |                   |                   |             |
|             | 1999-NIVA      |                      | W                  |             |             |                   |                   |   | 309                | 0.5                | 34                |                   |                   |             |
|             | 2000-NIVA      |                      | W                  |             |             |                   |                   |   | 309                | 0.5                | 39                |                   |                   |             |
|             | 2001-NIVA      |                      | W                  |             |             |                   |                   |   | 309                | 0.5                | 42                |                   |                   |             |
|             | 2002-NIVA      |                      | W                  |             |             |                   |                   |   | 309                | 0.5                | 43                |                   |                   |             |
|             | 2003-NIVA      | MQ                   | W                  |             |             |                   |                   |   | 309                | 0.5                | 56                |                   |                   |             |
| 2004-NIVA   |                | W                    |                    |             |             |                   |                   | 309                                     | 0.5                | 58                 | 26                | 14                |                   |             |
| 2005-NIVA   | E!             | W                    |                    |             |             |                   |                   | 309                                     | 0.5                | 51                 |                   |                   |                   |             |
| 2006-NIVA   | R44_EX705_BT-4 | W                    |                    |             |             |                   |                   | 309                                     | 0.5                | 48                 |                   |                   |                   |             |
| DBP         | 1992-NIVA      |                      | 309                | 0.2         | 8           |                   |                   |   | 309                | 0.2                | 46                |                   |                   |             |
| DBT         | 1998-NIVA      |                      | W                  |             |             |                   |                   |   | 309                | 0.5                | 39                |                   |                   |             |
|             | 1999-NIVA      |                      | W                  |             |             |                   |                   |   | 309                | 0.5                | 34                |                   |                   |             |
|             | 2000-NIVA      |                      | W                  |             |             |                   |                   |   | 309                | 0.5                | 39                |                   |                   |             |
|             | 2001-NIVA      |                      | W                  |             |             |                   |                   |   | 309                | 0.5                | 42                |                   |                   |             |
|             | 2002-NIVA      |                      | W                  |             |             |                   |                   |   | 309                | 0.5                | 43                |                   |                   |             |
|             | 2003-NIVA      | MQ                   | W                  |             |             |                   |                   |   | 309                | 0.5                | 56                |                   |                   | 20          |
|             | 2004-NIVA      | R5                   | W                  |             |             |                   |                   |   | 309                | 0.5                | 58                | 31                | 20                |             |
|             | 2005-NIVA      | F!                   | W                  |             |             |                   |                   |   | 309                | 0.5                | 51                |                   |                   |             |
| 2006-NIVA   | R44_EX705_BT-4 | W                    |                    |             |             |                   |                   | 309                                     | 0.5                | 48                 |                   |                   |                   |             |
| DBTC1       | 1995-NIVA      |                      | W                  |             |             |                   |                   |   | 309                | 0.2                | 57                |                   |                   | 14          |











| Tissue      |           |                      | Fish liver         |                     |                   |                   |                   | Fish fillet, Shrimp tail, Mussel, Other |                    |                    |                   |                   |                   |                   |     |
|-------------|-----------|----------------------|--------------------|---------------------|-------------------|-------------------|-------------------|---|--------------------|--------------------|-------------------|-------------------|-------------------|-------------------|-----|
| Contaminant | Mon. Year | Inter-calibr. +basis | Analys method code | Detec t limit (ppb) | Total value count | Count below d.lim | N (<) below d.lim | N (<) above d.lim                       | Analys method code | Detect limit (ppb) | Total value count | Count below d.lim | N (<) below d.lim | N (<) above d.lim |     |
|             |           |                      |                    |                     |                   |                   |                   |   |                    |                    |                   |                   |                   |                   |     |
|             | 2000-NIVA |                      | W                  | 340                 | 2                 | 230               | 65                | 20                                      | 29                 | 341                | 0.05              | 186               | 27                | 15                | 10  |
|             | 2001-NIVA |                      | W                  | 340                 | 2                 | 250               | 96                | 18                                      | 20                 | 341                | 0.05              | 211               | 21                | 21                | 160 |
|             | 2002-NIVA |                      | W                  | 340                 | 2                 | 249               | 147               | 76                                      | 13                 | 341                | 0.05              | 210               |                   |                   | 83  |
|             | 2003-NIVA |                      | W                  | 340                 | 2                 | 239               | 96                | 86                                      | 85                 | 341                | 0.05              | 181               |                   |                   | 102 |
|             | 2004-NIVA |                      | W                  | 340                 | 2                 | 271               | 137               | 87                                      | 19                 | 341                | 0.05              | 241               |                   |                   | 8   |
|             | 2005-NIVA |                      | W                  | 340                 | 2                 | 281               | 236               | 133                                     | 10                 | 341                | 0.05              | 248               |                   |                   |     |
|             | 2006-NIVA | R44_EX704_BT-3       | W                  | 340                 | 2                 | 280               | 140               | 112                                     | 1                  | 341                | 0.05              | 221               |                   |                   |     |
| HG          | 1981-NIVA |                      | D                  |                     |                   |                   |                   |   |                    | 310                | 10                | 3                 |                   |                   |     |
|             | 1981-SIIF | 1E                   | W                  | 120                 | 10                | 15                |                   |   | 1                  | 120                | 10                | 35                |                   |                   |     |
|             | 1982-NIVA |                      | D                  |                     |                   |                   |                   |   |                    | 310                | 10                | 3                 |                   |                   |     |
|             | 1982-SIIF | 1E                   | W                  |                     |                   |                   |                   |   |                    | 120                | 10                | 18                |                   |                   |     |
|             | 1982-VETN |                      | W                  | 220                 | 10                | 51                |                   |   |                    | 220                | 10                | 54                |                   |                   |     |
|             | 1983-SIIF | 1E                   | W                  |                     |                   |                   |                   |   |                    | 120                | 10                | 17                |                   |                   |     |
|             | 1983-VETN | 1Z                   | W                  |                     |                   |                   |                   |   |                    | 220                | 10                | 48                |                   |                   |     |
|             | 1984-FIER | 1G                   | W                  |                     |                   |                   |                   |   |                    | 401                | 10                | 39                |                   |                   |     |
|             | 1984-SIIF | 1G                   | W                  |                     |                   |                   |                   |   |                    | 120                | 10                | 27                | 6                 | 1                 |     |
|             | 1984-VETN | 1Z                   | W                  |                     |                   |                   |                   |   |                    | 220                | 10                | 66                |                   |                   |     |
|             | 1985-SIIF | 1G                   | D                  |                     |                   |                   |                   |   |                    | 120                | 10                | 30                |                   |                   |     |
|             | 1985-VETN | 1Z                   | W                  |                     |                   |                   |                   |   |                    | 220                | 10                | 90                |                   |                   |     |
|             | 1986-NIVA | 1H                   | D                  |                     |                   |                   |                   |   |                    | 310                | 10                | 74                |                   |                   |     |
|             | 1987-FIER | 1G                   | W                  |                     |                   |                   |                   |   |                    | 401                | 10                | 38                |                   |                   |     |
|             | 1987-NIVA | 1H                   | D                  |                     |                   |                   |                   |   |                    | 310                | 10                | 98                |                   |                   | 14  |
|             | 1988-NIVA | 1H                   | D                  |                     |                   |                   |                   |   |                    | 310                | 10                | 116               |                   |                   |     |
|             | 1989-NIVA | 1H                   | D                  |                     |                   |                   |                   |   |                    | 310                | 100               | 137               |                   |                   |     |
|             | 1989-NIVA | 1H                   | W                  |                     |                   |                   |                   |   |                    | 310                | 10                | 36                | 5                 |                   |     |
|             | 1990-NIVA | 1H                   | D                  |                     |                   |                   |                   |   |                    | 310                | 10                | 6                 |                   |                   |     |
|             | 1990-NIVA | 1H                   | W                  |                     |                   |                   |                   |   |                    | 310                | 10                | 266               |                   |                   |     |
|             | 1991-NIVA | 1H                   | D                  |                     |                   |                   |                   |   |                    | 310                | 100               | 6                 |                   |                   |     |
|             | 1991-NIVA | 1H                   | W                  |                     |                   |                   |                   |   |                    | 310                | 100a              | 264               | 126               | 6                 |     |
|             | 1992-NIVA | 1H                   | D                  |                     |                   |                   |                   |   |                    | 310                | 100               | 6                 |                   |                   |     |
|             | 1992-NIVA | 1H                   | W                  |                     |                   |                   |                   |   |                    | 310                | 100a              | 303               | 122               |                   |     |
|             | 1993-NIVA | 1H                   | D                  |                     |                   |                   |                   |   |                    | 310                | 5                 | 5                 |                   |                   |     |
|             | 1993-NIVA | 1H                   | W                  |                     |                   |                   |                   |   |                    | 310                | 5                 | 300               |                   |                   |     |
|             | 1994-NIVA | 1Z                   | D                  |                     |                   |                   |                   |   |                    | 310                | 5                 | 5                 |                   |                   |     |
|             | 1994-NIVA | 1Z                   | W                  |                     |                   |                   |                   |   |                    | 310                | 5                 | 381               |                   |                   |     |
|             | 1995-NIVA |                      | D                  |                     |                   |                   |                   |   |                    | 310                | 5                 | 6                 |                   |                   |     |
|             | 1995-NIVA |                      | W                  |                     |                   |                   |                   |   |                    | 310                | 5                 | 442               | 1                 |                   |     |
|             | 1996-NIVA | V1                   | D                  |                     |                   |                   |                   |   |                    | 310                | 5                 | 24                |                   |                   |     |
|             | 1996-NIVA | V1                   | W                  |                     |                   |                   |                   |   |                    | 310                | 5                 | 481               |                   |                   |     |
|             | 1997-NIVA | AH                   | D                  |                     |                   |                   |                   |   |                    | 310                | 5                 | 6                 |                   |                   |     |
|             | 1997-NIVA | AH                   | W                  |                     |                   |                   |                   |   |                    | 310                | 5                 | 404               |                   |                   |     |
|             | 1998-NIVA | CF                   | D                  |                     |                   |                   |                   |   |                    | 310                | 5                 | 6                 |                   |                   |     |
|             | 1998-NIVA | CF                   | W                  |                     |                   |                   |                   |   |                    | 310                | 5                 | 402               |                   |                   |     |
|             | 1999-NIVA |                      | W                  | 310                 | 5                 | 3                 |                   |   |                    |                    |                   |                   |                   |                   |     |
|             | 1999-NIVA | EF                   | D                  |                     |                   |                   |                   |   |                    | 310                | 5                 | 6                 |                   |                   |     |
|             | 1999-NIVA | EF                   | W                  |                     |                   |                   |                   |   |                    | 310                | 5                 | 407               |                   |                   |     |
|             | 2000-NIVA | GS                   | D                  |                     |                   |                   |                   |   |                    | 310                | 5                 | 7                 |                   |                   |     |
|             | 2000-NIVA | GS                   | W                  |                     |                   |                   |                   |   |                    | 310                | 5                 | 349               |                   |                   |     |
|             | 2001-NIVA | IM                   | D                  |                     |                   |                   |                   |   |                    | 310                | 5                 | 6                 |                   |                   |     |
|             | 2001-NIVA | IM                   | W                  |                     |                   |                   |                   |   |                    | 310                | 5                 | 377               |                   |                   |     |
|             | 2002-NIVA | LH                   | D                  |                     |                   |                   |                   |   |                    | 310                | 5                 | 6                 |                   |                   |     |
|             | 2002-NIVA | LH                   | W                  |                     |                   |                   |                   |   |                    | 310                | 5                 | 387               |                   |                   |     |
|             | 2003-NIVA | MM                   | W                  |                     |                   |                   |                   |   |                    | 310                | 5                 | 368               | 2                 |                   |     |
|             | 2004-NIVA |                      | W                  |                     |                   |                   |                   |   |                    | 310                | 5                 | 441               |                   |                   |     |
|             | 2005-NIVA | A!                   | W                  |                     |                   |                   |                   |   |                    | 310                | 5                 | 453               | 1                 |                   |     |
|             | 2006-NIVA | R42_Ex685_BT-1       | W                  |                     |                   |                   |                   |   |                    | 310                | 5                 | 429               |                   |                   |     |
| ICDP        | 1992-NIVA |                      | W                  | 309                 | 0.2               | 8                 |                   |   |                    | 309                | 0.2               | 46                |                   |                   |     |



| Tissue      |           |                      | Fish liver |               |       |             |             | Fish fillet, Shrimp tail, Mussel, Other |             |               |              |             |             |             |             |
|-------------|-----------|----------------------|------------|---------------|-------|-------------|-------------|---|-------------|---------------|--------------|-------------|-------------|-------------|-------------|
| Contaminant | Mon. Year | Inter-calibr. +basis | W          | Detect        |       |             |             |   |             |               |              |             |             |             |             |
|             |           |                      |            | Analys method | limit | Total value | Count below | N (<) below                             | N (<) above | Analys method | Detect limit | Total value | Count below | N (<) below | N (<) above |
|             |           |                      |            | code          | (ppb) | count       | d.lim       | d.lim                                   | d.lim       | code          | (ppb)        | count       | d.lim       | d.lim       | d.lim       |
| .           | 1999-NIVA |                      | W          |               |       |             |             |   | 309         | 0.5           | 34           |             |             |             |             |
|             | 2000-NIVA |                      | W          |               |       |             |             |   | 309         | 0.5           | 39           |             |             |             |             |
|             | 2001-NIVA |                      | W          |               |       |             |             |   | 309         | 0.5           | 41           |             |             |             |             |
|             | 2002-NIVA |                      | W          |               |       |             |             |   | 309         | 0.5           | 42           |             |             |             | 9           |
|             | 2003-NIVA |                      | W          |               |       |             |             |   | 309         | 0.5           | 55           |             |             |             | 1           |
| NAP2M       | 1992-NIVA |                      | W          | 309           | 0.2   | 8           |             |   | 309         | 0.2           | 46           |             |             |             |             |
|             | 1995-NIVA |                      | W          |               |       |             |             |   | 309         | 0.2           | 15           |             |             |             | 13          |
|             | 1997-NIVA |                      | W          |               |       |             |             |   | 309         | 0.5           | 34           |             |             |             |             |
|             | 1998-NIVA |                      | W          |               |       |             |             |   | 309         | 0.5           | 37           |             |             |             |             |
|             | 1999-NIVA |                      | W          |               |       |             |             |   | 309         | 0.5           | 34           |             |             |             |             |
|             | 2000-NIVA |                      | W          |               |       |             |             |   | 309         | 0.5           | 39           |             |             |             |             |
|             | 2001-NIVA |                      | W          |               |       |             |             |   | 309         | 0.5           | 41           |             |             |             |             |
|             | 2002-NIVA |                      | W          |               |       |             |             |   | 309         | 0.5           | 42           |             |             |             | 9           |
| 2003-NIVA   |           | W                    |            |               |       |             |             | 309                                     | 0.5         | 55            |              |             |             | 4           |             |
| NAPC1       | 1995-NIVA |                      | W          |               |       |             |             |   | 309         | 0.2           | 55           |             |             |             | 6           |
|             | 1996-NIVA |                      | W          |               |       |             |             |   | 309         | 0.2           | 61           |             |             |             |             |
|             | 2004-NIVA |                      | W          |               |       |             |             |   | 309         | 2             | 58           | 23          | 15          |             |             |
|             | 2005-NIVA |                      | W          |               |       |             |             |   | 309         | 2             | 51           |             |             |             |             |
|             | 2006-NIVA |                      | W          |               |       |             |             |   | 309         | 2             | 48           |             |             |             | 29          |
| NAPC2       | 1995-NIVA |                      | W          |               |       |             |             |   | 309         | 0.2           | 57           |             |             |             | 6           |
|             | 1996-NIVA |                      | W          |               |       |             |             |   | 309         | 0.2           | 60           |             |             |             |             |
|             | 2004-NIVA |                      | W          |               |       |             |             |   | 309         | 2             | 58           | 14          | 6           |             |             |
|             | 2005-NIVA |                      | W          |               |       |             |             |   | 309         | 2             | 51           |             |             |             |             |
|             | 2006-NIVA |                      | W          |               |       |             |             |   | 309         | 2             | 48           |             |             |             | 15          |
| NAPC3       | 1995-NIVA |                      | W          |               |       |             |             |   | 309         | 0.2           | 57           |             |             |             | 5           |
|             | 1996-NIVA |                      | W          |               |       |             |             |   | 309         | 0.2           | 60           |             |             |             |             |
|             | 2004-NIVA |                      | W          |               |       |             |             |   | 309         | 2             | 58           | 3           |             |             | 5           |
|             | 2005-NIVA |                      | W          |               |       |             |             |   | 309         | 2             | 51           |             |             |             | 3           |
|             | 2006-NIVA |                      | W          |               |       |             |             |   | 309         | 2             | 48           |             |             |             | 5           |
| NAPD2       | 1997-NIVA |                      | W          |               |       |             |             |   | 309         | 0.5           | 34           |             |             |             |             |
|             | 1998-NIVA |                      | W          |               |       |             |             |   | 309         | 0.5           | 39           |             |             |             |             |
|             | 1999-NIVA |                      | W          |               |       |             |             |   | 309         | 0.5           | 34           |             |             |             |             |
|             | 2000-NIVA |                      | W          |               |       |             |             |   | 309         | 0.5           | 39           |             |             |             |             |
|             | 2001-NIVA |                      | W          |               |       |             |             |   | 309         | 0.5           | 41           |             |             |             |             |
|             | 2002-NIVA |                      | W          |               |       |             |             |   | 309         | 0.5           | 42           |             |             |             |             |
|             | 2003-NIVA |                      | W          |               |       |             |             |   | 309         | 0.5           | 55           |             |             |             |             |
| NAPDI       | 1992-NIVA |                      | W          | 309           | 0.2   | 8           |             |   | 309         | 0.2           | 46           |             |             |             |             |
|             | 1995-NIVA |                      | W          |               |       |             |             |   | 309         | 0.2           | 15           |             |             |             | 6           |
|             | 1997-NIVA |                      | W          |               |       |             |             |   | 309         | 0.5           | 34           |             |             |             |             |
|             | 1998-NIVA |                      | W          |               |       |             |             |   | 309         | 0.5           | 39           |             |             |             |             |
|             | 1999-NIVA |                      | W          |               |       |             |             |   | 309         | 0.5           | 34           |             |             |             |             |
|             | 2000-NIVA |                      | W          |               |       |             |             |   | 309         | 0.5           | 39           |             |             |             |             |
|             | 2001-NIVA |                      | W          |               |       |             |             |   | 309         | 0.5           | 41           |             |             |             |             |
|             | 2002-NIVA |                      | W          |               |       |             |             |   | 309         | 0.5           | 42           |             |             |             |             |
|             | 2003-NIVA |                      | W          |               |       |             |             |   | 309         | 0.5           | 55           |             |             |             |             |
| NAPT2       | 1997-NIVA |                      | W          |               |       |             |             |   | 309         | 0.5           | 34           |             |             |             |             |
|             | 1998-NIVA |                      | W          |               |       |             |             |   | 309         | 0.5           | 39           |             |             |             |             |
|             | 1999-NIVA |                      | W          |               |       |             |             |   | 309         | 0.5           | 34           |             |             |             |             |
|             | 2000-NIVA |                      | W          |               |       |             |             |   | 309         | 0.5           | 39           |             |             |             |             |
|             | 2001-NIVA |                      | W          |               |       |             |             |   | 309         | 0.5           | 42           |             |             |             |             |





| Tissue      |           |                      | Fish liver         |          |       |             |       | Fish fillet, Shrimp tail, Mussel, Other |                    |                    |                   |                   |       |       |
|-------------|-----------|----------------------|--------------------|----------|-------|-------------|-------|---|--------------------|--------------------|-------------------|-------------------|-------|-------|
| Contaminant | Mon. Year | Inter-calibr. +basis | Analys method code | Detected | Total | Count below | N (<) | N (<)                                   | Analys method code | Detect limit (ppb) | Total value count | Count below d.lim | N (<) | N (<) |
|             |           |                      |                    | limit    | value | d.lim       | d.lim | d.lim                                   |                    |                    |                   |                   |       |       |
|             |           |                      |                    | (ppb)    | count | d.lim       | d.lim | d.lim                                   |                    |                    |                   |                   |       |       |
| 2002-NIVA   |           |                      | W                  |          |       |             |       |   | 309                | 0.2                | 43                |                   |       |       |
| 2003-NIVA   |           | MQ                   | W                  |          |       |             |       |   | 309                | 0.2                | 56                |                   |       |       |
| 2004-NIVA   |           | R5                   | W                  |          |       |             |       |   | 309                | 0.2                | 58                |                   |       |       |
| 2005-NIVA   |           | F!                   | W                  |          |       |             |       |   | 309                | 0.2                | 51                |                   |       | 2     |
| 2006-NIVA   |           | R44_EX705_BT-4       | W                  |          |       |             |       |   | 309                | 0.5                | 48                |                   |       |       |
| PAC1        | 1995-NIVA |                      | W                  |          |       |             |       |   | 309                | 0.2                | 57                |                   |       | 1     |
|             | 1996-NIVA |                      | W                  |          |       |             |       |   | 309                | 0.2                | 65                |                   |       |       |
|             | 2004-NIVA |                      | W                  |          |       |             |       |   | 309                | 2                  | 58                | 8                 |       |       |
|             | 2005-NIVA |                      | W                  |          |       |             |       |   | 309                | 2                  | 46                |                   |       |       |
|             | 2006-NIVA |                      | W                  |          |       |             |       |   | 309                | 2                  | 48                |                   |       | 1     |
| PAC2        | 1995-NIVA |                      | W                  |          |       |             |       |   | 309                | 0.2                | 56                |                   |       |       |
|             | 1996-NIVA |                      | W                  |          |       |             |       |   | 309                | 0.2                | 65                |                   |       | 2     |
|             | 2004-NIVA |                      | W                  |          |       |             |       |   | 309                | 2                  | 58                |                   |       |       |
|             | 2005-NIVA |                      | W                  |          |       |             |       |   | 309                | 2                  | 51                |                   |       |       |
|             | 2006-NIVA |                      | W                  |          |       |             |       |   | 309                | 2                  | 48                |                   |       | 1     |
| PAC3        | 2004-NIVA |                      | W                  |          |       |             |       |   | 309                | 2                  | 58                | 5                 |       |       |
|             | 2005-NIVA |                      | W                  |          |       |             |       |   | 309                | 2                  | 45                |                   |       |       |
|             | 2006-NIVA |                      | W                  |          |       |             |       |   | 309                | 2                  | 48                |                   |       | 6     |
| PADM1       | 1997-NIVA |                      | W                  |          |       |             |       |   | 309                | 0.5                | 36                |                   |       |       |
|             | 1998-NIVA |                      | W                  |          |       |             |       |   | 309                | 0.5                | 39                |                   |       |       |
|             | 1999-NIVA |                      | W                  |          |       |             |       |   | 309                | 0.5                | 34                |                   |       |       |
|             | 2000-NIVA |                      | W                  |          |       |             |       |   | 309                | 0.5                | 39                |                   |       |       |
|             | 2001-NIVA |                      | W                  |          |       |             |       |   | 309                | 0.5                | 42                |                   |       |       |
|             | 2002-NIVA |                      | W                  |          |       |             |       |   | 309                | 0.5                | 43                |                   |       |       |
|             | 2003-NIVA |                      | W                  |          |       |             |       |   | 309                | 0.5                | 56                |                   |       |       |
| PADM2       | 1997-NIVA |                      | W                  |          |       |             |       |   | 309                | 0.5                | 36                |                   |       |       |
|             | 1998-NIVA |                      | W                  |          |       |             |       |   | 309                | 0.5                | 39                |                   |       |       |
|             | 1999-NIVA |                      | W                  |          |       |             |       |   | 309                | 0.5                | 34                |                   |       |       |
|             | 2000-NIVA |                      | W                  |          |       |             |       |   | 309                | 0.5                | 39                |                   |       | 1     |
|             | 2001-NIVA |                      | W                  |          |       |             |       |   | 309                | 0.5                | 42                |                   |       |       |
|             | 2002-NIVA |                      | W                  |          |       |             |       |   | 309                | 0.5                | 43                |                   |       |       |
|             | 2003-NIVA |                      | W                  |          |       |             |       |   | 309                | 0.5                | 56                |                   |       |       |
| PAH         | 1987-NIVA |                      | W                  | 309      | 0.02  | 1           |       |   |                    |                    |                   |                   |       |       |
| PAM1        | 1992-NIVA |                      | W                  | 309      | 0.2   | 8           |       |   | 309                | 0.2                | 45                |                   |       |       |
|             | 1995-NIVA |                      | W                  |          |       |             |       |   | 309                | 0.2                | 15                |                   |       | 2     |
|             | 1997-NIVA |                      | W                  |          |       |             |       |   | 309                | 0.5                | 36                |                   |       |       |
|             | 1998-NIVA |                      | W                  |          |       |             |       |   | 309                | 0.5                | 39                |                   |       |       |
|             | 1999-NIVA |                      | W                  |          |       |             |       |   | 309                | 0.5                | 34                |                   |       |       |
|             | 2000-NIVA |                      | W                  |          |       |             |       |   | 309                | 0.5                | 39                |                   |       |       |
|             | 2001-NIVA |                      | W                  |          |       |             |       |   | 309                | 0.5                | 42                |                   |       |       |
|             | 2002-NIVA |                      | W                  |          |       |             |       |   | 309                | 0.5                | 43                |                   |       |       |
|             | 2003-NIVA |                      | W                  |          |       |             |       |   | 309                | 0.5                | 55                |                   |       | 9     |
| PAM2        | 1997-NIVA |                      | W                  |          |       |             |       |   | 309                | 0.5                | 36                |                   |       |       |
|             | 1998-NIVA |                      | W                  |          |       |             |       |   | 309                | 0.5                | 39                |                   |       |       |
|             | 1999-NIVA |                      | W                  |          |       |             |       |   | 309                | 0.5                | 34                |                   |       |       |
|             | 2000-NIVA |                      | W                  |          |       |             |       |   | 309                | 0.5                | 38                |                   |       |       |
|             | 2001-NIVA |                      | W                  |          |       |             |       |   | 309                | 0.5                | 42                |                   |       |       |
|             | 2002-NIVA |                      | W                  |          |       |             |       |   | 309                | 0.5                | 43                |                   |       |       |
|             | 2003-NIVA |                      | W                  |          |       |             |       |   | 309                | 0.5                | 56                |                   |       |       |
| PB          | 1981-NIVA |                      | D                  |          |       |             |       |   | 312                | 150                | 3                 |                   |       |       |
|             | 1982-NIVA |                      | D                  |          |       |             |       |   | 312                | 150                | 3                 |                   |       |       |
|             | 1983-SIIF | 1G                   | W                  |          |       |             |       |   | 130                | 20                 | 12                |                   |       |       |
|             | 1984-SIIF | 1G                   | W                  |          |       |             |       |   | 130                | 20                 | 27                |                   |       | 2     |
|             | 1985-SIIF | 1G                   | D                  |          |       |             |       |   | 130                | 20                 | 35                |                   |       |       |
|             | 1986-NIVA | 1Z                   | D                  | 312      | 150   | 56          | 4     |   | 312                | 150                | 20                |                   |       |       |
|             | 1987-FIER | 1G                   | W                  | 403      | 10    | 37          | 1     |   |                    |                    |                   |                   |       |       |

| Tissue      |                      |    |   | Fish liver         |             |                   |                   |             |                   | Fish fillet, Shrimp tail, Mussel, Other |             |                   |                   |             |                   |
|-------------|----------------------|----|---|--------------------|-------------|-------------------|-------------------|-------------|-------------------|---|-------------|-------------------|-------------------|-------------|-------------------|
| Contaminant |                      |    |   | Detect             |             |                   |                   |             |                   | Detect                                  |             |                   |                   |             |                   |
| Mon. Year   | Inter-calibr. +basis |    |   | Analys method code | limit (ppb) | Total value count | Count below d.lim | N (<) d.lim | N (<) above d.lim | Analys method code                      | limit (ppb) | Total value count | Count below d.lim | N (<) d.lim | N (<) above d.lim |
| 1987-NIVA   | 1Z                   | D  |   | 312                | 150         | 57                |                   |             | 12                | 312                                     | 150         | 42                |                   |             |                   |
| 1988-NIVA   | 1Z                   | D  |   | 312                | 150         | 61                | 17                | 9           | 3                 | 312                                     | 150         | 55                |                   |             |                   |
| 1989-NIVA   | 1Z                   | D  |   | 312                | 150         | 135               | 9                 | 4           | 9                 | 312                                     | 150         | 3                 |                   |             |                   |
| 1989-NIVA   | 1Z                   | W  |   |                    |             |                   |                   |             |                   | 312                                     | 150         | 36                |                   |             |                   |
| 1990-NIVA   | 1Z                   | D  |   |                    |             |                   |                   |             |                   | 312                                     | 50          | 6                 |                   |             |                   |
| 1990-NIVA   | 1Z                   | W  |   | 312                | 50          | 187               | 3                 | 3           | 1                 | 312                                     | 150         | 77                | 3                 |             |                   |
| 1991-NIVA   | 1Z                   | D  |   |                    |             |                   |                   |             |                   | 312                                     | 50          | 6                 |                   |             |                   |
| 1991-NIVA   | 1Z                   | W  |   | 312                | 50          | 193               | 14                | 10          |                   | 312                                     | 50          | 67                |                   |             |                   |
| 1992-NIVA   | 1Z                   | D  |   |                    |             |                   |                   |             |                   | 312                                     | 50          | 6                 |                   |             |                   |
| 1992-NIVA   | 1Z                   | W  |   | 312                | 50          | 191               | 119               | 94          |                   | 312                                     | 50          | 111               | 2                 | 2           |                   |
| 1993-NIVA   | 1H                   | D  |   |                    |             |                   |                   |             |                   | 312                                     | 30          | 5                 |                   |             |                   |
| 1993-NIVA   | 1H                   | W  |   | 312                | 30          | 221               | 40                | 36          |                   | 312                                     | 30          | 79                |                   |             |                   |
| 1994-NIVA   | 1Z                   | D  |   |                    |             |                   |                   |             |                   | 312                                     | 30          | 5                 |                   |             |                   |
| 1994-NIVA   | 1Z                   | W  |   | 312                | 30          | 302               | 3                 | 2           |                   | 312                                     | 30          | 81                |                   |             |                   |
| 1995-NIVA   |                      | D  |   |                    |             |                   |                   |             |                   | 312                                     | 30          | 6                 |                   |             |                   |
| 1995-NIVA   |                      | W  |   | 312                | 30          | 318               | 162               | 150         | 30                | 312                                     | 30          | 124               |                   |             |                   |
| 1996-NIVA   | V1                   | D  |   |                    |             |                   |                   |             |                   | 312                                     | 30          | 24                |                   |             |                   |
| 1996-NIVA   | V1                   | W  |   |                    |             |                   |                   |             |                   | 312                                     | 30          | 110               |                   |             |                   |
| 1996-NIVA   | V2                   | W  |   | 312                | 30          | 368               |                   |             | 109               |   |             |                   |                   |             |                   |
| 1997-NIVA   |                      | D  |   |                    |             |                   |                   |             |                   | 312                                     | 40          | 6                 |                   |             |                   |
| 1997-NIVA   |                      | W  |   | 312                | 40          | 287               | 10                | 8           | 28                | 312                                     | 40          | 113               |                   |             |                   |
| 1998-NIVA   |                      | W  |   | 312                | 40          | 285               | 126               | 117         | 2                 |   |             |                   |                   |             |                   |
| 1998-NIVA   | CF                   | D  |   |                    |             |                   |                   |             |                   | 312                                     | 40          | 6                 |                   |             |                   |
| 1998-NIVA   | CF                   | W  |   |                    |             |                   |                   |             |                   | 312                                     | 40          | 111               |                   |             |                   |
| 1999-NIVA   |                      | W  |   | 312                | 40          | 235               | 118               | 116         | 11                |   |             |                   |                   |             |                   |
| 1999-NIVA   | EF                   | D  |   |                    |             |                   |                   |             |                   | 312                                     | 40          | 6                 |                   |             |                   |
| 1999-NIVA   | EF                   | W  |   |                    |             |                   |                   |             |                   | 312                                     | 40          | 150               | 10                | 7           |                   |
| 2000-NIVA   |                      | W  |   | 312                | 40          | 227               | 67                | 62          | 4                 |   |             |                   |                   |             |                   |
| 2000-NIVA   | GS                   | D  |   |                    |             |                   |                   |             |                   | 312                                     | 40          | 7                 |                   |             |                   |
| 2000-NIVA   | GS                   | W  |   |                    |             |                   |                   |             |                   | 312                                     | 40          | 106               |                   |             |                   |
| 2001-NIVA   |                      | W  |   | 312                | 40          | 261               | 156               | 148         | 6                 |   |             |                   |                   |             |                   |
| 2001-NIVA   | IM                   | D  |   |                    |             |                   |                   |             |                   | 312                                     | 40          | 6                 |                   |             |                   |
| 2001-NIVA   | IM                   | W  |   |                    |             |                   |                   |             |                   | 312                                     | 40          | 111               |                   |             |                   |
| 2002-NIVA   |                      | D  |   |                    |             |                   |                   |             |                   | 315                                     | 40          | 6                 |                   |             |                   |
| 2002-NIVA   |                      | W  |   | 315                | 40          | 230               | 164               | 37          |                   | 315                                     | 40          | 128               |                   |             |                   |
| 2003-NIVA   | MM                   | W  |   | 315                | 40          | 233               | 179               | 136         | 1                 | 315                                     | 40          | 117               |                   |             |                   |
| 2004-NIVA   |                      | W  |   | 315                | 40          | 249               | 182               | 157         |                   | 315                                     | 40          | 160               |                   |             |                   |
| 2005-NIVA   | A!                   | W  |   | 315                | 40          | 272               | 219               | 149         |                   | 315                                     | 40          | 162               |                   |             |                   |
| 2006-NIVA   | R44_EX702_BT-1       | W  |   | 315                | 40          | 278               | 194               | 165         |                   | 315                                     | 40          | 139               |                   |             |                   |
| PBB15       | 1996-NILU            | W  |   | 843                | 0.01        | 4                 |                   |             | 3                 |   |             |                   |                   |             |                   |
|             | 2001-NILU            | W  |   | 843                | 0.01        | 6                 |                   |             | 6                 | 843                                     | 0.01        | 6                 |                   |             |                   |
|             | 2002-NILU            | W  |   |                    |             |                   |                   |             |                   | 843                                     | 0.01        | 2                 |                   |             |                   |
| PBB49       | 2001-NILU            | W  |   | 843                | 0.01        | 6                 |                   |             | 1                 | 843                                     | 0.01        | 6                 |                   |             |                   |
|             | 2002-NILU            | W  |   |                    |             |                   |                   |             |                   | 843                                     | 0.01        | 2                 |                   |             |                   |
| PBB52       | 1996-NILU            | W  |   | 843                | 0.01        | 4                 |                   |             |                   |   |             |                   |                   |             |                   |
|             | 2001-NILU            | W  |   | 843                | 0.01        | 6                 |                   |             | 1                 | 843                                     | 0.01        | 6                 |                   |             |                   |
|             | 2002-NILU            | W  |   |                    |             |                   |                   |             |                   | 843                                     | 0.01        | 2                 |                   |             |                   |
| PCB         | 1981-SIIF            | 2D | W | 110                | 10          | 27                |                   |             |                   | 110                                     | 10          | 35                |                   |             |                   |
|             | 1982-SIIF            | 2D | W |                    |             |                   |                   |             |                   | 111                                     | 5           | 17                |                   |             |                   |
|             | 1982-VETN            |    | W | 210                | 50          | 53                |                   |             |                   | 211                                     | 50          | 54                |                   |             |                   |
|             | 1983-SIIF            | 2E | W |                    |             |                   |                   |             |                   | 111                                     | 5           | 14                |                   |             |                   |
|             | 1983-VETN            | 2E | W |                    |             |                   |                   |             |                   | 211                                     | 50          | 48                |                   |             |                   |
|             | 1983-VETN            | 2Z | W | 210                | 50          | 48                |                   |             |                   |   |             |                   |                   |             |                   |
|             | 1984-SIIF            | 2E | W |                    |             |                   |                   |             |                   | 111                                     | 5           | 24                |                   |             |                   |
|             | 1984-VETN            | 2E | W |                    |             |                   |                   |             |                   | 211                                     | 50          | 66                |                   |             |                   |
|             | 1984-VETN            | 2Z | W | 210                | 50          | 66                |                   |             |                   |   |             |                   |                   |             |                   |
|             | 1985-SIIF            | 2E | W |                    |             |                   |                   |             |                   | 111                                     | 5           | 32                |                   |             | 6                 |



| Tissue      |           |                     | Fish liver    |       |             |             |             | Fish fillet, Shrimp tail, Mussel, Other |               |              |             |             |             |             |     |
|-------------|-----------|---------------------|---------------|-------|-------------|-------------|-------------|---|---------------|--------------|-------------|-------------|-------------|-------------|-----|
| Contaminant | Mon. Year | Inter-calibr.+basis | Detect        |       |             |             |             |   |               |              |             |             |             |             |     |
|             |           |                     | Analys method | limit | Total value | Count below | N (<) below | N (<) above                             | Analys method | Detect limit | Total value | Count below | N (<) below | N (<) above |     |
|             |           |                     | code          | (ppb) | count       | d.lim       | d.lim       | d.lim                                   | code          | (ppb)        | count       | d.lim       | d.lim       | d.lim       |     |
|             | 1996-NIVA |                     | W             | 340   | 3           | 332         | 306         | 250                                     |               | 341          | 0.05        | 243         | 109         | 103         |     |
|             | 1997-NIVA |                     | W             | 340   | 2           | 260         | 79          | 37                                      |               | 341          | 0.05        | 221         | 27          | 20          | 10  |
|             | 1998-NIVA |                     | W             | 340   | 2           | 284         | 121         | 99                                      | 101           | 341          | 0.05        | 209         | 177         | 148         | 1   |
|             | 1999-NIVA |                     | W             | 340   | 2           | 242         | 185         | 113                                     | 2             | 341          | 0.05        | 232         | 88          | 87          | 14  |
|             | 2000-NIVA |                     | W             | 340   | 2           | 230         | 198         | 171                                     | 1             | 341          | 0.05        | 186         | 123         | 112         | 1   |
|             | 2001-NIVA |                     | W             | 340   | 2           | 232         | 216         | 114                                     | 1             | 341          | 0.05        | 211         | 95          | 85          | 63  |
|             | 2002-NIVA |                     | W             | 340   | 2           | 248         | 235         | 175                                     |               | 341          | 0.05        | 210         | 99          | 84          | 4   |
|             | 2003-NIVA |                     | W             | 340   | 2           | 186         | 182         | 151                                     |               | 341          | 0.05        | 183         | 79          | 79          |     |
|             | 2004-NIVA |                     | W             | 340   | 2           | 229         | 227         | 178                                     |               | 341          | 0.05        | 241         | 215         | 206         |     |
|             | 2005-NIVA |                     | W             | 340   | 2           | 271         | 239         | 172                                     |               | 341          | 0.05        | 241         | 223         | 202         |     |
|             | 2006-NIVA |                     | W             | 340   | 2           | 255         | 184         | 103                                     |               | 341          | 0.03        | 221         |             |             |     |
| SCCP        | 2001-NILU |                     | W             | 850   | miss        |             | 4           |   |               | 850          | miss        | 3           |             |             |     |
| SE          | 1982-VETN |                     | W             | 240   | 10          |             | 46          |   |               | 240          | 10          | 54          |             |             |     |
| TBA         | 2001-NILU |                     | W             | 843   | 0.35        |             | 6           | 3                                       |               | 843          | 0.35        | 6           |             | 2           |     |
|             | 2002-NILU |                     | W             |       |             |             |             |   |               | 843          | 0.35        | 1           |             |             |     |
| TBBPA       | 2001-NILU |                     | W             | 830   | miss        |             | 6           |   |               | 830          | miss        | 6           |             |             |     |
| TBTIN       | 1997-NIVA |                     | D             |       |             |             |             |   |               | 320          | 5           | 13          |             |             |     |
|             | 1998-NIVA |                     | D             |       |             |             |             |   |               | 320          | 5           | 15          |             |             |     |
|             | 1999-NIVA |                     | D             |       |             |             |             |   |               | 320          | 5           | 13          |             |             |     |
|             | 1999-NIVA |                     | W             |       |             |             |             |   |               | 320          | 5           | 6           |             |             |     |
|             | 2000-NIVA |                     | W             |       |             |             |             |   |               | 320          | 0.5         | 23          |             |             |     |
|             | 2001-GALG |                     | W             |       |             |             |             |   |               | 775          | 0.12        | 11          |             |             |     |
|             | 2001-NIVA |                     | W             |       |             |             |             |   |               | 320          | 0.5         | 16          |             |             |     |
|             | 2002-EFDH |                     | W             |       |             |             |             |   |               | 777          | 0.2         | 32          |             |             |     |
|             | 2002-NIVA |                     | W             |       |             |             |             |   |               | 320          | 0.5         | 2           |             |             |     |
|             | 2003-NIVA |                     | W             |       |             |             |             |   |               | 320          | 0.2         | 36          | 1           |             | 2   |
|             | 2004-NIVA |                     | W             |       |             |             |             |   |               | 320          | 0.2         | 72          |             |             | 1   |
|             | 2005-NIVA |                     | W             |       |             |             |             |   |               | 320          | 0.2         | 34          |             |             | 2   |
|             | 2006-NIVA |                     | W             |       |             |             |             |   |               | 320          | 0.2         | 47          |             |             | 12  |
| TCDD        | 1995-NILU |                     | W             |       |             |             |             |   |               | 841          | 2E-05       | 6           |             | 1           |     |
|             | 1996-NILU |                     | W             | 841   | 0           |             | 4           |   |               | 841          | 1E-05       | 18          |             |             |     |
|             | 2002-NILU |                     | W             |       |             |             |             |   |               | 841          | 1E-05       | 12          |             |             |     |
|             | 2003-NILU |                     | W             |       |             |             |             |   |               | 841          | 1E-05       | 12          |             |             | 2   |
|             | 2004-NILU |                     | W             |       |             |             |             |   |               | 841          | 1E-05       | 13          |             |             |     |
|             | 2005-NILU |                     | W             |       |             |             |             |   |               | 841          | 1E-05       | 11          |             |             |     |
|             | 2006-NILU |                     | W             |       |             |             |             |   |               | 841          | 1E-05       | 12          |             |             | 1   |
| TDEPP       | 1991-NIVA |                     | W             | 340   | 1           | 138         |             |   | 1             | 341          | 0.05        | 68          |             |             |     |
|             | 1992-NIVA |                     | W             | 340   | 5           | 191         | 3           | 3                                       |               | 341          | 0.1         | 146         |             |             |     |
|             | 1993-NIVA |                     | W             | 340   | 4           | 212         | 24          | 12                                      | 3             | 341          | 0.1         | 138         |             |             |     |
|             | 1994-NIVA | 2Z                  | W             | 340   | 3           | 300         | 17          | 3                                       | 5             | 341          | 0.05        | 170         | 47          | 22          |     |
|             | 1995-NIVA |                     | W             | 340   | 3           | 318         | 36          | 20                                      |               | 341          | 0.05        | 228         | 51          | 30          |     |
|             | 1996-NIVA |                     | W             | 340   | 3           | 332         | 23          | 3                                       |               | 341          | 0.05        | 243         | 16          | 5           |     |
|             | 1997-NIVA |                     | W             | 340   | 3           | 260         | 23          |   |               |              |             |             |             |             |     |
|             | 1997-NIVA | AJ                  | W             |       |             |             |             |   |               | 341          | 0.05        | 221         | 11          | 2           |     |
|             | 1998-NIVA |                     | W             | 340   | 3           | 278         | 19          | 6                                       | 26            |              |             |             |             |             |     |
|             | 1998-NIVA | CH                  | W             |       |             |             |             |   |               | 341          | 0.05        | 209         | 1           | 1           | 44  |
|             | 1999-NIVA |                     | W             | 340   | 3           | 249         | 6           |   | 1             |              |             |             |             |             |     |
|             | 1999-NIVA | EG                  | W             |       |             |             |             |   |               | 341          | 0.05        | 232         | 2           | 2           | 71  |
|             | 2000-NIVA |                     | W             | 340   | 3           | 230         | 35          | 7                                       | 4             |              |             |             |             |             |     |
|             | 2000-NIVA | GU                  | W             |       |             |             |             |   |               | 341          | 0.05        | 185         | 11          | 10          | 67  |
|             | 2001-NIVA |                     | W             | 340   | 3           | 250         | 24          | 3                                       | 3             | 341          | 0.05        | 210         | 1           |             | 101 |
|             | 2002-NIVA |                     | W             | 340   | 3           | 248         | 24          | 2                                       | 3             | 341          | 0.05        | 210         |             |             | 124 |
|             | 2003-NIVA |                     | W             | 340   | 3           | 239         | 18          | 5                                       | 9             | 341          | 0.05        | 183         |             |             | 106 |
|             | 2004-NIVA |                     | W             | 340   | 3           | 272         | 30          | 6                                       |               | 341          | 0.05        | 241         |             |             | 138 |
|             | 2005-NIVA |                     | W             | 340   | 3           | 282         | 41          | 11                                      | 1             |              |             |             |             |             |     |
|             | 2005-NIVA | C!                  | W             |       |             |             |             |   |               | 341          | 0.05        | 246         |             |             | 156 |
|             | 2006-NIVA | R44_EX704_BT-3      | W             | 340   | 3           | 280         | 51          | 25                                      | 19            | 341          | 0.2         | 221         | 194         | 166         |     |

| <b>Tissue</b> |           |                      |                    | <b>Fish liver</b> |       |       |       |       | <b>Fish fillet, Shrimp tail, Mussel, Other</b> |        |       |       |       |       |
|---------------|-----------|----------------------|--------------------|-------------------|-------|-------|-------|-------|--|--------|-------|-------|-------|-------|
| Contaminant   | Mon. Year | Inter-calibr. +basis | Analys method code | Detect            | Total | Count | N (<) | N (<) | Analys method code                             | Detect | Total | Count | N (<) | N (<) |
|               |           |                      |                    | limit             | value | below | below | above |  | limit  | value | below | below | above |
|               |           |                      |                    | (ppb)             | count | d.lim | d.lim | d.lim |  | (ppb)  | count | d.lim | d.lim | d.lim |
| TPTIN         | 1997-NIVA |                      | D                  |                   |       |       |       |       | <b>320</b>                                     | 5      | 13    |       |       |       |
|               | 1998-NIVA |                      | D                  |                   |       |       |       |       | <b>320</b>                                     | 10     | 15    |       |       |       |
|               | 1999-NIVA |                      | D                  |                   |       |       |       |       | <b>320</b>                                     | 5      | 13    |       |       |       |
|               | 1999-NIVA |                      | W                  |                   |       |       |       |       | <b>320</b>                                     | 5      | 6     | 4     |       |       |
|               | 2000-NIVA |                      | W                  |                   |       |       |       |       | <b>320</b>                                     | 0.5    | 23    |       |       |       |
|               | 2001-GALG |                      | W                  |                   |       |       |       |       | <b>775</b>                                     | 0.1    | 11    |       |       | 1     |
|               | 2001-NIVA |                      | W                  |                   |       |       |       |       | <b>320</b>                                     | 0.5    | 16    |       |       | 9     |
|               | 2002-EFDH |                      | W                  |                   |       |       |       |       | <b>777</b>                                     | 2      | 24    | 13    | 12    |       |
|               | 2002-NIVA |                      | W                  |                   |       |       |       |       | <b>320</b>                                     | 0.5    | 2     |       |       | 2     |
|               | 2003-NIVA |                      | W                  |                   |       |       |       |       | <b>320</b>                                     | 2      | 36    | 35    | 29    |       |
|               | 2004-NIVA |                      | W                  |                   |       |       |       |       | <b>320</b>                                     | 2      | 64    | 61    | 47    |       |
|               | 2005-NIVA |                      | W                  |                   |       |       |       |       | <b>320</b>                                     | 2      | 34    | 34    | 26    |       |
|               | 2006-NIVA |                      | W                  |                   |       |       |       |       | <b>320</b>                                     | 2      | 47    | 45    | 39    |       |
| V             | 1996-NIVA |                      | D                  |                   |       |       |       |       | <b>312</b>                                     | 330    | 18    | 1     |       |       |
|               | 1996-NIVA |                      | W                  |                   |       |       |       |       | <b>312</b>                                     | 330    | 3     | 3     |       |       |
| ZN            | 1981-NIVA |                      | D                  |                   |       |       |       |       | <b>311</b>                                     | 3000   | 3     |       |       |       |
|               | 1982-NIVA |                      | D                  |                   |       |       |       |       | <b>311</b>                                     | 3000   | 3     |       |       |       |
|               | 1983-SIIF | 1G                   | W                  |                   |       |       |       |       | <b>131</b>                                     | 400    | 12    |       |       |       |
|               | 1984-SIIF | 1G                   | W                  |                   |       |       |       |       | <b>132</b>                                     | 400    | 27    |       |       |       |
|               | 1985-SIIF | 1G                   | D                  |                   |       |       |       |       | <b>132</b>                                     | 400    | 35    |       |       |       |
|               | 1986-NIVA | 1H                   | D                  | <b>311</b>        | 3000  | 56    |       |       | <b>311</b>                                     | 3000   | 20    |       |       |       |
|               | 1987-FIER | 1G                   | W                  | <b>405</b>        | 20    | 37    |       |       |  |        |       |       |       |       |
|               | 1987-NIVA | 1H                   | D                  | <b>311</b>        | 3000  | 57    |       |       | <b>311</b>                                     | 3000   | 42    |       |       |       |
|               | 1988-NIVA | 1H                   | D                  | <b>311</b>        | 3000  | 61    |       |       | <b>311</b>                                     | 3000   | 55    |       |       |       |
|               | 1989-NIVA | 1H                   | D                  | <b>311</b>        | 3000  | 135   |       | 1     | <b>311</b>                                     | 3000   | 3     |       |       |       |
|               | 1989-NIVA | 1H                   | W                  |                   |       |       |       |       | <b>311</b>                                     | 3000   | 36    |       |       |       |
|               | 1990-NIVA | 1H                   | D                  |                   |       |       |       |       | <b>311</b>                                     | 3000   | 6     |       |       |       |
|               | 1990-NIVA | 1H                   | W                  | <b>311</b>        | 3000  | 189   |       |       | <b>311</b>                                     | 3000   | 77    |       |       |       |
|               | 1991-NIVA | 1H                   | D                  |                   |       |       |       |       | <b>311</b>                                     | 1000   | 6     |       |       |       |
|               | 1991-NIVA | 1H                   | W                  | <b>311</b>        | 1000  | 193   |       |       | <b>311</b>                                     | 1000   | 67    |       |       |       |
|               | 1992-NIVA | 1H                   | D                  |                   |       |       |       |       | <b>311</b>                                     | 1000   | 6     |       |       |       |
|               | 1992-NIVA | 1H                   | W                  | <b>311</b>        | 1000  | 191   |       |       | <b>311</b>                                     | 1000   | 111   |       |       |       |
|               | 1993-NIVA | 1H                   | D                  |                   |       |       |       |       | <b>311</b>                                     | 1000   | 5     |       |       |       |
|               | 1993-NIVA | 1H                   | W                  | <b>311</b>        | 1000  | 221   |       |       | <b>311</b>                                     | 1000   | 79    |       |       |       |
|               | 1994-NIVA | 1Z                   | D                  |                   |       |       |       |       | <b>311</b>                                     | 1000   | 5     |       |       |       |
|               | 1994-NIVA | 1Z                   | W                  | <b>311</b>        | 1000  | 302   |       |       | <b>311</b>                                     | 1000   | 81    |       |       |       |
|               | 1995-NIVA |                      | D                  |                   |       |       |       |       | <b>311</b>                                     | 1000   | 6     |       |       |       |
|               | 1995-NIVA |                      | W                  | <b>311</b>        | 1000  | 318   |       |       | <b>311</b>                                     | 1000   | 142   |       |       |       |
|               | 1996-NIVA | V1                   | D                  |                   |       |       |       |       | <b>311</b>                                     | 1000   | 24    |       |       |       |
|               | 1996-NIVA | V1                   | W                  |                   |       |       |       |       | <b>311</b>                                     | 1000   | 131   |       |       |       |
|               | 1996-NIVA | V2                   | W                  | <b>311</b>        | 1000  | 368   |       |       |  |        |       |       |       |       |
|               | 1997-NIVA |                      | W                  | <b>311</b>        | 1000  | 287   |       |       |  |        |       |       |       |       |
|               | 1997-NIVA | AH                   | D                  |                   |       |       |       |       | <b>311</b>                                     | 1000   | 6     |       |       |       |
|               | 1997-NIVA | AH                   | W                  |                   |       |       |       |       | <b>311</b>                                     | 1000   | 131   |       |       |       |
|               | 1998-NIVA |                      | W                  | <b>311</b>        | 1000  | 285   |       |       |  |        |       |       |       |       |
|               | 1998-NIVA | CF                   | D                  |                   |       |       |       |       | <b>311</b>                                     | 1000   | 6     |       |       |       |
|               | 1998-NIVA | CF                   | W                  |                   |       |       |       |       | <b>311</b>                                     | 1000   | 72    |       |       |       |
|               | 1999-NIVA |                      | W                  | <b>311</b>        | 1000  | 235   |       |       |  |        |       |       |       |       |
|               | 1999-NIVA | EF                   | D                  |                   |       |       |       |       | <b>311</b>                                     | 1000   | 6     |       |       |       |
|               | 1999-NIVA | EF                   | W                  |                   |       |       |       |       | <b>311</b>                                     | 1000   | 120   |       |       |       |
|               | 2000-NIVA |                      | W                  | <b>311</b>        | 1000  | 227   |       |       |  |        |       |       |       |       |
|               | 2000-NIVA | GS                   | D                  |                   |       |       |       |       | <b>311</b>                                     | 1000   | 7     |       |       |       |
|               | 2000-NIVA | GS                   | W                  |                   |       |       |       |       | <b>311</b>                                     | 1000   | 70    |       |       |       |
|               | 2001-NIVA |                      | W                  | <b>311</b>        | 1000  | 261   |       |       |  |        |       |       |       |       |
|               | 2001-NIVA | IM                   | D                  |                   |       |       |       |       | <b>311</b>                                     | 1000   | 6     |       |       |       |
|               | 2001-NIVA | IM                   | W                  |                   |       |       |       |       | <b>311</b>                                     | 1000   | 72    |       |       |       |
|               | 2002-NIVA |                      | W                  | <b>315</b>        | 1000  | 230   |       |       |  |        |       |       |       |       |

| Tissue        |           |                     |                                 | Fish liver |       |       |       |       | Fish fillet, Shrimp tail, Mussel, Other |        |        |       |       |       |       |
|---------------|-----------|---------------------|---------------------------------|------------|-------|-------|-------|-------|---|--------|--------|-------|-------|-------|-------|
| Contaminant   | Mon. Year | Inter-calibr.+basis | D<br>W<br>W<br>W<br>W<br>W<br>W | Analys     | Detec | Total | Count | N (<) | N (<)                                   | Analys | Detect | Total | Count | N (<) | N (<) |
|               |           |                     |                                 | method     | limit | value | below | below | above                                   | method | limit  | value | below | below | above |
|               |           |                     |                                 | code       | (ppb) | count | d.lim | d.lim | d.lim                                   | code   | (ppb)  | count | d.lim | d.lim | d.lim |
| 2002-NIVA     |           | LI                  | D                               |            |       |       |       |       |   | 315    | 1000   |       | 6     |       |       |
| 2002-NIVA     |           | LI                  | W                               |            |       |       |       |       |   | 315    | 1000   |       | 86    |       |       |
| 2003-NIVA     |           |                     | W                               | 315        | 1000  | 233   |       |       |   |        |        |       |       |       |       |
| 2003-NIVA     |           | MM                  | W                               |            |       |       |       |       |   | 315    | 1000   |       | 72    |       |       |
| 2004-NIVA     |           |                     | W                               | 315        | 1000  | 249   |       |       |   | 315    | 1000   |       | 122   |       |       |
| 2005-NIVA     |           | A!                  | W                               | 315        | 1000  | 272   |       |       |   | 315    | 1000   |       | 132   |       |       |
| 2006-NIVA     |           | R44_EX702_BT-1      | W                               | 315        | 1000  | 278   |       |       |   | 315    | 1000   |       | 109   |       |       |
| Sum of counts |           |                     |                                 |            | 97044 | 16628 | 8994  | 4313  |   |        | 96691  | 7515  | 5275  | 7944  |       |

a(11) > ambiguous value (Maximum value displayed)



**Long-term monitoring of environmental quality in Norwegian coastal waters**

**Joint Assessment and Monitoring Programme (JAMP)**

Norwegian Pollution Control Authority (SFT)  
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 Telephone: 22 57 34 00 - Telefax: 22 67 67 06  
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|   |   |  |                                  |
|---|---|--|----------------------------------|
| Contractor<br>Norwegian Institute for Water Research  |   | ISBN-number<br>978-82-577-5298-9   |                                  |
| Contracting project manager<br>Norman Green   | SFT project manager<br>Jon L. Fuglestad | TA-number<br>2370/2008   |                                  |
|   | Year<br>2008                            | Pages<br>93  | SFT's contract number<br>5007040 |
| Publisher<br>Norwegian Institute for Water Research (NIVA)<br>NIVA-report 5563-2008   |   | Project financed by<br>Norwegian Pollution Control Authority<br><i>Statens forurensningstilsyn (SFT)</i> |                                  |
| Author(s)<br>Norman Green<br>Ivar Dahl<br>Alfhild Kringstad<br>Marin Schlabach (Norwegian Institute for Air Research (NILU))  |   |  |                                  |
| Title<br>Joint Assessment and Monitoring Programme (JAMP)<br><br>Overview of Norwegian analytical methods 1981-2007   |   |  |                                  |
| Summary<br>This report is a compilation of analytical method codes and descriptions used in the Norwegian contribution to the Joint Assessment and Monitoring Programme (JAMP) for investigation of the levels and trends of contaminants in near shore marine waters. It concerns primarily selected metals, organochlorines (e.g. PCBs, DDTs, HCHs, HCB), polycyclic aromatic hydrocarbons (PAHs) in seawater (only metals), sediment and biota collected 1981-2006 and analysed through to 2007. The method descriptions are brief and focus on the principles involved. |   |  |                                  |
| 4 emneord<br><i>Miljøgifter</i><br><i>Metoder</i><br><i>Marin</i><br><i>Norge</i>   |   | 4 subject words<br>Contaminants<br>Methods<br>Marine<br>Norway   |                                  |

## **Statens forurensningstilsyn**

Postboks 8100 Dep,  
0032 Oslo  
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Telefaks: 22 67 67 06  
E-post: [postmottak@sft.no](mailto:postmottak@sft.no)  
[www.sft.no](http://www.sft.no)

Statlig program for forurensningsovervåking omfatter  
overvåking av forurensningsforholdene i luft og nedbør,  
skog, vassdrag, fjorder og havområder.

Overvåkingsprogrammet dekker langsiktige undersøkelser av:

- overgjødsling
- forsuring (sur nedbør)
- ozon (ved bakken og i stratosfæren)
- klimagasser
- miljøgifter

Overvåkingsprogrammet skal gi informasjon om  
tilstanden og utviklingen av forurensningssituasjonen, og  
påvise eventuell uheldig utvikling på et tidlig tidspunkt.  
Programmet skal dekke myndighetenes  
informasjonsbehov om forurensningsforholdene, registrere  
virkningen av iverksatte tiltak for å redusere  
forurensningen, og danne grunnlag for vurdering av nye  
tiltak. SFT er ansvarlig for gjennomføringen av  
overvåkingsprogrammet.

TA-2370/2008  
ISBN 978-82-577-5298-9