

# Northern Contaminants Program (NCP) – QA/QC Interlaboratory Studies

## NCP III – Phase 6 of Proficiency Testing

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Data comparability is a crucial factor for results delivered by different laboratories and between different projects. This poster summarizes the NCP III Phase 6 interlaboratory study (ILS) conducted in 2011–2012 to evaluate the performances of 32 analytical laboratories for the determination of environmental contaminants of concern. The assessment of Phase 6 indicates that overall performances of NCP laboratories are satisfactory and the performance of laboratories was higher for the following groups:

- Hg over persistent organic pollutants (POPs)
- injection-ready standards (IRS) over natural-matrix samples
- certified reference materials (CRMs) over uncharacterized natural-matrix samples (UM).

### Introduction

- The Quality Assurance/Quality Control (QA/QC) Program was implemented to ensure that quality data are provided to NCP managers (1)
- ILS are conducted to routinely assess the ability of NCP and Arctic Monitoring Assessment Program (AMAP) laboratories to meet the data quality objectives (2)
- Participation as broken down by the contaminant class (Table 1)
- Analysis performed on natural-matrix material (Table 2): CRMs and UM, and injection-ready analytical standards (IRS)

Table 1. Performance\* and number of participants per contaminant class

Lab ID	PBDE/BFRs	PCDDs/PCDFs /DLPCBs	OCs	PCBs	PFCs	PCNs	Hg
1101a			47 (100)	70 (100)			
1101b			46 (100)	65 (100)			
1102	73 (100)	65 (45)	54 (91)	65 (67)			
1103			68 (-)	60 (-)			
1104	68 (79)		43 (21)	76 (73)	81 (100)		100 (100)
1105							100 (100)
1106			67 (100)		88 (100)		
1107	20 (5)	44 (-)	40 (58)	32 (33)			50 (100)
1108	86 (67)		87 (100)	94 (100)	100 (100)		100 (100)
1109	68 (92)	78 (-)		71 (76)		(75)	
1110	61 (87)		61 (67)	77 (100)	68 (100)		100 (100)
1111					59 (100)		
1112	70 (88)	86 (97)		75 (77)			
1113	71 (73)	83 (97)	74 (92)	75 (92)	77 (100)		
1115	65 (93)	80 (-)	46 (65)	83 (100)			
1119	76 (72)	81 (92)	77 (84)	79 (100)	88 (100)		
1120	66 (77)	70 (78)	60 (50)	74 (76)			
1121							50 (100)
1122	75 (79)	50 (-)	71 (83)	73 (73)	74 (100)	(92)	
1123	67 (100)	84 (-)	70 (95)	38 (-)		(75)	100 (100)
1124			94 (94)	-100)			100 (100)
1128							100 (100)
1129			17 (9)	52 (87)			0 (0)
1131	39 (0)	60 (67)	42 (53)	58 (87)	18 (20)		
1132							100 (100)
1134	36 (29)						0 (0)
1136	75 (81)		67 (68)	46 (-)			100 (100)
1137							50 (0)
1139	94 (100)	95 (-)	83 (83)				
1140	64 (100)		67 (86)	58 (91)			100 (100)
1141				18 (25)			100 (100)
1142	27 (-)	37 (16)			40 (100)	(50)	
1143			48 (57)	24 (0)		(0)	100 (100)
Grand Total	66 (78)	71 (72)	60 (71)	65 (78)	56 (92)	(74)	81 (82)
total number of participants	19 (18)	13 (7)	22 (21)	23 (20)	10 (10)	5	17 (17)

\*Percent success of all results that were within 20% of median values. Percent success for only the results of injection standards (IRS) are represented within brackets ( ).

### Study Design

- The contaminants of concern including the POPs and mercury presented in Table 1 and sample setup in Table 2

Table 2. Origins and nature of standard test samples, corresponding ID given

Natural-matrix Sample	Sample ID	Injection-ready/Spiking Standard (Solvent)	Sample ID
EDF-2525 (CIL)	NCP III-6 S1	Brominated Flame Retardants/Polybrominated Diphenyl Ethers (BFRs/PBDEs) (WL)	NCP III-6 BFR-1 NCP III-6 BFR-2 (optional)
SRM 1947 (NIST)	NCP III-6 S2	Dioxins/Furans/Dioxin-like Polychlorinated Biphenyls (PCDDs/PCDFs/DLPCBs) (WL)	NCP III-6 PCDDs/PCDFs/DLPCBs
Lake trout 2 ml of fish extract in hexane (MOE)	NCP III-6 S3* NCP III-6 S4*	Organochlorine Pesticides (OCs) (MOE)	NCP III-6-1 OCs
Lake Trout - Fish tissue (MOE)	NCP III-6 S5* NCP III-6 S6*	Polychlorinated Biphenyls (PCBs) (WL)	NCP III-6 PCBs
		Perfluorinated Chemicals (PFCs) (WL)	NCP III-6 PFCs
		Polychlorinated Naphthalenes (PCNs) (WL)	NCP III-6, PCN 1 NCP III-6, PCN 2 (optional)
		Chlorinated Paraffins (CPs) (MOE)	NCP III-6 CPs-1
		Metal Mercury (MOE)	NCP III-6 Hg-1
		Methyl Mercury (SA)	NCP III-6 MeHg

NIST – National Institute of Standards and Technology, CIL – Cambridge Isotope Laboratories, WL Wellington Laboratories Inc. and MOE – Ontario Ministry of the Environment, SA - Sigma-Aldrich

### Acknowledgements

We acknowledge the work and commitment from all of the participating laboratories.

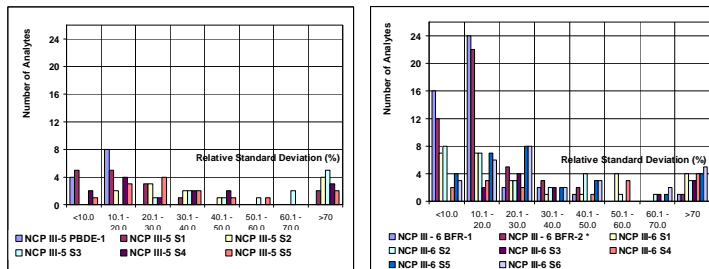


Fig. 1. Variability of results for PBDEs/BFRs analysis Phase 5 versus Phase 6

### Data Evaluation Methods

- The results were evaluated using the statistical method “Robust Statistics: a method of coping with outliers”, Analytical Methods Committee (3):

$$\text{Study Average} = \text{Median}$$

$$\text{Standard Deviation} = 1.5 \times \text{Median Absolute Deviation}$$

- Laboratory performances were evaluated by determining the number of results reported within 20% of the study median
- At the end of phase 6 a preliminary report was distributed
- Upon completion of the study a final report was provided
- Score performance was rated using the following levels:
  - 80–100% – excellent
  - 60–80% – satisfactory
  - 50–60% – marginal performance
  - <50% – needs improvement

### Study Results and Discussion

- A summary of laboratory performances is given in Table 1. These are the overall performances of each laboratory shown as the percentage of results within 20% of the study’s median values
- Thirty-two laboratories participated in Phase 6, eleven of which were NCP and six were AMAP laboratories
- Two additional classes of emerging contaminants (polychlorinated naphthalenes (PCNs) and chlorinated paraffins (CPs)) were analyzed
- The number of participating laboratories has increased from previous studies (32 versus 30 laboratories)
- Results were reported for the majority of the analytes listed on the report forms and some laboratories reported results for additional analytes (as an example see numbers of analytes for PBDE/BFRs Fig 1)

### Conclusion

- Compared to the previous studies in this round, laboratories demonstrated:
  - higher performances for natural-matrix material, except PFCs
  - improvement in the performance for PCBs and PFCs injection-ready standards
  - ability to analyze a large parameter group of congener,
  - willingness to analyze additional “optional” samples
  - interest to analyze additional groups of emerging contaminants (PCNs, CPs and methyl mercury)
- The increased number of participating laboratories helps to:
  - gives an expanded database
  - determine a more realistic consensus values for samples NCP III–6 S5 and S6
  - boost data comparability for the results delivered for NCP projects.

### References:

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