REPORT

issued by an Accredited Testing Laboratory

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Testing

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Emission measurements according to CDPH-IAQ

(5 appendices)

Object

One sample of a sound absorber was delivered to RISE.

Product name:	**Ginkgo A40 / Gaia A42**
Production date:	2017-06-18
Size of sample:	ca 0.50 x 0.42 m, wrapped in aluminium foil and plastic foil
Date of sampling:	2017-06-19
Date of arrival to RISE:	2017-06-20
Date of analysis:	week 25 – 32, 2017

Assignment

Emission measurement according to Sec 01350 (Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources using Environmental Chambers, version 1.1, 2010, by the California Department of Public Health) = CDPH-IAQ.

For evaluation of test results the principle of shared risk is applied, i.e. for a max limit (≤) a result ≤ the limit complies and a result > the limit does not comply (ILAC G8 section 2.7).

Method

The test was started 2017-06-22 by unpacking the sample and seal the backside with aluminium foil and –tape. The test specimen was placed in a separate conditioning container in a room with controlled climate conditions of 23 ± 2 °C and 50 ± 5 % RH. After 10 days ± 5 h of conditioning the specimen was placed in an emission chamber of stainless steel. Air samplings, minimum duplicates, were carried out after 24, 48 and 96 hours in the chamber.

Conditions in the emission chamber:

Chamber volume:	0.25 m^3, stainless steel
Temperature:	23 ± 1 °C
Relative humidity:	50 ± 5 % RH
Area of test specimen:	ca 0.2 m^2
Unit specific air flow rate:	0.12 m^3/unit h
Air exchange rate:	0.5 h^{-1}
Air velocity at specimen surface:	0.1 – 0.3 m/s

Accred. No. 1002
Testing
ISO/IEC 17025

Tenax TA was used as adsorption medium for VOC. The tubes were thermally desorbed and analysed in accordance to RISE method 0601, similar to ISO 16000-6:2011 (Determination of volatile organic compounds in indoor and test chamber air by active sampling on Tenax TA sorbent, thermal desorption and gas chromatography using MS/FID). This means an analysis in a gas chromatograph and detection with a flame ionisation detector (FID) and mass selective detector (MS). The capillary column used is coated with 5% phenyl/ 95 % methylpolysiloxane. The FID signals are used for compound quantification. The total volatile organic compounds (TVOC) means compounds eluting between and including n-hexane to hexadecane, having boiling points in the range of about 70-260 °C. The emission rate of TVOC is quantified in toluene equivalents and includes all compounds ca ≥ 1 µg/m^3 in the chamber. Minimum duplicate air samples were taken and the results are mean values. Sampled volumes are 2 to 7 L.

Tenax TA was also used as adsorption medium for testing of volatile carcinogenic compounds according to EU Regulation No 1272/2008 Annex VI, cat 1A and 1B), (exclusive formaldehyde), 1 µg/m^3 and above.

The samplings of formaldehyde and acetaldehyde were carried out with DNPH samplers. The samplers were analysed according to RISE method 2302, similar to ISO 16000-3:2011(Indoor air--Part 3: Determination of formaldehyde and other carbonyl compounds – Active sampling method). This means analysis on a liquid chromatograph with absorbance detector. Duplicate air samples were taken and the results are mean values. Sampled volumes were 30 to 50 L.

Results

The results in Table 1 and 2 are expressed as concentrations in the test chamber and as unit specific emission rates. Calculation of emission rate from chamber concentration:

$$SER_u = \frac{Conc \times n}{L}$$

SER_u = unit specific emission rate, in µg/unit and h
Conc = concentration of a VOC in the chamber, in µg/m^3
n = air exchange rate, in changes per hour
L = loading factor, in unit/m^3 (unit/volume of chamber)

Test results of TVOC and formaldehyde after 24 and 48 hours

Table 1
Test results of **Ginkgo A40 / Gaia A42**, after 24 and 48 h

Volatile organic compound	**CAS number**	**Retention time** (min)	**ID** [1]	**Concentration in the chamber** (µg/m^3)	**Emission rate** (µg/unit h)
After 24 h:					
TVOC (C_6 – C_{16})	--	6.2-37.9	B	46	6
Formaldehyde	50-00-0	--	A	1	0.2
After 48 h:					
TVOC (C_6 – C_{16})	--	6.2-37.9	B	31	4
Formaldehyde	50-00-0	--	A	1	0.2

[1)] ID: A = quantified compound specific, B = quantified as toluene equivalent

Test results of TVOC and VOCs after 96 hours

Table 2
Test results of **Ginkgo A40 / Gaia A42**, after 96 h

Volatile organic compound	CAS number	Retention time (min)	ID [1]	Concentration in the chamber (µg/m^3)	Emission rate (µg/unit h)
TVOC (C_6 – C_{16})	--	6.2-37.9	B	26	3
Identified substances:					
1-Hexanol, 2-ethyl-	104-76-7	20.1	A	4	0.5
Nonanal	124-19-6	23.0	A	10	1
Cyclopentasiloxane, decamethyl-	541-02-6	23.2	B	5	0.6
Caprolactam	105-60-2	28.7	A	11	1
Cyclohexasiloxane, dodecamethyl-	540-97-6	28.8	B	5	0.6
Substances outside TVOC:					
VVOC (< C_6) [2]		4.5 – 6.2			
No substances identified	--	--	B	< 2	< 0.2
SVOC (C_{16} – C_{22}) [3]		37.9 - 50.0			
No substances identified	--	--	B	< 2	< 0.2
Formaldehyde	50-00-0	--	A	1	< 0.2
Acetaldehyde	75-07-0	--	A	< 1	< 0.2

[1)] ID: A = quantified compound specific, B = quantified as toluene equivalent
[2)] VVOC = very volatile organic compounds, as defined in ISO 16000-6 (not accredited)
[3)] SVOC = semi-volatile organic compounds, as defined in ISO 16000-6 (not accredited)

Only compounds with a concentration in the chamber higher than 2 µg/m^3 are listed in the tables. Measurement uncertainty for VOC is 15 % (rel) and for formaldehyd/acetaldehyde 30 % (rel). Quantification limit for TVOC is 2 µg/unit h. Background of TVOC in the empty chamber was less than 20 µg/m^3.

See Appendix 1 for gas chromatograms (FID spectra).

The emission results in table 3 are expressed as unit emission rates (in µg/unit h) and as concentrations in a standard private office and in a standard school classroom (in µg/m^3). Calculation of concentration of VOC in the standard private office from emission rate:

$$C = \frac{SER_u \times U}{n \times V}$$

C = concentration of VOC in the private office, in µg/m^3
SER_u = unit specific emission rate of the tested product, in µg/unit h
U = number of products, here one unit
n = air ventilation rate, in changes per hour, here 0.68 h^{-1}
V = volume of a private office in m^3, here 30.6 m^3

For a standard school classroom the air ventilation rate is 0.82 h^{-1} and the volume of the room is 231 m^3.

Test results of the estimated concentrations in a standard private office and a standard school classroom scenarios according to the target VOCs according to one-half of the CREL list (compound 1-35) and non-listed compounds:

Table 3
Estimated concentrations in a standard private office and a standard school classroom:

No	Volatile organic compound	CAS number	ID [1]	Emission rate (µg/unit h)	Concentration in private office (µg/m^3)	Concentration in school classroom (µg/m^3)
1.	Acetaldehyde	75-07-0	A	< 0.2	**< 0.01**	**< 0.001**
2.	Benzene	71-43-2	-	n.d	**< 0.01**	**< 0.001**
3.	Carbon disulfide	75-15-0	-	n.d	**< 0.01**	**< 0.001**
4.	Carbon tetrachloride	56-23-5	-	n.d	**< 0.01**	**< 0.001**
5.	Chlorobenzene	108-90-7	-	n.d	**< 0.01**	**< 0.001**
6.	Chloroform	67-66-3	-	n.d	**< 0.01**	**< 0.001**
7.	Dichlorobenzene (1,4-)	106-46-7	-	n.d	**< 0.01**	**< 0.001**
8.	Dichloroethylene (1,1)	75-35-4	-	n.d	**< 0.01**	**< 0.001**
9.	Dimethylformamide (N,N-)	68-12-2	-	n.d	**< 0.01**	**< 0.001**
10.	Dioxane (1,4-)	123-91-1	-	n.d	**< 0.01**	**< 0.001**
11.	Epichlorohydrin	106-89-8	-	n.d	**< 0.01**	**< 0.001**
12.	Ethylbenzene	100-41-4	-	n.d	**< 0.01**	**< 0.001**
13.	Ethylene glycol	107-21-1	-	n.d	**< 0.01**	**< 0.001**
14.	Ethylene glycol monoethyl ether	110-80-5	-	n.d	**< 0.01**	**< 0.001**
15.	Ethylene glycol monoethyl ether acetate	111-15-9	-	n.d	**< 0.01**	**< 0.001**
16.	Ethylene glycol monomethyl ether	109-86-4	-	n.d	**< 0.01**	**< 0.001**
17.	Ethylene glycol monomethyl ether acetate	110-49-6	-	n.d	**< 0.01**	**< 0.001**
18.	Formaldehyde	50-00-0	A	< 0.2	**< 0.01**	**< 0.001**
19.	Hexane (n-)	110-54-3	-	n.d	**< 0.01**	**< 0.001**
20.	Isophorone	78-59-1	-	n.d	**< 0.01**	**< 0.001**
21.	Isopropanol	67-63-0	-	n.d	**< 0.01**	**< 0.001**
22.	Methyl chloroform	71-55-6	-	n.d	**< 0.01**	**< 0.001**
23.	Methylene chloride	75-09-2	-	n.d	**< 0.01**	**< 0.001**
24.	Methyl t-butyl ether	1634-04-4	-	n.d	**< 0.01**	**< 0.001**
25.	Naphtalene	91-20-3	-	n.d	**< 0.01**	**< 0.001**
26.	Phenol	108-95-2	-	n.d	**< 0.01**	**< 0.001**
27.	Propylene glycol monomethyl ether	107-98-2	-	n.d	**< 0.01**	**< 0.001**
28.	Styrene	100-42-5	-	n.d	**< 0.01**	**< 0.001**
29.	Tetrachloroethylene	127-18-4	-	n.d	**< 0.01**	**< 0.001**

30.	Toluene	108-88-3	-	n.d	**< 0.01**	**< 0.001**
31.	Trichloroethylene	79-01-6	-	n.d	**< 0.01**	**< 0.001**
32.	Vinyl acetate	108-05-4	-	n.d	**< 0.01**	**< 0.001**
33-35	Xylenes (m-, o-, p-)	108-38-3, 95-47-6, 106-42-3	-	n.d	**< 0.01**	**< 0.001**
	Other non-listed identified substances:					
	TVOC (C_6 – C_{16})	--	B	3	0.2	0.02
	1-Hexanol, 2-ethyl-	104-76-7	A	0.5	0.02	0.003
	Nonanal	124-19-6	A	1	0.06	0.006
	Cyclopentasiloxane, decamethyl-	541-02-6	B	0.6	0.03	0.003
	Caprolactam	105-60-2	A	1	0.07	0.008
	Cyclohexasiloxane, dodecamethyl-	540-97-6	B	0.6	0.03	0.003

n.d. = not detected (detection limit is approx < 0.2 µg/unit h)

Evaluation of the test results

The single VOC compounds found in the emission test of **Ginkgo A40 / Gaia A42** with a defined CREL are in table 4 compared with the maximum allowable concentrations of the target CREL VOCs.

Table 4
Single VOC compounds found with defined CREL and a comparison with the target CREL VOCs

Single VOC compounds found with defined CREL	**Concentration in private office** (µg/m^3)	**Concentration in school classroom** (µg/m^3)	**CREL Maximum allowable conc.** (µg/m^3)	**Pass / Fail**
No substances identified	**n.d.**	**n.d.**	--	**PASS**

Summary of the test results

The tested product **Ginkgo A40 / Gaia A42** complies with the requirements of the Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources using Environmental Chambers, version 1.1, 2010, by the California Department of Public Health.

In appendix 5 there is a table of the estimated concentrations for 100 units of the product, which also complies with the requirements.

RISE Research Institutes of Sweden AB
Chemistry, Materials and Surfaces - Chemistry

Performed by

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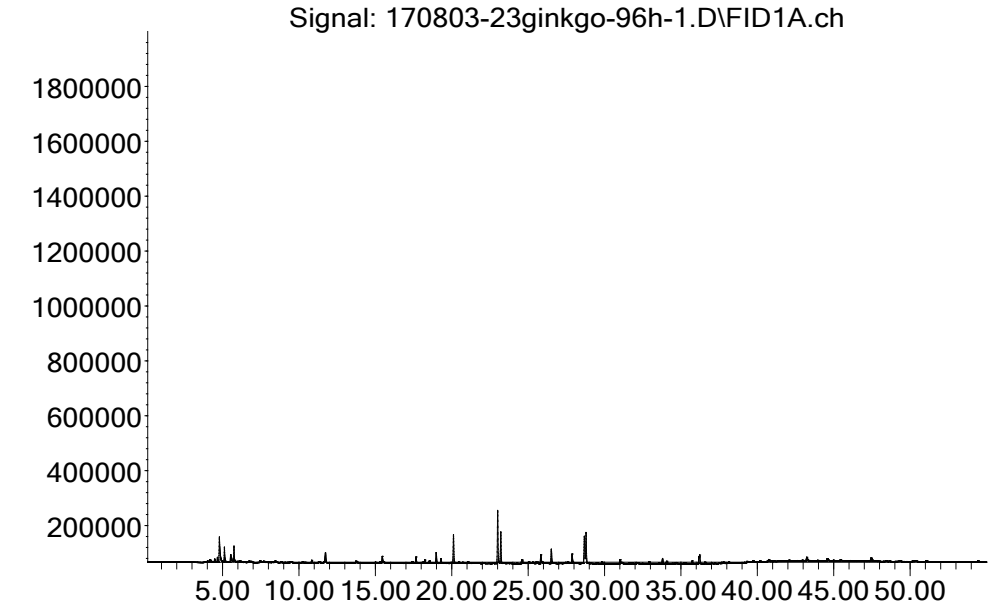
Appendices

1. Gas Chromatograms
2. Photo of the test specimen
3. Sampling report
4. Target CREL VOCs and their maximum allowable concentrations
5. Estimated concentrations of 100 units of the tested product

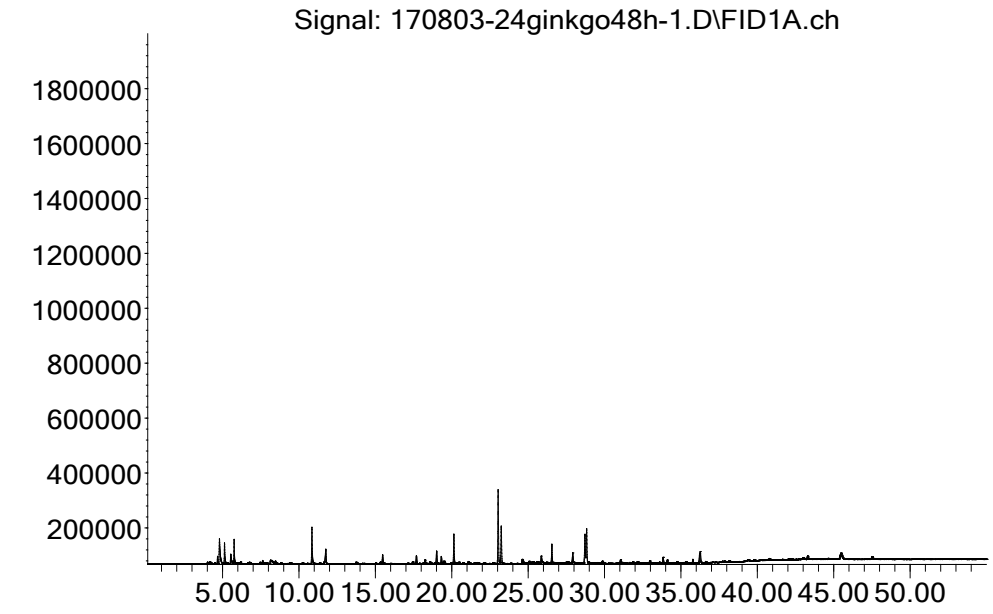
Appendix 1

Gas chromatograms

Ginkgo A40 / Gaia A42, after 96 h:
Sampled volume = 6.7 L

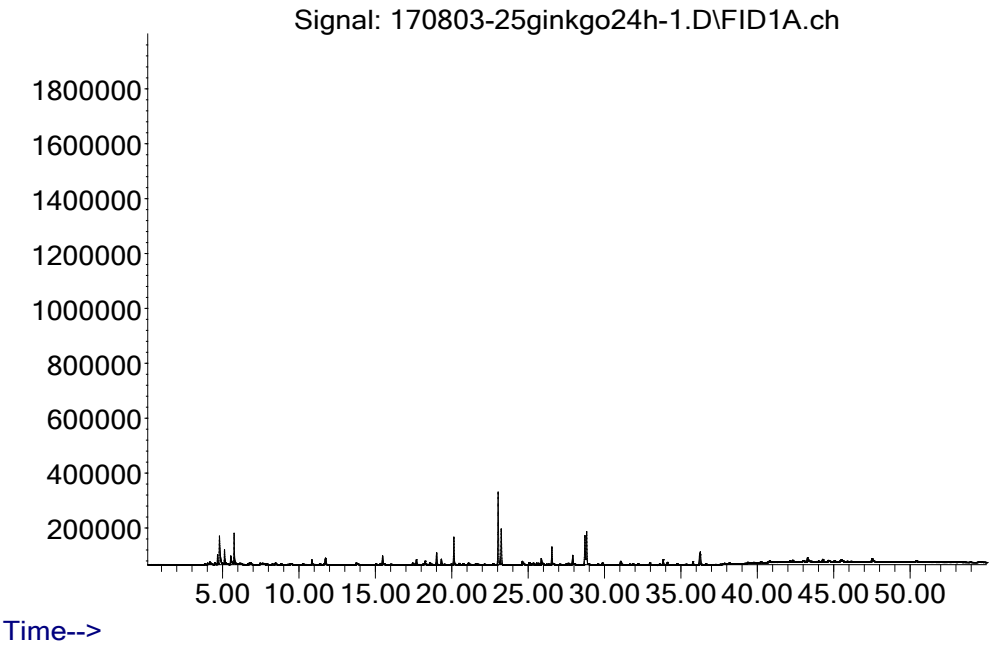


Ginkgo A40 / Gaia A42, after 48 h:
Sampled volume = 6.7 L



Appendix 1

Ginkgo A40 / Gaia A42, after 24 h:
Sampled volume = 6.7 L



TVOC between C_6 and C_{16}, means compounds eluting between 6.2 and 37.9 minutes.

Appendix 2

Photo of the test specimen

Ginkgo A40 / Gaia A42

Appendix 3

Sampling Report

Sampler (Name, Company, contact info): Blå Station AB Sandvaktaregatran 17 29635 Åhus Isaac Svensson 0414-30003414	**ManufNacturer of the product** (Company, address): NÅ Formtextil Bultgatan 6, 302 44 Halmstad 035-186580
Name of product: Ginkgo A40 / Gaia A42	**Type of product:** **Soundabsorber/wall decoration**
Manufacturing Date: 2017 06 18	**Batch No:** **Week 25-1**
Date of sampling: 2017-06-19	**Amount of material sampled:** 1pcs **Packing material: Aluminum foil/plastic wrap/cardboard box**
Sample is taken from: Production line X Stock / Storage ☐ Miscellaneous ☐ -where, specify:	**How was the product stored before sampling?** Plastic bag in cardboard box
If a sub-sample was collected from a larger material amount, describe how the sub-sample was taken:	
Observations and remarks:	
Confirmation I hereby confirm that the sample was selected, taken and packed in accordance with the instructions.	
Date: 20170619	**Signature:**

Appendix 4

Target CREL VOCs and their maximum allowable concentrations

according to table 4-1 in CDPH/EHLB/Standard Method V1.1. (February 2010)

No	Volatile organic compound	CAS number	Maximum allowable conc. ($\mu g/m^3$)
1.	Acetaldehyde	75-07-0	**70**
2.	Benzene	71-43-2	**30**
3.	Carbon disulfide	75-15-0	**400**
4.	Carbon tetrachloride	56-23-5	**20**
5.	Chlorobenzene	108-90-7	**500**
6.	Chloroform	67-66-3	**150**
7.	Dichlorobenzene (1,4-)	106-46-7	**400**
8.	Dichloroethylene (1,1)	75-35-4	**35**
9.	Dimethylformamide (N,N-)	68-12-2	**40**
10.	Dioxane (1,4-)	123-91-1	**1 500**
11.	Epichlorohydrin	106-89-8	**1.5**
12.	Ethylbenzene	100-41-4	**1 000**
13.	Ethylene glycol	107-21-1	**200**
14.	Ethylene glycol monoethyl ether	110-80-5	**35**
15.	Ethylene glycol monoethyl ether acetate	111-15-9	**150**
16.	Ethylene glycol monomethyl ether	109-86-4	**30**
17.	Ethylene glycol monomethyl ether acetate	110-49-6	**45**
18.	Formaldehyde	50-00-0	**9**
19.	Hexane (n-)	110-54-3	**3 500**
20.	Isophorone	78-59-1	**1 000**
21.	Isopropanol	67-63-0	**3 500**
22.	Methyl chloroform	71-55-6	**500**
23.	Methylene chloride	75-09-2	**200**
24.	Methyl t-butyl ether	1634-04-4	**4 000**
25.	Naphtalene	91-20-3	**4.5**
26.	Phenol	108-95-2	**100**
27.	Propylene glycol monomethyl ether	107-98-2	**3 500**
28.	Styrene	100-42-5	**450**
29.	Tetrachloroethylene	127-18-4	**17.5**
30.	Toluene	108-88-3	**150**
31.	Trichloroethylene	79-01-6	**300**
32.	Vinyl acetate	108-05-4	**100**
33-35	Xylenes (m-, o-, p-)	108-38-3, 95-47-6, 106-42-3	**350**

Appendix 5

Estimated concentrations of **100 units** of **Ginkgo A40 / Gaia A42**

in a standard private office and a standard school classroom

No	Volatile organic compound	CAS number	ID [1]	Emission rate (µg/100unit h)	Concentration in private office (µg/m^3)	Concentration in school classroom (µg/m^3)
1.	Acetaldehyde	75-07-0	A	< 9	**< 0.5**	**< 0.05**
2.	Benzene	71-43-2	-	n.d	**< 1**	**< 0.1**
3.	Carbon disulfide	75-15-0	-	n.d	**< 1**	**< 0.1**
4.	Carbon tetrachloride	56-23-5	-	n.d	**< 1**	**< 0.1**
5.	Chlorobenzene	108-90-7	-	n.d	**< 1**	**< 0.1**
6.	Chloroform	67-66-3	-	n.d	**< 1**	**< 0.1**
7.	Dichlorobenzene (1,4-)	106-46-7	-	n.d	**< 1**	**< 0.1**
8.	Dichloroethylene (1,1)	75-35-4	-	n.d	**< 1**	**< 0.1**
9.	Dimethylformamide (N,N-)	68-12-2	-	n.d	**< 1**	**< 0.1**
10.	Dioxane (1,4-)	123-91-1	-	n.d	**< 1**	**< 0.1**
11.	Epichlorohydrin	106-89-8	-	n.d	**< 1**	**< 0.1**
12.	Ethylbenzene	100-41-4	-	n.d	**< 1**	**< 0.1**
13.	Ethylene glycol	107-21-1	-	n.d	**< 1**	**< 0.1**
14.	Ethylene glycol monoethyl ether	110-80-5	-	n.d	**< 1**	**< 0.1**
15.	Ethylene glycol monoethyl ether acetate	111-15-9	-	n.d	**< 1**	**< 0.1**
16.	Ethylene glycol monomethyl ether	109-86-4	-	n.d	**< 1**	**< 0.1**
17.	Ethylene glycol monomethyl ether acetate	110-49-6	-	n.d	**< 1**	**< 0.1**
18.	Formaldehyde	50-00-0	A	12	**0.6**	**0.06**
19.	Hexane (n-)	110-54-3	-	n.d	**< 1**	**< 0.1**
20.	Isophorone	78-59-1	-	n.d	**< 1**	**< 0.1**
21.	Isopropanol	67-63-0	-	n.d	**< 1**	**< 0.1**
22.	Methyl chloroform	71-55-6	-	n.d	**< 1**	**< 0.1**
23.	Methylene chloride	75-09-2	-	n.d	**< 1**	**< 0.1**
24.	Methyl t-butyl ether	1634-04-4	-	n.d	**< 1**	**< 0.1**
25.	Naphtalene	91-20-3	-	n.d	**< 1**	**< 0.1**
26.	Phenol	108-95-2	-	n.d	**< 1**	**< 0.1**
27.	Propylene glycol monomethyl ether	107-98-2	-	n.d	**< 1**	**< 0.1**
28.	Styrene	100-42-5	-	n.d	**< 1**	**< 0.1**
29.	Tetrachloroethylene	127-18-4	-	n.d	**< 1**	**< 0.1**
30.	Toluene	108-88-3	-	n.d	**< 1**	**< 0.1**
31.	Trichloroethylene	79-01-6	-	n.d	**< 1**	**< 0.1**

Appendix 5

32.	Vinyl acetate	108-05-4	-	n.d	**< 1**	**< 0.1**
33-35	Xylenes (m-, o-, p-)	108-38-3, 95-47-6, 106-42-3	-	n.d	**< 1**	**< 0.1**
	Other non-listed identified substances:					
	TVOC (C_6 – C_{16})	--	B	320	15	2
	1-Hexanol, 2-ethyl-	104-76-7	A	50	2	0.3
	Nonanal	124-19-6	A	62	6	0.6
	Cyclopentasiloxane, decamethyl-	541-02-6	B	57	3	0.3
	Caprolactam	105-60-2	A	140	7	0.8
	Cyclohexasiloxane, dodecamethyl-	540-97-6	B	58	3	0.3