



7290B Investment Drive North Charleston, South Carolina 29417
Phone: 866.272.0932 Fax: 866.509.5146 www.o2si.com



ISO 17025 Accredited Chemical Testing Lab
Cert. No. 3031.01

HRP760

Date Received: _____

Certificate of Analysis

Rev 0

Page 1 of 1

Catalog No.: 120340-01	Lot No.: 495673	Storage: ≤ -10 °C	Solvent: P/T Methanol	Exp. Date: 25-Aug-2027	Description: Custom Volatile Mix, 8-7, 1,000 mg/L, 1 mL
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Compound	CAS No.	Purity (%)	Neat Material Lot No.	Concentration
benzene	71-43-2	99.99	146.19P	1000 ± 13.82 mg/L
ethylbenzene	100-41-4	100	174.7.1P	1003 ± 13.89 mg/L
methyl t-butyl ether	1634-04-4	99.97	208.24.4P	1002 ± 13.88 mg/L
styrene	100-42-5	99.5	180.9.4P	997.1 ± 13.81 mg/L
toluene	108-88-3	100	184.48.1P	1001 ± 13.87 mg/L
m-xylene	108-38-3	99.7	193.7.1.2P	1003 ± 13.89 mg/L
o-xylene	95-47-6	99	192.29.3P	1003 ± 17.1 mg/L
p-xylene	106-42-3	99.9	194.7.1P	1006 ± 13.93 mg/L

ARPA Umbria
 DATA 4/8/23
 IDENTIF. HRP760
 APPROVATO DA [Signature]

An 4/8/23

Certified By: _____
 Sanquetta Coakley
 Manufacture Date 26-Aug-2022

Follow all storage requirements, keep tightly closed when not in use, and use good laboratory practices when handling.
 This Reference Material was manufactured, produced, and/or certified under a quality management system by an ISO/IEC accredited testing laboratory. Certificates of accreditation can be reviewed by visiting www.o2si.com.

All weights are traceable through N. I. S. T. Test No. 822/264157-00.
 Concentration (correct for purity) and uncertainty (95% confidence) values listed are determined gravimetrically.
 The stated uncertainty is the expanded uncertainty with a coverage factor of two to give a 95% confidence level.



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ISO 17025 Accredited Chemical Testing Lab
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MRP 764

Date Received: _____

Certificate of Analysis

Rev 0

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Catalog No.: 020480-01	Lot No.: 486000	Storage: ≤ -10 °C	Solvent: P/T Methanol	Exp. Date: 15-Sep-2024	Description: 502.2 Internal Standard Solution, 2,000 mg/L, 1 ml
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Compound	CAS No.	Purity (%)	Neat Material Lot No.	Concentration
1-chloro-2-fluorobenzene	348-51-6	99.8	480.1.2P	2011 ± 57.48 mg/L

ARPA Umbria
 DATA 6-8-23
 IDENTIF MRP 764
 APPROVATO DA AS

Arr. 6/8/23

Amanda Frazier

Certified By: _____

Amanda Frazier
Manufacture Date 17-Sep-2019

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CI 488

Date Received: _____

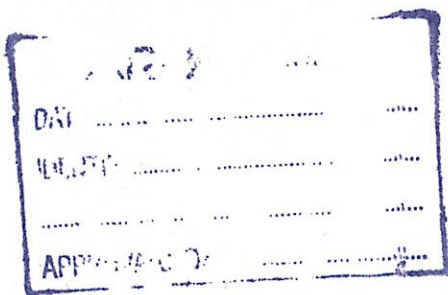
Certificate of Analysis

Rev 0

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Catalog No.: 120255-01 **Lot No.:** 477400 **Storage:** ≤ -10 °C **Solvent:** P/T Methanol **Exp. Date:** 22-Mar-2026 **Description:** Custom Volatile Mix, 12-255, 1000 mg/L, 1 mL

Compound	CAS No.	Purity (%)	Neat Material Lot No.	Concentration
benzene	71-43-2	99.99	146.1.9P	1003 ± 10.42 mg/L
bromodichloromethane	75-27-4	98.7	149.1.11P	1000 ± 10.44 mg/L
bromoform	75-25-2	99.3	150.7.2P	999.7 ± 10.43 mg/L
carbon tetrachloride	56-23-5	100	154.9.1P	1001 ± 10.45 mg/L
chloroform	67-66-3	99.8	156.7.1P	1000 ± 10.44 mg/L
dibromochloromethane	124-48-1	98.6	159.1.8.1P	999.9 ± 10.43 mg/L
1,2-dichloroethane	107-06-2	99.9	164.158.1P	1001 ± 10.45 mg/L
ethylbenzene	100-41-4	100	174.7.1P	1001 ± 10.45 mg/L
tetrachloroethylene	127-18-4	100	183.1.2P	1002 ± 10.41 mg/L
toluene	108-88-3	100	184.48.1P	996.6 ± 10.4 mg/L
trichloroethylene	79-01-6	100	188.29.2P	1001 ± 10.4 mg/L
vinyl chloride	75-01-4	99	143.158.5.2P	994 ± 10.51 mg/L



Bradley Richter

Certified By: _____

Bradley Richter

Manufacture Date 18-Mar-2022

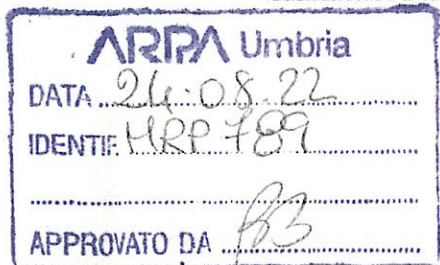
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Concentration (correct for purity) and uncertainty (95% confidence) values listed are determined gravimetrically.

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CE 4393

Date Received: _____

Certificate of Analysis

Rev 0

Page 1 of 2

Catalog No.:	Lot No.:	Storage:	Solvent:	Exp. Date:	Description:
121507-01	486002	≤ -10 °C	P/T Methanol	25-Jul-2024	Halogenated Volatiles Mix, 36-254, 100 mg/L, 4 x 1 mL
-4PAK					

Compound	CAS No.	Purity (%)	Neat Material Lot No.	Concentration
allyl chloride	107-05-1	98.9	227.1.2P	100.3 ± 1.44 mg/L
bromodichloromethane	75-27-4	99.2	149.1.12P	99.86 ± 1.04 mg/L
bromoform	75-25-2	99.3	150.7.2P	99.9 ± 1.04 mg/L
bromomethane	74-83-9	99.9	139.158.2P	99.98 ± 2.02 mg/L
carbon tetrachloride	56-23-5	100	154.9.1P	100.1 ± 1.04 mg/L
chlorobenzene	108-90-7	99.9	155.29.1P	100.4 ± 1.04 mg/L
chloroethane	75-00-3	99.94	141.2.3P	99.88 ± 2.01 mg/L
chloroform	67-66-3	99.8	156.7.1P	100.2 ± 1.04 mg/L
chloromethane	74-87-3	99.7	140.158.3P	100.8 ± 2.03 mg/L
cis-1,2-dichloroethylene	156-59-2	98.5	166.1.7.1P	99.93 ± 1.04 mg/L
dibromochloromethane	124-48-1	98.6	159.1.8.1P	100.9 ± 1.05 mg/L
1,2-dibromo-3-chloropropane	96-12-8	98.6	160.7.2.3P	99.81 ± 1.04 mg/L
1,2-dibromoethane	106-93-4	99.9	161.9.1P	99.95 ± 1.04 mg/L
dibromomethane	74-95-3	99.8	162.1.2P	100.5 ± 1.44 mg/L
1,2-dichlorobenzene	95-50-1	99.8	43.7.1P	100 ± 1.04 mg/L
1,3-dichlorobenzene	541-73-1	99.8	44.1.2P	100.2 ± 1.04 mg/L

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Melissa Workoff

Certified By: _____

Melissa Workoff

Manufacture Date 26-Jul-2022



All weights are traceable through N. I. S. T. Test No. 822/264157-00.
Concentration (correct for purity) and uncertainty (95% confidence) values listed are determined gravimetrically.
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Certificate of Analysis

Catalog No.: 121507-01-4PAK

Lot No.: 486002

Expiration Date: 25-Jul-2024

Compound	CAS No.	Purity (%)	Neat Material Lot No.	Concentration
1,4-dichlorobenzene	106-46-7	99.9	45.1.2P	100 ± 1.44 mg/L
trans-1,4-dichloro-2-butene	110-57-6	93.5	201.1.17.2P	100.1 ± 1.04 mg/L
dichlorodifluoromethane	75-71-8	99	142.158.5P	100.4 ± 2.26 mg/L
1,1-dichloroethane	75-34-3	98.1	163.247.3.2P	99.69 ± 1.43 mg/L
1,2-dichloroethane	107-06-2	99.9	164.158.1P	100.1 ± 1.04 mg/L
1,1-dichloroethylene	75-35-4	99.98	165.1.4P	99.99 ± 1.03 mg/L
trans-1,2-dichloroethylene	156-60-5	99.7	167.9.1P	100.1 ± 1.04 mg/L
1,2-dichloropropane	78-87-5	99.7	168.8.1.1P	99.49 ± 1.43 mg/L
cis-1,3-dichloropropylene	10061-01-5	99.5	172.7.6.1P	99.7 ± 1.04 mg/L
trans-1,3-dichloropropylene	10061-02-6	99	173.7.11P	100 ± 1.04 mg/L
hexachlorobutadiene	87-68-3	98	47.158.3.1P	100.1 ± 1.44 mg/L
iodomethane	74-88-4	99.9	203.29.2P	99.99 ± 1.04 mg/L
methylene chloride	75-09-2	99.9	178.24.4P	101 ± 1.05 mg/L
1,2,4,5-tetrachlorobenzene	95-94-3	99.9	53.7.3P	98.9 ± 2.01 mg/L
1,1,1,2-tetrachloroethane	630-20-6	99.8	181.7.2.9P	99.84 ± 1.04 mg/L
1,1,2,2-tetrachloroethane	79-34-5	99.4	182.8.2P	101 ± 1.45 mg/L
tetrachloroethylene	127-18-4	100	183.1.2P	100.4 ± 1.04 mg/L
1,2,4-trichlorobenzene	120-82-1	99.6	54.29.1P	100.2 ± 1.04 mg/L
1,1,1-trichloroethane	71-55-6	99	187.1.1P	100.1 ± 1.44 mg/L
1,1,2-trichloroethane	79-00-5	99.6	195.7.1.6P	99.88 ± 1.04 mg/L
trichloroethylene	79-01-6	100	188.29.2P	100.1 ± 1.04 mg/L
trichlorofluoromethane	75-69-4	99	144.1.3P	100.6 ± 2.11 mg/L
1,2,3-trichloropropane	96-18-4	99.5	189.1.3P	100.3 ± 1.04 mg/L
vinyl chloride	75-01-4	99	143.158.5.2P	100.7 ± 2.26 mg/L

Melissa Workoff

Certified By: _____

Melissa Workoff

Manufacture Date 26-Jul-2022

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Certificate of Analysis

Catalog No.: 121507-01-4PAK

Lot No.: 486002

Expiration Date: 25-Jul-2024

Compound

CAS No.

Purity (%)

Neat Material Lot No.

Concentration

Melissa Workoff

Certified By: _____

Melissa Workoff

Manufacture Date 26-Jul-2022

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Date Received: _____

Certificate of Analysis

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Catalog No.: 116040-01 **Lot No.:** 421562 **Storage:** ≤ 6 °C **Solvent:** Methanol **Exp. Date:** 5-Sep-2023 **Description:** Custom Phenol Solution, 9-2, 100 mg/L, 1 mL

Compound	CAS No.	Purity (%)	Neat Material Lot No.	Concentration
2-chlorophenol	95-57-8	99.9	103.1.3.1P	100.9 ± 1.43 mg/L
4-chlorophenol	106-48-9	99.9	1146.9.1P	100.9 ± 1.43 mg/L
2,4-dichlorophenol	120-83-2	99.2	104.9.1.1P	99.2 ± 1.41 mg/L
2-methylphenol	95-48-7	99.6	114.7.3P	98.6 ± 1.02 mg/L
3-methylphenol	108-39-4	99.2	115.7.3P	100.2 ± 1.01 mg/L
4-methylphenol	106-44-5	99.9	116.9.1.1P	99.9 ± 1.42 mg/L
pentachlorophenol	87-86-5	99	110.1.7P	102 ± 1.01 mg/L
phenol	108-95-2	99.9	112.9.5P	101.9 ± 1.02 mg/L
2,4,6-trichlorophenol	88-06-2	98	113.9.1.1P	101.9 ± 1.42 mg/L

MRP 816
22-6-22
B3

*used in
lab*



Certified By: _____
Daniel Castillo
Manufacture Date 31-Aug-2020

Follow all storage requirements, keep tightly closed when not in use, and use good laboratory practices when handling.

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All weights are traceable through N. I. S. T. Test No. 822/264157-00. Concentration (correct for purity) and uncertainty (95% confidence) values listed are determined gravimetrically.

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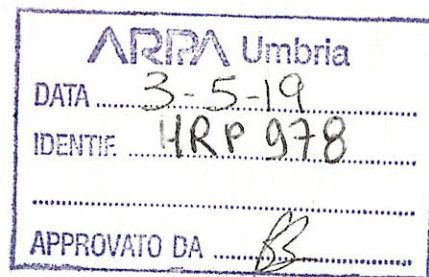
Certificate of Analysis

Rev 0

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Catalog No.: 121416-02	Lot No.: 374223	Storage: ≤ -10 °C	Solvent: P/T Methanol	Exp. Date: 11-Apr-2021	Description: Custom Volatile Mix, 2-1416, 1,000 mg/L, 1 ml
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Compound	CAS No.	Purity (%)	Neat Material Lot No.	Concentration
decane (C10)	124-18-5	99.5	415.7.1P	1001 +/- 10.45 mg/l
2-methylpentane	107-83-5	99	384.158.1.1P	996.3 +/- 14.37 mg/l



Aquilla Samuel

Certified By: _____

Aquilla Samuel

Manufacture Date 12-Apr-2019

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All weights are traceable through N. I. S. T. Test No. 822/264157-00. Concentration (correct for purity) and uncertainty (95% confidence) values listed are determined gravimetrically.

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Date Received: _____

Certificate of Analysis

Rev 0

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Catalog No.: 110499-02 **Lot No.:** 419730 **Storage:** ≤ -10 °C **Solvent:** Heptane **Exp. Date:** 1-Jun-2024 **Description:** Custom n-Alkanes Mix, 16-28, 50 mg/L, 1 ml

Compound	CAS No.	Purity (%)	Neat Material Lot No.	Concentration
decane (C10)	124-18-5	99.5	415.7.1P	49.57 ± .88 mg/L
docosane (C22)	629-97-0	99.7	420.1.1P	49.99 ± 1.02 mg/L
dodecane (C12)	112-40-3	99.2	416.7.1P	50.98 ± .9 mg/L
dotriacontane (C32)	544-85-4	98.4	425.29.1.1P	50.09 ± .92 mg/L
eicosane (C20)	112-95-8	98.9	419.29.1P	49.84 ± .88 mg/L
hexacosane (C26)	630-01-3	99.5	422.7.1.1P	49.67 ± .88 mg/L
hexatriacontane (C36)	630-06-8	97.7	427.1.1P	50.18 ± .92 mg/L
n-hexadecane (C16)	544-76-3	99.45	368.271.1P	49.04 ± .87 mg/L
octacosane (C28)	630-02-4	98.7	423.400.1P	49.37 ± 1 mg/L
n-octadecane (C18)	593-45-3	99.5	418.29.1P	49.75 ± .88 mg/L
octatriacontane (C38)	7194-85-6	97.4	428.7.1.1P	50.03 ± .77 mg/L
tetracontane (C40)	4181-95-7	100	429.7.1P	50 ± .92 mg/L
tetracosane (C24)	646-31-1	99.7	421.1.1P	49.54 ± 1.01 mg/L
n-tetradecane (C14)	629-59-4	99	417.29.4P	49.64 ± 1.01 mg/L
tetratriacontane (C34)	14167-59-0	98	426.7.1.1P	50.11 ± .92 mg/L
triacontane (C30)	638-68-6	99.5	424.7.1.1P	50.2 ± .78 mg/L

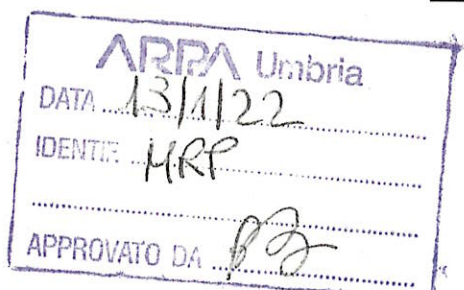
Katherine Wood

Certified By: _____
Katherine Wood
Manufacture Date 3-Jun-2019

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Date Received: _____

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Catalog No.: 116662-01	Lot No.: 496225	Storage: ≤ -10 °C	Solvent: Ethyl Acetate	Exp. Date: 24-Jan-2028	Description: Custom PAH Solution, 23-2, 2 mg/L, 1 ml
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Compound	CAS No.	Purity (%)	Neat Material Lot No.	Concentration	
acenaphthene	83-32-9	99.9	13.1.5P	2.005 ± .03	mg/L
acenaphthylene	208-96-8	97.6	14.290.1P	2.007 ± .03	mg/L
anthracene	120-12-7	99.5	15.7.1P	2.03 ± .03	mg/L
benzo[a]anthracene	56-55-3	98.7	16.7.2.5P	2.018 ± .03	mg/L
benzo[b]fluoranthene	205-99-2	98.7	17.1.16P	1.994 ± .03	mg/L
benzo(j)fluoranthene	205-82-3	98.8	1766.5.3P	1.966 ± .05	mg/L
benzo[k]fluoranthene	207-08-9	98.9	18.421.4P	2.007 ± .03	mg/L
benzo[ghi]perylene	191-24-2	97.3	19.286.3P	2 ± .05	mg/L
benzo[a]pyrene	50-32-8	99	20.1.6P	1.999 ± .04	mg/L
benzo[e]pyrene	192-97-2	98.5	619.421.2P	1.98 ± .03	mg/L
chrysene	218-01-9	96	21.286.2P	2.001 ± .04	mg/L
dibenz[a,h]anthracene	53-70-3	99.44	22.286.3P	2.004 ± .03	mg/L
dibenzo(a,e)pyrene	192-65-4	99.24	930.421.2.4P	1.995 ± .02	mg/L
dibenzo(a,h)pyrene	189-64-0	98.3	1517.7.5.1P	2.005 ± .02	mg/L
dibenzo(a,i)pyrene	189-55-9	99.33	1478.286.5.2P	1.977 ± .02	mg/L
dibenzo(a,l)pyrene	191-30-0	99.3	1516.421.1P	1.966 ± .03	mg/L
fluoranthene	206-44-0	98.6	23.7.3P	2.003 ± .03	mg/L

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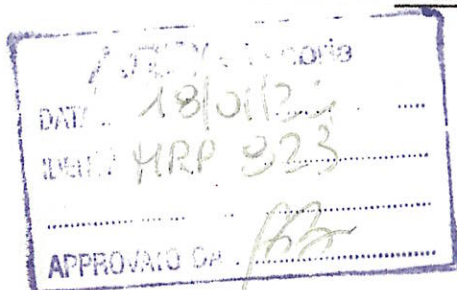
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Certified By: _____

Shane C. Tipton

Clint Tipton

Manufacture Date 25-Jan-2023



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Concentration (correct for purity) and uncertainty (95% confidence) values listed are determined gravimetrically.

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Certificate of Analysis

Page 2 of 2

Catalog No.: 116662-01

Lot No.: 496225

Expiration Date: 24-Jan-2028

<u>Compound</u>	<u>CAS No.</u>	<u>Purity (%)</u>	<u>Neat Material Lot No.</u>	<u>Concentration</u>
fluorene	86-73-7	98.5	24.29.1P	2.025 ± .03 mg/L
indeno[1,2,3-cd]pyrene	193-39-5	98	25.286.3P	2 ± .04 mg/L
naphthalene	91-20-3	99.8	26.9.1P	2.001 ± .03 mg/L
perylene	198-55-0	98	939.286.1P	1.98 ± .03 mg/L
phenanthrene	85-01-8	98.9	27.1.3P	2.007 ± .04 mg/L
pyrene	129-00-0	98.5	28.9.1.1P	2.001 ± .03 mg/L



Certified By: _____

Clint Tipton

Manufacture Date 25-Jan-2023

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Certificate of Analysis

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Catalog No.: 115461-01	Lot No.: 501372	Storage: ≤ -10 °C	Solvent: Toluene	Exp. Date: 17-May-2024	Description: Custom PAH Internal Standard, 3-5461, 2 mg/L, 5 x 1 mL
-5PAK					

Compound	CAS No.	Purity (%)	Neat Material Lot No.	Concentration
acenaphthylene-d ₈	93951-97-4	98.2	1975.421.1P	2.003 ± .05 mg/L
benzo[e]pyrene-d ₁₂	205440-82-0	98.7	2560.120.2P	1.974 ± .03 mg/L
p-terphenyl-d ₁₄	1718-51-0	99.3	9.120.8P	1.986 ± .03 mg/L



Briana Smith

Certified By: _____

Briana Smith
Manufacture Date 28-Apr-2023

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The stated uncertainty is the expanded uncertainty with a coverage factor of two to give a 95% confidence level.



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Page 1 of 2

Catalog No.: 116310-25 **Lot No.:** 506392 **Storage:** ≤ -10 °C **Solvent:** Methylene Chloride **Exp. Date:** 23-Jul-2026 **Description:** Custom PAH Solution, 22-1, 2 mg/L, 5 x 1 mL

Compound	CAS No.	Purity (%)	Neat Material Lot No.	Concentration	
acenaphthene	83-32-9	99	13.1.4P	2 ± .03	mg/L
acenaphthylene	208-96-8	97.6	14.290.1P	1.999 ± .03	mg/L
anthracene	120-12-7	99.2	15.29.1.1P	1.999 ± .04	mg/L
benzo[a]anthracene	56-55-3	98.7	16.7.2.5P	1.999 ± .03	mg/L
benzo[b]fluoranthene	205-99-2	99.9	17.1.15P	2 ± .03	mg/L
benzo[k]fluoranthene	207-08-9	98.9	18.421.4P	1.999 ± .03	mg/L
benzo[ghi]perylene	191-24-2	97.3	19.286.3P	1.999 ± .05	mg/L
benzo[a]pyrene	50-32-8	98.3	20.286.1P	2 ± .05	mg/L
benzo[e]pyrene	192-97-2	99.9	619.1.8P	2.018 ± .02	mg/L
chrysene	218-01-9	96	21.286.2P	2.002 ± .04	mg/L
dibenz[a,h]anthracene	53-70-3	98	22.286.2.1P	2.002 ± .05	mg/L
dibenzo(a,e)pyrene	192-65-4	99.2	930.421.3P	2.004 ± .03	mg/L
dibenzo(a,h)pyrene	189-64-0	98.6	1517.7.4.3P	2.002 ± .02	mg/L
dibenzo(a,i)pyrene	189-55-9	97	1478.286.4P	1.998 ± .03	mg/L
dibenzo(a,l)pyrene	191-30-0	99.3	1516.421.1P	1.996 ± .03	mg/L
fluoranthene	206-44-0	98.6	23.7.4P	2 ± .03	mg/L

Katrina Emelianoff

Certified By: _____

Katrina Emelianoff
 Manufacture Date 19-Jul-2023

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Certificate of Analysis

Catalog No.: 116310-25-5PAK

Lot No.: 506392

Expiration Date: 23-Jul-2026

<u>Compound</u>	<u>CAS No.</u>	<u>Purity (%)</u>	<u>Neat Material Lot No.</u>	<u>Concentration</u>	
fluorene	86-73-7	99.8	24.1.4P	1.999 ± .04	mg/L
indeno[1,2,3-cd]pyrene	193-39-5	98	25.286.3P	2 ± .04	mg/L
naphthalene	91-20-3	99.8	26.9.2P	2 ± .03	mg/L
perylene	198-55-0	98	939.286.1P	2.009 ± .03	mg/L
phenanthrene	85-01-8	98.9	27.1.3P	2.001 ± .04	mg/L
pyrene	129-00-0	98.5	28.9.1.1P	2 ± .03	mg/L



Katrina Emelianoff

Certified By:

Katrina Emelianoff
Manufacture Date 19-Jul-2023

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Catalog No.: 130110-01 **Lot No.:** 495203 **Storage:** ≤ -10 °C **Solvent:** Isooctane **Exp. Date:** 10-Jan-2026 **Description:** PCB Congener Solution 28-1, 100 mg/L, 1 ml

Compound	CAS No.	Purity (%)	Neat Material Lot No.	Concentration
2,2',3,3',4',5,6-heptachlorobiphenyl (BZ# 177)	52663-70-4	99.5	833.5.3.1P	100.3 ± 2.84 ug/mL
2,2',3,3',4,4',5-heptachlorobiphenyl (BZ# 170)	35065-30-6	99	526.4.2.1P	100.1 ± 1.81 ug/mL
2,2',3,4',5,5',6-heptachlorobiphenyl (BZ# 187)	52663-68-0	99.4	542.421.1P	100.8 ± 1.57 ug/mL
2,2',3,4,4',5',6-heptachlorobiphenyl (BZ# 183)	52663-69-1	99	664.5.5.8P	99.79 ± 2.83 ug/mL
2,2',3,4,4',5,5'-heptachlorobiphenyl (BZ# 180)	35065-29-3	98.2	527.286.1P	99.77 ± 1.81 ug/mL
2,3,3',4,4',5,5'-heptachlorobiphenyl (BZ# 189)	39635-31-9	99.3	656.421.1P	99.7 ± 1.81 ug/mL
2,2',3,4',5',6-hexachlorobiphenyl (BZ# 149)	38380-04-0	99.9	811.421.3P	99.9 ± 1.59 ug/mL
2,2',3,4',5,5'-hexachlorobiphenyl (BZ# 146)	51908-16-8	98	808.421.3P	99.96 ± 1.81 ug/mL
2,2',3,4,4',5'-hexachlorobiphenyl (BZ# 138)	35065-28-2	99.4	541.421.1P	99.8 ± 1.81 ug/mL
2,2',3,5,5',6-hexachlorobiphenyl (BZ# 151)	52663-63-5	98.9	813.421.1P	99.69 ± 1.81 ug/mL
2,2',4,4',5,5'-hexachlorobiphenyl (BZ# 153)	35065-27-1	98.8	525.421.2P	99.99 ± 1.59 ug/mL
2,3',4,4',5,5'-hexachlorobiphenyl (BZ# 167)	52663-72-6	99.9	655.5.6P	99.5 ± 2.82 ug/mL
2,3,3',4,4',5-hexachlorobiphenyl (BZ# 156)	38380-08-4	99	659.421.3P	99.4 ± 1.8 ug/mL
2,3,3',4,4',5'-hexachlorobiphenyl (BZ# 157)	69782-90-7	98.8	654.421.4P	99.59 ± 2.49 ug/mL
3,3',4,4',5,5'-hexachlorobiphenyl (BZ# 169)	32774-16-6	99.3	660.421.4P	99.3 ± 1.8 ug/mL
2',3,4,4',5-pentachlorobiphenyl (BZ# 123)	65510-44-3	99.4	658.5.6P	100 ± 2.83 ug/mL

Certified By: _____
 Joseph Blackmon-Dishaw
 Manufacture Date 6-Jan-2023

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APR 17 10 16
 DATA: 17/10/23
 IDENT: MRP 850
 APPROVAL:

Certificate of Analysis

Catalog No.: 130110-01

Lot No.: 495203

Expiration Date: 10-Jan-2026

Compound	CAS No.	Purity (%)	Neat Material Lot No.	Concentration	
2,2',3,5',6-pentachlorobiphenyl (BZ# 95)	38379-99-6	96	767.421.3P	100 ± 2.48	ug/mL
2,2',4,4',5-pentachlorobiphenyl (BZ# 99)	38380-01-7	99.9	771.5.4P	99.9 ± 2.83	ug/mL
2,2',4,5,5'-pentachlorobiphenyl (BZ# 101)	37680-73-2	99.64	520.286.2P	100 ± 2.51	ug/mL
2,3,3',4,4'-pentachlorobiphenyl (BZ# 105)	32598-14-4	99.2	521.421.2P	99.99 ± 1.81	ug/mL
2,3',4,4',5-pentachlorobiphenyl (BZ# 118)	31508-00-6	98	539.286.1P	99.57 ± 2.49	ug/mL
2,3,3',4',6-pentachlorobiphenyl (BZ# 110)	38380-03-9	97.9	779.421.2P	99.86 ± 2.5	ug/mL
2,3,4,4',5-pentachlorobiphenyl (BZ# 114)	74472-37-0	99.5	522.4.1.4P	99.9 ± 1.51	ug/mL
3,3',4,4',5-pentachlorobiphenyl (BZ# 126)	57465-28-8	94.8	540.421.3.1P	99.73 ± 1.8	ug/mL
2,2',5,5'-tetrachlorobiphenyl (BZ# 52)	35693-99-3	98.8	518.421.2P	99.59 ± 1.8	ug/mL
3,3',4,4'-tetrachlorobiphenyl (BZ# 77)	32598-13-3	99.84	538.421.1P	99.84 ± 1.67	ug/mL
3,4,4',5-tetrachlorobiphenyl (BZ# 81)	70362-50-4	98.5	657.421.4P	99.68 ± 1.81	ug/mL
2,4,4'-trichlorobiphenyl (BZ# 28)	7012-37-5	98	516.286.1.2P	99.96 ± 2.5	ug/mL



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Catalog No.: 130307-01 **Lot No.:** 492828 **Storage:** -18°C +/- 4°C
Solvent: Isooctane **Exp. Date:** 14-Nov-2027 **Description:** PCB Congener Solution 32-2,
 10 mg/L, 1 mL

Compound	CAS No.	Purity (%)	Neat Material Lot No.	Concentration
2,2',3,3',4',5,6-heptachlorobiphenyl (BZ# 177)	52663-70-4	99.5	833.5.3.2P	9.87 ± .33 mg/L
2,2',3,3',4,4',5-heptachlorobiphenyl (BZ# 170)	35065-30-6	100	526.5.1.6P	9.92 ± .25 mg/L
2,2',3,4',5,5',6-heptachlorobiphenyl (BZ# 187)	52663-68-0	99.4	542.421.1P	10.14 ± .21 mg/L
2,2',3,4,4',5',6-heptachlorobiphenyl (BZ# 183)	52663-69-1	99	664.5.5.8P	9.821 ± .33 mg/L
2,2',3,4,4',5,5'-heptachlorobiphenyl (BZ# 180)	35065-29-3	98.2	527.286.1P	9.899 ± .25 mg/L
2,3,3',4,4',5,5'-heptachlorobiphenyl (BZ# 189)	39635-31-9	99.3	656.421.1P	10.01 ± .22 mg/L
2,2',3,3',4,4'-hexachlorobiphenyl (BZ# 128)	38380-07-3	99	523.421.2P	10.01 ± .22 mg/L
2,2',3,4',5',6-hexachlorobiphenyl (BZ# 149)	38380-04-0	97.5	811.421.2P	9.984 ± .28 mg/L
2,2',3,4',5,5'-hexachlorobiphenyl (BZ# 146)	51908-16-8	98	808.421.3P	9.918 ± .22 mg/L
2,2',3,4,4',5'-hexachlorobiphenyl (BZ# 138)	35065-28-2	98.3	541.421.3P	9.909 ± .22 mg/L
2,2',3,5,5',6-hexachlorobiphenyl (BZ# 151)	52663-63-5	99	813.5.5P	10.02 ± .2 mg/L
2,2',4,4',5,5'-hexachlorobiphenyl (BZ# 153)	35065-27-1	99.9	525.5.5.4P	9.99 ± .23 mg/L
2,3',4,4',5,5'-hexachlorobiphenyl (BZ# 167)	52663-72-6	98.31	655.421.2P	9.831 ± .22 mg/L
2,3,3',4,4',5-hexachlorobiphenyl (BZ# 156)	38380-08-4	99	659.421.3P	10.06 ± .22 mg/L
2,3,3',4,4',5'-hexachlorobiphenyl (BZ# 157)	69782-90-7	98.8	654.421.3.2P	9.999 ± .28 mg/L
3,3',4,4',5,5'-hexachlorobiphenyl (BZ# 169)	32774-16-6	100	660.5.6P	9.96 ± .31 mg/L

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 Joseph Blackmon-Dishaw
 Manufacture Date 15-Nov-2022

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Certificate of Analysis

Catalog No.: 130307-01

Lot No.: 492828

Expiration Date: 14-Nov-2027

Compound	CAS No.	Purity (%)	Neat Material Lot No.	Concentration	
2',3,4,4',5-pentachlorobiphenyl (BZ# 123)	65510-44-3	99.4	658.5.6P	9.92 ± .31	mg/L
2,2',3,5',6-pentachlorobiphenyl (BZ# 95)	38379-99-6	99.3	767.5.7.1P	9.93 ± .31	mg/L
2,2',4,4',5-pentachlorobiphenyl (BZ# 99)	38380-01-7	99.2	771.5.3.1P	9.841 ± .3	mg/L
2,2',4,5,5'-pentachlorobiphenyl (BZ# 101)	37680-73-2	96.9	520.421.6P	9.961 ± .23	mg/L
2,3,3',4,4'-pentachlorobiphenyl (BZ# 105)	32598-14-4	99.2	521.421.2P	9.92 ± .25	mg/L
2,3',4,4',5-pentachlorobiphenyl (BZ# 118)	31508-00-6	99.2	539.421.2P	9.98 ± .22	mg/L
2,3,3',4',6-pentachlorobiphenyl (BZ# 110)	38380-03-9	99.3	779.5.6P	9.93 ± .31	mg/L
2,3,4,4',5-pentachlorobiphenyl (BZ# 114)	74472-37-0	99.5	522.4.1.2P	10.03 ± .23	mg/L
3,3',4,4',5-pentachlorobiphenyl (BZ# 126)	57465-28-8	94.8	540.421.3.1P	9.935 ± .22	mg/L
2,2',3,5'-tetrachlorobiphenyl (BZ# 44)	41464-39-5	100	536.5.5.1P	9.98 ± .23	mg/L
2,2',5,5'-tetrachlorobiphenyl (BZ# 52)	35693-99-3	98.8	518.421.2P	9.959 ± .23	mg/L
3,3',4,4'-tetrachlorobiphenyl (BZ# 77)	32598-13-3	99.8	538.421.2P	9.94 ± .2	mg/L
3,4,4',5-tetrachlorobiphenyl (BZ# 81)	70362-50-4	98.5	657.421.4P	9.909 ± .22	mg/L
2,4,4'-trichlorobiphenyl (BZ# 28)	7012-37-5	98	516.286.1.2P	9.957 ± .29	mg/L
2,2',5-trichlorobiphenyl (BZ# 18)	37680-65-2	99.9	515.5.6P	10.02 ± .21	mg/L
2,4',5-trichlorobiphenyl (BZ# 31)	16606-02-3	99	712.5.4.1P	10.06 ± .24	mg/L



Joseph Blackmon-Dishaw

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Joseph Blackmon-Dishaw
 Manufacture Date 15-Nov-2022

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WELLINGTON LABORATORIES

CERTIFICATE OF ANALYSIS DOCUMENTATION

P48-W-ES-STK

EN 1948-4:2010
Mass-Labelled WHO PCB
Extraction Standard Stock Solution

PRODUCT CODE: P48-W-ES-STK
LOT NUMBER: WPLCS0914
SOLVENT(S): Nonane/Toluene
DATE PREPARED: (mm/dd/yyyy) 09/29/2014
LAST TESTED: (mm/dd/yyyy) 06/23/2018
EXPIRY DATE: (mm/dd/yyyy) 08/01/2025
RECOMMENDED STORAGE: Store ampoule in a cool, dark place



DESCRIPTION:

P48-W-ES-STK is a solution/mixture of twelve $^{13}\text{C}_{12}$ -labelled chlorinated biphenyls ($^{13}\text{C}_{12}$ -PCBs). The components and their concentrations are given in Table A.

P48-W-ES-STK was designed for, and prepared to be used according to, the European Standard Method EN 1948-4 "Stationary Source Emissions - Determination of the Mass Concentration of PCDDs/PCDFs and dioxin-like PCBs" (EN 1948-4:2010). This solution contains the twelve $^{13}\text{C}_{12}$ -labelled analogues of the PCB congeners designated by the World Health Organization (WHO) and U.S. Environmental Protection Agency (EPA) as being "dioxin-like" in their potential health effects.

The individual $^{13}\text{C}_{12}$ -PCBs all have chemical purities of >98% and isotopic purities of $\geq 99\%$.

DOCUMENTATION/ DATA ATTACHED:

Table A: Components and Concentrations of the Solution/Mixture
Figure 1: HRGC/HRMS Data for P48-W-ES-STK (1/10 Dilution)
(SIR; 10,000 mass resolving power)

ADDITIONAL INFORMATION:

- See page 2 for further details.

FOR LABORATORY USE ONLY: NOT FOR HUMAN OR DRUG USE

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519-822-2436 • Fax: 519-822-2849 • info@well-labs.com

INTENDED USE:

The products prepared by Wellington Laboratories Inc. are for laboratory use only. This certified reference material (CRM) was designed to be used as a standard for the identification and/or quantification of the specific chemical compounds it contains.

HANDLING:

This product should only be used by qualified personnel familiar with its potential hazards and trained in the handling of hazardous chemicals. Due care should be exercised to prevent unnecessary human contact or ingestion. All procedures should be carried out in a well-functioning fume hood and suitable gloves, eye protection, and clothing should be worn at all times. Waste should be disposed of according to national and regional regulations. Safety Data Sheets (SDSs) are available upon request.

SYNTHESIS / CHARACTERIZATION:

Our products are synthesized using single-product unambiguous routes whenever possible. They are then characterized, and their structures and purities confirmed, using a combination of the most relevant techniques, such as NMR, GC/MS, LC/MS/MS, SFC/UV/MS/MS, x-ray crystallography, and melting point. Isotopic purities of mass-labelled compounds are also confirmed using HRGC/HRMS and/or LC/MS/MS.

HOMOGENEITY:

Prior to solution preparation, crystalline material is tested for homogeneity using a variety of techniques (as stated above) and its solubility in a given diluent is taken into consideration. Duplicate solutions of a new product are prepared from the same crystalline lot and, after the addition of an appropriate internal standard, they are compared by GC/MS, LC/MS/MS, and/or SFC/UV/MS/MS. The relative response factors of the analyte of interest in each solution are required to be <5% RSD. New solution lots of existing products, as well as mixtures and calibration solutions, are compared to older lots in a similar manner. This further confirms the homogeneity of the crystalline material as well as the stability and homogeneity of the solutions in the storage containers. In order to maintain the integrity of the assigned value(s), and associated uncertainty, the dilution or injection of a subsample of this product should be performed using calibrated measuring equipment.

UNCERTAINTY:

The maximum combined relative standard uncertainty of our reference standard solutions is calculated using the following equation:

The combined relative standard uncertainty, $u_c(y)$, of a value y and the uncertainty of the independent parameters

x_1, x_2, \dots, x_n on which it depends is:

$$u_c(y(x_1, x_2, \dots, x_n)) = \sqrt{\sum_{i=1}^n u(y, x_i)^2}$$

where x is expressed as a relative standard uncertainty of the individual parameter.

The individual uncertainties taken into account include those associated with weights (calibration of the balance) and volumes (calibration of the volumetric glassware). An expanded maximum combined percent relative uncertainty of $\pm 5\%$ (calculated with a coverage factor of 2 and a level of confidence of 95%) is stated on the Certificate of Analysis for all of our products.

TRACEABILITY:

All reference standard solutions are traceable to specific crystalline lots. The microbalances used for solution preparation are regularly calibrated by an external ISO/IEC 17025 accredited laboratory. In addition, their calibration is verified prior to each weighing using calibrated external weights traceable to an ISO/IEC 17025 accredited laboratory. All volumetric glassware used is calibrated, of Class A tolerance, and traceable to an ISO/IEC 17025 accredited laboratory. For certain products, traceability to international interlaboratory studies has also been established.

EXPIRY DATE / PERIOD OF VALIDITY:

Ongoing stability studies of this product have demonstrated stability in its composition and concentration, until the specified expiry date, in the unopened ampoule. Monitoring for any degradation or change in concentration of the listed analyte(s) is performed on a routine basis.

LIMITED WARRANTY:

At the time of shipment, all products are warranted to be free of defects in material and workmanship and to conform to the stated technical and purity specifications.

QUALITY MANAGEMENT:

This product was produced using a Quality Management System registered to the latest versions of ISO 9001 by SAI Global, ISO/IEC 17025 by the Canadian Association for Laboratory Accreditation Inc. (CALA; A 1226), and ISO 17034 by ANSI-ASQ National Accreditation Board (ANAB; AR-1523).



For additional information or assistance concerning this or any other products from Wellington Laboratories Inc., please visit our website at www.well-labs.com or contact us directly at info@well-labs.com

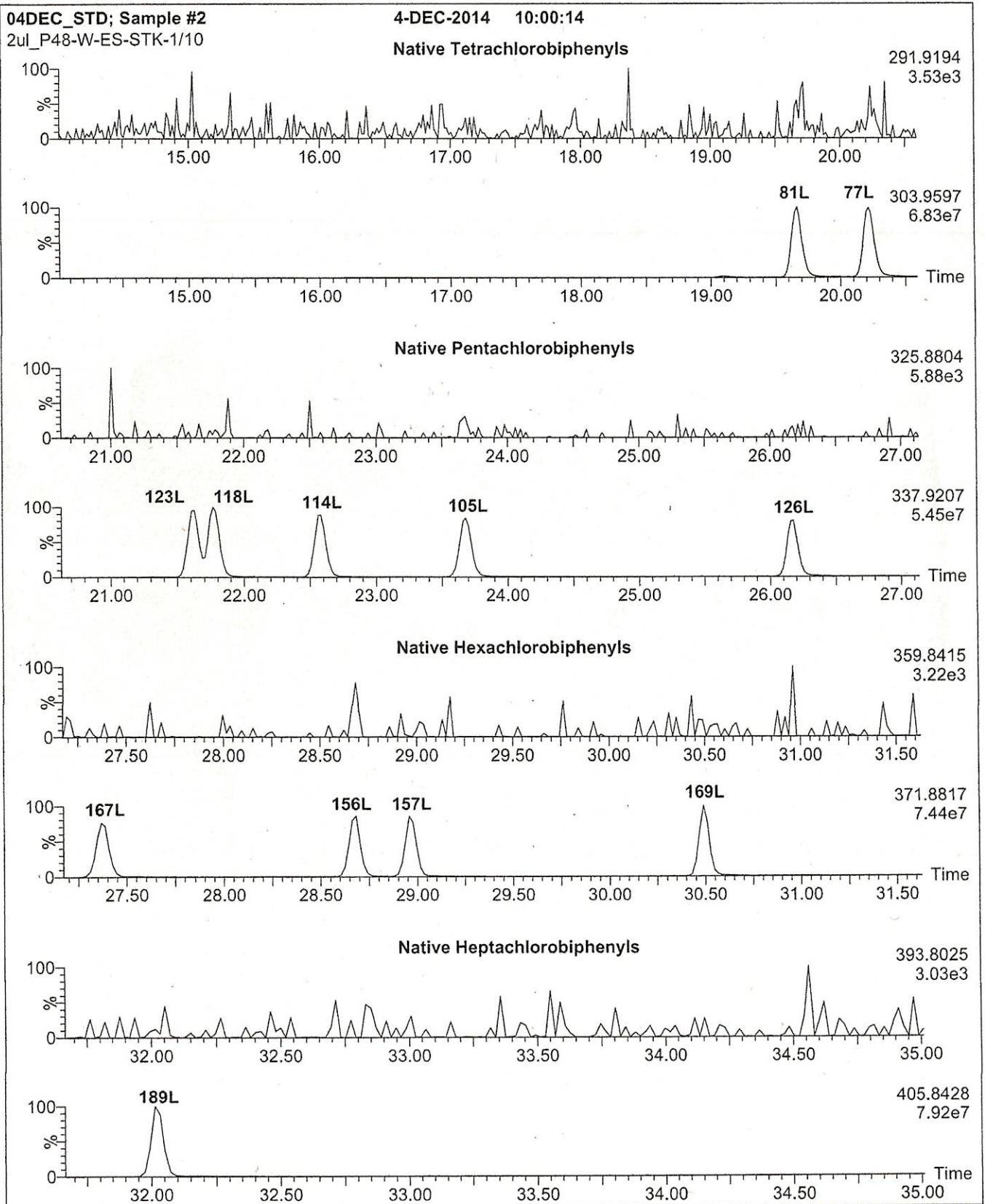
Table A: P48-W-ES-STK; Components and Concentrations (pg/μl, ± 5% in nonane/2.4% toluene)

IUPAC #	13C-PCB	CAS #	Concentration (pg/μl)
77L	3,3',4,4'-Tetrachloro[¹³ C ₁₂]biphenyl	105600-23-5	1000
81L	3,4,4',5-Tetrachloro[¹³ C ₁₂]biphenyl	208461-24-9	1000
105L	2,3,3',4,4'-Pentachloro[¹³ C ₁₂]biphenyl	208263-62-1	1000
114L	2,3,4,4',5-Pentachloro[¹³ C ₁₂]biphenyl	208263-63-2	1000
118L	2,3',4,4',5-Pentachloro[¹³ C ₁₂]biphenyl	104130-40-7	1000
123L	2',3,4,4',5-Pentachloro[¹³ C ₁₂]biphenyl	208263-64-3	1000
126L	3,3',4,4',5-Pentachloro[¹³ C ₁₂]biphenyl	208263-65-4	1000
156L	2,3,3',4,4',5-Hexachloro[¹³ C ₁₂]biphenyl	208263-68-7	1000
157L	2,3,3',4,4',5'-Hexachloro[¹³ C ₁₂]biphenyl	235416-30-5	1000
167L	2,3',4,4',5,5'-Hexachloro[¹³ C ₁₂]biphenyl	208263-69-8	1000
169L	3,3',4,4',5,5'-Hexachloro[¹³ C ₁₂]biphenyl	208263-70-1	1000
189L	2,3,3',4,4',5,5'-Heptachloro[¹³ C ₁₂]biphenyl	208263-73-4	1000

Certified By: 
 B.G. Chittim, General Manager

Date: 10/15/2018
(mm/dd/yyyy)

Figure 1: P48-W-ES-STK (1/10 Dilution); HRGC/HRMS Data (60 m DB-5)





WELLINGTON LABORATORIES

CERTIFICATE OF ANALYSIS DOCUMENTATION

P48-M-ES

EN 1948-4:2010
Mass-Labelled Marker PCB Extraction Standard

PRODUCT CODE:	P48-M-ES
LOT NUMBER:	P48MES1021
SOLVENT(S):	Nonane/Toluene
DATE PREPARED: (mm/dd/yyyy)	10/07/2021
LAST TESTED: (mm/dd/yyyy)	10/09/2021
EXPIRY DATE: (mm/dd/yyyy)	10/09/2028
RECOMMENDED STORAGE:	Store ampoule in a cool, dark place



DESCRIPTION:

P48-M-ES is a solution/mixture of six mass-labelled ($^{13}\text{C}_{12}$) polychlorinated biphenyls (PCBs). The components and their concentrations are given in Table A.

P48-M-ES was designed for, and prepared to be used according to, the European Standard Method EN 1948-4 "Stationary Source Emissions - Determination of the Mass Concentration of PCDDs/PCDFs and dioxin-like PCBs" (EN 1948-4:2010). This solution contains the six ^{13}C -labelled analogues of the Marker PCB congeners.

The individual ^{13}C -labelled PCBs all have chemical purities of >98% and isotopic purities of $\geq 99\%$.

DOCUMENTATION/ DATA ATTACHED:

Table A: Components and Concentrations of the Solution/Mixture
Figure 1: HRGC/HRMS Data (SIR; 10,000 mass resolving power)

ADDITIONAL INFORMATION:

- See page 2 for further details.

FOR LABORATORY USE ONLY: NOT FOR HUMAN OR DRUG USE

Wellington Laboratories Inc., 345 Southgate Dr. Guelph ON N1G 3M5 CANADA
519-822-2436 • Fax: 519-822-2849 • info@well-labs.com

INTENDED USE:

The products prepared by Wellington Laboratories Inc. are for laboratory use only. This certified reference material (CRM) was designed to be used as a standard for the identification and/or quantification of the specific chemical compounds it contains.

HANDLING:

This product should only be used by qualified personnel familiar with its potential hazards and trained in the handling of hazardous chemicals. Due care should be exercised to prevent unnecessary human contact or ingestion. All procedures should be carried out in a well-functioning fume hood and suitable gloves, eye protection, and clothing should be worn at all times. Waste should be disposed of according to national and regional regulations. Safety Data Sheets (SDSs) are available upon request.

SYNTHESIS / CHARACTERIZATION:

Our products are synthesized using single-product unambiguous routes whenever possible. They are then characterized, and their structures and purities confirmed, using a combination of the most relevant techniques, such as NMR, GC/MS, LC/MS/MS, SFC/UV/MS/MS, x-ray crystallography, and melting point. Isotopic purities of mass-labelled compounds are also confirmed using HRGC/HRMS and/or LC/MS/MS.

HOMOGENEITY:

Prior to solution preparation, crystalline material is tested for homogeneity using a variety of techniques (as stated above) and its solubility in a given diluent is taken into consideration. Duplicate solutions of a new product are prepared from the same crystalline lot and, after the addition of an appropriate internal standard, they are compared by GC/MS, LC/MS/MS, and/or SFC/UV/MS/MS. The relative response factors of the analyte of interest in each solution are required to be <5% RSD. New solution lots of existing products, as well as mixtures and calibration solutions, are compared to older lots in a similar manner. This further confirms the homogeneity of the crystalline material as well as the stability and homogeneity of the solutions in the storage containers. In order to maintain the integrity of the assigned value(s), and associated uncertainty, the dilution or injection of a subsample of this product should be performed using calibrated measuring equipment.

UNCERTAINTY:

The maximum combined relative standard uncertainty of our reference standard solutions is calculated using the following equation:

The combined relative standard uncertainty, $u_c(y)$, of a value y and the uncertainty of the independent parameters

x_1, x_2, \dots, x_n on which it depends is:

$$u_c(y(x_1, x_2, \dots, x_n)) = \sqrt{\sum_{i=1}^n u(y, x_i)^2}$$

where x is expressed as a relative standard uncertainty of the individual parameter.

The individual uncertainties taken into account include those associated with weights (calibration of the balance) and volumes (calibration of the volumetric glassware). An expanded maximum combined percent relative uncertainty of $\pm 5\%$ (calculated with a coverage factor of 2 and a level of confidence of 95%) is stated on the Certificate of Analysis for all of our products.

TRACEABILITY:

All reference standard solutions are traceable to specific crystalline lots. The microbalances used for solution preparation are regularly calibrated by an external ISO/IEC 17025 accredited laboratory. In addition, their calibration is verified prior to each weighing using calibrated external weights traceable to an ISO/IEC 17025 accredited laboratory. All volumetric glassware used is calibrated, of Class A tolerance, and traceable to an ISO/IEC 17025 accredited laboratory. For certain products, traceability to international interlaboratory studies has also been established.

EXPIRY DATE / PERIOD OF VALIDITY:

Ongoing stability studies of this product have demonstrated stability in its composition and concentration, until the specified expiry date, in the unopened ampoule. Monitoring for any degradation or change in concentration of the listed analyte(s) is performed on a routine basis.

LIMITED WARRANTY:

At the time of shipment, all products are warranted to be free of defects in material and workmanship and to conform to the stated technical and purity specifications.

QUALITY MANAGEMENT:

This product was produced using a Quality Management System registered to the latest versions of ISO 9001 by SAI Global, ISO/IEC 17025 by the Canadian Association for Laboratory Accreditation Inc. (CALA; A1226), and ISO 17034 by ANSI National Accreditation Board (ANAB; AR-1523).



For additional information or assistance concerning this or any other products from Wellington Laboratories Inc., please visit our website at www.well-labs.com or contact us directly at info@well-labs.com


Table A: P48-M-ES; Components and Concentrations (pg/μL, ± 5% in nonane/1.2% toluene)

Compound	IUPAC #	CAS #	Concentration (pg/μL)
2,4,4'-Trichloro(¹³ C ₁₂)biphenyl	28L	208263-76-7	1000
2,2',5,5'-Tetrachloro(¹³ C ₁₂)biphenyl	52L	208263-80-3	1000
2,2',4,5,5'-Pentachloro(¹³ C ₁₂)biphenyl	101L	104130-39-4	1000
2,2',3,4,4',5'-Hexachloro(¹³ C ₁₂)biphenyl	138L	208263-66-5	1000
2,2',4,4',5,5'-Hexachloro(¹³ C ₁₂)biphenyl	153L	185376-58-3	1000
2,2',3,4,4',5,5'-Heptachloro(¹³ C ₁₂)biphenyl	180L	160901-82-6	1000

m 10⁻³
 μ 10⁻⁶
 M 10⁻⁹
 P 10⁻¹²

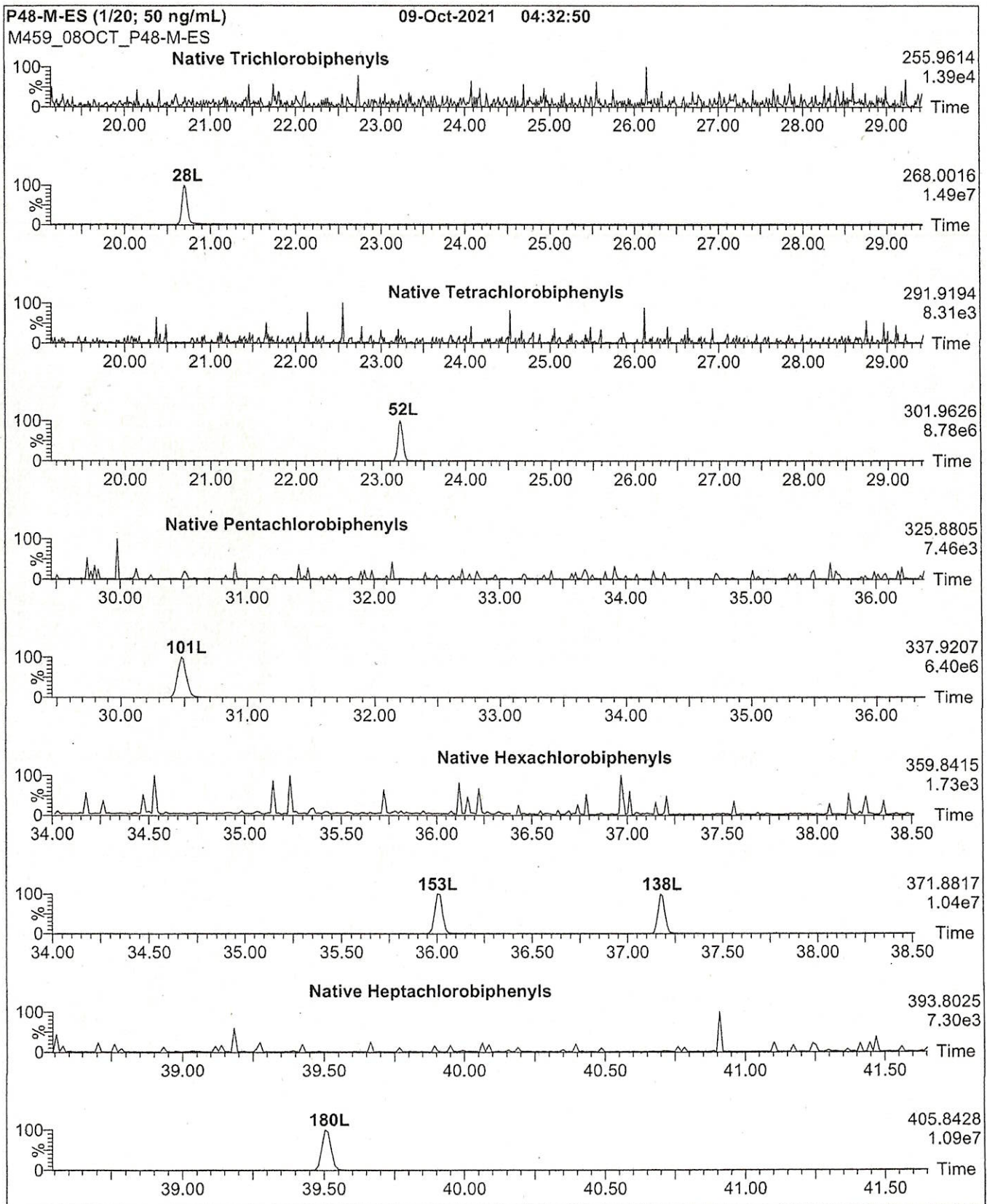
mg/mL
 μg/L ppb

pg = μg

Certified By: 
 B.G. Chittim, General Manager

Date: 10/15/2021
(mm/dd/yyyy)

Figure 1: P48-M-ES; HRGC/HRMS Data (60 m DB-5 Column)





P48-RS-STK

EN 1948-4:2010
Mass-Labelled PCB Recovery Standard Stock

PRODUCT CODE: P48-RS-STK
LOT NUMBER: 020123
SOLVENT(S): Nonane
DATE PREPARED: (mm/dd/yyyy) 02/01/2023
LAST TESTED: (mm/dd/yyyy) 02/09/2023
EXPIRY DATE: (mm/dd/yyyy) 02/09/2030
RECOMMENDED STORAGE: Store ampoule in a cool, dark place



DESCRIPTION:

P48-RS-STK is a solution/mixture of three mass-labelled ($^{13}\text{C}_{12}$) polychlorinated biphenyls (PCBs). The components and their concentrations are given in Table A.

P48-RS-STK was designed for, and prepared to be used according to, the European Standard Method EN 1948-4 "Stationary Source Emissions - Determination of the Mass Concentration of PCDDs/PCDFs and dioxin-like PCBs" (EN 1948-4:2010). It can be used with either of two sets of calibration solutions: P48-M-CVS or P48-W-CVS.

The individual ^{13}C -labelled PCBs all have chemical purities of >98% and isotopic purities of $\geq 99\%$.

DOCUMENTATION/ DATA ATTACHED:

Table A: Components and Concentrations of the Solution/Mixture
Figure 1: HRGC/HRMS Data for a dilution of P48-RS-STK (SIR; 10,000 mass resolving power)

ADDITIONAL INFORMATION:

- See page 2 for further details.

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HANDLING:

This product should only be used by qualified personnel familiar with its potential hazards and trained in the handling of hazardous chemicals. Due care should be exercised to prevent unnecessary human contact or ingestion. All procedures should be carried out in a well-functioning fume hood and suitable gloves, eye protection, and clothing should be worn at all times. Waste should be disposed of according to national and regional regulations. Safety Data Sheets (SDSs) are available upon request.

SYNTHESIS / CHARACTERIZATION:

Our products are synthesized using single-product unambiguous routes whenever possible. They are then characterized, and their structures and purities confirmed, using a combination of the most relevant techniques, such as NMR, GC/MS, LC/MS/MS, SFC/UV/MS/MS, x-ray crystallography, and melting point. Isotopic purities of mass-labelled compounds are also confirmed using HRGC/HRMS and/or LC/MS/MS.

HOMOGENEITY:

Prior to solution preparation, crystalline material is tested for homogeneity using a variety of techniques (as stated above) and its solubility in a given diluent is taken into consideration. Duplicate solutions of a new product are prepared from the same crystalline lot and, after the addition of an appropriate internal standard, they are compared by GC/MS, LC/MS/MS, and/or SFC/UV/MS/MS. The relative response factors of the analyte of interest in each solution are required to be <5% RSD. New solution lots of existing products, as well as mixtures and calibration solutions, are compared to older lots in a similar manner. This further confirms the homogeneity of the crystalline material as well as the stability and homogeneity of the solutions in the storage containers. In order to maintain the integrity of the assigned value(s), and associated uncertainty, the dilution or injection of a subsample of this product should be performed using calibrated measuring equipment.

UNCERTAINTY:

The maximum combined relative standard uncertainty of our reference standard solutions is calculated using the following equation:

The combined relative standard uncertainty, $u_c(y)$, of a value y and the uncertainty of the independent parameters

x_1, x_2, \dots, x_n on which it depends is:

$$u_c(y(x_1, x_2, \dots, x_n)) = \sqrt{\sum_{i=1}^n u(y, x_i)^2}$$

where x_i is expressed as a relative standard uncertainty of the individual parameter.

The individual uncertainties taken into account include those associated with weights (calibration of the balance) and volumes (calibration of the volumetric glassware). An expanded maximum combined percent relative uncertainty of $\pm 5\%$ (calculated with a coverage factor of 2 and a level of confidence of 95%) is stated on the Certificate of Analysis for all of our products.

TRACEABILITY:

All reference standard solutions are traceable to specific crystalline lots. The microbalances used for solution preparation are regularly calibrated by an external ISO/IEC 17025 accredited laboratory. In addition, their calibration is verified prior to each weighing using calibrated external weights traceable to an ISO/IEC 17025 accredited laboratory. All volumetric glassware used is calibrated, of Class A tolerance, and traceable to an ISO/IEC 17025 accredited laboratory. For certain products, traceability to international interlaboratory studies has also been established.

EXPIRY DATE / PERIOD OF VALIDITY:

Ongoing stability studies of this product have demonstrated stability in its composition and concentration, until the specified expiry date, in the unopened ampoule. Monitoring for any degradation or change in concentration of the listed analyte(s) is performed on a routine basis.

LIMITED WARRANTY:

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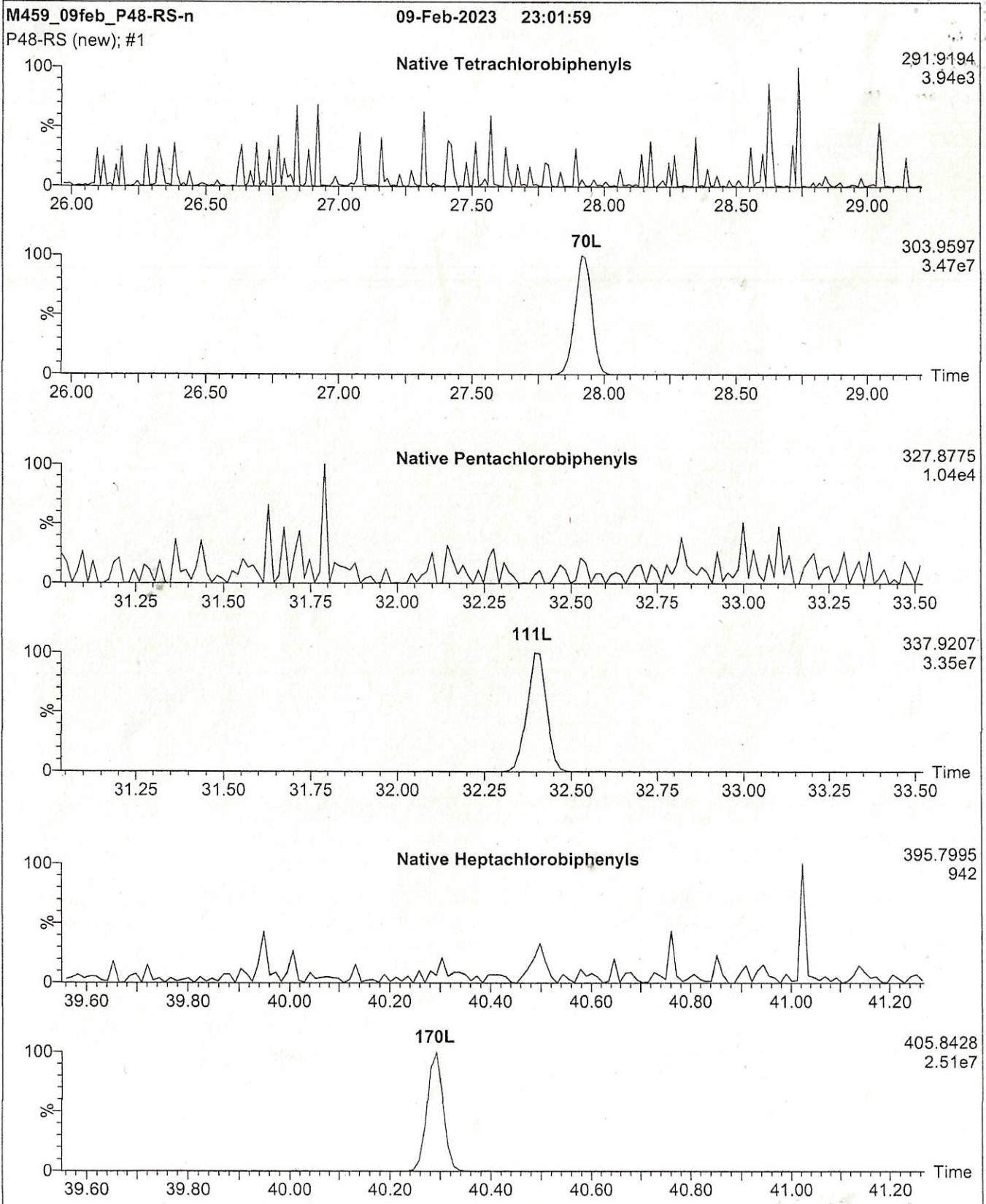
Table A: P48-RS-STK; Components and Concentrations (pg/ μ L, \pm 5% in nonane)

Compound	IUPAC #	CAS #	Concentration (pg/ μ L)
2,3',4',5-Tetrachloro($^{13}\text{C}_{12}$)biphenyl	70L	208263-81-4	1000
2,3,3',5,5'-Pentachloro($^{13}\text{C}_{12}$)biphenyl	111L	235416-29-2	1000
2,2',3,3',4,4',5-Heptachloro($^{13}\text{C}_{12}$)biphenyl	170L	160901-80-4	1000

Certified By: 
B.G. Chittim, General Manager

Date: 02/24/2023
(mm/dd/yyyy)

Figure 1: P48-RS-STK Dilution (P48-RS); HRGC/HRMS Data (60 m HP-5MS UI Column)



Analysis Report

1.0 DESCRIPTION: Matrix Reference Material *EnviroMAT Contaminated Soil (SS-1)*
 Catalogue Number: 140-025-001
 Lot Number: SC0063618
 Expiration Date: 2 years from date of shipment (See Ship Date label on bottle)

2.0 CONSENSUS VALUES (See section 8 for additional details):

Parameter	Consensus Value (mg/kg)	Uncertainty (+/-)	Confidence Interval (mg/kg)	Tolerance Interval (mg/kg)
Ag	0.88	0.03	0.85 - 0.91	0.72 - 1.04
Al	12 163	410	11 753 - 12 572	9 579 - 14 746
As	20.7	1.0	19.7 - 21.8	14.0 - 27.5
B	26.9	8.4	18.5 - 35.2	0.0 - 77.8
Ba	464	16	448 - 480	359 - 569
Be	0.48	0.05	0.43 - 0.53	0.22 - 0.74
Ca	50 265	1213	49 052 - 51 478	42 222 - 53 308
Cd	3.2	0.2	3.0 - 3.5	1.8 - 4.7
Ce	(40.1)	----	----	----
Co	12.9	0.4	12.5 - 13.4	10.2 - 15.7
Cr	103	5	97.9 - 109	66.6 - 140
Cu	403	10	393 - 413	334 - 472
Fe	72 000	2273	69 728 - 74 273	57 212 - 86 789
Hg	0.41	0.02	0.39 - 0.43	0.29 - 0.53
K	2232	150	2082 - 2382	1257 - 3208
Li	14.3	1.4	12.9 - 15.8	6.4 - 22.3
Mg	9690	230	9459 - 9920	8141 - 11 239
Mn	737	19	718 - 756	605 - 869
Mo	6.8	0.3	6.5 - 7.2	4.7 - 9.0
Na	650	64	587 - 714	235 - 1066
Ni	59.2	1.3	57.9 - 60.5	50.4 - 68.0
P	1552	34	1518 - 1586	1329 - 1775
Pb	764	15	749 - 779	665 - 863
S	1916	140	1776 - 2057	1045 - 2787
Sb	5.5	1.1	4.4 - 6.6	0.0 - 12.0
Se	0.78	0.14	0.64 - 0.92	0.02 - 1.54
Sn	340	17	324 - 357	245 - 436
Sr	114	1	113 - 116	106 - 122
Ti	530	57	473 - 587	195 - 865
Tl	(0.19)	----	----	----
U	0.78	0.03	0.74 - 0.81	0.61 - 0.94
V	27.2	1.4	25.9 - 28.6	18.8 - 35.7
Zn	1114	37	1078 - 1151	860 - 1369

3.0 APPROVAL AND REVISION:

Approval: Daniel Boisvert, Chemist
 Date of Issue of Report: May 3rd, 2010

[Signature]

[Handwritten notes]
 ARPA-PA-C FORMS