GC/HPLC Analyses of Organic Compounds in Drinking Water: US EPA Procedures

This bulletin summarizes the analyses for organic compounds in drinking water according to US Environmental Protection Agency Series 500 methodology. Sample preparation, chromatography columns, and detection are described for each class of compounds. Most of the analyses are illustrated with chromatograms. Supelco products, most of which are tested for environmental applications, are listed for each method.

Key Words:
- drinking water
- US EPA Series 500 methods
- water quality

In the United States, drinking water quality is monitored according to the US Environmental Protection Agency's Series 500 methods (1).* Most of these methods call for analysis by capillary gas chromatography. Some methods suggest using a confirmational column to verify identities of organic compounds found in a sample. Most methods call for detection by conventional means (electron capture, nitrogen-phosphorus, photoionization, etc.) but some call for mass spectrometry. Volatile organic compounds can be analyzed with photoionization and electrolytic/conductivity detection, in series (Method 502.2), or by GC/mass spectrometry (Method 524.2). Two methods (Method 531.1 for carbamate herbicides and Method 547 for glyphosphates) call for analysis by HPLC, with a postcolumn reaction system as part of the detection process. Methods 549.1 and 550 also specify HPLC.

Sample Preparation

Organic pollutants in drinking water samples normally are present in parts-per-billion or lower concentrations, and must be concentrated prior to chromatographic analysis. Volatile organics are purged from the sample and trapped on solid adsorbents (methods 502.2 and 524.2), then rapidly heat desorbed from the trap onto the chromatographic column. Recommended traps are described for each method. Nonvolatile organics are extracted in solvent or, in one method, by solid phase extraction (Method 525). Extraction techniques and cleanup procedures are described in detail in the EPA methodology.

Previous EPA restrictions limited the use of adsorbents for collecting volatile organic compounds (VOCs) to those specified in the method. Now the EPA officially allows the use of alternative adsorbents. This allowance is published in the Federal Register (59 FR 62456-71), which lists changes to several EPA methods contained in the document, *Technical Note for Drinking Water Methods* (Technical Notes) (2). This Technical Note amends two methods with the following sentence:

> The use of alternative sorbents is acceptable provided the data acquired meets all quality control criteria described in section 10, and provided the purge and desorption procedures specified in section 11 of the method are not changed.

This sentence is added to Method 502.2, Rev. 2.0, at the end of Section 6.2.2, and replaces the last sentence in Method 524.2, Rev. 4.0, in Section 6.2.2.

Anticipating these allowances in future methods, scientists now can look at ways to greatly enhance the performance of their system by the selection of modern adsorbents. The VOCARB™ 4000 purge trap contains a combination of carbon adsorbents that efficiently trap and release the broad range of analytes in methods 502.2 and 524.2. Excellent thermal stability of the adsorbents in the trap allows higher desorption temperatures (250°C), with less background contamination, than traps specified in the methods, providing more rapid transfer of analytes and improved chromatography.

Chromatography

Supelco columns and packings were used to obtain most of the chromatograms in this bulletin. Supelco products are listed by name in many of these EPA methods. For most of the other methods, Supelco materials are generically equivalent alternatives to listed materials. Specific testing for environmental applications ensures consistent performance from these products.

VOCOL™ capillary columns are tested specifically for analyses of volatile priority pollutants in wastewater, according to EPA methods 601, 602, and 624. Thus, they are ideal for monitoring these same compounds in drinking water at all stages of treatment. A 0.75mm ID VOCOL column is listed in EPA Method 524.2. Because 0.75mm ID VOCOL columns have high optimum carrier gas flow rates, analytes can be desorbed directly from the adsorbent trap to the column. In contrast, sample cryofocusing is necessary with narrower bore columns. In addition, 0.75mm ID VOCOL columns can be used with either capillary or packed column injection systems and detectors.

PTE™-5 capillary columns are tested specifically for analyses of acidic and basic organic compounds in water. These inert, 0.25mm ID columns are excellent for analyses of nitrogen- and phosphorus-containing pesticides (Method 507) and chlorinated pesticides, herbicides, and PCBs (methods 508 and 515). Very low column bleed ensures minimal interference with analyte detection in GC/MS systems.

Table 1. Regulated Drinking Water Compounds

Contaminants	Methods
Benzene	502.2, 524.2
Carbon tetrachloride	502.2, 524.2, 551
Chlorobenzene	502.2, 524.2
1,2-Dichlorobenzene	502.2, 524.2
1,4-Dichlorobenzene	502.2, 524.2
1,2-Dichloroethane	502.2, 524.2
cis-Dichloroethylene	502.2, 524.2
trans-Dichloroethylene	502.2, 524.2
Dichloromethane	502.2, 524.2
1,2-Dichloropropane	502.2, 524.2
Ethylbenzene	502.2, 524.2
Styrene	502.2, 524.2
Tetrachloroethylene	502.2, 524.2, 551
1,1,1-Trichloroethane	502.2, 524.2, 551
Trichloroethylene	502.2, 524.2, 551
Toluene	502.2, 524.2
1,2,4-Trichlorobenzene	502.2, 524.2
1,1-Dichloroethylene	502.2, 524.2
1,1,2-Trichloroethane	502.2, 524.2
Vinyl chloride	502.2, 524.2
Xylenes (total)	502.2, 524.2
2,3,7,8-TCDD (Dioxin)	1613
2,4-D	515.2, 555, 515.1
2,4,5-TP (Silvex®)	515.2, 555, 515.1
Alachlor	505■, 507, 525.2, 508.1
Atrazine	505■, 507, 525.2, 508.1
Benzo(a)pyrene	525.2, 550, 550.1
Carbofuran	531.1, 6610
Chlordane	505, 508, 525.2, 508.1
Dalapon	552.1, 515.1
Di(2-ethylhexyl)adipate	506, 525.2
Di(2-ethylhexyl)phthalate	506, 525.2
Dibromochloropropane	504.1, 551
Dinoseb	515.2, 555, 515.1
Diquat	549.1
Endothall	548.1
Endrin	505, 508, 525.2, 508.1
Ethylene dibromide	504.1, 551
Glyphosate	547, 6651
Heptachlor	505, 508, 525.2, 508.1
Heptachlor epoxide	505, 508, 525.2, 508.1
Hexachlorobenzene	505, 508, 525.2, 508.1
Hexachlorocyclopentadiene	505, 525.2, 508, 508.1
Lindane	505, 508, 525.2, 508.1
Methoxychlor	505, 508, 525.2, 508.1
Oxamyl	531.1, 6610
PCBs	
as Decachlorobiphenyl ▲	508A
as Aroclors	505, 508
Pentachlorophenol	515.2, 525.2, 555, 515.1
Picloram	515.2, 555, 515.1
Simazine	505 ■, 507, 525.2, 508.1
Toxaphene	505, 508, 525.2
Trihalomethanes (total)	502.2, 524.2, 551

■ If lower detection limits of alachlor, atrazine, and simazine are required, a nitrogen-phosphorous detector should be substituted for the electron capture detector in Method 505; or, another approved method should be used.

▲PCBs are qualitatively identified as Aroclors and measured for compliance purposes as decachlorobiphenyl using Method 508A.

◆Regulations specified by the US EPA require monitoring for certain contaminants to which maximum contaminant levels do not apply. These chemicals are called "unregulated" contaminants, and presently include sulfate, 34 volatile organic chemicals (VOCs) and 13 synthetic organic chemicals (SOCs).

Table 2. Unregulated Drinking Water Compounds◆

VOC Contaminants	Methods
Chloroform	502.2, 524.2, 555
Bromodichloromethane	502.2, 524.2, 551
Bromoform	502.2, 524.2, 551
Chlorodibromomethane	502.2, 524.2, 551
Bromobenzene	502.2, 524.2
Bromochloromethane	502.2, 524.2
Bromomethane	502.2, 524.2
n-Butylbenzene	502.2, 524.2
sec-Butylbenzene	502.2, 524.2
tert-Butylbenzene	502.2, 524.2
Chloroethane	502.2, 524.2
Chloromethane	502.2, 524.2
o-Chlorotoluene	502.2, 524.2
p-Chlorotoluene	502.2, 524.2
Dibromomethane	502.2, 524.2
m-Dichlorobenzene	502.2, 524.2
Dichlorodifluoromethane	502.2, 524.2
1,1-Dichloroethane	502.2, 524.2
1,3-Dichloropropane	502.2, 524.2
2,2-Dichloropropane	502.2, 524.2
1,1-Dichloropropene	502.2, 524.2
1,3-Dichloprpropene	502.2, 524.2
Fluorotrichloromethane	502.2, 524.2
Hexachlorobutadiene	502.2, 524.2
Isopropylbenzene	502.2, 524.2
p-Isopropyltoluene	502.2, 524.2
Naphthalene	502.2, 524.2
n-Propylbenzene	502.2, 524.2
1,1,2,2-Tetrachloroethane	502.2, 524.2
1,1,1,2-Tetrachloroethane	502.2, 524.2
1,2,3-Trichlorobenzene	502.2, 524.2
1,2,3-Trichloropropane	502.2, 524.2, 504.1
1,2,4-Trimethylbenzene	502.2, 524.2
1,3,5-Trimethylbenzene	502.2, 524.2

SOC Contaminants	Methods
Aldicarb	531.1, 6610
Aldicarb sulfone	531.1, 6610
Aldicarb sulfoxide	531.1, 6610
Aldrin	505, 508, 525.2, 508.1
Butachlor	507, 525.2
Carbaryl	531.1, 6610
Dicamba	515.1, 515.2, 555
Dieldrin	505, 508, 525.2, 508.1
3-Hydroxycarbofuran	531.1, 6610
Methomyl	531.1, 6610
Metolachlor	507, 525.2, 508.1
Metribuzin	507, 525.2, 508.1
Propachlor	508, 525.2, 508.1

References

1. Methods 502.2, 505, 507, 508, 508A, 515.1, and 531.1 are in *Methods for the Determination of Organic Compounds in Drinking Water.* Order number PB 91-231480.

   Methods 506, 547, 550, 508, 550.1, and 551 are in *Methods for the Determination of Organic Compounds in Drinking Water — Supplement II.* Order number PB 91-146027.

   Methods 515.2, 524.2, 548.1, 549.1, 552.1, and 555 are in *Methods for the Determination of Organic Compounds in Drinking Water — Supplement II.* Order number PB 92-207703.

   Methods 502.1 and 503.1 are replaced by Method 502.2, effective 7/1/96.

   Method 524.1 is replaced by Method 524.2 effective 7/1/96.

   Current methods are available from NTIS, 5285 Port Royal Road, Springfield, VA 22161.
2. National Technical Information Service, US Department of Commerce, *Technical Note for Drinking Water,* NTIS Document #PB95-104766, NTIS, 5285 Port Royal Road, Springfield, VA 22161 USA. Phone 800-553-6847.

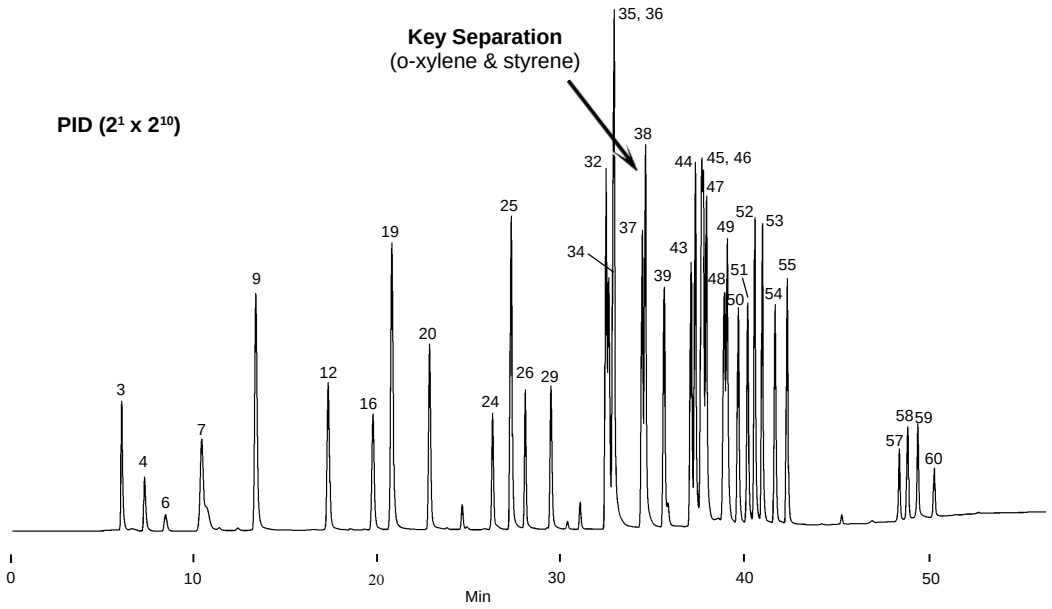
***Methods listed in this bulletin are included in reference 1. Obtain methods for other compounds separately from the same source.

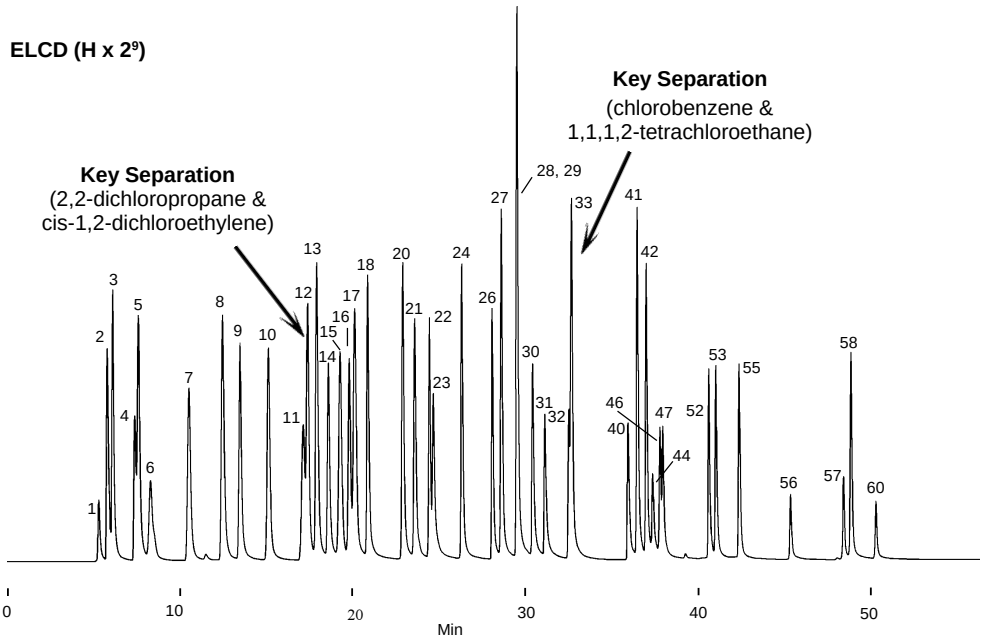
Method 502.2 – Volatile Organics (Replaces Methods 502.1 and 503.1)

Figure A. Volatile Compounds by Method 502.2

(Photoionization/Electrolytic Conductivity Detector)

Column: VOCOL, 105m x 0.53mm ID, 3.0µm film
Oven: 35°C (10 min) to 200°C at 4°C/min
Carrier: helium, 10mL/min (plus 20mL/min helium as make-up gas)
Inj.: 20ppb each analyte in 5mL water, purged as described in US EPA Method 502.2/524.2 (Tenax/silica gel/charcoal trap)





1. Dichlorodifluoromethane
2. Chloromethane
3. Vinyl chloride
4. Bromomethane
5. Chloroethane
6. Trichlorofluoromethane
7. 1,1-Dichloroethene
8. Methylene chloride
9. trans-1,2-Dichloroethylene
10. 1,1-Dichloroethane
11. 2,2-Dichloropropane
12. cis-1,2-Dichloroethylene
13. Chloroform
14. Bromochloromethane
15. 1,1,1-Trichloroethane
16. 1,1-Dichloropropene
17. Carbon tetrachloride
18. 1,2-Dichloroethane
19. Benzene
20. Trichloroethylene
21. 1,2-Dichloropropane
22. Bromodichloromethane
23. Dibromomethane
24. cis-1,3-Dichloropropene
25. Toluene
26. trans-1,3-Dichloropropene
27. 1,1,2-Trichloroethane
28. 1,3-Dichloropropane
29. Tetrachloroethylene
30. Dibromochloromethane
31. 1,2-Dibromoethane
32. Chlorobenzene
33. 1,1,2,2-Tetrachloroethane
34. Ethylbenzene
35. m-Xylene
36. p-Xylene
37. o-Xylene
38. Styrene
39. Isopropylbenzene
40. Bromoform
41. 1,1,2,2-Tetrachloroethane
42. 1,2,3-Trichloropropane
43. n-Propylbenzene
44. Bromobenzene
45. 1,3,5-Trimethylbenzene
46. 2-Chlorotoluene
47. 4-Chlorotoluene
48. tert-Butylbenzene
49. 1,2,4-Trimethylbenzene
50. sec-Butylbenzene
51. p-Isopropyltoluene
52. 1,3-Dichlorobenzene
53. 1,4-Dichlorobenzene
54. n-Butylbenzene
55. 1,2-Dichlorobenzene
56. 1,2-Dibromo-3-chloropropane
57. 1,2,4-Trichlorobenzene
58. Hexachlorobutadiene
59. Naphthalene
60. 1,2,3-Trichlorobenzene

Purge and Trap Concentrator: O.I. Analytical Corporation Model 4460A
Tandem PID/ELCD detector: O.I. Analytical Corporation Model 4440
Chromatograms provided courtesy of O.I. Analytical, College Station, TX.

713-1165, 1166

Sample Preparation: Purge and trap using a VOCARB 4000 trap (8.5cm Carbopack™ C/10cm Carbopack B/6cm Carboxen 1000/1cm Carboxen 1001).

GC Column: VOCOL wide bore capillary column, 105m x 0.53mm ID fused silica, 3.0µm phase film.

Confirmational Column: None listed.

Detector: Photoionization and electrolytic/conductivity, in series.

Chemical Standards: See page 13.

Qualifications: Current EPA regulations require water utilities to monitor for 49 volatile compounds (27 are unregulated) which could be monitored with a VOCOL column.

Also see listings for Method 524.2.

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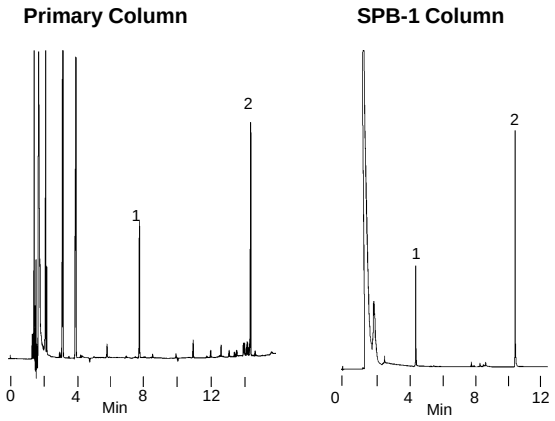
Method 504 – 1,2-Dibromoethane and 1,2-Dibromo-3-chloropropane

Figure B. Ethylene Dibromide and Dibromochloropropane by Method 504

Column: *Primary* – SPB-1/Carbowax 20M (25:75), 30m x 0.32mm ID, 0.25µm film
SPB-1 Column – 30m x 0.32mm ID, 0.25µm film
Oven: 40°C (4 min) to 190°C at 8°C/min
Carrier: helium, 25cm/sec
Det.: ECD, 4 x 10^{-11} (primary column) or 128 x 10^{-11} AFS
Inj.: 1µL hexane containing 2ng each analyte, split 100:1

1. Ethylene dibromide
2. Dibromochloropropane



796-0317, 0318

Sample Preparation: Extract with hexane.

GC Column: SPB™-1 methyl polysiloxane/Carbowax® 20M polyethylene glycol capillary column (25:75), 30m x 0.32mm ID fused silica, 0.25µm film.

Confirmational Column: SPB-1 capillary column, 30m x 0.32mm ID fused silica, 1.0µm phase film. Figure B shows a 30m x 0.32mm ID, 0.25µm film SPB-1 column also provides excellent results.

Detector: Electron capture.

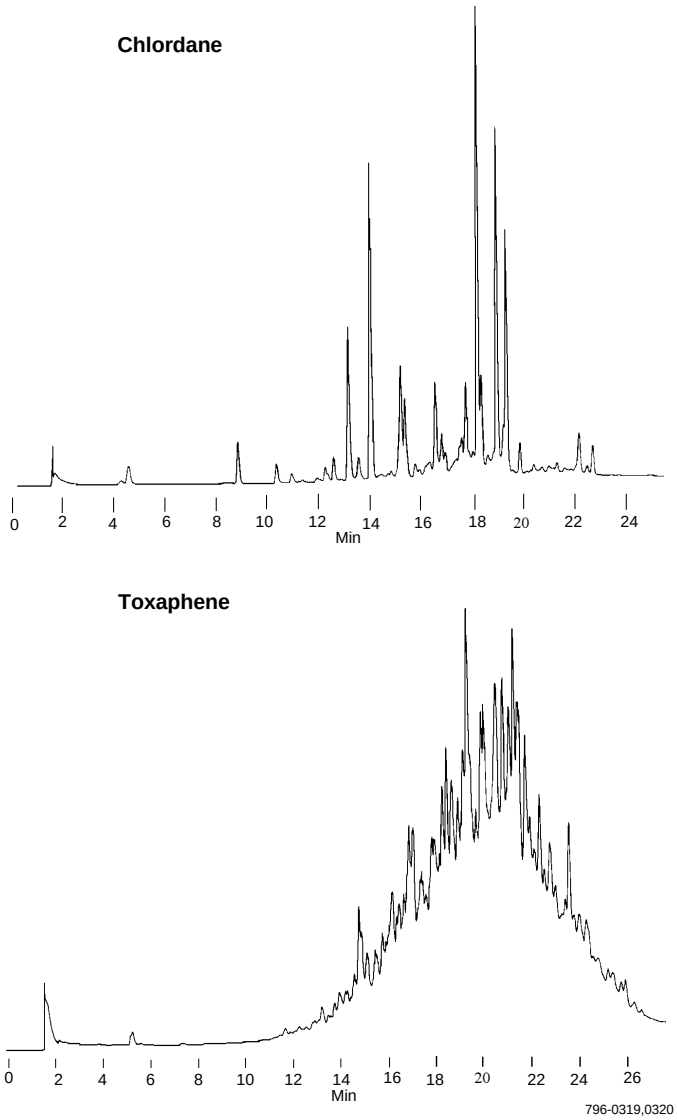
Chemical Standard: EPA EDB/DBCP Mix.

Qualifications: The capillary GC system must be equipped with a splitless injector.

Method 505 – Organohalide Pesticides & PCBs/Microextraction GC/ECD

Figure C. Chlordane or Toxaphene by Method 505

Column: SPB-1, 30m x 0.32mm ID, 1.0µm film
Oven: 180°C to 260°C at 4°C/min
Carrier: helium, 25cm/sec
Det.: ECD, 32 (chlordane) or 16 x 10^{-11} AFS
Inj.: 1µL hexane containing 2ng each analyte, split 100:1

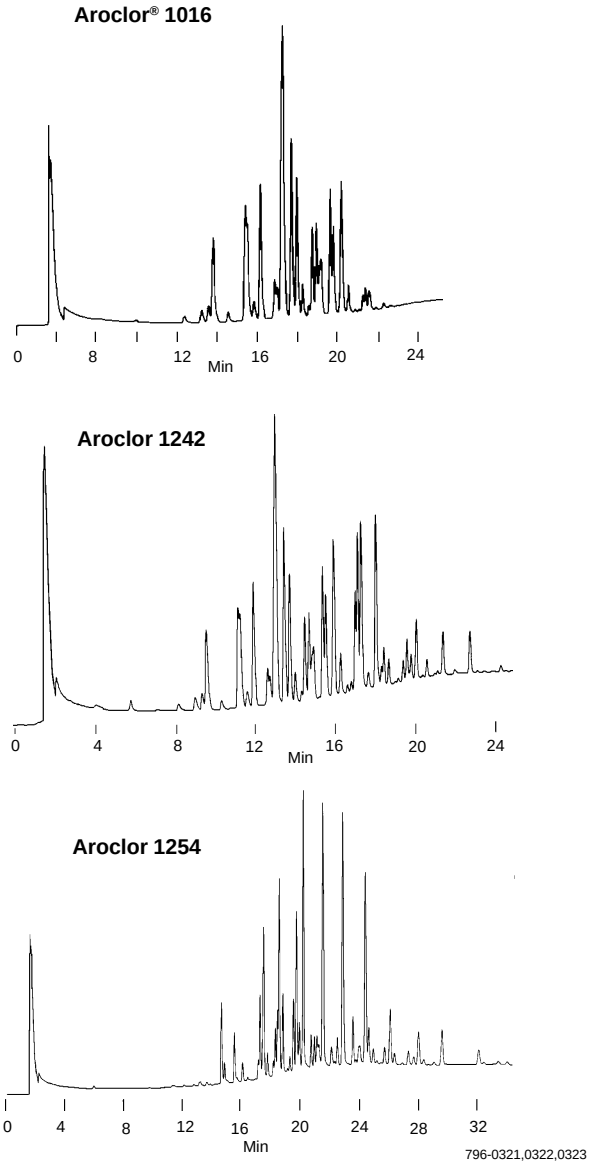


796-0319,0320

Method 505 contd. on next page.

Figure D. Polychlorinated Biphenyls Mixtures by Method 505

Column: SPB-1, 30m x 0.32mm ID, 1.0µm film
Oven: 180°C to 260°C at 4°C/min
Carrier: helium, 25cm/sec
Det.: ECD, 4 x 10^{-11} AFS
Inj.: 1µL hexane containing 2ng Aroclor PCBs mixture, split 100:1



796-0321,0322,0323

Sample Preparation: Extract with hexane.

GC Column: SPB-1 methyl polysiloxane capillary column, 30m x 0.32mm ID fused silica, 1.0µm phase film.

Confirmational Column: SPB-1/Carbowax 20M PEG (50:50) capillary column, 30m x 0.32mm ID fused silica, 0.25µm phase film, **or** Methyl/phenyl silicone (50:50) capillary column (e.g. SPB-50), 25m x 0.25mm ID fused silica, 1.5µm phase film.

Detector: Electron capture.

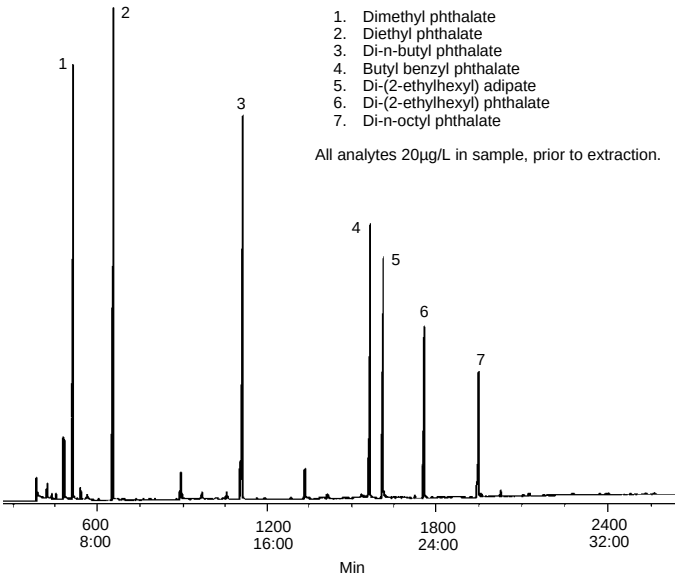
Chemical Standards: See page 13.

Qualifications: Either on-column or splitless injection may be used.

Method 506 – Phthalate and Adipate Esters

Figure E. Phthalate and Adipate Esters

Sample: 1L drinking water, add 5mL methanol and mix thoroughly
Extraction Disk: ENVI-18 DSK, 47mm
Conditioning: 5mL dichloromethane (pull completely through disk)
5mL methanol (do not allow disk to dry out)
5mL reagent water
Sample Addition: adjust vacuum to flow rate of 100mL/min
Extraction: rinse sample container with 5mL acetonitrile, extract disk with solution, rinse container with 2 x 5mL dichloromethane, extract disk with solution
Column: 5% diphenyl/95% dimethyl silicone capillary (PTE-5 equivalent), 30m x 0.25mm ID, 0.25µm film
Oven: 40°C (1 min) to 160°C (3 min), then to 300°C (3 min) at 6°C/min
Carrier: helium, 30cm/sec
Det.: MS, scan range m/z=45-450
Inj.: 1µL, split/splitless, 45 sec delay, 240°C



794-0795

Sample Preparation: ENVI™-18 DSK extraction disk, 47mm.

GC Column: 5% diphenyl/95% dimethyl silicone capillary, 30m x 0.25mm ID, 0.25µm film (PTE-5 equivalent).

Confirmational Column: SPB-1 capillary column, 30m x 0.32mm ID fused silica, 0.25µm phase film.

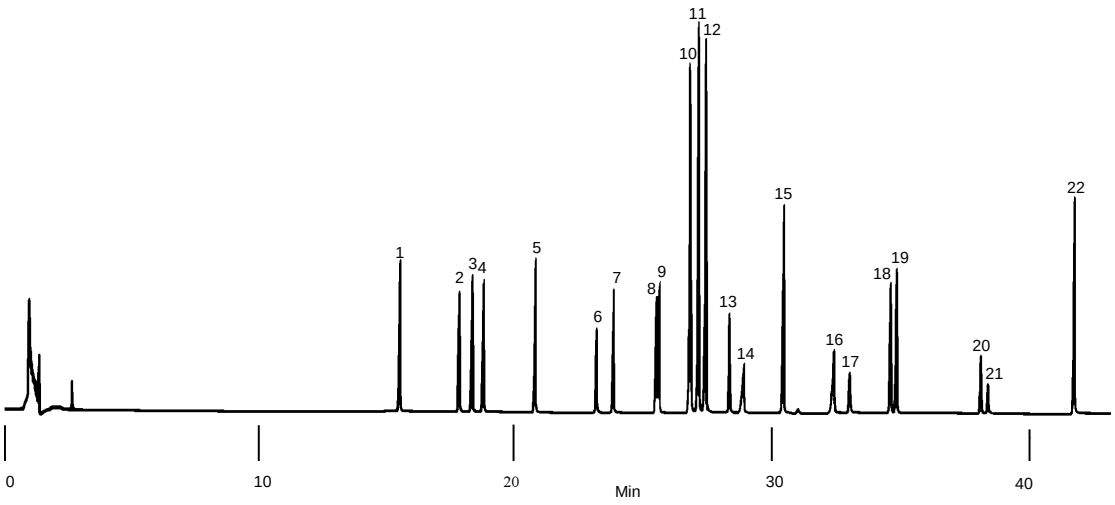
Detector: PID, 10 volt.

Chemical Standards: See page 13.

Method 507 – Nitrogen- & Phosphorus-Containing Pesticides

Figure F. Nitrogen-Containing Herbicides by Method 507

Column: PTE-5, 30m x 0.25mm ID, 0.25µm film
Oven: 60°C to 300°C at 4°C/min
Carrier: helium, 30cm/sec
Det.: TSD, 64 x 10^{-12} AFS
Inj.: 2µL ethyl acetate containing 5ng each herbicide, splitless

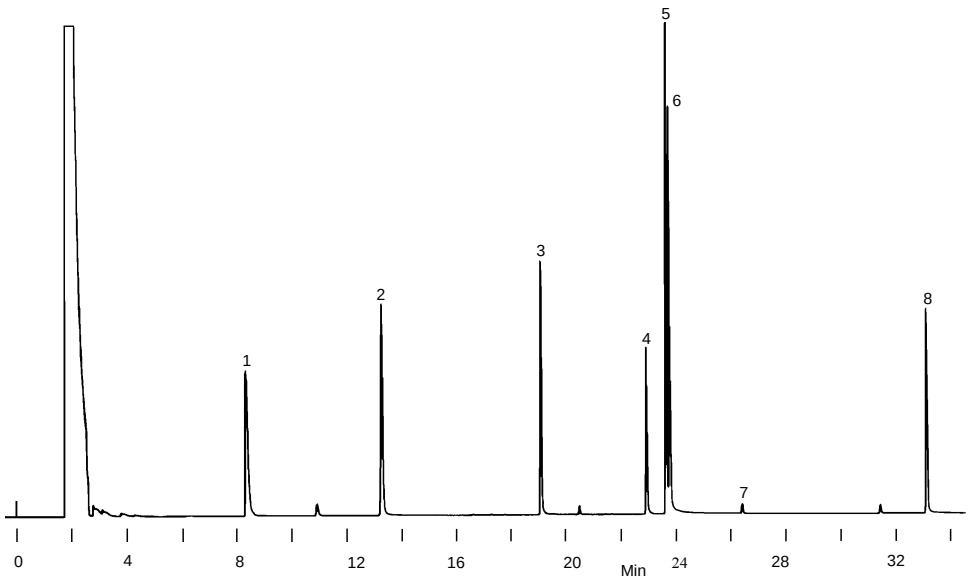


1. Eptam®
2. Sutan®
3. Vernam®
4. Tillam®
5. Ordram®
6. Propachlor
7. Ro-Neet®
8. Treflan®
9. Balan®
10. Simazine
11. Atrazine
12. Propazine
13. Tolban®
14. Terbacil
15. Sencor®
16. Bromacil
17. Dual®
18. Paarlan®
19. Prowl®
20. Oxadiazon
21. Goal®
22. Hexazinone

713-1062

Figure G. Organophosphorus Compounds and Alachlor by Method 507

Column: PTE-5, 30m x 0.25mm ID, 0.25µm film
Oven: 100°C to 300°C at 4°C/min
Carrier: helium, 20cm/sec
Det.: TSD, 256 x 10^{-11} AFS
Inj.: 1µL methyl tertiary butyl ether containing 10ng each analyte, splitless



1. Dichlorvos
2. Mevinphos
3. Ethoprop
4. Terbufos
5. Disulfoton
6. Diazinon
7. Alachlor
8. Merphos

713-1063

Sample Preparation: Extract with methylene chloride, concentrate, transfer to methyl tert-butyl ether.

GC Column: PTE-5 capillary column, 30m x 0.25mm ID fused silica, 0.25µm phase film.

Confirmational Column: SPB-1701 capillary column, 30m x 0.25mm ID fused silica, 0.25µm phase film.

Detector: Nitrogen-phosphorus (NPD) or TSD.

Chemical Standards: See page 13.

Qualifications: Splitless injection is recommended.

Method 508 – Chlorinated Pesticides

Method 508.1 – Chlorinated Pesticides

Method 508A (screen test) — Perchlorinated PCBs

Figure H. Chlorinated Pesticides by Method 508

Column: PTE-5, 30m x 0.25mm ID, 0.25µm film
Oven: 60°C to 300°C at 4°C/min
Carrier: helium, 30cm/sec
Det.: ECD, 32 x 10^{-11} AFS
Inj.: 2µL methyl tertiary butyl ether containing 20-2000pg each analyte, splitless

1. Chlorneb
2. Propachlor
3. α-BHC
4. γ-BHC
5. Pentachloronitrobenzene (int. std.)
6. Chlorothalonil
7. Aldrin
8. Heptachlor epoxide
9. Endosulfan I
10. Dieldrin
11. Endrin
12. Endosulfan II
13. Endrin aldehyde
14. 4,4'-DDT
15. cis-Permethrin

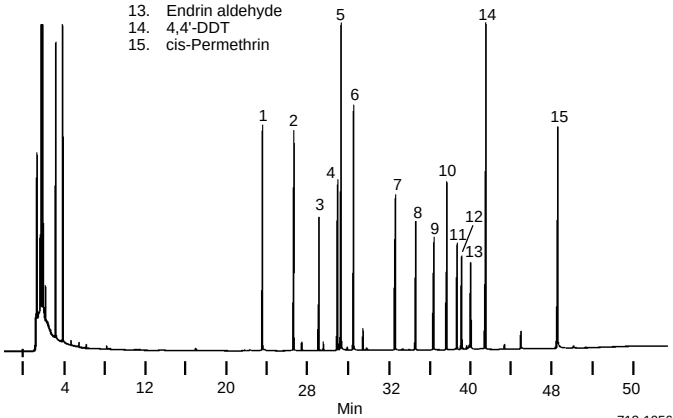
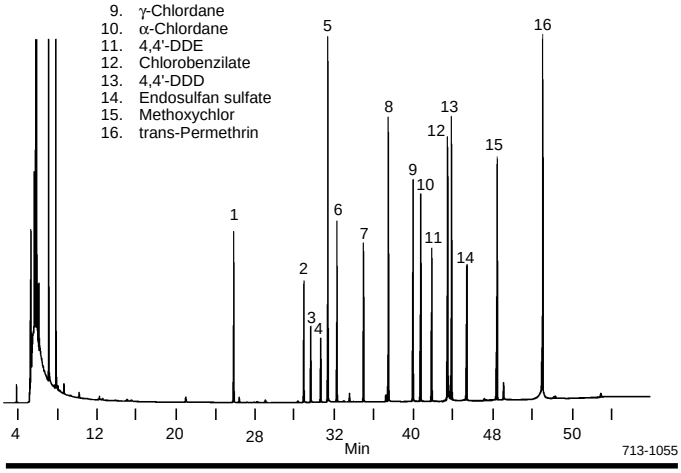


Figure I. Chlorinated Pesticides by Method 508

Conditions: same as Figure H

1. Etridiazole
2. Trifluralin
3. Hexachlorobenzene
4. ß-BHC
5. Pentachloronitrobenzene (int. std.)
6. δ-BHC
7. Heptachlor
8. DCPA
9. γ-Chlordane
10. α-Chlordane
11. 4,4'-DDE
12. Chlorobenzilate
13. 4,4'-DDD
14. Endosulfan sulfate
15. Methoxychlor
16. trans-Permethrin



Method 508

Sample Preparation: Extract 1 liter water sample with methylene chloride, concentrate, transfer to methyl tert-butyl ether.

GC Column: PTE-5 capillary column, 30m x 0.25mm ID fused silica, 0.25µm phase film.

Confirmational Column: SPB-1701 capillary column, 30m x 0.25mm ID fused silica, 0.25µm phase film.

Detector: Electron capture.

Chemical Standards: See page 14.

Qualifications: Refer to the EPA method for relative retention times for pesticides.

Method 508A

Sample Preparation: Extract 1L water sample with methylene chloride, dry, concentrate, transfer to chloroform. Perchlorinate PCBs to decachlorobiphenyl for GC confirmation.

GC Column: PTE-5 capillary column, 30m x 0.32mm ID fused silica, 0.25µm phase film.

Detector: Electron capture.

Chemical Standards: See page 14.

Method 515.1 (revision 4) – Chlorinated Herbicides

Method 515.2– Chlorinated Acids

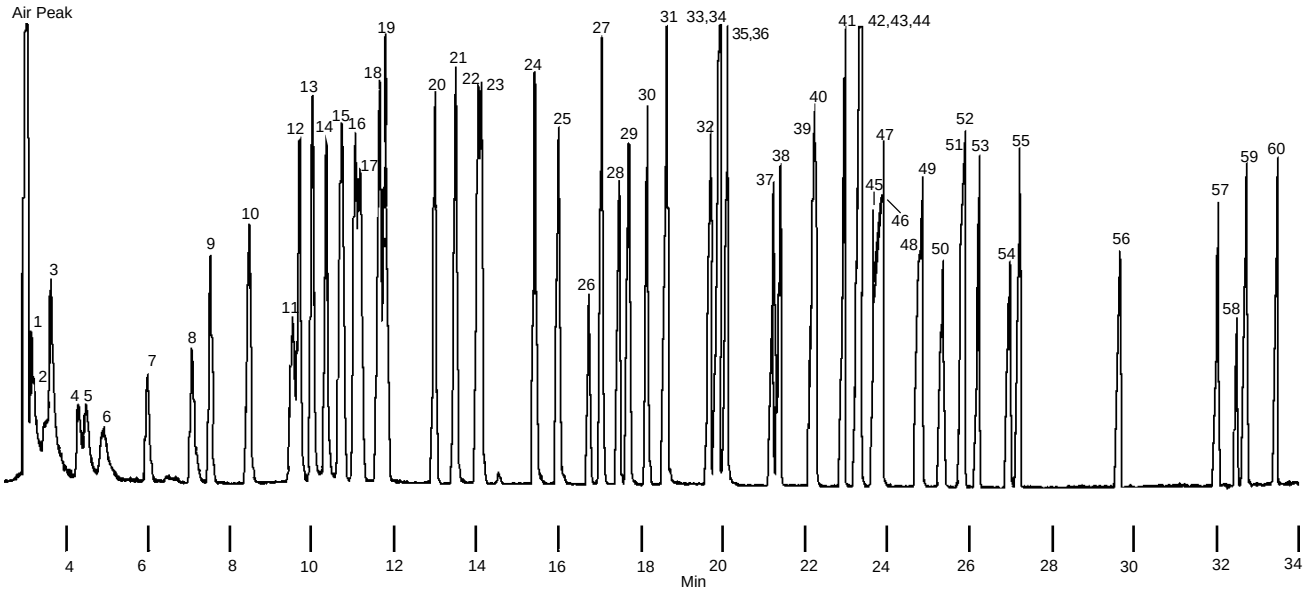
Sample Preparation:
515.1: 1 liter sample volume adjusted to pH 12; extract in ethyl ether before conversion to methyl esters with diazomethane.
515.2: 250mL sample volume; extract acids with 47mm resin disk.
GC Column:
PTE-5 capillary column, 30m x 0.25mm ID fused silica, 0.25µm phase film.
Confirmational Column:
SPB-1701 capillary column, 30m x 0.25mm ID fused silica, 0.25µm phase film.

Figure J. Purgeable Organics by Method 524.2

(Using Tekmar® LCS 2000 Purge & Trap and GC/MS)

Column: VOCOL, 60m x 0.75mm ID, 1.5µm film
Oven: 10°C (4 min) to 170°C at 4°C/min
Carrier: 10mL/min
Det.: MS, scan range m/z=33-275, 1 scan/0.700 sec
Inj.: composite of VOC mixes, 100ppb each compound in 5mL water

1. Dichlorodifluoromethane
2. Chloromethane
3. Vinyl chloride
4. Bromomethane
5. Chloroethane
6. Trichlorofluoromethane
7. 1,1-Dichloroethene
8. Dichloromethane
9. trans-1,2-Dichloroethene
10. 1,1-Dichloroethane
11. 2,2-Dichloropropane
12. cis-1,2-Dichloroethene
13. Trichloromethane
14. Bromochloromethane
15. 1,1,1-Trichloroethane
16. 1,1-Dichloropropene
17. Tetrachloromethane
18. Benzene
19. 1,2-Dichloroethane
20. Trichloroethene
21. 1,2-Dichloropropane
22. Bromodichloromethane
23. Dibromomethane
24. cis-1,3-Dichloropropene
25. Toluene
26. trans-1,3-Dichloropropene
27. 1,1,2-Trichloroethane
28. Tetrachloroethene
29. 1,3-Dichloropropane
30. Dibromochloromethane
31. 1,2-Dibromoethane
32. Chlorobenzene
33. 1,1,1,2-Tetrachloroethane
34. Ethyl benzene
35. p-Xylene
36. m-Xylene
37. o-Xylene
38. Styrene
39. Bromoform
40. Isopropylbenzene
41. 1,1,2,2-Tetrachloroethane
42. Bromobenzene
43. 1,2,3-Trichloropropane
44. Propylbenzene
45. 2-Chlorotoluene
46. 1,2,4-Trimethylbenzene
47. 4-Chlorotoluene
48. tert-Butylbenzene
49. 1,2,4-Trimethylbenzene
50. sec-Butylbenzene
51. Isopropyltoluene
52. 1,3-Dichlorobenzene
53. 1,4-Dichlorobenzene
54. Butylbenzene
55. 1,2-Dichlorobenzene
56. 1,2-Dibromochloropropane
57. 1,2,4-Trichlorobenzene
58. Hexachlorobutadiene
59. Naphthalene
60. 1,2,3-Trichlorobenzene



796-0324

Sample Preparation: Purge and trap using a VOCARB 4000 trap (8.5cm Carbopack C / 10cm Carbopack B / 6cm Carboxen 1000 / 1cm Carboxen 1001).

GC Column: VOCOL wide bore capillary column, 60m x 0.75mm ID borosilicate glass, 1.5µm phase film.

Confirmational Column: VOCOL wide bore capillary column, 30m x 0.53mm ID fused silica, 3µm phase film.

Detector: Mass spectrometer (70eV, 35-260amu scanning capability).

Chemical Standards: See page 14.

Qualifications: When used with this method, 30m x 0.53mm ID capillary columns must be cooled to temperatures below 10°C.

Method 525 – General Purpose Organics

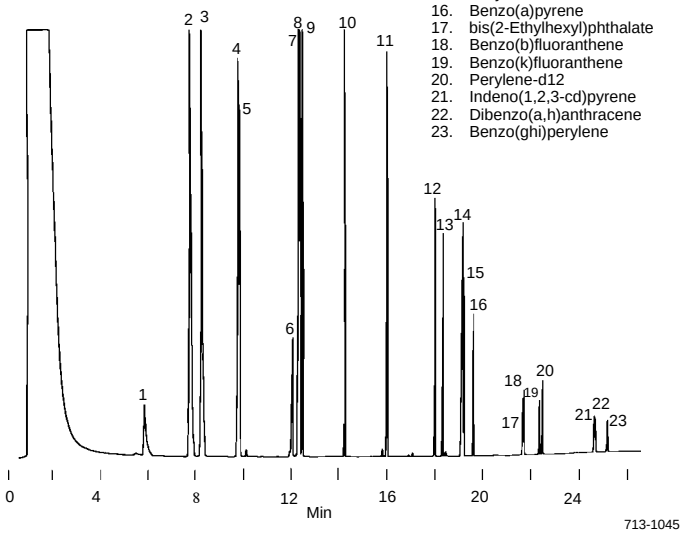
Method 525.1 – General Purpose Organics

Method 525.2 – General Purpose Organics

Figure K. General Purpose Organic Compounds by Method 525

Column: PTE-5, 30m x 0.25mm ID, 0.25µm film
Oven: 120°C (4 min) to 320°C at 10°C/min
(Trap Desorption Temp.: 240°C)
Carrier: helium, 40cm/sec
Det.: FID (32 x 10^{-11} AFS)
Inj.: 1µL methanol/methylene chloride containing 100ng each analyte, splitless

1. Hexachlorocyclopentadiene
2. Dimethylphthalate
3. Acenaphthene-d10
4. Acenaphthylene
5. Diethyl phthalate
6. Pentachlorophenol
7. Phenanthrene
8. Phenanthrene-d10
9. Anthracene
10. Di-n-butyl phthalate
11. Pyrene
12. Benzyl butyl phthalate
13. bis(2-Ethylhexyl)adipate
14. Benzo(a)anthracene
15. Chrysene
16. Benzo(a)pyrene
17. bis(2-Ethylhexyl)phthalate
18. Benzo(b)fluoranthene
19. Benzo(k)fluoranthene
20. Perylene-d12
21. Indeno(1,2,3-cd)pyrene
22. Dibenzo(a,h)anthracene
23. Benzo(ghi)perylene

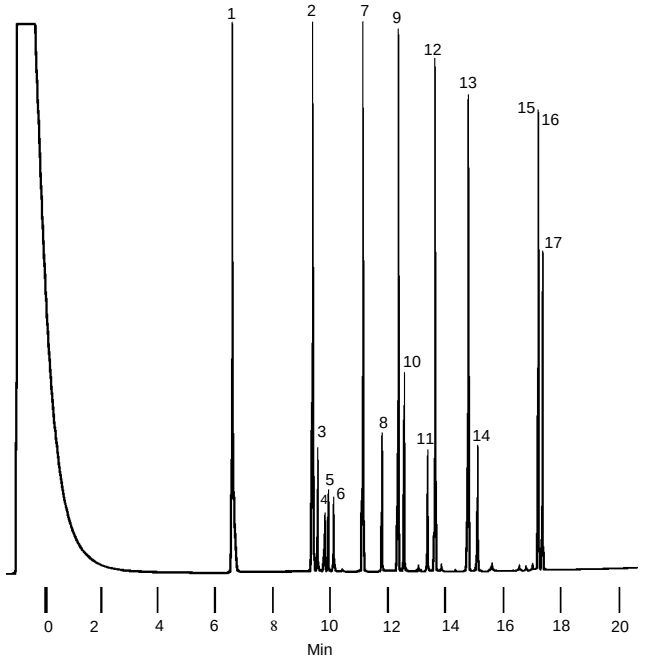


713-1045

Figure L. General Purpose Organic Compounds by Method 525

Column: PTE-5, 30m x 0.25mm ID, 0.25µm film
Oven: 120°C (4 min) to 320°C at 10°C/min
(trap desorbed at 240°C)
Carrier: helium, 40cm/sec
Det.: FID (32 x 10^{-11} AFS)
Inj.: 1µL methanol/methylene chloride containing 100ng each pesticide, 250ng each PCB, splitless

1. 2-Chlorobiphenyl
2. 2,3-Dichlorobiphenyl
3. Hexachlorobenzene
4. Simazine
5. Atrazine
6. Lindane
7. 2,4,5-Trichlorobiphenyl
8. Heptachlor
9. 2,2',4,4'-Tetrachlorobiphenyl
10. Aldrin
11. Heptachlor epoxide
12. 2,2',3',4,6-Pentachlorobiphenyl
13. 2,2',4,4',5,6'-Hexachlorobiphenyl
14. Endrin
15. Methoxychlor
16. 2,2',3,3',4,4',6-Heptachlorobiphenyl
17. 2,2',3,3',4,5,6',6'-Octachlorbiphenyl



796-0325

Sample Preparation:

525: Extract 1 liter water sample on ENVI-18 solid phase extraction tube, recover in methylene chloride.

525.1: Extract on ENVI-18 solid phase extraction tube or extraction disk, recover in methylene chloride.

525.2: Extract on ENVI-18 solid phase extraction tube or extraction disk, recover in ethyl acetate followed by methylene chloride.

GC Column: PTE-5 capillary column, 30m x 0.25mm ID fused silica, 0.25µm phase film.

Confirmational Column: None listed.

Detector: Mass spectrometer (70eV, 45-450amu scanning capability).

Chemical Standards: See page 14.

Method 531.1 – N-Methyl Carbomoyloximes & N-Methyl Carbamates

Sample Preparation: Direct injection.

HPLC Column: SUPELCOSIL™ LC-18, 15cm x 4.6mm ID, 5µm packing.

Confirmational Column: None listed.

Detector: Fluorescence (postcolumn derivatization of analytes to methyl amines with o-phthalaldehyde and 2-mercaptoethanol).

Chemical Standards: Custom prepared mix.

Qualifications: A postcolumn reaction system is required.

Method 548.1 – Endothall

Sample Preparation: 100mL sample extracted using an SPE tube (8mL) using ion exchange or extraction disk.

GC Column: PTE-5 capillary column, 30m x 0.25mm ID fused silica, 0.25µm phase film.

Confirmational Column: VOCOL, 30m x 0.53mm ID fused silica, 3µm film.

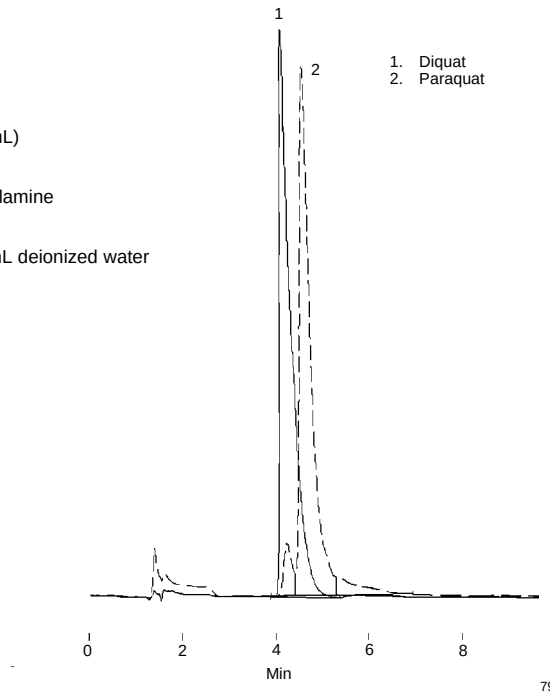
Detector: FID or mass spectrometry.

Chemical Standards: Custom prepared mix.

Method 549.1 – Diquat and Paraquat

Figure M. Diquat and Paraquat by Method 549.1

Sample:	250mL drinking water, adjust sample pH to 10.5 ± 0.2 with sodium hydroxide solution (10% w/v) or hydrochloric acid solution (10% v/v)
Extraction Disk:	ENVI-8 DSK, 47mm
Conditioning:	10mL methanol 2 x 10 mL reagent water 10mL conditioning solvent A (0.5g cetyl trimethyl ammonium bromide and 5mL conc. ammonium hydroxide in 500mL water, dilute to 1L) 2 x 10mL reagent water 10mL conditioning solvent B (10.0g hexanesulfonic acid, sodium salt and 10mL ammonium hydroxide in 250mL deionized water, dilute to 500mL)
Sample Addition:	adjust vacuum to flow rate of 100mL/min
Extraction:	0.5 to 1.0mL methanol (to cover disk) 2 x 4mL eluting solution (13.5mL orthophosphoric acid and 10.3mL diethylamine in 500mL water, dilute to 1L)
Column:	C18, 15cm x 4.6mm ID, 5µm particles
Mobile Phase:	3.5mL triethylamine and 1.0g 1-hexane-sulfonic acid, sodium salt to 800mL deionized water add orthophosphoric acid to pH = 2.5, dilute to 1L
Flow Rate:	1.0mL/min
Temp.:	35°C
Det.:	Photodiode array, quantitate Diquat -308nm, Paraquat -257nm
Inj.:	100µL



Sample Preparation: C8 SPE tube (500mg) or extraction disk.

HPLC Column: LC-18, 15m x 4.6mm ID, 5µm particles.

Confirmational Column: None listed.

Detector: Photodiode array, 308nm for diquat, 257nm for paraquat.

Chemical Standards: Custom prepared mix.

Method 547 – Glyphosate

Sample Preparation: Sample is filtered, 200µm injected into cation exchange HPLC column.

HPLC Column: Aminex A-9, 25cm x 4.6mm ID.

Confirmational Column: None listed.

Detector: Fluorescence (postcolumn derivatization with o-phthalaldehyde and 2-mercaptoethanol).

Chemical Standards: Custom prepared mix.

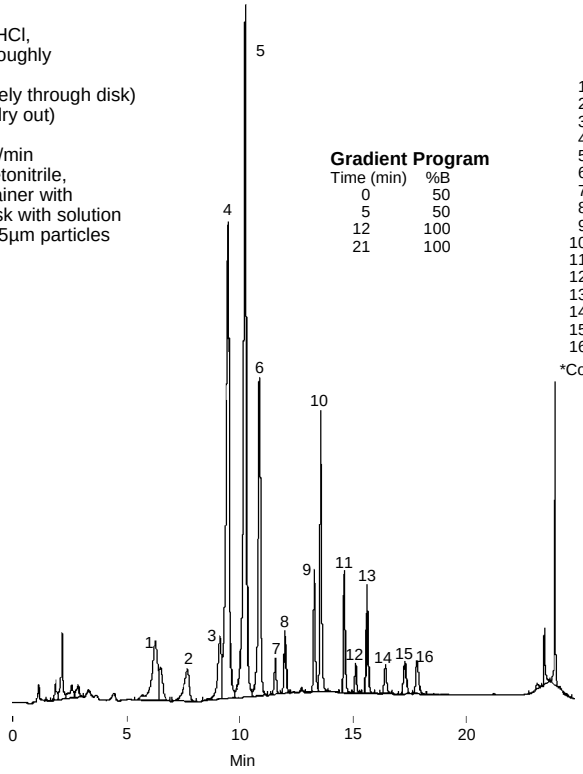
Method 550.1 – Polycyclic Aromatic Hydrocarbons

Figure N. Polycyclic Aromatic Hydrocarbons by Method 550.1

Sample:	1L drinking water, pH to <2 with 6N HCl, and add 5mL methanol and mix thoroughly
Extraction Disk:	ENVI-18 DSK, 47mm
Conditioning:	5mL dichloromethane, (pull completely through disk) 5mL methanol (do not allow disk to dry out) 5mL reagent water
Sample Addition:	adjust vacuum to flow rate of 100mL/min
Extraction:	rinse sample container with 5mL acetonitrile, extract disk with solution, rinse container with 2 x 5mL dichloromethane, extract disk with solution
Column:	Vydac 201TP54, 25cm x 4.6mm ID, 5µm particles
Mobile Phase:	A = water B = acetonitrile
Flow:	2.0mL/min
Det.:	UV, 254nm
Inj.:	10µL

Gradient Program

Time (min)	%B
0	50
5	50
12	100
21	100



		µg/L*
1.	Naphthalene	10.0
2.	Acenaphthylene	10.0
3.	Acenaphthene	10.0
4.	Fluorene	10.0
5.	Phenanthrene	10.0
6.	Anthracene	10.0
7.	Fluoranthene	1.0
8.	Pyrene	1.0
9.	Benz(a)anthracene	1.0
10.	Chrysene	1.0
11.	Benzo(b)fluoranthene	1.0
12.	Benzo(k)fluoranthene	0.5
13.	Benzo(a)pyrene	1.0
14.	Dibenz(a,h)anthracene	1.0
15.	Benzo(ghi)perylene	1.0
16.	Indeno(1,2,3-cd)pyrene	1.0

*Concentration in sample, prior to extraction.

794-0797

Sample Preparation: ENVI-18 DSK extraction disk, 47mm.

HPLC Column: 25cm x 4.6mm ID, 5µm particles.

Confirmational Column: None listed.

Detector: UV, 254nm.

Chemical Standards: Custom prepared mix.

Method 551 – Chlorinated Disinfection Byproducts and Chlorinated Solvents

Sample Preparation: 35mL sample extracted with 2mL methyl-tert-butyl ether.

GC Column: SPB-1 capillary column, 30m x 0.32mm ID fused silica, 1.0µm phase film.

Confirmational Column: SPB-2401 capillary column, 30m x 0.32mm ID fused silica, 0.5µm phase film.

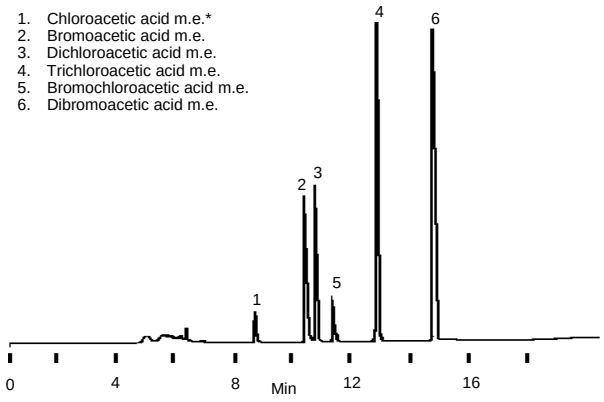
Chemical Standards: See page 15.

Method 552.1 – Haloacetic Acids and Dalapon

Method 552.2 – Haloacetic Acids and Dalapon

Figure O. Haloacetic Acid Methyl Esters Using PTE-5 Column

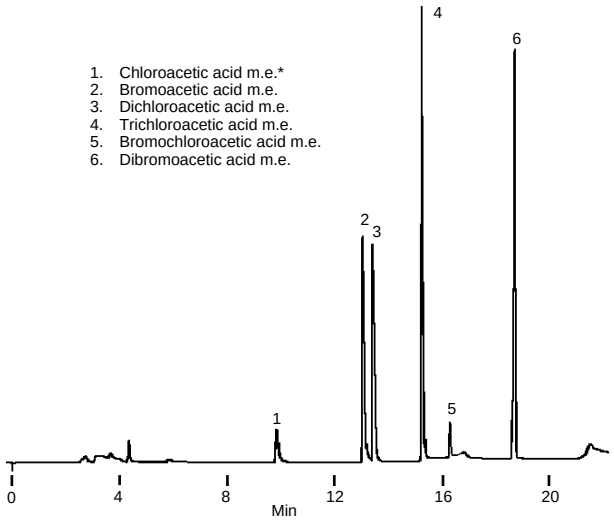
Column: PTE-5, 30m x 0.25mm ID, 0.25µm film
Oven: 50°C (10 min) to 200°C at 10°C/min
Carrier: helium, 25cm/sec
Det.: ECD, 300°C
Inj.: 1µL MTBE (~0.02ng bromochloroacetic acid, other analytes 0.2ng), splitless, 200°C



*Compounds analyzed as diazomethane-derivatized methyl esters. 712-0129

Figure P. Haloacetic Acid Methyl Esters Using SPB-1701 Column

Column: SPB-1701, 30m x 0.32mm ID, 0.25µm film
Oven: 50°C (10 min) to 120°C at 10°C/min, hold 3 min
Carrier: helium, 25cm/sec
Det.: ECD, 300°C
Inj.: 1µL MTBE (20ng/mL bromochloroacetic acid, all others 200ng/mL each), splitless 200°C



*Compounds analyzed as diazomethane-derivatized methyl esters. 712-0128

Sample Preparation: 40mL sample is adjusted to pH <0.5, extracted with 4mL methyl tert-butyl ether.

GC Column: PTE-5 capillary column, 30m x 0.25mm ID fused silica, 0.25µm phase film.

Confirmational Column: SPB-1701 capillary column, 30m x 0.25mm ID fused silica, 0.25µm phase film.

Detector: Electron capture.

Chemical Standards: See page 15.

Method 555 – Chlorinated Acids

Sample Preparation: 100mL sample adjusted to pH 12, 20mL aliquot extracted with C18 SPE tube or disk.

HPLC Column: SUPELCOSIL C18, 25cm x 4.6mm ID, 5µm particles.

Confirmational Column: None listed.

Detector: Photodiose array UV.

Chemical Standards: Custom prepared mix.

Ordering Information:

Product	Description	Cat. No.

502.2 Volatile Organics

Columns

VOCOL capillary column, 60m x 0.75mm ID glass, 1.5µm film	**23731**
VOCOL capillary column, 105m x 0.53mm ID fused silica, 3µm film	**25358**
VOCOL capillary column, 30m x 0.53mm ID fused silica, 3µm film	**25320-U**

Sample Preparation

VOCARB 4000 adsorbent trap, 30.5cm x 0.125" x 0.105" ID, containing Carbopack C, Carbopack B, Carboxen S-III adsorbents	**20308***

Calibration Standards▲

VOC Calibration Standards Kit	**48804**
Volatile Organic Compounds Mix 1, 1mL	**48775◆**
Volatile Organic Compounds Mix 2, 1mL	**48777◆**
Volatile Organic Compounds Mix 3, 1mL	**48779◆**
Volatile Organic Compounds Mix 4, 1mL	**48786◆**
Volatile Organic Compounds Mix 5, 1mL	**48797◆**
Volatile Organic Compounds Mix 6, 1mL	**48799-U◆**
Volatile Organic Compounds Mix 7, 1mL	**48802-U◆**
Volatile Organic Compounds Mix 8, 1mL	**48803**
Volatile Organic Compounds Mix 9, 1mL	**47399**

Internal Standards▲

1-Chloro-2-fluorobenzene, 2000µg/mL in methanol, 1mL	**48369**
2-Bromo-1-chloropropane, 2000µg/mL in methanol, 1mL	**48713**
1,4-Dichlorobutane, 2000µg/mL in methanol, 1mL	**48066**
EPA 502 Internal Standard Mix, 1mL	**48950-U**

504.1 1,2-Dibromoethane & 1,2-Dibromo-3-chloropropane

Columns

SPB-1/Carbowax 20M capillary column (25:75), 30m x 0.32mm ID fused silica, 0.25µm film	**custom**
SPB-1 capillary column, 30m x 0.32mm ID fused silica, 1.0µm film	**24045-U**
VOCOL capillary column, 30m x 0.53mm ID fused silica, 3µm film	**25320-U**

Sample Preparation

Pre-assembled vials, 40mL, pk. of 100	**27181**

Calibration Standards▲

EPA EDB/DBCP Mix, 1mL	**48225-U**

505 Organohalide Pesticides & Polychlorinated Biphenyls (PCBs)

Columns

SPB-1 capillary column, 30m x 0.32mm ID fused silica, 1.0µm film	**24045-U**
SPB-1/Carbowax 20M capillary column (25:75), 30m x 0.32mm ID fused silica, 0.25µm film	**custom**
SPB-50 capillary column, 30m x 0.32mm ID fused silica, 1.5µm film	**custom**

Sample Preparation

Pre-assembled vials, 40mL, pk. of 100	**27181**

Calibration Standards▲

PCB Kit 3	**48825**
EPA 505/525 Update Pesticides Mix A, 1mL	**47727-U**
EPA 505/525 Update Pesticides Mix B, 1mL	**47728-U**
Chlordane, 5000µg/mL in methanol, 1mL	**40089**
α-Chlordane, 100µg/mL in hexane, 1mL	**48192**
γ-Chlordane, 100µg/mL in hexane, 1mL	**48193**
Toxaphene, 5000µg/mL in methanol, 1mL	**40111**

Product	Description	Cat. No.

506 Phthalate & Adipate Esters

Columns

PTE-5 capillary column, 30m x 0.32mm ID fused silica, 0.25µm film	**24143**
SPB-1 capillary column, 30m x 0.32mm ID fused silica, 0.25µm film	**24044**

Sample Preparation

ENVI-18 solid phase extraction tubes, 6mL (1g packing), box of 30	**57065**
ENVI-18 DSK extraction disks, 47mm, pk. of 24	**57171**
Sample bottle, amber glass, 32oz., with Teflon-lined screw cap	**24559**
Separatory funnel, 2 liter, Teflon stopcock	**64806**
Kuderna-Danish macro concentrator, w/ground joints, 500mL	**64685-U**

Calibration Standards▲

EPA 506 Phthalate Esters Mix 1, 1mL	**48223**
EPA Phthalate Esters Mix, 1mL	**48805-U**
Di-n-octyl phthalate, 5000µg/mL in methanol, 1mL	**40067**
Di(2-ethylhexyl)phthalate, 2000µg/mL in methanol, 1mL	**47994**
Di(2-ethylhexyl)adipate, 2000µg/mL in methanol, 1mL	**47995-U**

507 Nitrogen & Phosphorus Pesticides

Columns

PTE-5 capillary column, 30m x 0.25mm ID fused silica, 0.25µm film	**24135-U**
SPB-1701 capillary column, 30m x 0.25mm ID fused silica, 0.25µm film	**24113**

Sample Preparation

Sample bottle, amber glass, 32oz., with Teflon-lined screw cap	**24559**
Separatory funnel, 2 liter, Teflon stopcock	**64806**
Kuderna-Danish macro concentrator, with ground joints, 500mL	**64685-U**

Calibration Standards

custom prepared	**custom**

Internal Standard

Triphenyl phosphate, 500µg/mL in methyl tert-butyl ether, 1mL	**48064**

Surrogate Standard

1,3-Dimethyl-2-nitrobenzene, 250µg/mL in methyl tert-butyl ether, 1mL	**48063**

Performance Standard▲

507 Laboratory Performance Check Solution, 1mL	**48946**

*For Tekmar LSC purge/trap units. For traps for other models, refer to the Supelco catalog.

▲For a listing of the components of mixes and kits, refer to the Supelco catalog.

◆Separate source standard is available for this product.

Product	Description	Cat. No.

508, 508.1, 508A Chlorinated Pesticides & PCBs

Columns▲

PTE-5 capillary column, 30m x 0.25mm ID fused silica, 0.25µm film	**24135-U**
SPB-1701 capillary column, 30m x 0.25mm ID fused silica, 0.25µm film	**24113**

Sample Preparation

ENVI-18 solid phase extraction tubes, 6mL (0.5g packing), box of 30	**57064**
ENVI-18 solid phase extraction tubes, 6mL (1g packing), box of 30	**57065**
Sample bottle, amber glass, 32 oz., with Teflon-lined screw cap	**24559**
Separatory funnel, 2 liter, Teflon stopcock	**64806**
Kuderna-Danish macro concentrator, with ground joints, 500mL	**64685-U**

Calibration Standards▲

PCB Kit 3	**48825-U**
TCL Pesticides Mix, 1mL	**48913◆**
EPA Phase V 508 Pesticide/SOC MCL Mix, 1mL	**47361**
Standard Mix A-1, 1mL	**47977**
Chlordane, 5000µg/mL in methanol, 1mL	**40089**
α-Chlordane, 100µg/mL in hexane, 1mL	**48192**
γ-Chlordane, 100µg/mL in hexane, 1mL	**48193**
Toxaphene, 5000µg/mL in methanol, 1mL	**40111**

Internal Standard

Pentachloronitrobenzene, 5000µg/mL in methanol, 1mL	**40156**

Surrogate Standard

4,4'-Dichlorobiphenyl, 500µg/mL in isooctane, 1mL	**48260**

Performance Standards▲

DDT-Endrin Mix, 1mL	**48282**
EPA Pesticide-Herbicide QC Mix, 5mL	**49145**

515.1, 515.2 Chlorinated Herbicides

Columns

PTE-5 capillary column, 30m x 0.25mm ID fused silica, 0.25µm film	**24135-U**
SPB-1701 capillary column, 30m x 0.25mm ID fused silica, 0.25µm film	**24113**

Sample Handling

ENVI-18 solid phase extraction tubes, 6mL (0.5g packing), box of 30	**57064**
ENVI-18 solid phase extraction tubes, 6mL (1g packing), box of 30	**57065**
Sample bottle, amber glass, 32oz., with Teflon-lined screw cap	**24559**
Separatory funnel, 2 liter, Teflon stopcock	**64806**
Kuderna-Danish macro concentrator, with ground joints, 500mL	**64685-U**

Product	Description	Cat. No.

524.2 Purgeable Organics

Columns

VOCOL capillary column, 60m x 0.75mm ID fused silica, 1.5µm film	**23731**
VOCOL capillary column, 30m x 0.53mm ID fused silica, 3µm film	**25320-U**
PTE-5 capillary column, 30m x 0.32mm ID fused silica, 1µm film	**24159**

Sample Handling

VOCARB 4000 adsorbent trap, 30.5cm x 0.125" x 0.105", containing Carbopack C, Carbopack B, & Carboxen 1000	**20308***

Calibration Standards▲

VOC Calibration Standards Kit	**48804**
EPA 524 Volatile Organic Compounds Kit	**47936**
EPA 524.2 Volatile Organic Compounds Mix, 1mL	**47932**
EPA 524 Volatile Organic Compounds Mix A, 1mL	**47933**
EPA 524 Volatile Organic Compounds Mix B, 1mL	**47934**
Volatile Organic Compounds Mix 1, 1mL	**48775◆**
Volatile Organic Compounds Mix 2, 1mL	**48777◆**
Volatile Organic Compounds Mix 3, 1mL	**48779◆**
Volatile Organic Compounds Mix 4, 1mL	**48786◆**
Volatile Organic Compounds Mix 5, 1mL	**48797◆**
Volatile Organic Compounds Mix 6, 1mL	**48799-U◆**

Internal Standards▲

Fluorobenzene, 2000µg/mL in methanol, 1mL	**48943**
EPA 524 Internal Standard Mix, 1mL	**48948**
EPA 524.2 Fortification Solution, 1mL	**47358**

Surrogate Standards▲

EPA 524 Surrogate Standard Mix, 1mL	**48466**
4-Bromofluorobenzene, 2000µg/mL in methanol, 1mL	**48083**
1,2-Dichlorobenzene-d4, 1mL	**48952**

QC Standards▲

Discretionary Aromatic Volatiles Mix NC, 1mL■	**47273**
Volatile Organic Contaminants Mix 1 NC, 1mL■	**47274**
Volatile Organic Contaminants Mix 2 NC, 1mL■	**47275**

*For Tekmar LSC purge/trap units. For traps for other models, refer to the Supelco catalog.

▲For a listing of the components of mixes and kits, refer to the Supelco catalog.

◆Separate source standard is available for this product.

■This mix is the Supelco equivalent of the former EPA-certified QC sample.

Product	Description	Cat. No.

525.2 General Purpose Organics

Column

PTE-5 capillary column, 30m x 0.25mm ID fused silica, 0.25µm film	**24135-U**

Sample Handling

ENVI-18 solid phase extraction tubes, 6mL (1g packing), box of 30	**57065**
ENVI-18 DSK extraction disks, 47mm, pk. of 24	**57171**

Calibration Standards▲

EPA 505/525 Update Pesticide Mix A, 1mL	**47727-U**
EPA 505/525 Update Pesticide Mix B, 1mL	**47728-U**
EPA 525 Update Phthalate Esters Mix, 1mL	**47973**
Volatile Organic Compounds Mix 9, 1mL	**47399**
EPA Phase V 525.1 MCL Pesticides Mix, 1mL	**47400**
525 Polynuclear Aromatic Hydrocarbons Mix A, 1mL	**48953**
EPA 525 Polynuclear Aromatic Hydrocarbons Mix A, 1mL	**48249**
EPA 525/525.1 PCB Mix, 1mL	**48246**
Toxaphene, 500µg/mL in methanol, 1mL	**48243**

Internal Standards▲

EPA 525/525.1 Internal Standard Mix, 1mL	**48242**

Surrogate Standard

Perylene-d12, 2000µg/mL in methylene chloride, 1mL	**48081**

Fortification Standards▲

EPA 525 Fortification Solution A, 1mL	**48230**
EPA 525 Fortification Solution B, 1mL	**48099**

QC Standard▲

EPA Pesticide-Herbicide QC Mix, 5mL	**49145**

531.1 N-Methylcarbamoyloximes & N-Methylcarbamates

Column

SUPELCOSIL LC-18 HPLC column, 15cm x 4.6mm ID, 5µm packing	**58230**
For components of postcolumn reaction system, see our general catalog.	

Calibration Standards

custom prepared	**custom**

547 Glyphosate

For components of postcolumn reaction system, see our general catalog.

Calibration Standards

custom prepared	**custom**

548.1 Endothall

Columns

PTE-5 capillary column, 30m x 0.25mm ID fused silica, 0.25µm film	**24135-U**
VOCOL capillary column, 30m x 0.53mm ID fused silica, 3µm film	**25320-U**

Calibration Standards

custom prepared	**custom**

549.1 Diquat & Paraquat

Sample Handling

ENVI-8 solid phase extraction tubes, 6mL (0.5g packing), box of 30	**57232**
ENVI-8 DSK extraction disks, 47mm, pk. of 24	**57172**

Calibration Standards

custom prepared	**custom**

Product	Description	Cat. No.

550, 550.1 Polycyclic Aromatic Hydrocarbons

Column

SUPELCOSIL LC-PAH HPLC column, 25cm x 4.6mm ID, 5µm packing	**58229**

Sample Handling

ENVI-18 solid phase extraction tubes, 6mL (1g packing), box of 30	**57065**
ENVI-18 DSK extraction disks, 47mm, pk. of 24	**57171**
Sample bottle, amber glass, 32 oz., with Teflon-lined screw cap	**24559**
Separatory funnel, 2 liter, Teflon stopcock	**64806**
Kuderna-Danish macro concentrator, with ground joints, 500mL	**64685-U**

Calibration Standard▲

TCL Polynuclear Aromatic Hydrocarbons Mix, 1mL	**49156**

551 Chlorinated Disinfection Byproducts & Chlorinated Solvents

Columns

SPB-1 capillary column, 30m x 0.32mm ID fused silica, 1.0µm film	**24045-U**
SP-2401 capillary column, 30m x 0.32mm ID fused silica, 0.5µm film	**custom**

Sample Handling

Pre-assembled vials, 40mL, pk. of 100	**27181**

Calibration Standards▲

EPA 551 Disinfection By-Products Kit	**48112**
EPA 551A Halogenated Volatiles Mix, 1mL	**48045**
EPA 551B Halogenated Volatiles Mix, 1mL	**48046**
Chloral hydrate, 1000µg/mL in acetonitrile, 1mL	**47335**

552.1, 552.2 Haloacetic Acids & Dalapon

Columns

SPB-1701 capillary column, 30m x 0.32mm ID fused silica, 0.25µm film	**24184**
SPB-210 capillary column, 30m x 0.32mm ID fused silica, 0.50µm film	**24329**

Sample Handling

ENVI-18 solid phase extraction tubes, 1mL, box of 108	**57023**

Calibration Standards▲

EPA 552.1 Acids Calibration Mix ICR, 1mL	**47629**
EPA 552.1 Esters Calibration Mix ICR, 1mL	**47630**
EPA 552.1 Acids Calibration Mix with Surrogate, 1mL	**47652**
EPA 552.1 Esters Calibration Mix with Surrogate, 1mL	**47653**

Internal Standard

1,2,3-Trichloropropane, 1000µg/mL in methyl tert-butyl ether, 1mL	**47669**

Surrogate Standards

2,3-Dibromopropionic acid, 1000µg/mL in methyl tert-butyl ether, 1mL	**47789**
Methyl-2-bromopropionate, 1000µg/mL in methyl tert-butyl ether, 1mL	**47668**

555 Chlorinated Acids

Column

SUPELCOSIL LC-18 HPLC column, 25cm x 4.6mm ID, 5µm packing	**58298**

Calibration Standards

custom prepared	**custom**

*For Tekmar LSC purge/trap units. For traps for other models, refer to the Supelco catalog.

▲For a listing of the components of mixes and kits, refer to the Supelco catalog.

◆Separate source standard is available for this product.

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