

OAK RIDGE NATIONAL LABORATORY

OPERATED BY MARTIN MARIETTA ENERGY SYSTEMS, INC.

WM DOCKET CONTROL
CENTER

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OAK RIDGE, TENNESSEE 37831

February 28, 1985

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Dan Goode
U.S. NRC
MS 623-SS
Washington, DC 20555

Subject: Transmittal of Method 8600 Results on Sheffield, Illinois Ground
Water Samples

Greetings Dan,

Enclosed is a copy of the results obtained in application of the Method 8600 organic screening tests to the ground water samples from the Sheffield Low-Level Waste Disposal Site. In general, the results obtained in the organic analyses parallel those obtained in inorganic and radiological analyses with respect to ranking of effects on ground water quality by migration of materials out of the disposal trenches. Trench 18 showed the largest amount of organic constituents, Well 523 had high organic content, Well 563 had high volatile content, and Wells 574 and 575 had low organic content. As noted in the report, work will continue to identify the predominant organic compounds present. The result of analysis of the sample from Well 523 for tritium is $1.2E4 \pm 0.1E4$.

We will begin preparation of a formal report on this work in March. Don't hesitate to call me if you have questions pertaining to these results.

Sincerely,

Dick

Richard H. Ketelle

RHK/mg

Enclosure

cc: R. B. McLean

WM DOCKET CONTROL	WM PROJECT
2027	9/1/85
DISPATCHED	10/1/85
<i>D. Goode</i>	<i>M. Haisfield</i>
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Report of Progress in Screening for Organics in Sheffield, IL Water Samples
February 14, 1985

Summary

The 8600 methods were applied to nine water samples. As a screening method, the procedures appeared to have worked satisfactorily; however, some modifications are suggested. The screening results indicate that at least three of the water samples (Well 523, Well 563, and Trench 18) contain some organic compounds in excess of 10 ppb; and it is also quite likely that the upgradient sample (Well 574) contained some organic compounds. These organic constituents are both volatile and semi-volatile. Table 1 summarizes the results of these screening procedures. From this summary it is quite evident that the two samples from Trench 18 had the highest organic content and that the upgradient sample (Well 574) had the lowest organic content.

Well 575. This sample has relatively low organic content with the bulk of this organic content being volatile. There appear to be two major volatile halogenated constituents (Method 8010) and several additional non-halogenated volatile constituents.

Well 563. The semi-volatile and non-volatile organic content appears to be low; however, the organic volatiles content (both halogenated and non-halogenated) appears to be quite high with the chromatographic profiles from Methods 8010, 8015, and 8030 all showing several major chromatographic peaks.

Trench 18. Water samples from this trench showed very high organic content including both volatile and semi-volatile compounds. In the halogenated

volatiles profile (Method 8010), there are at least eight major components. In like manner, the ultraviolet spectrum of the reversed phase extract (Method 8610) showed the highest intensity of any sample.

Well 523. This well showed fairly high organic content with both the volatile methods (8010, 8015, and 8030) and general method (8610) showing positives.

Well 574. This was the upgradient sample. Thus, only the volatile results can be compared with the other samples; but in all cases (Methods 8010, 8015, and 8030), this sample showed the lowest response for organic volatile compounds.

In brief, it must be concluded that significant amounts (several constituents present at levels greater than 10 ppb) of organic compounds are present in well 563, well 523, and trench 18. As time and resources permit, selected portions of these samples will be subjected to methods beyond the 8600 screening methods in order to identify some of the major organic constituents.

Description of Samples and Methods

Samples: Waters collected at Sheffield, Illinois during January, 1985.
Samples were identified as follows:

<u>Sample ID</u>	<u>Comment</u>
Well 575, (1-14-85)	Low organic content; mostly volatiles.
Well 574, (1-15-85)	Upgradient Sample.
Well 563, (1-15-85)	High Volatiles content; Low Semi-Volatiles content.
Trench 18	High organic content.
Well 523	High organic content.

The samples were subjected to the following screening procedures outlined in the 8600 Methods (EPA):

Method 3560: A Waters "Sep-Pak" reversed cartridge (C₁₈) was washed with 30 ml of methanol followed by 30 ml of water. The washed cartridge was then stored under clean water until used for sampling. [All solvents were drawn through the cartridge from a 50-ml glass syringe reservoir by a vacuum which was adjusted by a needle-valve to give a 10 ml/min flow rate.] Subsequently, 100 ml of a given water sample was drawn through the C₁₈ cartridge at a rate of 10 ml/min. The cartridge was then washed with 5 ml of clean water and removed from the vacuum apparatus. Organic compounds sorbed onto the cartridge were then removed by forcing 6 ml of hexane from a 10-ml glass syringe through the cartridge. This hexane was followed by several ml of air. This hexane eluent was then concentrated to less than 1 ml under a stream of nitrogen at reduced pressure and brought up to a final volume of 1 ml to form the hexane extract. The same cartridge was next washed with 6 ml of methanol in order to generate a methanol extract in the same manner as the hexane extract. Finally, a second 100-ml aliquot of a given water sample was passed through a clean reversed-phase cartridge. However, this second cartridge was eluted with ether resulting in a third sample referred to as the ether extract. The ether extract was then subjected to derivitization by method 8630 before analysis by specific procedures. These three extracts (methanol, hexane, and ether) along with samples of the original water were the samples subjected to analysis by one or more of the methods listed below:

<u>Method</u>	<u>Samples</u>	<u>Results</u>
8610	Methanol extract Hexane extract Ether extract	Pass/Fail (Go to 8620) Pass/Fail (Go to 8620) Low/High (Go to 8015 and 8030)
8620	Methanol extract Hexane extract	Pass/Fail Pass/Fail
8010	Water	Low/High
8015/8030	Water	Low/High

Results

Tables 2 and 3 summarize the results with estimates made for the concentrations of total volatile organics (Table 3) in each sample and for the concentration of semi- and non-volatile organics in the methanol extract of each water sample. In brief, one can be virtually certain that all of the water samples contained several individual organic constituents in excess of 10 ppb. The summary of the tests performed is shown on the attached analysis sheets (Tables 4-8).

A graphic example of the "organics" content is illustrated in Figure 1 which contrasts the non-halogenated volatiles in the upgradient control with a second sample from the upgradient well (1641), a very high sample (Trench 18), and a standard sample containing bromodichloromethane (248 ppb), bromoform (181 ppb), chlorobenzene (127 ppb), diethyl ether (98 ppb), acetonitrile (122 ppb), and toluene (198 ppb).

In examining this figure the reader should note that the data was generated according to Method 8015 (non-halogenated volatiles monitored by GC FID). Thus, halogenated volatiles (8010) and those requiring heated purge and trap (8030) will be seen with less sensitivity than would be expected for the methods specifically designed for them. In short, then

all water samples contained detectable amounts of organic volatiles. Table 9 summarizes the number of major constituents in each sample and indicates the retention time for the most prominent components. The similarity of retention times for many major constituents would tend to indicate that these waters have common major contaminants.

Quality Assurance

Because the EPA has no quality control sample that can be applied specifically to the SW 846 Methods, two Quality Control Samples were prepared: 1. A methanol solution containing six volatile compounds chosen to represent compounds targeted in the three volatile methods - Method 8010 (bromodichloromethane, bromoform, and chlorobenzene), Method 8015 (chlorobenzene, diethyl ether, and toluene) and Method 8030 (acetonitrile); and 2. A methanol solution containing three semi-/non-volatile compounds used to characterize Method 3560 - 2,4,5-trichlorophenol, parathion, and fluoranthene. An examination of the chromatograms indicates that two of the nine submitted water samples (1642 and 1644) contained these quality control samples in water in the following amounts for the volatiles:

1642 $21 \pm 5 \mu\text{l}$ in 40 ml of water

1644 $6 \pm 1.5 \mu\text{l}$ in 40 ml of water

Method 8620 (N/P detector) also detected a peak corresponding to parathion in sample 1642 and a trace of parathion in 1644 while none of the well or trench samples show any activity for this method. However, the amount of parathion detected in 1644 is very close to the detection limit.

Additional Efforts

The samples have been screened for organics by the 8600 methods as indicated. All appear to contain some organics. Thus, within the limitations

of present resources, effort will be made to identify some of the major organic constituents. This effort will involve two specific approaches: (1) The hexane and methanol extracts (from Method 3560) will be combined and concentrated to a minimal volume (approaching 0.3 ml). This concentrate will then be subjected to GC/MS analysis and an attempt will be made to identify the major constituents. (Preliminary chromatograms of the extracts before combination and concentration indicate more than a few semi-volatile organic constituents; however, progress in identification may be hindered by phthalate contamination arising from sample containment.) (2) Either an extract of the volatiles sample or a cartridge from the heated purge and trap will be subjected to GC/MS analysis and an attempt will be made to identify major constituents.

Suggested Approach for Future Samples

A scheme is attached as Table 10 which outlines a possible modified approach for future studies. There are three changes and/or additions in this modified approach. First of all, the polar and non-polar extracts from Method 3560 are combined. This seems reasonable because the polar/non-polar separation does not appear to be that "clean". In addition, it is suggested that when semivolatiles (Methods 8610 and 8620) and volatiles (Methods 8010, 8015, and 8030) are known to be present, further studies should be carried out to identify the major organic constituents by specific techniques which are not part of the 8600 Matrix.

Table 1

Summary Showing Which Tables of Organic Compounds May be Present

Sample	Tables of Organic Compounds ^a							
	3	3B	4	5	6	7	8	9
Well 575 (1636)	X	X	X	—	—	—	X	X
Well 563 (1638)	X	X	X	—	—	—	X	X
Trench 18 (1639)	X	X	X	X	—	X	X	X
Trench 18 (1640)	X	X	X	X	—	X	X	X
Well 523 (1643)	X	X	X	—	—	—	X	X
Well 574 (1637/1641)	—	X	X	—	—	—	—	X

^aX indicates a table could not be eliminated; — indicates that a table could be eliminated. The Tables of Organic Compounds are included as the Appendix.

Table 2

Summary of Ultraviolet Spectral Data for
Reversed Phase/Hexane Extraction

Sample No.	Result	Selected Absorbances, nm ^a			Estimated Concentration, ppb ^b
		236 nm	274 nm	292 nm	
Well 575	Fail	0.023	0.006	<0.005	1
Well 574	Reference	[0.327]	[0.427]	[0.327]	-
Well 563	Fail	0.118	0.019	<0.005	2
Trench 18	Fail	0.418	0.308	0.059	20
	Fail	0.329	0.245	0.127	23
Well 523	Fail	0.213	0.070	0.047	10
STD ^b		0.237	0.138	0.085	

^aAbsorbances are given for wavelength of maximum absorbance for fluoranthene, (236), parathion (274), and 2,4,5-trichlorophenol (292). The Absorbances are the absorbances in excess of the absorbance for the reference.

^bEstimated concentration is an average calculated by assuming an absorption coefficient (absorbance unit/ppb) of 0.025 at 234 nm, 0.015 at 274 nm, and 0.003 at 292 nm. This number should be considered only a very rough estimate for non polar compounds. The standard, (STD), contained 2,4,5-trichlorophenol (12 ppb), parathion (11 ppb) and Fluoranthene (0.8 ppb).

Table 3

Estimate of Volatiles in NRC Water Samples

Sample	Estimated Concentration, PPB
Well 575	200
Well 574	170
Well 563	500
Trench 18	1800
Well 523	1450

Table 4

Hierarchical Analysis Protocol
8600 Methods

Sample No.: Well 575

Date: 2-1-85

Customer/Project: Ketelle/NRC

Methods		Methanol Extract (Method 3560)	Sample Hexane Extract (Method 3560)	Ether Extract (Method 3560) + (Method 8630)	Water
		Polar	Non-Polar		
8610 (UV)	Pass Tables* Fail	Pass 5	4 Fail	8,9	
8620 (N/P)	Pass Tables* Fail	7	Pass 6		
9020 (Tox)	Low Tables* High			3,38	
8010 Volatiles	Low Tables* High			3A High	
8015 8030	Low Tables* High			8 High	

Tables Not Eliminated: 3, 38, 4, 8, 9

Tables Eliminated: 5, 6, 7

*Tables eliminated by Pass

Table 5

Hierarchical Analysis Protocol
8600 Methods

Sample No.: Well 563

Date: 2-1-85

Customer/Project: Ketelle/NRC

Methods		Methanol Extract (Method 3560)	Sample Hexane Extract (Method 3560)	Ether Extract (Method 3560) + (Method 8630)	Water
		Polar	Non-Polar		
8610 (UV)	Pass Tables* Fail	Pass 5	4 Fail	8,9	
8620 (M/P)	Pass Tables* Fail	7	Pass 6		
9020 (Tox)	Low Tables* High			3,38	
8010 Volatiles	Low Tables* High			3A Fail	
8015 8030	Low Tables* High			8 Fail	

Tables Not Eliminated: 3A, 3B, 4, 8, 9

Tables Eliminated: 5, 6, 7

*Tables eliminated by Pass

Table 6

Hierarchical Analysis Protocol
8600 Methods

Sample No.: Trench 18

Date: 2-1-85

Customer/Project: Ketelle/NRC

Methods		Methanol Extract (Method 3560)	Sample Hexane Extract (Method 3560)	Ether Extract (Method 3560) + (Method 8630)	Water
		Polar	Non-Polar		
8610 (UV)	Pass Tables* Fail	5 Fail	4 Fail	8,9	
8620 (N/P)	Pass Tables* Fail	7 Fail	Pass 6		
9020 (Tox)	Low Tables* High			3,38	
8010 Volatiles	Low Tables* High			3A High	
8015 8030	Low Tables* High			8 High	

Tables Not Eliminated: 3A,38,4,5,7,8,9

Tables Eliminated: 6

*Tables eliminated by Pass

Table 7

Hierarchical Analysis Protocol
8600 Methods

Sample No.: Well 523

Date: 2-1-85

Customer/Project: Ketelle/NRC

Methods		Methanol Extract (Method 3560)	Sample		Ether Extract (Method 3560) + (Method 8630)	Water
			Polar	Non-Polar		
8610 (UV)	Pass Tables* Fail	Pass 5		4 Fail	8,9	
8620 (N/P)	Pass Tables* Fail	7		Pass 6		
9020 (Tox)	Low Tables* High				3,38	
8010 Volatiles	Low Tables* High				3A High	
8015 8030	Low Tables* High				8 High	

Tables Not Eliminated: 3, 38, 4, 8, 9

Tables Eliminated: 5, 6, 7

*Tables eliminated by Pass

Table 8

Hierarchical Analysis Protocol
8600 Methods

Sample No.: Well 574 (Upgradient Sample)

Date: 2-1-85

Customer/Project: Ketelle/NRC

Methods		Methanol Extract (Method 3560)	Sample Hexane Extract (Method 3560)	Ether Extract (Method 3560) + (Method 8630)	Water
		Polar	Non-Polar		
8610 (UV)	Pass Tables* Fail	Pass 5	Pass 4	8,9	
8620 (N/P)	Pass Tables* Fail	7	6		
9020 (Tox)	Low Tables* High			3,3B	
8010 Volatiles	Low Tables* High			Pass 3A	
8015 8030	Low Tables* High			Pass 8	

Tables Not Eliminated: 3B, 4, 9

Tables Eliminated: 3A, 5, 6, 7, 8

*Tables eliminated by Pass

Table 9

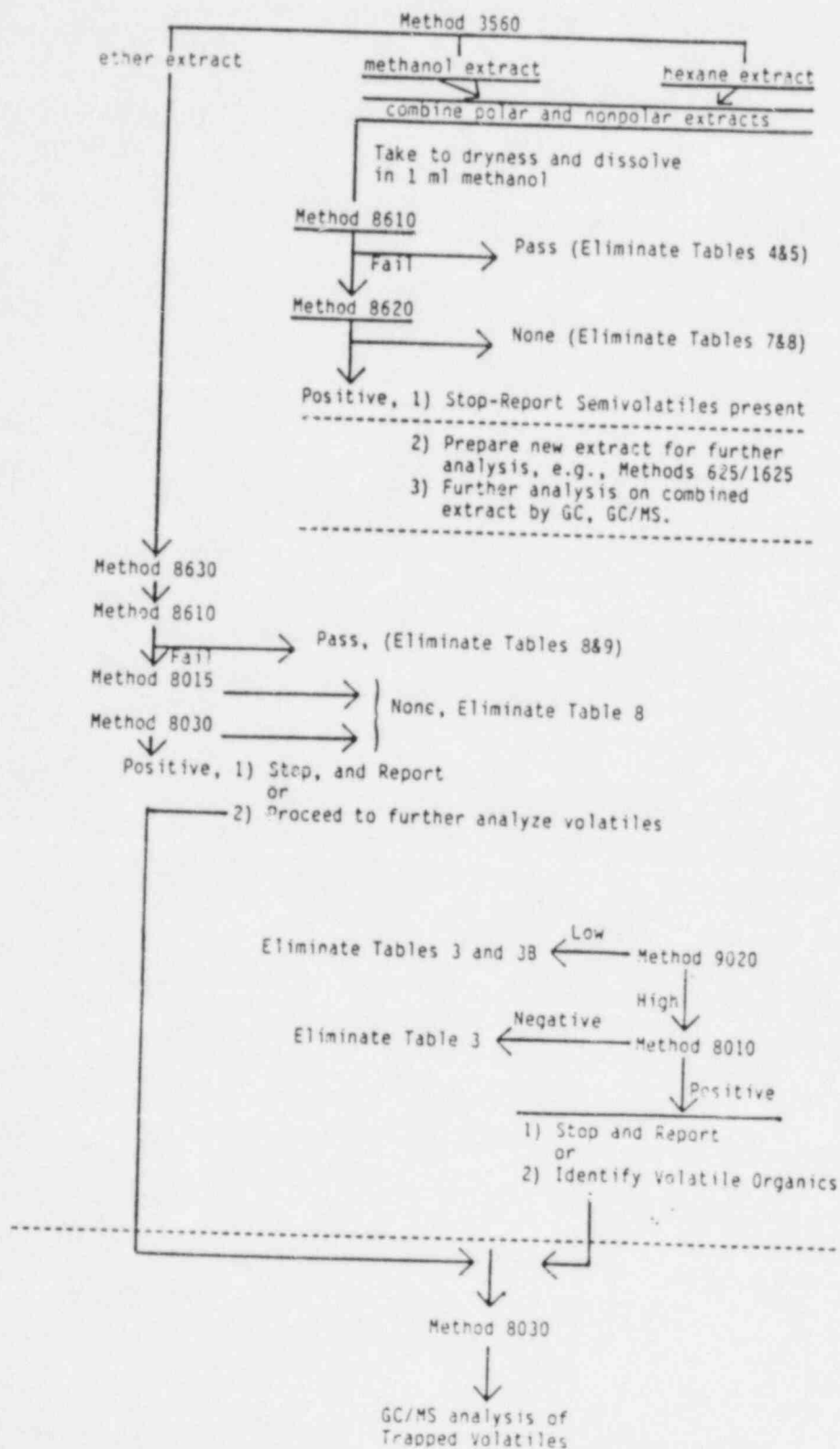
Most prominent peaks in gas chromatographic profile following heated
Purge-and-Trap (Method 8030).

Sample	No. of Peaks ^a	Retention Time, min							
Well 575	0 (2) ^b								
Well 574	0 (2) ^b								
Well 563	6	8.8	10.5		15.3			24.7	
Trench 18	4		10.6		15.2/15.7	17.5			
Well 523	5	8.7	10.5	12.5	15.5				

^aTotal number of peaks exceeding 10% of full scale.

^bThese samples contained no major volatile peaks and, in fact, resembled a "blank" water sample. There were two very minor peaks in both samples.

Table 10
Proposed Scheme for Future Screens



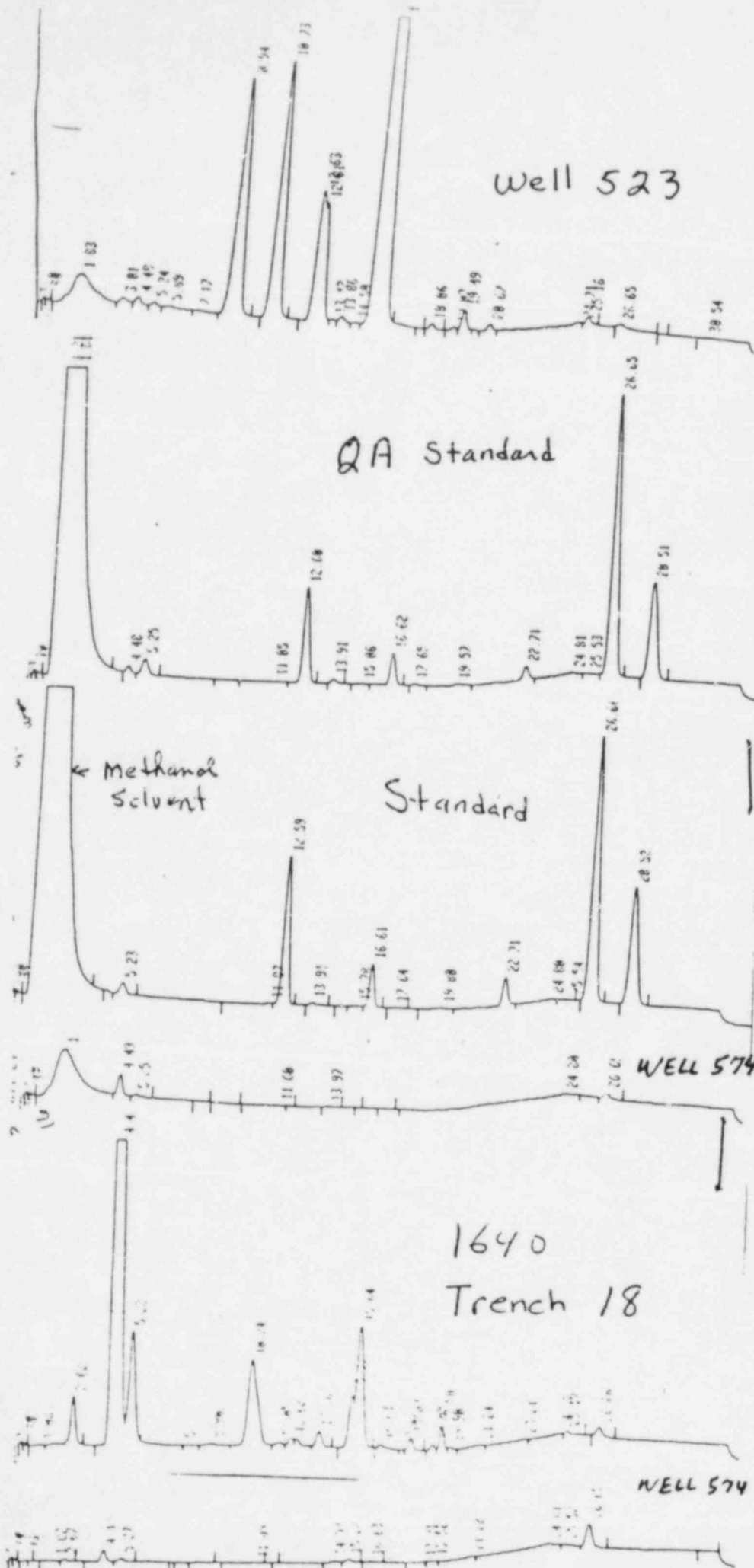


Figure 1. Comparison of the

APPENDIX

Tables of Organic Compounds (1)

Table 3 : Volatile Halogenated Organics

Table 3B: Semi-Volatile Halogenated Organics

Table 4 : Non-Polar UV Compounds

Table 5 : UV Active, Semi Volatile Polar Organics

Table 6 : N/P Containing, UV Active Non-Polar Organics

Table 7 : N/P Containing, UV Active Polar Organics

Table 8 : Volatiles derivatized by Method 8630

Table 9 : Non-Volatiles derivatized by Method 8630

- (1) Proposed Sampling and Analytical Methodologies for Addition to Test:
Methods for Evaluating Soild Waste Physical/Chemical Methods, U. S:
Environmental Protection Agency, NTIS PB85-103026.

Table 3 VOLATILE HALOGENATED ORGANICS

Bis(2-chloroethoxy)methane
Bis(2-chloroethyl) ether
Bis(2-chloroisopropyl) ether
Bis(chloromethyl) ether
Bromoacetone
Bromomethane
Chloral
Chlorinated benzenes, N.O.S.
Chlorinated ethane, N.O.S.
Chlorinated fluorocarbons, N.O.S.
Chloroalkyl ethers, N.O.S.
Chlorobenzene
1-Chloro-2,3-epoxypropane
2-Chloroethyl vinyl ether
Chloroform
Chloromethane
Chloromethyl methyl ether
1,2-Dibromo-3-chloropropane
1,2-Dibromoethane
Dibromomethane
1,4-Dichloro-2-butene
Dichlorodifluoromethane
1,1-Dichloroethane
1,2-Dichloroethane
trans-1,2-Dichloroethene
Dichloroethylene, N.O.S.
1,1-Dichloroethylene
Dichloromethane
Dichloropropane, N.O.S.
1-2-Dichloropropane
Dichloropropene, N.O.S.
1-3-Dichloropropene
Halomethane, N.O.S.
Hexachloroethane
Hexachloropropene
Iodomethane
Tetrachloroethane, N.O.S.
1,1,1,2-Tetrachloroethane
1,1,2,2-Tetrachloroethane
Tetrachloroethane
Tetrachloromethane
Tribromomethane
1,1,1-trichloroethane
1,1,2-trichloroethane
Trichloroethene
Trichloromonofluoromethane
Trichloropropane, N.O.S.
1,2,3-Trichloropropane
Vinyl chloride

Table 3B SEMI-VOLATILE HALOGENATED ORGANICS

Aldrin
 Aromite
 Benzene, dichloromethyl-
 Benzotrachloride
 Benzyl chloride
 N,N-Bis(2-chloroethyl)-2-naphthylamine
 4-Bromophenyl phenyl ether
 Chloridane
 Chlorinated benzenes, N.O.S.
 Chlorinated naphthalene, N.O.S.
 Chlorinated phenol, N.O.S.
 Chloroacetaldehyde
 Chloroalkyl ethers, N.O.S.
 Chlorobenzilate
 p-Chloro-m-cresol
 1-Chlorophenol
 3-Chloropropionitrile
 Cyclophosphamide
 DDD
 DDE
 DDT
 Diallate
 o-Dichlorobenzene
 m-Dichlorobenzene
 p-Dichlorobenzene
 Dichlorobenzene, N.O.S.
 1,1'-Dichlorobenzidine
 2,4-Dichlorophenol
 2,6-Dichlorophenol
 2,4-Dichlorophenoxyacetic acid, salts and esters (2,3-D)
 Dichloropropanol, N.O.S.
 Endosulfan
 Endrin and metabolites
 Heptachlor
 Heptachlor epoxide
 Hexachlorobenzene
 Hexachlorobutadiene
 Hexachlorocyclohexane (all isomers) (Lindane and isomers)
 Hexachlorocyclopentadiene
 1,2,3,4,10,10-Hexachloro-1,4,4a,5,8,8a-hexahydro-1,4:5,8-endo,endo-dimethanonaphthalene
 Hexachlorophene
 Kepone
 Methoxychlor
 Methylchlorocarbonate
 4,4'-Methylenebis (2-chloroaniline)
 Pentachlorobenzene
 Pentachloroethane
 Pentachloronitrobenzene (PCNB)
 Pentachlorophenol
 Polychlorinated biphenyls, N.O.S.
 Pronamide
 1,3-Propane sulfoxide
 1,2,4,5-Tetrachlorobenzene
 2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)
 2,3,4,6-Tetrachlorophenol
 Toxaphene
 1,2,4-Trichlorobenzene
 Trichloromethane
 2,4,5-Trichlorophenol
 2,4,6-Trichlorophenol
 2,4,5-Trichlorophenoxyacetic acid (2,4,5-T)
 2,4,5-Trichlorophenoxypropionic acid (2,4,5-TP)
 Tris (2,3-dibromopropyl) phosphate

TABLE 4

TABLE 4 Non-Polar UV Compounds

Benz(c)acridine
Benz(a)anthracene
Benzene
Benzene, dichloromethyl-
Benzo(b)fluoranthene
Benzo(j)fluoranthene
Benzo(a)pyrene
Benzotrichloride
Benzyl chloride
4-Bromophenyl phenyl ether
Chlorinated benzenes, N.O.S.
2-Chloronaphthalene
Chrysene
DDD
DDE
DDT
Dibenz(a,h)acridine
Dibenz(a,j)acridine
Dibenz(a,h)anthracene
7H-Dibenzo(c,g)carbazole
Dibenzo(a,e)pyrene
Dibenzo(a,h)pyrene
Dibenzo(a,i)pyrene
o-Dichlorobenzene
m-Dichlorobenzene
p-Dichlorobenzene
Dichlorobenzene, N.O.S.
7,12-Dimethylbenz(a)anthracene

Fluoranthene
Heptachlor
Hexachlorobutadiene
Hexachlorocyclopentadiene
Hexachlorophene
Idenol(1,2,3-cd)pyrene
Methoxychlor
3-Methylcholanthrene
Naphthalene
Polychlorinated biphenyls, N.O.S.
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)

5.0

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sho

com

7.C

TABLE 5 - UV ACTIVE, SEMI VOLATILE POLAR ORGANICS

Acetophenone
 3-(alpha-Acetylbenzyl)-4-hydroxycoumarin, and salts
 2-Acetylaminofluorene
 4-Aminobiphenyl
 5-(Aminomethyl)-3-isoxazolol
 Anitrole
 Aniline
 Aramite
 Auramine
 Benzenethiol
 Benzidine
 p-Benzoquinone
 N,N-Bis(2-chloroethyl)-2-naphthylamine
 Bis(2-ethylhexyl) phthalate
 Brucine
 Butyl benzyl phthalate
 2-sec-Butyl-2,4-dinitrophenol (DNBP)
 Chlorobenzilate
 p-Chloro-m-cresol
 2-Chlorophenol
 Coal tars
 Creosote
 2-Cyclohexyl-4,6-dinitrophenol
 Diallate
 Di-n-butyl phthalate
 3,3'-Dichlorobenzidine
 2,4-Dichlorophenol
 2,6-Dichlorophenol
 2,4-Dichlorophenoxyacetic acid, salts and esters (2,4-D)
 O,O-Diethylphosphoric acid, O-p-nitrophenyl ester
 Diethyl phthalate
 Diethylstilbestrol
 Dihydrosafrole
 3,3'-Dimethoxybenzidine
 p-Dimethylaminoazobenzene
 3,3'-Dimethylbenzidine
 alpha,alpha-Dimethylphenethylamine
 2,4-Dimethylphenol
 Dimethyl phthalate
 Dinitrobenzene, N.O.S.
 4,6-Dinitro-o-cresol and salts
 2,4-Dinitrophenol
 2,4-Dinitrotoluene
 2,6-Dinitrotoluene
 Di-n-octyl phthalate
 Diphenylamine
 1,2-Diphenylhydrazine
 Isosafrole
 Methapyrilene
 4,4'-Methylenebis(2-chloroaniline)
 Methyl parathion
 1,4-Naphthoquinone
 1-Naphthylamine
 2-Naphthylamine
 Nicotine and salts
 p-Nitroaniline
 Nitrobenzine
 4-Nitrophenol
 Parathion
 Pentachloronitrobenzene (PCNB)
 Pentachlorophenol
 Phenacetin
 Phenylenediamine
 Phosphorothioic acid, O,O-dimethyl O-(p-((dimethylamino)-sulfonyl)phenyl) ester
 Phthalic acid esters, N.O.S.
 Phthalic anhydride
 2-Picoline
 Propylthiouracil
 Pyridine
 Resorcinol
 Safrole
 2,4,5-Trichlorophenol
 2,4,6-Trichlorophenol
 2,4,5-Trichlorophenoxyacetic acid (2,4,5-T)
 2,4,5-Trichlorophenoxypropionic acid (2,4,5-Tp)

TABLE 6 - N/P CONTAINING, UV ACTIVE NON-POLAR ORGANICS

Dibenz(a,h)acridine
Dibenz(a,j)acridine
7H-Dibenzo(c,g)carbazole

TABLE 7 - N/P CONTAINING, UV ACTIVE POLAR ORGANICS

1-Acetyl-2-thiourea	Tetraethylthiopyrophosphate
4-Aminobiphenyl	Tetraethylpyrophosphate
5-(Aminomethyl)-3-isoxazolol	O,O,O-Triethylphosphorothioate
Amitrole	Tris(2-3-dibromopropyl) phosphate
Aniline	
Auramine	
Benzidine	
N,N-Bis(2-chloroethyl)-2-naphthylamine	
Brucine	
2-sec-Butyl-2,4-dinitrophenol (DNBP)	
3-Chloropropionitrile	
2-Cyclohexyl-4,6-dinitrophenol	
Cyclophosphamide	
Diallate	
3,3'-Dichlorobenzidine	
N,N-Diethylhydrazine	
O,O-Diethyl O-2-pyrazinyl phosphorothioate	
Dinethoate	
3,3'-Dimethoxybenzidine	
p-Dimethylaminoazobenzene	
3,3'-Dimethylbenzidine	
1,1-Dimethylhydrazine	
1,2-Dimethylhydrazine	
3,3-Dimethyl-1-(methylthio)-2-butanone	
alpha,alpha-Dimethylphenethylamine	
Dinitrobenzene, N.O.S.	
4,6-Dinitro-o-cresol and salts	
2,4-Dinitrophenol	
2,4-Dinitrotoluene	
2,6-Dinitrotoluene	
Diphenylamine	
1,2-Diphenylhydrazine	
Di-n-propylnitrosamine	
2,4-Dithiobiuret	
Ethyl carbamate	
Ethyl cyanide	
Ethyleneimine	
Ethylenethiourea	
Hydrazine	
Maleic hydrazide	
Malononitrile	
Methacrylonitrile	
Methacrylonitrile	
2-Methylaziridine	
4,4'-Methylenebis(2-chloroaniline)	
2-Methylacetonitrile	
2-Methyl-2-(methylthio)propionaldehyde-o-(methylcarbonyl) oxime	
N-Methyl-N'-nitro-N-Nitrosoguanidine	
Methyl parathion	
Methylthiouracil	
1-Naphthylamine	
2-Naphthylamine	
1-Naphthyl-2-thiourea	
Nicotine and salts	
p-Nitroaniline	
Nitrobenzine	
Nitroglycerin	
4-Nitrophenol	
4-Nitroquinoline-1-oxide	
Nitrosamine, N.O.S.	
N-Nitrosodl-n-butylamine	
N-Nitrosodietanolamine	
N-Nitrosodimethylamine	
N-Nitrosodimethylamine	
N-Nitroso-N-ethylurea	
N-Nitroso-N-methylethylamine	
N-Nitroso-N-methylurea	
N-Nitroso-N-methylurethane	
N-Nitroso-N-methylvinylamine	
N-Nitrosomorpholine	
N-Nitrosomorpholine	
N-Nitrosopiperidine	
Nitrosopyrrolidine	
N-Nitrososarcosine	
5-Nitro-o-toluidine	
Octamethylpyrophosphoramide	
Parathion	
Pentachloronitrobenzene (PCNB)	
Phenacetin	
Phenylendiamine	
2-Picoline	
Promamide	
1,3-Propane sulfone	
n-Propylamine	
Propylthiouracil	
Saccharin and salts	
Toluenediamine	
o-Toluidine hydrochloride	
Tolylene diisocyanate	
Tris(1-aziridinyl) phosphine sulfide	
O,O-Diethyl S-methyl ester of phosphorodithioic acid	
O,O-Diethylphosphoric acid, 3-p-nitrophenyl ester	
Diisopropylfluorophosphate (DFP)	
Dinethoate	
Disulfoton	
Hexaethyltetraphosphate	
Phosphorodithioic acid, O,O-diethyl ester	

TABLE 8

Acetonitrile
Acrolein
Acrylamide
Acrylonitrile
1,2,3,4-diepoxybutane
*1,4-Dioxane
Ethylene oxide
Formaldehyde
Glycidylaldehyde
Isobutyl alcohol
Methanethiol
Methyl ethyl ketone
Paraldehyde

*1,4-Dioxane cannot be eliminated by method 8630.

TABLE 9

Aflatoxins
Allyl alcohol
Azaserine
2-Butanone peroxide
Crotonaldehyde
Ethyl methacrylate
Ethyl methanesulfonate
Fluoroacetic acid
Formic acid
Malic anhydride
Methyl acetonitrile
Methyl methacrylate
Methyl methansulfonate
7-Oxabicyclo(2.2.1)heptane-2,3-
dicarboxylic acid
Phenol
2-Propyn-1-ol
Streptozotocin
Tetranitromethane
Thiosemicarbazide
Thiourea