DoD-Wide Occurrence of Emerging COCs in Groundwater & Soil

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Overview

- List of “Emerging” COCs analyzed
- Data sources for groundwater & soil
- Methods used to analyze occurrence
- “Short” List derived
- Summary & Conclusions

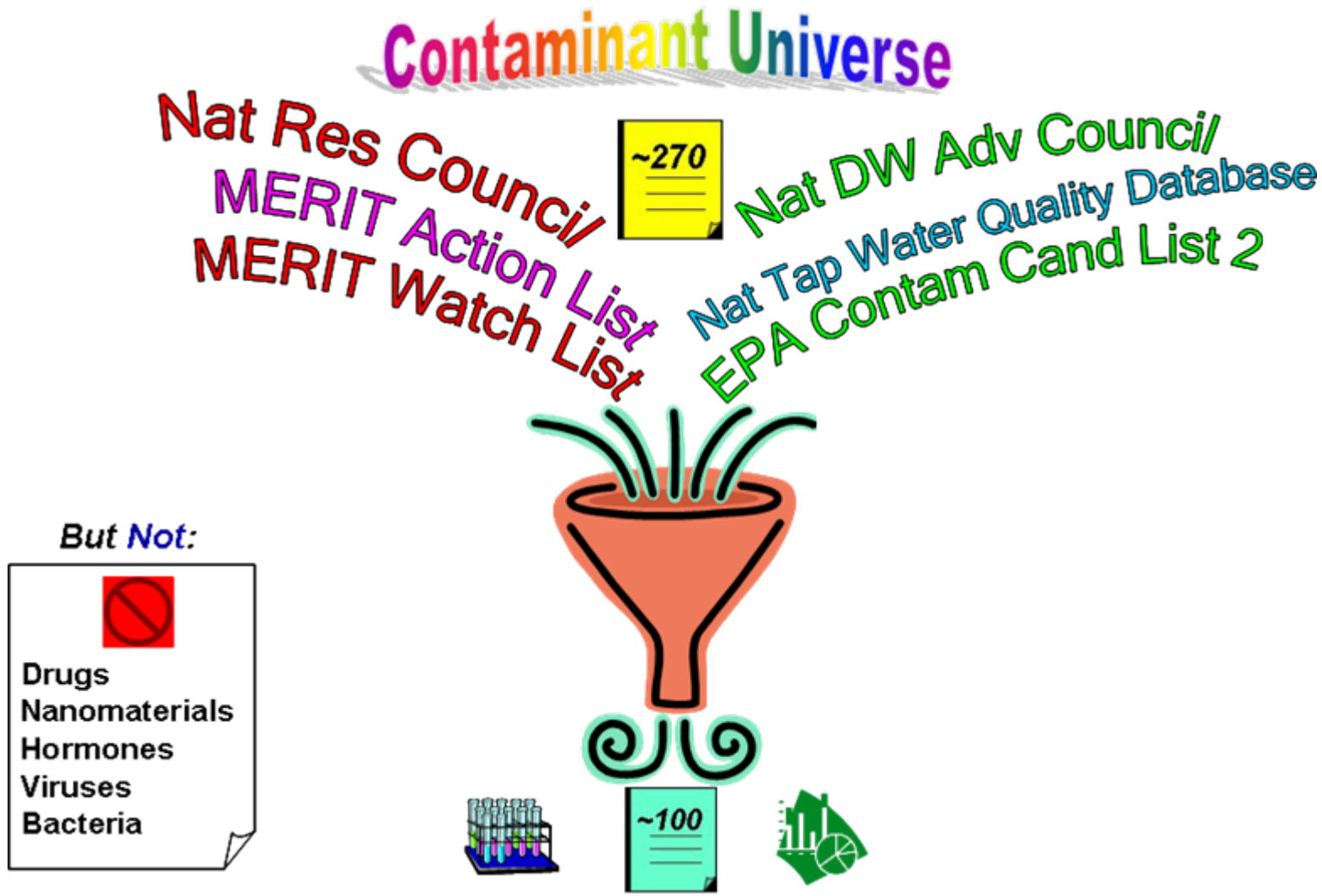
Commonly Recognized Emerging COCs
"ECOCs"

- Perchlorate
- 1,4-Dioxane
- NDMA
- RDX
- MTBE
- Polybrominated diphenyl ethers (PBDEs)
- Chromium (VI)
- Naphthalene
- 1,2,3-Trichloropropane
- PFOA & PFOS
- TCE

How Occurrence Was Analyzed . . . with Frequency Data

- Individual installations
- Individual sampling locations
  - Monitoring wells
  - Boreholes
- Number of total samples
- Detect rate (detects/total samples)
- Tendency of concentrations to exceed PRGs
- density patterns & clustering of COC groups

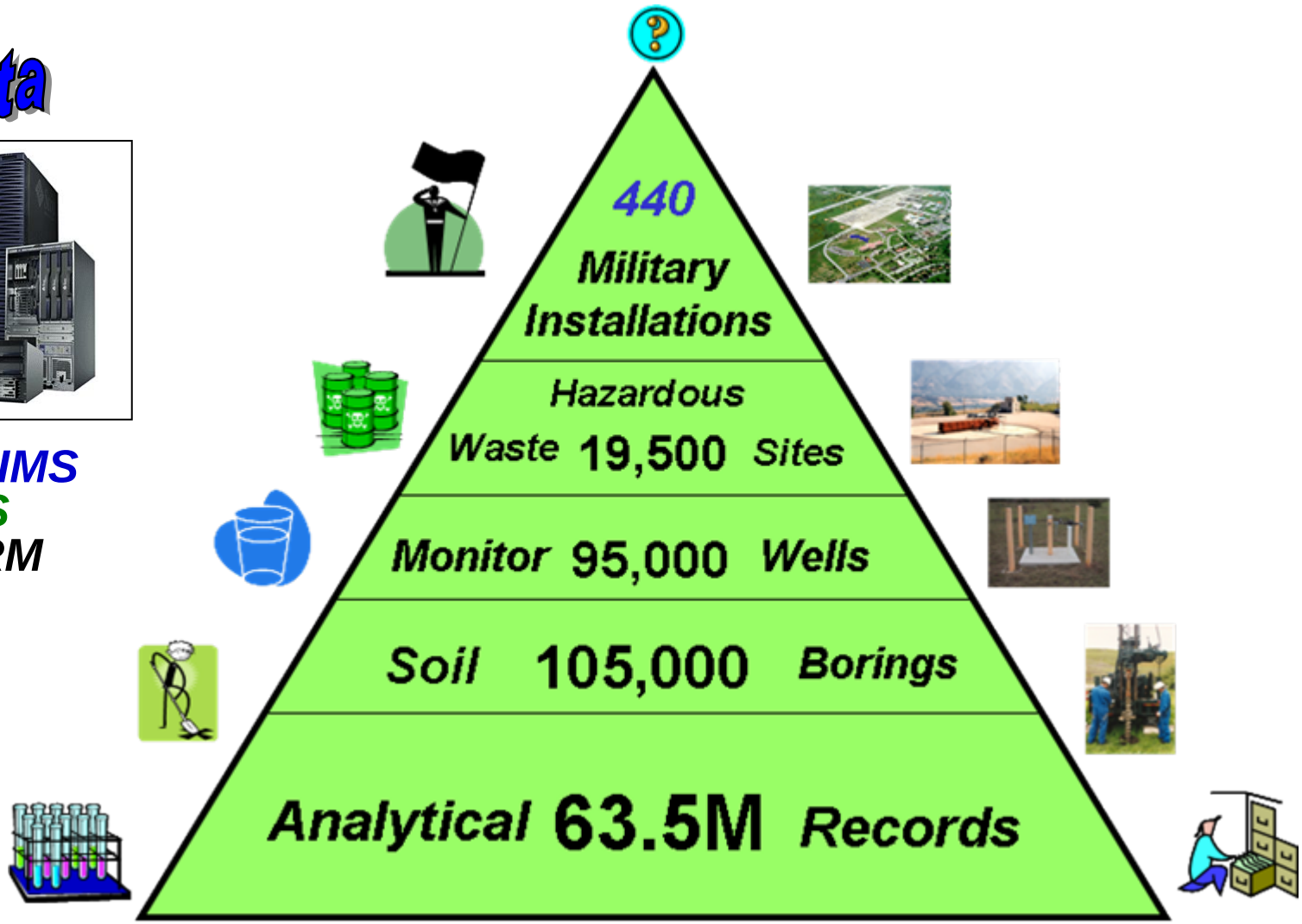
"Emerging" COC List



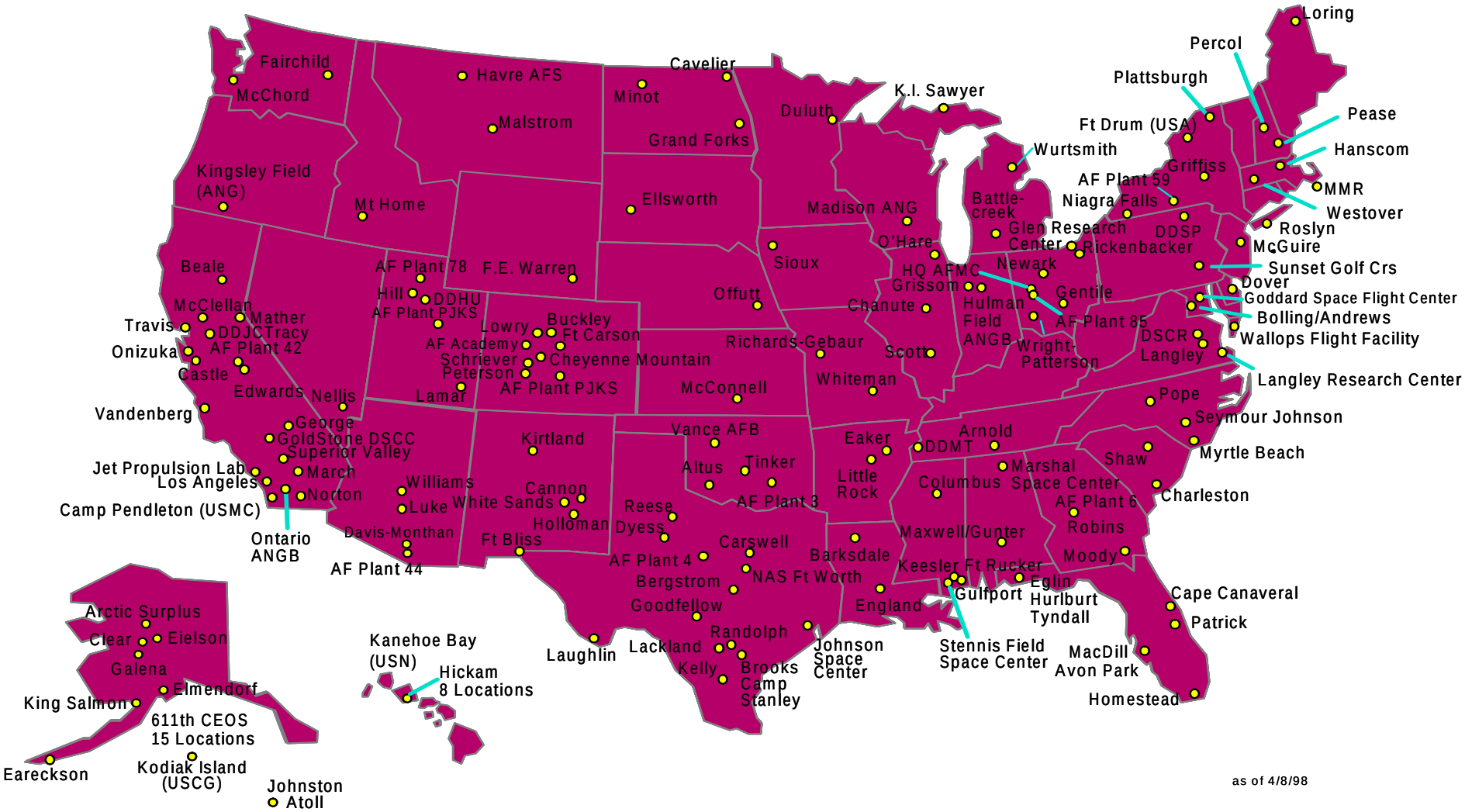
Air Force, Army, & Navy Data

Data

- ERPIMS
- ERIS
- NORM

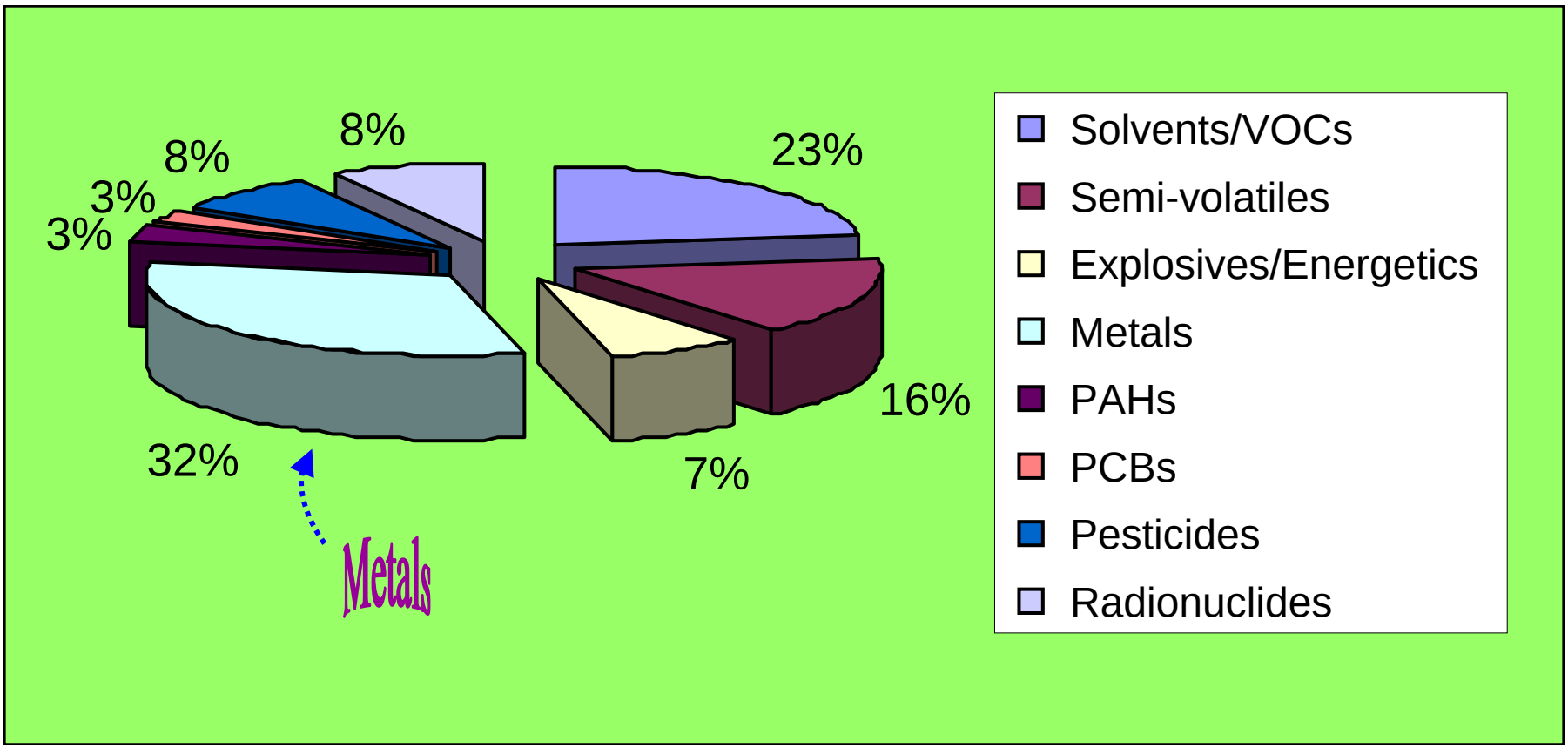


Data . . . AF Installations



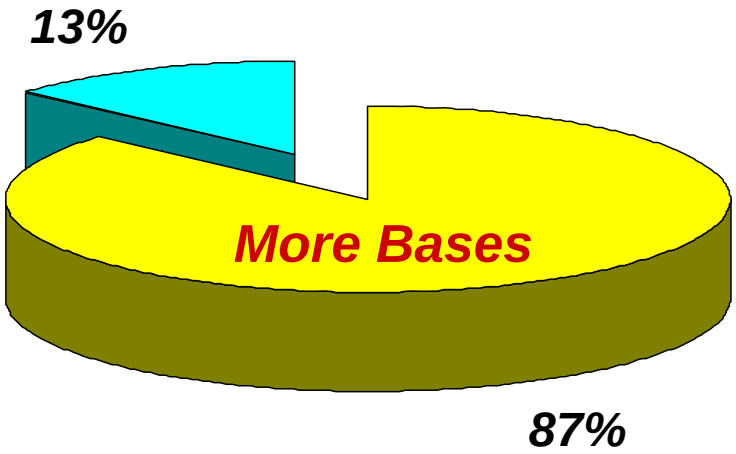
Categories of Emerging COCs

Metals are Important



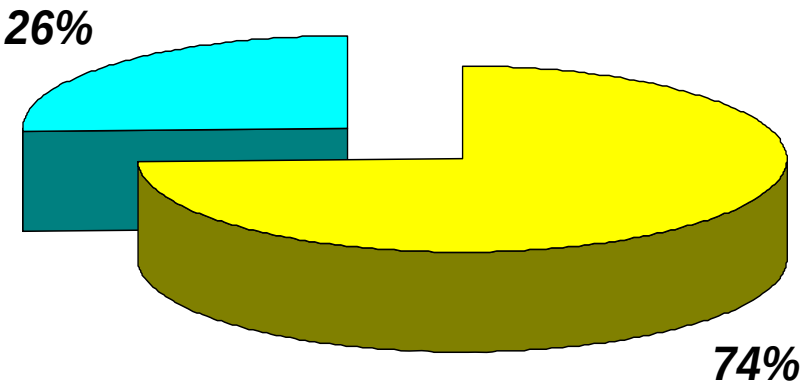
TCE is Detected in GW at More Bases

Installations with Detects / Non-Detects



= Groundwater

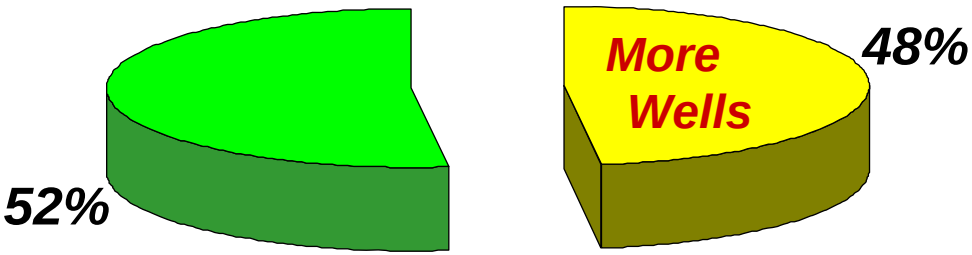
Soil =



Detected Not Detected

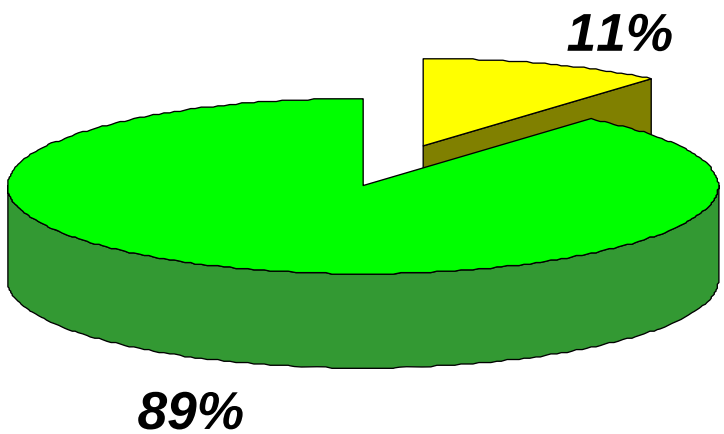
TCE is More Commonly Detected in GW

Wells and Boreholes with Detects / Non-Detects



= Groundwater

Soil =



Detected Not Detected

ECOCs Not sampled For

. . . Impact Unclear

Constituent	Media
4-NONYL PHENOL	Groundwater, Soil
PBDEs	Groundwater, Soil
PFOA and PFOS	Groundwater, Soil
DCPA ACID METABOLITES (a)	Groundwater
PHTHALIC ANHYDRIDE	Groundwater
CYANAZINE	Soil
DIPHENYL ETHER (PHENYLETHER)	Soil
FONOPHOS	Soil
HEXAZINONE	Soil
METOLACHLOR	Soil
METRIBUZIN	Soil
MOLINATE	Soil
RADIUM-224	Soil
TERBACIL	Soil
TERBUFOS	Soil

ECOCs Not Detected

Sampled But . . . Impact Insignificant

Constituent	Media
1,3-BUTADIENE (ERYTHRENE)	Groundwater, Soil
FORMALDEHYDE	Groundwater, Soil
RADIUM-223	Groundwater, Soil
ACETOCHLOR	Groundwater
CYANAZINE	Groundwater
DIAZINON	Groundwater
EPTC (S-ETHYL di-N,N-PROPYLTHIOCARBAMATE)	Groundwater
FONOPHOS	Groundwater
METOLACHLOR	Groundwater
METRIBUZIN	Groundwater
MOLINATE	Groundwater
RADIUM-224	Groundwater
TERBACIL	Groundwater
TERBUFOS	Groundwater
TRIETHYLENE GLYCOL	Groundwater
TUNGSTEN	Groundwater
1,3-DICHLOROPROPENE (CIS AND TRANS)	Soil

U.S. AIR FORCE

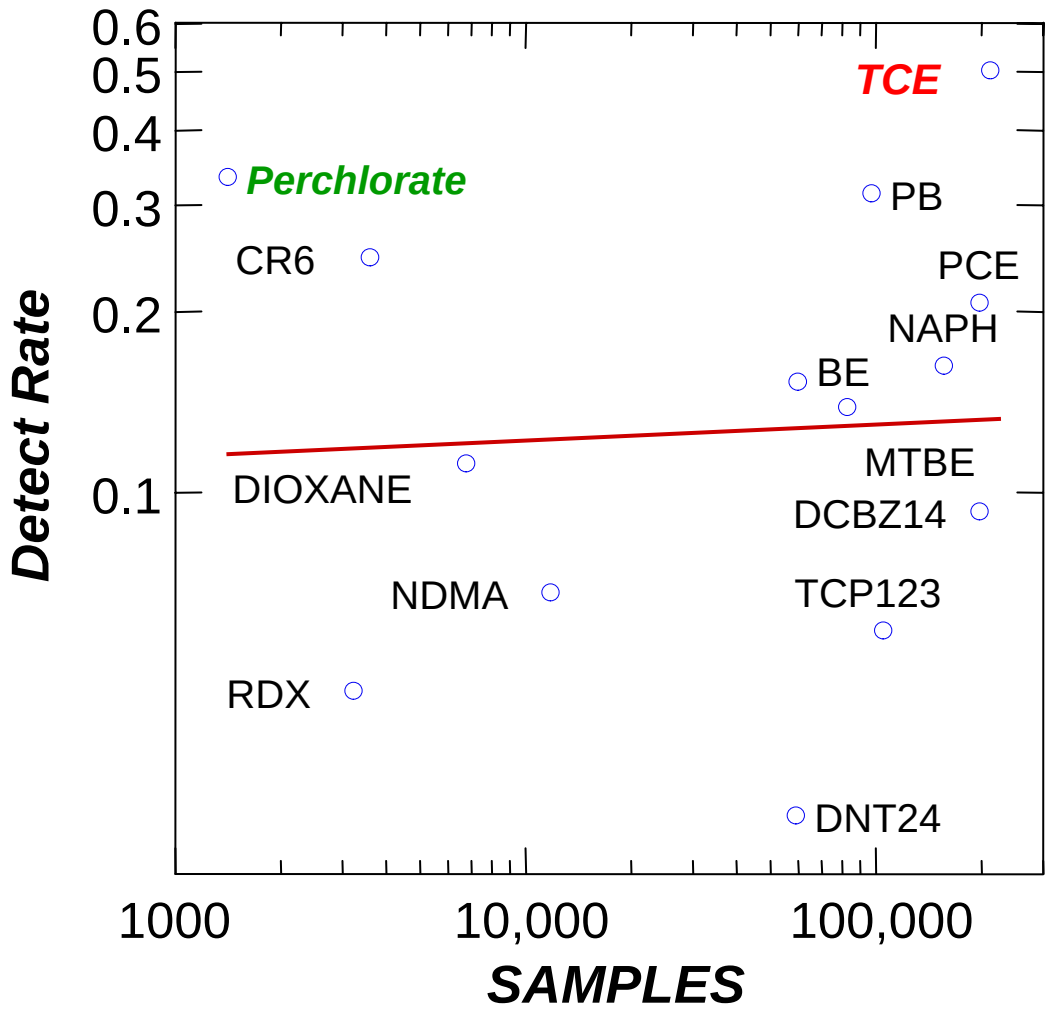
Detected Above PRGs

Occurrence is a Concern

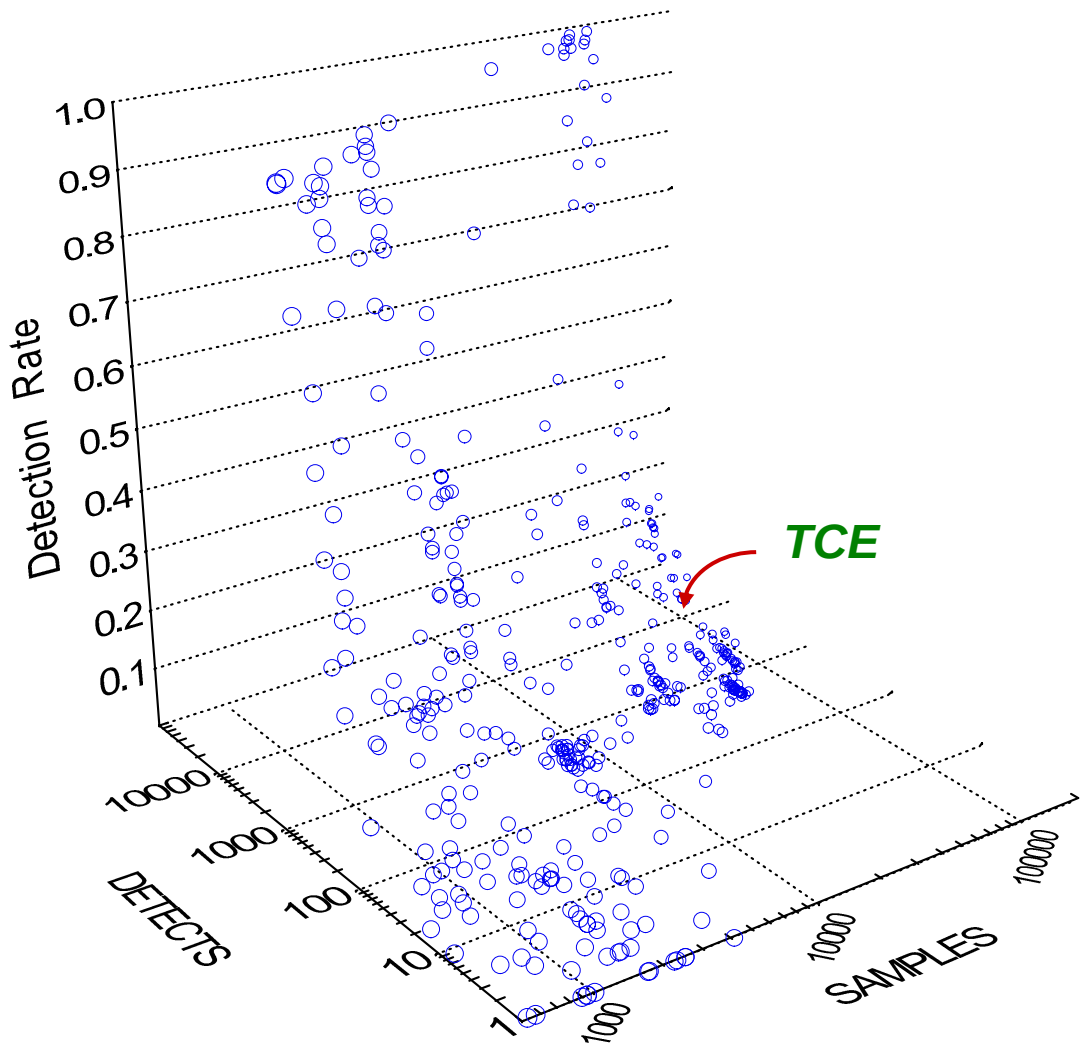
Constituent	Matrix
Aluminum, Arsenic, Antimony, Cadmium, Lead, Manganese, Vanadium	Groundwater & Soil
Diuron	Groundwater & Soil
NDMA, N-NITROSODIMETHYLAMINE	Groundwater & Soil
PCE, TETRACHLOROETHYLENE	Groundwater & Soil
TCE	Groundwater & Soil
1,2,3-TRICHLOROPROPANE	Groundwater & Soil
1,2,4-TRIMETHYLBENZENE	Groundwater & Soil
Chromium (VI)	Groundwater
1,4-Dioxane	Groundwater
MTBE, tert-BUTYL METHYL ETHER	Groundwater
Naphthalene	Groundwater
Nickel	Groundwater
Perchlorate	Groundwater
RDX	Groundwater
1,1,2,2-Tetrachloroethane	Groundwater
2,4,6-TRICHLOROPHENOL	Groundwater
Aldrin	Soil
DDE, (1,1-bis(CHLOROPHENYL)-2,2-ICHLOROETHENE)	Soil
1,4-Dichlorobenzene	Soil

Detects in Groundwater

10% is Significant

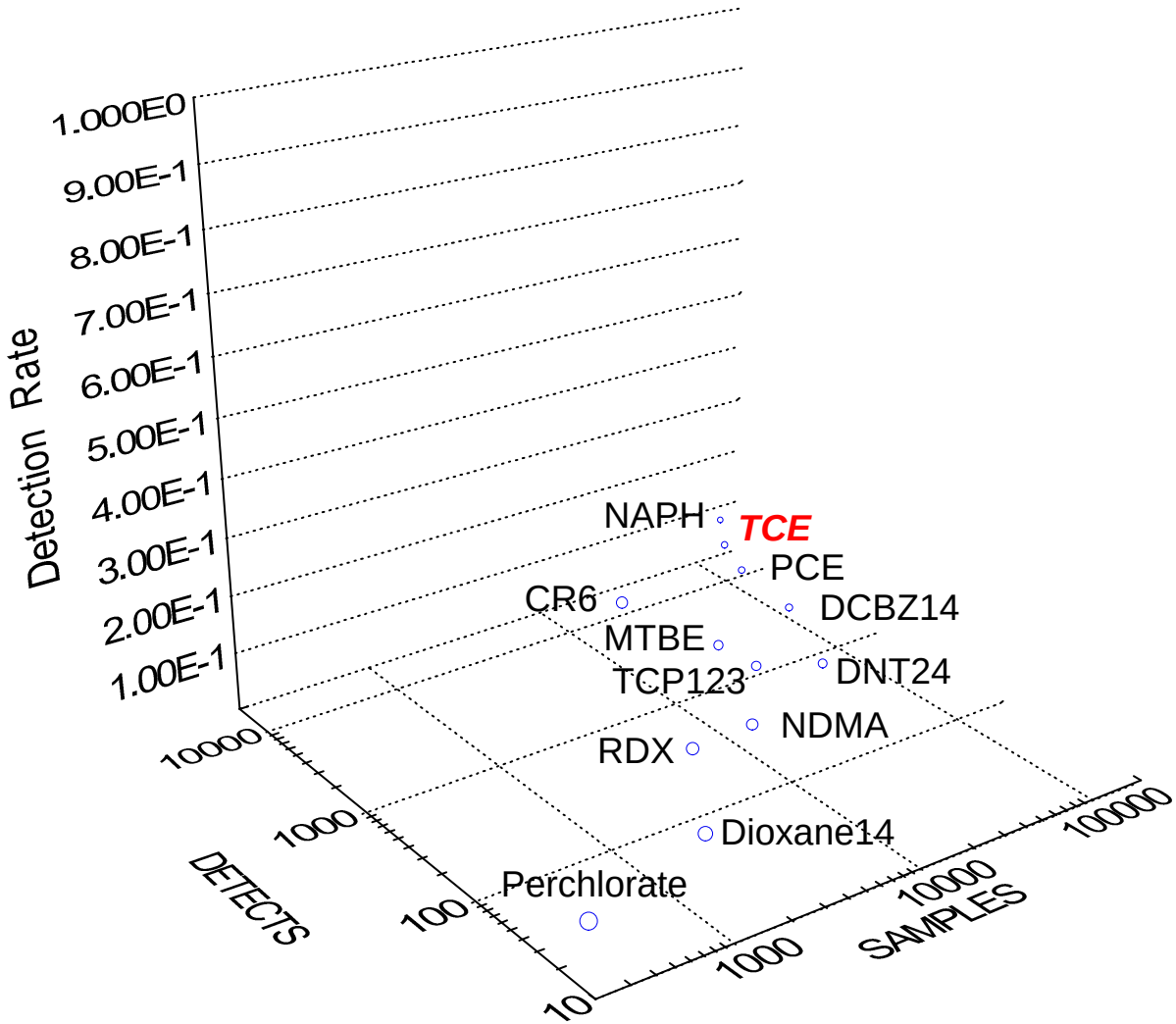


Detects in Soil



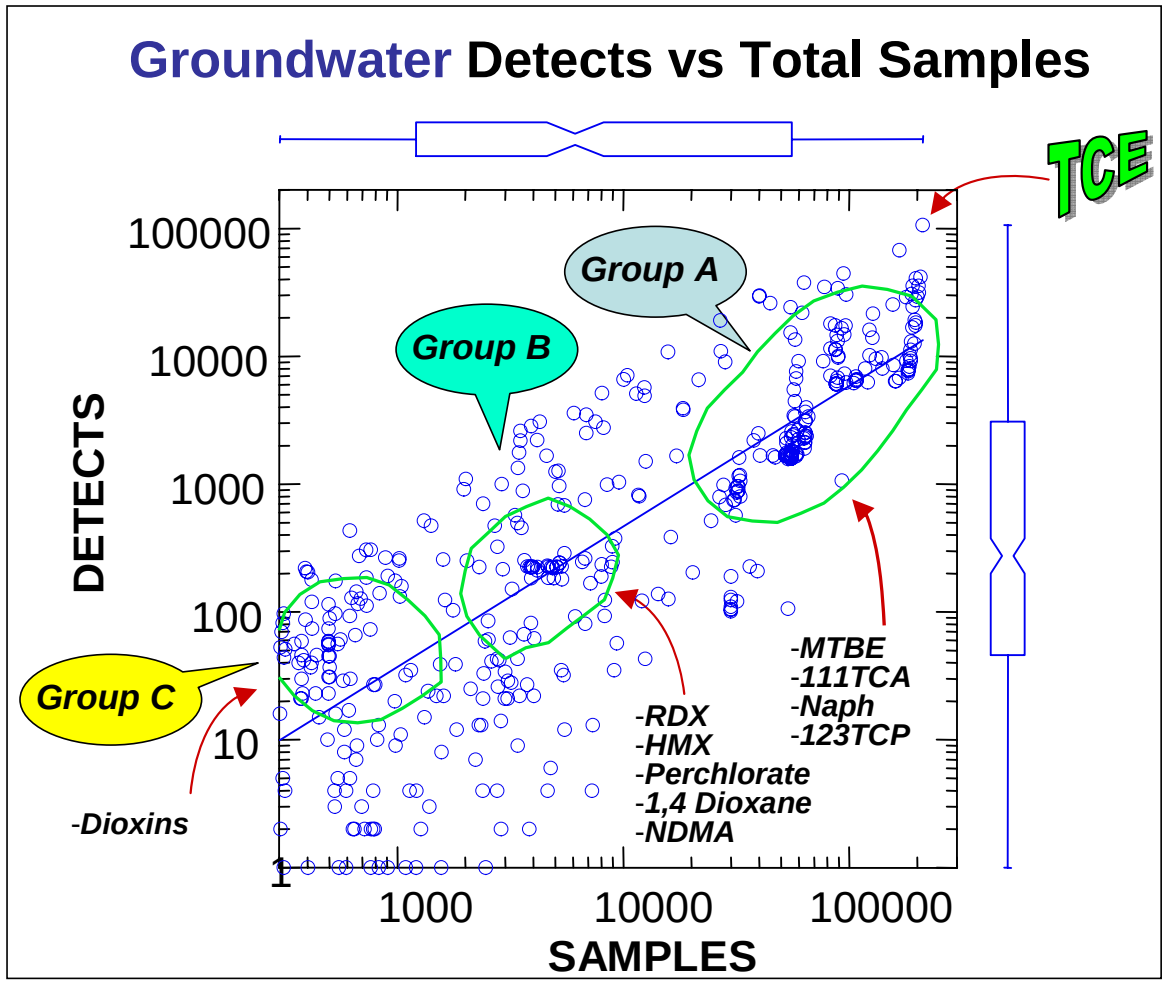
Detects in Soil

Common ECOCs



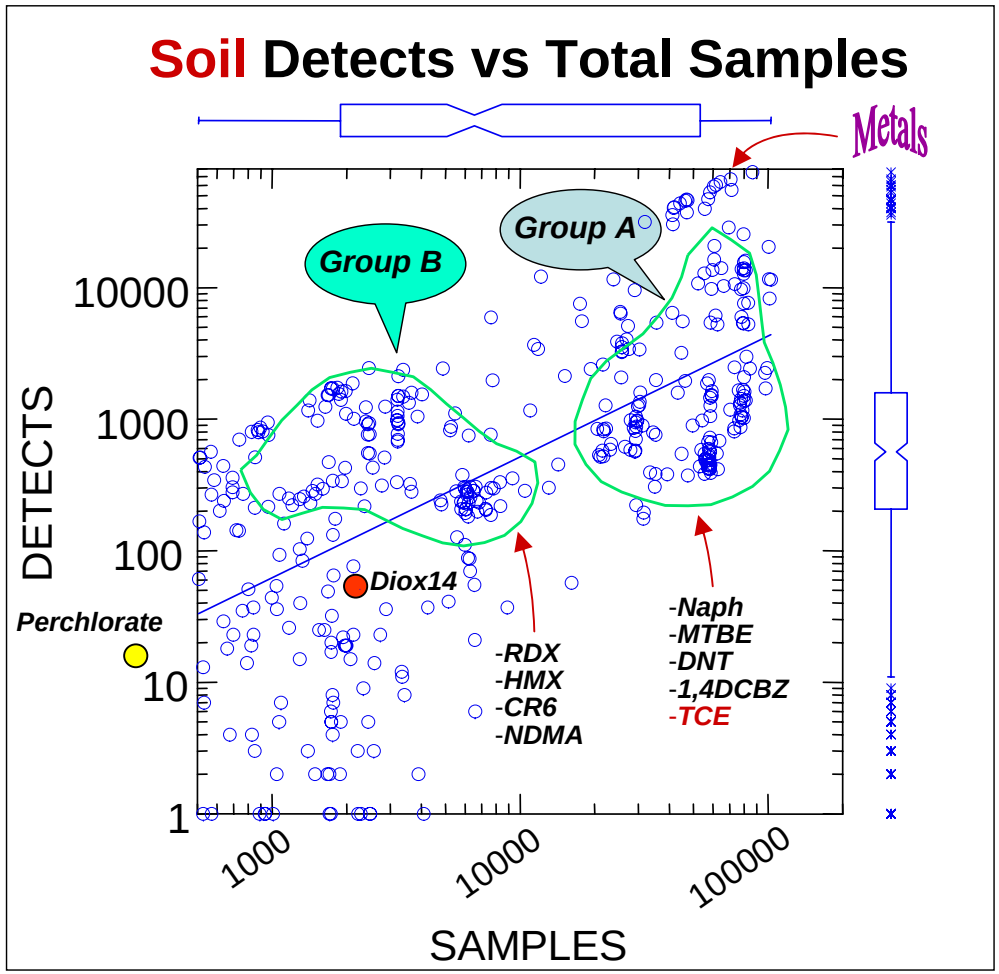
COC Groups

3 Major Groups in Groundwater



COC Groups

. . . 2 Major Groups in Soil



Detected Above PRGs
Groundwater (ug/l)

Constituent	Bases w/ Detects	Wells w/ Detects	Median Detect	Sample Size (n)	Detect Rate
MANGANESE	280	24,967	122	94,513	88%
TCE	309	23,489	18	158,895	53%
LEAD	322	18,732	5	129,160	35%
ALUMINUM	253	16,977	313	68,734	59%
ARSENIC	290	16,294	8	116,707	38%
NICKEL	293	14,211	20	103,558	40%
VANADIUM	248	12,492	11	77,506	39%
PCE (TETRACHLOROETHYLENE)	252	11,689	3	227,244	24%
CADMIUM	272	8,193	3	115,150	16%
NAPHTHALENE	212	7,472	8	150,517	39%
ANTIMONY	229	6,108	7	87,152	15%
1,2,4-TRIMETHYLBENZENE	120	4,708	6	86,131	28%
MTBE (tert-Butyl Methyl Ether)	95	3,068	4	79,831	15%
PCA (1,1,2,2-Tetrachloroethane)	141	2,982	10	15,264	7%
RDX	67	2,614	4	34,857	16%
1,2,3-TRICHLOROPROPANE	45	1,448	1	96,832	17%
2,4,6-TRICHLOROPHENOL	46	990	10	68,154	6%
NDMA (N-NITROSODIMETHYLAMINE)	25	759	6	22,255	15%
PERCHLORATE	18	665	33	10,824	26%
CHROMIUM, HEXAVALENT	90	625	11	4,748	25%
1,4-Dioxane	18	285	11	1,241	26%

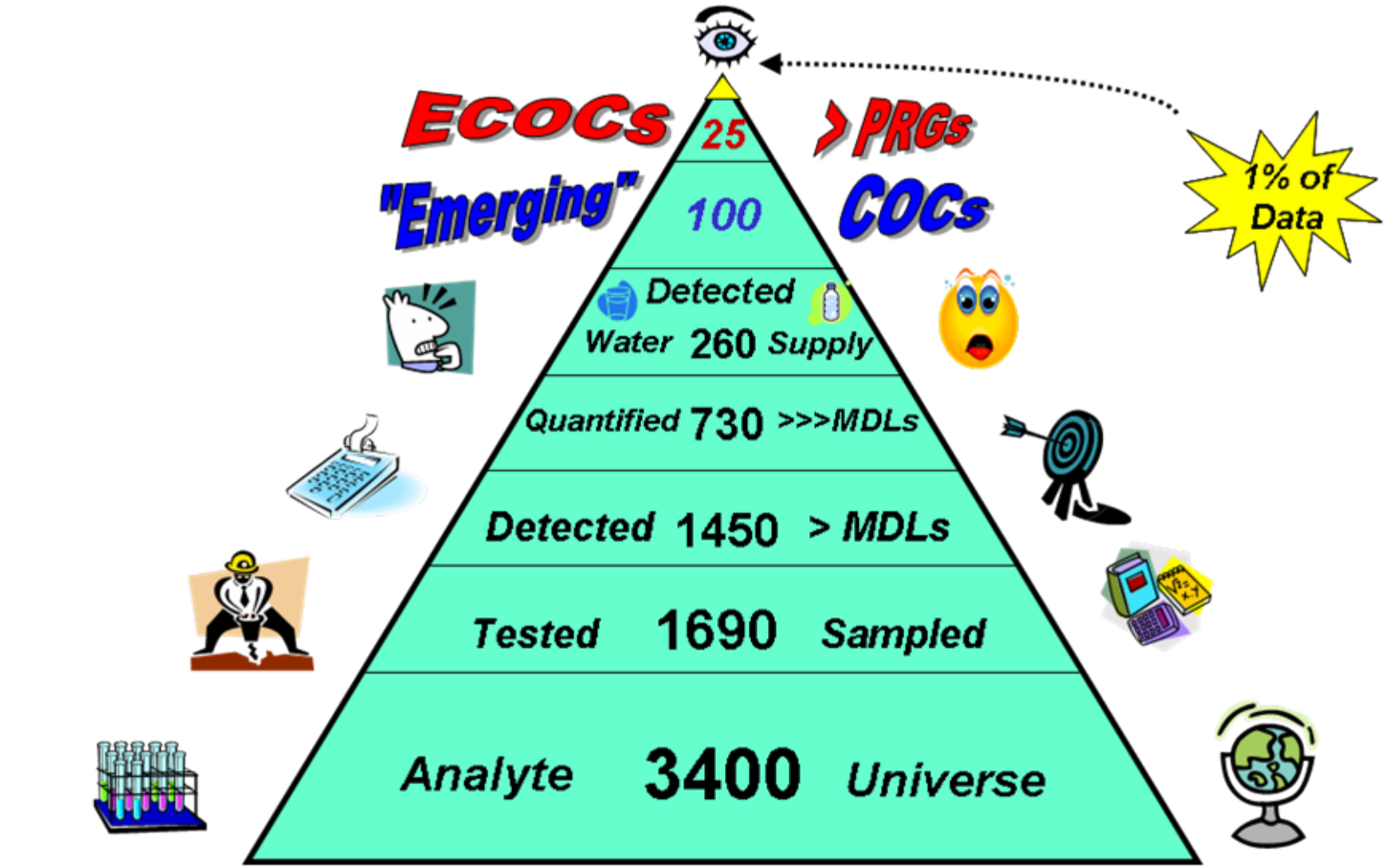
Detected Above PRGs
Soil (ug/kg)

Fewer ECOCs in Soil

Constituent	Bases w/ Detects	Boreholes w/ Detects	Median Detect	Sample Size (n)	Detect Rate
LEAD	385	59,568	17,750	178,957	86%
ARSENIC	319	45,710	5,130	155,173	76%
VANADIUM	292	38,946	16,850	108,876	98%
MANGANESE	300	38,596	334,000	108,041	99%
ALUMINUM	287	37,714	8,830,000	103,464	99%
CADMIUM	322	23,527	553	145,904	35%
ANTIMONY	276	13,467	2,115	122,269	22%
TCE	219	7,859	40	129,624	13%
PCE (TETRACHLOROETHYLENE)	206	4,932	7	124,104	15%
DDE (1,1-bis(CHLOROPHENYL)-2,2-DICHLOROETHENE)	105	3,483	8.00	44,655	20%
1,4-Dichlorobenzene	123	3,012	210.00	156,945	5%
1,2,4-TRIMETHYLBENZENE	107	2,863	65	28,192	16%
ALDRIN	142	1,566	2	62,665	4%
1,2,3-TRICHLOROPROPANE	27	851	23	32,442	7%
NDMA (N-NITROSODIMETHYLAMINE)	20	755	350	34,576	10%

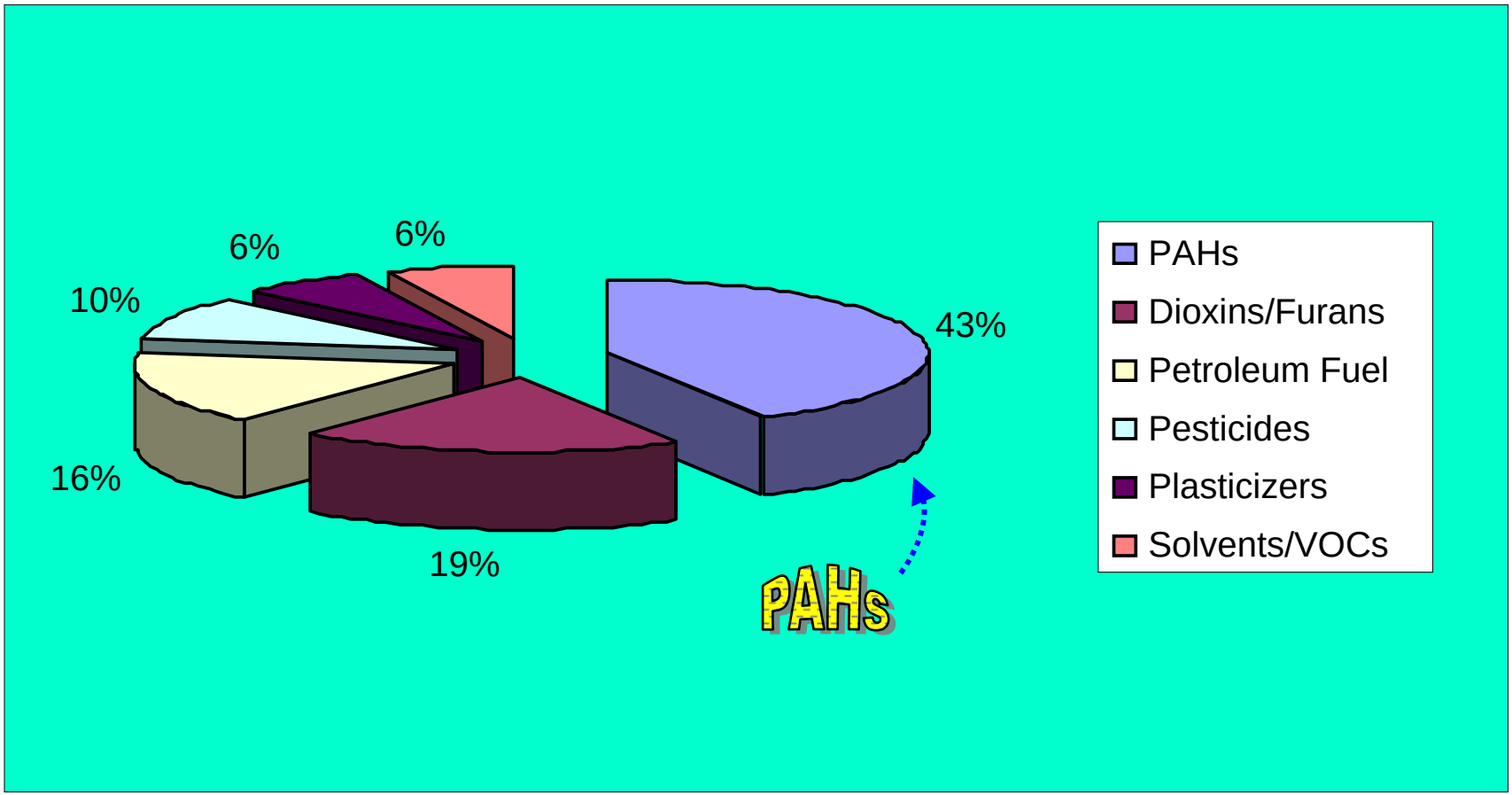
Few Constituents Exceed PRGs

Number of Analytes by Category



Categories of Additional Constituents

. . . of Potential Interest



Summary

- Multiple lists used to derive “ECOCs”
- Compared list to Air Force, Army & Navy data
- “ECOCs” exceeding PRGs differ for groundwater and soil
- Small percentage of data exceeds PRGs
- Background analysis is important for metals and PAHs

Thanks

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