

# Missouri Risk-Based Corrective Action: Major Changes and 2006 vs 2024 Comparison of Risk-Based Target Levels

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# What is not Changing in the MRBCA Guidance

- Only applicable to BVCP sites with very limited exceptions.
- Does not replace or supersede the 2013 Tanks MRBCA Guidance.
- The same “tiered” approach to risk evaluation is retained including site-specific flexibility at Tiers 2 and 3.
- The risk level “points of departure” (i.e.,  $1 \times 10^{-5}$  for carcinogens and a Hazard Index (HI) of 1 for non-carcinogens) are retained.
- Land use scenarios (residential and non-residential) are retained.
- Once final guidance updates are complete following public review/comment and DNR response to comments, guidance will be incorporated into an updated MRBCA rule.

# Major Changes to the MRBCA Guidance

- Outside contractor previously used to develop the calculator tool. Now using DHSS which should result in simpler and faster updates and fixes.
- Models and equations updated to be consistent with those used to develop/update EPA's Regional Screening Levels (RSLs).
- Multiple soil types are eliminated at Tier 1 in favor of a single soil type (sandy) that conforms more closely with parameters used to develop EPA's RSLs. There will be 1/3 the number of Tier 1 tables and Tiers 2 and 3 will still be available if site conditions vary from the conservative Tier 1 defaults.
- Soil-based RBTLs for VI have been removed due to lack of technical support but soil gas and groundwater RBTLs for Vapor Intrusion (VI) are being added.
- Construction worker exposures will be evaluated based on a "trench model" as opposed to standard residential/non-residential exposure scenarios.
- Cross pathway substitution of toxicological parameters is eliminated and as a result some chemicals that previously had RBTLs will no longer have them.
- Representative chemical concentrations will be based on 95% Upper Confidence Limits (UCLs) rather than averages for data sets that are large enough to support UCL calculations.

# Major Changes to the MRBCA Guidance (cont'd)

- Petroleum sites (roughly 1/3 of BVCP sites to date) will be able to use vertical and horizontal separation distances between a building foundation and contamination to assess VI as reflected in recent ITRC guidance and supported by EPA. As a result, some sites may “screen-out” from further VI investigation.
- The TPH fraction summation problem which resulted in high RBTLs for TPH GRO DRO ORO has been fixed. This change will result in differing RBTLs for TPH when compared with the 2013 Tanks MRBCA Guidance, at least until that guidance is updated.
- VI chapter contains much more information about VI investigation and risk evaluation while accommodating new and emerging approaches and providing clarity/flexibility. For example, use of separation distances and passive soil gas collection methods.
- Soil bulk concentration RBTLs for VI can no longer be used in risk assessment due to insufficient technical support. If VOCs are present, generally soil vapor/subslab/indoor air will have to be analyzed. Excavation endpoints for soil contaminated with VOCs to prevent potential VI will need to be determined via means other than the soil-based VI RBTLs included in the 2006 MRBCA Guidance.

# What Changes Have Been Made to the List of Chemicals and associated Risk Based Target Levels (RBTLs)?

- Number of chemicals with DTLs/RBTLs has increased from 312 to 837
- 30 PFAS chemicals added to the list with DTLs/RBTLs.
- Special treatment for hexavalent chromium via DHSS determination.
- Residential Lead to 200 mg/kg from 260 mg/kg per new EPA Lead Policy.
- Soil-based RBTLs for VI have been removed due to lack of technical support but soil gas and groundwater RBTLs for Vapor Intrusion (VI) being added.

# Comparison of 2006 versus 2024 Lowest Default Target Levels (DTLs) for Common Chemicals

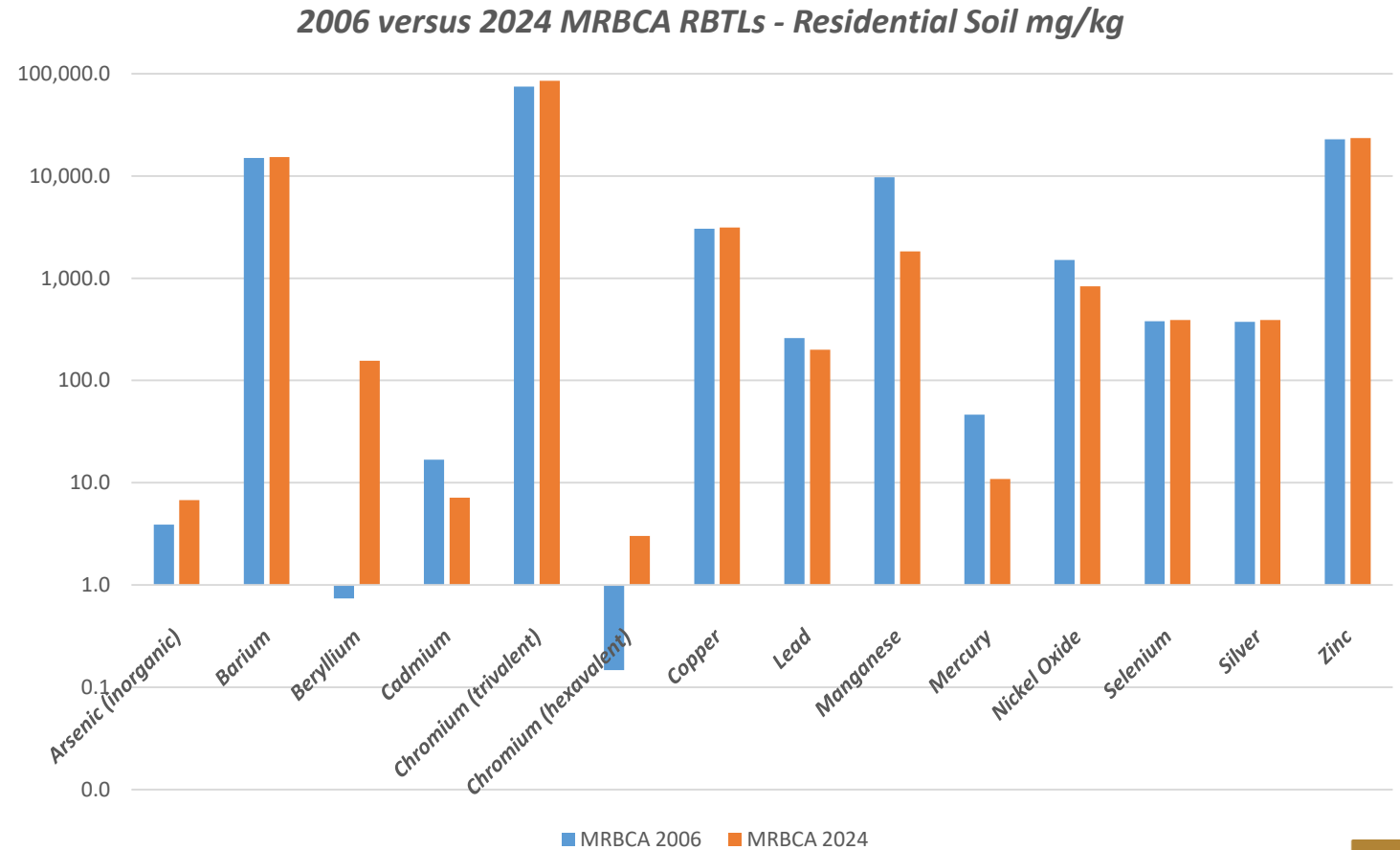
Comparison of 2006 versus 2024 Lowest Default Target Levels (DTLs) for Common Chemicals									
Chemical	2006 - Soil mg/kg	Basis	2024 - Soil mg/kg	Basis		2006 - Groundwater µg/l	Basis	2024 - Groundwater µg/l	Basis
Arsenic (inorganic)	3.89	SDC	0.292	GWP		10	DWG	10	DWG
Benzene	0.0561	GWP	0.00256	GWP		5	DWG	5	DWG
Benzo(a)pyrene	0.62	SDC	0.235	GWP		0.0102	GDC	0.2	DWG
Benzo(k)fluoranthene	62	SDC	29.4	GWP		0.646	DWG	25.1	DWG
Cadmium	9.31	GWP	7.14	SDC-R		5	DWG	5	DWG
Chlordane (technical)	5.4	GWP	0.271	GWP		0.302	DWG	2	DWG
Chloroform	0.0766	INH	0.0222	GWP		80	DWG	8.14	VIG
Chromium (total)	74,600	SDC	180,000	GWP		100	DWG	100	DWG
Chromium (hexavalent)	0.0016	GWP	0.883	GWP		0.0034	DWG	46	DWG
1,1-Dichloroethane	0.18	GWP	0.00782	GWP		24.9	DWG	27.5	DWG
1,1-Dichloroethylene	0.108	GWP	0.00251	GWP		7	DWG	7	DWG
cis-1,2-Dichloroethylene	0.521	GWP	0.0206	GWP		70	DWG	70	DWG
trans-1,2-Dichloroethylene	1.1	GWP	0.0313	GWP		100	DWG	100	DWG
1,4-dioxane	0.235	GWP	0.000942	GWP		61	DWG	4.59	DWG
Ethylbenzene	39.9	GWP	0.785	GWP		700	DWG	34.9	VIG
Fluoranthene	2,280	SDC	89.1	GWP		164	DWG	802	DWG
Lead	3.74	GWP	13.5	GWP		15	DWG	15	DWG
Mercury (elemental)	2.19	INH	0.889	VIG		50.7	INH	0.104	GWP
Methyl Ethyl Ketone	7.3	GWP	1.16	GWP		3,640	DWG	5,570	DWG
Naphthalene	0.325	GWP	0.00385	GWP		1.09	DWG	1.17	DWG
Pentachlorophenol	0.0894	GWP	0.00138	GWP		1	DWG	1	DWG
Polychlorinated biphenyls (high risk)	2.2	SDC	0.00311	GWP		0.0634	GDC	0.0199	DWG
1,1,1,2-Tetrachloroethane	0.0715	GWP	0.00219	GWP		5.27	DWG	5.74	DWG
1,1,2,2-Tetrachloroethane	0.0105	GWP	0.000296	GWP		0.689	DWG	0.757	DWG
Tetrachloroethylene (PCE)	0.141	GWP	0.00227	GWP		5	DWG	5	DWG
Trichloroethylene (TCE)	0.141	GWP	0.00179	GWP		5	DWG	5	DWG
TPH – GRO	385	INH	100	GWP		18,100	DWG	133	DWG
TPH – DRO	4,150	INH	100	GWP		34,300	DWG	154	DWG
TPH – ORO	124,000	SDC	1000	GWP		31,800	DWG	802	DWG
2,3,7,8-tetrachlorodibenzo-p-dioxin**	NA	NA	0.000015	GWP		NA	NA	0.00003	DWG
Toluene	29.8	GWP	0.692	GWP		1,000	DWG	1000	DWG
1,1,1-trichloroethane	4.24	GWP	0.0701	GWP		200	DWG	200	DWG
1,1,2-trichloroethane	0.0448	GWP	0.00162	GWP		5	DWG	0.93	CWG
1,2,4-trimethylbenzene	3.93	GWP	0.0808	GWP		7.06	DWG	55.7	DWG
Vinyl Chloride	0.0192	GWP	0.00069	GWP		2	DWG	1.47	VIG
Xylenes (total)	24.7	INH	9.9	GWP		10,000	DWG	385	VIG

SDC = Soil Direct Contact GWP = Groundwater Protection (leaching) INH = Inhalation NA = Not Available DWG = Domestic Groundwater Use GDC = Groundwater Direct Contact  
VIG = Vapor intrusion Groundwater, CWG = Construction Worker Exposure to Groundwater **Red = decreased DTL**, **Yellow = same DTL**, **Green = increased DTL**



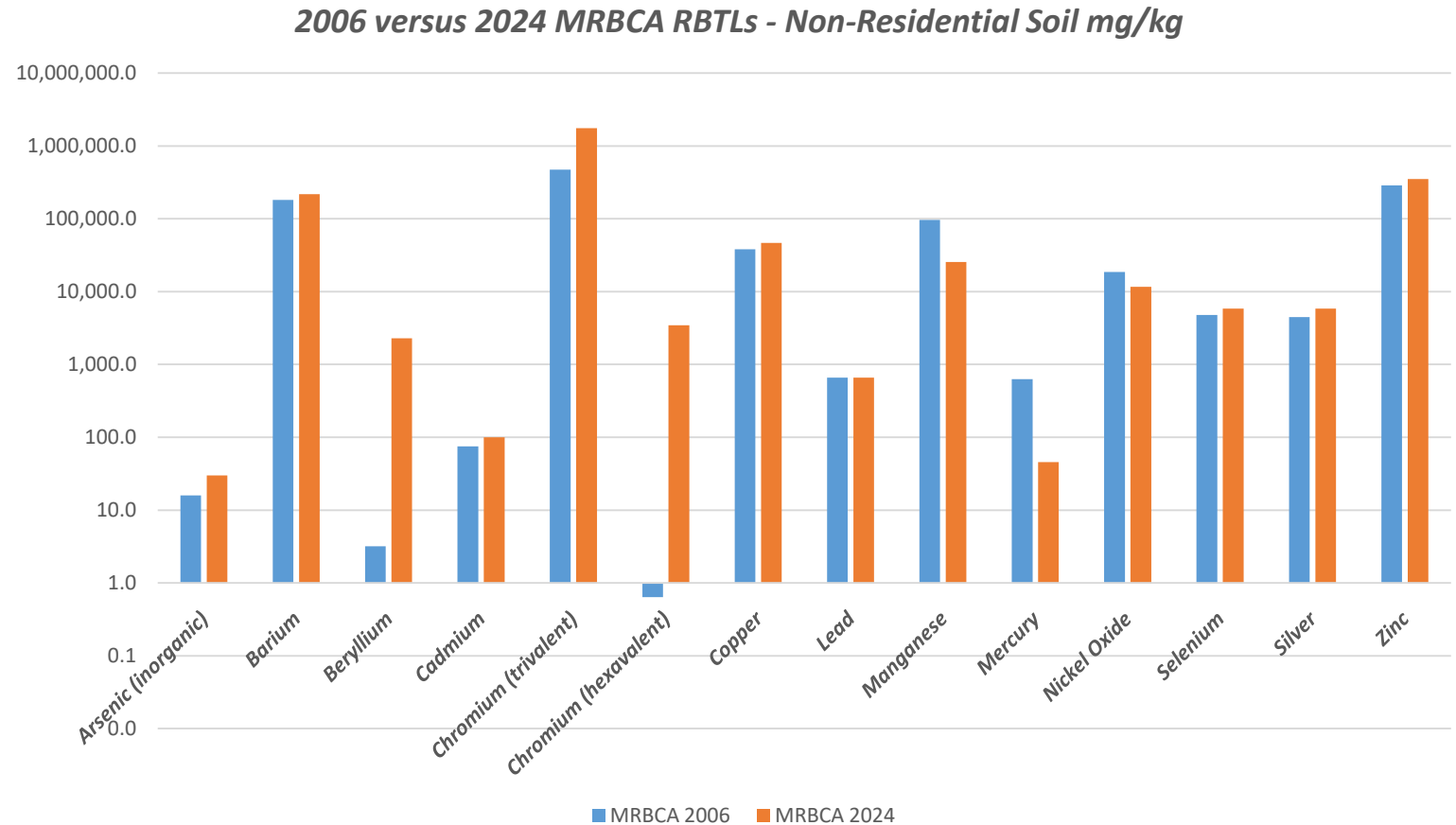
# Residential: Comparison of Selected 2006 Soil Type 1\* (Sandy) RBTLs and 2024 MRBCA Draft RBTLs - Metals

Chemical	Residential Soil (mg/kg)	
	2006	2024
Arsenic (inorganic)	3.89	6.77
Barium	15,000	15,300
Beryllium	0.737	156
Cadmium	16.8	7.14
Chromium (trivalent)	74,600	85,000
Chromium (hexavalent)	0.147	3.01
Copper	3,040	3,130
Lead	260	200
Manganese	9,680	1,830
Mercury	46.3	10.9
Nickel Oxide	1,510	835
Selenium	380	391
Silver	374	391
Zinc	22,800	23,500



# Non-Residential: Comparison of Selected 2006 Soil Type 1\* (Sandy) RBTLs and 2024 MRBCA Draft RBTLs - Metals

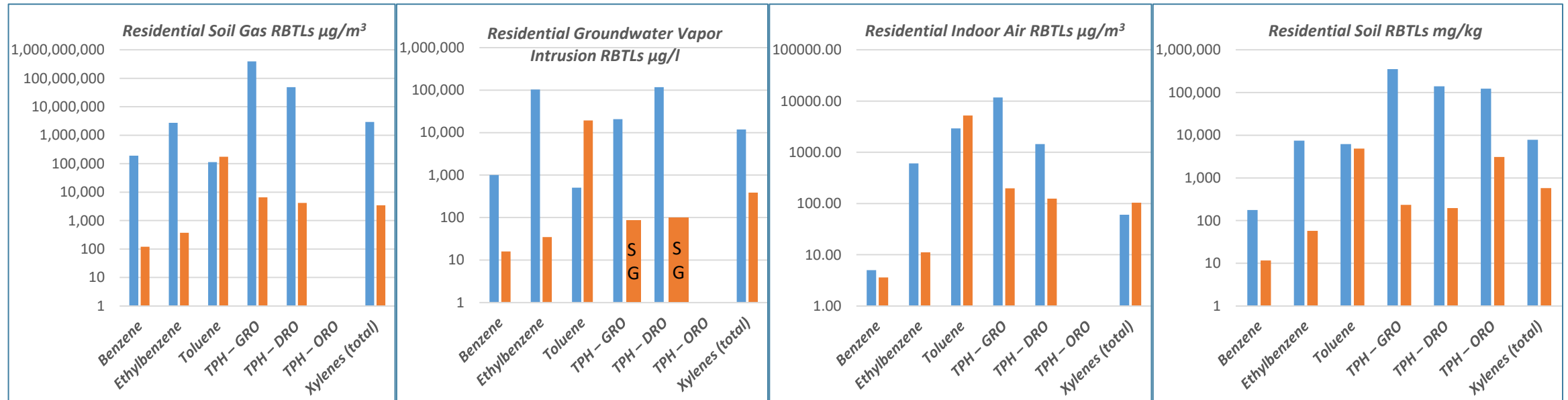
Chemical	Non-Residential Soil (mg/kg)	
	2006	2024
Arsenic (inorganic)	15.9	30
Barium	181,000	217,000
Beryllium	3.19	2,290
Cadmium	74.8	99.7
Chromium (trivalent)	472,000	1,750,000
Chromium (hexavalent)	0.639	3,450
Copper	38,100	46,700
Lead	660	660
Manganese	96,700	25,600
Mercury	630	45.6
Nickel Oxide	18,600	11,600
Selenium	4,780	5,840
Silver	4,480	5,840
Zinc	288,000	350,000





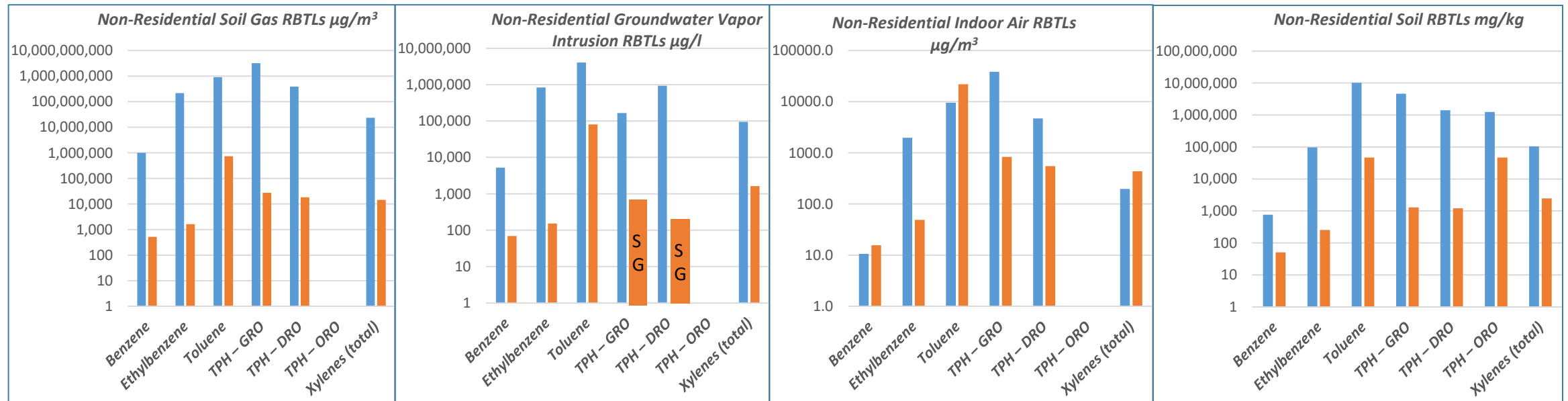
# Residential: Comparison of Selected 2006 Soil Type 1\* (Sandy) RBTLs and 2024 MRBCA Draft RBTLs - Petroleum

Chemical	Soil Gas ( $\mu\text{g}/\text{m}^3$ )		Groundwater VI ( $\mu\text{g}/\text{l}$ )		Indoor Air ( $\mu\text{g}/\text{m}^3$ )		Soil ( $\text{mg}/\text{kg}$ )	
	2006	2024	2006	2024	2006	2024	2006	2024
Benzene	190,000	120	1,000	15.9	4.98	3.6	177	11.6
Ethylbenzene	2,720,000	374	103,000	34.9	606	11.2	7,450	57.8
Toluene	113,000	174,000	508	19,200	2,920	5,210	6,210	4,890
TPH – GRO	397,000,000	6,600	20,800	Use Soil Gas (SG)	11,800	198	354,000	233
TPH – DRO	48,700,000	4,170	117,000	Use Soil Gas (SG)	1,450	125	140,000	196
TPH – ORO							124,000	3,100
Xylenes (total)	2,910,000	3,480	11,800	385	60.6	104	7,830	576



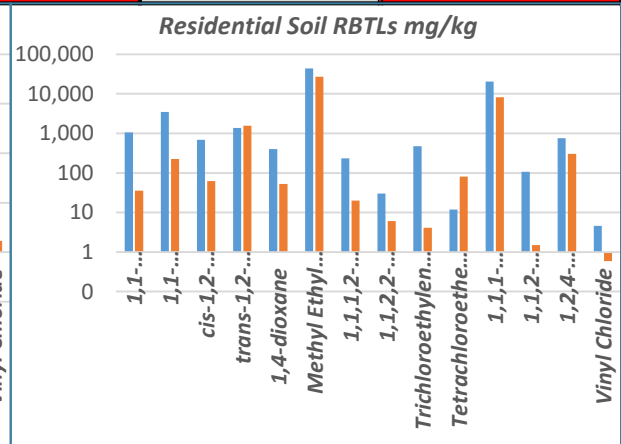
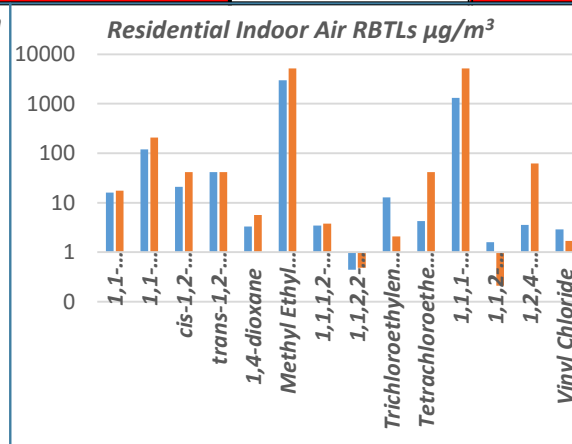
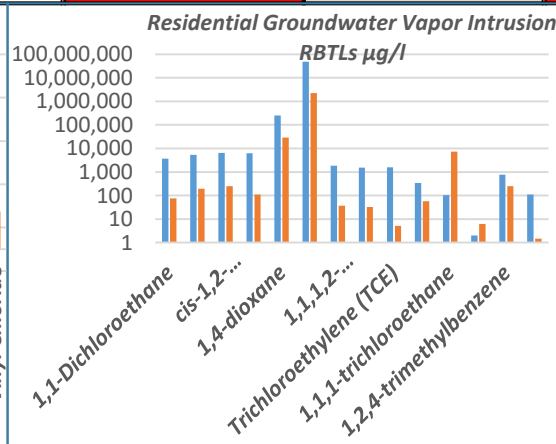
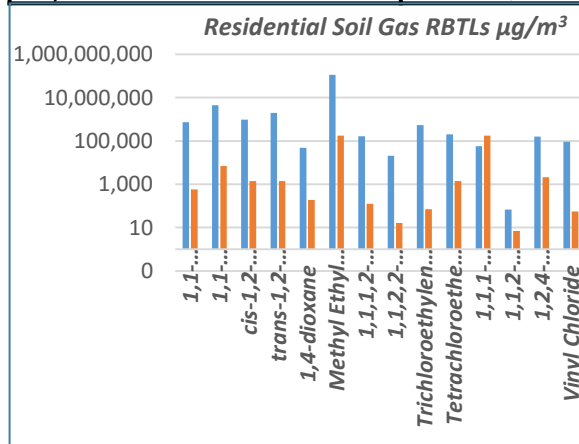
# Non-Residential: Comparison of Selected 2006 Soil Type 1\* (Sandy) RBTLs and 2024 MRBCA Draft RBTLs - Petroleum

Chemical	Soil Gas ( $\mu\text{g}/\text{m}^3$ )		Groundwater VI ( $\mu\text{g}/\text{l}$ )		Indoor Air ( $\mu\text{g}/\text{m}^3$ )		Soil (mg/kg)	
	2006	2024	2006	2024	2006	2024	2006	2024
Benzene	998,000	524	5,250	69.3	10.6	15.7	763	50.8
Ethylbenzene	218,000,000	1,640	832,000	152	1,980	49.1	97,500	254
Toluene	909,000,000	730,000	4,080,000	80,700	9,540	21,900	10,300,000	46,800
TPH – GRO	3,190,000,000	27,700	167,000	Use Soil Gas (SG)	38,500	832	4,650,000	1,300
TPH – DRO	392,000,000	18,400	938,000	Use Soil Gas (SG)	4,730	552	1,410,000	1,210
TPH – ORO							1,250,000	46,700
Xylenes (total)	23,400,000	14,600	94,900	1,620	198	438	104,000	2,490



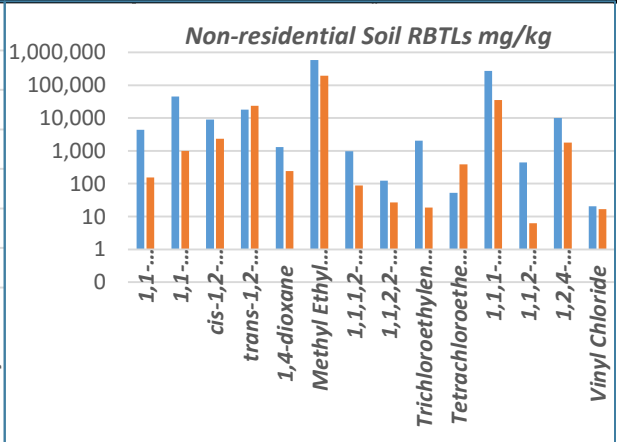
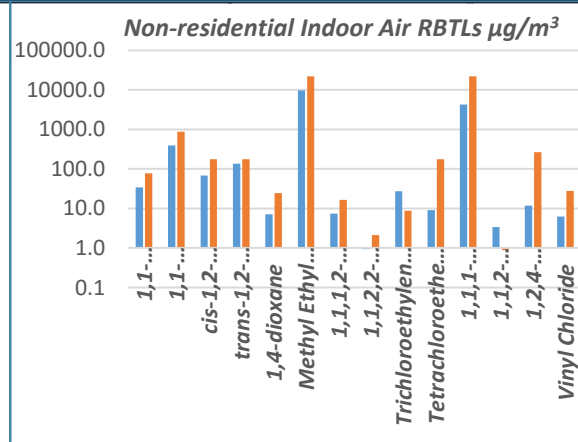
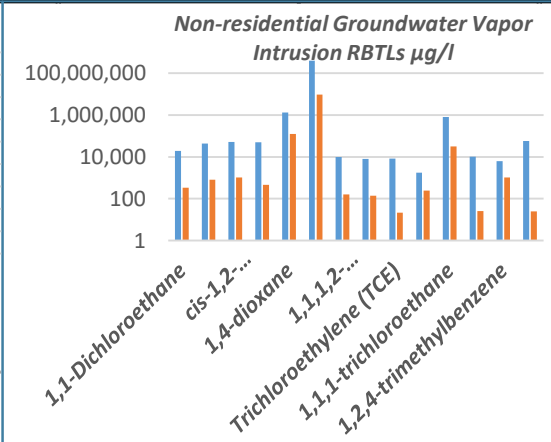
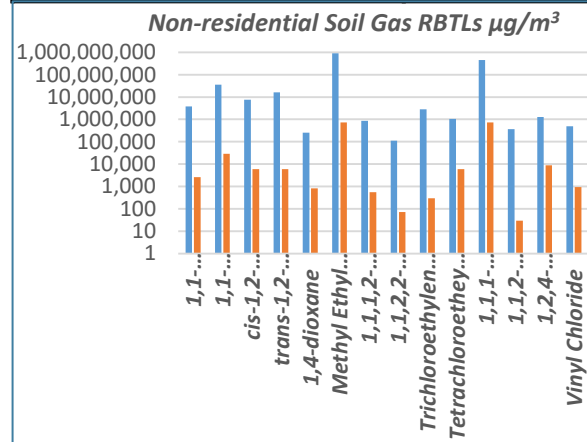
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Chemical	Soil Gas ( $\mu\text{g}/\text{m}^3$ )		Groundwater VI ( $\mu\text{g}/\text{l}$ )		Indoor Air ( $\mu\text{g}/\text{m}^3$ )		Soil (mg/kg)	
	2006	2024	2006	2024	2006	2024	2006	2024
1,1-Dichloroethane	728,000	585	3,730	76.4	16	17.5	1,060	35.5
1,1-Dichloroethylene	4,460,000	6,950	5,380	195	119	209	3,470	227
cis-1,2-Dichloroethylene	954,000	1,390	6,550	250	20.9	41.7	683	63
trans-1,2-Dichloroethylene	1,990,000	1,390	6,240	109	41.8	41.7	1,370	1,560
1,4-dioxane	48,500	187	250,000	28,600	3.33	5.62	400	53
Methyl Ethyl Ketone	112,000,000	174,000	48,900,000	2,240,000	2,980	5,210	44,200	27,000
1,1,1,2-Tetrachloroethane	164,000	126	1,870	37.1	3.46	3.79	233	19.9
1,1,2,2-Tetrachloroethane	20,900	16.1	1,540	32.3	0.442	0.484	30.2	6.04
Trichloroethylene (TCE)	546,000	69.5	1,600	5.18	12.8	2.09	477	4.12
Tetrachloroethylene (PCE)	200,000	1,390	338	57.6	4.27	41.7	11.8	81
1,1,1-trichloroethane	56,600	174,000	102	7,420	1,310	5,210	20,600	8,150
1,1,2-trichloroethane	69.1	6.95	1.98	6.19	1.6	0.209	106	1.5
1,2,4-trimethylbenzene	161,000	2,090	775	248	3.58	62.6	749	303
Vinyl Chloride	92,400	55.9	111	1.47	2.91	1.68	4.56	0.592



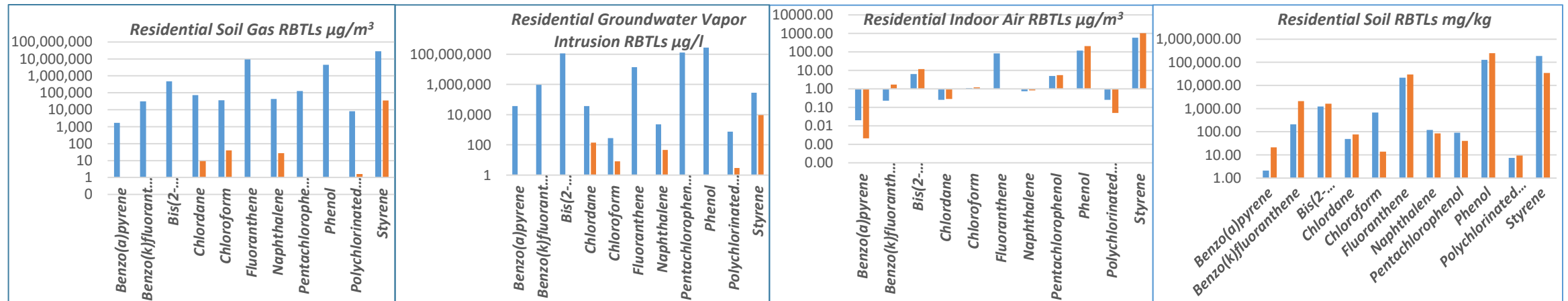
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Chemical	Soil Gas ( $\mu\text{g}/\text{m}^3$ )		Groundwater VI ( $\mu\text{g}/\text{l}$ )		Indoor Air ( $\mu\text{g}/\text{m}^3$ )		Soil (mg/kg)	
	2006	2024	2006	2024	2006	2024	2006	2024
1,1-Dichloroethane	3,820,000	2,560	19,500	334	34.1	76.7	4,420	155
1,1-Dichloroethylene	35,900,000	29,200	43,300	821	389	876	45,600	995
cis-1,2-Dichloroethylene	7,670,000	5,840	52,700	1,050.00	68.2	175	8,970	2,340
trans-1,2-Dichloroethylene	16,000,000	5,840	50,200	457.00	136	175	17,900	23,400
1,4-dioxane	254,000	818	1,310,000	125,000	7.08	24.5	1,300	245
Methyl Ethyl Ketone	901,000,000	730,000	393,000,000	9,410,000	9,740	21,900	579,000	193,000
1,1,1,2-Tetrachloroethane	860,000	552	9,820	162	7.37	16.6	967	87.5
1,1,2,2-Tetrachloroethane	110,000	70.5	8,060	141	0.94	2.11	125	26.7
Trichloroethylene (TCE)	2,860,000	292	8,410	21.8	27.3	8.76	2,050	18.7
Tetrachloroethylene (PCE)	1,050,000	5,840	1,770	242	9.09	175	52.7	389
1,1,1-trichloroethane	455,000,000	730,000	822,000	31,100	4,280	21,900	269,000	35,600
1,1,2-trichloroethane	362,000	29.2	10,400	26	3.41	0.876	442	6.31
1,2,4-trimethylbenzene	1,290,000	8,760	6,230	1,040	11.7	263	10,100	1,770
Vinyl Chloride	484,000	929	58,200	24.5	6.2	27.9	20.4	16.8



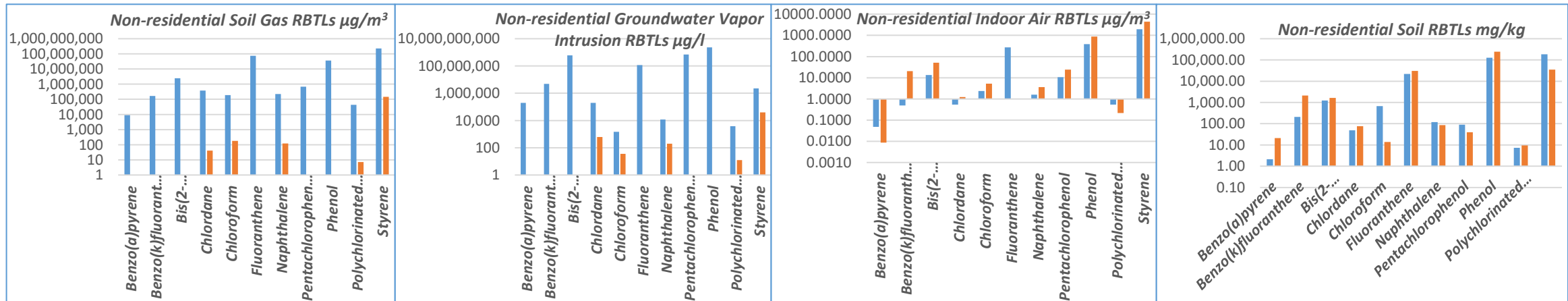
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Chemical	Soil Gas ( $\mu\text{g}/\text{m}^3$ )		Groundwater VI ( $\mu\text{g}/\text{l}$ )		Indoor Air ( $\mu\text{g}/\text{m}^3$ )		Soil ( $\text{mg}/\text{kg}$ )	
	2006	2024	2006	2024	2006	2024	2006	2024
Benzo(a)pyrene	1,700		37,300		0.02	0.00209	0.62	1.15
Benzo(k)fluoranthene	31,400		937,000		0.23	1.69	62	115
Bis(2-ethylhexyl)phthalate	470,000		114,000,000		6.41	11.7	347	388
Chlordane	72,800	9.36	37,100	141	0.256	0.281	13.8	17.1
Chloroform	36,000	40.7	280	8.14	1.11	1.22	180	3.16
Fluoranthene	9,270,000		14,200,000		83.6		2,280	2,390
Naphthalene	42,600	27.5	2,250	45.9	0.748	0.826	36.3	20.1
Pentachlorophenol	128,000		130,000,000		4.98	5.51	29.7	10.2
Phenol	4,510,000		281,000,000		119	209	11,700	19,000
Polychlorinated biphenyls (high risk)	8,290	1.64	741	2.9	0.256	0.0493	2.2	2.28
Styrene	28,300,000	34,800	286,000	9,280	597	1040	14,200	6,000



# Non-Residential: Comparison of Selected 2006 Soil Type 1\* (Sandy) RBTLs and 2024 MRBCA Draft RBTLs – SVOCs/Other

Chemical	Soil Gas ( $\mu\text{g}/\text{m}^3$ )		Groundwater VI ( $\mu\text{g}/\text{l}$ )		Indoor Air ( $\mu\text{g}/\text{m}^3$ )		Soil (mg/kg)	
	2006	2024	2006	2024	2006	2024	2006	2024
Benzo(a)pyrene	8,930		195,000		0.0489	0.00876	2.11	21.1
Benzo(k)fluoranthene	165,000		4,910,000		0.489	20.4	210	2,110
Bis(2-ethylhexyl)phthalate	2,460,000		597,000,000		13.6	51.1	1,230	1,640
Chlordane	382,000	40.9	194,000	617	0.545	1.23	48.7	76.6
Chloroform	189,000	178	1,470	35.5	2.37	5.33	678	13.8
Fluoranthene	74,500,000		114,000,000		273		21,800	30,100
Naphthalene	223,000	120	11,800	201	1.59	3.61	119	85.7
Pentachlorophenol	672,000		681,000,000		10.6	24	90	39.7
Phenol	36,300,000		2,260,000,000		389	876	128,000	246,000
Polychlorinated biphenyls (high risk)	43,400	7.17	3,880	12.7	0.545	0.215	7.38	9.42
Styrene	227,000,000	146,000	2,300,000	39,000	1,950	4,380	186,000	34,800



# Questions?

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