



CSR Vapour Standards

Stakeholder Workshop

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Vapour Standards - Outline

1. Schedule 11

- application
- errors

2. Vapour standards derivation

- toxicology
- chemistry

3. VPHv

4. Draft analytical methods

5. Soil vapour attenuation table

SCHEDULE 11
GENERIC NUMERICAL VAPOUR STANDARDS LJM

COLUMN I Substance	COLUMN II Chemical Abstract Service Number (CAS)	COLUMN III Agricultural, Urban Pests, Household Use Standard ¹	COLUMN IV Commercial Use Standard ²	COLUMN V Industrial Use Standard ³
acetaldehyde	75-07-0	4.5	15	40
acetone	67-64-1	20	60	200
acetone cyanohydrin	75-86-5	60	200	550
acetonitrile	75-05-8	60	200	550
acrolein (2-propenal) ⁴	107-02-8	2	2	2
acrylonitrile (2-propenenitrile) ⁵	107-13-1	1.5	1.5	1.5
allyl chloride (3-chloropropene)	107-05-1	1	3	9
ammonia	7664-41-7	100	300	900
BDCM (bromochloromethane) ⁶	75-27-4	1	2	6.5
benzene	71-43-2	1.5	4	10
benzotrifluoride (1,1,1-trichloroethane) ⁶	98-07-7	0.2	0.2	0.2
bisopropyl chloride (1,1-dichloroethane)	100-44-7	5	15	45
bis(2-chloroethyl) ether ⁶	111-44-4	2	2	2
bis(2-chloroisopropyl) ether	39638-32-9	80	250	700
bis(2-chloromethyl) ether ⁶	542-88-1	1	1	1
bis(2-chloro-1-methylethyl) ether	108-60-1	1	3	9
bromobenzene	108-86-1	10	30	90
bromodichloromethane (BDCM) ⁶	75-27-4	1	2	6.5
bromobenzene (vinyl bromide) ⁶	593-60-2	1	1	3
bromocloro (tribromomethane)	75-25-2	9	30	85
bromobenzene (methyl bromide)	74-83-9	5	15	45
1,3-butadiene	106-99-0	2	6	20
2-butanone (methyl ethyl ketone)	78-93-3	5 000	15 000	45 000
carbon disulfide	75-15-0	700	2 000	6 500
carbon tetrachloride (tetrachloromethane)	56-23-5	0.65	2	6
chloroform ⁶	7782-50-5	20	20	20
chlorobenzene (monochlorobenzene)	108-90-7	50	150	450
1-chloro-2,2-dichloroethane	98-56-6	50	150	550
2-chloro-1,3-butadiene	126-99-8	7	20	65
1-chlorobutane	109-69-3	1 000	3 000	10 000

Schedule 11 – Vapour Standards

- Numerical Standards ($\mu\text{g}/\text{m}^3$)
- Protective of Human Health only
 - Acceptable “respirable concentrations”
 - $\text{HQ} \leq 1$
 - $\text{ILCR} \leq 10^{-5}$
- Strict application to Contaminated Sites
- Use with Tech Guidance 4 Soil Vapour Investigations

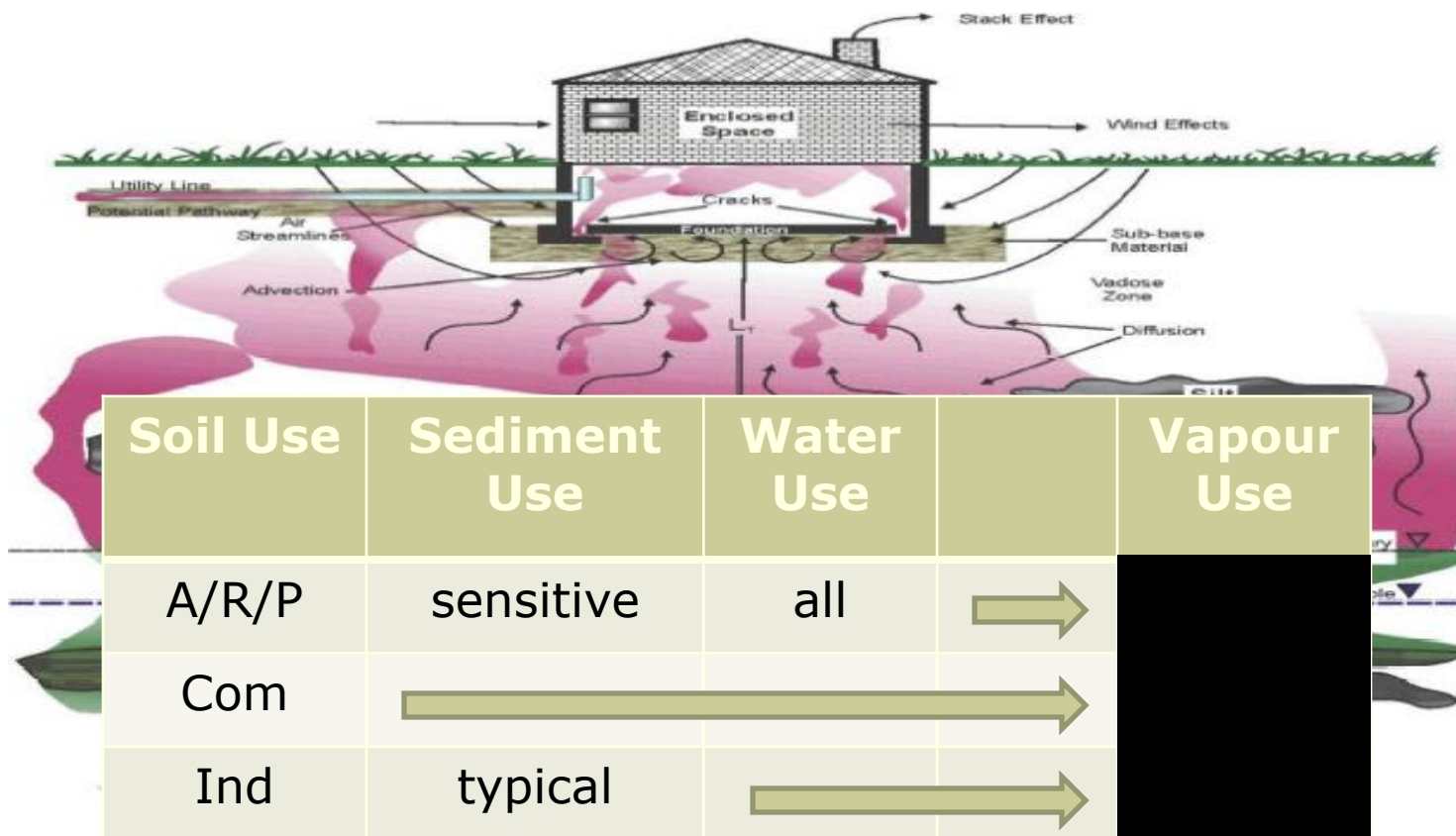


<http://www.env.gov.bc.ca/epd/remediation/cselink/recent.htm>

Vapour Standards – Media Use Specific

Standards apply to: soil, sediment or water

- as sources of contaminated vapour





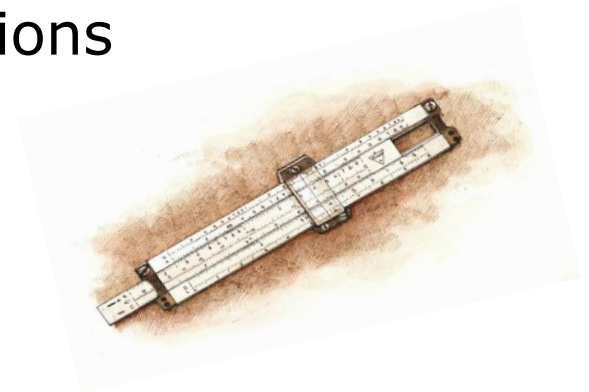
Schedule 11 – Known Errors

- Typographical errors
 - Freon 113
 - 1,2,2-trichloro-1,2,2-trifluoroethane
 - 1,1,2-trichloro-1,2,2-trifluoroethane
 - a-chlorotoluene (benzyl chloride)
 - Industrial standard – 50 ug/m³
 - Industrial standard – 45 ug/m³
- Inclusion error
 - 4-chloronitrobenzene
 - not volatile by ministry definition

<http://www.env.gov.bc.ca/epd/remediation/cselink/recent.htm>

Vapour Standards – Toxicological Derivation

- Derived using
 - Modified SABCS/Health Canada equations
 - CSST receptor/exposure assumptions
 - TRVs from:
 - US EPA (i.e. US DoE – RAIS)
 - Health Canada
- Details in
 - Director's Interim Air Concentration Criteria



http://www.env.gov.bc.ca/epd/remediation/requests_for_comments/archives/2007/pdf/air_con_criteria.pdf

Vapour Standards – Chemical Derivation

- Volatility based
- Schedule 11 provides vapour standards for all CSR prescribed substances which meet ministry volatility criteria
- BCELQAAC volatility definition:
 - Henry's Law constant $> 1 \times 10^{-5}$ atm-m³/mol and
 - Vapour Pressure > 0.05 Torr @ 1 atm, 25°C



http://www.env.gov.bc.ca/air/wamr/labsys/bclqaac/sched11_recs_july30_08.pdf

Vapour Standards - VPHv

- VPHv Definition

- Footnote 11

- *"VPHv includes the sum of those compounds that elute on a 100% polydimethylsiloxane gas chromatographic column between the retention times for n-hexane (nC6) and n-tridecane (nC13) minus the sum of: benzene, ethylbenzene, n-decane, n-hexane, toluene and xylenes"*

- $VPHv = [VHv - (BTEX + decane + hexane)]$



Vapour Standards

- VPHv but no LEPHv
- Why?



- BCELQAAC volatility definition could capture some hydrocarbons out to C13
- Recommended extending VPHv range from C6 – C10 to C6 – C13
- New VPHv standard eliminates need for a separate LEPH vapour standard

Vapour Standards – Analytical Methods

- Five draft methods posted
 1. Volatile Hydrocarbons in Air
 2. Calculation of VPHv in:
Solids, Water or Air (vapour)
 3. VOCs in Air by Canister
 4. VOCs in Air by Charcoal Tubes
 5. VOCs in Air by Thermal Desorption Tubes

- Comment period closed Feb 27, 2009



http://www.env.gov.bc.ca/air/wamr/labsys/lab_man_07.html

Vapour Standards – Soil Depth Attenuation Table

- Ministry has calculated a [draft Table](#) providing soil depth dependent attenuated vapour concentrations for Schedule 11 substances
- Calculated values based on:
 - 2005 SAB SLRA Level II Vapour Intrusion model
<http://www.sabcs.chem.uvic.ca/SLRAFinal03-06.pdf>
 - TG 4 (Health Canada) vapour attenuation factors
- Values corrected for substance Lower Explosive Limit

Soil Depth Attenuation Table

- Table Limitations
 - Table values are not substance specific
 - values based on benzene as universal surrogate for volatile substances
 - Listed substances need to be corrected for:
 - maximum theoretical vapour concentration (i.e. “vapour solubility limit”)
 - acceptable odour concentration
 - Also considering adding values for differing soil type

CSR Vapour Standards



Questions



Vapour Standards - Application

- Strict application to contaminated sites
- Can not be used:
 - To supersede other regulatory requirements,
 - As air emission limits for discharge permits,
 - As ambient air quality criteria/objectives,
 - As general indicators of:
 - indoor air quality, or
 - workplace air quality

