COMMUNITY MEETING – Trichloroethylene contamination

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Trichloroethylene

- Commercial use began in 1920s
- Used in degreasing, metal cleaning, some consumer products (e.g. Typewriter correction fluid, paint removers, adhesives, spot removers, rug cleaners)
- Evaporates into air, but relatively short lived
- If groundwater is contaminated can be very persistent
- US Household Products Database – provides list of household products that contain TCE and in what percentage
- Historic use as a surgical anesthetic

TCE Production - A widely used chemical in the past

- Production Western Europe 1980 : 210 kilotonnes
- 1990 : 131
- US 121
- 1980 : 1990: 79
- Japan 1980: 82
- 1990: 57

Exposures to workers and public

- Worker exposures – inhaling in workplace air, skin contact with liquid TCE
- Worker exposure limits much higher than for public - **10 ppm (53700 ug/m3) 8 hour average**
- Public exposures – inhaling in indoor and outdoor air, drinking water where contamination has occurred, traces found in food.
- No regulated exposure limit for the public - recommendations by different agencies vary: For effects other than cancer **US CDC - 540 ug/m3, Calif REL 600ug/m3, RIVM, Netherlands 200 ug/m3 (provisional) .** These values are under review and will likely be lowered.

Occupational exposures to TCE in the US in the 1980s

Job, task or industry	Air concentration (mg/m3) N.B. 1mg/m3 = 1000 ug/m3		Reference
	Mean	Range	
Tank relining	1.3	ND-5.4	Burroughs (1980)
Degreasing sheet metal	11	10-12	Johnson (1980)
	11	4-18	
Degreasing, custom finishing	8.3	1-38	Ruhe & Donohue (1980)
	6	4-8	
Vapour degreasing	333	26.9-1670	Burgess (1981)
Degreasing, bus maintenance	3	ND-8.9	Love & Kern (1981)
Degreasing	742	56-2000	Ruhe et al. (1981)
	145	37-357	

Concentrations in community and residential air

Outdoor air survey , Canada 1988-90, 11 urban, 1 rural site

Site mean concentrations ranged from 0.07 ug/m3 – 0.45 ug/m3, with an overall mean of 0.28 ug/m3

Indoor air, Survey of 750 Canadian homes in 10 provinces , mean concentration 1.4 ug/m3, max 165 ug/m3

Exposure to Trichloroethylene is widespread, even in areas without a local source of contamination. Exposures to the public are coming down as trichloroethylene use is restricted.

Contamination around Northstar site in Cambridge

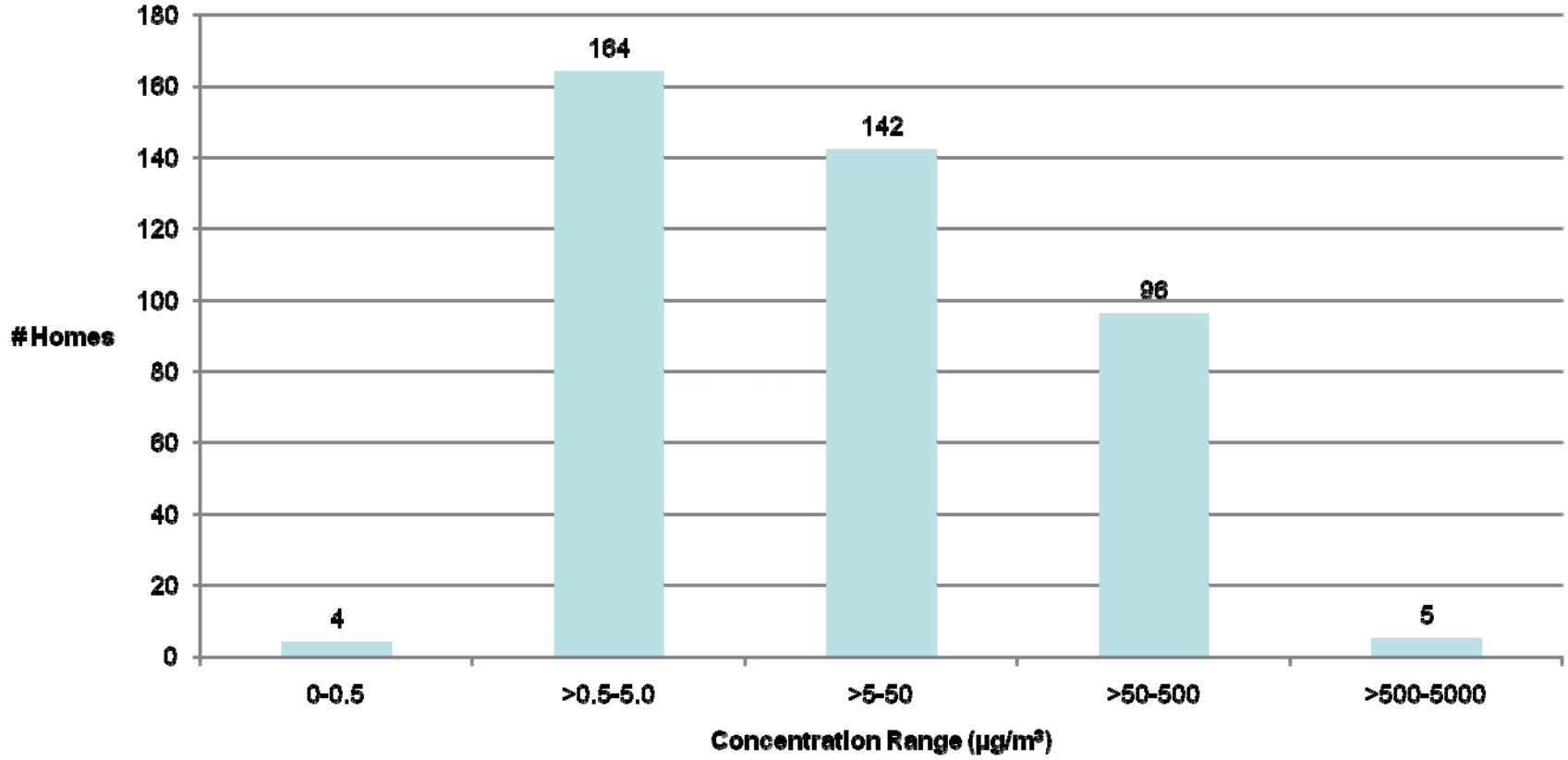
- Poor past TCE disposal practices resulting in soil and groundwater contamination
- Vapour movement through soil into basements.
- Contamination of indoor air in many homes to levels far above those normally found in Canadian residences.
- Municipal drinking water does not appear to be affected; the only route of exposure to local residents that has been found is through indoor air.

What is subsurface vapour intrusion?

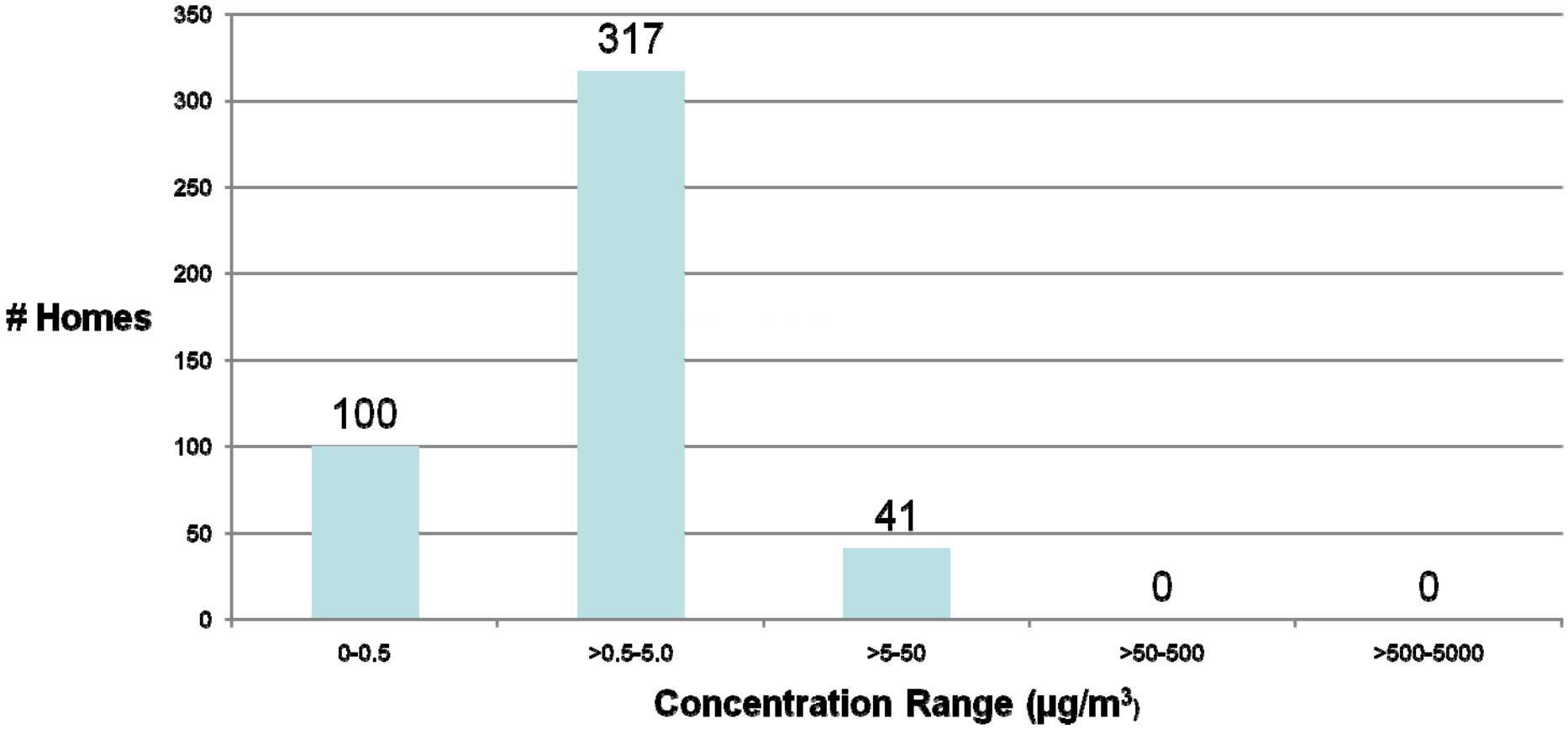
- Chemicals in ground water or soil can volatilize (evaporate) and enter overlying buildings, contaminating indoor air
- Naturally present chemicals (radon)
- Chemicals that entered the environment from a spill or other discharge (TCE, hydrocarbon fuels)
- Rates of intrusion vary depending on many factors

How much TCE is in homes?

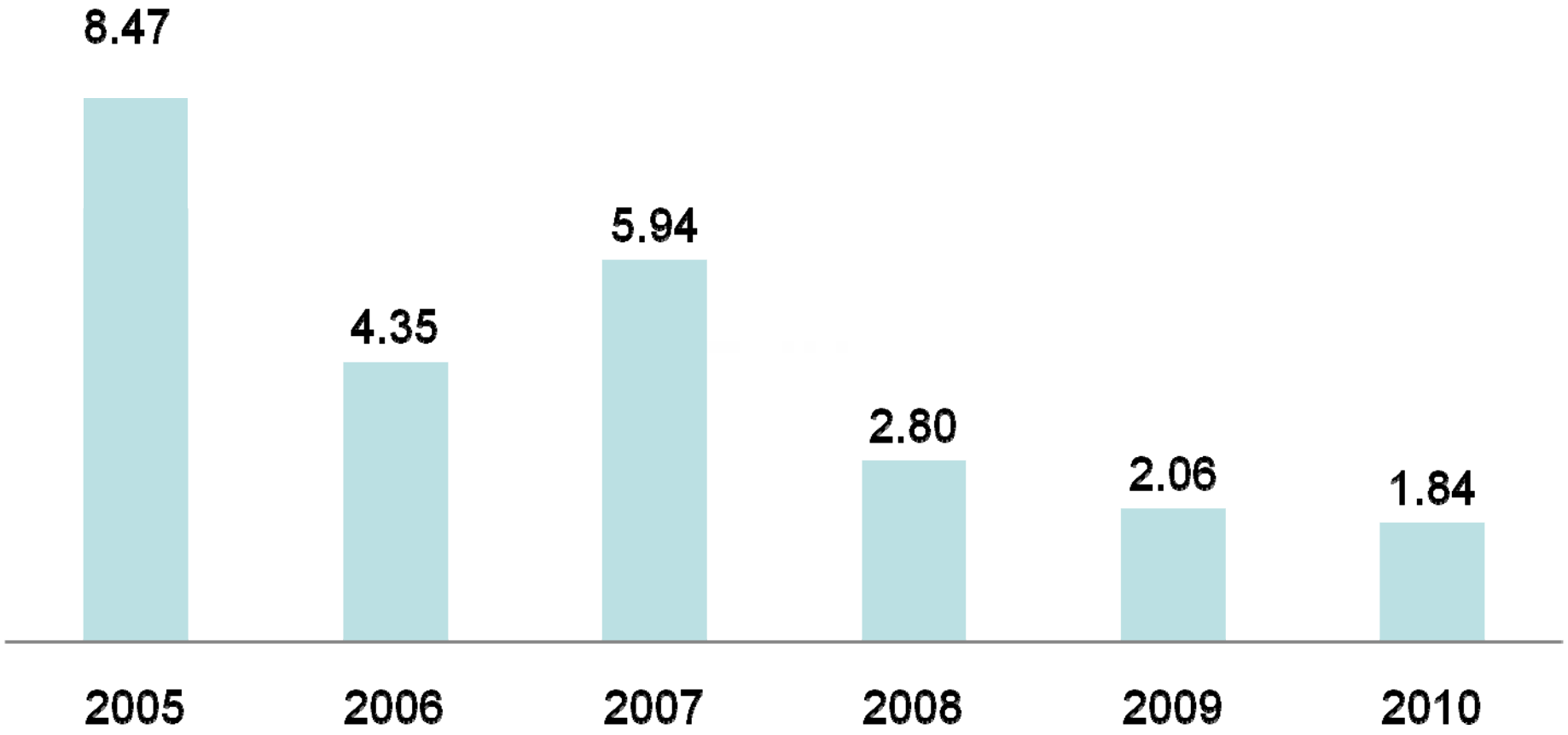
Indoor air concentrations prior to installation of mitigation measures in dwellings, 2005-2006



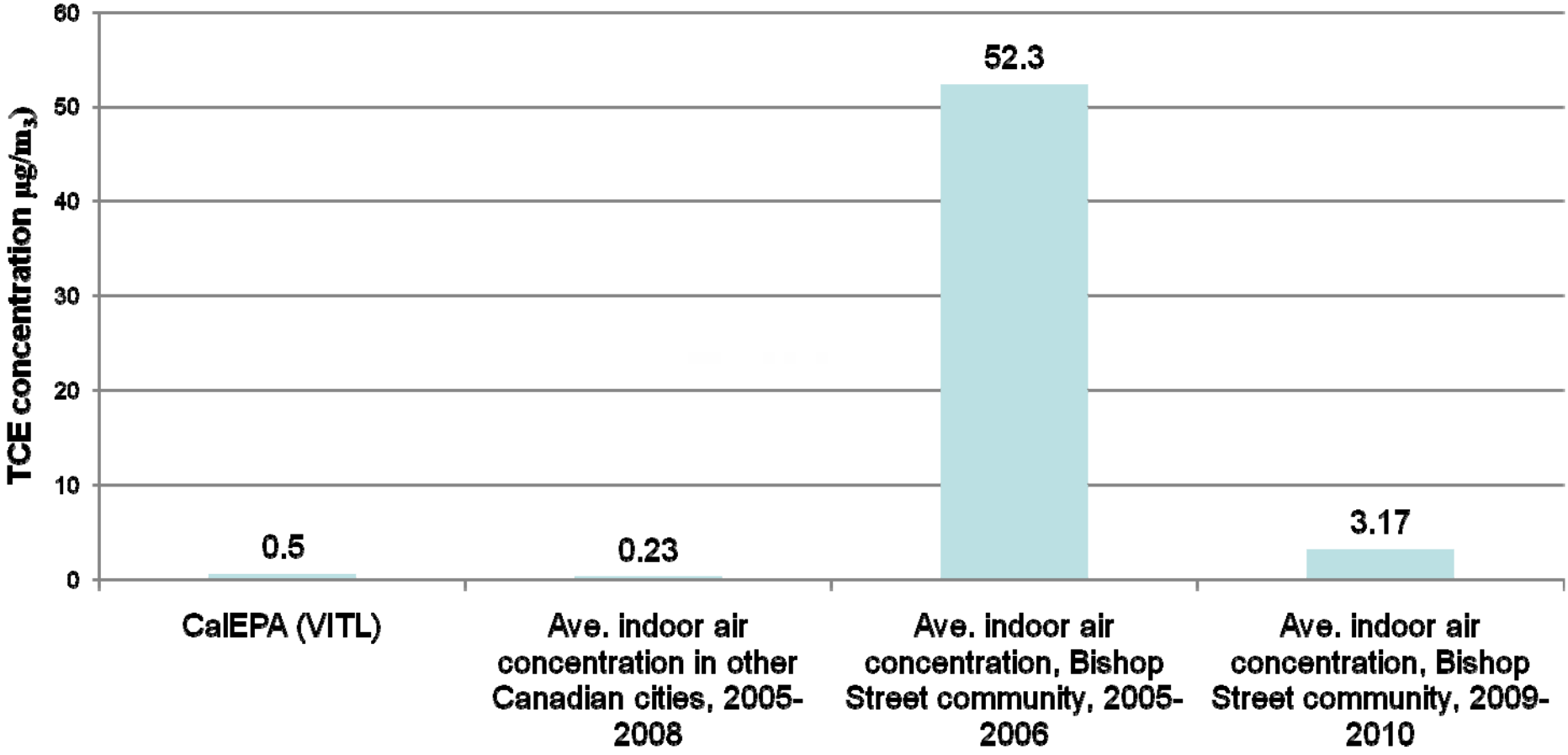
Current indoor air concentrations (air samples collected between August 1, 2009-August 31, 2010)



Mean Indoor Air Concentrations of TCE in Dwellings Where Specific Mitigation Measures Were Never Installed, µg/m³ (averaged per dwelling)



TCE in indoor air: other Cdn cities vs Bishop Street



Cancer Risks

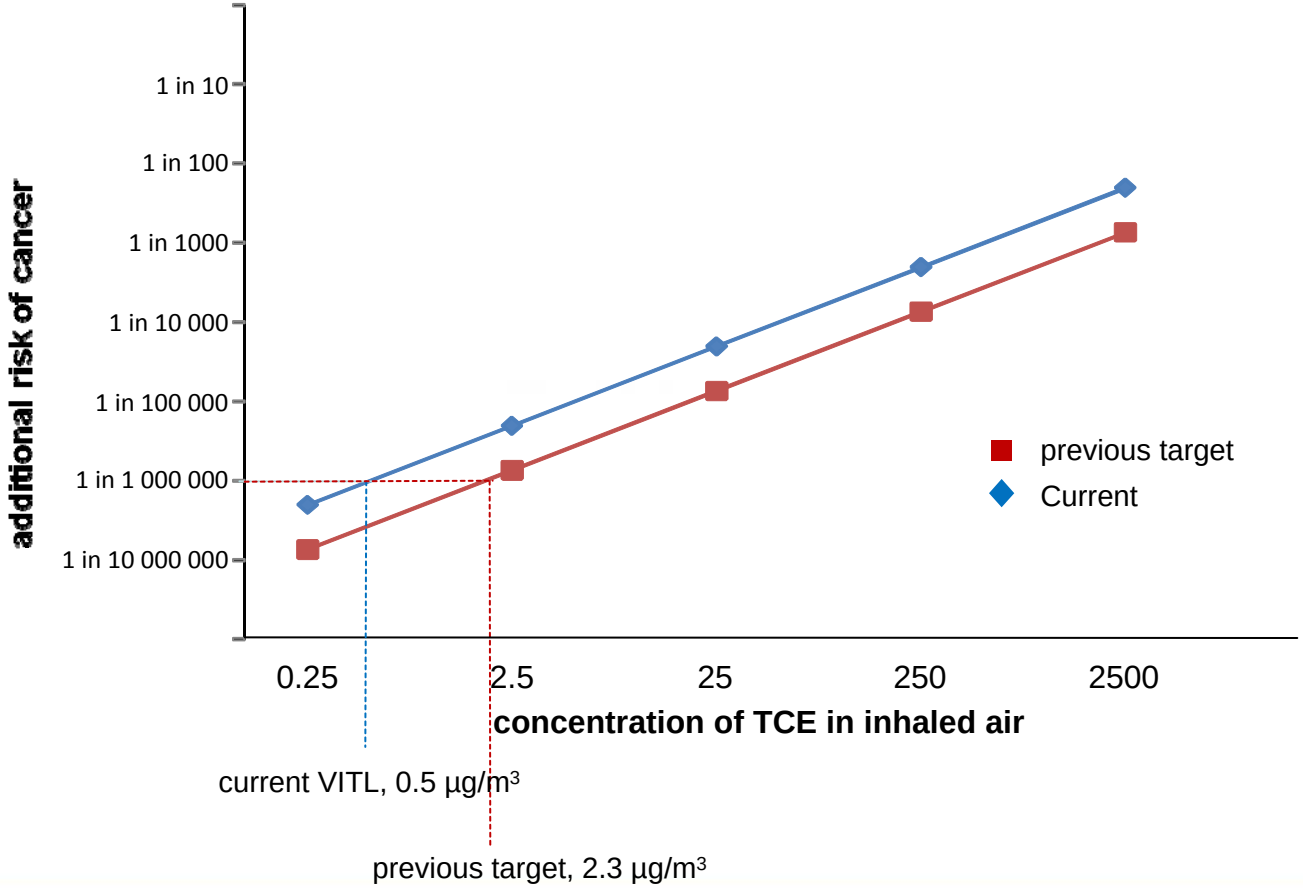
- For many carcinogens, it is believed there is no threshold for risk and that any exposure is associated with some 'non-zero' risk
- Risk does depend on level and duration of exposure
- Carcinogens vary in 'potency'; the amount of cancer risk that is associated with a given degree of exposure
- Quantitative risk assessment uses the results of studies in animals (and sometimes humans) to predict the probability of developing cancer at a certain level of exposure
- This type of assessment is often used by regulators to set standards and can also be used to predict the additional number of cancers 'expected' in a group of people with a given level of exposure to a particular carcinogen.

What about effects other than cancer?

- Large amount of information on toxicological effects of TCE
- Many different potential effects have been investigated
- The potential for toxic effects depends on how much one is exposed to, and for how long
- In the past, the effects considered to be most significant were effects on the nervous system, kidney and liver. These have been used as the basis for exposure limits.
- However, there is some evidence that effects on the fetus (cardiac development) may occur at lower levels and this has been used as the basis for the recent guideline for TCE in drinking water.

What are the TCE related cancer risks around the Northstar site?

Potential Incremental Cancer Risks due to TCE at various air concentrations (Individual Perspective)



What does 1 in 1 000 000 mean?

In a community of 1500 people, there would be 0.0015 additional cases of cancer

What does 1 in 10 000 mean?

In a community of 1500 people, there would be 0.15 additional cases of cancer

How many cancers attributable to TCE would we expect in the neighbourhood?

- Assuming an average long-term exposure of 52 ug/m3 to 1500 people, one would predict approx 0.04 additional cancers using the old potency estimate and approx 0.15 additional cancers over a lifetime (76 years) using the new potency estimate
- This estimate is based on those homes that have been tested to date; it can be recalculated if there additional homes are tested.