



CSAP

Contaminated Sites Approved Professionals of British Columbia

CSAP Technical PD Workshop Oct 15, 2009

Soil Vapour Session





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Welcome to the Soil Vapour Session

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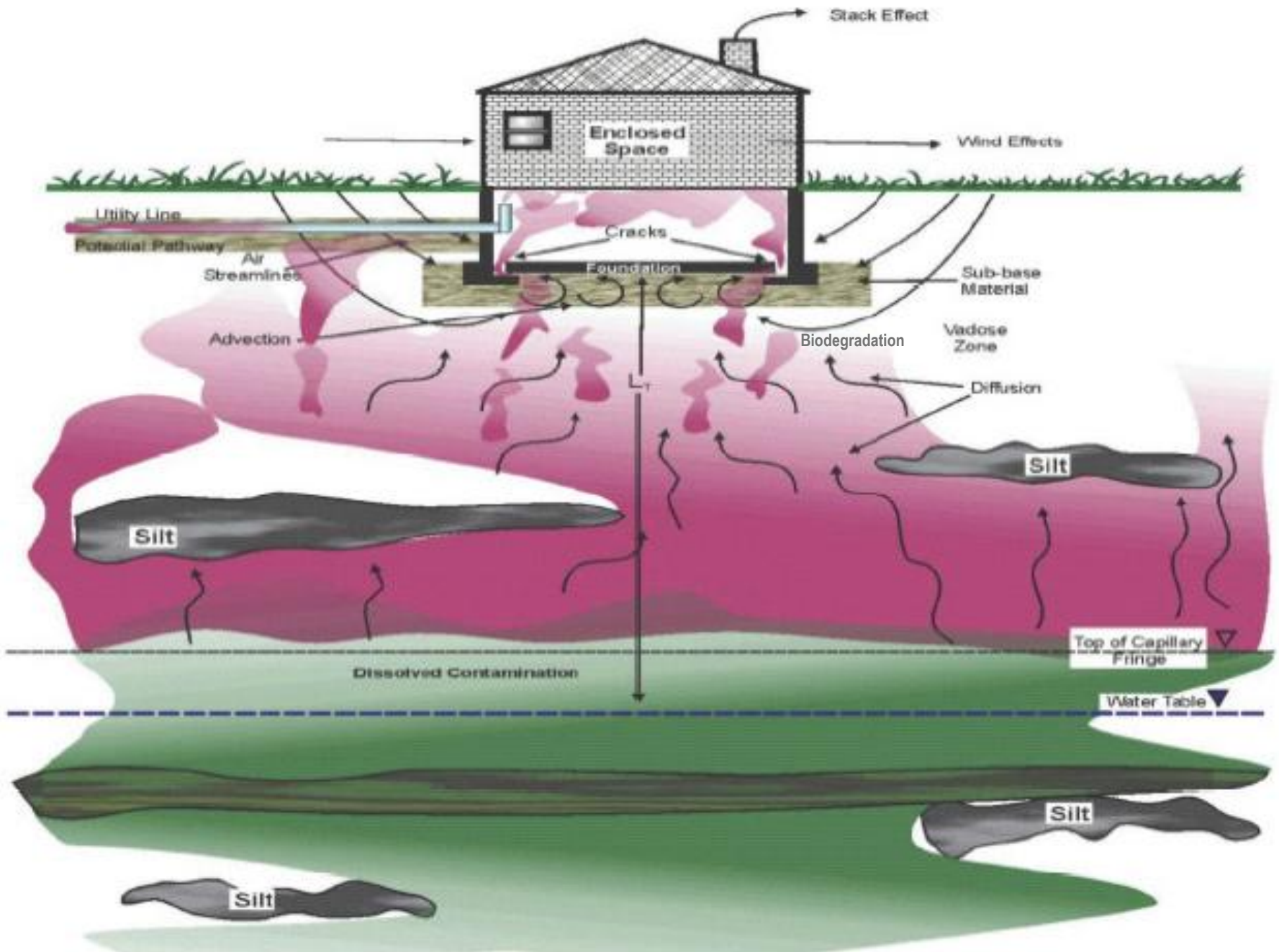
CSAP Soil Vapour Guidance

Potential Issues to Discuss – 1/1

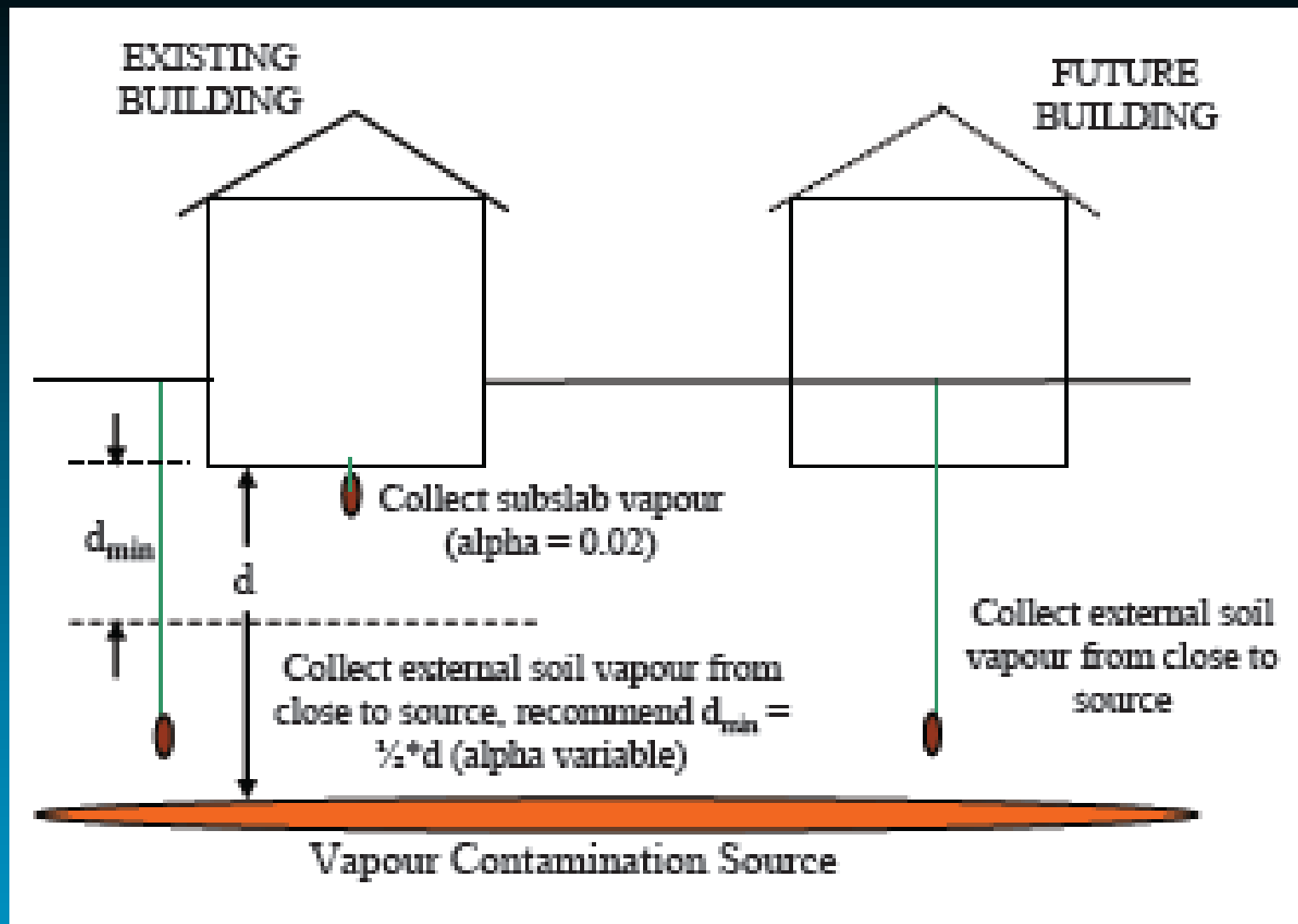
1. How to address contamination at less than one meter
2. How to address lateral migration of contamination, and in turn delineation
3. Use of groundwater monitoring wells as vapour monitoring wells
4. Preferential pathways
5. Vapour PCOCs not assessed in soil/groundwater
6. How to assess potential seasonal variation or year-over-year variation
7. How to document that the vapour plume is at steady-state

Potential Issues to Discuss – 2/2

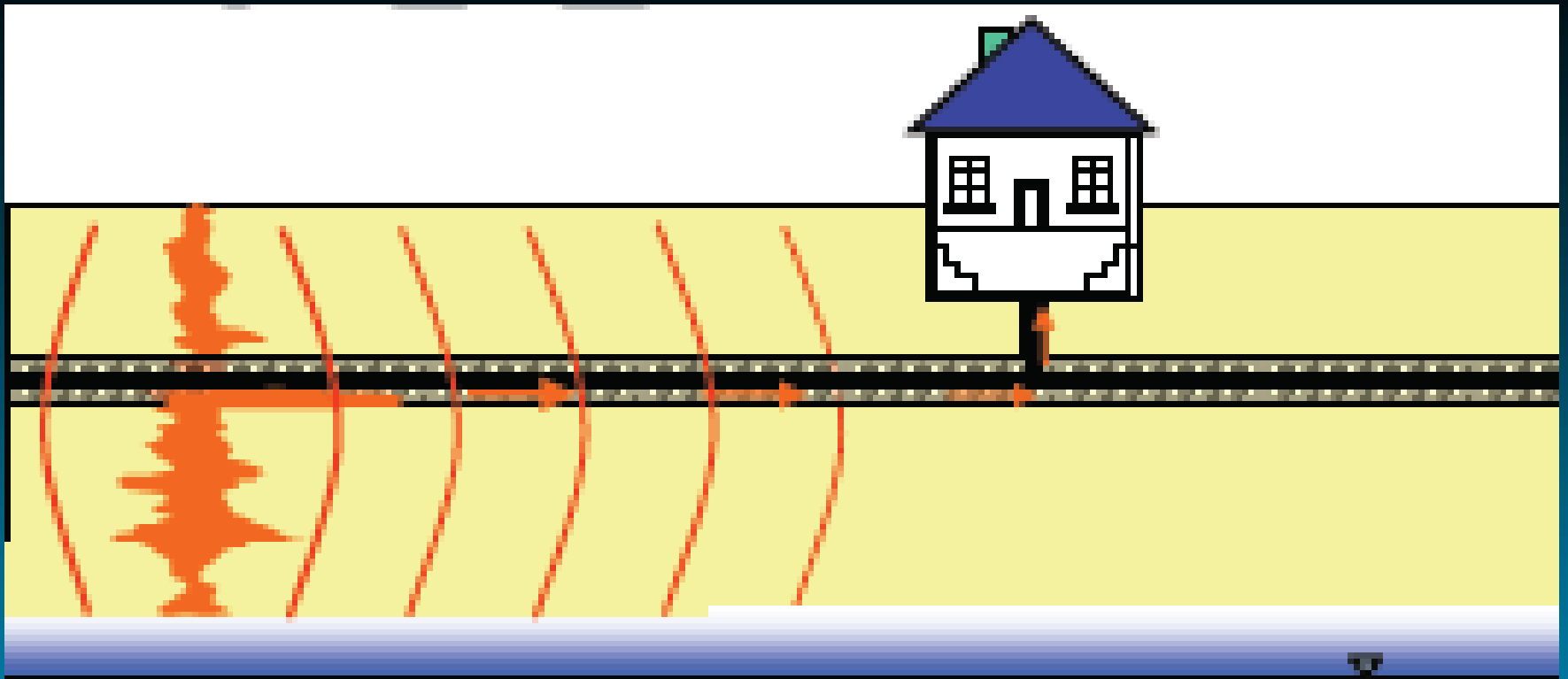
8. Future building scenarios
9. Land uses for parkades
10. Offsite APECs for vapour
11. Background vapour contaminants
12. Applicable attenuation factors are based on distance from bottom of foundation to top of well screen
13. Acceptable vapour management systems
14. Verifying efficacy of vapour management systems
15. Offsite notification requirements



USEPA, 2002. Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance). Office of Solid Waste and Emergency Response - *modified*



Health Canada, 2008 (draft). Federal Contaminated Site Risk Assessment in Canada:
Part VIII: Guidance for Soil Vapour Intrusion Assessment at Contaminated Sites



Preferential Pathways

Health Canada, 2007(draft). Guidance Manual for Environmental Site Characterization in Support of Human Health Risk Assessment: Volume I Technical Guidance

Sampling Within 1 m of Grade

Surface coverage?

< 1 m



The diagram illustrates a cross-section of the ground. A horizontal brown bar at the top represents the ground surface. A vertical grey pipe with a filter at the bottom is shown extending downwards from the surface. A yellow double-headed arrow on the left indicates the distance between the ground surface and the filter, labeled as '< 1 m'. Below the pipe, an orange oval represents a 'Vapour Contaminant Source'.

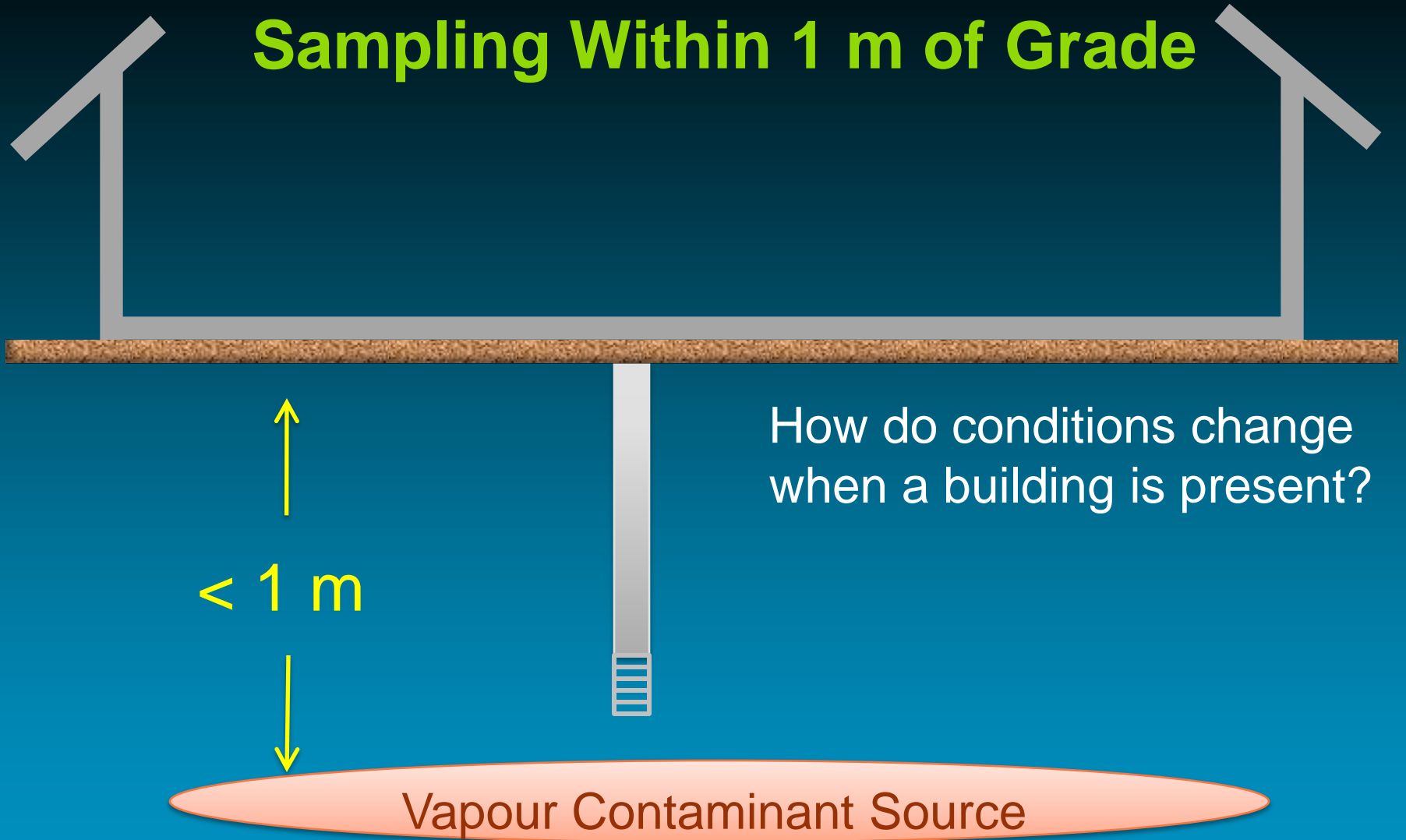
Vapour Contaminant Source

Sampling Within 1 m of Grade

Add pavement or liner prior to sampling



Sampling Within 1 m of Grade



Example Scenario: Commercial Property

- currently vacant
- future slab-on-grade building

Measure C_{ss} .

$C_{ss} \cdot \alpha(\text{CL}) < \text{Sch.11 (CL)}$

Therefore soil vapours meet
CL standards at the site.

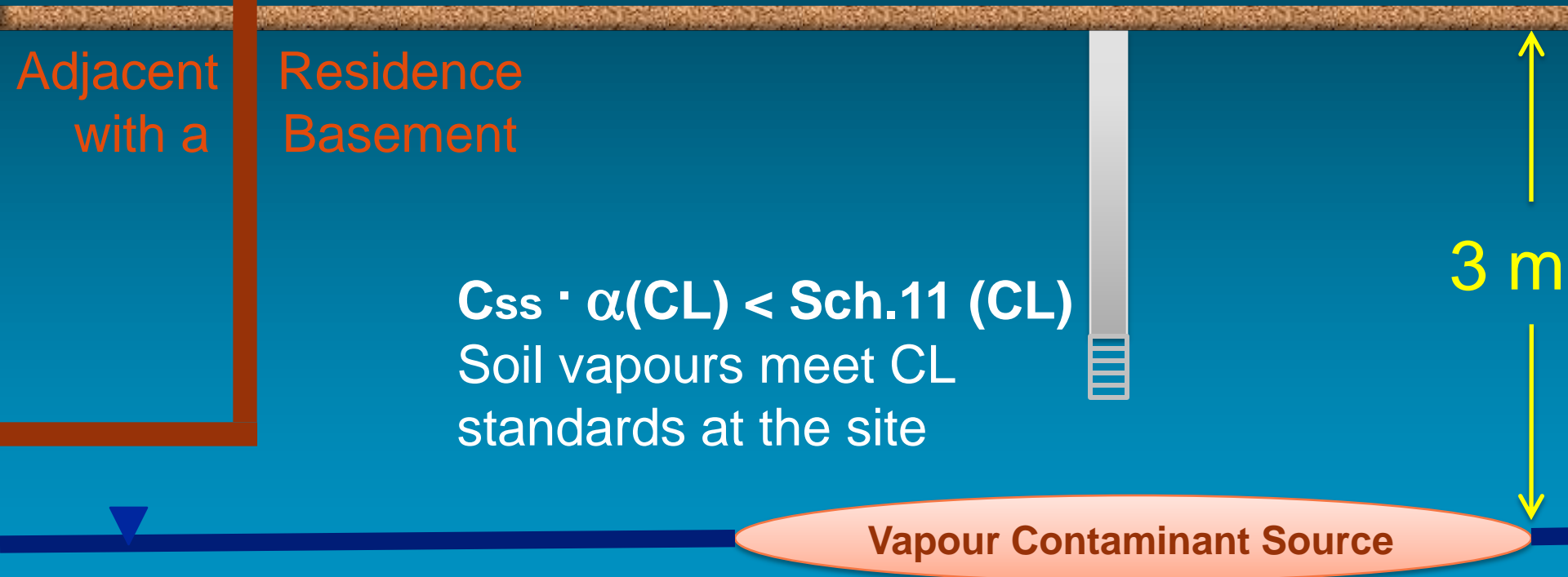
Is the vapour assessment complete?



Vapour Contaminant Source

Example Scenario: Commercial Property

- currently vacant
- future slab-on-grade building



Vapour PCOCs Not Assessed in Soil/Groundwater

- ◆ *FROM BCMOE Q&A: The draft Technical Guidance 4 section entitled “Refining the list of vapour PCOCs” (page 1) indicates that we can refine our list of vapour PCOCs by excluding those substances which are not detectable in soil, sediment, or water on or near the site. How are we expected to apply this refinement step to substances which are not routinely analyzed for in soil, sediment, or water?*
- ◆ *If you do not have soil, sediment (if applicable), and water data for a particular vapour PCOC, then you cannot complete this vapour PCOC refinement step for that substance – i.e., you will have to retain that substance as a vapour PCOC for your site. Furthermore, since you do not have soil, sediment, and water concentration data for the substance, you will need to collect vapour data to investigate potential vapour contamination by that substance – i.e., you will not be able to model the concentration of that substance in vapour using soil, sediment, or water concentration data.*

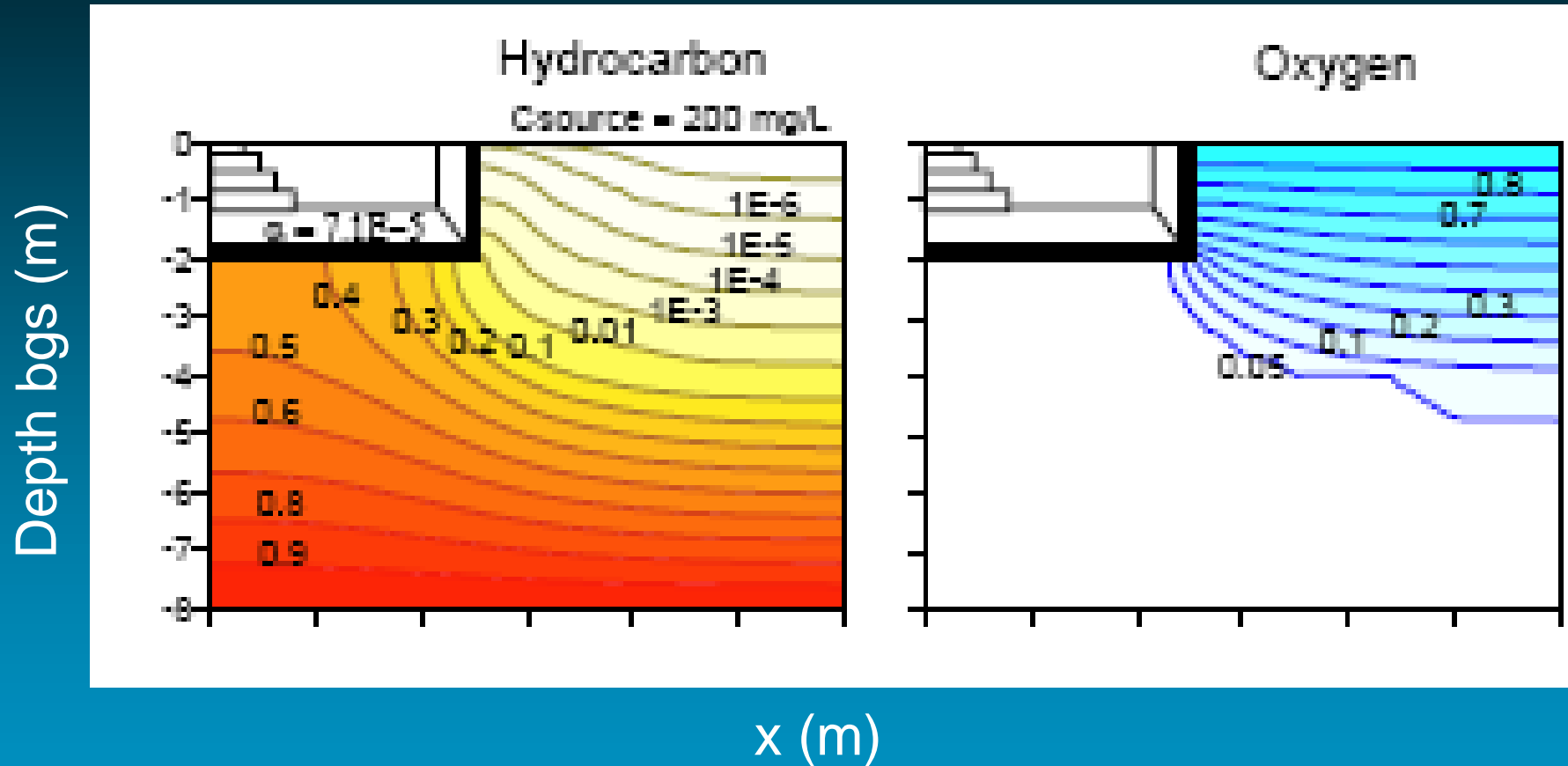
Use of Groundwater Wells for Vapour Sampling

- ◆ *FROM BCMOE Q&A: Can we use vapour data collected from groundwater monitoring wells to characterize vapour contamination at our site?*
- ◆ *Yes, but note that given the scarcity of guidance on such sampling, collection and use of vapour data from groundwater monitoring wells raises many questions to which the ministry currently does not have answers. For instance, how does one collect a representative vapour sample from an apparatus that is designed specifically for groundwater monitoring? What are the potential sources of sampling error? Should vapour attenuation factors be applied to such data? If so, should they be based on the distance from the base of a building to the top of the capillary fringe, the top of the vapour sampling screen, the bottom of the bentonite seal, or some other reference point? Furthermore, is such vapour sampling appropriate for sites with potential vapour sources in soil?*
- ◆ *Given these issues, the ministry strongly recommends that when you use vapour data collected from groundwater monitoring wells to characterize vapour contamination at your site, you*
 - *(a) provide a detailed description and diagram of your sampling apparatus and how it works,*
 - *(b) thoroughly discuss the representativeness of the vapour data,*
 - *(c) thoroughly discuss the rationale for all professional judgment decisions (e.g., explain why a particular vapour attenuation factor was chosen), and*
 - *(d) thoroughly discuss all your assumptions and uncertainties.*

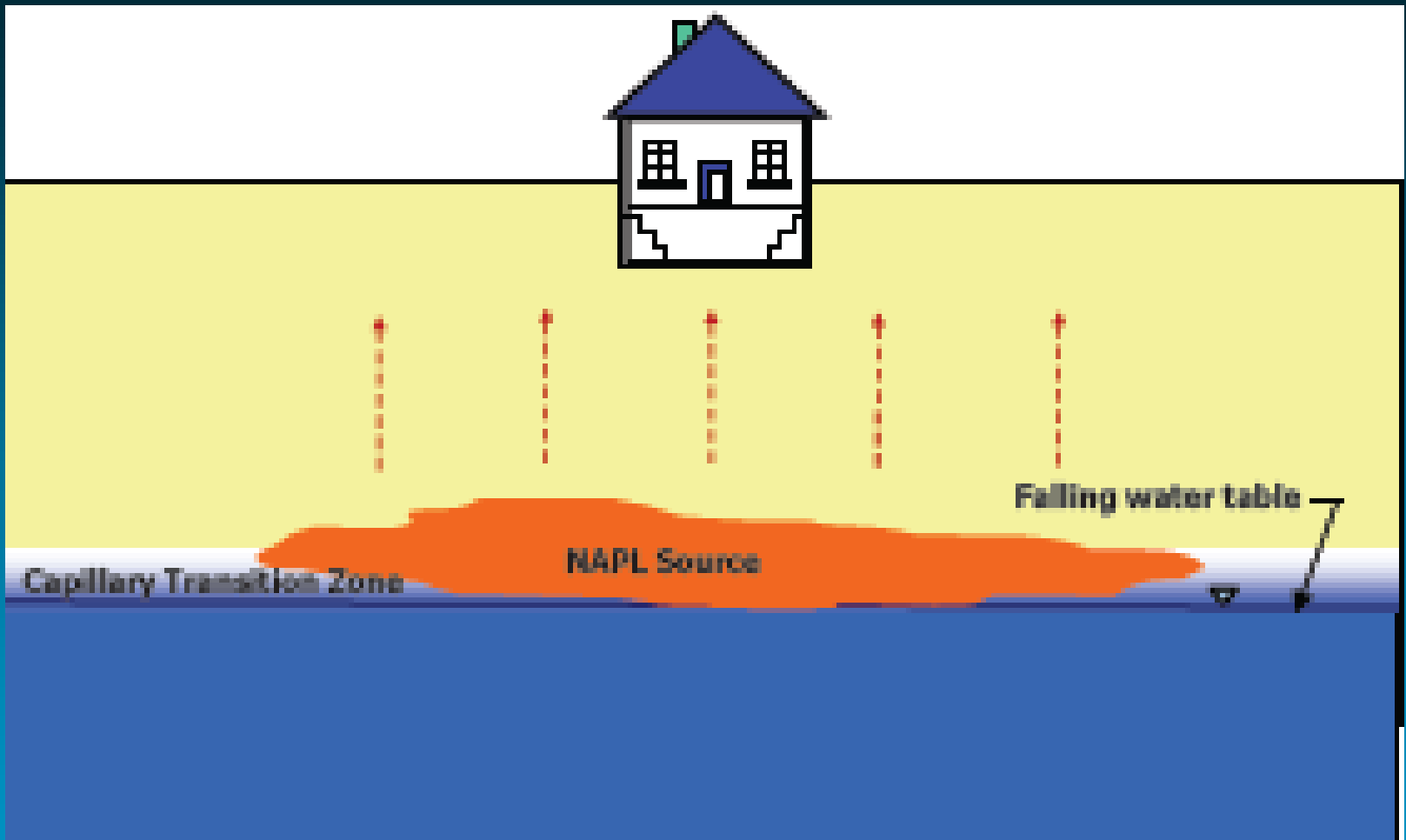
Verifying Efficacy of Vapour Management Systems

- ◆ *FROM BCMOE Q&A: Are we required to collect post-implementation indoor vapour samples to verify the efficacy of our vapour management system?*
- ◆ *No. You are required to verify that the vapour management system works (i.e., that substance concentrations in breathing zone vapour meet CSR numerical or risk-based standards), but this does not mean that you must conduct post-implementation indoor vapour sampling as this may not be feasible for some substances or some sites. Other system verification approaches, such as a combination of leak tracer testing, vapour modeling, literature citation, and qualitative discussion are acceptable to the ministry as long as they are supported by defensible, documented scientific rationale.*

Predicted Subsurface Hydrocarbon and Oxygen Concentrations In the Vicinity of a Building



From Abreu & Johnson, ES&T, 2006, 40, 2304-2315



Health Canada, 2007(draft). Guidance Manual for Environmental Site Characterization in Support of Human Health Risk Assessment: Volume I Technical Guidance