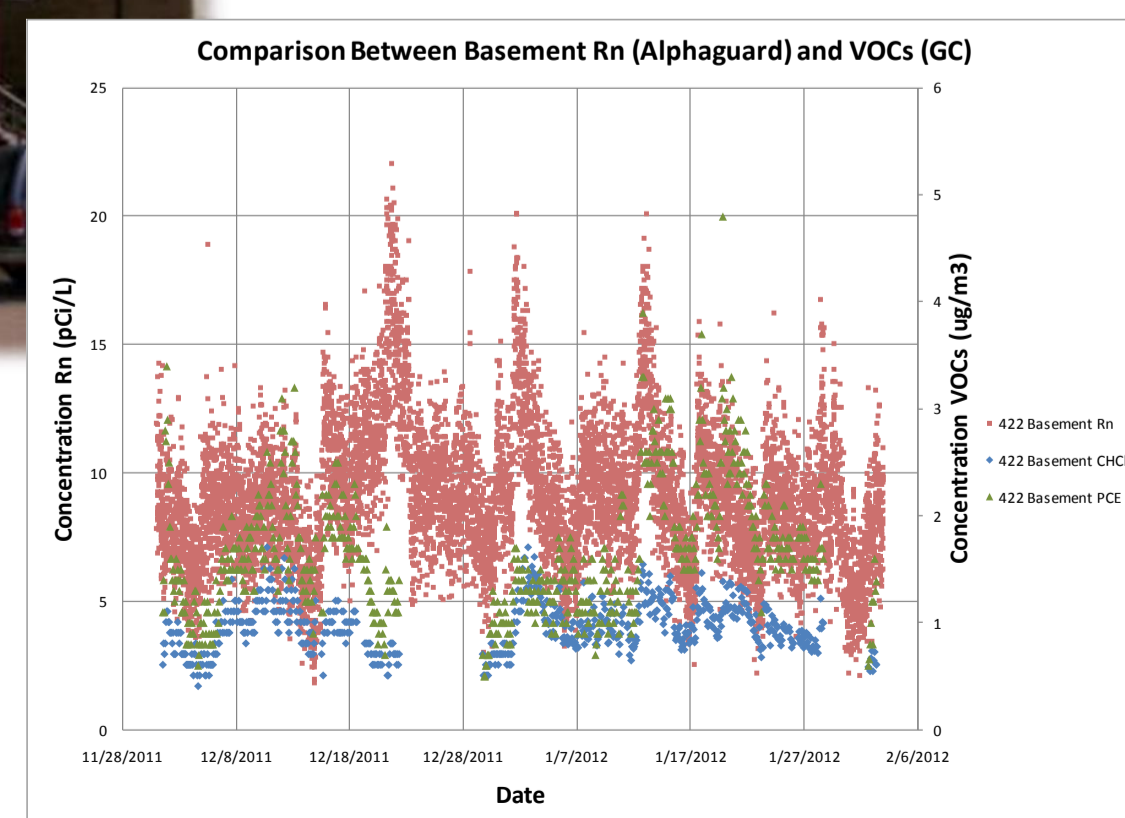




### Purpose/Utility of Research

Vapor intrusion is the migration of subsurface vapors, including radon and volatile organic compounds (VOCs), in soil gas from the subsurface to indoor air. The primary purpose of this research was to better characterize the spatial and temporal variability of vapor intrusion by collecting a full year's dataset of weekly measurements of subslab soil gas, external soil gas, and indoor air, on a single house that is impacted by vapor intrusion of radon and VOCs. By examining both short-term and long-term (average annual) VOC concentrations, the research provided valuable information on how to best collect samples, when to collect samples during the year, and allowed the evaluation of the data to estimate long-term, chronic risk to vapor intrusion.



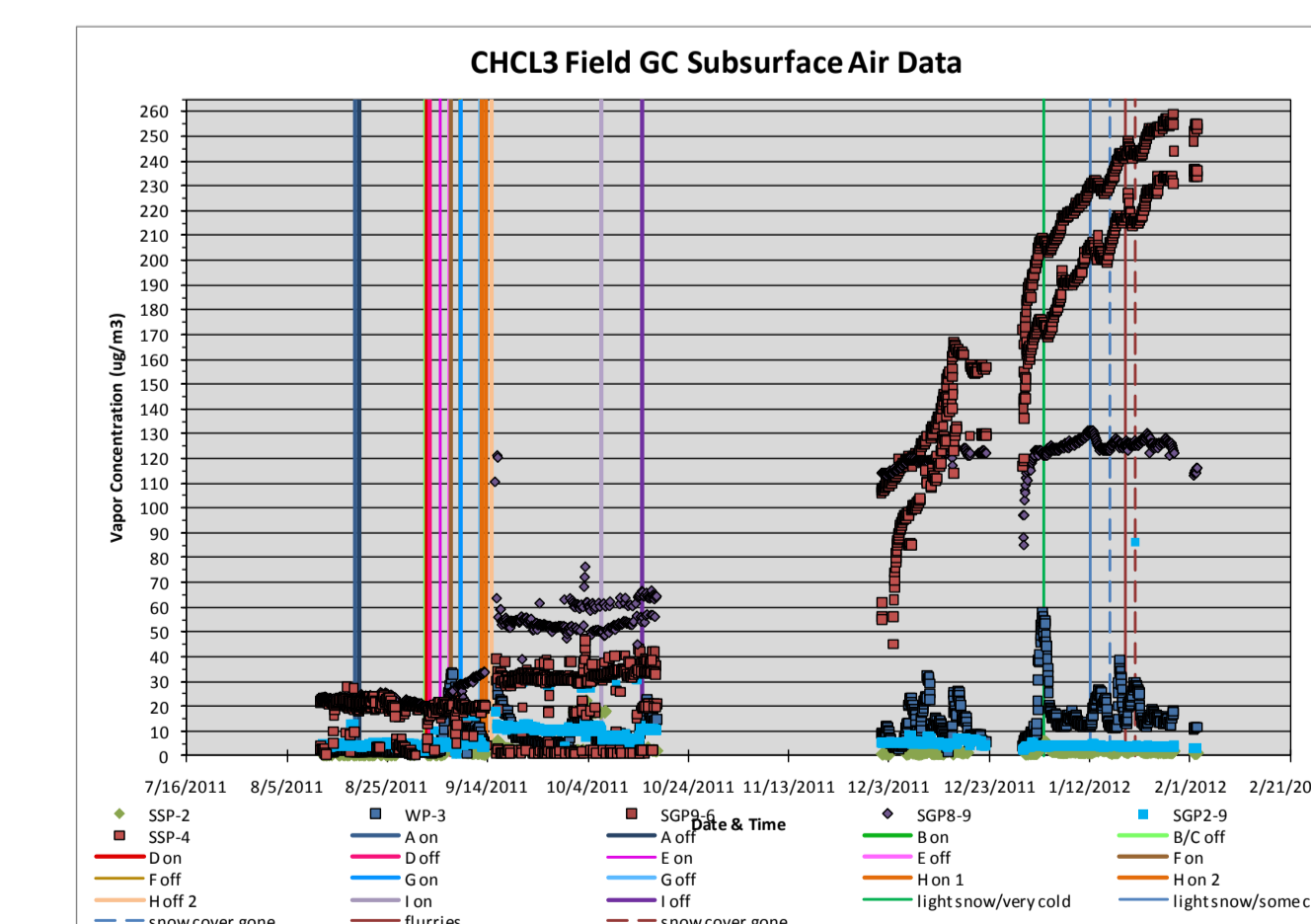
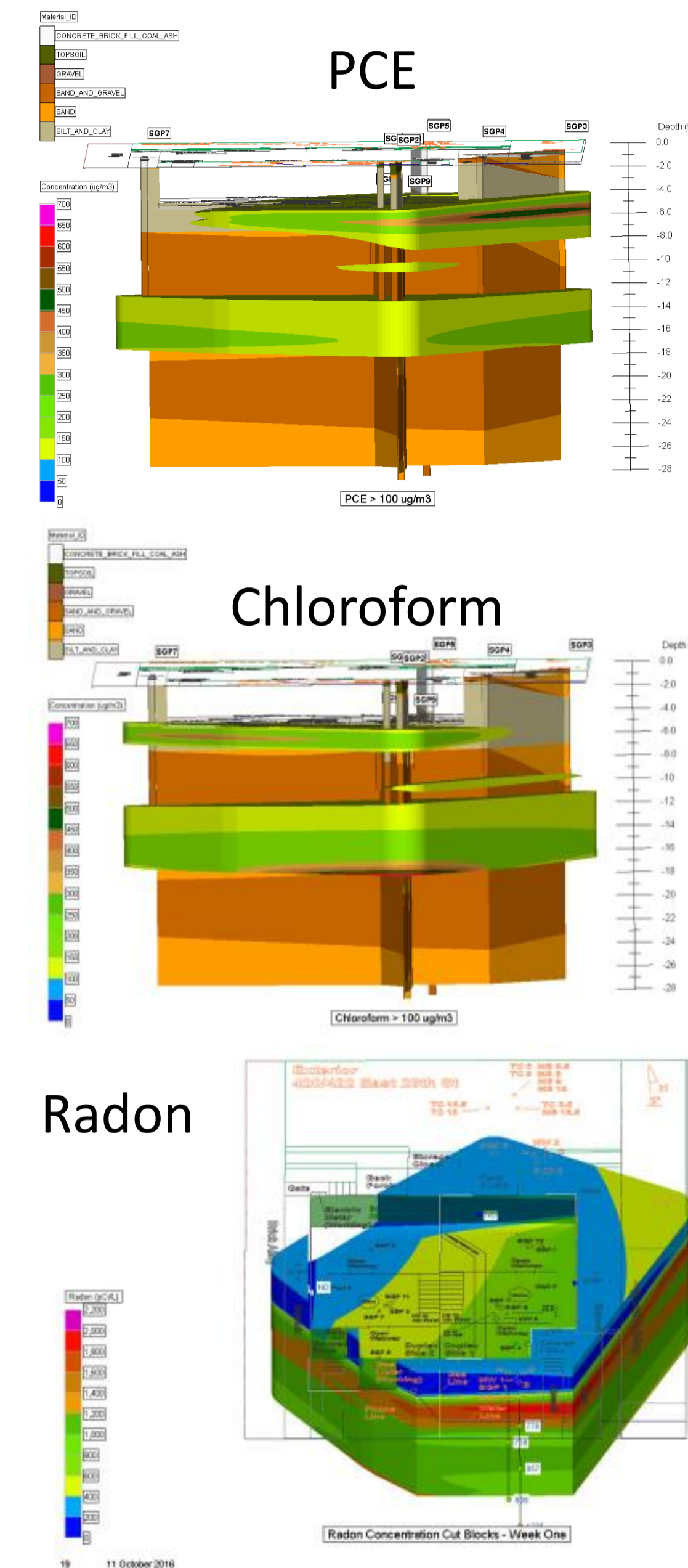
### Highlights

- At the Indianapolis research duplex, tetrachloroethylene (PCE), chloroform, and radon have different spatial patterns in subslab and external soil gas.
- Higher indoor air VOC concentrations were observed in the winter months when the HVAC system was operational.
- Long-term radon concentrations in subslab air were more stable than VOC concentrations, presumably because the shallow soils themselves were the dominant source of radon and VOCs originate at a greater depth/distance.

### Application & Translation

- The results have provided the Program Offices and Regions with vital information that has been directly incorporated into the latest vapor intrusion guidance document released in mid-2015 entitled, "OSWER Technical Guide for Assessing and Mitigating the Vapor Intrusion Pathway from Subsurface Vapor Sources to Indoor Air."
- These research results have also been the basis for the examination on when to sample if you only can sample a limited number of times. This research is still ongoing in the vapor intrusion community.

U.S. Environmental Protection Agency. (2012) Fluctuation of Indoor Radon and VOC Concentrations Due to Seasonal Variations. EPA/600/R-12/673.



### Intended End Users

The intended end users for this research project include: Office of Land and Emergency Management (OLEM), Regions, vapor intrusion researchers, regulators, universities, and the private sector who deal with vapor intrusion sampling issues. This research was identified and requested by OLEM during their annual research needs identification process. OLEM vapor intrusion personnel were intimately involved in this research effort through their review of products at all stages from initiation through completion.

### Lessons Learned

- The results of our determination of the spatial and temporal distributions of VOCs show a highly complex system of possible sources that should be considered during vapor intrusion investigations. With potentially different VOC sources and marked variability due to seasonal effects, careful planning is essential.
- This report helps fill in knowledge gaps identified by the Program Offices (e.g., Office of Land and Emergency Response) and the Regions in providing vapor intrusion guidance.
- Clients will use results to provide new and updated VI guidance related to the determination of the potential for vapor intrusion into the home and in determining how and when to assess whether vapor intrusion is occurring.