



# **EPA Vapor Intrusion Workshop**

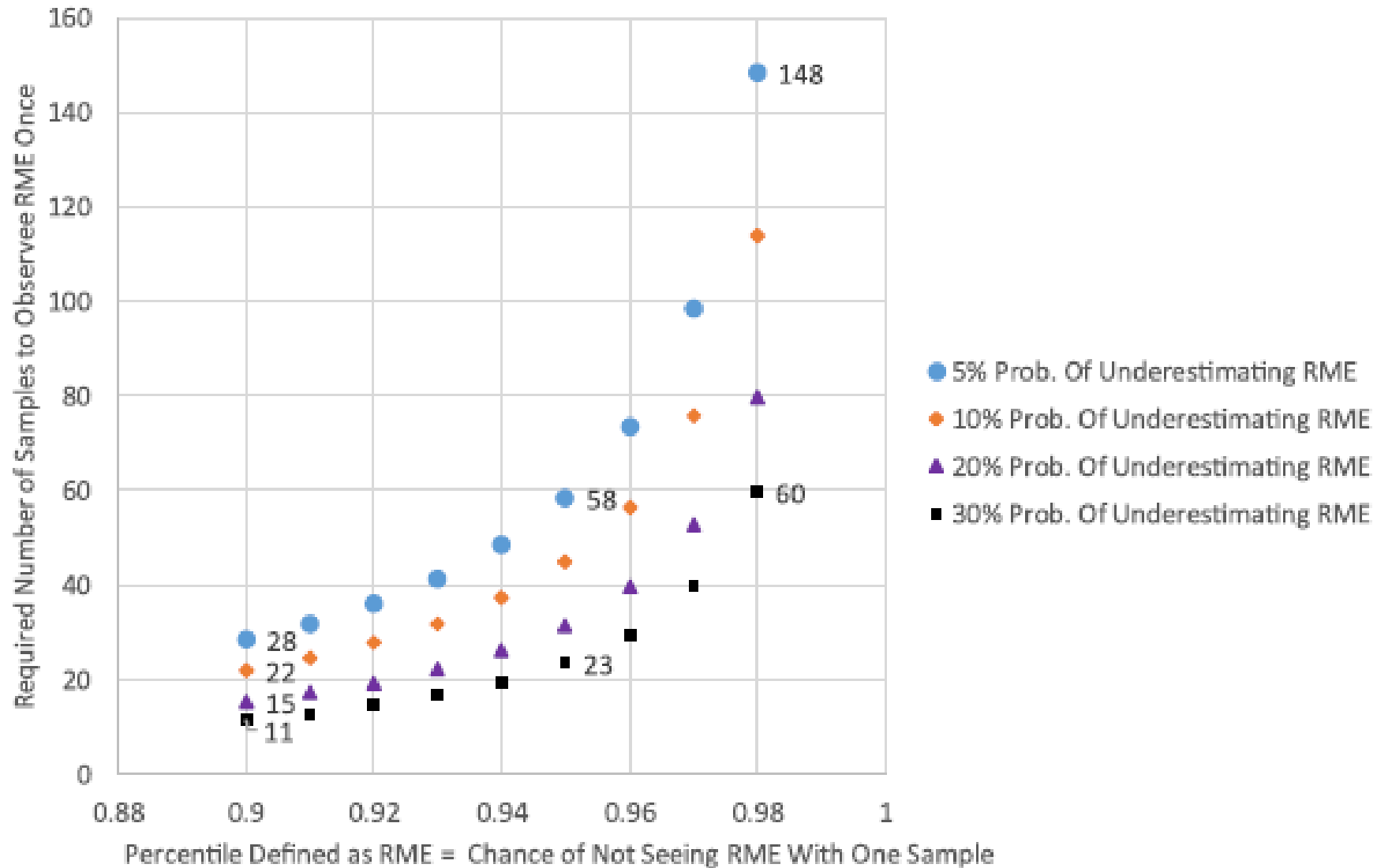
***Why (When, Where, and How) You Should Continuously Monitor Indoor Radon, Differential Temperature and Pressure During Chlorinated Vapor Intrusion Assessments***

**Triggered or Event-Based Sampling  
Approaches for VI Assessment**

Chase Holton, Ph.D., P.E.(CO, OK), Geosyntec

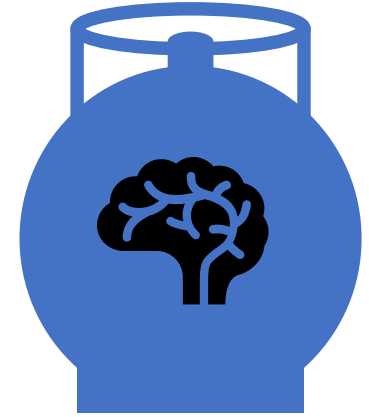
**Geosyntec**  
consultants

## Required Number of Unguided Random Samples Per Location/Zone to Observe RME Once at Various Confidence Levels



# Smarter Short-Term Sampling

- Add-ons and New Approaches
  - Timed or scheduled sampling
  - Remote start and stop
  - Triggered- or event-based sampling systems



*Restek Canister Air  
Sampling Timer*



*Entech TM1050 Remote  
Start/Stop System*



*SGS  
SmartSense*

# Event-Based Sampling

- *“Worst case conditions typically occur during the winter months...”* (MT DEQ, 2011)
- *“DWM recommends that one of the samples be collected in winter or summer conditions, typically when it would be expected that the structure would be closed up and the HVAC system operating.”* (NC DEQ, 2018)
- *“sample... between November 1 and March 31”* (NJ DEP, 2018)

# Event-Based Sampling

*“Worst case conditions are generally thought to occur during winter, when windows are usually closed and heating systems are more active, factors conducive to vapor intrusion”*

(MA DEP, 2016)

Parameter	Most Conservative (Worst-case) Conditions	Least Conservative Conditions
Season	Late Winter/Early Spring	Summer
Temperature	Indoor Temp. 10° F > Outdoor Temp.	Indoor Temp. < Outdoor Temp.
Wind	Steady > ~ 5 mph	Calm
Groundwater	High Water Table	Low Water Table
Barometric Pressure	Decreasing	Increasing (3 days before)
Doors/Windows	Closed	Open
Heating System	Operating	Off

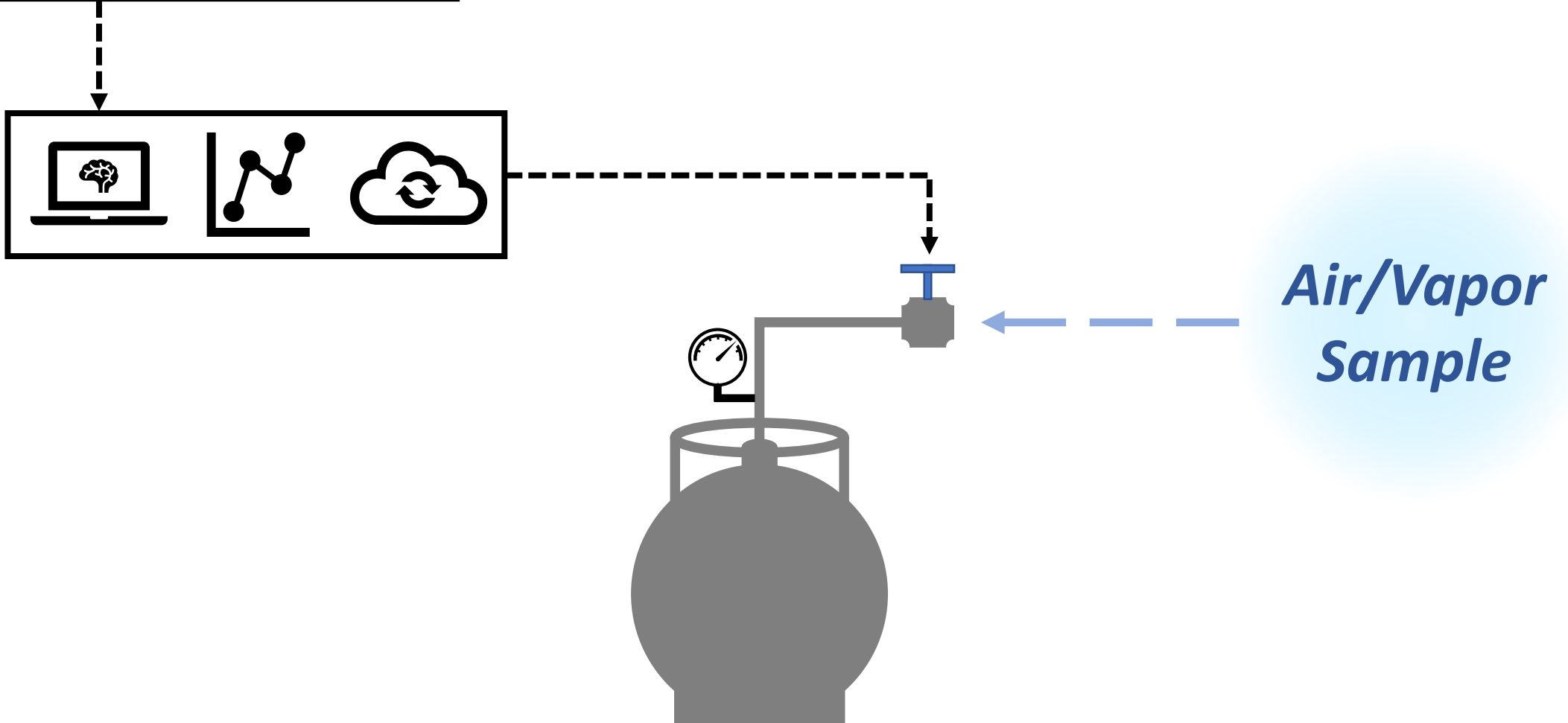
Image source: Table 2-1: Conditions for Sampling Indoor Air, MassDEP, 2016

# Event-Based Sampling

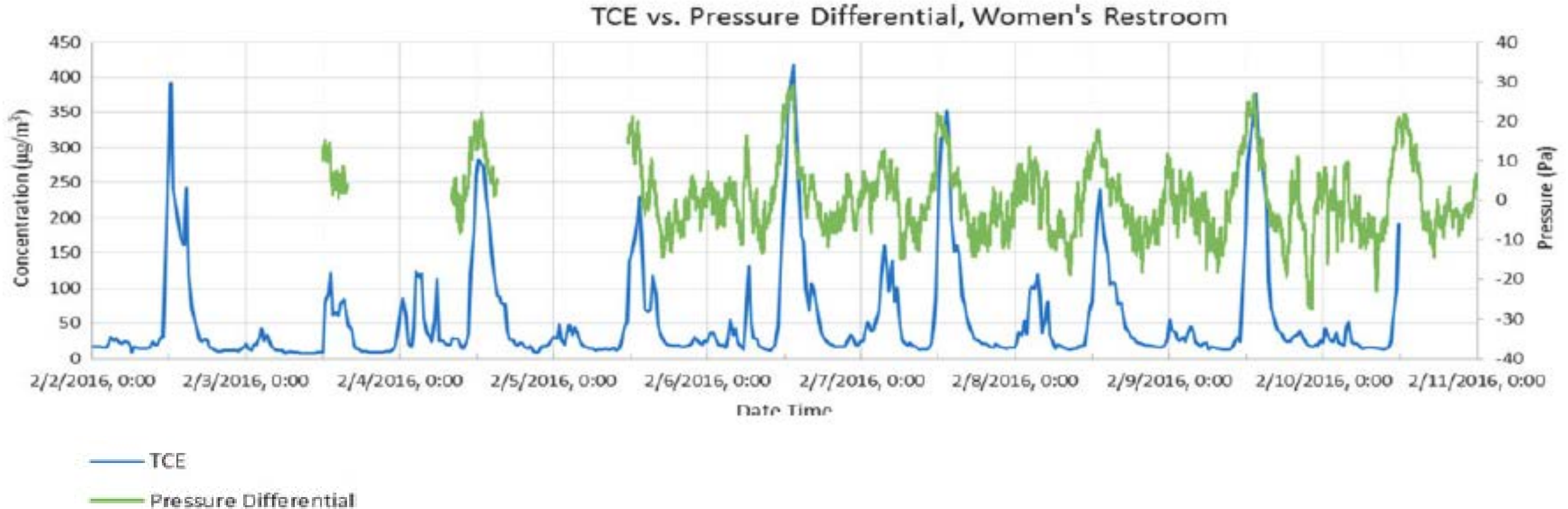
- *“...at least one sampling event should be conducted when the indoor air pressure is less than sub-slab soil gas pressure.”* (WA DOE, 2018)
- *“The indoor air data collected for screening purposes should be collected when the daily average outdoor temperature is at least 15°F (8°C) below the minimum indoor temperature in the occupied space and when the heating system is operating normally.”* (PA DEP, 2019)

# Triggered Sampling

Continuous Indicator

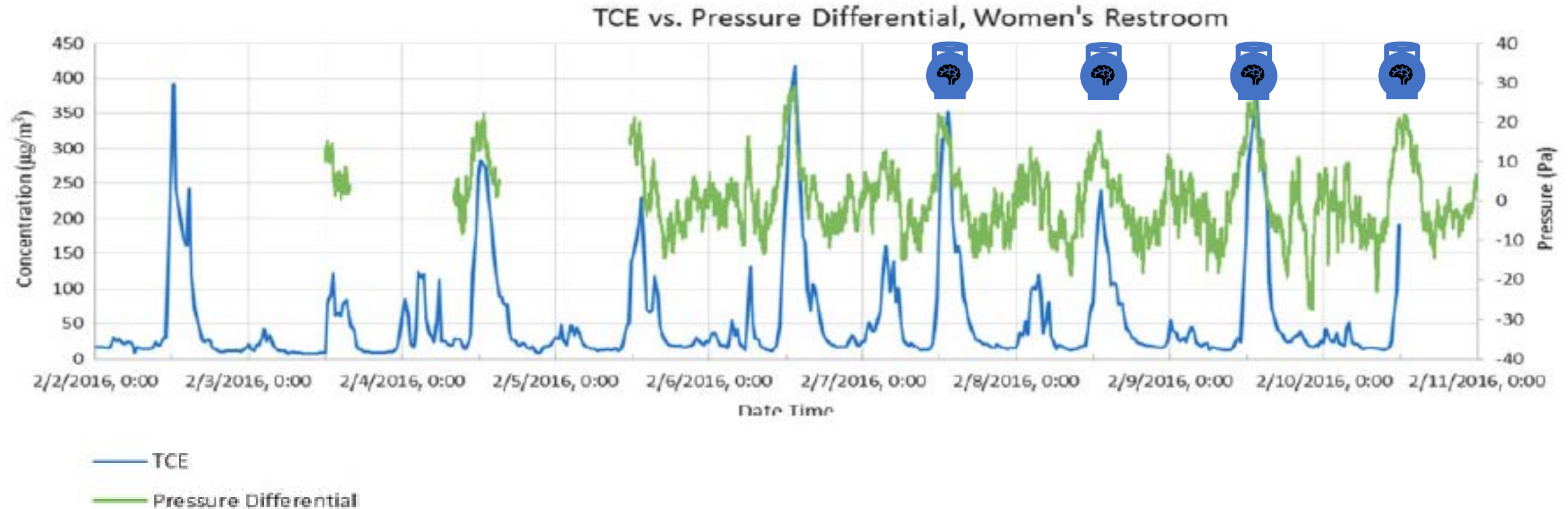


# Triggered-Sampling Systems, *example*





# Triggered-Sampling Systems, *example*



# Considerations for Triggered Sampling

- Project objectives
- Canister certification limitations, holding times
- Initial and final pressure measurements
- Baseline data requirements
- When to trigger and based on what?



# Summary

- Triggered or event-based sampling represents a potential application for real-time ITS data
- Several considerations to navigate, limited commercial options currently available

# Questions?

*Thank you,*

**Chase Holton, Ph.D., P.E.(CO)**

[CHolton@Geosyntec.com](mailto:CHolton@Geosyntec.com), [www.Geosyntec.com/VI](http://www.Geosyntec.com/VI)

**Geosyntec**   
consultants