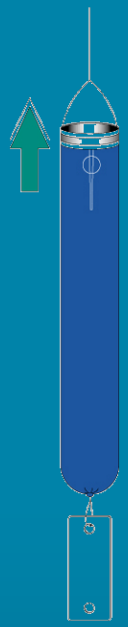
HYDRASleeve™ Sampler: A no-purge, whole volume sampling methodology to reduce cost and improve efficiency



MWH

BUILDING A BETTER WORLD

Initial evaluation of passive sampling options had several objectives

- Reduce costs
- Improve efficiency by reducing collection time
- Collect comparable data consistent with historical low flow samples
- Collect representative data to justify remediation and monitoring decisions

ITRC prepared two documents with evaluation of passive sampling methods

- Technology Overview of Passive Sampler Technologies (DSP-4), March 2006
  - Presents technical overview of 12 passive sampling technologies
  - Describes basis of operation, intended application, advantages, limitations, and development status
- Protocol for Use of Five Passive Samplers to Sample for a Variety of Contaminants in Groundwater (DSP-5), February 2007
  - Presents sampling protocols for Snap Sampler™, HYDRASleeve™, regenerated-cellulose dialysis membrane sampler, rigid porous polyethelene sampler, and GORE™ module

Three methods were evaluated further based on commercial availability

- Passive Diffusion Bag Sampler (PDBS)
- Snap Sampler™
- HYDRASleeve™ Sampler

Passive Diffusion Bag Samplers were previously evaluated at several AFBs

- PDBS were a relatively low cost investment and easy to use
- Previous studies indicated lack of representativeness for PCE and MTBE values
- Sample volume was limited to VOCs
- PDBS successfully implemented for some sites
- Because PCE is a primary groundwater contaminant at March ARB, PDBS were excluded from further consideration

Snap Sampler™ is a whole-volume sampler with studies demonstrating comparability

- Previous studies indicated precision was very good with Snap Sampler™, since loss of volatiles is limited
- Whole volume sample increased representativeness and comparability with historical data set
- Sample volume limited to VOA vials, with additional cost to cover QC samples
- Some complexity in use may increase potential field error and require additional training
- High capital investment required for implementation

HYDRASleeve™ samplers were a low cost option for whole volume sampling

- Previous studies indicated data comparable with low flow samples
- Whole volume sample increased representativeness and comparability with historical data set
- Some exposure to atmosphere may decrease sample accuracy
- Sampler volume sufficient for multiple analyses and/or QC samples
- Sampler inexpensive and easy to use, with limited up-front investment

No purge sampling has similar assumptions as low flow sampling

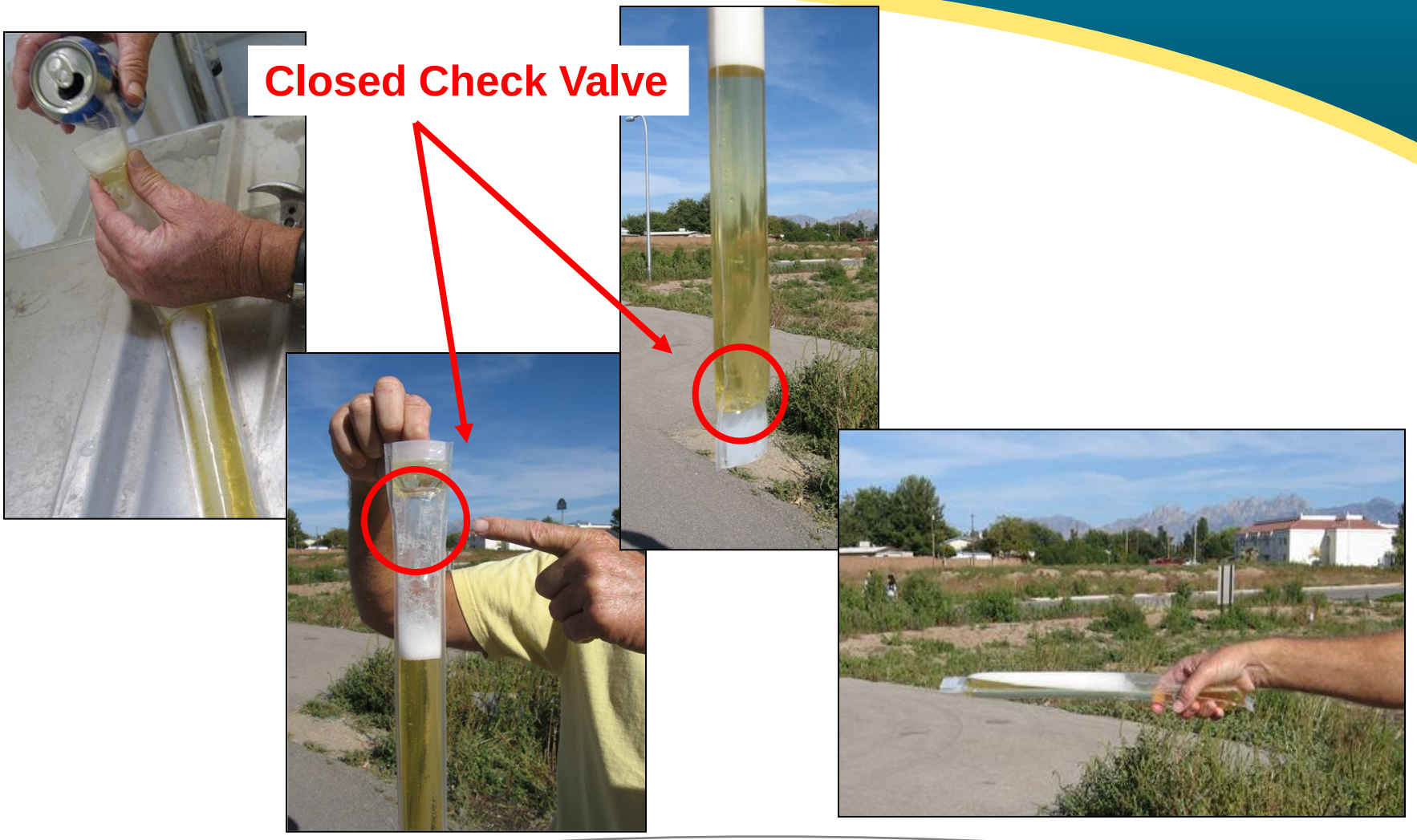
- Formation water continuously flows through well screen at an ambient rate
- Insertion of sampling device causes disturbance of the water column within the screen and negatively impacts the equilibrium of the well screen with the formation
- While low flow induces a flow to return equilibrium, no purge sampling allows equilibrium to return under ambient conditions

HYDRASleeve™ consists of a polyethene bag equipped with a reed valve

Diameter (inches)	Fill Volume (mL)	Length (inches)	Fill Stroke (inches)
2	650	30	30-45
2	1,000	36	36-72
4	1,600	30	30-45

Composite samplers are also available

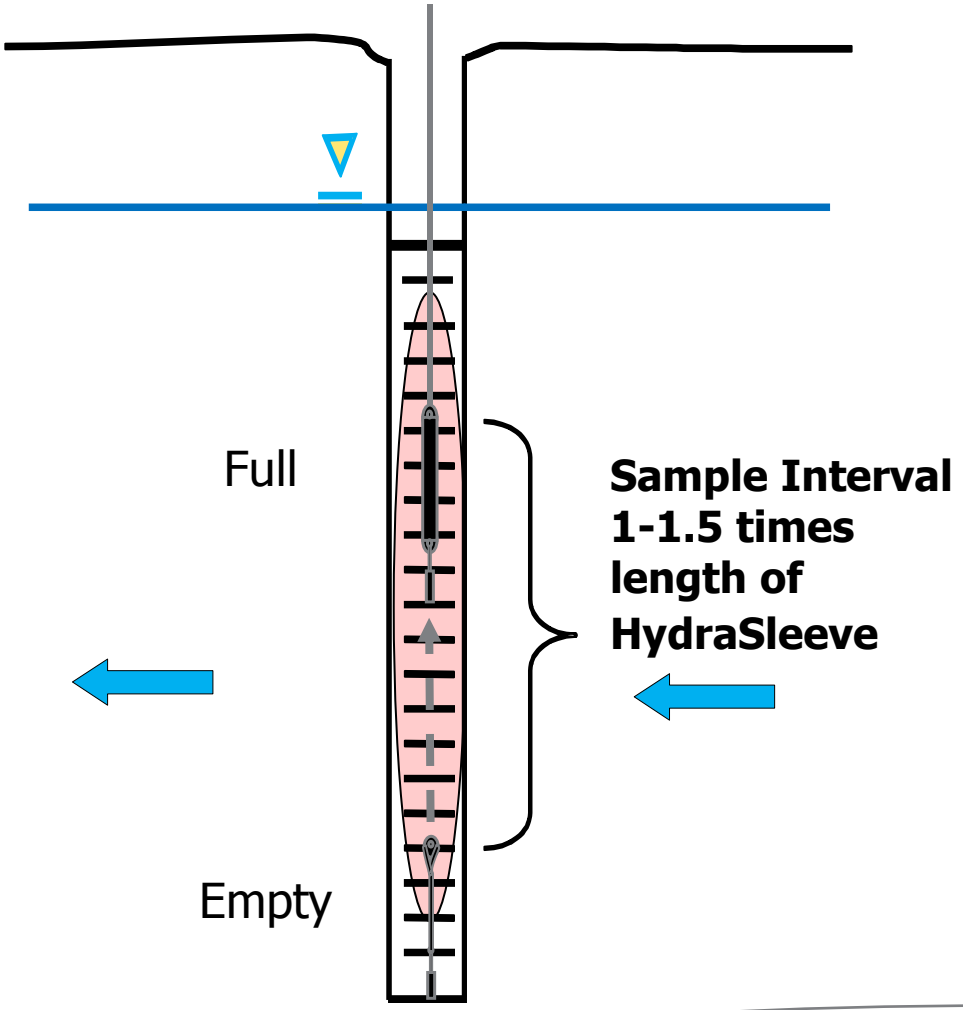
Reed valve opens and closes due to hydrostatic pressure

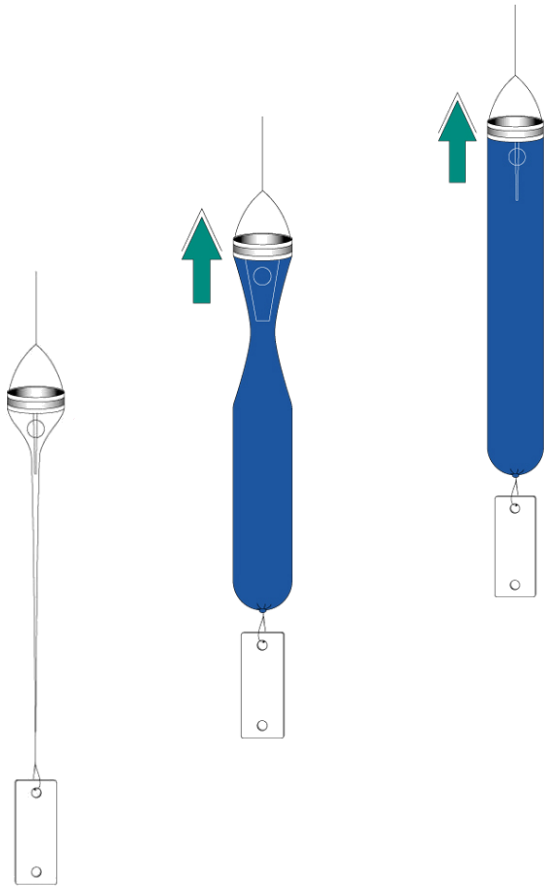


HYDRASleeve™ samplers have a limited equilibration period

- Samplers have a low profile and limit disturbance of the groundwater
- Well conditions dictate how long well should equilibrate, but typical interbedded sediments need 2-3 days
- More may be warranted for wells with very low hydraulic conductivity

HYDRASleeve™ will remain empty until pulled up to collect the sample





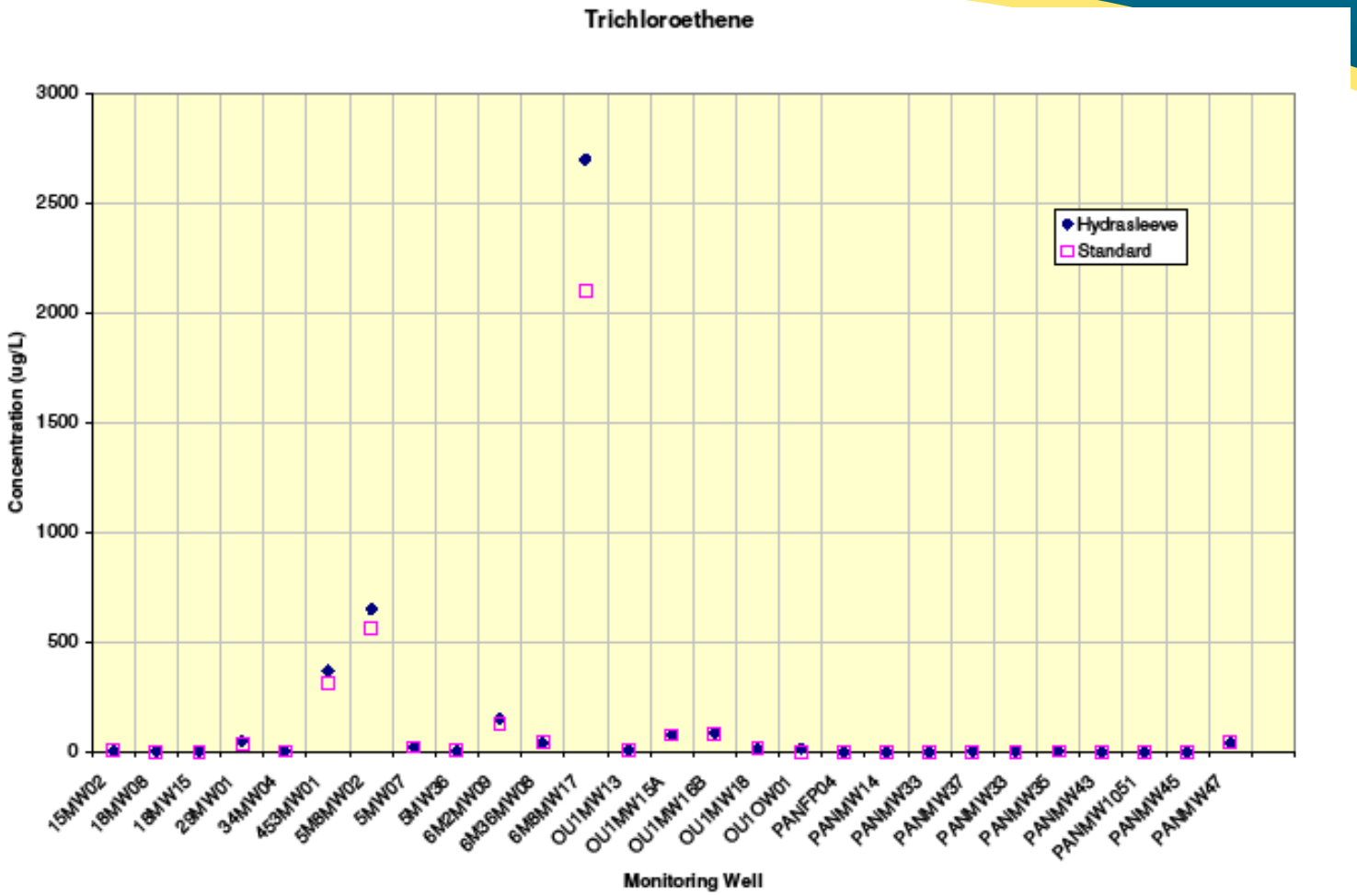
March ARB demonstration study included comparative samples in 27 wells

- Study included initial comparison analysis of 20 samples from wells of various depths and range of VOC concentrations
- Additional 7 wells sampled to provide additional comparison of benzene and TPH results
- HYDRASleeve™ sampler placed in well 48 to 72 hours prior to collecting samples
- Low flow sample collected using portable pump immediately following collection of HydraSleeve™ sample

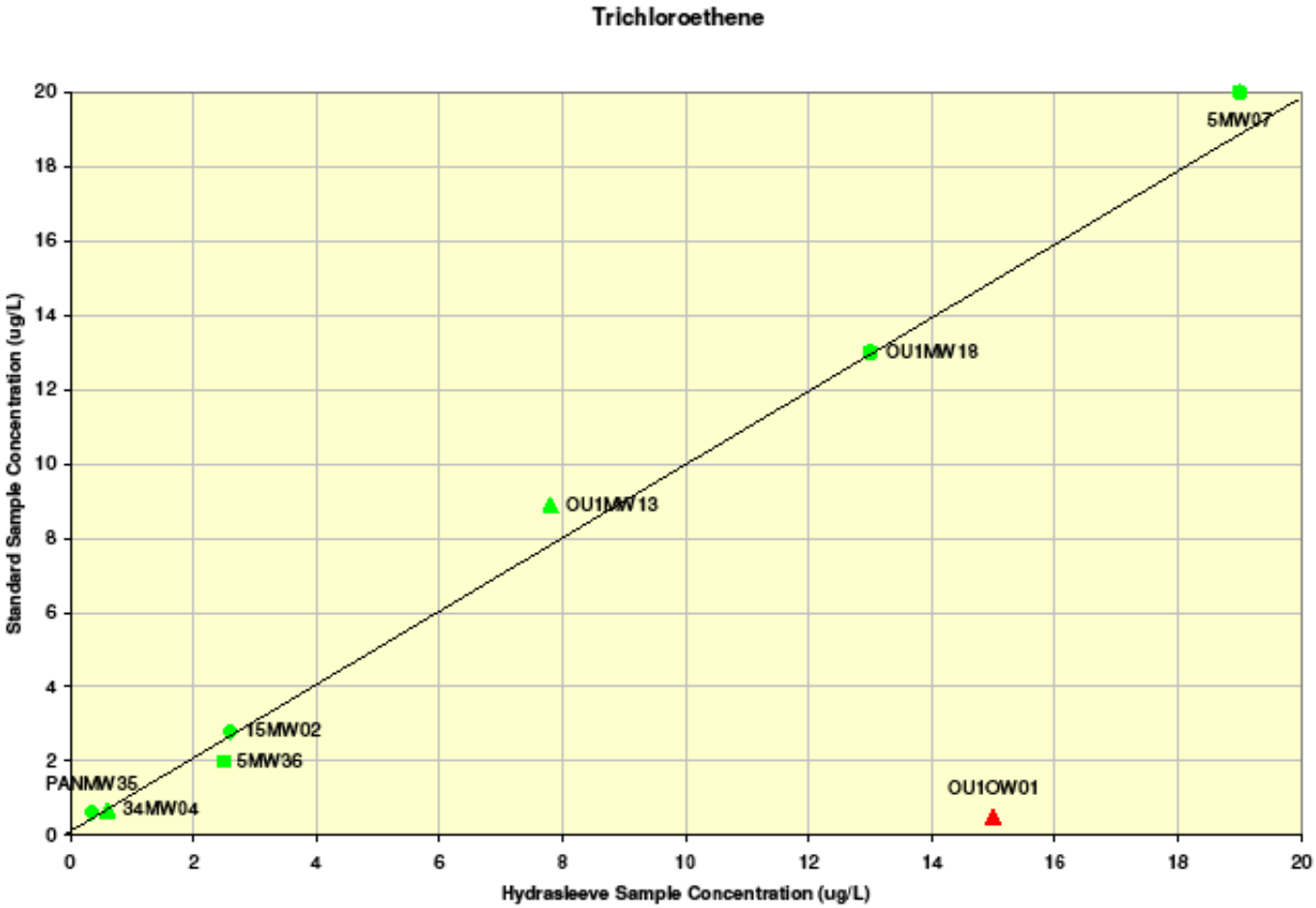
Study demonstrated that results were comparable for VOCs

- Low concentrations of VOCs very similar in both low flow and HYDRASleeve™ samples
- Comparison of results fall close to 1:1
- Greater differences observed in samples with relatively high concentrations, with HYDRASleeve™ results generally slightly higher than low flow results

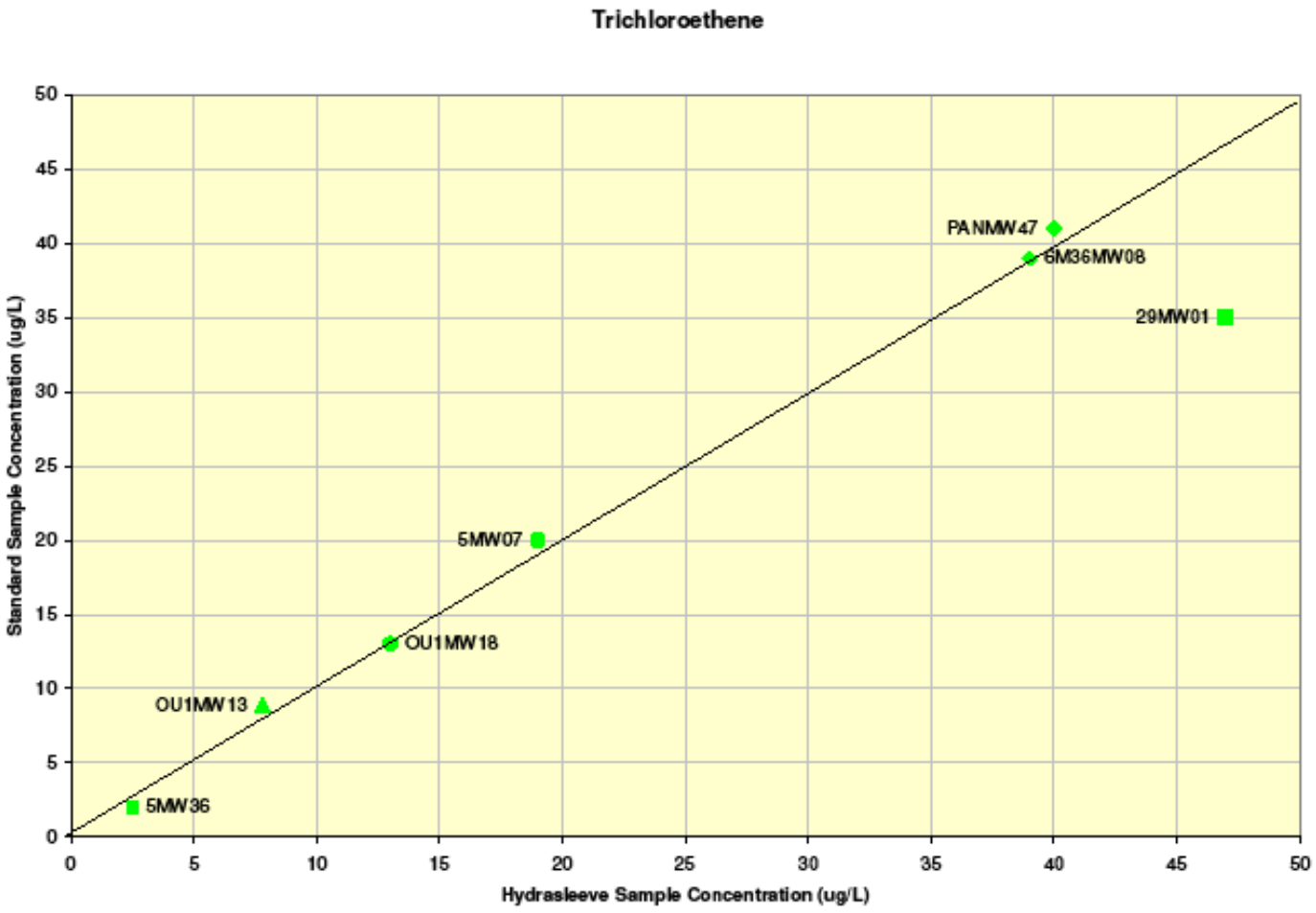
TCE, Comparative Results



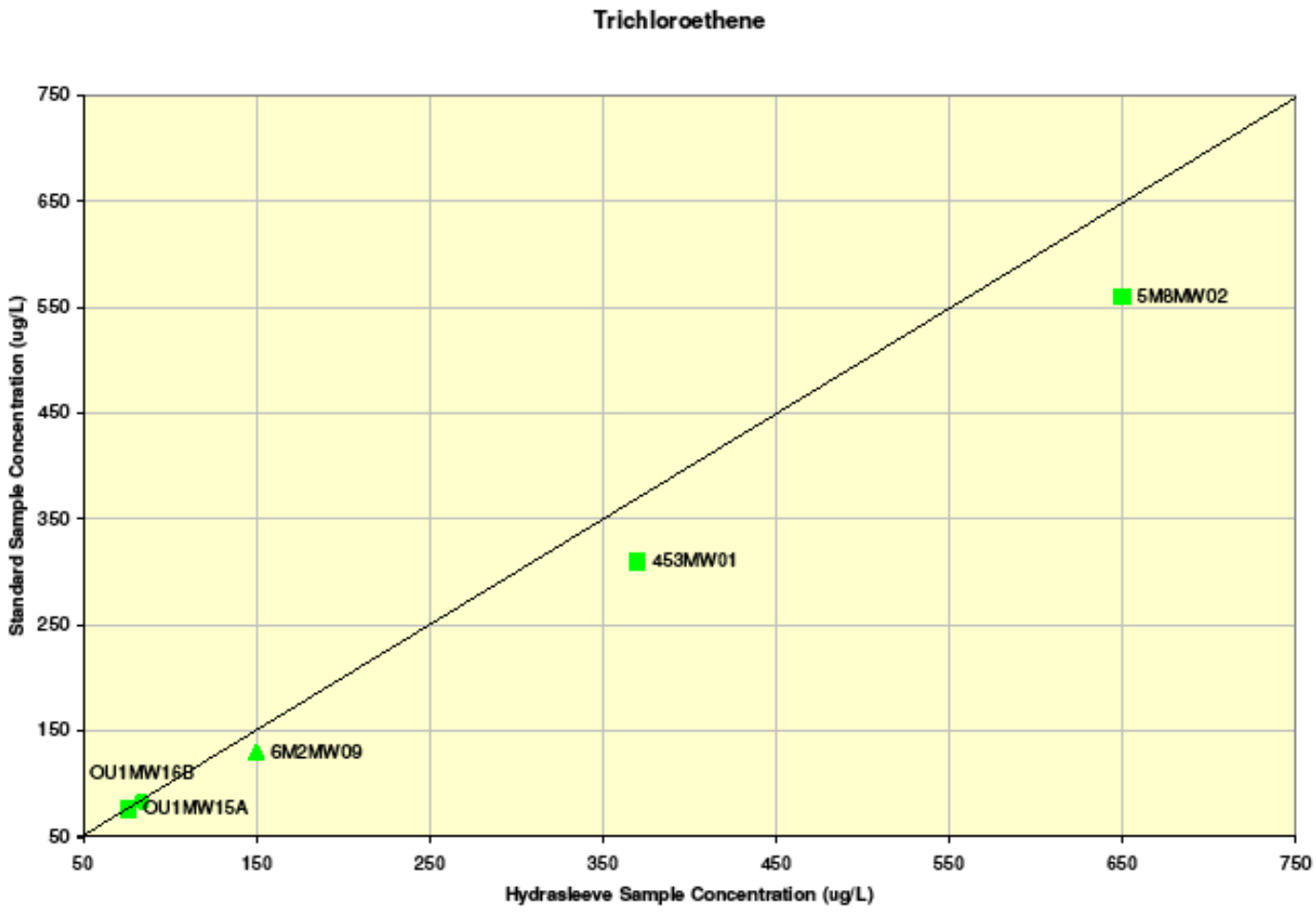
TCE, Low Values



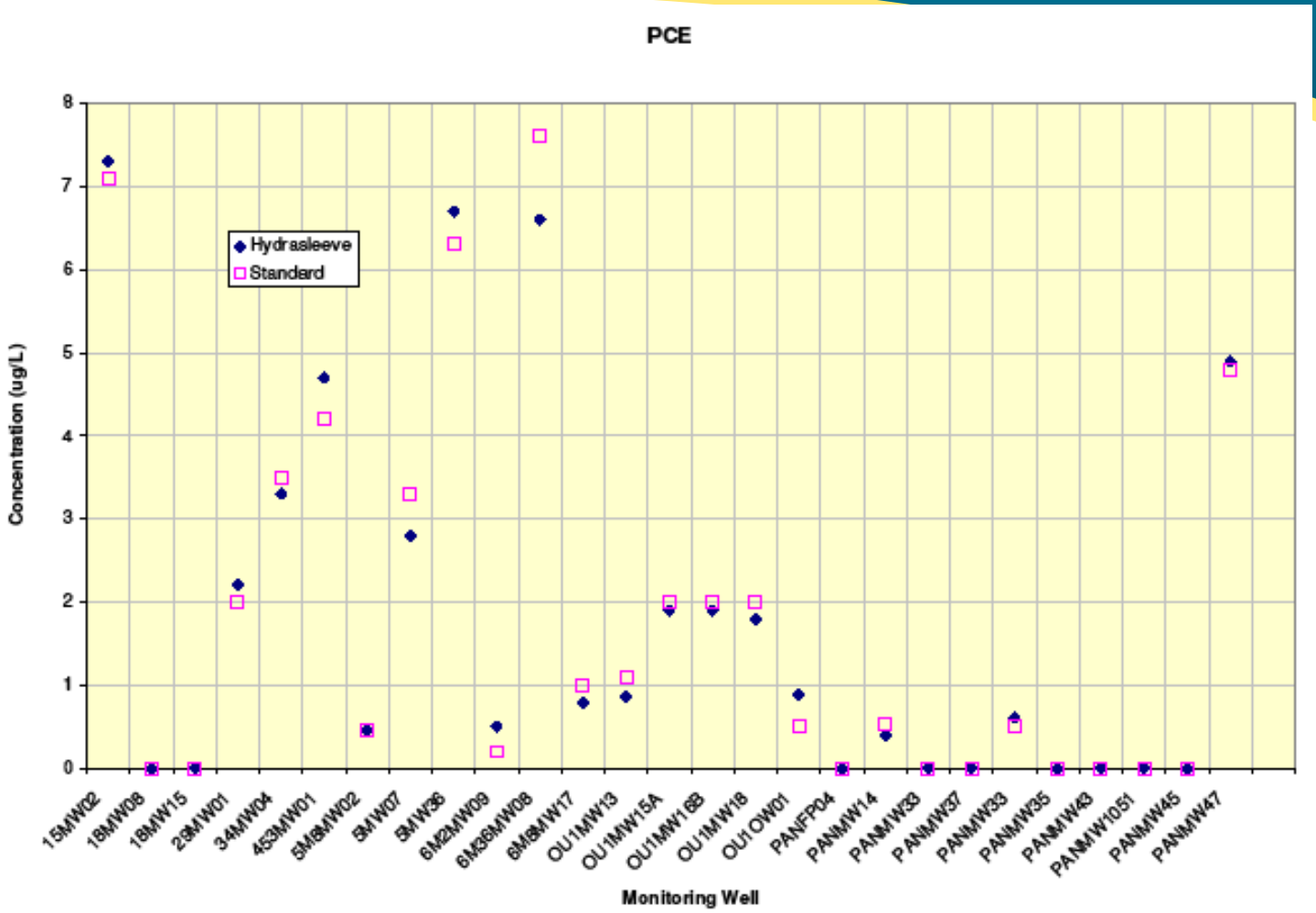
TCE, Mid Range



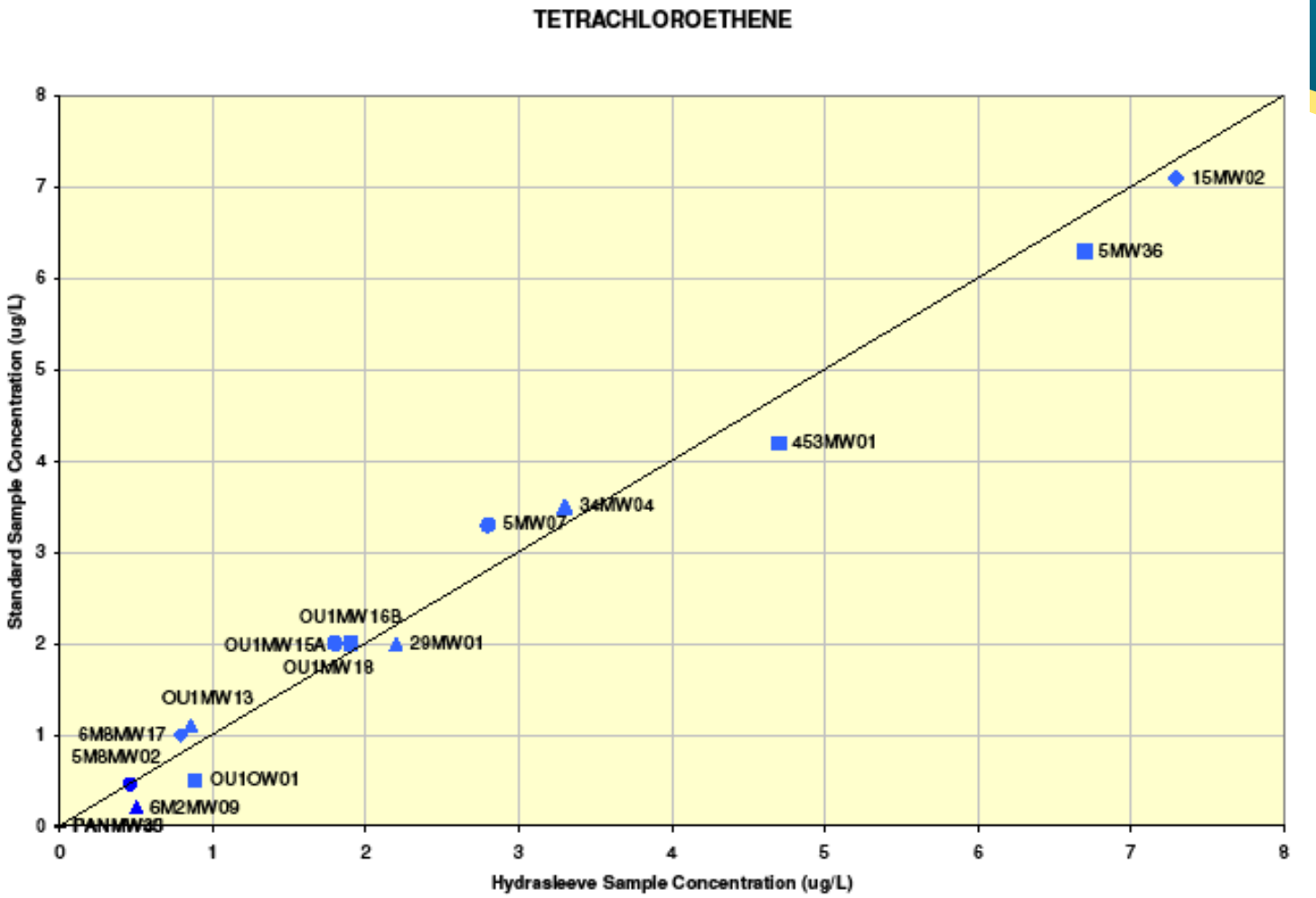
TCE, High Values



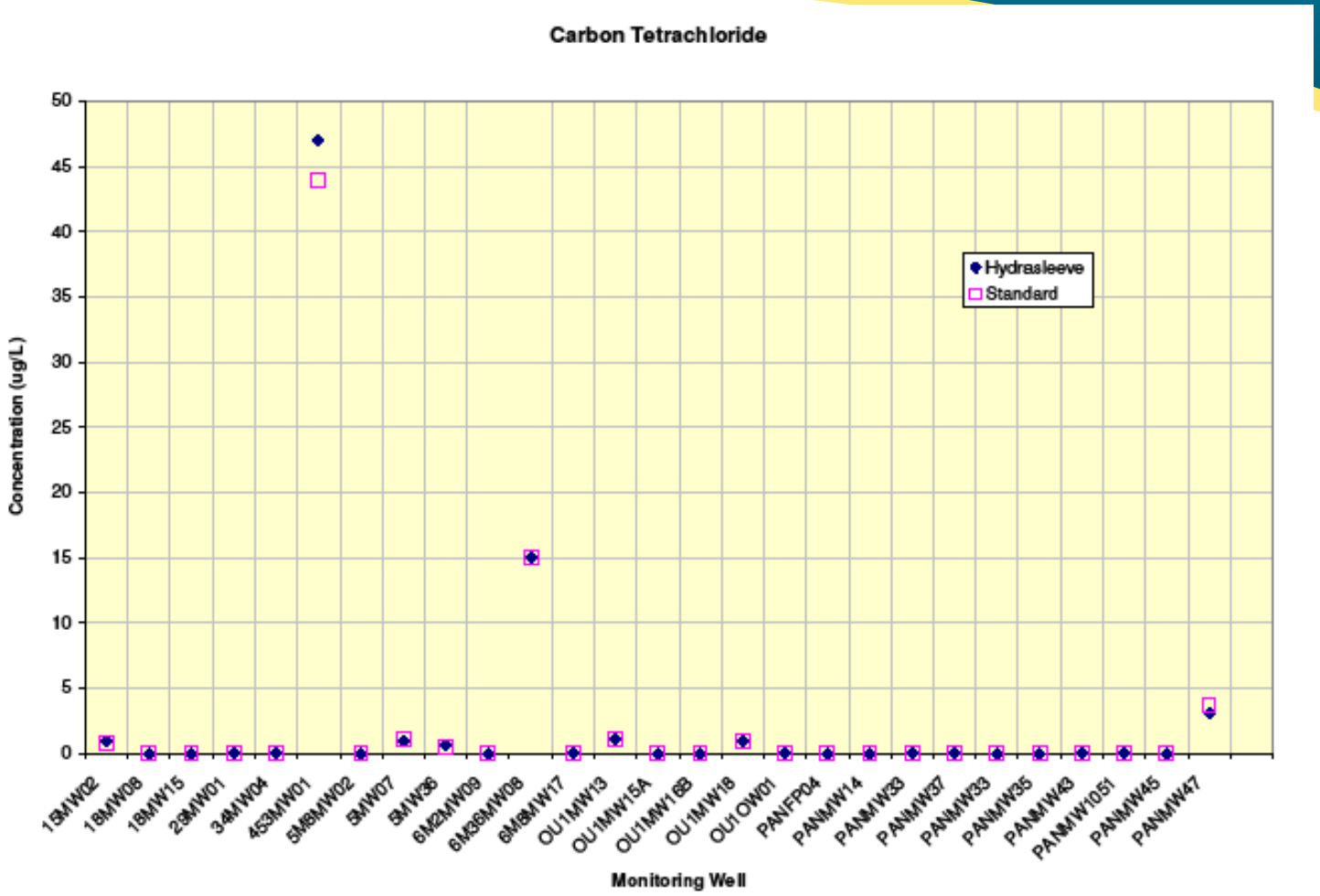
PCE, Comparative Results



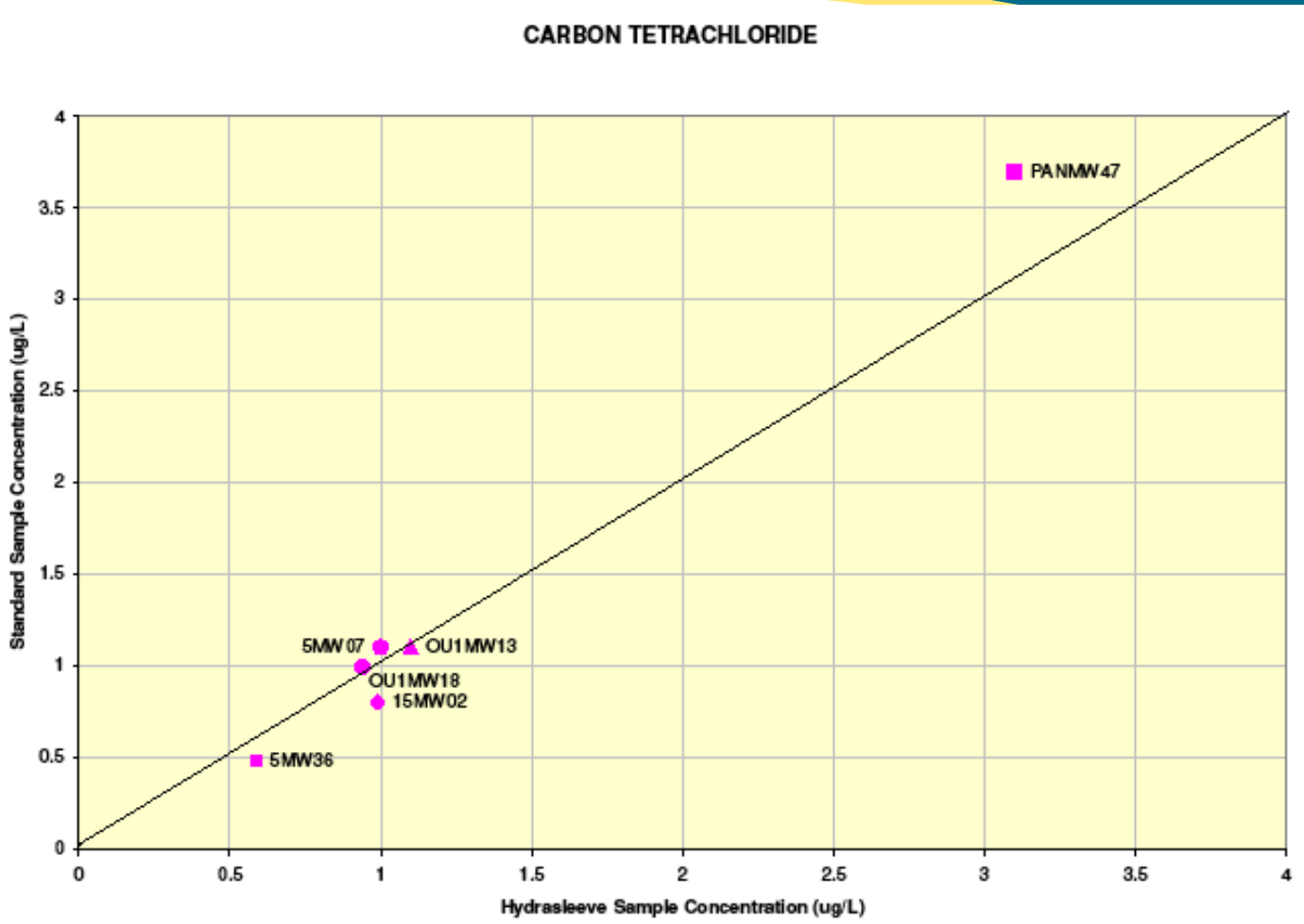
PCE, Low Values



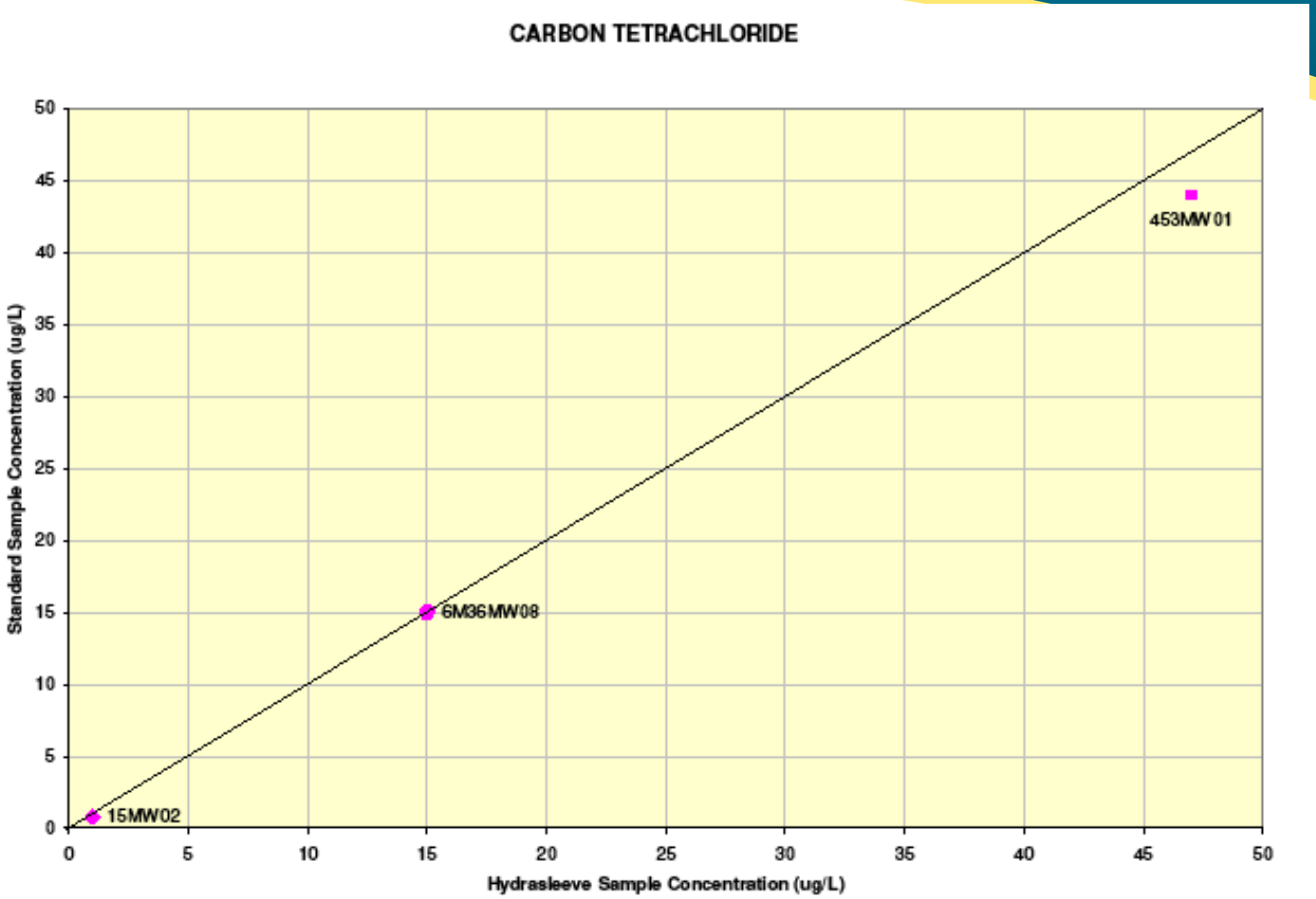
Carbon Tetrachloride, Comparative Results



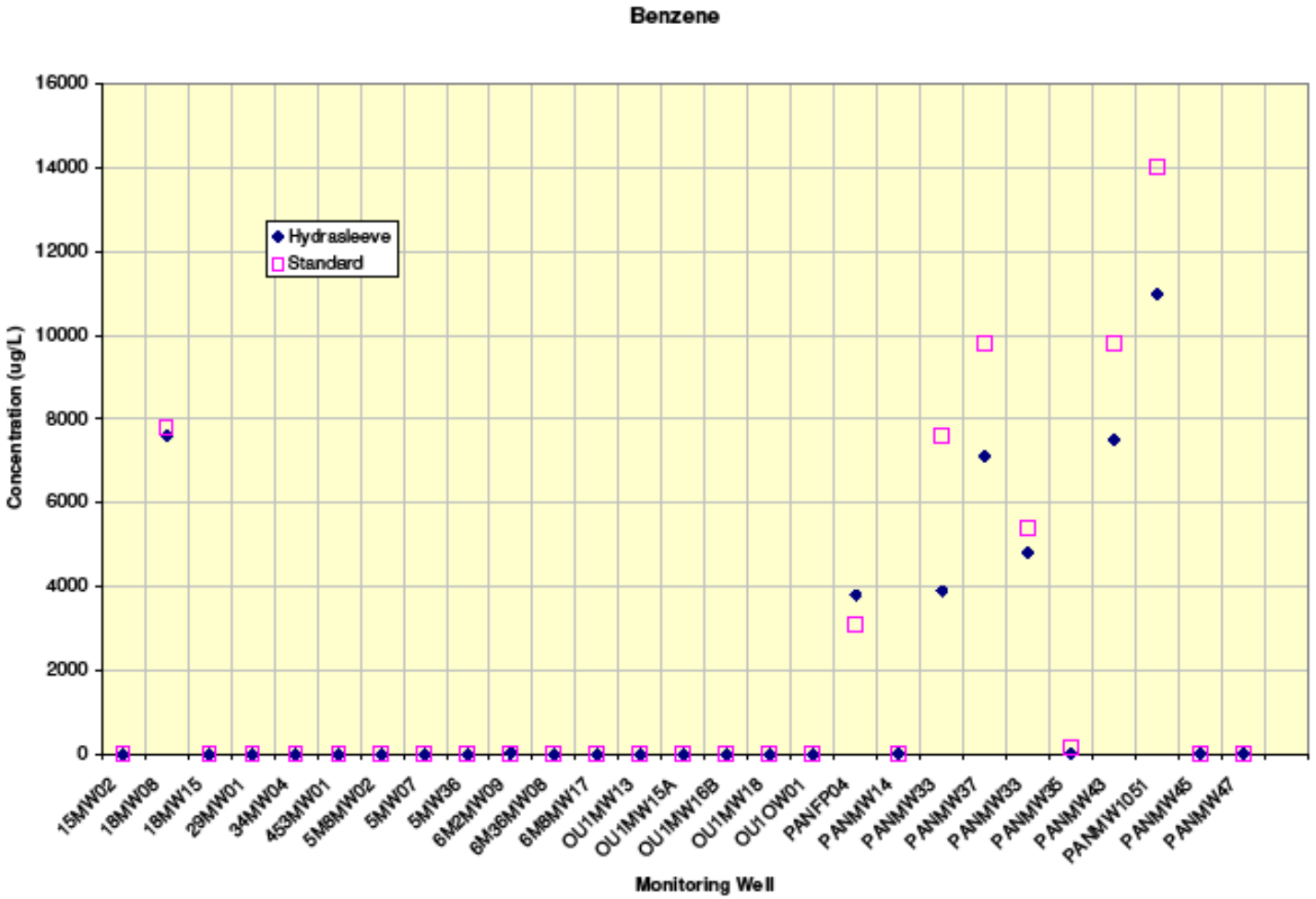
Carbon Tetrachloride, Low Values



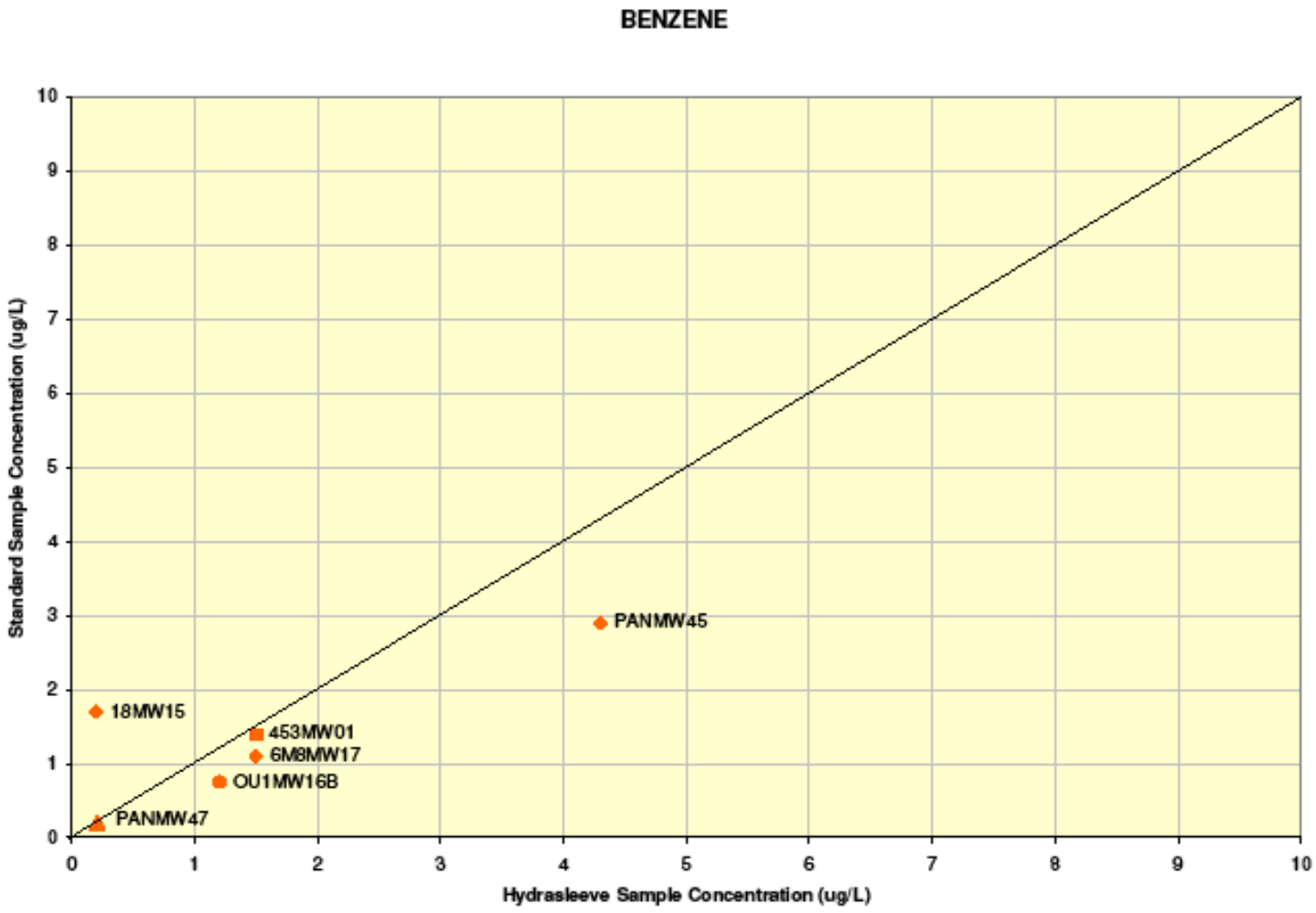
Carbon Tetrachloride, High Values



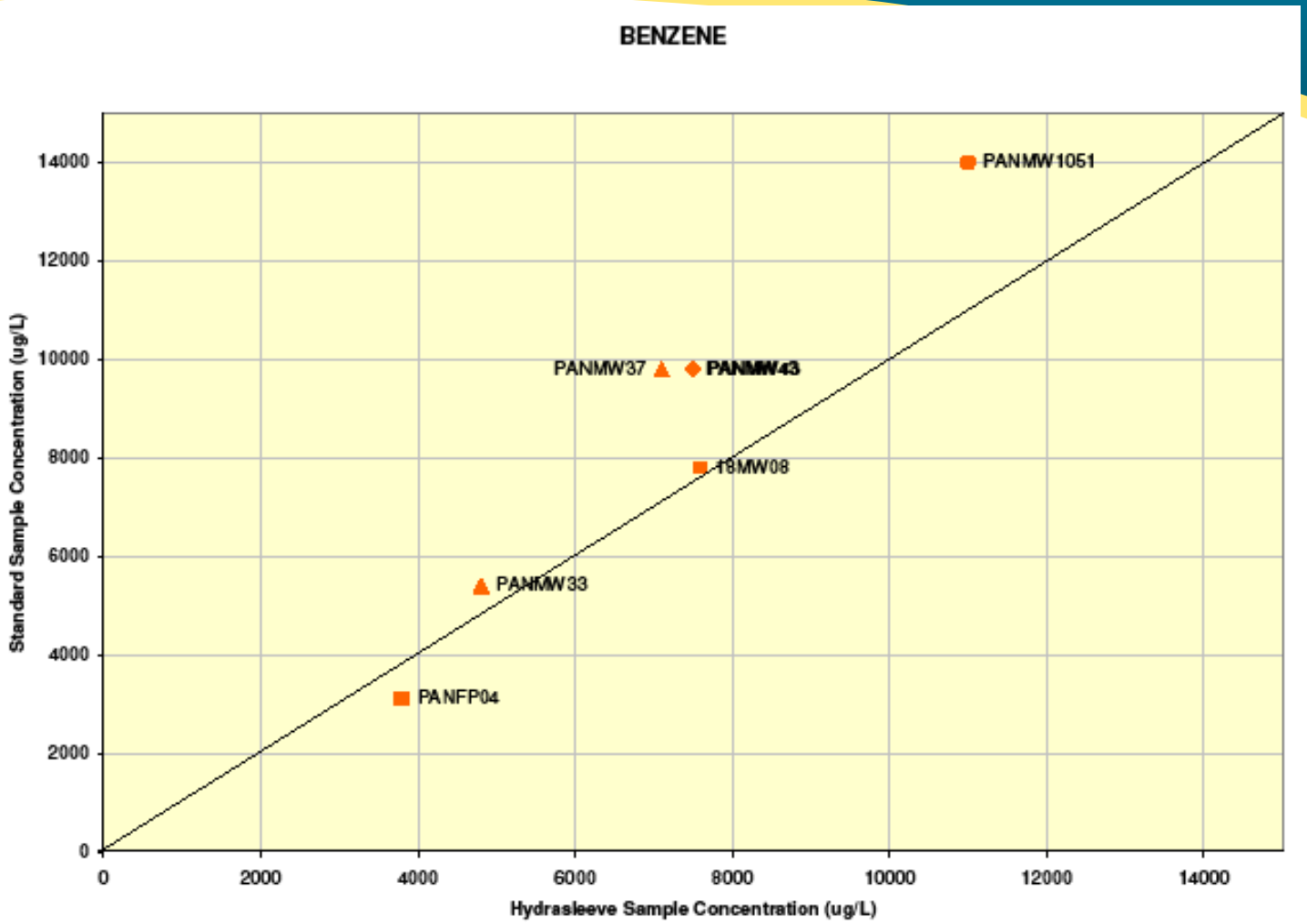
Benzene, Comparative Results



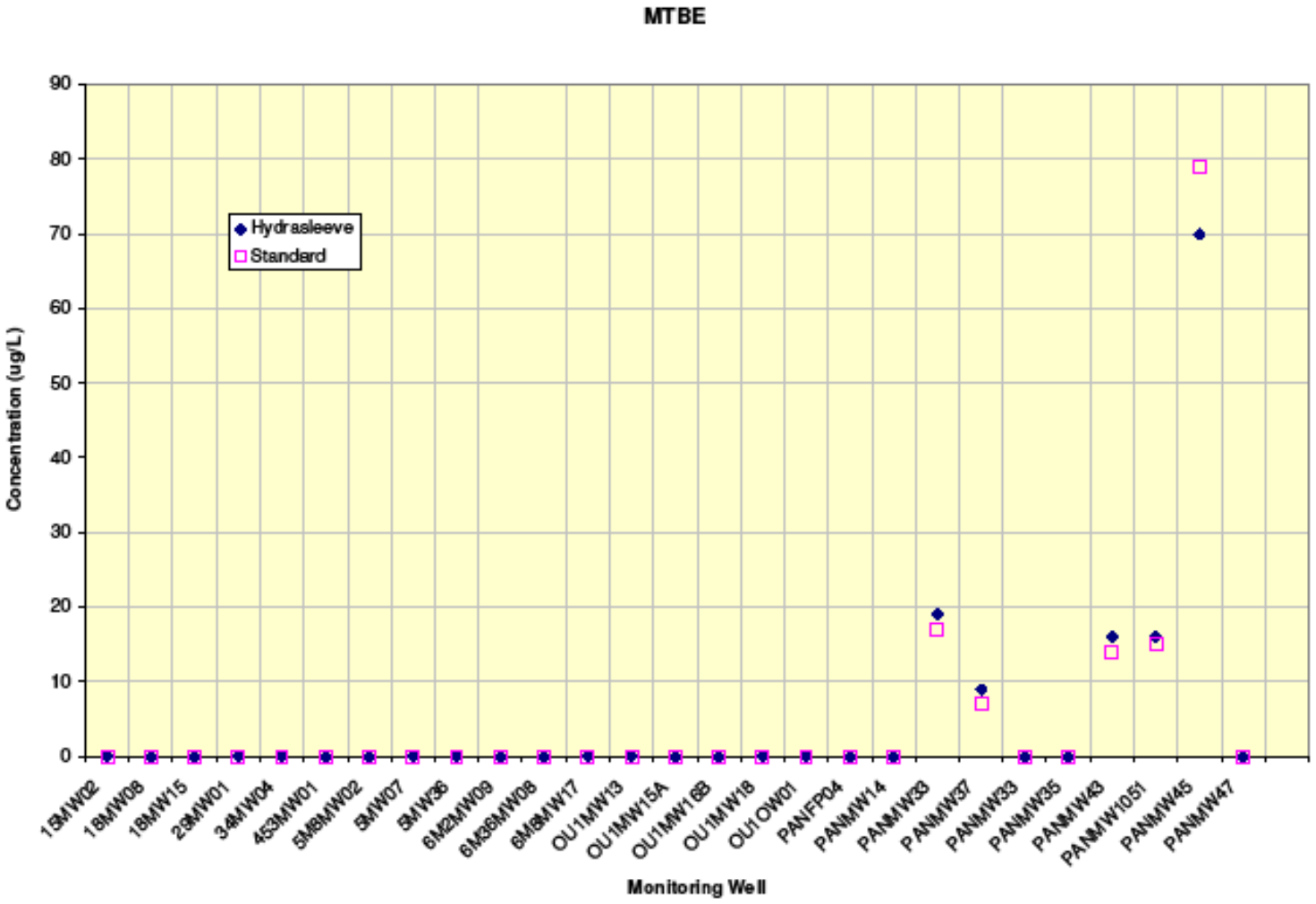
Benzene, Low Values



Benzene, High Values



MTBE, Comparative Results



HYDRASleeve™ has been recommended for full-scale implementation at March ARB

- Regulators open to concept of no-purge sampling prior to study
- HYDRASleeve™ results comparable at low levels and suitable for environmental decisions
- Petroleum site samples more variable in benzene and TPH analyses, more sensitive to position within well (i.e., at high concentrations, with submerged screens yield less comparable results)

HYDRASleeve™ estimated to reduce sampling and analysis costs by 50%

- Reduces sampling labor costs by 50%
- Eliminates need for decontamination
- Eliminates need for rinsate QC samples
- Accelerated schedule reduces trip blanks
- Eliminatescosts for waste transport
- Reduces equipment costs for sampling (<$30/well)
- Low initial investment (<$25/well)