DO WE REALLY NEED ALL THE QUALITY ASSURANCE/QUALITY CONTROL SAMPLES IN GROUNDWATER MONITORING?

A Statistical Evaluation of a Large Data Set | August 8, 2019

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Large Data Evaluation of QA/QC Samples

Objective:

To determine the value added by blanks in the evaluation of groundwater

How often do these QA/QC samples prevent false positive detections from resulting in unnecessary action?

At what cost?

Data Set Size

- Five Dow facilities in Texas
- Ten-year time period 2008 to 2018
- Target compounds only (no surrogates or internal standards)
- VOCs, SVOCs, metals
- Sixteen laboratories

512,552 analyses

(records in the data base, constituents time samples)

Topics Explored

Blanks

- How often are target analytes detected in different field related blanks?
- How often do blanks add value by identifying false positive detections?

What defines value?

Rationale

- The requirements for the numbers of blanks in State regulations come from federal regulations
- The pertinent federal regulations were promulgated in the 1980s
- Over the past 35 years, field and laboratory techniques have improved
- Extra laboratory control program implemented

Field related Blanks – The Data Set

- Equipment blanks – 753 analyses, 8 detection
- Field blanks – 3,431 analyses, 33 detections
- Trip blanks – 5,451 analyses, 47 detections
- No other blanks like Ambient blanks, Bottle blanks

Total – 9,635 analyses, 88 detections

0.9% rate of detection

(No method blanks or spike blanks or other lab blanks)

What Compounds Were Detected in the Field related blanks?

- Acetone – 50
- Methylene chloride – 15
- Methyl ethyl ketone - 3
- Other potential contaminants – 20
  - Chlorobenzene – 7
  - Toluene – 7
  - Chloromethane – 2
  - 1,2-Dichloroethane, Trichloroethene, Vinyl chloride, Xylenes – 1 each

Did the Blanks add value towards achieving Data Quality Objectives?

- Chlorobenzene: 7 blank detections, 6 cases of a site detection being negated by the “5 X rule” and no cases of such a detection being above the 100 µg/L residential PCL in Texas. **Value added: Zero**.
- Toluene: 7 blank detections, no cases of a site detection being negated by the “5 X rule” and thus, no cases of such a detection being above the 1,000 µg/L residential PCL in Texas. **Value added: Zero**.
- Chloromethane: 2 blank detections, 2 cases of a site detection being negated by the “5 X rule” and no cases of such a detection being above the 70 µg/L residential PCL in Texas. **Value added: Zero**.

Did the Blanks add value towards achieving Data Quality Objectives?

- TCE, Vinyl chloride and Xylenes each had a blank detection, but only TCE had a single case of negating a site detection, but that detection was less than the PCL of 5 µg/L. **Value added: Zero**
- Acetone is actually detected in 15.3% of site samples, but the highest blank detection was 77.8 µg/L. Ten times this detection is 778 µg/L, and the PCL for acetone is 2,200 µg/L. **Value added: Zero**
- Acetone and Methylene Chloride are common laboratory background contaminants. Therefore 65 out of the 88 detections are not truly associated to the field related blanks

One Case that Value Added by a Blank

- 1,2-Dichloroethane was detected in a field blank on July 15, 2008 at 6.5 µg/L. On that day, there was a detection of 13 µg/L overturned by this blank contamination. The field blank mathematically could contribute 50% to the determined amount. The PCL for this compound is 5 µg/L
- How much did Dow spend on blanks in Texas from 2008 to 2018? (There were 1038 blanks)

Was it worth it?

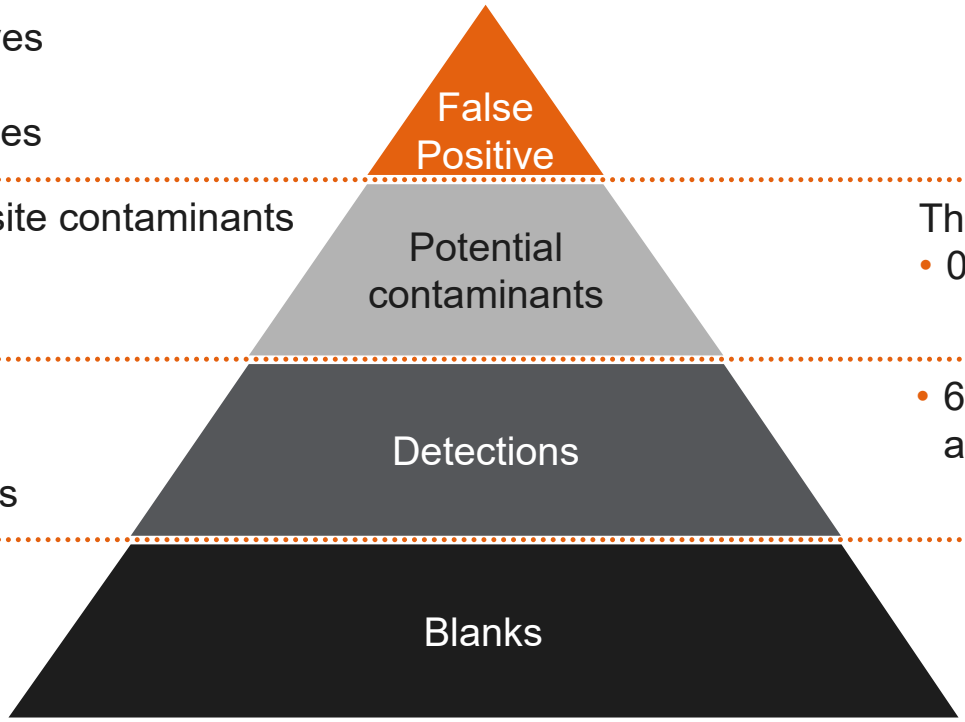
Value Added

Overturned false positives
- 1
- 0.01% of blank analyses

Detections of potential site contaminants
- 20

Detections in blanks
- 88
- 0.9% of blank analyses

Total blanks - 1038
- 9,635 analyses
- 1.9% of analyses



These detections are:
- 0.2% of all blank analyses

- 65 most likely laboratory associated

Improvements in Technique (Lab and Field)

- Improved sampling methods
- Better extraction methods – closed system versus syringe
- Better analytical methods
- The separation of the SVOC analysis from VOC analysis
- Better instrumental methods
- Better laboratory practice
- All these improvements make field related blanks obsolete

New Statistical Guidance

- Permits in Texas include statistical evaluation of groundwater data
- The 2009 USEPA groundwater statistical guidance includes strategies for controlling the Site-Wide False Positive Rate
- These strategies include retesting:
  - 1 of m schemes (such as 1 of 2, 1 of 3, 1 of 4)
  - Modified California approach (majority must be within the limit)
- The Double Quantification Rule

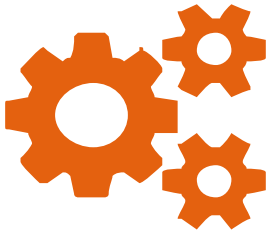
These strategies allow for resampling of wells with unexpected detections.

Conclusions

Blanks

- Target analytes are detected less than 0.2% of the time in blanks
- In the data base that was examined were 1038 blanks and 9635 samples; one analysis was identified that **could** have added value by identifying false positive detection, a rate of 0.01%
- Blanks in long-term monitoring have been rendered obsolete by new statistical methods

Where do we go from here?



- Awareness is the first step to regulatory recognition
- We should recognize improvements in field and laboratory techniques and bring them into the QAAP
- What can be done to ensure Quality?
- Evaluate data from other regions
- Present the data to the regulators
- Update QAPPs and Workplans

Where do we go from here? (..continued)

- Change Control guidance
  - One Trip Blank per day and cooler for VOC
  - One Field Blank/Equipment Blank per day or per 20 samples
- Do not take Trip Blanks and Field/Equipment Blanks
- Ask laboratories to control the equipment provided for components of concern
- Use disposable equipment whenever feasible (no equipment blanks necessary)
- If data seem to be questionable, go back and resample

Questions/Discussion