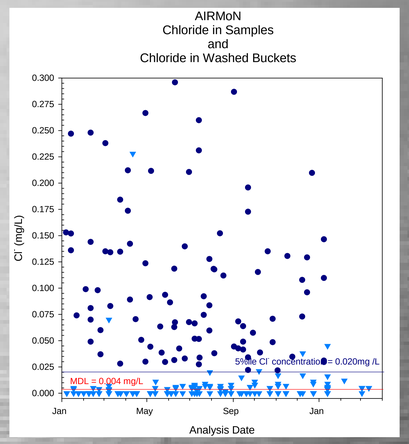
Kicking the Bucket in Illinois

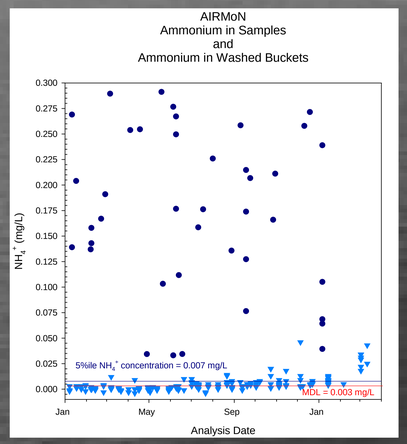
Jane Rothert
Quality Assurance Chemist
Central Analytical Laboratory
NADP

Illinois State Water Survey
University of Illinois
2204 Griffith Drive
Champaign, IL 61820

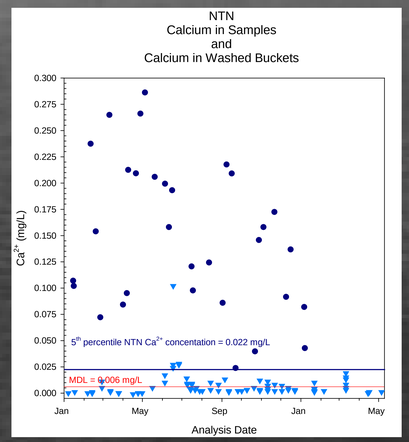
The IL11 Bucket Study was designed to follow all buckets used at the IL11 site for both NTN and AIRMoN for an entire year. The study addressed these questions: Do some buckets need multiple cleanings to be certified clean? Does sample concentration influence bucket cleanliness after washing? Is there a limited life expectancy for the buckets after which they are difficult or impossible to clean effectively? At the start of the study, new buckets were clean with all analyte-of-interest concentrations below detection limit. No bucket was sent back into the field unless all analytes were below detection limit.

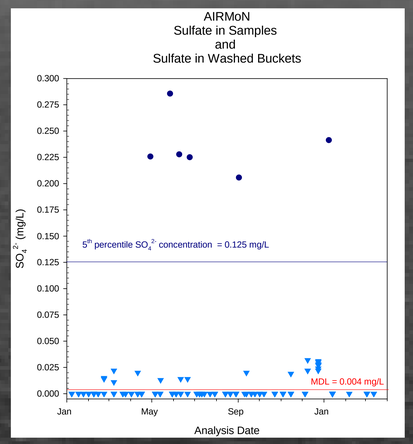
Ten buckets were used for the NTN sampler and 18 were used for the AIRMoN sampler. Each bucket was used between four and nine times. Seven of the AIRMoN buckets were only cleaned once between uses. Six had a mixture of one or two washes. Two had mostly two washes to get them clean. One had three washes to clean and six at the end of the study to get clean. Most required two to 6 washes at the end of the study to get all analytes below the Method Detection Limit (MDL).



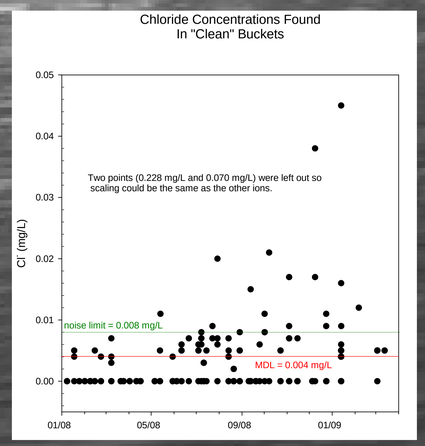


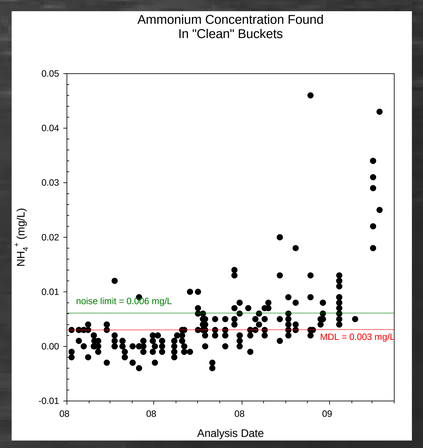
Dark blue dots are sample concentrations. Light blue triangles are "clean" bucket concentrations.

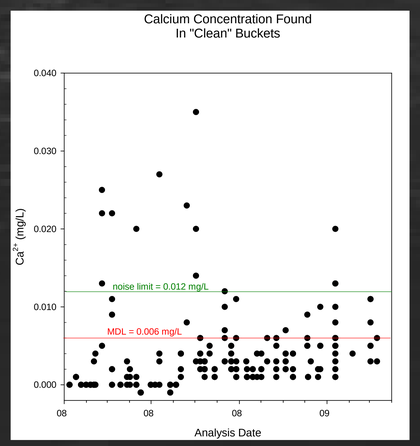


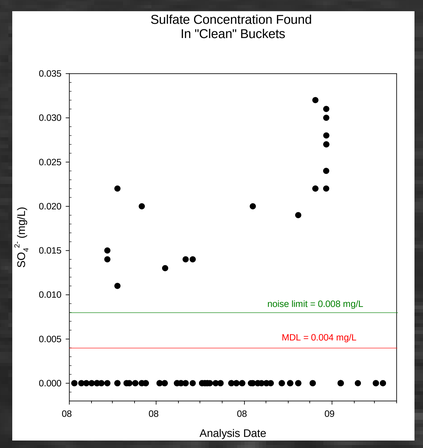


For most analytes, the contamination in the buckets is less than the concentration in the precipitation found at IL11. There are a few exceptions. Although the graphs used in this poster are primarily AIRMoN, the NTN data show the same trends and patterns.









For all analytes measured, the contamination in the buckets increased as the year progressed. In other words, it became harder to get the buckets clean enough for reuse, requiring more washings to get all analytes below the MDLs. However, even with the increasing contamination in the bucket, most of the analytes were still less than the concentrations found in the precipitation samples.

Conclusion: Buckets used more than one year could potentially contribute contamination to precipitation samples. When used no more than nine times, the contamination, although above detection limit, is still below most of the concentrations of the analytes found in rain samples at IL11 but would not be low enough for clean sites. For NH_4^+, Cl^-, and Ca^{2+}, the bucket contamination is greater than the NTN 5th percentile The more the buckets are used, the higher the background contamination from the buckets. No relationship between very dirty samples and how easy it was to clean the buckets was observed.

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