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NEPM 2013 Metals, Containers and Soil Digest Equivalence

QUALITY ASSURANCE CONSIDERATIONS

The new NEPM includes two aspects in the metals area that potentially conflict with current industry practice. This EnviroMail presents study data in support of current practices and provides resolution from a quality assurance perspective. The two aspects raised are sample container suitability and acid mixtures to be used for digestion. The adjacent information outlines the ALS findings and position on both topics. It should be noted that the current practice of using glass containers for both organics and inorganics/metals in soils has endured for over a decade when using food grade jars and many CRMS for metals also use glass jars. ALS has however completed studies to re-assess potential impacts to ensure metals data quality is not compromised.

NEPM METALS CHANGES

In May 2013 the new NEPM was released with a number of changes in the metals of interest. Barium, total Chromium and Vanadium were omitted with Boron, Selenium and hexavalent Chromium, ($Cr6^{+}$) added. This change will impact future and also potentially current projects.

ALS has taken the decision to retain current NEPM metals and add in new ones by ICP in ALS suites. This allows data continuity and will avoid confusion for the many projects that commenced prior to the release of NEPM 2013. To facilitate this ALS has simply added the additional metals by ICP to the ALS-NEPM metals analytical suite (S-3). The exception is Hexavalent Chromium ($Cr6^{+}$) which is a separate test and has not been added. Given that Chromium was in the previous NEPM list and will remain in the ALS S-3 analytical suite it may be used for screening purposes (if the total Chromium determined in the soil is less than the guideline level for $Cr6^{+}$, then the $Cr6^{+}$ concentration must by definition be less than the guideline limit). This combined with the extended holding time option for Hexavalent Chromium may allow subsequent Hexavalent Chromium testing and reduce costs. Samples collected from sites with expected high levels of Chromium or $Cr6^{+}$ may however be better off requesting testing for Hexavalent Chromium in the first instance.

No additional cost will be levied for analytical suites S-3 and W-3 despite the addition of extra metals to the suites.

SAMPLE CONTAINERS – DO THEY NEED TO CHANGE?

The new NEPM provides guidance on sample containers suitable for collecting soils. NEPM B3, Table 1 recommends plastic or glass for general metals but plastic only for Hexavalent Chromium, CEC and Mercury. For many years laboratories have analysed soil samples collected in glass jars for exchangeable Cations, Hexavalent Chromium and metals including Mercury. In addition, laboratories use glass for Hexavalent Chromium and Mercury at trace levels in water – way below that of soils in accordance with APHA 22nd Edition. At ALS, food grade quality glass jars have been routinely provided to clients for soil samples for a wide range or organics and inorganics analytes. Should plastic bottles be required this would impact sampling staff and efficiencies. The question is "would it make any difference?"

To verify the need for plastic containers for soil, a trial was performed by ALS to determine if any bias is caused to CEC, Hexavalent Chromium and mercury results as a consequence of using glass for collection for soils. The results of the trial confirmed that absolutely no result bias is produced using the glass jars routinely provided by ALS. Therefore, rather than expecting clients to fill another different container for the abovementioned analysis, ALS will continue to accept soil samples collected in the glass jars and deem this equivalent and therefore compliant with the requirements of the new NEPM B3.

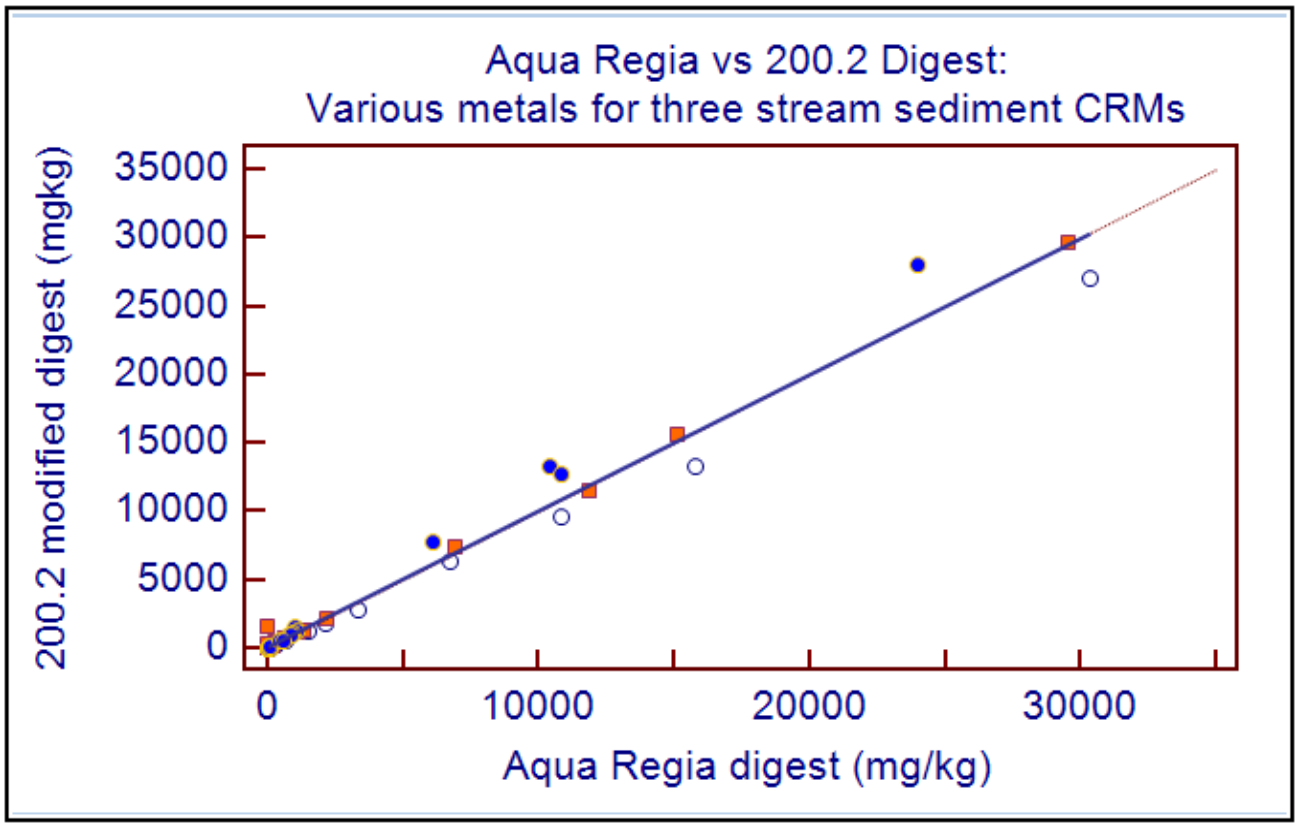
USEPA 200.2 DIGESTS VERSUS AQUA REGIA FOR METALS IN SOILS

Another reference in the new NEPM was 'Aqua Regia' digestion for metals. Aqua Regia (Latin for Royal water because it dissolves gold) is a mix of Nitric acid, Hydrochloric acid and water. The USEPA 200.2 digest includes both Nitric and Hydrochloric acids (in different ratios to Aqua Regia) but also Hydrogen Peroxide in a pre-digestion to oxidise organics. Both acid mixtures contain an oxidant to liberate metals from relatively easily oxidised minerals such as pyrite as this is important in assessing potential metal liberation and mobilisation into the environment. What is also important to note is that neither mixture contains Hydrofluoric acid or the four acid digest mixes which are commonly used by the minerals industry to assess 'Total metals' or metals occluded within a soil matrix (not subject to leaching).

As a result of the NEPM guidance, ALS commissioned a study to determine the degree of equivalency of the USEPA 200.2 digest of metals in soils (employed by ALS) versus the 'Aqua Regia' digest referred to in the 2013 NEPM. The recovery data presented below demonstrated good comparability between these methods as expected and in accordance with NEPM guidelines has been deemed equivalent.

The ALS study involved three commercially available internationally certified reference materials, (CRMs), by the two digestion methods. The metal results are plotted below, (Graph 1) with different colour dots denoting different metals in different CRMs. The graph clearly shows equivalence of the two digests. The red dotted line, with a slope of 1 is the line of equivalence and is obscured by the blue line of best fit. The regression is 0.9976 confirming equivalence of the two digests.

Graph 1



REFERENCES

NEPM B1 Guideline on Investigation levels for Soil and Groundwater – May 2013 (F2013L00768)
NEPM B3 Guideline on Laboratory Analysis of Potentially Contaminated Soils – May 2013, (F2013L00768)