



OnSite Chemical Analysis Tools with Application to C4SL's, S4UL's and SGV's

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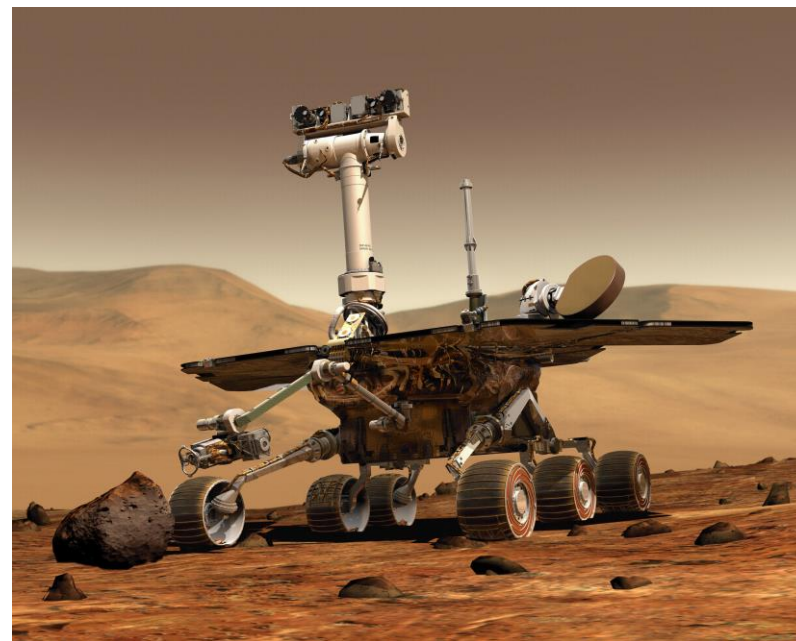


- Background to OnSite Chemical Analysis Tools
- Overview of Instruments
- Things to Consider
 - Quality
 - Instrument LOD in relation to SGV's, C4SL's & S4UL's
 - Health & Safety
- Case Studies
- Additional Applications / Considerations

ALS OnSite Analysis Background



- Field Chemists and Equipment Hire Team since 1990
 - Purchase of Cybersense in 2008
- Instruments for Soil, Water and Dusts
- Wide Range of Parameters
 - Inorganic Analytes
 - Metals
 - Hydrocarbons
 - TPH, PAH, BTEX, PCB
 - VOCs
- Screening and more detailed analysis
- All three components of the risk management process
 - Risk Assessment, Options Appraisal and Implementation of Remediation



Benefits of OnSite Chemical Analysis



- Practicality
 - Access to real time data allows rapid/reactive decision making
 - Representative data : stability (holding) times
- Improved Quality of Data
 - Quality of OnSite data can equal that of off site analysis
 - Greater sample density allows increased confidence in the risk management process
- Cost
 - Direct : Volume of samples
 - Indirect : Time between sampling and results

Instruments Overview : Inorganic Analytes



- Monitoring of up to 13 different water quality parameters on screen in one event
- Including pH, ORP, DO, EC, TDS, Turbidity, Specific Gravity
- Data logging for up to 60,000 samples



- Field Portable X-Ray Fluorescence (XRF) Analyser
- Soils, Dust & Swabs
- 2001 : Kalnicky and Singhvi
- USEPA Approved : (Method 6200, SITE trial)
- In-situ, Ex-situ and Ex-situ plus sample preparation
- All metals from Sulphur (16) to Uranium (92)



Metals : SGVs, C4SLs and S4ULs



	XRF LOD (in standard soil matrix) mg/kg	C4SL's						SGV's		
		Residential (Produce)	Residential (No Produce)	Allotment	Commercial	POSresi	POSpark	Residential	Allotment	Commercial
Arsenic	11	37	40	49	640	79	168	32	43	640
Cadmium	12	26	149	4.9	410	220	880	10	1.8	230
Chromium (III / IV)	85	21	21	170	49	23	250			
Copper	35									
Lead	13	86 - 210	130 - 330	34 - 84	1100 - 6000	270 - 760	580 - 1400			
Mercury (Inorganic)	10							1	26	26
Nickel	65							130	230	1800
Selenium	20							350	120	13000
Zinc	25									

Instruments Overview : Hydrocarbons



- PetroFlag
 - Soils; TPH with an LOD of 15 mg/kg



- TD-500
 - Soils and Waters; PAH: 0.025 mg/kg (mg/l), TPH: 5 mg/kg (mg/l)



- UVF3100
 - Soils and Waters GRO (C6 to C8), BTEX/DRO, EDRO and PAH
 - GRO: 1 mg/kg (mg/l)
 - PAH : 0.1 mg/kg (mg/l)
 - EDRO: 0.2 mg/kg (mg/l)
 - TPH–Oil: 1 mg/kg (mg/l)
 - 5 point calibration
 - Fluorescence of Aromatic fraction – Quenching at high concentrations
 - USEPA Approved : (600/R-01/080) , New Jersey Dept. of EP 2009



Hydrocarbons : SGVs, C4SLs and S4ULs



	UVF3100 LOD (in standard soil matrix) mg/kg	C4SL's						SGV's		
		Residential (Produce)	Residential (No Produce)	Allotment	Commercial	POSresi	POSpark	Residential	Allotment	Commercial
TPH	0.2									
PAH	0.1	5	5.3	5.7	76	10	21			
Benzene	1	0.87	3.3	0.18	98	140	230	0.33	0.07	95
Toluene	1							610	120	4400
Ethyl Benzene	1							350	90	2800
Xylene (o, m, p)	1							250 / 240 / 230	160 / 180 / 160	2600 / 3500 / 3200

Instruments Overview : VOCs



- 3D sensor provides 3 second response up to 10,000 ppm.
- Strong, built-in sample pump draws up to 30m (100ft) horizontally or vertically.
- Stores up to 267 hours of data at one minute intervals.
- Widely used for land clean up checking and land remediation. PID makes it simple to carry out headspace analysis.



- EA : Rapid Measurement Techniques (RMT) Framework in the context of CLR11.
 - As part of a site specific sampling plan
 - Clear standard operating procedures
 - Complement rather than replace laboratory analysis
 - Quantification of uncertainties
- U.S. EPA
 - SITE reports and prescribed methods
 - State specific guidance

- Reduction and quantification of uncertainties
- Before work commences
 - Selection of RMT to be utilised
 - Demonstration of Method Applicability (DMA)
 - SOP and correction factors
- During work
 - Monitoring of RMT results against laboratory results
 - Calibration : Standards, Duplicates, Blanks
 - System Suitability Checks
 - Recording of measurement uncertainties



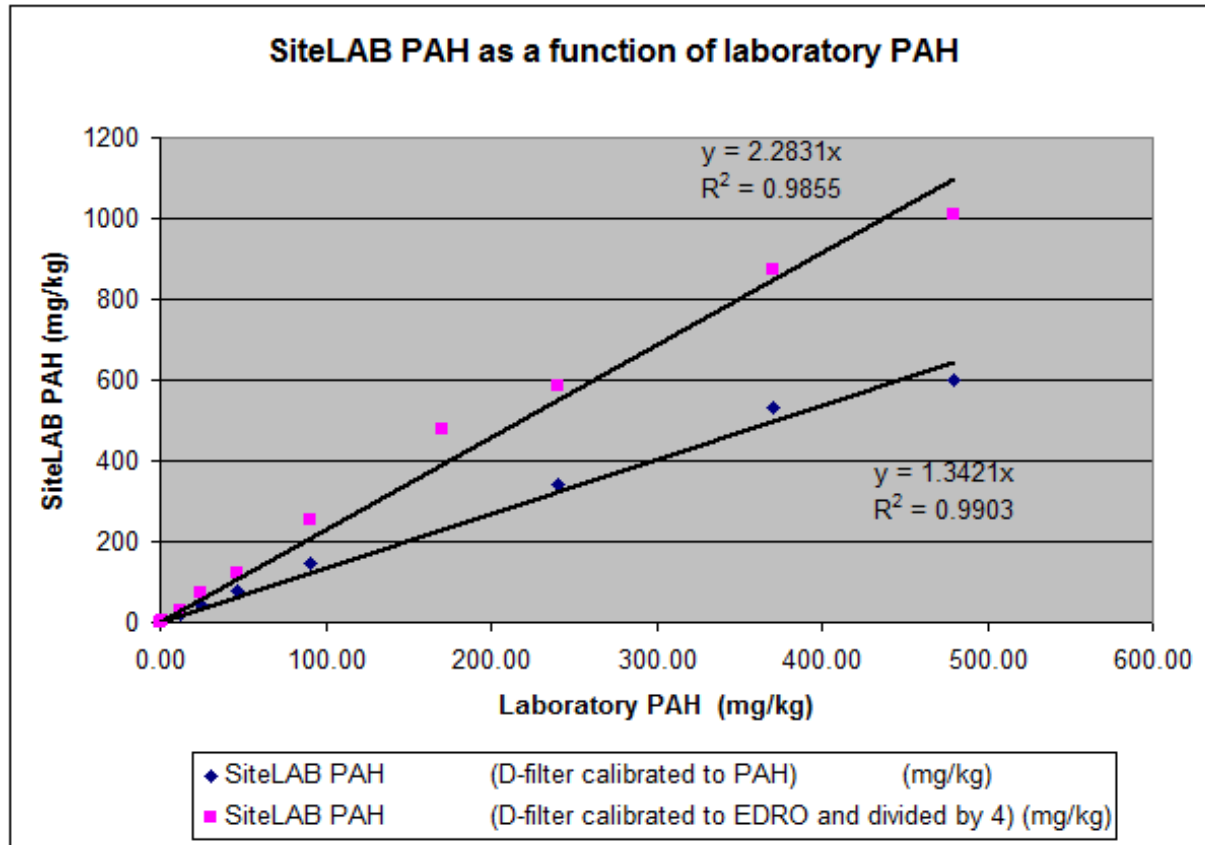
Demonstration of Method Applicability (DMA)



- OnSite and Laboratory Analysis
 - Data set of 20 samples
 - Spiking of samples
- Regression analysis of results
- Allows determination of:
 - Suitability of RMT for this site
 - Errors associated with sampling and measurement
 - Correction factors between RMT and lab results
 - Corrected Site Acceptance Criteria
 - Fine tuning of sampling procedures



Demonstration of Method Applicability (DMA)



- SiteLAB UVF3100 results against laboratory results. Showing PAH calibration and EDRO calibration with PAH filter giving approximate PAH value when divided by 4.

Determination of suitability to utilise for SGVs, C4SLs and S4ULs



- Suitability of OnSite instrument to achieve screening values for a site determined by:
 - Instrument LOD (Usually expressed interference free)
 - Correction factor obtained from validation results in DMA
- Need to consider sample preparation and presentation method

Case Study – Cross Rail



- Lab set up at TUCA for BBMV
- UVF3100 and Portable XRF
- 1 in 10 samples verified at laboratory
- London Clay – Time for transfer to Wallasea Island, Essex a critical factor for the project
- Samples initially from the Liverpool Street Station and Whitechapel Station sites but expansion during project to a number of other sites



Case Study – Cross Rail



	Soil Acceptance Criteria (SAC) mg/kg	XRFLOD (in standard soil matrix) mg/kg	Correlation coefficient R(sq)	Correction factor (k)	XRF equivalent of SAC (mg/kg)
Arsenic	35	11	0.9755	0.9434	33
Cadmium	30	12	0.9313	0.8524	26
Chromium	200	85	0.9856	$y = 0.7621x + 78.234$	231
Copper	130	35	0.9674	0.9002	117
Lead	450	13	0.9929	0.9665	435
Mercury	15	10	(-2.1318)	<LOD	<LOD
Nickel	99	65	0.4468	$y = 0.7238x + 61.595$	133
Selenium	260	20	0.9807	1.0735	279
Zinc	300	25	0.9732	0.9895	297

- XRF
 - XRF utilises an X-Ray emitter and comes under IRR 1999
 - HSE notification for usage / change of specification
 - RPS – X ray emitters
- UVF 3100 / TD500 / Petro FLAG
 - Methanol
- Development of LWIs/SOPs/RAs
- Dealing with H&S on a clients site
 - Site awareness e.g. Toolbox talks



- RSK Blackmoor Lane Badnell's Pit Remediation Project
 - Delineation of contamination – 104 spot samples across the site
- Crossrail remediation monitoring
- MOD Sites for Pb contamination delineation of artillery pits
- Waste site gatehouse monitoring
- Aluminium ore grade monitoring
- Metals Fingerprinting
 - Stainless steel grades within the pharmaceutical industry
 - Classic Sports cars



- Thank you for listening and any questions?