

Operational Experience in the use of automated contamination survey techniques to improve site contamination surveys



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Why do we perform Contamination Surveys?

- A Contamination survey programme is designed to meet one or more of the following criteria:
 - To demonstrate the adequacy of site contamination control processes and to identify breakdown in contamination controls.
 - To ensure that existing area designations remain valid.
 - To characterise legacy contamination from historical operations.
 - At the end of decommissioning activities, to allow delicensing of the site.



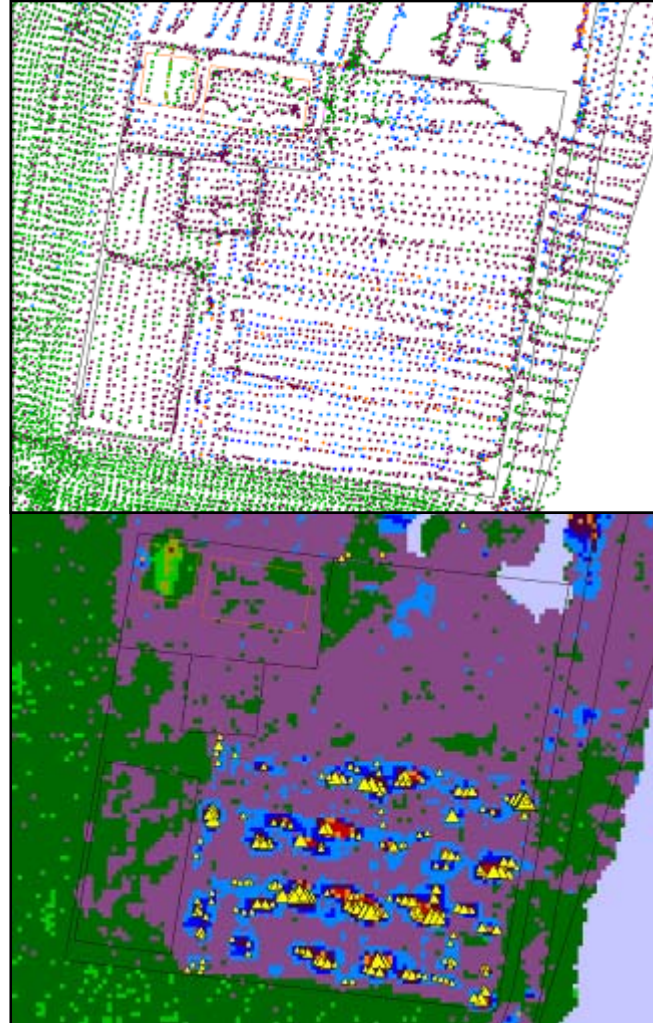
Groundhog Site Surveys – Nuvia

- Replacing laborious surveys with conventional instruments
- With automatic systems, logging of position and radiation measurements



Rapid, high density surveys

- ~1 reading / m²
- >20,000 readings / day / person
- >50,000 / day / vehicle
- Analysis for ¹³⁷Cs, now for many radionuclides
- Identification of shine and buried sources by gamma radiation downscatter



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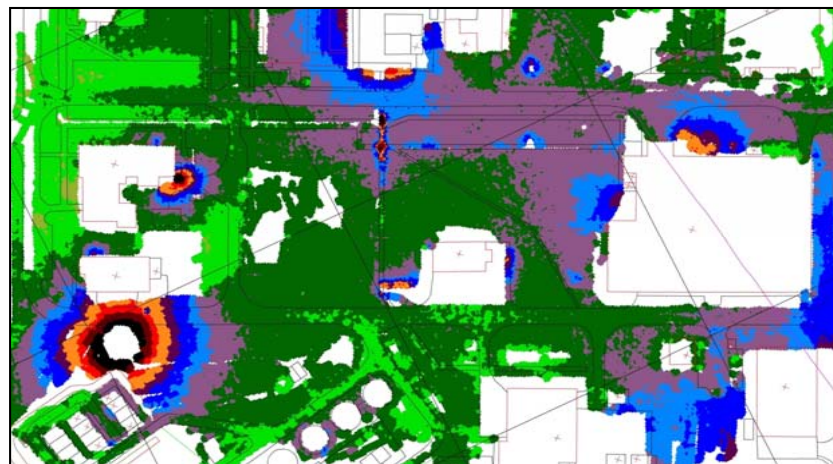
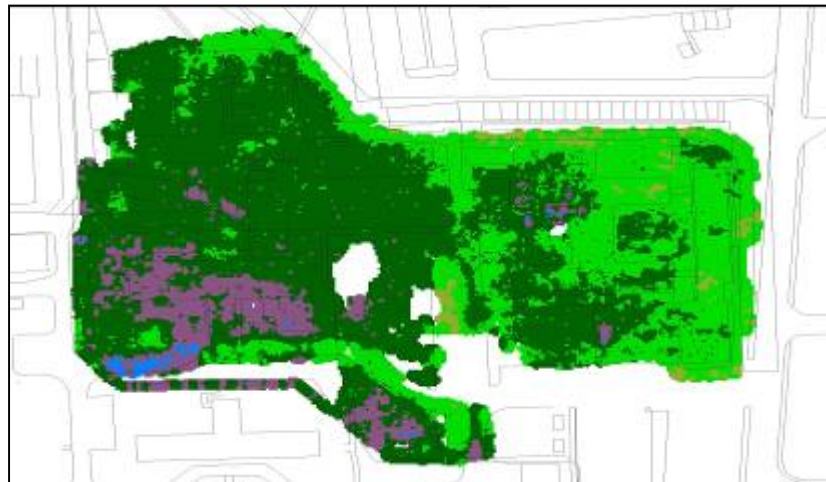
We find flexible solutions are important

- Standard equipment, but configured for each project
- Vehicle-based surveys for large areas
- Borehole & drain monitoring
- Collimated surveys
- Surveys of unsafe ground



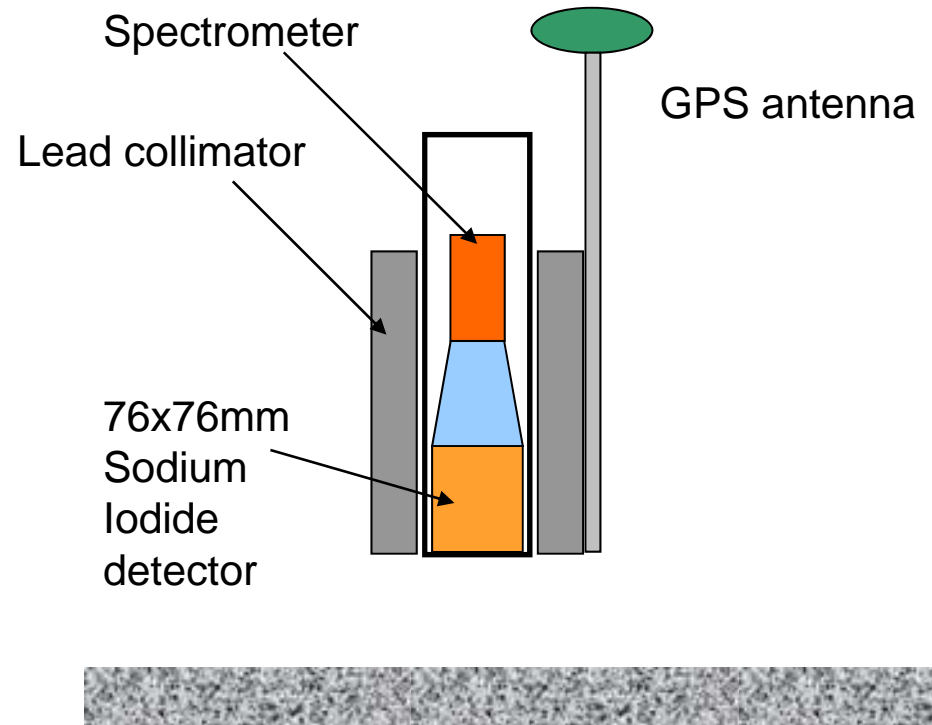
Suitable for a variety of surveys

- Reassurance surveys
 - Operational NPPs
 - De-licensing of nuclear sites
 - Due-diligence surveys of land for sale (ex-military sites for Ra-226)
- Remediation surveys
 - Before,
 - During, and
 - After Remediation Works



Collimated systems for NPP surveys

- Groundhog 'Fusion' system
- 76x76mm Sodium Iodide detector
- Collimated to reduce shine from storage facilities / plant
- 1024-channel spectrometer
- Carbon-fibre composite casings
- Mapping-grade GPS – sub-meter accuracy



The challenges of NPP surveys

- The plants are typical very compact, with buildings in close proximity
 - GPS satellite coverage is routinely poor, so techniques are required to allow radiation measurements to be correctly attributed.
 - 'Shine' from stored radioactive material or operating plant needs to be clearly identified
- The surveys are usually of roadways
 - Roadways are typically of tarmac and/or concrete, of various ages, with varying degrees of naturally-occurring radioactive materials.
 - Road repairs and patches may be present.
- Sites are secure
 - Information about the facilities on the site may only be available on request, in response to specific queries



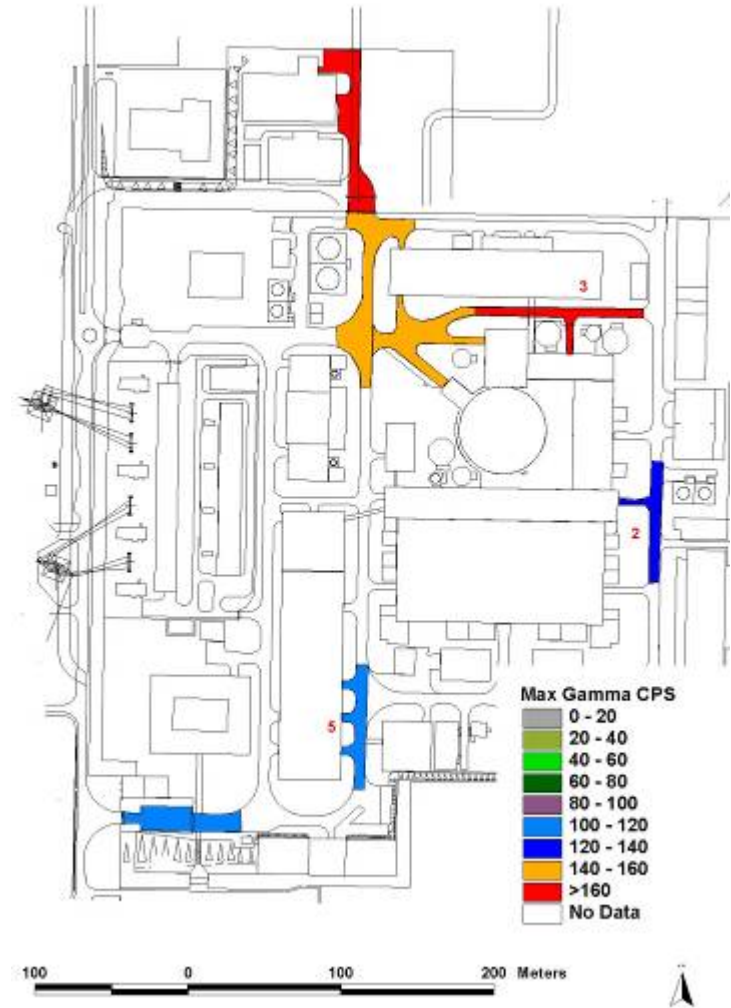
Challenges, not problems

- All measurements are logged
 - Date / time
 - Gamma spectrum regions of interest
 - Location (or estimated)
- Analyses
 - Basic counting statistics – there are lots of measurements
 - Spatial domain:
 - Shape, size of features
 - Consistent with the local environment?
 - Time domain:
 - A point source or a large-area source?



Sizewell B survey summary

- Typically 13,000 measurements
- Approx half can be mapped
- The remainder analysed by survey block



Recent large area surveys

- Surveys of beaches at Dounreay and Sellafield for 'particles' of radioactive material discharged from sites – 4×10^8 measurements / year
- Rosyth Dockyard – Final delicensing survey, following scoping survey in 2001
- Oldbury Nuclear Power Station – Delicensing survey
 - Working in Environmentally Sensitive areas
 - To achieve 50% of IAEA RS-G-1.7 levels – 0.05 Bq.g^{-1} - performed with High Resolution Gamma Spectrometry – 1,600 measurements
 - Groundhog survey to confirm no discrete areas of contamination – 330,000 measurements



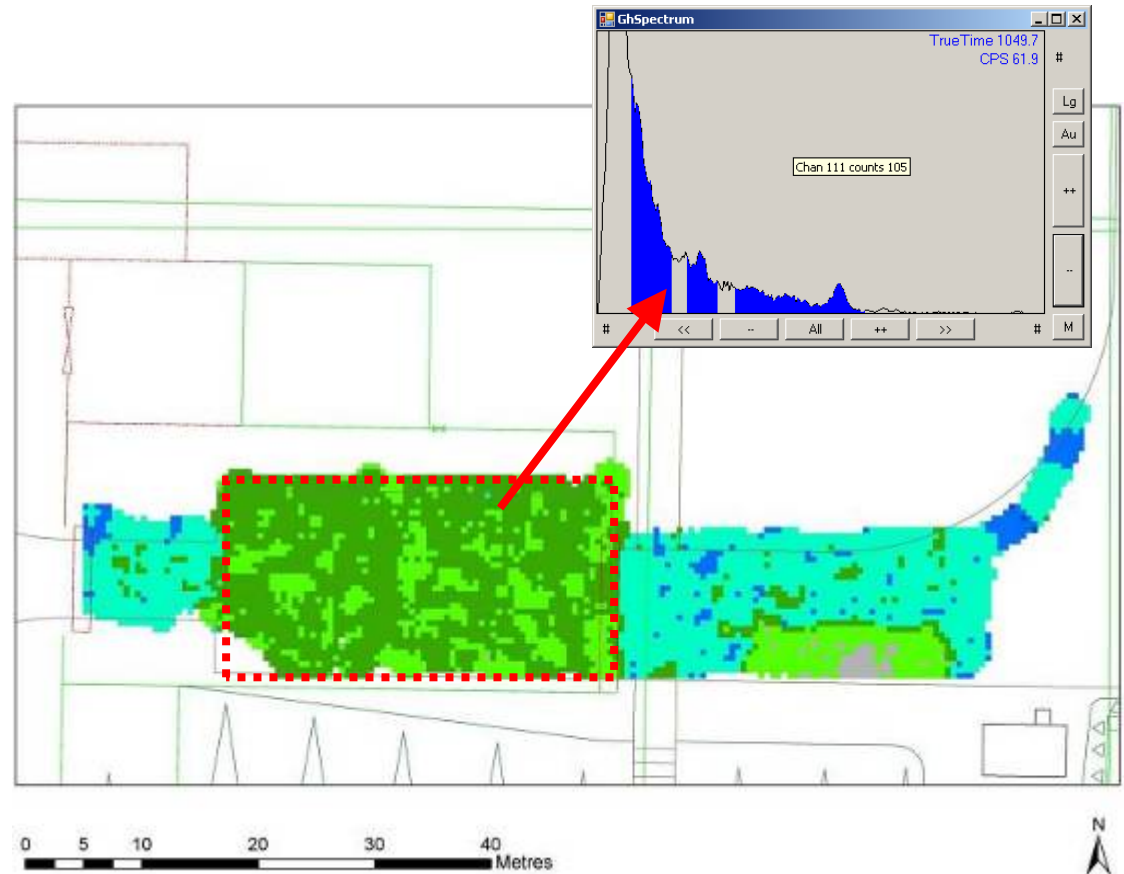
Groundhog surveys

	Reassurance	Character- isation	Compliance	Delicensing	Decommissioning		
					Prior	Remediation	Final
Bruce NPP, Canada	✓						
Dalgetty Bay, SEPA		✓				✓	
Devonport Dockyard	✓						
Ditton Manor Park (Ra-226)					✓	✓	✓
Dounreay Vulcan	✓						
Dounreay DSRL, Beaches		✓	✓				
Dounreay DSRL, many locations		✓			✓	✓	✓
Harwell RSRL, Catapult Pit					✓		✓
Harwell RSRL, many locations				✓	✓	✓	✓
Harwell RSRL, Southern Storage Area		✓		✓	✓	✓	
Hunterston B NPP	✓						
Koburg NPP, South Africa	✓						
Oldbury NPP				✓			
Olen, Belgium (Ra-226)		✓					
Phosphates, various sites					✓	✓	✓
Pickering NPP, Canada	✓						
Ra-226, many sites	✓	✓			✓	✓	✓
Rosyth Dockyard					✓		✓
Sellafield, Beaches		✓	✓				
Sizewell B NPP	✓						
Torness NPP	✓						
Winfrith RSRL, A59 Decommissioning		✓		✓	✓	✓	✓
Winfrith RSRL, many locations				✓			



Recent innovations

- Gamma spectra are logged automatically
- High levels of natural materials can be rapidly eliminated from investigation



Conclusions

- The drive for Continuous Improvement coupled with regulatory pressures require plants to adopt enhanced contamination control processes
- Recent experience has shown that both decommissioning and operational sites can be challenged
- Groundhog has been shown to be a effective tool to improve the quality and productivity of open site contamination surveys

Sellafield finds 'hot' pebbles

Published at 01:00, Friday, 08 June 2007
VBrenan

EXPERTS at Sellafield are puzzled by the discovery of pebbles on local beaches that have absorbed radioactivity. The handful of cases of 'hot pebbles' came to light after a new scanning and monitoring machine made extensive checks across beaches at Sellafield, Seascale and St Bees.



Fines over Asco nuclear power plant leak could total €22.5 million
The Nuclear Safety Council says the leak occurred in November but operators did not detect it until March 14 and then waited until April 4 to notify regulators.

