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10 years of NSZD Application In Australia – The Evolution from LNAPL Active Removal to Natural Attenuation

Welcome



A side
note
(1995)
→



NATIONAL GEOGRAPHIC

ROCKY TIMES FOR
BANFF 46

BORING
LEAFCUTTER
ANTS 98

KOBE WAKES TO
A NIGHTMARE 112

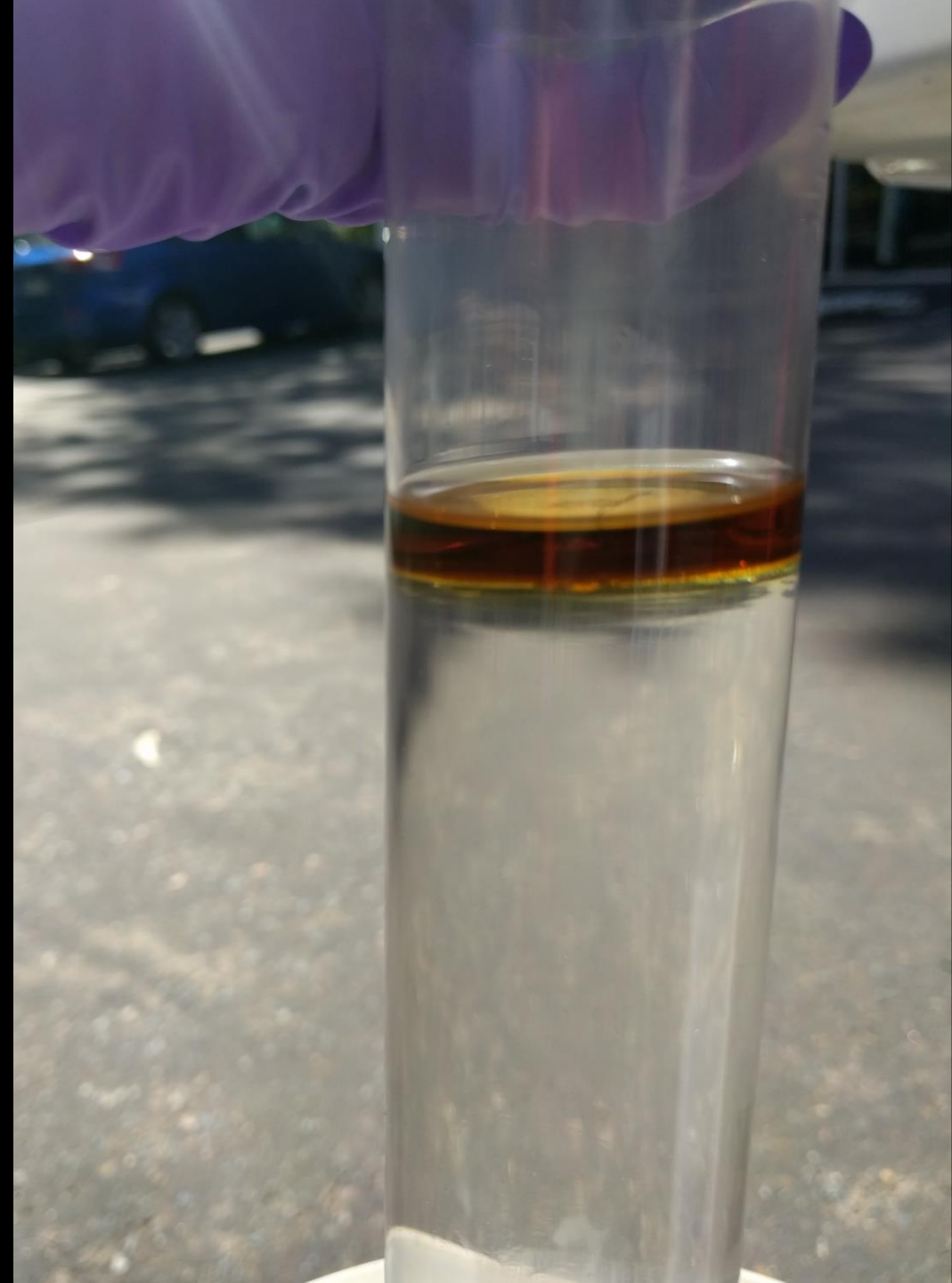
Ndoki



Why are we here?



- How we used to treat LNAPL
- Regulator expectations, then and now
- Changes in guidance
- Review of NSZD implementation in Aus
- Case studies
- Where are we now?





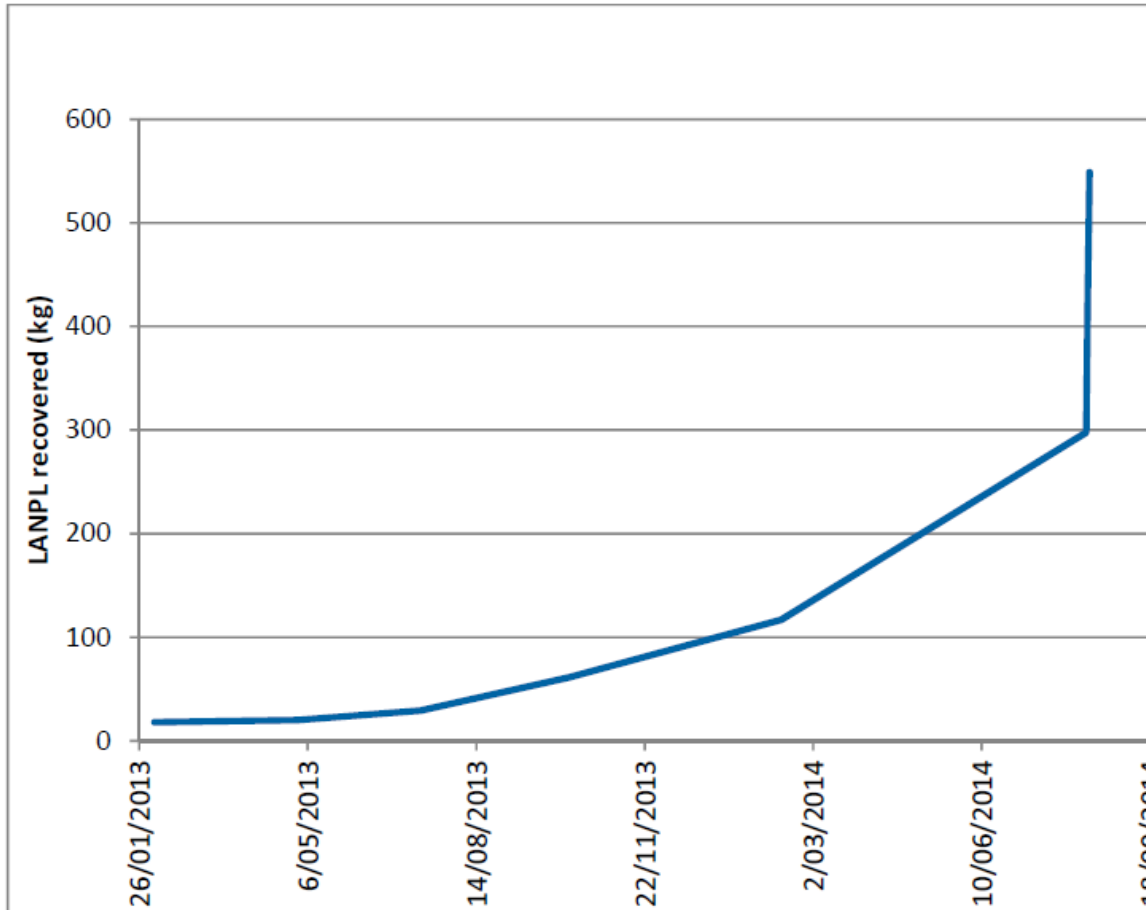
LNAPL Remediation

→ Where we were a decade ago
(mostly)



MPVE recovery example

Chart 2 Cumulative volume of LNAPL Recovered (kg)



- Moderate to good LNAPL recovery volumes
- Highly dependent on GW level
- Little effect on dissolved phase



A Quick Detour - Australian Contaminated Site Regulation

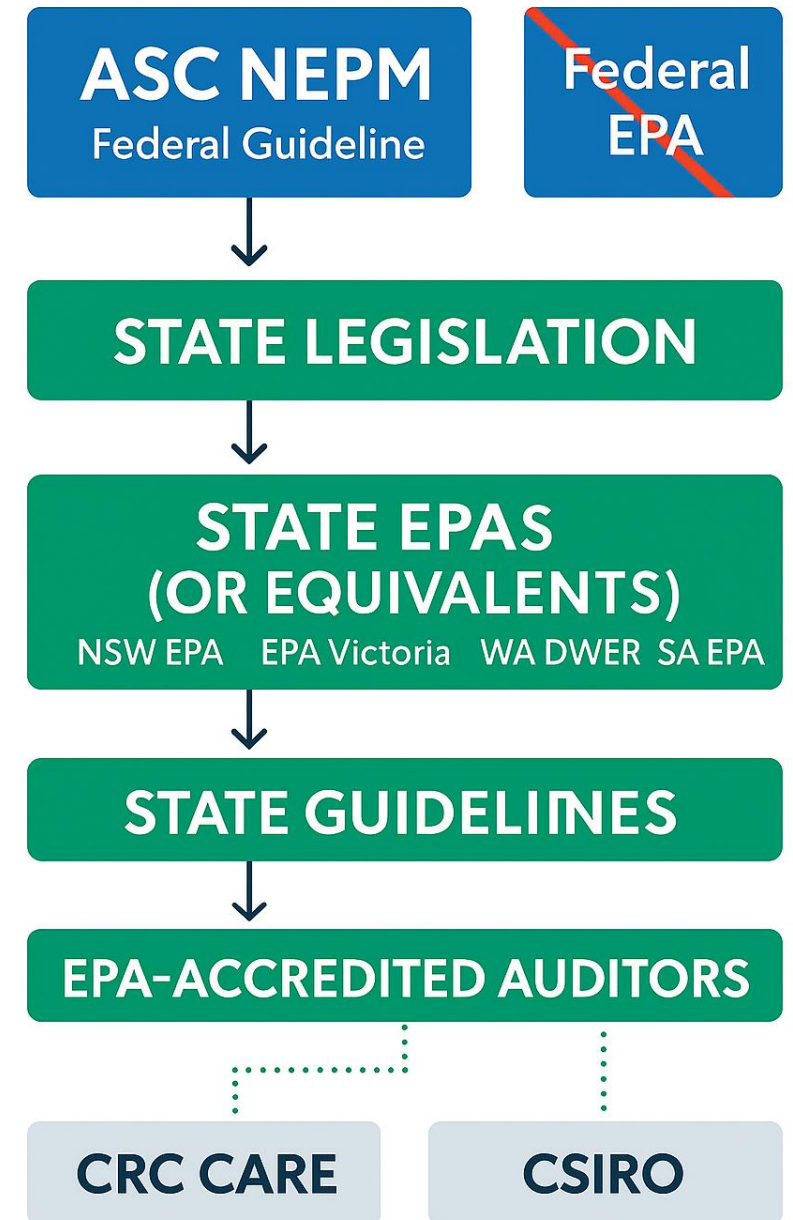


In Australia we have:

- No Federal EPA
- State-based EPAs (loosely aligned)
- EPA Accredited “Site Auditors”

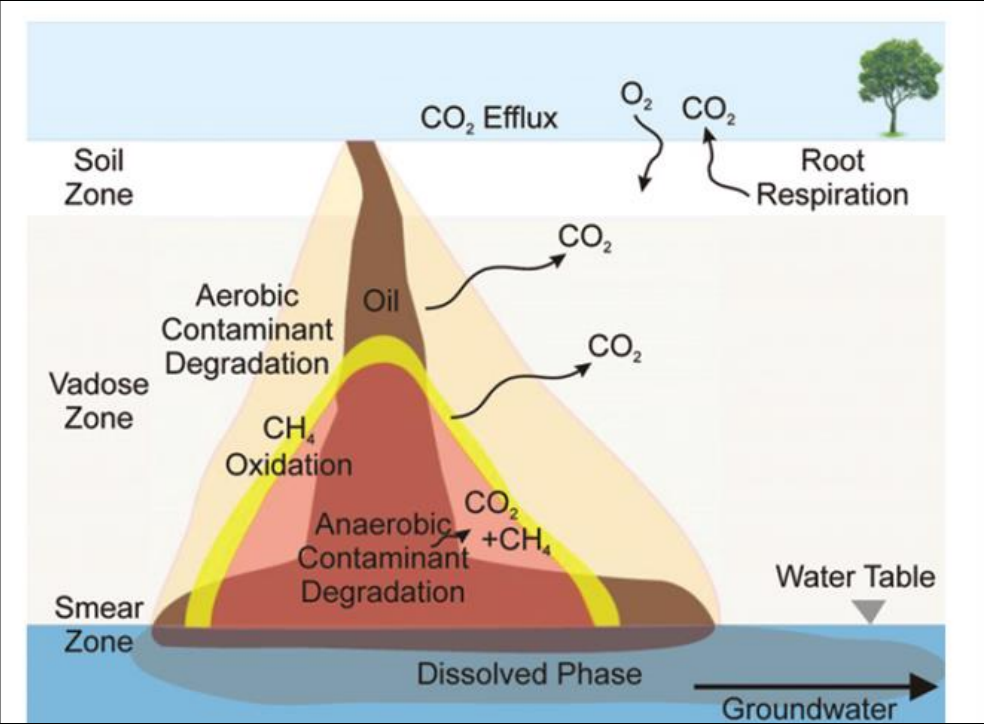
Guidelines are a mix of federal and state based.

EPA Auditors also refer to guidance / research by CRC CARE and CSIRO





So what started the NSZD revolution down under?



**CleanUp
2015**



Technical Note:
Light Non-Aqueous Phase
Liquid Assessment and
Remediation

www.epa.nsw.gov.au
Environment Protection Authority



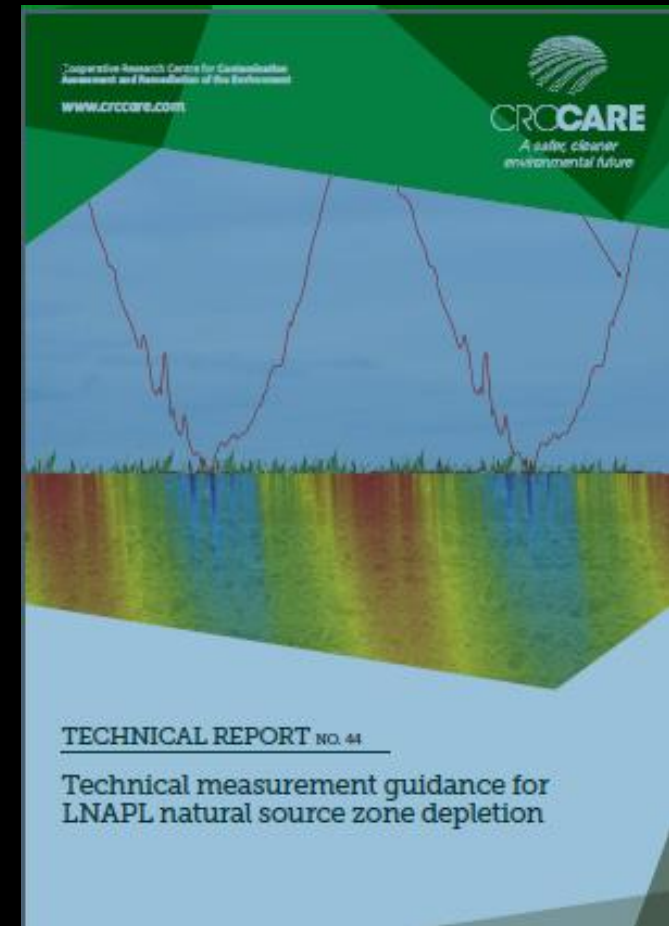


First NSZD
trials in 2016





New Guidance – CRC CARE →



Bringing NSZD to the regulators





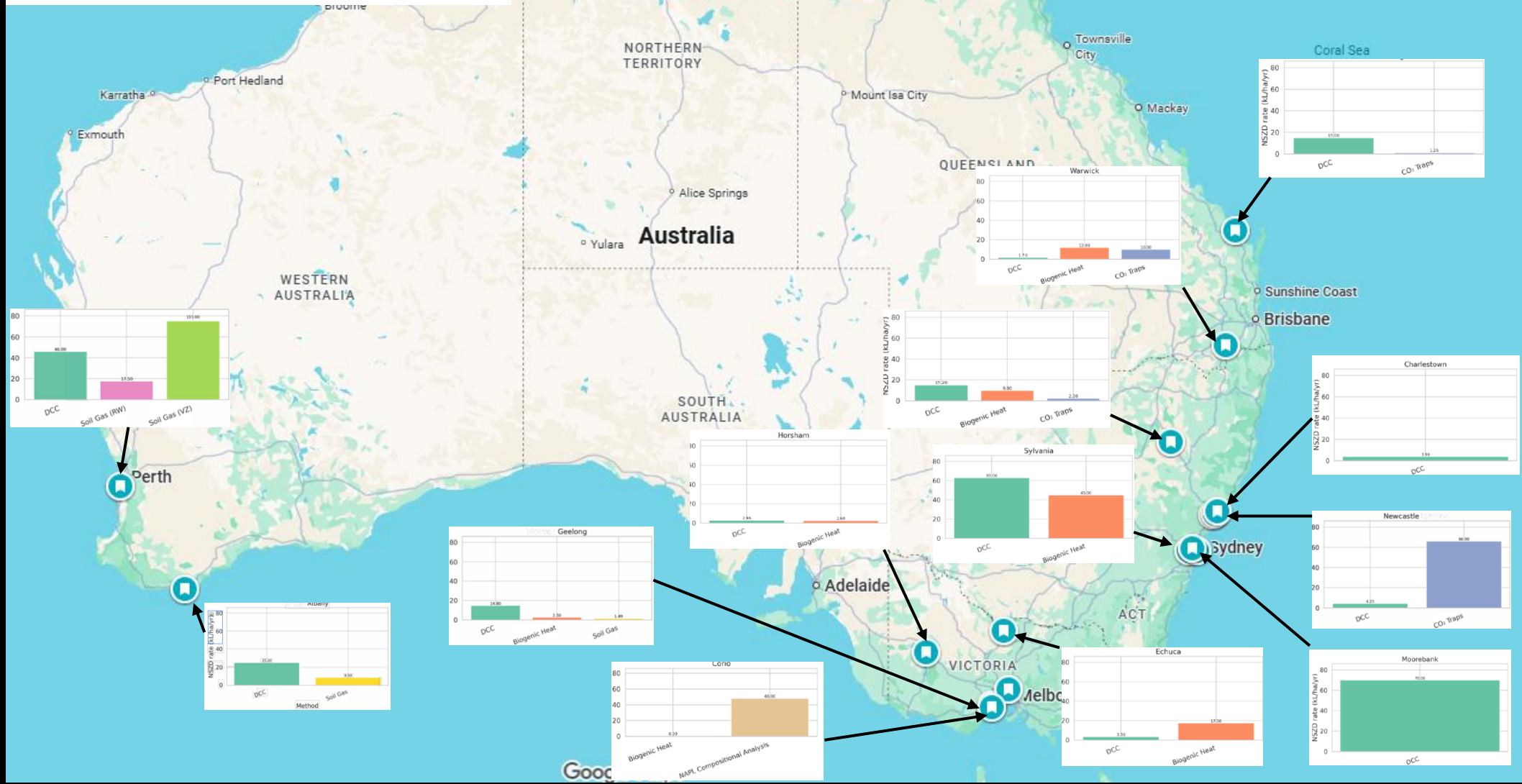
NSZD Application Prerequisites (CRC CARE TR46)

- • The LNAPL body has stabilised.**
- LNAPL recovery is infeasible and/or will not provide a beneficial change in conditions.**
- There are no potentially unacceptable risks to human health or the environment, or potential risks can be effectively mitigated through controls.**

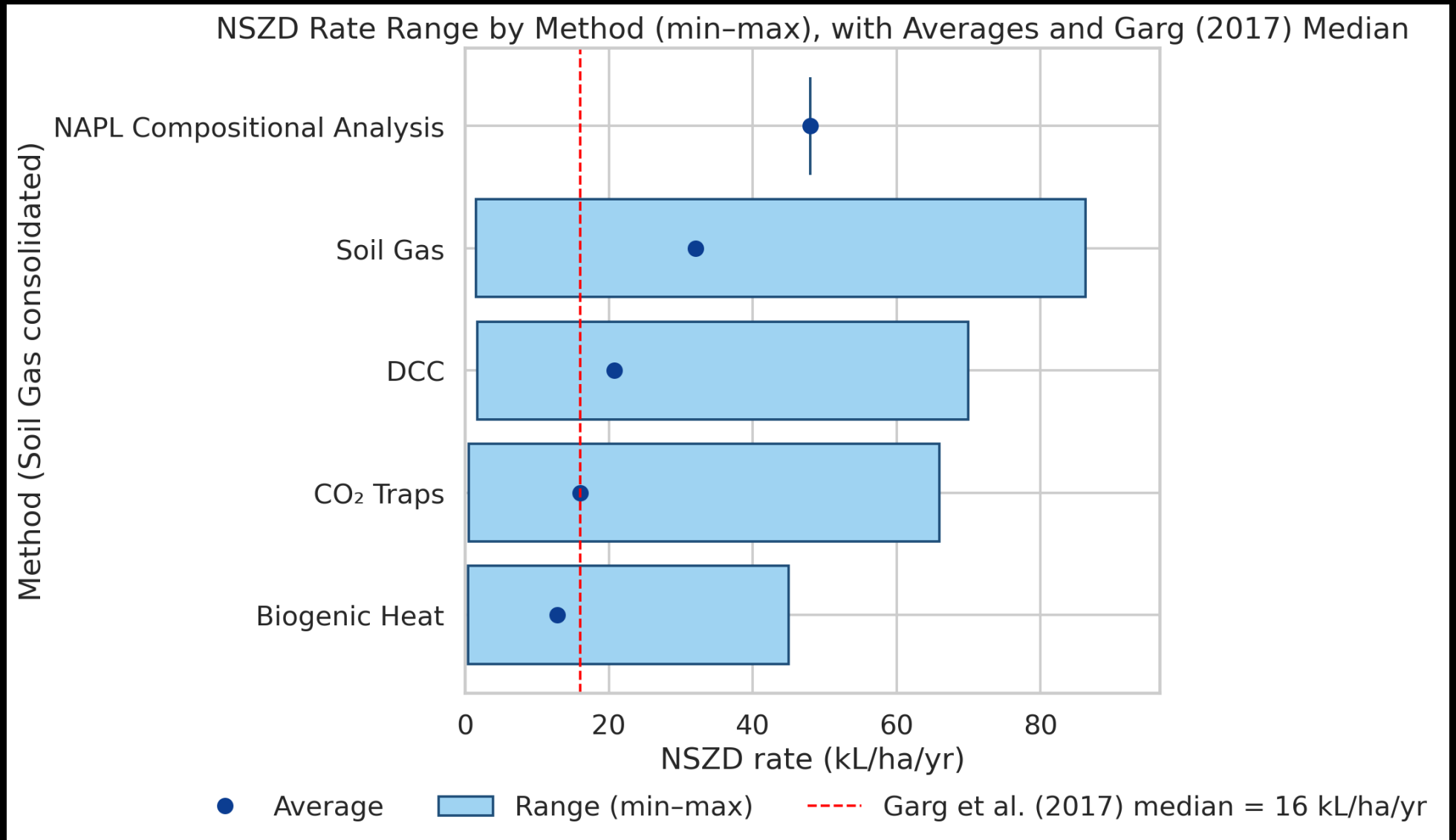


NAPL Compositional Analysis

Soil Gas
Soil Gas (VZ)
Soil Gas (RW)
CO₂ Traps
Biogenic Heat
DCC

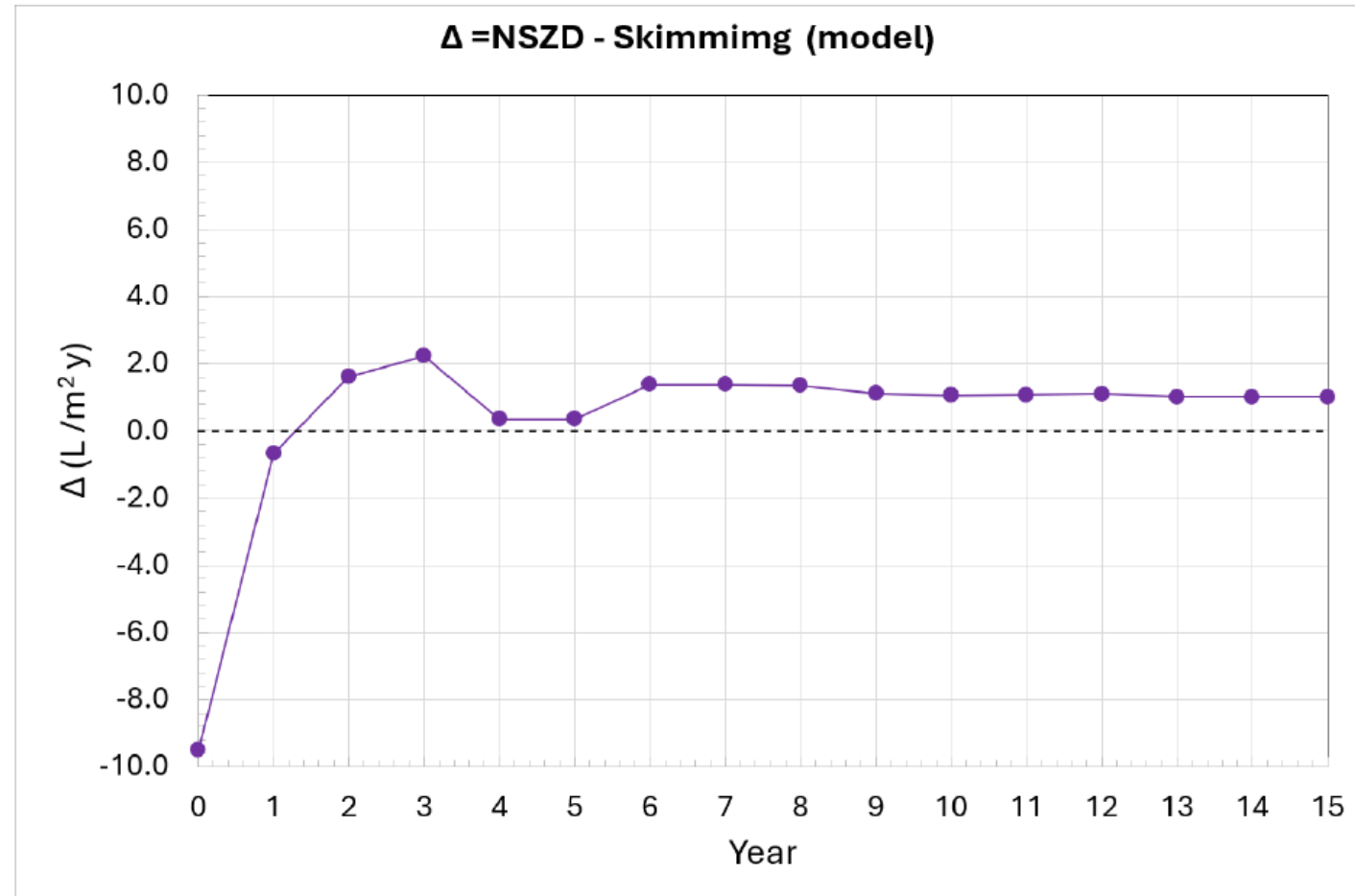
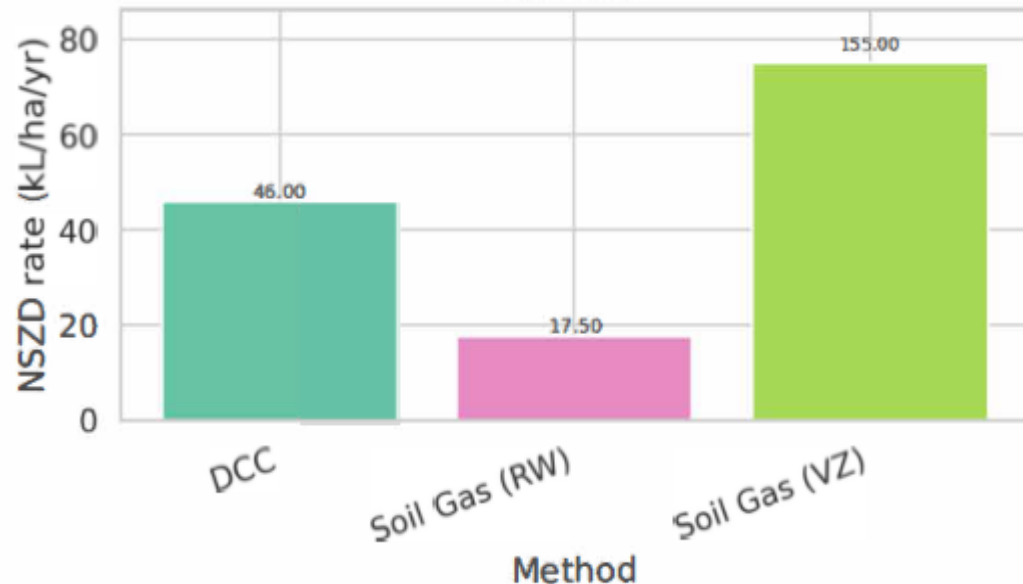


AU GHD LNAPL NSZD rates by measurement type



WA Case study – using NSZD to turn off the pumps

- Large diesel release
- Rapid MPVE deployment (within 1 week to recover as much mobile mass as possible)
- Skimmers deployed for over 12 months
- NSZD rates monitored concurrently

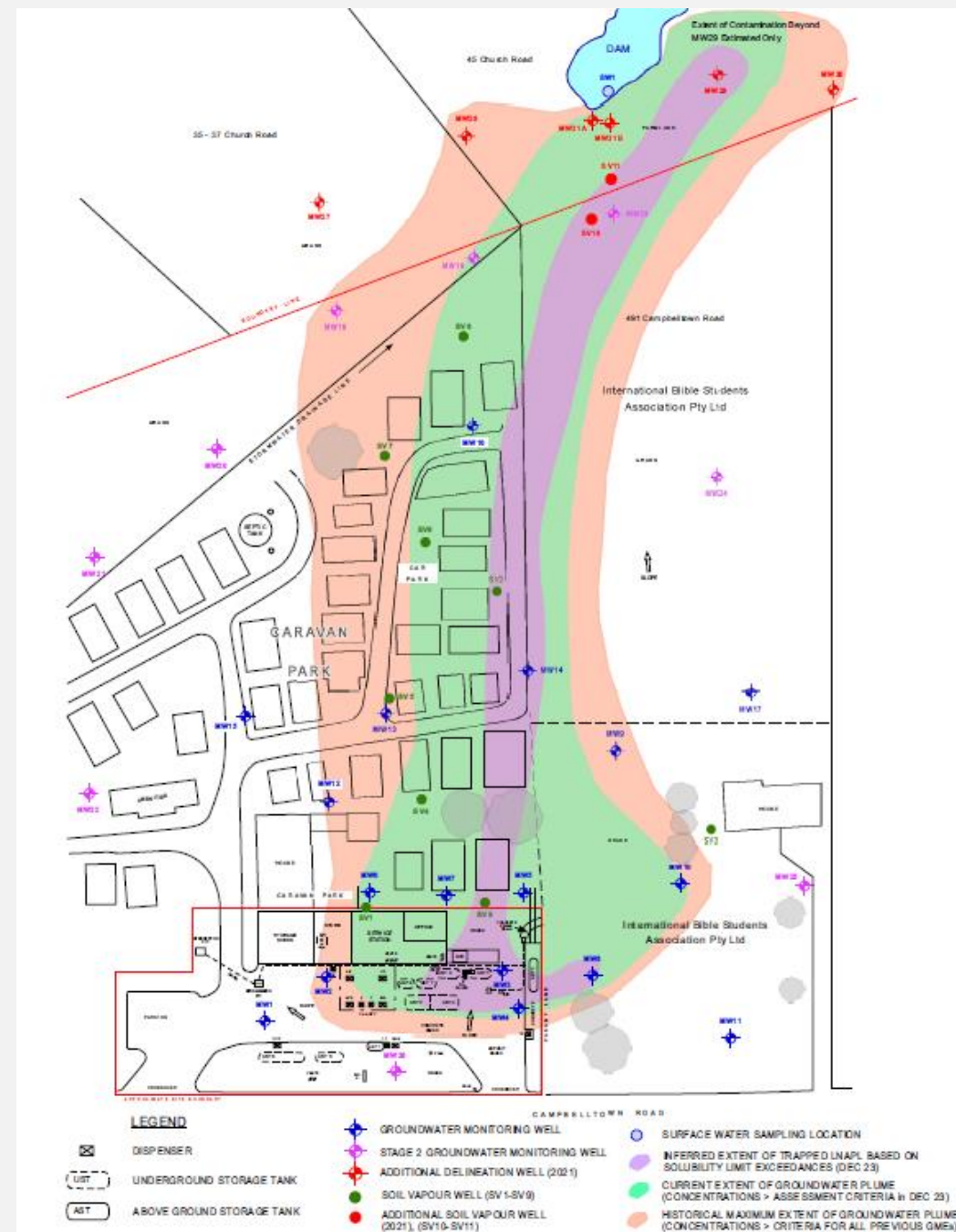


This site also demonstrated the importance of rapid MPVE deployment for spill response – in line with CSIRO (2022).



NSW Case study – using NSZD to justify no active remediation

- GHD Audited site
- Extended benzene plume
- Tight bedrock
- No complete SPR linkages
- NSZD verified
- = Site closure with institutional controls

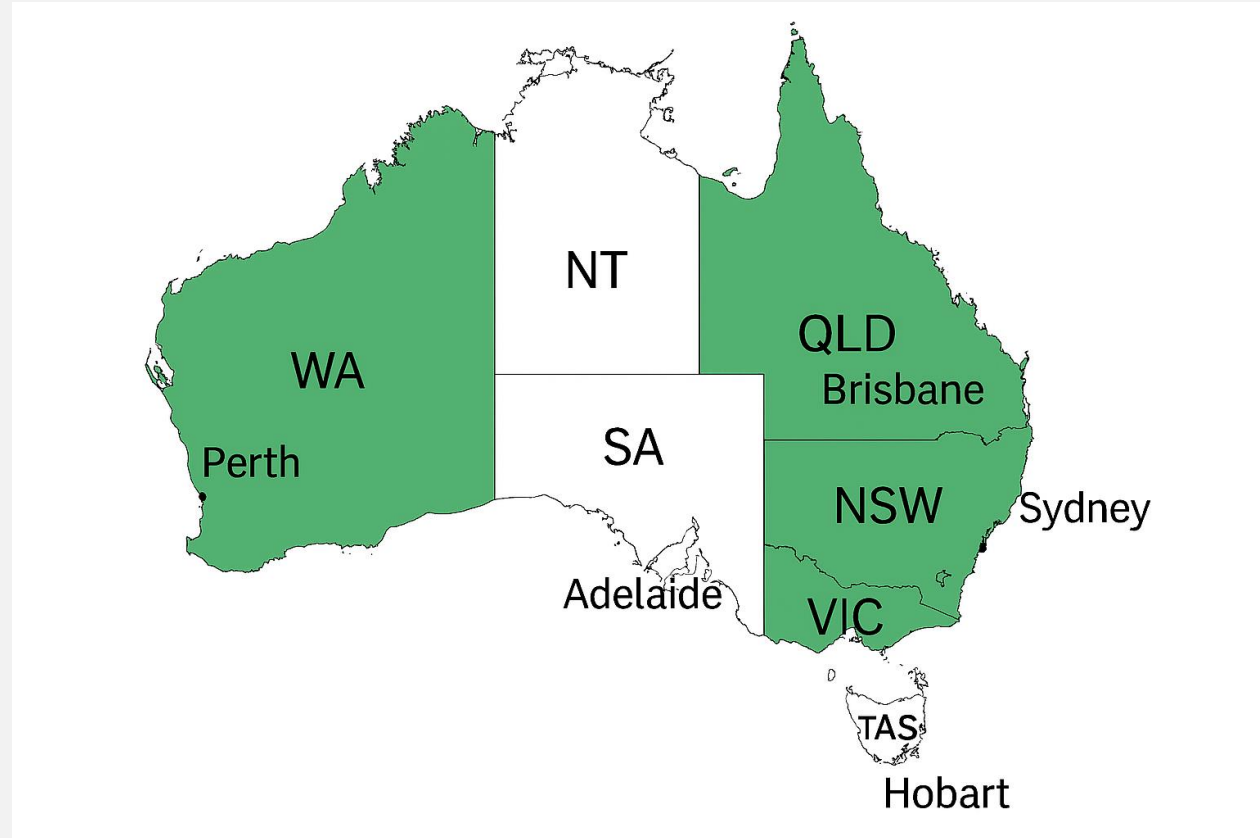


Regulatory progress in NSZD acceptance

→ Challenges:

Acceptable timeframes

Concept of Intergenerational equity





Takeaways

NSZD is now routinely accepted as a closure method for petroleum hydrocarbon sites in most of Australia, both by regulators and auditors, especially for residual LNAPL where active remediation is no longer effective or practicable.



Site closure using NSZD is most likely to be approved when:

- The site is in a stable, low-risk condition.
- NSZD rates are well-documented and monitored.
- There is a clear plan for ongoing stewardship and contingency if conditions change.

The uptake in regulatory acceptance of NSZD in Australia has correlated with a significant decline in “cosmetic” active LNAPL remediation

A lot of change in only a decade!



*** Thank You**