Bajwa EnviroConsult Technical Seminar
LANDFILL BEST PRACTICE

20 November 2025

BAJWA ENVIRO CONSULT

Welcome!

3.15 – 4.30pm Technical presentations

4.30 – 5.00pm Q&A discussion panel

5.00 – 6.00pm Networking and drinks

Technical presentations

Amelia Donato, Bajwa EnviroConsult	*About Bajwa EnviroConsult*
Josh Crawley, Hi-Quality	*Implementing the BPEM: An Operator's Perspective*
Andrea Hill, Enqip	*Landfill Monitoring: Best Practice Technology*
Lya Assef & Simon Clay, City of Ballarat	*Landfill Gas - Environmental Challenges and Management Strategies - Ballarat Regional Landfill*
Maya Brennan, Bajwa EnviroConsult	*From Contaminated Land to Landfill: My Journey Across Disciplines*

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Submit your questions

www.slido.com

Event code: #1255478

Amelia, Bajwa EnviroConsult

About Bajwa EnviroConsult

BAJWA ENVIRO CONSULT

About BEC

20 November 2025

4 years of BEC…

2021

Established BEC in VIC with 2 staff

2022

8 permanent staff and 5 casual staff in VIC

2024

BEC-IWP established in WA

Achieved ISO certification for our IMS

2025

BEC Eastern Region Established in NSW & QLD

20 permanent staff and 5 casual staff

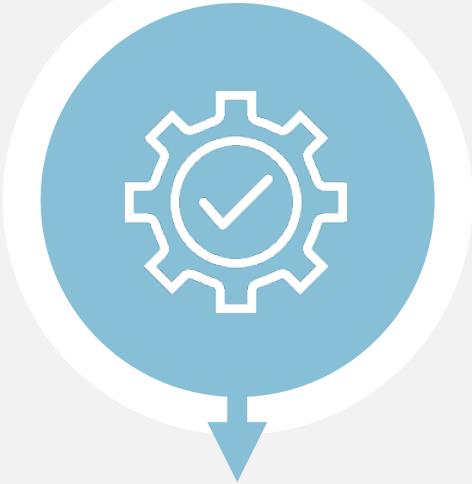
Our technical team

BAJWA ENVIRO CONSULT

Our accreditations

EPA Appointed Environmental Auditors

Wajahat Bajwa
Aya Salih
Marissa Verberne



Registered / Chartered Engineers

Wajahat Bajwa
Aya Salih

VEU Approved Auditors

Wajahat Bajwa
Aya Salih

GCI-ICP Certified Inspectors

Aya Salih, Marissa Verberne, Esraa Salih
Kimlong Kong

BAJWA ENVIRO CONSULT

Our solutions will be tailored to you

Regulatory Knowledge

We have a depth of experience in delivering local, State and Commonwealth environmental approvals, for complex and unique projects, including major infrastructure projects. This is complemented by our other services which enable us to provide end-to-end environmental support for projects, from the design and approval phase right through to delivery and verification

Client Focused

We want to help de-risk and de-stress.
We work collaboratively with our clients and understand their key issues / risks such as fulfilling regulator requirements, adherence to project budgets and timelines, HSE/Safety in Design risks, communication between multiple parties and contractor management. We ensure projects are delivered cost-effectively and in a safe and sustainable manner

Innovative Design Solutions

Our design & construction team specialises in providing turn-key solutions in landfill and other containment systems. We are intimately familiar with national and international EPA regulations and understand that landfills are not 'one size fits all'. We deliver innovative and individualised design solutions with a focus on constructability

Reliable Field Staff

We provide field personnel who are highly skilled, communicative, proactive, and well supported by specialists with waste management, contaminated land and EPA approvals experience. We provide timely and succinct reports to empower our clients to make decisions when it counts most

Specialised Team

We have a streamlined and adaptable team with an extensive network of specialised sub-consultants for input on complex technical issues

Adaptable Site Engineers

We understand that landfill construction is a reactive, time critical environment. We pride ourselves on our practical and efficient approach to construction verification auditing and supervision, and the preparation of credible audit reports

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BEC Service Offerings

Landfill Design

- New landfill cells including piggyback lining systems.
- Leachate pond and leachate infrastructure.
- Site specific lining system design, including the design of geomembranes, GCLs, geocomposites, geotextiles and compacted clay liners.
- Capping (conventional capping and phytocapping) and rehabilitation, including landfill gas infrastructure.
- Landfill masterplanning.
- Construction design support.
- Safety in Design risk assessments.
- Assessments and designs to maximise airspace (e.g. steep sidewall lining systems).
- Ancillary services, including:
  - Geotechnical investigations
  - Slope stability assessments
  - Stormwater management system design
  - 3D modelling
  - Leachate modelling and water balance
  - Material cost/benefit analysis
  - Bill of Quantities

Construction Supervision

- Onsite GITA and geosynthetic CQA supervision services.
- Several certified GCI-ICP CQA Inspectors for clay and geosynthetics.
- Project management and superintendent services.
- Efficient Hold Point release utilising proforma templates.
- Preparation of CQA Reports documenting construction works in a succinct and logical manner.
- Access to a wide pool of technical staff to provide construction input.
- Combined GITA/TPCC and auditing services.

Construction Verification Auditing

- Cap, cell and leachate pond CQA auditing.
- Dedicated EPA Appointed Auditor and CQA audit support team.
- Efficient Auditor Hold Point release utilising proforma templates.
- Streamlined CQA audit reporting.
- Record of key construction issues to refer to for approval of variations based on experience.

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Environmental Approvals

- EPA development and operating licence applications.
- EPA permit applications.
- Specific experience in all types of approvals for landfills and other waste management facilities (i.e. waste resource recovery, soil treatment, composting, waste to energy etc.).
- Support services for Environmental Effects Statements.
- Support services for Commonwealth approvals under the Environment Protection and Biodiversity Conservation Act 1999.

Environmental Management

- Preparation and review of Environmental Management Plans.
- Preparation and review of Environmental Management System documentation.
- Preparation of whole-of-site or whole-of project environmental management framework documentation.
- Preparation and delivery of environmental inductions and training.
- Preparation of financial assurance proposals.
- Preparation hydrogeological assessment reports.
- Preparation rehabilitation and aftercare management plans.
- Preparation of environmental risk management and monitoring programs.

Environmental Compliance

- Assessment of compliance with regulatory requirements.
- Gap analysis to determine compliance with new regulatory requirements (i.e. the VIC *Environment Protection Act 2017* and *Environment Protection Regulations 2021*).
- EPA licence and remedial notice compliance.
- Preparation of Annual Environmental Reports.
- Liaison with State and Commonwealth regulators regarding compliance matters.

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Environmental Auditing

- Statutory and voluntary environmental audits under the VIC EPA audit system.
- Internal EMS auditing for compliance with ISO 14001.
- Verification of implementation of Construction and Operational Environmental Management Plans.

Contaminated Land Management

- Liaison with State and Commonwealth regulators regarding compliance matters.
- Site history assessment to establish the potential for contamination.
- Soil and groundwater investigations.
- Due diligence assessments.
- Soil assessments for offsite disposal or reuse.
- Preliminary Site Investigations (PSI).
- Detailed Site Investigations (DSI).
- Acid Sulphate Soil investigations and Acid Sulphate Soil Management Plans (ASSMP).
- PFAS management.
- Pre and post lease assessments.

Environmental Monitoring

- Environmental monitoring (groundwater, surface water, soil, soil vapour).
- Environmental site inspections.
- Review and interpretation of monitoring reports.
- Environmental site assessments.

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Innovative & Complex Project Experience

Innovative detailed design and construction supervision

- Steep sidewall design to increase cell airspace while reducing overall footprint
- Steep capping design to prevent the need to relocate waste
- Retaining wall design as part of PSCP development to tie-in to natural ground surface
- Construction supervision (GITA/TPCC) of the above

Environmental approvals and assessments

- EPBC approvals for Melbourne Airport
- Construction EMP for Melbourne's Airports Third Runway
- Environment Asset Management Plan for Melbourne Airport
- Environmental approvals strategy for quarry site
- RMMPs for large metro Melbourne sites, quarries and recycling facilities

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Josh Crawley, HiQ

Implementing the BPEM: An Operator's Perspective

Implementing the BPEM: An Operator's Perspective

Josh Crawley Technical Manager
HiQ

My Role

Bio

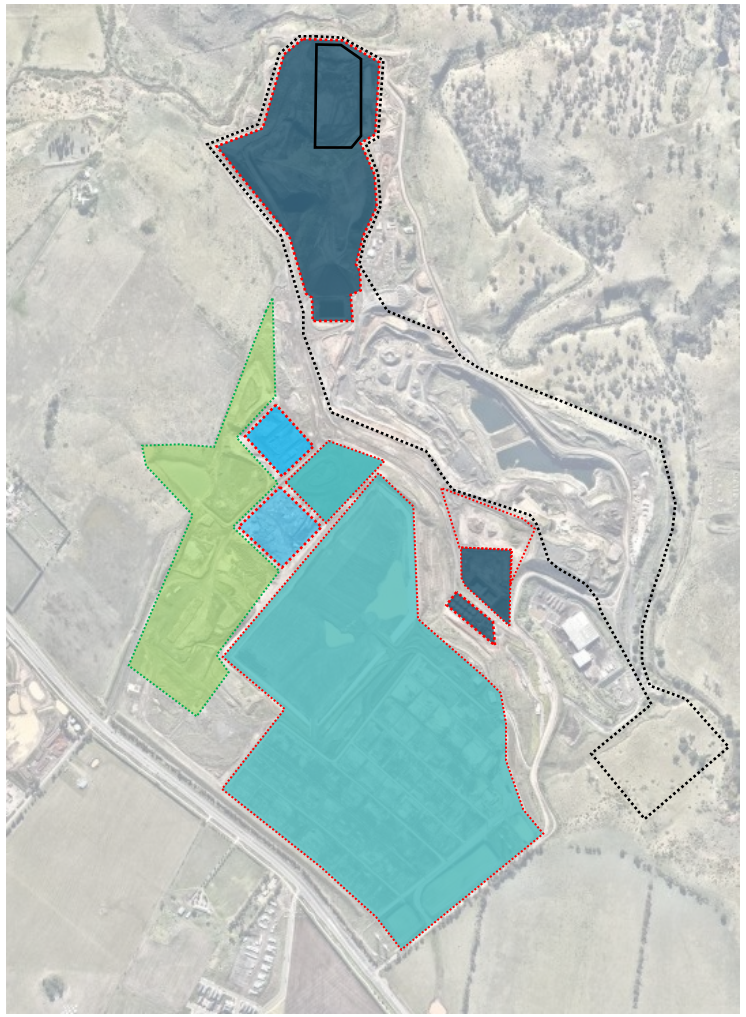
Josh Crawley is the Technical Manager at Hi-Quality's Bulla operations, working across landfill engineering, regulatory approvals, environmental performance and daily operational delivery. He specialises in translating the intent of EPA Victoria's BPEM and risk-based frameworks into practical, workable systems for operators on the ground. With a background that spans contaminated land, remediation, resource recovery and major infrastructure projects, Josh bridges the gap between policy, design and field execution — ensuring compliance, clarity and operational efficiency actually align in practice. His work focuses on simplifying complex regulatory requirements and embedding them into real-world operational decision-making across large, fast-moving sites.

Contact: jcrawley@hiq.au

- **Daily compliance + operational decisions**
- **Landfill design → construction → capping → monitoring**
- **Regulatory interactions**
- **Translating BPEM into real-world decisions**

The Site

Location: 570 – 600 Sunbury Road, Bulla VIC 3428



PERMITTED ACTIVITIES

Landfill (Operating Licence A01, A05a & A04)

Resource Recovery – Soil and C&D "Site B"

Resource Recovery – Major Projects

Resource Recovery – C&D

Resource Recovery – Acid Sulphate

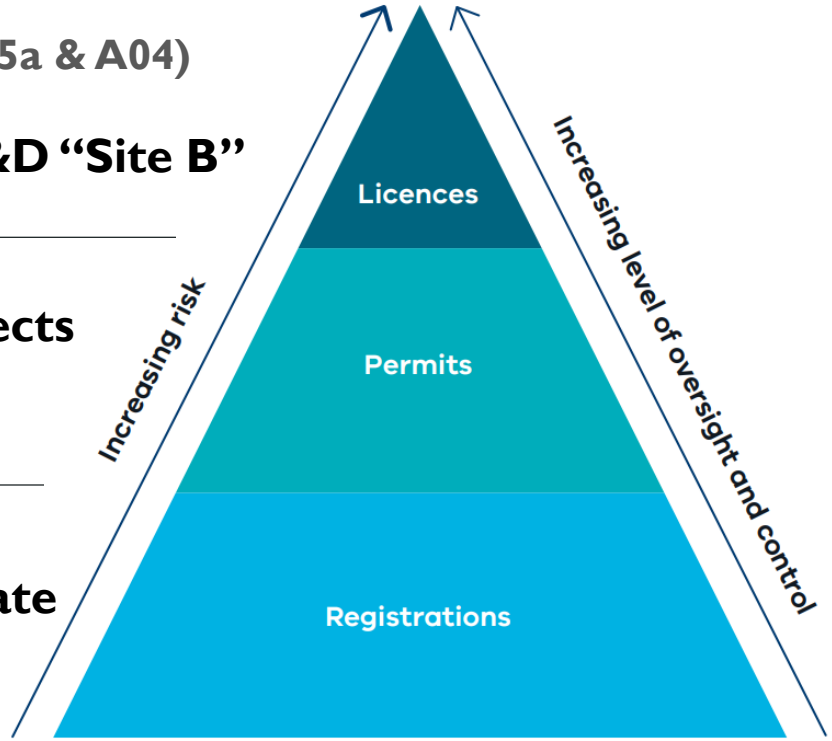
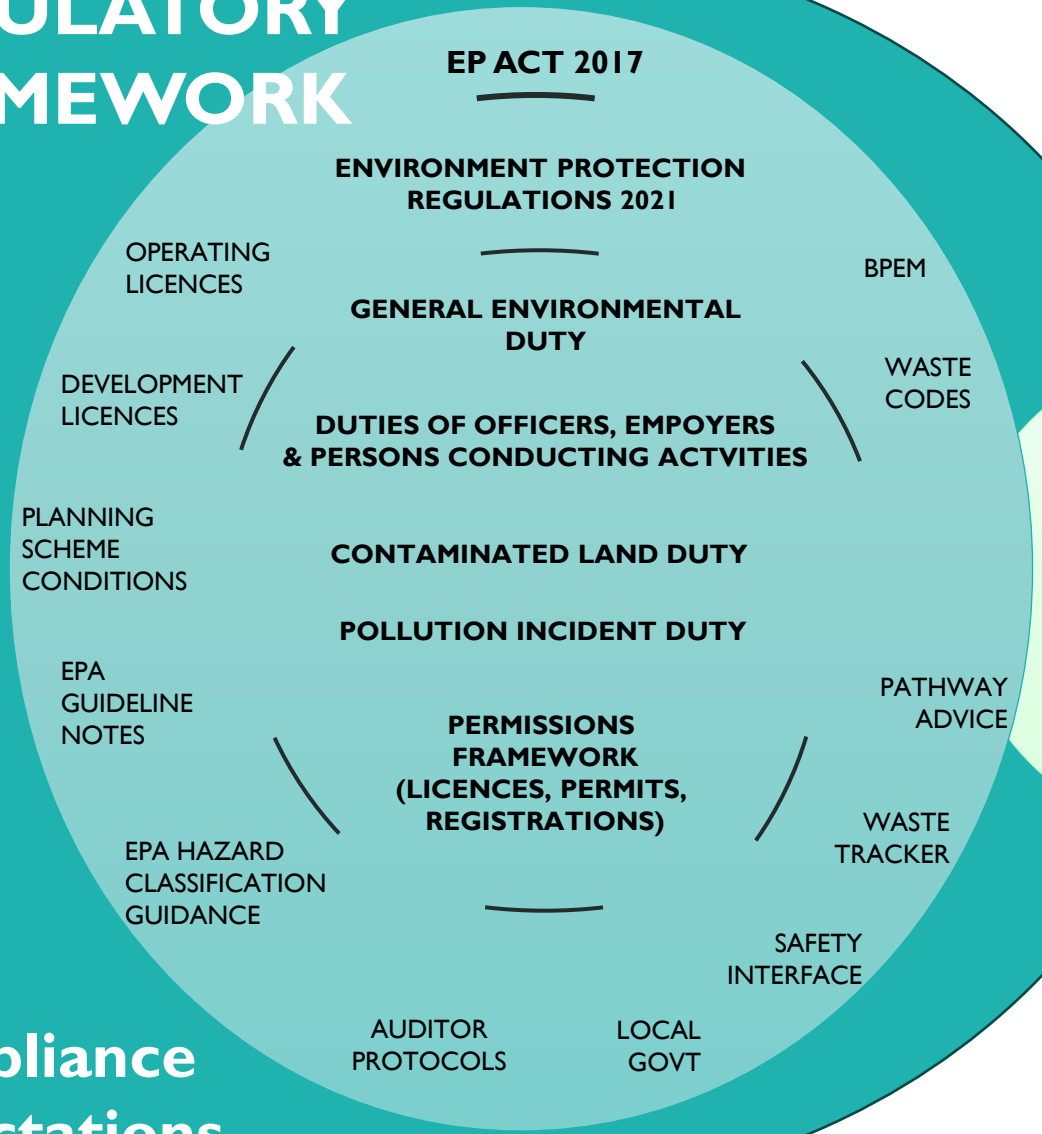


Figure 3 Tiers of the Permissions Scheme

Cleanfill acceptance area (Planning Permit P4131)

Quarry (Work Authority 1123)

REGULATORY FRAMEWORK



Compliance Expectations

OPERATOR

Translating complex Regulatory duties into workable solutions.

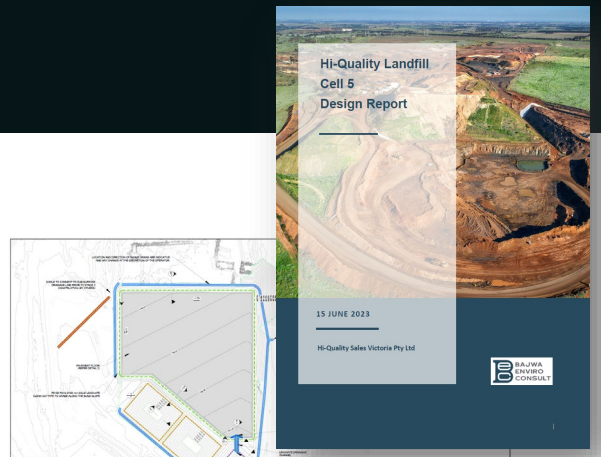
OPERATIONAL REALITY

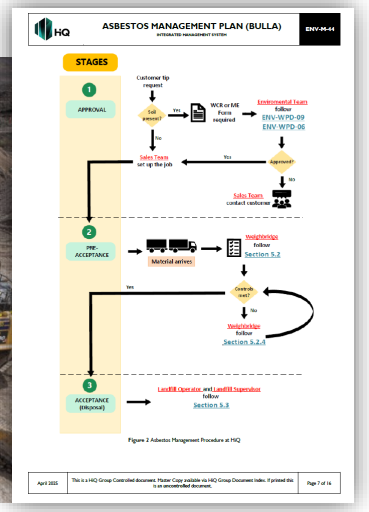
- EMPs
- RMMPs
- CQAPs
- Technical Specifications
- Monitoring
- Waste Acceptance Procedures
- Internal Management Systems
- SOPs
- WMS
- Drone Surveys
- Weighbridge supervision
- Staff training
- Forecasting
- Resource mgt
- EPA liaison
- Consulting

How we deliver it

What the BPEM Means in Practice

- **Framework for competent landfilling – from beginning to end**
- **Rick compass for operations**
- **Outlines targets and expectations:**
  e.g., liner, leachate, gas, cover





Where BPEM works well

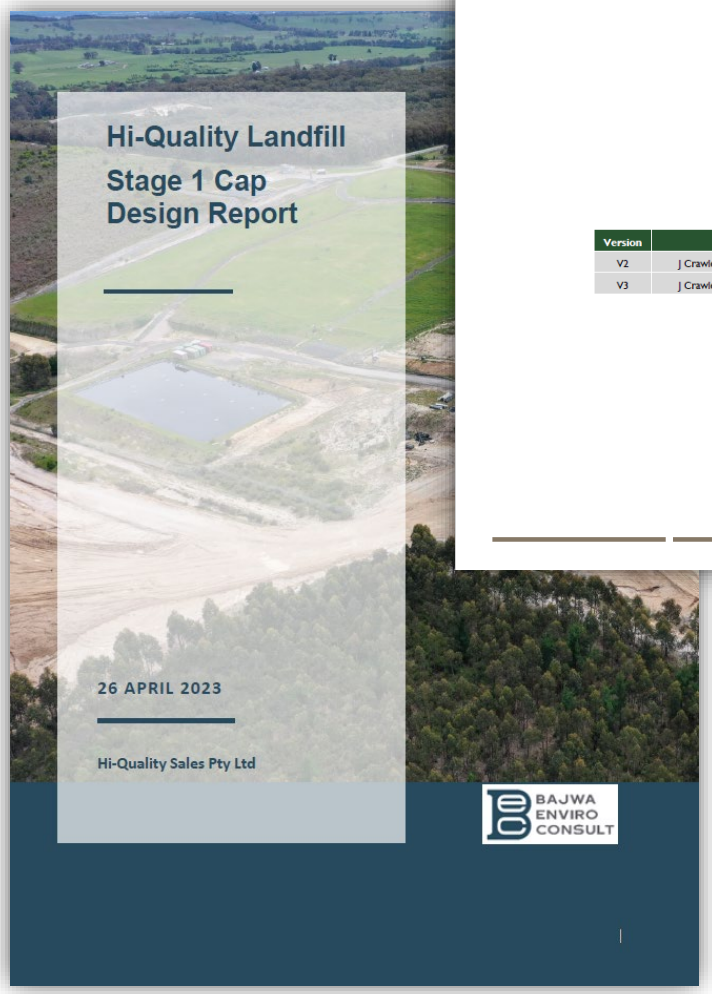
- **Predictable requirements**
- **Stable technical foundation**
- **Simplifies some EPA conversations.**

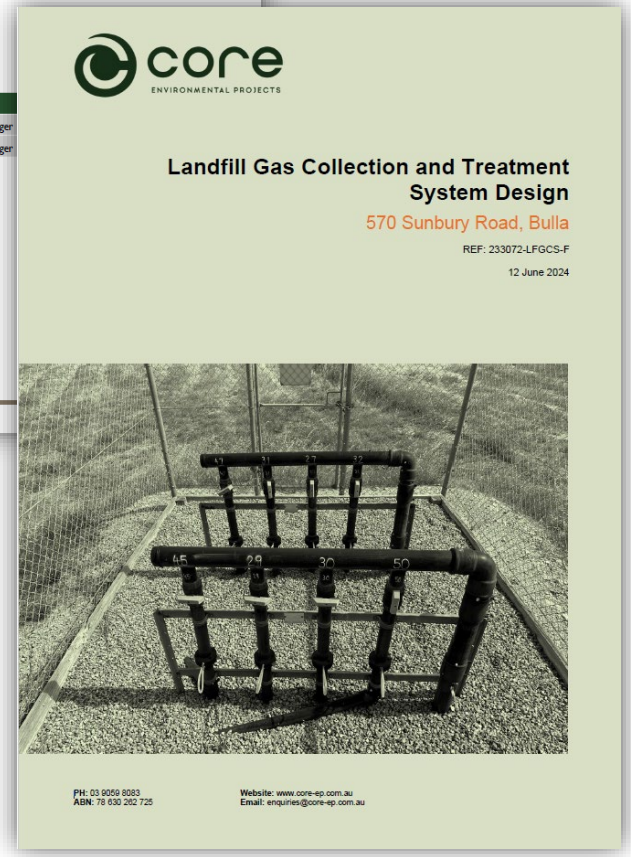
Where BPEM gets challenging

- Not all sites are textbook
- Site irregularities require outside BPEM processes during D&C
- Waste variability, volumes, schedules require different operational approaches
- Sequencing – overlap of priorities not acknowledged in BPEM

CASE STUDY: LFG & REHAB

- **Seen as higher risk compliance area**
- **Timing + sequencing critical**
- **Live tipping complicates ideal BPEM sequence**





CASE STUDY: LFG & REHAB

Bridging the gap

- Vertical bores staged to filling & stability
- Horizontal collectors for early capture
- Interim flare for early compliance
- Rehab benches shaped around gas system
- Drone settlement data for timing

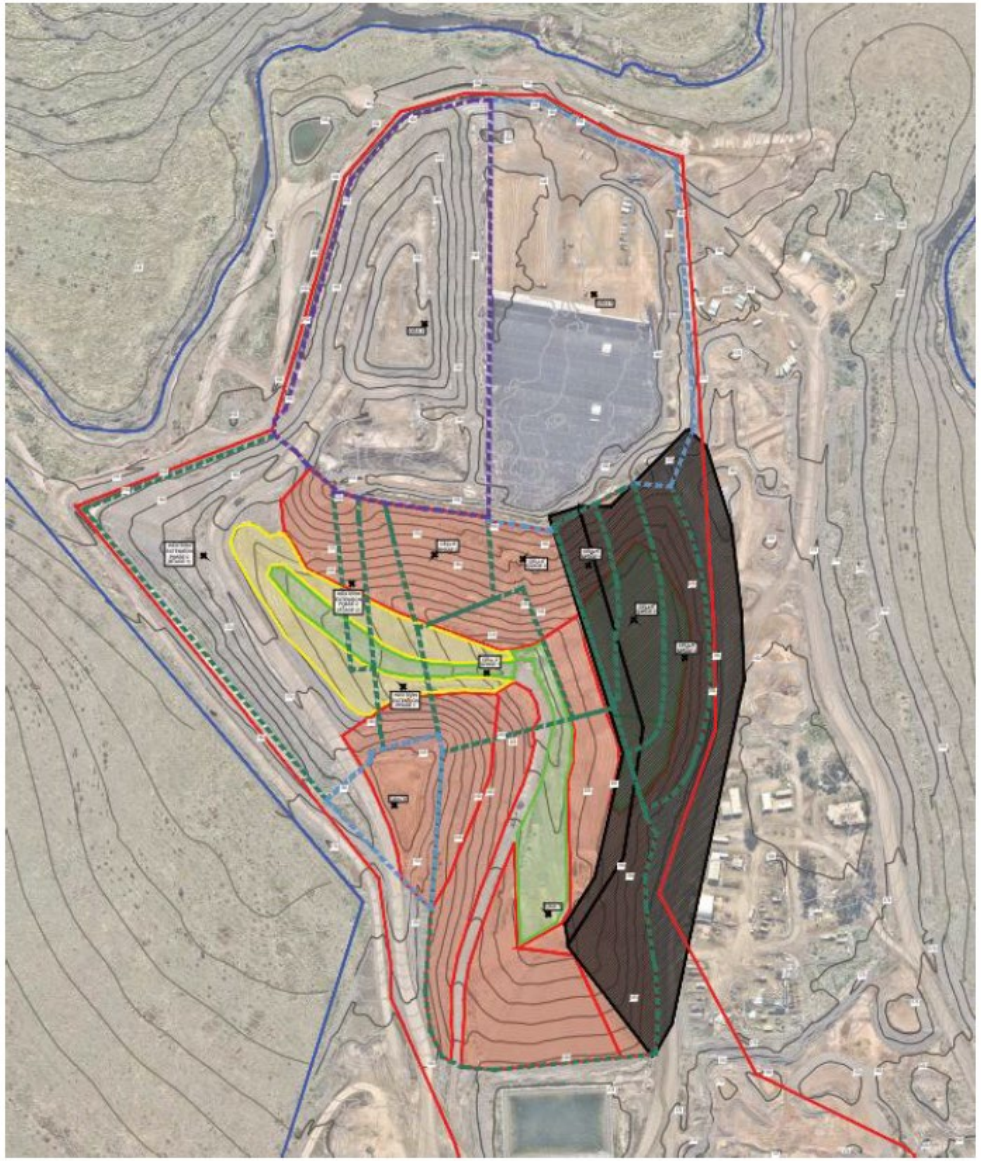


Figure 5.1 Topography Constraints

CASE STUDY: LFG & REHAB

Bridging the gap

Thank you

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Andrea Hill, Enqip

Landfill Monitoring: Best Practice Technology

Landfill Monitoring

BEST PRACTICE TECHNOLOGY

enqip

Equipment with Care

Present and Future

Extractive Landfill Gas Analysers

- Industry standard GA5000, GFM430, GEM5000 → GEM PRO
- Options for gas sensors and sensor range
- Measures concentration, pressure and flow
- Quick connect to well

enqip

Low Concentration Methane Detectors

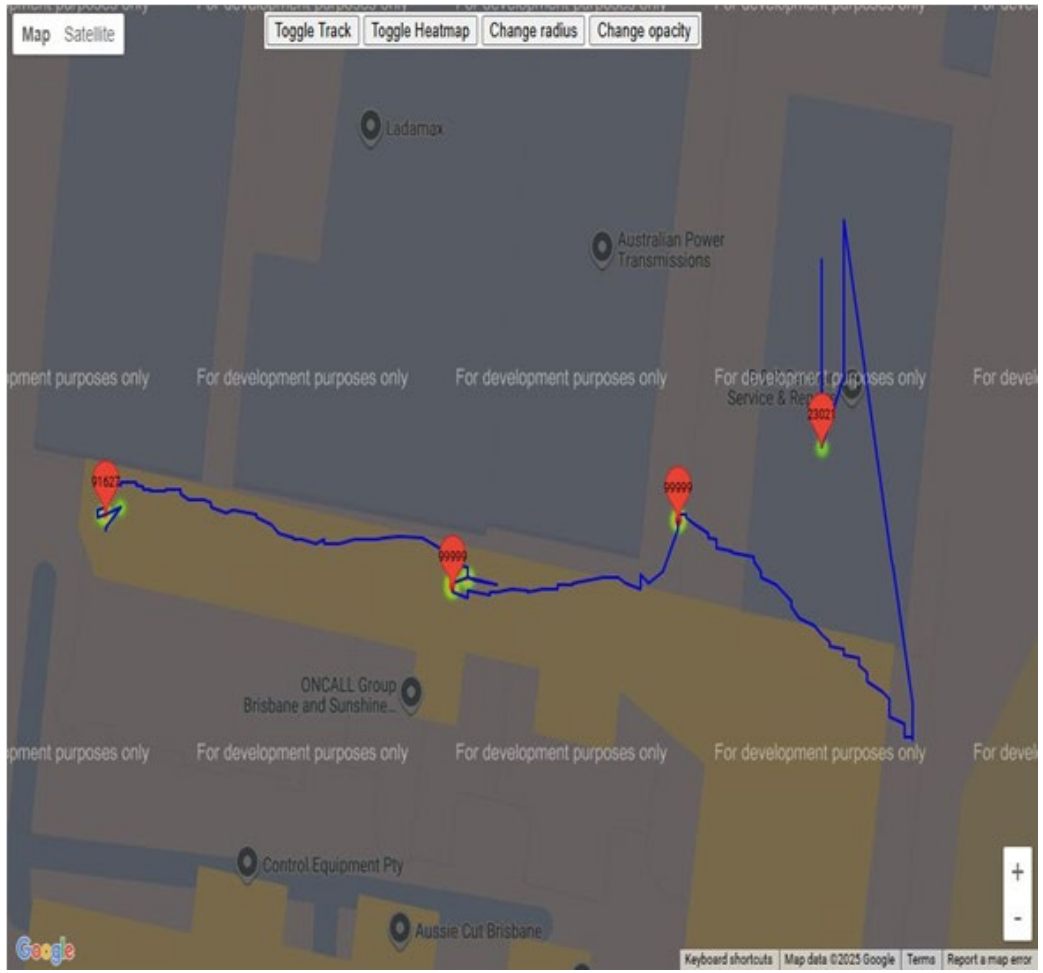
- Tuneable Diode Laser Absorption Spectroscopy
  - Inspectra Laser
  - Huberg Laser One
- Methane specific
- Laser One - GPS built in
- Requires calibration check

enqip

LM Smart

- External laser (measurement in ppm/m versus ppm)
- Walk and measure every 0.1 seconds
- User friendly
- Reliability (no moving parts, no suction)

Enhanced Reporting

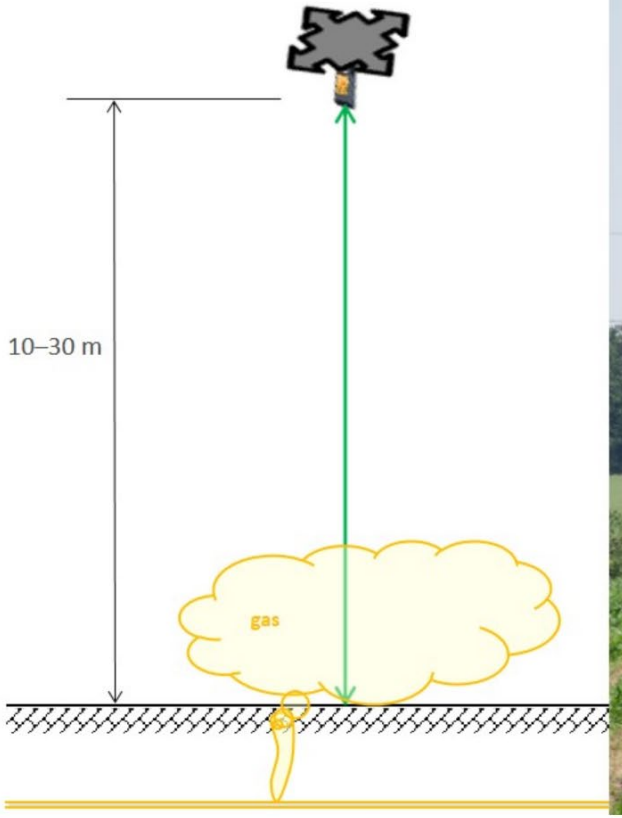


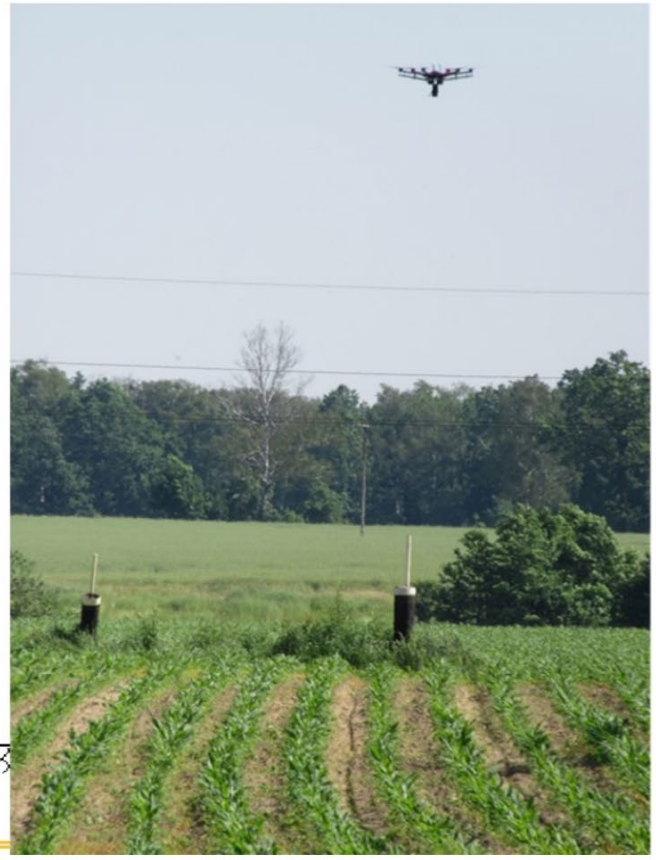
- Mapping of:
  - GPS - path over time
  - Alarm level detection (hotspots)

enqip

Future: Drone Survey

- LiDAR
- GPS
- Methane measurement
- Plume mapping



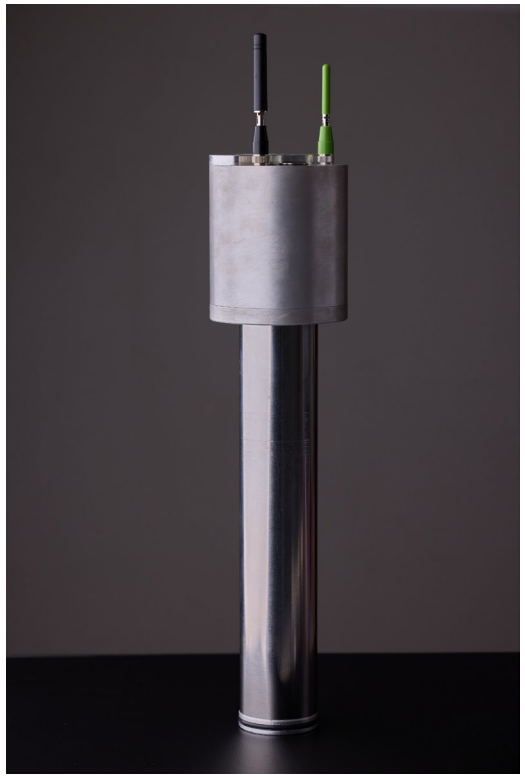


Continuous Gas Monitoring

enqip

Miasma Meter

- Utilises differential pressure
- Measures concentration of CH_4, O_2 and CO
- Measures flow
- Low power demand
- Secures under gatic lid or lockable upstand (no external equipment)
- Online accessible data via telemetry
- Designed and assembled in Victoria, Australia



enqip

Thank you

Lya Assef & Simon Clay, City of Ballarat

Landfill Gas - Environmental Challenges and Management Strategies – Ballarat Regional Landfill

CITY OF BALLARAT

Landfill Gas Extraction – Management Strategies and Data Interpretation

Ballarat Regional Landfill

20th November 2025

Meet the Team - BRL

Lya Assef

Landfills and Transfer Station Manager

- 19+ years in **environmental management, sustainability, and waste operations**
- 5 years managing **landfills and transfer stations at City of Ballarat**
- Focused on resource recovery, sustainability, and **EPA & OHS compliance**
- Environmental **Engineering** degree**, MBA, and Bachelor** in Occupational Safety Engineering

Simon Clay

Project Manager Waste Strategy Services

- 35+ years in circular economy and waste management
- Expertise in **policy development**, **program management**, and **waste operations** (collections, landfills, transfer stations)
- **10+ years** managing landfills, including **strategic planning**, **approvals**, **compliance**, **capital works**, **operations**, and **business development**
- **EPA Facilities Auditor** (1992–1998)

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Purpose

- Ballarat Regional Landfill
- Interpreting gas field data
- Optimising gas recovery

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Ballarat Regional Landfill

- Landfilling activity started **1996**
- Previously operated by **Boral as a sandy quarry**
- Quantity: **50,000 ton/year**
- Solid **inert waste, putrescible and prescribed industrial waste**
- The site covers **130 ha** in total , including **20 ha** that has already been landfilled
- **13 cells – 2 active cells**

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Current Management Practices at BRL

❖ **LFG system**

- LFG system operating since 2005
- Operated by the LMS
- 124 extraction points (wells, leachate sumps, leachate lines)
- Used for power generation with flare backup

❖ **Quarterly Gas Monitoring (FY24/25)**

- No exceedances - buildings, structures and services
- Surface emissions – 8 exceedances
- Consistent CH_4 exceedances in several monitoring bores

Table 1: Summary provided by the LFGHC (FY24/25)

Date Range / Item	24/25 FY
Biogas wells - Tested	116
% Biogas Wells - Flowing	57%
Methane %	46%

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LFG Monitoring Network with Methane affected areas

Picture 1: Ballarat Regional Landfill with Methane affected area

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Interpreting Gas Field Data

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Interpreting gas field data

- Monthly Reporting and Data analysis

- Wells, Pressure (Pa), gas composition - CH_4 (%) CO_2 (%), O_2 (%), Bal. Gas (%), CO (ppm), Temp (C), H_2S (ppm)
- What does this tell us:
  - CH_4/CO_2 - ideally should be 1.5
  - Balance gas - mostly nitrogen. High balance gas indicates air ingress
  - O_2/N_2
    - if 0.2-0.25 then indicates air leak close to or above surface
    - if low (little or no free O_2), indicates O_2 being consumed in biological process and converted to CO_2
  - CO – can be an indicator of hot spots and > 500 ppm should be investigated
  - Temperatures above 60^{o}C may indicate a hot spot but be aware waste is a very good insulator

Interpreting gas field data

Examples from 4 gas wells at BRL are presented below:

Table 2: Examples from gas wells at Ballarat Regional Landfill

Well	Pressure (Pa)	Flow (m3/h)	CH_4 (%)	CO_2 (%)	O_2 (%)	Bal. Gas (%)	CH_4:CO_2 Ratio	O_2/N_2	CO (ppm)	Temp (C)	H_2S (ppm)	Comments
1	-253	4.1	54	34	0	12	1.59	0.00	23	12	70	Ideal CH_4/CO_2, low balance gas
2	-42	1.1	7	10	14	69	0.70	0.20	15	18	2	Low CH_4 & CO_2, poor CH_4/CO_2, High O_2 and N_2 indicates leakage at or near surface.
3	-1300	15.9	45	31	0.7	23.3	1.45	0.03	15	15.5	53	High N_2 and low O_2 indicates biological degradation. Suggests over extraction.
4	-320	1.1	0	0	20	80		0.25	4	12	1	No CH_4 . O_2 and N_2 suggest major air leak near or at surface

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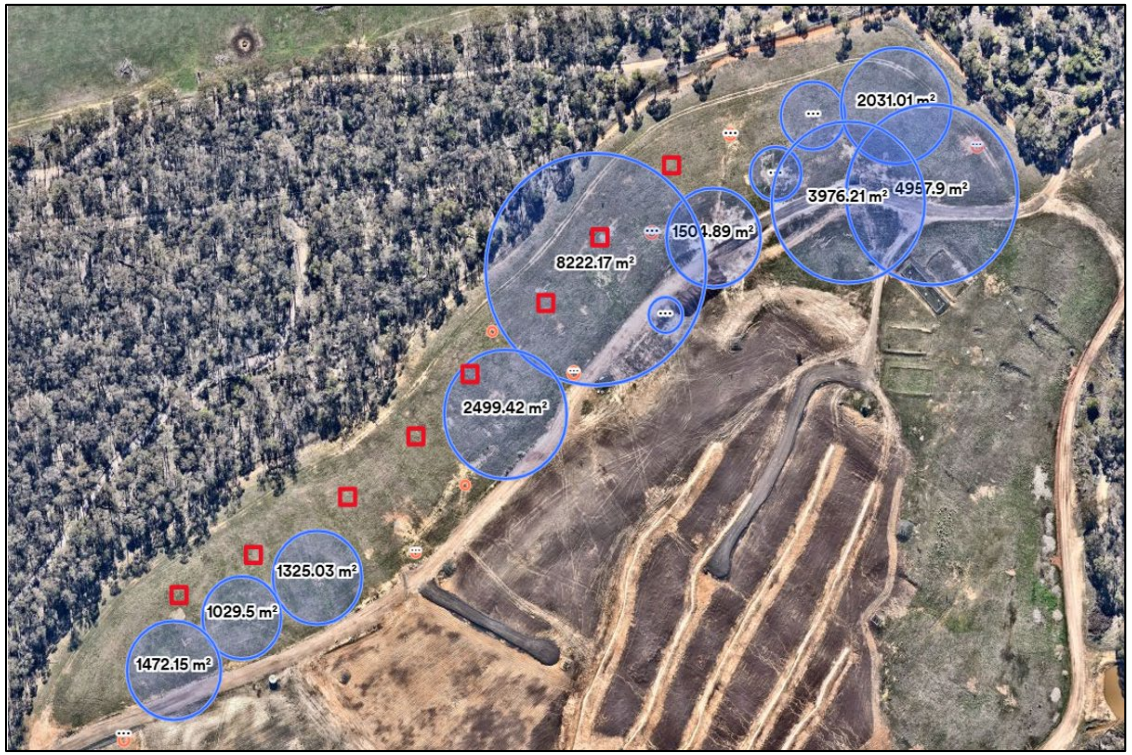
Optimising Gas Recovery

Strategic Improvements and Future Steps

❖ Installation of Gas Extraction Wells

New gas extraction wells are installed to increase capacity and improve landfill gas emission control.

Picture 3: Location of the T-wells



Picture 2: Illustration of gas field extraction

Strategic Improvements and Future Steps

❖ T-Well installation

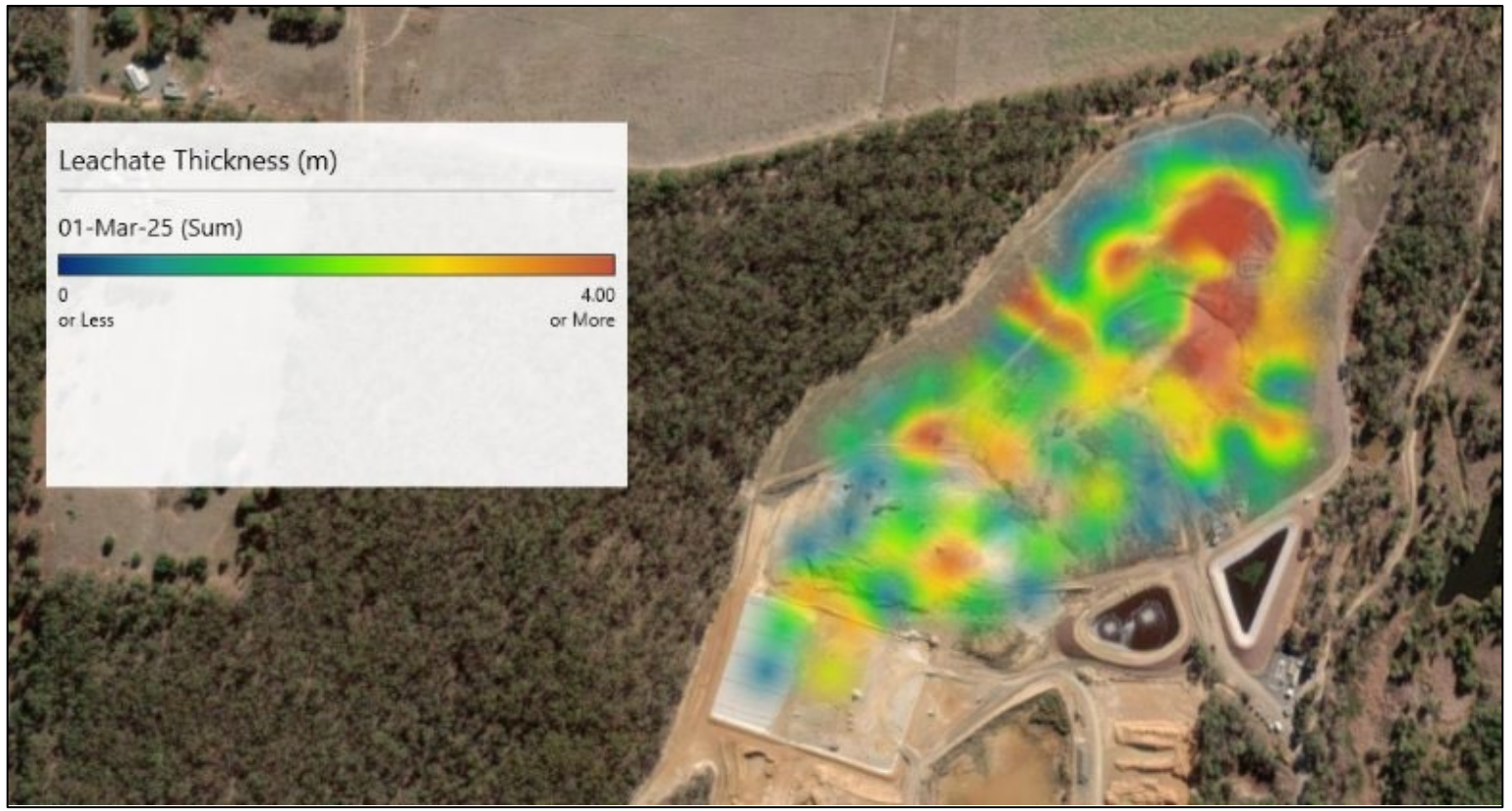
- Installation of 8 T-wells along cell boundary where exceedances being measured.
- Initial testing indicates only 4 wells are pulling any methane.
- May require relocation of some wells (despite test pitting of the cap no waste was observed at 4+ meters at some locations).
- Impact on gas monitoring bore readings to be assessed over at least 6 months (not immediate).

Picture 4: Digging trench for T-wells

Strategic Improvements and Future Steps

❖ **Leachate Pump Trial**

- Wells with elevated leachate levels mostly in cells that predate BPEM
- Leachate drainage systems simple network of trenches cut into cell floor
- Likely to have failed – leachate drawdown test to confirm
- Trial to pump leachate from the most impacted gas wells
- Review any changes to gas collection effectiveness.



Picture 5: Leachate Thickness in gas extraction wells

Strategic Improvements and Future Steps

- **Improved Contract Management**

Regular meetings with LMS to promote information sharing and a cooperative approach to gas management

- **EPA and EPA appointed Auditor**

Keep the EPA and the Auditor updated regarding the gas system management, actions and outcomes

- **Comprehensive Gas Risk Review**

Reviewing and updating gas risk assessment and landfill action plan to ensure compliance with EPA guidelines and updated mitigation strategies.

- **Installation of Gas Extraction Wells**

New gas extraction wells are installed to increase capacity and improve landfill gas emission control.

- **Increase Team's knowledge and understanding of the gas management system**

Improve knowledge through training with the LFG contractor and purchase portable gas analyser to provide onsite ability to assess gas field conditions.

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Summary

- Long time history of gas extraction
- Rich data but complex to interpret
- Important to optimize gas extraction and minimize environmental impacts
- Partnership is the key to enhance outcomes and meet compliance

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Maya Brennan, Bajwa EnviroConsult

From Contaminated Land to Landfill: My Journey Across Disciplines

From Contaminated Land to Landfill: My Journey Across Disciplines

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My Professional Journey

- Studied environmental science at RMIT
- Worked as contaminated land and remediation consultant
- Joined BEC with no landfill experience

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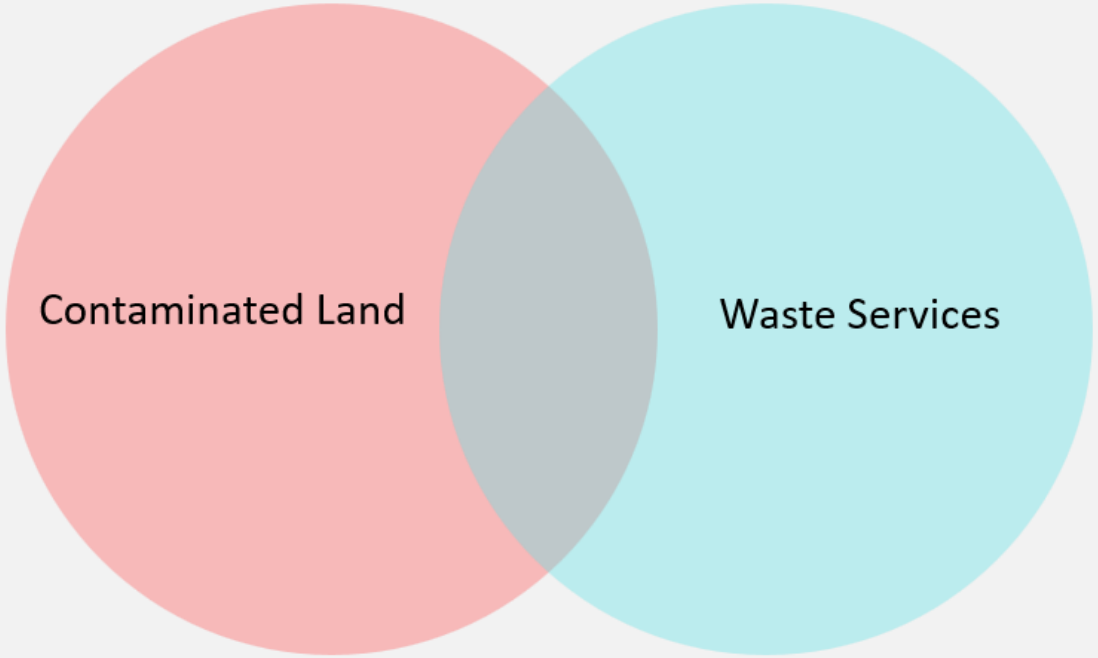


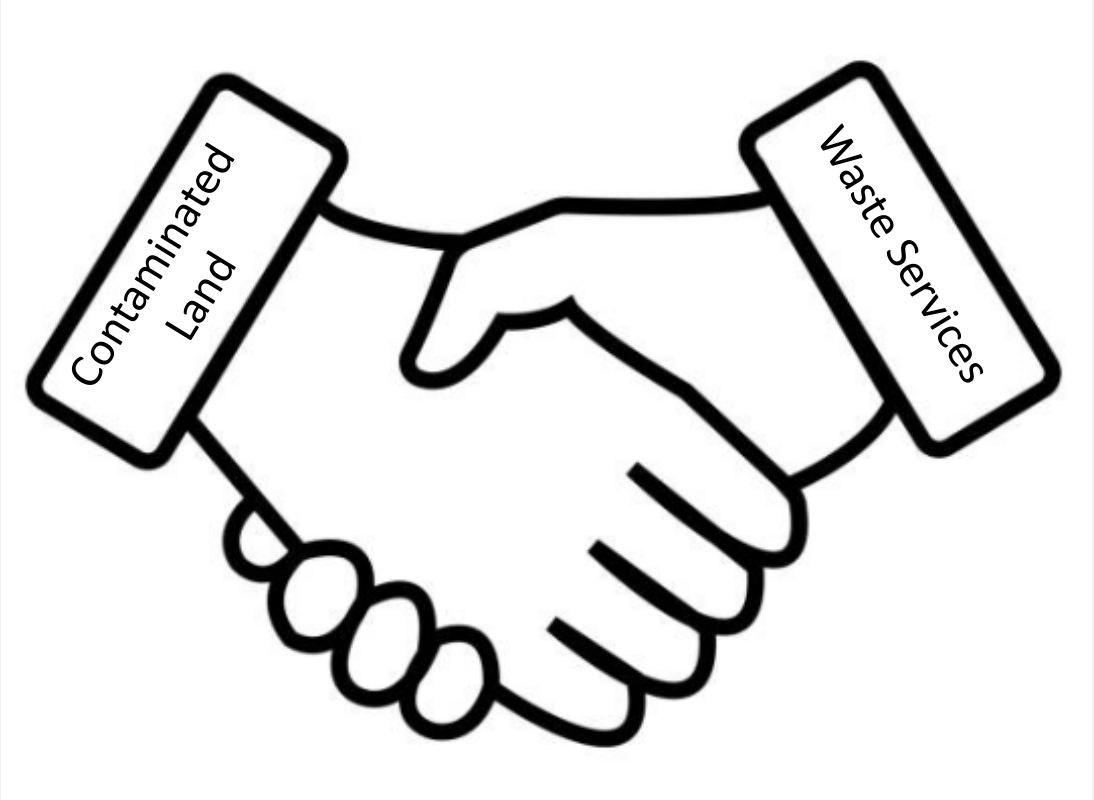
- Focus on assessment, remediation and management of contaminated sites
- Clean-up or manage contamination for re-use or development

- Focus on operation and management for the full life cycle (closure, aftercare) of waste disposal facilities
- Prevent and manage pollution from facilities

Contaminated Land vs Waste Services

Similarities

- Overall aim – prevent environmental harm
- Regulatory framework (GED, NEPM, ERS, EPA Guidance)
- Fieldwork methodology
- Risk-based decision making
- Reporting requirements



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A Combined Approach

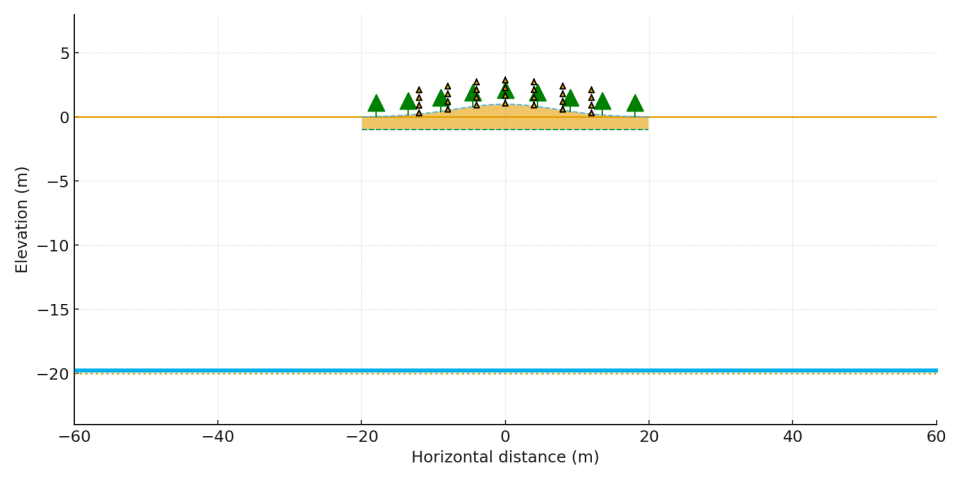
- Utilising people across both disciplines broadens technical knowledge
- New remediation/treatment technologies
- Redevelopment of former industrial precincts often near to landfills

Case Study – Structure Plan

- Assessment of suitability of over 200 sites
- 16 properties recommended to proceed to audit as they were located within the landfill buffer (500m)
- BEC completed a supplementary assessment of these properties and the landfill

Case Study – Structure Plan

- Landfill had been closed >30 years, well vegetated, clay cap, groundwater was deep and travelling away from the site
- No detectable concentrations of LFG in services, through the cap
- Risk assessment concluded the site was considered suitable for the proposed development
- No audits required



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Summary

- The fields are same same but different
- Benefits for projects on have both perspectives working together
- Transiting between work in both can be relatively seamless

Thank you!

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Q&A discussion panel

Thank you for attending!

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