CITY OF BALLARAT

Integrated Leachate + Landfill Gas Management

Ballarat Regional Landfill

OPERATIONS • CONTROL • RESILIENCE • PEOPLE





REGIONAL INFRASTRUCTURE

Ballarat Regional Landfill

SERVING THE REGION SINCE 1996

45,000

TONNES MANAGED EACH YEAR

130 ha total • 20 ha landfilled
14 ha remaining • 13 cells • 2 active

SOLID INERT • PUTRESCIBLE
ASBESTOS • CATEGORY C&D LANDFILL





LEACHATE CONTROL

Existing leachate management

12 ML

TOTAL CAPACITY ACROSS 2 LEACHATE PONDS

COLLECTION NETWORK

11 leachate sumps

- 1 groundwater sump
- 6 gas wells
- Condensate from the flare unit and Renewable Energy Facility

Leachate Pond 1 and Pond 2



BALLARAT REGIONAL LANDFILL

Passive pond evaporation + mechanical spray evaporator

WHY WE LOOKED DEEPER

Operational pressure was rising faster than our visibility.

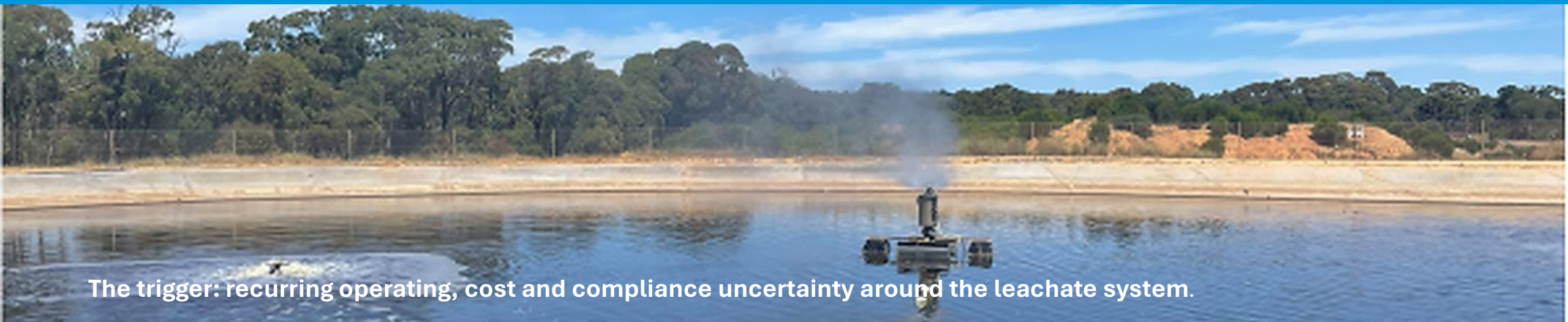
6 PRESSURE POINTS

OPERATIONAL PRESSURE

Tankering offsite
Evaporator issues
Budget management

RISK & SYSTEM VISIBILITY

Limited knowledge of major leachate sources
Gas-management impacts
Compliance



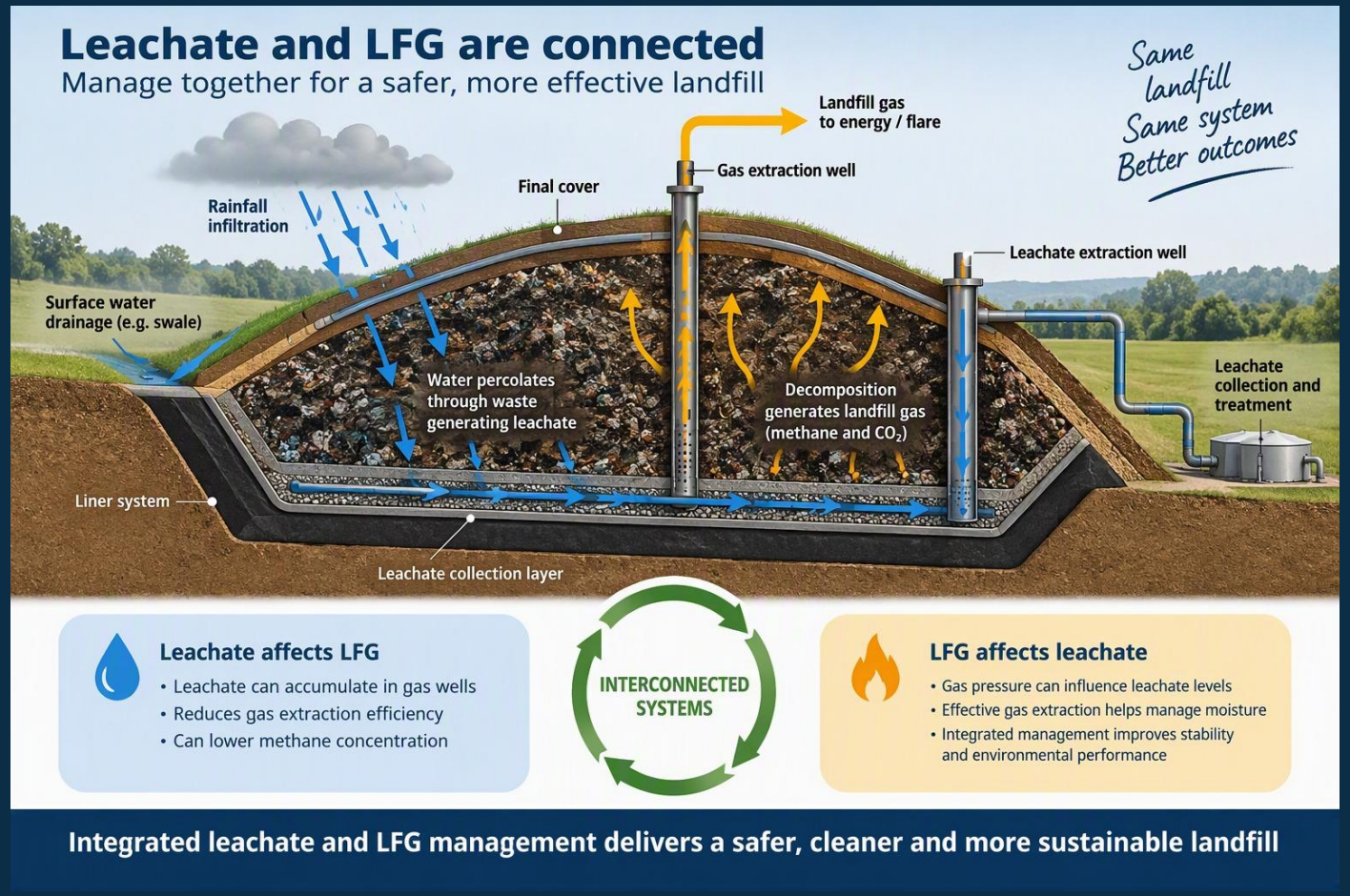
The trigger: recurring operating, cost and compliance uncertainty around the leachate system.

Leachate and LFG: An Integrated challenge

Every litre of water entering the landfill affects both leachate generation and gas performance

LEACHATE IMPACTS

- Higher leachate volumes
- Increased pumping costs
- Greater storage needs
- Flooded gas wells
- Reduced methane capture



LANDFILL GAS IMPACTS

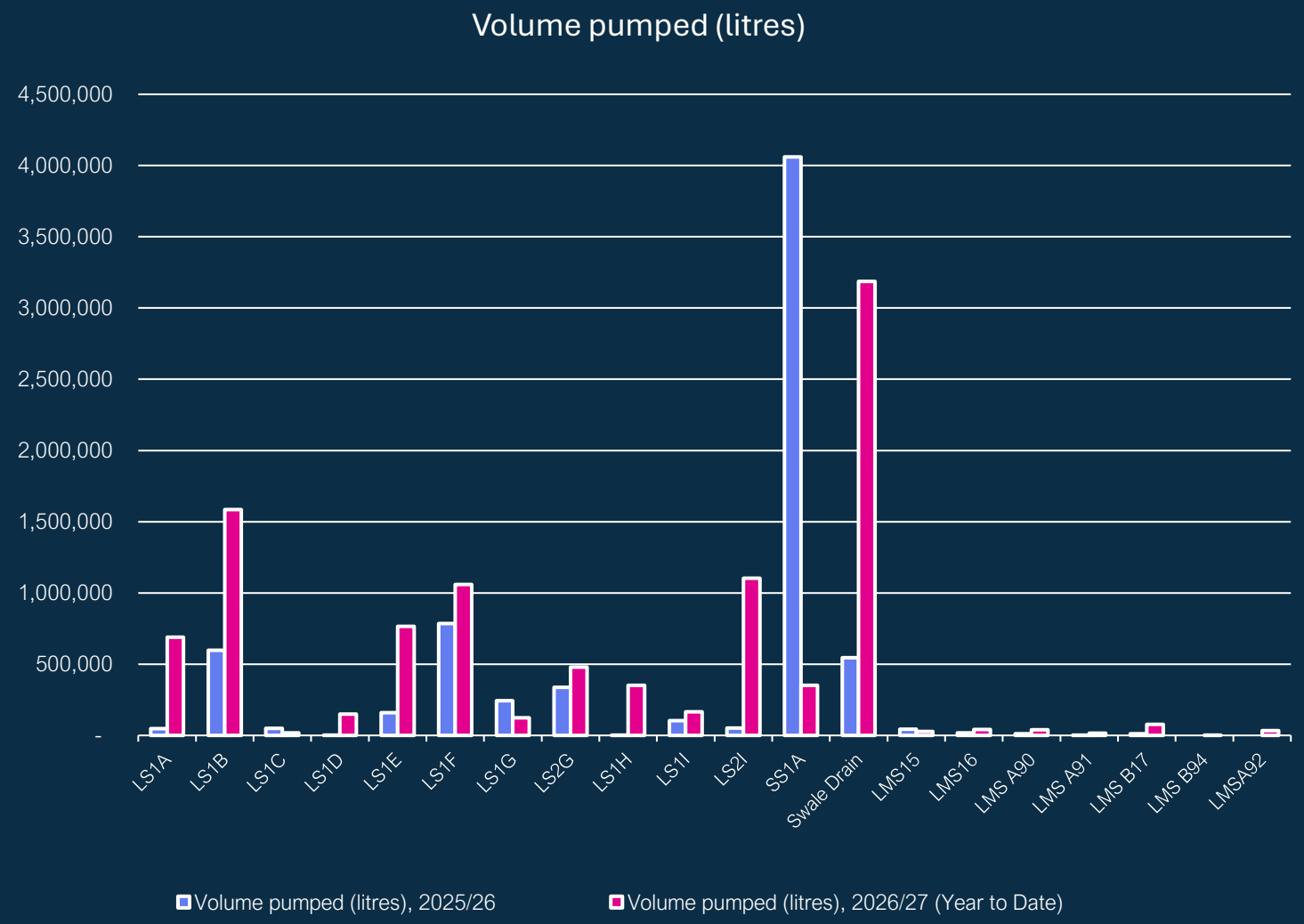
- Increased moisture
- Reduced gas extraction
- Greater GHG risk
- Reduced stability
- Higher long-term costs

Understanding Leachate System Inputs

Data Quality, Measurement Gaps & Key Sources

Key Insights

- Significant data gaps affect confidence in results
- Evaporation losses currently uncertain
- Flowmeter calibration and assumptions require refinement
- Obvious data anomalies identified
- SS1A and Swale Drain are dominant leachate sources



Focus Areas: Data Accuracy | Source Identification | Operational Decision-Making

Leachate Management Options Assessment

Addressing Symptoms vs Reducing the Source

OPTIONS CONSIDERED

🚚 Continue Tankering Offsite

🏭 Treatment & Sewer Discharge

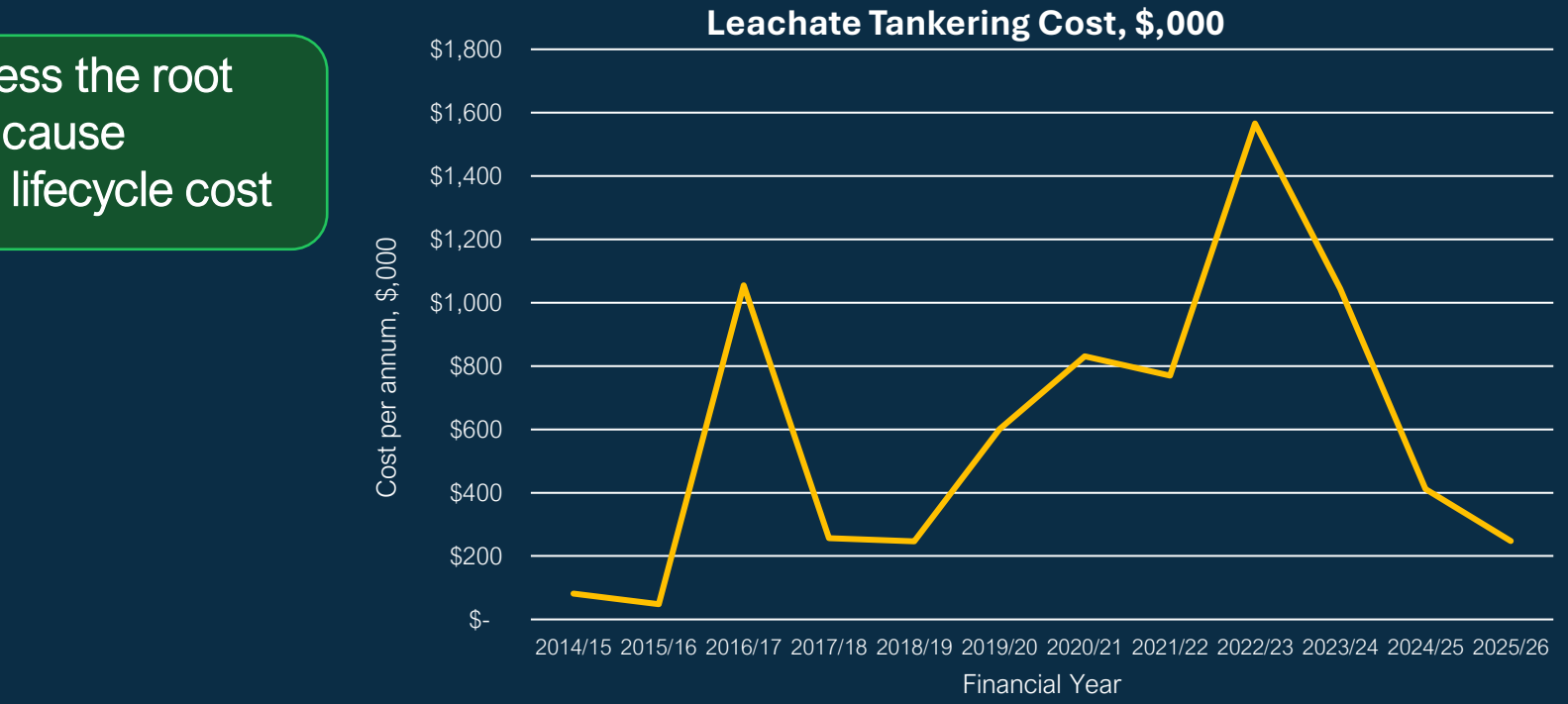
☀️ Accelerated Evaporation

🌱 Treatment & Irrigation

✅ PREFERRED OPTION
REDUCE LEACHATE INPUTS

Address the root cause
Lowest lifecycle cost

$1.5M+
Peak annual tankering cost



Recommended Strategy: Focus on reducing leachate generation at source by targeting SS1A, Swale Drain and infiltration pathways before investing in additional treatment infrastructure.

Leachate Data Forensics

Can we trust the data?

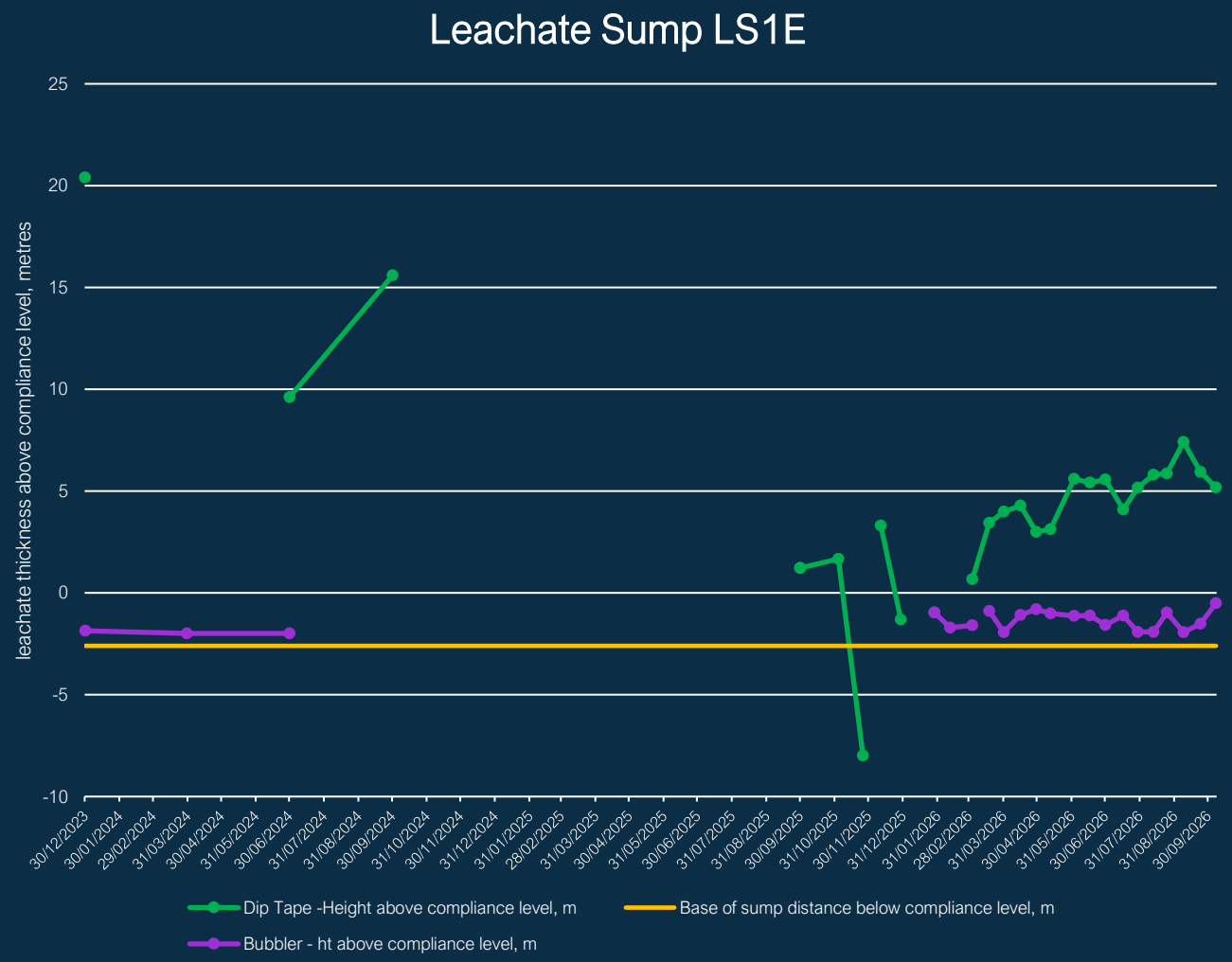
FINDINGS

⚠ Dip tape readings exceed realistic operating ranges

⚠ Sudden level changes without corresponding operational events

⚠ Material divergence between dip tape and bubbler systems

⚠ Readings indicate physically impossible levels



DATA CONFIDENCE

🟠 Moderate for trend analysis
🔴 Low for investment decisions
🔴 Low for water balance calculations
🔴 Low for source quantification

Breakthrough Finding: Groundwater Pathway Identified

Historic chimney drains may be driving significant leachate generation

WHY THIS MATTERS

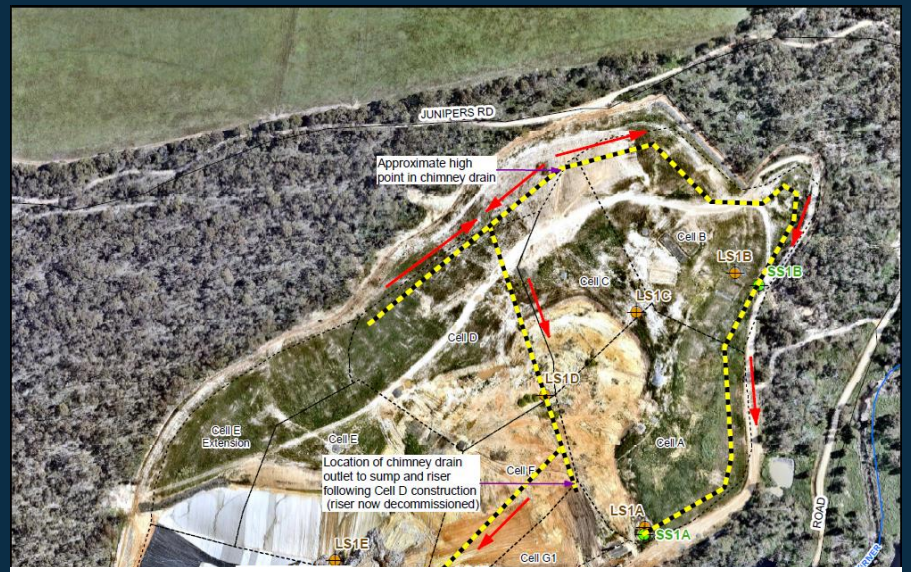
Groundwater may be entering historic chimney drains, moving through the waste mass and ultimately reporting to SS1A and associated leachate collection infrastructure.

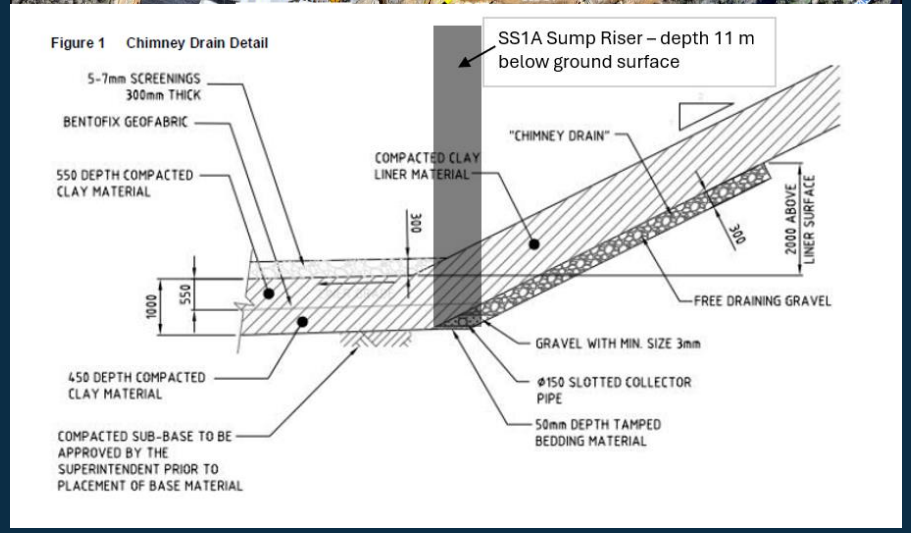


Groundwater → Chimney Drain → Waste Mass → SS1A

🎯 KEY FINDING

SS1A may be receiving groundwater-derived flows in addition to landfill leachate.





SUPPORTING EVIDENCE

- ✅ Groundwater chimney drains installed in early cells
- ✅ Cell A riser extends through waste mass
- ✅ Leachate observed entering riser joints
- ✅ Groundwater entering riser already contaminated
- ✅ SS1A identified as a major contributor

Rainfall May Be Converting Swale Drains into Leachate Generation Pathways

Simple source-to-impact pathway

Rainfall → Swale Drains → Infiltration → Waste Mass → Leachate → Cost

KEY MESSAGE

Every rainfall event directs additional water into the landfill where it becomes leachate and increases pumping, storage and treatment requirements.

OPPORTUNITY

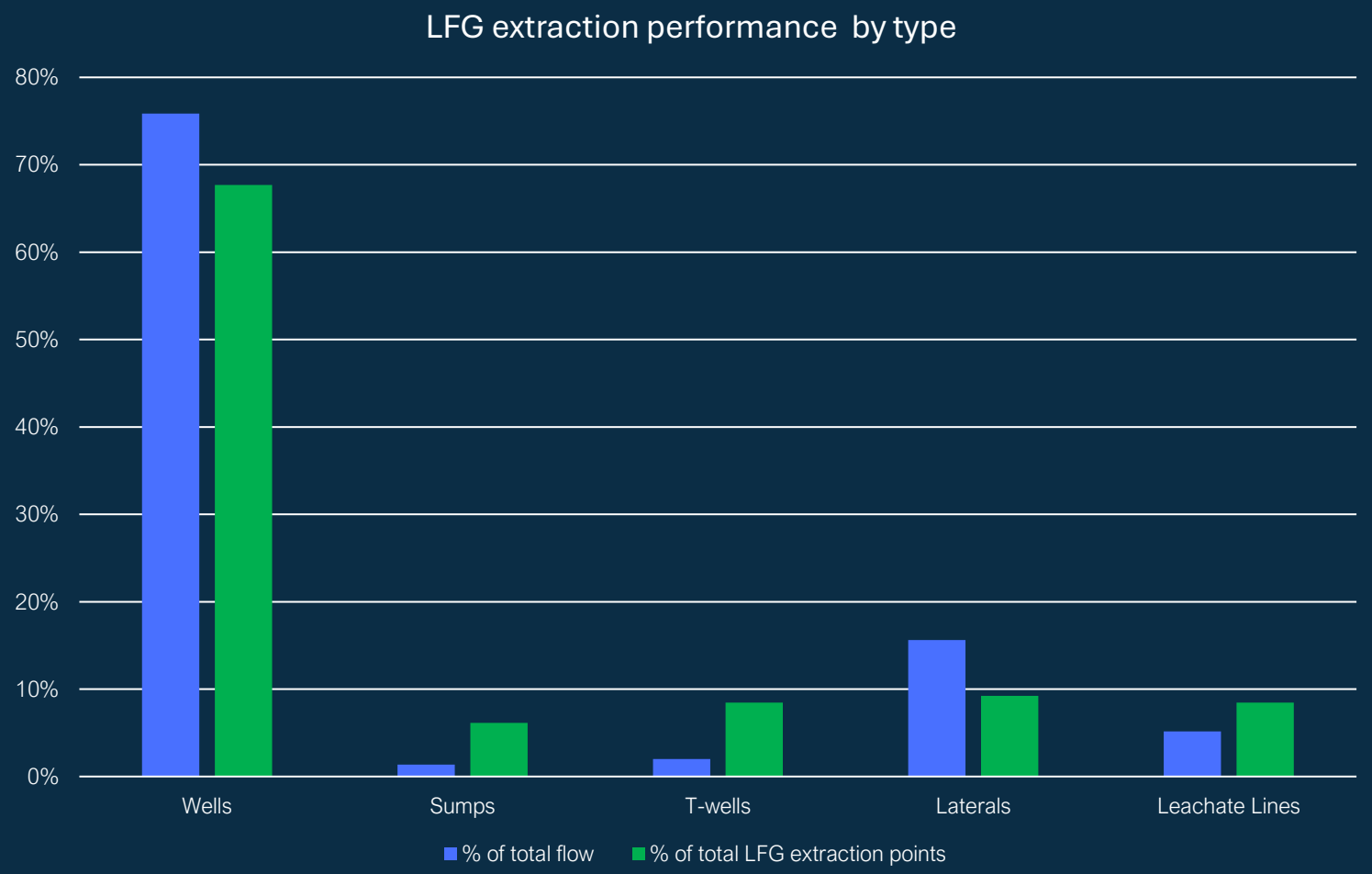
Reduce leachate generation by diverting clean stormwater before it enters waste areas.



SWALE DRAINS

Existing Landfill Gas System

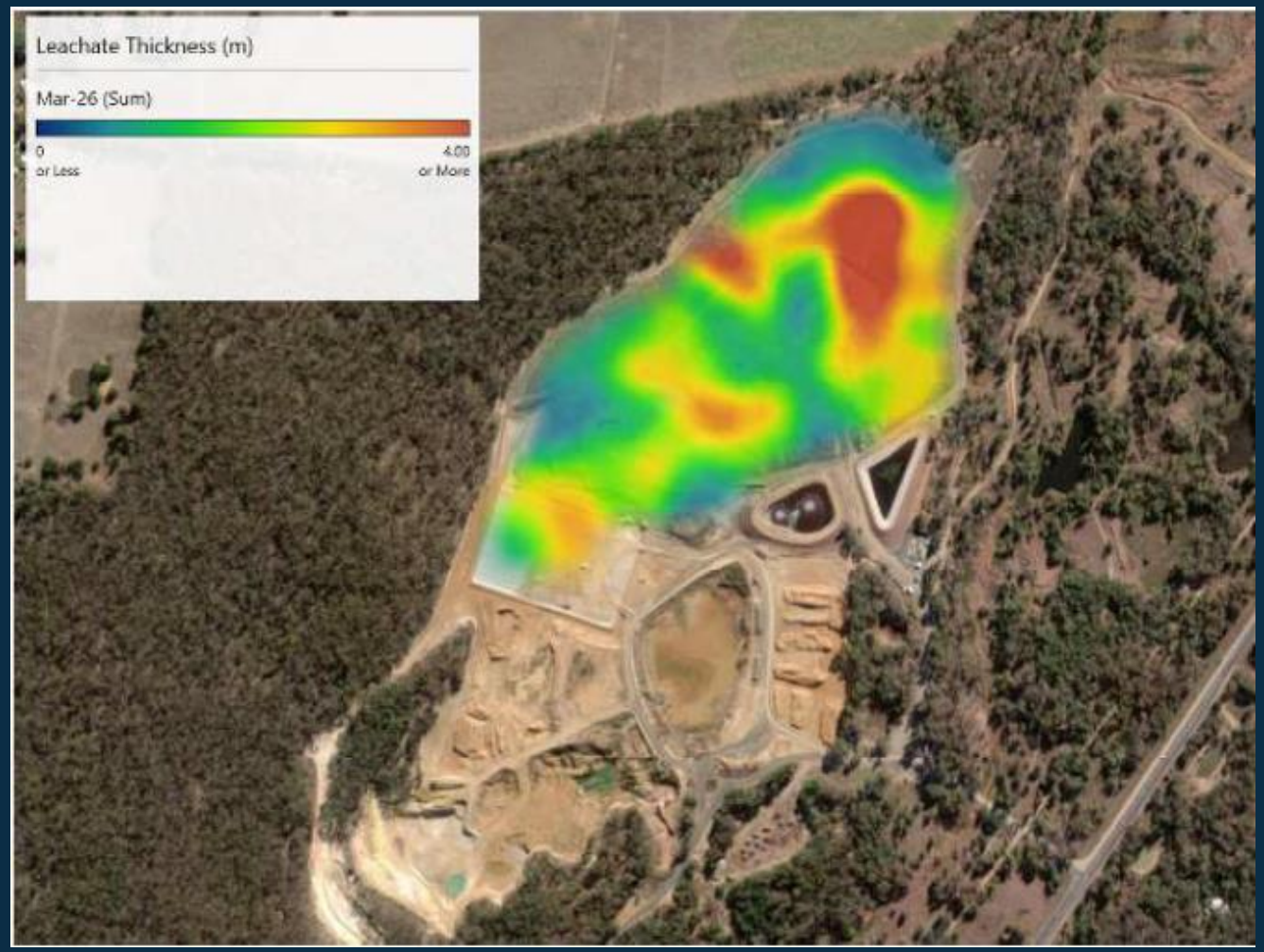
- LFG system operating since 2005 (LMS)
- 130 extraction points (wells, leachate sumps, leachate lines) of which 97 were flowing in September 2026
- Used for power generation with flare backup
- Completed longitudinal assessment of all gas extraction points (2026 data) to determine changes in performance



Gas field performance and leachate impacts

Leachate Pumping from Gas Wells

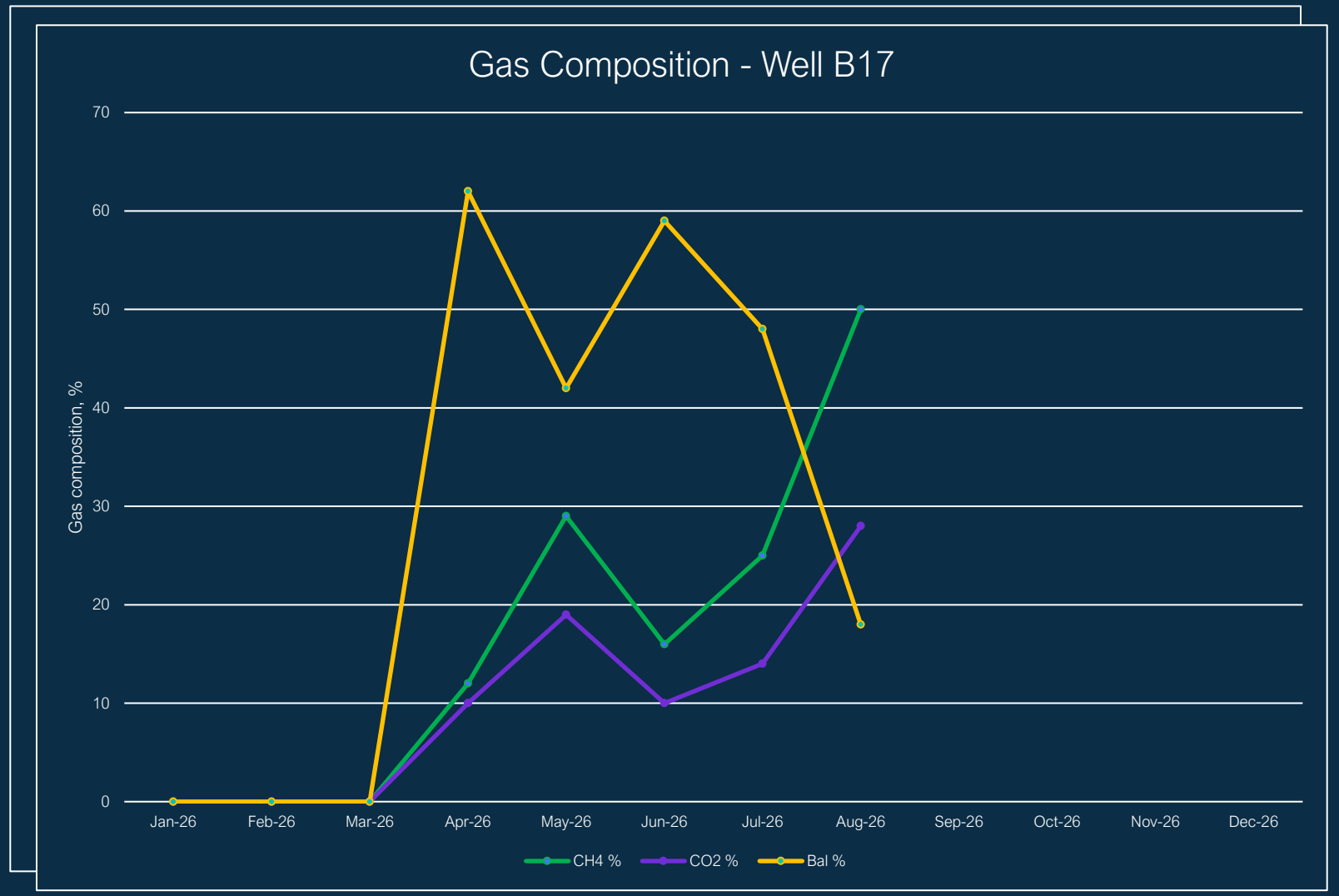
- Measuring leachate levels in gas wells suggests it could contribute to lower gas extraction
- 2 gas wells used for pumping leachate for approximately 10 years
- Planning to drawdown leachate in affected wells commenced in early 2026
- Commenced in June after purchasing additional pumps and coordinating with LMS
- Started with 4 wells – moved one pump in September
- To date 188 KL of leachate removed from 5 wells



BRL LEACHATE THICKNESS MAP

Results from pumping

- Increased methane concentrations
- Reduced balance gas
- Improved gas field performance



Addressing perched leachate

Historical areas of leachate seeps

- Test pits confirmed perched leachate from thick daily cover layers
- Installed interception trench late 2025 to facilitate draining through to underlying waste
- No further seeps from this treatment over winter 2026
- Will be expanded to other areas with seeps over summer 2026/2027



Perched leachate BRL – Cell B

Planned and implemented actions

Leachate Management	Landfill Gas Management	Integrated Actions
Dust suppression optimisation	Intermediate capping program	Contract management improvements
Evaporator optimisation and management	Rectify deficient capping on older cells	Monitoring and data validations
Swale drains rectification	Leachate drawdown from gas wells	Site Operations Manual update
SS1A investigation and rectification	Improve gas extraction performance	Team capability and training
Fixing perched leachate	Gas field optimisation	Continuous improvement, and review

Lessons for other Landfills



Measure before investing



Validating monitoring data



Manage leachate and LFG together



Invest in people, capability and training



Small improvements can deliver major gains

OFFIC

Thank you

Lya Assef

Landfills & Transfer Station Manager

City of Ballarat

Simon Clay

Landfill Business Improvement Lead

City of Ballarat



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