Ending landfill post-closure – a rational approach to facility end-of-life care

Remediation Technologies Symposium
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Overview

- Landfill life cycle
- Approaches to landfill post-closure
- Overview of landfill functional stability
- Data collection requirements and assessment
- Links to outcome-based closure for other facilities

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Fundamental objectives

- Alberta contaminated sites framework is based on three fundamentals
  - Pollution prevention
  - Health protection
  - Productive use
- Reasonable fundamentals for landfill post-closure

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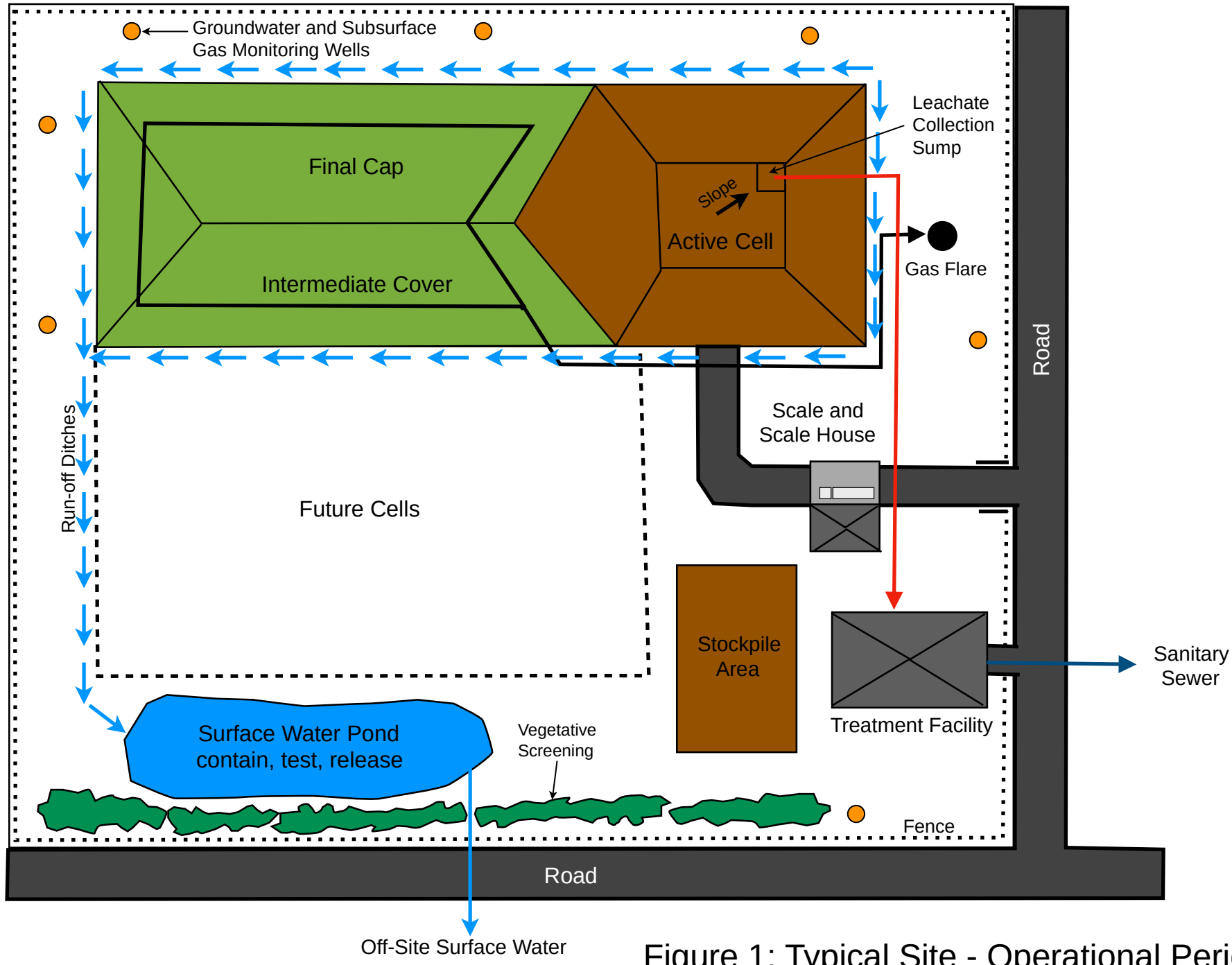

Figure 1: Typical Site - Operational Period

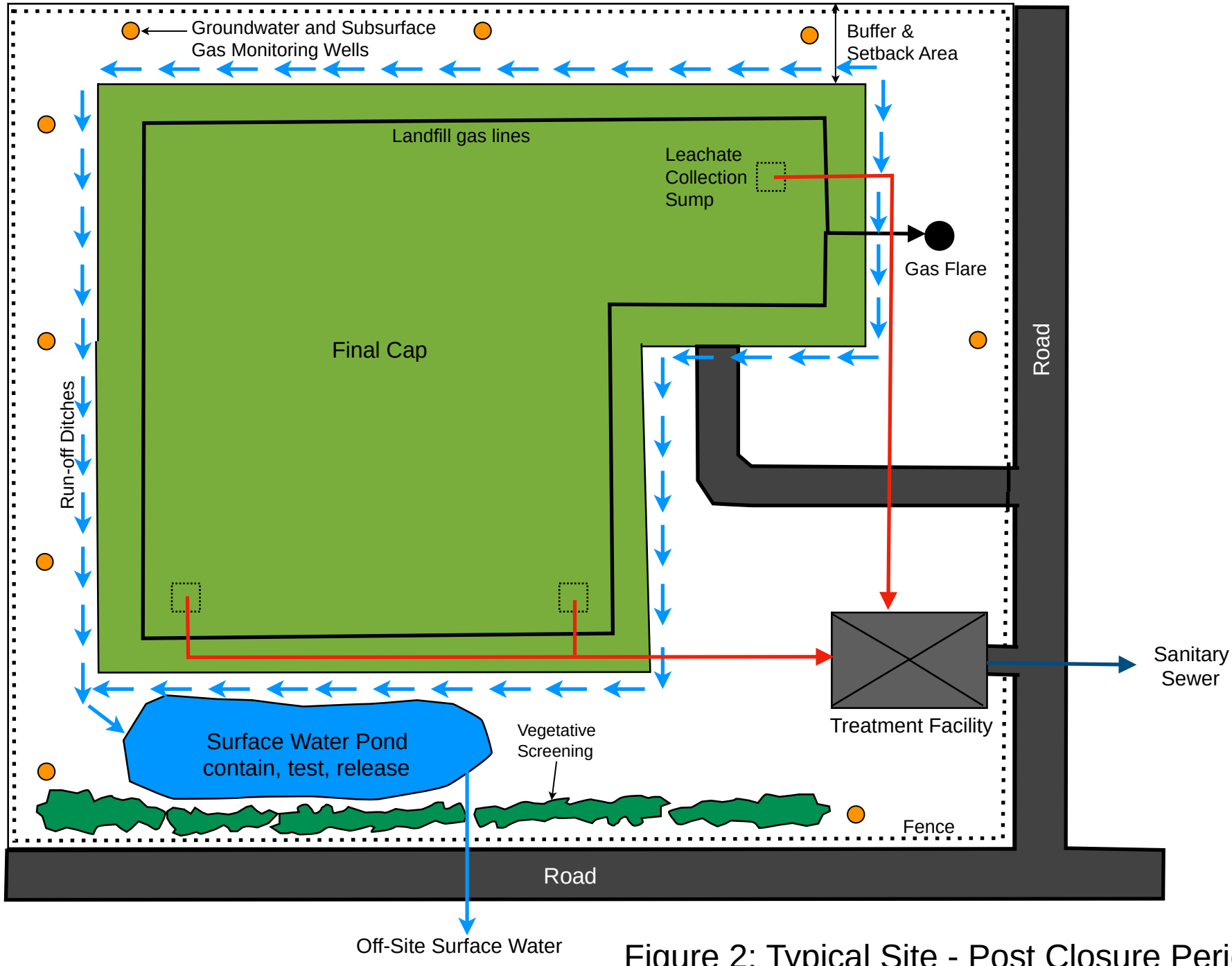

Figure 2: Typical Site - Post Closure Period

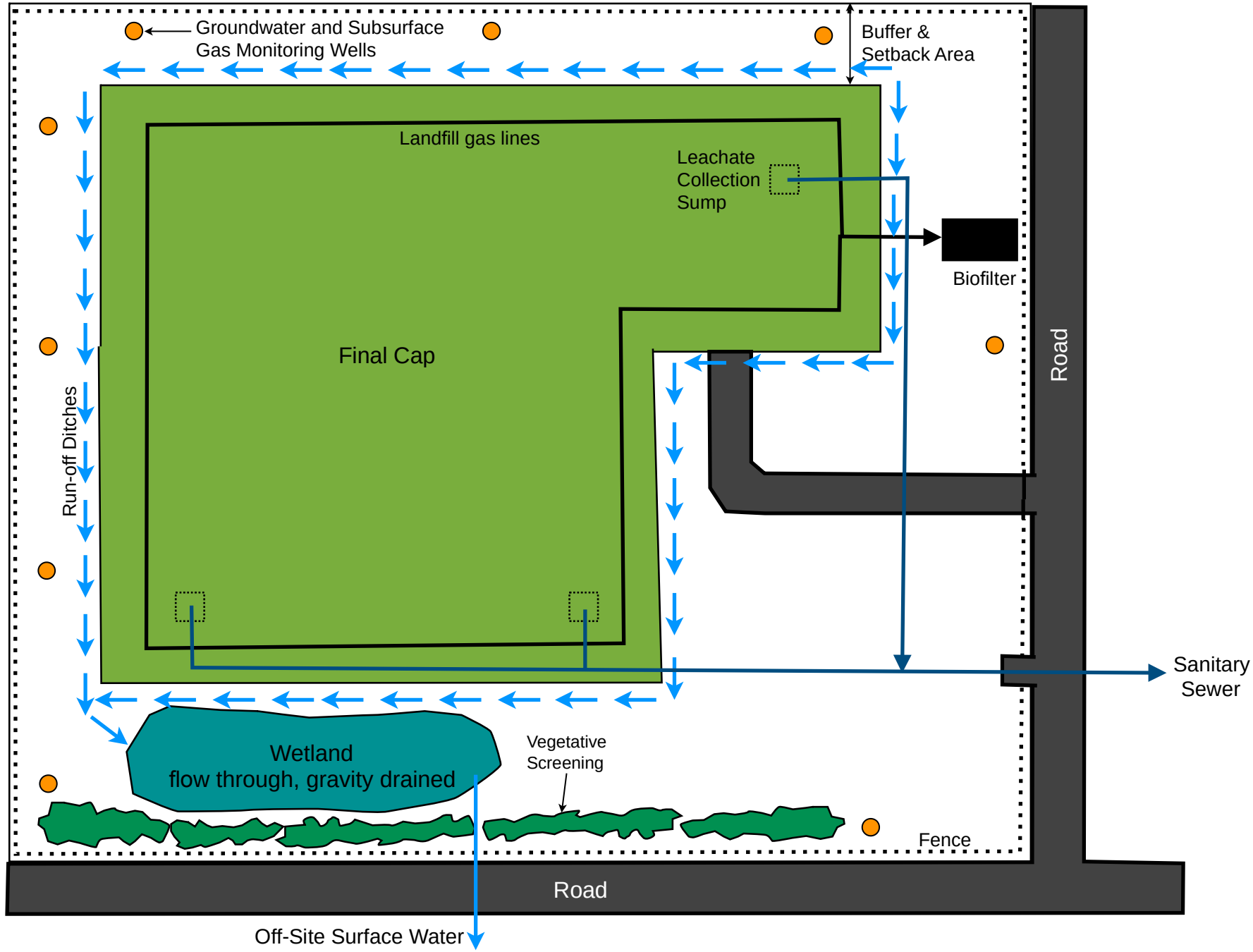

Figure 3: Typical Site - Monitoring Passive Systems

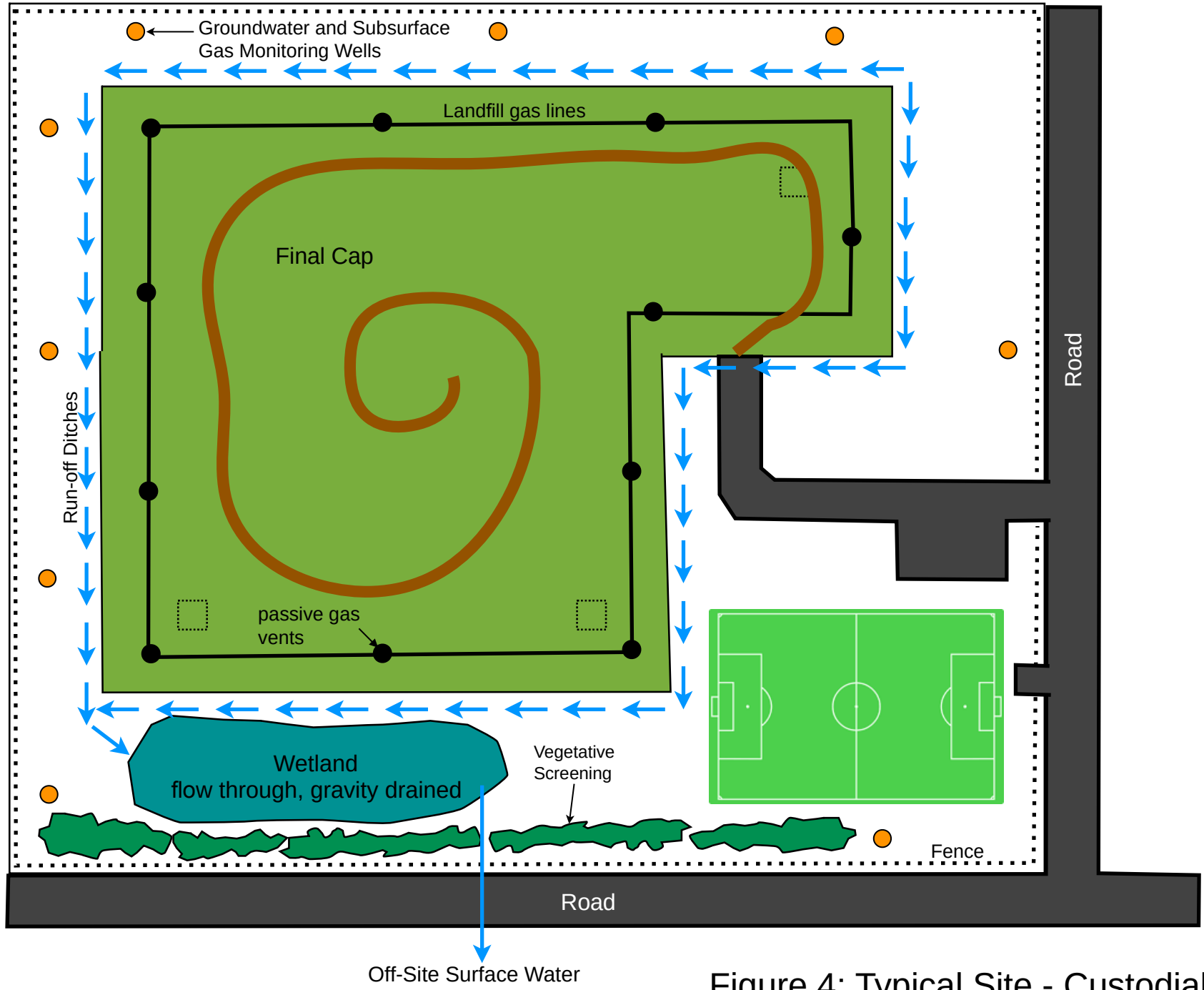

Figure 4: Typical Site - Custodial Care

Landfills in Alberta

- Municipal, industrial, and oilfield landfills
- AER vs AEP
- Directive D058 vs Standards for Landfills

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Landfill Post-Closure in Alberta

- Standards for Landfills in Alberta, 2010
- Post-Closure Care Plan
- Minimum 25 years
- Cannot end until groundwater and gas concentrations in compliance, and leachate meets groundwater quality limits

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Landfill Post-Closure in Alberta

- ‘One size fits all’ approach
- Landfills not eligible for reclamation certificates (not specified lands)

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Post Closure outside of Alberta

- Ontario – minimum of 25 years
- Post Closure Period defined as

  period of time within which the landfill will produce contaminants at concentrations that could have an unacceptable impact if they were discharged from the site

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Post Closure outside of Alberta

- USA – default post-closure period is 30 years
- Can be varied to meet the requirements of protection of human health and the environment

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Methods for ending Post-Closure

- Time based
- Perpetual care
- Range of timeframes based on facility characteristics
- Waste stabilization target
- Performance-based (Functional Stability)

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Functional Stability

"A landfill is functionally stable when it does not pose a threat to human health and the environment at the point of exposure in the absence of active control systems"

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Functional Stability

- Risk-based analysis of landfill contaminants (leachate and gas)
- Define targets based on risk analysis
- Monitor to confirm targets are met
- Assumes generation of leachate and gas are predictable over long term

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Risk analysis

- Need to understand existing and future receptors
- Assumes maintaining final cover system and passive control systems

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Potential end point categories

- Leachate quantity and quality
- Landfill gas quantity and quality
- Groundwater quality
- Surface water quality
- Final cover integrity including settlement

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Custodial care

- Passive control systems
- Minimum maintenance costs
- Various potential land uses

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Steps to apply Functional Stability

- Assessment of current data collection and identification of gaps
- Risk analysis to determine target end points
- Analysis of monitoring data to develop statistically significant trends

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Steps to apply Functional Stability

- Identification of management changes to reduce post-closure period
- Implementation of management changes
- Monitoring and assessment of predicted performance

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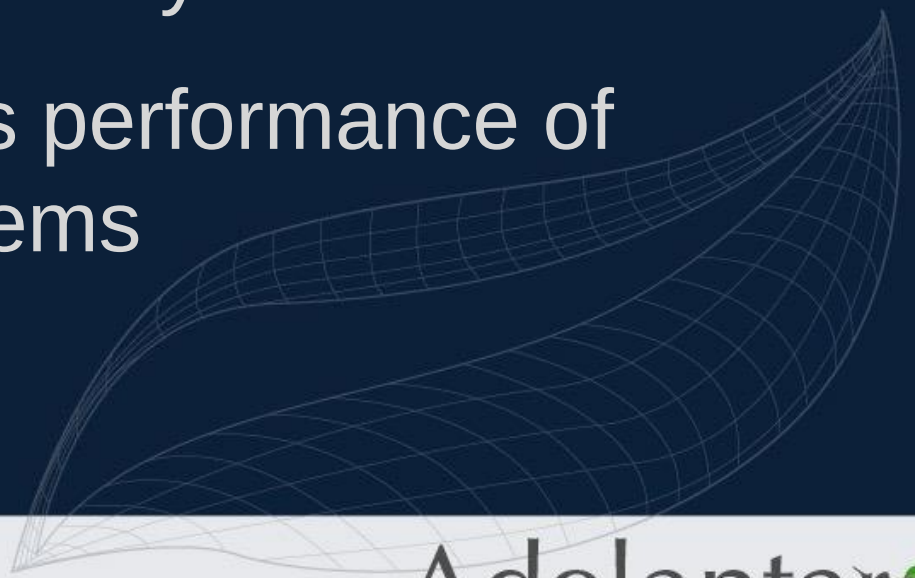
Steps to apply Functional Stability

- Determination of end of post-closure based on monitoring data
- Shift to passive control systems
- Monitoring to assess performance of passive control systems
- Custodial care



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Outcome-based closure of contaminated sites

- Similarities and differences to landfill closure
- Contaminated site clean-up often includes landfilling of contaminated material
- Landfill is one of final resting places for material from clean-up activities

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Why is this important?

- Provincial inconsistency
- Current approach to defining the end of post closure for landfills in Alberta is practically unachievable
- Prevents appropriate planning and recognition of site characteristics

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Why is this important?

- Functional Stability approach provides benefits of potentially shorter post-closure periods and reduced costs
- Outcomes based on site characteristics
- Consistent with Alberta approach to other activities
- Avoids over-stating liability

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Landfill Variables

- Waste types (C&D, MSW, Soils)
- Size
- Physical setting (geology, climate, etc.)
- Proximity to receptors
- Filling practices (conventional MSW vs batch fills)

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Landfill Variables

- Environmental protection systems (leachate collection, gas collection, base liner, cap, etc.)
- End use objectives

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Summary

- End-of-life objectives should be rational and achievable
- Existing fundamentals of **pollution prevention**, **health protection** and **productive use** are reasonable
- One size does not fit all – risk analysis should be part of liability assessment

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