Landfill Cell Design

Trevor Mahoney – Project Manager
XCG Consulting Limited

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Environmental Engineers & Scientists

Landfill Cell Design

1) The Basics of Landfill Cell Design
   I. Landfill Cell Design Constraints
   II. Landfill Cell Design Components
2) Project Example – Alberta Pacific Forest Industries Inc. Landfill
   I. Brief Project Introduction
   II. Expansion Options
   III. Slope Stability
   IV. Existing Infrastructure
   V. Climate Challenges

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Landfill Cell Design

The basics of landfill cell design

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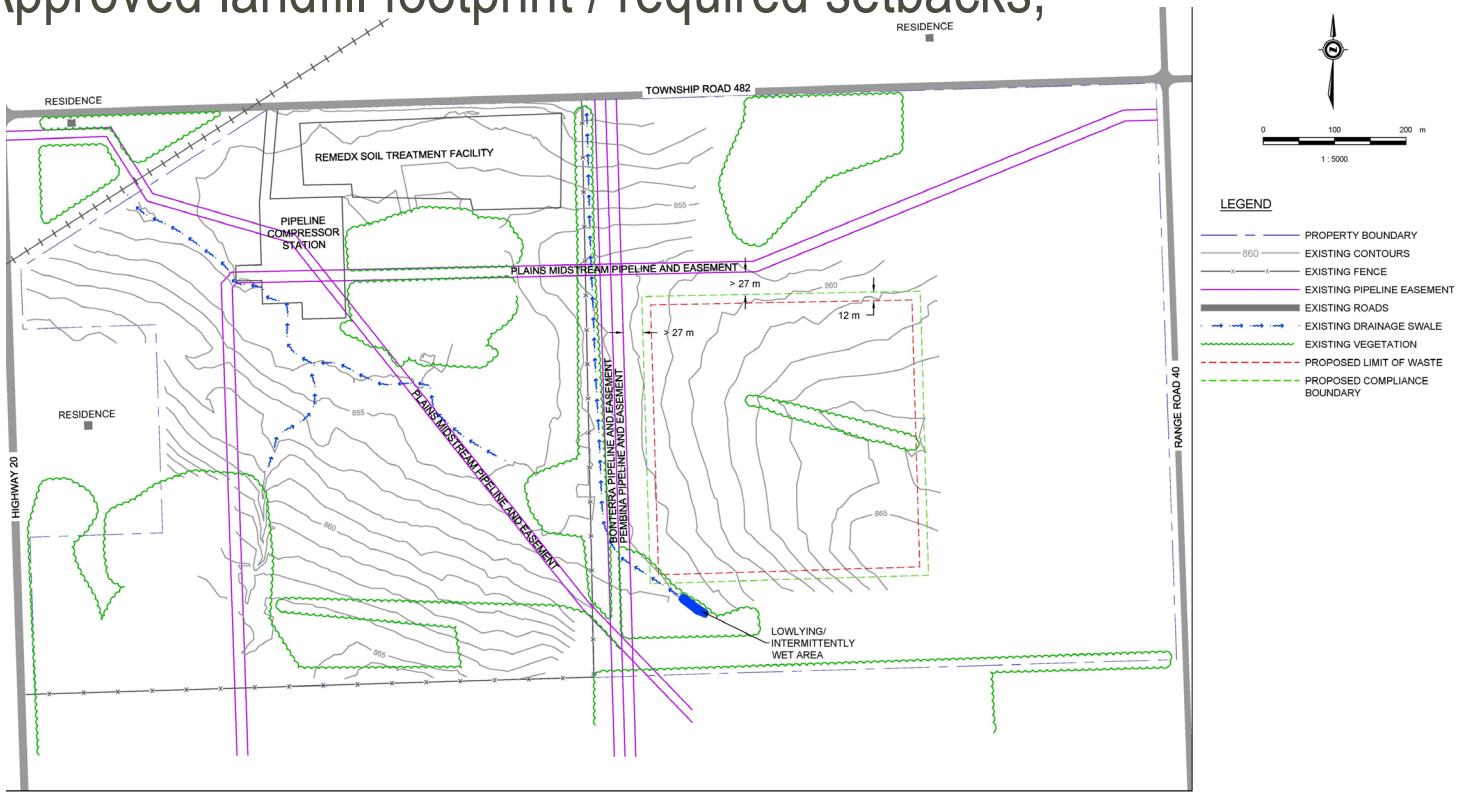
Landfill Cell Design

- The basics of landfill cell design
  - Design constraints include
    - Approved landfill footprint / required setbacks;



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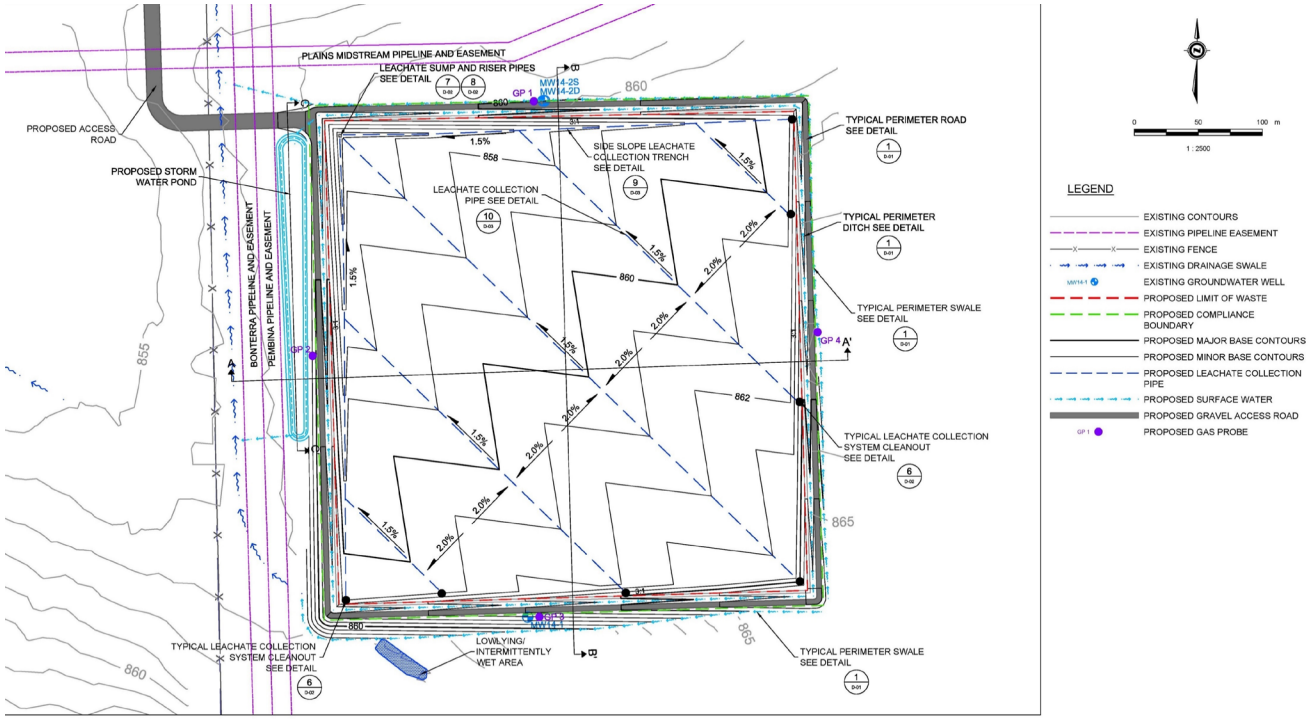
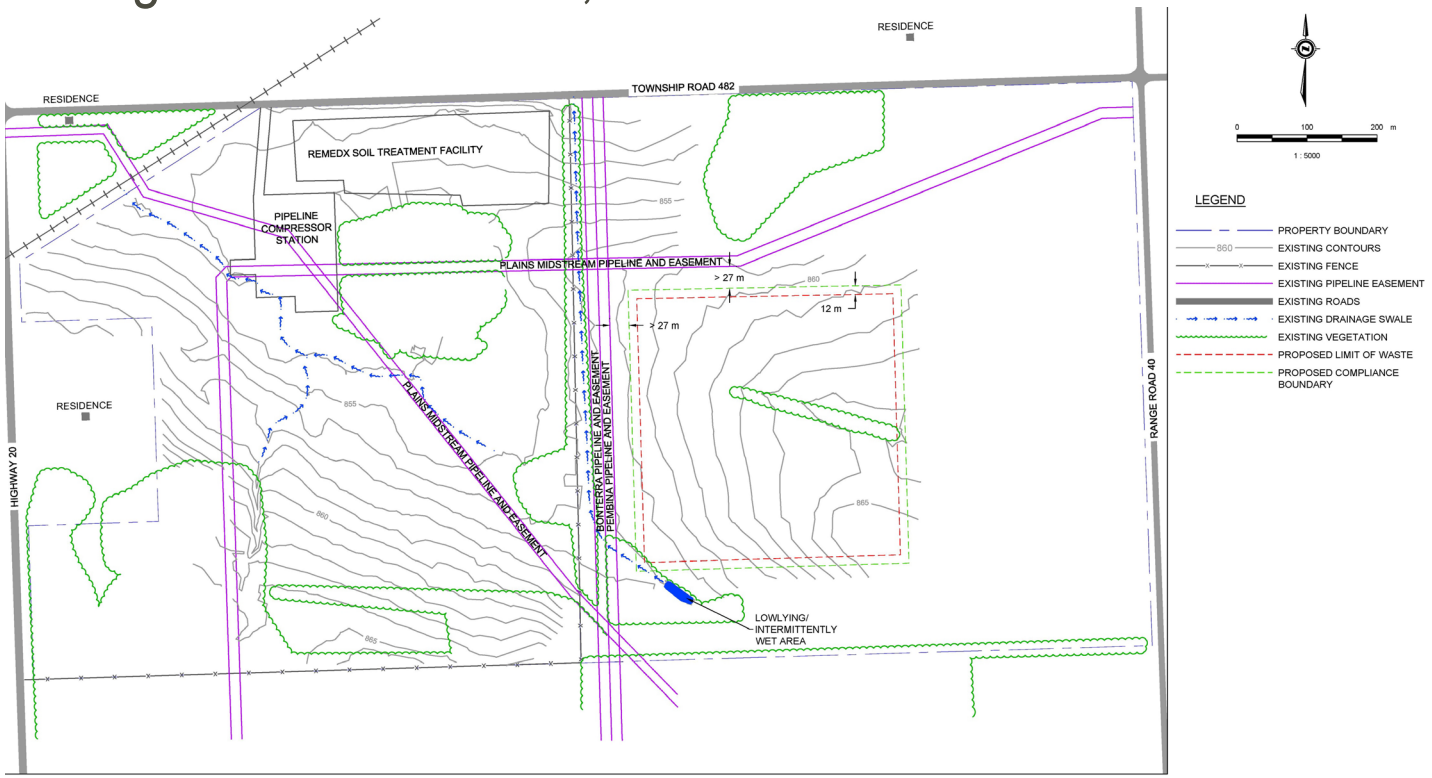
Landfill Cell Design

- The basics of landfill cell design
  - Design constraints include:
    - Hydrogeological and geological restraints;



Landfill Cell Design

- The basics of landfill cell design
  - Design constraints include:
    - Existing site infrastructure; and



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Landfill Cell Design

- The basics of landfill cell design:
  - Design constraints include:
    - Regulatory and approval requirements.

3.1.11 The Detailed Construction Plan and Specifications in 3.1.3 for any new landfill cell shall be in accordance with section 3.5(c) or 3.5(d) of the *Standards* , and shall include, at a minimum, all of the following:

(a) a composite liner including:

(i) Option 1:

(A) a minimum of 1 meter engineered clay with hydraulic conductivity of less than $1x10^{-9}$ metres/second; and

(B) a 60 mil (1.5mm) High Density Polyethylene Geomembrane placed directly on the engineered clay liner, or

(ii) Option 2: geosynthetic clay liner and a 60 mil (1.5mm) High Density Polyethylene liner with combined equivalent advective performance of Option 1.

(b) a leachate collection system capable of meeting the maximum acceptable leachate head requirements;

(c) a groundwater monitoring system;

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Landfill Cell Design

- The basics of landfill cell design:
  - Landfill cell design typically includes:

- Review of regulatory and design requirements

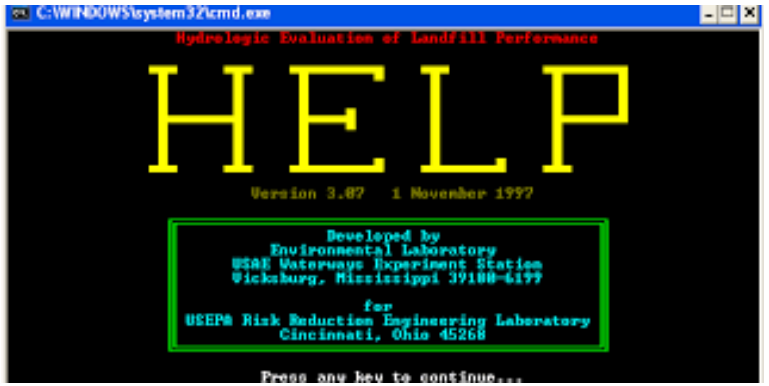
Alberta Environment and Parks

APPROVAL

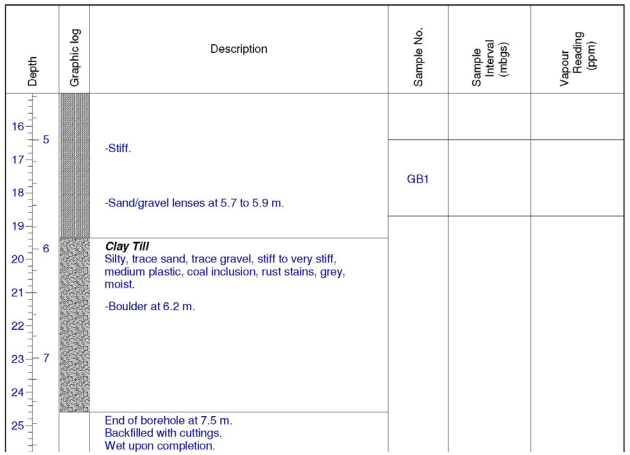
PROVINCE OF ALBERTA

ENVIRONMENTAL PROTECTION AND ENHANCEMENT ACT
R.S.A. 2000, c.E-12, as amended.

- Topography, geology, hydrogeology and climate review



- Site investigations and soil analysis



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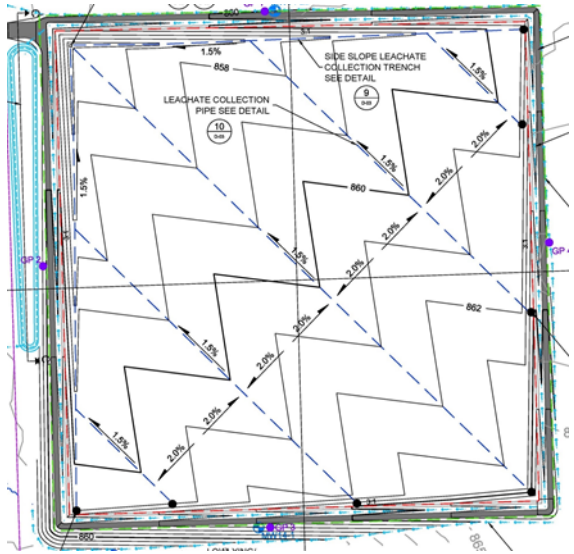
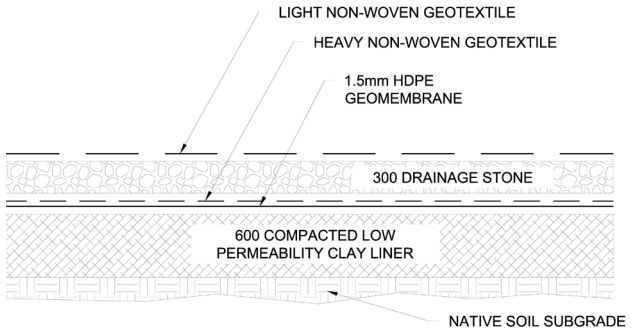
Landfill Cell Design

- The basics of landfill cell design:
  - Landfill cell design typically includes:

- Base contours / grades for the landfill cell

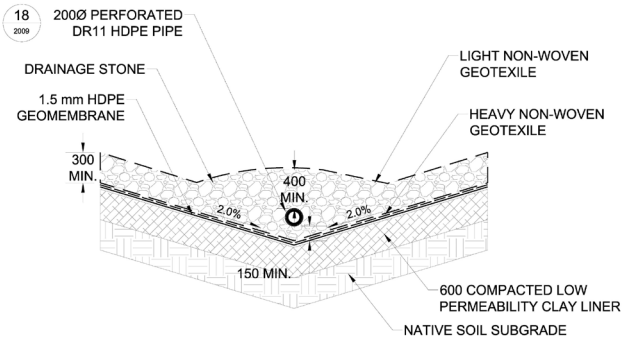


- Liner design for environmental containment



DETAIL 2 BASE LEACHATE COLLECTION SYSTEM AND LINER
N.T.S. D-01

- Leachate generation assessment and collection system design



DETAIL 14 LEACHATE COLLECTION PIPE
N.T.S. C-02

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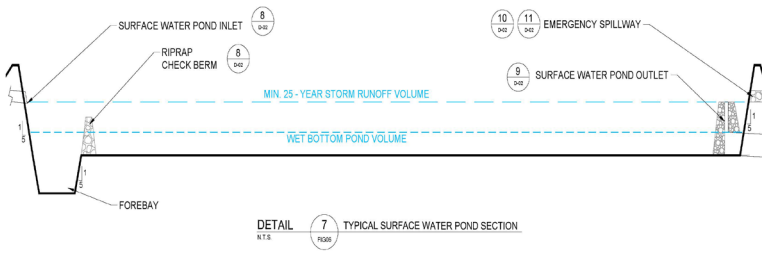
Landfill Cell Design

- The basics of landfill cell design:
  - Landfill cell design typically includes:

- Surface water management



- Staging, access and materials management

- Construction cost estimate

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Landfill Cell Design

Project Example

Alberta Pacific Forest Industries Inc. Landfill

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Landfill Cell Design

- XCG undertook the detailed design of the 2020 Landfill Expansion at the Alberta-Pacific Landfill.
- The project included a conceptual landfill plan design brief and a staged detailed design of a new engineered landfill expansion including design drawings, specifications and a construction quality assurance and quality control plan.

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Landfill Cell Design

- Alberta Pacific Forest Industries Inc. Landfill:
  - Expansion Options

- Option 1 – berm extension in cell 2B

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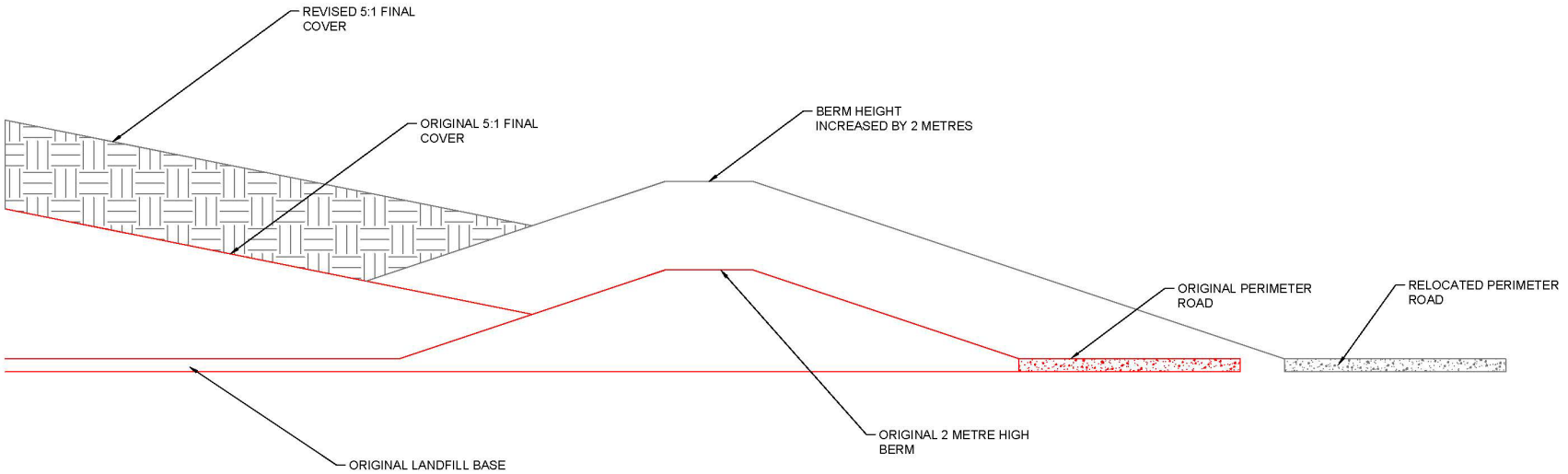
Landfill Cell Design

- Alberta Pacific Forest Industries Inc. Landfill:
  - Expansion Options

- Option 1 – berm extension in cell 2B



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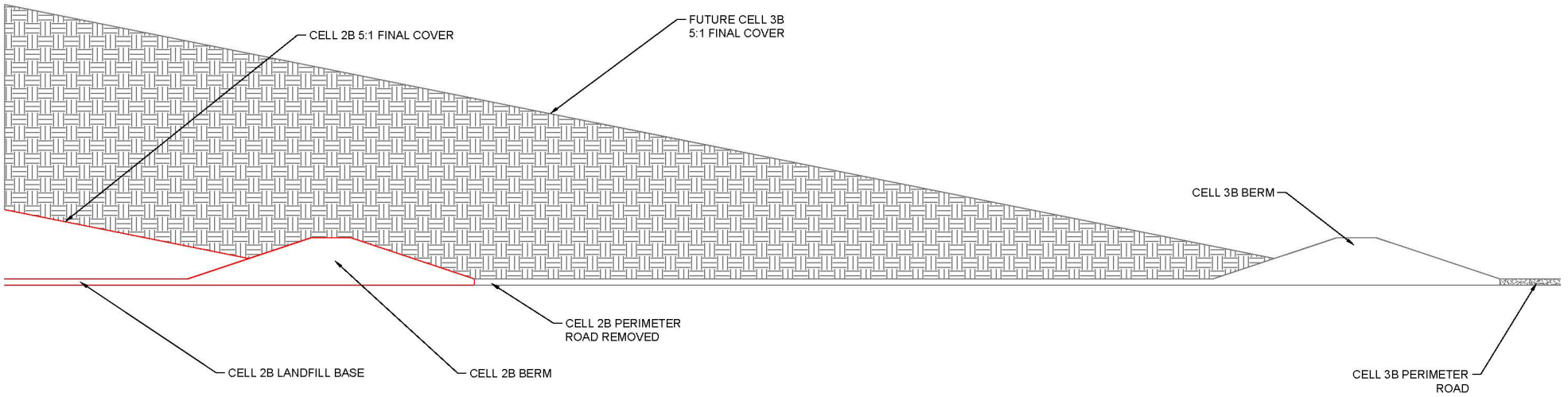
Landfill Cell Design

- Alberta Pacific Forest Industries Inc. Landfill:
  - Expansion Options

- Option 2 – construct new cell 3B



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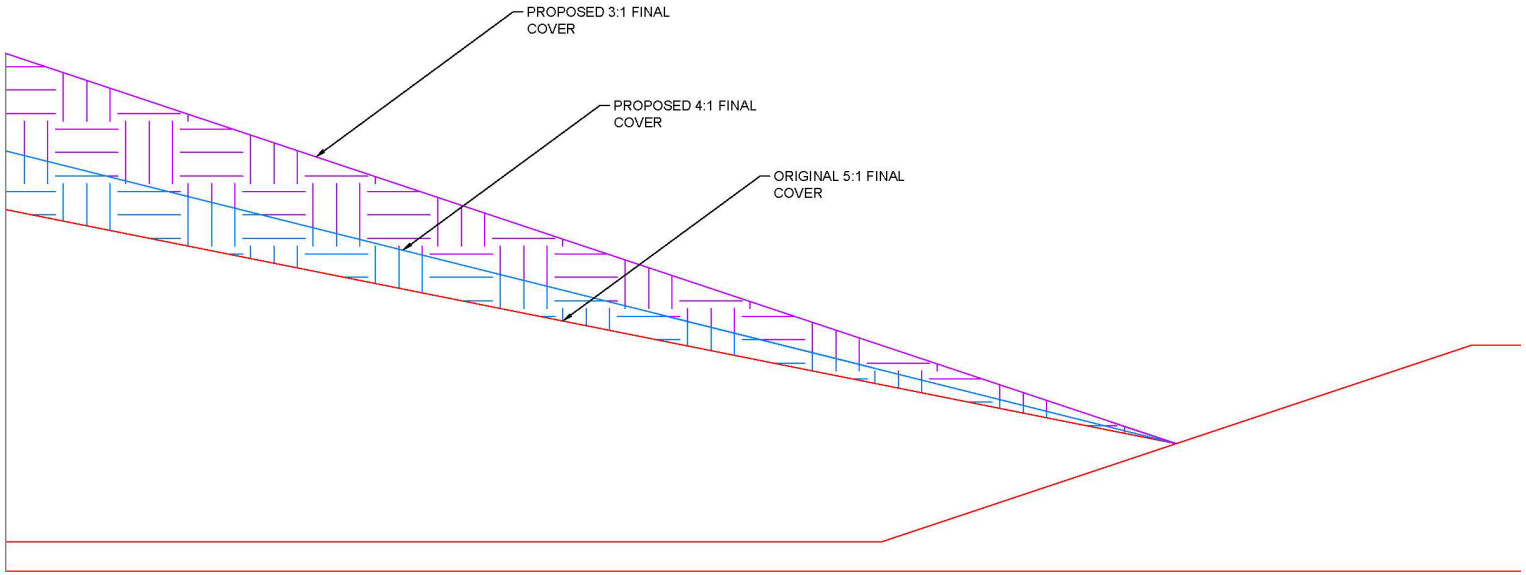
Landfill Cell Design

- Alberta Pacific Forest Industries Inc. Landfill:
  - Slope Analysis

- Evaluate 4:1 and 3:1 side slopes



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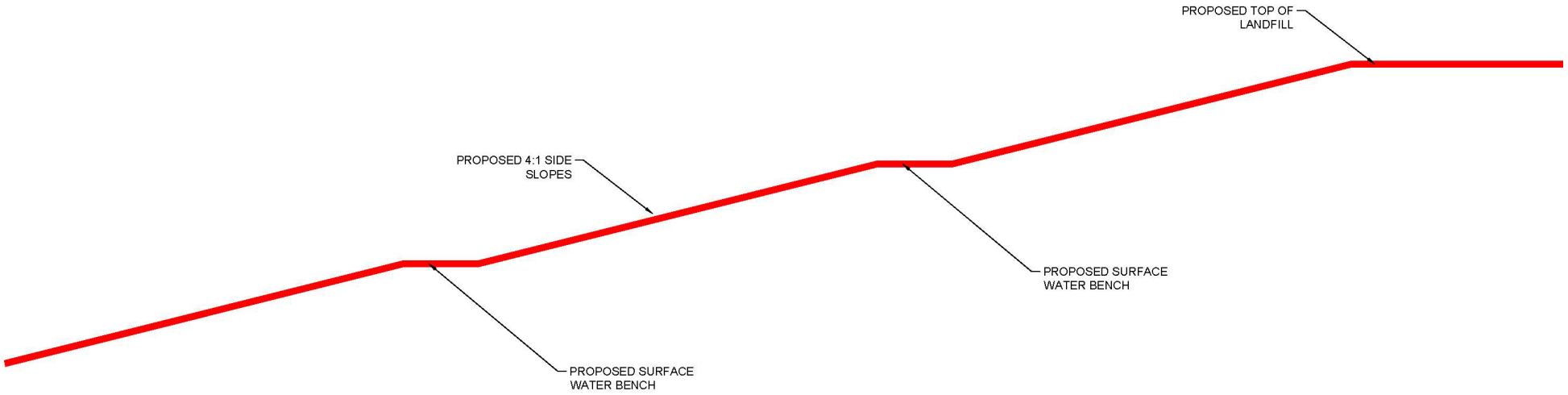
Landfill Cell Design

- Alberta Pacific Forest Industries Inc. Landfill:
  - Slope Analysis

- Result? Surface water benches



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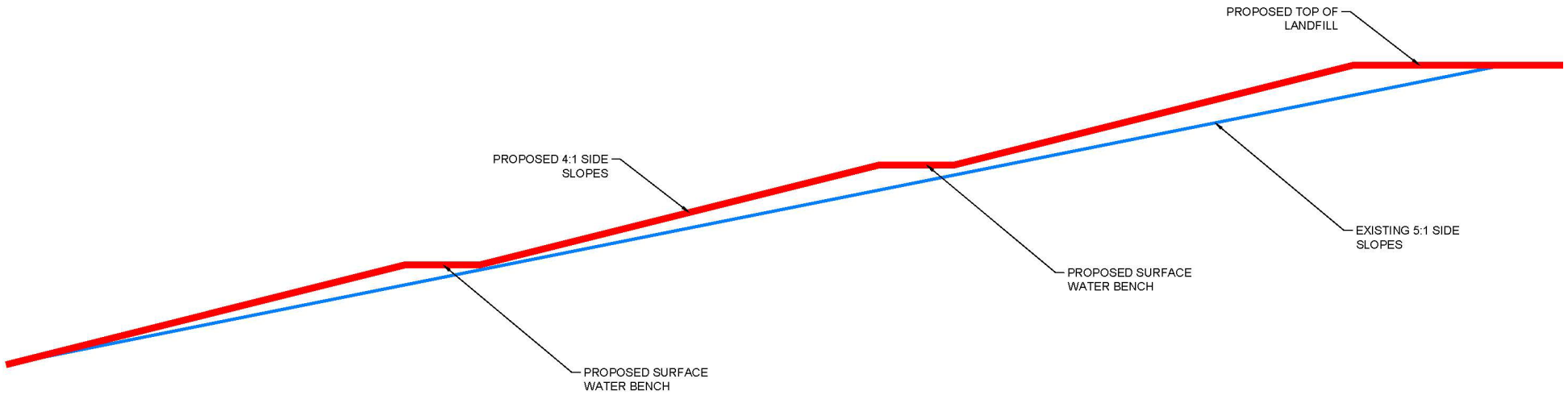
Landfill Cell Design

- Alberta Pacific Forest Industries Inc. Landfill:
  - Slope Analysis

- Decision was made to stay at 5:1 slopes



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Landfill Cell Design

- Alberta Pacific Forest Industries Inc. Landfill:
  - Tying in to older leachate collection system
    - The Issue?
      - Older HDPE pipes
      - Shifting over time
      - Grade issues

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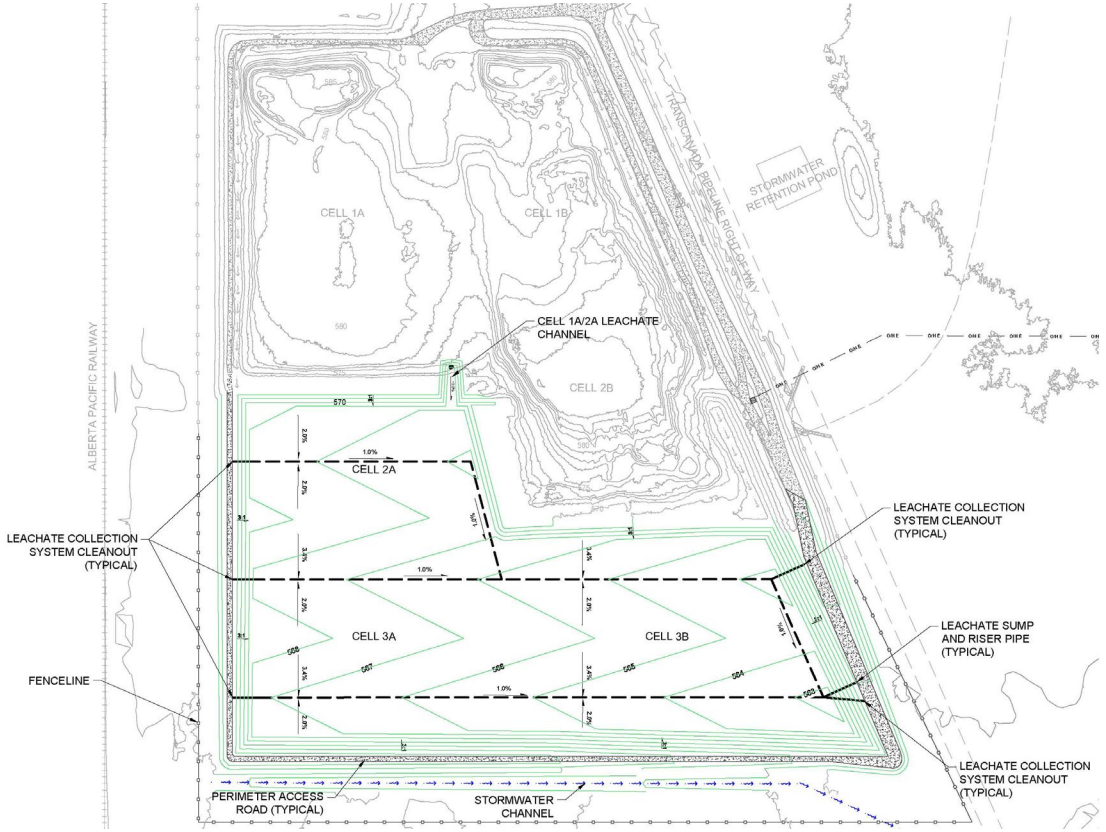
Landfill Cell Design

- Alberta Pacific Forest Industries Inc. Landfill:
  - Tying in to older leachate collection system

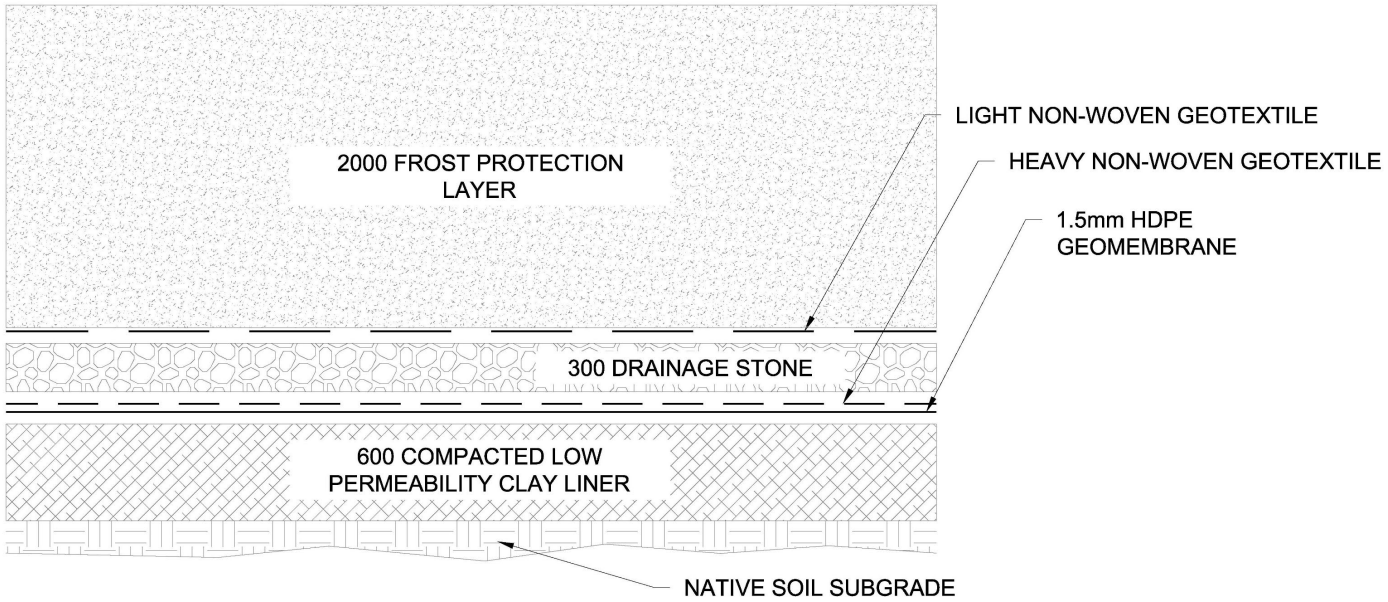
- The solution



Landfill Cell Design

- Alberta Pacific Forest Industries Inc. Landfill:
  - Climate challenges

- The issue?



DETAIL 2 BASE LEACHATE COLLECTION SYSTEM AND LINER
N.T.S. 2007

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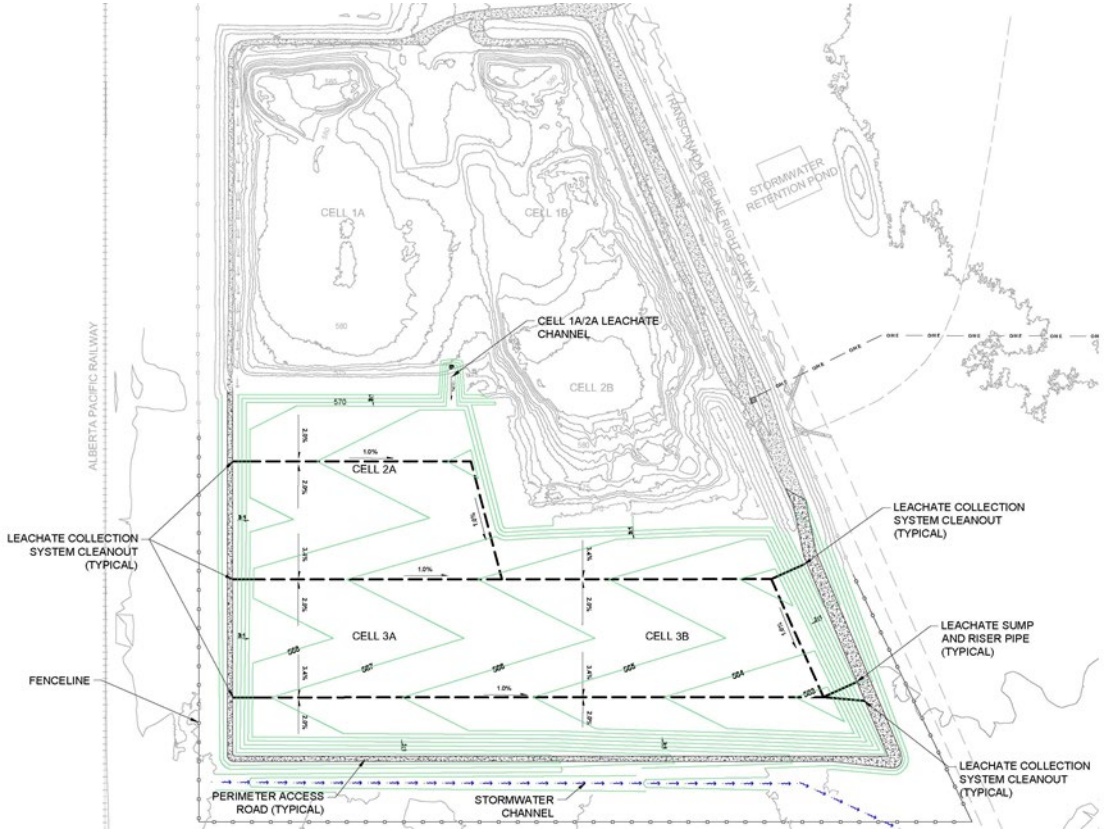
Landfill Cell Design

- Alberta Pacific Forest Industries Inc. Landfill:
  - Climate challenges

- The solution



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