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# Geotechnical Design for Stewiacke Flood Control

## Introduction

- Flooding of recreational area near on the Stewiacke River.
- 2ft floods over the ball field, dog park, and start of walking trail.
- The current dyke has not been maintained and is insufficient to prevent flooding.
- An image of the current dyke is shown below.

## Design Analysis Phases

1. Site Assessment
2. Slope Stability Analysis of Dyke Designs
3. Settlement Analysis
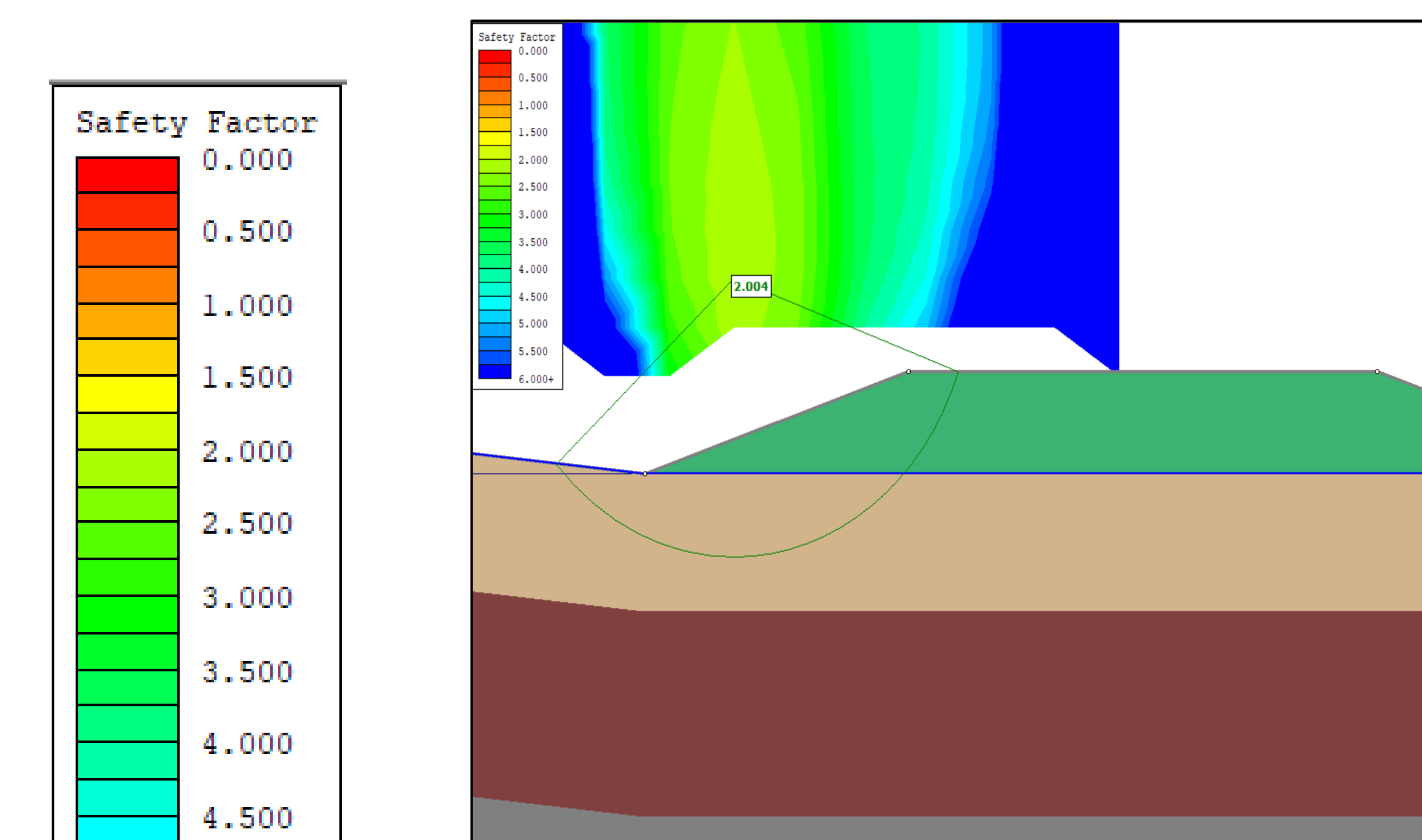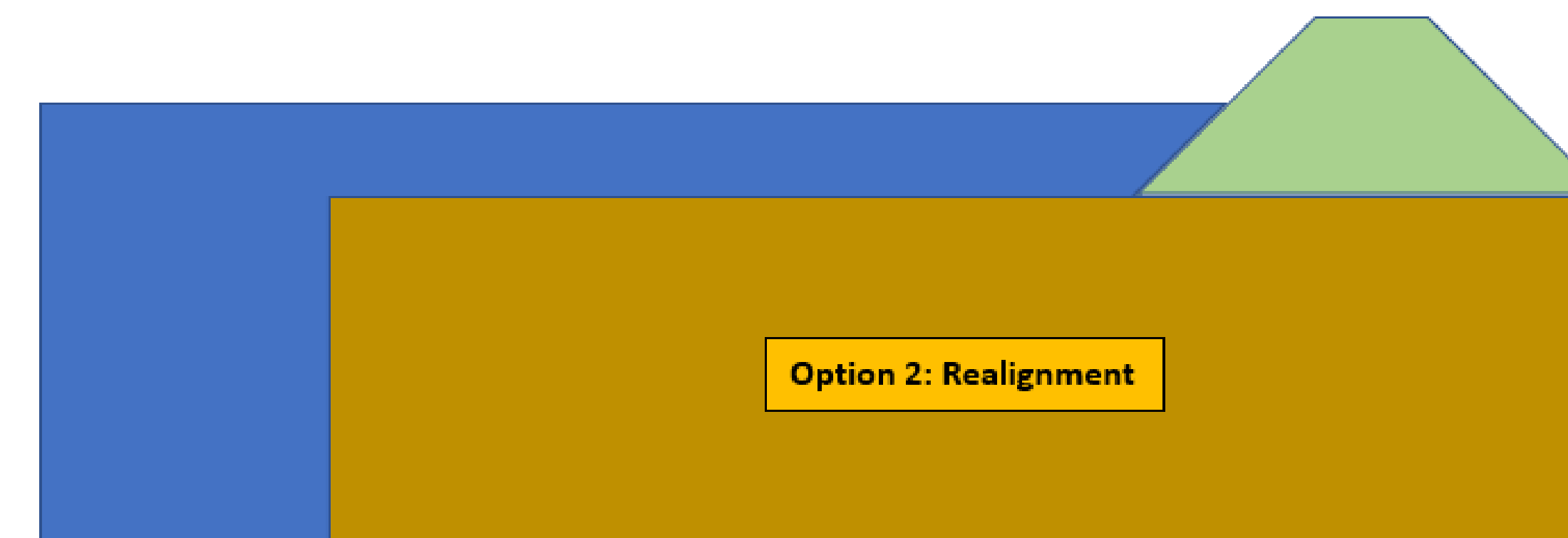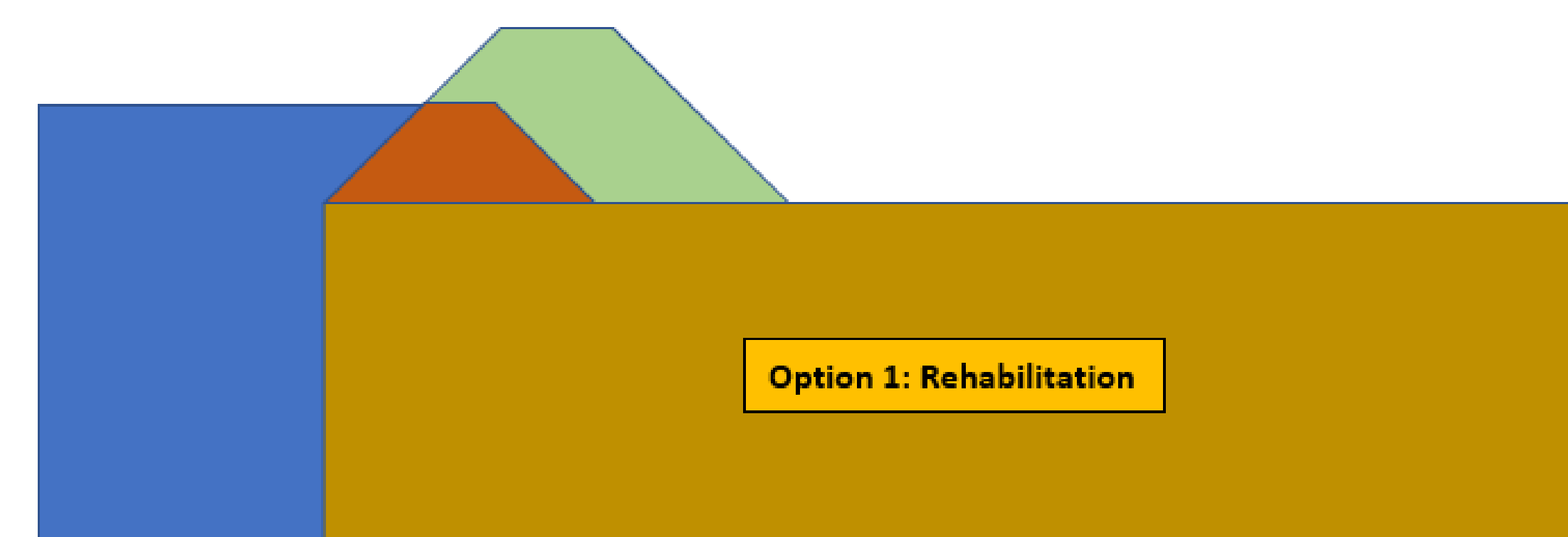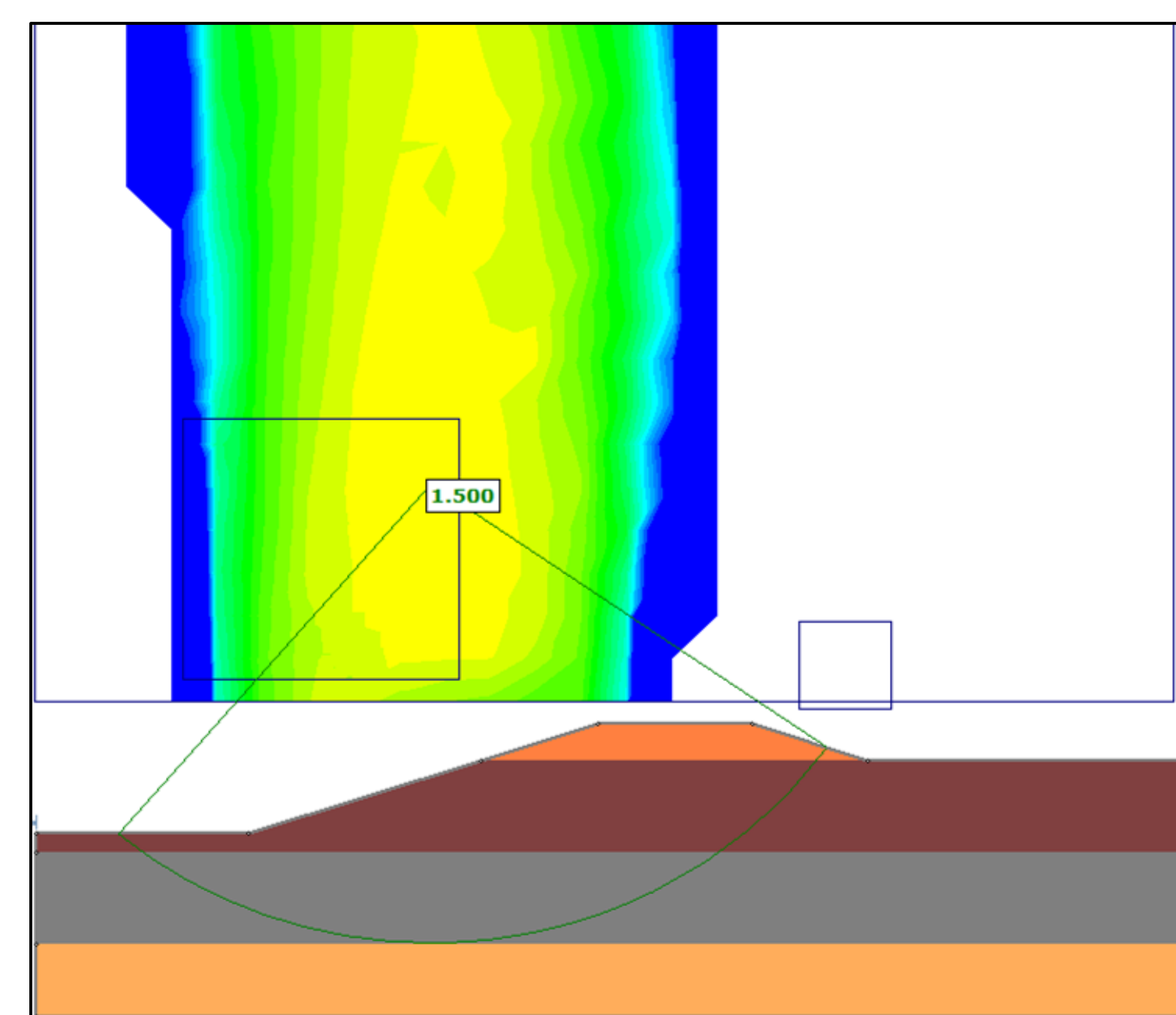4. Sustainability and Environment

## Goals of Design

- Determine the geotechnical feasibility of dyke rehabilitation or realignment for the site.
- Design two solutions for the site and make recommendations.

## Site Assessment

- The dyke does not have a maintained flood plain or defined ridge required to function properly.
- Soil conditions in the area are soft and must be considered when determining cross sections of the soil layers for stability analysis.
- Understanding the maximum flood height and effects on the recreational facilities. A flood simulation is shown below.

## Slope Stability of Dyke Designs

- The maximum water level was assumed to be 9m in elevation. It was later confirmed to be 8.3m.
- The drained and undrained conditions needed to be tested to ensure stability throughout construction.
- The minimum FOS is greater than 1.5.
- One cross-section was used for the rehabilitation design.

- three potential cross-sections were required for the relocation design since it has varying elevations.
- 2:1 slopes were attempted on the land side of the dykes but they were insufficient.
- 3:1 slopes were determined to be sufficient.
- Both design options do not need staged construction.
- Crest elevations are 10m and crest widths are 8m.

## Realignment

- The drained analysis for Cross Section 1 had the lowest FOS=2.004 with a 3:1 slope.
- Attempted a 2:1 slope facing the water, however, the slope failed with a FOS=1.156.

Option 2: Realignment

Option 1: Rehabilitation

| Safety Factor | |
|---|---|
| | 0.000 |
| | 0.500 |
| | 1.000 |
| | 1.500 |
| | 2.000 |
| | 2.500 |
| | 3.000 |
| | 3.500 |
| | 4.000 |
| | 4.500 |
| | 5.000 |
| | 5.500 |
| | 6.000+ |

## Rehabilitation

- The analysis for had the lowest FOS = 1.5 with a 3:1 slope.
- Tried to place a 2:1 slope facing the water, however, the slope failed with a FOS = 1.132.
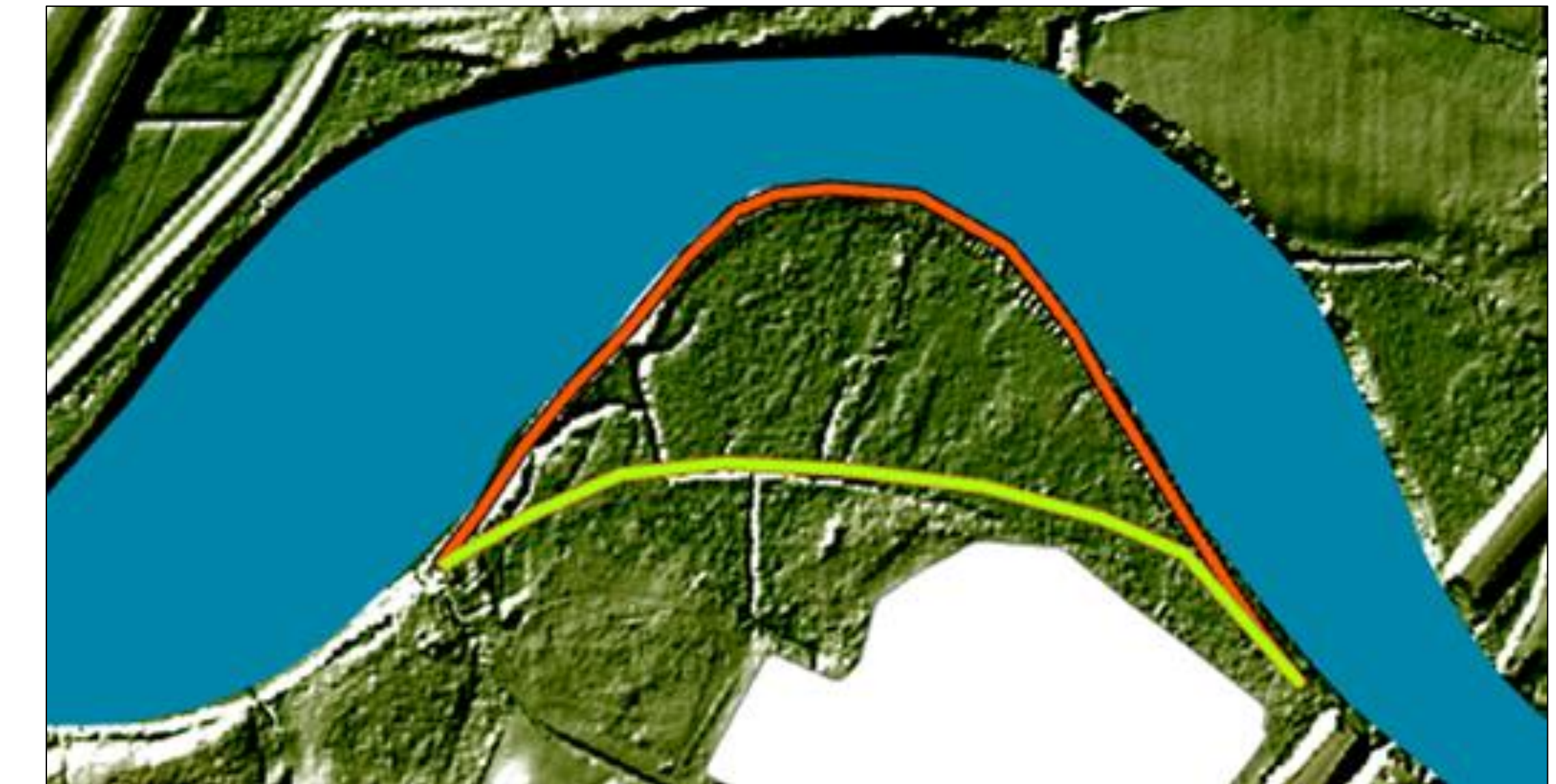
## Settlement Analysis

- The settlement must be calculated at three points of the dyke.
- The period of time at which the settlement occurs must be calculated.
- The settlement and time period calculated will determine when the dyke should be topped up.

Settlement (mm)

Settlement at Specific Year

Time (Years)

Settlement
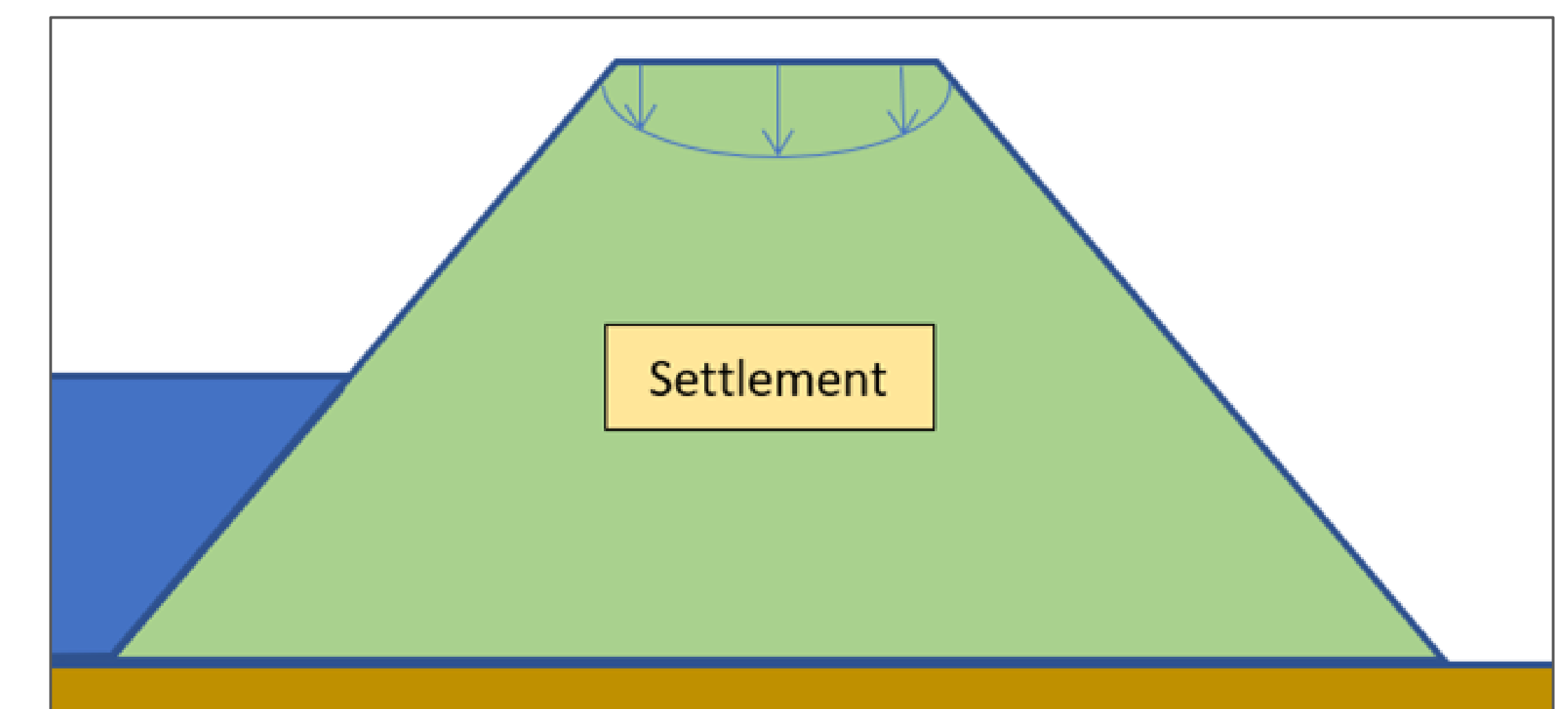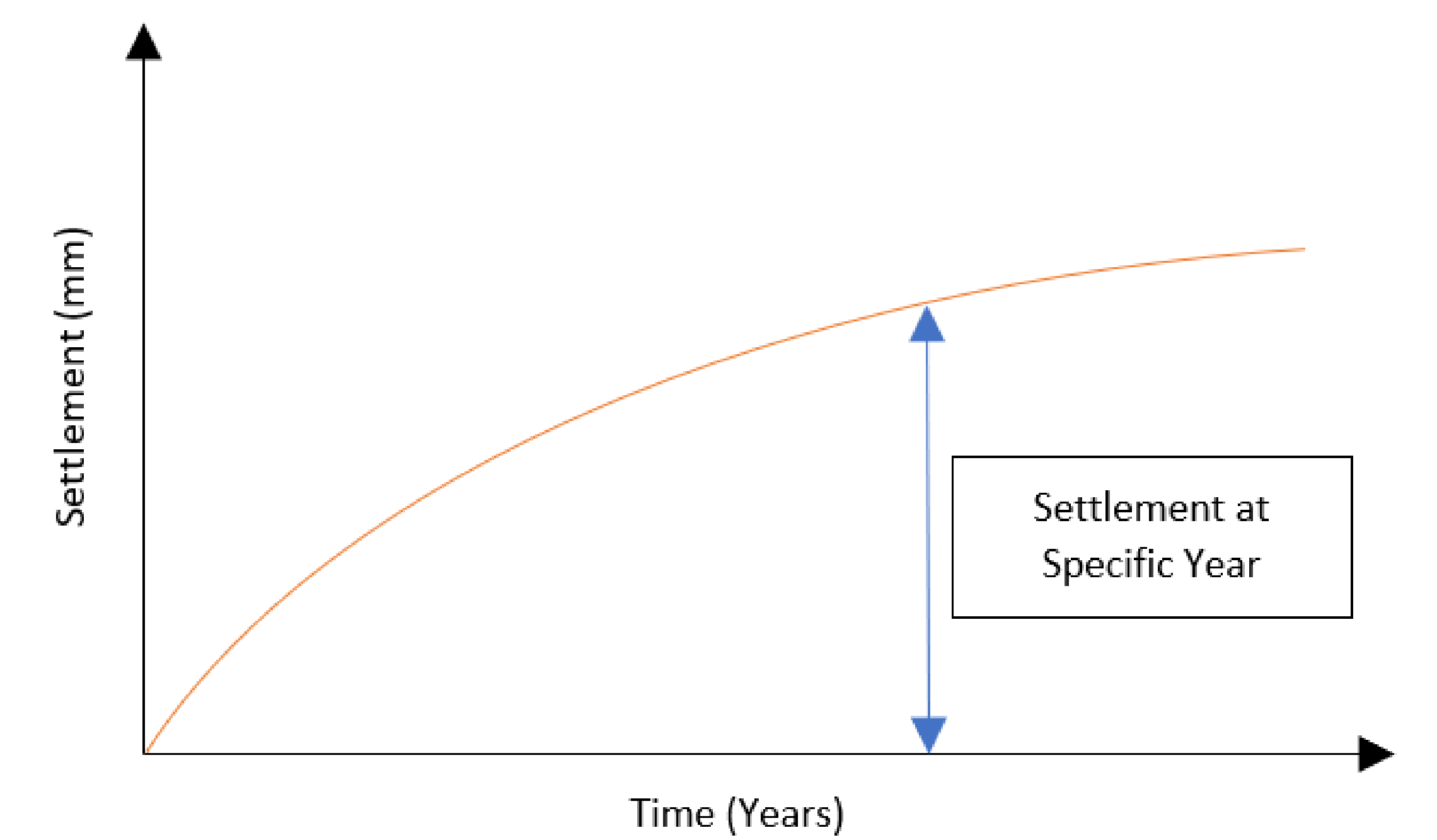
## Sustainability and Environment

- On site material will need to be drained.
- Material will be sourced from a local quarry.
- Reduced transit by using local material. .