Bridge Configuration Testing

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BMT

Background

Question: When is it appropriate to model a bridge (2d_bg) using a polygon?

Answer: For bridges modelled using a polygon the bridge deck width to 2D cell size ratio should be 4 or more. This will provide consistent results for all cell orientations. This document presents test results demonstrating why.

Model Test Configurations
Sensitivity Test Variables

- 1 bridge design (2d_bg_R)

  - Inundation of piers with 0.5 Form Loss Coefficient (FLC)

  - 35m bridge deck width

- Linear Channel

  - 4 cell orientations relative to cell orientation: 45º, 30º, 15º, 0º
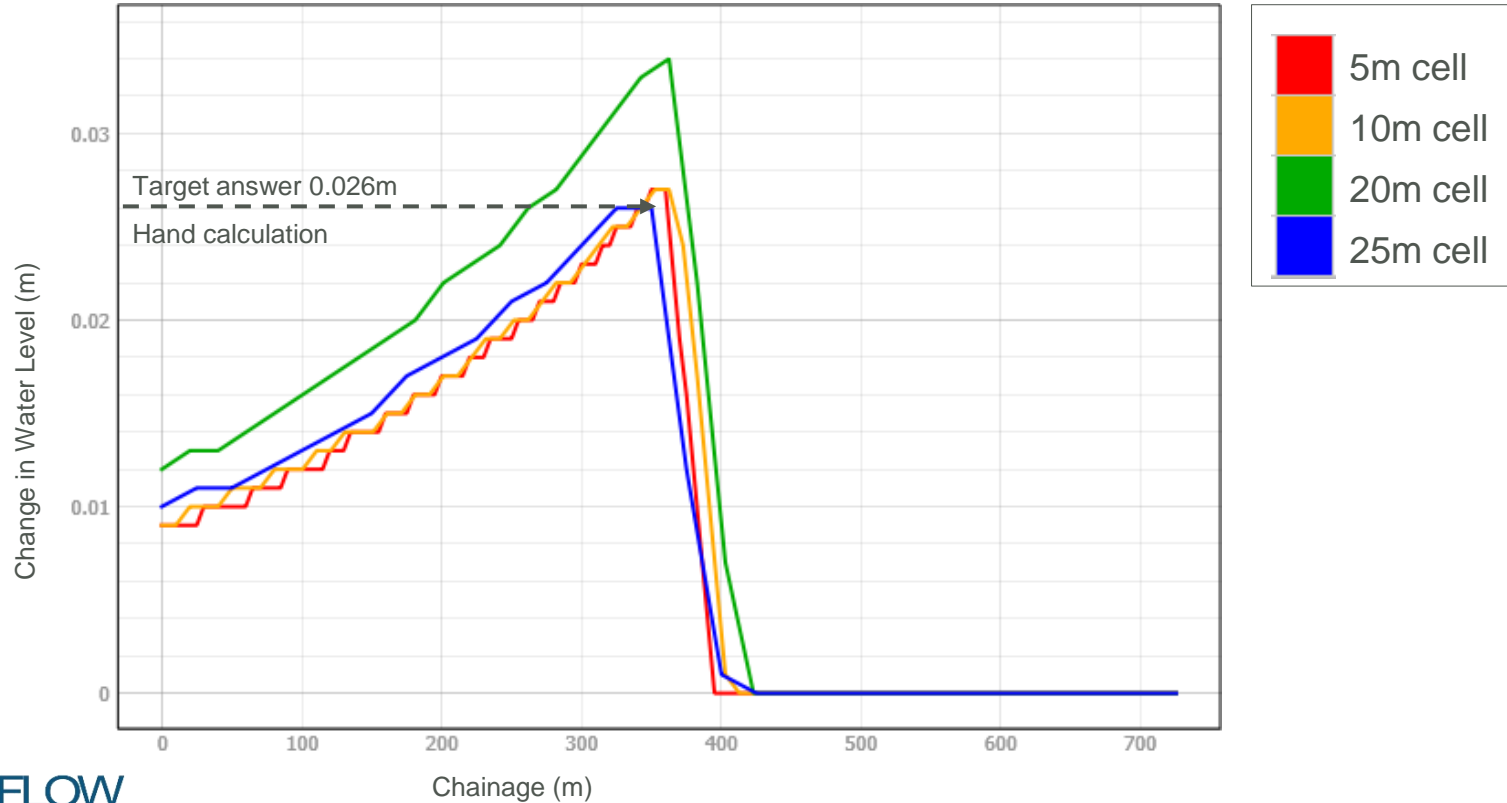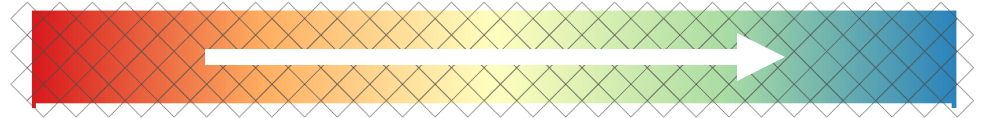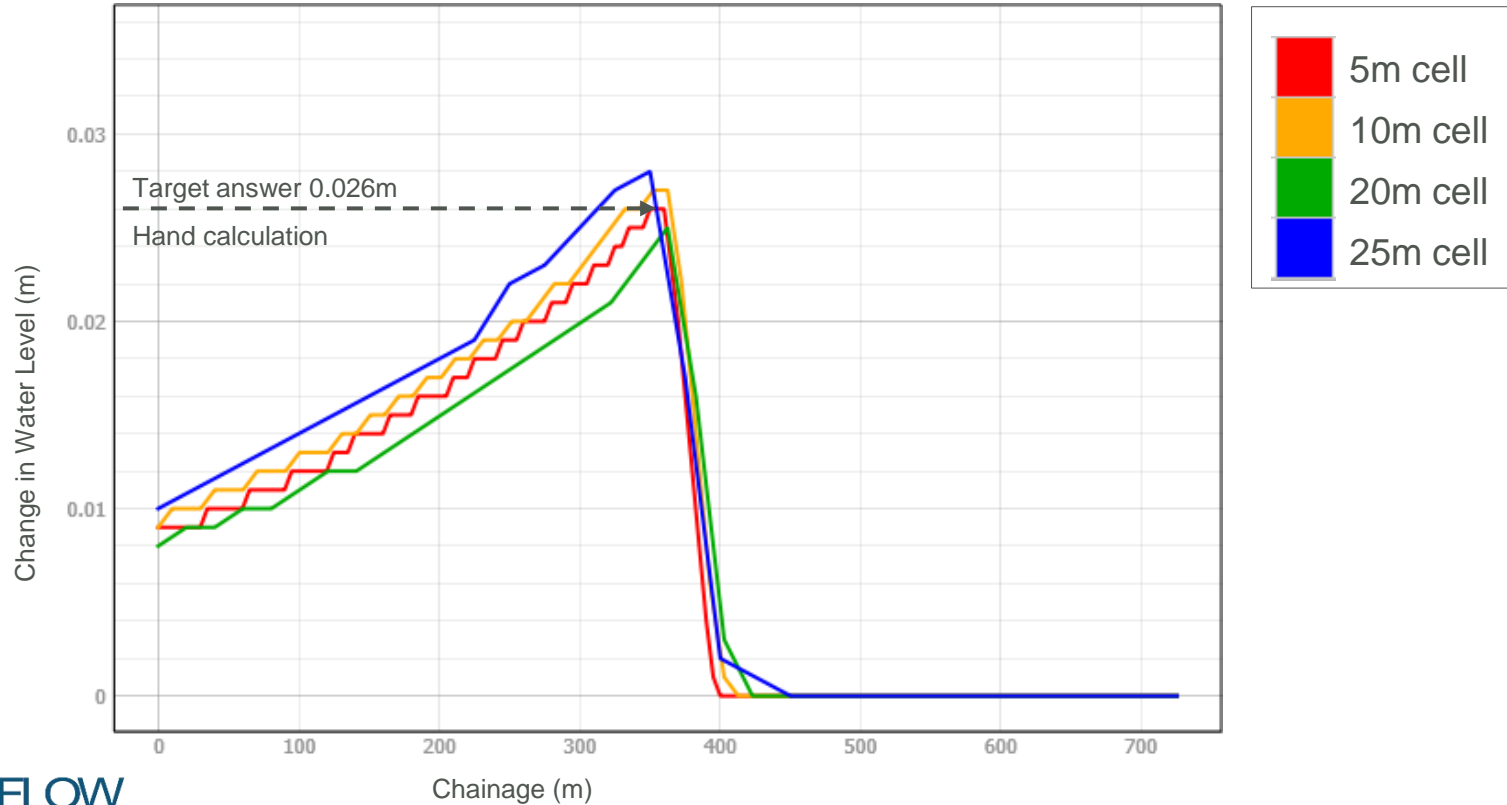
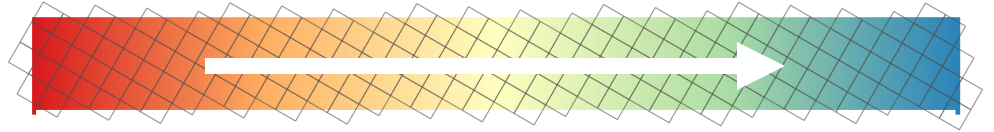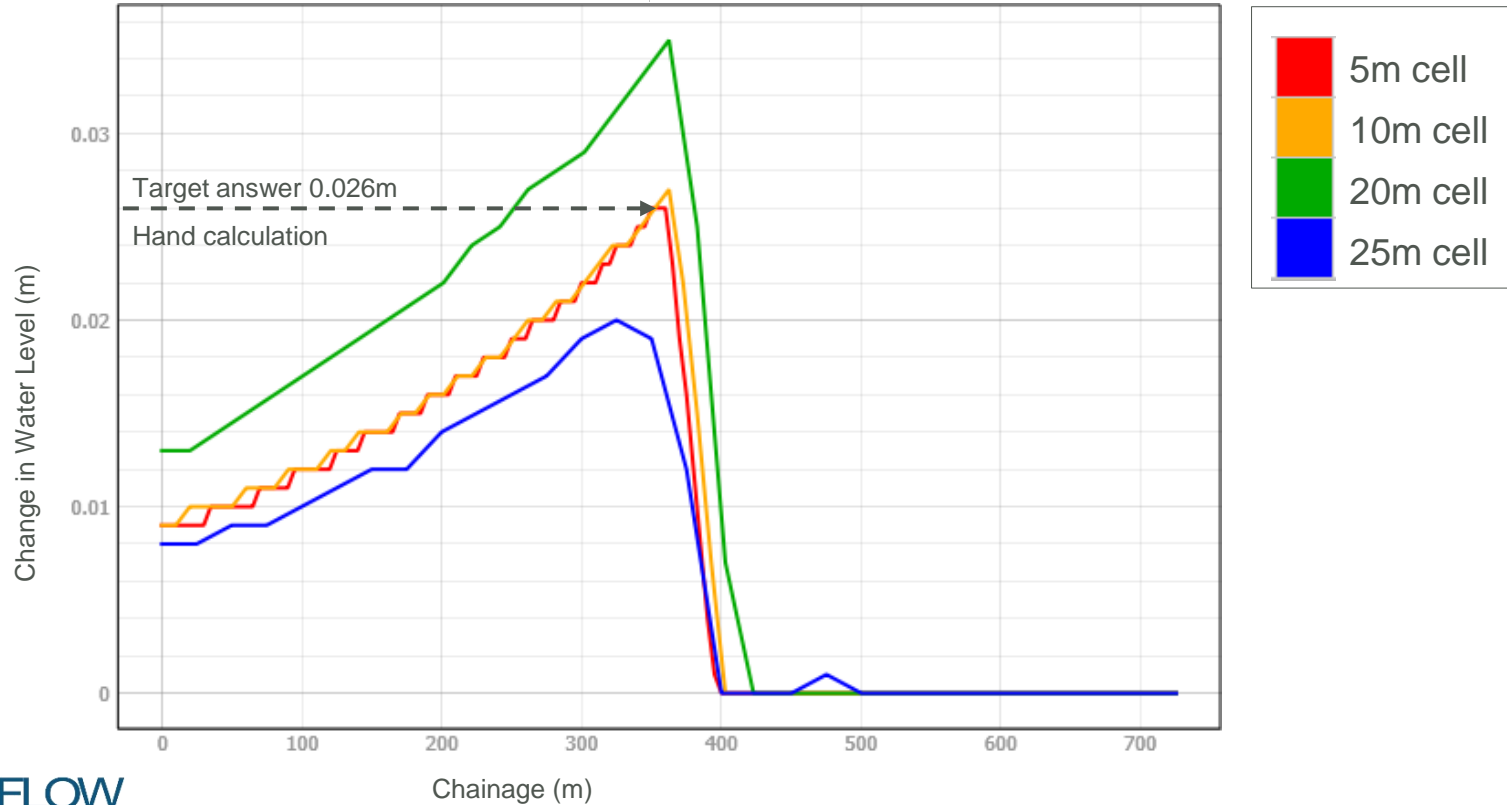 - 4 cell sizes: 25m, 20m, 10m, 5m
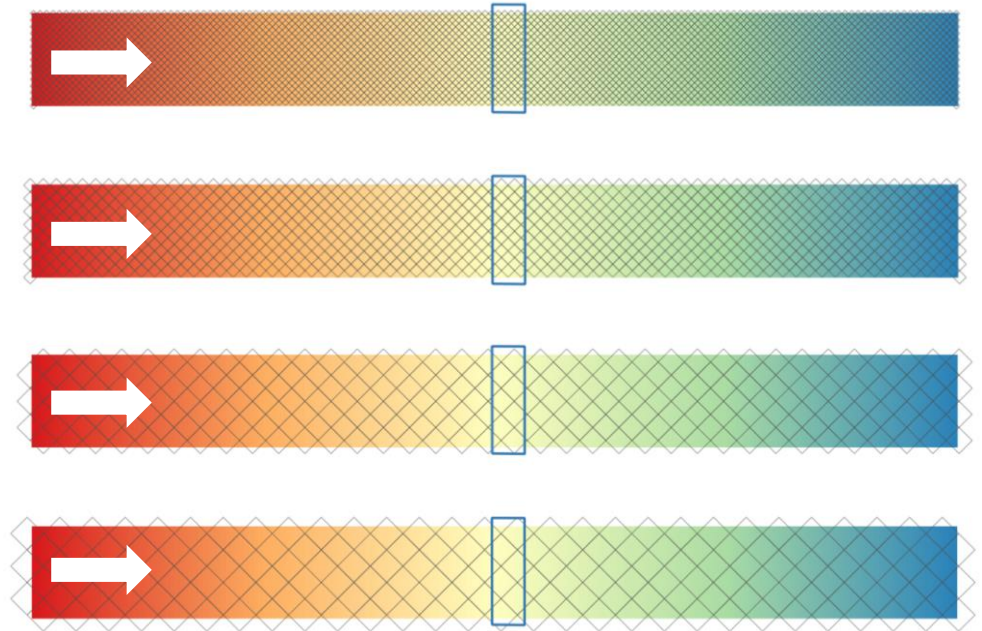
Results

4 Cell Sizes
4 Channel Orientations

Test Results
45° Channel

Test Results
30° Channel

Test Results
15° Channel

Legend:
- 5m cell (red)
- 10m cell (orange)
- 20m cell (green)
- 25m cell (blue)

Y-axis: Change in Water Level (m)
X-axis: Chainage (m)

Target answer 0.026m
Hand calculation
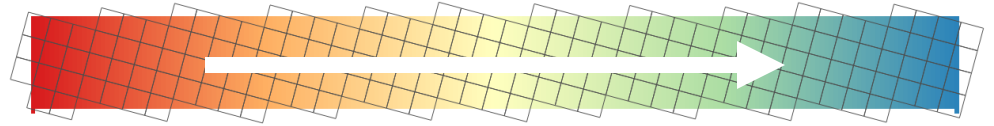
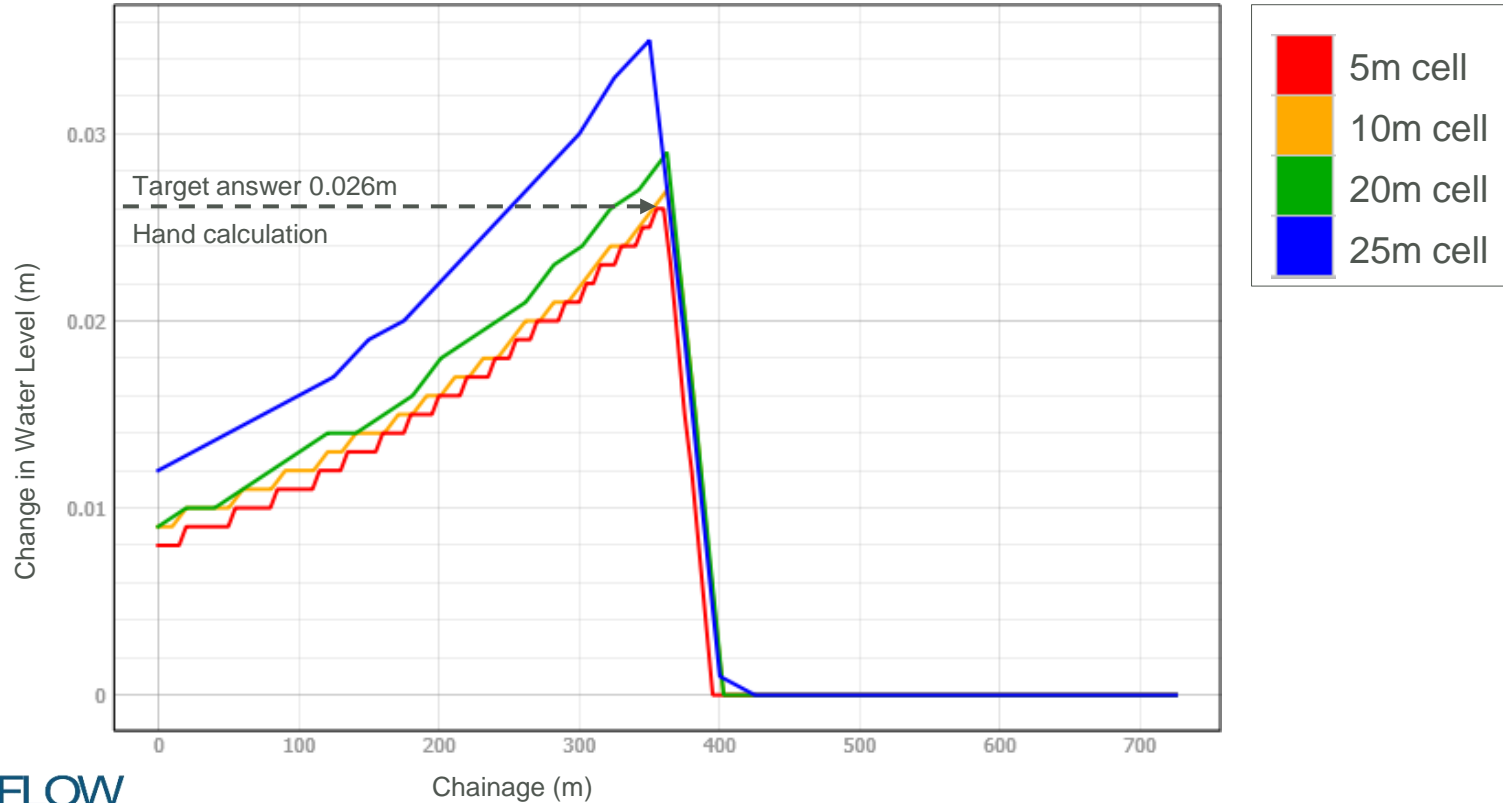# Test Results
0° Channel

Test Results
Findings

- The results converge to a common solution for all cell orientations (0 to 45 degrees) when the cell size is 10m or less

- A cell size of 10m relative to a 35m wide bridge equals 3.5 cells

- **Conservative Recommendation:**
  For bridges modelled using a polygon the bridge deck width to 2D cell size ratio should be 4 or more. This will provide consistent results for all cell orientations

- Example

  - Bridge = 35m width   2D cell size = 8.5m
  - Ratio = 4.1 ✓

8.5m 2D cell   Ratio = 4.1

35m

Flow ✓

10m 2D cell   Ratio = 3.5

Flow ✗