

# National Stormwater Modelling Guide

Workshop 3 - Stormwater Conference 2023

4pm to 5.30pm



# Agenda

- Welcome & background
- Guidance history and current work scope
- Literature Review
- **Breakout 1** - Have we missed any key guidance documents?
- Gap Analysis
- **Breakout 2** - Gaps & opportunities – what do you think?
- **BREAK – Approx. 4.45pm**
- Guidance Document Structure
- **Breakout 3** – Feedback on document structure and format
- Thank you & close (~5.20pm)

# Welcome & context

- The case for better coordination of stormwater approaches nationwide is already clear.
- Gaps in flood risk information and how its used, variations between approach, design standards and policies.
- A consistent national approach to stormwater modelling, smarter land use planning controls and design standards are needed.

# Guidance history and current work scope

- Previous workshops / consultations:
  - Industry Survey: July / August 2020
  - Water NZ Conference Workshop: November 2020
  - Modelling Symposium Workshop: June 2021
- Outcomes
  - Established need (97% of responses to survey in support)
  - Identified current guidance in use (NZ and international)
  - Priorities for development:
    - Rainfall runoff (outside scope of current project)
    - Climate change
- Rainfall runoff (outside scope of current project)
- Climate change

# Guidance history and current work scope

- Work scope for Phase 1
  - Stakeholder engagement & collaboration
  - Literature review:
    - Existing guidance
    - Codes of practice / engineering standards
    - Regional / District Plans
  - Summary report / gap analysis
  - Confirm need and scope for Phase 2 (guideline development)
    - Urban stormwater context only (not rivers or rural applications)
    - Not a specification
    - Software agnostic
    - Enable consistency and confidence in outputs

# Guidance history and current work scope

- Programme / Deliverables
  - Engagement
    - Advisory Group (monthly meetings)
    - Online workshop (April 2023)
    - Industry survey (April / May 2023)
    - Stormwater conference (May 2023)
    - WaterNZ Conference (October 2023)
  - Summary report / gap analysis
    - Published on WaterNZ website (June 2023)
  - Phase 2 – June to December 2023

# Literature Review

## New Zealand

### Application of Hydraulic Modelling under Regulatory Context - for Regional, Territorial, Private Sector

Natural Built Environments Act

Strategic Planning Act

Climate Adaptation Act

Building Act

Local Government Act

Soil Conservation and Rivers Control Act

### National Guidance

MFE Coastal Hazards 2017

Takawa platform

NIWA wave and storm-surge assessments (WASP)

HIRDS v4 2018

### Modelling guidelines

Auckland Stormwater Modelling Specifications

Waikato Regional Council Stormwater Management Guidelines

Waikato Regional Council Hydrology Guideline

Waikato LASS RITS document

Hamilton City Council Standard Stormwater Modelling Methodology

Greater Wellington Flood Modelling Guidelines

Bay of Plenty Hydraulic Modelling Guidelines

Tauranga City Council Guidelines for Stormwater Modelling

Wellington Water Modelling Specifications

Christchurch City Council - series of reports/guidance

## International

### Australia

Australian Disaster Resilience Handbook 7: Managing the Floodplain

Queensland Department of Transport and Main Roads: Technical Guideline Hydrologic and Hydraulic Modelling

Australian Rainfall and Runoff Guidebook

Book 9 - Runoff in Urban Areas (Chapter 6 Modelling Approaches)

Also see Book 4 - Catchment Simulation for Design Flood Estimation, and Book 1 - Scope and Philosophy

DHI Australia Stormwater Runoff from Green Urban Areas - A Modeller's Guide (*this one seems to be an Aus organisation but most of their data is from Denmark, so unsure if within scope*)

Melbourne AM STA 6200 Flood Mapping Project Specifications

### UK

Scottish EPA Flood Modelling Guidance for Responsible Authorities

CIWEM Integrated Urban Drainage Modelling Guide

RoFSW technical specification

### USA

Minnesota Stormwater Manual

# Breakout 1 - Have we missed any key guidance documents?

- Table introductions
  - 30sec
  - Who you are and why you are interested in the guidelines
- Have we missed any key documents?
- If so, what are they and why are they important?

*Remember: We are producing a guidance document (not a modelling specification)*

# Gap Analysis

- **Purpose:** Summarise the key gaps and inconsistencies that need to be overcome to arrive at a consistent national approach for stormwater modelling
- Sources of information:
  - Industry knowledge and experience
  - Engagement workshops
  - Industry surveys
  - Literature review
  - Interviews with industry experts
- Note overlap with National Three Waters Code of Practice – coordination is underway

# Gap Analysis

1. **Model confidence rating** – No consistent method for defining confidence in model outputs → Poor understanding and application of results
2. **Rainfall-runoff methodology** - No nationally consistent method → Some regional methods are applied inappropriately in other regions. International methods are often applied with no consideration of suitability for NZ conditions.
3. **Lack of links between council and developer modelling** - Differing purposes often using substantially different underlying assumptions and resolution levels → Difficult for end users to interpret, understand and compare outputs
4. **Model validation / calibration** - lack of guidance on how to validate models against flood incident or operational data & no guidance on calibration thresholds → Model outputs are often uncalibrated and / or unvalidated with limited links back to the reality

# Gap Analysis

5. **Data collection** - Limited amounts of level and flow data measured and flood incidents → not enough data to calibrate/validate/verify models
6. **Joint or coincident probability** - Limited guidance on how to select and apply events → Flooding predictions are over or underestimated
7. **Understanding why a model is needed and how it will be used** – Poor setting of objectives and understanding end use → Model outputs do not meet the needs of end users
8. **Scenario testing** - Inconsistent guidance on how & when to model blockages / partial blockages and similar common scenarios → Urban stormwater systems are prone to failure and the impact of blockage is often missed
9. **Design storm selection** – Within NZ there are inconsistent requirements, standards and levels of service (LoS) → This creates confusion where requirements are often incorrectly applied
10. **Existing specifications are too detailed** - lack flexibility to apply new knowledge or techniques limits innovation in the sector → End users do not benefit from application of innovative approaches

# Gap Analysis

11. **Floodplain mapping cut-off levels** - This varies substantially across regions within NZ → Inconsistent flood extents are used for planning purposes between districts
12. **Design storms vs. actual events** - Limited guidance on how design storm and actual event modelling should be used → Models are often built using design storms, then used to replicate actual rainfall events or actual events are used as design standards leading to inconsistency / inaccuracy
13. **Levels of service for habitable floor flooding** - This varies substantially across regions within NZ → Inconsistent drivers for investment in stormwater / urban flood management infrastructure between regions
14. **Freeboard** - Allowances vary substantially across regions within NZ / purpose often misunderstood → Inconsistent requirements for development between regions.

# Gap Analysis

15. **Generation and use of flood hazard rating** - Definition and application of flood hazard varies → Flood hazard mapping and use of flood hazard data to assess potential flood impacts is inconsistent
16. **Boundary conditions** - There is varying levels of detail within current guidance documents on consideration of and setting of key boundary conditions → Often poorly selected or set to default values without considering the impact of external influences.
17. **Application of climate change** - Most guidance documents provide content on these issues, but there is substantial variation in assumptions made → Outputs cannot be compared to other studies or are inconsistent between regions
18. **Model and outputs metadata** - No standard for recording model or output metadata → Model and their outputs can be used inappropriately as the end user does not have easily accessible knowledge on key modelling assumptions or quality of input data

# Gap Analysis

19. **Model build log / model build reporting** - There is no minimum standard → Models cannot be re-used if key assumptions or methods have not been recorded
  
20. **Sensitivity analysis** - Poorly understood and often not applied for smaller scale models → Fundamental assumptions on key input parameters are not appropriately tested

# Breakout 2 – Gaps & opportunities – what do you think?

Are the gaps / opportunities the right ones?

Are there any others?

1. Model confidence rating	11. Floodplain mapping cut-off levels
2. Rainfall-runoff methodology	12. Design storms vs. actual events
3. Lack of links between council and developer modelling	13. Levels of service for habitable floor flooding
4. Model validation / calibration	14. Freeboard
5. Data collection	15. Generation and use of flood hazard rating
6. Joint or coincident probability	16. Boundary conditions
7. Understanding why a model is needed and how it will be used	17. Application of climate change to sea level rise, river levels, groundwater and rainfall profiles
8. Scenario testing	18. Model and outputs metadata
9. Design storm selection	19. Model build log / model build reporting
10. Existing specifications are too detailed	20. Sensitivity analysis

# Break – 5-10min

# Guidance Document Structure

- Draft Structure of document based on
  - Previous work by Water NZ
  - Workshops
  - Surveys
  - Review of existing guidance documents
  - Discussions with industry
  - Gap Analysis
  - Technical Advisory Group
- Feedback on:
  - Draft structure of document
  - Format
  - Anything missing?

# Breakout 3 – Feedback on document structure

## 1 INTRODUCTION

- 1.1 Purpose/Objectives/Drivers
- 1.2 Scope
- 1.3 Document Structure
- 1.4 Hydraulic Modelling Principles

## 2 PLAN

- 2.1 Overview
- 2.2 Define Model Purpose
- 2.3 Key decisions
- 2.4 Define Success Criteria
- 2.5 Identify relevant phenomena
- 2.6 Review relevant studies and guidance
- 2.7 Modelling Approach
  - 2.7.1 Modelling for planning
  - 2.7.2 Modelling for new developments and infrastructure upgrades
- 2.8 Modelling Process
  - 2.8.1 Model Categories
  - 2.8.2 Data Collation and Collection
  - 2.8.3 Model Management
  - 2.8.4 Metadata
  - 2.8.5 Model Extent
  - 2.8.6 Schematisation
  - 2.8.7 Quality Assurance and Peer Review

## 3 BUILD

- 3.1 Overview
- 3.2 Modelling software
- 3.3 Rainfall
- 3.4 Hydrology
- 3.5 Boundary conditions
- 3.6 Primary system
- 3.7 Secondary system
- 3.8 Limitations and Assumptions
- 3.9 Model Confidence
- 3.10 Reporting

## 4 USE

- 4.1 Scenarios
  - 4.1.1 Boundary Conditions
  - 4.1.2 Initial Conditions
  - 4.1.3 Hydrological Modifications
  - 4.1.4 Hydraulic Modifications
  - 4.1.5 Evaluation of Scenarios
- 4.2 Outputs
- 4.3 Using an existing model

## 5 MAINTAIN

- 5.1 Model Archiving
- 5.2 Model Updates

## 6 SHARE

- 6.1 Metadata
- 6.2 Intellectual Property
- 6.3 OpenGIS Formats?

## 7 REFERENCES

- 7.1 Useful Stormwater Modelling Guidelines
- 7.2 Technical references
- 7.3 Other references

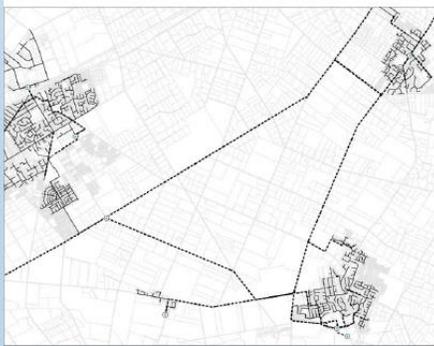
# Breakout 3 – Feedback on document format

PDF?



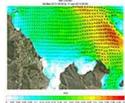
WATER NEW ZEALAND MODELLING GROUP  
National Modelling Guidelines

WATER DISTRIBUTION  
NETWORK MODELLING



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## Main Page

### TUFLOW Wiki Homepage

This Wiki contains information relating to the flood and coastal simulation software TUFLOW Classic and TUFLOW HPC (Heavily Parallelised Compute). It is designed to be used in conjunction with the TUFLOW Manual and Website.

**TUFLOW Set-up and use**

**TUFLOW**

- How to install TUFLOW
- How to configure a licence
- How to build a TUFLOW model (tutorials)
- How to run a TUFLOW model
- Free pre/post-processing utilities
- Result Viewing - TUFLOW Viewer

**TUFLOW Benchmarks**

- TUFLOW Solution Accuracy Benchmarks
- Computer Hardware Speed Benchmarks

**Best Practice Guidance**

- TUFLOW Modelling Guidance
- Modelling Videos
- Webinars

**START HERE**

**HPC Tutorial Models**

- Tutorial Model Introduction
- Module 1 - 2D Base Model
- Module 2 - Topography Updates
- Module 3 - 1D Culverts
- Module 4 - 2D Bridges
- Module 5 - Integrated Urban Drainage
- Module 6 - Direct Rainfall
- Module 7 - Quadtree
- Module 8 - Scenario Management
- Module 9 - Event Management
- Module 10 - Dam Break
- Module 11 - 1D Open Channel

**NEW for 2022**

**TUFLOW Troubleshooting**

**Error/Warning Message Database**

- About This Database
- 0xxx TUFLOW Messages
- 1xxx TUFLOW Messages
- 2xxx TUFLOW Messages
- 3xxx TUFLOW Messages
- 4xxx TUFLOW Messages
- 9xxx TUFLOW Messages

TUFLOW Check Files

support@tuflow.com

WEST LONDON STRATEGIC FLOOD RISK ASSESSMENT

HOME | USER GUIDE | SECTIONS | CHECKLISTS | Search

Welcome to the West London Strategic Flood Risk Assessment (West London SFRA) resource hub for the boroughs of Barnet, Brent, Ealing, Harrow, Hillingdon and Hounslow.

**Website?** EXECUTIVE SUMMARY

INTRODUCTION

PLANNING AND POLICY FRAMEWORK

SOURCES AND ASSESSMENT OF FLOOD RISK

FLOOD RISK ASSESSMENT GUIDANCE

POLICY RECOMMENDATIONS

REVIEW AND NEXT STEPS

MAPPING

APPENDIX A - SFRA LEVEL 2 - SCREENING ASSESSMENT

Something Else??



# Thank you & close

- Next steps
  - Confirm structure & delivery format for guidance
  - Develop guidance and consult on draft
- Want to contribute?
  - Provide your contact details to group facilitator
  - Email [Nicci.Wood@waternz.org.nz](mailto:Nicci.Wood@waternz.org.nz)