Appendix A: Metadata Standard

This section provides a framework for documenting stormwater model metadata. A minimum data requirement is provided along with a list of optional attributes.

Purpose

Metadata provides important context and confidence in reviewing and interpreting models and their results. It clarifies underlying assumptions and increases transparency in data sharing. It is also important for long-term data preservation. The purpose of this standard is to:

- Facilitate the creation and update of stormwater model metadata
- Enable consistent description and organisation of model data
- Improve data management efficiency

Attribute selection

A long list of all potential metadata attributes was collated from local and international guidelines. There is no single internationally accepted standard for stormwater model or result metadata. Documents referenced comprised both geospatial metadata guidelines and stormwater modelling and specification documents:

- Kāinga Ora Stormwater and Flood Modelling Guideline (v1, 2023)
- UK Risk of Flooding from Surface Water: Submitting locally produced information for updates to the RoFSW map (v1.3, 2016)
- Auckland Council Model Review Template (v1.0, 2019)
- data.govt.nz metadata schema (v1.2.0, 2018)
- EU metadata standard INSPIRE (2007)
- ISO 19115:2009 international geographic information metadata standard

The most relevant attributes from these documents were selected for inclusion. Additional metadata attributes have been included where deemed necessary. The proposed metadata standard aims to include enough detail for a high-level understanding of model purpose and assumptions without becoming tedious.

The attribute categorisation structure in this guide is primarily derived from the Kāinga Ora guideline. Some categories have been added to incorporate model-specific metadata, as the Kāinga Ora standard was for flood mapping outputs only.

Metadata attributes

The proposed metadata attributes have been divided into eight categories as below:

- Administrative
- Model description
- Input data
- Schematisation
- Datums
- Scenario
- Results
- Terms of use

Table A-1 provides the metadata requirements when sharing a stormwater model and Table A-2 provides the metadata requirements when sharing a scenario and its outputs. Attributes in **bold** are required.

Table A-1: Metadata requirements for model.

Category	Attribute	Definition	Purpose	Input format	Example
Administrative	**Model name**	Descriptive name of the project model	Identify model	Free text	Parnell Flood Hazard Mapping
	Base model used	Name and version of the model from which the current model is derived (if applicable)	Understand baseline assumptions and query any previous results available	Free text	Auckland Regional Hazard Model
	Completion date	Month and year of model completion	Assess relevance	Date	March 2021
	Model purpose	Description of reason why model was built	Assess relevance	Free text	Flood mitigation options assessment
	Model owner	Owner of the model and its outputs	Whom to contact with questions about the model or request the model from	Free text	Whangarei District Council
	Owner contact details	Email and / or phone number of model owner	Find additional information on the model if needed	Free text	jane.doe@example.com
	File manifest	A list of files associated with the model	Identify files relevant to model	Free text	Model files Model update log
	Comments	Any other details	Add information not covered in other fields	Free text	
Model description	**Model type**	Aligned with definitions in guide - Section 3.4	Understand model approach	Dropdown	Dynamic/simple

Category	Attribute	Definition	Purpose	Input format	Example
	Descriptive summary	Brief narrative summary of the model	Quickly understand model uses and relevance	Free text	This model was built to assess how upsizing the High Street stormwater main impacts property flood risk. It includes an assessment of sea level rise effects at the outfall.
	Location	Location or region the model relates to	Provides a quick guide to the region	Free text	Thames, Waikato
	Software	Software used to build model (including version)	Understand any limitations inherent to software used	Free text	InfoWorks ICM 2023.2
	Model build report path	URL or path to model build report within shared model package	Find details of the model and how it was built	Free text	\ModelLog\ModelBuildReport.pdf
Input data	DEM used	Source, year, and resolution of DEM	Assess relevance and check DEM resolution	Free text	NRC 1m LiDAR 2018-2020
	Input data licenses	Licenses for input model data	Compliance with input data terms of use and sharing	Free text	Aerial photography from LINZ (Creative Commons 4.0); Pipe network from Tauranga City Council (Creative Commons 3.0)
Schematisation	Pipe network	Which pipes and culverts were included in the model, if any. *Includes sub-fields: methodology, level of detail, rigour, data maturity.*	Understand pipe network assumptions	Free text	Modelled all pipes > 300mm dia and associated manholes
	Open channel representation	Whether and how open channels and watercourses were represented. *Includes sub-fields: methodology, level of detail, rigour, data maturity.*	Understand watercourse assumptions	Free text	Channels modelled in 2D with cross-sections derived from LiDAR
	2D surface representation	How the 2D surface was represented, including spatial resolution.	Understand flow routing within model	Free text	2m mesh resolution in option areas, 5m mesh resolution upstream. Building plinth represented by raising mesh by 200mm.

Category	**Attribute**	**Definition**	**Purpose**	**Input format**	**Example**
		Includes sub-fields: methodology, level of detail, rigour, data maturity.			
	Hydrological parameters	Rainfall-runoff methodology and any antecedent moisture condition applied. *Includes sub-fields: methodology, level of detail, rigour, data maturity.*	Understand how runoff was estimated	Free text	Runoff estimated using rain-on-grid SCS Curve Number method. Initial loss of 10mm/hr.
	Upstream catchment	How runoff from upstream areas feeds into the model domain. *Includes sub-fields: methodology, level of detail, rigour, data maturity.*	Understand inflows into model	Free text	Single subcatchment representing rural upstream area. Upstream runoff enters the model domain at Kiwi Street culvert.
	Boundary representation	How the model boundary was represented. *Includes sub-fields: methodology, level of detail, rigour, data maturity.*	Identify locations of boundary conditions	Free text	Downstream boundary at river mouth and upstream boundary at dam, vertical walls elsewhere.
	Hydraulic structures	What structures were included (e.g. bridges, weirs, flap gates). *Includes sub-fields: methodology, level of detail, rigour, data maturity.*	Understand any changes in flow behaviour around structures	Free text	Flap gates modelled at all outfalls to sea.
Datums	**Coordinate reference system**	Geographic system in which the model and result files are created (including projection if relevant)	Correctly georeference any downloaded data	Free text	NZGD2000 / Hokitika 2000
	Vertical datum	Vertical datum used to measure ground and water level elevations	Understand flood and boundary levels relative to other data sources	Free text	Auckland Vertical Datum 1946

Table A-2: Metadata requirements scenario / result data.

Category	Attribute	Definition	Purpose	Input format	Example
Scenario	**Simulation ID**	ID field following the naming conventions set out in guide (Section 3)	Identify simulation	Free text	CatchmentA_FD_R1pctAEP_2pt1CC_MPD_20240101
	Scenario name	Name of model scenario for which simulations were run	Link simulation to scenario	Free text	2.1° climate change, maximum probable development
	Simulation period	Simulation duration and date range (if applicable)	Benchmark simulation length against storm duration and historic weather events	Free text	12hr simulation with 5min timestep
	Rainfall	Rainfall parameters applied, including data source, AEP event, climate change, and spatial & temporal distribution	Understand relevance and input parameters	Free text	TP108 nested storm; 2% AEP event with 20% CC uplift on peak rainfall
	Tide	Tidal parameters applied, including data source, AEP event, climate change, and components considered	Understand relevance and input parameters	Free text	Tide level from Waikato Regional Council Coastal Inundation Tool. Considered 2130 MHWS level
	Inflow	Inflow parameters applied, including data source, AEP event, climate change, and components considered	Understand relevance and input parameters	Free text	Inflow from Whanganui River (10yr+CC flow) and farm catchment runoff
	Physical modifications	Changes to the physical geometry of the model applied during the simulation, such as land use change or pipe modification	Understand relevance and input parameters	Free text	Widened Beach Road concrete channel to 2m
	Operational scenario	Changes to the operation of structures for the simulation, such as sluice opening or modification of pump curves	Understand relevance and input parameters	Free text	Weir lowered by 0.5m
	Boundary conditions	All boundary conditions	Understand relevance and input parameters	Free text	Tidal boundary = 3.2m AVD

Category	Attribute	Definition	Purpose	Input format	Example
Results	**Result types**	Type of results files generated	Facilitate finding relevant results	Free text	Elevation, hazard, depth, Froude number, 1D, 2D
	Result path	URL or path to results files within shared model package	Quickly find results	Free text	\Simulation\Results\100yrCC
Terms of use	Model license	Information about the license or terms of use for the dataset	How data can be used	Free text	Open Data Commons
	Limitations	Key assumptions or limitations of the model and/or dataset	Transparency, assess fit for purpose	Free text	All sub-catchment runoff was assumed to enter freely into the reticulation system. Catchpit inlet control was not modelled for stormwater reticulation.
	Distribution	Information on how the dataset can be obtained, accessed (online and offline), and distributed, including any restrictions	Access information and any sharing limitations	Free text	The dataset is available for download as a zipped shapefile or geodatabase file from [link]

Metadata Generation

Metadata generation need not be onerous. It is likely that some form of metadata is already being collected in data flags, change logs and model build reports. Metadata should be consolidated into one central location for ease of access and sharing. For efficiency, it is suggested to collate metadata during the model build process by including it as part of the model build log (see Section 3.10).

Distribution

Metadata must be included in the sharing of any model package or result files, in scenarios including but not limited to:

- Models shared for peer review
- Mapped results for public access
- Results submitted to support resource consents

A variety of distribution formats may be used, including Excel (as included with this guidance), XML or GIS. Open access data formats are preferred, so that viewing metadata does not require proprietary software licenses. Spreadsheets are the recommended metadata format when sharing a full model package that includes both model and outputs. For metadata on geospatial model outputs, XML is preferred, as this can be easily integrated with online mapping or OpenData portals.

A template metadata spreadsheet is provided with this guide. This may be adapted for specific use cases if needed. It is noted that some organisations have their own metadata templates. The template in this standard has been designed to align with existing standards as far as practicable. Any departures from the standard should maintain the mandatory attributes from this standard to enable future comparison.

The spreadsheet separates out metadata for the model and its results. This allows sharing of simulation parameters (such as rainfall and boundary conditions) for each simulation while avoiding duplication of overarching model details (such as model purpose and schematisation). As a full description of each simulation relies on the description of the model, both model and result metadata must be maintained in the same location. The 'result' tab may be duplicated as required.

XML is preferred for metadata on geospatial outputs as it is compatible with commonly used online mapping portals. The metadata structure provided below may be converted into an XML schema that can then be imported for metadata entry. If the GIS platform being used does not support XML, the metadata spreadsheet should be used instead.