

A large, decorative graphic consisting of three overlapping, wavy bands in shades of blue and teal, positioned above the main title.

Flood Study Template

Flood Work Application No.

Property Name

Supplier:

Date:

Please note: This is a template provided by WaterNSW, that can be used as a framework to complete a flood study. If preferable, the branding on this document can be removed to represent a customer or consultant.

Table of Contents

1. Introduction	4
1.1 General	4
1.2 Objectives	5
1.3 Study limitations	6
2. Regional floodplain management plan	7
2.1 Overview	7
2.2 Required development assessment criteria	8
3. Site background	9
3.1 Site description	9
3.2 Existing unapproved and/ or proposed flood work(s)	11
3.2.1 Flood work(s) history	11
3.2.2 Flood work(s) plan	11
4. Flood modelling analysis	13
4.1 Hydrologic data (including model/FFA information as required)	13
4.2 Hydraulic modelling	14
4.2.1 Digital elevation model	14
4.2.2 Hydraulic model	15
4.2.2.1 Upstream and downstream boundary conditions	16
4.2.3 Model calibration/ sensitivity analysis and quality assurance	16
5. Hydraulic model results	17
5.1 Pre-development condition	18
5.1.1 Design flood event A (FMP adopted large historic design flood event)	18
5.1.1.1 Peak flood depths and levels	18
5.1.1.2 Peak flood velocities	18
5.1.2 Design flood event B (FMP adopted small historic design flood event)	18
5.1.2.1 Peak flood depths and levels	18
5.1.2.2 Peak flood velocities	18
5.2 Existing development condition	19
5.2.1 Design flood event A (FMP adopted large historic design flood event)	19
5.2.1.1 Peak flood depths and levels	19
5.2.1.2 Peak flood velocities	19
5.2.2 Design flood event B (FMP adopted small historic design flood event)	19
5.2.2.1 Peak flood depths and levels	19
5.2.2.2 Peak flood velocities	19
5.3 Post-development condition	19
5.3.1 Design flood event A (FMP adopted large historic design flood event)	19
5.3.1.1 Peak flood depths and levels	19

5.3.1.2	Peak flood velocities	19
5.3.2	Design flood event B (FMP adopted small historic design flood event).....	19
5.3.2.1	Peak flood depths and levels	19
5.3.2.2	Peak flood velocities	19
6.	Flood impact assessment results	20
6.1	Peak flood level differences	21
6.2	Peak flood flow redistribution	22
6.3	Peak flood velocity changes.....	22
7.	Conclusions	23
8.	Recommendations.....	24
9.	References	24

Table of figures:

Table of tables:

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Issue No.	Date of issue	Description	Author	Checker	Approver

2. Regional floodplain management plan

2.1 Overview

The regional Floodplain Management Plan (FMP) that the flood work(s) lies within is required to be addressed in this section.

Include a figure showing the regional FMP management zones and the location of the flood work(s). Any previously approved flood works should be clearly labelled and included on any figures. You must also indicate the type of flood work, e.g., limited/unlimited height levee; below/above ground channel.

2.2 Required development assessment criteria

In this section, it is expected that the supplier addresses management zone(s) that existing unapproved and/or proposed flood work(s) are in and the associated hydraulic assessment criteria. Include a table showing the required design floods (e.g., small and large), maximum allowable flood level differences, flow velocity changes, peak flood flow redistribution and any additional areas of importance.

Include any specific areas of assessment that are not covered by FMP.

- ecological/cultural heritage assets

- any locations of active erosion in vicinity of works (this should include supporting photographs)

- flooding patterns (mapped flow paths) and history (including information on the nature of flooding, observed flood levels and flood imagery showing spatial extents etc.)

- Include a plan showing property location.

- flood work height, specifically regarding limited height used in the updated/developed model; otherwise, justification for the assumption of using unlimited heights
- flood work base width
- high value infrastructure located in vicinity of property
- identified hydraulic control structures (regulators, training banks, engineered offtakes etc)
- drainage & waterway structures (pipes, culverts, causeways, syphons, bridges etc)

4. Flood modelling analysis

4.1 Hydrologic data (including model/FFA information as required)

Detailed hydrologic data used in the study is required to be discussed in this section. This includes design peak flows and/or inflow hydrographs from existing FMP models. Please include a table and figure of design peak flows as provided by WaterNSW.

If hydrologic modelling is required for this study, information regarding modelling software, catchment characteristics, model parameters, and additional information to determine the quality of the model will need to be provided. More exhaustive/detailed information on hydrologic model parameters and outputs can be provided as an Appendix.

In addition, if flood frequency analysis is required, details are provided in Chapter 2 of Book 3 of Australian Rainfall and Runoff 2019 (ARR 2019). Annual Exceedance Probability (AEP) of the selected design flood(s) needs to be consistent with the FMP (if applicable).

IF REQUIRED: add any additional adopted inflow hydrographs.

- pre-development conditions
- existing development conditions
- post-development condition

If elevation data is not available for the pre-development condition, include the best-available DEM - removing all existing infrastructure by performing an interpolation across the base of each structure.

Details on adopted watercourse bathymetry should also be provided, including bathymetric sources, assumptions and supporting figures, as necessary.

4.2.2 Hydraulic model

Details of the hydraulic model to meet the FIA study's goals should be included here. It is expected that industry standard, two-dimensional hydraulic software will be required to complete the assessments (e.g., TUFLOW, HEC-RAS) unless evidence can be provided on the suitability of alternate hydraulic software/modelling approaches.

Details on the software name, version, modelled area, cell/grid size, main structures, design events, and time step are required in this section. A table listing adopted hydraulic roughness values should also be included.

5. Hydraulic model results

In section 5, provide and discuss hydraulic model result maps including peak flood depths, levels and velocity across the study area per below sections.

Notes:

- all figures in this report should be provided in a consistent template, which includes:
 - property name
 - applicant name (s)
 - scale
 - north point
 - date
 - property boundaries
 - applicant site boundary
 - surrounding properties which may be affected
 - the flood work proposal
 - existing development
 - ecological and cultural assets
 - high value infrastructure

- hydraulic measurement check points/control lines
- easy to interpret/colourblind-friendly palettes
- flood levels should be shown in metres relative to AHD
- velocity maps need to show velocity in m/s with velocity vectors as required
- mapping for all scenarios and comparisons with appropriate colour thresholds that match the assessment criteria

Along with this report, WaterNSW also request the modelling output files for each design flood and development scenario.

5.1 Pre-development condition

5.1.1 Design flood event A (FMP adopted large historic design flood event)

5.1.1.1 Peak flood depths and levels

5.1.1.2 Peak flood velocities

5.1.2 Design flood event B (FMP adopted small historic design flood event)

5.1.2.1 Peak flood depths and levels

5.1.2.2 Peak flood velocities

5.2 Existing development condition

5.2.1 Design flood event A (FMP adopted large historic design flood event)

5.2.1.1 Peak flood depths and levels

5.2.1.2 Peak flood velocities

5.2.2 Design flood event B (FMP adopted small historic design flood event)

5.2.2.1 Peak flood depths and levels

5.2.2.2 Peak flood velocities

5.3 Post-development condition

5.3.1 Design flood event A (FMP adopted large historic design flood event)

5.3.1.1 Peak flood depths and levels

5.3.1.2 Peak flood velocities

5.3.2 Design flood event B (FMP adopted small historic design flood event)

5.3.2.1 Peak flood depths and levels

5.3.2.2 Peak flood velocities

If more than two design floods require assessment, the above sections should be repeated for 'Design Flood Event C', 'Design Flood Event D' etc.

6. Flood impact assessment results

In this section, depending on whether flood work(s) seeking approval is/are existing or proposed, flood impact assessment results considering peak flood level differences, peak flood flow redistribution and peak flood velocity differences are required for the following scenarios:

- post-development (proposed) condition against existing development condition

- post-development (proposed) condition against pre-development condition

- existing development condition against pre-development condition

Notes:

- changes in peak flood level differences to be reported in metres

- changes in peak flood flow redistributions to be reported as m³/s and as percentages

- changes in peak flood velocity to be reported as m/s and as percentages

- peak flood level difference maps are required for all scenarios with appropriate colour thresholds that match the assessment criteria. Peak flood depth difference maps are not required

- newly wet/dry areas must be shown on all the peak flood level difference maps
- peak flood level difference maps are to show local high value infrastructure (if applicable) and ecological assets
- tables detailing changes in peak flood flow redistribution at hydraulic measurement control lines for all scenarios and their compliance against FMP assessment criteria need to be included
- peak flood velocity change maps are required for all scenarios with appropriate colour thresholds that match the assessment criteria

This provides only a general guide of what is routinely needed for approval of the flood works. Different FMPs and different zones within FMPS, may have additional requirements that need to be met. It is up to the supplier to understand the requirements for the particular application and to provide the necessary evidence for approval.

6.1 Peak flood level differences

3 figures for each design flood:

- post-development condition against pre-development condition

- post-development condition against existing development condition

- existing development condition against pre-development condition

6.2 Peak flood flow redistribution

A minimum of 1 table and potentially 1 additional table are required for each design flood. The hydraulic modeller is required to refer to the relevant FMP to confirm the flow redistribution scenarios that are required. If no FMP is available, tables for all the scenarios listed below should be provided for each design flood:

- post-development condition against existing development condition (required for all assessments)

- post-development condition against pre-development condition (required for some assessments – please refer to the relevant FMP for confirmation on the scenarios to be assessed)

Figure is to be provided showing locations and extent of flow measurement lines. As a minimum, these should be located upstream of the flood works at the downstream property boundary(s) and at the entrances/exits of major floodways and watercourses. Flow sections should be orientated perpendicular to the direction of flow where possible.

6.3 Peak flood velocity changes

3 figures for each design flood:

- post-development condition against pre-development condition

- post-development condition against existing development condition

- existing development condition against pre-development condition

7. Conclusions

This section should summarise the FIA study results for existing unapproved and/or proposed flood works including flood impacts associated with:

- local and regional hydraulic behaviour

- critical (high value) infrastructure

- erosion or disturbance of heritage/cultural sites

- flood connectivity to ecological, cultural & heritage sites

The conclusion should include a table showing compliance with FMP rules & assessment criteria. This can be an expanded version of the table introduced in Section 2.2.

8. Recommendations

This section must detail any recommendations regarding remediation options for the existing unapproved and/or proposed flood work(s) to allow compliance with FMP rules and assessment criteria.

9. References

List references used in this FIA study to be included in this section for independent verification when required.