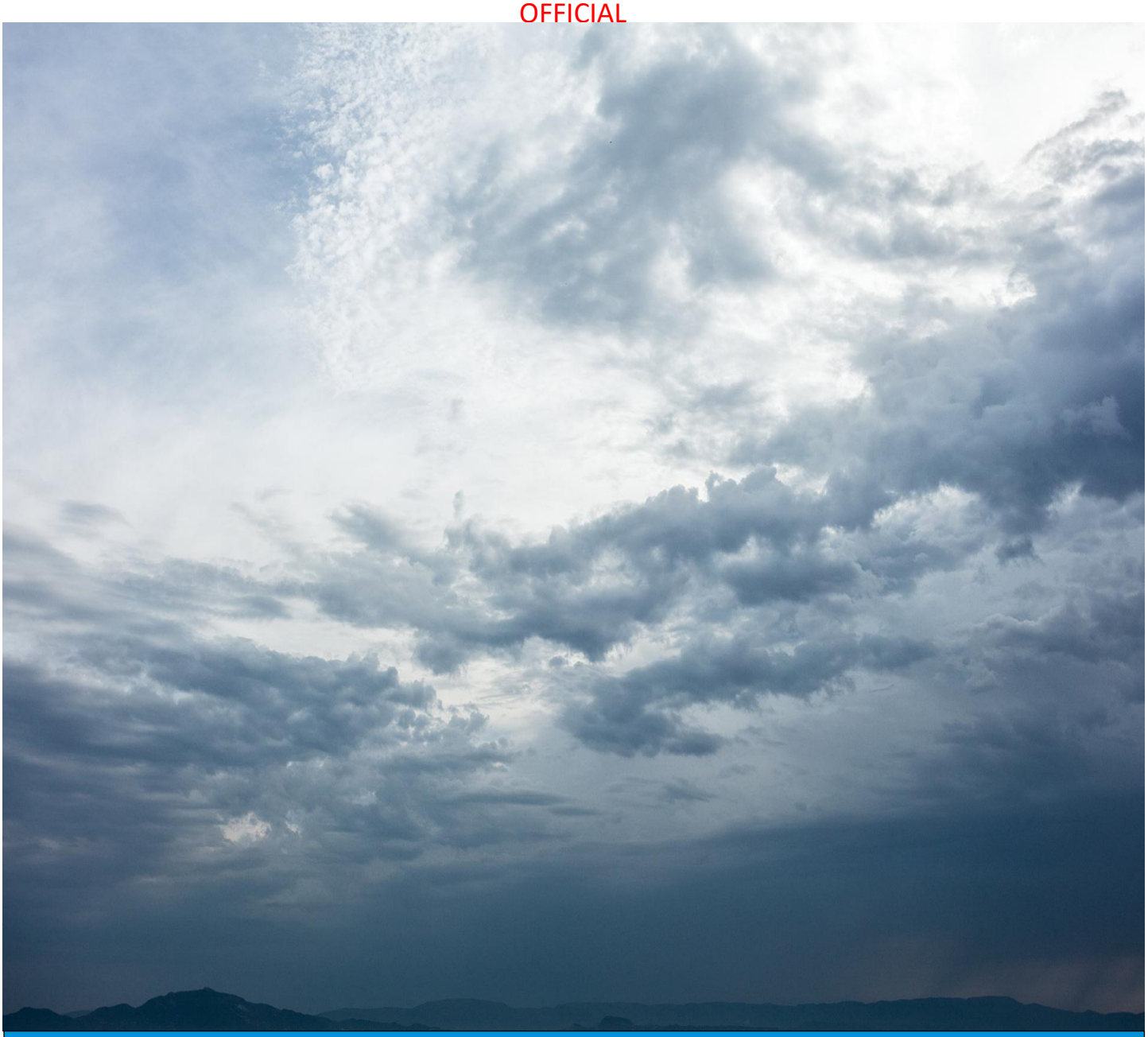

Flood Impact (Afflux) Practice Note

Floodplain Development Impact Assessment

December 2025

Acknowledgements

We extend our sincere gratitude to the Urban Planning and Development Strategic Collaboration Group Technical Working Group for their contributions to the development of this Practice Note in collaboration with Melbourne Water. Their technical expertise, collaborative spirit, and commitment to strengthening floodplain management practices have been instrumental in shaping a resource that will support more consistent and informed decision-making across the sector.

We also wish to thank industry stakeholders for their valuable feedback throughout the development process. Their insights and practical perspectives have helped ensure the Practice Note is both technically robust and grounded in real-world application.

This Practice Note reflects a shared vision for resilient and sustainable urban planning. Protection of the community is our number one priority. Our approach to flood risk management in this Practice Note aligns with both state and national guidelines to ensure that the appropriate safeguards are in place.

We thank all involved for their time, knowledge, and continued partnership in enhancing our collective capacity to manage flood risk effectively.

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1. Introduction

1.1 Purpose

The Flood Impact (Afflux) Practice Note (Practice Note) has been developed to provide clear and practical guidance on managing offsite flood level impacts for proposed developments, where zero-afflux cannot be achieved, by using a risk-based flood impact assessment framework.

1.2 Scope

As the designated floodplain manager for the Port Phillip and Westernport region, Melbourne Water plays a critical role in managing flood risks and ensuring that development does not adversely affect flood behaviour, property or community safety.

Melbourne Water collaborates with councils, developers, and other stakeholders to assess flood impacts and guide planning decisions. For more information on Melbourne Water's flood management responsibilities and resources, visit Flooding and drainage.

The Practice Note is intended to assist developers, their advisers, and the community with the preparation of development applications in flood-prone areas, by providing guidance on the matters that Melbourne Water will take account of when assessing development applications with respect to flood-affected areas. It can also be used by Melbourne Water and other authorities to assess whether applications for development in these areas are acceptable.

Specifically, this Practice Note:

- synthesises the relevant components of various applicable best practice guidelines and technical standards and thereby provides a framework for statutory authorities, developers, and community, to better understand further steps that can be taken to mitigate the impacts of such changes to flood behaviour and risk

- provides general advice on expected flood risk situations and associated offsite flood impact tolerances and by extension, provides guidance on the assessment criteria for deciding whether a development application will result in a *significant change* to the residual offsite flood risk in certain applications, and

- provides a recommended procedure (that is used by Melbourne Water, and can be used by statutory agencies, developers and consultants) that evaluates both the risk and scale of flood impact.

This Practice Note is intended to be a guide only and not a set of rules. Decision makers should exercise discretion and also have regard to any relevant statutory obligations, functions, and duties, when assessing development applications and applying this Practice Note.

"Floodplain managers have discretion to vary from the guidelines, considering local circumstances, the nature of the development proposal and the flood risk". (DEECA Guidelines, 2019)

1.3 Current guidelines

This Practice Note and its supporting technical guidance has been prepared by Melbourne Water, in its capacity as a floodplain manager under Section 202 of the *Water Act 1989*. It was developed in accordance with the 2019 Department of Energy, Environment and Climate Action Guidelines for Development in Flood Affected Areas (DEECA Guideline). This is used by developers and decision-makers (including floodplain managers, local councils, and other statutory agencies) in the preparation and assessment of land use and development applications in flood-affected areas.

One of the key principles in the DEECA Guideline is to ensure that developments cause "*no detrimental impacts to nearby properties, particularly properties downstream.*" Developers and decision-makers must ensure development proposals adhere to this principle, including the four key objectives and criteria established to assess development impacts.

Onsite vs offsite impacts
Onsite impacts of proposed developments should be assessed in accordance with the DEECA guidelines and the flood-related criteria set by relevant asset owners to ensure both regulatory compliance and asset specific risk management.

Offsite impacts of proposed developments should be assessed in accordance with DEECA guidelines and this practice note.

The four objectives for demonstrating compliance with the guidelines are:

- Objective 1: Safety - the protection of human life and health and safety from flood hazard.
- Objective 2: Flood damage – minimising flood damage to property and associated infrastructure.
- Objective 3: Offsite impacts – maintaining free passage and temporary storage of floodwaters.

- Objective 4: Protecting and enhancing the environmental features of waterways and floodplains.

The most relevant objective to this Practice Note, is the requirement to "*Maintain free passage and temporary storage of floodwaters*." All proposed development that has the potential to affect flood storage or flow conveyance (Objective 3 in DEECA guidelines) is required to address this objective using the assessment criteria in Table 1.

Table 1. Reproduction of the DEECA Guidelines Objective 3 - Guiding principles and assessment criteria

Guiding principle		
The natural function of floodplains and overland flow paths to convey and store floodwater must not be compromised.	3.1	**Flow diversion.** Development (including earthworks) should not divert floodwaters to the detriment of any adjoining property.
	3.2	**Velocity impact.** Development (including earthworks) should not increase the flood velocity on any adjoining property.
	3.3	**Flood level impact.** Development (including earthworks) should not increase flood levels on any adjoining properties.
	3.4	**Flood storage.** Earthworks and buildings should not result in a detrimental loss of flood storage.

Development works, such as infrastructure projects, in flood-prone areas must also comply with Melbourne Water standards, the AM STA 6100 Infrastructure Projects in Flood-Prone Areas.

1.4 Zero afflux policy

Melbourne Water's approach to managing flood impacts in the first instance requires development proposals in a floodplain to achieve a zero afflux, by employing mitigation measures if required to achieve this outcome. However, where it can be demonstrated that a zero afflux[1] cannot be achieved or is impractical, this Practice Note can be used to further assess a development proposal. Melbourne Water will also assess the cumulative impacts of afflux where tolerable allowances are deemed acceptable, consistent with this Practice Note.

[1] *This can include taking into account model precision.*

1.5 Review of Practice Note

Melbourne Water will review this Practice Note within 12 months of its release and continue to update it as necessary over time. This will ensure its applicability across all types and scales of development and confirm that the Practice Note risk-based approach is operating effectively and progressively improved.

The initial review will assess whether the guidance is clear, practical and aligned with its intent. It will also identify any gaps, inconsistencies or unintended consequences arising from the introduction of the Practice Note risk-based approach.

Feedback can be provided to Melbourne Water via email land.development@melbournewater.com.au or calling 131 722.

2. Assessing flood impacts

Direct tangible flood impacts are theoretical metrics associated with flood behaviour. These may include any of the following:

- flood flows
- flood levels
- duration of inundation
- velocity
- warning and evacuation time
- level of service estimate
- flood storage
- flood hazard category, and
- at risk population or property.

For most applications, the assessment of flood impacts is primarily based on the flood level, flood hazard category, level of service and duration of inundation. These are considered the most appropriate criteria for assessing flood impacts. Other criteria are generally excluded for the following reasons:

- flood flows - are deemed to be suitably managed by planning scheme provisions (see for example planning scheme clauses 13.03, 19.03-3S, 53.18-4, 56.07-4)
- flood velocity - is captured within hazard mapping and it is also difficult to assess a change (given fundamentally it is a 2D vector metric)
- warning and evacuation time - is not likely applicable to most applications. Generally, only applicable to key infrastructure, and
- flood storage - deemed to be captured suitably with the flood level, level of service and flood hazard metrics.

There may be situations where Melbourne Water requests further information on one (or more) of the other flood behaviour/impact characteristics. This may allow Melbourne Water to better understand the flood risk profile of development applications outside the standardised assessment. For example, a proposal might alter the distribution of flows, affect flood storage or have the potential to cause major erosion or contribute to cumulative impacts within the floodplain.

If necessary, applicants may be requested to comment on indirect tangible impacts of flooding (such as, financial, opportunity costs, clean-up).

2.1 Estimating modelling uncertainties

Relevant to this practice note is the Australian Rainfall and Runoff (ARR) Book 1, Chapter 2.8.2 that describes two types of uncertainties in estimating flows, which can extend to all aspects of flood modelling and estimating flood risk. The two types are:

- **Aleatory or inherent uncertainty:** uncertainty arising through natural randomness or natural variability in flood drivers, such as rainfall intensities, durations, temporal and spatial patterns, as well as antecedent conditions such as soil moisture. The length of record for a gauging station, particularly if it includes lengthy periods of drought or above average rainfall, strongly influence flood frequency estimates too.
- **Epistemic or knowledge-based uncertainty:** uncertainty associated with the state of knowledge of a physical system, our ability to measure it and the inaccuracies of the physical system. Examples of this include the accuracy of topographic information, the choice of model used, the availability, and the accuracy of historic flood levels used for model calibration.

No matter how well a flood modeller understands/controls the epistemic uncertainty of a flood estimate, the estimate will always exhibit aleatory uncertainty. This means that flood risks are inherently uncertain and variable. Therefore, it is considered almost impossible to develop a strict set of 'rules' that work in all situations, as what is appropriate in one situation may not be appropriate in another.

2.2 Cumulative impacts

The impact of a proposed development on cumulative changes in afflux is an important consideration of any flood impact assessment. The significance of cumulative impacts can vary depending on site-specific conditions, such as waterway gradients, cross-sectional profiles, land terrain and surrounding land use.

For instance, cumulative impacts may be more of a concern in the following areas: **Pondage areas or broad floodplains,** even small increases in water level can travel laterally over long distances, affecting flood extents, land use and infrastructure.

Sensitive assets and critical infrastructure, relatively small increases in flood level due to cumulative afflux may have significant impacts.

Proposals should consider changes in afflux and the resultant cumulative impact by demonstrating:

- development application compliance by achieving "no-objection afflux" according to the Practice Note (meeting allowable offsite flood impacts tolerances).

- no net loss of floodplain storage for developments along waterways or affected by flooding associated with waterways.
- no substantial change in major overland and underground flow conveyance for developments in urban infill areas or affected by flooding associated by stormwater drains.

Cumulative impacts must be considered in development proposals, even if one application on its own does not have measurable impacts on flood behaviour. The cumulative impact of many development proposals can result in changes to the flood extent and depth, and the flow velocity. (DEECA Guidelines, 2019).

3. Flood impact assessment risk-based approach

This section outlines the process for evaluating flood impacts resulting from proposed developments on the floodplain. Melbourne Water may apply a risk-based framework when assessing development applications requiring a flood impact assessment. Applicants must follow these procedural steps when submitting their development application.

Step 1)	**Screen Development Application** Melbourne Water engineers/decision makers will follow internal procedures to assess risk and make informed decisions to determine whether the application is expected to cause a *significant change* to offsite flood impact. • If it is deemed that the application is expected to cause a *significant change* to offsite flood impact, **proceed to Step 2**, or • If it is deemed that the application is not expected to cause a *significant change* to offsite flood impact, the applicant must provide justification in the form of calculations supported by a fit-for-purpose flood impact assessment, documenting assumptions and findings.
Step 2)	**Model Proposed Development and Mitigate Flood Impacts** Applicant to undertake a flood impact assessment supported by computer flood modelling aiming to achieve zero afflux and no *detrimental impacts*. If all feasible mitigation measures have been explored and some detrimental flood impacts remain, a mitigation optioneering statement is to be prepared and approved before the remaining steps in this Practice Note can be applied. Submit a mitigation optioneering statement to Melbourne Water. **Proceed to Step 3.**
Step 3)	**Assess Existing Conditions Offsite Flood Risks** If it is deemed that the application is expected to cause a significant change to offsite flood impact, assess the existing conditions flood impact to determine the current offsite risks and land-uses. Several pathways and flood risk categories (one or more criteria) can be identified for a development application. **Proceed to Step 4**.
Step 4)	**Determine Allowable Offsite Flood Impact Tolerances** Using the offsite flood risk categories identified in Step 3 (based on one or more criteria under existing conditions), determine the allowable offsite flood impact tolerances for each land use listed in Table 3. **Proceed to Step 5**.
Step 5)	**Demonstrate Development Application Compliance** (including any mitigation measures) to Allowable Offsite Flood Impact Tolerances.

Step 1 – Screen development application

Some proposed developments, either by the nature of the development or the flood risk at the location of the proposed development, are not likely to cause a significant change to offsite flood impact and therefore are not required to provide detailed flood modelling to substantiate this determination.

Screening of development applications (including major projects) is to be done with Melbourne Water as part of a planning scheme statutory referral by the authorities or the pre-development advice application by the applicant. Refer to the technical guidance note (Appendix 1) for more information.

Generally, applications which are not expected to cause a *significant change* in offsite flood impacts include those relating to land use or development activities which are inconsequential when compared with other broader footprint and complex development activities. Typical examples may include the construction of:

- minor extensions to dwellings or outbuildings
- replacement fencing (like for like)
- carports
- pergolas
- in-ground swimming pool, and
- deck extensions that allow free flow of floodwater.

For these types of applications, hydrological and/or hydraulic calculations documented (with assumptions used) in a fit-for-purpose flood impact assessment demonstrating that flow conveyance and/or flood storage are not *significantly changed* is suitable for Melbourne Water review. Proposed development Planning Permit responses may include conditions such as requiring stumps instead of construction of a slab on-ground for a deck.

Model precision tolerance *may be considered in preliminary or modelled estimates of afflux. For instance, a tolerable afflux of less than 10 mm is considered to have a negligible adverse impact to the flood risk level in most cases. However, where inundation increases impact on flood levels that are at, or above, floor levels, or where increases are over large proportions of the model domain, zero afflux may apply.*

Step 2 – Model proposed development and mitigate impacts

Should the screening from Step 1 indicate that the development proposal is expected to cause a *significant change* (potentially or otherwise) in offsite flood impacts, the proponent may be required to undertake hydraulic modelling of the proposed development to quantify the flood impacts as part of the development application.

Should modelling show detrimental flood impacts caused by the development, mitigation measures should be assessed to identify a viable option(s) to alleviate the flood impacts. Mitigation options should be pursued with the intent of resolving all detrimental flood impacts. If all feasible mitigation measures have been explored and some *detrimental flood impacts* remain, a mitigation optioneering statement should be prepared, submitted and approved before the remaining steps in this Practice Note can be applied.

When applying this Practice Note any floodplain manager, statutory agency, or applicant, should ensure the model used to assess the flood categories of risk is fit-for-purpose and can assess flood impacts associated with a proposed development within the context of the extent of catchment urbanisation and urban planning controls. For major infrastructure projects, refer to Melbourne Water standards, AM STA 6100 Infrastructure Projects in Flood-Prone Areas.

Table 2 presents a mitigation optioneering statement example for a theoretical single dwelling development in the floodplain that causes some *detrimental flood impact*.

Table 2: Example mitigation optioneering statement

Prompt (applicant to provide as much detail as possible)	Response (example provided)
Does suitable space exist within the project/site boundary which could be excavated to increase flood storage?	*No, site is a residential lot with minimal yard space which is not suitable to significant excavation due to resultant slopes. Sub-floor required to be free draining and not appropriate for storage of water.*
Where a project has resulted in a significant loss of floodplain storage, have external sites been considered to offset this storage?	*No suitable sites adjacent or nearby. Neighbouring properties are developed residential lots or road reserve.*

Prompt (applicant to provide as much detail as possible)	Response (example provided)
Has the implementation of underground flood storage (e.g. oversized pipes) been considered?	*Yes, additional storage provided by large pipes (financially unfeasible) does not fully mitigate impact.*
Has the project caused a change in conveyance of floodwater? If so, have options to restore conveyance (e.g., orifice plates to restrict flow, additional culverts or excavation to increase flow, backflow prevention valves) been explored?	*Project has caused a change in conveyance.* *Offset of proposed development from the property boundary to allow for overland flow with provision for permeable fencing with 50% minimum opening.*
Where flow paths have been blocked or redirected, has every effort been exerted in restoring the original flow path?	*Yes, sides of property kept free of structures and obstructions.*
Have non-viable options been considered? If so, provide details.	*Culverts under house considered to allow flow to pass under the house.*
If the reasons for one or many potential mitigation options being unviable are related to finance, please provide a statement summarising the financial implication of these options.	*N/A – note no example provided here as every project will be unique in its financial capability and feasibility.*

Step 3 – Assess offsite flood risks under existing conditions (pre-development)

Where available, Melbourne Water will provide flood information including peak flow value (or hydrograph), flood levels and maps to enable establishing the existing or pre-development flood risk. If pre-development flood information is not available, the applicant may be required to determine the existing flood conditions by undertaking computer flood modelling by a suitably qualified consultant.

Where available, existing conditions flood information supplied by Melbourne Water should be utilised with consideration of the:

- age of mapping and technology employed
- type of model utilised, 1- or 2-dimensional, differential grid vs volumetric
- direction of flow, relation to local and regional hydraulic control
- representation of obstructions to flow within the floodplain
- modelling assumptions made, such as:
  - the catchment assumptions

  - the boundary conditions
  - joint probability considerations
  - the rainfall assumptions
  - the drainage network assumptions, and/or
  - the scale of the model.
- inputs into the model (such as LiDAR, survey or photogrammetry).

Using the existing flood information supplied by Melbourne Water or produced through existing conditions flood modelling, and the known current offsite land use(s), the applicant is to use the Flood Risk Assessment flow chart in Figure 1 to determine the flood risk categories (one or more criteria) identified for a development application by assessing the **offsite (only)** land affected by flooding under existing conditions.

This assessment should be undertaken with a **focus on areas of land affected, rather than at a property parcel level**. The Technical Guidance Note provides further guidance on how to assess offsite flood risks.

The assessment of flood risk, under existing conditions, and consideration of allowable flood impact tolerances have been informed by a literature review of approaches taken by road authorities, catchment management authorities and others throughout Australia. Refer to References for more information.

The following explanatory notes apply to the Flood Risk Assessment flowchart in Figure 1 when **applied to each area of land affected by flooding under existing and pre-developed conditions**.

- Is there expected to be a *significant change* to offsite flood impact?
  - *Significant change* is defined in the Definitions section of this Practice Note and Step 1 relates to screening the development application and provides additional guidance to respond to this question.
- Is there a flood control?
  - **Yes,** signifies a planning scheme zone or overlay applies to the land, as determined from the local planning scheme.
- Is the area otherwise a flood affected area?
  - **Yes,** signifies knowledge of information of a flood affected area outside the flood zone or overlays. It could be because flood mapping has been updated but not yet incorporated in a planning scheme, or it could be identified through flood maps connected with a designated special area liable to flooding (as per Reg 148 of the Victoria Building Regulations 2018) or identified as such on a plan of subdivision.
- In relation to the land use categories, these refer to the specific areas of the land affected by afflux and are not necessarily defined by the Vicmap parcel

land zoning or property scale typical land use. The Technical Guidance Note provides further guidance on how to interpret land use categories.

- With respect to farm properties:
  - A farmhouse should be assessed as a residential dwelling.
  - Farm buildings should be assessed as either a residential or commercial/industrial building.
- Building finished floor levels should be determined by way of survey, site inspection or other approved estimation method as described in the Technical Guidance Note. Determination of floor levels will support assessment of flooding above/below floor level and identification of the flood risks category.
- If the flooding above/below floor level or non-urban use for pasture or crops cannot be ascertained, the high flood risk category in the area of land use identified must be selected (conservative assumption).

If there are multiple offsite uses, assessment of several risk categories may be required due to the possibility of multiple pathways.

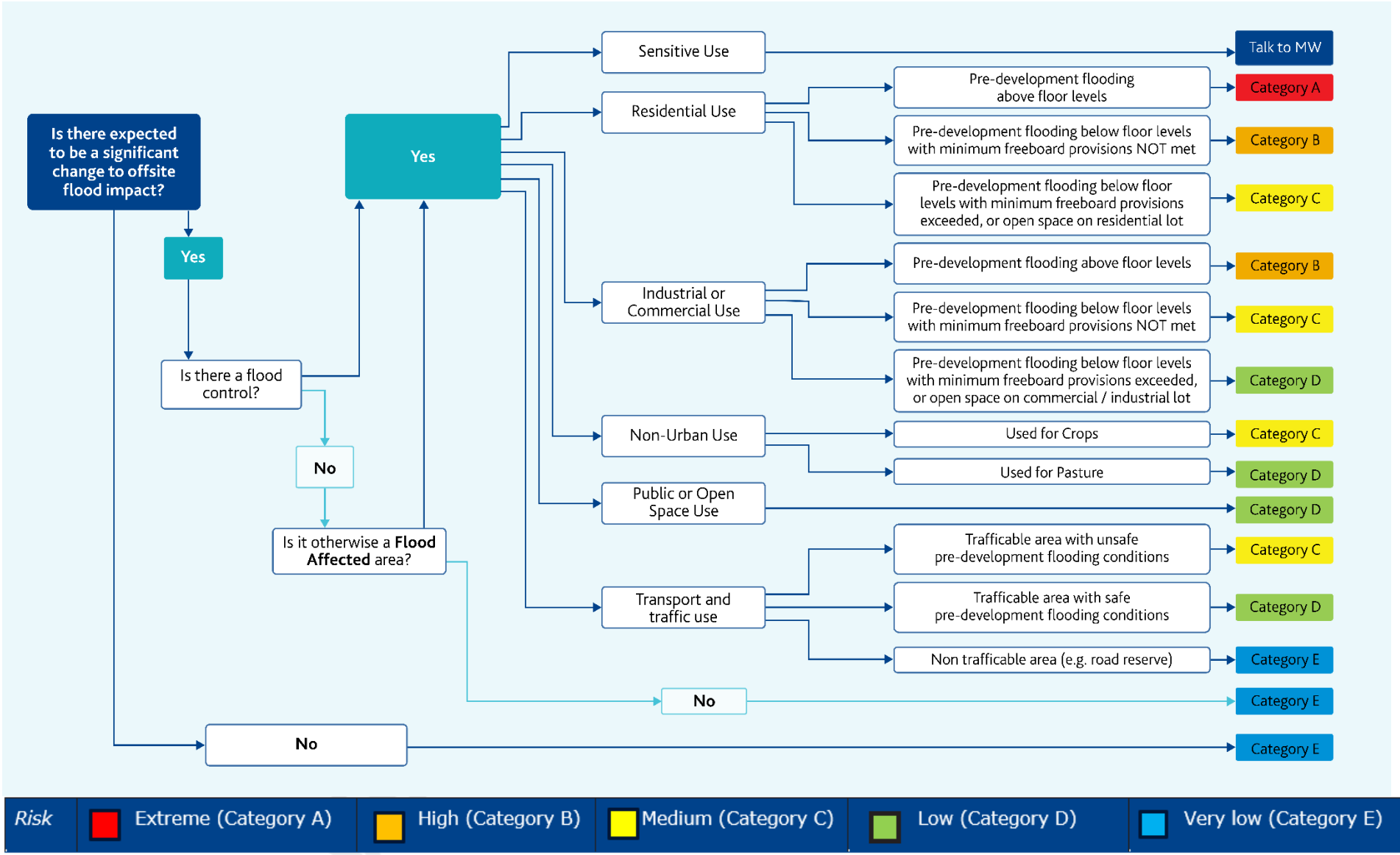
Flood risk categories

The Flood Risk categories outlined in Figure 1 (Flood Risk Assessment flowchart under the existing conditions and further explained in Table 3) have been determined as follows:

- '**Very Low**' Flood Risk:
  - no detrimental flood impact on adjoining properties.
- '**Low**' Flood Risk:
  - no significant change in terms of an increase in area flooded
  - no above floor flooding of nearby properties, and
  - 100 mm afflux is not expected to have any *significant change* in terms of additional impact to back/front yards, open space, paddocks or crops, considering the duration of flooding, velocities and depths of flooding.
- '**Medium**' Flood Risk:
  - no significant change in terms of an increase in area flooded
  - no above floor flooding of nearby properties, and
  - 50 mm afflux is not likely to have any *significant change* in terms of an additional impact to back/front yards, open space, paddocks or crops, considering the duration of flooding, velocities and depths of flooding.
- '**High**' Flood Risk:
  - no significant change in terms of an increase in area flooded, and
  - no above floor flooding of nearby properties.

- '**Extreme**' Flood Risk:
  - any afflux is likely to have an impact on adjoining properties, causing significant change with respect to risk to human life, economic loss, social disruption and / or potential for litigation
  - significant change by way of an increase in area flooded, and
  - above floor flooding of nearby properties
  - land currently outside the relevant flood overlay will flood.
- A '**Talk to Melbourne Water'** flood risk category is assigned to Flood Risk Assessment impacting sensitive use, defined in 'Definitions' with further direction provided in the supporting Technical Guidance Note.

Figure 1: Flood Risk Assessment Flowchart for application to Existing conditions flooding



Step 4 – Determine allowable offsite flood impact tolerances

Table 3: Allowable offsite flood impact tolerances based on existing conditions flood risk category

Category	Risk level (Consequence × Likelihood)	Allowable Afflux·	Flood hazard requirement	Duration of inundation	Other considerations
A	Extreme	Up to 10 mm	No substantial increase in category	**Above 1 hour** (existing), the duration of inundation may be increased by no more than 10% for the critical design event. Below 1 hour, increases up to 1 hour total (developed) may be accepted.	• Where inundation increases impact on flood levels that are at, or above, floor levels, zero afflux may apply • No *negative substantial change to* post-development above floor level inundation tolerable (residential use) • No negative *substantial change* in the level of service provided by existing infrastructure.
B	High	Up to 30 mm	No substantial increase in category	**Above 1 hour** (existing), the duration of inundation may be increased by no more than 10% for the critical design event. **Below 1 hour**, increases up to 1 hour total (developed) may be accepted.	• No post-development above floor level inundation tolerable (residential use) • Where inundation increases impact on flood levels that are at, or above, floor levels, zero afflux may apply • No negative *substantial change to* post-development above floor level inundation (industrial or commercial use) • No negative *substantial change* in the level of service provided by existing infrastructure.
C	Medium	Up to 50mm	No substantial increase in category	**Above 1 hour** (existing), the duration of inundation may be increased by no more than 10% for the critical design event. **Below 1 hour**, increases up to 1 hour total (developed) may be accepted.	• Retain at least minimum freeboard provisions to buildings floor level (residential use) • No post-development above floor level inundation (industrial or commercial use) • No negative *substantial change* in the level of service provided by existing infrastructure.

Category	Risk level (Consequence × Likelihood)	Allowable Afflux	Flood hazard requirement	Duration of inundation	Other considerations
D	Low	Up to 100mm	No substantial increase in category	**Above 1 hour** (existing), the duration of inundation may be increased by no more than 10% for the critical design event. **Below 1 hour**, increases up to 1 hour total (developed) may be accepted.	• Retain at least minimum freeboard provisions to buildings floor level (industrial or commercial use) • No negative *substantial change* in the level of service provided by existing infrastructure.
E	Very Low	N/A	N/A	N/A	• No detailed flood impact assessment required. • Flood risk to be managed by conditions and on a case-by-case basis.

The following notes apply to the allowable offsite flood impact tolerance thresholds, by comparing change between pre- and post-development conditions, in Table 3:

- Afflux should be calculated with model outputs rounded to the nearest 3 decimal place in metres and then shaded as per the defined legend provided in Appendix 2 - Preferred afflux thematic mapping.
- A tolerable afflux of less than 10 mm is considered to have a negligible adverse impact to the flood risk level in most cases. However, where inundation increases impact on flood levels that are at, or above, floor levels, or where increases are over large proportions of the model domain, zero afflux may apply. Adopting a 10 mm tolerable limit on afflux is consistent with industry practice, including:
  - Glenelg Hopkins CMA, Flood Modelling Guidelines and Specifications, August 2024; and
  - NSW Department of Transport and Main Roads, Technical Guideline, Hydrologic and Hydraulic Modelling, January 2024.
- Flood hazard, and flood hazard classifications are taken as defined within ARR 2019, Book 6 Chapter 7. Flood hazard is a function of the estimated flood depth and velocity.
- Localised afflux, increased flooded area, higher hazard category and/or duration of inundation affecting isolated areas of land smaller than 10 m^2 in surface area per property parcel is considered to not have a *significant change* on the flood risk under any risk level.
- The duration of inundation tolerances applies only to a single design storm.
  - If the expected existing duration of inundation is longer than 1 hour, the duration of inundation may be increased by no more than 10% for the critical design event, unless downstream of a retarding basin as per the following note.
  - Generally, the duration of inundation tolerances does not apply when assessing impacts directly downstream of a retarding basin. As per ARR 2019, Book 1, Chapter 5.8 and Book 9, Chapter 4. Retarding basins (by design) store and slowly release volumes of water at discharge rates at or below existing conditions for long periods of time. Hence, it is likely that retarding basins will, by design, increase the duration of inundation downstream.
  - The 1-hour duration of inundation trigger is consistent with the requirements of planning scheme Clauses 53.18-4 and 56.07-4 for urban settings.

The allowable afflux tolerances for the medium and low risk categories align with the limits for residential, industrial and commercial zoned land for Major Projects Conditions of Approval, in accordance with the requirements laid out in the NSW Department of Planning and Environment (DPE) Flood impact and risk assessment as part of the NSW DPE Flood Risk Management Manual 2023. Examples can be found on the NSW DPE planning portal.

Step 5 – Demonstrate development application compliance

Once allowable offsite impact tolerances have been determined under existing conditions offsite risks and land uses from Figure 1 and Table 5 above, the applicant will be required to undertake post-development flood modelling, including incorporation of mitigation measures required. This should demonstrate that the flood impacts expected lie within the allowable offsite impact tolerances for each offsite land use area type.

Land use areas which were dry (under pre-developed conditions) now wet (under post-development conditions) should also be assessed using the Flood Risk Assessment flowchart (Figure 1) to determine the flood risk category, and Table 5 to determine the allowable offsite flood impact tolerances. **Areas of increased flood extent are to be assessed as an increase in flood hazard.**

Refer to the Technical Guidance Note for direction on the evidence and deliverables expected to be provided to Melbourne Water for development assessment.

Appendix 1. Technical Guidance Note

This technical guidance note provides detailed direction on interpreting and applying the Flood Impact (Afflux) Practice Note to support compliance with floodplain development impact assessment requirements.

It is intended for use by statutory authorities and advisers to development applicants when evaluating the potential effects of proposed developments on flood levels and flood risk.

The technical guidance note is tailored for a technical audience, including Melbourne Water service providers, internal and external modelling professionals, and third-party consultants who prepare flood impact assessments for Melbourne Water's review and approval. It should be read in conjunction with the Flood Impact (Afflux) Practice Note to ensure consistent and informed application.

There are key steps that should be followed to effectively apply this Practice Note. This section provides detailed guidance on each key step, outlines the necessary information, and highlights helpful resources to support the assessment process.

Getting started

Before submitting a development proposal, it's important to carry out a thorough due diligence check. This means identifying any planning controls that apply to the site. Two key resources to help get started include:

- **Planning Property Report** - this publicly available report provides essential information for your site and is available on the VicPlan website from the Department of Transport and Planning.
- **Flood planning controls** - there are four types of flood-related planning controls that may require consent from Melbourne Water before council can issue a planning permit. To learn more, visit the Flood planning controls explained page on the Melbourne Water website.

A development site not affected by any flood controls in the Planning Scheme does not mean it is not affected by flooding. Clause 65.01 of the Victoria Planning Provisions stipulates that the responsible authority must consider flood and erosion hazards before deciding on an application or approval of a plan.

Additional flood related due diligence should be made by contacting statutory agencies (Melbourne Water or Council) to seek flood related information that may be relevant to the development site. This includes:

- Melbourne Water's Pre-Development Application Service may assist in providing some information and guidance, such as flood level data, flood extents and levels to help you understand flood-related considerations for your site. They may also provide information about Melbourne Water assets, waterways, reserves, and easements that may impact your proposal.
- The local government authority (i.e., Council) where the development site is located, should also be contacted to find out if any flood records or reports are available that can provide information on whether the site is flood-prone.

A development site located nearby to a large drainage pipe (i.e., 900 mm and above), overland channel and/or waterways may be susceptible to overland flooding.

Information required in flood-prone areas

If the development site is known to be affected by flooding, you should request the following information from Melbourne Water:

- Applicable flood level(s) at the development site.
- Applicable flood requirements relevant to the proposed development, including:
  - If the development application is required to provide a detailed flood impact assessment (supported by computer flood modelling) or a basic flood impact assessment (supported by hydrological and/or hydraulic calculations).
  - Design storm(s) required to assess flood risks against.
  - Flood level protection (minimum freeboard).
- Copies of flood maps showing the relevant design storm(s) peak flood levels, hazard classifications (or depths and velocities), and duration of inundation typically above a threshold depth (e.g., 350 mm) for the critical duration (if available).
- Land use maps

- Flood flow values or hydrographs for the relevant design storm(s) to be assessed to inform computer flood modelling if required).

Note not all of the above information may be available. In some cases, the applicant will be required to determine existing flooding conditions for the application to proceed.

An understanding and description of the existing (pre-development) conditions is required using flow conveyance and flood storage terminology.

Datasets required to apply the Practice Note

In some cases, multiple flooding mechanisms may be present (such as, riverine and overland/stormwater inundation). In these cases, both mechanisms must be investigated and the Practice Note applied to each individually.

Table 4 presents a checklist of required input datasets needed to apply the Practice Note. It includes:

- Development site property address and spatial boundary (as a GIS file and/or visible on maps), or project boundary (as applicable), critical to distinguish between onsite and offsite flood impacts. The flood impacts assessment and allowable offsite flood impacts tolerances **only apply to offsite** flood impacts.
- Utilising the existing flood information supplied by Melbourne Water or produced through existing conditions flood modelling, and the known offsite **current and approved future land uses**, the applicant is to utilise the Flood Risk Assessment flowchart to determine the flood risk categories.
    - Current land uses are to be assessed and not future using recent (not obsolete) aerial imagery, rather than planning scheme zoning. This is to base the flood risk assessment on current land conditions, acknowledging rezoning, staging and delays in future land development.
    - The flood risk assessment for application to existing conditions should be undertaken with **a focus on the usage of the area of land affected by flooding**, rather than on the overall property land use zoning. For example, a property zoned "General Residential' would include the following areas of land: residential dwelling, trafficable driveway, backyard.
- **Finished Floor Levels** for buildings impacted by offsite flood risks due to existing conditions should be determined through direct survey or estimated using alternative ground elevation methods, such as LiDAR. In cases where flood levels are at, or near floor level, survey data is preferred to more accurately assess the potential flood risk. Supporting information should include

photographs/images and calculations detailing data sources, assumptions, and indicative accuracy levels. This should be accompanied by either:

- On-site measurements and observations, or
- Desktop-based assessments, such as Google Earth or Street View.

If the flooding above/below floor level or non-urban use for pasture or crops cannot be ascertained, the highest flood risk category in the area of land uses identified must be selected (conservative assumption).

- Areas of land use affected by existing conditions flooding categorised as 'Sensitive use' (sensitive environment/waterways) should be derived by reviewing the Melbourne Water Healthy Waterways Strategy reporting website and engaging with Melbourne Water to check the potential additional requirements for development near sensitive waterways.
- Area of land uses affected by existing conditions flooding categorised 'Sensitive Land use' (sensitive infrastructure or vulnerable people) should be derived by inspecting the Vicmap Features of Interest vector layer (points) crossing over existing conditions flooding with the following feature types:
  - Education centre (i.e., primary school, secondary school, special school).
  - Emergency facility (i.e., ambulance station, fire station, SES unit, police station).
  - Hospitals
  - Care facility (i.e. childcare, aged care)

Table 4: Checklist for Practice Note application

Dataset description	Collected (Yes/No)	Purpose
Development site property address and spatial boundary (as a GIS file and/or visible on maps)		To distinguish between onsite and offsite *flood impacts*. Onsite impacts may include *afflux* above allowable offsite *flood impacts* tolerances (but acceptable) due to onsite fill raising the post-development flood level.
Copy of Melbourne Water Pre-Development Advice letter (ideally no older than 3 months)		To check development application requirement (detailed or basic impact assessment) – Practice Note Step 1.
Planning zoning and flood controls map(s)		To commence assessing *Existing Conditions* Offsite *Flood Risks* using the Practice Note *Flood Risk* Assessment Flowchart.

Dataset description	Collected (Yes/No)	Purpose
Finished Floor Levels for buildings affected by *Existing Conditions* Offsite *Flood Risks* (via survey or other estimation methods as detailed herein)		To estimate if pe-development flooding affecting residential dwellings, industrial, commercial or other buildings is above floor levels, below floor levels (within or without minimum freeboard protection).
Locality map(s) showing a recent high-resolution aerial imagery of the development site and surrounding properties affected by Existing Conditions flooding.		To estimate as accurately as possible the usage of the area of land affected by flooding. For example, a road reserve may be made up of 3 areas of land affected by flooding: roadway (in the middle), footpath (on one side) and open space (open drain on the other side).
Vicmap Features of Interest vector layer (points) crossing over Existing Conditions flooding.		To locate facilities vulnerable to flooding expected to be categorised as 'Sensitive use' and need discussion with Melbourne Water.
Existing and Developed conditions flood level map(s) and/or raster modelling file(s) representing the critical duration. **Use TUFLOW output h_Max (or equivalent) for water level**		To allow comparison of change in flood level (afflux) against the allowable offsite flood impacts tolerances. Acceptable data type: raster (.ers / .flt / .tif)
Existing and Developed conditions flood hazard classification (H1 - H6) or hazard category map(s) and/or raster modelling file(s) representing the critical duration. **Use TUFLOW output ZAEM1 (or equivalent) for hazard classifications** (preferred)**, or Z0 (or equivalent) for hazard category.**		To allow comparison of change in flood hazard (classifications or category) against the allowable offsite flood impacts tolerances. Acceptable data type: raster (.ers / .flt / .tif)

Dataset description	Collected (Yes/No)	Purpose
Existing and Developed conditions duration of inundation above a depth threshold (e.g. 350 mm) map(s) and/or raster modelling file(s) representing the critical duration. **Use TUFLOW output TDur_<cutoff> (or equivalent) for duration of inundation**		To allow comparison of change in duration of inundation (classifications or category) against the allowable offsite flood impacts tolerances. Acceptable data type: raster (.ers / .flt / .tif)

Demonstrating compliance

To demonstrate development application compliance, the following guidance should be followed to facilitate flood impact assessment review and approval by Melbourne Water:

- Flood Impact Assessment reporting is to be submitted. Single memos or reports (attached to an email) are the preferred method for submission including:
  - **Locality map(s)** showing a recent aerial imagery of the development site and surrounding properties expected to be impacted by flooding.
  - **Topography map(s)** showing the development site, catchment and surrounding properties expected to be impacted by flooding.
  - **Planning zoning map(s)**
  - **Flood overlay(s) map(s)** or related knowledge to gauge the baseline flooding conditions including hazard, risk, past records (i.e. loss of life, damages, etc.) and if a planning control exists.
  - Finished Floor Levels survey or estimation methods with justification.
  - Data sources and modelling methodology with justifications.
  - **Mitigation detail(s)** to allow assessor to understand the purpose and extent of the development, the baseline flood conditions and mitigation assessment including constraints, opportunities and limitations.
  - **Afflux map(s)** using the Practice Note preferred thematic mapping (in GIS and pdf formats).
  - **Supporting documents, calculations, graphs or maps** to demonstrate no substantial cumulative impacts from the development.
  - **Allowable offsite flood impacts tolerances table** reporting the pre- and post-development flood level, hazard classification or category; and duration of inundation for each land use area type impacted by afflux and where dry under pre-developed conditions but wet under post-development conditions.

If the development application achieves “no-objection afflux” as per the Practice Note, a final proposed and tested mitigation strategy is to be detailed in the report with associated modelling assumptions.

Appendix 2. Preferred afflux thematic mapping

Afflux mapping

It is recommended that afflux plots be shaded as per Table 5, below to facilitate internal review by Melbourne Water.

Table 5: Recommended afflux thematic for plot mapping

Label	Lower Band Value	Upper Band Value	Colour RGB	Colour
Was Wet Now Dry			37, 197, 90	
< -100mm		-100mm	96, 92, 156	
-100 to -50 mm	-100mm	-50mm	86, 169, 214	
-50 to -30 mm	-50mm	-30mm	118, 226, 215	
-30 to -10 mm	-30mm	-10mm	34, 242, 233	
-10 to 0 mm	-10mm	0mm	222, 226, 223	
0 to 10 mm	0mm	10mm	174, 183, 177	
10 to 30 mm	10mm	30mm	244, 173, 110	
30 to 50 mm	30mm	50mm	233, 111, 83	
50 to 100 mm	50mm	100mm	244, 67, 28	
> 100 mm	100mm		181, 41, 9	
Was Dry Now Wet			299, 17, 183	

Hazard Mapping

It is recommended that hazard plots be shaded as per Table 6 to facilitate internal review by Melbourne Water.

Table 6: Recommended Flood Hazard thematic for plot mapping

Hazard Category	Colour RGB	Colour
H1	143, 170, 255	
H2	189, 231, 255	
H3	117, 213, 142	
H4	194, 229, 155	
H5	255, 255, 147	
H6	255, 176, 137	

Definitions

The table below details definitions which are relevant for the purpose of this Practice Note.

Table 7. Definitions used in this Practice Note

Term	Meaning
afflux	The theoretical difference between the post-*development* and the pre-*development* flood level estimate i.e., a change in water level.
aleatory uncertainty	Uncertainty that arises through natural randomness or natural variability that we observe in nature.
annual exceedance probability (AEP)	The probability of occurrence of a *flood* of a given size or larger happening in any one year. *AEP* is usually expressed as a percentage, e.g., 1% *AEP*.
critical duration	The storm burst duration that produces the peak *flood* estimate for the catchment when ensembles of various storm durations are simulated.
cumulative flood impact	A potential overall *flood impact* generated by numerous smaller scale changes to floodplain function.
design event / design flood event	The theoretical *flood* event selected for design and planning purposes that is used to define the *level of service* for infrastructure or for land use planning and building systems. In Victoria, for most types of *development* or infrastructure, this is the 1% *AEP flood* (or 100-year ARI *flood*).
development	Changes to *existing conditions* within a catchment, including the construction, alteration or demolition of a building or works and the subdivision or consolidation of land.
detrimental	*Detrimental* means harmful or damaging. A *detrimental flood impact* tends to result in health issues, financial losses, environmental degradation, service disruptions, and physical damage.
duration of inundation	The duration that a particular location is inundated in one isolated storm event. This is a separate concept to "Critical Duration".
feasible	A flood mitigation option is considered feasible if it is physically and financially achievable, and likely to succeed.

Term	Meaning
existing or pre-developed conditions	Catchment conditions prior to a development or structural change within a catchment.
epistemic uncertainty	Uncertainty that is associated with the state of knowledge of a physical system (our estimation of reality), our ability to measure it and the inaccuracies in our predictions of the physical system.
flood	A natural phenomenon that occurs when water covers land that is normally dry. This can be categorised as riverine, coastal or stormwater flooding, and is caused by runoff from rainfall, high tides and / or storm surge.
flood affected	Land expected to be inundated by the current best estimate of the design flood event.
flood control	A zone or overlay in the relevant planning scheme that applies to the land and includes the Urban Floodway Zone, Floodway Overlay, Land Subject to Inundation Overlay and Special Building Overlay.
flood estimation model	Computer representation of a flood, based on both theoretical data and statistical extrapolations, using mathematical estimations of the physical processes involved in runoff generation and stream flow.
flood frequency analysis	A technique used to relate the magnitude of flow peaks or volumes to their frequency of occurrence using statistical analysis. This can take the form of a statistical analysis of gauged data (see Australian Rainfall & Runoff-A Guide to Flood Estimation Version 4.2 [2019] (ARR2019), Book 3 Chapter 2) or rainfall (see ARR 2019 Book 2) - Not to be confused with level of service as defined herein.
flood hazard	A metric of flood behaviour relating to the stability of people, vehicles and buildings when subjected to flood flows, based on estimates of depth, velocity and the product of the depth and velocity. Generic classifications of hazard are provided in Figure 6.7.9 of ARR 2019.
flood impact	The likely change to one or more theoretical metrics associated with flood behaviour. See Section 3.
flood mitigation	The strategies implemented to manage and reduce adverse flood impact (defined above) usually adopted to protect or improve lives, property, and the environment.

Term	Meaning
flood risk	The potential risk of flooding to people, their social setting and their built and natural environment.
freeboard	The vertical buffer above the design flood level, used as a safety margin when setting floor levels, car park entrances, and similar features. It accounts for wave action, local flow effects, and uncertainties in the estimated 1% AEP flood level.
hydraulic control	A structure or natural formation that dictates upstream or downstream flow conditions.
level of service	The serviceability of a piece of infrastructure during a flood event of a particular magnitude (i.e., AEP). This can be considered the maximum AEP at which the infrastructure is operational.
risk	A product of the consequences of an event (including changes in circumstances) and the associated likelihood of occurrence.
risk category	A category that triggers different thresholds for afflux and other requirements, based on an assessment of risk.
sensitive use	These are uses identified periodically by Melbourne Water that are particularly vulnerable to flood impacts because of the nature of the use (e.g. hospital, emergency services facilities), the nature of the users (e.g. school children, elderly retirement village, babies and toddlers at child care or kindergarten) or the nature of the environment (e.g. threatened species, eroded waterways). This does not constitute an exhaustive list. Further direction is provided in the supporting Technical Guidance Note.
service life exceedance probability (SLEP)	The probability of exceedance during a project's adopted service life, rather than as an annual probability (i.e., its AEP).
significant change	A change that is considered to have a detrimental flood impact on the floodplain.
substantial change	A change that, to a great extent, affects a situation or decision. In the context of flood mapping output plots, a change of a few, or small amount of, pixels in isolation would likely not be a substantial change.
trafficable	Intended/designed to be traversed by vehicles or pedestrians.

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