

Planning for sea level rise

Interim guidelines - Assessing development in areas prone to tidal inundation from sea level rise in the Port Phillip and Westernport Region



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New flood levels for areas affected by predicted sea level rise

The Victorian Government has asked relevant authorities to begin planning for a sea level rise of no less than 0.8m by 2100.

In response and consultation with the Department of Sustainability and Environment, Floodplain Management Unit and Coastal Catchment Management Authorities, Melbourne Water has adopted new 100 year flood levels to support a flexible approach to predicted sea level rise.

The flood levels to be applied for planning purposes are an increase on the existing 2010 100 year flood levels of 200mm by 2040 and 800mm by 2100.

Table 1 Applicable flood levels for planning development purposes to Australian Height Datum (AHD)

Region	Existing 100yr flood level	Applicable 2040 100yr flood level	Predicted 100yr flood level for 2100
Port Phillip	1.6m	1.8m	2.4m
Western Port	2.7m	2.9m	3.5m

Based on the Intergovernmental Panel on Climate Change (IPCC) Scenario 2 and taking into consideration the uncertainty associated with sea level rise projections, these new 100 year flood levels should be used in accordance with the principles and core requirements contained in Melbourne Water's *Guidelines for Development in Flood-prone Areas*.

Benchmarks for flood levels

Floor levels for the redevelopment of existing buildings or new buildings and apexes of the entry/exit driveways of basement car parking within existing development zones should be set 600mm above the relevant 2040 flood level. This level has been set to accommodate the uncertainties associated with tidal inundation (such as wave action and other storm surge activity) and is consistent with Melbourne Water's practice in relation to open waterways.

Table 2 Applicable floor levels for development planning purposes to AHD

Region	Applicable 2040 100yr flood level	Existing Development Zone floor level	Isolated Residential/ Major Development floor level
Port Phillip	1.8m	2.4m	3.0m
Western Port	2.9m	3.5m	4.1m

The application of 2040 flood levels to determine minimum floor levels when assessing development proposals is based on an assumption that residential buildings typically have a lifespan of 30 to 40 years before some form of redevelopment occurs – either through a new dwelling, redevelopment or addition to the building.

This approach also recognises the potential significant risks from sea level rise and that the accuracy of sea level rise projections will improve over time.

Before minimum floor levels can be determined, the following points also need to be considered:

- Planning decisions should reflect sea level rise projections for the same period as the intended timeframes of the assessment.
- Local conditions such as isolation and the asset life of development proposals should be taken into account when setting flood levels at the detailed design stage.
- Major developments that significantly increase flood damage potential or the number of occupants at risk of flooding require a detailed assessment of the flood risk. This includes an assessment of wave set up and wave run up and how flood risk can be mitigated.

Application of flood levels for planning purposes

The following examples have been developed to assist in determining minimum floor levels for development proposals.

Example 1 - Property at risk of tidal inundation, but not subject to catchment flooding (Port Phillip Bay)

The redevelopment of existing buildings or new buildings within existing development zones should be assessed on a flood risk with a 30 year time horizon (i.e. 2040). While the existing 100 year flood level for Port Phillip Bay is 1.6m AHD, the flood level that should be used when assessing this property is the 2040 flood level of 1.8m AHD.

Region	Existing 100yr flood level	Applicable 2040 100yr flood level	Predicted 100yr flood level for 2100
Port Phillip	1.6m	1.8m	2.4m
Western Port	2.7m	2.9m	3.5m

In this case, Melbourne Water would advise that all new development on this site requires a minimum finished floor level of 2.4m AHD – which is 600mm above the highest flood level (1.8m AHD) applicable to the property.

Example 2 – Isolated (rural) residence/subdivision and major development

The development of an isolated rural residence/subdivision or major development should be assessed against the highest predicted flood level (i.e. 2100). Major developments are characterised by an intensification of flood risk which would include the introduction of a large numbers of people to a site/area (e.g. the construction of schools, childcare centres, hospitals, nursing homes and large scale residential developments).

Major developments that significantly increase flood damage potential or the number of occupants at risk of flooding require a detailed assessment of the flood risk. This includes an assessment of wave set up and wave run up and how flood risk can be mitigated.

Region	Applicable 2040 100yr flood level	Predicted 100yr flood level for 2100	Isolated Residential/ Major Development floor level
Port Phillip	1.8m	2.4m	3.0m
Western Port	2.9m	3.5m	4.1m

If located on Port Phillip Bay, Melbourne Water would advise that all new development on this site requires a minimum finished floor level of 3.0m AHD – which is 600mm above the predicted 2100 100 year flood level (2.4m AHD) applicable to the property.

If located on Western Port, Melbourne Water would advise that all new development on this site require a minimum finished floor level of 4.1m AHD – which is 600mm above the predicted 2100 100 year flood level (3.5m AHD) applicable to the property.

Melbourne Water's role in planning for sea level rise

Melbourne Water Corporation (MWC) has functions as a Water Authority under the *Water Act 1989*, and as the Floodplain Management Authority under the *Planning and Environment Act 1987*. Melbourne Water is also a Section 55 referral authority for planning permit application, listed in Clause 66.03 of the Victorian Planning Provisions.

As the floodplain management authority for Melbourne's waterway management district, Melbourne Water's functions relate to flooding caused by tidal inundation. This includes providing advice to councils on flooding and development controls, as well as consideration flooding and projected rises in mean sea levels. However, this does not extend to factors contributing to coastal physical vulnerability such as storm surge and erosion.

While councils may also request a Coastal Vulnerability Risk Assessment, it is not Melbourne Water's role to provide comments and approval on these assessments.

New requirements

Traditionally, Melbourne Water's role as floodplain manager has been to consider flooding from the urban drainage system and waterway flooding.

However, Clause 13.01 of State Planning Policy now requires 'decision makers' to consider flood risks associated with an increase in sea level of not less than 0.8m by 2100, and to ensure that this is factored in to the approval of the location and design of new developments.

Melbourne Water is required to provide this advice in its role as a referral authority for planning permit applications where land has been identified as being subject to inundation in Municipal Planning Schemes.

Advice is given under the provisions of Clause 66 of Municipal Planning Schemes, in accordance with Section 55 of the Planning and Environment Act 1987.

Where flooding information has not been included in the planning schemes and where arrangements have been entered into with councils, Melbourne Water can provide advice in accordance with the provisions of Section 52 of the *Planning and Environment Act 1987*.

Melbourne Water's process for determining flood levels

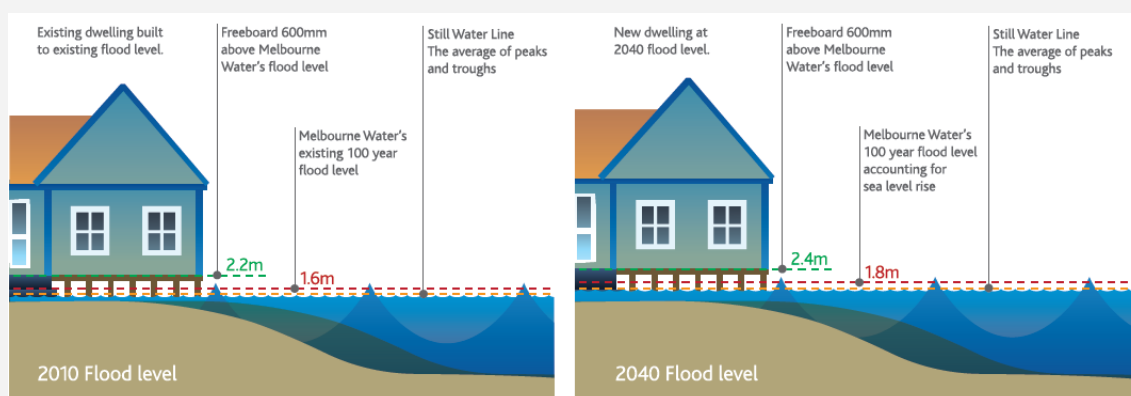
For almost 20 years Melbourne Water has been applying flood levels for the northern end of Port Phillip Bay and Western Port. The process for determining these levels involves the review of all available data on flood events and flood levels from 1874 to 1939 and 1944 to 1984.

Melbourne Water tidal flood levels (vs) CSIRO tidal flood levels

It should be noted that the 100 year tidal flood levels adopted by Melbourne Water are different to those contained in the CSIRO report -The Effect of Climate Change on Extreme Sea Levels in Port Phillip Bay (2009). This is because Melbourne Water's process considers all available records on flood events and flood levels, while the CSIRO does not factor in tide levels regarded as outliers (i.e. severe storm events/levels considered to be statistical anomalies). For example, in calculating the existing 100 year sea level at St. Kilda, the CSIRO calculated a level of 1.15m AHD, whereas Melbourne Water calculated a level of 1.4 m AHD (both for still water with no wave action).

Allowing for wave action

CSIRO flood levels are based on "still water" levels, which are an average of the peaks and troughs of any wave action. However, it is the peaks of the waves that should be considered when setting floors levels. Property damage is increased significantly when floors become wet - even if only for a short period of time.



NOTE: Melbourne Water's flood levels make some allowance for wave action. However, when assessing an application for a planning permit, consideration should always be given to the adequacy of these levels based on the location of the development.

Tidal Data for Port Phillip Bay

A Bay level of 1.52m AHD was “recorded” at Williamstown during the 1934 flood event. This level was accepted by the Melbourne and Metropolitan Board of Works, (MMBW) and was rounded up to 1.6m AHD as a starting water level for flood modelling on various waterways.

A further study was undertaken by the MMBW Hydrology and Flood Warning Unit in 1987. Tide levels during November to December 1934 - flood high tide frequency analysis found that the maximum level at Williamstown in the 1934 flood event was more likely to have been 1.33m AHD. As part of the same study, the frequency analysis of tide charts determined the flood level for a 100 year average recurrence interval (ARI) event to be 1.3m AHD.

In 2009, Melbourne Water completed a frequency analysis study of all available data for St Kilda Marina. Using 31 years in available data, this study found that a reasonable flood level for a 100 year ARI event to be 1.4m AHD. This analysis included a July 2004 recorded still tide level of 1.29m AHD.

Melbourne Water’s existing 100 year flood level of 1.6m AHD provides a minor allowance for wave action.

Flood level increases for Port Phillip Bay from the existing 1.6m AHD to the predicted 100 year flood level of 2.4m AHD include the same minor allowance for wave action.

Tidal Data for Western Port

A high tide of 2.63m was reported at Tooradin Jetty in the 1934 flood event. The Rural Water Commission of Victoria rounded this up to 2.7m AHD for their Koo Wee Rup Area Guidelines, produced in 1988. It is assumed that this level includes an allowance for wave action.

The Devon Meadows – Cannons Creek Drainage Study, carried out by Associate Professor John Hinwood in 1983, calculated 100 year tide levels for Eagle Rock (east of Tyabb) to be 2.14m AHD and 2.19m AHD for Warneet. Allowing for wind effect, 100 year flood levels were calculated to be 2.44m AHD for Eagle Rock and 2.54m AHD for Warneet.

Conclusion and Supporting information

Melbourne Water will continue to work with relevant agencies to monitor sea level rise observations and projections and will periodically review these planning benchmarks.

For further information about Melbourne Water's approach to planning for sea level rise contact Bruce Rush Team Leader Town Planning (03) 9235 2146.

Policy references

The Victorian Coastal Strategy 2008

The *Victorian Coastal Strategy 2008* (VCS) was released in December 2008. The strategy listed a numbers of policies and actions to deal with the impacts of climate change on the Victorian coast. A key action is the requirement to begin planning for sea level rise of not less than 0.8m by 2100.

Victoria Planning Provisions Clause 13.01: Climate change impacts

This requirement of the VCS has now been included in the Victoria Planning Provisions, at Clause 13.01. Specifically this policy, (Clause 13.01-1: Coastal inundation and erosion) states that decision making by planning authorities and responsible authorities should:

- Plan for sea level rise of not less than 0.8 metres by 2100, and allow for the combined effects of tides, storm surges, coastal processes and local conditions such as topography and geology when assessing risks and coastal impacts associated with climate change
- Apply the precautionary principle to planning and management decision making when considering the risks associated with climate change
- Ensure that new development is located and designed to take account of the impacts of climate change on coastal hazards such as the combined effects of storm tides, river flooding, coastal erosion and sand drift
- Ensure land subject to coastal hazards is identified and appropriately managed to ensure that future development is not at risk
- Avoid development in areas susceptible to inundation (both river and coastal), erosion, landslip/landslide, acid sulphate soils, wildfire and geotechnical risk.

Ministerial Direction No.13

The Minister for Planning issued Direction No. 13, Managing Coastal Hazards and the Coastal Impacts of Climate Change, which is applicable to any planning scheme amendment that provides for the re-zoning of non-urban land for urban use and development of all land abutting the coastline or coastal reserve and land if it is less than 5 metres AHD elevation within one kilometre of the coastline. The Ministers direction stated that in preparing an Amendment the planning authority must consider:

- If the proposal is consistent with Clause 13.01
- Addresses the current and future risks
- Is based on an evaluation of the potential risks and presents an outcome that seek to avoid or minimise exposing future development to projected coastal hazards
- Ensures new development is suitably located designed and protected from coastal hazards.

General Practice Note, Managing Coastal Hazards and the Coastal Impacts of Climate Change (December 2008)

The Department of Planning and Community Development have prepared a practice note that among other things makes it clear that the impacts of climate change on coastal hazards also needs to consider development of individual parcels of land within existing zoning and overlay provisions within planning schemes.

The practice note also states that the precautionary approach is an accepted principle in coastal decision making. It requires decision makers to act having regard to the best available science, knowledge and understanding of the consequences of decisions and in the context of increasing uncertainty, to make decisions that minimise adverse impacts on current and future generations and the environment.

Planning and Environment Act 1987

Section 4(1) of the Act outlines the objectives for planning in Victoria. Objectives of relevance to flooding are:

- to provide for the fair, orderly, economic and sustainable use, and development of land;
- to provide for the protection of natural and man-made resources and the maintenance of ecological processes and genetic diversity;
- to secure a pleasant, efficient and safe working, living and recreational environment for all Victorians and visitors to Victoria.

Section 52 of the Act requires the responsible authority to give notice of an application in a prescribed form:

- c) to any person to whom the planning scheme requires it to give notice;

Section 55 of the Act requires;

1. A responsible authority must give a copy of an application to every person or body that the planning scheme specifies as a referral authority for applications of that kind without delay unless the applicant satisfies the responsible authority that the referral authority has—
 - a) considered the proposal for which the application is made within the past three months; and
 - b) stated in writing that it does not object to the granting of the permit for the proposal.
2. The referral authority must tell the responsible authority in writing within the prescribed time after getting the application if it needs any more information.

Section 60(1)(e) of the Act requires that before deciding on an application the Responsible Authority must consider

- any significant effects which the responsible authority considers the use or development may have on the environment or which the responsible authority considers the environment may have on the use or development.

Victorian Planning Provisions

Clause 13.02: Floodplains

One of the objectives of Clause 13.02 (specifically 13.02-1: Floodplain management) is to assist the protection of life, property and community infrastructure. General implementation includes:

Identify land affected by flooding, including floodway areas, as verified by the relevant floodplain management authority, in planning scheme maps. Land affected by flooding is land inundated by the 1 in 100 year flood event or as determined by the floodplain management authority.

Avoid intensifying the impacts of flooding through inappropriately located uses and developments.

Locate emergency and community facilities (including hospitals, ambulance stations, police stations, fire stations, residential aged care facilities, communication facilities, transport facilities, community shelters and schools) outside the 1 in 100 year floodplain and, where possible, at levels above the height of the probable maximum flood.

Locate developments and uses which involve the storage or disposal of environmentally hazardous industrial and agricultural chemicals or wastes and other dangerous goods (including intensive animal industries and sewage treatment plants) must not be located on floodplains unless site design and management is such that potential contact between such substances and floodwaters is prevented, without affecting the flood carrying and flood storage functions of the floodplain.

Land Subject to Inundation Overlay and Special Building Overlay Decision Guidelines

The majority of planning permit applications that Melbourne Water receives are referred under the provisions of either the Land Subject to Inundation Overlay or the Special Building Overlay. The decision guidelines set out in these overlays requires consideration, as appropriate, of the following matters:

- The State Planning Policy Framework and the Local Planning Policy Framework, including the Municipal Strategic Statement and local planning policies, i.e. Clauses 13.01-1 and 13.02-1.
- Any local floodplain development plan.
- Any comments from the relevant floodplain management authority.
- The existing use and development of the land.
- Whether the proposed use or development could be located on flood-free land or land with a lesser flood hazard outside this overlay.
- The susceptibility of the development to flooding and flood damage.
- The potential flood risk to life, health and safety associated with the development. Flood risk factors to consider include:
 - The frequency, duration, extent, depth and velocity of flooding of the site and accessway.
 - The flood warning time available.
 - The danger to the occupants of the development, other floodplain residents and emergency personnel if the site or accessway is flooded.
 - The effect of the development on redirecting or obstructing floodwater, stormwater or drainage water and the effect of the development on reducing flood storage and increasing flood levels and flow velocities.
 - The effect of the development on river health values including wetlands, natural habitat, stream stability, erosion, environmental flows, water quality and sites of scientific significance.

Clause 65

In the absence of an overlay control, Clause 65 states that before deciding on an application or approval of a plan, the responsible authority, must consider, as appropriate:

- The degree of flooding, erosion or fire hazard associated with the location of the land and the use, development or management of the land so as to minimise any such hazard.

Clause 66

These provisions set out the types of applications which must be referred under Section 55 of the Act or for which notice must be given under Section 52(1)(c) of the Act. The provisions do not apply to the seeking of advice about an application or where a responsible authority may choose to give notice under another sub-section of Section 52(1) of the Act. These provisions also specify when a plan must be referred under Section 8(1)(a) of the Subdivision Act 1988.

Referrals

Applications of the kind listed in Clauses 66.01, 66.02, 66.03 and 66.04 must be referred to the person or body specified as a referral authority in accordance with Section 55 of the Act.

This does not apply if in the opinion of the responsible authority, the proposal satisfies requirements or conditions previously agreed in writing between the responsible authority and the referral authority, or the referral authority has considered the proposal for which the application is made within the past three months and has stated in writing that it does not object to the granting of the permit for the proposal.

Notice

Notice of an application of the kind listed in Clauses 66.05 and 66.06 must be given in accordance with Section 52(1)(c) of the Act to the person or body specified as a person or body to be notified.

This does not apply if, in the opinion of the responsible authority, the proposal satisfies requirements or conditions previously agreed in writing between the responsible authority and the person or body to be notified.

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