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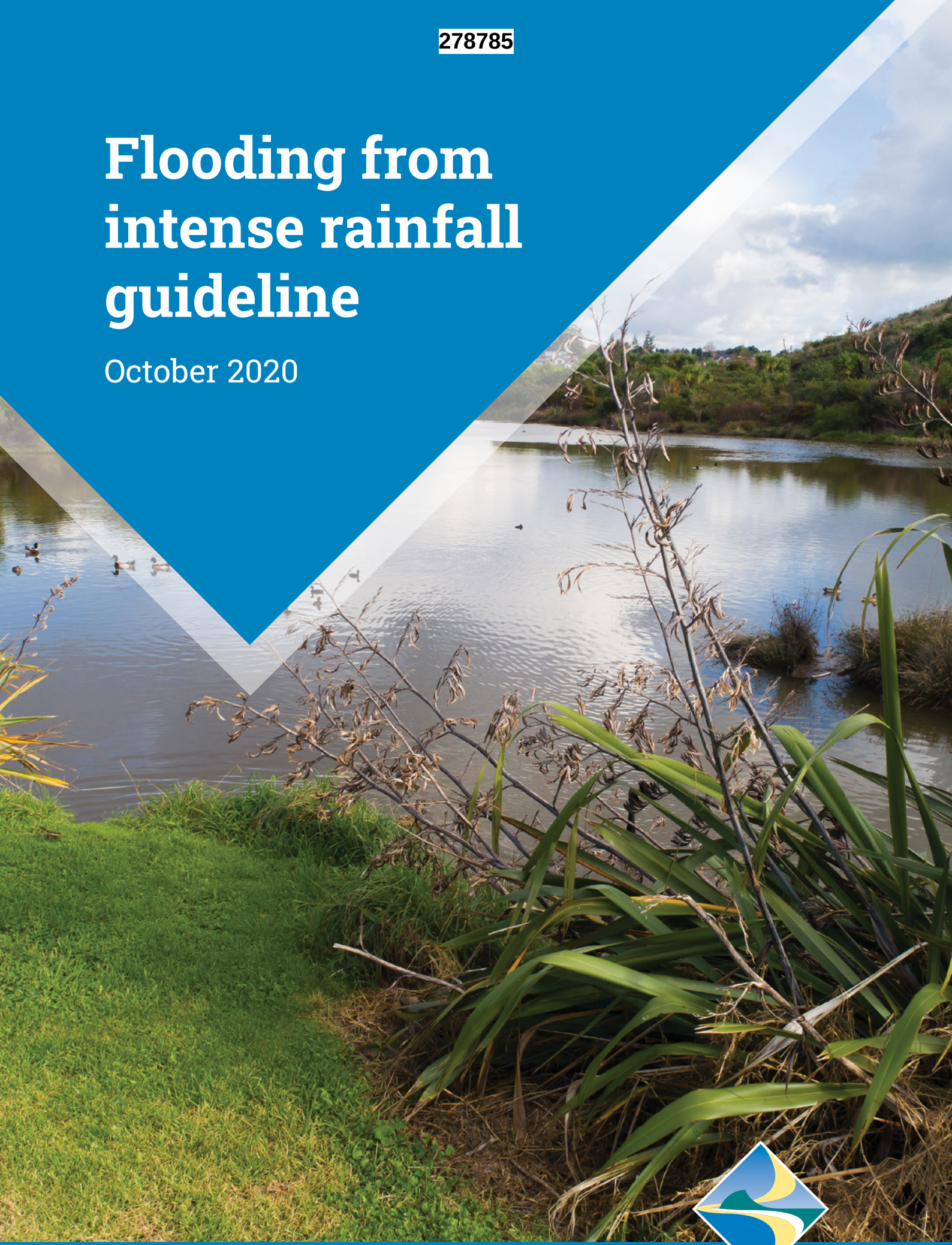
Flooding from intense rainfall guideline

October 2020



Tauranga City

Contents

1. Introduction

Tauranga is prone to intense rainfall causing significant amounts of surface water and has already experienced the effects of flooding, specifically in 2005 and 2013, when flooding caused damage to properties and put people at risk.

It is expected that the likelihood of flooding will increase over time because of the effects of climate change and sea level rise. To reduce the damage to land, property and potentially lives, it is crucial that surface water resulting from rainfall, which can cause flooding of properties and houses, is properly managed.

Tauranga City Council has mapped all properties affected by flooding and the Tauranga City Plan (City Plan) sets out rules to mitigate or avoid the risk of flooding.

The Resource Management Act 1991 (RMA) requires Tauranga City Council to recognise and provide for the management of natural hazards while taking into account climate change when considering subdivision, use and development of land. This is supported by the Bay of Plenty Regional Policy Statement (RPS) which requires Tauranga City Council to reduce the risk of flooding from intense rainfall events.

1.1 Purpose of this guideline

This document has been prepared to aid in using and implementing provisions introduced to the Tauranga City Plan through Plan Change 27 – flooding from intense rainfall. It is a live document and elements of these guidelines may be developed further or changed as required.

1.2 Using this guideline

This document should be read alongside the City Plan rules relating to floodplains, overland flowpaths, flood prone areas and impervious surfaces.

Section 2	**This section has been prepared to assist property owners, developers, designers and builders to:**
	Understand the broader issues and constraints of building within areas susceptible to flooding
	Understand the issues created by increasing impervious surfaces without providing mitigation
	Provide general guidance and examples of mitigating flood risk on your property
	Provide general guidance to avoid increasing or causing flooding on other properties
Section 3	**This section has been prepared as guidance to assist property owners and developers who are considering developing on land susceptible to flooding.**
Section 4	**This section outlines other documents that should be considered at the design stage, such as the Resource Management Act (RMA), the Infrastructure Development Code (IDC) and other Tauranga City Council guidelines and Bay of Plenty Regional Council (BoPRC) plans.**

2. General guidance

2.1 Why design for flooding?

Based on the prediction that flooding in Tauranga will likely increase, it becomes more and more important that surface water resulting from rainfall is properly managed, to reduce the potential damage to land, property and potentially lives.

To understand the risk of flooding, risk assessments have been undertaken that considered the effects of climate change on sea level to 2130 as required by the Bay of Plenty Regional Policy Statement (RPS). This included flood modelling of the likely impacts of intense rainfall in Tauranga, taking into account recorded rainfall data and flood levels from past events, the contours of the land and the existing stormwater network. The modelling is based on current best practice and has been peer-reviewed by independent experts and Bay of Plenty Regional Council (BoPRC).

The risk assessment identified that Tauranga is at high risk of flooding in a 1% AEP rainfall event which takes into account the effects of climate change to the year 2130. The RPS requires Tauranga City Council to reduce the risk of flooding to Medium and Low risk over time.

A 1% AEP rainfall event has a 1% or 1 in 100 chance of occurring in any one year and a 10% chance of occurring in any 10 year period. Similarly, a 1% AEP event can be considered equivalent to the 100 year storm.

2.2 How do I know if I am affected by flooding?

The GIS viewer, Mapi, on council's website shows the flood hazard maps for the city and helps you identify an overland flowpath, floodplains and flood prone areas in your area.

Following the 2005 and 2013 flooding, Tauranga City Council undertook flood modelling to understand the citywide risk of flooding from intense rainfall. The flood hazard maps are based on these flood models and show which areas in Tauranga are likely to experience flooding in a 1-in-a-100-year flood.

Access Mapi at www.tauranga.govt.nz/maps

Mapi shows the following overlays:

- Floodplains
- Major overland flowpaths
- Minor overland flowpaths
- Flood prone areas (depth=100-299mm)
- Flood prone areas (depth=/>300mm)

2.3 Where do I find rules relating to flooding from intense rainfall in the City Plan?

The primary chapter managing the risk of flooding from intense rainfall is:	Chapter 8D – Natural Hazards (Flooding from Intense Rainfall)
The following chapters also include provisions relating to flooding from intense rainfall:	Chapter 4C – General Rules (Earthworks)
	Chapter 9 – Hazardous Substances and Contaminated Land
	Chapter 12 – Subdivision, Services and Infrastructure
	Chapter 14 – Residential Zones

2.4.1 Floodplains

The depth, velocity (speed of flow) and volume of the water in a floodplain during intense rainfall presents a risk to life and property.

What is a floodplain

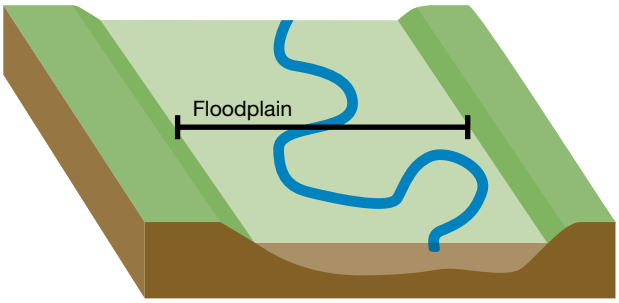
Floodplains are areas of land situated near a river or stream which are inundated by water during a flood event.

How floodplains work

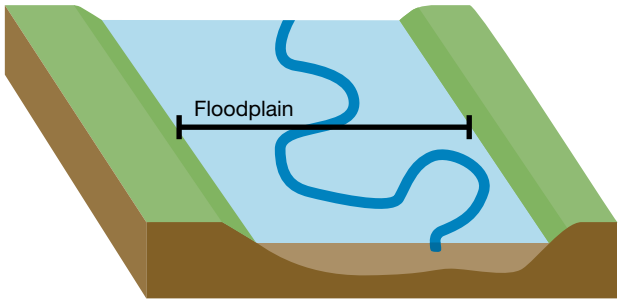
Floodplains carry out the important function of water conveyance and storage during a flood. A stream or river starts to overflow in a large rainfall event into the floodplain like a bathtub. When the amount of water coming into the bathtub is higher than the amount that can flow out, the water level in the bathtub goes up. And then it goes down again, when the amount of water coming in is less than the amount going out.

If a floodplain is altered, it will increase velocity on site, upstream and downstream.

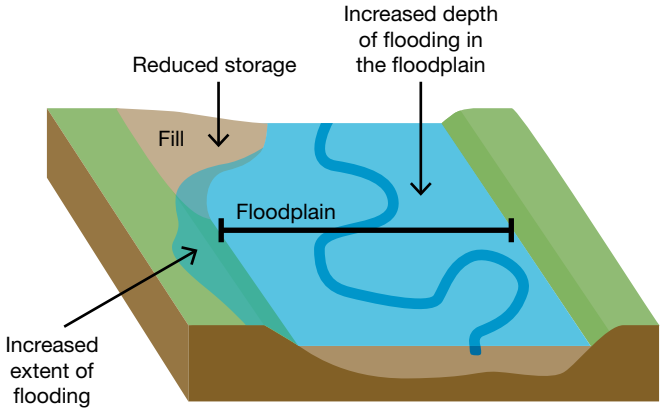
Water storage capacity of a floodplain



Normal conditions



Flood conditions



Effects of fill in flood conditions

How to reduce risks

Floodplains are part of the stormwater system and need to be protected to reduce impacts on people and property. The water carrying and storage capacity of the floodplains needs to be maintained in order to reduce the peak of the flow passed on downstream. Without the storage, the peak flow to be dealt with downstream would be higher and the flood risk greater.

What if my property is in a floodplain

If your property is within a floodplain, you need to make sure that you do not build within the floodplain. Building in a floodplain will increase the risk of flooding on your property and on your neighbouring properties.

The key requirements within the City Plan for activities within a floodplain are:

- Additions to existing buildings of up to 20m^2 in total are permitted.
- New residential, industrial or business activities within a floodplain are discretionary activities and require a resource consent.
- Minor earthworks are permitted, but earthworks above 10m^3 and 300mm are a restricted discretionary activity and require a resource consent.
- Subdivision partially within a floodplain is a restricted discretionary activity, however, subdivision creating a new lot wholly within a floodplain is a non-complying activity and should be avoided.

What you can do

- Consider the flood risk onsite and risk to upstream and downstream properties.
- Make sure that the floor levels of habitable rooms are above flood level.
- Consider what your evacuation plan is in a flood.
- Consider the location of goods to avoid mobilisation of goods e.g. vehicles or containers stored outside.
- Social and cultural buildings should be located outside a floodplain, but where that is not possible, consider the above points to ensure safety of people inside the building.
- Critical buildings should be located outside a floodplain, but where this is not possible, you need to ensure that the buildings can continue to function before and after the flood.
- Restrict infill and subdivision in floodplains to ensure new development does not occur in high risk areas.

These requirements are designed to prevent higher flood levels from occurring due to reductions in flood storage volume and loss of flood attenuation in floodplains, reducing risk to life and property overtime.

For further guidance, see Section 3 of this guideline alongside the relevant City Plan provisions.

2.4.2 Overland flowpaths

The depth, velocity (speed of flow) and volume of the water in an overland flowpath during intense rainfall presents a risk to life and property.

What is an overland flowpath

Water naturally flows to low points and follows flowpaths over land towards the stormwater network, floodplains or the harbour. Overland flow is a natural occurrence.

Overland flowpaths can be identified by looking at the shape of the ground and where the lowest point is. To help identifying these areas, council has produced maps based on flood modelling.

Overland flowpath in Mount Maunganui

How an overland flowpath works

Overland flowpaths, like floodplains, carry out the important function of water conveyance and storage during a flood event. By allowing water to flow where it would flow naturally, water will not pond on your property.

If an overland flowpath is altered or obstructed, it will increase the depth and/or velocity of water on site, upstream and downstream, causing flood damage to buildings and potentially creating a life-threatening hazard. The increased depth of water can be dangerous to people, especially children and vulnerable members of the community.

Furthermore, once an obstruction is removed, the velocity of the water increases as it rushes out with enough force to knock adults off their feet and cause damage to property. A high combination of depth and velocity (DxV) can cause vehicles to become buoyant and unstable, people and vehicles to be swept away, and, at very high DxV, foundations and buildings to be damaged.

How to reduce risks

Water must be allowed to flow through areas where overland flow would naturally occur. Overland flowpaths are an important part of the system in an intense rainfall event and the water carrying and water storage capacity of overland flowpaths needs to be maintained.

Overland flowpaths flow through roads, stormwater reserves and private property and any obstruction can lead to flooding.

By not obstructing the natural flow of water, the risk of flooding to people, land and buildings can be avoided or mitigated.

What if there is a major overland flowpath on my property?

If there is a major overland flowpath on your property, you need to make sure that you do not build within it or divert the water.

Major overland flowpaths, like floodplains, have the function of water storage as well as water conveyance. Obstructing or diverting the flowpath inappropriately will cause flooding on your property and your neighbours' properties, increasing the risk of flood damage to life, buildings and the land.

What if there is a minor overland flowpath on my property?

If there is a minor overland flowpath on your property, you need to make sure that you do not obstruct the water.

Minor overland flowpaths naturally have a function of water conveyance and must be allowed to flow through areas where they would naturally occur. Obstruction of a minor overland flowpath could cause ponding on your property or your neighbour's property and when the water is able to flow again, there could be increased velocities which are hazardous to people and property further downstream.

A minor overland flowpath can be diverted on your property appropriately as long as the water carrying capacity is maintained.

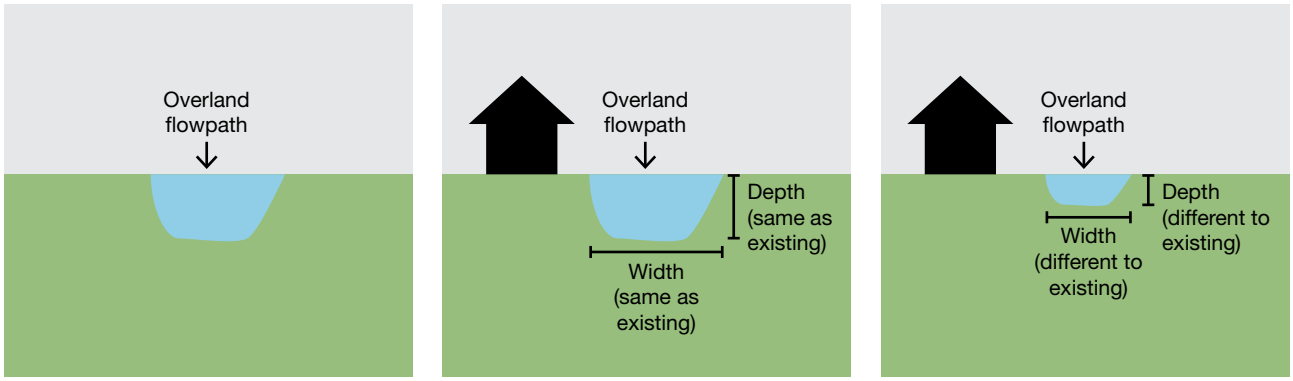
What is water carrying capacity?

The water carrying capacity must be maintained to ensure that existing flood risks are not made worse by alterations to the flow of water in an overland flowpath. Flow rates can be affected by changes to the gradient or diversion of an overland flowpath. A decrease in the available flow area due to obstruction can increase flood levels upstream and increase the velocity past the obstruction. This increase in velocity can increase risk of damage to life and property, including causing erosion downstream.

An overland flowpath will keep its water carrying capacity if its dimensions are maintained in regard to width, depth and gradient.

It is important that any potential environmental impacts are considered when flowpaths are altered. Altering the shape of a flowpath may result in increased erosion and diversion of floodwater from natural floodplain storages.

Water carrying capacity of an overland flowpath



Existing

Good practice: water carrying capacity maintained

Recreate the same space for water flow when moving an overland flowpath.

Bad practice: overland flowpath is constricted

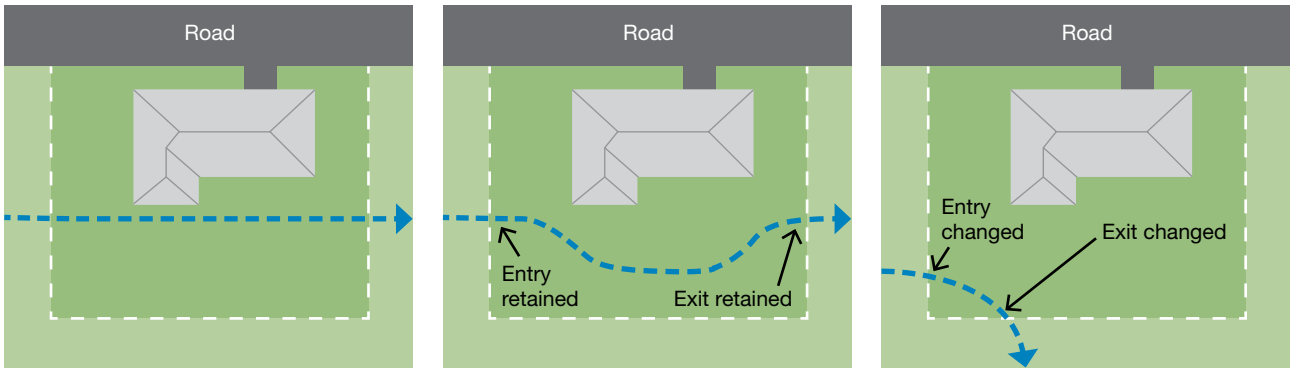
Do not constrict an overland flowpath by reducing either depth or width.

What does appropriate diversion look like?

If you wish to alter the minor overland flowpath on your property, ensure that flood risk to you and your neighbours is not increased.

Do not change the entry and the exit points of the overland flowpath on your property.

Minor overland flowpath on a property



Existing

Good practice: overland flowpath stays on site

Bad practice: redirect onto neighbouring property

The key requirements in the City Plan for activities within a flood prone area are:

If you wish to alter the minor overland flowpath on your property, ensure that flood risk to you and your neighbours is not increased.

- Obstruction of an overland flowpath, including building a fence or wall, is a restricted discretionary activity and requires a resource consent. A fence should be 70% pervious to allow the water to flow through.

Pervious fence allowing water to flow

Solid fence blocking overland flows

Additions to social and cultural buildings and critical buildings within an overland flowpath are discretionary activities and require a resource consent.

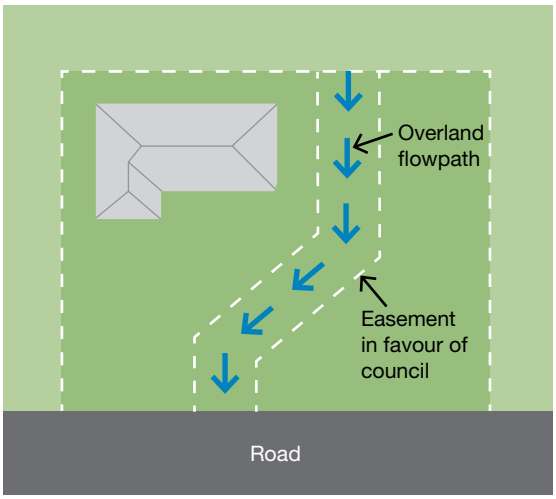
Additions to any other building, including residential, Marae, business and industrial buildings within an overland flowpath are restricted discretionary activities and require a resource consent.

A resource consent is required for any new builds in an overland flowpath:

- New business and industrial activities are restricted discretionary activities
- New residential and marae buildings are discretionary activities
- New social and cultural or critical buildings are non-complying activities.

Minor earthworks are permitted, but earthworks above 10m^3 and 300mm are restricted discretionary activities and require a resource consent.

With a subdivision, it is important to protect and maintain an overland flowpath. If you are subdividing and there is a minor overland flowpath on site, it should be designed on an easement in favour of council.



What you can do

Consider the flood risk caused by any overland flowpath onsite and risk to upstream and downstream properties.

Make sure that the floor levels of habitable rooms are above flood level.

Consider what your evacuation plan is in a flood.

Consider the location of goods to avoid mobilisation of goods e.g. vehicles or containers stored outside.

Social and cultural buildings should be located outside an overland flowpath, but where that is not possible, consider points a-d to ensure safety of everyone inside the building.

Critical buildings should be located outside a floodplain, but where this is not possible, you need to ensure that the buildings can continue to function before and after the flood.

Similar to floodplains, the requirements in the City Plan managing overland flowpaths are designed to avoid or mitigate higher flood levels from occurring, caused by reductions in flood storage volume and/or an increase in the velocity(speed) of the flow. Typically, impacts of individual developments and the long-term cumulative impacts arising from similar developments have the potential to increase or cause new flooding. The City Plan rules aim to manage overland flowpaths to provide this important function while protecting people, property and the land. If overland flowpaths are managed poorly, the potentially destructive power of the water can cause damage to land, property and people.

For further guidance see Section 3 of this guideline alongside the relevant City Plan provisions.

2.4.3 Flood prone area

The depth of water in a flood prone area in an intense rainfall presents a risk to life and buildings.

What is a flood prone area

These are low points in the land where water ponds during a rainfall.

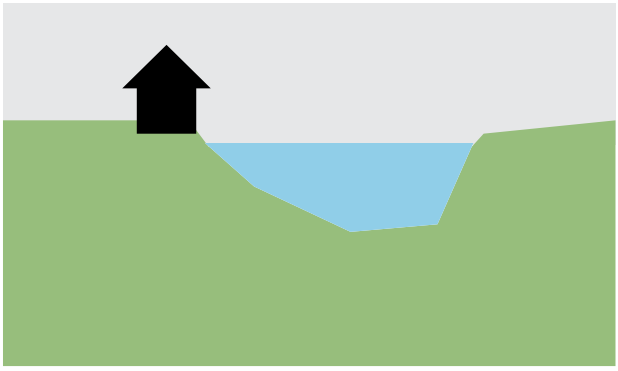
How to reduce risks

Inappropriate development within flood prone areas can increase flooding on site and will cause adverse displacement effects, e.g. the water will spill over onto neighbouring properties increasing or causing flooding.

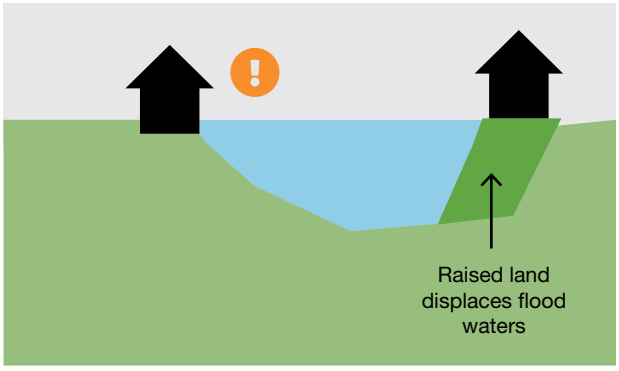
Development and redevelopment within a flood prone area needs to be designed to ensure that floor levels are above flood levels and any adverse impacts of displacement are managed.

Water levels above 300mm can be dangerous to people and cause trafficability issues (e.g. cause cars to float), and as a result, new developments need to be designed to ensure the safety of people in a flood event.

How development can displace flood water and increase flood risk



House built above the flood level



Raised land displaces flood waters affecting flood levels of neighbouring properties

What if my property is in a flood prone area?

If you can, build outside the flood areas. If you cannot, make sure you build above the flood level.

When raising land on your property, water will spill over onto your neighbours' properties. This needs to be managed through design to make sure your neighbouring properties don't flood.

The key requirements in the City Plan for activities within a flood prone area are:

- **Additions of up to 20m^2 where the water depth is below 300mm are permitted, as long as the floor level is above flood level.**
- **New builds where the water depth is below 300mm are permitted, as long as the floor level is above flood level with additional freeboard of:**
  - 500mm for residential buildings and Marae
  - 300mm for industrial and business activities.
- **Additions or new development where the water depth is 300mm or more are restricted discretionary activities and require a resource consent.**
- **Minor earthworks are permitted but earthworks above 10m^3 and 300mm are restricted discretionary activities and require a resource consent.**

What you can do

- **Consider flood risk caused onsite or offsite – such as displacement of water onto other properties.**
- **Make sure that the floor levels of habitable rooms are above flood level.**
- **Consider what your evacuation plan is in a flood.**
- **Design your land and building to protect goods and internal fittings from flood damage.**

The City Plan seeks to enable the community to build out of flood prone areas while ensuring existing risk of flooding is not increased. The requirements for managing activities in flood prone areas are designed to avoid or mitigate higher flood levels from occurring caused by reductions in flood storage volume. Individual developments will cause long-term cumulative impacts by increasing or causing new flooding.

For further guidance, see Section 3 of this guideline alongside the relevant City Plan provisions.

2.5 Impervious surfaces

30% of any site in the Suburban Residential, Large Lot Residential and City Living zones shall be pervious.

What are pervious surfaces?

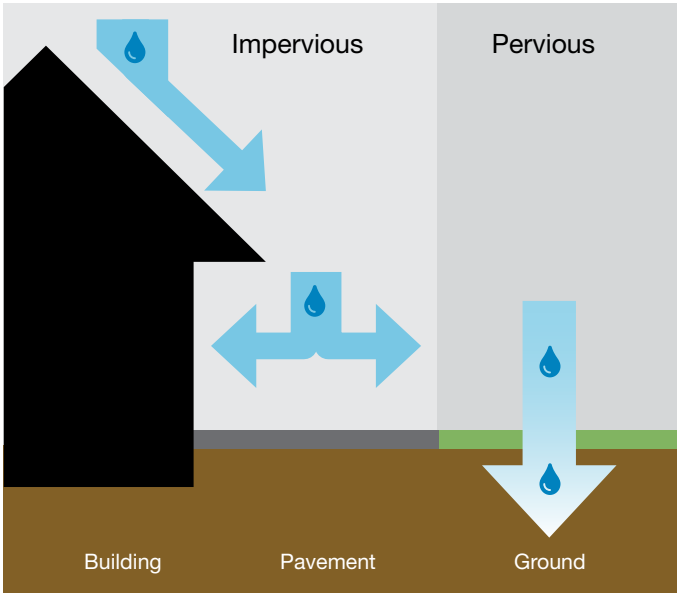
Pervious surfaces absorb and detain stormwater, reducing runoff. Natural pervious surfaces include grass and landscaped and planted areas. Constructed pervious surfaces generally consist of a layered construction to enable rainwater filtration into the ground, such as living roofs and slatted decks.

What are impervious surfaces?

Impervious surfaces are hard surfaces that do not let water soak into the ground, such as sealed roads, roofs and patios.

Increase in flood risk

As Tauranga continues to grow and develop land, the potential increase in impervious surfaces can lead to increased flooding on downstream properties and put additional pressure on the existing stormwater network.



The key requirements in the City Plan for activities within a flood prone area are:

New developments within the Suburban Residential, Large Lot Residential and City Living zones where the impervious surfaces exceed 70% are restricted discretionary activities and require a resource consent.

Benefits of pervious surfaces include:

- Improved hydrological response of stormwater peak flow by holding and releasing water in a controlled manner
- Reduced volume of flow discharge to the stormwater system and also support of groundwater recharge
- Improved water quality by filtering out contaminants
- Providing amenity/landscape feature.

3. Matters to consider when developing

3.1 Development planning

Flooding and stormwater should be considered at the outset of any development planning. Done well, floodable and stormwater management areas can be effectively incorporated into development and contribute to urban design, landscape amenity and connectivity objectives.

Consider the following requirements when planning a subdivision and site development.

Review available information

Review information on Mapi at www.tauranga.govt.nz/maps to understand site context including:

- Flood mapping
- Flood analysis (by clicking on the location and feature of interest you can view flood depth (in meters) or flood RL)
- City Plan zones
- Other natural hazards (e.g. harbour and coastal inundation, liquefaction, tsunami, erosion etc.)
- Existing infrastructure
- Contours

Check associated Tauranga City Plan provisions for the zone, activity and natural hazards at www.cityplan.tauranga.govt.nz

Check Bay of Plenty Regional Natural Resources Plan (RNRP) and Regional Coastal Environment Plan (RCEP) at https://www.boprc.govt.nz/your-council/plans-and-policies/plans/regional-plans

Identify Comprehensive Stormwater Consent, Urban Growth Plan and Structure Plan specific requirements for stormwater management

- Urban Growth Plans: City Plan Part B, Section 6, (www.cityplan.tauranga.govt.nz)
- Structure Plans: Part of Development Contributions Policy (https://www.tauranga.govt.nz/council/council-documents/development-contributions)
- Comprehensive Stormwater Consents (Please contact council for further information)

Note: Consenting process

Council holds comprehensive stormwater consents for stormwater discharges from existing urban areas across the city. These consents require developments to meet certain water quality and flow thresholds. These are in addition to provisions in the City Plan.

It is suggested that council's development engineers are involved in pre-application meeting(s) before a resource consent is lodged, to understand the design expectations of the Council.

Consider provision for vesting

- Subdivision planning needs to consider vesting requirements and allow for this in site plans.
- Overland flowpaths and floodplains should not be built in as part of new developments. Vesting allows these areas to become part of the public network for stormwater management, and to create any associated recreational, amenity and ecological linkages.
- Discretion on the extent of floodplain vesting allows for site context to be taken into account. For example:
  - In an urban development it is appropriate that floodplain becomes public reserve.
  - In a low-lying rural area where floodplains are extensive, the agreement may be for floodplains to remain private and continue to be used for rural activities.

Consider access and lifelines

Subdivision hazard assessment should consider the effect of flooding on lifeline utilities.

- Access to the subdivision and individual lots must be demonstrated. Avoid creating a single access which will be cut off in a flood event for more than a day.
  - Floodwater from large catchments can remain high after an intense rainfall event. Subdivisions with accesses proposed in major overland flowpaths and floodplains need to demonstrate an alternative method of access and egress. Flood modelling may be required to assess the duration of a compromised access.
  - In flood prone areas, flood water can take time to recede. Low-lying areas with no natural outlet can be flooded for a long time before water drains away or may even require pumping to remove floodwater. The assessment needs to consider how floodwater can recede after an intense rainfall event and how long access may be compromised.
- Where lots are proposed to be serviced by onsite effluent treatment, the effects of flooding need to be considered so that this system is not functionally compromised. Subdivision needs to demonstrate that this servicing is feasible and will not occur within a floodplain.

2005 flood water receding slowly (right photo taken four hours after left)

Consider layout

- Lots should not be created which flood entirely and are problematic to develop. The proposed subdivision should demonstrate the feasibility of future development activities. In floodplains in particular, this means subdivision plans need to show that future structures and any proposed onsite effluent treatment can occur outside of the floodplain.
- Identify existing overland flowpaths within the subject site and how these are proposed to be provided for in the development while maintaining capacity. Identify secondary flowpaths as part of subdivision stormwater infrastructure.
- Overland flowpath design should be considered as part of the subdivision planning as it can affect the layout and space allocation. Design of overland flowpaths within a development must be undertaken in accordance with the IDC. This includes locating overland flowpaths on public land and following design criteria for appropriate depth and velocity.

3.2 Assessing onsite flood risk

Policy NH 4B of the RPS requires a low risk to be achieved at the completion of any development. The risk level is based on the consequences of a hazard for multiple categories, including:

- Built form (buildings, social/cultural buildings and critical buildings)
- Lifeline utilities
- Health and safety.

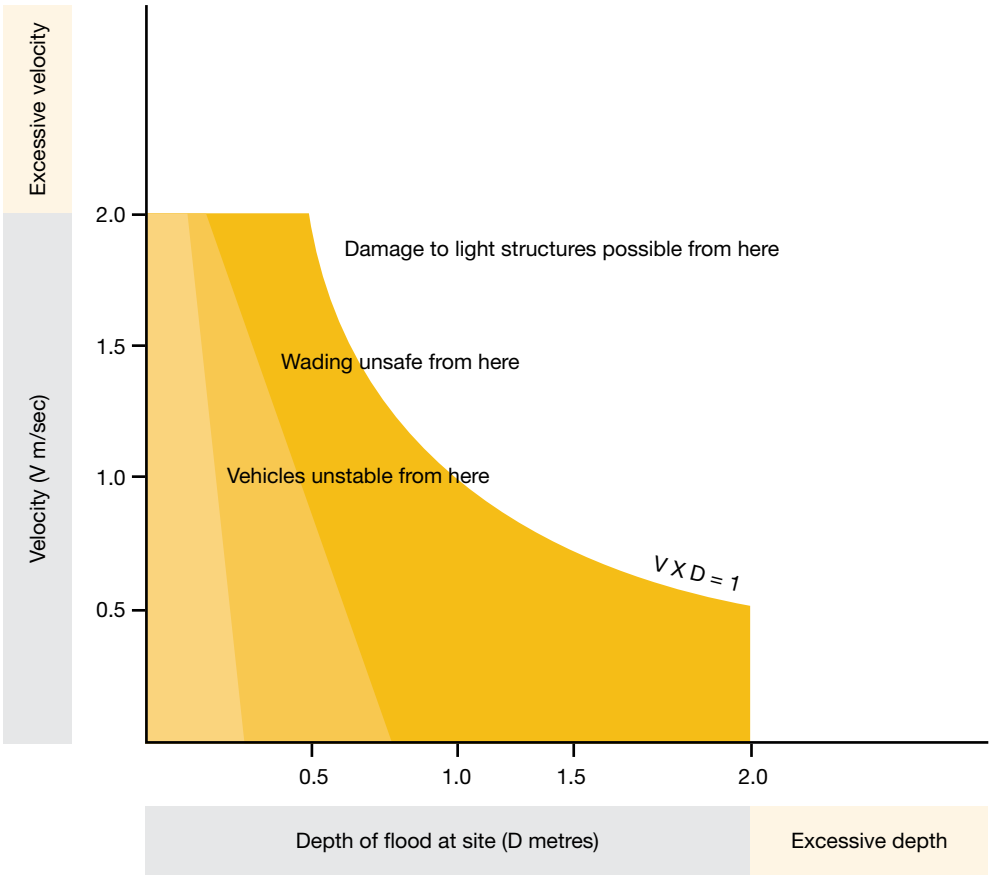
These requirements inform the allowable development of a site to achieve low risk post development and need to be considered at the design stage of development.

When considering development in floodable areas you should consider:

What happens during flooding?

- How deep is the water and is there a drowning risk on the site? Identify the flood depth and consider safety on the proposed site use and layout.
  - Water depth above 1m is considered hazardous. Even if building floor levels are above the flood level, a building should not be surrounded by significant depth of water in a flood event.
  - Detailed guidance on flood hazard and safety considerations can be found in documents including Australian Rainfall and Runoff (2019) and New South Wales Government Floodplain Development Manual (2005)

Example indication of flood depth and velocity influence on flood hazards from New South Wales Government Floodplain Development Manual (2005).



Would the site be isolated for an extended period during and after intense rainfall?

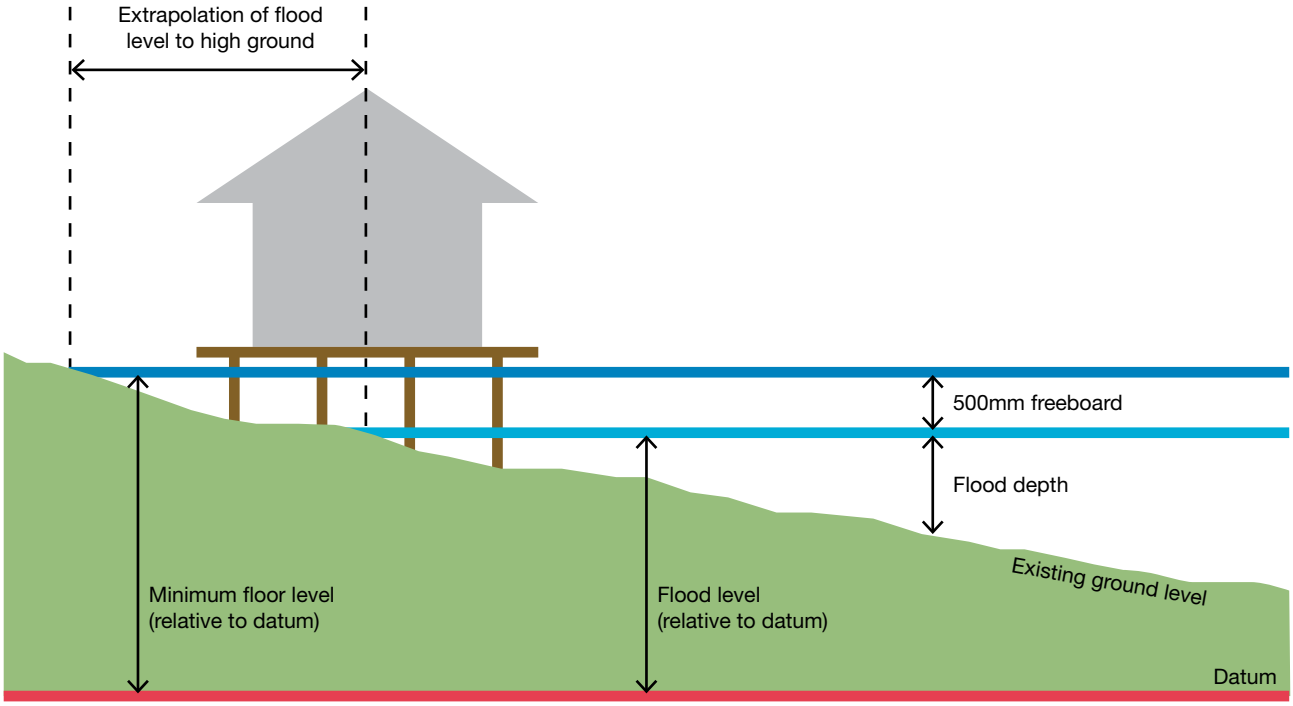
- Identify site access. Consider the type of flooding and how readily the water can recede. Flooding could remain for hours or days if there is extensive flooding with limited drainage of the area.

Can a building be developed with floor levels above the 1% AEP design rainfall event flood levels, with required freeboard?

- Think about whether future building development is achievable before subdividing land.
- Identify the building location, building use and floor levels.
- Consider the flood levels early on at the subdivision and design stage.
- Freeboard above the flood levels in a 1% AEP design rainfall event is specified within the City Plan rules for development within floodable areas to account for uncertainty (e.g. waves generated by vehicles) and protect buildings from flooding.

  Note: Building sites outside floodable areas also need to allow for freeboard to satisfy the IDC and minimum building floor levels under the Building Code.

Key aspects for setting floor levels



Waves generated by vehicle following intense rainfall 2017

If a building was to flood above floor level, what would be the effect?

- If a building is flooded, it can be very costly to remediate flood damage. If a building is proposed to be in a floodable area, consider how the effects of flooding can be mitigated.
  - If a non-habitable building is at risk of flooding, has it been designed to mitigate the effects on the building function after the flood event? For example:
    - building material selected considers flooding
    - the building is designed to ensure that electricals are above flood levels
    - storage locations are considered with goods stored above flood level or managed in a flood event to mitigate damage onsite and offsite (e.g. due to goods floating away).

2014 flooding of a warehouse on Glenyon Ave (Photo: SunLive)

3.3 Effects assessment and mitigation

It is important that development or redevelopment does not increase or cause flooding outside of the development site.

This is controlled in the City Plan by:

Controlling earthworks in flood prone areas, major overland flowpaths and floodplains

Earthworks must consider the effects on other properties where flood water is displaced. Earthworks should not cause building floor levels to be flooded if this doesn't already occur.

Controlling changes to overland flowpaths

Development cannot change where water flows without a resource consent. Any change to where water flows should not cause downstream flooding of buildings or a hazardous combination of depth and velocity.

Limiting the cumulative effects of impervious surfaces on runoff

Development is expected to occur within the urban area. The City Plan sets a limit of 70% for residential sites unless consent is granted, so that cumulative development effects do not further increase flood risk.

When assessing the effects of the proposal consider the following:

What would be the effect of onsite flooding?

- Consider the site layout, building design and materials used. Are the buildings and activities on the site able to withstand flooding? Damage can occur to structures where depth and velocity product is greater than 1.
- Consider site use, layout and response plans to the 1% AEP flood event. Is there a risk of activities on the site causing damage in a flood event? For example, by either mobilising hazardous materials or mobilising other items which could float and cause damage to property or block stormwater networks. For example, stored landscaping materials and gravel can be washed away in intense rainfall and contribute to damage and blockage of stormwater networks.

What is the effect of proposed site works?

- Does the proposed development include structures or earthworks filling the site?
  - Consider the displacement effects. Development should not cause other building floor levels to be flooded if this doesn't already occur.
  - Consider alternatives to reduce this effect, such as the use of pile foundations which displace less water, or alternative building footprint locations.
- Does the proposed development include earthworks or structures affecting an overland flowpath?
  - Consider how the overland flowpath could be incorporated into the site. Where possible, development activity should occur outside of overland flowpaths.
  - Consider the design and location of structures with an overland flowpath, e.g. does the structure obstruct the flow of water. For example, fencing and walls should allow the water to flow through and not alter the flow to demonstrate compliance with the permitted activity rule in the City Plan.
  - Consider whether the land can be shaped so that overland flowpaths are directed around rather than into houses and garages to reduce the flood risk to buildings on the property.
  - If it is proposed to change the gradient (e.g. flattening a sloped site), narrow or divert an overland flowpath, an engineering assessment should be undertaken which addresses the following:
    - the effects on neighbouring properties
    - water carrying capacity
    - water storage capacity
    - flood hazards (water depth and velocity)
    - erosion effects
    - appropriate methods and approvals to provide for the altered flowpath.

3.4 Impervious surfaces

Impervious surfaces of up to 70% are permitted within the Suburban Residential and Large Lot Residential zones. If a development proposes to exceed 70% impervious surfaces on a site in the Suburban Residential, Large Lot Residential and City Living zones, a resource consent will be required. The level of imperviousness beyond 70% can generate stormwater runoff beyond what may be included in stormwater system design and flood hazard mapping, leading to flooding onsite and offsite.

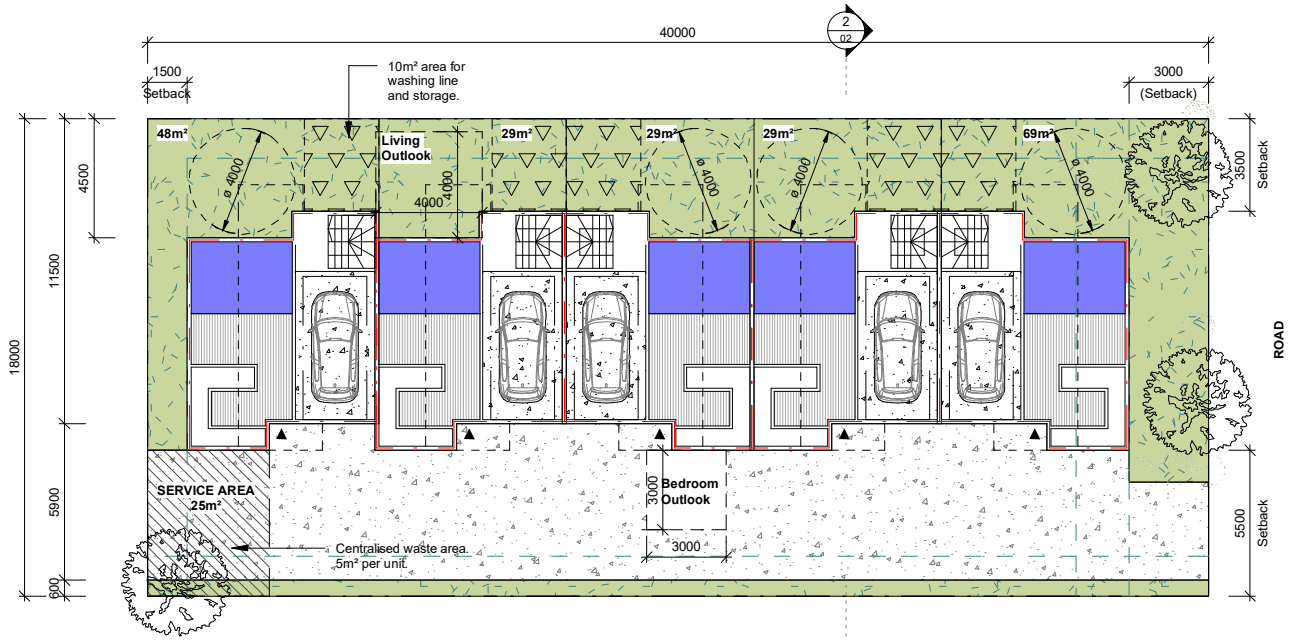
By considering impervious surfaces in the early stages, developments can be delivered with less than 70% site imperviousness. Options for reducing impervious surfaces can include:

- Replacing impervious surfaces with pervious alternatives such as living roofs, permeable paving, slatted decks over natural ground
- Aggregating buildings, utility areas etc. to reduce the total footprint.

Pervious and impervious areas are defined in the City Plan.

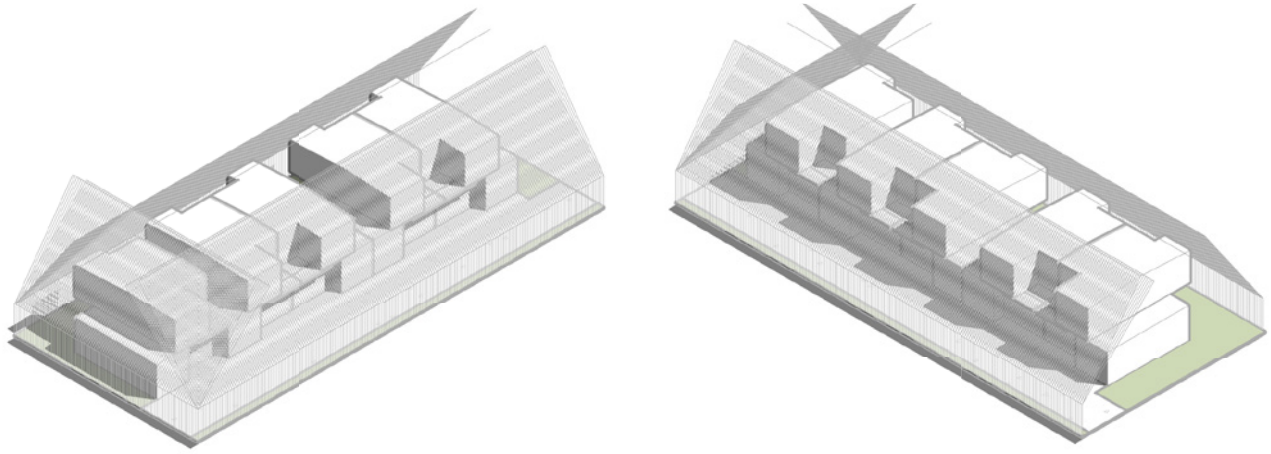
The 70% permitted activity threshold applies on a site level.

You can figure out how much of a residential site is impervious by adding up the parts of the site which are defined as impervious and comparing to the total site area. The total roof area (including eaves etc.) should be used, not the building footprint.



Site area:	720m²	100%
Permeable area:	227.0m²	32%
Impermeable area:	493.0m²	68%

Architectural testing showing impervious surfaces rule can be met while providing for intensification.



If impervious areas greater than 70% are proposed the resource consent application should consider:

How can the increased runoff generation potential be mitigated within the site?

- Increased impervious surfaces have the potential to generate increased runoff in rainfall events. Consider how the effects of this increase can be mitigated. Mitigation measures should be designed to manage runoff from impervious surfaces in the 10% AEP rainfall event. Mitigation should be applied to the impervious areas in excess of 70% of the site area, so that the runoff from the site is equivalent to no more than 70% impervious.

  Example: A 1000m^2 site is proposed to be developed with 80% impervious surfaces.
  This is an additional 100m^2 more impervious area than if the site was 70% impervious.

What are mitigation measures?

The runoff from the excess 100m^2 should be mitigated so that the runoff is no more than the pre-development (previous) runoff in a 10% AEP rainfall event. Mitigation measures could include but are not limited to:

- ground soakage
- onsite detention prior to discharge to the stormwater network, for example with detention tanks

The proposed development should demonstrate mitigation measures considered and taken, and that these measures are appropriate for the site. For example, if proposing soakage to ground this must be demonstrated to be feasible considering the soil type, proximity to slopes and the groundwater table. Consider the following at design stage:

- Mitigation measures must be designed to relevant design standards, including the IDC, and it is recommended that the proposal is discussed with council's development engineers through a pre-application meeting.
- Property owners will be responsible for maintaining onsite stormwater management. The operation and maintenance should be considered when proposing mitigation devices and their location on site. Mitigation measures which are unable to be effectively maintained will not be accepted as these can become ineffective over time.

Note: There are also urban form requirements within the City Plan, such as setbacks and building height, which need to be considered when designing the site layout.

4. Other documents to consider

4.1 Resource Management Act (RMA)

Section 106 of the RMA relates specifically to subdivisions, where it requires the applicant and consent authority to consider the risk and potential effects on land, other land and structures from natural hazards. This includes the worsening, acceleration and causing a natural hazard. The consent authority may refuse the subdivision consent or place conditions if the impacts of the natural hazard(s) are not mitigated.

4.2 Bay of Plenty Regional Natural Resources Plan (RNRP)

The RNRP promotes the sustainable and integrated management of land and water resources within the Bay of Plenty. The purpose of the provisions in the RNRP is sediment management, retention and enhancement of vegetative cover, protection of important aquifers and protection of the water quality of lakes, streams and rivers.

The RNRP does not give effect to the RPS Natural Hazards Chapter. The RNRP does not protect properties from flood damage in a 1% AEP rainfall event while taking into account the effects of climate change to the year 2130.

The provisions in the RNRP and the City Plan are complementary and there may be instances where both the City Plan and the RNRP provisions apply to an activity within a floodplain and overland flowpath. For example, works near or within a stream bed will require a consent from Bay of Plenty Regional Council.

4.3 Infrastructure Development Code (IDC)

The IDC outlines the information that needs to be provided with an application for resource consent. This includes a checklist of reports and drawing information to be provided. It also sets out the engineering compliance requirements.

4.4 Tauranga City Council Stormwater Management Guidelines (2012)

The Stormwater Management Guidelines provide a common reference point for the design and management of stormwater systems in Tauranga, highlighting the low impact design (LID) approach. They also provide background information on the effects of stormwater runoff, council's stormwater systems and receiving environments and the regulatory and policy frameworks for stormwater management.

For the avoidance of doubt, the Proposed Plan Change 27 provisions seek to reduce risk of flooding from a 1% AEP intense rainfall event should be used when considering stormwater management while taking into account the effects of climate change to the year 2130.

For more information

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