
# WAIKATO DISTRICT COUNCIL

# STORMWATER DESIGN GUIDELINE

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## 1. Stormwater Strategy

A good design starts with a suitable stormwater strategy. This strategy should be consistent across the development and ultimately the catchment. This strategy should outline how each stormwater element (treatment, detention, extended detention, flood and overland flow paths) is managed.

A summary (simple table or bullet points) of the stormwater strategy within the consent application is recommended as this enables the Land Development Engineers (LDE) to understand and quickly reference how the proposal will achieve its legislative requirements. A stormwater strategy should be developed at the commencement of the design once all the constraints and opportunities have been assessed. This will assist the designer in achieving the required outcomes. Keep it simple. If possible utilise the natural characteristics of the site.

## 2. Good Design Practice recommendations

Recommendations for getting the best stormwater management solution for your site:

- Stormwater management and assets should be designed by a suitably qualified engineer that understands good design practices and can provide an optimal solution for all stakeholders (PCBUs – refer Safety in Design in section 3).
- At the start of the project consider all responsible parties and engage with stakeholders along the way on any design aspect that are likely to affect them including any non-standard design elements.
- Understand the site constraints at the start of the project, such as: current stormwater discharge points, the capacity of existing infrastructure, ground conditions, the impacts of land use and land modification on stormwater. Determine if stormwater from the site can be appropriately managed without causing adverse effects.
- Consider stormwater management options before the site layout has been finalised and make sure the site layout considers stormwater collection, conveyance, discharge and access.
- Consider designs that provide mutual benefits and check the selected design aligns with all current or draft Catchment Management Plans (CMPs).
- Consider safety in design (SiD) throughout all design stages and show how SiD has been applied to the stormwater design.
- Consider the whole-of-life cost for the design, using a pragmatic approach when factoring in the long-term cost versus the magnitude of costs and benefit(s).
- Ensure that operational and maintenance (O&M) approaches are simple, accessible, and safe. Provide a O&M plan that is clear and easy to follow, covering off the who, what, when, where, why and how considerations.


*"Place all the pieces on the table before solving the puzzle"*

## 3. Safety in Design

Safety in Design is a mandatory requirement for all design projects and should be integrated into the design process and reflected in the assets delivered. As operators, Watercare is a stakeholder and is required to be consulted as part of the design process. Watercare should attend any safety in design workshops to provide operational and maintenance inputs. Please find below questions that are relevant to our operational staff for anyone undertaking design work:

- What equipment needs to get access to the site/asset? How do I access the site?
- How specialised is the maintenance of the asset and is specific training required?
- How much debris is likely to enter the asset and what is the likelihood of blockage?
- What happens if the asset blocks? Is there a secondary flow path?
- Does the asset cause or increase slip or fall from heights hazards?
- How could children, cyclists, motorists and pedestrians interact with the asset(s) and are there any safety risks to these people?
- Is the asset secure and safe from vandalism?
- How often does the asset need maintaining and what are the associated costs?
- Is the asset commonly used in the local area and are materials (replacement parts and media) readily available?
- How would the asset be decommissioned or replaced in the future if needed?
- How long will the asset last (design life)?

Council expect the developer to provide enough information to show that the SiD process has been incorporated into the design. This is likely to include the following:

Consent stage:

- A draft SiD register showing main items considered
- An outline of the proposed communication strategy
- Any relevant workshop minutes or high level SiD items being considered.

Engineering Plan Approval stage (as per detailed design requirements for SID):

- A detailed SiD register that shows any residual safety risks that Council is expecting to accept.
- A detailed communication strategy
- A report/section that outlines the SiD process and considerations undertaken during design

Refer to the Worksafe NZ website for additional information. Watercare has drafted an example communication strategy that can be used by developers if suitable.

**Safety in Design (SiD) Communication Plan Example**

*As required by the Health and Safety at work Act (WorkSafe New Zealand: 2015) a communication plan is required to enable information to be shared with all PCBUs and stakeholders during all stages of design, construction, operation and decommissioning of any new asset. The Following strategy outlines the components of the communication plan to enable these requirements to be met.*

1. *Design and Construction: During the design and construction stages the current SID information is included on the drawings and in the design report. These documents will be distributed to PCBUs and stakeholders by the designer utilising the designers document management system. This strategy includes the following components:*
   - *The **Detailed Design Report** will include a SID section outlining relevant SID information (including a detailed communication plan and SID register). It will also outline the SID information to be included in the Operations and Maintenance Manual.*
   - *The SID register will be included in the detailed drawing set on its own drawing(s).*
   - *All detailed design drawings will reference the SID section of the design report and the SID register drawing.*
   - *After construction, if needed, any updates/revisions to the SID information will be undertaken within the Operations and Maintenance Manual.*

2. *Operation and Decommissioning: During the operation and decommissioning stages, the communication plan will utilise the District Councils document management system to store and retrieve the SID information when required. This strategy includes the following components:*
   - ***SID Register** will be included in the as built drawing set as its own drawing(s) and will reference the SID sections contained in the Operations and Maintenance Manual.*
   - *The **Operations and Maintenance Manual** will include duplicate/relevant SID information from the design report including a copy of the as-built drawing set (which includes the SID register).*
   - *All **As-built Drawings** will include relevant safety in design information and reference the SID register drawing(s) along with the SID sections in the Operations and Maintenance Manual.*

*This multiple referencing strategy will link the reader of any individual document/drawing to all the relevant SID information. This enables any person conducting physical or re-design works in the future to retrieve all the required SID information required to safely undertake any maintenance, upgrades, re-designs or extensions etc.*

## 4. Stormwater Treatment

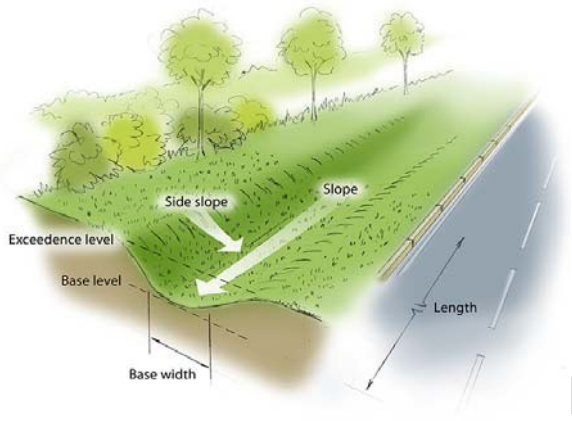
There are many stormwater treatment devices available in New Zealand. From an operators and maintenance perspective, having a large variety of device types across the district does not enable effective maintenance (increased costs and reduced efficiencies).

A new development should have an overall stormwater strategy that limits the different types of treatment devices. Watercare recommends a maximum of 2 treatment device types. Also consider grouping assets with similar maintenance requirements (ie. raingardens, swales, filter strips and wetlands require mostly vegetation management type maintenance, whereas filter chambers, GPT and catchpit inserts all require mechanical/vacuum cleaning).

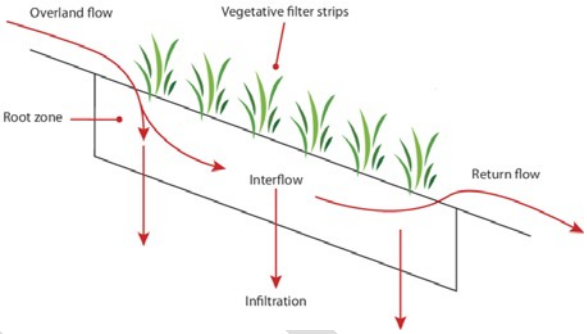
The following list outlines WDC/WSL preferences for stormwater treatment devices from preferred to least desirable.

1. Vegetated Swales
2. Grass Swales – preference in Road reserves
3. Filter Strips
4. Wetlands
5. Gross Pollutant Traps (manhole type as part of treatment chain/pre-treatment)
6. Raingardens
    - Concrete encased only, reinforced earth gardens are not preferred
    - Safety grate across surface required to avoid drop off (cyclists, cars and pedestrian safety issue)
7. Filter chambers
    - Requires access to all filter pods without physical entry into the chamber – no confined space entry.
    - Filter cartridges must be readily available within New Zealand.
    - Consider maintenance costs – filter and media replacement costs based on flow rate.
8. Catchpit inserts
    - Pre-treatment only with external secondary flow bypass
    - EnviroPods may involve a lifting hazard when bags are too full/wet
    - Preference is for litter traps over enviropods due to ease of maintenance, but this reduces pre-treatment effectiveness
9. Private assets (avoid where possible), filter strips or swales acceptable, avoid private rain gardens and filter chambers (any specialised treatment devices).
10. Other – as approved or accepted by Council

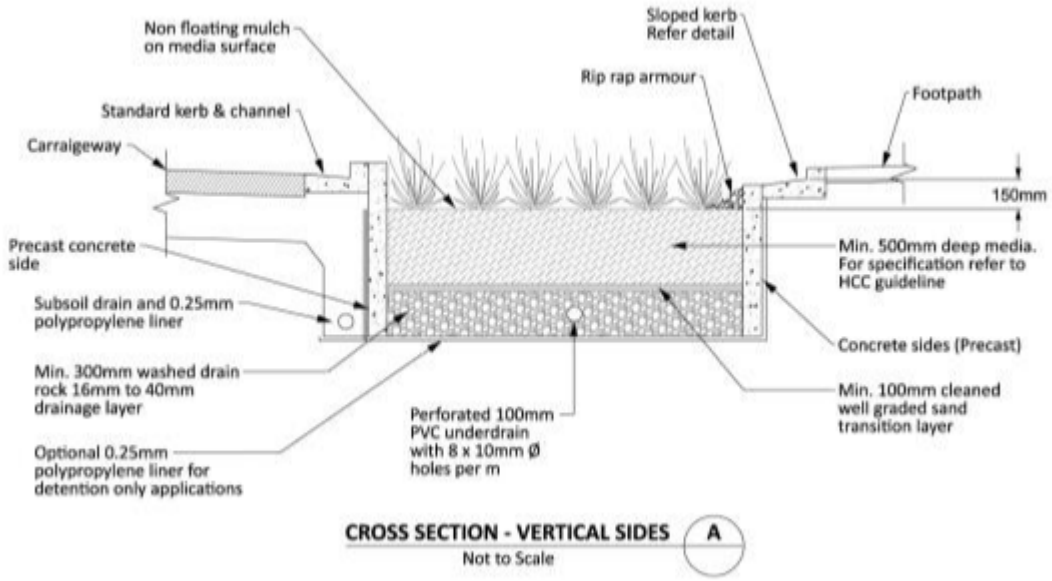
Ensuring private water quality assets are maintained is more costly and time consuming. Watercare's (and WRC's) preference is that no critical assets are in private property relying on property owners for its maintenance. There are also limited mechanisms for knowledge transfer if properties are sold.




Treatment Swale

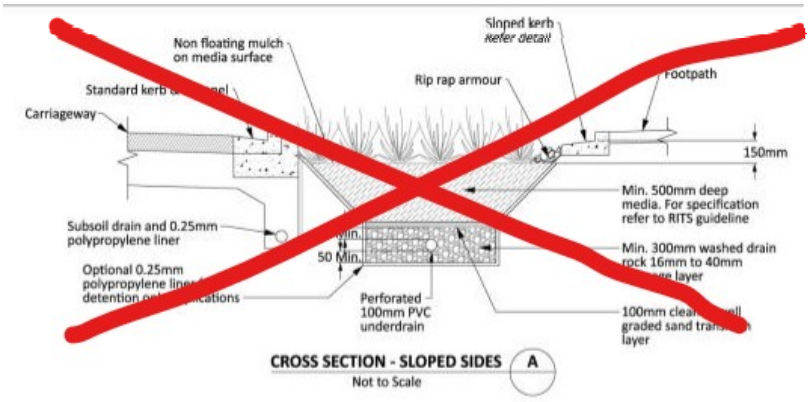



Filterstrip




**Earth encased raingardens:**

Although this type of raingarden is shown in the RITS these are not considered an acceptable solution due to the inability to utilise machinery to replace media (due to the geotechnical stability required along the edges). Also, the offsets to the traffic loads is not enough to provide resilience with several examples of failures occurring around NZ.




## 5. Stormwater Disposal

**Permeable Paving:**

Permeable paving is not considered a treatment device unless it includes a significant vegetated area as per below. Permeable pavement that have no significant voids for vegetation (i.e. look like solid concrete or paving) are not acceptable solutions for treatment or disposal. Permeable paving with no vegetation requires specialised maintenance and its small pores will easily block within relatively short time frames (1-5 years) resulting in an equivalent impervious surface.


*Figure 1: Pervious pavement acceptable and unacceptable options*

**Soakage and infiltration:**

Disposal by soakage is a commonly proposed stormwater disposal method, however the following is required when proposing soakage for any new development:

- Utilise the following standards:
  - Regional Infrastructure Technical Specifications https://www.colabsolutions.govt.nz/wp-content/uploads/2019/01/Regional-Infrastructure-Technical-Specification-V1.0.pdf
  - Matamata Piako District Council Soakage standards https://www.mpdc.govt.nz/pdf/CouncilDocuments/Policies/Stormwater/Soakage

Manual.pdf

- Auckland Council Soakage standard https://content.aucklanddesignmanual.co.nz/regulations/technical-guidance/Documents/GD07%20Soakage%20and%20Groundwater%20Recharge%20Guide.pdf

- NZ standard soakage testing (including pre-wetting)
- Use of a suitable factor of safety (x2 minimum)
- Undertake a suitable number of tests that cover the area (ideally test location will be in the same location as the proposed soakage chamber).
- Provide an overflow that can operate if the soakage device blocks or does not work as designed.

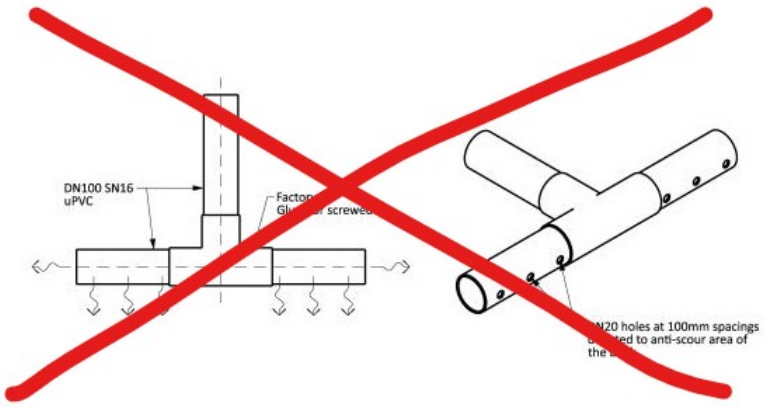
The building code standards around soakage are not considered best practice in the Waikato and should not utilised for determination of infiltration rates.

**Bubble up chambers:**

Public bubble up chambers or hydraulic syphons should be avoided as they provide poor hydraulic characteristics and act as debris and sediment collection devices requiring regular maintenance.

**Minor stream outlets:**

Although these are shown in the RITS these are not considered an acceptable solution as an outlet due to the lack of resilience these provide.



## 6. Stormwater Detention

Detention is often required to limit downstream erosion and flooding. Maintaining above ground flood mitigation assets is generally easier and preferred. The following list outlines WDC/WSL preferences for stormwater detention devices from preferred to least desirable.

1. Utilising above ground treatment devices for storage (wetlands, ponds etc.)
2. Conveyance swales (weirs can be used to increase storage volume)
3. Utilising conveyance networks for storage (Oversizing pipes) – Online/Offline
4. Rock filled trenches (preferred only as infiltration devices)
5. Private stormwater tanks above ground
6. Private stormwater tanks below ground (not preferred)
7. Plastic/PE crate type storage underground (not acceptable) – no access, unable to be repaired or cleaned out, unable to CCTV, units fail if ground movement occurs or if geo-wrap contains a hole. Multiple examples of failures in the UK from this product.

***Example of the consequences of failure of a modular geocellular tank after three years***

*Image source: Structural design of modular geocellular drainage tanks by Steve Wilson: The Environmental Protection Group Limited.*

**Floatation**: Checking the floatation of stormwater assets is required to ensure issues don't occur when ground water tables impact assets. Any underground stormwater asset requires a floatation calculation to confirm suitability (generally at EPA stage, but worth considering at consent stage if it could revise the design).

## 7. Location of Devices

The location of a stormwater devices can affect how easy it is to operate and maintain. Considerations include notification requirements, traffic management, other utilities and surfaces requiring reinstatement (these should be considered in the safety in design process).

The following list outlines WDC/WSL preferences for stormwater device location from preferred to least desirable.

1. Parks and reserves (open space/grass cover only)
2. Stormwater easements
3. Road reserves verge (outside of carriageway)
4. Road reserves under carriageway
5. Private property

## 8. Pipes and culverts

**Pipe material:** Most commonly available pipe material is generally acceptable (Concrete, GRP/FRP, Extruded PE and PVC) provided it is fit for purpose and complies with the required specifications (including manufacturers requirements).

Corrugated PE pipes are not acceptable due to issues with jointing and repair work limitations. Corrugated PE pipes do not enable a robust continuous strength repair solution once in the ground. Built in electrofusion couplers on corrugated pipe are also not acceptable as there is no robust repair methodology if they fail during installation.

**Pipe sizing:** Refer to WRC guidelines and RITS for design and sizing criteria. In addition to the required design flow pipe sizing, new rigid pipes (FRP and Concrete) should also enable future lining installations (CIPP) without encroaching on the design size. Typically, these types of liners (cured in place, concrete spray lining and spiral liners) are less than 25mm thick (depending on pipe size and strength required). We recommend that an additional 40-50mm of diameter is allowed for in the pipe design so that future linings can occur without reducing on the design capacity. This is likely to be incorporated in the stepped sizing selection in the design process.

**Multiple conduits:** A single (large) pipe is preferred over multiple smaller parallel pipes. Maintaining two or more pipes when one can achieve the same conveyance is not considered efficient (future maintenance costs should be considered during the design process). There

are circumstances where multiple pipes maybe required (size of a single pipe is greater than 2m, avoiding critical services, limited cover available, depth of excavation becomes unsafe etc..). If providing minimum cover is an issue, the design should consider the use of box culverts before selecting a multiple conduit solution.

**Driveway culverts:** Culverts under a driveway can be problematic if the swale size either side of the culvert is too shallow. The swale size needs to account for minimum pipe size and cover on the pipe. Currently the RITS allows plastic pipes with minimal cover with a 225mm dia minimum pipe size. This standard is not considered adequate for a significant design life and we recommend developers align with the roading standards being, minimum pipe size 300mm dia, concrete RCRRJ pipe with a minimum cover of 300mm (designer must ensure loading requirements are met). This relates to a minimum swale depth of at least 600mm.

**Pipes and box culverts:** Due to the ease of supply (cost) and standardised connections, circular pipes are preferred over box culverts. Box culverts are acceptable provided there is reasoning for their selection (i.e., limited cover/physical constraints).

**Alignment:** Pipes under buildings or in locations where they cannot be easily accessed for replacement/repairs is to be avoided. Placement of pipes will affect the location of access and maintenance points (manholes). Manhole locations should be considered carefully during the design process (Safety in Design consideration).

## 9. Pond and Wetland edge planting

**Water temperature:** Water temperature is becoming a more significant issue across the region with a recent example of temperature increase causing low dissolved oxygen significantly affecting aquatic life. Water temperature is a required consent measured parameter. One of the main causes for temperature increase is the use of ponds and wetland without shading/perimeter planting. Careful consideration of any trees and shrubs to be use for perimeter planting is required to ensure the following:

- Does not contribute to blockage risk by dropping leaves into the pond/wetland
- Requires minimal maintenance
- Does not significantly increase or create a significant hazard or operational/maintenance issue
- Aligns with local planting requirements where possible
- Utilises local natives where possible

## 10. Vesting of Assets, Reserve Areas and Easements

*Stormwater assets require vesting if they provide a specific stormwater function for the community that requires specialist operation and maintenance.*

This includes:

- Public Dry ponds/Ponds
- Public Wetlands, treatment swales and Raingardens
- Public pipe networks and associated assets (headwalls etc…)
- Public Weirs and flow control devices

This excludes:

- Existing gullies and waterways
- Existing wetlands
- Private stormwater assets

Vesting of land is only required for ponds. The land to be vested is to only be the land in which the pond is located and required for access. Additional land not required for stormwater functions or 'left over' land is not to be vested.

Easements are required for the following:

- Above pipes and manholes
- Where vegetation is required to be maintained (e.g. public swales)

**Rights of way:** Right of ways are not be vested to Council, however raingardens or filter chambers that treat the runoff from the right of way **that serves multiple properties** is required to be vested to Council. The linking pipework for any Council owned asset must to the RITS requirements.

## 11. Post-construction Considerations

As per the WDC bylaws (public places bylaw, stormwater bylaw Urban vs. Rural) it is the property owner's responsibility to maintain the road frontage/verge.

Generally, there are two types of swales across the district being conveyance swales and treatment swales. Treatment swales are vegetated and treat the stormwater during conveyance. There are two main types of treatment swales being grassed and planted. Planted swales generally contain shrubs and reed type vegetation in the base and along the side slopes.

The following list outlines activities that the property owner can undertake in terms of stormwater swales located within the verge and when you may need to contact

WDC/Watercare:

- **Grassed swales** should have side slopes that enable mowing. The property owner is responsible for mowing these as they form part of the verge.

  Consider cutting the grass inside the swale less often than your main lawn as maintain a high grass height in the invert of the swale will ensure a higher level of treatment for water entering our waterways.

- **Planted swales** utilise plants to treat the stormwater runoff. The plants inside the swales are not be removed or weed sprayed. If the plants have grown outside of the swale perimeter, then the property owner can trim the plants back to the edge of the swale. If the plants are too high and are causing an issue with visibility (i.e. you don't have clear line of site to the road), then the property owner can trim the plants to a minimum height of 0.5m from the edge of the swale. Clearing of the ends of the swales around the inlet or outlet is acceptable. If the plants die off please contact Council for replanting.

Swales must be designed in accordance with the parameters outlined in the Regional Infrastructure Technical Specifications:

- Longitudinal slope:
  - 1.5 – 3% - ideal,
  - 5% - allowed in accordance with the design guidelines,
  - Check dams can be used if slopes between 5-10%.

Width of swales depend on several contributing factors including desired depth and overall contributing catchment area. Swales should have a minimum width of 1 meter with 1:3 batters either side.

Contact WDC:

- If the plants inside a planted swale are in poor condition, dying or dead
- If the plants inside a planted swale are causing a blockage within the swale stopping its conveyance function or causing surface flows outside of the swale
- If there is litter or other debris within the swale
- If there is significant amount of silt within the base of the swale

## 12. Flood Risk

Floodplains and flood prone areas are situated in overland flow paths or near a river or stream. They are part of the secondary stormwater system and become inundated during a flood event. Floodplains and flood prone areas need to be maintained to reduce flooding impacts on surrounding property and to protect people and property. If a floodable area is reduced or blocked, the depth and velocity of stormwater can change and impact on people / property.

Local catchment management plans (CMPs) include:

- WDC CMPs - https://www.waikatodistrict.govt.nz/your-council/plans-policies-and-bylaws/plans/catchment-management-plans
- WRC CMPs - https://www.waikatoregion.govt.nz/council/policy-and-plans/rules-and-regulation/regional-plan/

District wide flood modelling is not available in all areas. The level of accuracy in the flood modelling can varies across the CMPs. Additional analysis is usually required if the flood risks are unclear or appear imprecise.

Waikato Regional Council has a Hazards Portal for flood management along the Waikato River, and major overland drainage paths. The portal contains spatial hazard information that is held by Waikato Regional Council, as well as data from other organisations. The portal can be used to identify your property is protected by flood control methods such as stopbanks, dams and floodgates.

https://waikatoregion.maps.arcgis.com/apps/MapSeries/index.html?appid=f2b48398f93146e8a5cf0aa3fddce92c
https://waikatoregion.govt.nz/services/regional-services/regional-hazards-and-emergency-management/regional-hazards-portal/

To understand the flood risk thresholds, hazard vulnerability curves can be used. Following an example from the ARR Guidance document (or similar guidance), hazard vulnerability classifications can be split, and depth / velocity limits assigned, refer to the figure below:

As a general rule - For people, vehicles and building the maximum depth (m) x velocity (m/s):

- 0.3
- For larger vehicles the maximum depth x velocity = 0.6

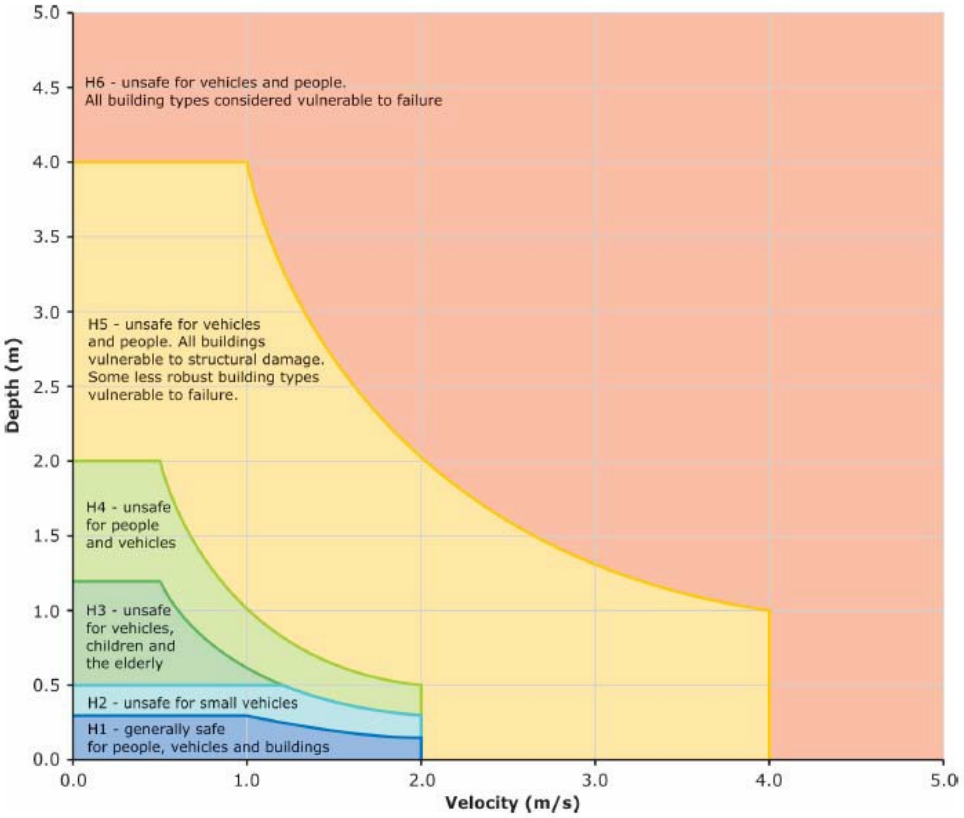



*Figure 2: ARR Flood Hazard Curves (Source: Figure 6.7.9. Combined Flood Hazard Curves (Smith et al., 2014))*

## 13. Overland Flow Paths (OFP)

OFPs must enter and existing at the property boundary in the same location as the existing OLPs (no works outside of the property unless approved by landowners). The overland flow path capacity (1% AEP+ CC) must be maintained so it does not affect the upstream or downstream conveyance/flooding. Piping of any overland flow paths is unlikely to be approved by WRC due to not aligning with the latest guidelines or local Iwi preferences. WSL prefers open channels to pipes as pipes reduce the existing water treatment gained from vegetation and UV from the open channel and also assists with flood mitigation.

## 14. Erosion Protection

The hydraulic design of any stormwater system should consider erosion potential. This can be done using velocities and the Froude number to determine erosion protection requirements. It is recommended to reduce velocities within the hydraulic design of an asset before utilising baffles and velocity reduction systems to reduce erosion potential (i.e. can the pipe grades be reduced and remove the need for baffles? Baffles within culverts and pipes is not preferred due to the additional blockage risk and maintenance requirements but can be used if the site constraints provide no reasonable alternative).

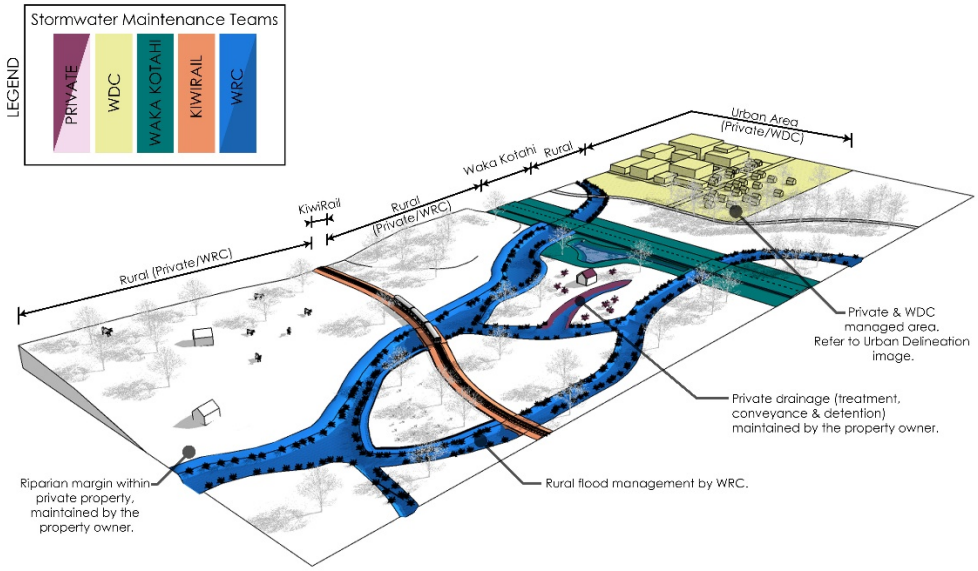
Riprap is added to outlet to minimise the risk of bed erosion and prevent undermining of the outlet headwall.

For additional guidance on riprap design refer to:

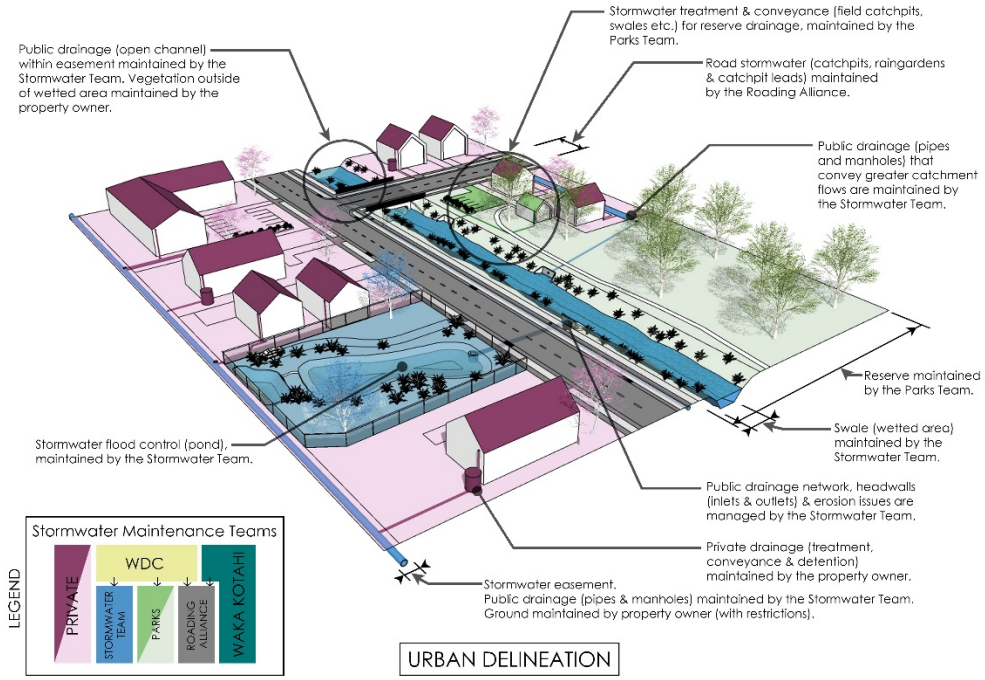
Hydraulic Engineering Circular No. 14, Third Edition - Hydraulic Design of Energy Dissipators for Culverts and Channels - HEC 14 (buildingincalifornia.com)

Or Catchment and Creaks, Brisbane Australia - Rock Sizing - Catchments & Creeks PTY Ltd (catchmentsandcreeks.com.au)

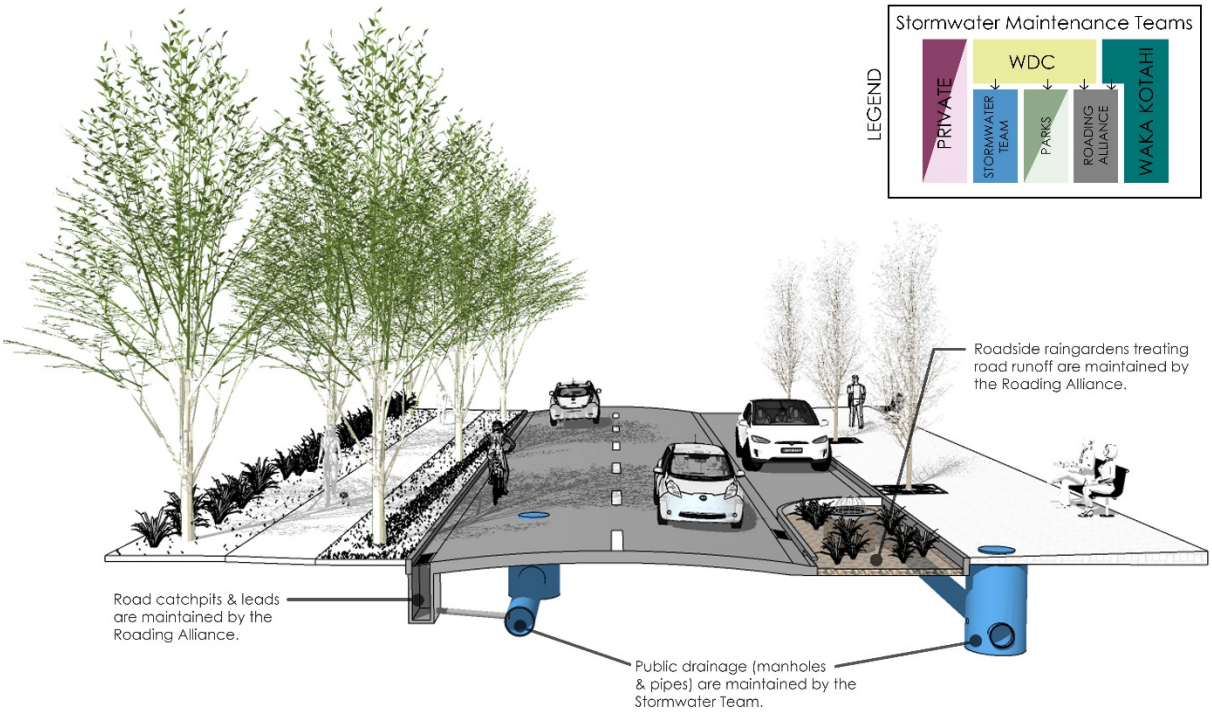
# 15. Asset Responsibilities Graphics



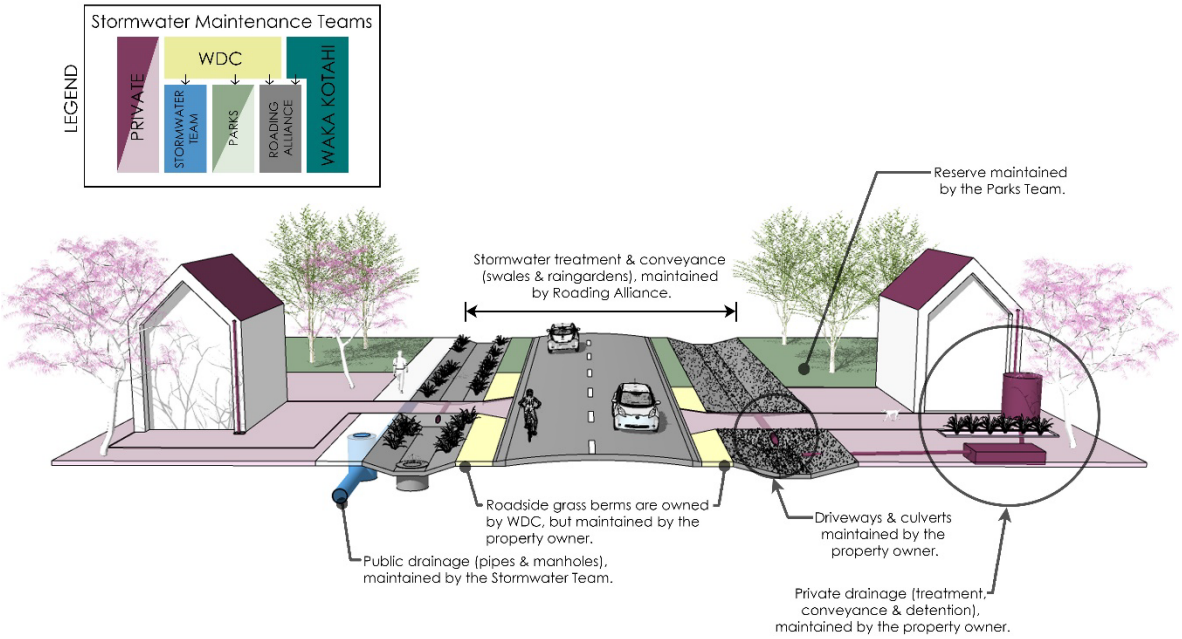

DISTRICT WIDE RESPONSIBILITIES




URBAN DELINEATION




URBAN STREET SCAPE #1 - CROSS SECTION




URBAN STREET SCAPE #2 - CROSS SECTION

## 16. Legislation and Policy

Technical guidance documents provide an array of design support including: outlining design objectives and what is required to meet local, regional and national standards; providing guidance on stormwater management approaches and how to design infrastructure that meet the required level of service; and how to address health, safety and environmental factors through good stormwater practices.

A summary of key technical guidance material that support stormwater design in the Waikato Region are below.

| Guidance Material | Relevance | Considerations in SW design |
|---|---|---|
| Regional Infrastructure Technical Specifications (RITS) | Standards for design of public infrastructure in the Waikato District | Refer to for all SW Design. Refer to RITS preference section. |
| Waikato Regional Policy Statement | Provides overview of resource management issues policies and methods to achieve intergraded management of resources. | Important for non-point discharges (such as agricultural or stormwater run-off). Link - Waikato Regional Policy Statement: Te Tauākī Kaupapahere Te-Rohe O Waikato \| Waikato Regional Council |
| Waikato Stormwater Management Guideline. WRC Technical Report 2020/07 | Technical guidance document outlining the design criteria and how to select, design, construct and maintain stormwater management systems | Refer to for all SW Design Link - Waikato Stormwater Management Guidelines |
| Waikato Stormwater Runoff Modelling Guideline. WRC Technical Report 2020/06 | Outlines the stormwater modelling guidelines for the Waikato Region, to ensure consistent results from different practitioners | Refer to if modelling SW Link - Waikato stormwater runoff modelling guideline \| Waikato Regional Council |

| | | |
|---|---|---|
| Te Ture Whaimana o Te Awa o Waikato – the Vision and Strategy | Outlines the key objectives for the Waikato River and its catchments, outlining strategies/policies to achieve the objectives | For stormwater design that impacts on the Waikato River or how the catchments operate. |
| National Policy Statement for Freshwater Management | The National Policy Statement for Freshwater 2020 provides local authorities with updated direction on how they should manage freshwater under the Resource Management Act 1991. | Document that support freshwater management design National Policy Statement for Freshwater Management 2020 (environment.govt.nz) |
| New Zealand Fish Passage Guidelines by NIWA<br><br>Waikato Regional Council document 'Best Practice Guidelines for Waterway Crossings' 2006 | The New Zealand Fish Passage Guidelines sets out recommended practice for the design of instream infrastructure to provide for fish passage. | Refer to guidelines for fish passage design.<br><br>NZ-FishPassageGuidelines-upto4m-NIWA-DOC-NZFPAG.p df untitled (waikatoregion.govt.nz) |
| Worksafe Introduction to the Health and Safety at Work Act 2015 (HSWA) | A guide to New Zealand's key work health and safety law and its regulators | Legislation behind Safety in Design components Introduction to the Health and Safety at Work Act 2015 – special guide \| WorkSafe |
| Hamilton City Standard Technical Specifications Manual. Part 7: Landscape works | Covers the preparation, installation and maintenance of planting designs and all new and existing planted stormwater devices. | For assets vested over that require a planting plan Link Part 7 - Landscape Works - Hamilton City Council |
| Auckland City Council and Matamata Piako Soakage and infiltration guidelines | These guidelines are considered more up to date than the building code guidelines and considered best practice. | https://content.aucklanddesignmanual.co.nz/regulations/technical-guidance/Documents/GD07%20Soakage%20and%20Groundwater%20Recharge%20Guide.pdf |

# 17. STORMWATER CONSENT APPROVAL CHECKLIST

Revision 1: March 2022

| ENGINEERING CHECKLIST | | |
|---|---|---|
| **Item** | **Description** | **Checked (tick if no follow up required** |
| 1.1 | Are you a qualified Engineer (CPEng) familiar with WRC modeling and stormwater requirements? | |
| 1.2 | Are multiple Road Crossings proposed when one could work? | |
| 1.3 | Are road culverts/pipes crossing the road at a perpendicular angle? | |
| 1.4 | Is a detailed traffic management plan and equipment needed to access assets? | |
| 1.5 | Is a soakage proposed and if so has soakage testing been completed to NZ standards? | |
| 1.6 | Are assets easily accessible? | |
| 1.7 | Is access to media and filters inside assets (manholes/raingardens) easy or does it require specialist equipment? | |
| 1.8 | Are there pipes that change direction or grade without a manhole chamber or using a catchpits as manhole chamber? | |
| 1.9 | Do subsoil drains connect into a sump? | |
| 1.10 | Do earthworks encroach on flood plain area? | |
| 1.11 | Does treated water mix with untreated or clean water before entering a treatment device? | |
| 1.12 | Is the catchment delineation correct? Has it considered catchments outside of the proposed site? | |
| 1.13 | Are upstream flows entering the site managed? | |
| 1.14 | Is there an opportunity to improve water quality of the overall catchment? This is a consent condition requirement that Council may wish to utilise. | |
| 1.15 | Are level spreaders being proposed for steep slope discharge or for more than a single house/residential property? | |

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| 1.16 | If proposing on lot mitigation, has the application assessed how individual private lots will meet their SW management requirements? WDC expect to see proof that a standard solution is possible. | |
| 1.17 | Does the application rely on private assets to treat stormwater? If so, how will Council be able to easily confirm compliance? Recommend the only private assets approved are filter strips (with easements) and above ground tanks. Any other assets are likely to be rejected by unless there are limited alternatives. | |
| 1.18 | Has downstream flooding risk increased? | |
| 1.19 | Does the application assess upstream and downstream effects including issues within the existing network and overland flow paths? | |
| 1.20 | Could connections to the existing network cause flooding other areas? Specifically, could the hydraulic design cause flows to exit via an existing catchpit? | |
| 1.21 | Does the design require a flap gate to protect assets? If so, is there an alternative? | |
| 1.22 | Has the design considered the use of non-mechanical type flap gates? | |
| 1.23 | Has Safety in Design (SID) been considered with proof of this included in the application? | |
| 1.24 | Has soakage been proposed when the site has access to an existing SW network or waterway/overland flow path? | |
| 1.25 | Does the designer have an acceptable SW strategy that covers, detention (if required), treatment and conveyance? | |
| 1.26 | If in an urban area and proposing the use of swales, has the Roading team been consulted? | |
| 1.27 | Does the proposal align with other developments in the area? (Caveat: two wrongs don't make a right) | |
| 1.28 | Does the proposal utilise and enhance any existing natural features of the site? | |
| 1.29 | Does the proposal affect any parks, footpaths or reserves? If so, have parks been consulted? | |
| 1.30 | Is fish passage required or been considered in the design? | |
| 1.31 | Does the development required WRC consent (is there any new outfalls or SW modifications proposed)? | |

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| 1.32 | Is the National Policy Statement (NPS) for fresh water require an ecological assessment? Is there possible mud fish in the proposed location (farm drains)? | |
| 1.33 | Will proposed building impede the overland flow path? | |