

Water sensitive urban design (WSUD) assets

Inspection and maintenance guidelines

Rainwater tanks

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This guideline has been adapted from:

- Blacktown City Council (2019) *Water sensitive urban design (WSUD) inspection and maintenance guidelines*. Developed with assistance from E2Designlab Pty Ltd. A previous version was developed with assistance from Alluvium Consulting Australia Pty Ltd.

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This guide is of a general nature only. Advice from a suitably qualified professional should be sought for your particular circumstances. Depending on each unique situation, there may be occasions where compliance is not achieved.

Water Sensitive SA welcomes feedback on improvements to these guidelines, particularly WSUD assets images in differing conditions for the *Condition assessment audit visual reference sheets*.



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1 Asset description and functional components

Inspection and maintenance guidelines of rainwater tanks must be read in conjunction with *Water sensitive urban design (WSUD) assets: Inspection and maintenance guidelines | Overview*

Rainwater tanks

A rainwater tank captures and stores roof runoff water for use on-site and/or detains flows as part of local flood control.

The tank **retention storage** (volume below the overflow pipe outlet or orifice, or detention outlet in Figure 1.1) is plumbed to:

- internal uses such as toilet flushing, hot water service and laundry cold tap, and/or
- outdoor uses such as irrigation or car washdown.

The tank **detention storage** water (volume above the lowest overflow pipe outlet or orifice) discharges to a Council stormwater network at a specified slow-release rate to minimise localised flooding during storm events.

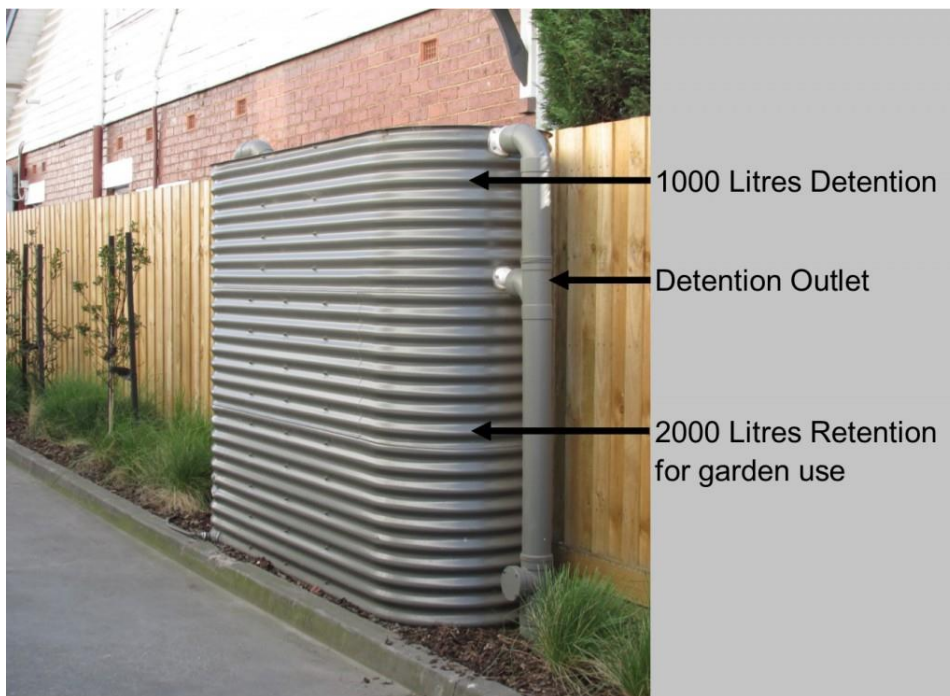


Figure 1.1 Combined detention and retention tank (Source: Slimline Tanks)

It is important that the tank fills and empties regularly, as water stored in tanks for extended periods can become a health hazard. Maximising demand from the tank, in conjunction with an effective rainwater harvesting and treatment system, will help to maintain suitable water quality.



Functional components

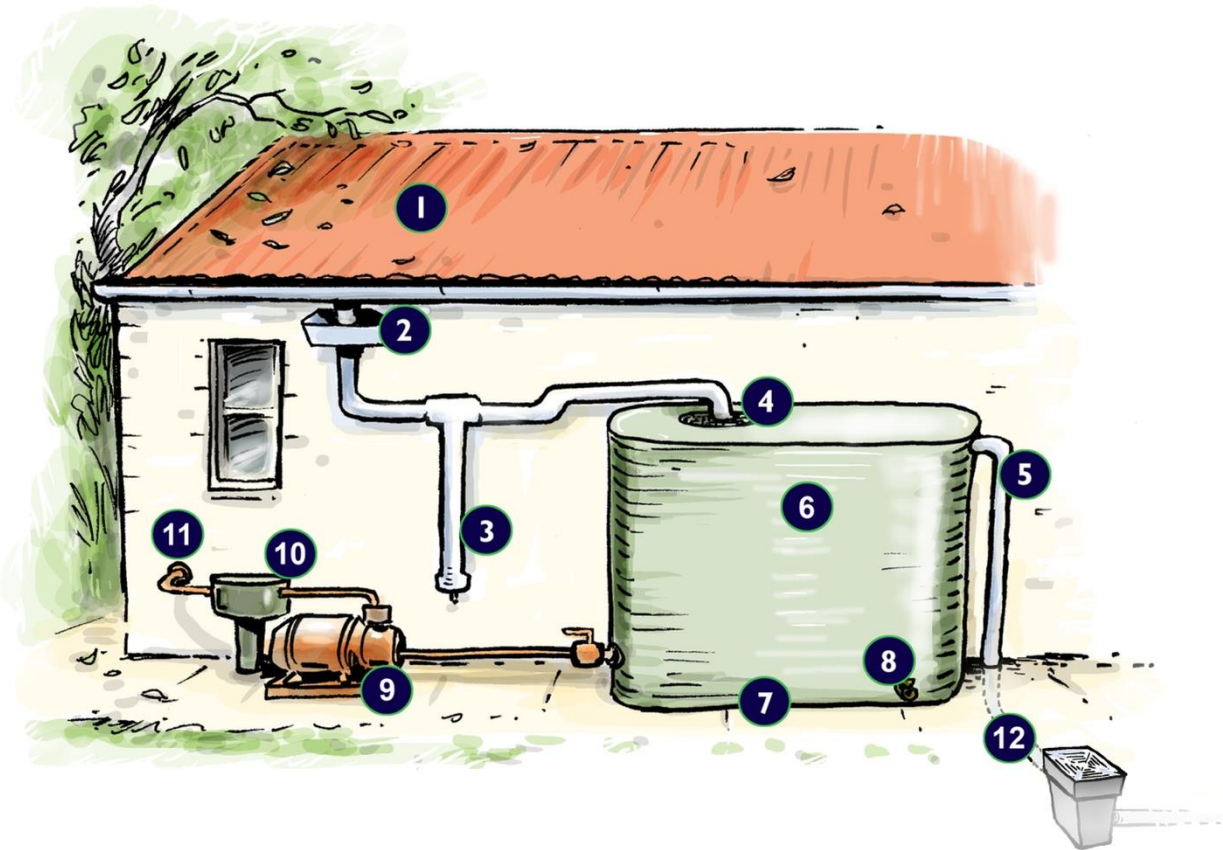


Figure 1.2 The functional components of a rainwater tank and its connections

Rainwater tanks comprise five main functional components (Figure 1.2):

Roof, gutter and downpipes

1. **Roof and gutters** collect rainwater and direct rain towards the rainwater tank (tank). Gutters are susceptible to a build-up of leaf litter from surrounding trees.
2. **Downpipes** including screen (also known as a rain head) is the connector between the gutter and pipe to the tank. This can include a leaf diverter and mosquito screen.
3. **First flush device** captures the initial dirty runoff from the roof and diverts it away from the tank.

Tank inlet

4. **Tank inlet screen** filters the water entering the tank and keeps mosquitoes and pests out.

Tank

The **tank** stores captured water for reuse.

5. **Overflow pipe** typically drains excess rainwater into the stormwater drainage network, when the tank is full.
Alternatively, and if site conditions permit, the overflow pipe may be connected to an infiltration trench, subsurface passive irrigation, swale or other WSUD asset. To avoid nuisance flows to neighbouring properties, excess overflow must be returned to the stormwater drainage network.
6. **Tank body** stores rainwater prior to use, and is commonly constructed of steel, concrete or plastic.
7. Tank **base/foundation** is a solid and stable base for the tank to rest on.
8. **Tap or sludge valve**, located towards the base of the tank, is used to drain and de-sludge the tank.



Supply systems

9. **Pumps, valves and backflow devices** may be used to supply re-use (indoor or outdoor), which takes water from the tank and pressurises it. Pumps and valves often require a professional to undertake maintenance.
 - Mains water top-up systems (optional) has an internal float valve that automatically determines when storage water levels are low and mains water top-up is needed.
 - Backflow prevention device prevents backflow of water from the tank into the mains water supply, and is required whenever mains water top-up system is used.
 - Isolation valve controls the flow of water from the mains water supply into the tank, and may need to be installed prior to and after pump systems.
 - Flow meter monitors water usage from the tank and is generally only used for commercial and industrial developments.

10. **Filters** The level of filtration will be determined by the intended end use of the rainwater:
 - Hot water systems and laundry –tannin and sediment filters are required.
 - Toilet bowl – tannin and sediment filters are advisable to prevent discolouration.
 - Irrigation or outdoor use – filtration is not required.

Consult filter suppliers for advice on a suitable filter for the quality and flow rate required.

Ensure that filter housing is accessible and shut-off valves are installed so water will not drain out of the pipework.

11. **Rainwater supply pipe** connects the rainwater tank to end uses such as irrigation systems, toilets, washing machines and hot water tanks.

12. **Inspection pit** temporarily holds overflow from the rainwater tank, prior to roof rainwater runoff being discharged to the council drainage system.

Expertise required

Most rainwater tank maintenance and monitoring tasks are simple and non-technical; however, mechanical components (e.g. pumps, filters, backflow prevention devices and valves) require specialist skills to service. Rainwater tank maintenance and monitoring can also present challenging access and safety issues (e.g. on roofs, tank desludging) that may require specialised equipment. A complete rainwater tank condition inspection is typically undertaken by a qualified and licensed tradesperson, such as a plumber.

The property owner or owners' corporation can undertake some basic checks and maintenance to keep rainwater tanks in good working order. This includes listening to confirm the pump is running when expected; and cleaning leaf litter and/or debris from screens or filters and replacing as needed when accessible.

Care should be taken when cleaning gutters, as there are hazards associated with working at heights. Under no circumstances should an unlicensed person enter a confined space such as a rainwater tank.

Resources

General information:

- The [Rainwater Harvesting Association of Australia \(RHAA\)](#) provides general guidance on tank elements and maintenance including a troubleshooting guide of common issues and solutions for pumps
- [Your home: Australia's guide to environmentally sustainable homes - Rainwater](#)

Design optimisation:

- [InSite Water Tool](#)



Construction:

- Refer to your plumber for more information on how to set up rainwater harvesting system, e.g. backflow prevention devices.

2 Inspection and maintenance forms and activities

Routine inspection requirements typically involve:

- Check for sediment, leaf litter and/or debris build-up in gutters, rainheads, first flush devices and tank inlet screens
- Check cleanliness of filter cartridge
- Check pump is in good working order
- Check valve controlling backflows is in good working order
- Check potable/mains water backup
- Monitor tank exterior condition and base stability

Routine (proactive) maintenance requirements typically involve:

Activity

Frequency

- | | |
|--|---------------------------------|
| ▪ Remove sediment, leaf litter and/or debris from gutters, rainheads, first flush devices and tank inlet screens | Prior to significant rain event |
| ▪ Clean/replace filter cartridge (if applicable) | Annually |

Major maintenance or rectification activities typically involve:

- Service or replace pump, backflow device, flow meter and valves
- Desludging of tank

Details of the routine inspection and maintenance activity to maintain the amenity of rainwater tanks can be found in form

01: Inspection and maintenance sheet | Rainwater tanks – routine (proactive)

Routine inspections include the performance of a condition assessment audit to inform asset management planning. The condition assessment score matrices are detailed in form

02: Condition assessment audit – descriptive reference sheet | Rainwater tanks

Trouble shooting

Pump cutting out regularly Tank water level is low and/or potable/mains backup is not working.

Water flowing from tank contains sediment or is discoloured Poor water quality may result from:

- tank water level is too low
- tank needs desludging
- maintenance required with treatment train: Gutters, rainhead, first flush device, and tank inlet screen and filter
- no first flush device or filter present in rainwater harvesting system.

Scour occurring at tank overflow outlet pipe Connect tank overflow pipe to a slotted agricultural pipe covered in a geotextile fabric sock and bury the slotted pipe within garden beds to passively irrigate landscaped areas. Connect outflow from agricultural pipe to Council drainage system.



Tank regularly overflows to Council drainage network Connect more internal uses (demand) to the tank, e.g. additional toilets, hot water service or cold laundry tap OR upgrade to a larger tank.

Date	_____	Purpose of visit	Rainfall conditions
Location	_____	<input type="checkbox"/> Routine inspection	<input type="checkbox"/> Rainfall today (__mm)
Asset name	_____	<input type="checkbox"/> Response to complaint	<input type="checkbox"/> Rainfall in last 3 days (__mm)
Asset ID	_____	<input type="checkbox"/> Other (specify)	<input type="checkbox"/> No recent rainfall
Inspected by (name /company)	_____		

INSTRUCTIONS

Prior to maintenance activities occurring, rate asset functional component condition score (from 0 to 5) as per the scoring system below and circle the relevant score.

If score = 0, generate Works Request to refer matter to relevant Council team to decommission the asset or investigate further.

If score = 1, no action is required.

If score = 2, action may be required in some circumstances.

If score = 3, undertake the necessary maintenance and record action taken in right hand side column.

If score = 4 or 5, generate Works Request to refer matter to relevant Council team for rectification works.

Scoring

0 – Asset has been decommissioned, no longer exists or was not able to be rated due to serviceability issues

1 – As new

2 – Working well, PI met

3 – Routine (proactive) maintenance required

4 – Major maintenance/minor rectification works required

5 – Major rectification required

Actions

If further action is required, raise a Works Request for relevant department.

Provide reason for 0 rating/not rated.

Functional component		Performance indicator (PI)	Existing condition score and action(s)						
1		Roof and gutters							
1a	Damage and/or rust (Annual)	Roof and gutters stable with minimal rust	0	1	2	3	4	5	<input type="checkbox"/> Clean roof and gutters – remove moss, lichen and debris <input type="checkbox"/> Other (provide details): Information: Leaves and debris may need to be removed from roofs, gutters, first flush devices, tank inlets and outlets monthly where overhanging vegetation is present. Where overhanging vegetation is not present, an annual or 6-monthly clean may be sufficient. Commence with 3-monthly inspections and adjust as required.
2		Downpipes, including rain head							
2a	Damage (Annual)	Secure downpipe Limited holes or leaks Limited amount of leaf litter and/or debris Water can still enter tank	0	1	2	3	4	5	<input type="checkbox"/> Manual removal of leaf litter and/or debris <input type="checkbox"/> Other (provide details): Information: Leaf litter and/or debris may need to be removed from roofs, gutters, first flush devices, tank inlets and outlets monthly where overhanging vegetation is present. Where overhanging vegetation is not present, an annual or 6-monthly clean may be sufficient. Commence with 3-monthly inspections and adjust as required.

Functional component		Performance indicator (PI)	Existing condition score and action(s)
3		First flush device	
3a	Blockage	Limited blockage Water can easily enter first flush device	0 1 2 3 4 5 <input type="checkbox"/> Manual removal of leaf litter and/or debris <input type="checkbox"/> Other (provide details): Information: Leaf litter and/or debris may need to be removed from roofs, gutters, first flush devices, tank inlets and outlets monthly where overhanging vegetation is present. Where overhanging vegetation is not present, an annual or 6-monthly clean may be sufficient. Commence with 3-monthly inspections and adjust as required.
4		Tank inlet screen	
4a	Damage	Limited holes or damage to screen Gross pollutants cannot enter tank	0 1 2 3 4 5 <input type="checkbox"/> Remove grate and screen. Clean and repair as required <input type="checkbox"/> Other (provide details): Information: Remove grate and screen and examine for rust or corrosion, especially at corners or welds. Depending on type of screen, replacement may be as simple as placing another screen on existing fitting, with no tools required.
4b	Blockage	Limited blockage	0 1 2 3 4 5 <input type="checkbox"/> Clear accumulated sediment and leaf litter from inlet <input type="checkbox"/> Other (provide details):
5		Overflow pipe	
5a	Blockage	Limited blockage	0 1 2 3 4 5 <input type="checkbox"/> Clear accumulated sediment and leaf litter from overflow pipe <input type="checkbox"/> Other (provide details):
5b	Damage (Annual)	Limited damage	0 1 2 3 4 5 <input type="checkbox"/> Repair overflow pipe. <input type="checkbox"/> Other (provide details):
5c	Erosion	Limited erosion at overflow outlet	0 1 2 3 4 5 <input type="checkbox"/> Re-profile ground surface <input type="checkbox"/> Other (provide details):
6		Tank body	
6a	Damage (body integrity) (Annual)	No damage to body of tank	0 1 2 3 4 5 <input type="checkbox"/> Remove grate to inspect internal walls. Check condition of tank walls and roof to ensure no holes, cracks or spalling have occurred due to tank deterioration Information: Do not enter tank without confined space certification. Secure open access covers to prevent risk of entry. <input type="checkbox"/> Contact licensed plumber to repair defects or leaks <input type="checkbox"/> Other (provide details):
7		Tank base	
7a	Damage (base stability) (Annual)	Limited damage to base.	0 1 2 3 4 5 <input type="checkbox"/> Contact licensed plumber if integrity is questionable <input type="checkbox"/> Other (provide details): Information: If tank is on a stand or concrete slab, check structural integrity of support.

Functional component		Performance indicator (PI)	Existing condition score and action(s)						
8		Tap or sludge valve							
8a	Sediment (Annual)	No sediment in outflow	0	1	2	3	4	5	<input type="checkbox"/> Siphon bottom portion of sediment from tank or empty and rinse tank by opening cleaning outlet and allowing water and sludge to pass out <input type="checkbox"/> Ensure sludge is disposed of appropriately <input type="checkbox"/> Other (provide details): Information: First flush systems and mesh screens on tank inlets will reduce amount of sediment and debris entering tank, thereby extending time required before desludging is needed. For large tanks, it is recommended a professional tank cleaner be employed as confined space entry may be required. Plastic tanks should be tied down prior to being emptied if strong winds are present. Waste must be transported to a waste facility that is appropriately licensed to accept such waste (if there is no opportunity for reuse onsite). A tank and/or pit may be considered a confined space, requiring safety equipment and training.
9		Pumps, valves and backflow devices							
9a	Condition (pump) (Annual)	Good working order	0	1	2	3	4	5	<input type="checkbox"/> Clear accumulated dust and/or debris. Check to see if power supply is switched on. Contact licensed professional to regularly service, in line with manufacturer's instructions <input type="checkbox"/> Other (provide details): Information: Contact manufacturer, an electrician or licensed plumber if you suspect there is a problem. DO NOT tamper with these systems as they have potential to contaminate mains water supply.
9b	Condition (valves) (Annual)	Good working order	0	1	2	3	4	5	<input type="checkbox"/> Contact licensed plumber to rectify malfunction, in line with manufacturer's instructions <input type="checkbox"/> Other (provide details): Information: A licensed plumber can advise about SA Water requirements.
9c	Condition (potable/mains backup) (Annual)	Good working order	0	1	2	3	4	5	<input type="checkbox"/> Contact licensed plumber to rectify malfunction, in line with manufacturer's instructions <input type="checkbox"/> Other (provide details): Information: A licensed plumber can advise about SA Water requirements.
9d	Condition (backflow prevention device) (Annual)	Good working order, fitted correctly	0	1	2	3	4	5	<input type="checkbox"/> Contact licensed plumber to rectify malfunction, in line with manufacturer's instructions <input type="checkbox"/> Other (provide details): Information: A licensed plumber can advise about SA Water requirements.
10		Filters							
10a	Blockage (Annual)	Clean, in good condition	0	1	2	3	4	5	<input type="checkbox"/> Clean and replace cartridges, in line with manufacturer's instructions <input type="checkbox"/> Other (provide details): Information: Pleated sediment filters must be changed annually if part of a drinking water supply. Ceramic filters to be removed for cleaning when the flow rate becomes too low. Filters require specific tools or a professional to undertake maintenance.

Functional component		Performance indicator (PI)	Existing condition score and action(s)					
11		Rainwater supply pipe						
11a	Damage	Limited damage	0	1	2	3	4	5
			<input type="checkbox"/> Repair rainwater supply pipe <input type="checkbox"/> Other (provide details):					
12		Other fittings or components, e.g. pipes, orifices						
12a	Damage to or removal of structures (Annual)	Limited damage	0	1	2	3	4	5
			<input type="checkbox"/> Contact licensed plumber to rectify malfunction, in line with manufacturer's instructions <input type="checkbox"/> Other (provide details):					

Functional component		Inspection frequency (months)	Very good (condition score – 1)	Good – Performance indicator (PI) met (condition score – 2)	Fair (condition score – 3)	Poor (condition score – 4)	Very poor (condition score – 5)
1		Roof and gutters					
1a	Damage and/or rust (Annual)	Annual	No damage to roofs and gutters	Roofs and gutters stable with minimal rust	Minor damage and/or areas of rust in roofs and gutters Minimal impact on inflow into tank	Moderate damage and/or areas of rust in roofs and gutters Minor risk to safety Moderate impact on inflow into tank	Significant damage and/or extensive areas of rust in roofs and gutters. Moderate to significant risk to safety Significant impact on inflow into tank
2		Downpipes, including rain head					
2a	Damage (Annual)	Annual	Secure downpipe No holes or leaks Clear of leaf litter and/or debris	Secure downpipe Limited holes or leaks Limited amount of leaf litter and/or debris Water can still enter tank	Downpipe showing signs of wear and/or has minor amount of holes or leaks Minor amount of leaf litter and/or debris Water can still enter tank	Downpipe is unstable and/or only transferring moderate amount of inflow to tank Showing moderate signs of wear Downpipe and screen (rainhead) partially blocked by leaf litter and/or debris	Downpipe is unstable and/or is not transferring inflow to tank Showing significant signs of wear Downpipe and screen (rainhead) blocked by leaf litter and/or debris
3		First flush device					
3a	Blockage	6	No blockage	Limited blockage Water can easily enter first flush device	Minor blockage Water can still enter first flush device at a reduced rate	Moderate blockage Stopping moderate amount of water from entering first flush device	Significant blockage Stopping majority of water from entering first flush device
4		Tank inlet					
4a	Damage	6	No holes or damage	Limited holes or damage Gross pollutants cannot enter tank	Minor small holes/light damage Can still function to remove most gross pollutants	Moderate holes/damage to screen Moderate amount of gross pollutants can enter tank	Significant holes/damage to screen Significant amount of gross pollutants can enter tank
4b	Blockage	6	No blockage	Limited blockage	Minor blockage	Moderate blockage	Significant blockage

Functional component	Inspection frequency (months)	Very good (condition score – 1)	Good – Performance indicator (PI) met (condition score – 2)	Fair (condition score – 3)	Poor (condition score – 4)	Very poor (condition score – 5)	
5	Overflow pipe						
5a	Blockage	6	No blockages	Limited blockage	Minor blockage.	Moderate blockage	Significant blockage
5b	Damage (Annual)	Annual	No damage	Limited damage	Minor damage, e.g. mosquito screen	Moderate damage, e.g. elbow	Significant damage, e.g. cracked or missing overflow pip
5c	Erosion	6	No erosion at overflow outlet	Limited erosion at overflow outlet	Minor erosion at overflow outlet	Moderate erosion at overflow outlet	Significant erosion at overflow outlet
6	Tank body						
6a	Damage (body integrity) (Annual)	Annual	Body of tank in excellent condition	No damage to body of tank	Minor holes/cracks in body of tank Surrounds suggest minor leakage occurring	Moderate sized holes/cracks in body of tank Surrounds suggest moderate leakage occurring	Integrity of body of tank is undermined by significant holes and/or cracks Surrounds suggest significant leakage occurring
7	Tank base						
7a	Damage (base stability) (Annual)	Annual	No damage to base	Limited damage to base	Minor damage to base, e.g. minor cracking and signs of wear on footings and/or foundation	Moderate damage to base, e.g. moderate cracking and signs of wear on footings and/or foundation Minor risk to integrity of asset, safety or asset function	Significant damage to base, e.g. significant cracking and signs of wear on footings and/or foundation Moderate to significant risk to integrity of asset, safety or asset function
8	Tap or sludge valve						
8a	Sediment (Annual)	Annual	No sediment in outflow or base of tank	No sediment in outflow	Minor amount of sediment in outflow Water flowing from tank has minor discolouration	Moderate amount of sediment in outflow Water flowing from tank has moderate discolouration	Significant amount of sediment in outflow Water flowing from tank has significant discolouration
9	Pumps, valves and backflow devices						
9a	Condition (pump)	Annual	Excellent working order	Good working order	Working but requires adjustment	Working but stalls intermittently, requiring manual reset	Not working or requires replacement
9b	Condition (valves)	Annual	Excellent working order	Good working order	Working but requires adjustment	Diminished functionality, requires adjustment and/or replacement	Not working, requires replacement

Functional component		Inspection frequency (months)	Very good (condition score – 1)	Good – Performance indicator (PI) met (condition score – 2)	Fair (condition score – 3)	Poor (condition score – 4)	Very poor (condition score – 5)
9c	Condition (potable/ mains backup)	Annual	Excellent working order	Good working order	Working but requires adjustment	Diminished functionality, requires adjustment and/or replacement	Not working, requires replacement
9d	Condition (backflow prevention device)	Annual	Excellent working order, fitted correctly	Good working order, fitted correctly	Working but requires adjustment	Diminished functionality and/or is not fitted correctly, requires adjustment	Not working, requires replacement
10	Filters						
10a	Blockage	Annual	Clean, in excellent condition	Clean, in good condition	Minor blockage, requires cleaning	Moderate blockage causing diminished function, requires cleaning	Significant blockage, requires cleaning and/or replacement
11	Rainwater supply pipe						
11a	Damage	Annual	No damage	Limited damage	Minor damage	Moderate damage	Significant damage
12	Other fittings or components, e.g. pipes, orifices						
12a	Damage to or removal of structure/s	Annual	No damage	Limited damage	Minor damage	Moderate damage, requires replacement	Major damage, requires replacement