

# WaterFootprint C<sup>3</sup> Calculator<sup>©</sup>

## User Manual

CONTAMINANT, COST AND CARBON ASSESSMENT TOOL

Version 1 September 2025



## ABOUT THE MODEL

The **WaterFootprint C3 Calculator**® includes an easy-to-use annual load model which allow users to quantify the relative treatment removal efficiencies of various stormwater management devices on a site or catchment wide basis. It is coupled with a life cycle cost (LCC) model which allows users to quantify the relative difference in the cost of various treatment approaches on a site or catchment wide basis and also calculates the carbon emissions of particular interventions. Together, the models allow consultants, developers and decision-makers to assess the contaminant removal benefits of various stormwater interventions, their relative cost efficiency and carbon emissions, thereby determining their “WaterFootprint”.

The purpose of the model is to facilitate comparison of different stormwater source control and mitigation approaches on a catchment, subdivision and site scale (>1000m<sup>2</sup> impervious area). It is recommended that more than one scenario is run in order to assess the most cost-efficient, low carbon approach. The model can be used for asset management planning, development of stormwater management plans, catchment planning and assessment of stormwater discharge consents.

You can view the "How to use the **Waterfootprint C3 Calculator**®" [video here](#).

Please see the supporting technical report for full details of assumptions used within the calculator.

## DATA ASSUMPTIONS USED IN THE **Waterfootprint C3 Calculator**©

Contaminant loads provided in this model are median values for each surface type modelled in the baseline FWMT modelling v1.3. Where appropriate, original FWMT surface types (termed Hydrological Response Units in the FWMT) have been grouped for simplicity of use. Details of the FWMT baseline modelling and calibration can be found on Knowledge Auckland.

Load reduction factors (LRFs), which determine the efficiency of the stormwater treatment interventions, are based on an international literature review undertaken by Koru Environmental. They are based on a GD01 (or similar) compliant design.

The life cycle costs (LCCs) provided in the model are average LCCs, based on work undertaken for Auckland Council's Freshwater Management Tool programme. The purpose of the model is to facilitate comparison of different green infrastructure approaches on a catchment scale. The Cost Calculator also allows for costing of devices that do not provide water quality treatment (as modelled through the FWMT), such as rain tanks and green roofs. Details of the FWMT urban intervention LCCs report can be found on Knowledge Auckland.

The Model takes a statistical approach to calculating average LCCs, with the following assumptions:

- The base date for all default cost data is 2025.
- The total life cycle analysis period is 50 years.
- A 4% discount rate is used to calculate the average LCCs.
- Costs provided are indicative estimates. Emphasis should be placed on the relative difference between different green infrastructure approaches rather than the actual dollar value of a particular intervention.
- It is noted that the LCCs generated exclude land costs. Land costs would need to be added to the indicative estimate LCCs.

The carbon equivalent (kgCO<sub>2</sub>eq) emissions used in this model are based on work undertaken for Auckland Council's Freshwater Management Tool programme. The emissions provided are indicative estimates based on current data, and it is noted that not all interventions included in this model have sufficient data for an emissions profile to be developed.

As new local data becomes available, data assumptions in the **Waterfootprint C3 Calculator**© will be updated.

## USING THE TOOL

### Step 1: Enter your project details

Once you have accepted the “User Agreement”, wait until the map of Auckland appears with the sub-catchment boundaries. You can start using the model and will need to enter the relevant project details, including site area, in the “Project Details” tab [Project Details](#). You can do this by entering all details manually or uploading a previous project file (steps described below).

Manual Entry:

1. Fill in all relevant details into the input fields (e.g. project name and site address).
2. The project area (i.e. the shapefile) can be drawn or uploaded.
  - a. Draw project area:
    - i. Select “Draw” under the “Shapefile” subheading.
    - ii. Draw a polygon or rectangle on the area of interest of the project map.
    - iii. Click on the “Get land cover” button in the bottom left corner of the map. The land cover classes of the selected area will then appear. Larger or more detailed areas may take longer to load.
  - b. Upload project area:
    - i. Select “Upload” under the “Shapefile” subheading.
    - ii. A shapefile of the project area can be uploaded. This file must be in a folder containing .cpg, .dbf, .prj, .shp and .shx files [zipped or unzipped].

The screenshot shows the 'Project Map' interface. On the left is a form titled 'Project Details' with various input fields. On the right is a map of Auckland with sub-catchment boundaries. Annotations with arrows point to specific elements:

- 1. Fill in project details**: Points to the 'Project Name' and 'Site Address' fields.
- 2ai. Select "Draw" to define project area**: Points to the 'Draw' radio button under the 'Shapefile' section.
- 2aii. Select polygon or rectangle tool to draw area on the map**: Points to the polygon tool icon in the map's toolbar.
- 2aiii. Get land cover**: Points to the 'Get land cover' button at the bottom left of the map.

The 'Project Details' form includes fields for: Project Name, Shapefile (Upload/Draw), Site Address, Stormwater catchment name/ID, Model Run Description, User Name/Company, Date, Scenario Name, Slope (pre-development), Pre-development Landuse, Soil Type, AUP SMAF Requirements, and Total Site Area (ha).

This close-up shows the 'Shapefile' section of the form. It includes radio buttons for 'Upload' (selected) and 'Draw', a 'Browse...' button, and a 'No file selected' message. Annotations with arrows point to:

- 2bi. Select "Upload" to define project area**: Points to the 'Upload' radio button.
- 2bii. Upload shapefile**: Points to the 'Browse...' button.

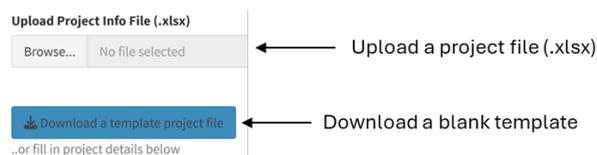


- Optional: Go to the “Export Results” tab [Export Results](#) and “Download Project Data” (see Step 10). You could reload this data if you want to repeat the work (shown below).

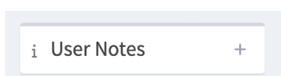
#### Uploading Previous Project File:

- Upload a previously run project file from excel (.xlsx) which includes your landuse data.

This field is only recommended if you have used the model for a previous project and the Excel fields match the required details as shown on the model. A blank template can be downloaded from the “Download a template project file” button.



In the tool you will often see an “INFORMATION” box such as the one below. Click on the cross to see more information about any of the particular notes.



Once you have entered all the necessary fields, the icon next to the “Project Details” tab will change from a warning sign ⚠️ to a tick ✅.

## Step 2: Enter your land cover data

Enter the future land cover area data (area in ha) into the table located under the “Land Cover” tab

[Land Cover](#) The total areas of the current land cover area and the future land cover area must match otherwise the model will return an “error” result (i.e. column appears red).

To help with this, the difference between the future and current land cover area is shown at the bottom right.

**Enter Data**



Surface Type	Current land cover area (ha)	Future land cover area (ha)
Roofs - high yielding	0	0
Roofs - medium yielding	0	0
Roofs - low yielding	0.36	0.36
Paved Commercial	0	0
Paved Industrial	0	0
Paved Residential	1.38	1.38
<1,000 VPD	0.78	0.78
1,000 - 5000 VPD	0	0
5,000 - 20,000 VPD	0	0
20,000 - 50,000 VPD	0	0
50,000 - 100,000 VPD	0	0
>100,000 VPD	0	0
A+ Soils - Developed Pervious <15%	0	0
A+ Soils - Developed Pervious >15%	0	0
A Soils - Developed Pervious <15%	0	0
A Soils - Developed Pervious >15%	0	0
B Soils - Developed Pervious >15%	0	0
B Soils - Developed Pervious <15%	0	0
C & D Soils - Developed Pervious <15%	0	0
C & D Soils - Developed Pervious >15%	0	0
Countryside Living with onsite wastewater systems	0	0
Horticulture	0	0
Pasture	0	0
Rural Grassland	75.76	75.76
Forest	27.8	27.8
Unsealed Road	0	0
Bare earth	0.03	0.03
Water	0.02	0.02
<b>Total</b>	<b>106.13</b>	<b>106.13</b>

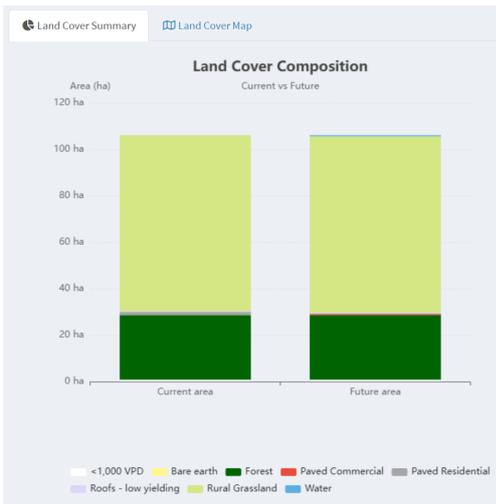
Surface Type	Current land cover area (ha)	Future land cover area (ha)
Roofs - high yielding	0	0
Roofs - medium yielding	0	0
Roofs - low yielding	0.36	0.36
Paved Commercial	0	0
Paved Industrial	0	0
Paved Residential	1.38	1.5
<1,000 VPD	0.78	0.9
1,000 - 5000 VPD	0	0
5,000 - 20,000 VPD	0	0
20,000 - 50,000 VPD	0	0
50,000 - 100,000 VPD	0	0
>100,000 VPD	0	0
A+ Soils - Developed Pervious <15%	0	0
A+ Soils - Developed Pervious >15%	0	0
A Soils - Developed Pervious <15%	0	0
A Soils - Developed Pervious >15%	0	0
B Soils - Developed Pervious >15%	0	0
B Soils - Developed Pervious <15%	0	0
C & D Soils - Developed Pervious <15%	0	0
C & D Soils - Developed Pervious >15%	0	0
Countryside Living with onsite wastewater systems	0	0
Horticulture	0	0
Pasture	0	0
Rural Grassland	75.76	76.34
Forest	27.8	27.8
Unsealed Road	0	0
Bare earth	0.03	0.03
Water	0.02	0.02
<b>Total</b>	<b>106.13</b>	<b>108.95</b>

Current and Future Land Cover Areas Do Not Match

Compare Current and Future Land Areas



A graphical comparison between the current and future land cover areas is shown at the top right.



Once you have entered all the necessary fields, the icon next to the "Land Cover" tab will change from a warning sign ⚠️ to a tick ✅.

**Step 3: Enter your stormwater mitigation approach**

Select the relevant contaminant under the "Contaminants" tab.

Contaminants

**Contaminant**

- Total Suspended Solids (TSS)
- Total Zinc (TZn)
- Total Copper (TCu)
- Total Phosphorus (TP)
- Total Nitrogen (TN)
- Ecoli

The subsection, "Unmitigated", shows the future contaminant load (kg/yr) and change in contaminant load for the selected contaminant as a result of the change in the surface type.

Unmitigated    Source Mitigations ⚠    Sub-catchment Mitigations ⚠

Surface Type	Current contaminant load (kg/yr)	Unmitigated Future contaminant load (kg/yr)	Change
Roofs - low yielding	23.77	23.77	0.00
Paved Commercial	0.00	100.84	100.84
Paved Residential	438.78	120.82	-317.96
<1,000 VPD	112.72	112.72	0.00
Rural Grassland	84,125.92	84,125.92	0.00
Forest	7,418.50	7,418.50	0.00
Bare earth	16.11	16.11	0.00
<b>Total</b>	<b>92,135.80</b>	<b>91,918.69</b>	<b>-217.11</b>

The model provides two "Source" stormwater management options which can be used in series for each surface type. These interventions can then drain to up to two "Sub-catchment" treatment devices. All devices operate in series.

### Step 3(a): "Source Mitigations"

Select the mitigation/s which will be used for each surface type and then enter the fraction of area (as a percentage) of the surface type which will drain to that intervention.

Select the load reduction factor (LRF) for use. The LRF determines treatment performance of the selected intervention. In each case, a low, medium and high LRF is provided (where data permits). The following guidance is provided to help you select the most appropriate LRF for your site:

1. Use a low LRF for sites which have a low contaminant loading (e.g. low use roads, low density residential areas).
2. Use a low LRF for the second mitigation option within a treatment train.
3. The medium LRF can be used as the default LRF and is suitable for the majority of projects (although it is recommended that sensitivity analysis using various LRFs is undertaken), with the low LRF being used for devices in series.
4. Use a high LRF for sites which have a particularly high contaminant loading or where local monitoring has shown that this is the likely removal rate.

If a high LRF is chosen, you will be prompted to add a note demonstrating how you would achieve a higher than normal reduction.

### High Load Reduction Factor (LRF)

Demonstrate how you would achieve a higher than normal reduction. Add a note below.

**Note**

Cancel Submit

Only those mitigation/s which are considered as suitable options for a particular surface type will be available to choose for that surface type.

Active tab – "Source Mitigations"

Unmitigated
Source Mitigations ▲
Sub-catchment Mitigations ▲

i Source Mitigations +

i Load Reduction Factor (LRF) +

Surface Type	Future land cover area (ha)	Mitigations (in series)			High LRF Note (M1)	Mitigation 2 (M2)		
		Mitigation 1 (M1)	Fraction of Area Draining to M1 (%)	LRF level (M1)		Mitigation 2 (M2)	Fraction of Area Draining to M2 (%)	LRF level (M2)
Roofs - low yielding	0.36	▼ 0		medium ▼		▼ 0		medium ▼
Paved Commercial	0.52	Rain Garden ▼	33	high ▼	How will I achieve a higher than normal reduction?	Swale ▼	25	medium ▼
Paved Residential	0.38	▼ 0		medium ▼		▼ 0		medium ▼
<1,000 VPD	0.78	▼ 0		medium ▼		▼ 0		medium ▼
Rural Grassland	75.76	▼ 0		medium ▼		▼ 0		medium ▼
Forest	27.8	▼ 0		medium ▼		▼ 0		medium ▼
Bare earth	0.03	▼ 0		medium ▼		▼ 0		medium ▼
Water	0.5	▼ 0		medium ▼		▼ 0		medium ▼

Future land cover for each surface type is based on previous inputs

Area (%) of surface type draining into intervention

Note required for high LRF

### Step 3(b): "Sub-catchment Mitigations"

The model provides two sub-catchment mitigation stormwater management options which can be used in series for each surface type.

Select the mitigation/s which will be used and then enter the fraction of area of the surface type which will drain to that mitigation.

Given that there is generally only a single stormwater network within a subdivision/development area, it is assumed that all impervious areas will drain to the same catchment device. However, the fraction of area which drains to that device can be entered, therefore allowing any impervious areas which do not drain to a catchment-wide device to be excluded.

Select the load reduction factor (LRF) for use. The LRF determines treatment performance of the selected intervention. In each case, a low, medium and high LRF is provided. The following guidance is provided to help you select the most appropriate LRF for your site:

1. Use a low LRF for sites which have a low contaminant loading (e.g. low use roads, low density residential areas).
2. Use a low LRF for the second mitigation option within a treatment train.
3. The medium LRF can be used as the default LRF and is suitable for the majority of projects (although it is recommended that sensitivity analysis using various LRFs is undertaken), with the low LRF being used for devices in series.

- Use a high LRF for sites which have a particularly high contaminant loading or where local monitoring has shown that this is the likely removal rate.

If a high LRF is chosen, you will be prompted to add a note demonstrating how you would achieve a higher than normal reduction.

High Load Reduction Factor (LRF)

Demonstrate how you would achieve a higher than normal reduction. Add a note below.

**Note**

Cancel
Submit

Only those mitigation/s which are considered as suitable options for a particular surface type will automatically be filled for each respective surface type.

Active tab – “Sub-catchment Mitigations”

First catchment device

Sub-catchment Mitigation 1

Subcatchment rain garden

Second catchment device

Sub-catchment Mitigation 2

Please select an option below

- Constructed Wetland
- Subcatchment rain garden
- Wet pond
- Dry pond

Surface Type	Future land cover area (ha)	Mitigation 1 (SM1)	Fraction of Area Draining to SM1 (%)	LRF level (SM1)	High LRF Note (SM1)	Mitigation 2 (SM2)	Fraction of Area Draining to SM2 (%)
Roofs - low yielding	0.36	Subcatchment rain garden	0	medium			0
Paved Commercial	0.52	Subcatchment rain garden	0	medium			0
Paved Residential	0.38	Subcatchment rain garden	0	medium			0
<1,000 VPD	0.78	Subcatchment rain garden	0	medium			0
Rural Grassland	75.76		0	medium			0
Forest	27.8		0	medium			0
Bare earth	0.03		0	medium			0
Water	0.5		0	medium			0

First catchment device applied to all relevant surface types

Area can be set to “0” if areas are impervious or do not drain into a catchment-wide device

#### Step 4: Viewing your water quality mitigation results

Click on the “Calculate contaminant loads” button Calculate contaminant loads under the “Contaminants” tab



The load outcomes are shown at the bottom of the page, while the efficiencies of the source and sub-catchment mitigations are shown at the top of the page.

## Efficiency Results

Source Efficiency 0%    Sub-catchment Efficiency 0%    Overall Treatment Efficiency 0%

   Select results for either "Source Mitigations" or "Sub-catchment Mitigations"

Unmitigated     Source Mitigations     Sub-catchment Mitigations     Mitigation Outcomes

Sub-catchment Mitigations    Load Reduction Factors (LRF)

Sub-catchment Mitigation 1: Subcatchment rain garden    Sub-catchment Mitigation 2: Please select an option below

Surface Type	Future land cover area (ha)	Mitigation 1 (SM1)	Fraction of Area Draining to SM1 (%)	LRF level (SM1)	High LRF Note (SM1)	Mitigation 2 (SM2)	Fraction of Area Draining to SM2 (%)	LRF level (SM2)	High LRF Note (SM2)
Roofs - low yielding	0.36	Subcatchment rain garden	0	medium			0	medium	
Paved Commercial	0.52	Subcatchment rain garden	0	medium			0	medium	
Paved Residential	0.38	Subcatchment rain garden	0	medium			0	medium	
<1,000 VPD	0.78	Subcatchment rain garden	0	medium			0	medium	
Rural Grassland	75.76			medium				medium	
Forest	27.8			medium				medium	
Bare earth	0.03			medium				medium	

Sub-catchment Load Outcomes

Surface Type	Future land cover area (ha)	Mitigation 1 (SM1)	Post-Mitigated Load (SM1)	Mitigation 2 (SM2)	Post-Mitigated Load (SM2)	Post-Mitigated Contaminant Load
Roofs - low yielding	0.36		23.77		23.77	23.77
Paved Commercial	0.52		54.94		54.94	54.94
Paved Residential	0.38		120.82		120.82	120.82
<1,000 VPD	0.78		112.72		112.72	112.72
Rural Grassland	75.76		84,125.92		84,125.92	84,125.92
Forest	27.80		7,418.50		7,418.50	7,418.50
Bare earth	0.03		16.11		16.11	16.11

Load outcomes for selected contaminant

An additional subsection, "Mitigation Outcomes", appears following calculations and graphically shows where the various mitigations are being applied.



Once you have done this you can choose a different contaminant from the menu on the left hand side of the tool and see the removal results for that contaminant.

**Contaminants**

**Contaminant**

- Total Suspended Solids (TSS)
- Total Zinc (TZn)
- Total Copper (TCu)
- Total Phosphorus (TP)
- Total Nitrogen (TN)
- Ecoli

## Step 6: Calculating costs

Enter the relevant stormwater intervention details into the "Cost" tab . Only those interventions used in the mitigations portion of the tool will be shown in the Cost Calculator. The costs are a base date of 2025, with a 4% discount rate and are analysed over a 50 year time period. The costs provided exclude land costs.

The Cost Calculator allows you to calculate "Source Costs" and "Sub-catchment Costs".

### Step 6(a): "Source Costs"

Under the “Landuse” subsection, enter the "Landuse Category Prior to Development" to allow the model to calculate the development cost factor. This factor accounts for the increase in cost which relates to the current land use, since it is more expensive to construct devices in brownfield situations than greenfield areas. Please select the existing landuse (i.e. greenfields, brownfields, infill/ retrofit, ultra-urban) which best describes the current development status of the particular subcatchment.

Landuse		Buildings	Raingardens, Swales & Filter Systems	Permeable Paving	Green Roofs & Rain Tanks
Surface Type	Landuse Category Prior to Development				
Roofs - low yielding	Greenfields				
Paved Commercial	Greenfields				
Paved Residential	Greenfields				
<1,000 VPD	Greenfields				
Rural Grassland	Greenfields				
Forest	<b>Greenfields</b>				
Bare earth	Brownfields				
Water	Greenfields				

Whilst the land cover data is automatically carried across from previous parts of the tool, you will need to enter the number of dwellings where relevant under the “Buildings” subsection.

Landuse		Buildings	Raingardens, Swales & Filter Systems	Permeable Paving	Green Roofs & Rain Tanks
Surface Type	No. of Dwellings/ Buildings				
Residential Roofs	35				

Under the “Rain gardens, Swales and Filter Systems” subsection, enter the number of devices, the average surface area/ swale length/ contributing filter catchment area, and any other relevant information with respect to each surface type.

Landuse		Buildings	Raingardens, Swales & Filter Systems	Permeable Paving	Green Roofs & Rain Tanks
Surface Type	Number of Rain Gardens	Rain Garden Surface Area (m2)	Road/ Swale Length (m)		
Paved Commercial	0	0	0		

The LCCs which support the formula used in this model are based on the size of a particular device/ intervention. It is important that the surface area entered relates to the average size to be used. For example, if the subcatchment is being treated by several rain gardens with an average surface area of 200m<sup>2</sup>, then 200m<sup>2</sup> needs to be entered into the "Surface Area" column. Then enter the number of 200m<sup>2</sup> rain gardens to be used in the "Number of Devices" column. The "Surface Area" does NOT relate to the total surface area of all rain gardens/ devices in the subcatchment to be costed. This applies to all devices within the Cost Calculator.

If applicable enter any permeable paving, green roofs and/or rain tanks information under the “Permeable Paving” and “Green Roofs & Rain Tanks” subsection.

Landuse		Buildings	Raingardens, Swales & Filter Systems	Permeable Paving	Green Roofs & Rain Tanks
No Permeable Paving surfaces selected in Source Mitigations					

Landuse	Buildings	Raingardens, Swales & Filter Systems	Permeable Paving	Green Roofs & Rain Tanks	
Surface Type	No. of Dwellings/ Buildings	Average Roof Size (m2)	Percentage Dwellings/ Buildings with Green Roofs	Rain Tank Volume (Litres)	Percentage Dwellings/ Buildings with Rain Tanks
Residential Roofs	35	0	0	0	0

\*Rain tank size: residential = 5,000 L, commercial = 10,000 L

To view the "Source Cost" results, click the "Calculate source costs" button [Calculate source costs](#). Tabulated source cost results will appear at the bottom of the page.

### Source Costs Results

[Calculate source costs](#)

Surface Type	Future land cover area (ha)	No. of Dwellings/ Buildings	Total "At Source" LCC/yr	Total Acquisition Cost (\$)	Total Maintenance Cost (LCC/yr)
Residential Roofs	0.36	40	\$14,941.87	\$5,850.79	\$9,091.07
Paved Commercial	0.52		\$11,379.34	\$3,856.09	\$7,523.25
Paved Residential	0.38		\$0.00	\$0.00	\$0.00
<1,000 VPD	0.78		\$0.00	\$0.00	\$0.00
Rural Grassland	75.76		\$0.00	\$0.00	\$0.00
Forest	27.8		\$0.00	\$0.00	\$0.00
Bare earth	0.03		\$0.00	\$0.00	\$0.00
Water	0.5		\$0.00	\$0.00	\$0.00
<b>Total</b>	<b>106.13</b>	<b>40</b>	<b>\$26,321.20</b>	<b>\$9,706.88</b>	<b>\$16,614.32</b>

The Cost Calculator is limited to the use of the device sizes as specified in the table below.

Devices	Size Limitations
Wetlands (LCC\$/m <sup>2</sup> /yr)	100 - 10,000 m <sup>2</sup>
Ponds (LCC\$/m <sup>2</sup> /yr)	2,000 - 6,000 m <sup>2</sup>
Rain gardens (LCC\$/m <sup>2</sup> /yr)	5 - 1,000 m <sup>2</sup>
Swales (LCC\$/ m/yr)	100 - 5000 linear m
Filter systems (LCC\$/ha area treated/yr)	1 - 30 ha
Permeable paving (LCC\$/m <sup>2</sup> /yr)	50 - 600 m <sup>2</sup>
Green roofs (LCC\$/m <sup>2</sup> /yr)	200 - 400 m <sup>2</sup>
Rain tanks (LCC\$/tank size/yr)	1,0000 - 30,000 L tanks

### Step 6(b): "Sub-catchment Costs"

If stormwater treatment is also being provided on a catchment basis (i.e. there is a treatment train approach), please complete this section.

Select the "Pre-development Landuse" and enter any parameters relevant to "Rain Gardens" and/or "Wetlands & Riparian Planting".

Given that there is generally only a single stormwater network within a subdivision/ development area, it is assumed that all impervious areas will drain to the same catchment device. Resultantly, urban land uses for the "Sub-catchment Costs" have been lumped together and the "Pre-development Landuse" only needs to be selected once.

**Pre-development Landuse**

Greenfields

Toggle through the tabs below to edit the sub-catchment mitigation options and enter the surface area, number of devices and any other relevant information into the cells.

**Rain Gardens**    Wetlands & Riparian Planting

Landuse group	Total landuse	Landuse Category Prior to Development	Rain Garden Surface Area (m2)	Number of Rain Gardens
Urban	2.04	Greenfields	0	0

**Rain Gardens**    **Wetlands & Riparian Planting**

Landuse group	Total landuse	Landuse Category Prior to Development	Number of Wetlands	Wetland Surface Area (m2)	Stream Length (linear m)
Urban	2.04	Greenfields	0	0	0
Rural Grassland	75.76	Greenfields	0	0	0
Forest	27.8	Greenfields	0	0	0
Bare earth	0.03	Greenfields	0	0	0
Water	0.5	Greenfields	0	0	0

The LCCs which support the formula used in this model are based on the size of a particular device/ intervention. It is important that the surface area, treated catchment area or volume entered relates to the average intervention size to be used. For example, if the subcatchment is being treated by a number of rain gardens with an average surface area of 200m<sup>2</sup>, then 200m<sup>2</sup> needs to be entered into the "Surface Area" column. Then enter the number of 10m<sup>2</sup> rain gardens to be used in the "Number of Devices" column. The "Surface Area" does NOT relate to the total surface area of all rain gardens/ devices in the subcatchment to be costed. This applies to all devices within the Cost Calculator.

To view the "Sub-catchment Cost" results, click the "Calculate sub-catchment costs" button

[Calculate sub-catchment costs](#). Tabulated sub-catchment cost results will appear at the bottom of the page.

**Sub-catchment Costs Results**

[Calculate sub-catchment costs](#)

Landuse group	Total landuse	No. of Dwellings/ Buildings	Landuse Category Prior to Development	Total Acquisition Cost (\$)	Total Maintenance Cost (LCC/yr)	Total "Catchment" LCC/yr
Urban	2.04	40	Greenfields	\$0.00	\$0.00	\$0.00
Rural Grassland	75.76	0	Greenfields	\$0.00	\$0.00	\$0.00
Forest	27.8	0	Brownfields	\$0.00	\$0.00	\$0.00
Bare earth	0.03	0	Brownfields	\$0.00	\$0.00	\$0.00
Water	0.5	0	Greenfields	\$0.00	\$0.00	\$0.00
<b>Total</b>	<b>106.13</b>	<b>40</b>		<b>\$0.00</b>	<b>\$0.00</b>	<b>\$0.00</b>

The Cost Calculator is limited to the use of the device sizes as specified in the table above (Step 6(a)).

## Step 7: Viewing your cost calculator results

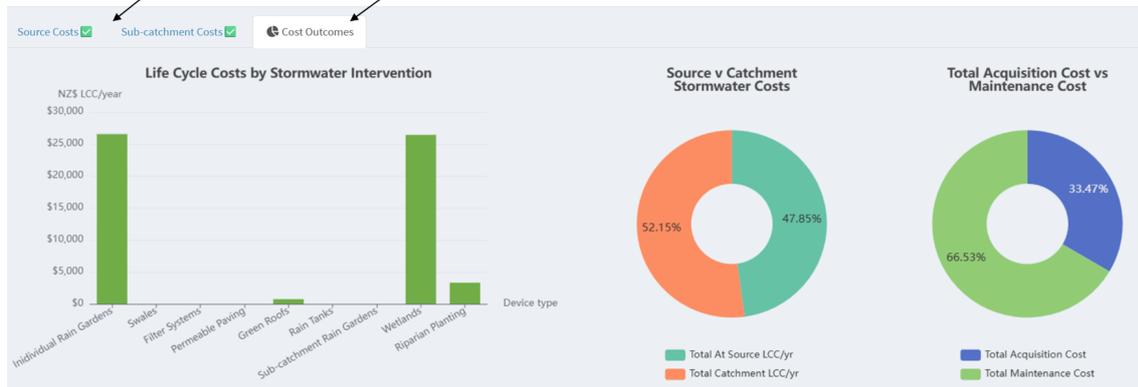
The LCCs generated through the model are tabulated under the "Source Costs" and "Sub-catchment Costs" while the tab "Cost Outcomes" graphically compares and tabulates comparative and total costs.

The "Cost Outcomes" tab only appears when the source costs and sub-catchment costs have been calculated (i.e. the displayed symbol for both tabs have changed from a warning sign ⚠️ to a tick ✅).

When reporting results, it is important that you also report the life cycle analysis period (50 years), base date of the costs (2025) and discount rate (4%).

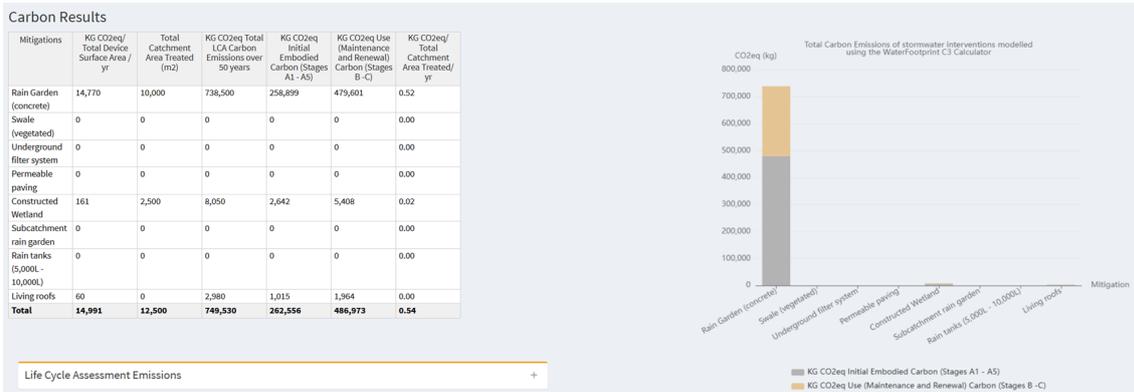
Both calculations must be complete for "Cost Outcomes" tab to appear

Active tab – "Cost Outcomes"



### Step 8: Using the carbon emissions calculator

No further data needs to be added to the carbon emissions data in the "Carbon" tab . Based on information you have put into the land cover, contaminants and cost calculators, the model will calculate the carbon emissions of relevant interventions.

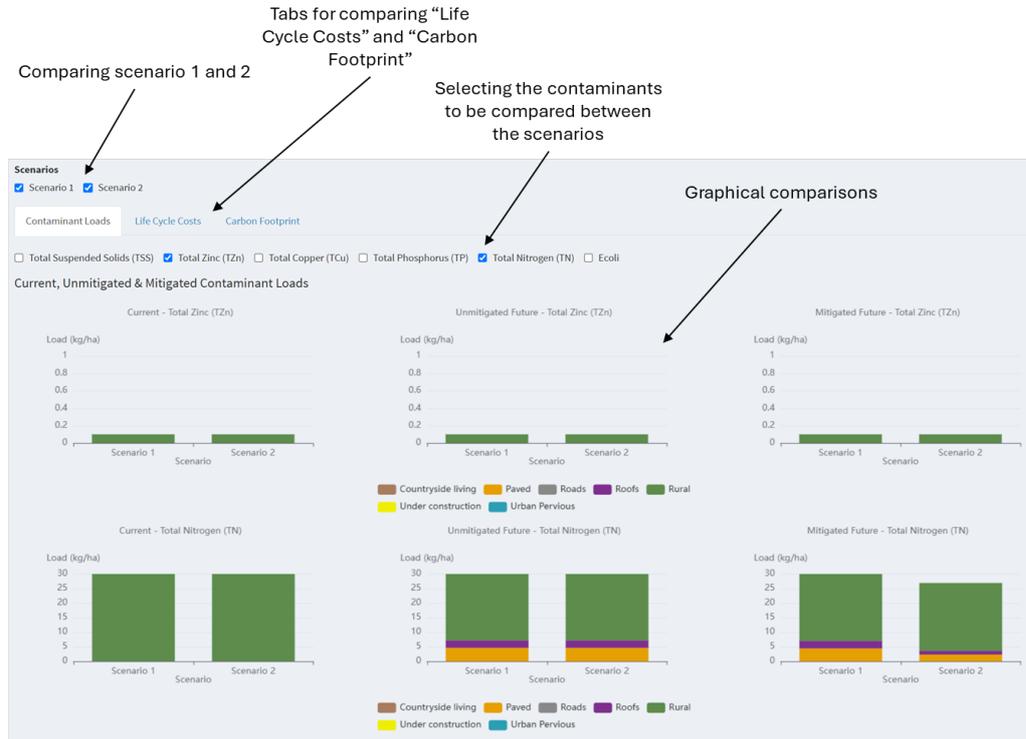


### Step 9: Comparing scenarios

The "Scenario Comparison" tab allows you to graphically compare the contaminant loads, life cycle costs and carbon footprints of different scenarios. The different scenarios to be compared can be selected using the checkboxes at the top of the page.

The checkboxes under the "Contaminant Loads" tab can be used to toggle comparisons between different contaminants.

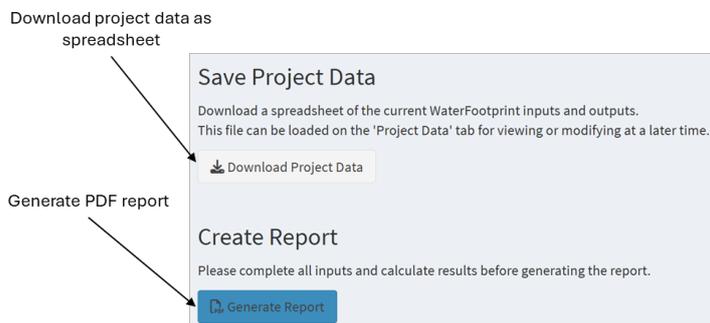
It is recommended that more than one scenario is run in order to assess the most cost-efficient, low carbon approach.



## Step 10: Exporting data and generating a report

An Excel spreadsheet of the current WaterFootprint inputs and outputs can be downloaded from the “**Export Results**” tab  using the “Download Project Data” button. This spreadsheet can be loaded on the “Project Details” tab for viewing and modifying at a later time.

After all information has been inputted and results calculated, a report in PDF format can be generated by clicking the “Generate Report” button.



## ACRONYMS

CO<sub>2</sub>eq: Carbon Dioxide Equivalent

FWMT: Freshwater Management Tool

LCA: Life Cycle Analysis

LCC: Life Cycle Cost

LRF: Load Reduction Factor

## MODEL LIMITATIONS, CAVEAT AND DISCLAIMER

Loads generated are based on the baseline average annual yields generated through the FWMT and relative mitigated loads as a result of various LRFs which are applied in the model. Estimates should only be used to compare the relative difference between pre-and post-mitigated loads of different stormwater management approaches.

Whilst every effort has been made to ensure the integrity of the data collected for this contaminant load model, Koru Environmental does not give any warranty as to the accuracy, completeness, currency or reliability of the information made available via the Model and expressly disclaims (to the maximum extent permitted by law) all liability for any damage or loss resulting from the use of, or reliance on the Model or the information or graphs provided through them.

Loads presented in the "Results" tab are indicative estimates based on loads generated through the FWMT and LRFs developed from current available international research. The Model makes no assumptions about the feasibility, consenting, timing, uptake or optimisation of stormwater management devices, nor about financing, ownership or governance of management approaches for particular land uses, activities or catchments.

Costs presented in the "Cost Results" tab are non-financial indicative life cycle cost estimates and are based on current available information. A LCC analysis is not a financial analysis of asset depreciation over time. It generally involves only quantifying the direct costs associated with a particular practice. LCC makes no assumptions about the feasibility, timing, uptake or optimisation of stormwater management devices, nor about financing, governance or distributions of costs for particular catchments or activities.

Life Cycle Analysis carbon emissions are average indicative carbon equivalent estimates over 50 years (includes production, installation/ construction, maintenance and renewals).

Any decision that is made after using this data must be based solely on the decision-makers own evaluation of the information available to them, their circumstances and objectives.

**If you have any concerns or difficulties when using the model, or need assistance, please contact Sue Ira on [sue.ira@koruenvironmental.co.nz](mailto:sue.ira@koruenvironmental.co.nz)**