HOW IS WATER USED?

Water, Rainwater & Greywater research

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Today’s Presentation:

- Office building water use
- Commercial rainwater & greywater feasibility
- Residential water use
- What’s most helpful for you?
- Stop me whenever ☺

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Doctoral Studies:

- Understand Water Use
- Increase Awareness
- Implementation

Field Study:

- 36 AKL Office Buildings
- 57 WLG Office Buildings
- 2009 to 2011

Outputs:

- PhD Thesis (VUW)
- Calculator Tool (WERT)
- Bright Ideas Challenge

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2011 Tariff Analysis:

2011 Auckland Tariff	Charge	2011 Wellington Tariff
$43 / year	Annual Service Fee	$100 / year
$1.300 / kL	Ingoing Water	$1.715 / kL
$4.056 / kL 75% of Ingoing Water Quantity	Outgoing Wastewater	0.00130171% Capital Value

Example Office Building: Auckland & Wellington

--

$59,000,000 Capital Value

28,000 kL/year

Total cost / year	Charge	Total cost / year
$43	Annual Service Fee	$100
$36,400	Ingoing Water	$48,020
$85,176	Outgoing Wastewater	$76,801
$121,620		$124,921

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Example Office Building: Auckland & Wellington

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$59,000,000 Capital Value

28,000 kL/year

Total VISIBLE cost / year	Total cost / year	Charge	Total cost / year	Total VISIBLE cost / year
$43	$43	Annual Service Fee	$100	$100
$36,400	$36,400	Ingoing Water	$48,020	$48,020
$85,176	$85,176	Outgoing Wastewater	$76,801	$ -
$121,620	$121,620		$124,921	$48,120

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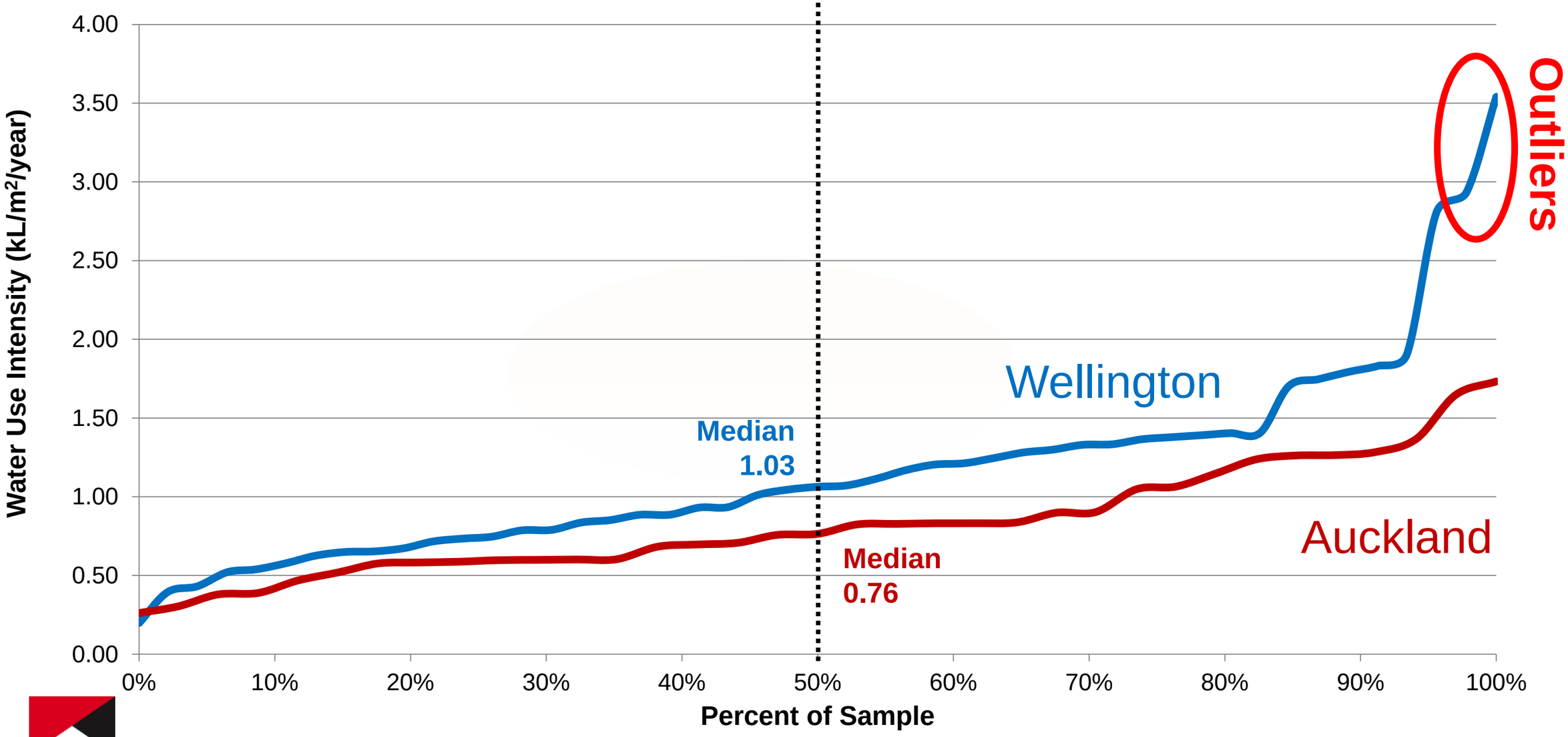
Cumulative Water Use:



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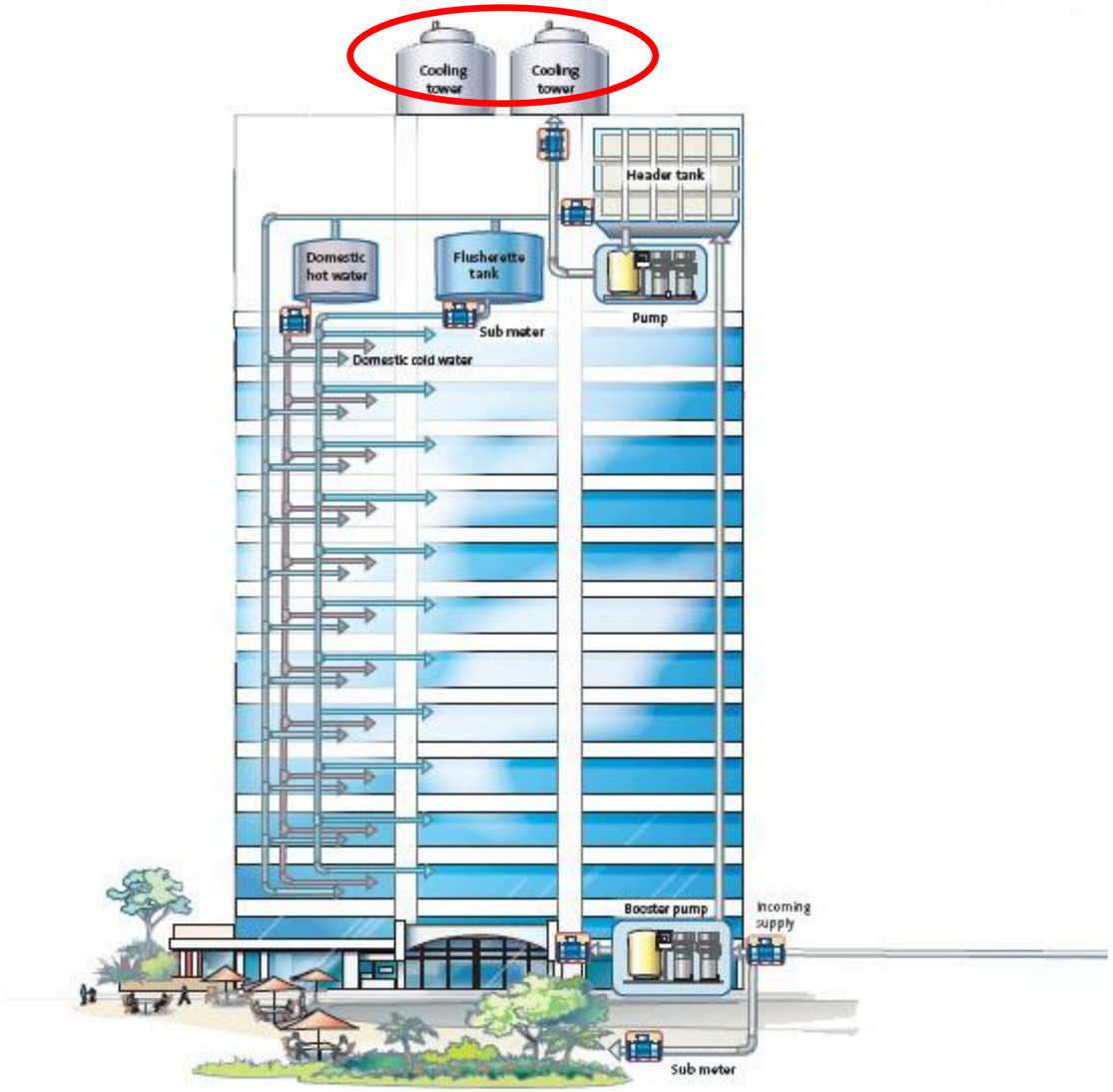
How is water used in a typical office building?



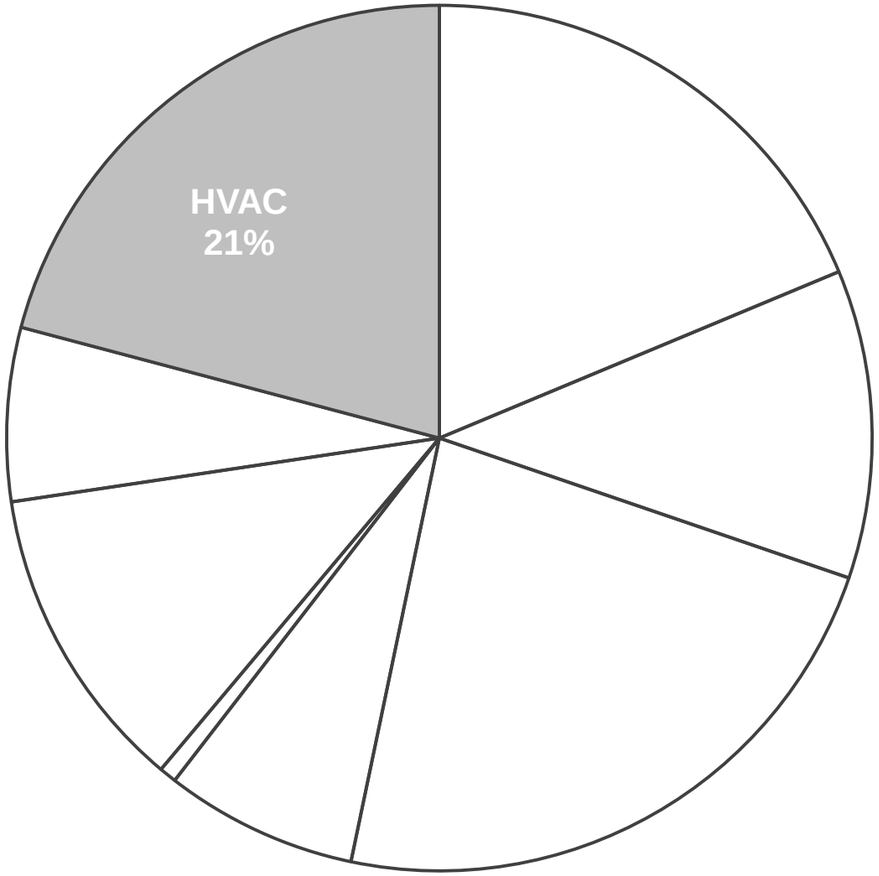


Image Source: Sydney Water Corporation, 2007

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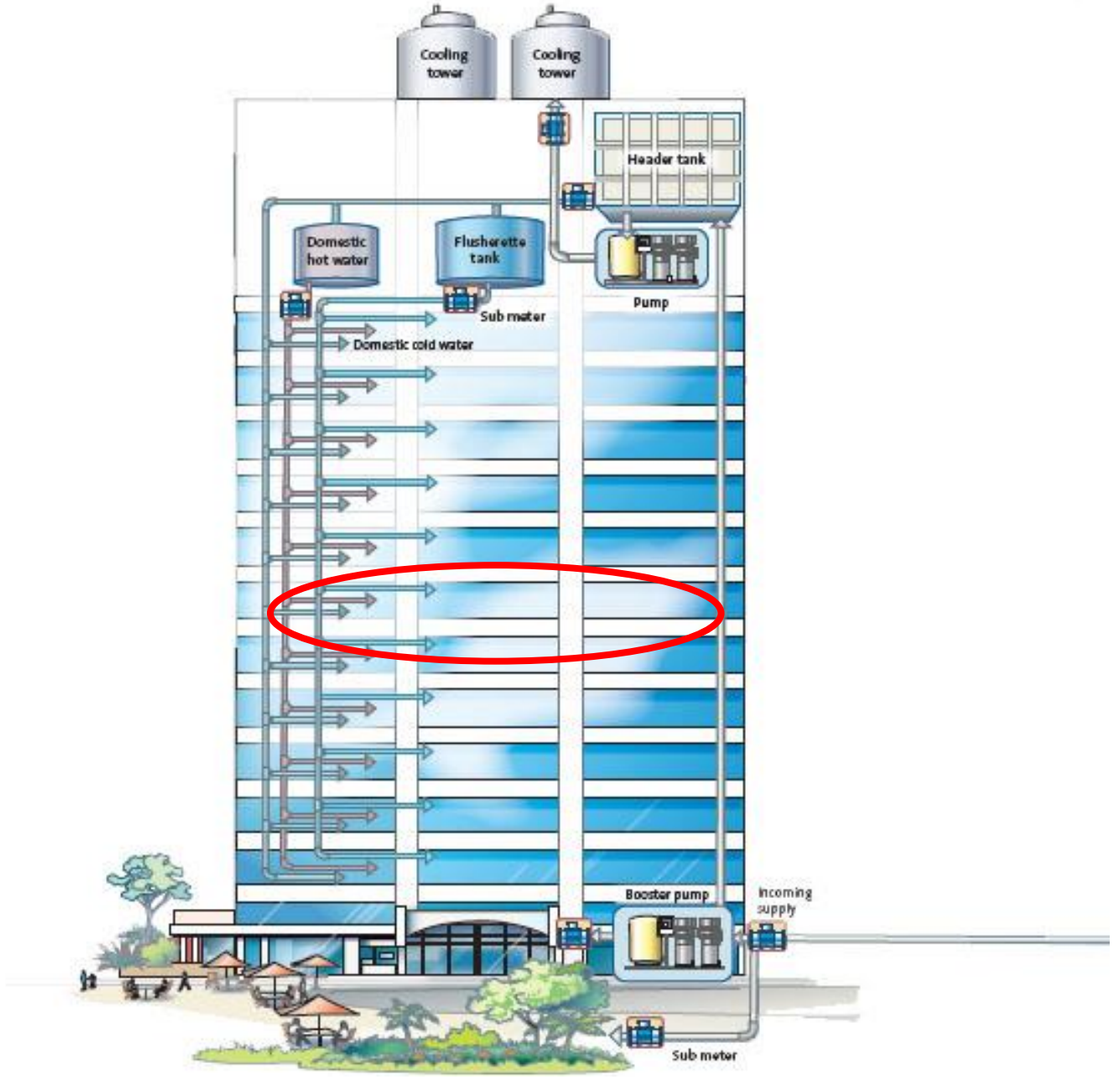

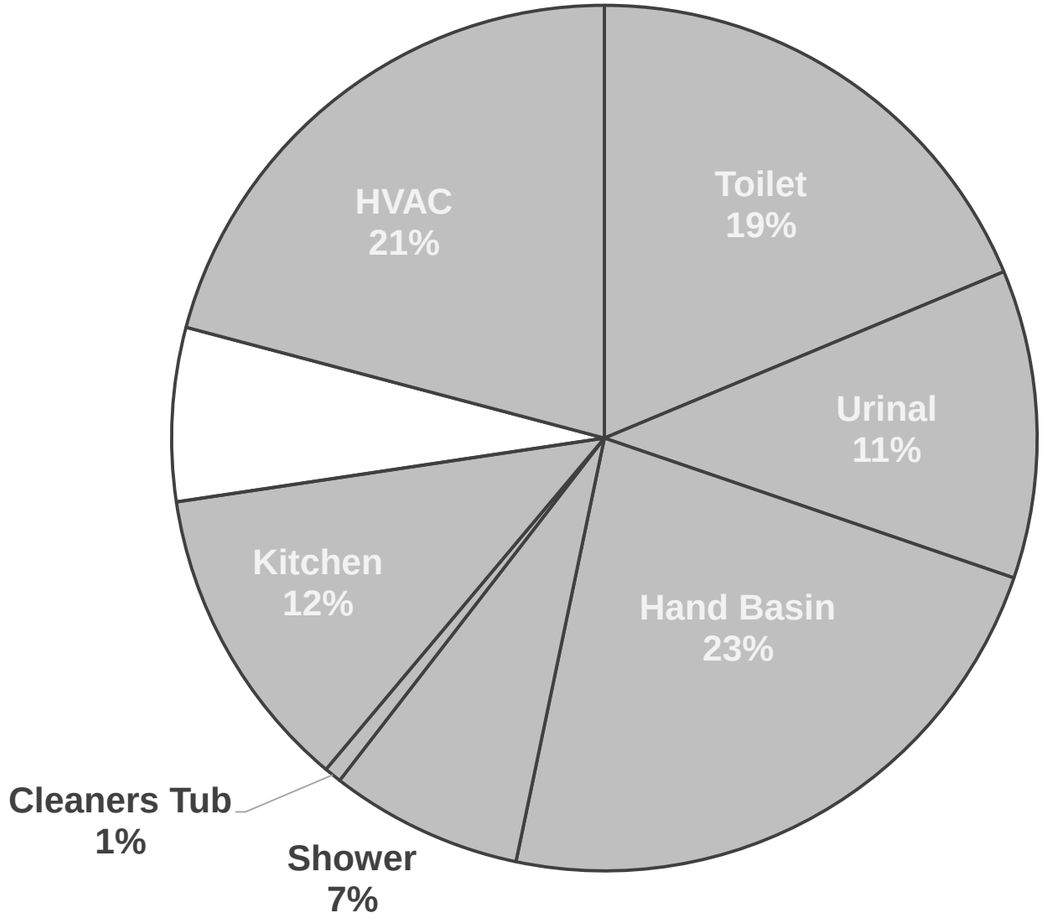

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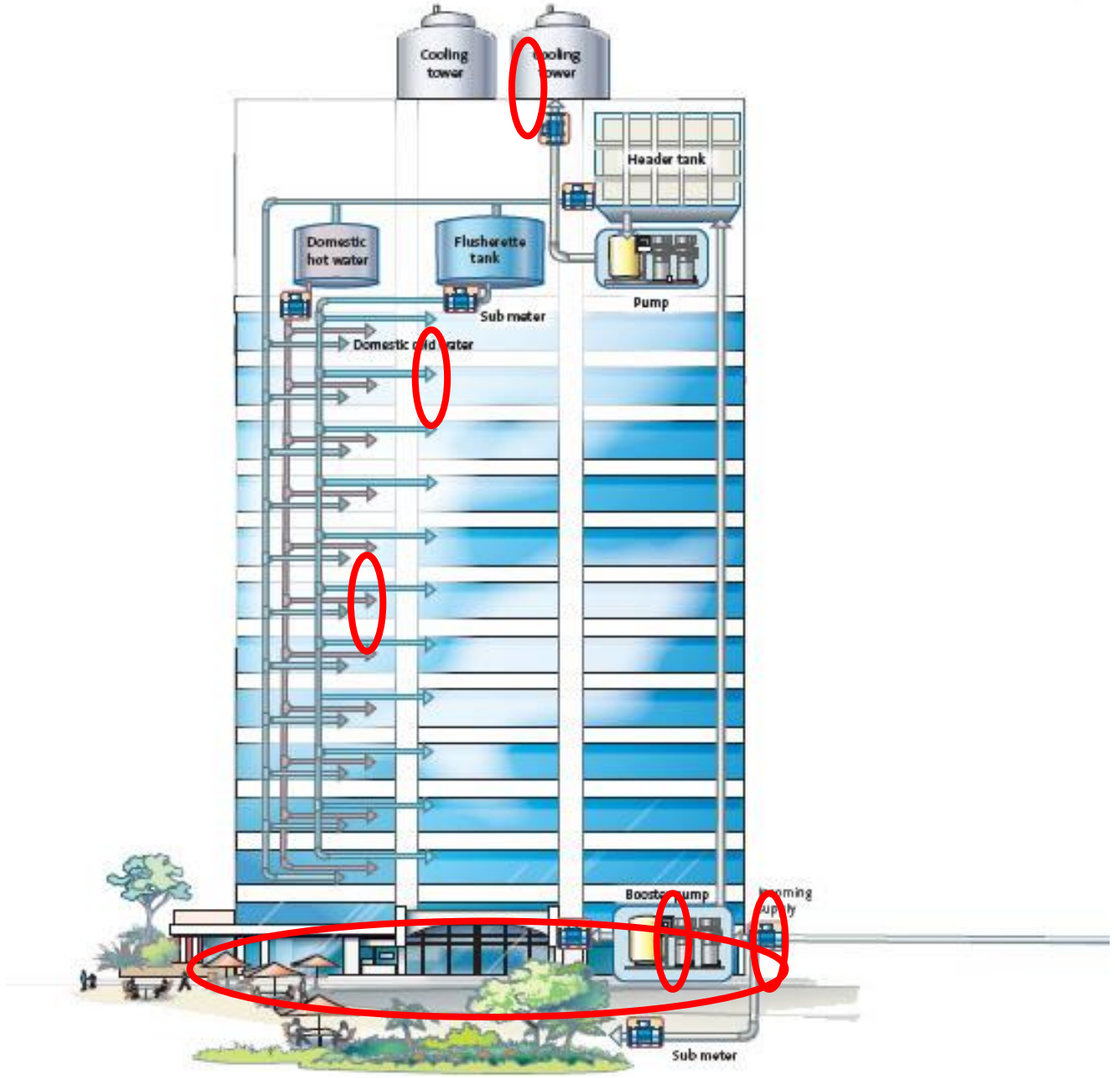

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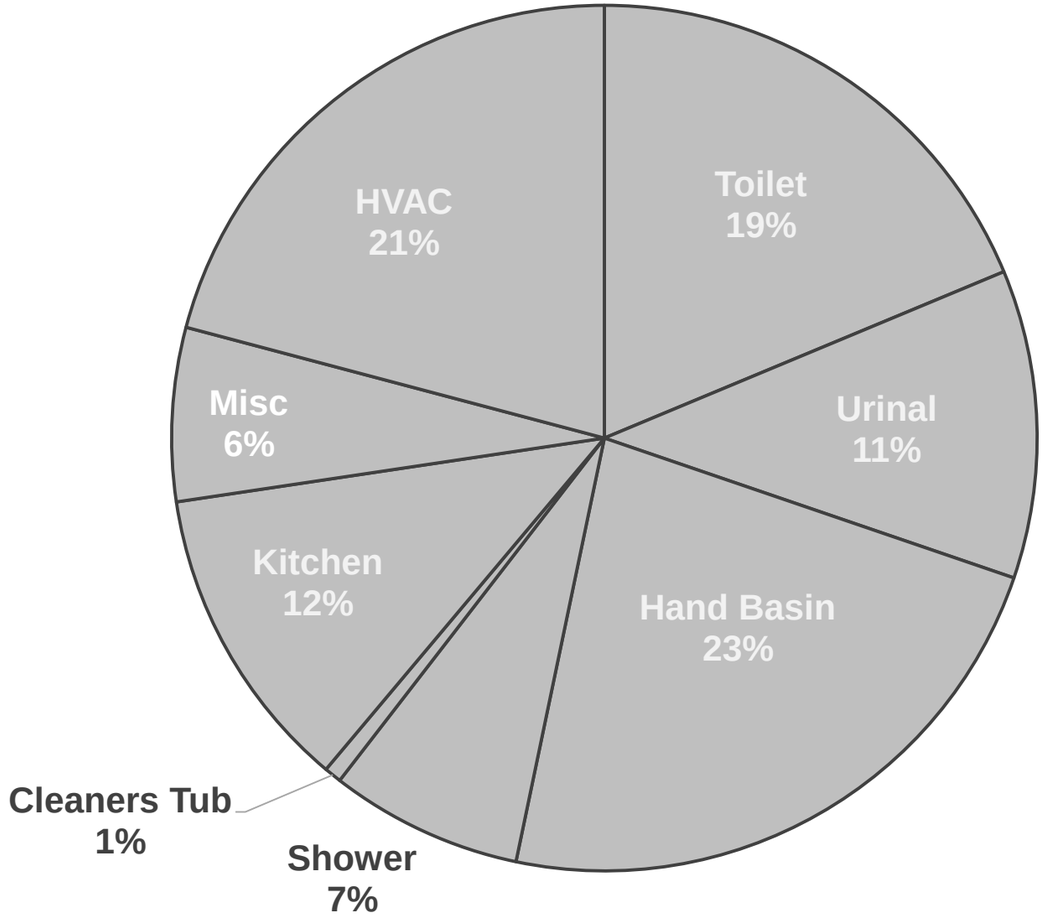
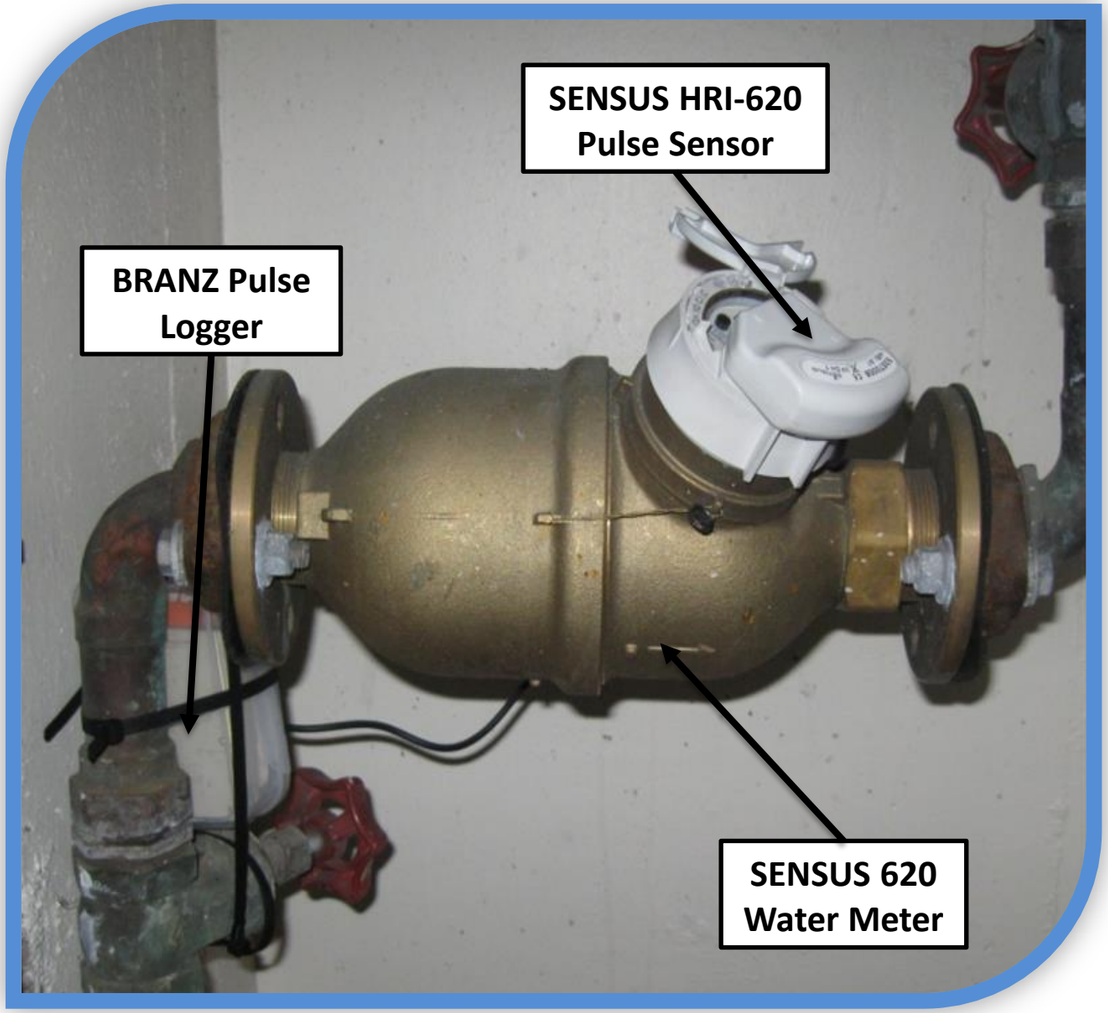
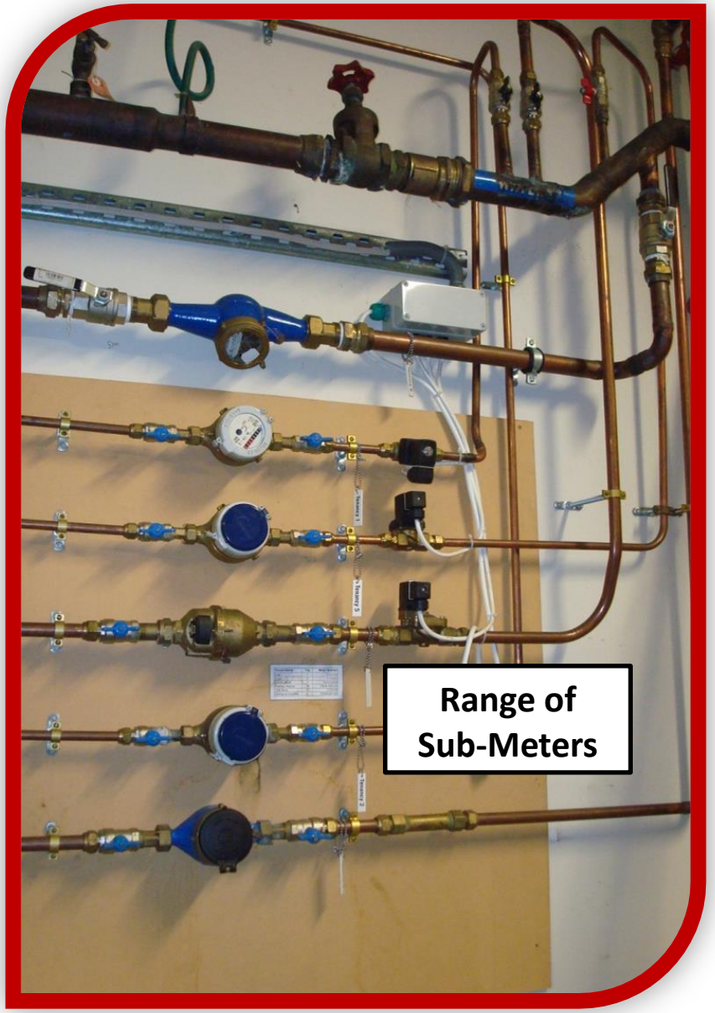
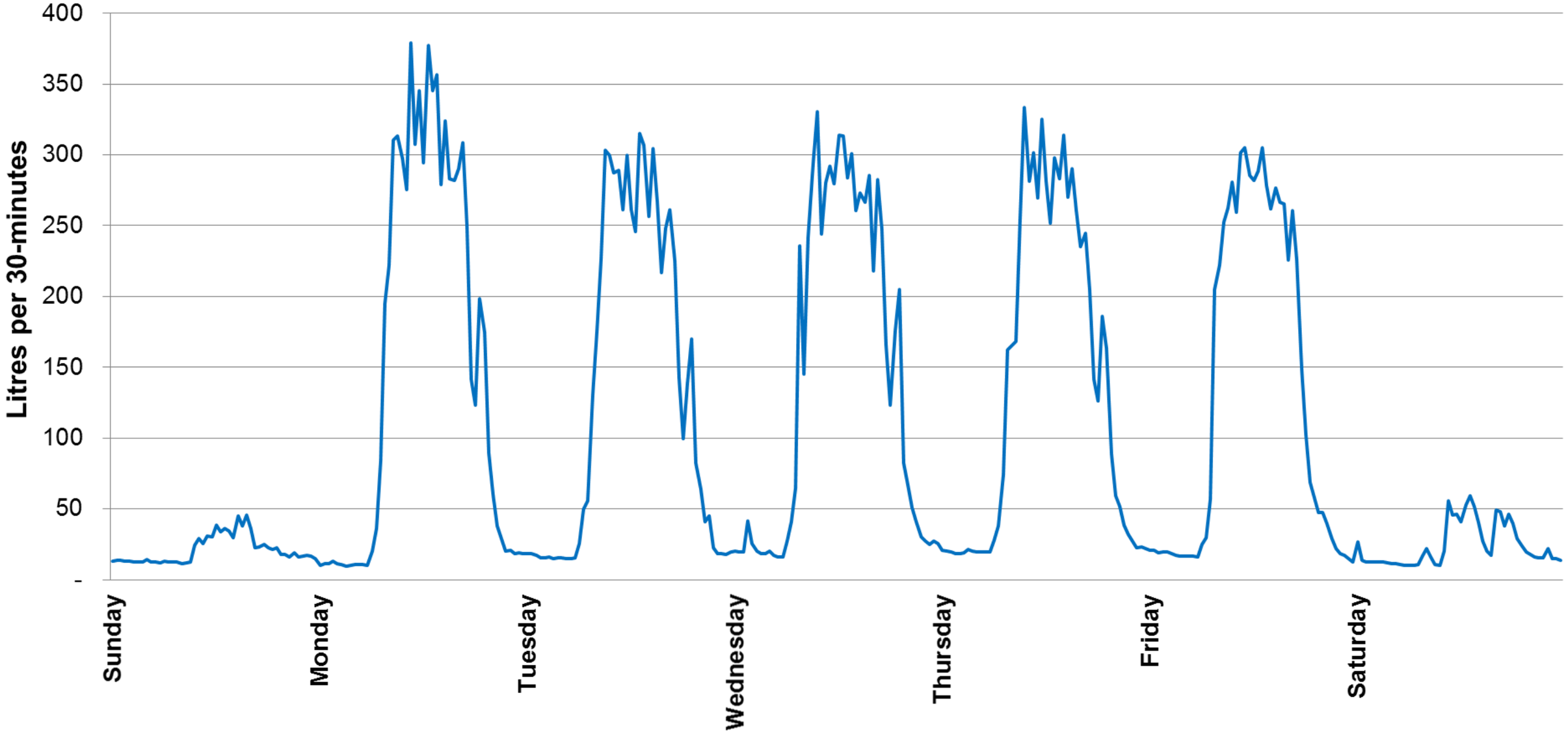
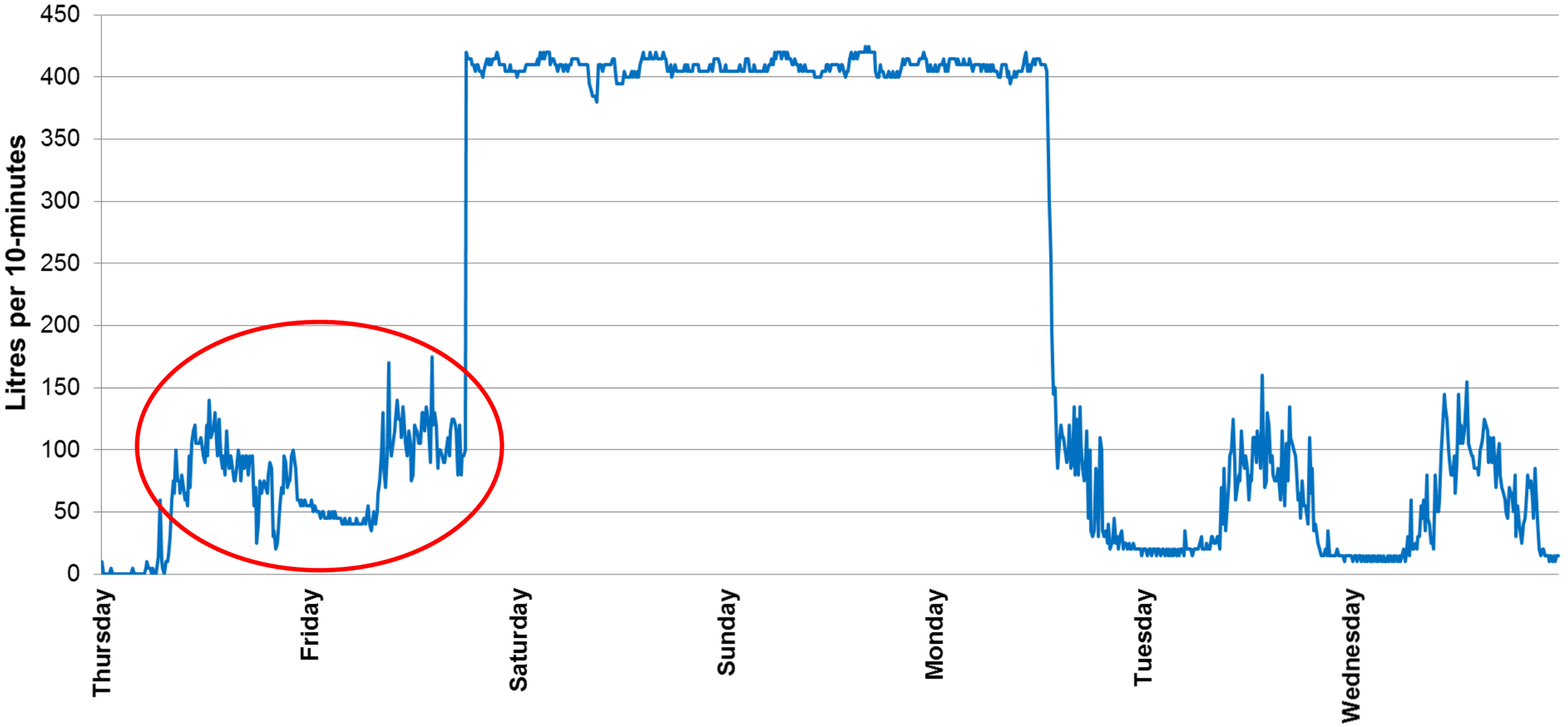



SENSUS HRI-620
Pulse Sensor
BRANZ Pulse
Logger
SENSUS 620
Water Meter


Range of
Sub-Meters


Litres per 30-minutes
400
350
300
250
200
150
100
50
-
Sunday
Monday
Tuesday
Wednesday
Thursday
Friday
Saturday


Litres per 10-minutes
450
400
350
300
250
200
150
100
50
0
Thursday
Friday
Saturday
Sunday
Monday
Tuesday
Wednesday

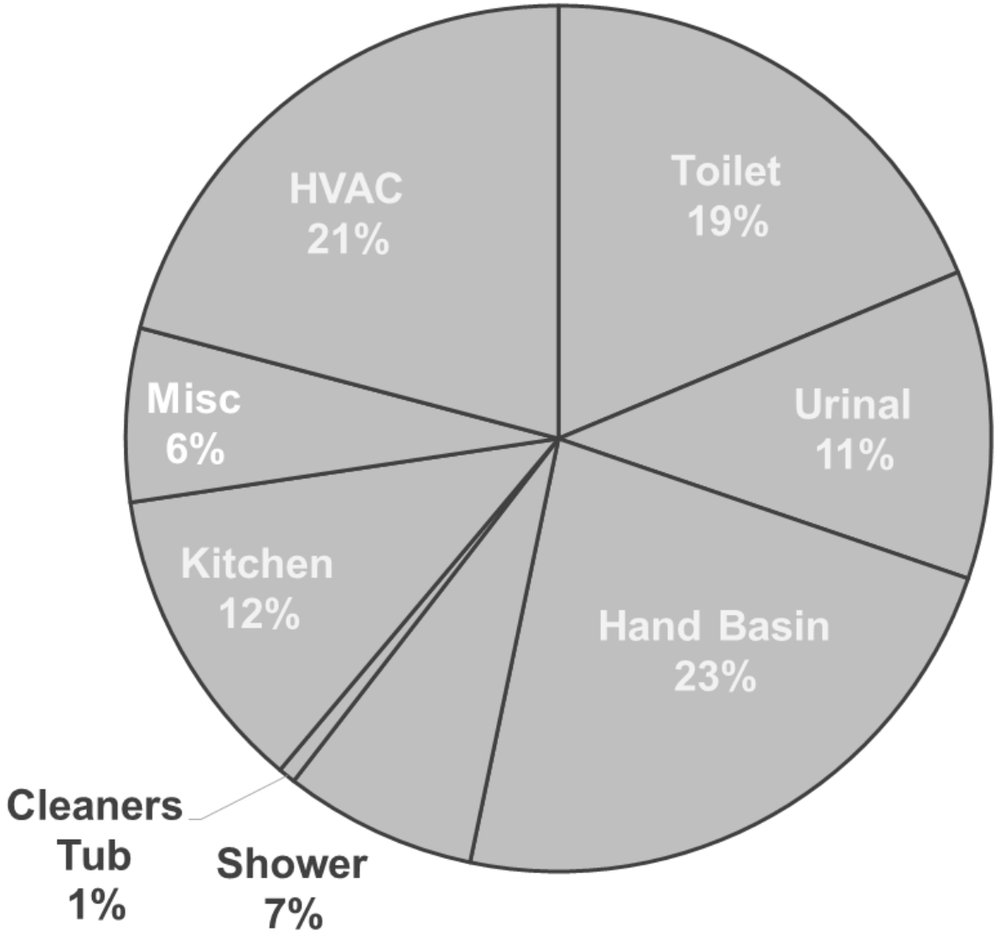
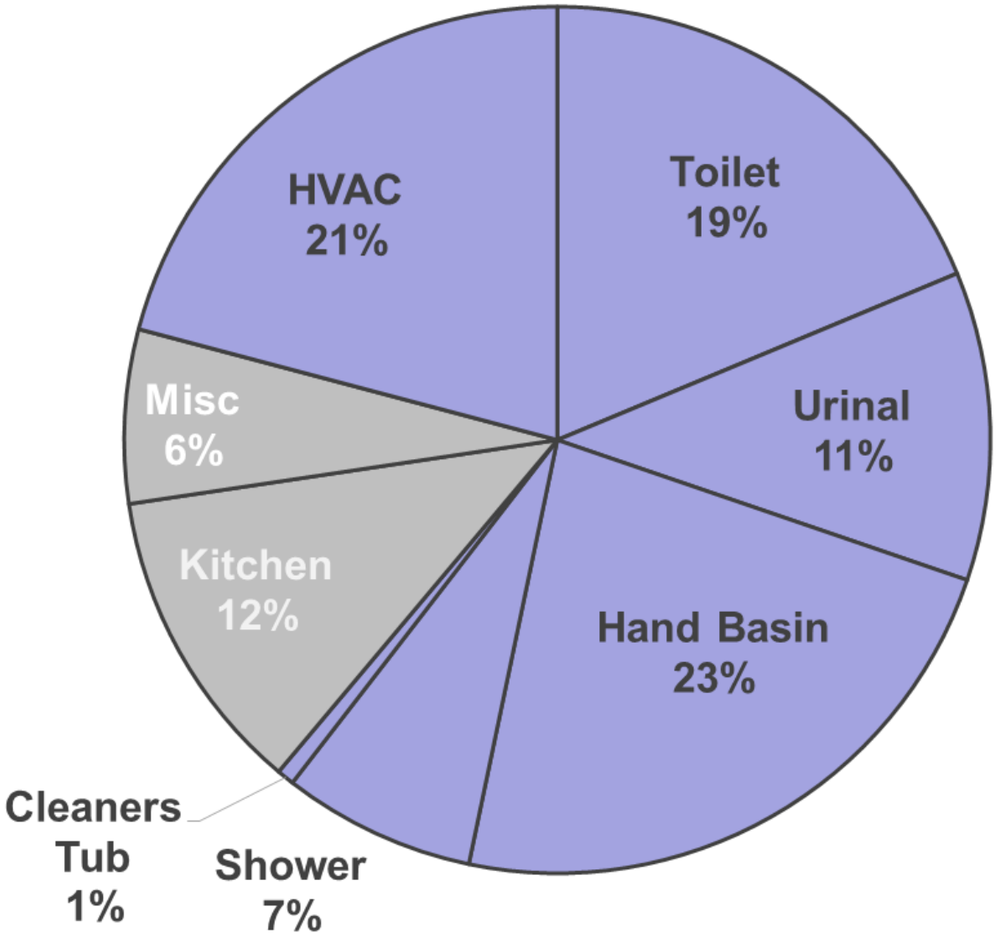
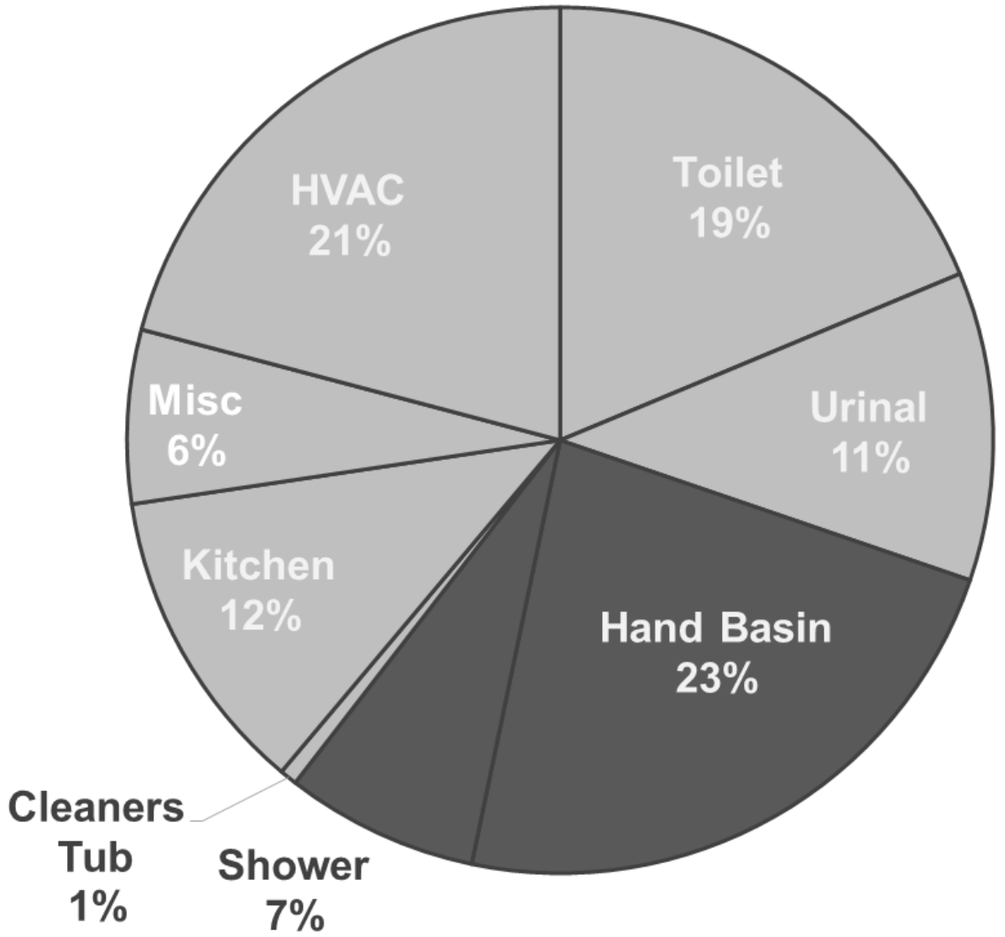


Image Source: Sydney Water Corporation, 2007

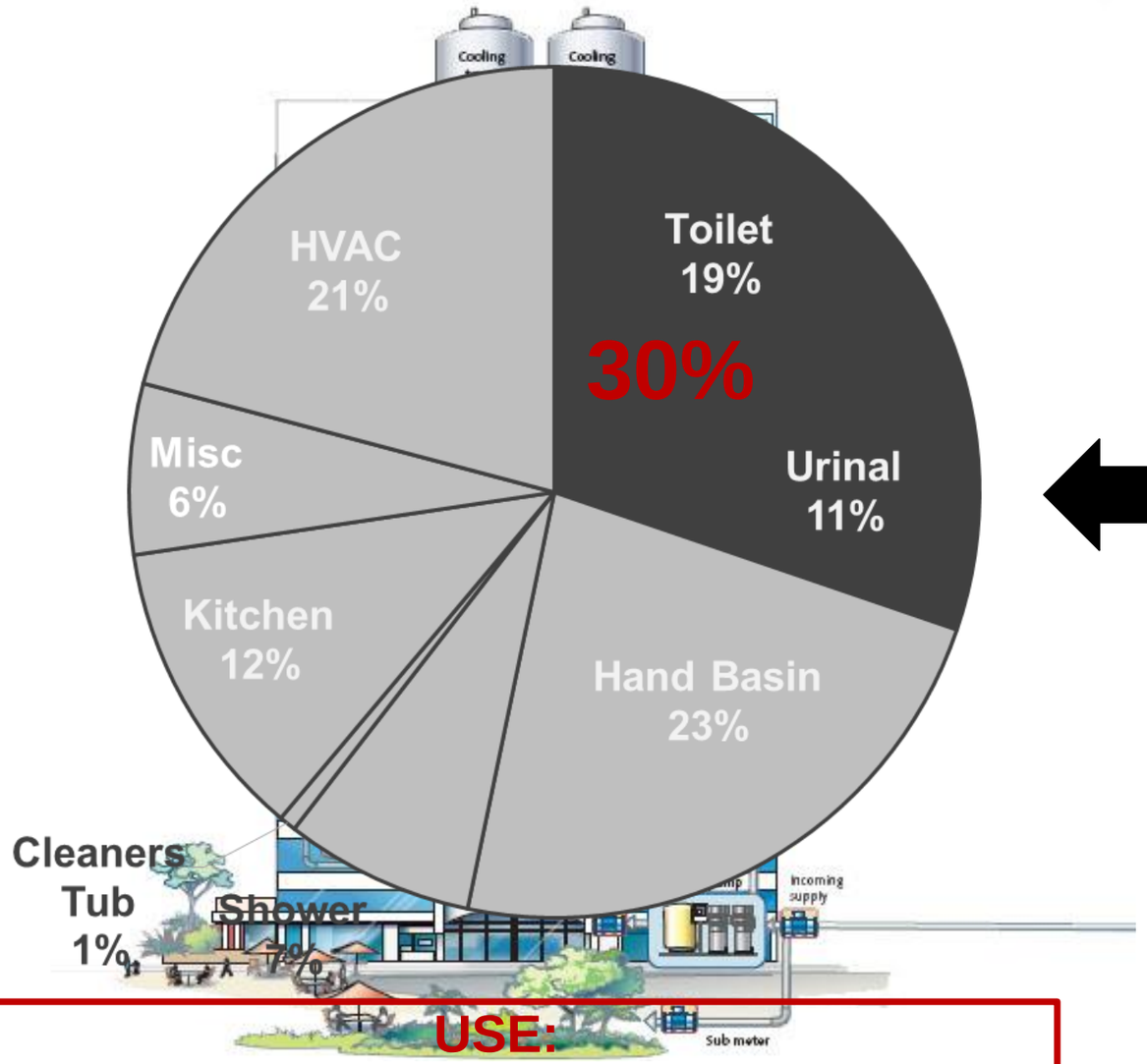


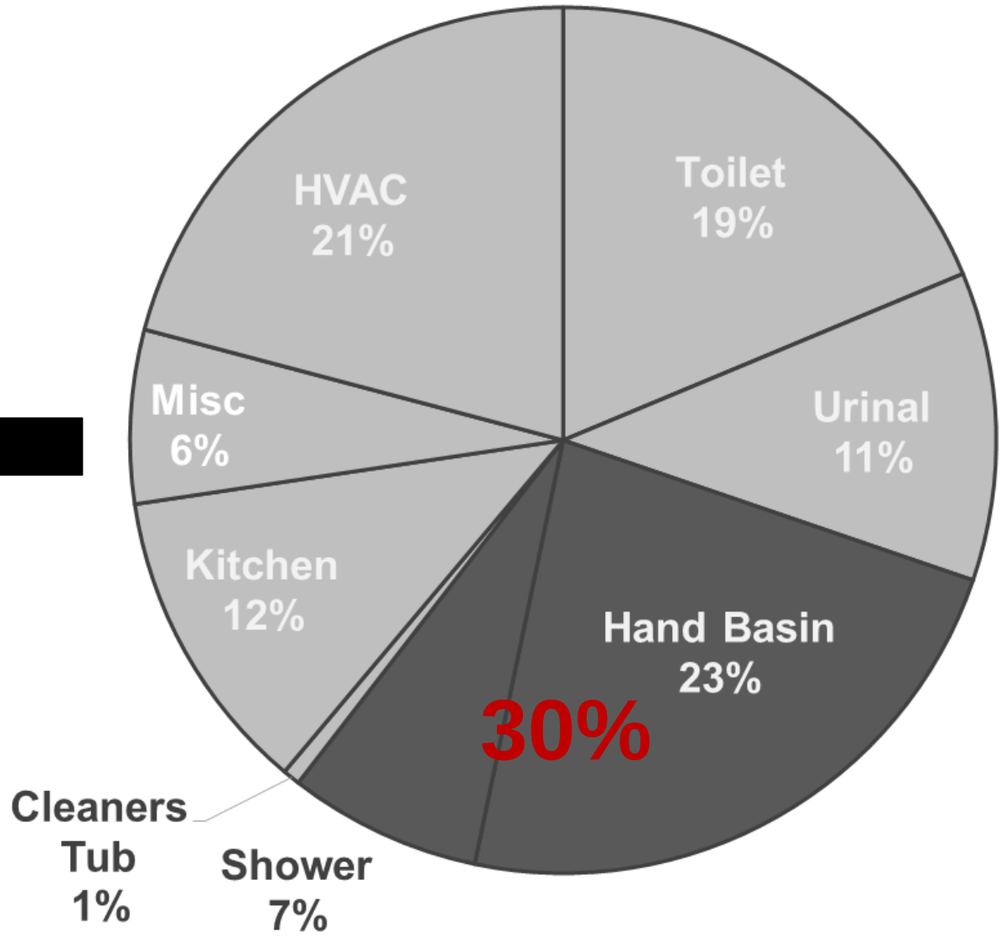
USE:
82% is for non-potable uses

Image Source: Sydney Water Corporation, 2007



SOURCE:
30% could be re-used





USE:
30% non-contact uses

SOURCE:
30% could be re-used

Image Source: Sydney Water Corporation, 2007

Rainwater & Greywater Feasibility:

Social & Policy

drivers and barriers
perceptions
experiences

Buildings

practical investigations
feasibility assessment
business case
water quantity and quality

Water Networks

impacts
regional consistency
charging mechanisms

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Online Survey:

- Perception and opinion
- Drivers and barriers
- Experience, operation and maintenance
- Feeds other research streams
- 72 respondents
  - building owners and managers
  - building occupants
  - product, equipment and service suppliers
  - interested in RWH and/or GWR
  - other
- Self-selecting sample

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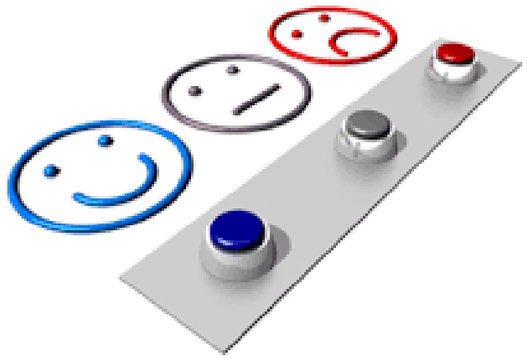
Online Survey Summary:

- >50% said RWH is acceptable for all water uses
- >70% said GWR is acceptable for toilet flushing & irrigation
- Top Incentives for:
  - RWH: cost savings, sustainability and resilience
  - GWR: sustainability, impact on supply and cost savings
- Lowest attraction was marketability (i.e. GSNZ)
- Biggest Barriers for:
  - RWH: storage, cost and education
  - GWR: education, regulations and water quality concerns
- Lower perceived understanding of GWR than RWH
- Opportunity for innovation in product, technology and expertise



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Key Questions:

1. Water Quality
   - Acceptable vs. Actual?
   - Health Impact Assessment?
2. Education & Awareness
   - Available Information (including Legislation)?
   - Level of Understanding?
3. Resource Consumption
   - Building Water & Energy Use?
   - Rainwater & Greywater Savings?
4. Feasibility
   - Financially?
   - Operationally?

5. Issues & Considerations
   - Industry Status & Performance?
   - Design Implications?

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Research Streams:

Social & Policy

drivers and barriers
perceptions
experiences

Buildings

practical investigations
feasibility assessment
business case
water quantity and quality

Water Networks

impacts
regional consistency
charging mechanisms

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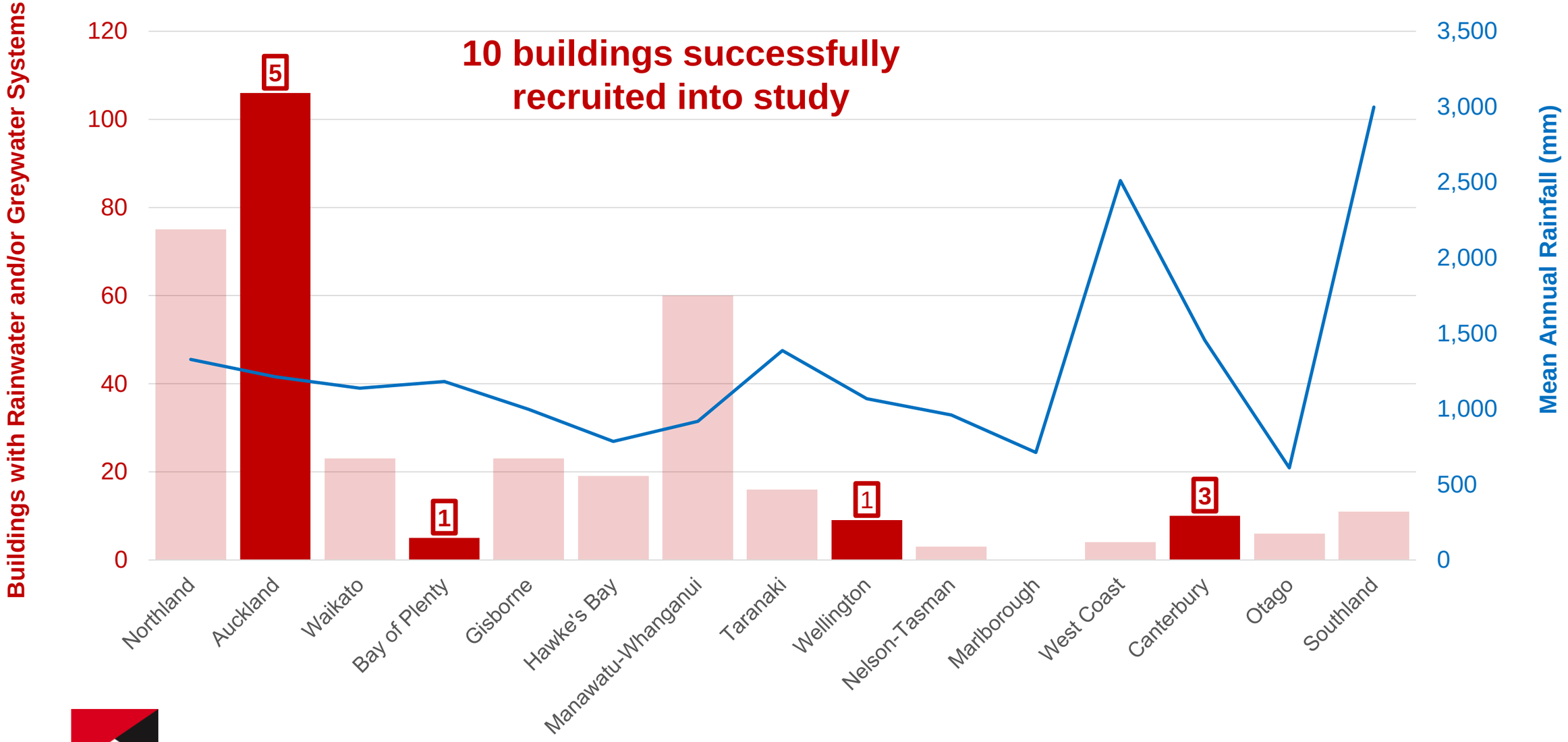
10 buildings successfully recruited into study
Buildings with Rainwater and/or Greywater Systems
Mean Annual Rainfall (mm)
120
100
80
60
40
20
0
3,500
3,000
2,500
2,000
1,500
1,000
500
0
5
1
1
3
Northland
Auckland
Waikato
Bay of Plenty
Gisborne
Hawke's Bay
Manawatu-Whanganui
Taranaki
Wellington
Nelson-Tasman
Marlborough
West Coast
Canterbury
Otago
Southland

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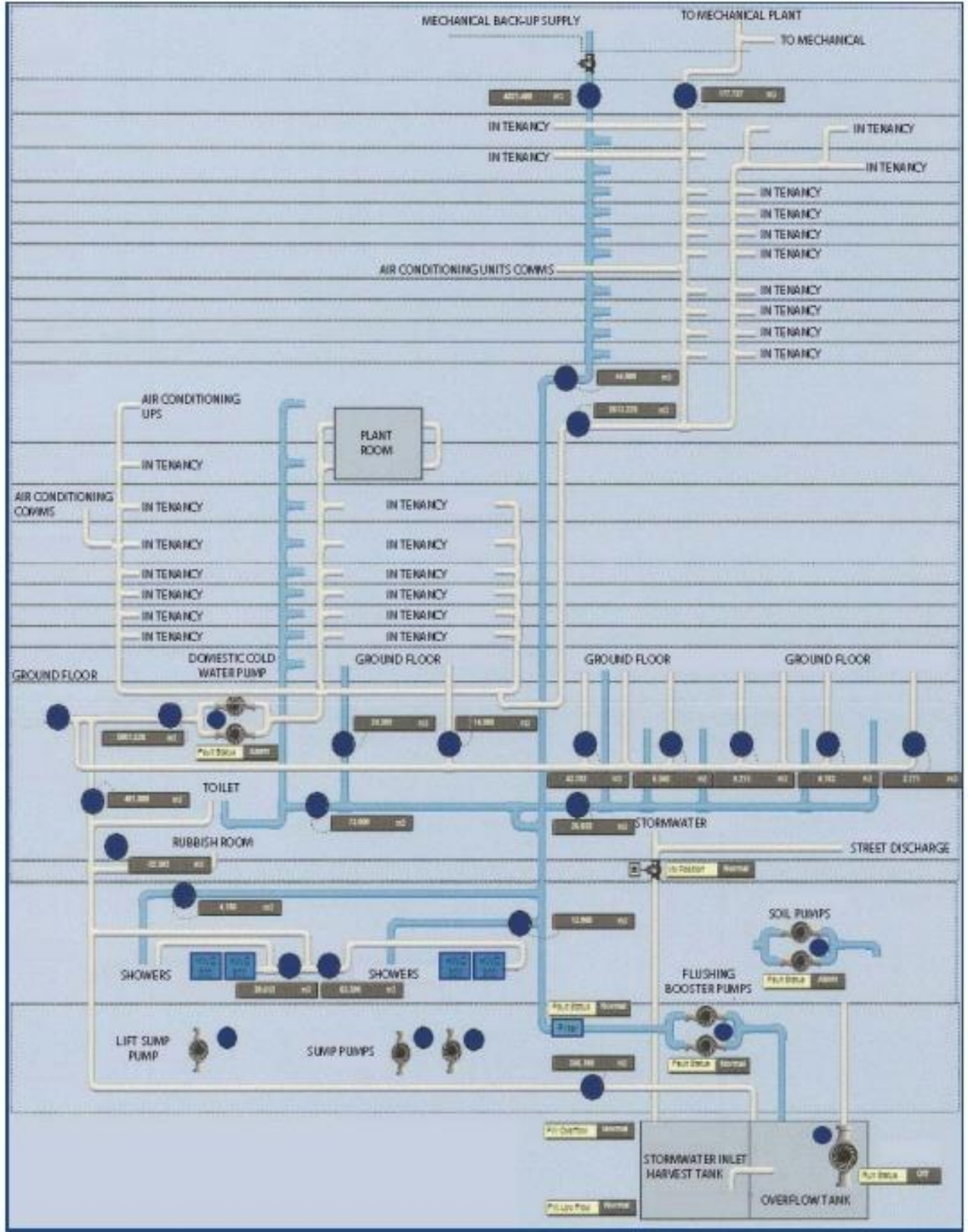
Building Investigations:

- How much water is used?
- Building size and use
- Cost of install and O&M

- New build vs. retrofit
- 4 pipe networks instead of 3
- Data analysis & management
- Storage
- What happens if no rain?



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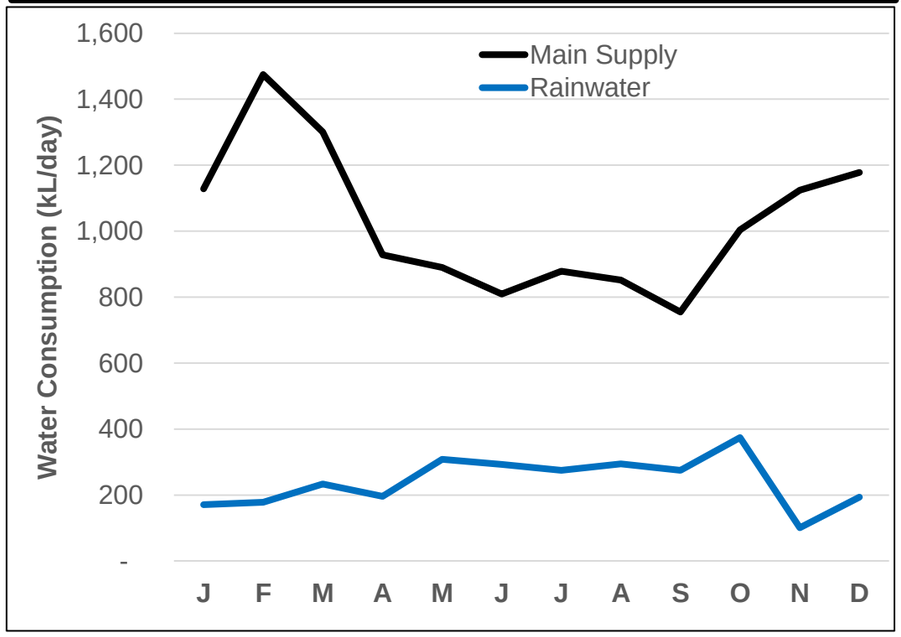
Auckland Office Building

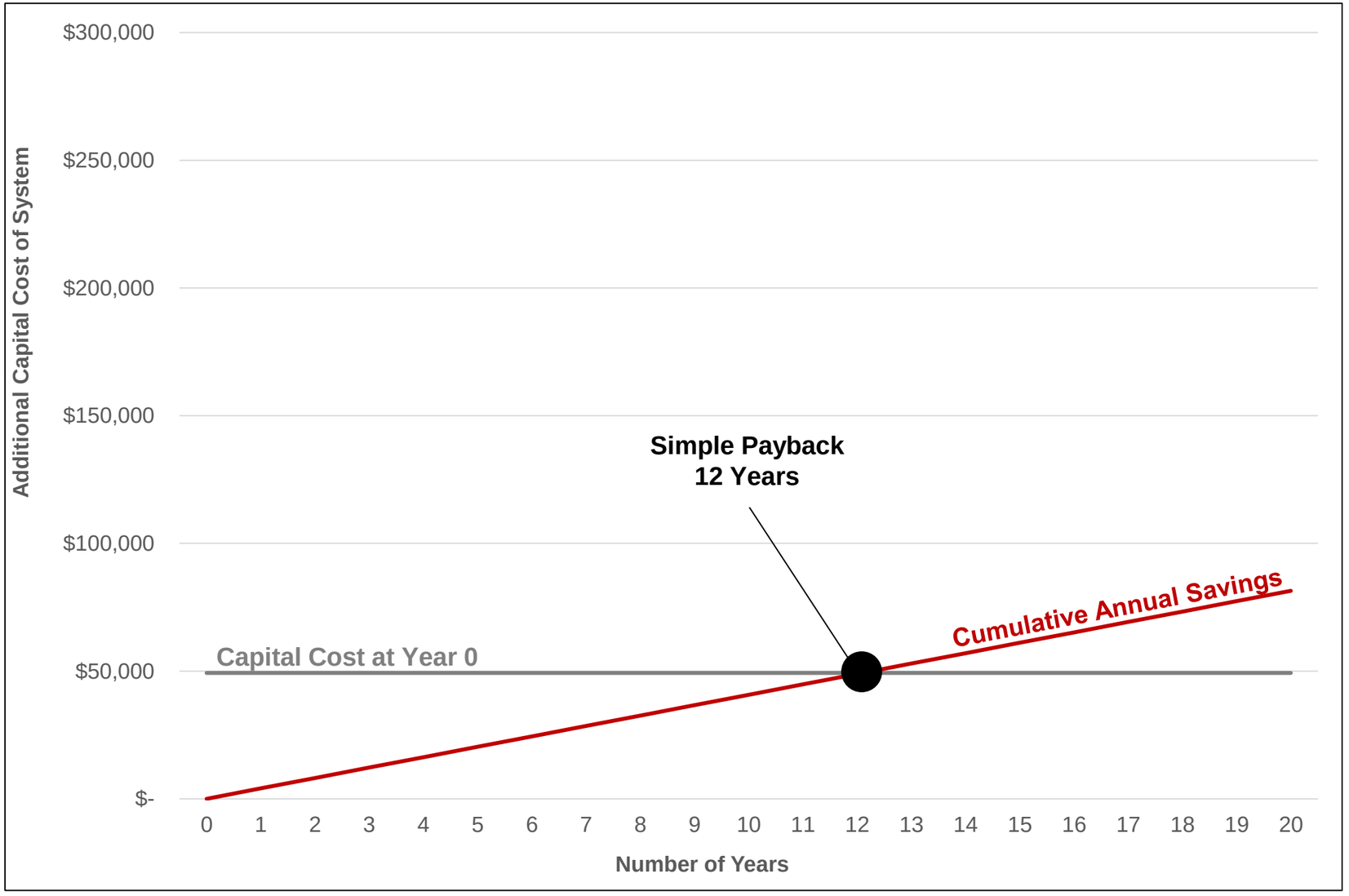
Water Savings only

Rainwater Harvesting System

a simple payback period of 12 years

Auckland's volumetric water tariffs of $1.409/kL





Auckland Office Building

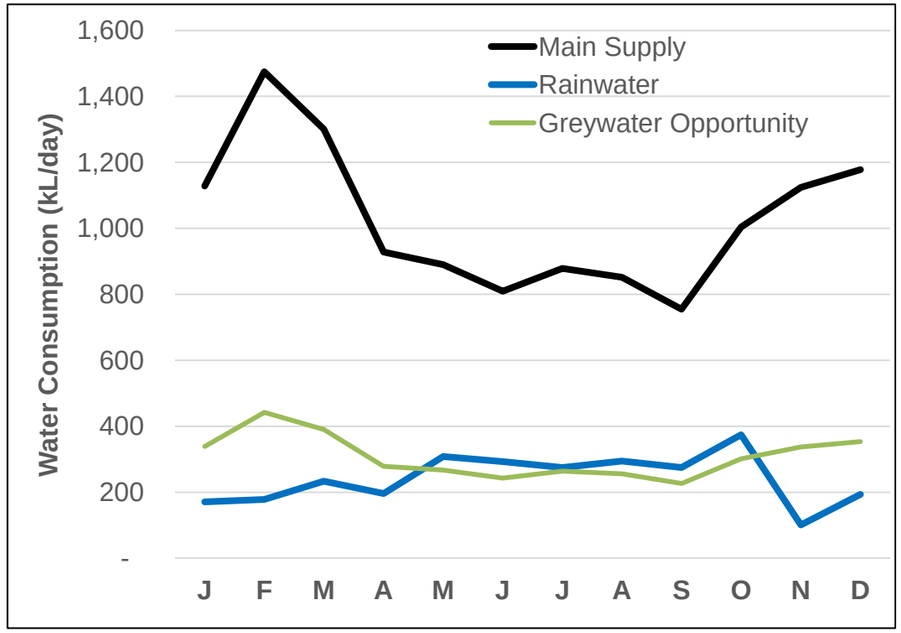
Water & Wastewater Savings

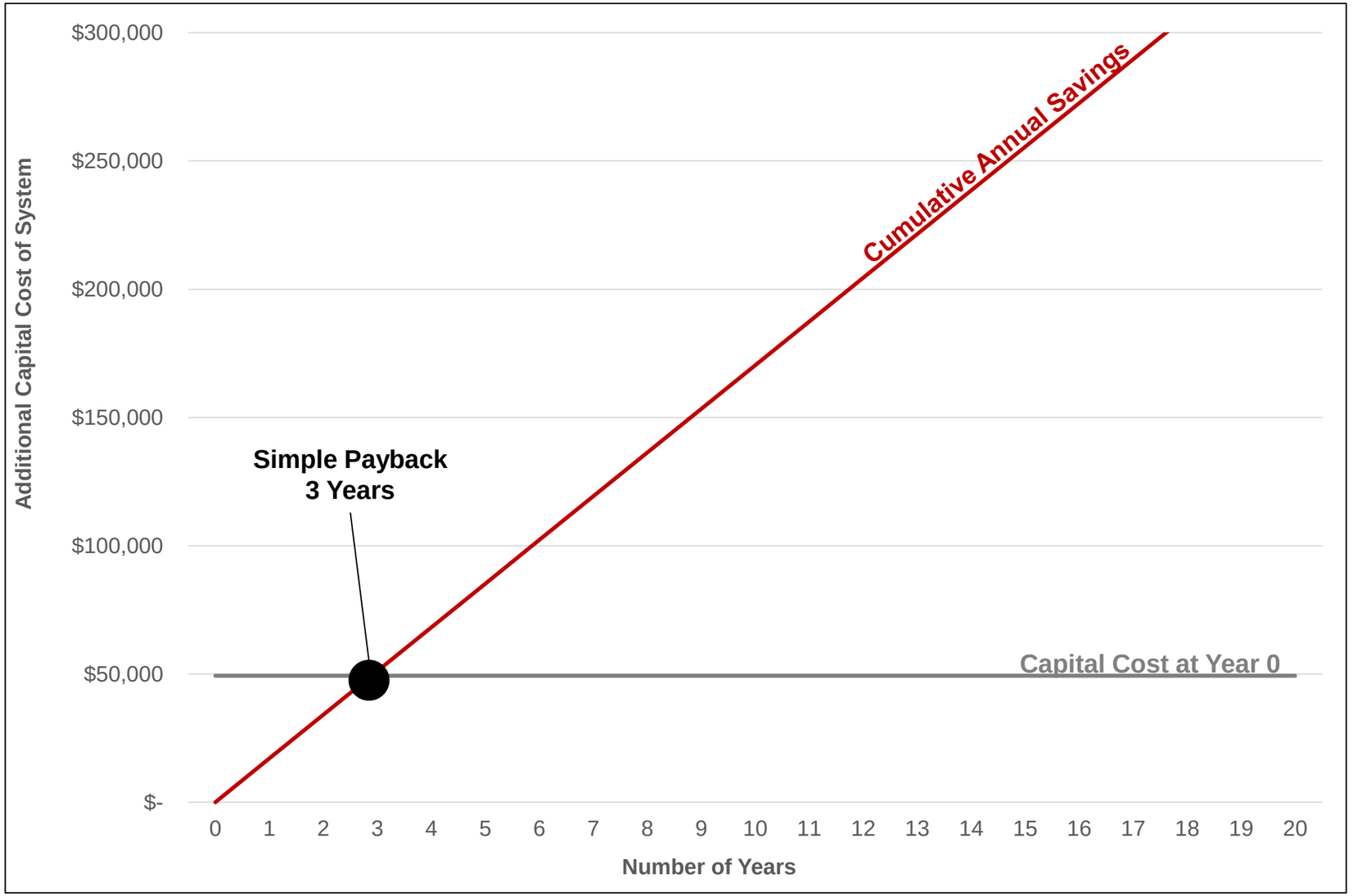
Rainwater Harvesting System

a simple payback period of 3 years

Auckland's volumetric water & wastewater tariffs of

$1.409/kL + $4.485/kL





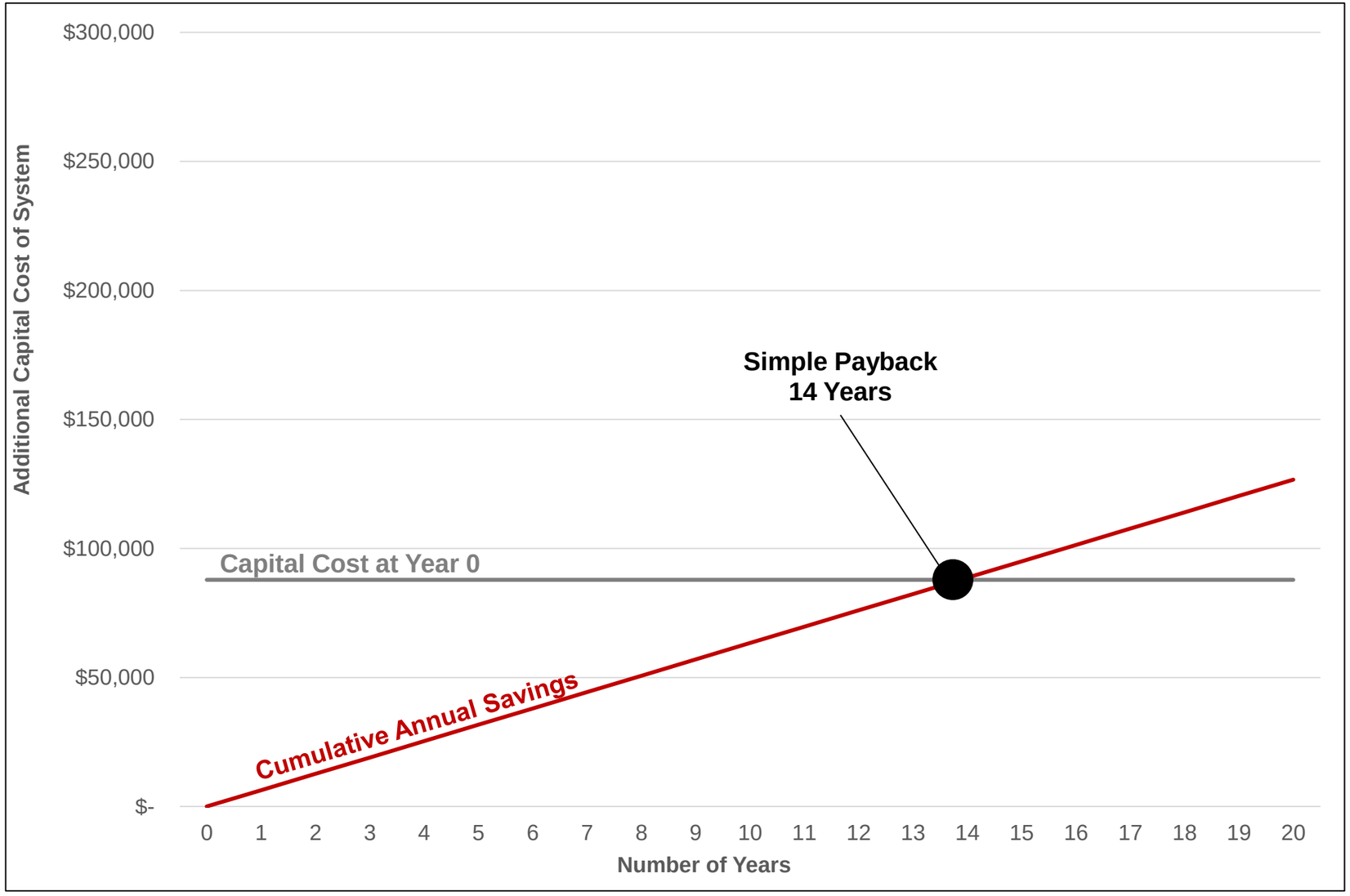
Bay of Plenty Retail Building

Water Savings

Rainwater Harvesting & Greywater Recycling System

a simple payback period of 14 years

Tauranga’s volumetric water tariffs of $1.409/kL



Bay of Plenty Retail Building

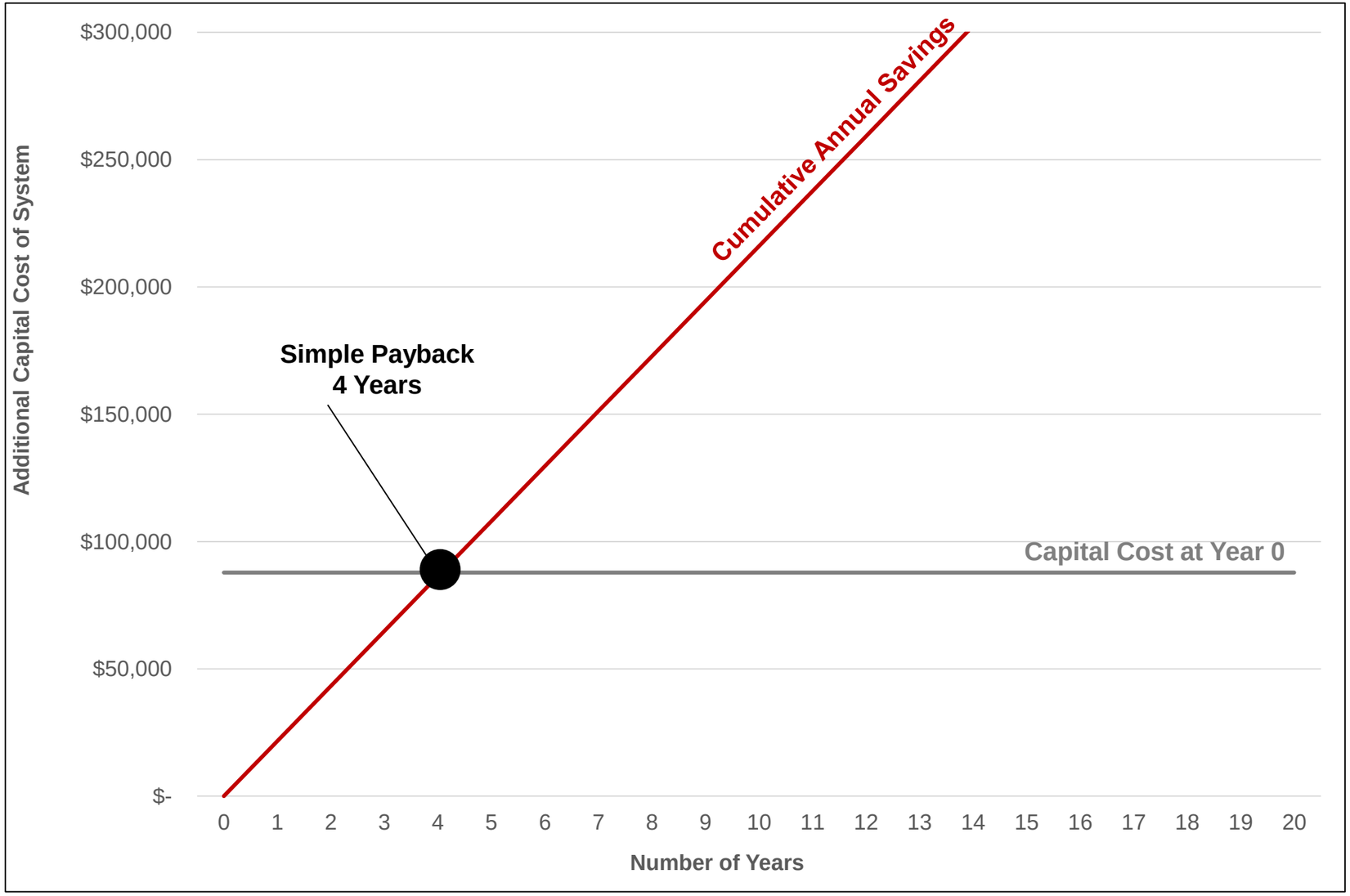
Water & Wastewater Savings in Auckland

Rainwater Harvesting & Greywater Recycling System

but then…

if you apply Auckland's water and wastewater instead

a simple payback period of 4 years



Canterbury Education Building

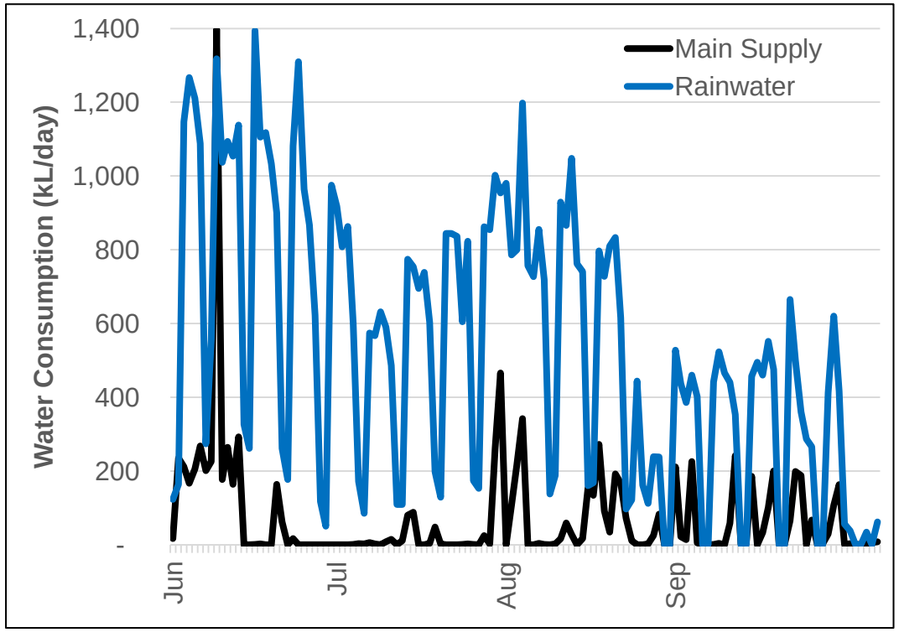
No Direct Financial Savings

Rainwater Harvesting System

water is not currently charged volumetrically in Canterbury

so…

no direct financial savings are made



greenstar

Research Streams:

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drivers and barriers
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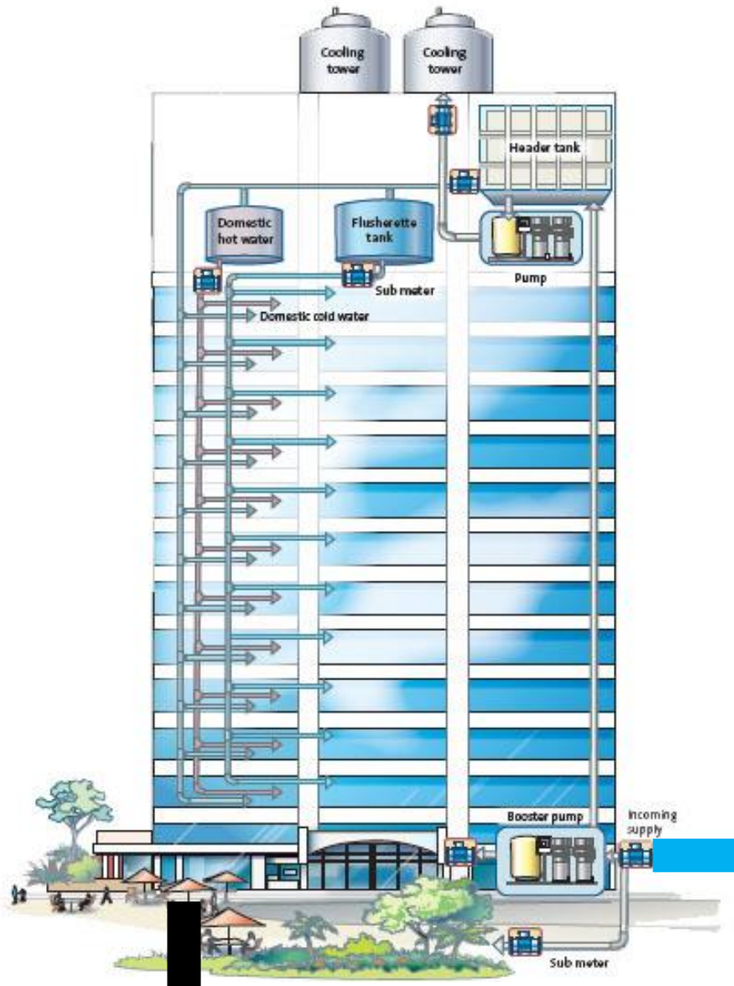


Potable Water

Wastewater

Potable Water

Wastewater

Stormwater

Potable Water

Rainwater
Storage Tank

Wastewater

Stormwater

Potable Water

Rainwater Storage Tank

Wastewater

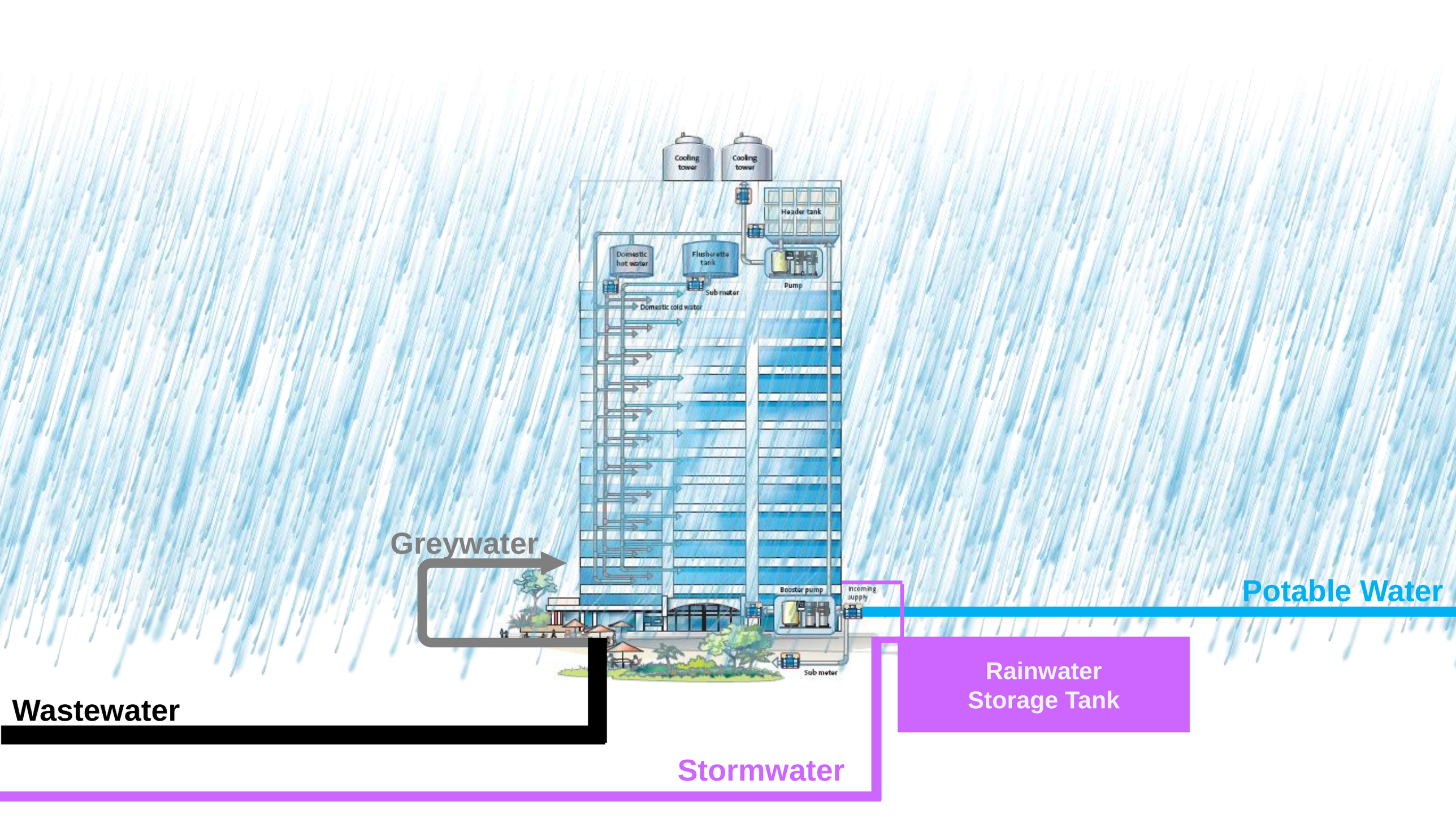
Stormwater

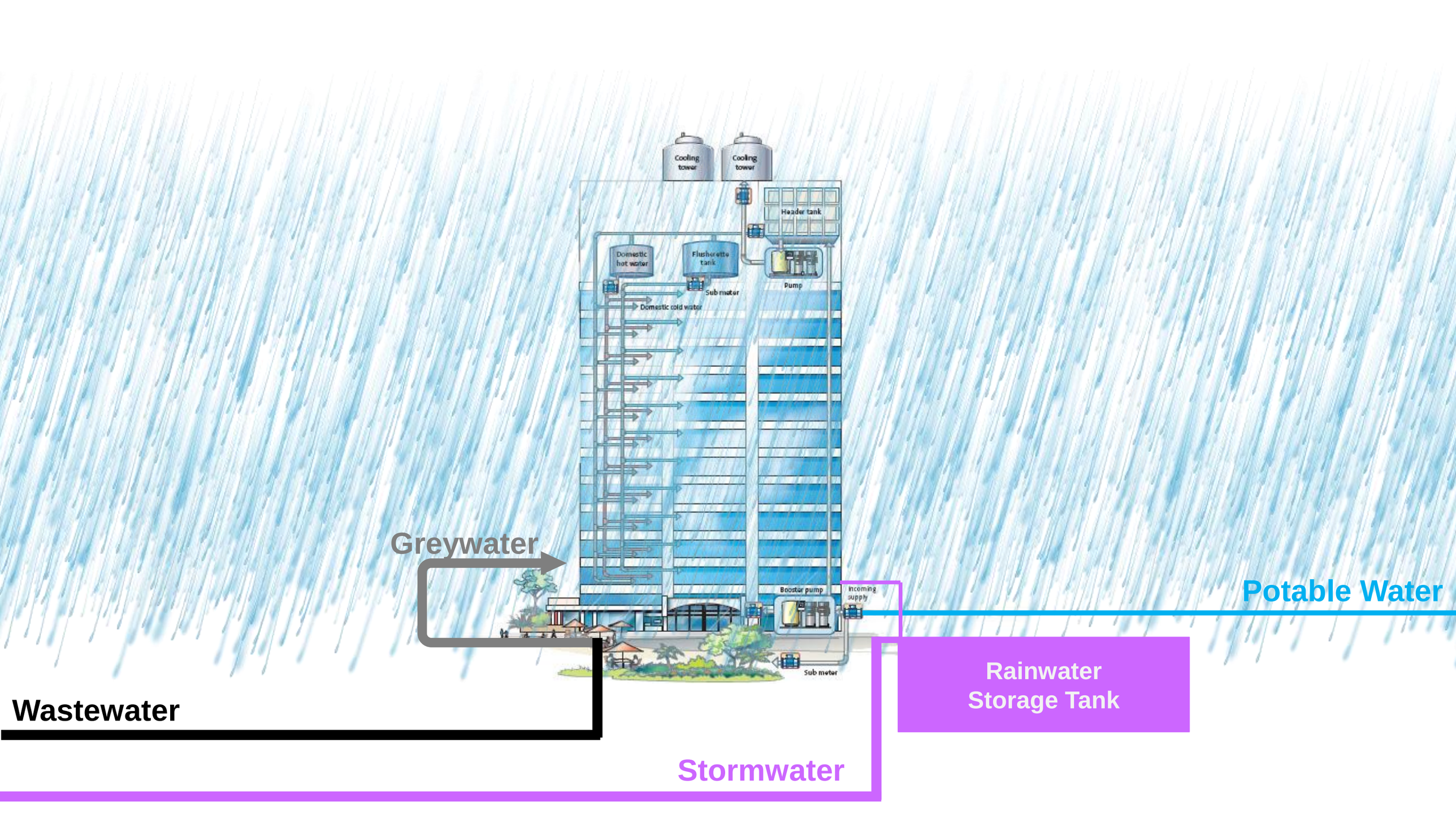
Potable Water

Rainwater
Storage Tank

Wastewater

Stormwater


Cooling tower
Cooling tower
Header tank
Domestic hot water
Flusherette tank
Pump
Sub meter
Domestic cold water
Greywater
Booster pump
Incoming supply
Potable Water
Sub meter
Rainwater Storage Tank
Wastewater
Stormwater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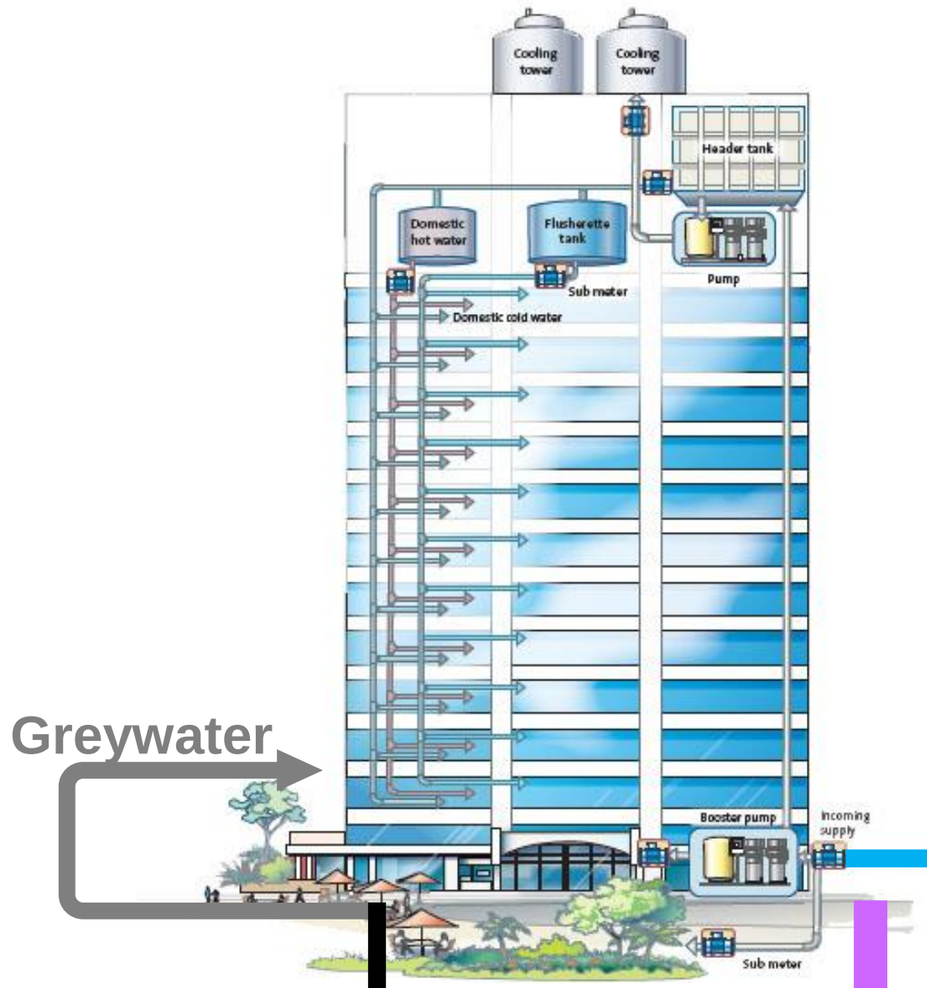
Potable Water
Sub meter
Rainwater Storage Tank
Wastewater
Stormwater

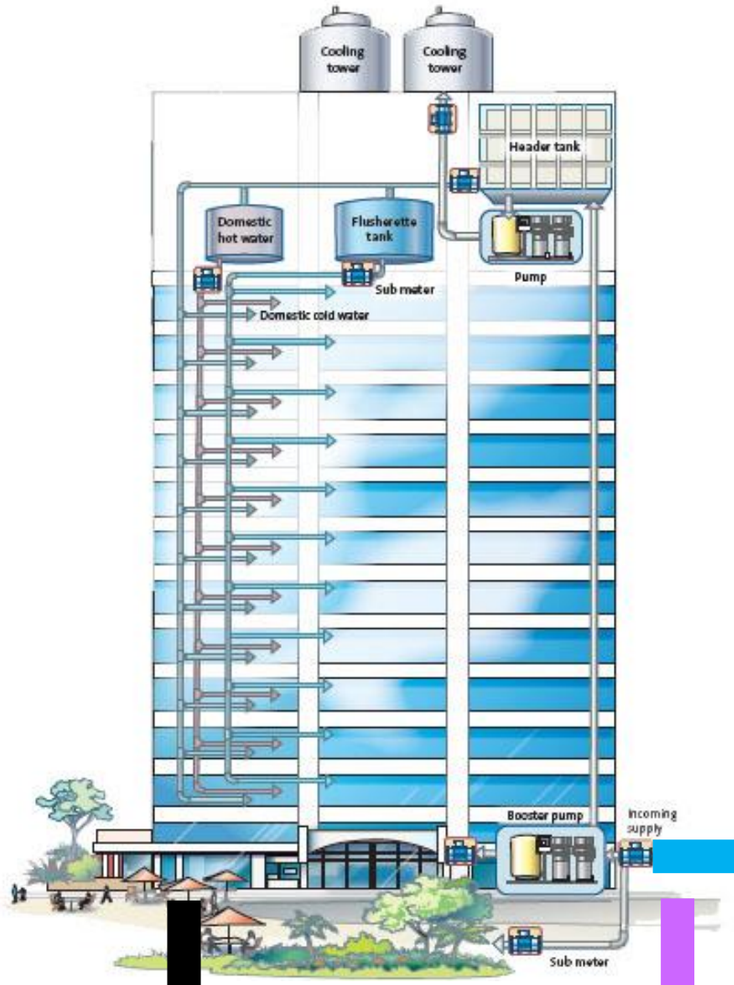


Greywater

Potable Water

Wastewater

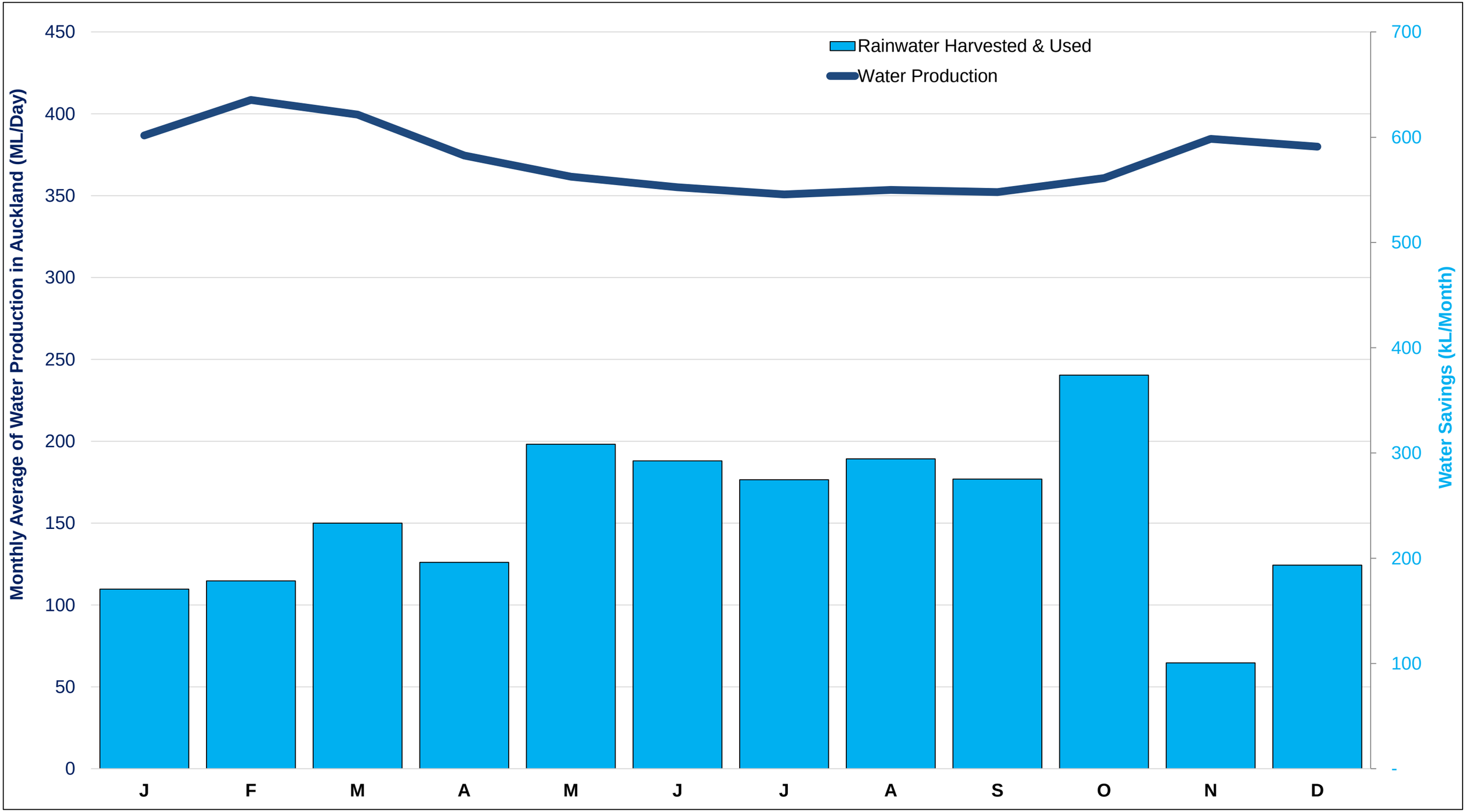
Stormwater

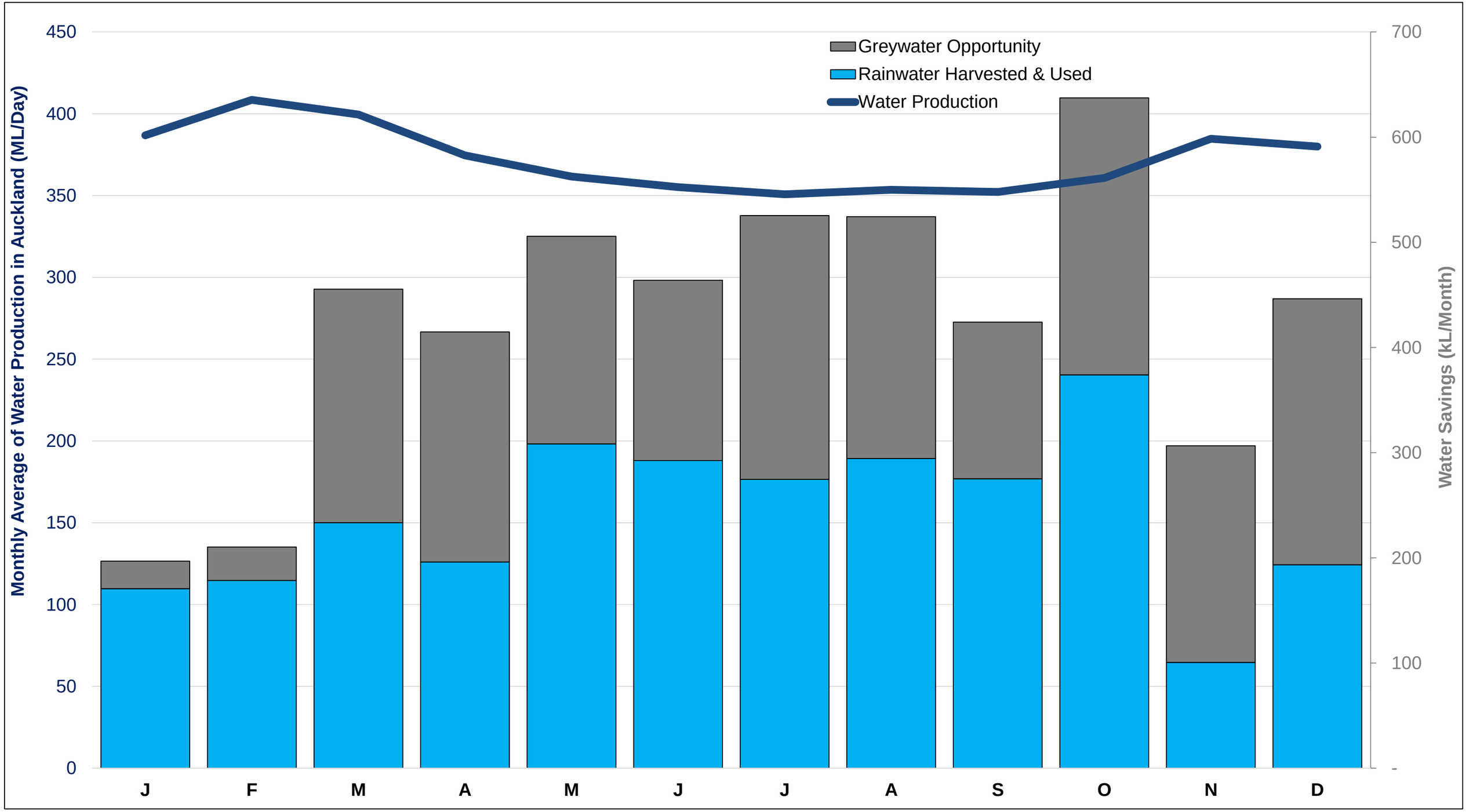


Potable Water

Wastewater

Stormwater


Rainwater Harvested & Used
Water Production
Monthly Average of Water Production in Auckland (ML/Day)
Water Savings (kL/Month)
450
400
350
300
250
200
150
100
50
0
700
600
500
400
300
200
100
-
J
F
M
A
M
J
J
A
S
O
N
D


Greywater Opportunity
Rainwater Harvested & Used
Water Production
Monthly Average of Water Production in Auckland (ML/Day)
Water Savings (kL/Month)
450
400
350
300
250
200
150
100
50
0
700
600
500
400
300
200
100
-
J
F
M
A
M
J
J
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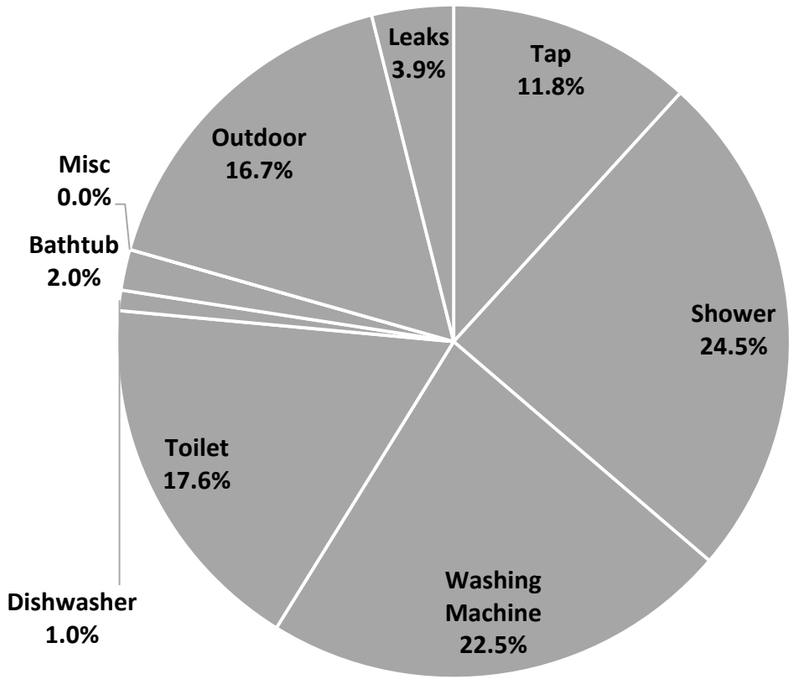
S
O
N
D

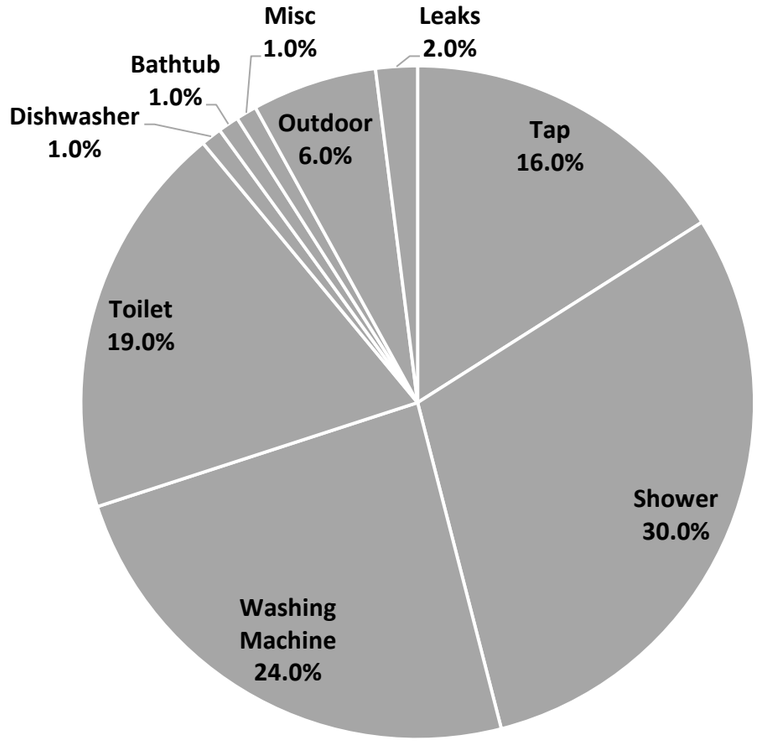
Where are we at?

Auckland Water Use Study (AWUS):

Summer



Winter



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Existing Research:

Household Energy End-use Project (HEEP):

- Nationwide
- Residential energy
- Energy end-uses
- Fuel sources
- Behaviours to energy use

No comparative work on residential water use being done…

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Residential Water Use Project:

Methods:

- Paper-based survey
- Water meter readings
- Disaggregation of water end-uses

Working with Water New Zealand and their SIGs

Working with water service providers around New Zealand

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Residential Water Use Project:

Proposed Outcomes:

- Understand residential water end-uses (incl. outdoor use)
- Influences on water use (behaviour, technology, demographic, climate, etc.)
- Baseline per capita consumption figures
- Infrastructure sizing advice
- Network model improvement support for un-metered areas
- Tariff determination support, using social and economic perspective
- Regions with most potential for water efficiency programmes
- Short and long term demand forecast assistance

Increased water awareness!!!

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Over to you:

How to best advance the issues with residential water use?

Most important aspects to consider?

Biggest questions you have regarding water use and awareness?

Other discussion topics?

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HOW IS WATER USED?

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