

# Inflow & Infiltration (I&I)

## End-to-end investigation solutions

Citycare Water provides comprehensive I&I identification and remediation services - identifying I&I sources, recommending remediation actions and, if desired, completing necessary repair work.

Inflow & Infiltration (I&I) is the process of liquids other than wastewater, such as groundwater and stormwater, entering the wastewater system. It is a major problem, causing numerous issues including:

- Significant stress on wastewater treatment plants during wet weather, potentially leading to breaches of Resource Consents.
- Wet weather overflows, contaminating the receiving environment.
- Pumping and treating these additional flows creates additional and unnecessary costs.
- Utilising network and treatment capacity that could be available for growth of the connected population.
- Necessitating investment in network upgrades and increasing network capacity.

### Investigation Outcomes

Our GIS-enabled digital job tracking system accurately records faults and captures data, photos, and outcomes live from the field.

Detailed reports from our I&I Investigation Team identify faults and provide recommendations for remedial works.

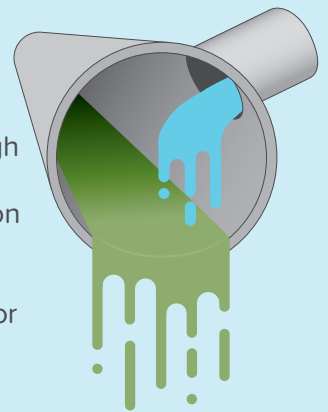
Citycare Water’s maintenance and construction crews are available to undertake corrective works to fix faults within the public networks.

### Investigation Benefits

- Identify I&I sources and responsible parties (property owner vs. local authority).
- Reduce long term costs.
- Protect the environment.
- Extend wastewater infrastructure lifespan.

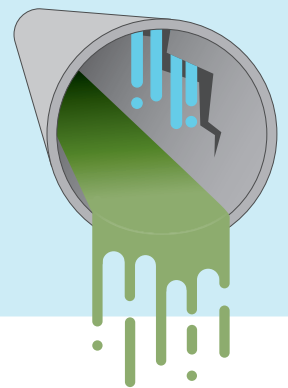
#### INFLOW

Stormwater enters the wastewater system through leaky manhole covers, uncapped sewer inspection points, low gully traps and stormwater pipes illegally connected to the laterals or wastewater network.

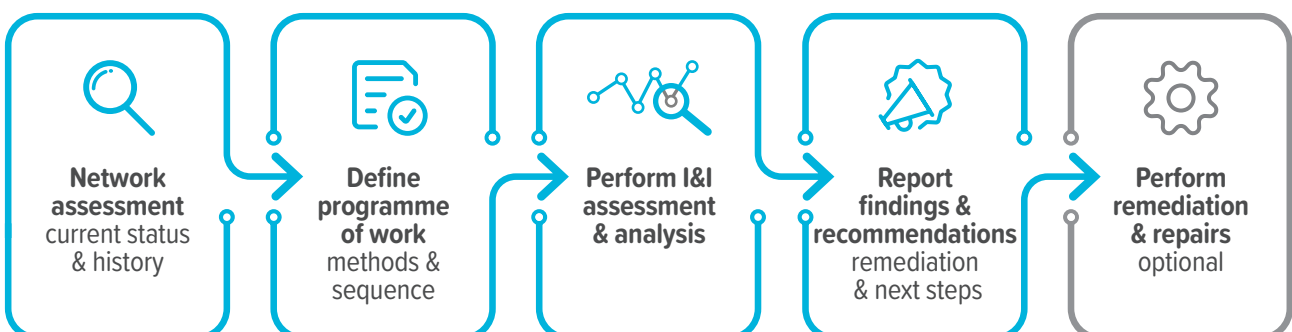


#### INFILTRATION

Groundwater seeps into wastewater pipes through cracks, holes, leaky joints, and deteriorated or faulty connections.



### Our I&I Investigation Methodology



# Our I&I Inspection Methods:

<p>① <b>Property inspections</b></p>	<p>Manual inspection of properties that feed into a wastewater main, looking for roof downpipe connections to the wastewater, low or damaged wastewater gullies, etc.</p>	<ul style="list-style-type: none"> <li>• Identification of I&amp;I sources on private property - we have found around 25% of properties to be non-compliant.</li> <li>• Fast and cost-effective.</li> </ul>
<p>② <b>Manhole inspections</b></p>	<p>Inspection of manholes using visual and pole camera assessments to identify broken or deformed components, erosion or corrosion, external intrusion, etc.</p>	<ul style="list-style-type: none"> <li>• Identification of I&amp;I sources at or close to manholes.</li> <li>• Quick and inexpensive.</li> </ul>
<p>③ <b>Smoke testing</b></p>	<p>Artificial, non-toxic smoke is introduced into the wastewater system and cracks, leaks and illegal connections identified by observing where the smoke escapes.</p>	<ul style="list-style-type: none"> <li>• Effective and low cost.</li> <li>• Can identify sources of I&amp;I.</li> <li>• Large areas can be tested in a short period of time.</li> </ul>
<p>④ <b>Dye testing</b></p>	<p>A coloured dye is added into suspected sources of inflow (e.g. roof downpipes). Illegal connections are confirmed if the dye is seen in the wastewater system.</p>	<ul style="list-style-type: none"> <li>• Highly effective for tracing specific sources of inflow.</li> <li>• Visual confirmation of where water is entering the wastewater system.</li> </ul>
<p>⑤ <b>Level monitoring</b></p>	<p>Level sensors are installed in manholes to monitor water levels. Sudden increases in water levels can indicate inflow or infiltration during rain events.</p>	<ul style="list-style-type: none"> <li>• Near real-time data on water levels during installed period.</li> <li>• Identification of unusual increases in water levels.</li> </ul>
<p>⑥ <b>Flow monitoring</b></p>	<p>Flow meters installed in the wastewater system continuously measure the wastewater flow to identify changes in flow patterns during rainfall events.</p>	<ul style="list-style-type: none"> <li>• Near real-time data on water flow during installed period.</li> <li>• Identification of unusual increases in water flow when it rains.</li> </ul>
<p>⑦ <b>Distributed Temperature Sensing (DTS)</b></p>	<p>Fibre optic cables installed in the wastewater system measure temperature changes that can indicate water entering the system via inflow and/or infiltration.</p>	<ul style="list-style-type: none"> <li>• Highly sensitive to temperature variations at 1.0m intervals.</li> <li>• Monitor large areas of the wastewater network over weeks.</li> </ul>
<p>⑧ <b>Closed-Circuit Television (CCTV)</b></p>	<p>High-resolution video of a pipe's interior from a camera mounted on a robotic crawler allows for visual inspection of cracks, root intrusion and other defects.</p>	<ul style="list-style-type: none"> <li>• Detailed, visual evidence of pipe conditions.</li> <li>• Identification of the exact location of infiltration.</li> </ul>

