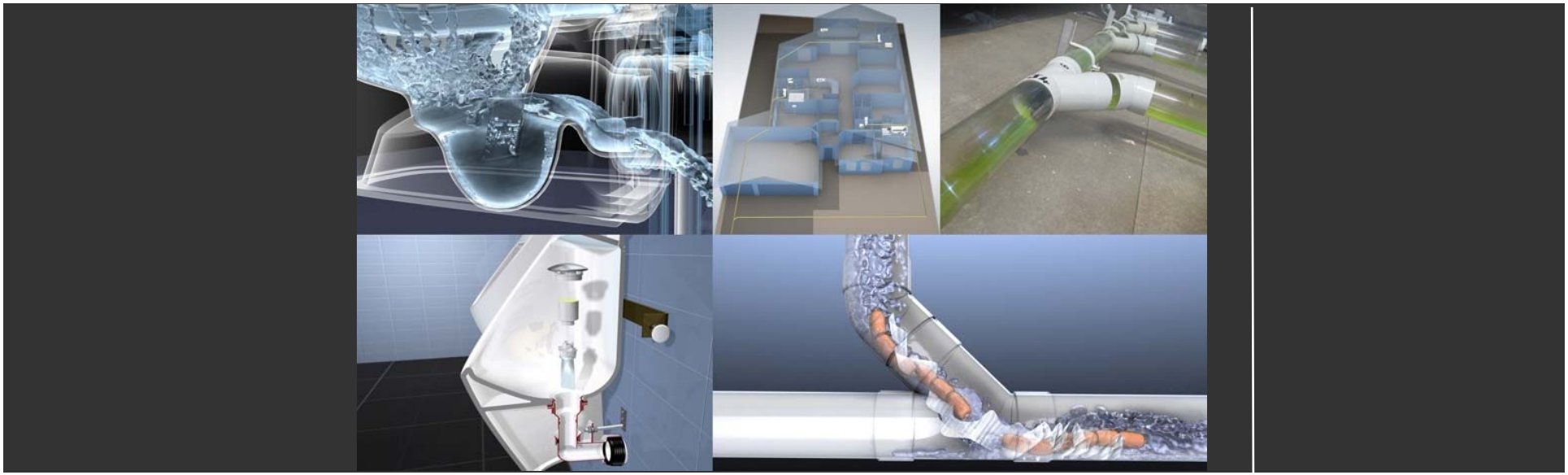
# Australasian Scientific Review of Reduction of Flows on Plumbing and Drainage Systems

Jeff Clark Chair ASFlow Committee



ASFlow

## Objectives of the ASFlow Project

- Develop efficient sanitary drain line designs by research that will optimise the transportation of waste discharged from sanitary fixtures into the network utility operator's systems.
- Investigate the implications on the transportation of black water within drain line systems where grey water has been separated.
- Compare systems internationally particularly those in Europe and the USA.
- Investigate the potential implications for lower flush volumes than the current minimum of 4.5/3L have on drainage systems complying with AS/NZS 3500.2.

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## Drainline Transportation Performance

The study will include but not be limited to :

1. WC transportation - Various flush volumes
2. Sweep Junctions affect on drain line transportation
3. Horizontal 45 junctions affect on drain line transportation
4. HDPE Fittings
5. Various types of bends affect on drain line transportation
6. Siphonic Plumbing Systems

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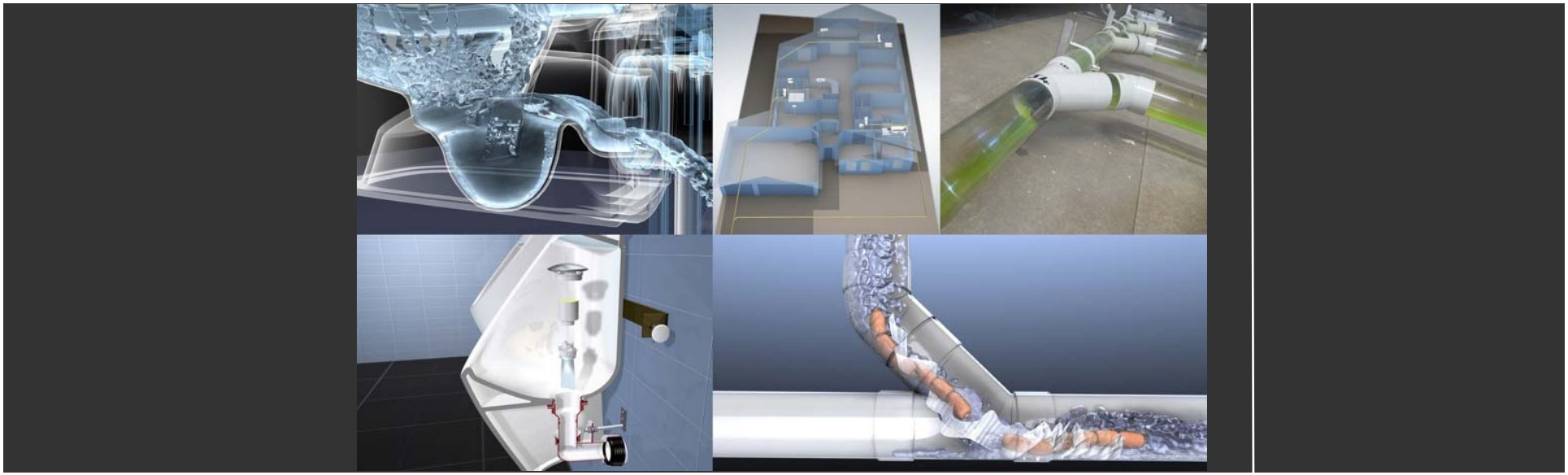
## **ASFlow** – Research approach

**The research approach taken by the ASFlow committee :**

- Investigate actual problems in the field
- Simulate the configuration in the laboratory
- Evaluate the results and conduct field testing
- Determine  appropriate solutions.

# Waterless Urinal Research



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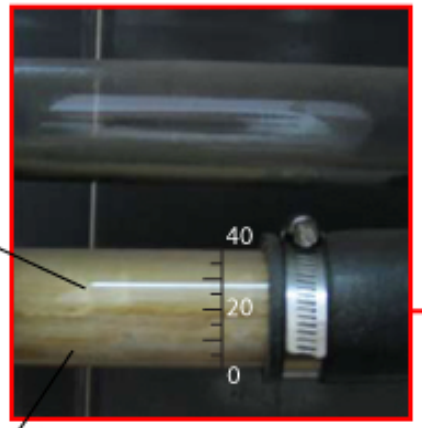
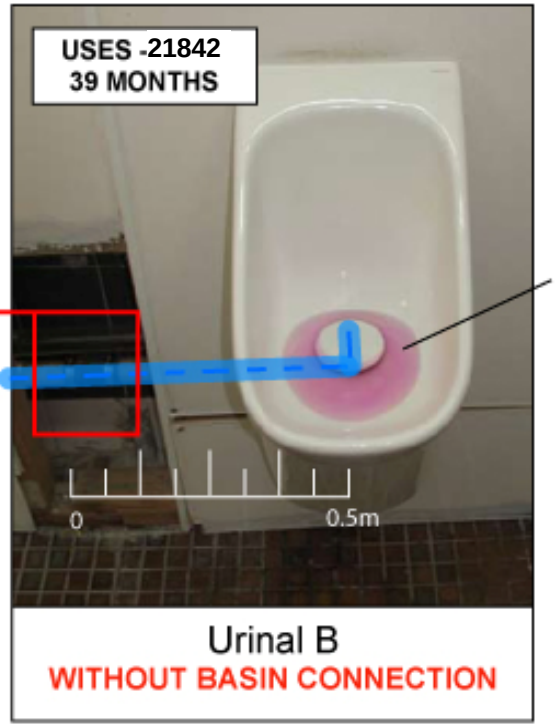
## **Waterless Urinal Research** – Drainline system evaluation

**URINAL B**
**DRAINLINE BLOCKAGE**
14th August 2008

Drainline
40mm Glass Pipe




Sedimentry Urine deposit completely
Blocking Pipe.

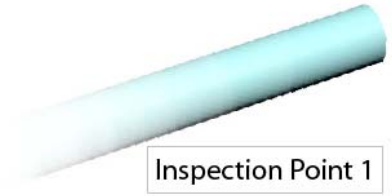



Liquid unable to
pass through urinal

Urinal B
WITHOUT BASIN CONNECTION

## **Waterless Urinal Research** – Drainline system evaluation

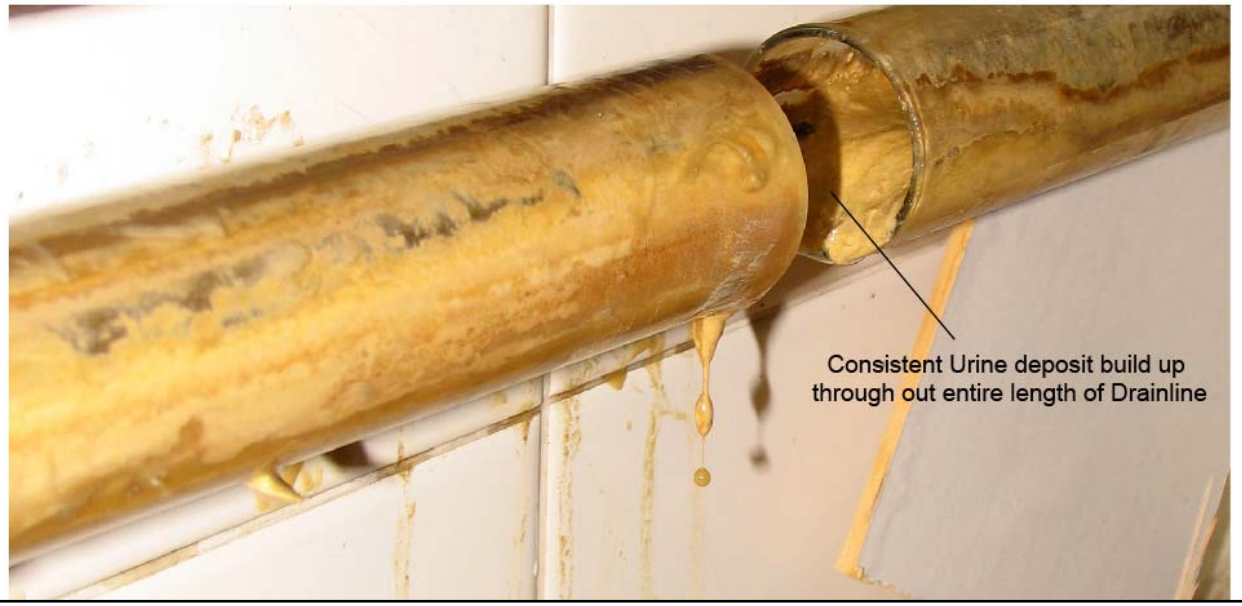
**URINAL B**
Plumbing Connection - Plumbing Inspection



Inspection Point 1

40mm Glass Pipe

Section Detail of Urinal Plumbing Connection



## **Waterless Urinal Research** – Drainline system evaluation

**As a result of this research an amendment has been prepared for AS/NZS 3500 Part 2**

Where a waterless urinal is installed, fixtures or appliances providing a minimum rating of 2 fixture units shall be connected upstream for each waterless urinal installed.

Non –flushing urinals with a cartridge seal may be installed without an additional fixture trap or self – sealing mechanical device.

Prior to installing a non-flushing urinal to an existing system, the installer shall determine the materials of the discharge pipes in the existing sanitary drainage system.

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National Plumbing Regulators Forum

# Waterless urinals advisory note

**The purpose of this advisory note is to provide guidance to the Australian and New Zealand plumbing industries and consumers regarding the installation and maintenance of waterless urinals.**

In an effort to integrate water-sensitive urban designs into current practice the National Plumbing Regulators Forum (NPRF) for Australia and New Zealand formed the Australasian Scientific Review of Reduction of Flows on Plumbing and Drainage Systems (ASFlow) committee to conduct research into the effects reduced flows are having on drainage systems.

The first stage of the project was to conduct research into the impact of waterless urinal discharge.

The NPRF ASFlow project committee has conducted a number of laboratory and field tests which have identified the potential for fitting and drainline blockages from struvite (magnesium ammonium phosphate).

Struvite is the main scale material that builds up downstream of waterless urinals, causing major blockages when not properly managed.

The trials have shown added flows to main pipes servicing waterless urinals will prevent rapid build up of struvite, but highlighted the need for ongoing maintenance of the urinal's outlet pipe at regular intervals to control the build-up of struvite.

## Current situation

The NPRF through its technical advisory committee has facilitated an amendment to *AS/NZS3500.2: 2003 part two: Sanitary plumbing and drainage* to manage the build up of struvite in sanitary plumbing and drainage systems.

*Struvite is the main scale material that builds up immediately downstream of waterless urinals, causing major blockages when not properly managed. These pictures show the build up of struvite within 12 months of installation.*

The amendment will provide provisions to minimise the risk of blockages by requiring a minimum of two fixture units (for example, two hand basins) to be installed upstream of each waterless urinal.

While this requirement will assist in preventing blockages of main drain lines, the trials demonstrated it will not prevent build up of struvite in the discharge pipe from the waterless urinal to the main drain line as discussed earlier.

Supplementary timed flushes may, however, reduce this problem. Retrofitted waterless urinals may have discharge pipes which exacerbate the build up of struvite and as such installations may require alternative flushing or cleaning regimes.

At this stage it is recommended that facility owners and managers arrange for waterless urinals be inspected and cleaned at periods of no less than six months until a more appropriate maintenance interval can be established for each facility.

The maintenance interval will be dependent on a number of factors such as usage patterns, waterless urinal type, drainage design and so on.

Waterless urinals require a different cleaning regime from conventional urinals, and cleaning contractors will need to be appropriately trained to ensure that odour-seal cartridges are not damaged or compromised during the cleaning process.

The users of waterless urinals may also need educating in order to reduce problems and overcome common prejudices.

*For further information contact the plumbing regulator in your State or Territory.*



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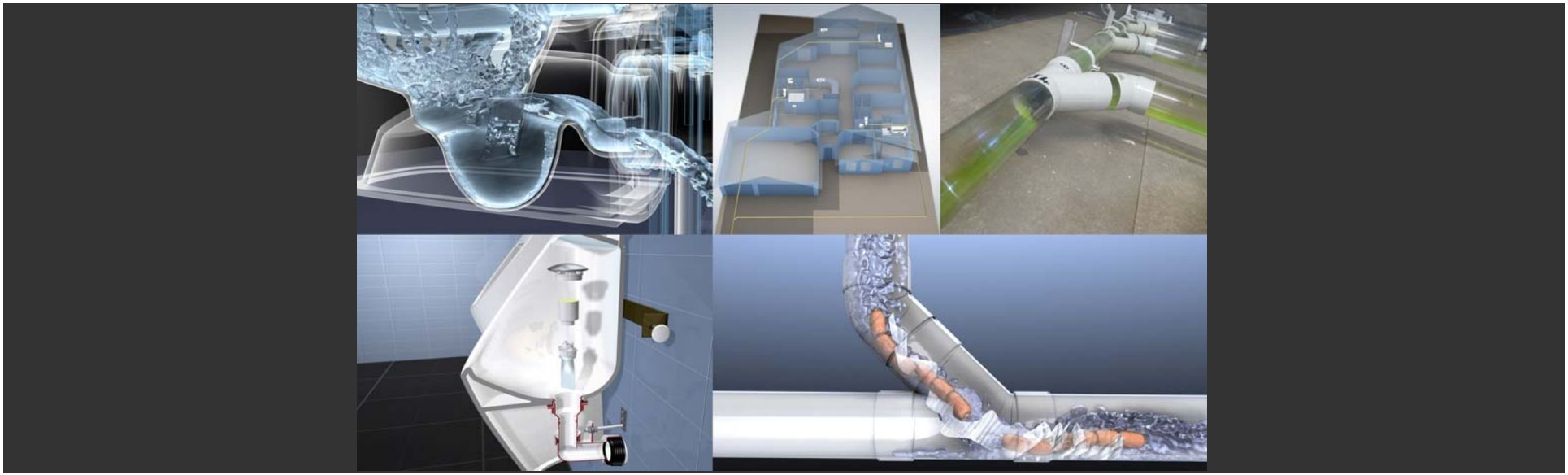
# Drainline transportation performance of low-flow water closets



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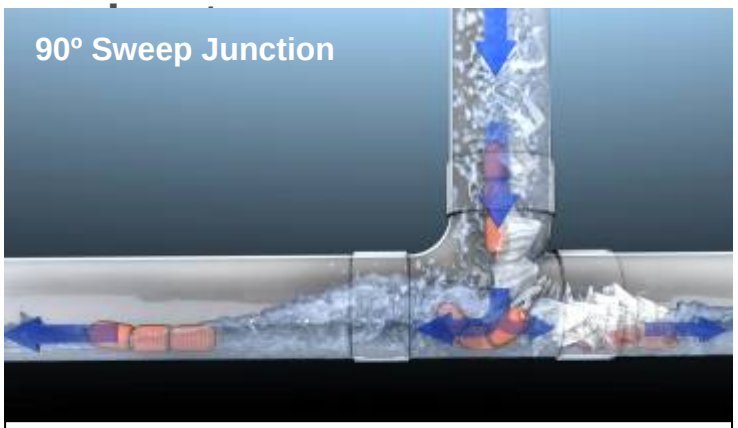
## **ASFlow** – sweep junction research study

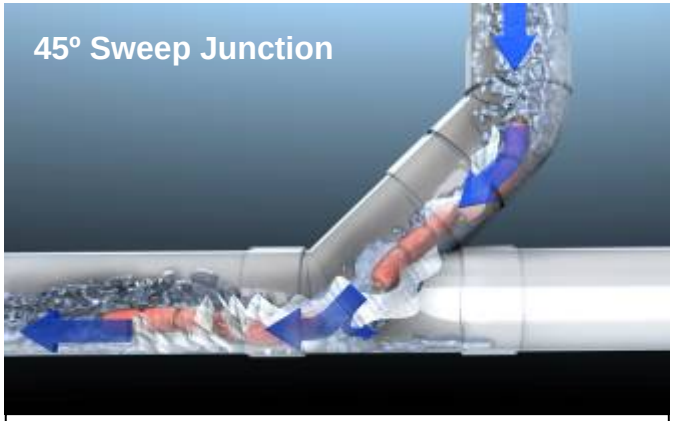
**As a result of this research the following amendments have been prepared for AS/NZS 3500 Part 2:**

Junctions installed in a vertical plane shall not be used for connection of stacks. Sweep and 45º junctions may be laid in the vertical plane for the connection of a single discharge pipe or a drain, provided:

**A 45º junction shall only be used for the connection of a water**




Problem




Solution

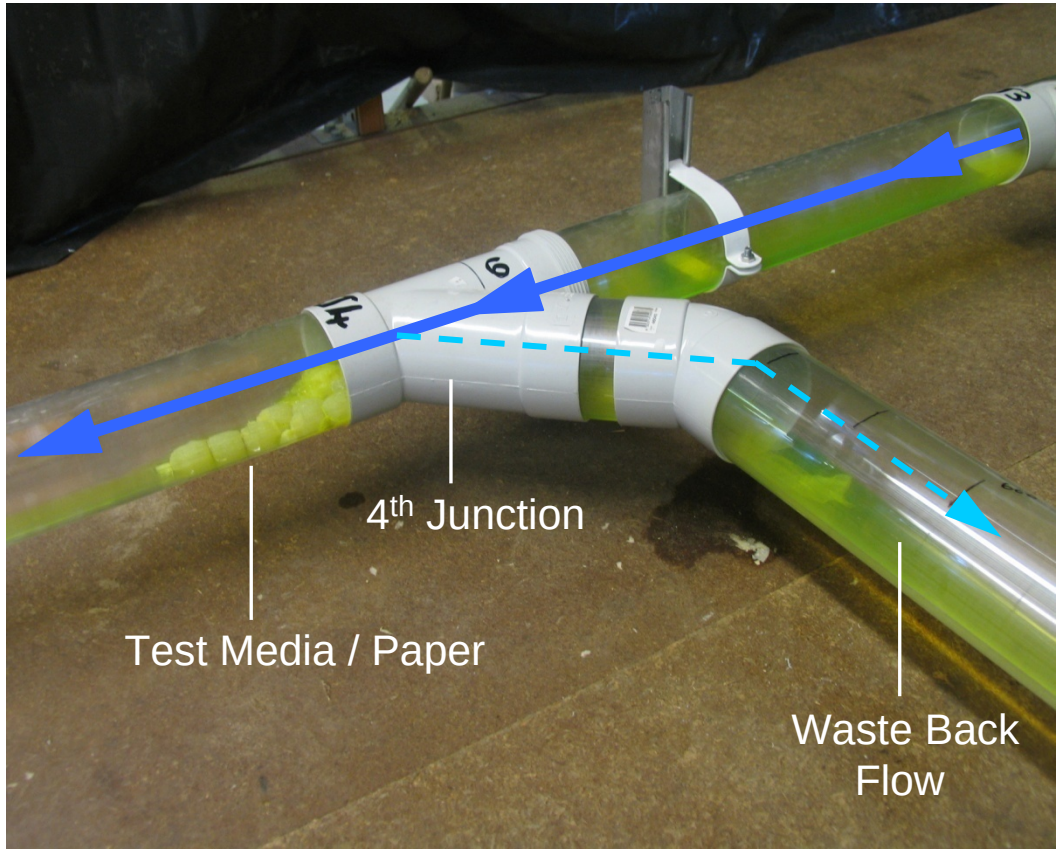
# Drainline Transportation Performance

60m testing rig

## **Drainline Transportation Performance** – Test Rig Installation Scenario 1

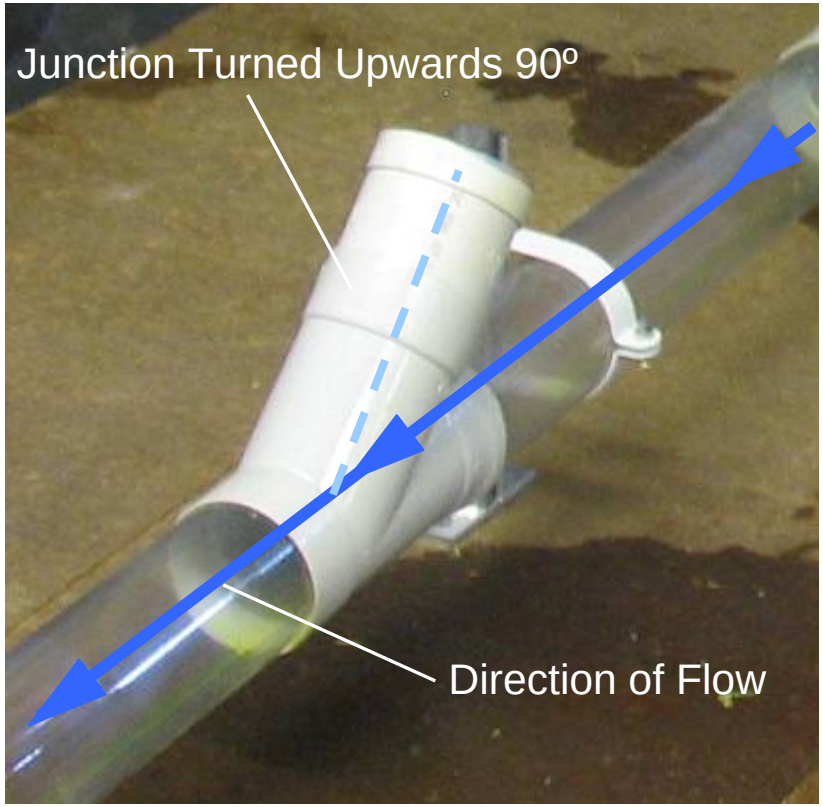
Canberra Institute of Technology simulation test rig

## **Drainline Transportation Performance** – Test Rig Installation Scenario 1

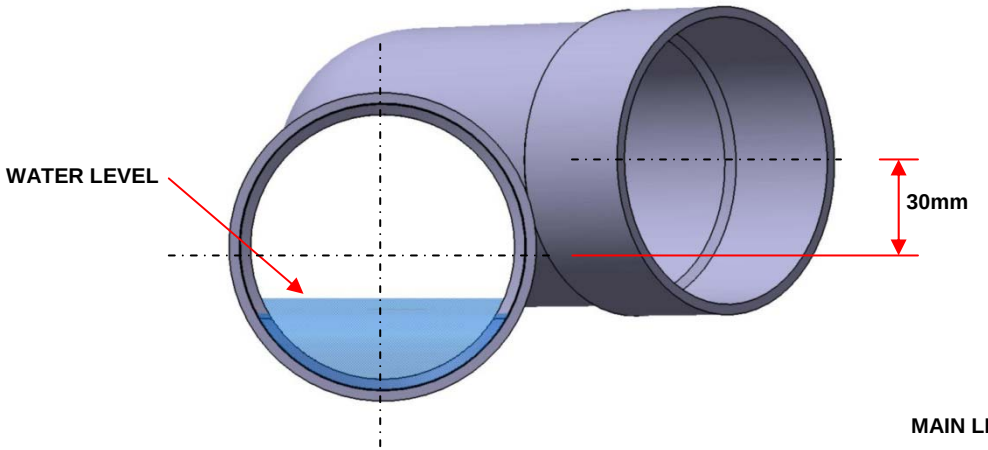



Identified cause of Western Australian installation failure

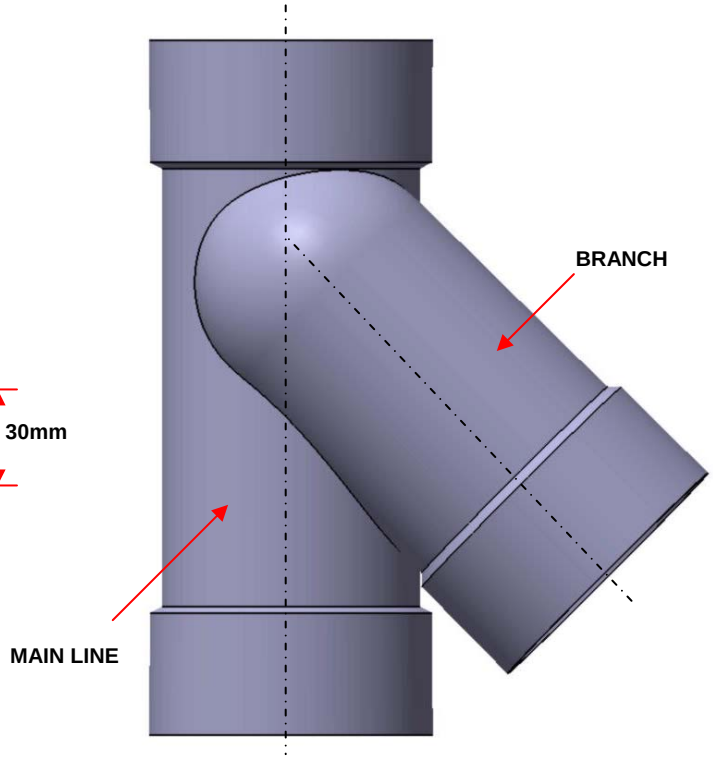
## **ASFlow** – CIT HET drainline transportation performance testing



## NEW JUNCTION DESIGN




FRONT VIEW

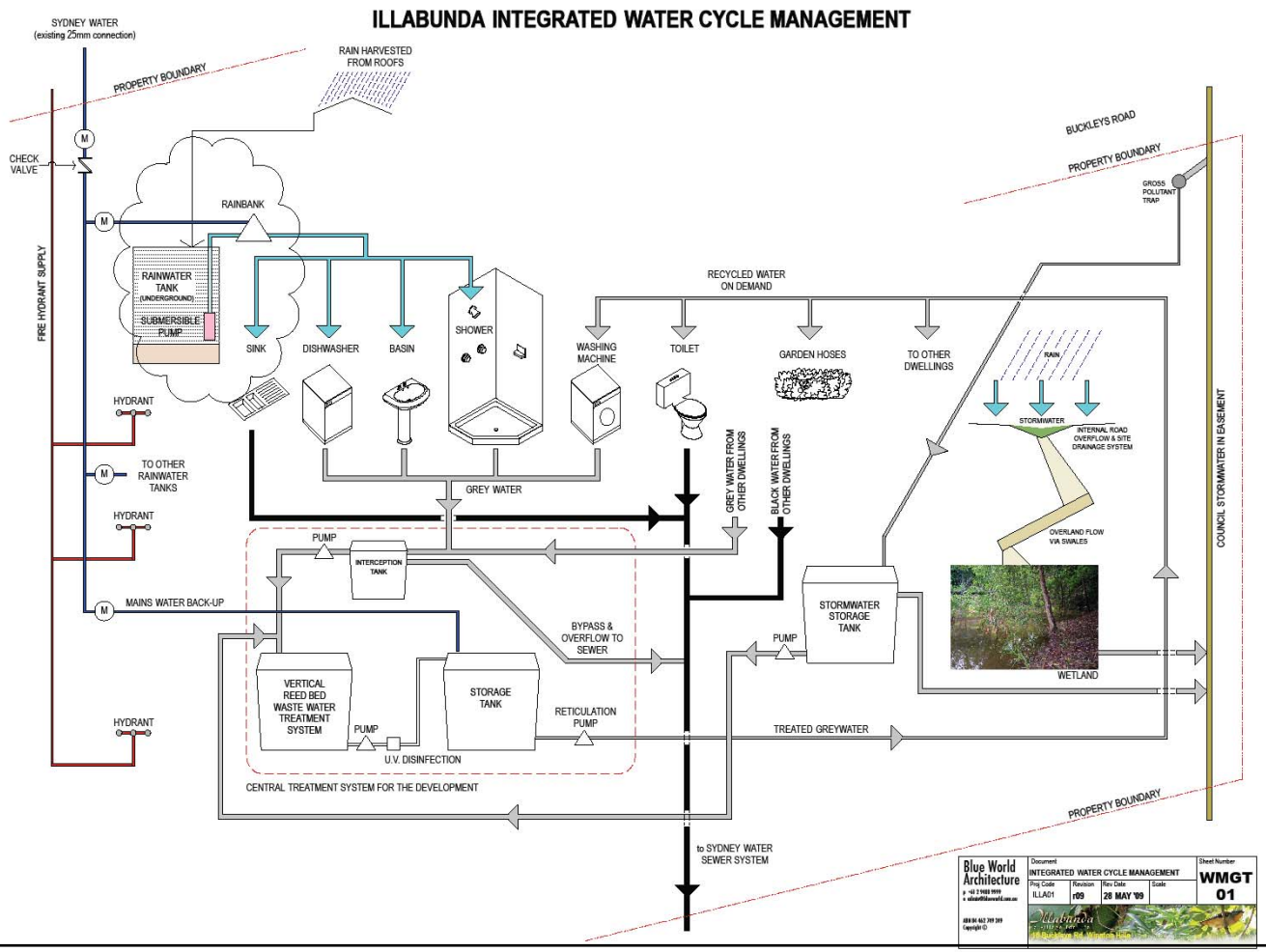



TOP VIEW

## **Drainline Transportation Performance** – Test Rig Installation Scenario 1

The affects of 90 degree bends (short radius)

# **Drainline Transportation Performance** – Field Trial (Sydney)



## **Drainline Transportation Performance** – Existing Field Trial (Sydney, 1990)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## **Drainline Transportation Performance** – Existing Field Trial (Sydney, 1990)


Syphonic System – receives discharge from

| | | |
|---|---|---|
| 24 | x | 4L WC's |
| 4 | x | Urinals |
| 16 | x | Hand basins |

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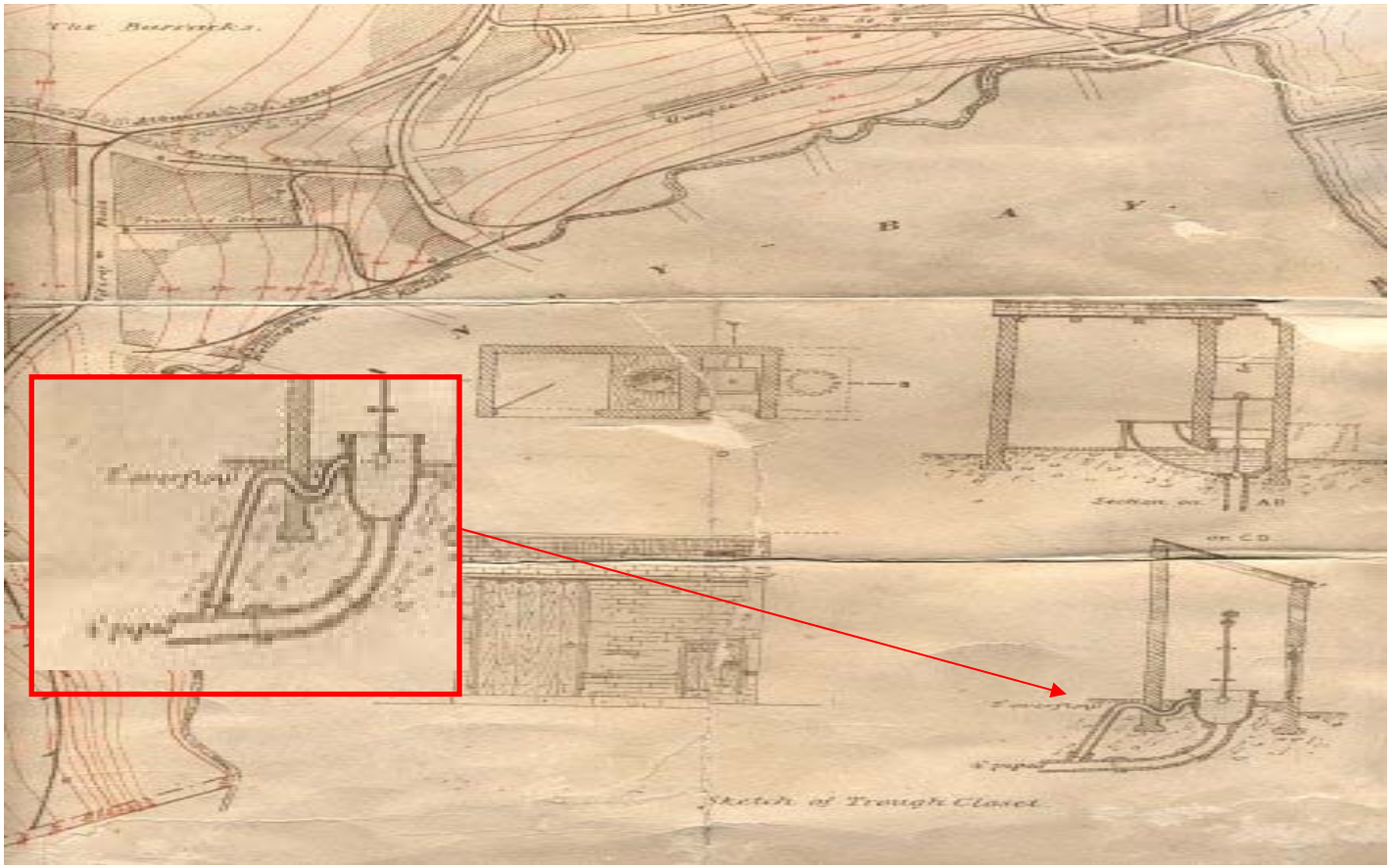
## **Drainline Transportation Performance** – Innovative Discharge Systems




Liverpool Trough Water Closet Tasmania (1886)

## Drainline Transportation Performance

- The design of current drainline systems and fitting configurations will need to be adapted to match the performance of future water efficient fixtures.

- Changes to standards and codes are necessary to provide more efficient drainline system performance.

**The results of this project will provide the future criteria for the design of sustainable sanitary plumbing systems**

**Thank you**

ASFlow