Pipe and Bedding Discussion

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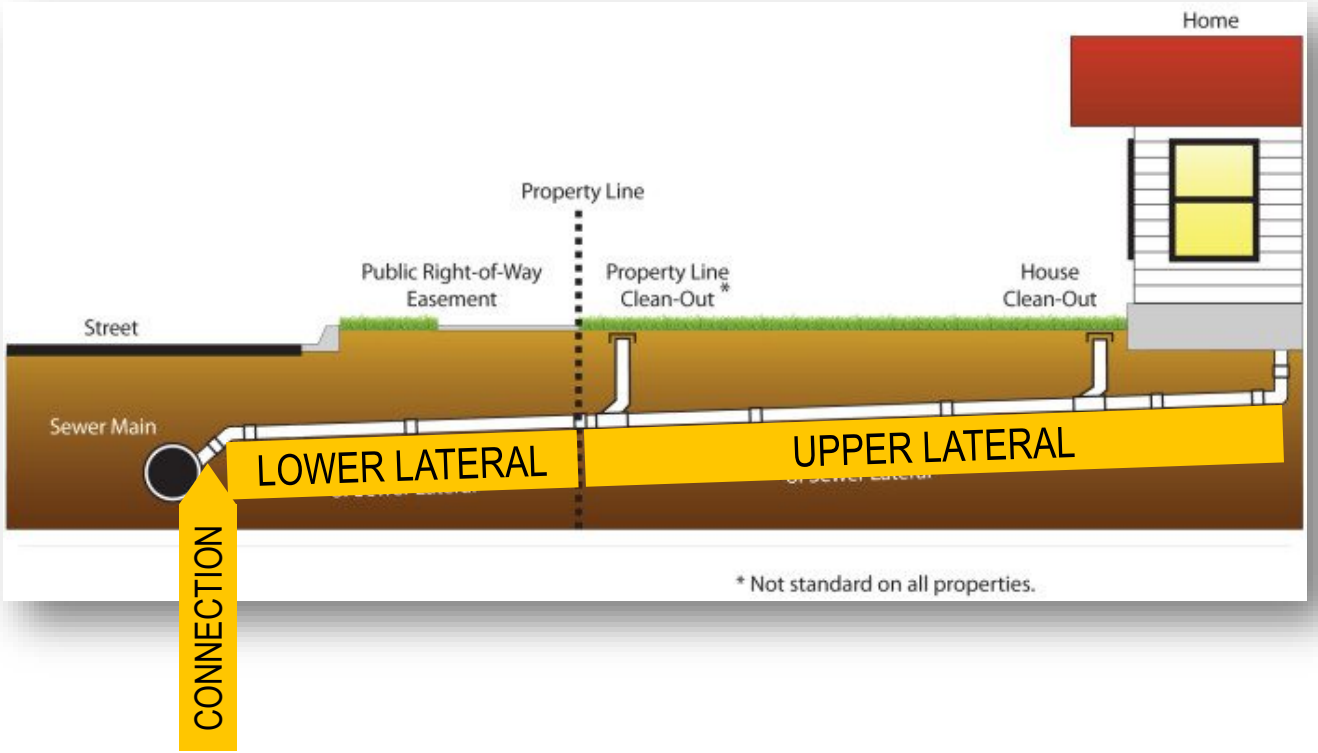
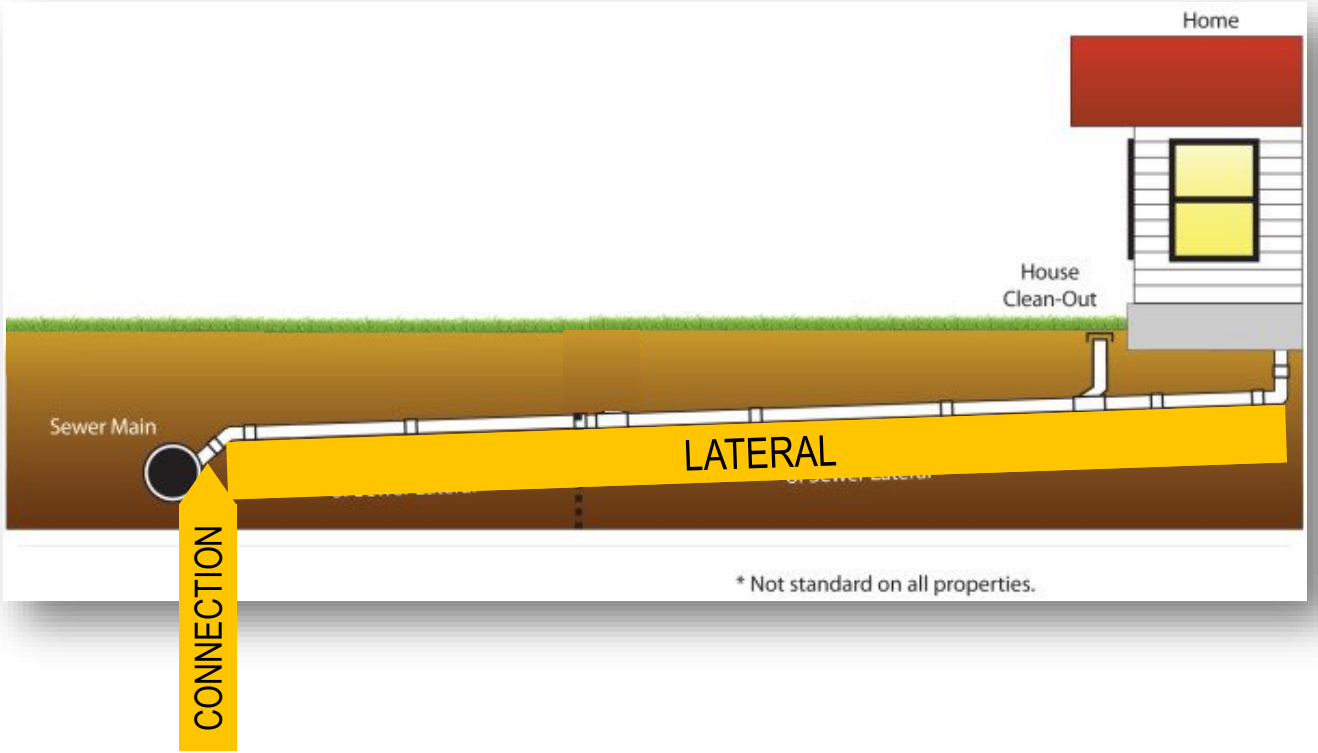
Sewer System Basics – Main in Public Right-of-Way

- Sewer Pipeline Components
  - Upper lateral
  - Lower lateral
  - Mainline connection
  - Mainline



Sewer System Basics – Main in Easement

- Sewer Pipeline Components
  - Upper lateral
  - Lower lateral
  - Mainline connection
  - Mainline



Extent of Private Sewer Lateral Changes with Agency Lateral Responsibility and Location of Main

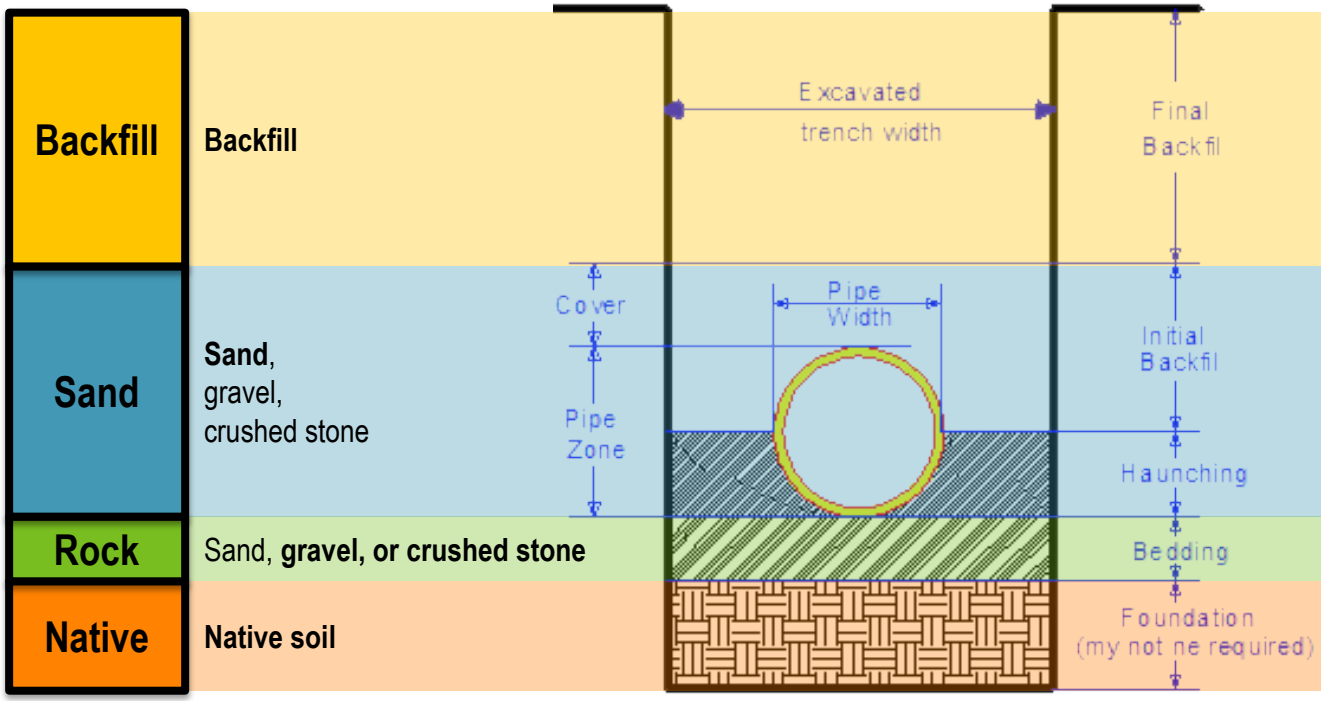
Agency Responsible for Upper Lateral	Agency Responsible for Lower Lateral	Agency Responsible for Connection	Main Location	Number of Agencies	Percent of Agencies	Agency Lateral Responsibility
Yes	Yes	Yes	Public ROW	113	13% (3%)*	Both Upper and Lower
Yes	N/A	Yes	Easement			
No	Yes	Yes	Public ROW	194	23% (33%)	Lower Lateral
No	N/A	Yes	Easement			
No	No	Yes	Public ROW	538	64% (63%)	No Lateral Responsibility
No	N/A	Yes	Easement			
No	No	No	Public ROW			
No	N/A	No	Easement			

Property Owner Responsibilty (Private Sewer Lateral Portion)

Agency Responsibilty

*Percent by length of pipe is in parentheses.

Typical Sewer Trench Profile

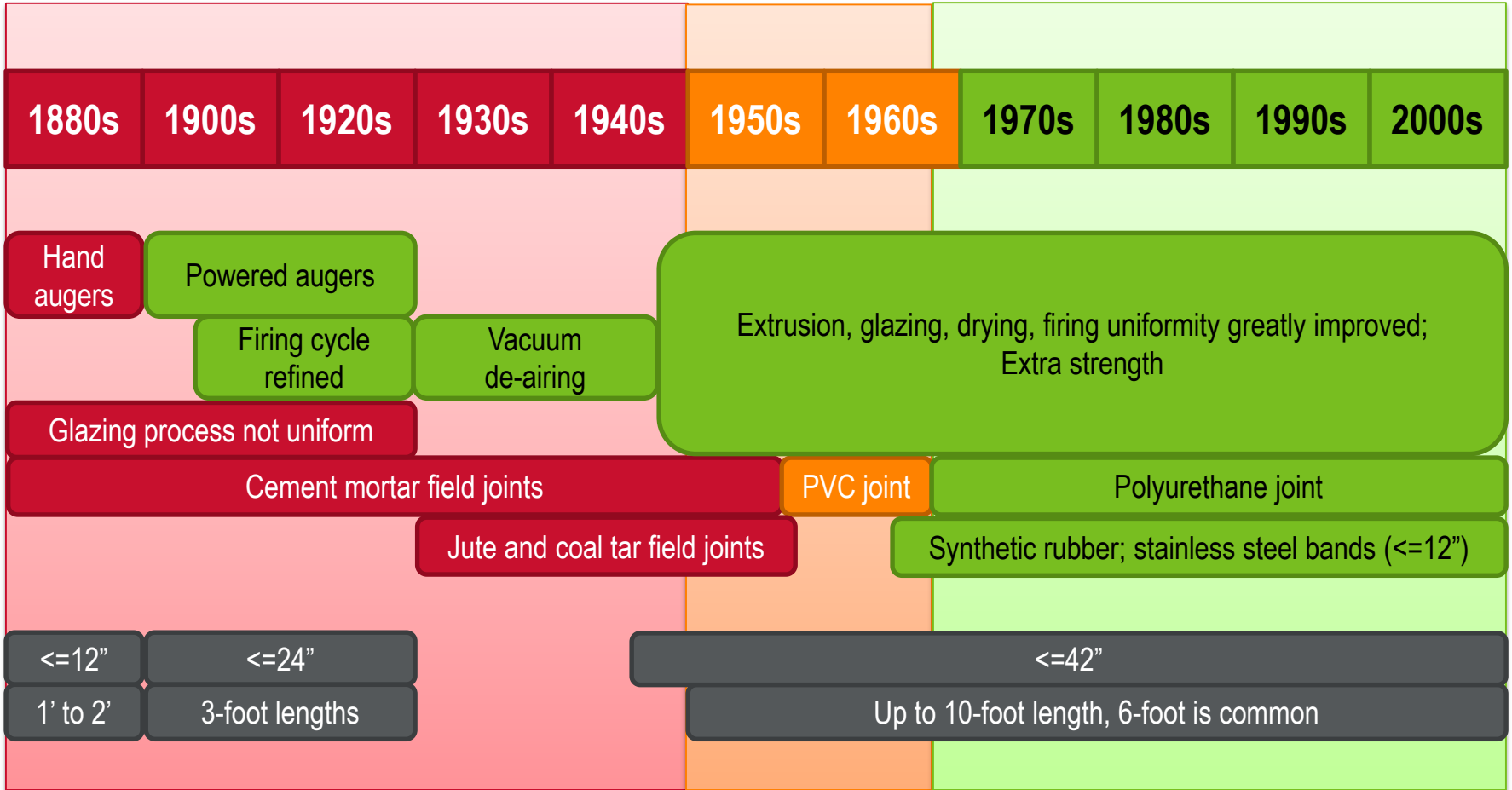


Pipe Materials

- Common Pipe Materials
  - High Density Polyethylene
  - **Polyvinyl Chloride**
  - Reinforced Concrete
  - **Unreinforced Concrete**
  - **Vitrified Clay**
  - Cured in place
- Other Pipe Materials
  - Concrete steel cylinder
  - Ductile Iron
  - Fiberglass Reinforced
  - Glass Reinforced
  - Polyetheylene
  - Plastic/steel composite
  - Reinforced Plastic (Truss)
  - Steel
- Pipe Materials Used in Past
  - **Asbestos Cement (Transite)**
  - Brick
  - Cast Iron
  - Clay Tile
  - **Orangeburg – pitch fiber**
  - Wood




Improvements in Clay Pipe Over Time

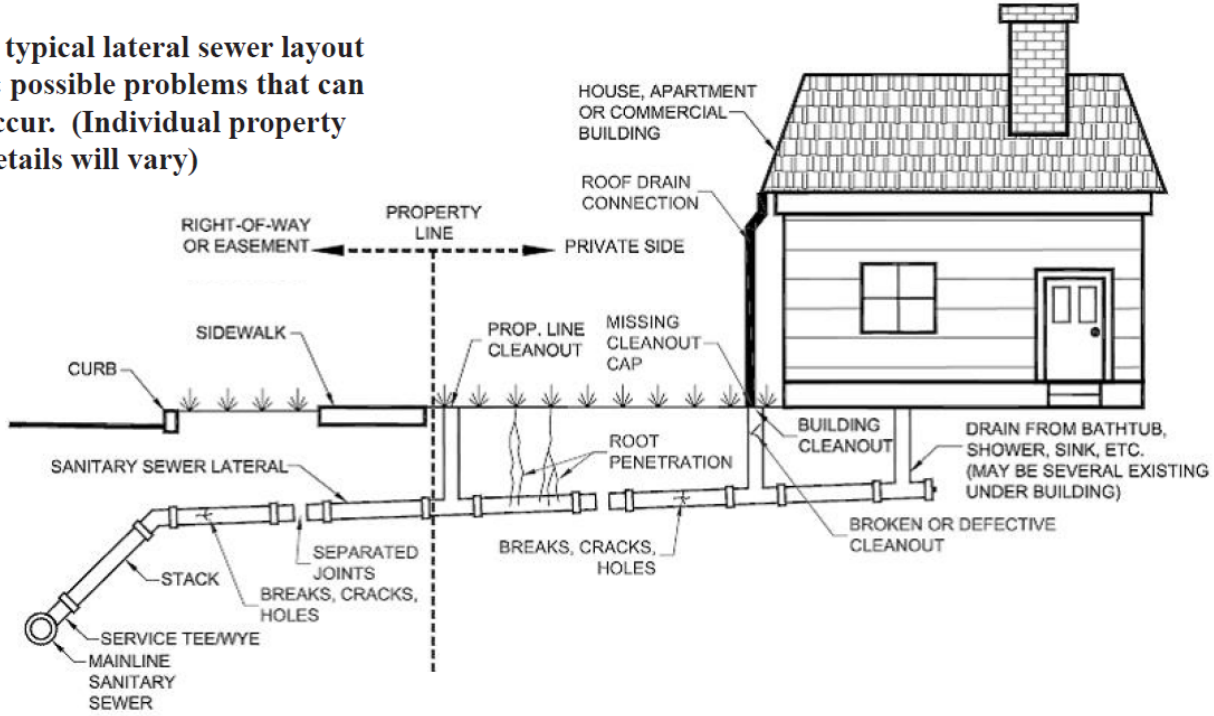


Deficiencies Potentially Allowing Infiltration/Exfiltration (I/E)

- Pipe Barrel Structural Defects
  - Broken Pipe
  - Cracks
  - Fractures
  - Holes
  - Missing Wall
  - Collapses
- Pipe Joint Structural Defects
  - Joint Offsets
  - Joint Separations

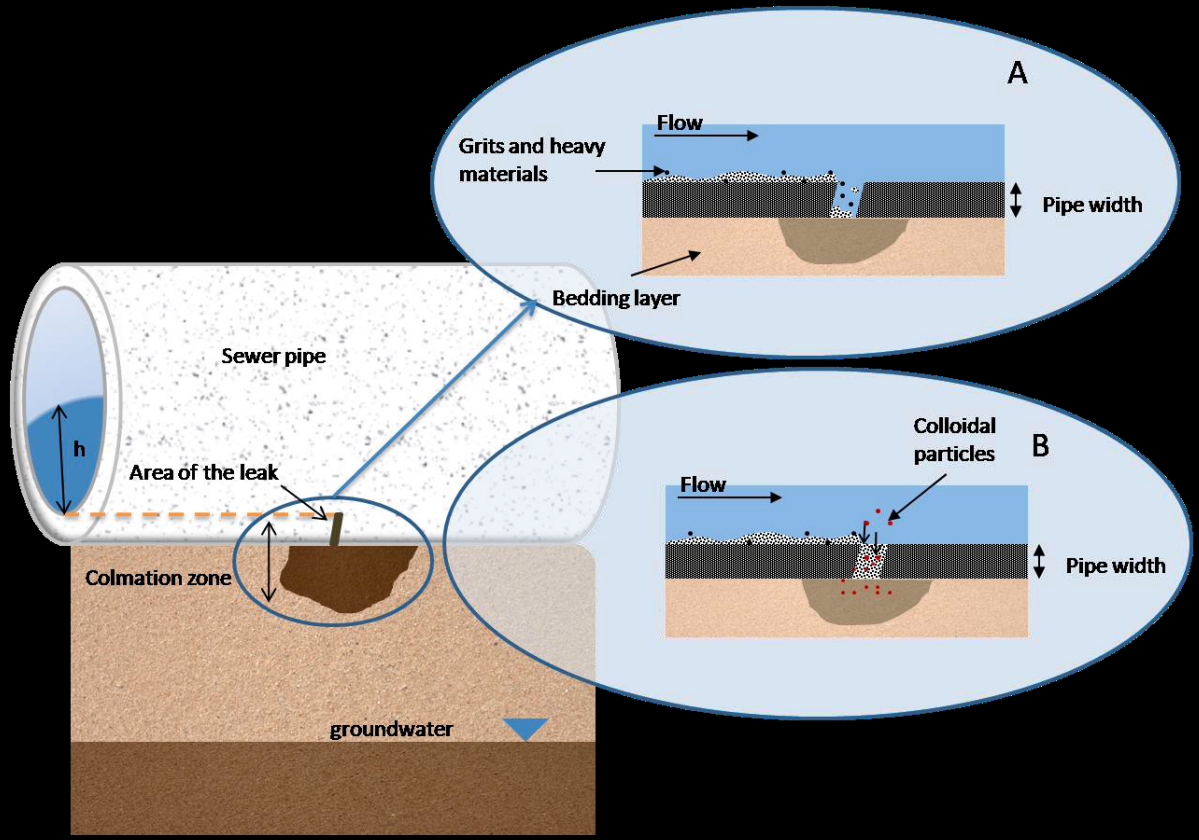
Possible Structural Deficiencies in Laterals

A typical lateral sewer layout & possible problems that can occur. (Individual property details will vary)



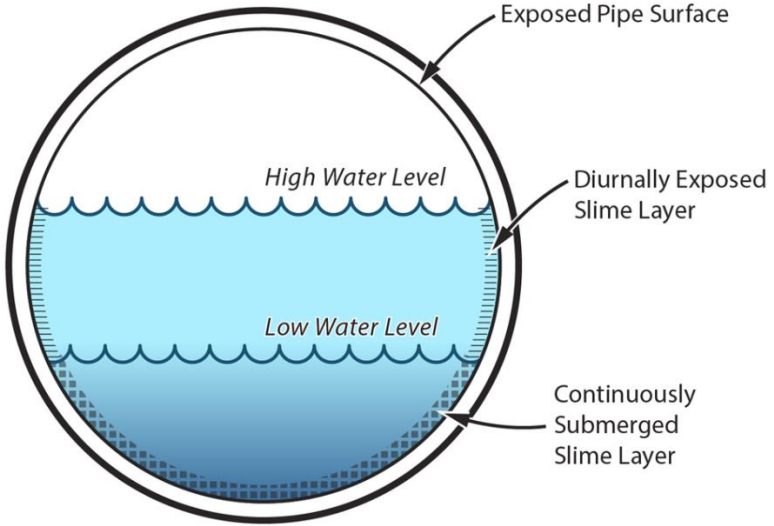
The customer is responsible for the private line located from the home to the City's main sewer line. If you are experiencing a backup in your sewer line, contact your plumber first.

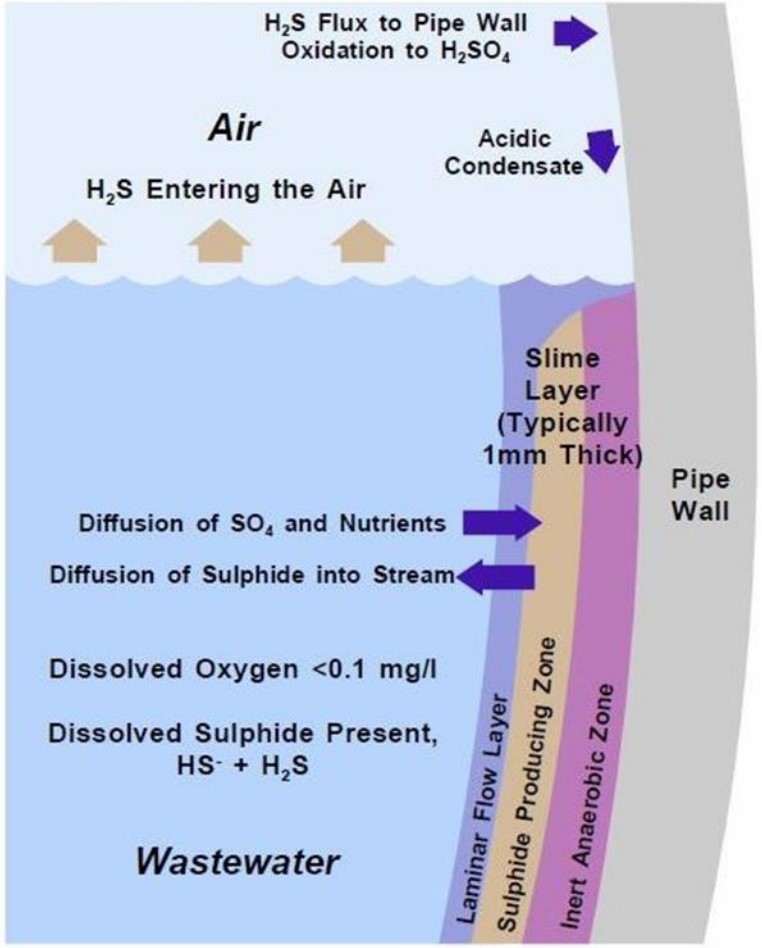
Sedimentation and Colmation Process in Sewers



Experimental Investigation of the Stability of the Colmation Zone Around Leaky Sewers, Nikpay, 2015

Microbial Slime Layer





Exfiltration Studies Indicate Exponential Trends in Self-Sealing of Sewers

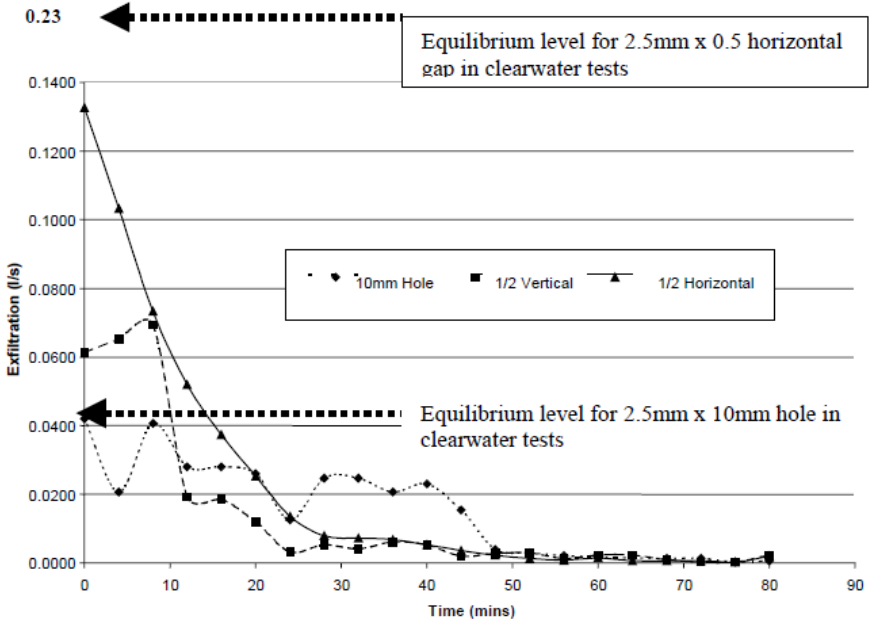


Fig. 5 Comparison of exfiltration rates for varying 3 mm gap geometries and constant head (42–44mm) in a live wastewater test rig.

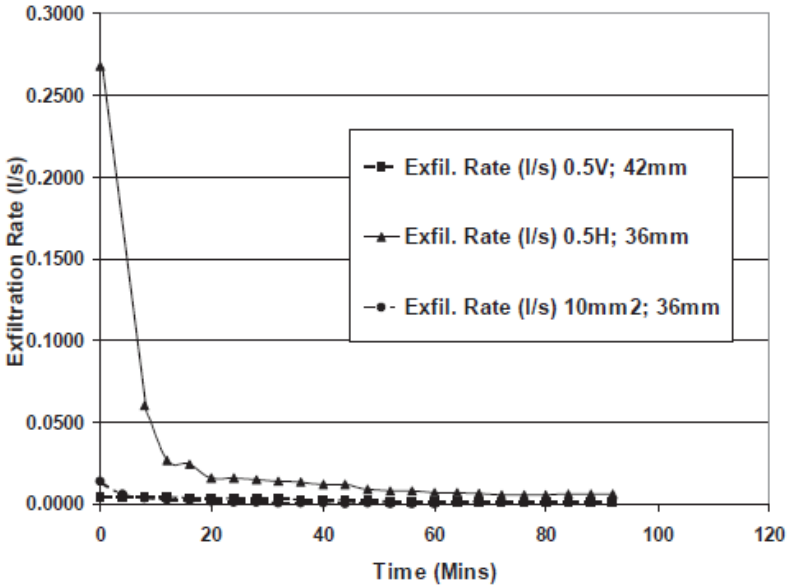


Fig. 6 A comparison of exfiltration rates for different 10 mm gap geometries for dry gravel trench backfill conditions in a live wastewater rig

Leaky sewers: assessing the hydrology and impact of exfiltration in urban sewers, Ellis, Revitt, Blackwood, Gilmour, 2004