Water and Wastewater Systems

Reference: Introduction to Environmental Engineering and Science,

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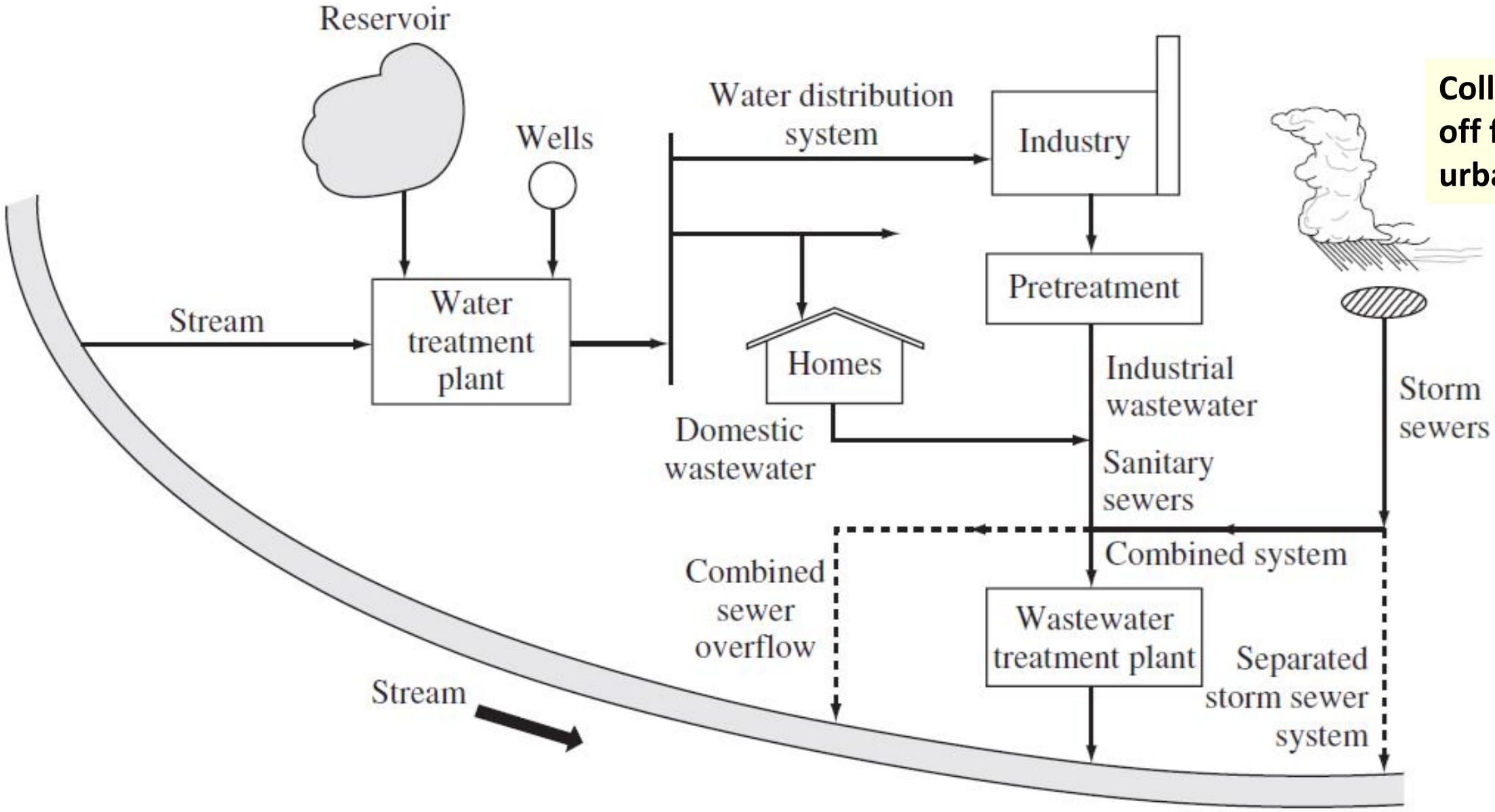
Water and wastewater systems



Water Treatment Systems

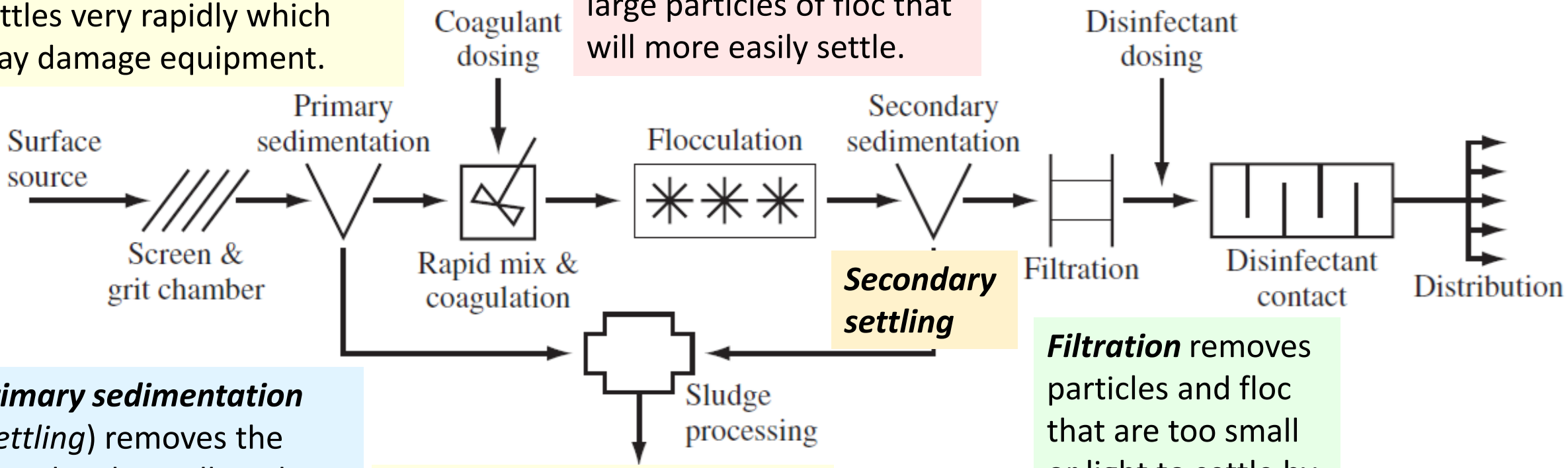
- The purpose of water treatment systems is to bring raw water up to drinking water quality.
- Typically surface water treatment focusses on **particle removal**, and groundwater treatment focuses on removal of **dissolved contaminants** such as calcium and iron.
- Producing a water **free of microbial pathogens** is critical for any water source, but surface water has a much greater chance of microbial contamination.

Schematic of a typical surface water treatment plant

Screening take out relatively large floating, suspended debris, sand and grit that settles very rapidly which may damage equipment.

Flocculation*:* process of gently mixing the water, encourages formation of large particles of floc that will more easily settle.

Disinfection *contact* provides sufficient time for the added disinfectant to inactivate any pathogens before the water is distributed.



Secondary settling

Primary sedimentation (*settling*) removes the particles that will settle out by gravity alone within a few hours.

Rapid mixing **and** ***coagulation*** use chemicals and agitation to encourage suspended particles to collide and adhere into larger particles.

Filtration removes particles and floc that are too small or light to settle by gravity.

Sludge processing refers to the dewatering and disposing of solids and liquids collected from the settling tanks.

GROUNDWATER

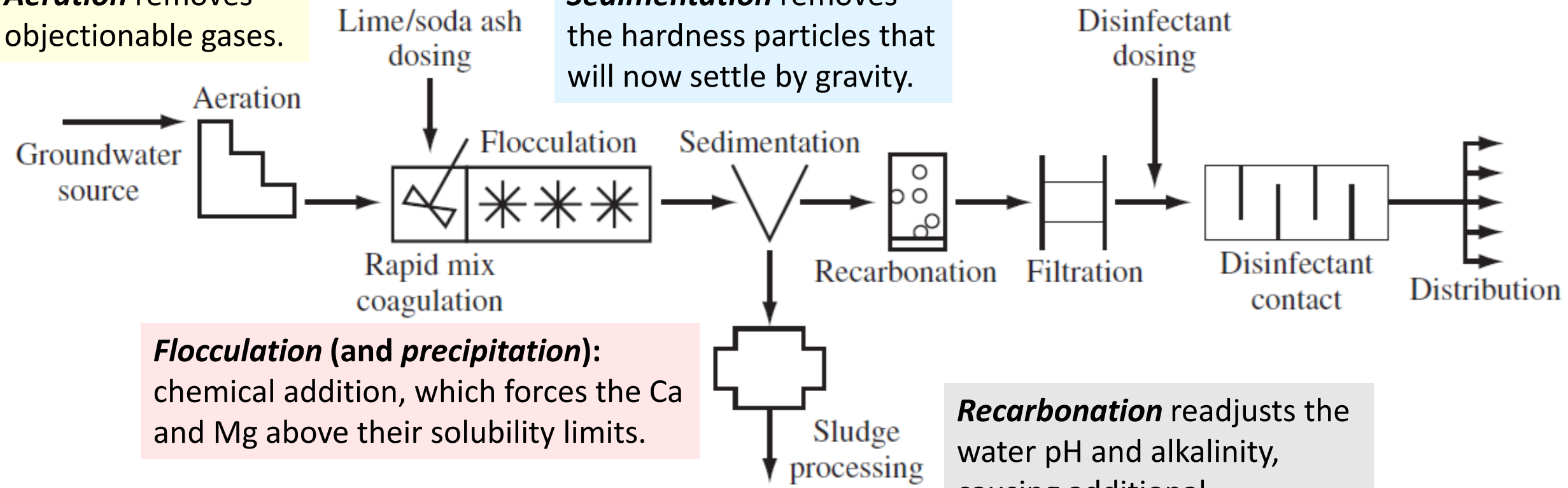
- Groundwater is much freer of particles and pathogens than surface water, and in many places, it is delivered after disinfection alone.
- However, because groundwater often moves through the soils and minerals of the subsurface for long periods before withdrawal, it may contain **high levels of dissolved minerals or objectionable gases**.
- The most common dissolved mineral contaminants are **calcium and magnesium**, which are termed *hardness*.
- The calcium and magnesium can be removed by precipitating them as particles.

Schematic of a typical water treatment plant for groundwater

Aeration removes objectionable gases.

Sedimentation removes the hardness particles that will now settle by gravity.

Filtration, disinfection, and *solids processing*



Flocculation **(and *precipitation*):** chemical addition, which forces the Ca and Mg above their solubility limits.

Recarbonation readjusts the water pH and alkalinity, causing additional precipitation of hardness-causing ions.