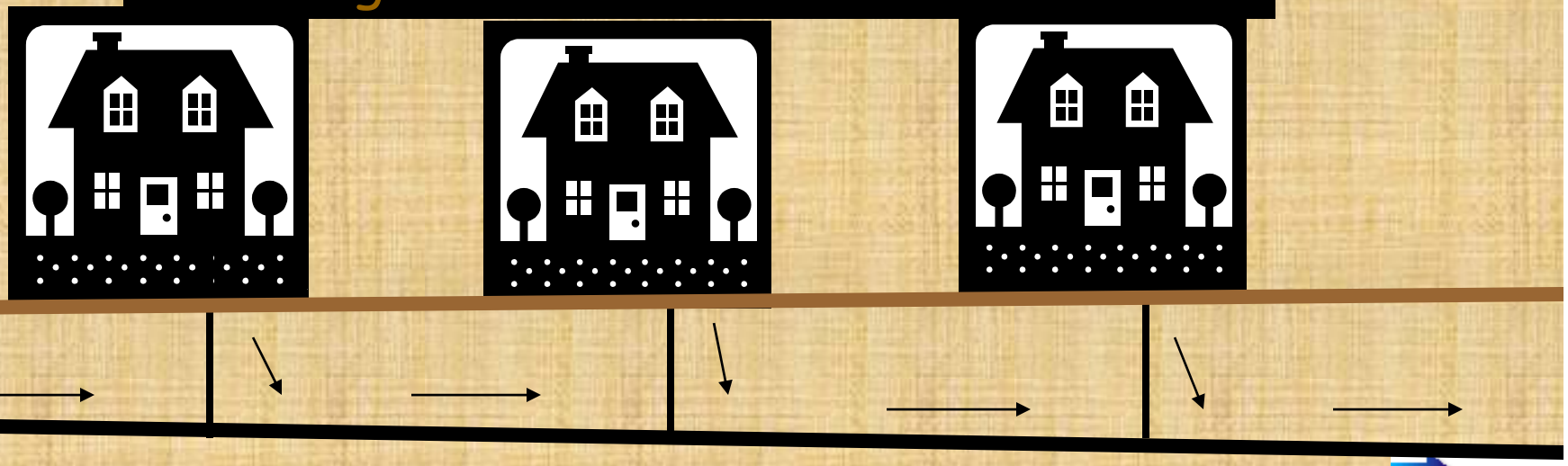
Sewage/Wastewater – Its Journey to Treatment and Return to the Environment

Where does it all go!

Where does the water from the washer go?

When you flush the toilet where does the contents go?

By gravity flow, the waste is on its way to Sewage Treatment Plant!



Why treat wastewater?

- Causes a demand for dissolved oxygen (lower DO levels of streams)
- Adds nutrients (nitrate and phosphate) to cause excessive growth
- Increases suspended solids or sediments in streams (turbidity increase)

Levels of Treatment

Primary

- removal by physical separation of grit and large objects (material to landfill for disposal)

Secondary

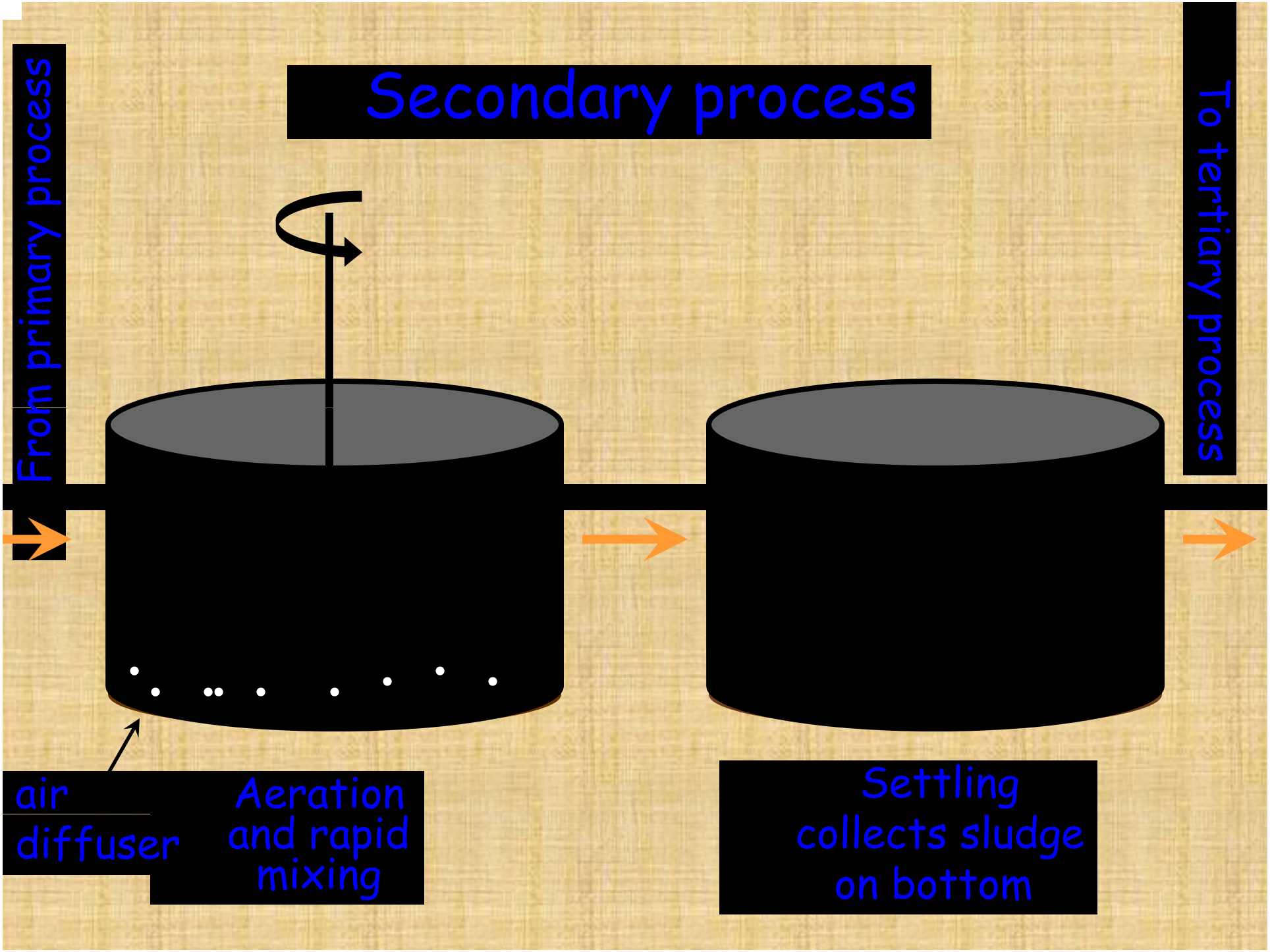
Mostly dead microbes

- aerobic microbiological process (sludge)

organic matter + O_2 → CO_2 + NH_3 + H_2O

NH_3 → NO_3^- ← aquatic nutrient

- lowers suspended solids content (into sludge)


Secondary process
From primary process
To tertiary process
air diffuser
Aeration and rapid mixing
Settling collects sludge on bottom

Levels of Treatment continued

Tertiary (advanced)

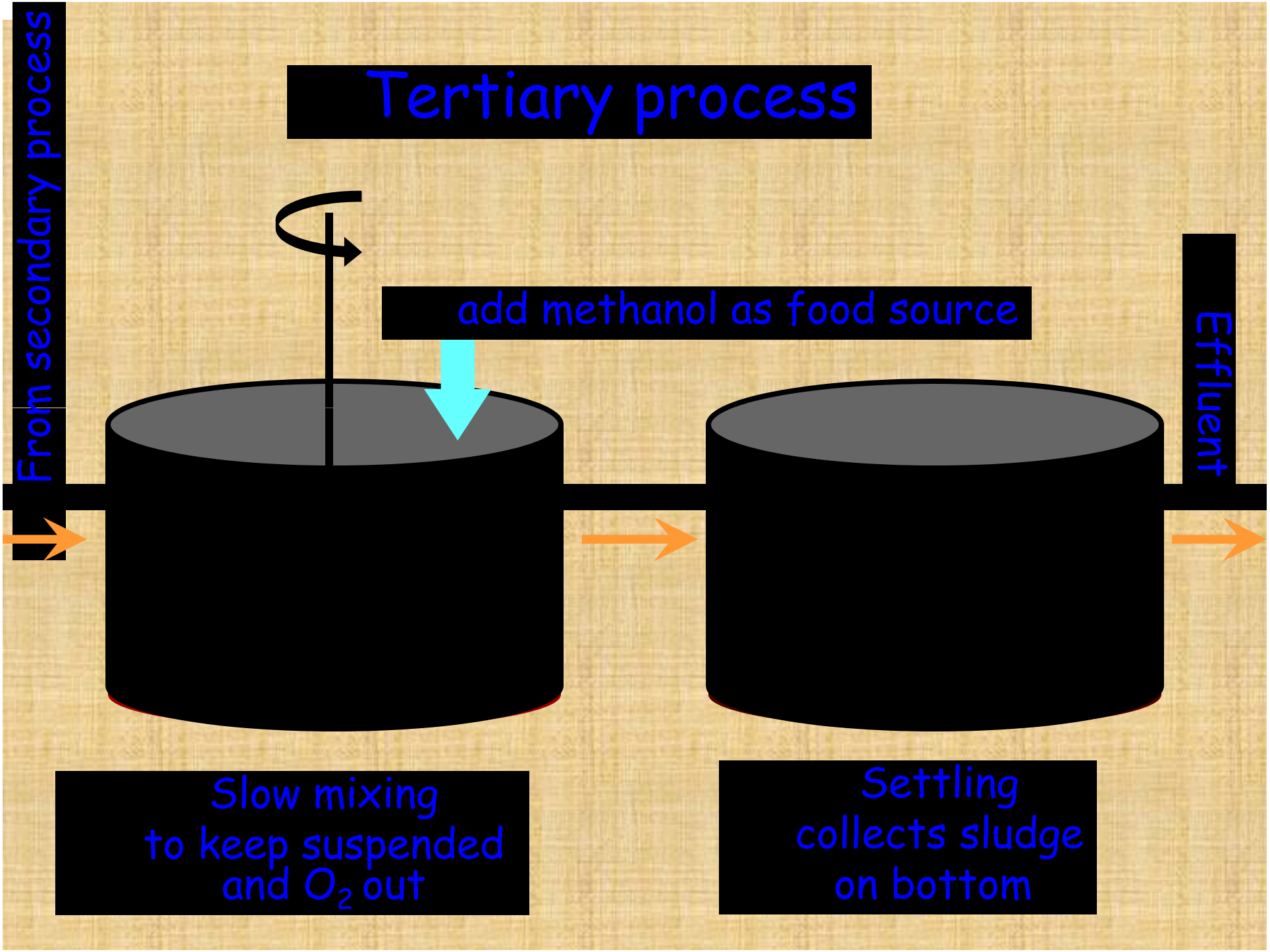
- anaerobic microbiological process with a different microbe where O_2 is toxic (more sludge)

$$NO_3^- \rightarrow N_2 \text{ (escapes to atmosphere)}$$

- PO_4^{-3} if not removed in sludge in secondary process

$$PO_4^{-3} + Al^{+3} \rightarrow AlPO_4\,(s) \quad \text{(into sludge)}$$

- aeration to strip N_2 and re-oxygenate (add DO)


Tertiary process
From secondary process
add methanol as food source
Effluent
Slow mixing
to keep suspended
and O_2 out
Settling
collects sludge
on bottom

When the treatment is done…

- Effluent back to stream after
  - a final carbon filtration and
  - chlorination/dechlorination

- Sludge – very nutrient rich
  - applied directly to land as fertilizer
  - incinerated (good fuel after drying)
  - composted