Building a One-way Street: Backflow Prevention Strategies for Produce Farms

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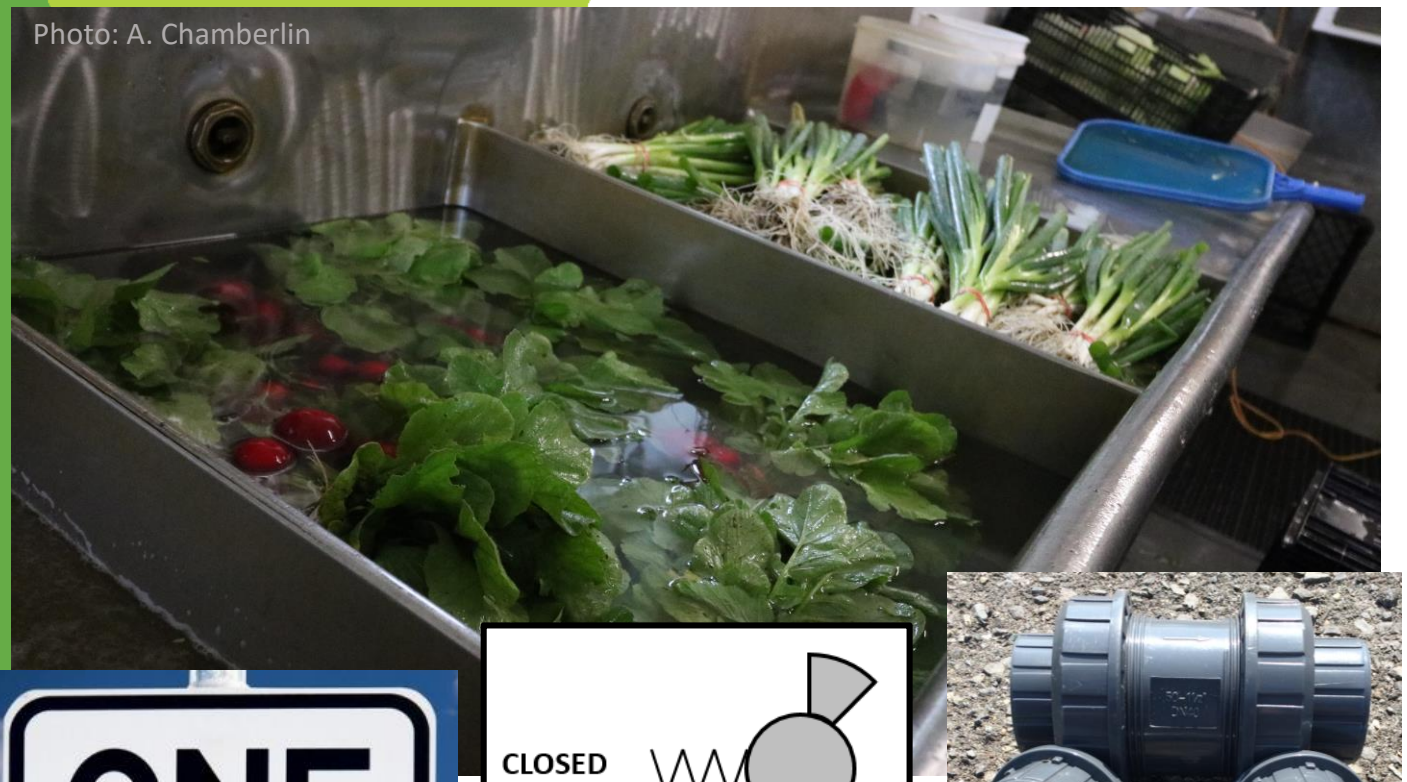
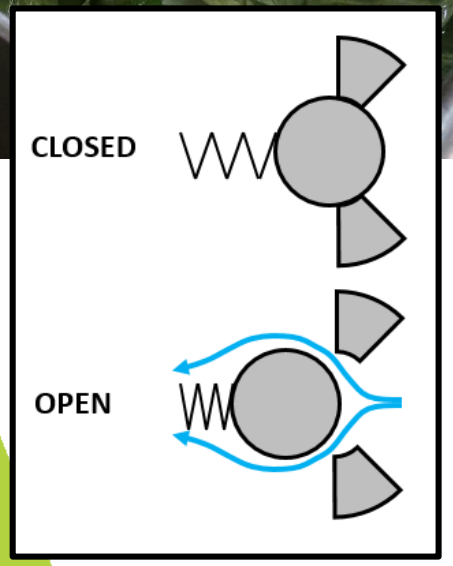
PSA Educators Call



http://www.spuryyc.org



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Outline

Intro to Backflow Prevention

FSMA PSR Context

Parts & Systems

Examples

Q&A

Learning Objectives

What is backflow?

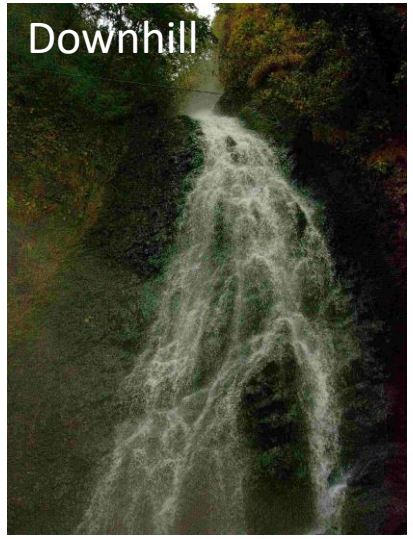
Why prevent it?

How to prevent it?

How to think about backflow at the farm / system level?

Fluid Mechanics

Water flows **downhill** and/or along the **path of least resistance.**



bigsprinkler.com

Water flows from **high to low pressure**

grainger.com

homedepot.com

Water flows in **pipe** and **tube**

We control the flow of water with **valves**

zoro.com

grainger.com

homedepot.com

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Introduction to Backflow Prevention

Backflow – Water traveling in the “wrong” direction or a direction other than the intended one.

Backflow Prevention – Taking steps to ensure water flow is in the intended direction or along a path that minimizes produce safety risk by cross-connection and cross-contamination.

FSMA PSR Context

The **intentional, directional, and reliable flow** of water is an important part of ensuring agricultural water is "safe and of adequate sanitary quality".

There are at least three places in the PSR that are relevant and two in the PSA Curriculum.

PSR	PSA
§112.41	Module 5.1 Slide 12
§112.42	Module 5.2
§112.133	Slide 17

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FSMA PSR Context – §112.41

§112.41 What requirements apply to the quality of agricultural water?

All agricultural water must be safe and of adequate sanitary quality for its intended use.

FSMA PSR Context – §112.42

§112.42 What requirements apply to my agricultural water sources, water distribution system, and pooling of water?

(a) … you must inspect all of your agricultural water systems… including consideration of the following: …

(5) The likelihood of introduction of known or reasonably foreseeable hazards to agricultural water by another user of agricultural water before the water reaches your covered farm.

(b) You must adequately maintain all agricultural water distribution systems … to prevent the water distribution system from being a source of contamination to covered produce, food contact surfaces, areas used for a covered activity, or water sources…

(c) You must adequately maintain all agricultural water sources… Such maintenance includes regularly inspecting each source to identify any conditions that are reasonably likely to introduce known or reasonably foreseeable hazards into or onto covered produce or food contact surfaces; correcting any significant deficiencies (e.g., … and control of cross-connections); and keeping the source free of … other possible sources of contamination …

(d) … implement measures reasonably necessary to reduce the potential for contamination … as a result of contact of covered produce with pooled water. …

FSMA PSR Context – §112.133

§112.133 What requirements apply to plumbing?

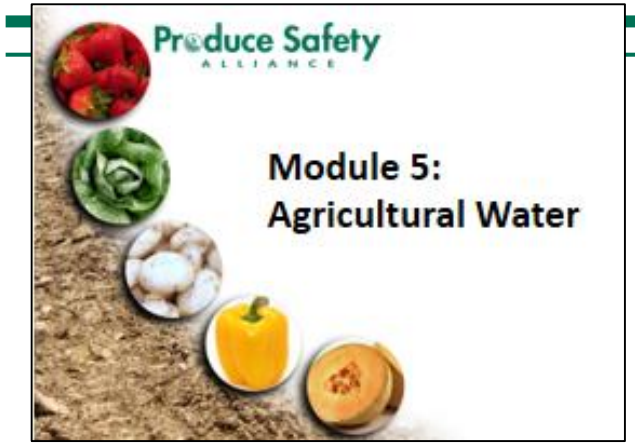
The plumbing must be of an adequate size and design and be adequately installed and maintained to:

(a) Distribute water under pressure as needed, in sufficient quantities, in all areas where used for covered activities, for sanitary operations, or for hand-washing and toilet facilities;

(b) Properly convey sewage and liquid disposable waste;

(c) Avoid being a source of contamination to covered produce, food contact surfaces, areas used for a covered activity, or agricultural water sources; and

(d) Not allow backflow from, or cross connection between, piping systems that discharge waste water or sewage and piping systems that carry water used for a covered activity, for sanitary operations, or for use in hand-washing facilities.



Preventing Contamination of Ground Water Sources

- Inspect well to ensure it is in good condition
- Inspect wellhead to ensure it is properly capped and elevated
- Be sure land slopes away from wellhead to prevent runoff contamination into the well
- Install backflow prevention devices

Produce Safety ALLIANCE

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Disposal of Used Water

- Waste water from produce washing or cooling must be disposed of properly so that it does not serve as a source of contamination to covered produce and fields used to grow covered produce
- Handwashing stations should have catch basins if not connected to a drain
- Check state, local and EPA regulations on discharging water into sewers, leach fields, and/or surface waters

Cleanup in aisle 5!

§

Produce Safety ALLIANCE

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Step One
Don't buy anything

Start by knowing your water systems.

Know your risks.

Google Map / FSA -> PowerPoint

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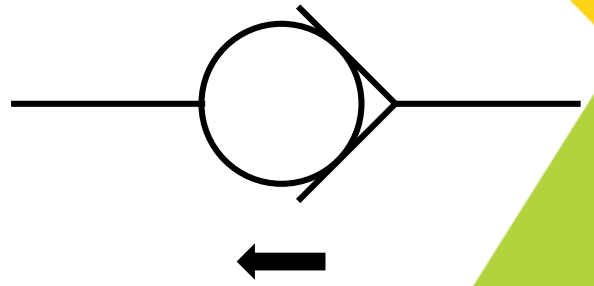
Parts & Systems

Backflow is typically prevented by

- Obstructing flow in one direction, or
- Providing an easier flow path in a different direction



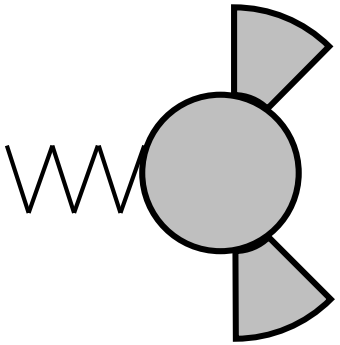
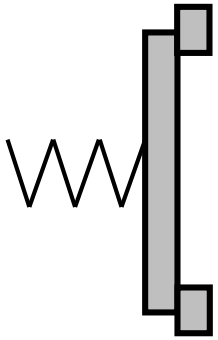
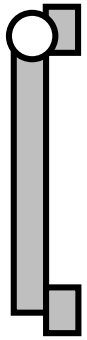
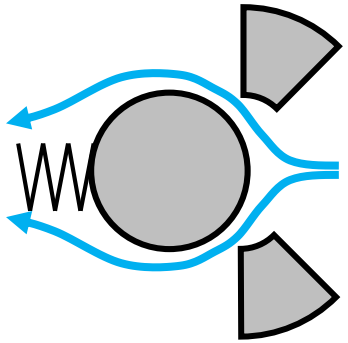
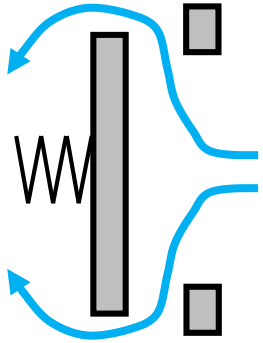
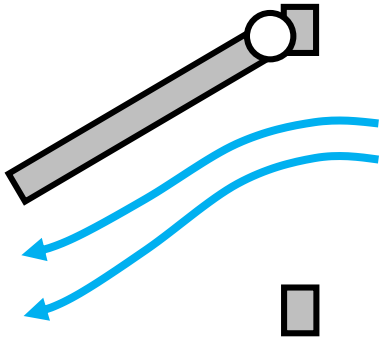
→ **"Check" or "Backflow" Valve**

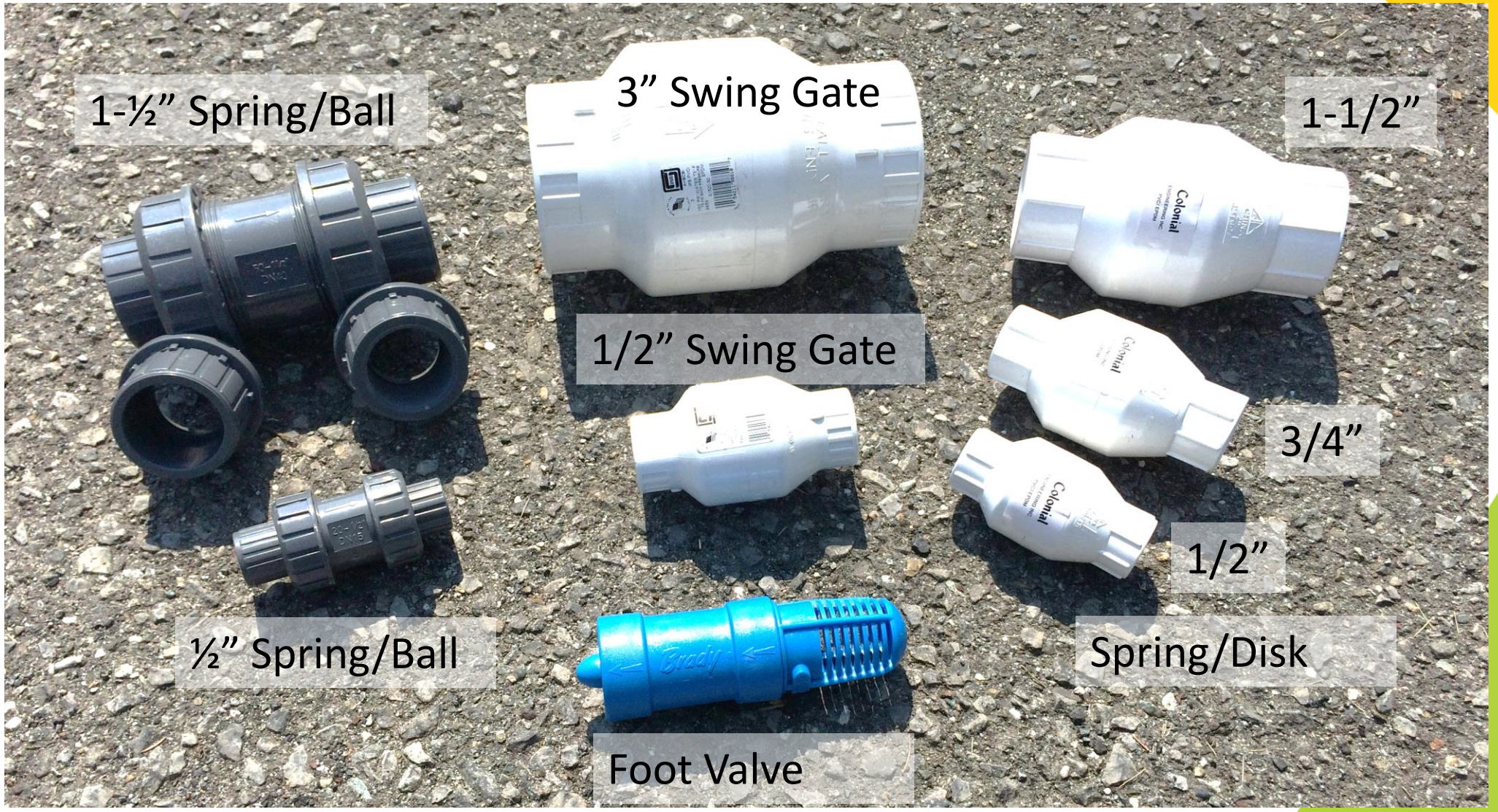
→ **"Air Gap" or "Broken Drain"**

Check Valves

Two main types:

- Swing – Gravity forces the gate down, but high enough water pressure will swing it up.
  - **Low pressure drop**
  - **Orientation is important**
- Spring – A spring forces the shuttle closed, but high enough water pressure from the other side will open the valve.
  - **Higher pressure drop**
  - **Any orientation**

	SPRING / BALL	SPRING / DISK	SWING / GATE	
CLOSED				EQUAL pressure or HIGH pressure on LEFT, LOW pressure on RIGHT Valve is **CLOSED**
OPEN				HIGH pressure on RIGHT, LOW pressure on LEFT… Valve is **OPEN,** **allowing flow**



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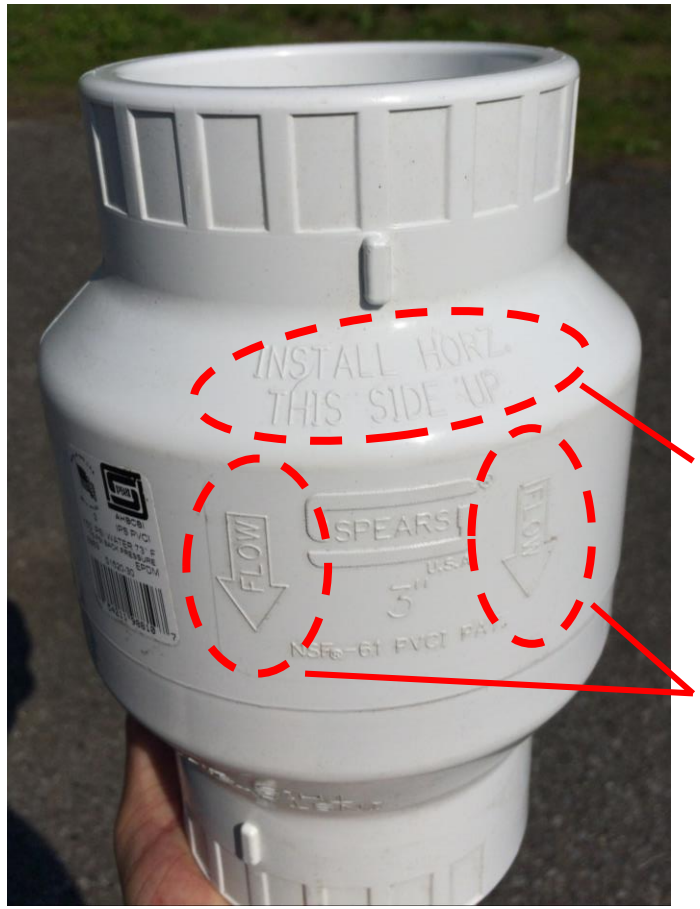
3” Swing Check Valve



Swing type check valves, should note correct installation orientation.

All check valves have arrows indicating the direction of allowed flow.

Hinge

Gate

3” Swing Check Valve

Installed in a line where **water flow** is meant to be **only away from you** (into the screen / page)

Correct, without water pressure on viewer side, the gate swings closed.

Correct, with water pressure on viewer side, the gate swings open.

Incorrect, with the valve upside down, the gate is always open.

Foot Valves

Just a special check valve application. Used on suction side of pump at water source. Primary purpose is to maintain pump “prime”.

Coarse filter basket. Removable for cleaning / maintenance.

Pump side. Threaded. Spring is pushing a disk away from us to close the valve.

Hey! A flow arrow!

Closed

Open

Two views from source side.

5 Key Points – Check Valves

Intent – What is the intent of the check valve. Think it through from a systematic perspective and make sure it is going to prevent the flow you're trying to prevent. Map your water system, identify potential backflow risks and insert check valves as needed.

Type - Know the difference between swing and spring check valves. SupplyHouse offers a good video: https://youtu.be/Sj1vJkhc5XE

Material Compatibility – Almost everything should work with water. If you're dealing with any injected chemicals, review the housing and seal materials for compatibility. For PAA and chlorine bleach mixed to common packshed concentrations (24-80 PPM and 25 PPM respectively), there shouldn't be any issues. If you have plumbing lines at higher concentrations it could require more attention. Watch out for chemical and mechanical contamination risks such as lead from brass check or foot valves.

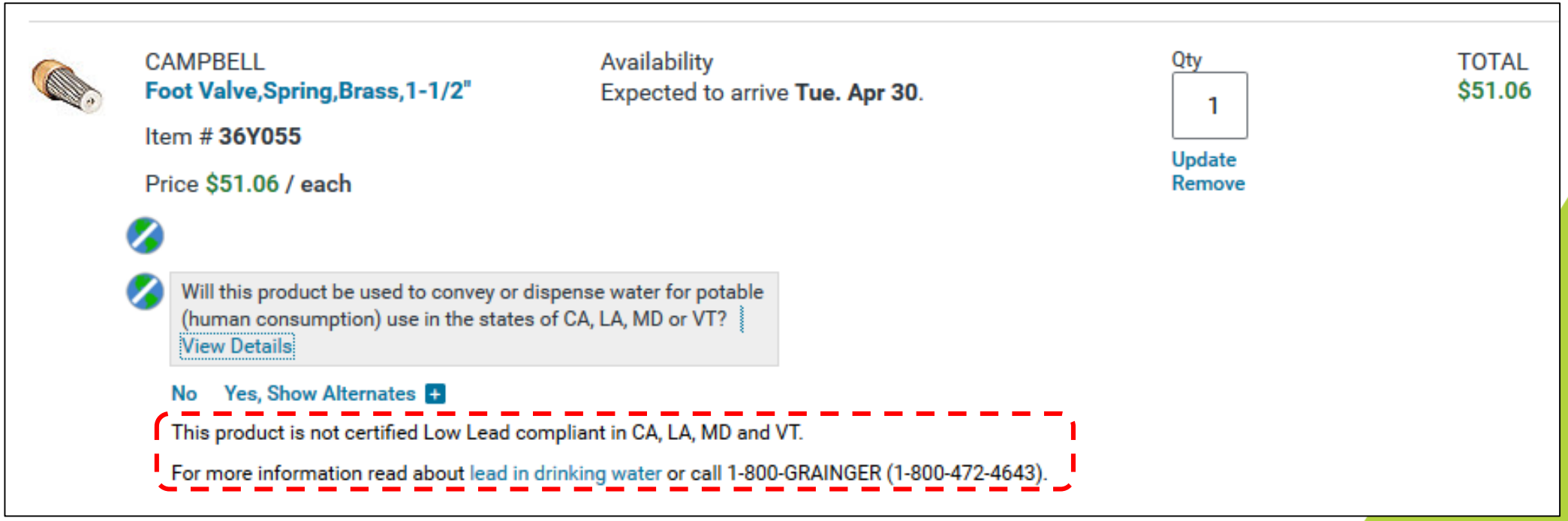
Orientation – There is an arrow on the housing of check valves. It indicates the direction of intended flow. Some check valves have other restrictions on installation orientation as noted previously (esp. swing type).

Sizing – Typically OK to go with the existing line size as a guide. If there are pressure drop concerns (limited pressure pump, gravity feed, etc.) up-sizing the check valve or using a low pressure drop type may be required.

5 Key Points – Check Valves

Material Compatibility – Mechanical / Chemical Contaminant Risk

Lead in Brass Fittings



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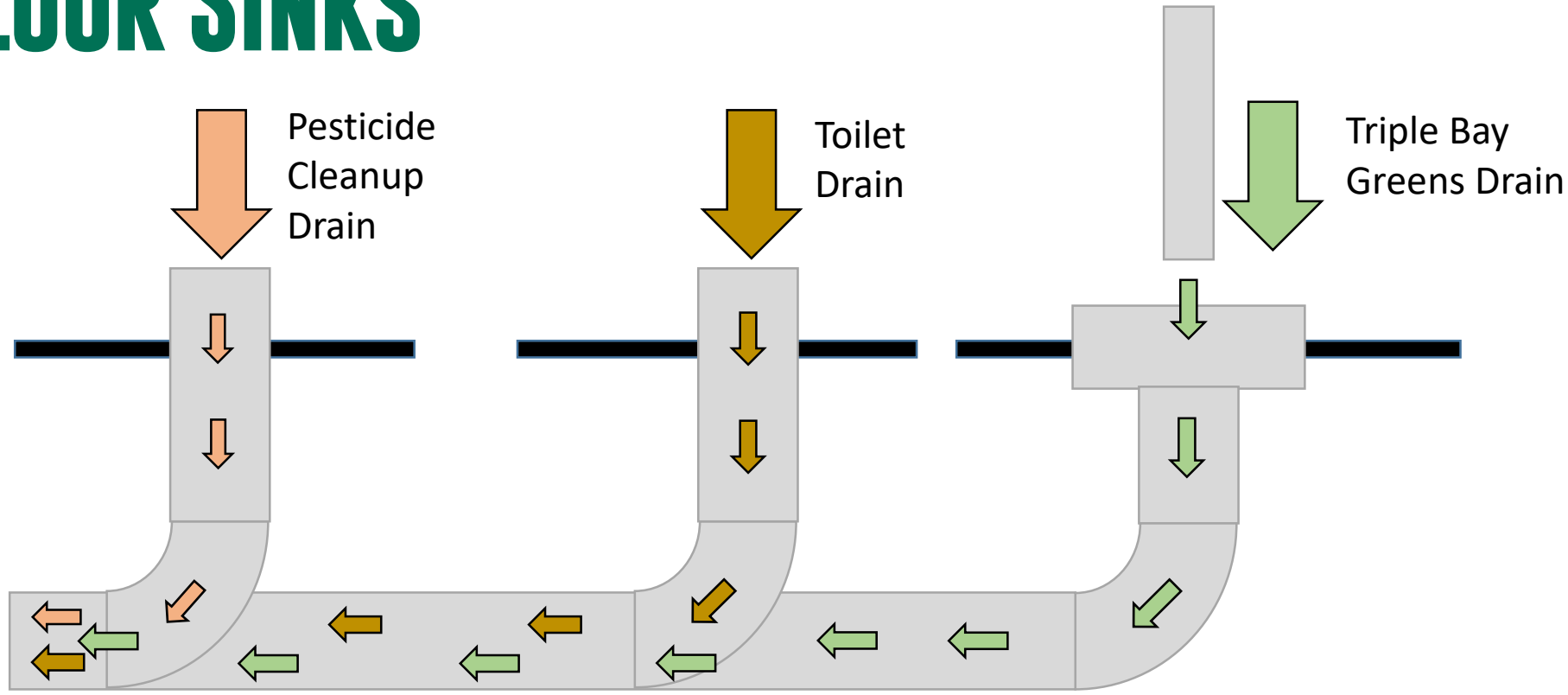
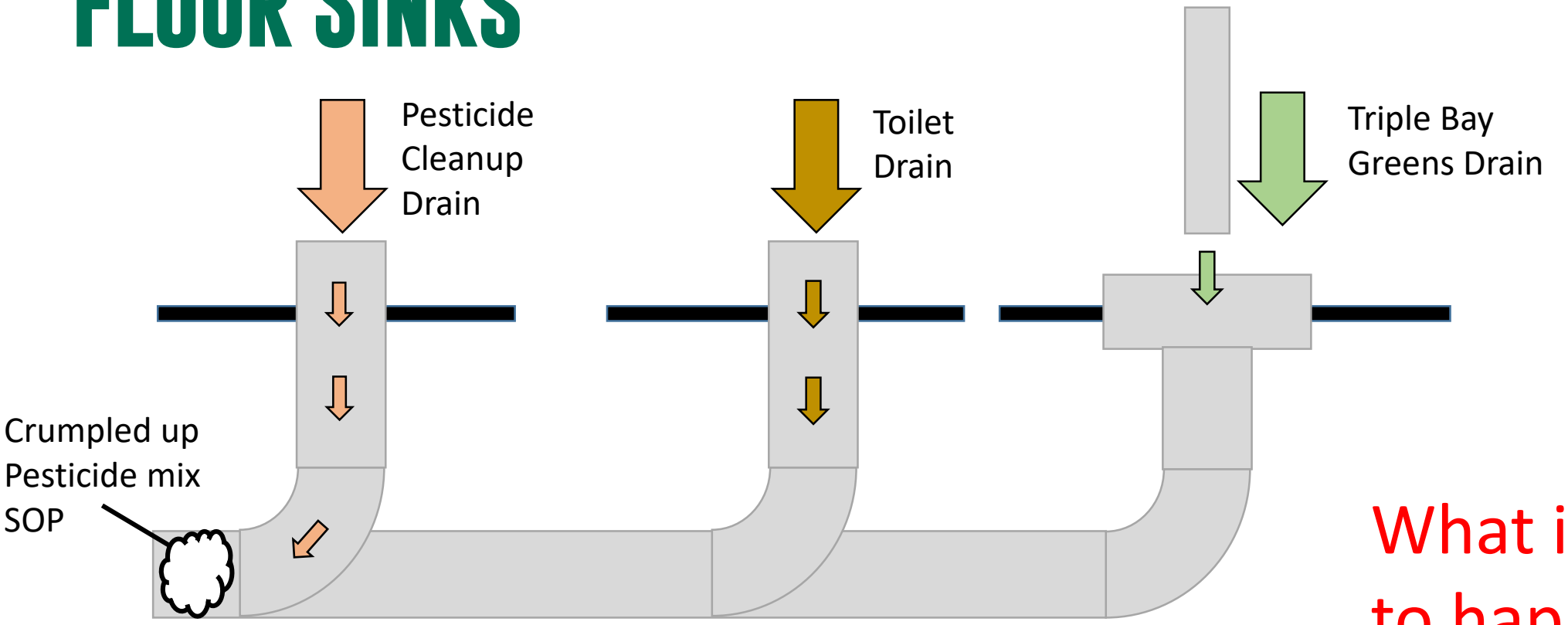
Air Gap Drains & Floor Sinks

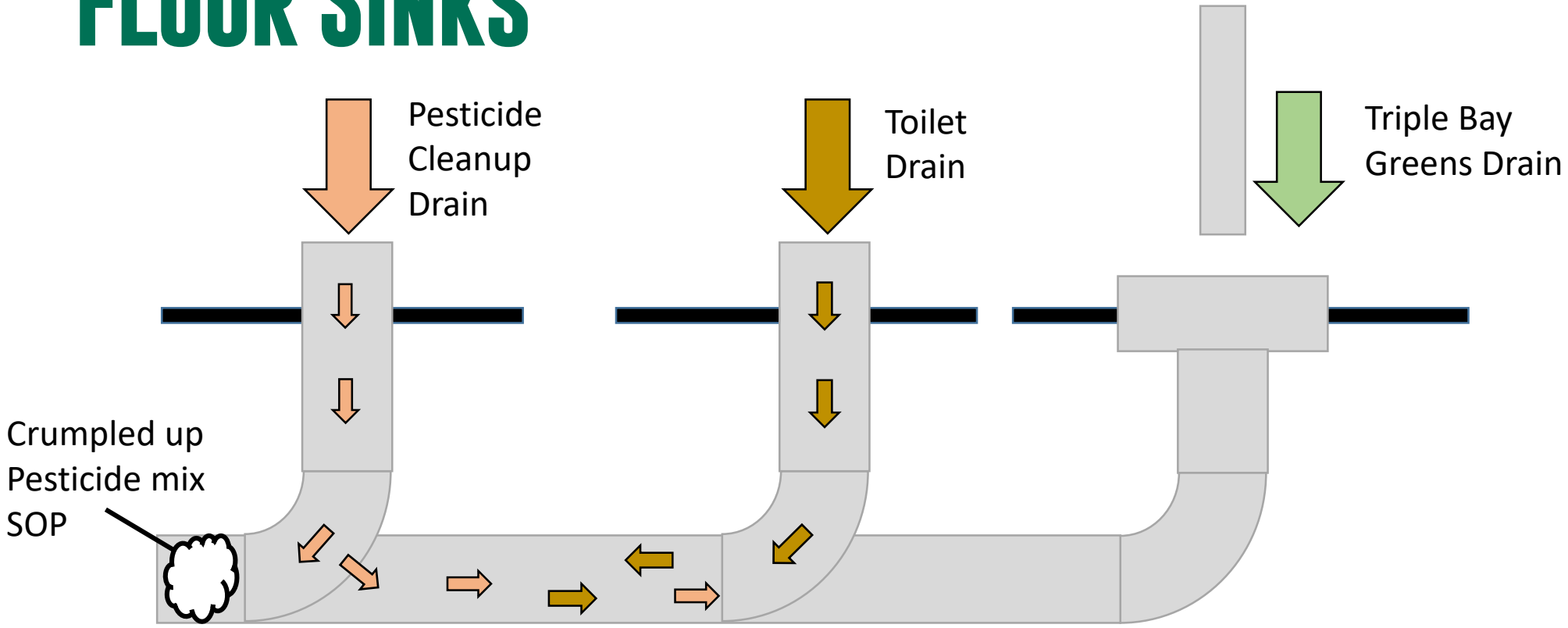


Air Gap Drains & Floor Sinks

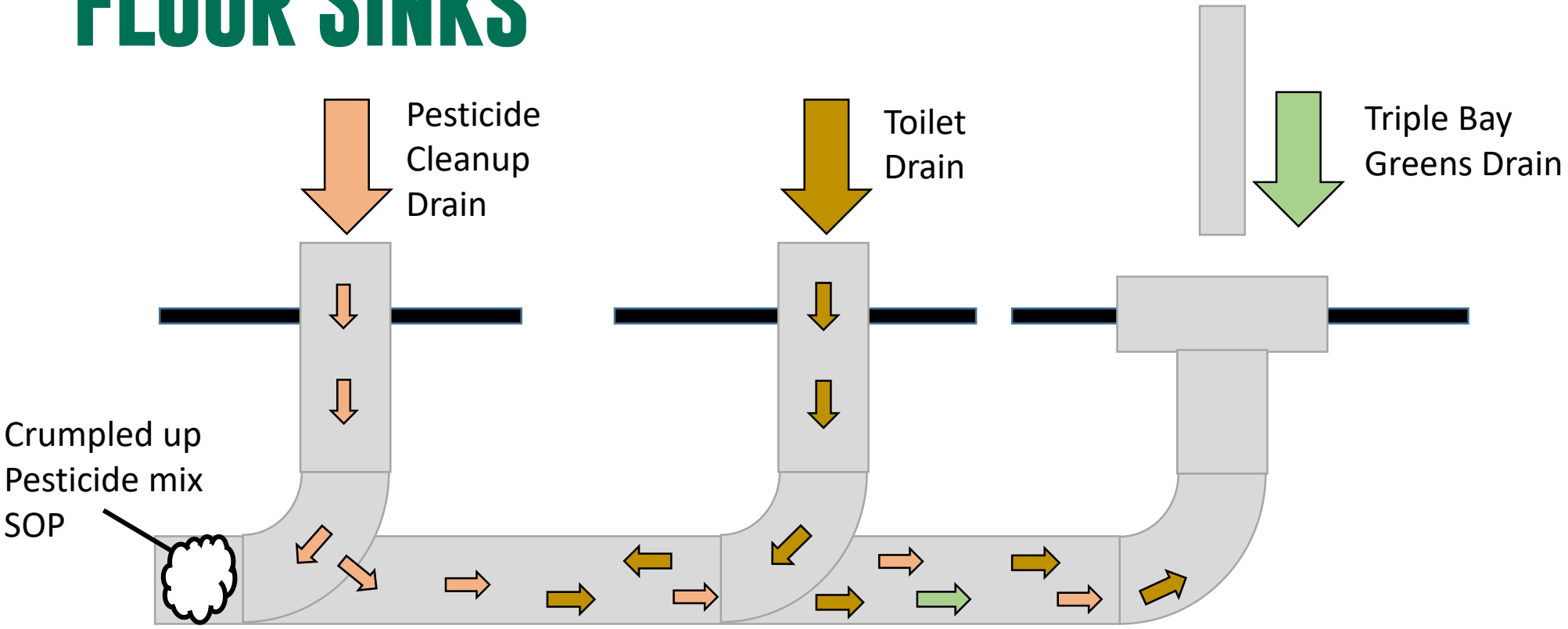


What is going to happen?

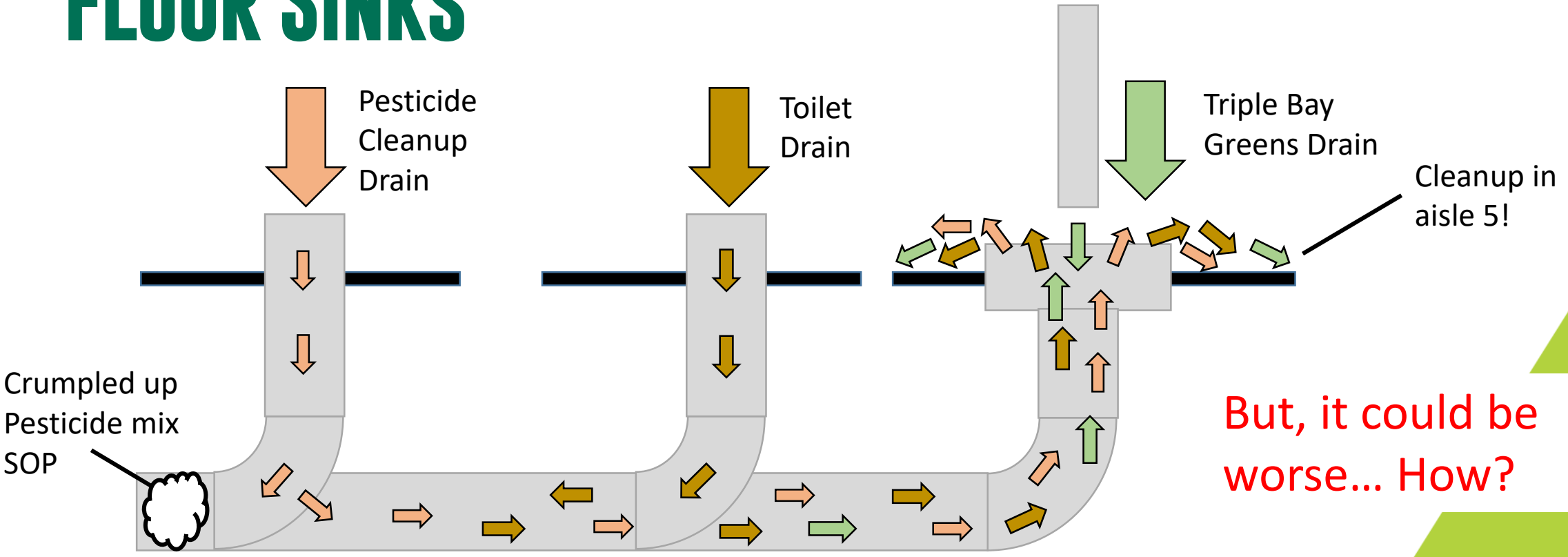
Air Gap Drains & Floor Sinks



Air Gap Drains & Floor Sinks

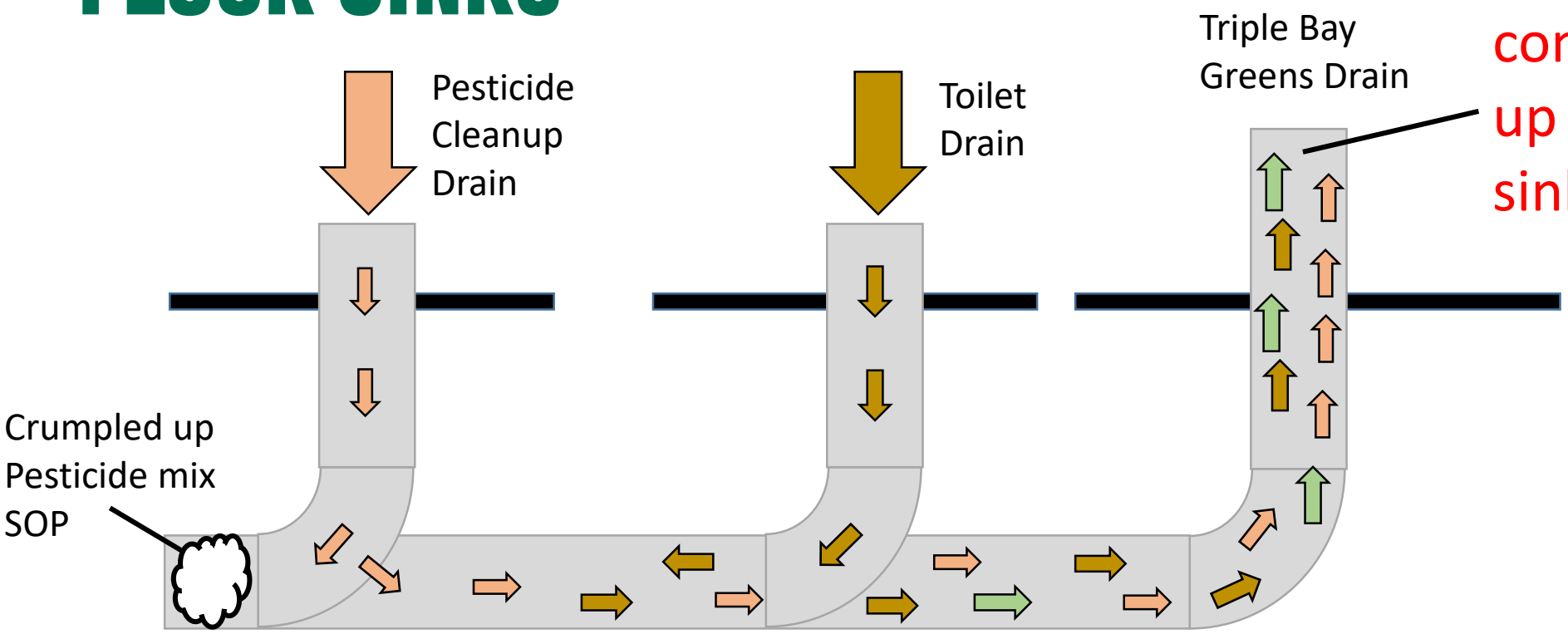


Air Gap Drains & Floor Sinks



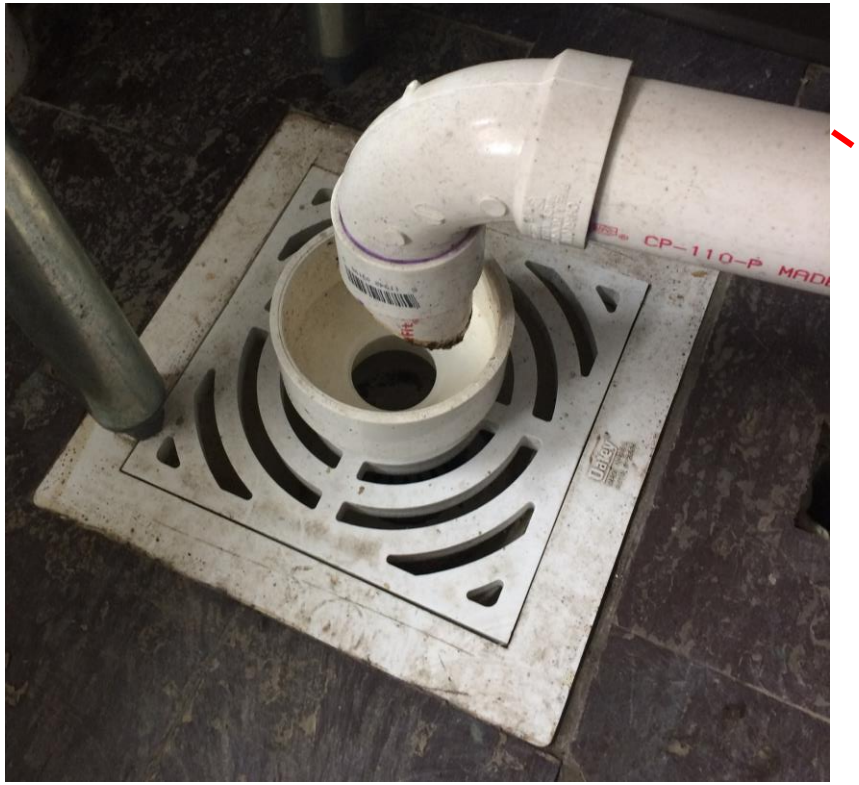
But, it could be worse… How?

Air Gap Drains & Floor Sinks



If the contaminants went up to the 3-bay sink!

Air Gap Drains & Floor Sinks



Air Gap Drains & Filling Tanks

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Backflow Prevention – Where?

- Water Supply
  - Check valves in supply lines at individual buildings
  - Check valves between uses that may present significant risks
  - Check valves in supply lines where chemicals are injected
  - Foot valves at irrigation sources
  - Air gaps at tank fill lines / or removable hoses (that are hung)
- Drains
  - Consider dedicated drains for different levels of effluent risk
  - Air gap drains / floor sinks to prevent direct cross-connection / cross-contamination
- SOP's
  - What happens when there is a mess?
  - Regularly check the operation of intended backflow prevention measures

Q&A

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