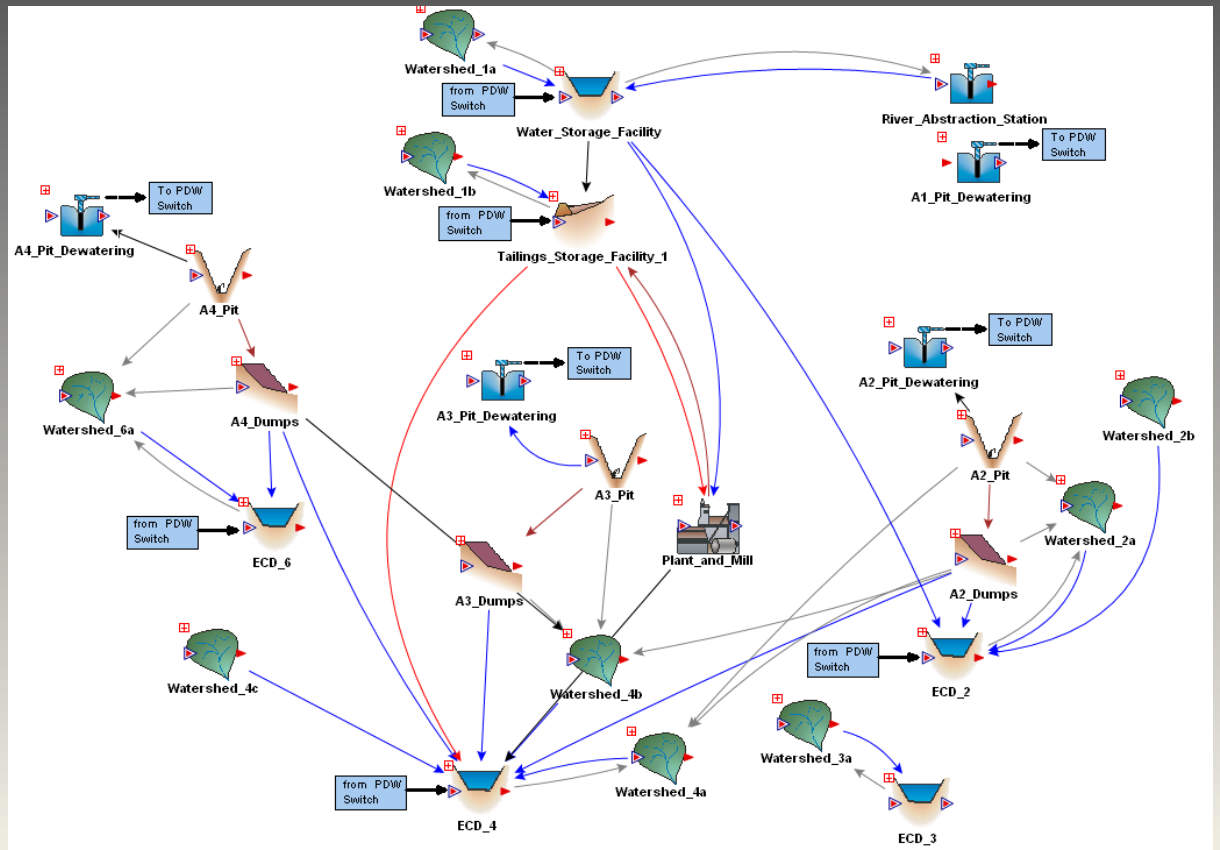
Time Tested Techniques for Developing Complex Water Management Models in GoldSim



Presented by:

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Water Balance Models vs. Water Management Models

- Water Balance
  - Revolves around the tenet that Inflows – Outflow = ΔStorage
  - Operating decisions are pre-made
  - Example: power plant water circulation flowsheet under nominal load
- Water Management
  - Incorporates decisions and operating logic and rules
  - Able to mimic operators logic (to the extent possible)
  - When projecting out into the future, addresses conditions that may not have occurred previously
  - Example: Irrigation decision support system that includes drought and wet year operating rules

How Many Facilities at the Top of the Model?

Everything starts from the top down construction approach – set up containers for each facility

but what counts as a 'facility'?

- Physical Location
- Distinct Process
- Distinct Water Quality
- Reporting needs
- Ability to isolate flows into and out of the facility (battery limits)

Define the Battery Limits of the Facilities

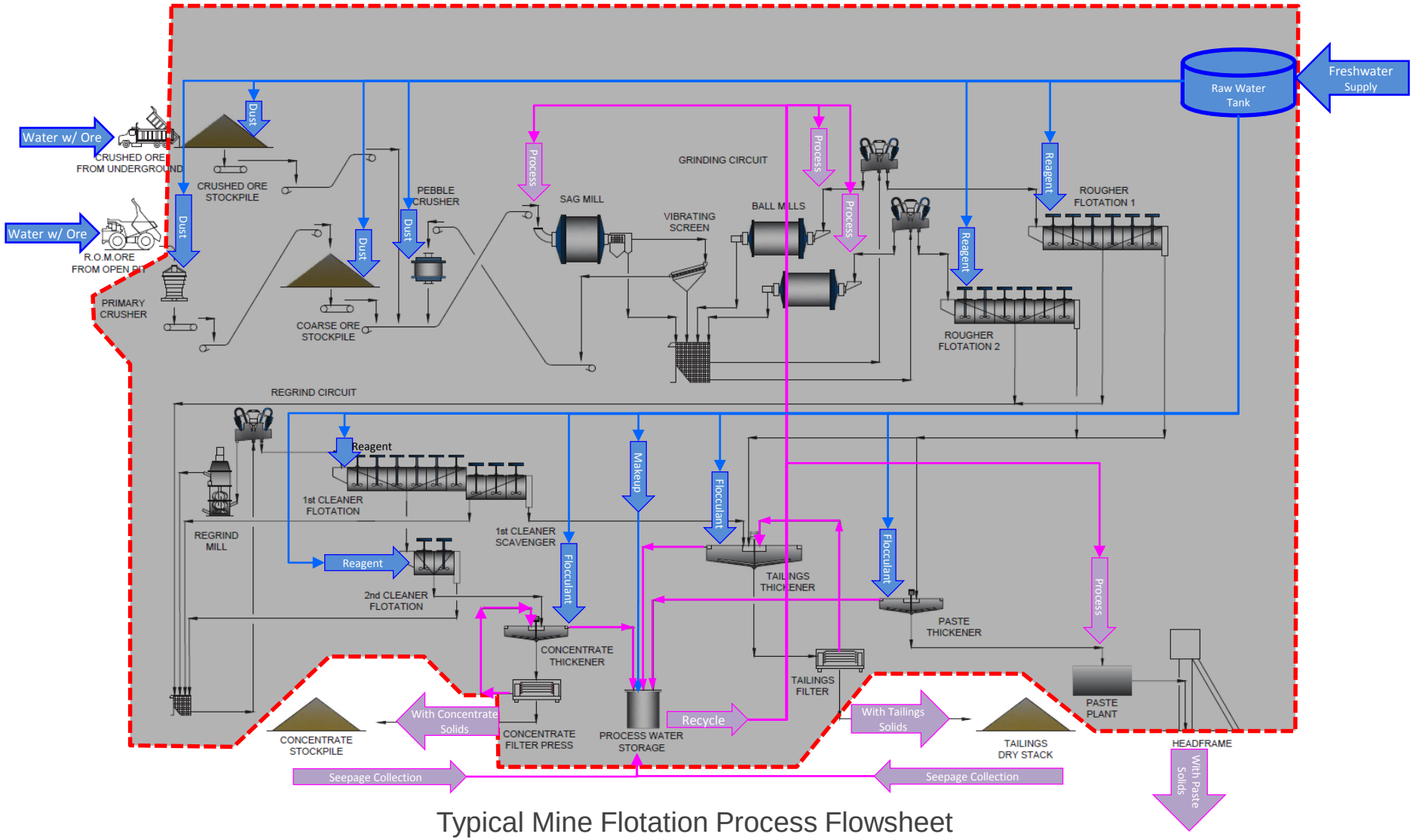
The battery limits of the facility is what we use to determine what is considered an ‘internal’ flow and what is ‘external’ – that is, passed between facility

Select battery limits that focus on where the facility interacts with OTHER facilities

Carefully selecting this limit can help reduce the number of flows that must be calculated

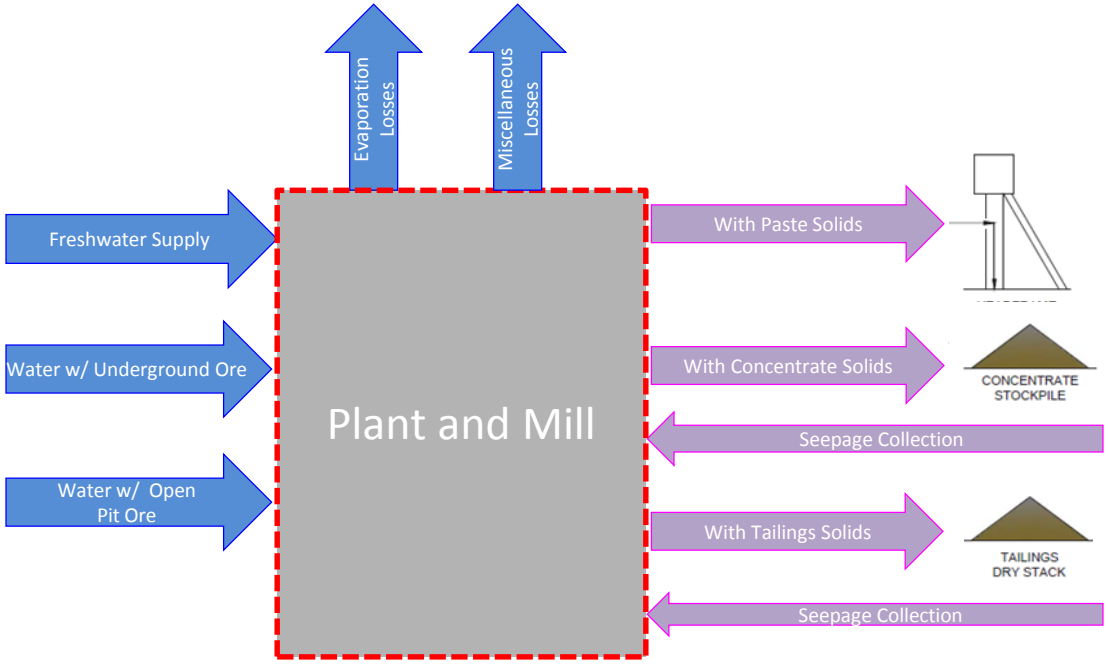
If it is internal, do we REALLY need to calculate it?

Selecting the Battery Limits Example



Typical Mine Flotation Process Flowsheet
With Process Water Circuit Overlay

Selecting the Battery Limits Examples



Typical GoldSim Water Management Model Plant and Mill Flowsheet

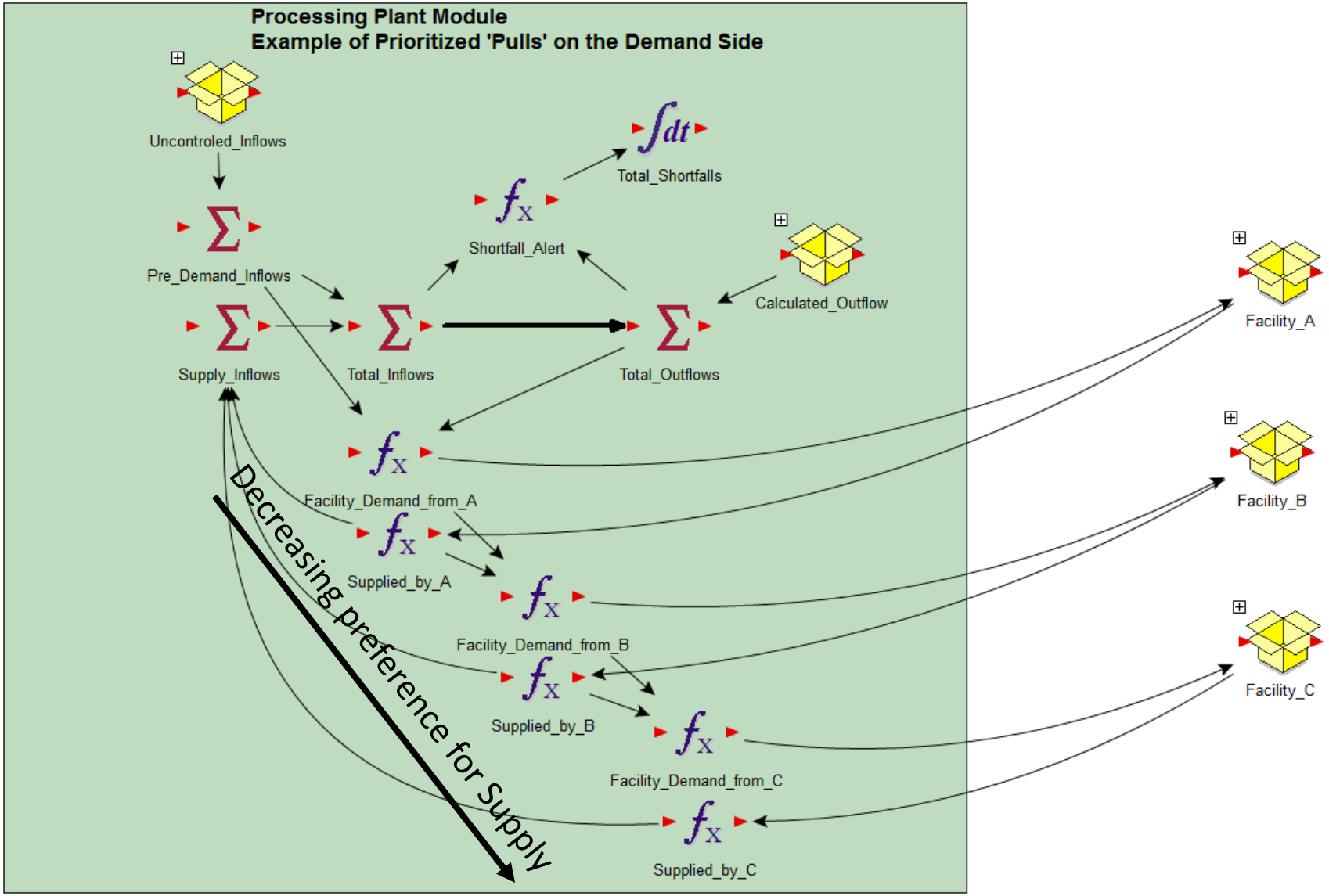
Calculate Demand and Verify Withdrawal

One big part of the water management model is calculating what one facility will need – the 'demand', and if another facility can meet that demand – the 'supply'

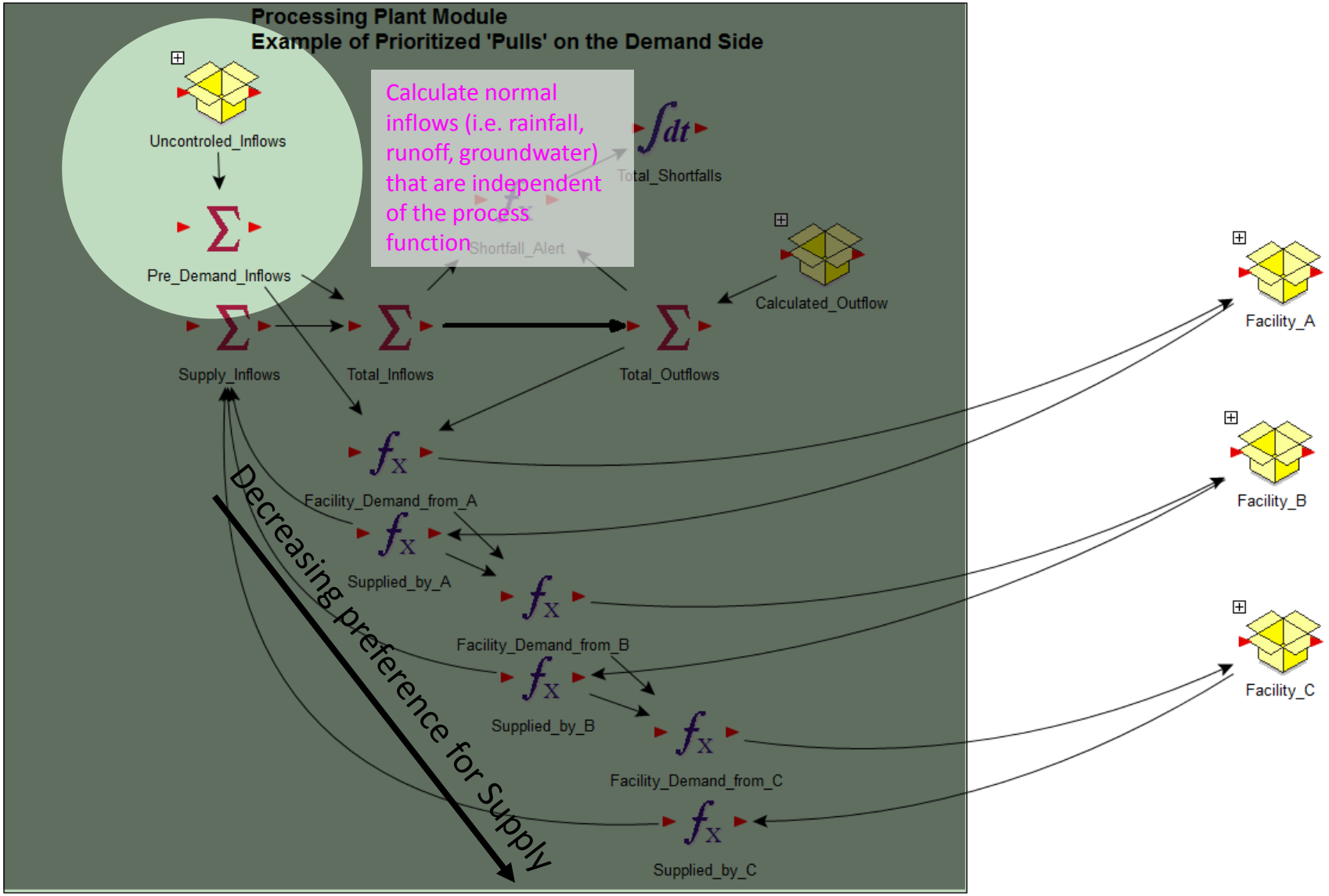
Often, it is very important to check to see if a facility can actually meet the demand

It can also be important to prioritize the demands and the supply – where you get your water from first, and who will get water first

Cascading Water Demand



Cascading Water Demand



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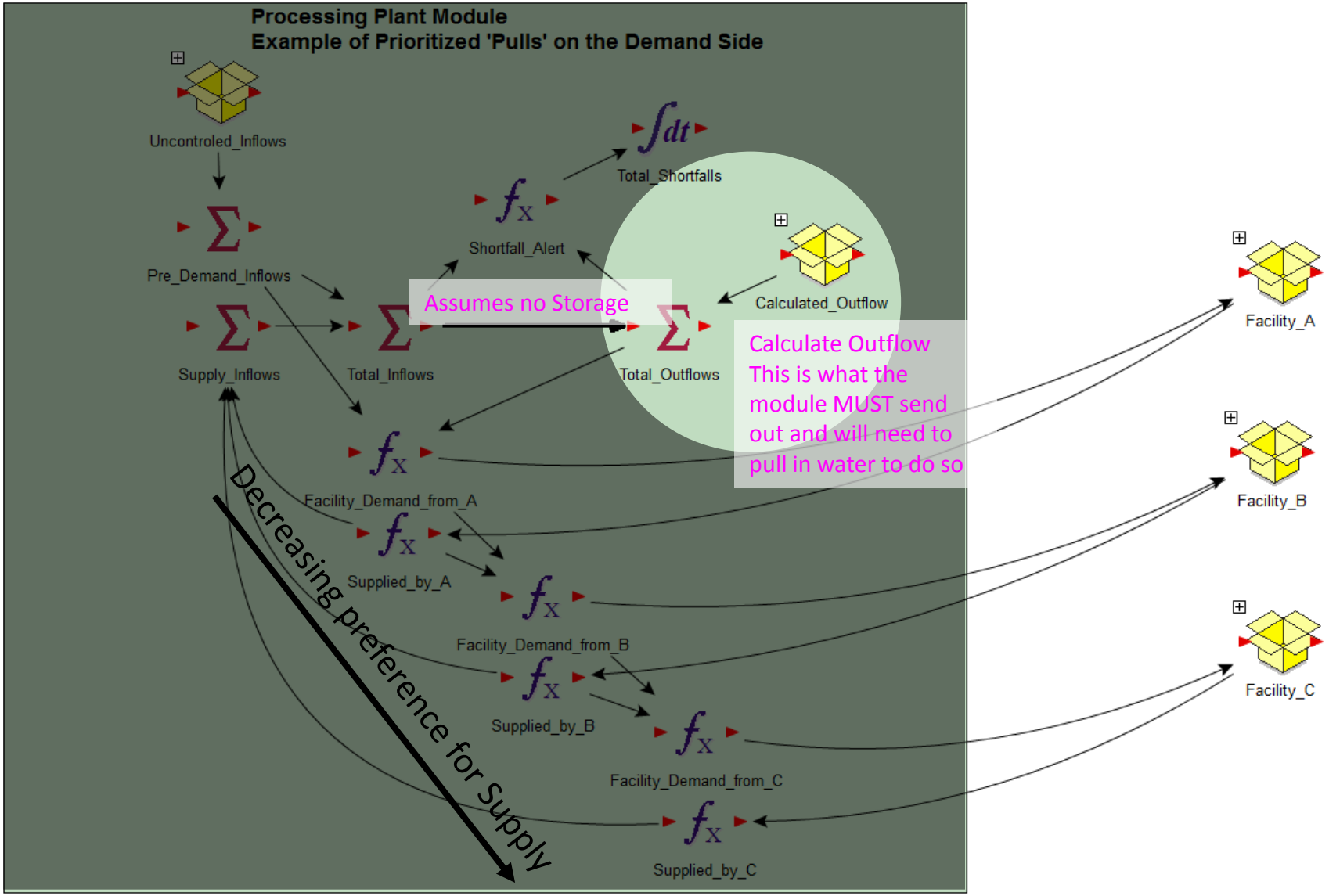

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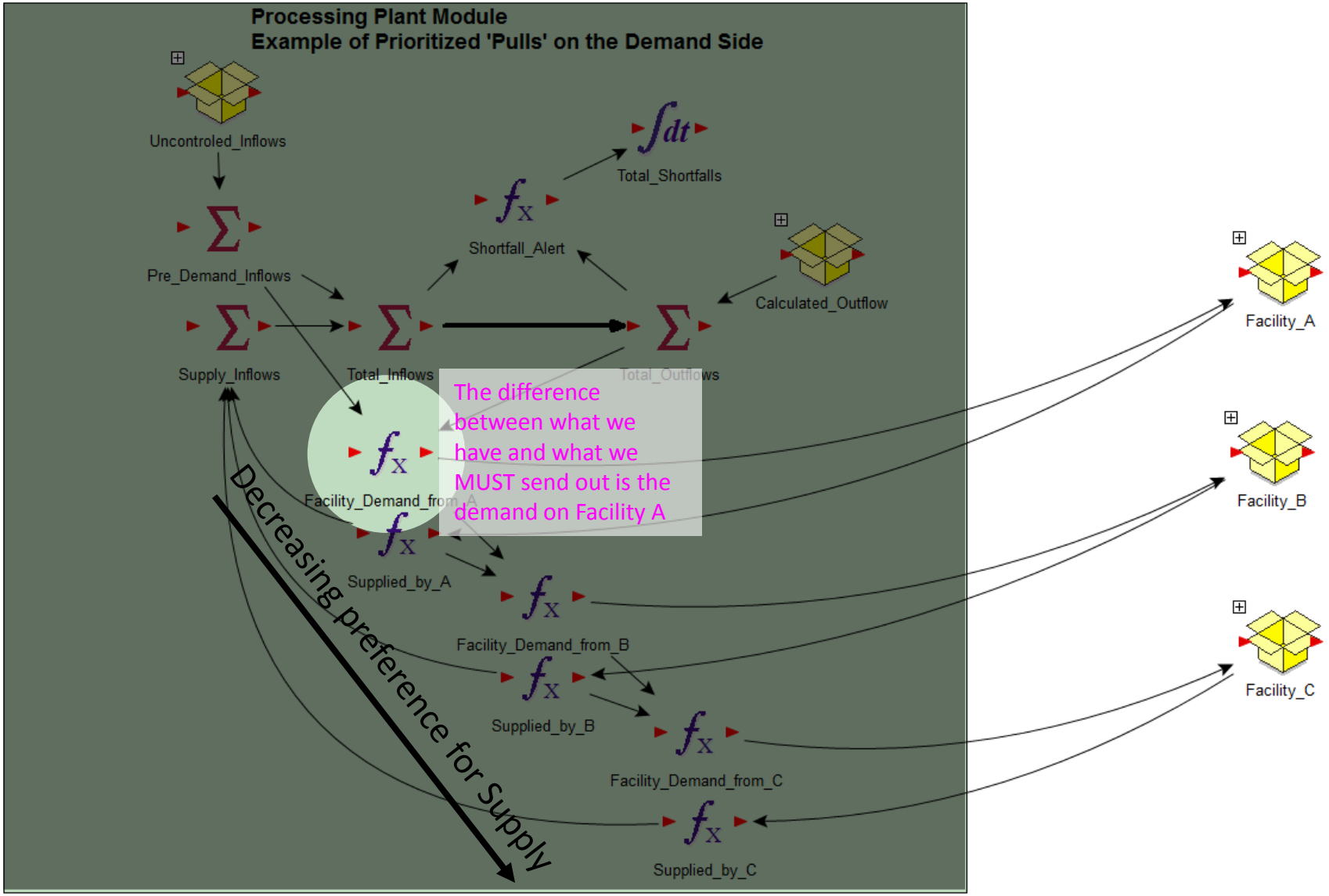

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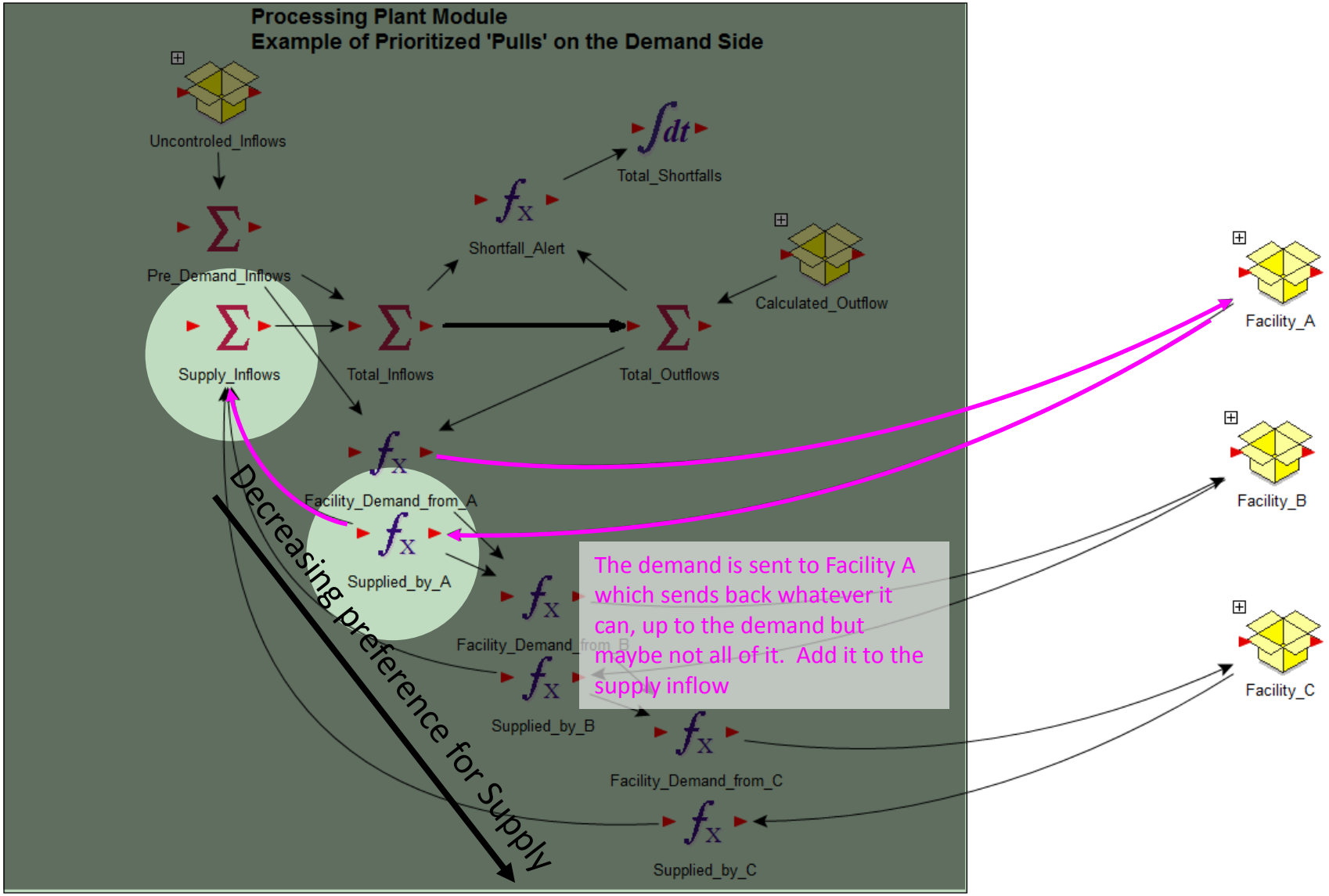

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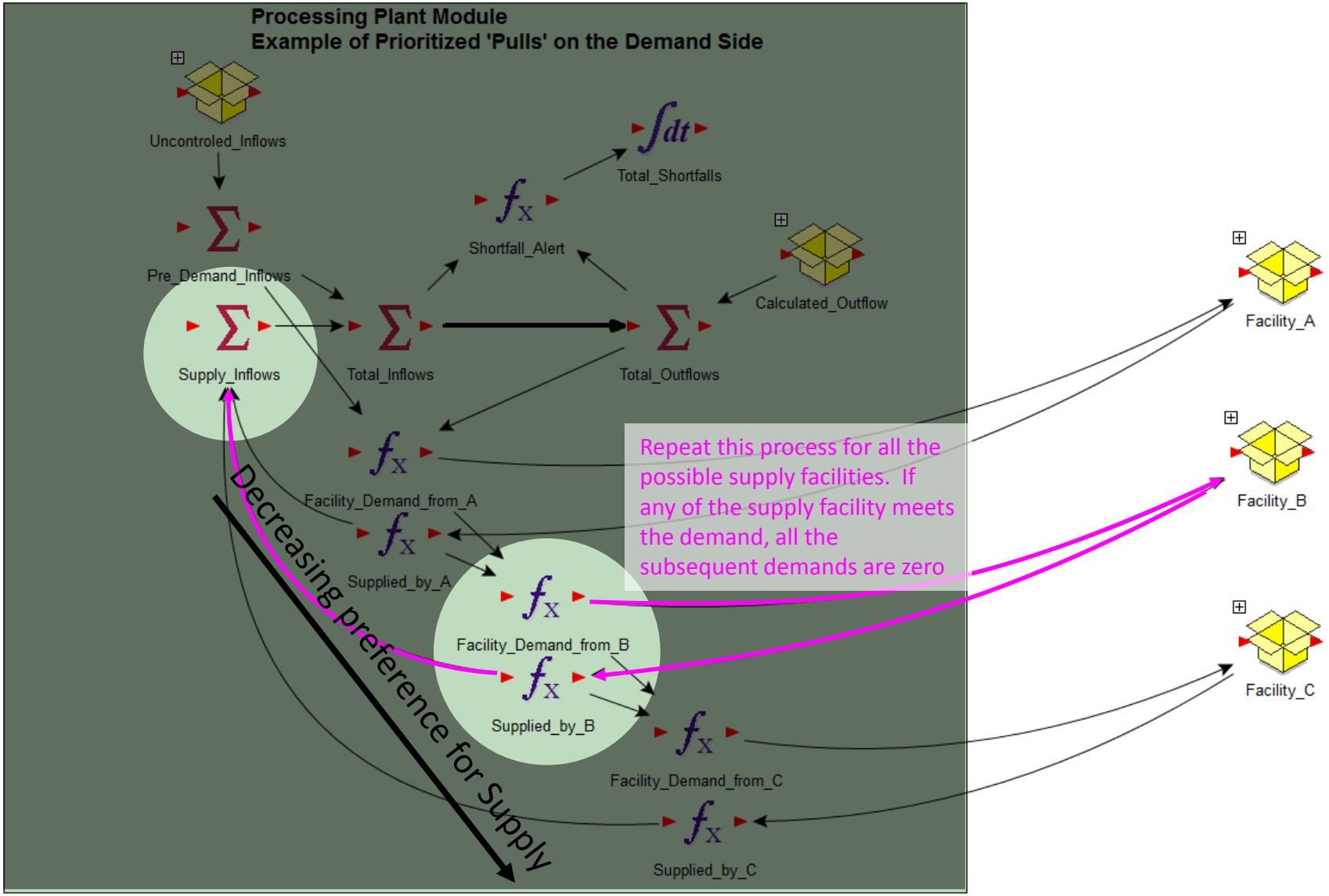

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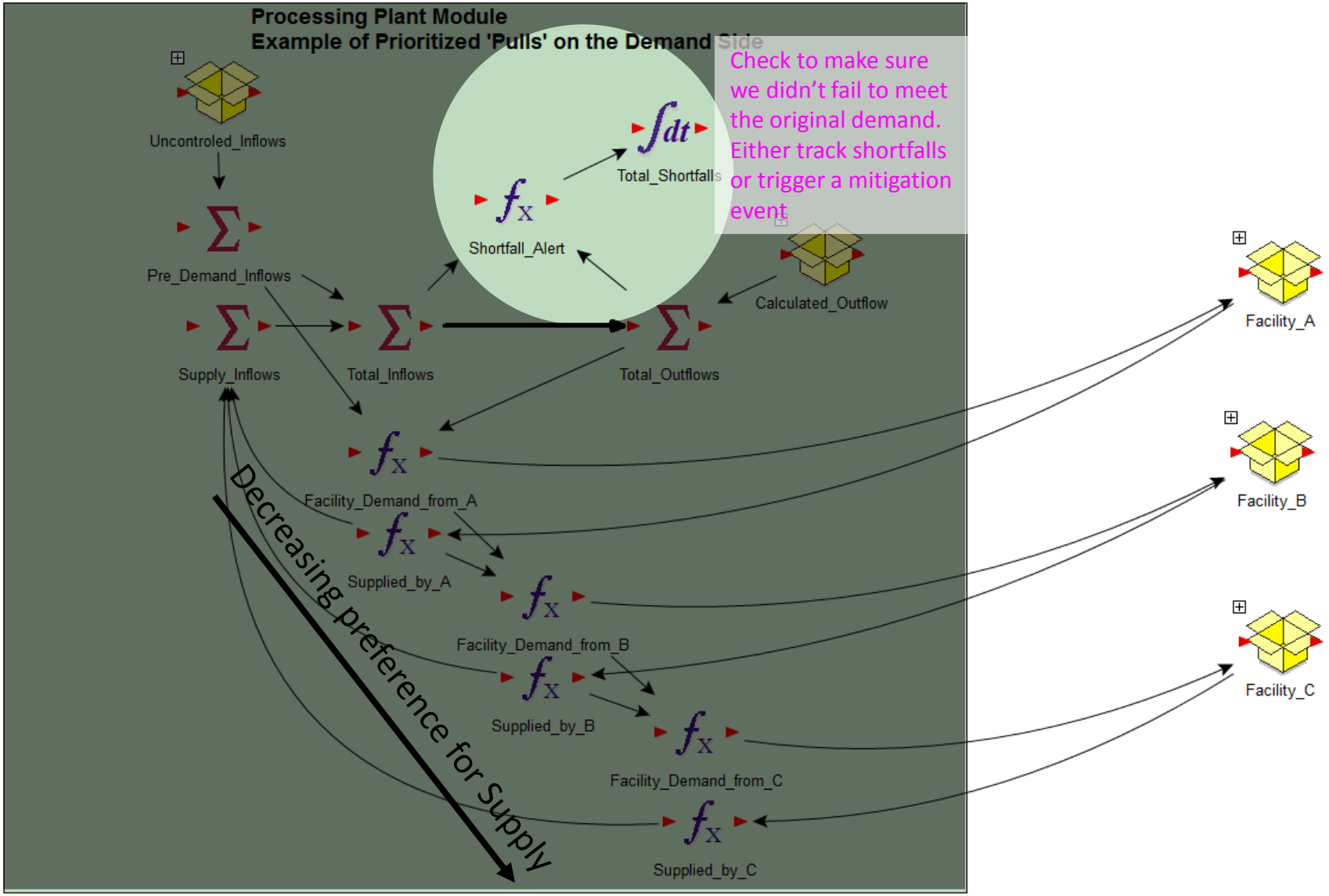
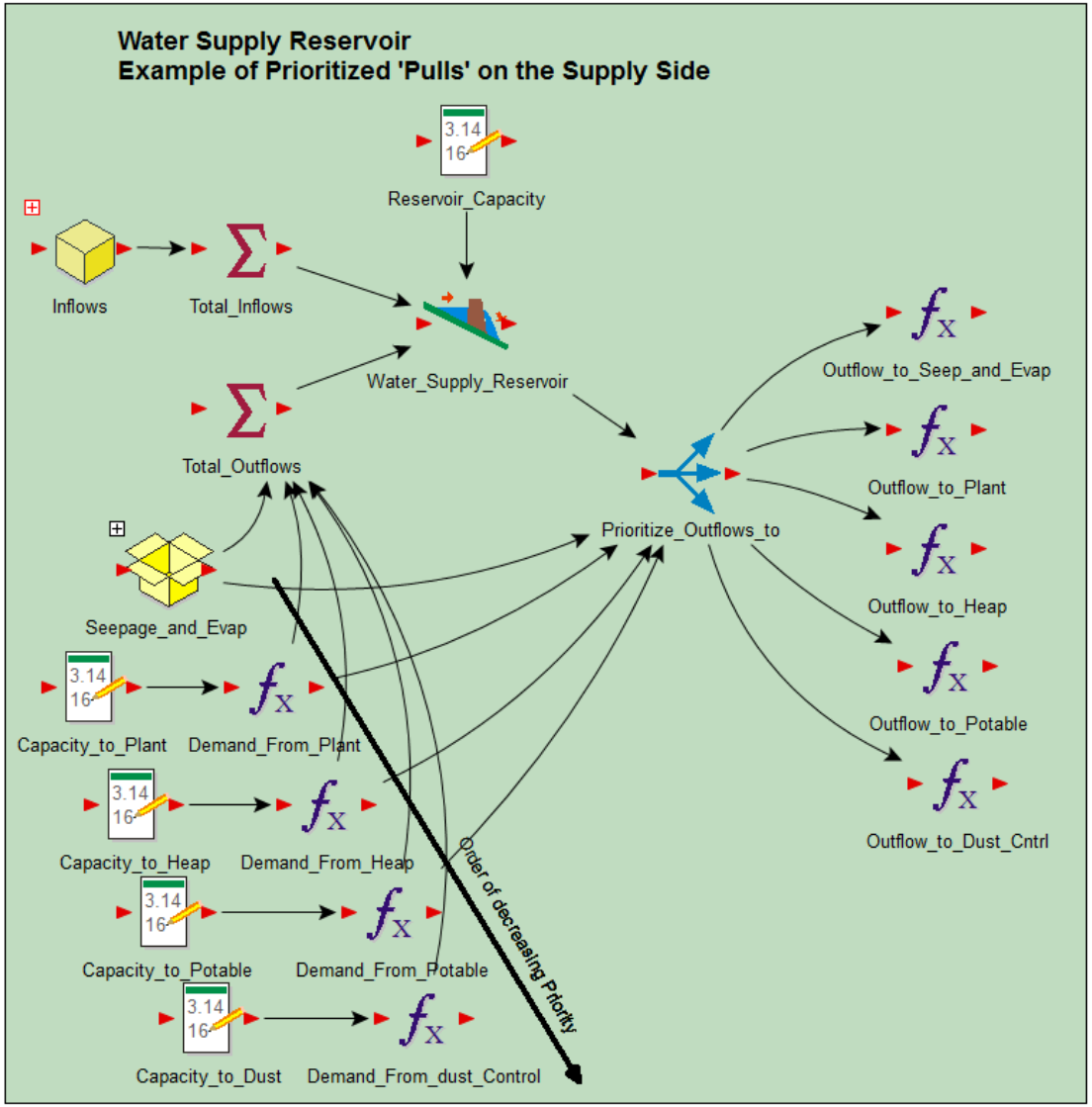


Allocated Water Supply



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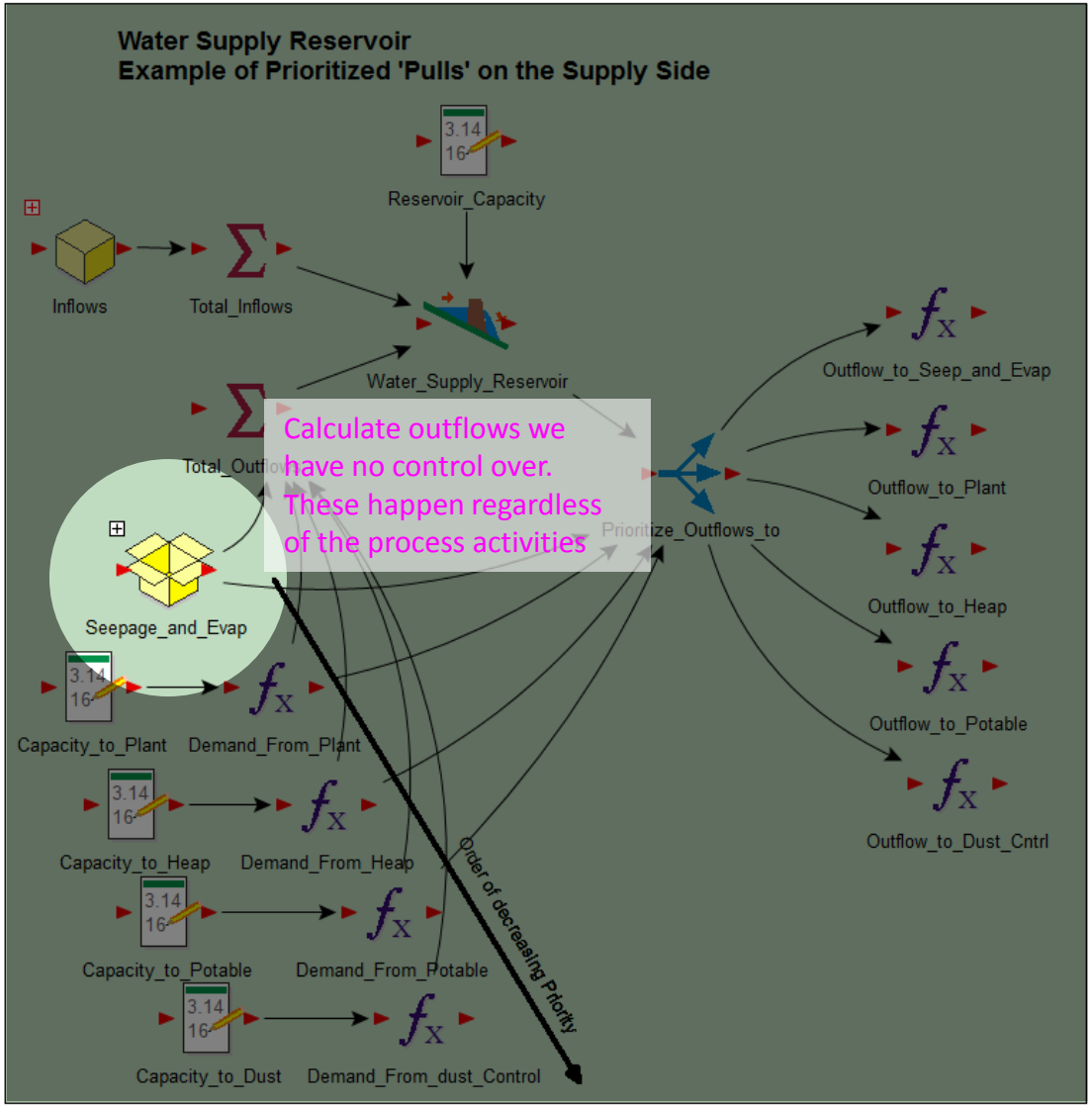

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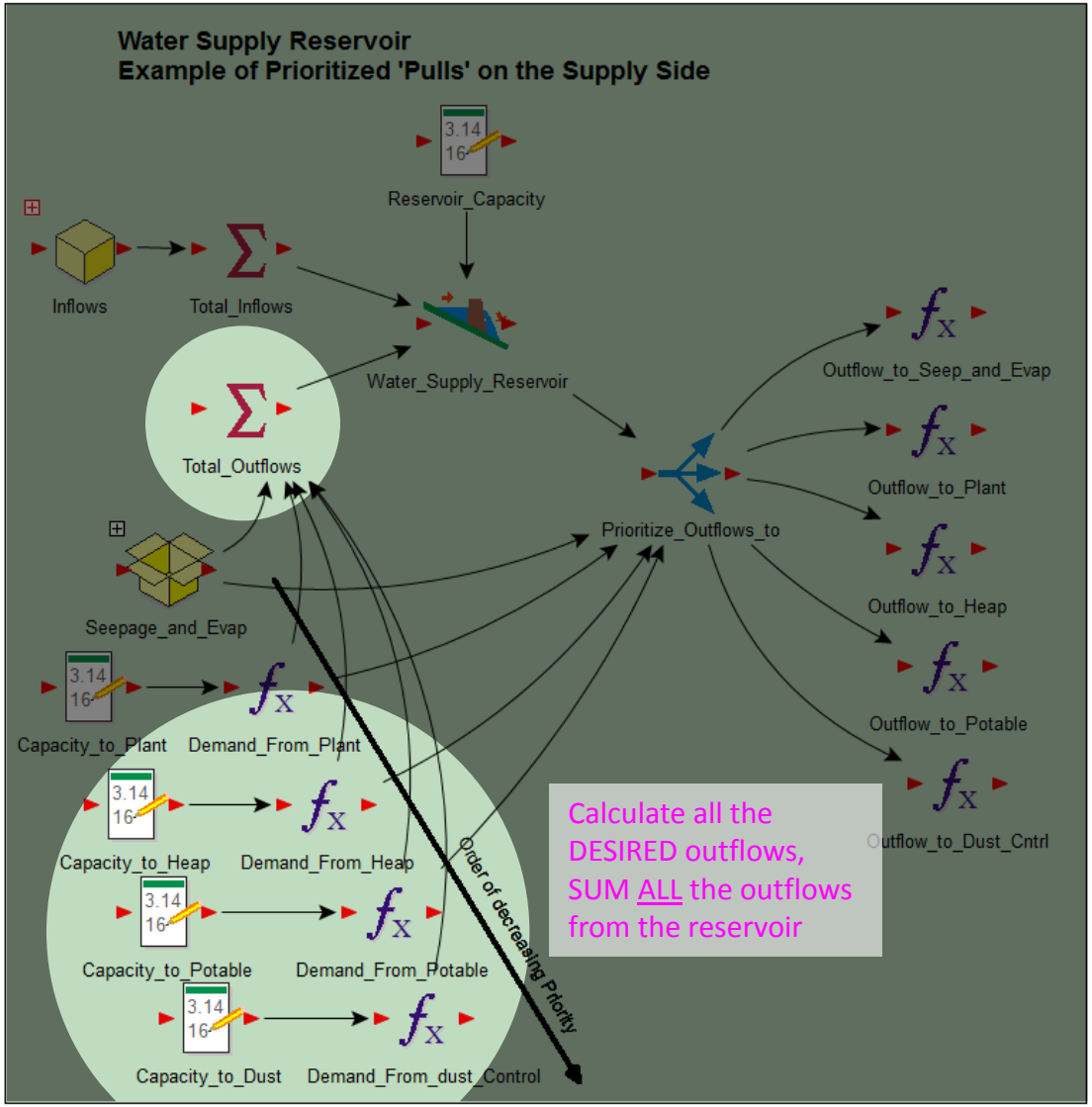

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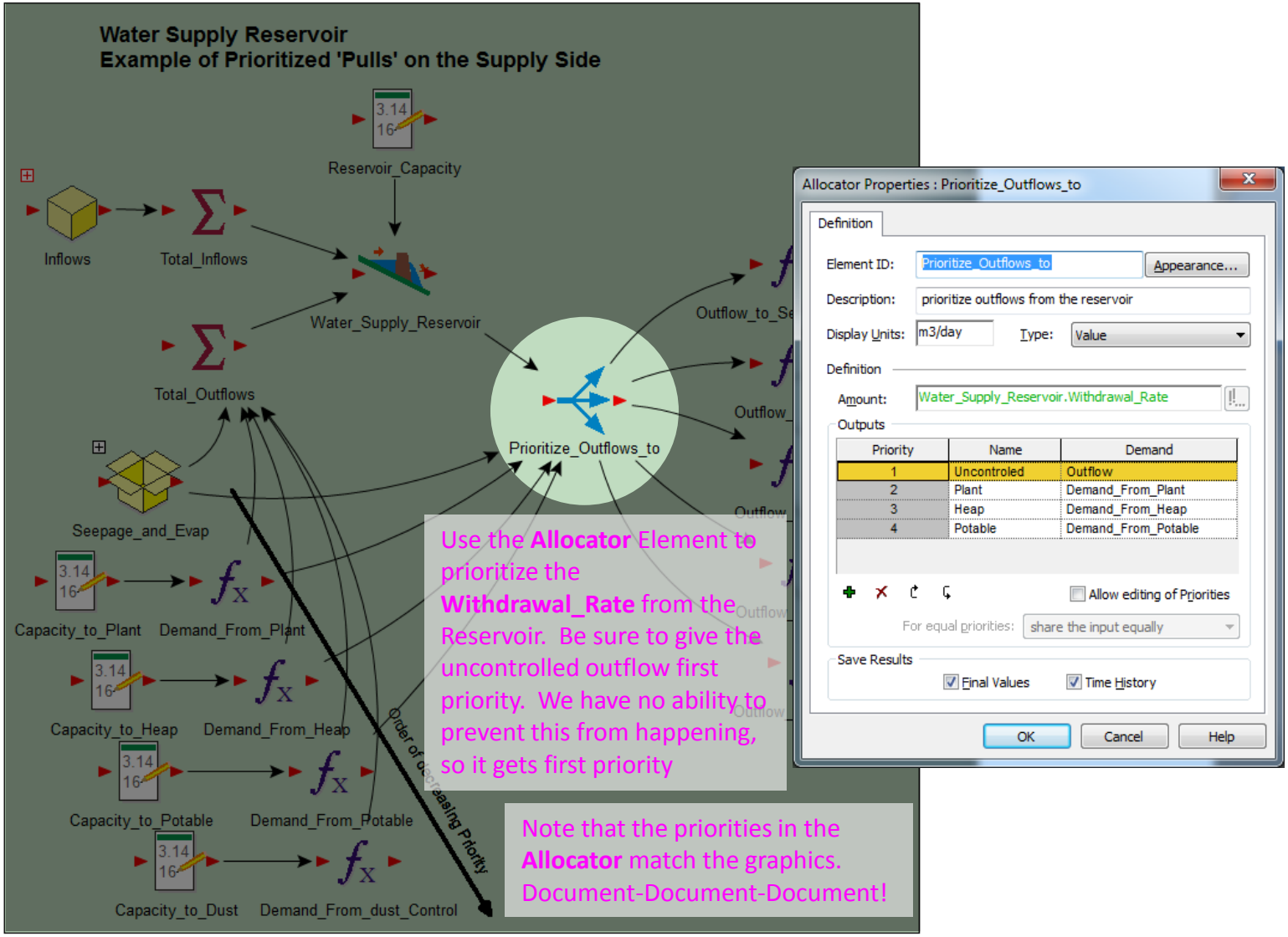

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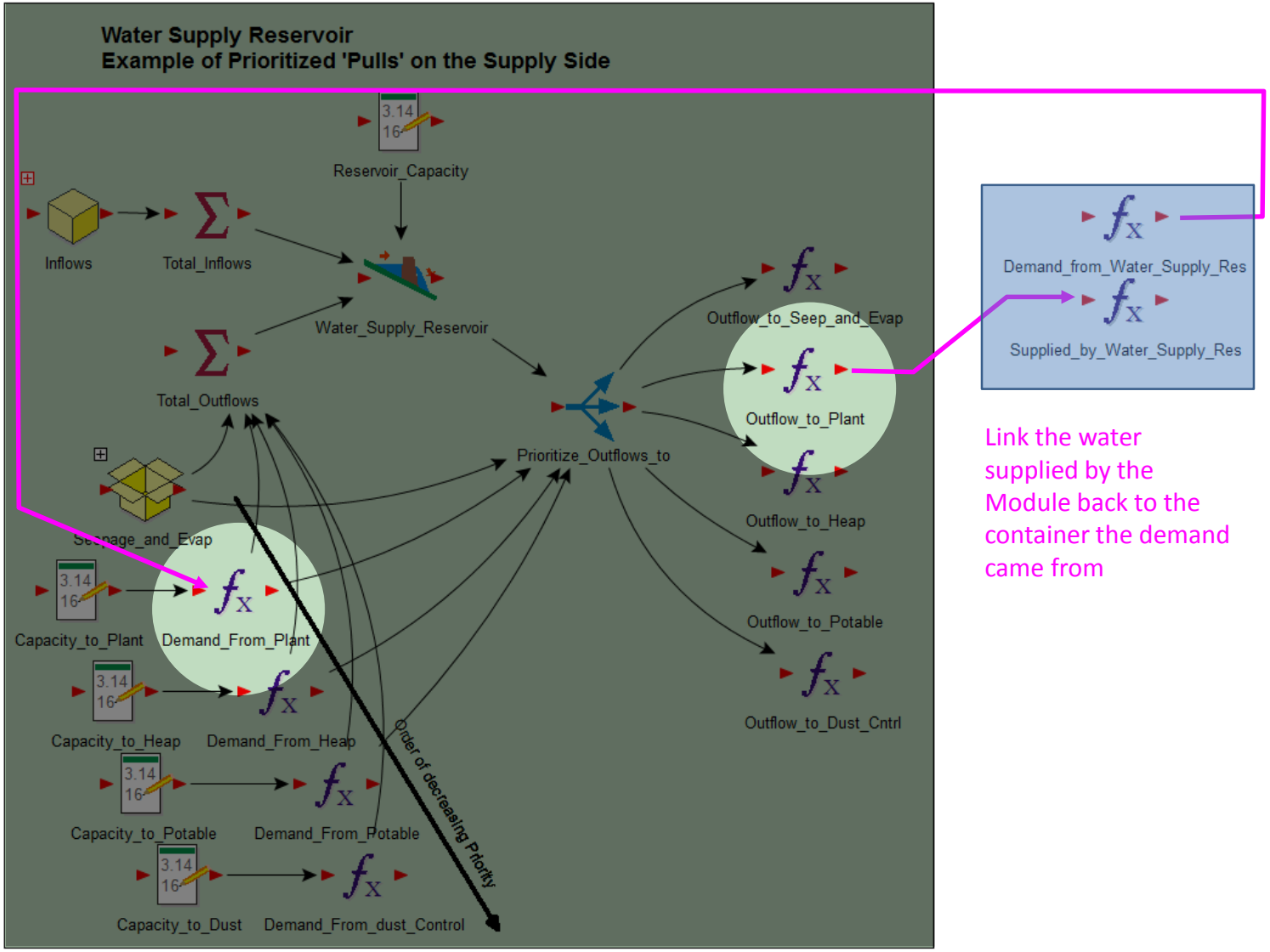


Link the water supplied by the Module back to the container the demand came from

Building Modular Components

Building modular components does more than allow you to reuse your code.

By putting elements you link to from other modules at the top of the module, you can quickly verify you have made the right connections and ensure you didn't connect to the wrong element

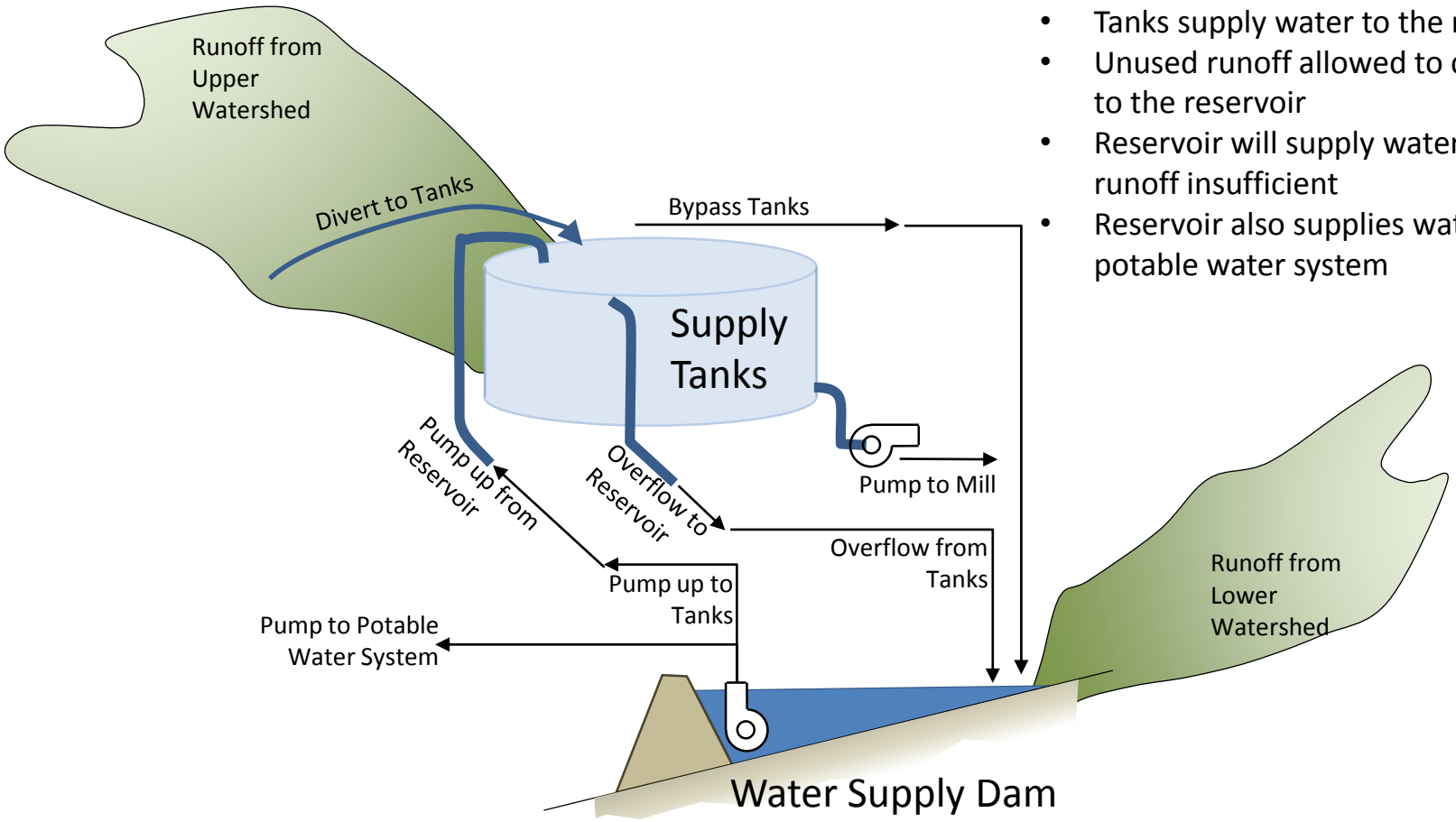
Envision your modules like circuit boards. Having connectors easily accessible means the are easier to connect to

Proper modularization allow you to 'pull and replace' modules – letting two people work on the same model

Example of Water Supply System

Modeling the following scenario:

- Runoff from upper watershed diverted to the tanks
- Tanks supply water to the mill
- Unused runoff allowed to continue down to the reservoir
- Reservoir will supply water to the tanks if runoff insufficient
- Reservoir also supplies water to the potable water system



Conceptual water supply system

Build Modular Components

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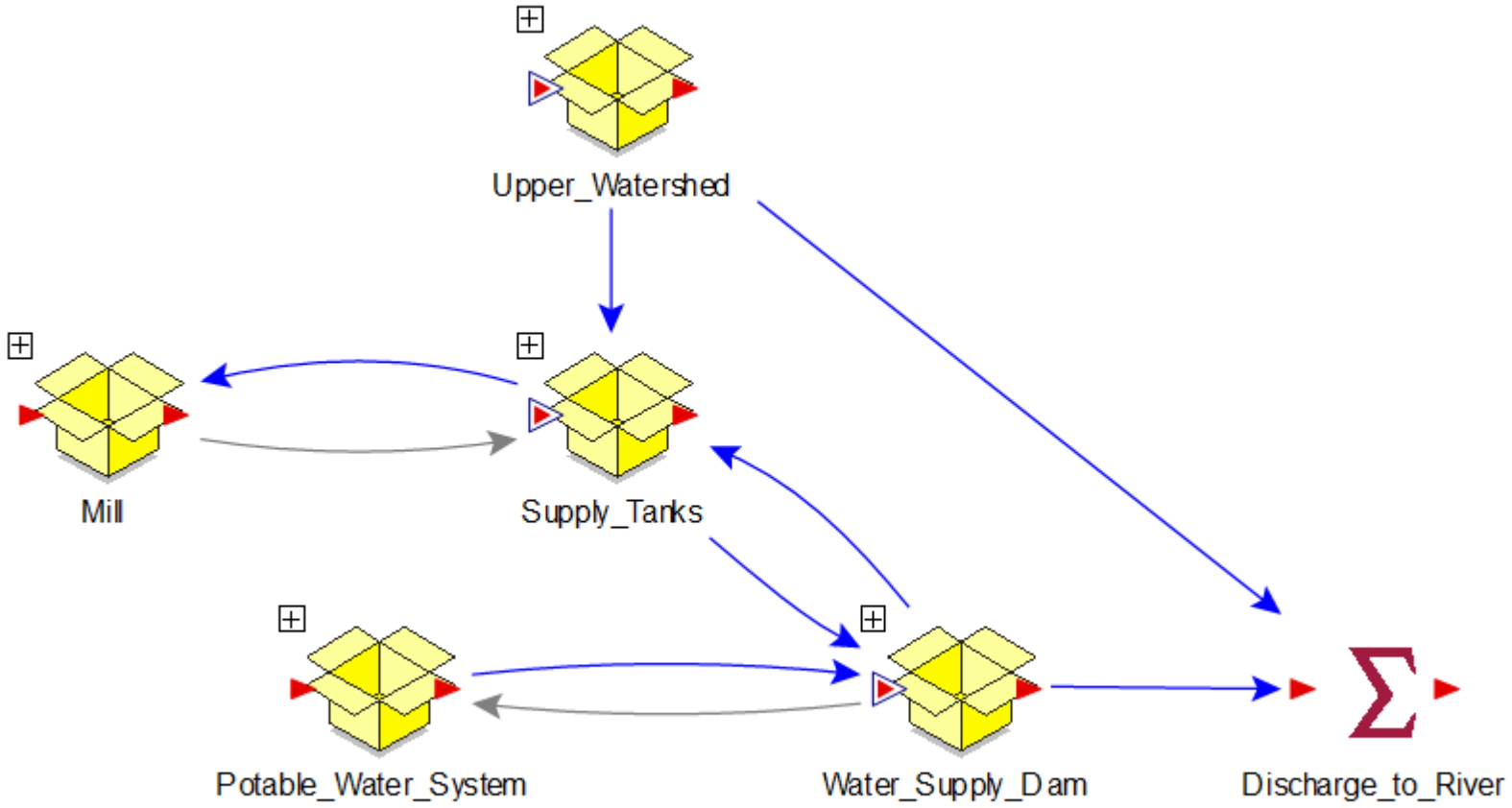
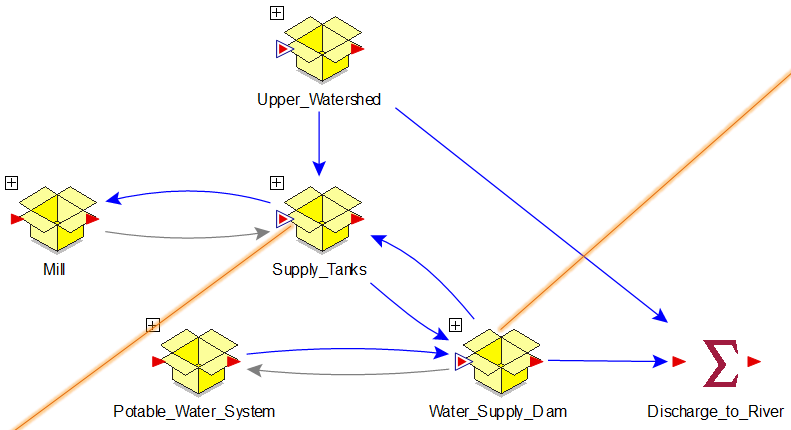
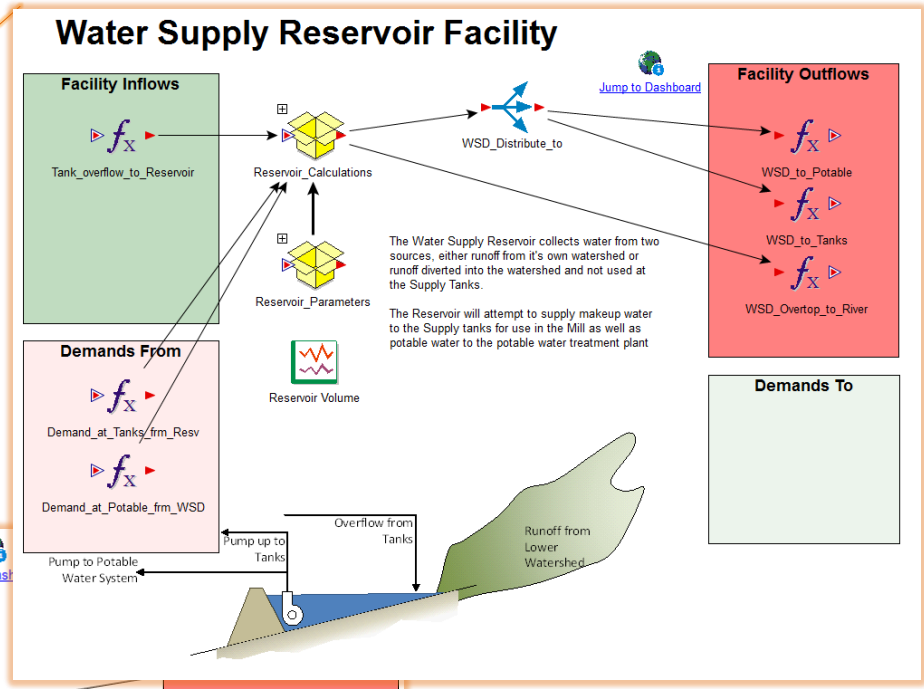
GoldSim Modularized Containers

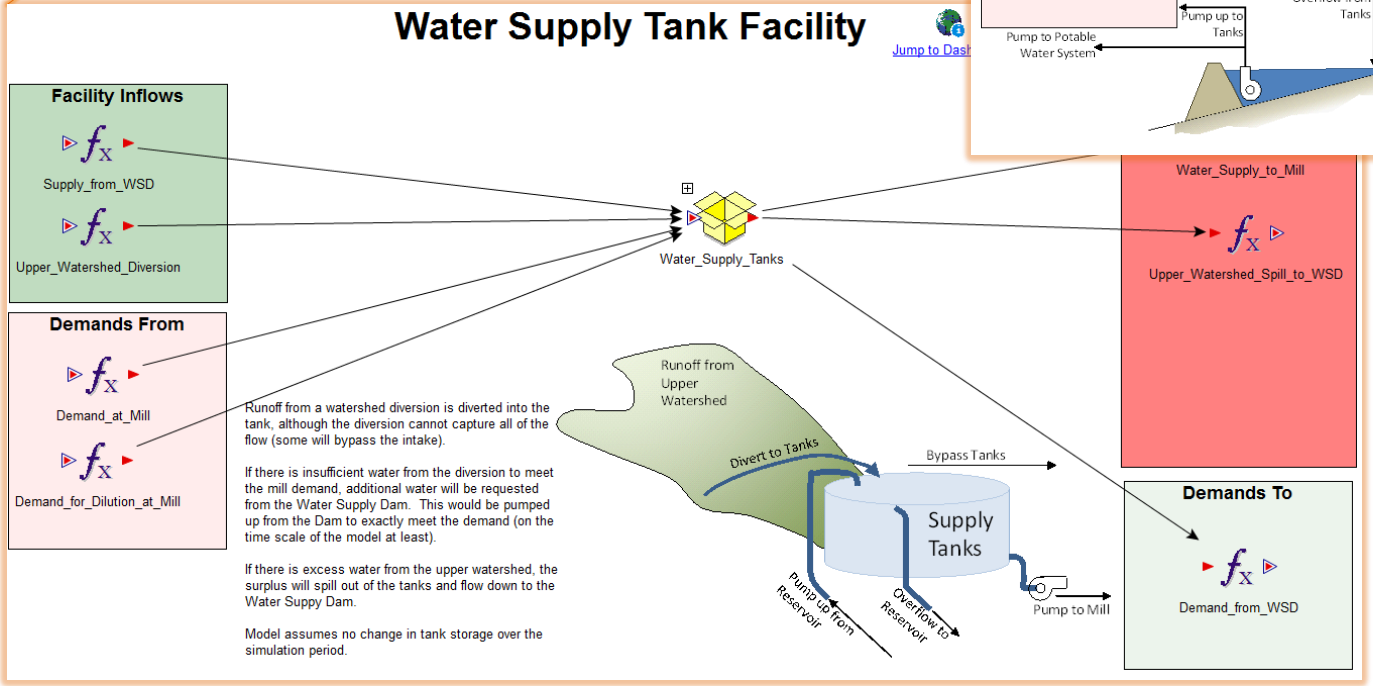


GoldSim construction of a water supply system

GoldSim Modularized Containers







GoldSim construction of a water supply system

Build Modular Components

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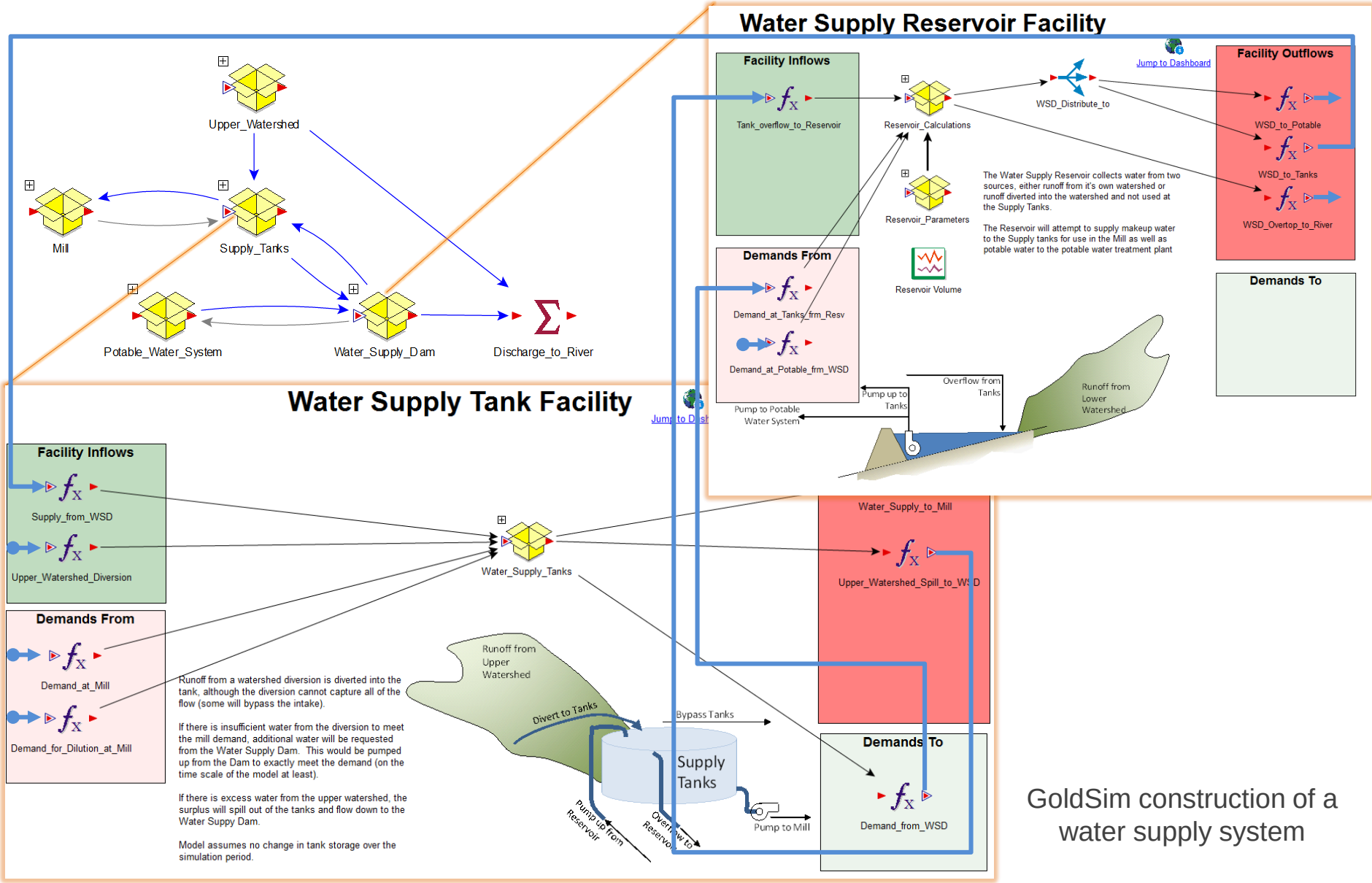
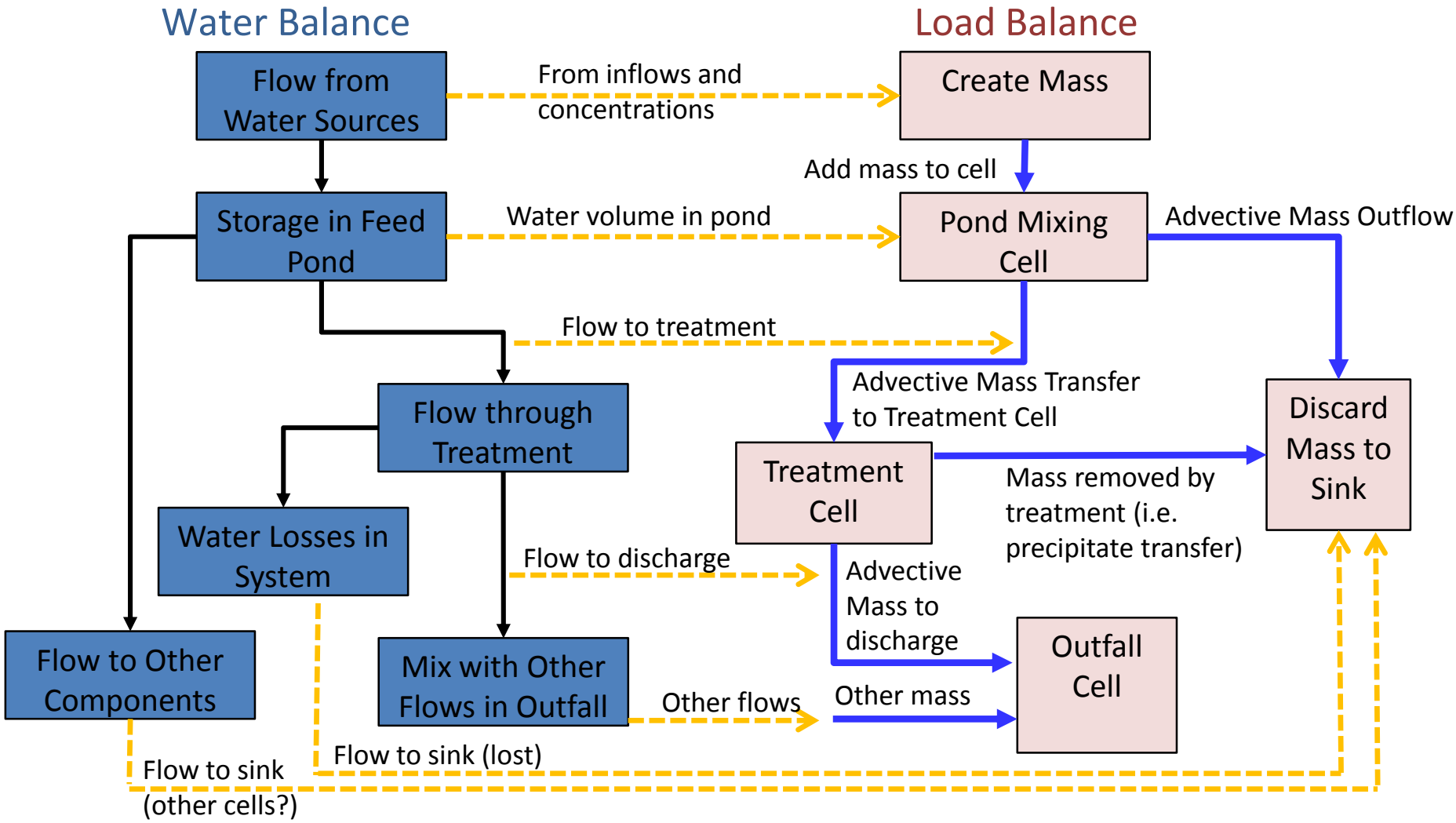
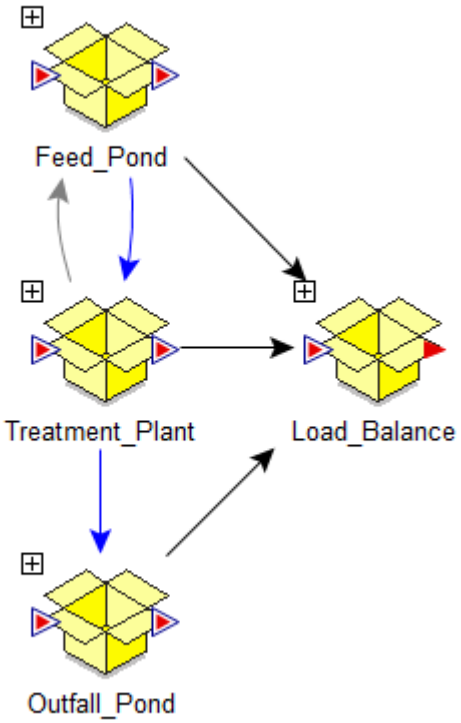


GoldSim construction of a water supply system

Typical Water and Load Balance Schematic

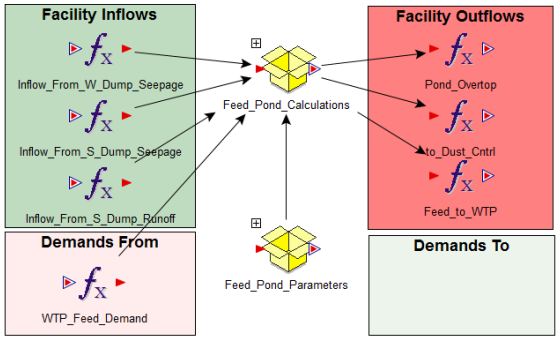


GoldSim Water and Load Balance

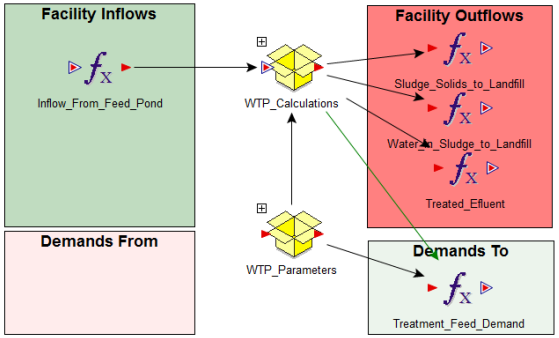


GoldSim Water and Load Balance

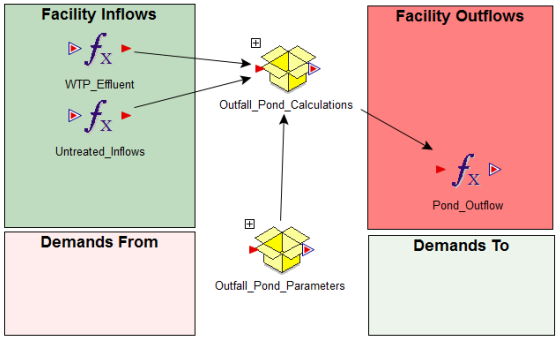
Water Treatment Feed Pond Facility



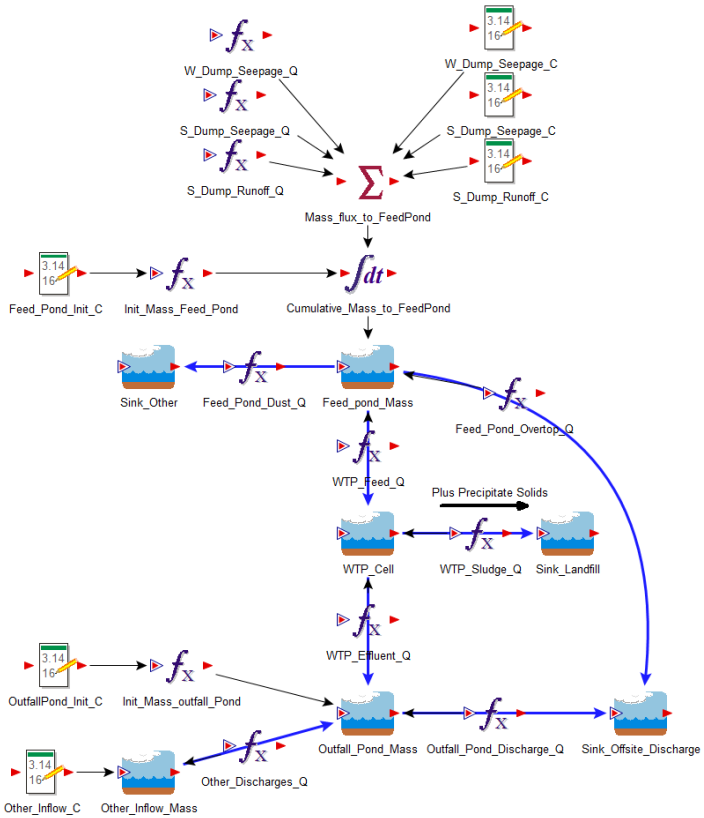
Water Treatment Plant Facility



Outfall Pond Facility



Water Treatment Load Balance



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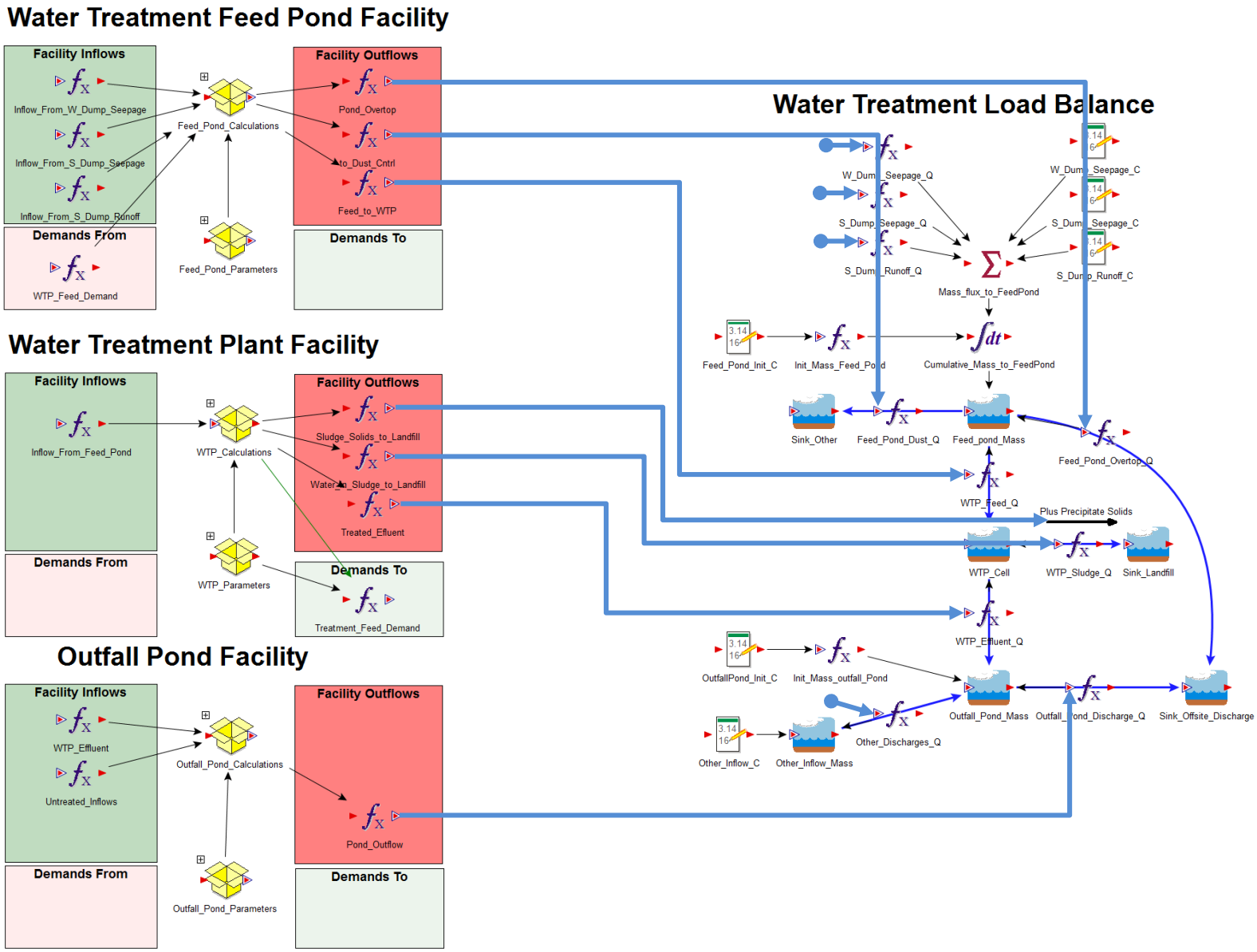

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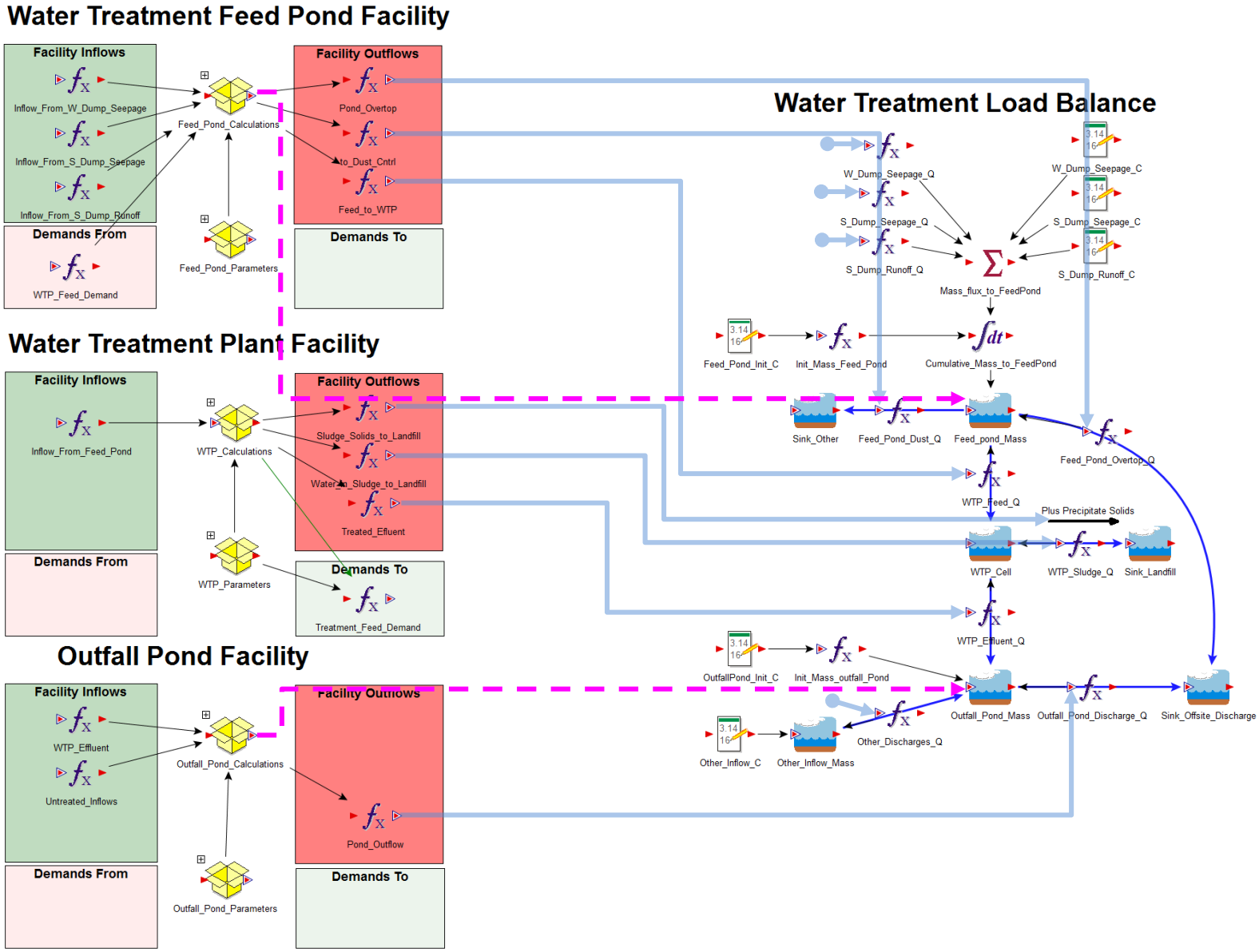

Thank You

Questions?

Discussion?