
Fundamentals of Asset Management

Step 1. Develop Asset Registry

A Hands-On Approach

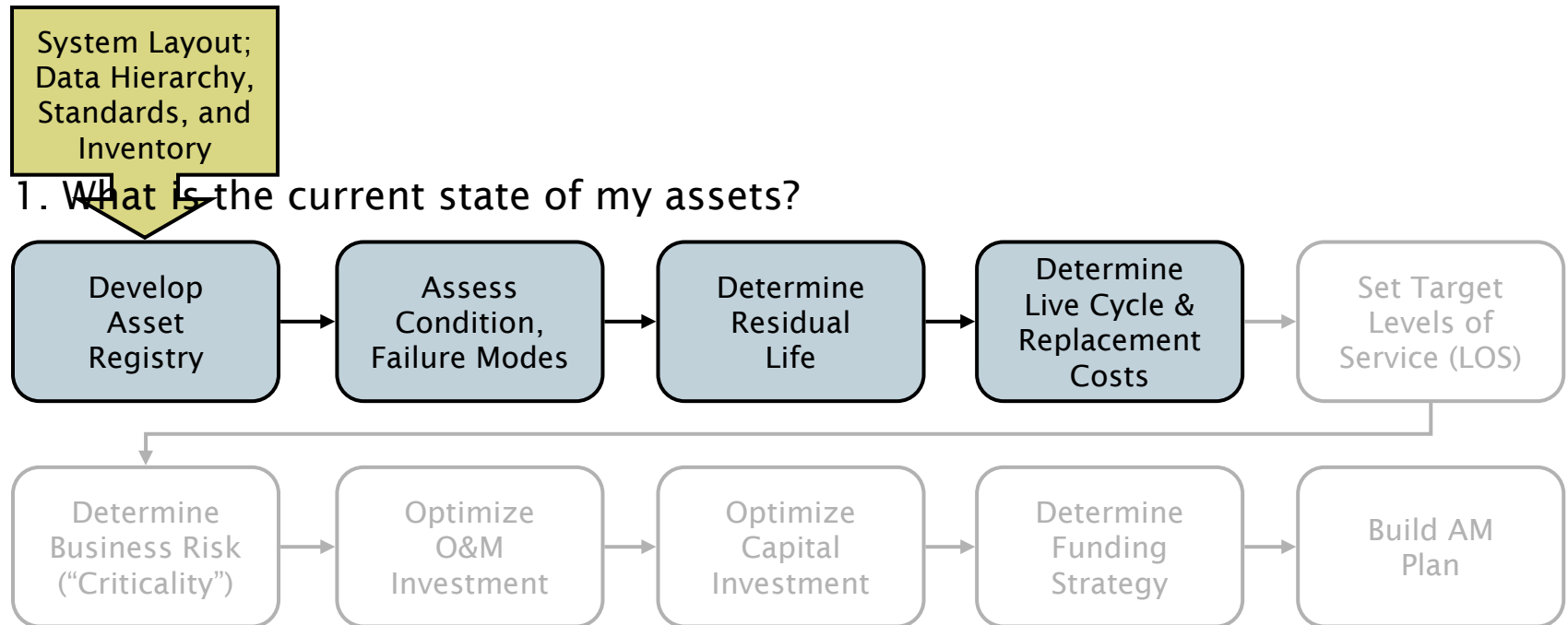
Tom's bad day...



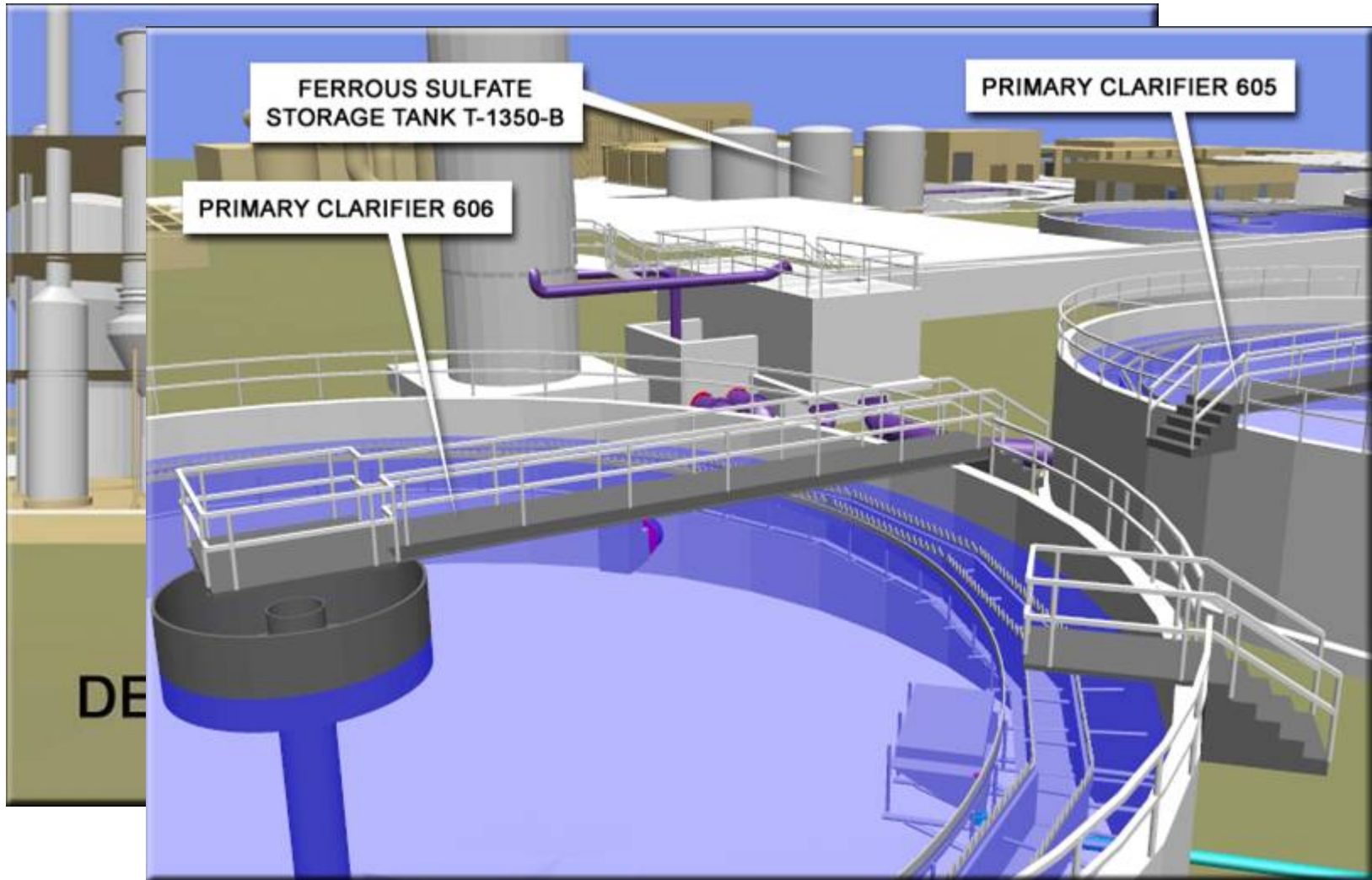
First of 5 core questions

1. What is the current state of my assets?
 - *What* do I own?
 - *Where* is it?
 - What *condition* is it in?
 - What is its *remaining useful life*?
 - What is its *remaining economic value*?

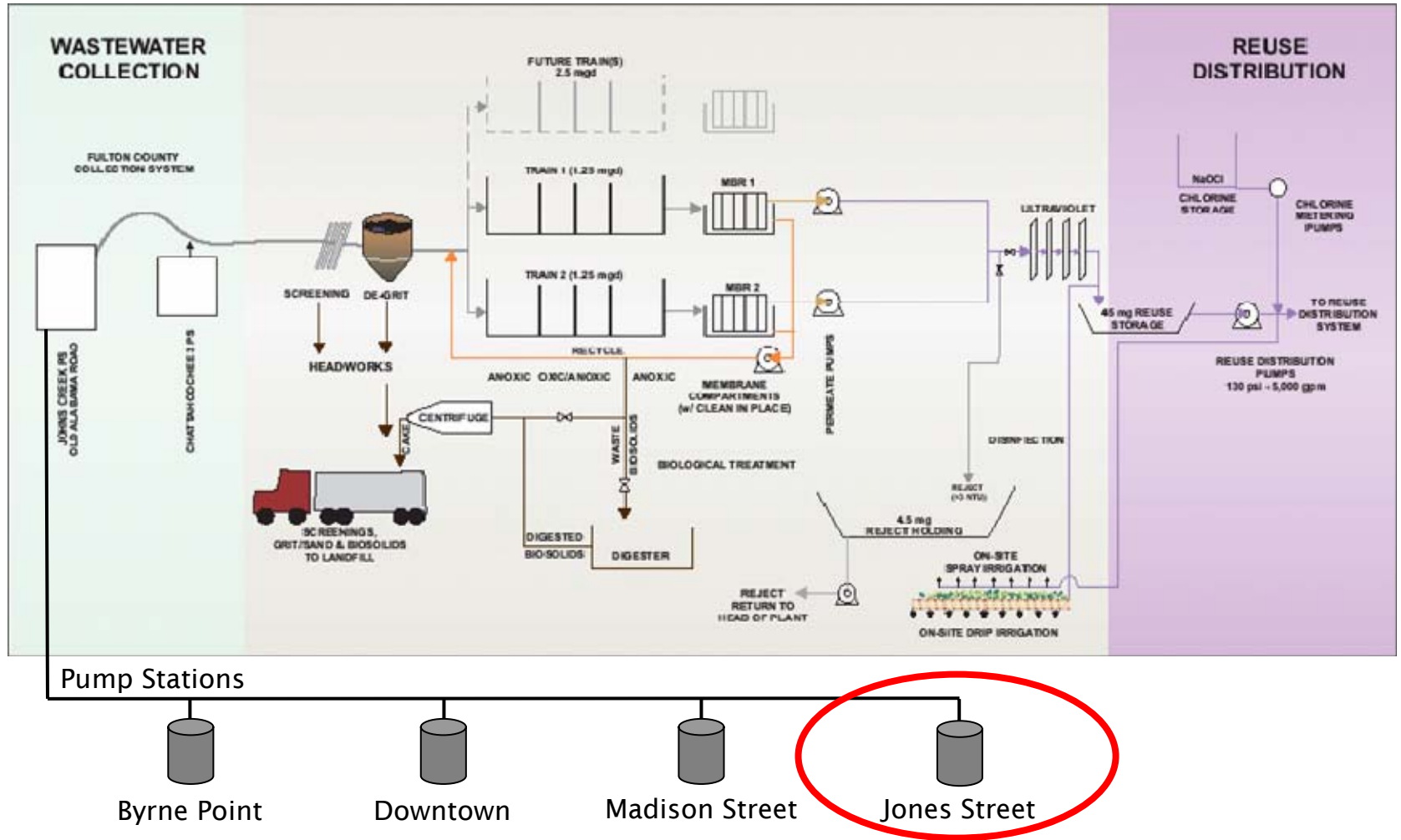
AM plan 10-step process



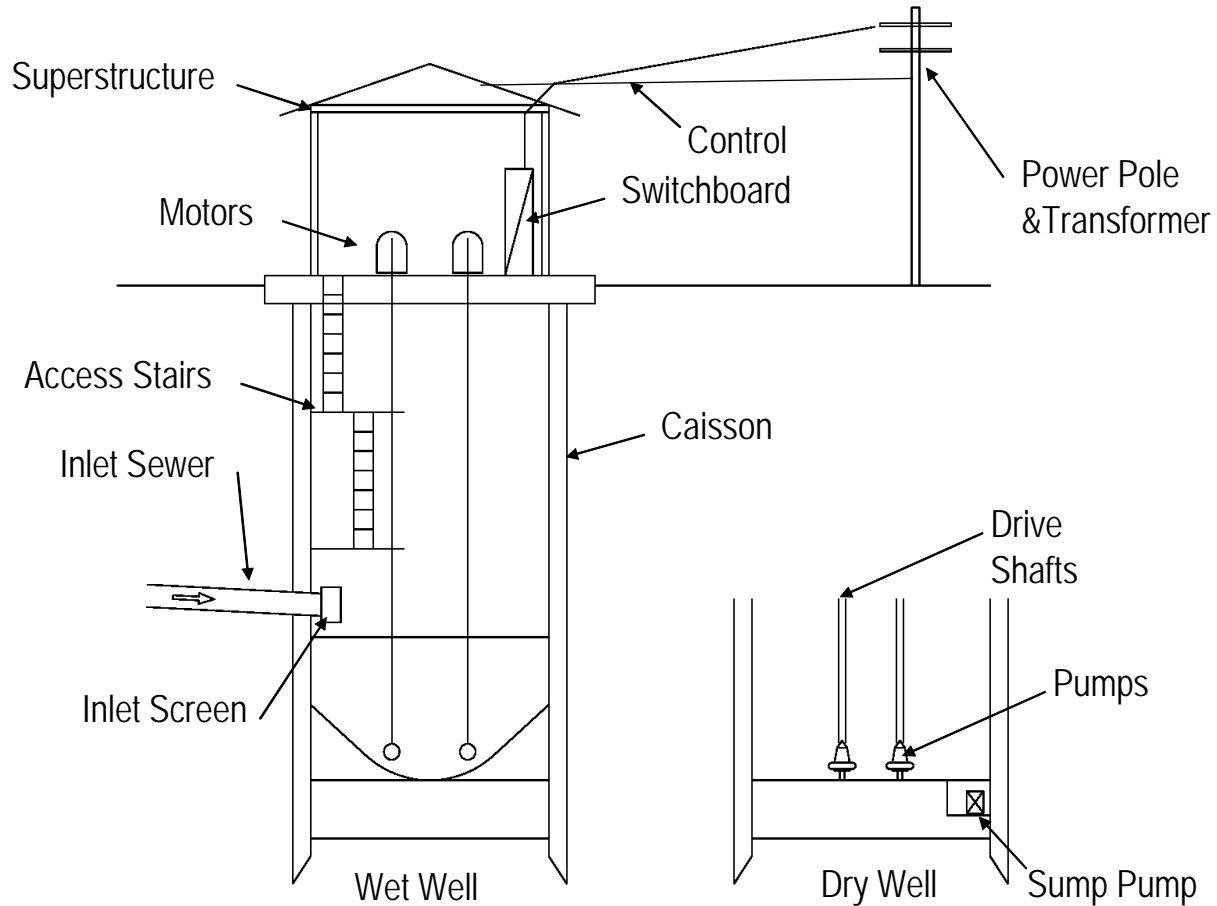
What exactly is an asset?



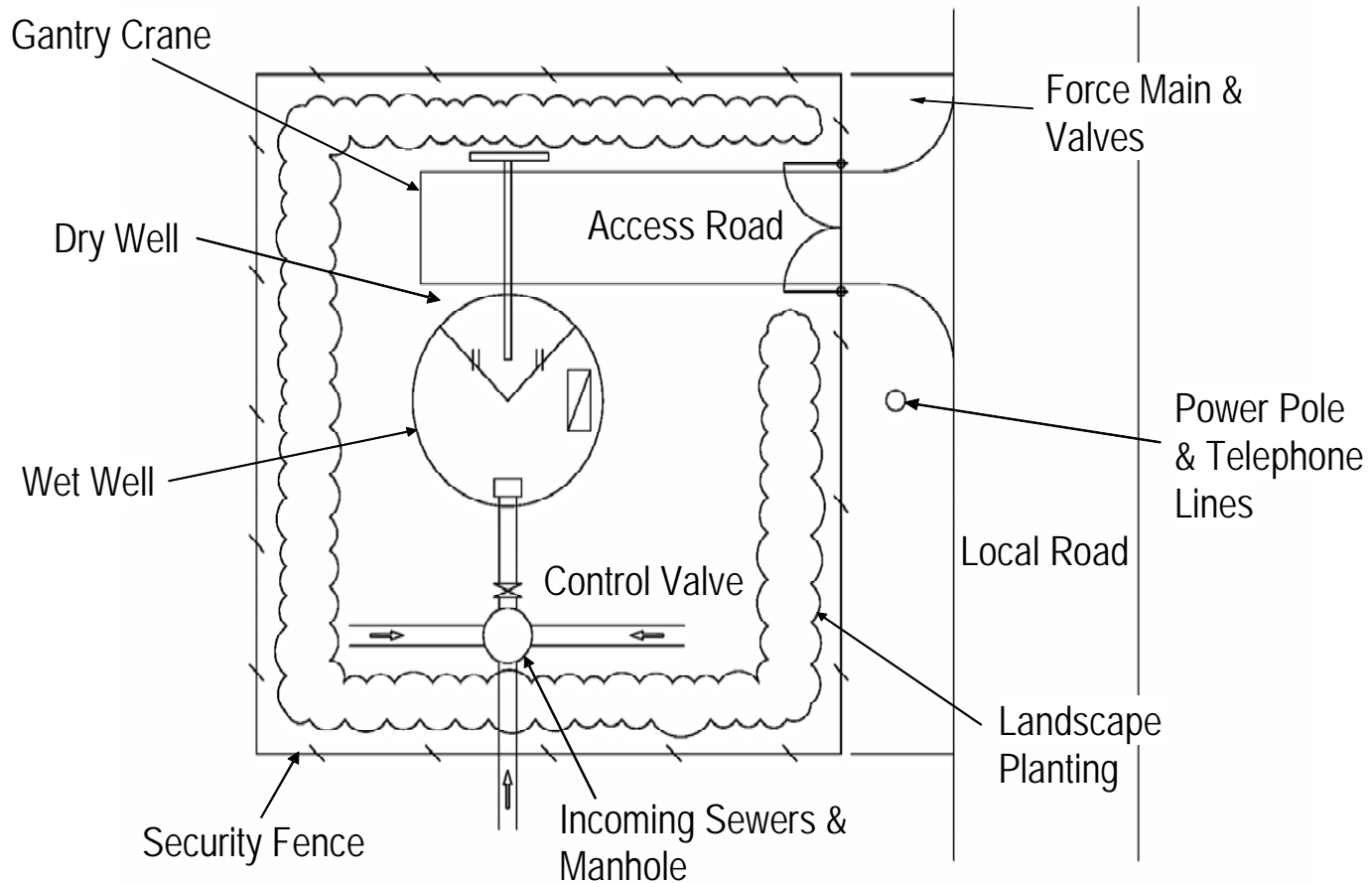
Tom's wastewater collection system layout



Jones Street pump station cross-section view



Jones Street pump station “aerial” view

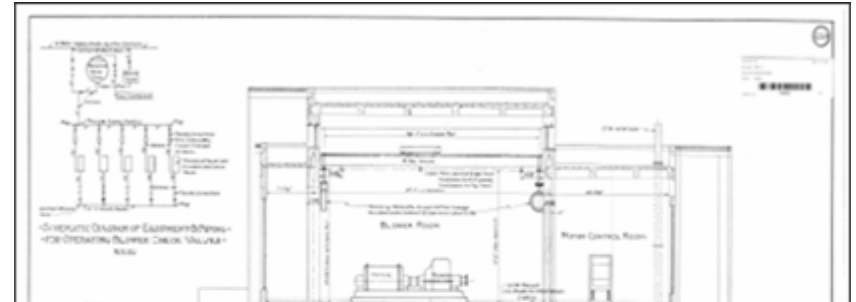


What is an asset register?

- *Systematic recording* of all assets an organization owns or for which it has responsibility
- Uses *asset identification numbers* to which attribute information can be linked

Sources of data

- As-built drawings
- Design drawings
- Manufacturers' manuals
- Bid documents
- Schedules of quantities
- Staff—current and previous
- Photos and videos

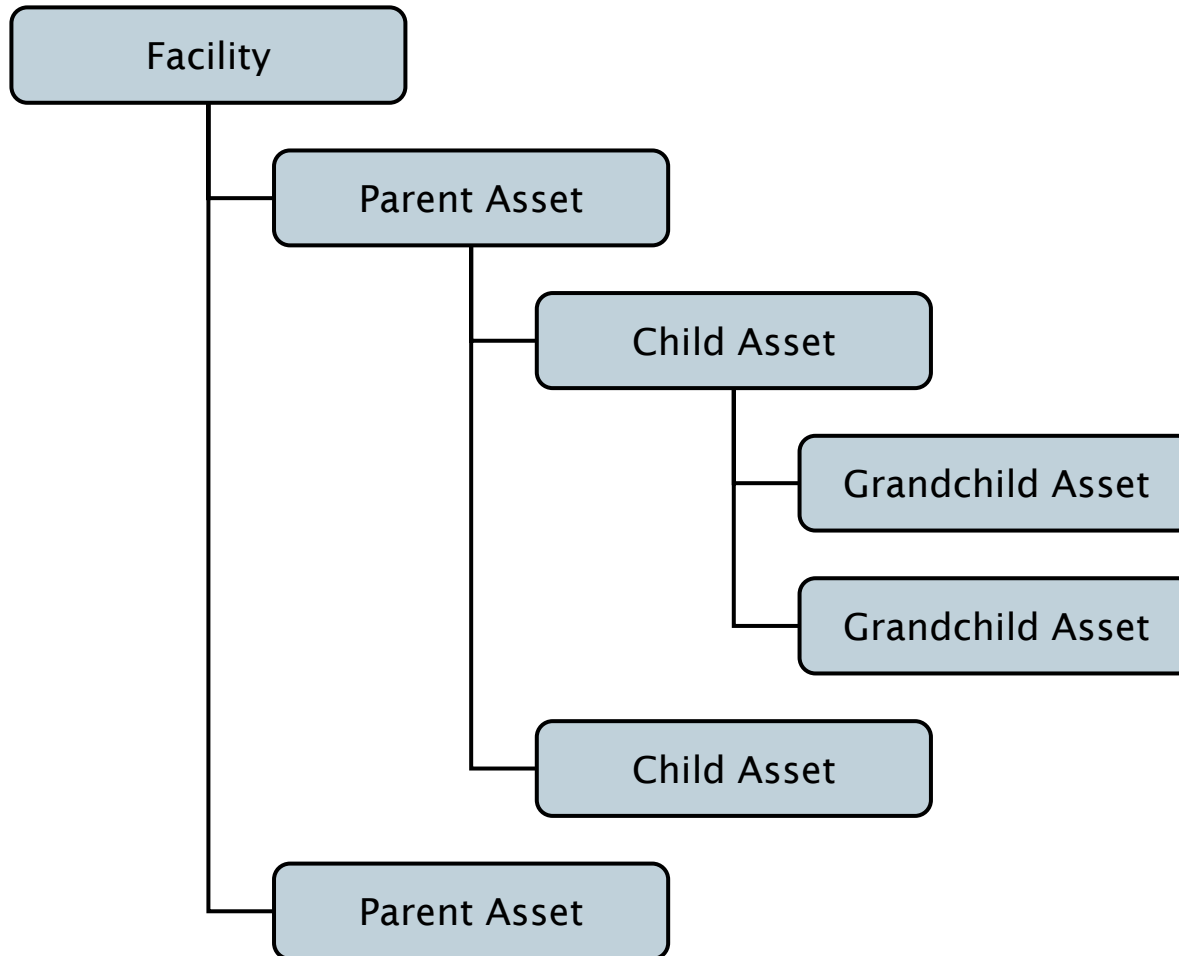


Types of asset registers

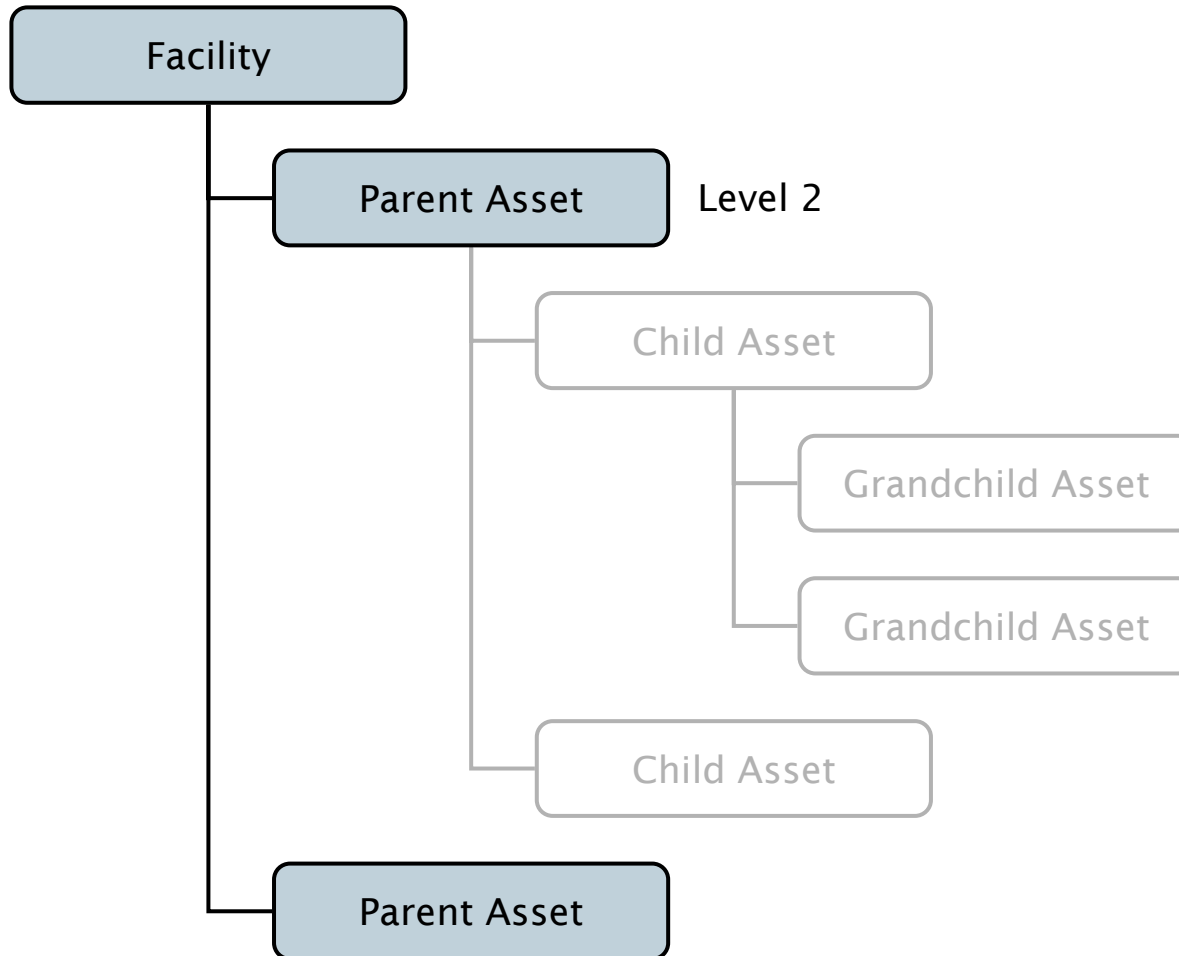
- Hierarchical—parent, child
- Category-based
- Process loops
- Spatial relationships—GPS-generated
- Business unit responsibilities
- Service provisions

GPS is global positioning system

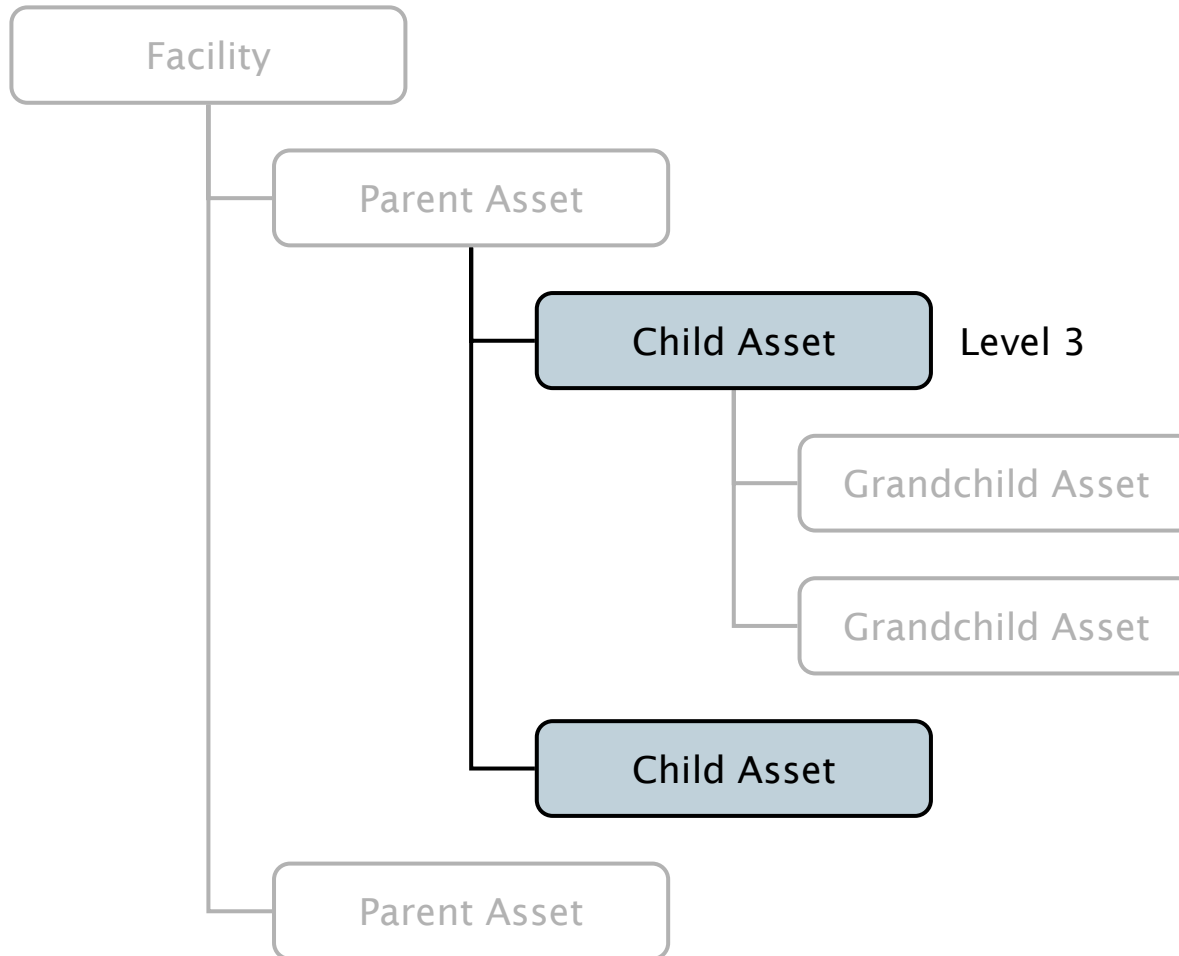
Asset hierarchy



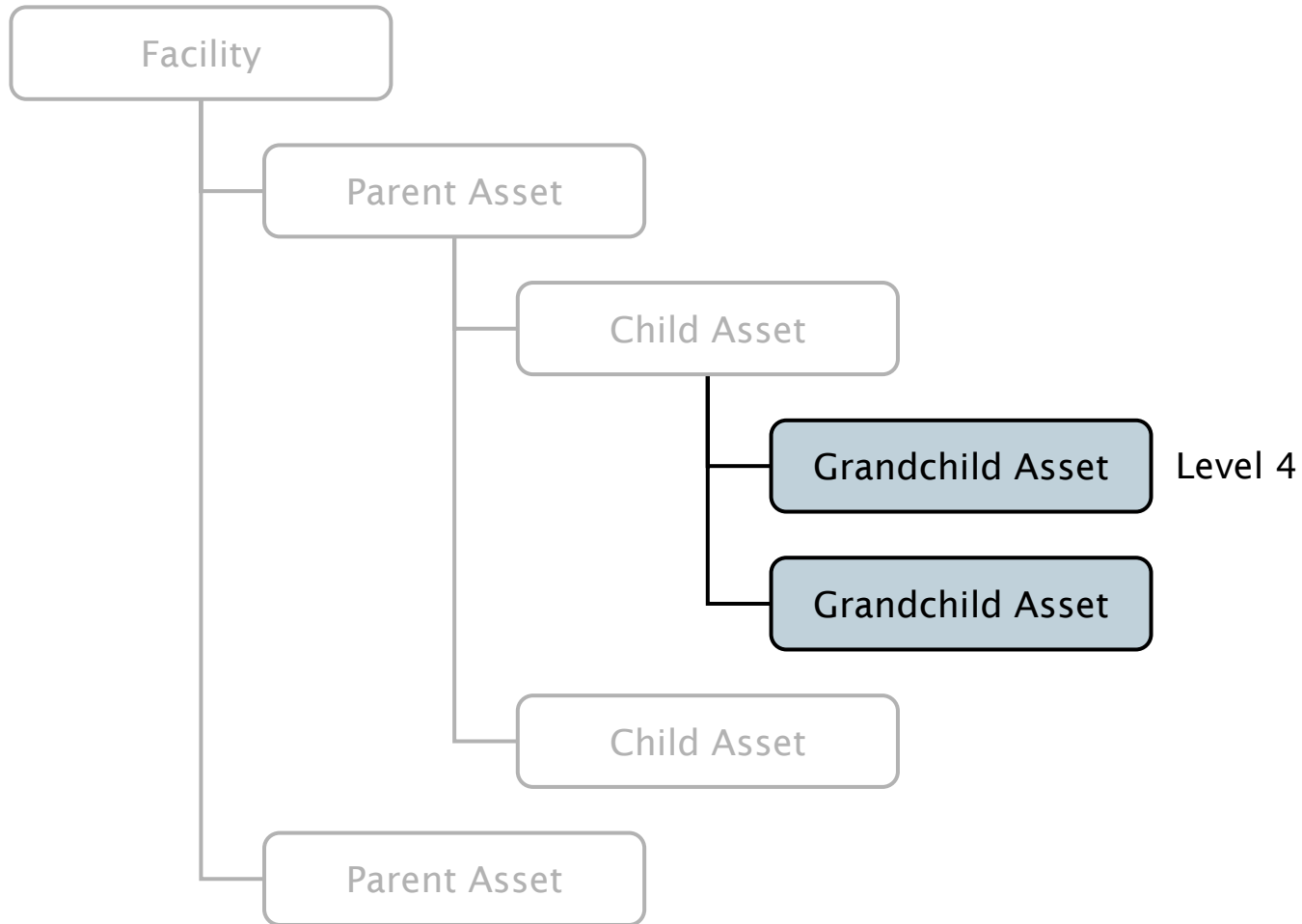
Asset hierarchy, levels 1 and 2



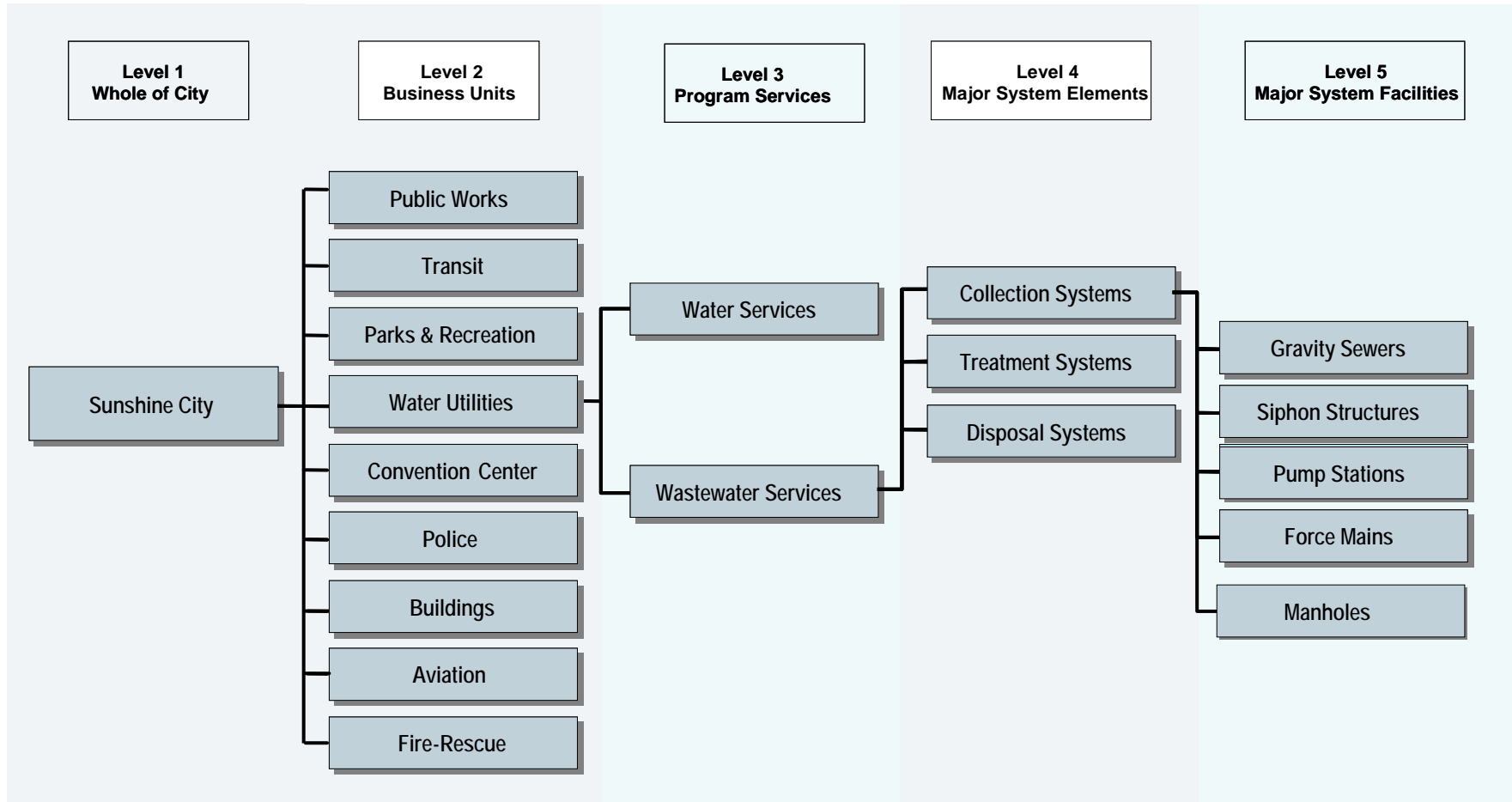
Asset hierarchy, level 3



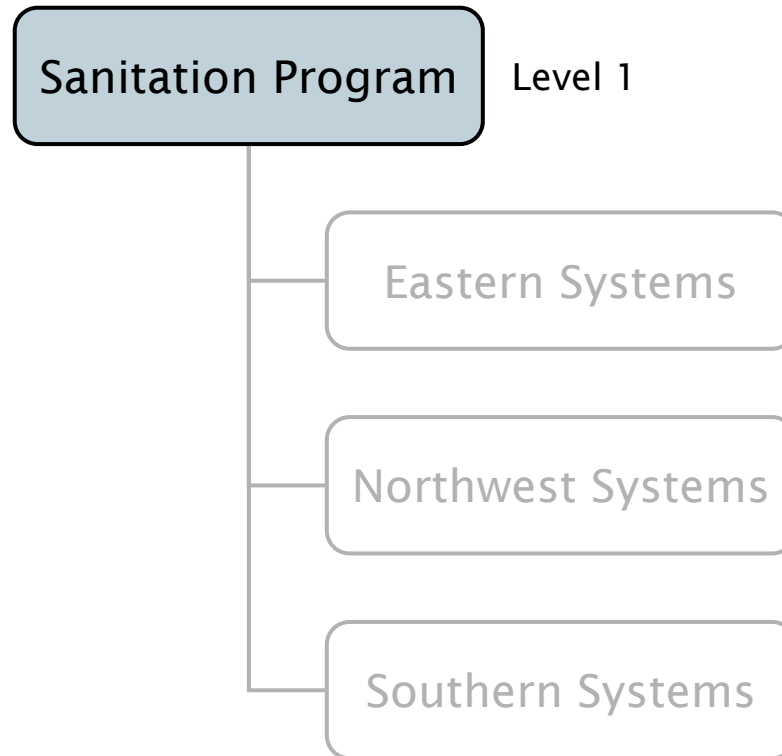
Asset hierarchy, level 4



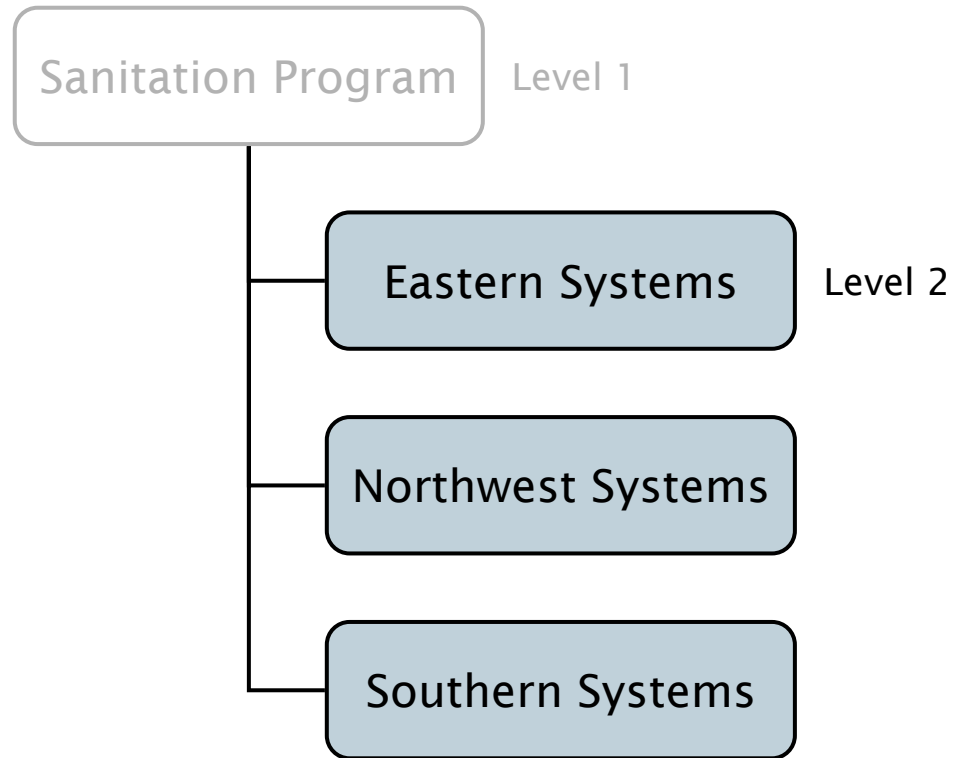
“Whole of government” asset hierarchy



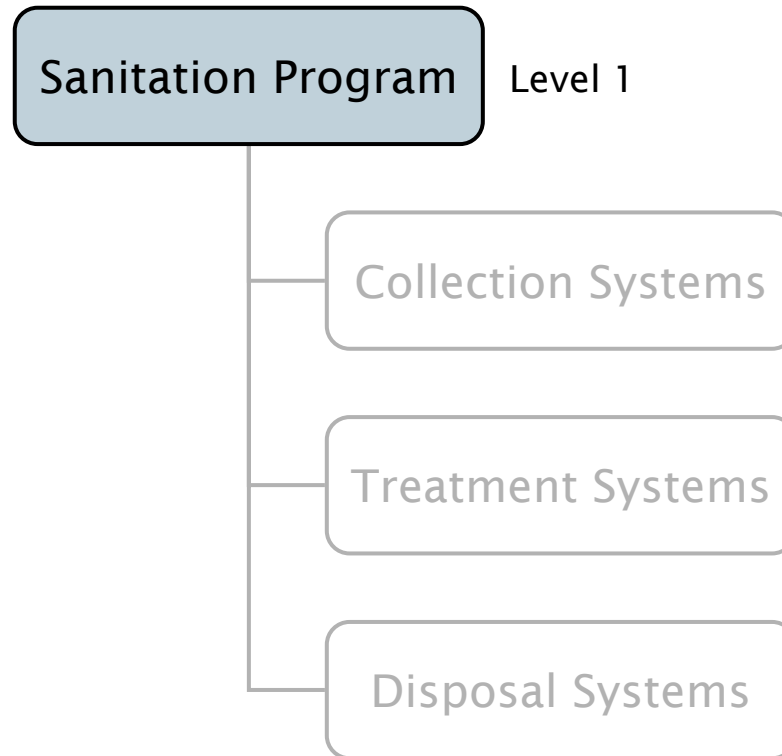
Asset hierarchy example, levels 1 and 2



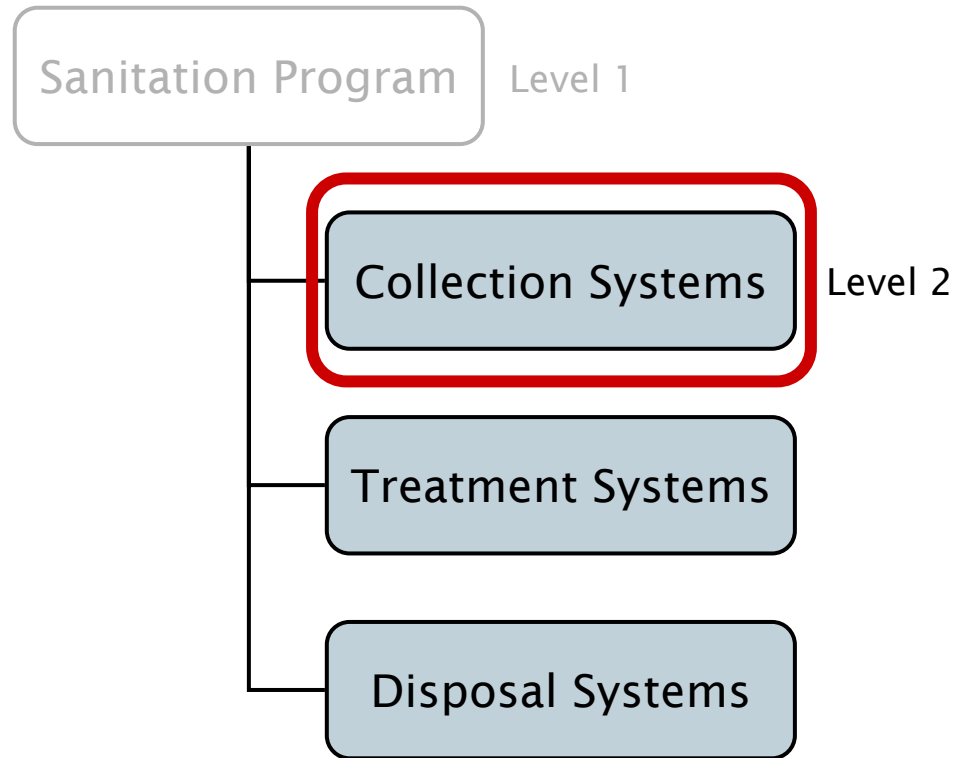
Asset hierarchy example, levels 1 and 2



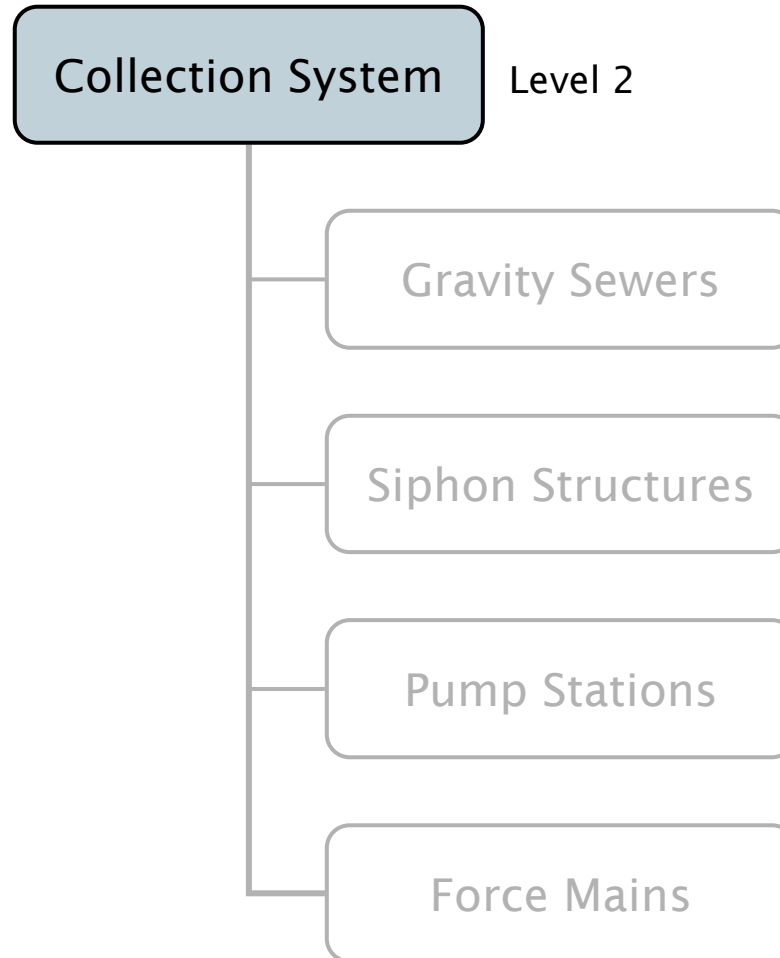
Asset hierarchy example, levels 1 and 2



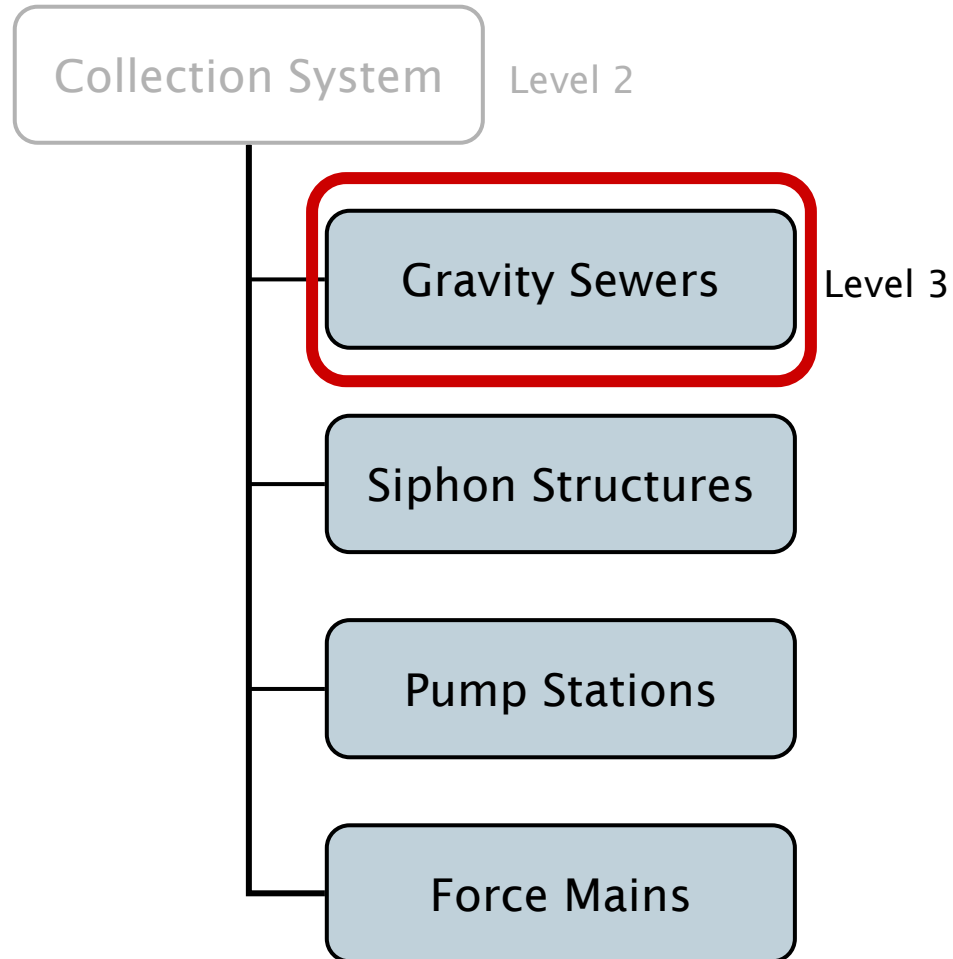
Asset hierarchy example, levels 1 and 2



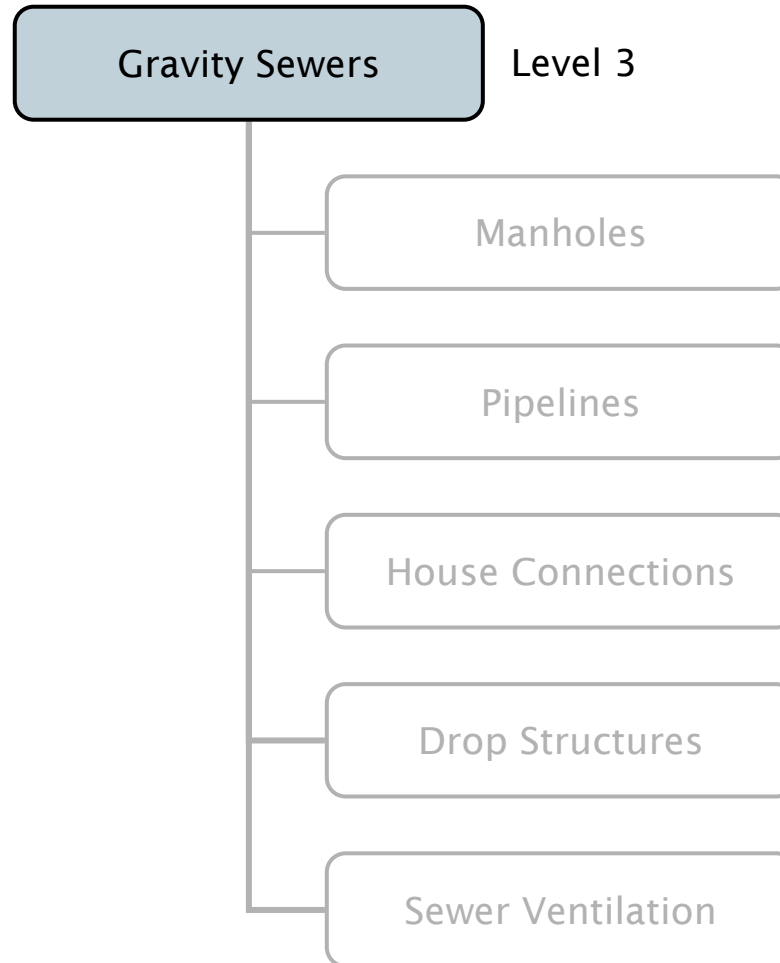
Asset hierarchy example, levels 2 and 3



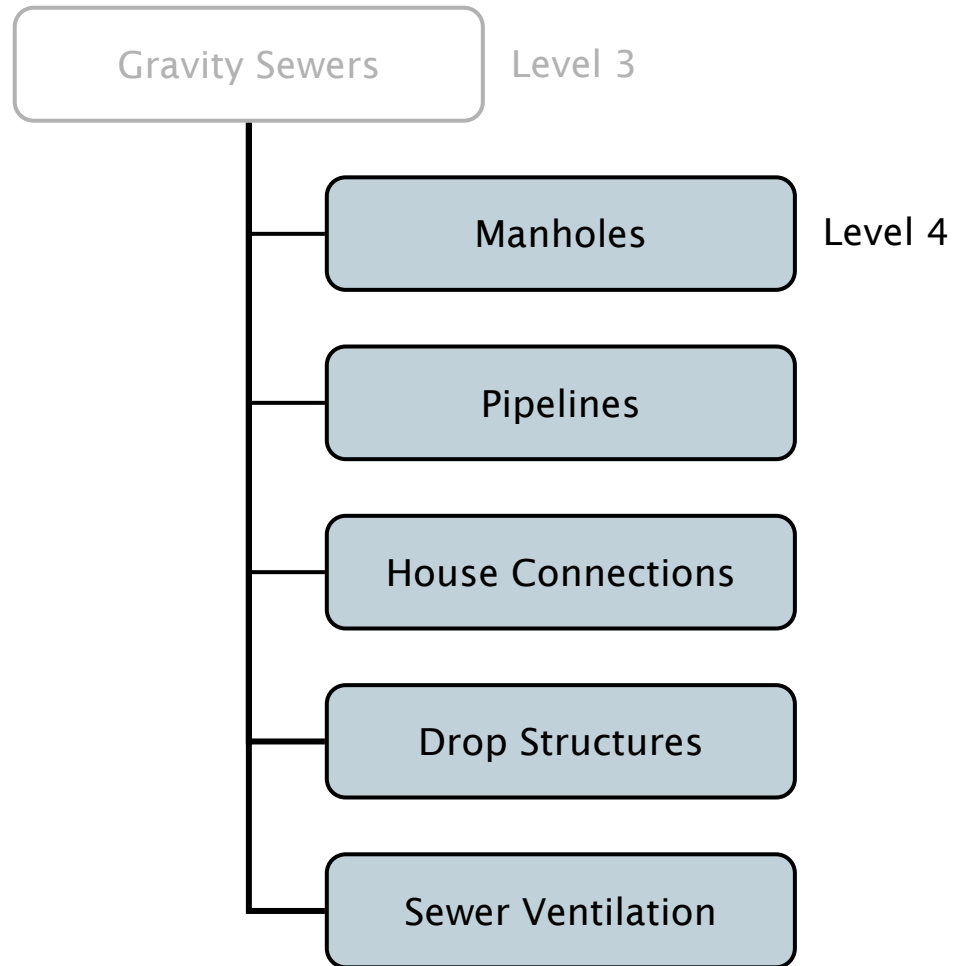
Asset hierarchy example, levels 2 and 3



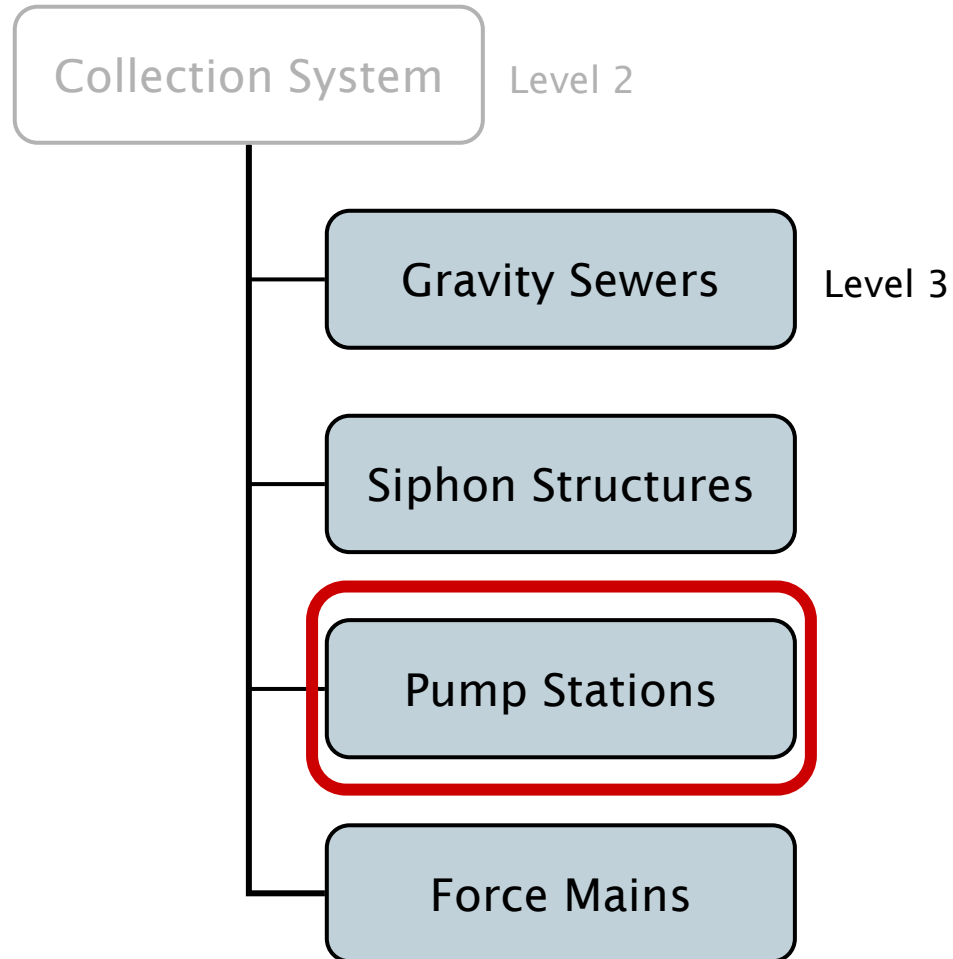
Asset hierarchy example, levels 3 and 4



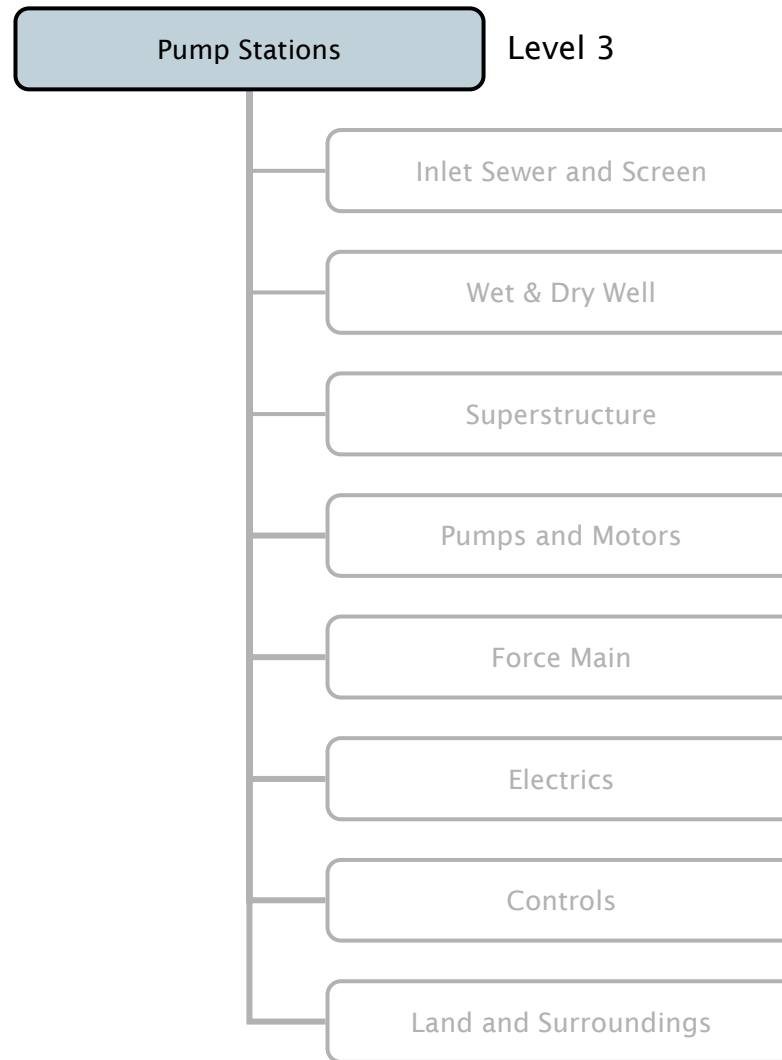
Asset hierarchy example, levels 3 and 4



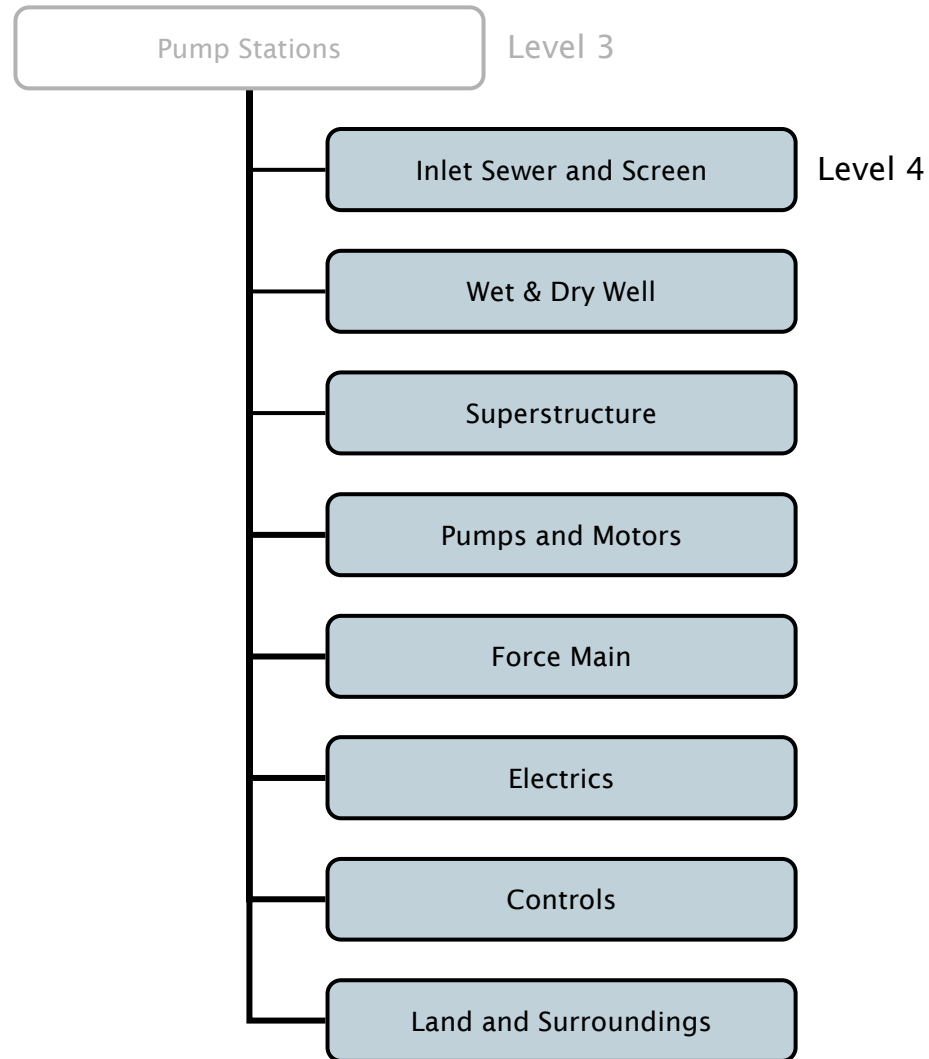
Asset hierarchy example, levels 2 and 3



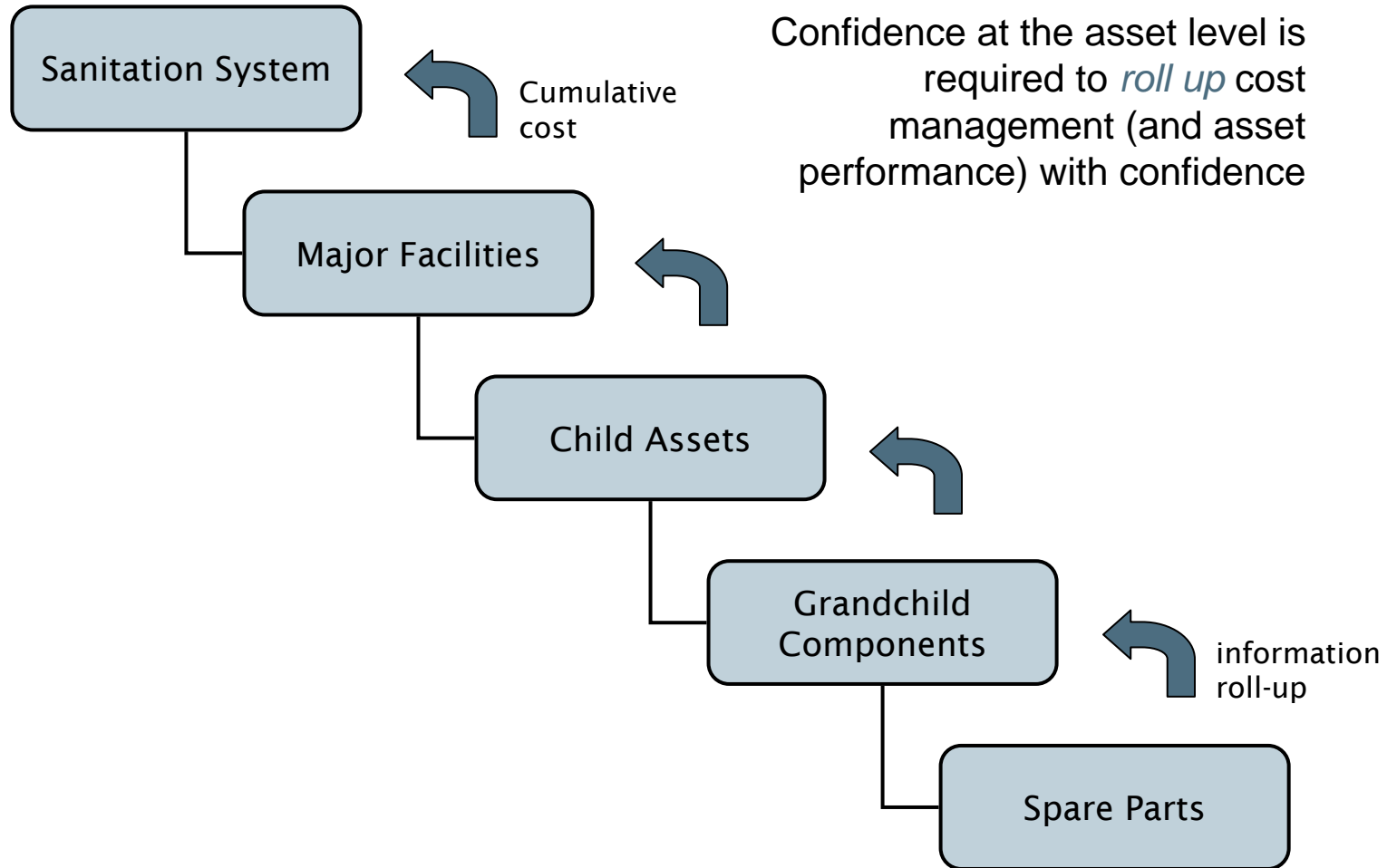
Asset hierarchy example, levels 3 and 4



Asset hierarchy example, levels 3 and 4

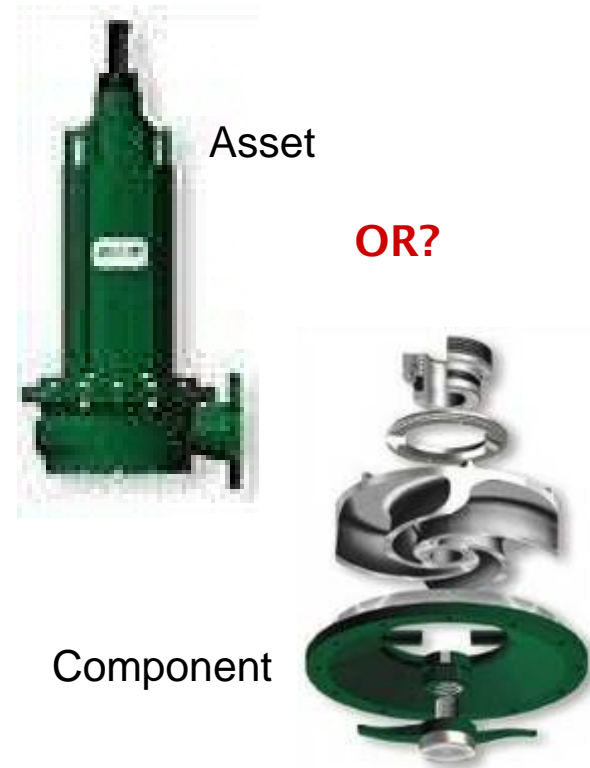


Roll up concept



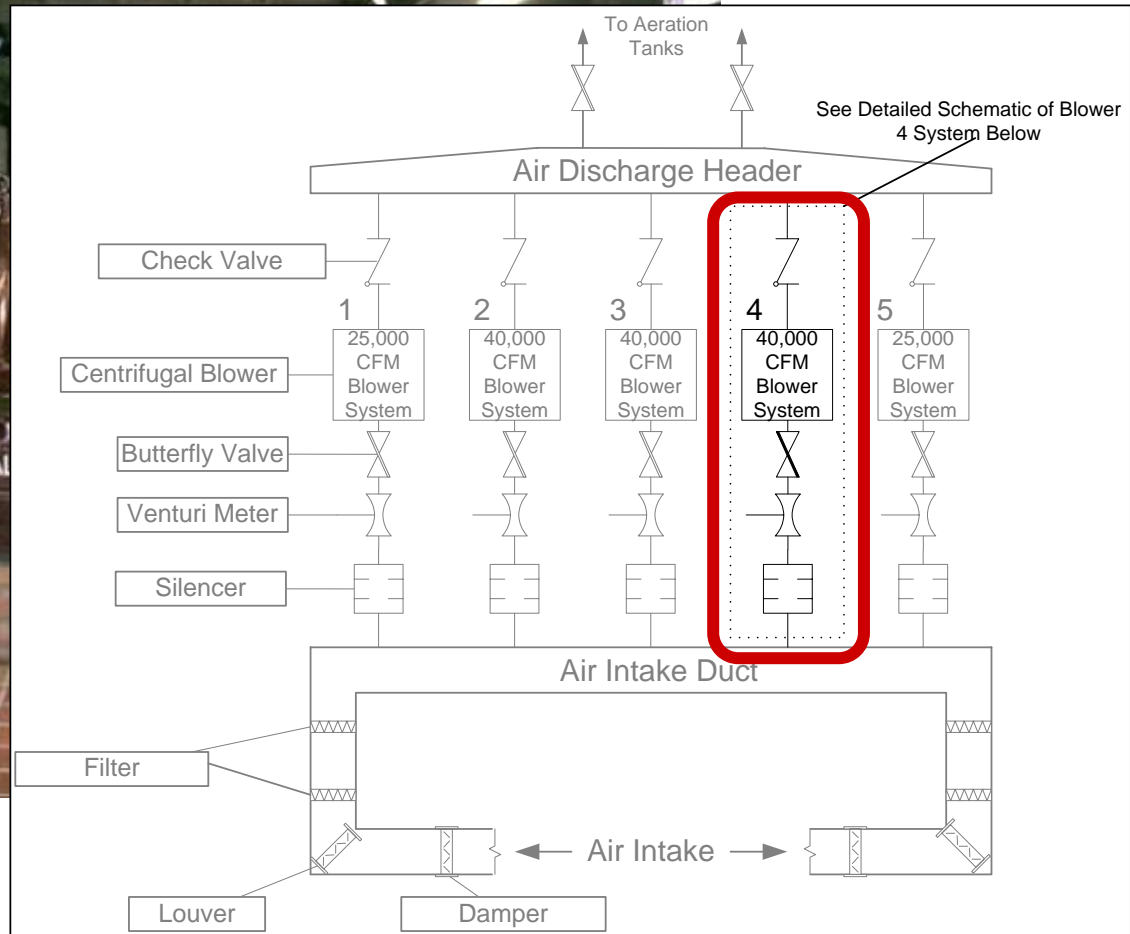
Maintenance managed item

- *Maintenance managed item* (MMI) is an item at the lowest level—*the smallest subdivision*—of an asset registry composed as a nested hierarchy
- Typically, it is the level at which an asset is *maintained* (for example, parts are identified), or *decisions* are made to repair, refurbish, or replace

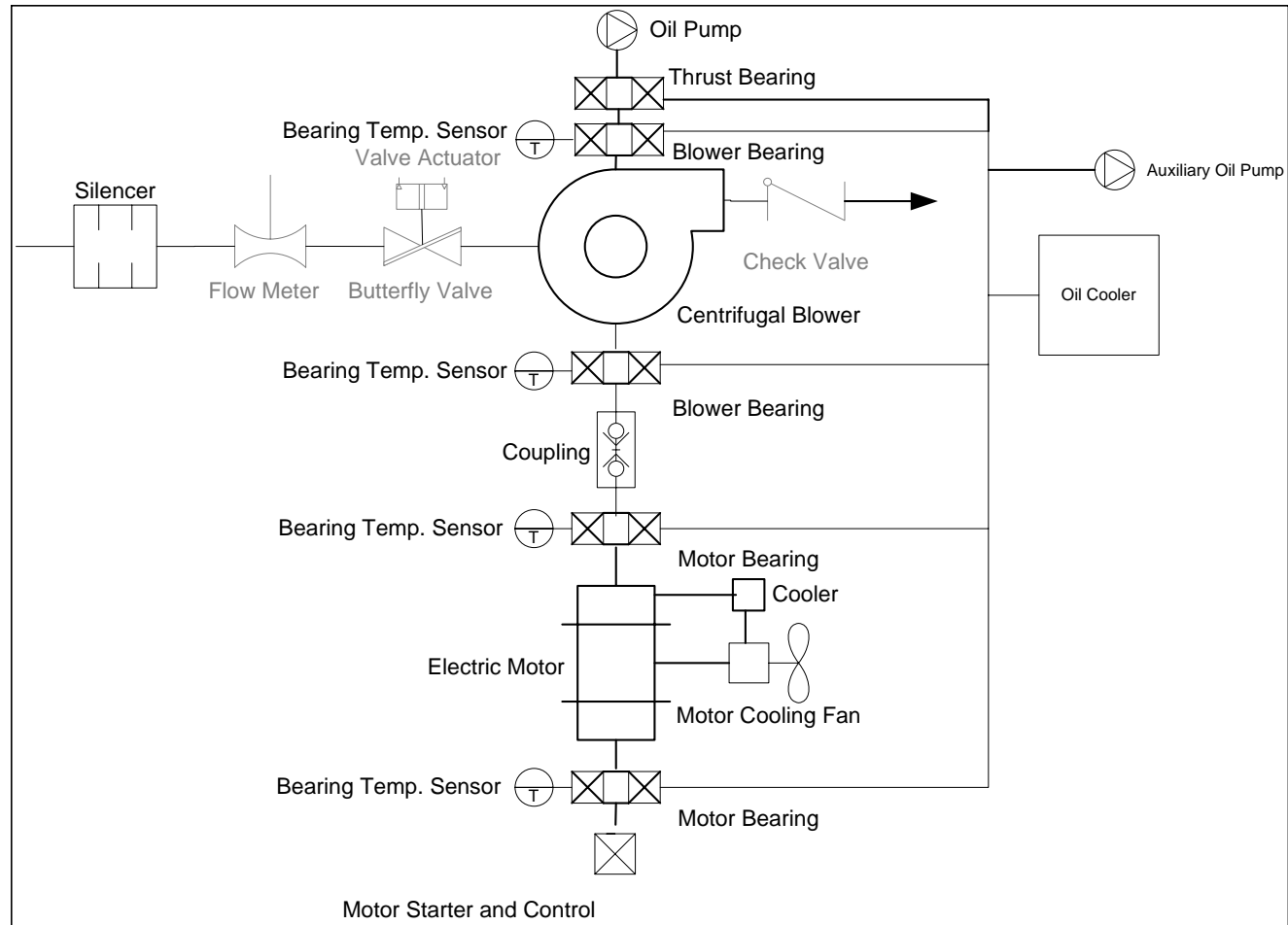


Think “work order”

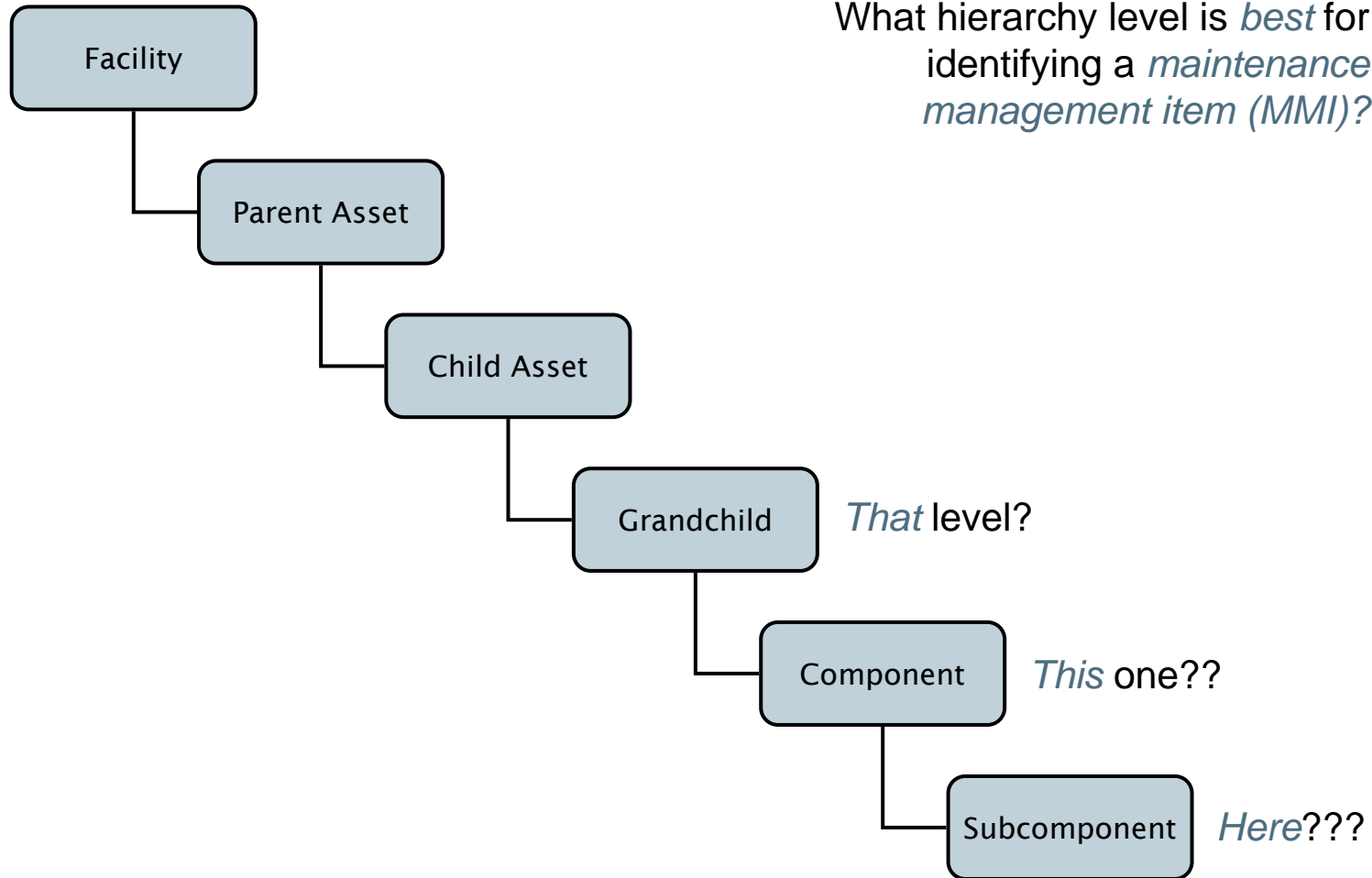
Using process layout with asset registry



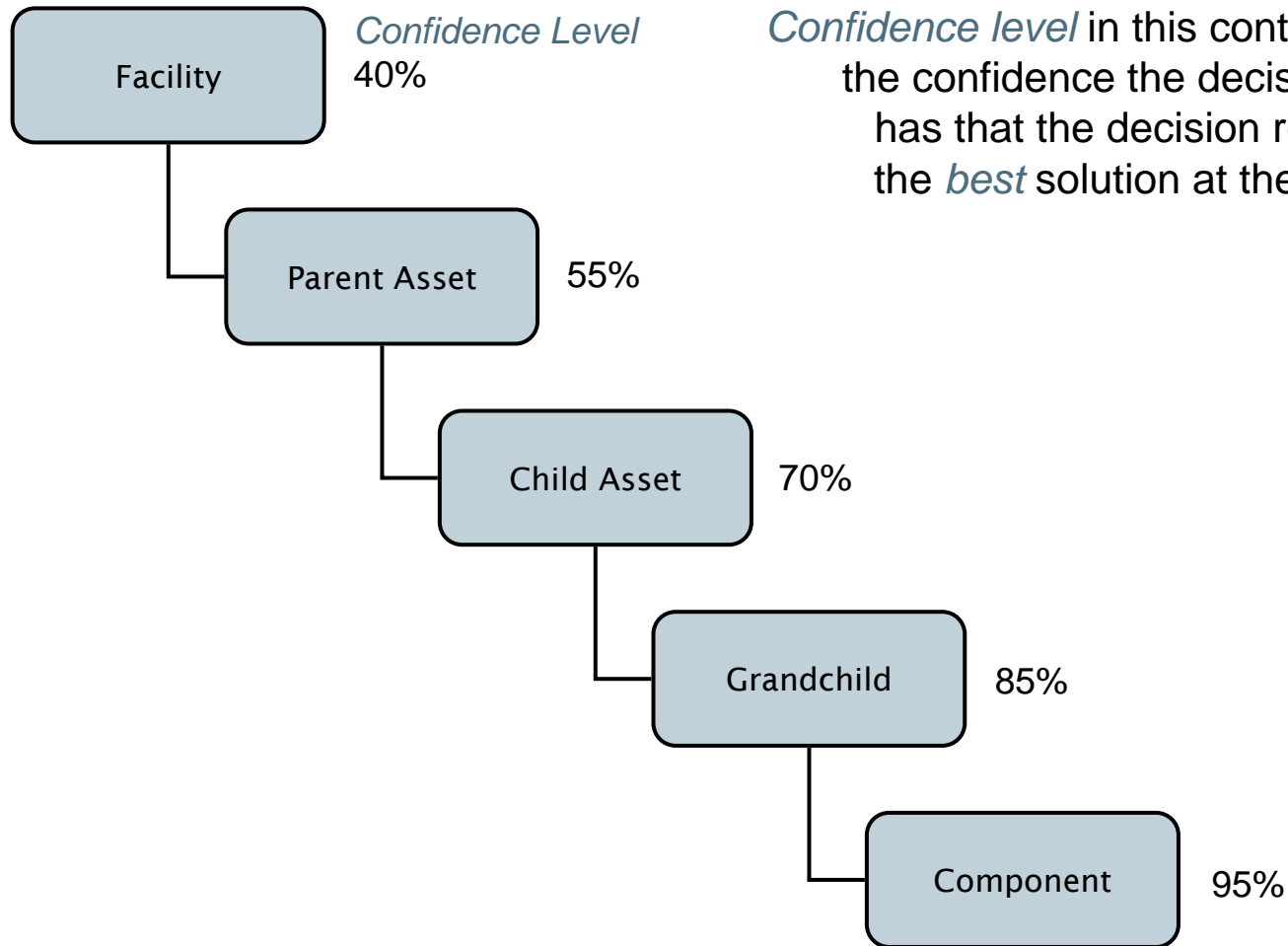
Using process layout with asset registry



Asset hierarchy

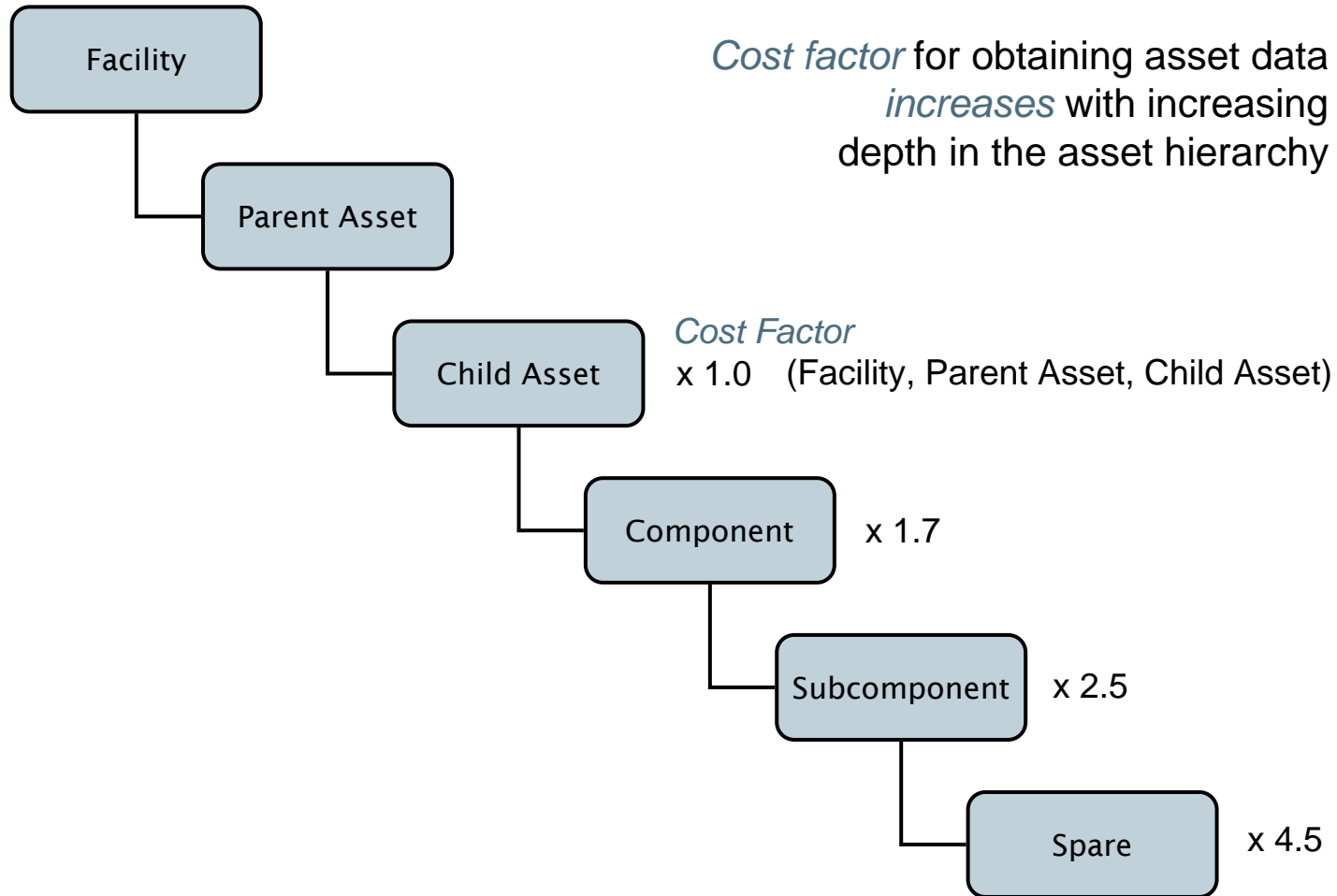


Data confidence levels within asset hierarchy



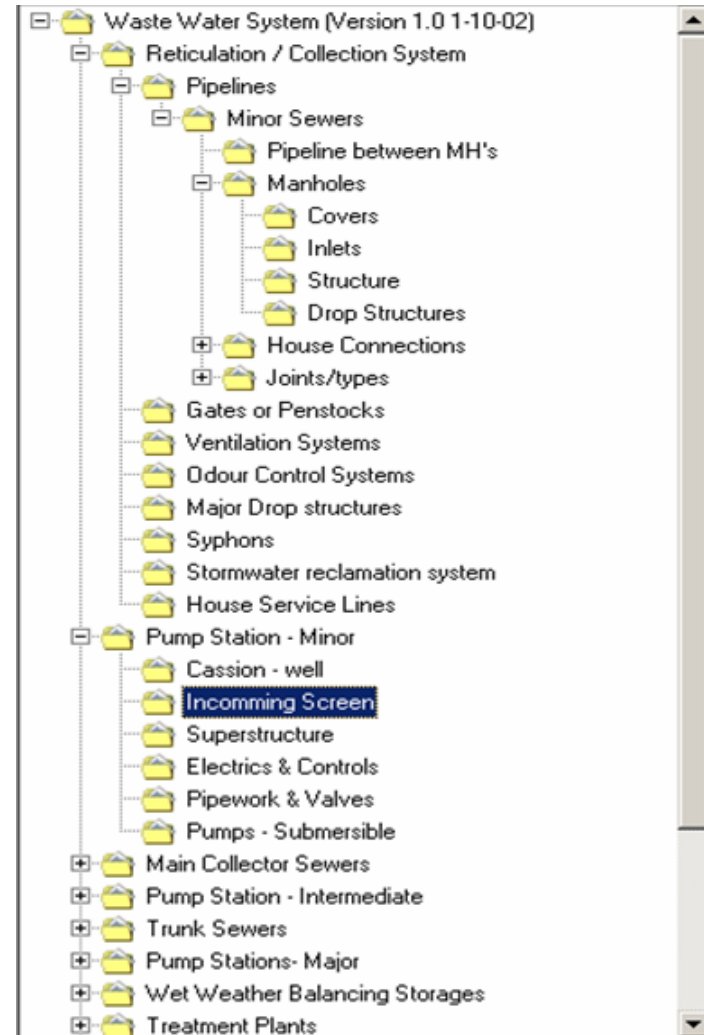
Confidence level in this context means the confidence the decision-maker has that the decision rendered is the *best* solution at the *right* time

Data costs within asset hierarchy



Examples of tree-style asset hierarchy

Asset Hierarchy								
1	2	3	4	5	6	7	8	Level 9 Name
Sanitation System								
	Disposal System							
	Collection System							
	Treatment Plants							
	Westerly Treatment Plant							
	Southerly Treatment Plant							
	Easterly Treatment Plant							
	Aeration System							
	Aeration Facility							
	Building & Services							
	Intake Header							
	Blower Assembly							
	Motor Starter							
	Blower Assembly 1							
	Blower Assembly 1							
	Blower Assembly 1							
	Blower Assembly 4							
	Rear motor bearing							
	Rear bearing temp sensor							
	Oil lube/cooling system							
	Oil pump							
	Circulation tubing							
	Oil sensor							
	Motor Cooling System							
	Cooling Water Pumps							
	Electric Motor for Cooling System							
	Piping and valves							
	Electric motor							
	Front motor bearing							
	Front bearing temp sensor							
	Coupling							
	Rear blower bearing							
	Rear bearing temp sensor							
	Centrifugal blower							
	Housing							
	Main shaft							
	Impeller							
	Seals							
	Front bearing temp sensor							
	Front blower bearing							
	Discharge check valve							
	Inlet butterfly valve							
	Silencer							
	Flow Meter							
	Thrust Bearing							
	Blower Assembly 5							
	Discharge Header							
	Aeration Tanks							



Data standard

Written record:

- Asset identification naming convention
- Attributes
- Record layouts
- Database architecture and protocols
- Data collection protocols

Asset ID naming convention issues

- What is an asset? (What gets a unique ID?)
- Linear (pipe) vs. vertical (plant) assets
 - Geo-reference
 - CAD versus GIS
- Active vs. passive
 - Lock-out/tag-out
 - Asset ID vs. asset location for mobile assets

CAD is computer-aided design, GIS is geographic information system

Data collection strategy

ATTRIBUTE	SOURCE	LEVEL	USE
Asset List	SPL / Drawings	Asset	All
Asset Hierarchical	SPL / Drawings	Asset	All
Asset ID / Number	SPL / Data Standard	Asset	All
Asset Status	Field Inspection, Staff Interviews	Asset	All
Asset Type	SPL / Data Standard	Asset	See Level Column
Installation Date	Drawings / Staff Interviews	Asset	Renewal Timing
Last Rehab Date	Staff Interviews	Asset	Renewal Timing
Size	Drawings / Field Inspection	Asset	CoF, Valuation
Size Unit	Drawings / Field Inspection	Asset	CoF, Valuation
Length	Drawings / Field Inspection	Asset	CoF, Valuation
Length Unit	Drawings / Field Inspection	Asset	CoF, Valuation
Capacity	Drawings / Field Inspection	Asset	CoF, Valuation
Capacity Unit	Drawings / Field Inspection	Asset	CoF, Valuation
Condition	Inspection, Staff Interviews	Asset	Renew Timing, PoF

■
■
■
Etc.

Major components of asset data

Tied to the *asset ID*...

- Physical attributes
- Geo-reference
- O&M manuals
- Drawings and photos
- Life cycle costs
- Knowledge and strategy

ATTRIBUTE	SOURCE	LEVEL	USE
Asset List	SPL / Drawings	Asset	All
Asset Hierarchical	SPL / Drawings	Asset	All
Asset ID / Num			All
Asset Status			All
Asset Type			See Level Column
Installation Date			Renewal Timing
Last Rehab Da			Renewal Timing
Size			OF, Valuation
Size Unit			OF, Valuation
Length			EM, Valuation
Length Unit			on
Capacity			
Capacity Unit			
Condition			

Primary Cost Unit	Minor code	Number of Units	\$/Unit	Allocated Cost
Direct Labor				
	Direct Pay	2.5 hours	\$42.00	\$105.00
	Overhead			
	Benefit Burden			
	FICA, etc			
Materials				
	Vehicle			
	Pipe			

The screenshot shows a software interface for a wastewater treatment plant. The tree view on the left includes:

- WASTEWATER COLLECTION
- WASTEWATER TREATMENT PLANT
- WASTEWATER DISTRIBUTION
- WASTEWATER STORAGE
- WASTEWATER TREATMENT PLANT
- WASTEWATER DISTRIBUTION
- WASTEWATER STORAGE
- WASTEWATER TREATMENT PLANT
- WASTEWATER DISTRIBUTION
- WASTEWATER STORAGE

 A red circle highlights a specific component in the tree view, likely related to the 'WASTEWATER TREATMENT PLANT' section.

Two approaches to generating registry data

*What we already have—
retrospective*

- *Critical first*
- Use existing crews as they respond to Work Orders
- Use engineering students

*What we are about to
acquire—prospective*

- Tie to commissioning or handover process
- Use contract details to retain control

Recording data—new technology



Ricoh Caplio Pro G3

Data responsibilities

<i>Data Task</i>	<i>Organization Group</i>
Asset details	Operations
Condition assessment	Maintenance
Asset values	Engineering
Residual physical lives	Engineering
Probability of failure	Maintenance
Consequence of failure	Engineering
Business risk exposure	Engineering
Optimal renewal strategy	Maintenance or Engineering

Key points from this session

What do I own and where is it?

Key Points:

- We have to know what we have before we can manage appropriately what residual life is left.
- Everything in AM starts with the Asset Registry.
- The “data standard” is the key building block for AM asset registries.

Associated Techniques:

- Asset registry/inventory
- Data standards, asset hierarchy
- System maps
- Delphi approach to locating other sources of data
- Process diagrams
- “Handover” procedures

Tom's spreadsheet

Microsoft Excel - EPA Seminar Master.xls

File Edit View Insert Format Tools Data Window Help Adobe PDF

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Asset Register and Hierarchy					What is the State of My Assets?			Required LOS?		Which Are Most "Critical"?		
Installed Date	Asset Class	Original Cost	Estimated Effective Life	Condition Rating	Annual Dep	Accum Dep	Current LOS?	Minimum Condition	Backup Reduction (Redundancy)	Probability of Failure	Consequence of Failure	
Year		\$	Years	1 to 10	\$	\$			%	Rating	1 to 10	
Act or Est	Tab A	Act or Est	Calculated	Tab A	Calculated	Calculated		Tab A	Tab D	Calculated	Tab C	
10	Sanitation System											
11	Disposal System											
12	Treatment Plants											
13	Collection Systems											
14	Sewer Mains											
15	Pump Station											
16	Incoming Sewer											
17	Pipes	1963	3	\$ 1,725	100	6	\$ 17	\$ 742				
18	Manhole	1963	3	\$ 340	100	5	\$ 3	\$ 146				
19	Influent Gate Valve	1986	5	\$ 442	30	8	\$ 15	\$ 235				
20	Incoming Power											
21	Pole & Transformer	2006	4	\$ -	40	1	\$ -	\$ -				
22	Connection	2006	7	\$ -	35	1	\$ -	\$ -				
23	Control system											
24	Incoming Telephone	1985	8	\$ 85	25	7	\$ 3	\$ 71				
25	PLC	1983	8	\$ 8,600	25	8	\$ 344	\$ 7,912				
26	Manual controls	1978	8	\$ 425	25	7	\$ 17	\$ 476				
27	Land & Improvements											
28	Land	1950	10	\$ 630	300	1	\$ 2	\$ 118				
29	Access Road	1963	1	\$ 12,500	75	5	\$ 167	\$ 7,167				
30	Landscaping	2000	1	\$ 595	75	6	\$ 8	\$ 48				
31	Security fence	1963	1	\$ 1,360	75	7	\$ 18	\$ 780				
32	Sub Structure											
33	Cassion Outer	1963	1	\$ 30,600	75	6	\$ 408	\$ 17,544				
34	Upper Floor	1963	1	\$ 4,250	75	6	\$ 57	\$ 2,437				
35	Dry well	1963	1	\$ 6,800	75	6	\$ 91	\$ 3,899				
36	Landings and Stairs	1963	9	\$ 4,250	60	7	\$ 71	\$ 3,046				
37	Wet Well	1963	1	\$ 5,100	75	6	\$ 68	\$ 2,924				
38	Shaped floor	1963	1	\$ 850	75	6	\$ 11	\$ 487				
39	Sump pump	1963	4	\$ 895	40	6	\$ 15	\$ 640				
40	Pumps											
41	Drive shafts	2006	6	\$ 12,560	35	1	\$ 359	\$ -				
42	Pumps	2006	4	\$ 29,750	40	1	\$ 744	\$ -				

Ready

start Modules 2 Duncan Rose - Inbox ... Webpage has expire...

EPA 0 Overview.ppt Day 1.EPA.Revised.ppt Microsoft Excel - EPA ...

10:43 AM Tuesday 4/10/2007