

Reference Guide For Asset Management Inventory and Risk Analysis (Drinking Water)



Prepared by the Southwest Environmental Finance Center

Document's Intended Use: This document provides suggestions on the type of information to be collected, by asset category, when completing an asset inventory. For each asset category, following the inventory table, there is a table providing suggestions for where the data may be found. Following the Data Locations information is a table for factors that could be considered when defining what impacts Probability of Failure and Consequence of Failure when determining an asset's criticality (or risk). The lists provided are not intended to be all inclusive nor do they purposefully exclude any items. Certainly, you will come up with other things that are important to your utility. This guide is intended to help you get started.

Hydrants (Fire, Flush, Flow Test)

Inventory	
Necessary Data	Optional Data
<ul style="list-style-type: none"> <input type="checkbox"/> Asset size - diameter and/or flow rate <input type="checkbox"/> Asset location <input type="checkbox"/> Installation date <input type="checkbox"/> Condition - Visible inspection, then update as needed with Maintenance history, age <input type="checkbox"/> Useful life (varies with type, if unknown an estimate is 50 years) <input type="checkbox"/> Replacement Cost 	<ul style="list-style-type: none"> <input type="checkbox"/> Redundancy – is another hydrant accessible? <input type="checkbox"/> Model number <input type="checkbox"/> Supplier name & phone <input type="checkbox"/> Under warranty <input type="checkbox"/> Warranty expiration date <input type="checkbox"/> Manufacturer <input type="checkbox"/> Manufacturer’s recommended O&M <input type="checkbox"/> Maintenance records: last date hydrant was flushed or exercised <input type="checkbox"/> Operational <input type="checkbox"/> Color (if useful) <input type="checkbox"/> Were design specifications followed? <input type="checkbox"/> Asset use

Inventory Data Locations	
<ul style="list-style-type: none"> • Aerial photographs • As-built record drawings • Existing utility maps • Visible inspection • Repair, maintenance and inspection records • Purchase records • O&M Manual 	<ul style="list-style-type: none"> • Interview current and former operators • Site visit • Photographs • Contact contractors or engineers familiar with the system

Note: Data may not be available for all sources- record what is available

Risk Assessments	
Factors Affecting Probability of Failure	Factors Affecting Consequence of Failure
<ul style="list-style-type: none"> • Age • Condition - rusting, corrosion, leaking seal? • Frequency of use - is it opened at least annually as part of a flushing or testing program? • Routine maintenance completed? • Pipe size connected to - less than 6 inch may cavitate • Tools needed to open readily available to fire department and water department? 	<ul style="list-style-type: none"> • Inability to fight a fire - loss of property, loss of life • Inability to properly flush system - health concerns • Water damage to nearby structures • Level of service failures

Meters

(Commercial, Master, Residential, Source, Well)

Inventory	
Necessary Data	Optional Data
<ul style="list-style-type: none"> <input type="checkbox"/> Asset size - diameter and/or flow rate <input type="checkbox"/> Asset location <input type="checkbox"/> Installation date <input type="checkbox"/> Condition - Visible inspection, then update as needed with gallons flowed, Maintenance history, age <input type="checkbox"/> Useful life (varies with type, if unknown an estimate is 15 years) <input type="checkbox"/> Replacement Cost 	<ul style="list-style-type: none"> <input type="checkbox"/> Redundancy - are spare meters/parts always available for repair/replacement <input type="checkbox"/> Model Number <input type="checkbox"/> Serial Number - if not tied to address in billing or other records <input type="checkbox"/> Manufacturer <input type="checkbox"/> Operational – is the meter operational? <input type="checkbox"/> Supplier Name and Phone <input type="checkbox"/> Under Warranty/Warranty Expiration Date <input type="checkbox"/> Maintenance recorded – primarily for larger commercial and master meters <input type="checkbox"/> Design specifications followed

Inventory Data Locations	
<ul style="list-style-type: none"> • Billing Records • Aerial photographs • As-built record drawings • Existing utility maps • Visible inspection • Repair, maintenance and inspection records • Purchase records 	<ul style="list-style-type: none"> • O&M Manual • Interview current and former operators • Site visit • Photographs • Contact contractors or engineers familiar with the system

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Risk Assessments	
Factors Affecting Probability of Failure	Factors Affecting Consequence of Failure
<ul style="list-style-type: none"> • Properly sized (meter size not always equal to pipe size) • Properly installed (distance to elbows, tees, etc.) • Age • Condition • Clogging issues • Air in lines • Maintenance History 	<ul style="list-style-type: none"> • Impacts to revenue (typically meters fail by under-reading = lost revenue) • Inability to understand water loss • Level of Service Failures • Cost of the failure

Pipe

(Asbestos Concrete, Cast Iron, Concrete, Ductile Iron, Polyvinyl Chloride (PVC), Steel, Transmission Main)

Inventory	
Necessary Data	Optional Data
<ul style="list-style-type: none"> <input type="checkbox"/> Asset size <input type="checkbox"/> Asset location <input type="checkbox"/> Installation date <input type="checkbox"/> Condition – base on break history and age, then update when inspection is possible <input type="checkbox"/> Useful life (varies with type, if unknown an estimate is 50-80 years) <input type="checkbox"/> Replacement Cost 	<ul style="list-style-type: none"> <input type="checkbox"/> Operational - is this pipe in use or valved off? <input type="checkbox"/> Redundancy - can water still reach all customers if this pipe fails? <input type="checkbox"/> Model Number <input type="checkbox"/> Manufacturer <input type="checkbox"/> Supplier Name and Phone <input type="checkbox"/> Under Warranty <input type="checkbox"/> Warranty Expiration Date <input type="checkbox"/> Manufacturer's Recommended Installation and Operation (pressure not exceeding rating) <input type="checkbox"/> Maintenance records - break records <input type="checkbox"/> Design Specifications followed?

Inventory Data Locations	
<ul style="list-style-type: none"> • As-built record drawings • Existing utility maps • Visible inspection – valve locations used to indicate pipe locations • Repair, maintenance and inspection records • Purchase records 	<ul style="list-style-type: none"> • Interview current and former operators • Photographs • Contact contractors or engineers familiar with the system

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Risk Assessments	
Factors Affecting Probability of Failure	Factors Affecting Consequence of Failure
<ul style="list-style-type: none"> • Age • Condition • Bedding • Vibration • Temperature change • Depth of Bury • Soil corrosivity • Electrolysis 	<ul style="list-style-type: none"> • Water Loss • Damage to structures (buildings, pavement, etc.) • Damage to environment (sink holes, chlorinated water entering a natural waterway, etc.) • Revenue Loss • Level of Service Failures • Cost of the failure • Number and type of customers impacted

Pumps

(Booster, Chemical, Metering, Pressure, Transfer, Well)

Inventory	
Necessary Data	
<input type="checkbox"/> Asset size - diameter and/or flow rate <input type="checkbox"/> Asset location <input type="checkbox"/> Condition – visible inspection, maintenance history, age, etc. <input type="checkbox"/> Installation date <input type="checkbox"/> Useful life (varies with type, 5 - 15 years) <input type="checkbox"/> Replacement Cost	
Optional Data	
<input type="checkbox"/> Operational - is this pump operational? <input type="checkbox"/> Model number <input type="checkbox"/> Serial number <input type="checkbox"/> Manufacturer <input type="checkbox"/> Supplier name & phone <input type="checkbox"/> Under warranty <input type="checkbox"/> Warranty expiration date <input type="checkbox"/> Manufacturer’s recommended O&M <input type="checkbox"/> Maintenance completed regularly <input type="checkbox"/> Redundancy- Spare pump/parts always available if this pump fails? <input type="checkbox"/> Were design specifications followed?	Electrical Data: <input type="checkbox"/> Variable speed? <input type="checkbox"/> Nameplate horsepower (used to calculate power consumption) <input type="checkbox"/> Measured power consumption per month or year <input type="checkbox"/> Average run time (used to calculate annual hours of operation) <input type="checkbox"/> Hours of operation per year <input type="checkbox"/> Peak Energy Demand

Inventory Data Locations	
<ul style="list-style-type: none"> • Aerial photographs • As-built record drawings • Existing utility maps • Visible inspection • Repair, maintenance and inspection records • Purchase records • O&M Manual 	<ul style="list-style-type: none"> • Interview current and former operators • Site visit • Photographs • Contact contractors or engineers familiar with the system • Maintenance Records

Note: Data may not be available for all sources- record what is available

Risk Assessments	
Factors Affecting Probability of Failure	Factors Affecting Consequence of Failure
<ul style="list-style-type: none"> • Age • Condition • Maintenance History - routine maintenance performed? Correct lubricants used? etc. • Installation - vibration or alignment concerns • Running as designed - on the pump curve • Properly sized? 	<ul style="list-style-type: none"> • Level of Service Failures • Health concerns • Inability to provide water • Time to repair may be lengthy - spare parts on hand? • Cost of the failure • Number and type of customers impacted

Sources (Intake Structure, Springs, Well Casing)

Inventory	
Necessary Data	Optional Data
<ul style="list-style-type: none"> <input type="checkbox"/> Asset size - diameter and/or flow rate <input type="checkbox"/> Asset location <input type="checkbox"/> Installation date <input type="checkbox"/> Condition - Visible inspection if possible, age, maintenance history, etc. <input type="checkbox"/> Useful life (varies with type, if unknown an estimate is 20-50 years) <input type="checkbox"/> Replacement Cost 	<ul style="list-style-type: none"> <input type="checkbox"/> Operational - is this source in use? <input type="checkbox"/> Redundancy - is another source accessible if this source becomes unavailable? <input type="checkbox"/> Model Number <input type="checkbox"/> Serial Number <input type="checkbox"/> Manufacturer <input type="checkbox"/> Supplier Name & Phone <input type="checkbox"/> Under Warranty <input type="checkbox"/> Warranty Expiration Date <input type="checkbox"/> Manufacturer's Recommended O&M <input type="checkbox"/> Maintenance records <input type="checkbox"/> Design Specifications followed?

Inventory Data Locations	
<ul style="list-style-type: none"> • As-built record drawings • Well Logs • Existing utility maps • Visible inspection • Repair, maintenance and inspection records 	<ul style="list-style-type: none"> • Purchase records • O&M Manual • Interview current and former operators • Photographs • Contact contractors or engineers familiar with the system

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Risk Assessments	
Factors Affecting Probability of Failure	Factors Affecting Consequence of Failure
<ul style="list-style-type: none"> • Age • Condition • Maintenance History • Installation • Clogging 	<ul style="list-style-type: none"> • Level of Service Failures • Health concerns • Inability to provide water • Time to repair may be lengthy - spare parts on hand? • Cost of the failure

Storage Tanks/Structures (Concrete, Earthen Basin, Fiberglass, Metal, Plastic/Polymer)

Inventory	
Necessary Data	Optional Data
<ul style="list-style-type: none"> <input type="checkbox"/> Asset size - diameter and/or capacity <input type="checkbox"/> Asset location <input type="checkbox"/> Installation date <input type="checkbox"/> Condition - Visible inspection, maintenance history, age, etc, <input type="checkbox"/> Useful life (varies with type, if unknown an estimate is 50 years) <input type="checkbox"/> Replacement Cost 	<ul style="list-style-type: none"> <input type="checkbox"/> Operational - is this storage tank in use? <input type="checkbox"/> Redundancy <input type="checkbox"/> Model Number <input type="checkbox"/> Serial Number <input type="checkbox"/> Manufacturer <input type="checkbox"/> Supplier Name & Phone <input type="checkbox"/> Under Warranty <input type="checkbox"/> Warranty Expiration Date <input type="checkbox"/> Manufacturer's Recommended O&M <input type="checkbox"/> Maintenance completed regularly (inspected, painted, cleaned)? <input type="checkbox"/> Design Specifications followed?

Inventory Data Locations	
<ul style="list-style-type: none"> • Aerial photographs • As-built record drawings • Existing utility maps • Visible inspection • Repair, maintenance and inspection records • Purchase records 	<ul style="list-style-type: none"> • O&M Manual • Interview current and former operators • Photographs • Contact contractors or engineers familiar with the system

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Risk Assessments	
Factors Affecting Probability of Failure	Factors Affecting Consequence of Failure
<ul style="list-style-type: none"> • Age • Condition • Inspection and Maintenance History • Location / elevation • Size • Exposure to corrosive or damaging elements - sun for plastic tanks, chlorine for metal tanks, etc. 	<ul style="list-style-type: none"> • Level of Service Failures • Health concerns • Inability to provide water or sufficient pressure • Time to repair • Cost of the failure • Environmental concerns • Flooding/washout concerns

Treatment

(Chlorination System, Contamination Removal, Disinfection System, Filtration, Ozonation System, Reverse Osmosis, Sedimentation System, Ultraviolet System)

Inventory	
Necessary Data	
<ul style="list-style-type: none"> <input type="checkbox"/> Asset size – diameter, capacity and/or flow rate <input type="checkbox"/> Asset location <input type="checkbox"/> Installation date <input type="checkbox"/> Condition - Visible inspection, maintenance history, age, etc. <input type="checkbox"/> Useful life (varies with type, if unknown an estimate is 10-30 years) <input type="checkbox"/> Replacement Cost 	
Optional Data	
<ul style="list-style-type: none"> <input type="checkbox"/> Operational - is treatment unit in use? <input type="checkbox"/> Redundancy - can the water continue treatment if this asset becomes unavailable? <input type="checkbox"/> Model Numbers <input type="checkbox"/> Serial Numbers <input type="checkbox"/> Manufacturer <input type="checkbox"/> Supplier Name & Phone <input type="checkbox"/> Under Warranty <input type="checkbox"/> Warranty Expiration Date <input type="checkbox"/> Manufacturer's Recommended O&M <input type="checkbox"/> Maintenance completed regularly? <input type="checkbox"/> Design Specifications followed? 	<p>Electrical Data:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Variable Speed? <input type="checkbox"/> Nameplate Horsepower (used to calculate power consumption) <input type="checkbox"/> Measured power consumption per month or year <input type="checkbox"/> Average run time (used to calculate annual hours of operation) <input type="checkbox"/> Hours of operation per year <input type="checkbox"/> Peak Energy Demand

Inventory Data Locations	
<ul style="list-style-type: none"> • As-built record drawings • Existing utility maps • Visible inspection • Repair, maintenance and inspection records • Purchase records 	<ul style="list-style-type: none"> • O&M Manual • Interview current and former operators • Photographs • Contact contractors or engineers familiar with the system

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Risk Assessments	
Factors Affecting Probability of Failure	Factors Affecting Consequence of Failure
<ul style="list-style-type: none"> • Age • Condition • Maintenance History • Frequency of Inspection • Standard Operating Procedures developed and followed • Chemical Supplies on-hand and ability to obtain in timely manner 	<ul style="list-style-type: none"> • Level of Service Failures • Health concerns • Inconvenience to customer -boil water notices • Inability to provide water • Time to repair may be lengthy - spare parts on hand? • Cost of the failure

Valves (Air Release (ARV), Air Vacuum, Ball, Butterfly, Check, Gate, Pressure Relief (PRV))

Inventory	
Necessary Data	Optional Data
<ul style="list-style-type: none"> <input type="checkbox"/> Asset size – diameter, flow rate or settings <input type="checkbox"/> Asset location <input type="checkbox"/> Installation date <input type="checkbox"/> Condition – visible inspection, maintenance history, age, etc <input type="checkbox"/> Useful Life (if unknown an estimate is 15 years for check valve, 20 for all others) <input type="checkbox"/> Replacement Cost 	<ul style="list-style-type: none"> <input type="checkbox"/> Operational - is this valve operational? Distribution system valves may need more than yes/or no answer - 100% flow stoppage, allows break to be repaired, etc. <input type="checkbox"/> Redundancy – will water service continue normally if this valve becomes unavailable? <input type="checkbox"/> Model Number <input type="checkbox"/> Serial Number <input type="checkbox"/> Manufacturer <input type="checkbox"/> Supplier Name & Phone <input type="checkbox"/> Under Warranty <input type="checkbox"/> Warranty Expiration Date <input type="checkbox"/> Manufacturer's Recommended O&M <input type="checkbox"/> Maintenance completed regularly (exercised, cleaned)? <input type="checkbox"/> Design Specifications followed?

Inventory Data Locations	
<ul style="list-style-type: none"> • Aerial photographs • As-built record drawings • Existing utility maps • Visible inspection • Repair, maintenance and inspection records • Purchase records 	<ul style="list-style-type: none"> • O&M Manual • Interview current and former operators • Photographs • Contact contractors or engineers familiar with the system

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Risk Assessments	
Factors Affecting Probability of Failure	Factors Affecting Consequence of Failure
<ul style="list-style-type: none"> • Age • Condition • Maintenance History (exercised regularly, pressure gauges inspected regularly, etc.) • Clogging • Water Hammer 	<ul style="list-style-type: none"> • Backflow concerns • Pressure concerns • Health concerns • Level of Service Failures • Maintenance concerns