Water Re-Use System for Industrial Discharger

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Outline

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Site Background

UTC-Aerospace Systems (division of UTC)
Windsor Locks, Connecticut

Manufacturer of Commercial and Military aircraft components

Site Development = 1950s

Mfg Space = 2.2M SF

Land Area = 300 Acres

Employees = 4,000

Industrial Wastewater

Flows = 30K to 40K GPD

Windsor Locks, CT Campus

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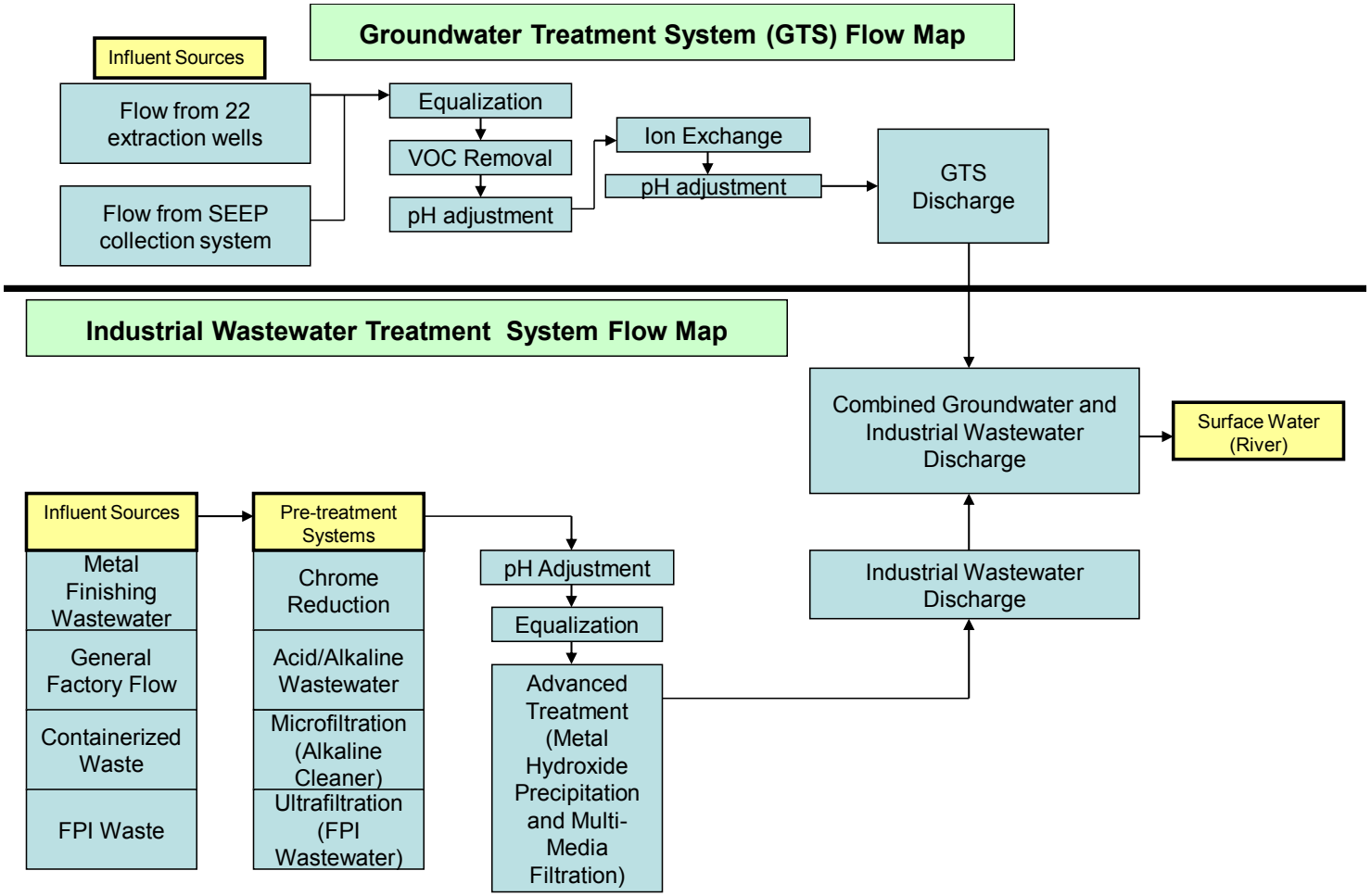
Process Flow Diagram



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Site Background

Wastewater Treatment Facility

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The Problem

Corporate goal is to reduce or eliminate environmental risks

- Corporate EHS staff have concluded that NPDES permit/surface water discharges represent significant environmental compliance risk and on-going environmental liability
  - Cost of maintaining compliance
  - Risk of permit violation/impact to environment
- Determine that relocating discharge to local sanitary sewer authority may provide some risk reduction but not adequate

The Solution

Eliminate industrial discharges from the site

- Implement water conservation measures
  - Extensive water audits
  - Process controls
    - Flow metering
    - Flow restriction
    - Conductivity-driven rinsewater use
    - Counterflow rinses
    - In-process/side stream treatment (I/X, filtration)
    - Point-of-use recycling (LPI, aqueous cleaning)
  - Operator training
- Upgrades to existing treatment processes
- Wastewater recycling and reuse

Treatment System Upgrades

- Chromium Pretreatment
- Equalization
- Groundwater Remediation
- Multi-Media Filtration

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The Process

Feasibility Study

- Gather data (develop understanding of current operations and water usage)
- Evaluate options (water conservation, treatment, recycling)
- Assess needs, recycle water opportunities & potential costs

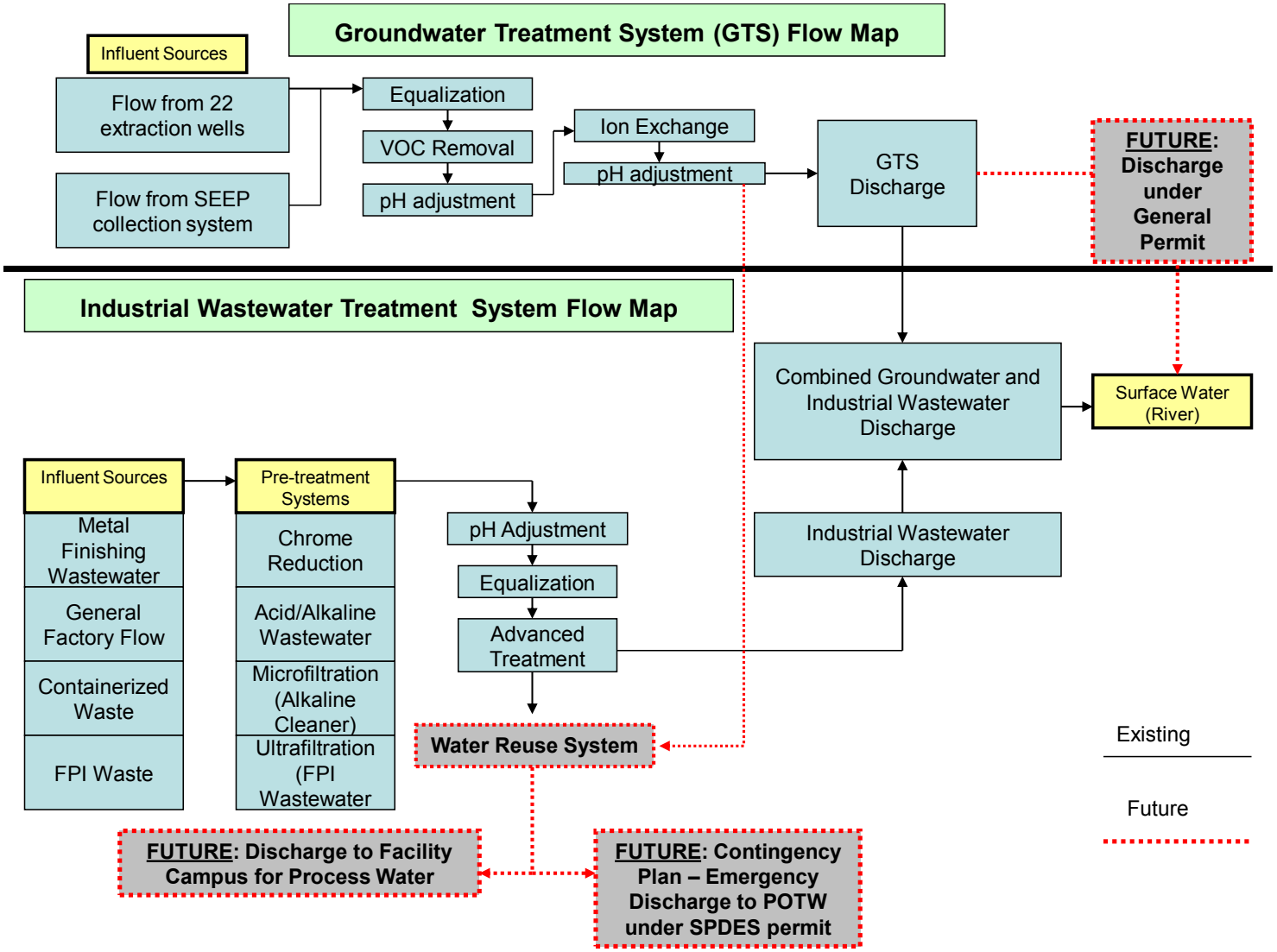
Pilot Study

- On-site, side stream operation
- Gather design criteria (flow rates, treatment efficiency)
- Assess maintenance requirements

Design

- Primary recycling equipment
- Supporting utilities (steam, electricity, cooling water)
- Other infrastructure (building, distribution system)

Process Flow Diagram



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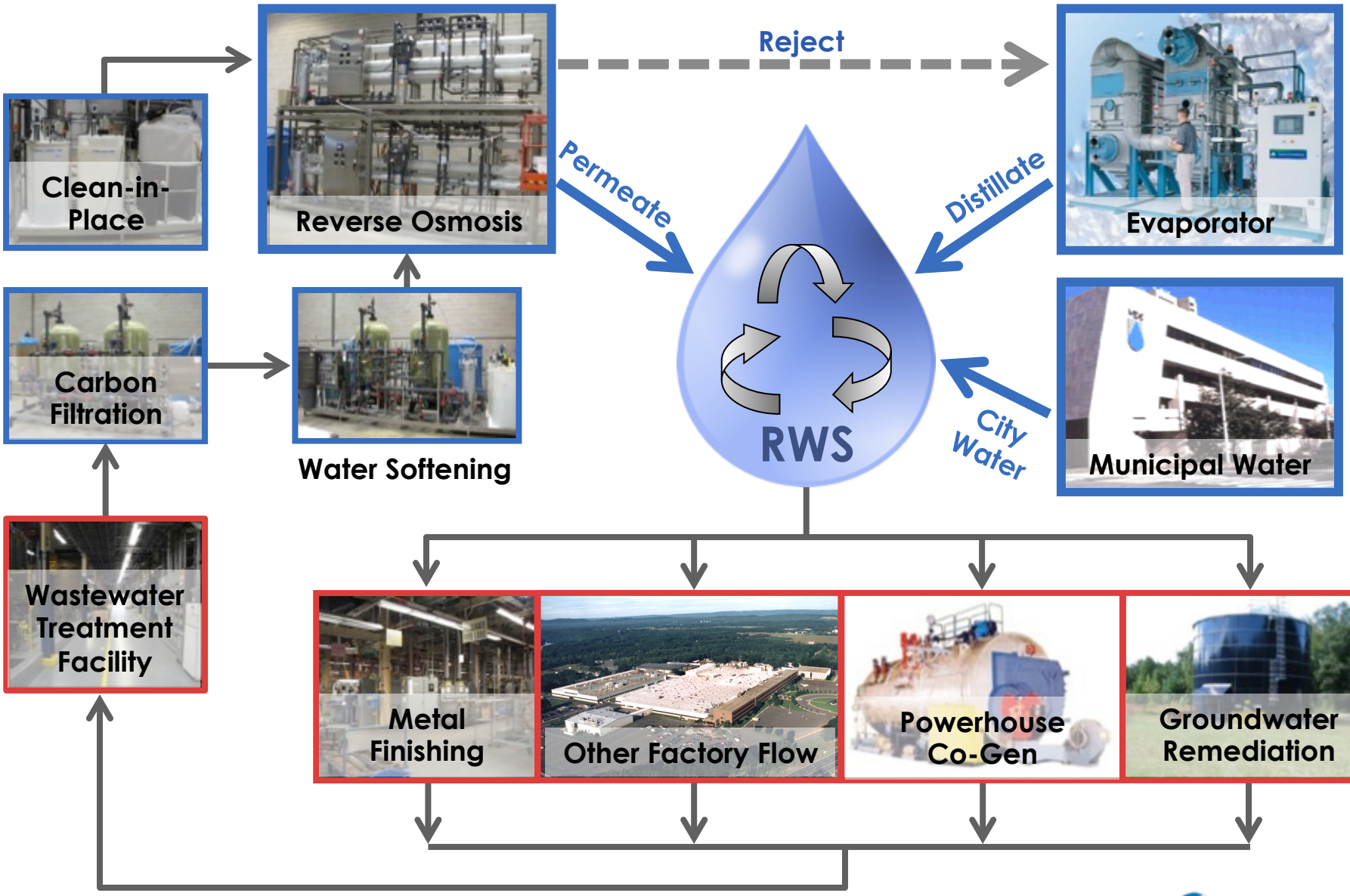
Recycled Water System



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Water Reuse System

5 Major Treatment Skid-Mounted Components

(Carbon Polishing, Water Softening, Reverse Osmosis, Vacuum Distillation and Clean-In-Place)

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Carbon Polishing

Purpose – Remove organics to protect RO membranes
Key Feature - Redundancy

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Water Softening

Purpose – To protect RO membranes
Key Feature - Redundancy

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Reverse Osmosis

Purpose – Primary recycling (85-90% permeate)
Key Features – 100% Redundancy (dual trains); 75 GPM

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Vacuum Distillation

Purpose – Enhanced recycling (98%+ recycle)
Key Features – Vacuum distillation and dual effect (900 GPH)

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The Infrastructure

- New building to house processes
- New utilities (steam, compressed air, electricity, cooling water)
- Upgraded process controls (instrumentation, SCADA)

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Water Reuse - Distribution

- 10,000 Gallon Storage Tank (Recycled Water)
- Recycle Water Distribution Network
- Two (2) – 30,000 Gallon Storage Tanks

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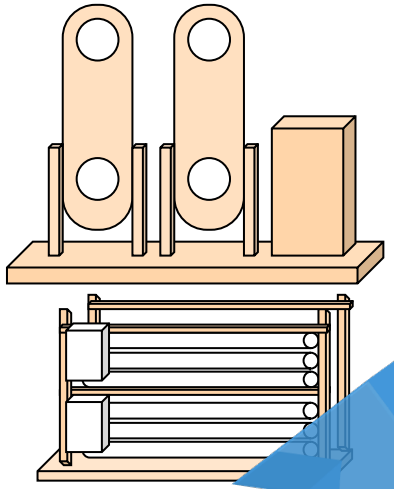
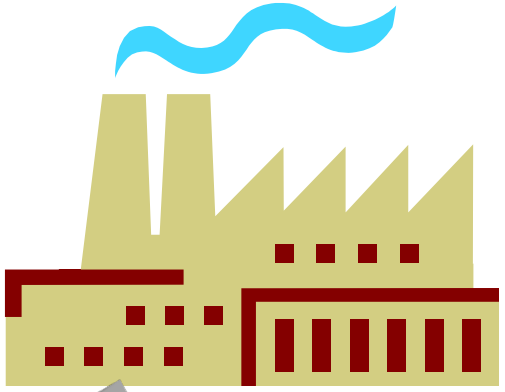
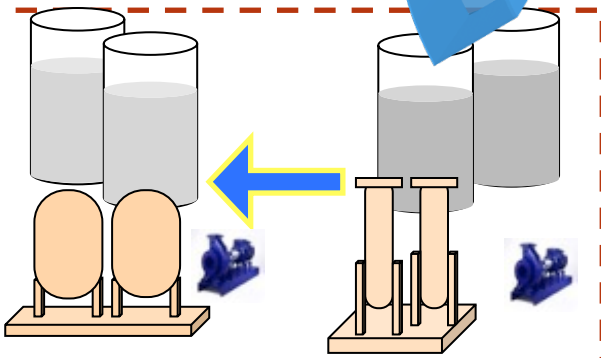
Facility Water Balance



WATER REUSE SYSTEM



FACTORY
METAL FINISHING
POWERHOUSE

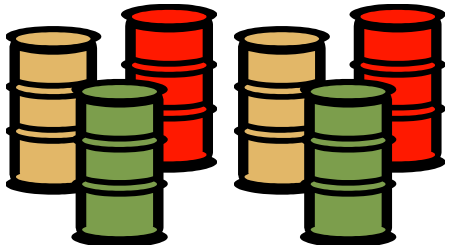


PRIMARY TREATMENT

- Metal Hydroxide Precipitation
- Clarification
- Multi-Media Filtration

PRE-TREATMENT

- Microfiltration
- Chrome Reduction
- Ultrafiltration
- Neutralization



WASTEWATER GENERATION

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Results

Completion in 2011

- Close-loop industrial wastewater
- Excellent and consistent water quality
- 30,000 to 40,000 GPD (average) reduction in discharges (approximately 13 to 14 MGY)

Revocation of NPDES Permit to the river

Pretreatment Permit for discharge to local POTW

- Regulatory coverage
- Emergency discharge option
- No discharge has occurred since system start-up (approximately 4.5 years)

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Transformative Decision

The company is evaluating zero discharge throughout its entire organization

- 150 manufacturing facilities world-wide

The outcome has been viewed as an overwhelming success

- Reduces corporate-wide environmental risk
- Promotes corporate goals for sustainability
- Improves business continuity

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Acknowledgement

UTC Aerospace Systems:

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Burlington, Ontario, Canada

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Questions/Discussion

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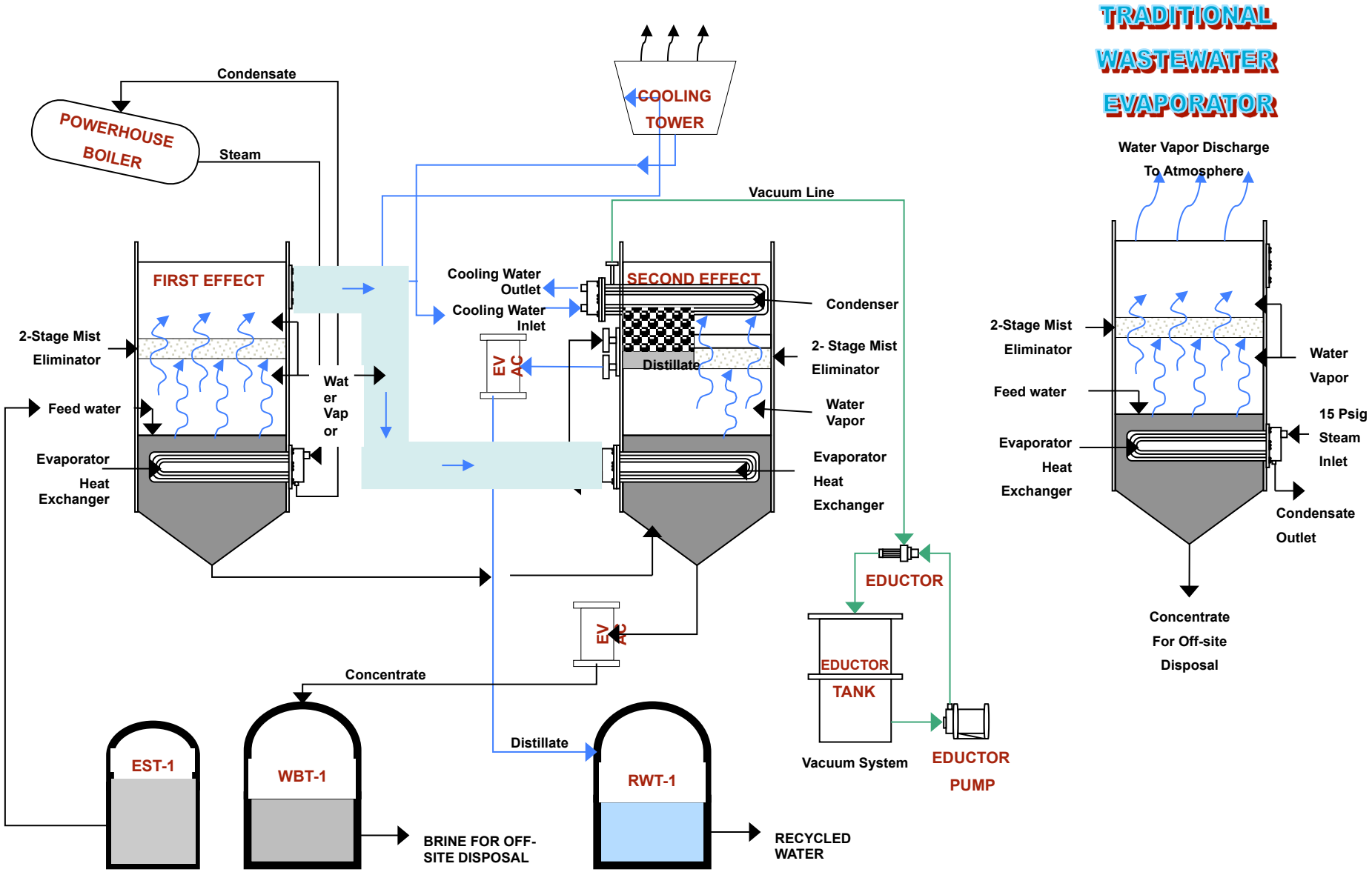
Water Reuse System
Wastewater Evaporative Recovery System



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