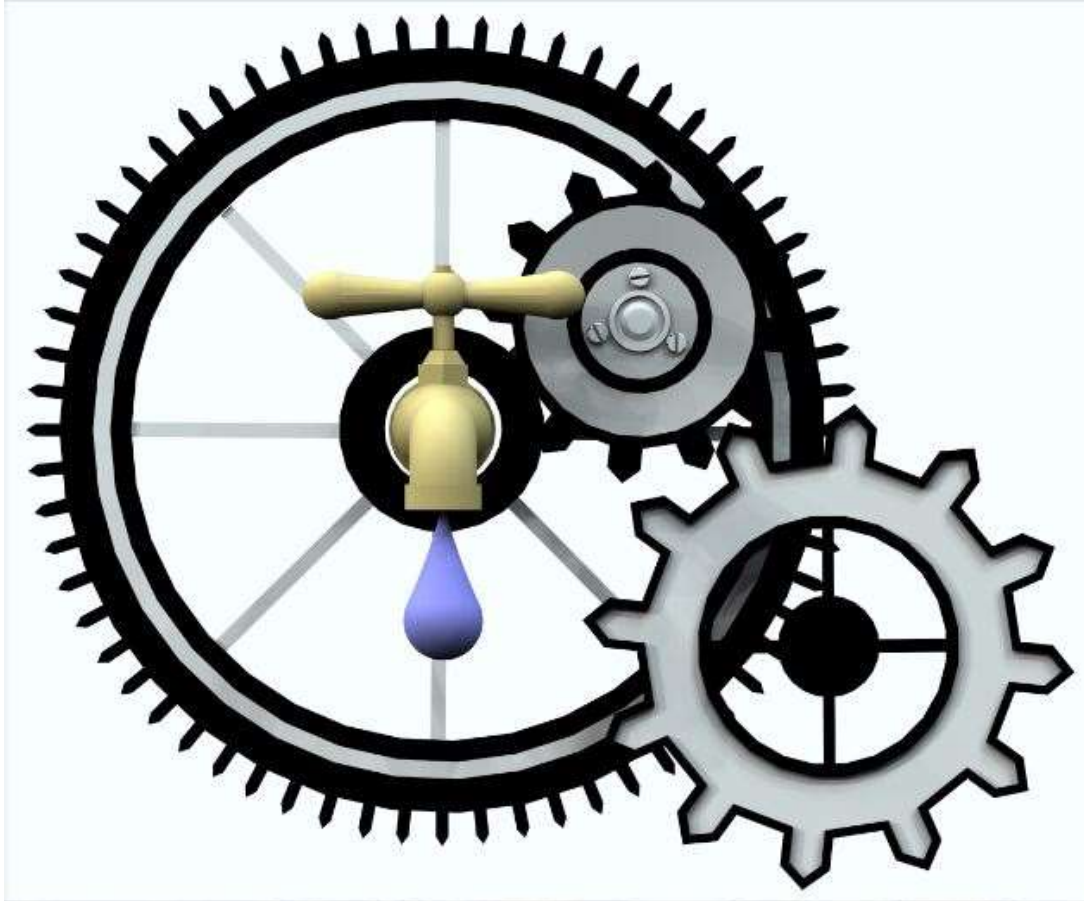


IRWIN WATER WORKS



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Why did USACE undertake this project?

- Fort Irwin is site of National Training Center
- 645,000 acres plus the airspace above available for training
- Comprehensive, realistic brigade-level training with live fire and force-on-force exercises
- Environment tests Service Members and equipment to their limits
- 5,000 – 6,000 Service Members train at Fort Irwin each month



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Why did USACE undertake this project?

- Groundwater is sole water supply
- Fort Irwin groundwater did not meet evolving drinking water standards
- Constructed Reverse Osmosis (RO) water supply network to meet “consumptive use” (drinking, cooking) demand
- RO system installed adjacent to existing Domestic System (DO) which is used for non-consumptive applications (bathing, laundry)



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Why did USACE undertake this project?

- Current system



Domestic (DO) system spigot



Reverse Osmosis (RO) system spigot



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What are the project's objectives?

- Bring Fort Irwin into compliance with State of California and US EPA drinking water standards
- Build single-source water supply system with all building interiors and housing equipped with a sole spigot; all field water points provided with water which is fit for human consumption
- Extend lifespan of National Training Center
- Keep facility footprint to minimum; provide maximum training space
- Comply with Army's "Net Zero" Initiative; build zero liquid waste discharge facility



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How did USACE meet project's objectives?

- “Stacked” water treatment technologies
- Design-Build Contract; outcome-driven or performance-oriented contracting vehicle
- Contract required D-B Contractor to construct facility and perform 90-Day “Prove Out” to demonstrate operability



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“Stacked” technologies



Electrodialysis
Reversal System

Close-Coupled Microfiltration/
Reverse Osmosis System

Mechanical Evaporation System



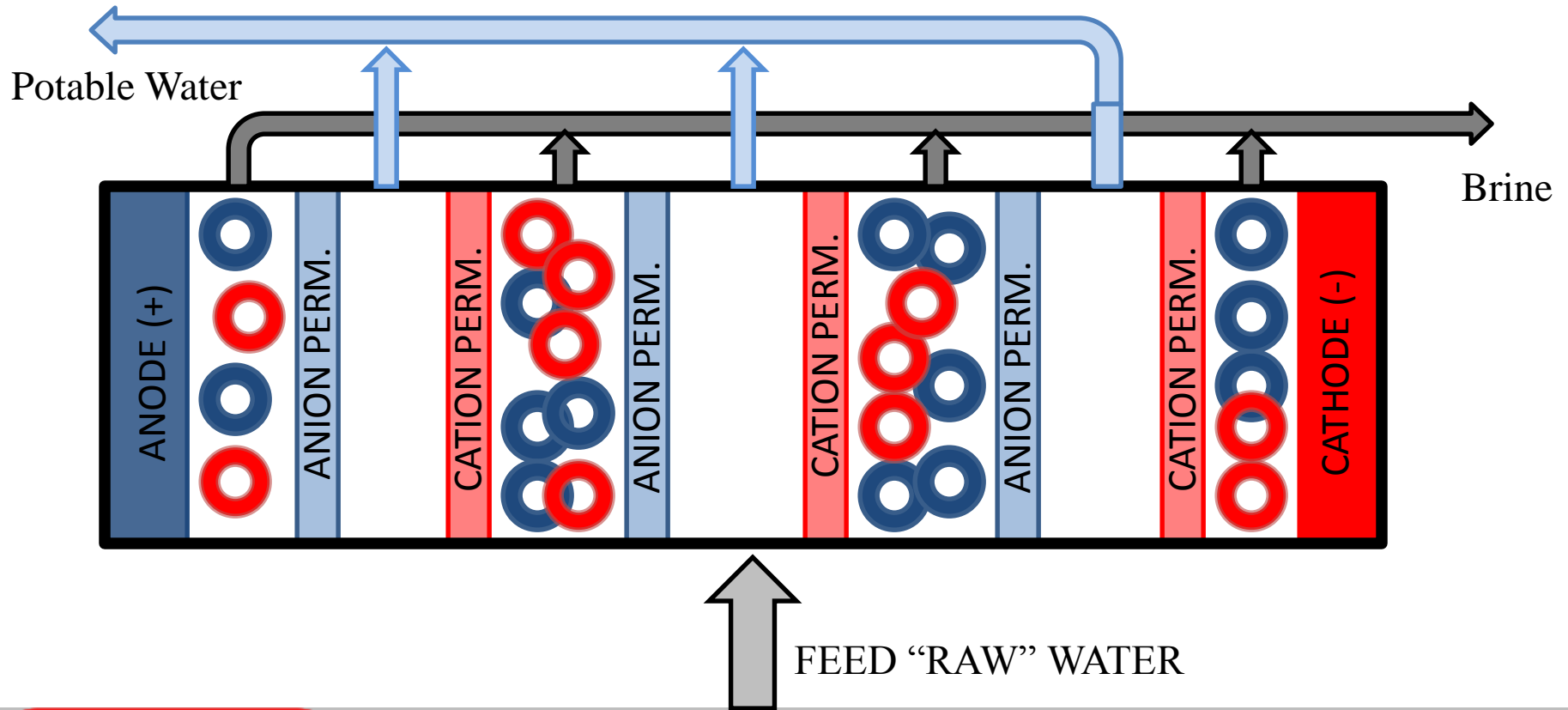
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Electrodialysis Reversal (EDR)

- Utilizes direct current; reversing polarity facilitates membrane flushing



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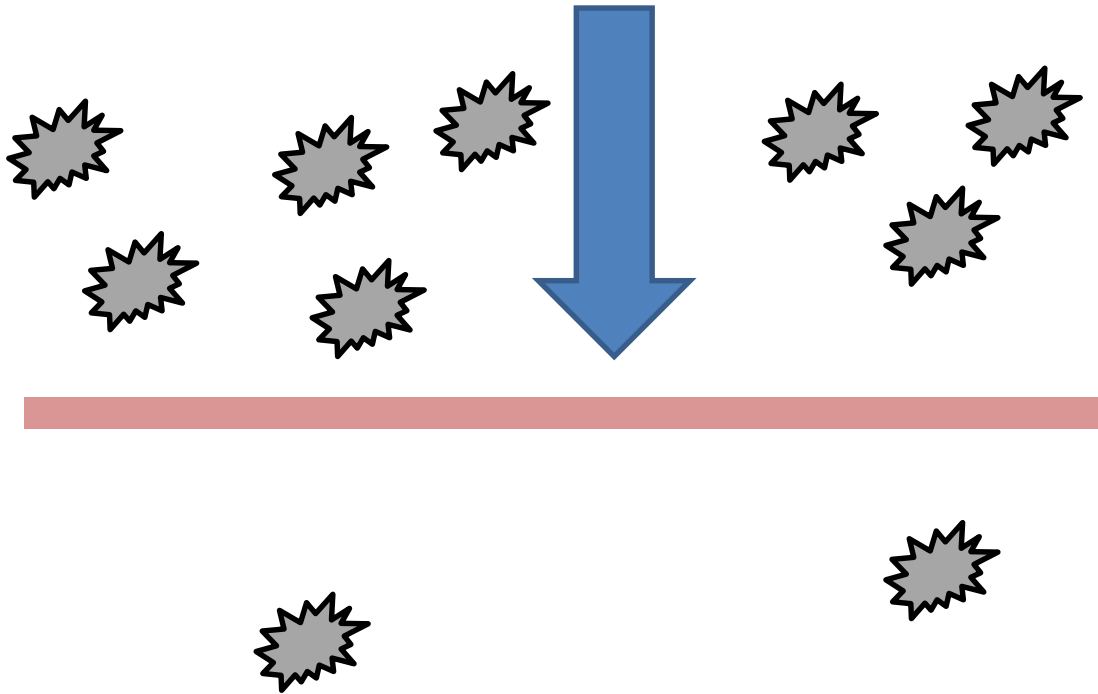
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Reverse Osmosis (RO)

- Membrane technology; employs high pressure



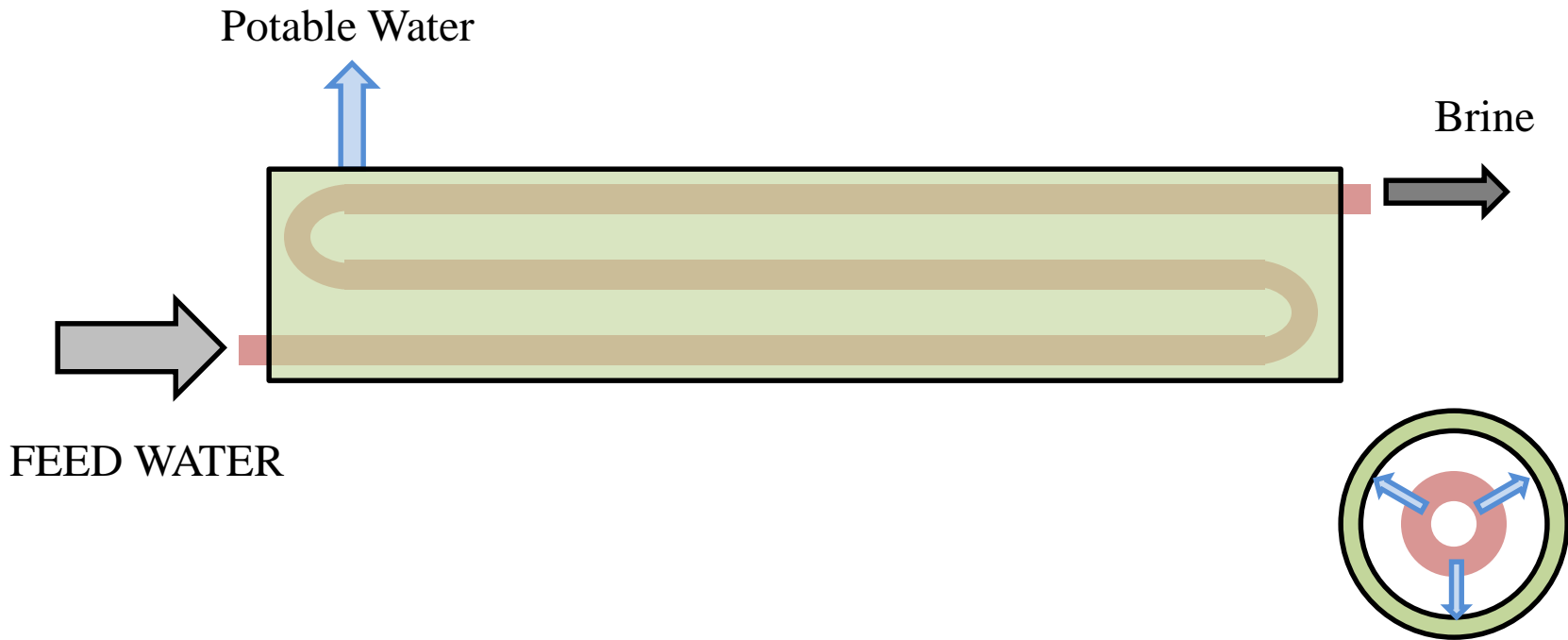
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Reverse Osmosis (RO)

- Arrayed in 3 Trains, each comprised of 3 stages
- Coupled with 5 Microfiltration Trains



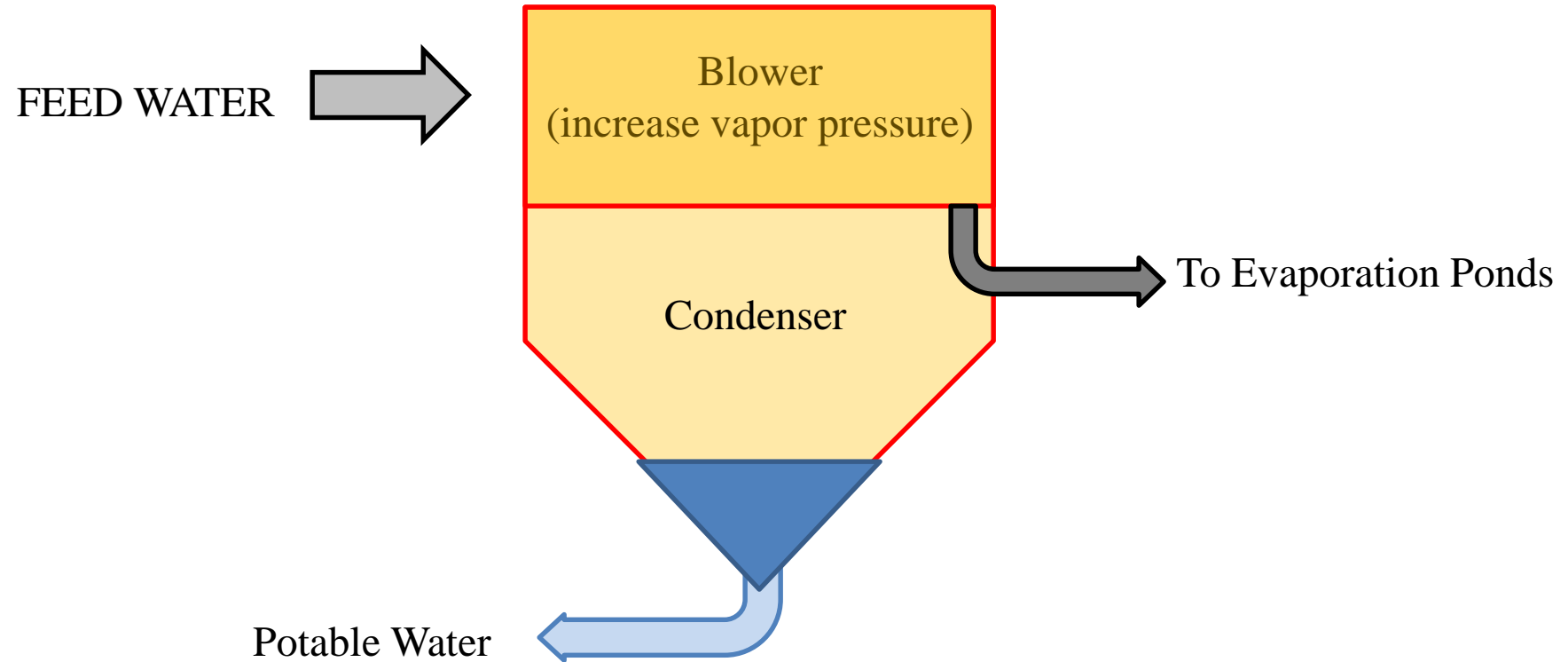
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Mechanical Evaporation (ME)

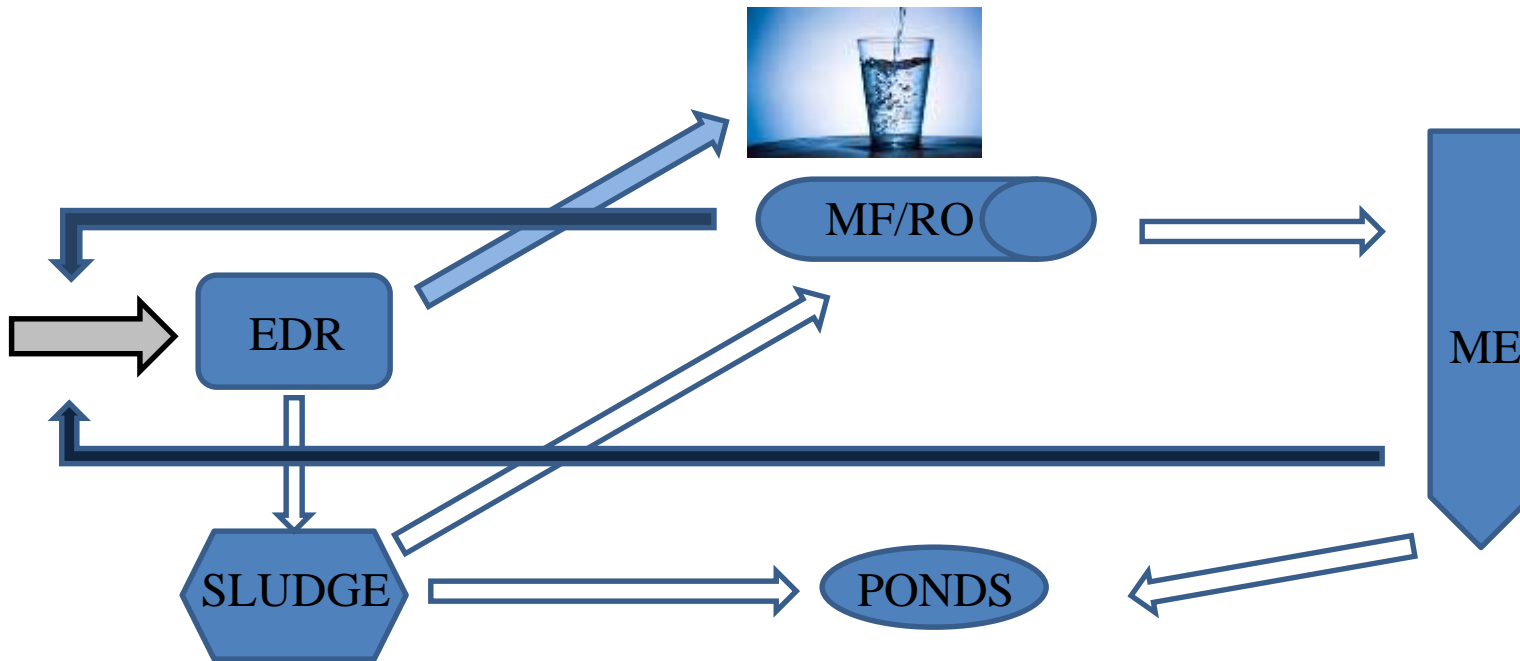
- Incorporates thermodynamic and mass transfer processes; creates water vapor which is then condensed



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Treatment Overview

- EDR achieves 92% recovery; presently only system permitted
- MF/RO improves recovery to 97%
- ME improves recovery to 99.7%



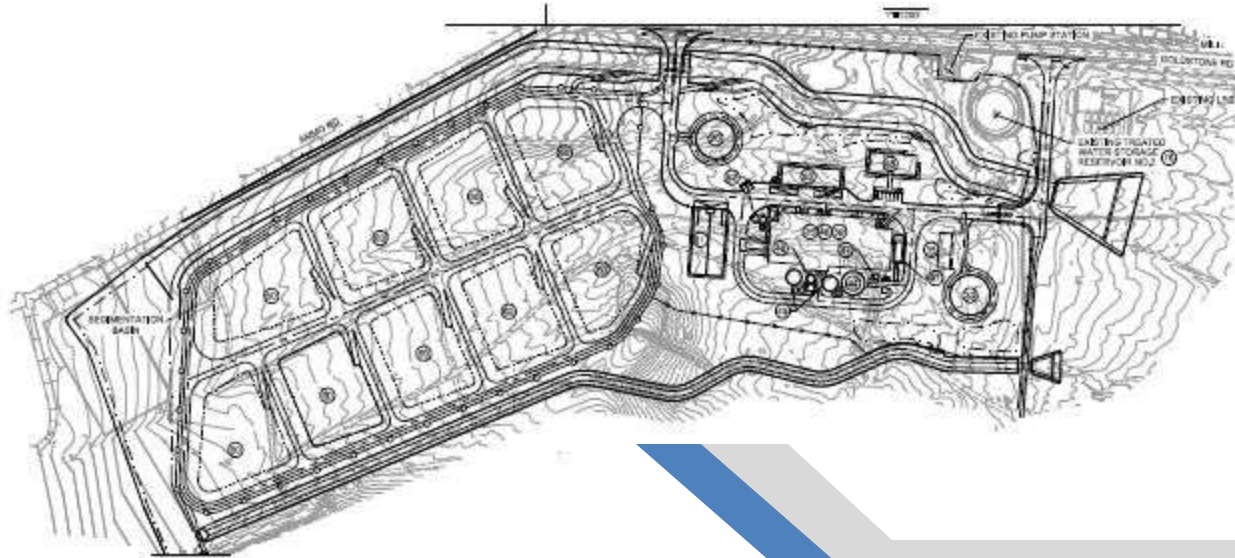
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Wastestream Management

- 9 Evaporation Ponds; encompassing approximately 7 acres
- Equipped with leachate collection network, monitoring equipment, alarms



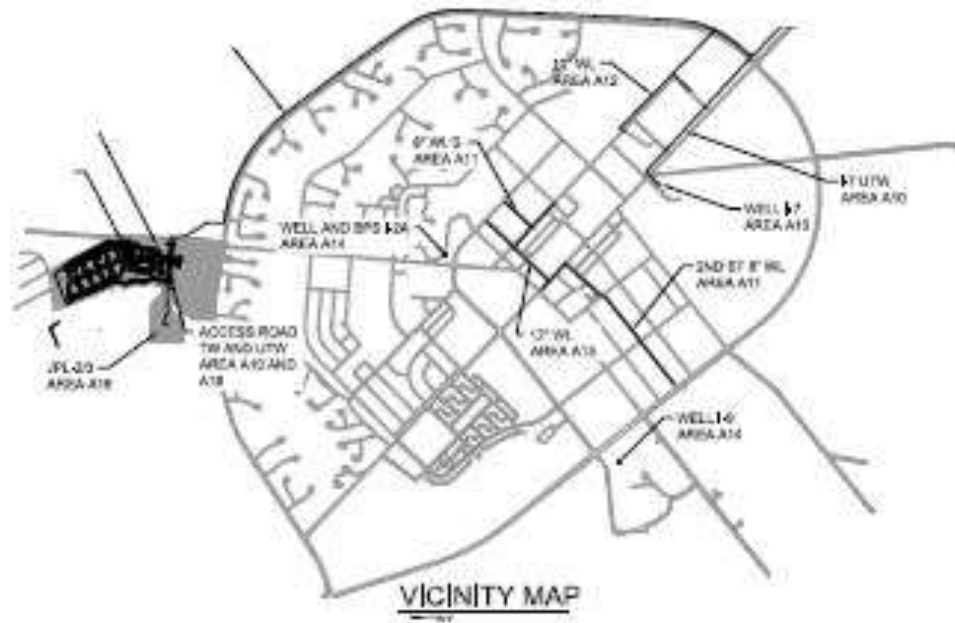
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Distribution System

- Installation of new untreated and treated water lines
- Extensive “flushing” program for existing distribution lines



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Budget/Schedule

- \$100,112,660 budgeted with a construction and commissioning schedule of 1095 days. Notice To Proceed (NTP) issued by USACE on 19 October 2013.
- Current budget of \$102,059,724 with construction and commissioning completed (anticipated) after 1635 days

Challenges

- Logistical struggles due to remote location of Fort Irwin
- Complicated construction due to situation in seismically active zone, area of high wind loads, and wide day/night and summer/winter temperature swings
- “Stacked” treatment technologies presented difficulties in commissioning various systems



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Small Business “Take Aways”

- Abundant opportunities for niche business (HVAC, SCADA, access control, door/lock installation, painting, fencing, low water-usage landscaping)
- Responsiveness is key
- Familiarity with EM 385-1-1 (USACE Safety and Health Requirements Manual) major differentiator

