Aquifer Recharge & Recovery
Treasure Valley CAMP – 11/10/10

Micron Water Usage

A stable supply of high-quality water is a critical raw material in the semiconductor manufacturing process.
Micron Water Use - Industrial

- Cleaning & rinsing silicon wafers
  - Cleans & rinses occur numerous times while building circuitry on wafers i.e., process is water intensive
  - Fab requires ultrapure water to minimize risk of contamination
- Facilities systems (fire suppression, boilers, scrubbers, cooling)

Micron Water Sources

- **Groundwater**
  - 3 onsite wells
  - Industrial
- **River Water**
  - Irrigation
  - Recharge
  - Industrial
- **Municipal Water**
  - Potable
  - Industrial
  - Reclaim/Reuse
  - 45-70% UPW
Area Groundwater History

- IDWR established Southeast Boise Groundwater Management Area in 1994 to stop decline in groundwater levels
  - No new water rights granted without adequate mitigation
- Reinforced Micron’s interest in stabilizing the area’s groundwater supply
- Micron developed a conceptual plan for an aquifer recharge & recovery (ARR) project in 1995

Micron’s ARR Conceptual Plan

- Acquire Boise River surface water rights
  - Irrigation, aquifer recharge, and industrial use
- Build a pump station at the Boise River and pipeline to site
- Treat surface water to drinking water standards
- Build & operate an injection well
- Technical studies
  - Computer model of aquifer
  - Geochemical compatibility of river water and local groundwater
ARR Project Water Rights

- Natural flow Boise River rights through annexation into Nampa & Meridian Irrigation District
- Bureau of Reclamation storage rights in Anderson Ranch Reservoir
  - 3,000 acre-feet (shared with Simplot)
  - Obtained by trading ~6,000 acre-feet of Lucky Peak storage water
- Boise River permit for flood control releases
  - When available (typically 5 weeks per year)

ARR Boise River Pump Station

- Constructed in 1998
ARR Boise River Pump Station

- Design capacity is ~ 26,000 gpm
- Co-Owned
  - Micron, Simplot & Surprise Valley (50%)
  - United Water (50%)
- Equipment includes a moving screen, two 200-hp, and two 400-hp pumps
- 170 psi is needed to lift water to MTI's river water treatment plant

ARR Pipeline

- 30-inch pipe at start
- 20-inch pipe at end
- 4.5 miles long
ARR Pipeline

Pump manifold
Two 30-inch pipelines

Micron ARR Overview

River Water - Process Cooling
River Water Treatment Plant
Injection Well
Aquifer Recharge
Production Wells

Well/Raw Water

Micron Direct Industrial Use (Non-Potable)
Micron Indirect Industrial Use (Manufacturing)
River Water Cooling of Process Water

- Collaborative effort with Idaho Power
- Pump cold (45-60 °F) river water to site
- Use in heat exchanger to cool warm (87 °F) process water
- Significant reduction in energy consumption achieved

River Water Treatment

- Water is treated via ultrafiltration to remove particles and microorganisms prior to recharge and industrial use
- Treatment performance
  - Drinking water standards
  - Porous membrane that rejects molecules > 0.01 µ (coliform, giardia, cryptosporidium, some viruses)
  - Eliminates the need for chlorine disinfection
  - Turbidity < 0.1 NTU
River Water Treatment

- Two 1-Mgd ultrafiltration membrane skids
  - Hollow fibers are bundled into membrane elements
  - One cross-flow system with inside-out flow (2 stages)
  - One dead-end flow system with outside-in flow
- Routine backwashes to force particles out of membrane
- Periodically perform a clean-in-place to remove fouling

Underground Injection Well

- Well is drilled to ~1,200 feet BGS
- Unique down-hole control valve
- Underground Injection Control Permit issued by IDWR
  - Injection capacity ~ 6,000 gpm
  - Sample quarterly for total coliform and total dissolved solids, report results to IDWR annually
  - Continuously monitor turbidity and temperature
- Additional monitoring
  - Measure and report groundwater levels at 7 wells to IDWR monthly
  - Quarterly water quality sampling of 6 Micron wells (BMP)
Goals Achieved with ARR

- Local aquifer water levels have stabilized
- Augmented the local groundwater supply
- Maintained existing groundwater quality

![Hydrograph - Area Wells](image-url)