

Aquifer Recharge & Recovery

Treasure Valley CAMP – 11/10/10



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Micron Water Usage

A stable supply of high-quality water is a critical raw material in the semiconductor manufacturing process

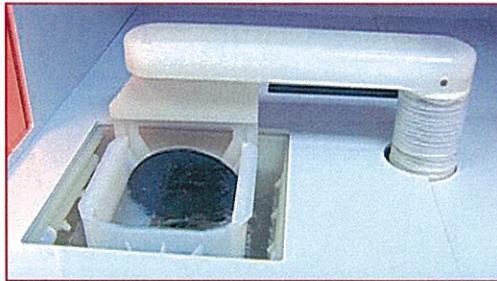


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Micron Water Use - Industrial

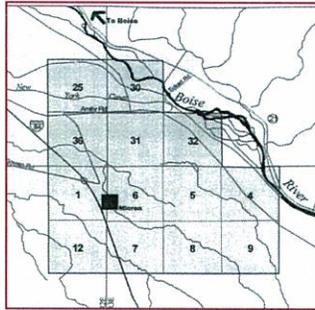
- Cleaning & rinsing silicon wafers
 - Cleans & rinses occur numerous times while building circuitry on wafers i.e., process is water intensive
 - Fab requires ultrapure water to minimize risk of contamination
- Facilities systems (fire suppression, boilers, scrubbers, cooling)



Micron Water Sources

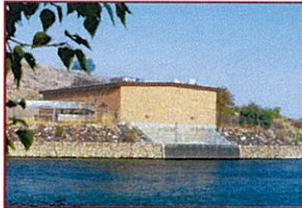


Area Groundwater History



- 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

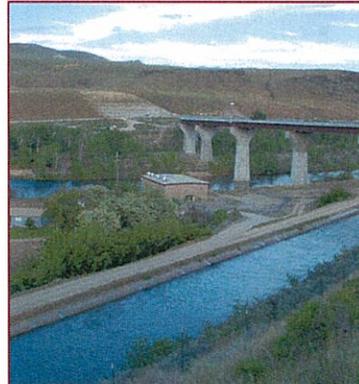
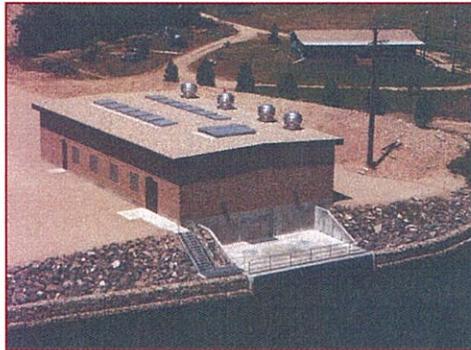


- Acquire Boise River surface water rights
 - Irrigation, aquifer recharge, and industrial use
- Build a pump station at the Boise River and pipeline to site
- Treat surface water to drinking water standards
- Build & operate an injection well
- Technical studies
 - Computer model of aquifer
 - Geochemical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



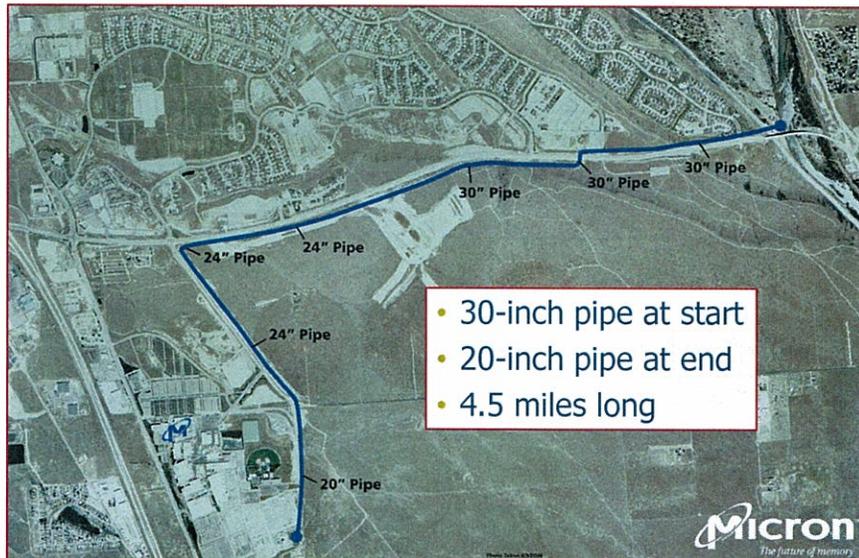
Constructed in 1998

ARR Boise River Pump Station

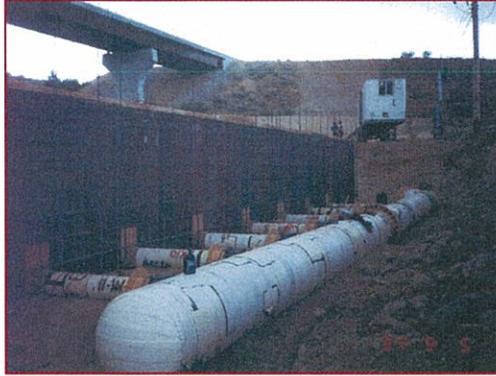


- Design capacity is ~ 26,000 gpm
- Co-Owned
 - Micron, Simplot & Surprise Valley (50%)
 - United Water (50%)
- Equipment includes a moving screen two 200-hp, and two 400-hp pumps
- 170 psi is needed to lift water to MTI's river water treatment plant

ARR Pipeline



ARR Pipeline

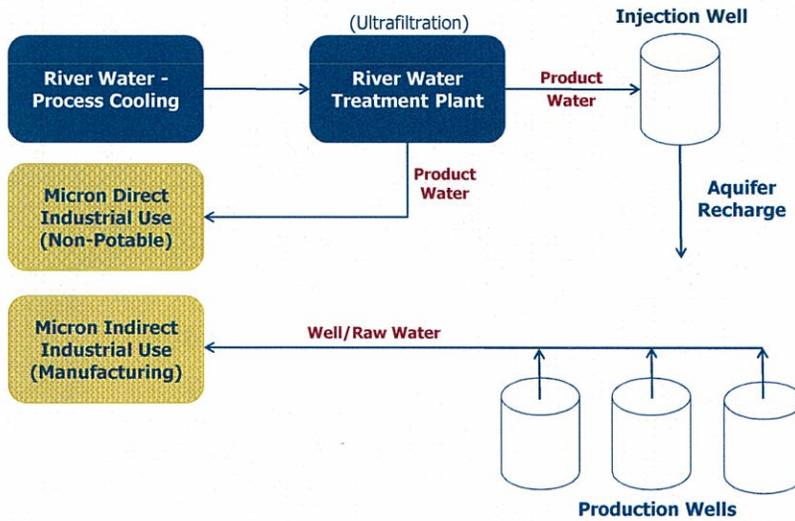


Pump manifold

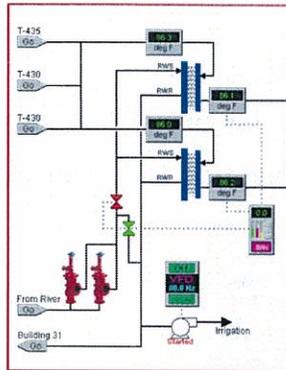


Two 30-inch pipelines

Micron ARR Overview



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 micro-organisms prior to recharge and industrial use
- Treatment performance
 - ▶ Drinking water standards
 - ▶ Porous membrane that rejects molecules $> 0.01 \mu$ (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



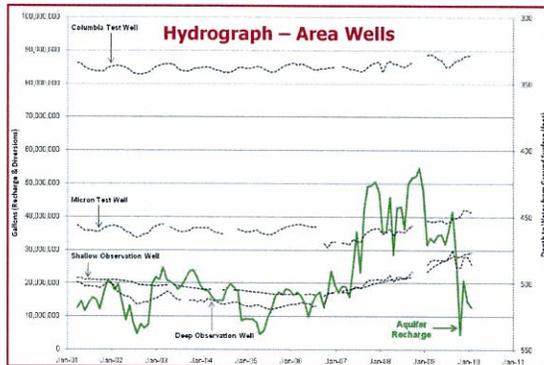
Underground Injection Well

- 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



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