

Arch Consulting

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Topic Title: Dry-Loop Model: Decoupling AWS's Growth from Local Water Systems

Audience: Amazon Web Services (AWS) Infrastructure Leadership

Sustainable Development Goal

SDG #6: Ensure availability and sustainable management of water and sanitation for all.

SDG #9: Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation.

Executive Summary

Amazon Web Services faces a critical structural constraint to its growth: the water required to cool its data centers. While AWS has optimized for energy efficiency, water is a uniquely fixed resource. Unlike energy, which can be transmitted across grids to offset regional demand, water risk is geographically tied to specific watersheds. U.S. data center water consumption has tripled to 66 billion liters annually, and as the market leader, AWS's evaporative cooling infrastructure is a primary driver of this demand, creating localized risks that threaten its long-term ability to scale. Current mitigations, such as AWS recycling wastewater across over 120 of its facilities, fail to account for the physics of evaporation. These systems still deplete up to 80% of intake water and leave behind concentrated toxic runoff. This liability was realized in the October 2025 federal lawsuit in Morrow County, Oregon, where AWS discharge nitrate levels exceeded local safety thresholds by 10 times. Ultimately AWS's "water positive by 2030" pledge is flawed because it measures global volumetric offsets rather than local discharge quality and chemical concentration.

To decouple growth from local water systems and lower long-term operating costs, AWS must transition to a three-tiered "Dry-Loop" infrastructure model. First, as aging CRAC/CRAH units reach end-of-life, AWS should retrofit its facilities by replacing evaporative towers with dry rooftop coolers and installing heat exchangers. This eliminates operational water use without requiring costly server upgrades. Second, all new high-density AI computing facilities should pair closed-loop direct-to-chip (DTC) cooling with dry heat rejectors, reducing Water Usage Effectiveness and eliminating nitrate discharge entirely. This is a technical necessity for next-gen hardware, such as NVIDIA Vera Rubin GPUs, which exceed 2,000W TDP and physically cannot be air-cooled. Finally, AWS must reform reporting to measure discharge quality at the watershed level and fund local nitrate remediation in impacted communities.