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Methodology and Data Sources

WaterMark v3.7 — June 2026. Standard Water Corp. All calculations, assumptions, and data sources used in the WaterMark assessment tool. **v3 release notes:** v3.0 added Watershed Stress Allocation (§3.5) and Mitigation Stack with Commitment Sheet export (§5.5); v3.2 added the US Siting Matrix (§6.5); v3.3 added the SVG state-tile heatmap, Promote-mode listings, Solutions catalog, and scenario save/compare; v3.4 expanded the calculator from 5 to 30 jurisdictions and added the audience chooser. **v3.5** adds the optional climate (wet-bulb) adjustment (§3.6), custom location input with localStorage persistence, cumulative impact mode (multiple facilities in a single jurisdiction), and a polished print/PDF cover header. **v3.6** refreshed regional grid water intensities against 2024–2025 generation mixes and expanded calculator coverage to 40 jurisdictions (35 scored in the Siting Matrix). **v3.7** migrated ICPRB citations to potomacriver.org, added the press section, and surfaced inline limitations on the tool.

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§1 Direct Water Consumption (Scope 1)

Direct water consumption refers to water withdrawn and consumed on-site by the data center's cooling system. For evaporative cooling — the dominant method in hyperscale facilities — water is circulated through cooling towers where a portion evaporates to dissipate heat.

FORMULA: DAILY DIRECT WATER

```
Daily_Gal = IT_Load_MW × 1,000 kW/MW × 24 hr/day × Water_Rate_L/kWh × 0.264172 gal/L
```

The water consumption rate (L/kWh) is determined by the cooling system type. The most widely cited figure is **1.8 liters per kWh of IT load** for evaporative cooling, sourced from Lawrence Berkeley National Laboratory's 2021 assessment of data center water use.

Note on PUE. The LBNL rate of 1.8 L/kWh is expressed per kWh of IT load, not total facility power. The cooling system overhead is already implicit in the water consumption figure — the cooling system is what consumes the water. We do not multiply by PUE for the water calculation to avoid double-counting. PUE (Power Usage Effectiveness) is used only for electricity calculations.

Annual consumption is calculated as daily × 365. We assume continuous operation (8,760 hours/year), which is standard for hyperscale data centers. Actual utilization rates vary but are typically 85–95% for large facilities.

Acre-feet conversion: 1 acre-foot = 325,851 gallons.

§2 Community Impact Metrics

Community impact metrics translate raw consumption figures into terms meaningful to local policymakers and residents.

Household Equivalency

FORMULA

```
Households = Daily_Gal ÷ 150 gal/household/day
```

The 150 gallons per household per day figure comes from USGS estimates of average domestic water use (approximately 82 gallons per person per day × 1.83 persons per household, with some rounding). This is a national average; actual use varies regionally.

Share of Utility Capacity

FORMULA

```
Share_% = (Daily_Gal ÷ (Utility_Capacity_MGD × 1,000,000)) × 100
```

System capacity (in million gallons per day, MGD) is the maximum daily production capacity of the water utility serving the jurisdiction. This metric shows the proportional demand a single facility places on local water infrastructure.

Annual Water Cost

FORMULA

```
Annual_Cost = (Annual_Gal ÷ 1,000) × Municipal_Rate_per_1000_Gal
```

Municipal water rates are sourced from each utility's published rate schedules. Data centers may negotiate industrial rates; the figures shown use the standard commercial/industrial rate tier as a baseline.

§3 Indirect Water Consumption (Scope 2)

Indirect or "Scope 2" water is the water consumed by power plants to generate the electricity used by the data center. Thermoelectric power generation is the **largest category of water withdrawal in the United States** (USGS Circular 1441 (https://pubs.usgs.gov/circ/1441/circ1441.pdf)), and a significant consumer of water.

Key finding. Indirect water is excluded from all major data center operator sustainability disclosures — including Google's Environmental Report, Microsoft's sustainability reports, and AWS's water stewardship page. When included, indirect water **typically doubles or triples** the true water footprint of a data center.

FORMULA: DAILY INDIRECT WATER

```
Indirect_Daily_Gal = IT_Load_MW × 1,000 kW/MW × 24 hr/day ×
Grid_Water_Intensity_gal/kWh
```

Grid water intensity (gallons per kWh) varies by region and depends on the generation mix:

GENERATION TYPE	WATER INTENSITY (GAL/KWH)	SOURCE
Nuclear	0.62 (once-through) – 2.20 (cooling tower)	NREL, 2003 (https://www.nrel.gov/docs/fy04osti/33905.pdf)
Coal (steam)	1.10 – 2.00	EIA-923 (https://www.eia.gov/electricity/annual/)
Natural gas (combined cycle)	0.15 – 0.60	EIA-923 (https://www.eia.gov/electricity/annual/)
Solar PV	0.00 (panel washing only)	NREL (https://www.nrel.gov/docs/fy04osti/33905.pdf)
Wind	0.00	NREL (https://www.nrel.gov/docs/fy04osti/33905.pdf)
Hydropower	4.50 (evaporation from reservoirs)	NREL (https://www.nrel.gov/docs/fy04osti/33905.pdf)

Regional Grid Water Intensity

We calculate a weighted average water intensity for each grid region based on its generation mix (from EIA Form 923) and the water intensity of each fuel type:

GRID REGION	WEIGHTED INTENSITY (GAL/KWH)	MAJOR GENERATORS
PJM Interconnection (MD/VA/DC)	0.42	Natural gas 44%, Nuclear 33%, Coal 15%, Renewables 8% (PJM-EIS GATS EY2024)
WECC Southwest (AZ)	0.37	Natural gas 36%, Nuclear 28%, Solar 18%, Coal 10%, Other 8%
MISO North (MN)	0.37	Wind 25%, Natural gas 24%, Nuclear 22%, Coal 22%, Other 7%

These weighted figures are derived from Macknick et al. 2012 (NREL, Environmental Research Letters) (https://doi.org/10.1088/1748-9326/7/4/045802) median operational water consumption factors for recirculating cooling towers, combined with PJM-EIS GATS EY2024 (https://gats.pjm-eis.com/) generation mix for PJM and EIA Form 923 (https://www.eia.gov/electricity/annual/) state-level data for WECC SW (AZ) and MISO N (MN). See §Errata (#errata) for the v1.1 correction log. The methodology is consistent with the approach used by the WRI Aqueduct water risk framework (https://www.wri.org/applications/aqueduct/water-risk-atlas/).

§3.5 Watershed Stress Allocation

The Watershed Stress Allocation block on the assessment tool shows the proposed facility's water demand alongside all other major consumptive water users in the same HUC-8 sub-basin. The intent is to provide local context — never national comparison.

> **Why local, not national.** National comparisons (e.g., "data centers vs. agriculture nationally") are not informative for a siting decision. The relevant question for a community, regulator, or utility planner is: *within this watershed*, how does the proposed load compare to existing claims? A facility may be a small share of national water use but a meaningful share of the basin it actually draws from.

Why consumptive use, not gross withdrawal

USGS publishes both *withdrawal* (water removed from the source) and *consumption* (water that does not return to the source — typically through evaporation). We use **consumptive use** as the comparator because:

- Data center evaporative cooling losses are consumptive — the water leaves the watershed.
- Thermoelectric withdrawal numbers are dominated by once-through cooling (10–100× larger than consumption); using withdrawals would understate the data center share for an unfair reason.
- Agriculture and irrigation losses are largely consumptive (evapotranspiration), so this is the apples-to-apples frame.
- The ICPRB Data Center Report (March 2026) (https://www.potomacriver.org/focus-areas/water-resources-and-drinking-water/water-resources/planning/data-centers-and-water-use-in-the-potomac-river-basin/) uses consumptive-use framing for the same reason.

Categories shown

- **Residential / municipal** — public-supply consumption (residential + commercial behind the same meter).
- **Thermoelectric power generation** — consumption at power plants located in the basin.
- **Industrial (non-data-center)** — manufacturing, chemicals, semiconductor fabs.
- **Agriculture / irrigation** — crop water consumption (evapotranspiration).
- **Mining / oil & gas** — extraction and processing.
- **Existing data centers** — operating data centers in the basin (where data is available).
- **Proposed data center (Scope 1)** — this facility's on-site cooling consumption.
- **Proposed data center (Scope 2 share)** — water consumed at upstream power plants attributable to this facility's load. *Note: Scope 2 water is consumed where the plants are, which often differs from the basin where the data center sits.* The tool labels this with a striped fill and a per-jurisdiction geographic note.

Data sources

- USGS Estimated Use of Water in the United States (https://www.usgs.gov/mission-areas/water-resources/science/water-use-united-states) — county-level, 5-year cycle. Most recent published: 2020.
- EIA Form 923 (https://www.eia.gov/electricity/data/eia923/) — thermoelectric plant-level consumption.
- State water plans where available (TX, AZ, CA, VA, MD).
- Local utility customer-class reports (for existing data center segments).
- ICPRB (https://www.potomacriver.org/focus-areas/water-resources-and-drinking-water/water-resources/planning/data-centers-and-water-use-in-the-potomac-river-basin/) Potomac data center cumulative impact study (March 2026).

Limitations. County-level USGS data does not perfectly align with HUC-8 boundaries; we use the county containing the proposed jurisdiction as a reasonable proxy for the served basin. Existing data center segments are best-effort estimates from utility filings and trade reporting and are the largest source of uncertainty in this allocation, particularly in Loudoun County (Data Center Alley). Where state-level projections (e.g., 2030 demand) exist they are noted; otherwise, the chart shows most-recent USGS actuals, which understate the present in counties with rapid recent industrial or DC growth.

What this block does *not* do

- It does not compare to *national* agricultural water use, almonds, golf courses, or any other framing intended to minimize data center impact.
- It does not declare a result "acceptable" or "unacceptable." It presents the local share and lets readers draw their own conclusions.
- It does not adjust for climate-vulnerability or drought projections — those belong in a separate basin-stress index, not this allocation.

§3.6 Climate (Wet-Bulb) Adjustment

The LBNL 1.8 L/kWh figure is a fleet average across surveyed US data centers and implicitly bakes in a "typical" climate. Recent peer-reviewed work (Mytton 2021, Siddik 2021, Li 2023) shows that hyperscale facilities in arid hot climates can run 1.3–1.6× the fleet average due to higher cooling tower duty at elevated wet-bulb temperatures. WaterMark v3.5 adds an optional climate adjustment to surface this effect.

Default off, opt-in by design. The LBNL fleet average remains the headline rate for backward compatibility with prior shares and citations. Users who want a more accurate per-location estimate enable the climate adjustment via the "Apply climate (wet-bulb) adjustment" checkbox in the calculator's Cooling System fieldset.

When on, the adjustment is shown alongside the rate in the Direct Water citation column ("1.8 L/kWh × 1.40 climate").

Formula

CLIMATE-ADJUSTED L/KWH

```
modifier = clamp( 1 + 0.04 × (WB_F − 70), 0.7, 1.6 )
adjusted_L_per_kWh = baseline_L_per_kWh × modifier
```

WB_F is the location's ASHRAE 1% summer design wet-bulb temperature in °F. The 70°F anchor reflects the approximate fleet-average WB implied by the LBNL survey. Modifier is clamped to [0.7, 1.6] to keep the planning estimate defensible — facilities outside this range exist (Mytton 2021 reports 4.5 L/kWh in extreme cases) but typically include either compounding mitigations not captured here or measurement-frame differences.

Per-location wet-bulb values

WaterMark uses ASHRAE 1% summer design wet-bulb (the temperature exceeded ~88 hours/year at peak) as the reference. Values are estimates from ASHRAE Climatic Design Conditions normals; per-site engineering analysis using actual TMY3 weather files would produce more precise numbers.

WET-BULB RANGE	MODIFIER	EXAMPLE LOCATIONS
60°F (cool, dry high desert)	0.70× (clamped)	Reno NV (60), Salt Lake UT (64), Pacific NW BPA (65)
65–67°F (semi-arid)	0.80–0.88×	Tucson AZ (65), Hermantown MN (65), Las Vegas NV (67)
70°F (LBNL baseline)	1.00×	Phoenix metro / Chandler (70)
74–77°F (humid temperate)	1.16–1.28×	NoVA / DC region (76), Atlanta (76), Nashville (77), DFW (78)
78–80°F (humid coastal)	1.32–1.40×	Wilmington NC (80), Houston / Gulf Coast (80+)

Important notes

- **Counterintuitive Phoenix result:** Phoenix has very high *dry*-bulb but moderate *wet*-bulb (~70°F) due to low humidity. Evaporative cooling efficiency tracks WB, not DB. Tucson is even better at 65°F WB. This is why arid SW data centers often use evaporative despite the heat.

- **What this misses:** The modifier is a planning-level approximation. It does not capture: cycles of concentration tuning, climate-zone-specific equipment sizing, hour-by-hour wet-bulb variation, or the impact of mitigations like adiabatic cooling (which themselves change the relationship to ambient WB).
- **Custom locations:** When using the custom location feature (v3.5+), users can supply a wet-bulb estimate or accept the 1.0× default.
- **Mitigation interaction:** The Mitigation Stack (§5.5) deltas are applied to the climate-adjusted baseline. A 30% RO pretreatment savings is 30% of whatever rate the cooling system actually runs at, not 30% of the LBNL fleet average.

§4 Electricity and Rate Impact

ANNUAL ELECTRICITY

```
Annual_MWh = IT_Load_MW × 8,760 hr/yr
```

GRID SHARE

```
Grid_Share_% = (IT_Load_MW ÷ Local_Utility_Peak_MW) × 100
```

Local utility peak capacity is sourced from the relevant ISO/RTO (PJM, MISO, WECC) load data. This represents the peak demand served by the utility in the jurisdiction's service territory.

Residential Rate Impact

The estimated residential rate impact is a range based on historical precedent from large industrial loads entering utility service territories. The methodology considers:

- **Transmission infrastructure** — new substations, distribution upgrades, and interconnection costs recovered through rate base
- **Generation adequacy** — whether new generation capacity must be added to serve the incremental load

- **Demand charges** — whether the large customer receives preferential economic development rates that shift costs to residential ratepayers

The range shown ($X–$Y per household per month) reflects uncertainty in how regulators allocate costs. The low end assumes full cost recovery from the data center customer; the high end assumes significant socialized cost allocation. Sources: EIA state electricity rate data (https://www.eia.gov/electricity/state/), utility rate case filings, and LBNL grid reliability studies (https://www.lbl.gov).

Caution. Rate impact estimates carry the highest uncertainty of any metric in this tool. Actual impacts depend on regulatory proceedings, utility rate design, and negotiations not publicly disclosed at the permitting stage.

§5 Cooling System Parameters

SYSTEM	WATER RATE (L/KWH)	NOTES	SOURCE
Evaporative (open cooling tower)	1.8	Most common for hyperscale. Highest water use.	LBNL, 2021 (https://escholarship.org/uc/item/2f04q62m)
Adiabatic hybrid	0.8	Evaporative only at peak heat. Growing adoption.	Energy, 2023 (https://doi.org/10.1016/j.energy.2023.127542)
Air-cooled (dry)	0.01	Negligible water (humidification only). 10–20% energy penalty.	LBNL, 2021 (https://escholarship.org/uc/item/2f04q62m)
Direct-to-chip liquid cooling	1.2	Cold-plate liquid loops on each chip. 20–40% reduction vs. evaporative tower; growing in AI clusters.	LBNL, 2021 (https://escholarship.org/uc/item/2f04q62m)
Liquid immersion	0.02	Near-zero water. Emerging for hyperscale.	GRC, 2024 (https://www.grcooling.com/)

The evaporative cooling rate of 1.8 L/kWh represents a fleet average across surveyed hyperscale facilities. Individual facilities range from approximately 1.2 to 2.5 L/kWh depending on climate, wet-bulb temperature, cycles of concentration, and equipment efficiency. Arid climates (Arizona, Texas) tend toward the higher end of this range.

§5.5 Mitigation Stack

The Mitigation Stack lets a developer or municipal authority compose a list of best-practice measures on top of the baseline cooling choice. Each measure carries a sourced range for its expected effect on Scope 1 water (on-site cooling), Scope 2 water (upstream power generation), and total facility power. Output flows two ways: a live side-by-side comparison in the Assessment Tool, and a printable **Commitment Sheet** exhibit suitable for siting agreements.

> **Strategic intent.** WaterMark v3.0 separates the *baseline scenario* (what's currently proposed, modeled with sourced industry averages) from *committed mitigations* (what the developer agrees to implement). This gives municipalities a menu of conditions they can attach to approval, and gives developers a way to demonstrate specific commitments rather than vague "sustainability" claims. The baseline number is never softened — mitigations earn their reductions off that baseline, with full source disclosure.

Composition rules

Mitigations compose **multiplicatively**. If two measures reduce Scope 1 water by 20% and 30% respectively, the combined effect is `1 − (1 − 0.20) × (1 − 0.30) = 44%`, not 50%. Multiplicative composition is the correct sequential model: the second measure operates on the residual after the first.

Each measure carries a **sourced range** (minimum to maximum delta from peer-reviewed or industry sources). The headline comparison uses the midpoint of each range. The Commitment Sheet shows the full range — best case (sourced minimums composed multiplicatively) and worst case (sourced maximums composed multiplicatively) — so signatories see the uncertainty band, not a single point estimate.

> **Methodology note vs. spec.** The original v3 spec text reads "stack multiplicatively within a category, additively across categories." We implement *multiplicative across all categories* because additive composition of percentage reductions is not mathematically valid (additively combining a 50% reduction and a 60% reduction would yield a 110% reduction). If the spec intended additive composition for capex/opex, that interpretation is preserved — capex/opex are summed across categories where applicable. Volume and power deltas are always multiplicative.

Mitigation library (v3.0 launch set)

Seventeen measures across four categories. Cooling architecture changes are handled through the baseline cooling dropdown rather than appearing as mitigations, since they replace rather than compose.

CATEGORY	MEASURE	S1 RANGE	S2 RANGE	POWER RANGE	MATURITY
Water source	Reclaimed / recycled municipal water†	0%	0%	0% to +2%	Proven
	Onsite rainwater harvesting	−15% to −5%	0%	+1% to +3%	Proven
	Greywater reuse onsite	−25% to −10%	0%	+2% to +5%	Proven
	Atmospheric water generation	−20% to −5%	+20% to +50%	+20% to +50%	Experimental
	Brackish source + onsite desal†	0%	0%	+30% to +80%	Emerging
Treatment	RO pretreatment (high cycles of concentration)	−30% to −15%	0%	+1% to +3%	Proven
	Sidestream filtration	−15% to −5%	0%	0% to +2%	Proven
	Zero-liquid-discharge	−40% to −20%	0%	+5% to +15%	Proven
	Advanced biocide / scale management	−10% to −5%	0%	0%	Proven
Power (Scope 2)	Onsite solar PV	0%	−20% to −5%	0%	Proven
	Onsite battery + load shifting	0%	−8% to −2%	0%	Proven
	PPA with non-thermoelectric generation	0%	−80% to −20%	0%	Proven
	Behind-the-meter natural gas + CHP‡	0%	0%	0%	Proven
	Behind-the-meter SMR‡	0%	0%	0%	Experimental
Operations	Raised supply temperature setpoint (ASHRAE A2/A3)	−15% to −5%	−5% to −2%	−5% to −2%	Proven
	Free cooling / economizer hours	−25% to −10%	−8% to −3%	−8% to −3%	Proven

CATEGORY	MEASURE	S1 RANGE	S2 RANGE	POWER RANGE	MATURITY
	Real-time water + power telemetry, public reporting[§]	0%	0%	0%	Proven

[†] Source-substitution measure: shifts demand off potable supply but does not reduce gross watershed consumption. The Watershed Stress Allocation block does not credit these toward the proposed-DC segments.

[‡] Plant-specific measure: water and Scope 2 deltas depend on the specific BTM generation design and are not modeled in the headline comparison. Listed for forward-looking commitments.

[§] Compliance lever: no direct volume effect, but is the verification mechanism that makes the Commitment Sheet enforceable.

Commitment Sheet

The "Generate Commitment Sheet" button in the As-Proposed-vs-With-Mitigations block produces a printable exhibit suitable for inclusion in a siting agreement. The exhibit lists the project, jurisdiction, baseline scenario, every selected mitigation with its sourced range and citation, the combined effect (best/expected/worst), assumptions and disclosures, and a signature block for developer and municipal/utility authority.

The Commitment Sheet is not a certification. WaterMark does not validate or audit the developer's actual implementation — that is the role of operational telemetry, third-party audit, and regulatory enforcement. The sheet is a structured artifact for negotiating and recording commitments, replacing ad-hoc PDFs and verbal assurances.

Citations

Each mitigation in the tool carries inline citations. Primary sources include LBNL data center efficiency research, ASHRAE TC 9.9 thermal guidelines and 90.4 standards, EPA WaterSense and Green Power Partnership, NREL water-energy nexus and renewable generation studies, the GHG Protocol Scope 2 guidance, and AWWA water reuse manuals. Per-measure source links appear in the Commitment Sheet's source column.

Limitations

- Effects are facility- and climate-dependent. The published ranges are typical, not guaranteed.
- The midpoint composition is a planning estimate. Actual savings depend on commissioning, controls tuning, and operational discipline — which is why telemetry is offered as a compliance lever.
- Capex and opex are not yet modeled in the comparison output. Adding them is a v3.1 follow-up.

- Some measures (BTM generation) are listed for completeness but require plant-specific engineering analysis to quantify.

§6 Location-Specific Data

JURISDICTION	UTILITY	CAPACITY (MGD)	STRESS INDEX	RATE ($/1,000 GAL)	GRID REGION
Prince George's Co., MD	WSSC Water	170	**3.4/5 High**	$9.80	PJM (0.42 gal/kWh)
Pima County, AZ	Tucson Water	110	**4.2/5 Ext. High**	$7.56	WECC SW (0.37 gal/kWh)
Hermantown, MN	Hermantown PU	4.2	**1.2/5 Low**	$5.40	MISO N (0.37 gal/kWh)
Chandler, AZ	Chandler Water	65	**3.9/5 High**	$5.88	WECC SW (0.37 gal/kWh)
Loudoun County, VA	Loudoun Water	62	**3.4/5 High**	$8.65	PJM (0.42 gal/kWh)
Prince William Co., VA	PWCSA	50	**3.4/5 High**	$8.00	PJM (0.42)
Henrico County, VA	Henrico DPU	75	**2.6/5 Medium**	$5.50	PJM (0.42)
Mecklenburg Co., VA	Roanoke River SA	8	**1.8/5 Low-Med**	$4.50	PJM (0.42)
Spotsylvania Co., VA	Spotsylvania Co.	14	**2.4/5 Medium**	$6.50	PJM (0.42)
Frederick County, VA	Frederick Water	14	**2.0/5 Low-Med**	$6.00	PJM (0.42)
Charles County, MD	Charles Co. DPW	9	**2.8/5 Med-High**	$8.50	PJM (0.42)
Davidson Co., TN	Metro Water Services	180	**2.0/5 Low-Med**	$5.50	TVA (0.44)

JURISDICTION	UTILITY	CAPACITY (MGD)	STRESS INDEX	RATE ($/1,000 GAL)	GRID REGION
Mecklenburg Co., NC	Charlotte Water	215	**2.6/5 Medium**	$5.20	Duke (0.50)
New Hanover Co., NC	CFPUA	60	**2.4/5 Medium**	$5.80	Duke Progress (0.50)
Fulton County, GA	City of Atlanta DWM	195	**3.8/5 High**	$8.00	GA Power (0.40)
Gwinnett Co., GA	Gwinnett DWR	130	**3.8/5 High**	$6.50	GA Power (0.40)
DeKalb County, GA	DeKalb County	110	**3.8/5 High**	$7.00	GA Power (0.40)
Williamson Co., TX	Brazos RA + city	90	**4.0/5 High**	$5.50	ERCOT (0.22)
Denton County, TX	Upper Trinity RWD	120	**3.5/5 High**	$5.00	ERCOT (0.22)
Bexar County, TX	SAWS	320	**4.2/5 Ext. High**	$4.20	ERCOT (0.22)
Clark County, NV	SNWA / LVVWD	410	**4.5/5 Ext. High**	$5.50	WECC SW NV (0.18)
Washoe County, NV	TMWA	105	**3.2/5 High**	$4.80	WECC SW NV (0.18)
Salt Lake County, UT	SLCDPU	130	**3.4/5 High**	$3.80	WECC NW (0.45)
Grant County, WA	Grant PUD	25	**1.5/5 Low**	$2.50	BPA (0.10)
Umatilla County, OR	Umatilla / Hermiston	20	**1.8/5 Low**	$4.00	BPA (0.10)
Morrow County, OR	Morrow County	5	**1.6/5 Low**	$3.50	BPA (0.10)
Polk County, IA	Des Moines Water Works	95	**2.0/5 Low-Med**	$5.00	MISO Central (0.30)
Pottawattamie Co., IA	Council Bluffs WW	35	**1.8/5 Low**	$3.50	MISO/SPP (0.20)
Licking County, OH	Licking Co. + Aldrich	25	**2.8/5 Med-High**	$5.50	PJM AEP (0.45)

JURISDICTION	UTILITY	CAPACITY (MGD)	STRESS INDEX	RATE ($/1,000 GAL)	GRID REGION
Franklin County, OH	Columbus DPU	145	**2.5/5 Medium**	$5.20	PJM AEP (0.45)
Shelby County, TN	MLGW	200	**1.6/5 Low-Med**	$8.06	TVA (0.44)
Mesa, AZ (Maricopa Co.)	City of Mesa	204.5	**3.8/5 High**	$4.83	WECC SW (0.33)
Pinal County, AZ	Arizona Water Co.	60	**4.6/5 Ext. High**	$3.39	WECC SW (0.33)
Storey County, NV	TRI-GID	8	**3.4/5 High**	$1.15	WECC SW NV (0.18)
Laramie County, WY	Cheyenne BOPU	45	**2.5/5 Med-High**	$6.65	WECC coal (0.50)
Valencia County, NM	Village of Los Lunas	12	**4.1/5 Ext. High**	$4.25	WECC PNM (0.38)
Santa Clara Co., CA	Valley Water / SJWC	380	**3.6/5 High**	$8.37	CAISO (0.18)
Washington Co., OR	Hillsboro / JWC	41.7	**2.6/5 Med-High**	$6.72	BPA (0.10)
Sarpy County, NE	Metro Utilities Dist.	99	**1.4/5 Low-Med**	$2.90	SPP (0.30)
Racine County, WI	Racine Water Utility	36	**0.8/5 Low**	$4.16	MISO (0.37)

Water stress index: Sourced from WRI Aqueduct 4.0 (https://www.wri.org/applications/aqueduct/water-risk-atlas/) (2023 baseline year). Scale: 0–1 Low, 1–2 Low-Medium, 2–3 Medium-High, 3–4 High, 4–5 Extremely High. Index values are at the HUC-8 basin level for the primary water source serving each jurisdiction.

Utility capacity: Maximum daily production capacity as reported in each utility's most recent annual report or Consumer Confidence Report (CCR). Actual average daily production is typically 50–70% of capacity.

Water rates: Standard commercial/industrial rate per 1,000 gallons from each utility's published rate schedule (as of Q1 2026). Data centers may negotiate separate rate agreements not reflected here.

§6.5 US Siting Matrix

The Siting Matrix (siting-matrix.html) is a national county-level table scoring US locations on suitability for new data center load. It supports the **Explore** mode of WaterMark — a developer or site selector trying to identify where in the country to build, evaluated against the same data and methodology that communities and regulators use to assess specific proposals via the calculator and active-tracking pages.

Strategic intent. The matrix is the "where to build" tool. Combined with the calculator (the "what's the impact at this site" tool) and the per-jurisdiction tracking pages (the "what's currently being proposed here" tool), all three audiences negotiate from one data set rather than competing decks. This alignment is the entire reason the referee posture works for both developers and communities.

Composite scoring model

Composite Siting Score (0–100, higher = better for new DC load) is a weighted sum of seven sub-scores. Each sub-score also runs 0–100, higher = better for siting (more headroom, less stress, less friction). Default weights:

SUB-SCORE	WEIGHT	WHAT "HIGH" MEANS	INPUTS
Water availability	25%	Abundant surface + groundwater headroom; low drought frequency	USGS Water Use 2020 + state water plans + USGS Groundwater Watch + NOAA drought monitor
Watershed stress (inverted)	20%	Current consumption far below sustainable yield; low projected 2035 stress	USGS withdrawal/consumption ratios; WRI Aqueduct 4.0; state water plans
Grid water intensity (inverted)	20%	Renewable / hydro-heavy grid (low gallons per kWh)	EIA Form 923 + Macknick et al. 2012 NREL water consumption factors
Regulatory friction (inverted)	15%	Predictable permits; no moratoria; clear water-rights process	Manual ingestion of state and county ordinances, EIR/EIS requirements, water rights filings
Power availability + cost	10%	Clear interconnection queue; low $/MWh wholesale; no transmission constraint	ISO/RTO interconnection queues (PJM, ERCOT, MISO, CAISO, SPP, NYISO, ISO-NE); EIA wholesale rates
Climate efficiency	5%	Low wet-bulb temperatures; long economizer hours possible	NOAA NCEI climate normals; ASHRAE TC 9.9 climate-zone analysis

SUB-SCORE	WEIGHT	WHAT "HIGH" MEANS	INPUTS
Incentive landscape	5%	State or local DC sales tax exemption, abatements, predictable enterprise zone	State revenue codes; locality-published abatement programs

Composite = (waterAvail × 25 + watershedStress × 20 + powerWater × 20 + regFriction × 15 + powerCost × 10 + climate × 5 + incentives × 5) / 100. Custom weighting will be available in a future paid consulting tier; the public matrix uses default weights.

v3.2 launch coverage

The v3.2 launch covers ~30 hand-curated counties spanning the major US data center clusters (Northern Virginia, Phoenix metro, Pacific Northwest, Iowa, Atlanta, North Texas, Tennessee, Ohio, Carolinas) plus a handful of emerging markets. Sub-scores for each county are estimates based on the inputs listed above; per-county source disclosure appears in the row drawer.

Hand-curation, not automated ingestion. The v3.4 dataset is 30 hand-scored counties, every score with a documented basis. The intentional limitation is that scores are estimates calibrated against published sources rather than the result of an automated USGS / EIA / NOAA pipeline. v3.5 (planned) replaces hand-curation with automated ingestion and expands to all CONUS counties.

Honesty guardrails

- **Composite score is not an endorsement.** It is one model with one set of default weights. The matrix's framing is "highest composite score under default weights," not "best places to build."
- **No "winners" lists in marketing copy.** Top 10 / Bottom 10 callouts on the matrix page are presented as analytical artifacts, not site recommendations.
- **Per-row sourced inputs.** Every county shows its source basis in the drawer — utility, basin, grid operator, incentive program references.
- **Last-updated dates per sub-score class.** Water = USGS 5-year cycle. Power = quarterly EIA / ISO. Regulatory = rolling. Climate = NCEI normals (30-year).
- **The matrix does not replace local diligence.** Tribal jurisdictions, recent ordinance changes, and project-specific factors require direct verification.

Geographic granularity

Scoring resolution is **county-level** by default — most users think in counties and most data is published county-level. HUC-8 watershed views are an open enhancement; water sub-scores would be more accurate at HUC-8, but power and incentive sub-scores remain at state/county level even in a watershed view.

Calculator deep-link integration

For the subset of counties where WaterMark has detailed water-utility and grid data (PG County, Pima County, Hermantown / St. Louis County, Chandler / Maricopa County, Loudoun County), the matrix row drawer surfaces a "Run full WaterMark analysis on this jurisdiction →" CTA that opens the calculator pre-populated with that location at 200 MW with Scope 2 included. Coverage will expand as additional jurisdictions are added to the calculator dataset.

§7 Limitations and Assumptions

- **Continuous operation assumed.** Calculations assume 24/7/365 operation at the specified IT load. In practice, utilization ramps up over months or years and averages 85–95% for mature facilities.
- **Climate not modeled.** Evaporative cooling efficiency varies significantly with climate. Wet-bulb temperature, humidity, and seasonal variation are not factored into the base rate. Arid climates may see 30–50% higher water use per kWh.
- **Single-facility analysis.** Community impact metrics measure one facility's impact. Cumulative impact from multiple data centers in the same jurisdiction may be significantly higher. The ICPRB March 2026 study found data centers collectively account for 9–12% of Potomac consumptive use during summer peak.
- **Static grid mix.** Indirect water calculations use current grid mix data. Facilities with dedicated PPAs, on-site generation, or renewable energy certificates may have different indirect water profiles.
- **Rate impact uncertainty.** Residential electricity rate impact carries high uncertainty and depends on regulatory decisions, utility negotiations, and cost allocation methodologies not publicly available during the permitting process.
- **Reclaimed water not modeled.** Some facilities use treated wastewater or reclaimed water. This reduces freshwater withdrawal but not total consumption. The tool does not currently differentiate between freshwater and reclaimed water sources.
- **Not engineering analysis.** This tool provides planning-level estimates for public information and policy discussion. It does not constitute engineering analysis, environmental impact assessment, or regulatory determination.

§8 Data Sources and References

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§9 About WaterMark

WaterMark is a data center water impact assessment tool developed by Standard Water Corp (https://standardwater.co) (SWCo). It provides transparent, source-cited estimates of water consumption and community impact for proposed and existing data center facilities.

The tool was built to address a critical information gap: communities facing data center proposals lack accessible, independent tools to evaluate water impact claims. Corporate sustainability disclosures exclude indirect water, environmental impact statements are often unavailable during early planning stages, and consulting assessments are typically funded by developers.

WaterMark is not affiliated with any data center developer, utility, or government agency. All calculations and data sources are publicly documented on this page.

Contact

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Version History

VERSION	DATE	CHANGES
3.7	June 2026	Migrated ICPRB citations from the retired icprb.org domain to potomacriver.org (verified live). Added a dated, sourced context note referencing the SpaceX S-1 water risk factor (June 2026), a press section for journalists, and an inline limitations note on the assessment tool. Corrected stale jurisdiction counts (30 → 35 scored) and version stamps. Mobile layout verified.
3.6	May 2026	Regional grid water intensity refreshed against current (2024–2025) generation mixes: TVA 0.55 → 0.44, GA Power 0.58 → 0.40 (post-Vogtle 3&4), ERCOT 0.30 → 0.22, NV Energy / WECC SW (Nevada) 0.35 → 0.18 (North Valmy Unit 2 coal retired Dec 2024). Same Macknick et al. 2012 NREL consumption-factor method, re-weighted by EIA / ISO fuel mix. These corrections lower indirect (Scope 2) estimates where prior values overstated thermal share.
1.1	April 2026	Regional grid water intensity corrected. PJM 1.42 → 0.42 gal/kWh, WECC SW 1.10 → 0.37, MISO N 1.05 → 0.37, derived from Macknick et al. 2012 NREL consumption factors weighted against PJM-EIS GATS EY2024 and EIA state-level generation mixes. Full audit trail in VALIDATION.md (https://github.com/rkurani/watermark/blob/master/VALIDATION.md).
1.0	April 2026	Initial release. 5 jurisdictions, 4 cooling types, direct + indirect water, electricity impact.