

VERMILLION COUNTY, INDIANA • DATA CENTER COMMITTEE

Water, Power and Cooling

What a data center actually uses, how cooling works, and how it compares to what Vermillion County uses today

Committee Report — October 11, 2026

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Draft A - For Review Only

How to read this report

A data center is the only industrial use most people will ever evaluate without being able to picture it. It makes no product you can hold, its impacts are invisible, and the numbers attached to it are large enough to be meaningless without something to compare them to.

This report is built to fix that. It explains the one physical relationship that governs everything; the connection between electricity and water, then walks through how cooling has been done, how it is done now, and where it is going. It closes with real numbers from real projects and a baseline of what Vermillion County itself uses every day.

Three ground rules. **Every figure is sourced**, and the source is named. **Where a published source appears to contain an error, this report denotes that** rather than repeating it. And **where a number is a projection or an allocation rather than measured use, it is labeled as such**.

Part 1 — The one idea that explains everything

Electricity becomes heat

A data center does not consume electricity in the way a factory does. A factory turns electricity into motion, or into a finished product that carries some of that energy away with it. A data center turns electricity into calculations — and calculations have no physical substance.

So essentially **one hundred percent of the electricity that enters a data center leaves it as heat**. A building drawing 100 megawatts of power is producing 100 megawatts of heat, continuously, and that heat has to go somewhere or the equipment destroys itself within minutes.

The practical consequence. If you know how many megawatts a facility will draw, you already know how much heat it must reject — and that sets the outer limit on how much water/cooling it could possibly need.

For scale: one megawatt of continuous heat is roughly what 280 central air conditioners would have to remove if they ran flat out, forever, without stopping. A 500-megawatt data center is 140,000 of them.

Part 2 — What a gallon of water actually does

Water cools by evaporating. When a gallon of water turns to vapor it carries away about **8,750 British Thermal Units** of heat. That is a fixed property of water.

Working from there:

- One megawatt of heat is 3.41 million BTU per hour.
- Divided by 8,750 BTU per gallon, that is about **390 gallons per hour**.
- Over a full day, about **9,400 gallons per megawatt** — or roughly **11,700 gallons** once you include the heat added by the chillers and pumps that move it around.

Roughly 11,700 gallons per day for every megawatt, while evaporative cooling is running. It is the ceiling. No cooling tower does better, because the limit is physics rather than engineering

Equipment efficiency barely affects water use. Operating hours determine almost all of it.

If evaporative cooling runs...	Water per year, per megawatt	What that is per day, averaged
100 hours (1% of the year)	49,000 gallons	133 gallons
500 hours (6%)	244,000 gallons	667 gallons
876 hours (10%)	427,000 gallons	1,169 gallons
2,190 hours (25%)	1,067,000 gallons	2,922 gallons
8,760 hours (all year)	4,266,000 gallons	11,689 gallons

Part 3 — Cooling, then and now and next

Cooling is the single most misunderstood thing in this subject and it has already produced flawed ordinance language in other Indiana counties.

Two stages, and only one uses water. **Stage one** moves heat off the computer chips. It can use air or liquid. **Either way it consumes no water** — a liquid system here is a sealed loop, the same fluid circulating indefinitely. **Stage two** moves heat from the building out to the outdoors. **This is the only stage that consumes water**, and only if the method works by evaporation.

Yesterday: what is now obsolete

Room cooling with tight tolerances (1990s–2008). Early data centers were kept at about 68 °F and 45 percent relative humidity, on the theory that computers were delicate. Air was cooled by room units sitting on a raised floor and blown up through perforated tiles. It was enormously wasteful of energy, and because the humidity band was narrow it consumed water in **winter**, adding moisture to dry air, as well as in summer removing heat.

Year-round chilled water plants. A water-cooled chiller paired with an open cooling tower, running every hour of the year regardless of the weather outside. This is the configuration that produced the historical water figures people still quote. It was not inefficient equipment; it was equipment that was never turned off.

Both approaches are obsolete, and that matters for how we read and consider older studies. **A water figure from a facility built before about 2010 describes a building nobody constructs anymore.**

Today: what an applicant would actually propose

Stage one, at the chips:

Method	How it works	Water	Where it stands
Air cooling	Fans blow air across metal heat sinks	None	Traditional. Runs out of capacity around 20–30 kilowatts per equipment rack
Direct-to-chip (cold plate)	A metal plate with liquid channels sits directly on the chip	None — sealed loop	Now mainstream. Handles 100 kilowatts per rack and beyond. What AI hardware requires

Method	How it works	Water	Where it stands
Immersion, single-phase	Whole servers submerged in a non-conductive oil	None — sealed	Works, but uncommon at large scale
Immersion, two-phase	Fluid boils on the chip and condenses above it	None — sealed	Highest performance. Uses PFAS fluids. See the caution below

Stage two, at the building — this is the water decision:

Method	How it works	Water	Energy
Open cooling tower	Warm water trickles through moving air; some evaporates	Highest — the 11,700 gallons per megawatt figure	Lowest
Closed-circuit fluid cooler	Same idea, but the process water stays in tubes and separate spray water evaporates outside them	High	Low
Adiabatic or hybrid cooler	A dry radiator that wets the incoming air only when the weather is hot	Low — runs completely dry most of an Indiana year	Moderate
Dry cooler or air-cooled chiller	A large radiator with fans. Nothing evaporates	None	Highest — about 10% more per year, roughly 20% on a hot day

The honest trade-off. Google, which operates data centers worldwide, argues publicly that evaporative cooling is the **better** environmental choice where water is not scarce, because it uses meaningfully less electricity. More electricity means more generation, and generating electricity consumes water somewhere else. There is no water-free option, only a choice about where the burden falls.

Tomorrow: what is arriving now

Warm-water operation. The single biggest lever, and the least visible. How often a facility needs water depends almost entirely on how warm the water returning to the computer equipment is permitted to be. The engineering society ASHRAE publishes classes for this:

Class	Water temperature the equipment accepts	Dry cooling works when outdoor air is below	Hours a year Indiana exceeds that
W17	63 °F	48 °F	Most of the year — needs a chiller
W27	81 °F	66 °F	Roughly 2,000–2,500
W32	90 °F	75 °F	Roughly 800–1,200
W40	104 °F	89 °F	Roughly 50–90
W45	113 °F	98 °F	Essentially none in a typical year

ASHRAE reports that most cold-plate installations today run at W32, and that current products may already be capable of W45. **A facility specified at W40 or warmer can run dry coolers in Vermillion County essentially year-round.** The specification chosen at the purchase order, moves annual water use by a factor of a hundred.

Zero-water designs, now being built. Microsoft introduced a closed-loop, direct-to-chip design in 2024 that consumes no water for cooling during operation — the loop is filled once at construction and recirculated. Pilot facilities are under construction in Phoenix and in **Mount Pleasant, Wisconsin** during 2026. Every Microsoft data center designed since August 2024 uses it.

Waste heat reuse. Liquid cooling produces heat at 122 to 140 °F, hot enough to be useful. Air cooling produces it at 77 to 95 °F, which is not. Germany now requires new data centers above one megawatt to reuse at least ten percent of their energy, rising to twenty percent by 2028. Documented examples include a 30-megawatt facility heating a factory in Quebec and a 32-megawatt facility heating a greenhouse in Sweden. Practical reach is a few miles, so it only works with a nearby user.

One caution on two-phase immersion. It uses fluids containing PFAS — the "forever chemicals." Microsoft's own peer-reviewed study flags this, notes the fluids face regulatory scrutiny, and observes they may become unavailable. Over an aquifer, that is a containment and long-term liability question of an entirely different character from cooling water, and the county should learn about it at application.

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Part 4 — Real numbers from real projects

What follows is measured or contractually committed use at named facilities. Where a figure is an allocation rather than measured consumption, it says so — the two are frequently confused, and the difference is often large.

Facility	Status	Water	Source and notes
Google — The Dalles, Oregon (3 data centers)	Operating	355.1 million gallons in 2021 — about 973,000 gallons per day	Measured. Disclosed only after the city sued a newspaper to keep it secret and then dropped the suit. Use grew from 104.3 million gallons in 2012. Represents 29 percent of the city's total water consumption
Meta — Lebanon, Indiana (1 gigawatt)	Under construction	Allocation: 250,000 gal/day average, 500,000 peak initially, rising to 4 million average and 8 million peak by 2031	Contractual allocation with Lebanon Utilities, not measured use. Facility uses closed-loop direct-to-chip cooling with dry coolers. See the note below
Amazon and General Motors — New Carlisle, Indiana	Under construction	County cap of 24 million gallons per day combined , against a stated 44.5 million gallons per day aquifer safe yield	A regulatory cap, not a use figure. St. Joseph County set it by agreement before approving the projects
Amazon — New Carlisle construction dewatering	Requested; tabled	35 million gallons per day for 546 days — about 19.1 billion gallons total	Construction dewatering, not operation. Discharge to a county ditch draining to the Kankakee River. The Drainage Board tabled it indefinitely after farmers objected
Chandler, Arizona (water services agreement)	Operating	414,643 gallons per day total, tiered, on a rolling three-year average	A negotiated allocation with enforcement tiers — a model for how a limit can be structured
Microsoft — fleet average per facility	Operating	Over 125 million liters per year per data center — about 90,400 gallons per day	Company-reported, at a water intensity of 0.30 liters per kilowatt-hour

The Meta Lebanon figure deserves a second look, and it is the most instructive number in this table. Meta has publicly committed to closed-loop cooling at Lebanon, which the company says uses about seventy percent less fresh water than evaporation. Yet the contractual allocation rises to **4 million gallons per day average and 8 million peak by 2031**. For a one-gigawatt facility that works out to roughly 4,000 gallons per day per megawatt — far more than a genuinely dry-cooled building should need. Either the allocation is a conservative reservation well above expected use, or "closed loop" is doing less work than the public messaging suggests. **Nobody outside the company can tell which, because nothing requires the facility to meter and report what it actually uses.** That is precisely the gap the draft ordinance closes.

A Purdue researcher quoted in coverage of the Lebanon project makes the companion point: closed loops need more electricity, and power plants use large amounts of water, so a closed loop may shift water use to the power provider rather than eliminate it. That is the same trade-off described in Part 3, confirmed independently.

Why the same industry reports 0.15 and 0.50

A committee member who reads three articles about data center water will encounter numbers that differ by a factor of ten and conclude someone is lying. Usually nobody is. The figures are different **kinds** of number, and the distinction is the single most useful thing in this report.

Kind of number	Example	What it actually tells you
Measured fleet average	Amazon 0.15, Meta 0.18, Microsoft 0.27–0.30 liters per kilowatt-hour	What one company's entire portfolio did last year, averaged across dozens of facilities of different ages in different climates. Backward-looking. Says nothing about any single site
Modeled industry average	Lawrence Berkeley National Laboratory, 0.36	An independent estimate across the whole U.S. fleet. The best neutral benchmark available
Design target	Whatever an applicant puts in a submittal	An engineer's prediction for one facility under assumed conditions. Optimistic by construction, and not binding unless the ordinance makes it so
Contractual allocation	Meta Lebanon 4 million gallons per day; Chandler, Arizona 414,643	The maximum a utility has agreed to deliver. A ceiling, not a forecast, and deliberately set well above expected use
Measured single-facility use	Google, The Dalles — 973,000 gallons per day	What one building actually used. The only figure that answers the question people are asking — and almost never available before approval

The point of that table. Only the last row describes what a specific facility actually does. Everything else is either an average of other buildings or a number somebody reserved. **An application that offers you a fleet average or an allocation has not told you what the building in front of you will use.**

Normalizing before comparing: a worked example

Two figures from this report appear wildly inconsistent. Microsoft reports an average of about 90,000 gallons per day per data center. Meta's Lebanon allocation is 4 million gallons per day. That is a factor of forty-four, between two companies in the same business.

Most of it is simply size, and you can prove that from the companies' own numbers.

- Microsoft reports 125 million liters per year per facility at a water intensity of 0.30 liters per kilowatt-hour. Divide one by the other and the implied computing load is **47.6 megawatts**. That is their fleet average facility — a modest building.
- Meta Lebanon is **1,000 megawatts**. Twenty-one times larger.

Put both on the same footing, gallons per day for each megawatt of computing load, on a consumption basis:

	Consumption per megawatt per day	Implied water intensity
Microsoft, measured fleet average	1,902 gallons	0.30 L/kWh
Meta Lebanon, 2031 allocation	3,200 gallons	0.50 L/kWh
Meta's own reported fleet average	1,140 gallons	0.18 L/kWh

Normalized, the gap is not forty-four times. It is about **1.7 times** against Microsoft's actual performance — and about **2.8 times** against Meta's own published fleet average.

Why that still matters. 1.7 times is not scandalous. 2.8 times against the company's own stated performance is a question worth asking at a public hearing. And note that Meta Lebanon's allocation, if fully used, would exceed the 0.40 liter-per-kilowatt-hour ceiling in Vermillion county's draft ordinance. That tells you the proposed ceiling is a real constraint on a real Indiana project rather than a formality — and that it is not unreasonable either, since Meta's own fleet runs at less than half of it.

The tell nobody looks for: peak versus average

Meta's Lebanon allocation is 4 million gallons per day average and **8 million peak** — a two-to-one ratio. Per megawatt, that peak is about **55 percent of a cooling tower running flat out**.

Here is why that is informative. **Dry cooling does not surge.** A radiator does not care much that it is August. Fire suppression, restrooms and equipment washing do not double on hot afternoons either. The only thing at a data center that spikes with the weather is evaporation.

So a facility publicly committed to closed-loop cooling, reserving twice its average draw for peak days, is telling you something: either the design includes evaporative assist for hot weather — which is sensible engineering and probably the right choice in Indiana — or the closed loop covers part of the facility rather than all of it. **Neither is improper. But it is not what the public messaging conveys,** and nothing in Lebanon's arrangement will ever establish which it was.

That gap is the entire case for metering and annual reporting. Lebanon negotiated an allocation and obtained a technology commitment. It did not obtain a requirement to measure and publish actual use. In 2031 the public record there will still read "4 million gallons per day allocated," with no way to know whether the real figure is one million or four.

The trend is moving the wrong way

It would be comfortable to assume that water intensity keeps falling the way it did from 2008 to 2023. The best available projection says otherwise.

Lawrence Berkeley National Laboratory projects U.S. fleet water intensity **rising** from about 0.36 to **0.45 to 0.48** liters per kilowatt-hour, attributing the increase to hyperscale and colocation growth and to higher-density liquid-cooled systems. Two forces are behind it:

- **Density.** Equipment racks have gone from roughly 10 kilowatts to 100 kilowatts and beyond. More heat in less space is harder to reject, and the facility-level systems work harder.
- **Utilization.** This one is underappreciated. Water tracks energy actually consumed, not nameplate capacity. A conventional cloud facility may average 40 to 60 percent utilization. An AI training cluster runs near capacity around the clock. The same nameplate megawatts therefore consume substantially more energy — and substantially more water.

What this means for reading company averages. Every operator fleet average quoted in this report describes a fleet built largely for conventional cloud workloads. The facilities now being proposed are a different animal running a different workload at a different duty cycle. **The historical figures are real, and they describe buildings that are being superseded.**

Why no developer will do this voluntarily

This is the most important paragraph in the report, and it is not about anyone’s character.

Consider a one-gigawatt facility. Electricity, running continuously at five cents per kilowatt-hour, costs roughly **\$438 million per year**. Water at 4 million gallons per day, at a typical industrial rate of \$3 per thousand gallons, costs roughly **\$4.4 million per year**. Energy costs about **one hundred times** what water costs.

Now price the cooling decision. Eliminating on-site water by using dry coolers raises energy consumption by about ten percent. Ten percent of \$438 million is **\$44 million per year, spent to avoid \$4.4 million per year of water**. A ten-to-one loss.

The conclusion the committee should take from that. A developer minimizing cost will choose **more** water, not less, because evaporative cooling trades the expensive input for the cheap one. This is not greed; it is arithmetic, and any rational operator reaches the same answer. It follows that a voluntary low-water commitment runs against the operator’s own financial interest, which is exactly why such commitments are made for siting and reputational reasons, and exactly why they belong in a recorded, enforceable instrument rather than a press release. **A county that writes no water standard will get the higher-water design by default, from a company behaving entirely rationally.**

Part 5 — Vermillion County, for comparison

Everything above is abstract until it sits next to what this county already uses. The figures below are from the Indiana Department of Natural Resources’ registered withdrawal data for calendar year 2024, the U.S. Census Bureau, and the Indiana Department of Environmental Management.

Vermillion County

Measure	Figure
Population (2025 estimate)	15,488
Households	6,594
Persons per household	2.31
Housing units	7,396
Average American family’s household water use	More than 300 gallons per day (U.S. EPA); about 30 percent of it outdoors

What Vermillion County withdraws in a day

All figures are registered withdrawals for 2024, converted from annual totals. Indiana requires registration only of facilities capable of withdrawing more than 100,000 gallons per day, so private household wells and small farm wells are **not** included.

Category	Per year	Per day
Energy (surface water — the Cayuga generating station)	236,750 million gallons	649 million gallons
Industry (149 surface + 1,240.5 from wells)	1,389.5 million gallons	3.81 million gallons
Public water supply (all from wells)	526.2 million gallons	1.44 million gallons

Category	Per year	Per day
Agriculture	49.9 million gallons	137,000 gallons
All registered wells in the county, every purpose	1,815.6 million gallons	4.97 million gallons
All registered surface water	236,900.2 million gallons	649 million gallons

The most important fact in this report, for Vermillion County specifically. The county's entire registered **groundwater** withdrawal — every well, every farm, every factory, every town water system combined — is **4.97 million gallons a day**. Its surface withdrawal is **649 million gallons a day**, essentially all of it the power plant.

Other things in the county, for scale

Benchmark	Capacity or use
City of Clinton wastewater treatment plant	1.0 million gallons per day average design flow; 2.5 million peak. Discharges to the Wabash River (IDEM permit IN0022608)

Putting a data center against those numbers

Using 11,700 gallons per megawatt-day as the ceiling when evaporative cooling runs, and the figures above:

A data center at...	Peak-day consumption	Compared to...
50 megawatts	585,000 gallons	Roughly 40 percent of all public water pumped in the county
100 megawatts	1.17 million gallons	More than the City of Clinton's entire sewage plant handles in a day
250 megawatts	2.92 million gallons	About 59 percent of all registered groundwater withdrawal in the county
500 megawatts	5.85 million gallons	More than every registered well in the county combined
1,000 megawatts	11.7 million gallons	Less than two percent of what the power plant already withdraws from the river

The same facility is either overwhelming or trivial depending entirely on which source it draws from. Every figure in that table is a **peak day with evaporative cooling running flat out**, the annual average for a well-designed facility in this climate would be a fraction of it.

Part 6 — What follows for the ordinance

Six conclusions, each of which is reflected in the draft Data Center Standards section.

1. Measure withdrawal and consumption separately.

Withdrawal is what competes with other users. Consumption is what never comes back. A facility can have low consumption and high withdrawal, or the reverse. An ordinance using "water usage" as a single undefined term regulates neither.

2. Require a peak-day figure and an annual figure.

They are nearly independent of each other. The peak day never changes with design; the annual total varies by a factor of thirty. Each answers a different question, and one without the other is misleading.

3. Regulate gallons, not equipment.

Indiana law reserves mechanical system regulation to the state building code, the county cannot verify an equipment choice over a thirty-year life, and, as Part 3 shows, forcing a particular technology can simply move the water consumption somewhere else. Capping the gallons and requiring meters accomplishes what an equipment mandate cannot.

4. Treat groundwater differently from surface water.

The 130-fold difference in Part 5 is the whole argument. A groundwater limit protects a genuinely constrained resource.

5. Require the specifications that predict water use.

The ASHRAE temperature class, the heat rejection method stated separately from the chip cooling method, and the number of hours per year evaporative cooling will operate. Those three answers let the county check a water estimate against the climate rather than take it on faith.

6. Require metering and annual reporting.

The Meta Lebanon example in Part 4 is the case for this. A facility can publicly commit to a low-water technology and still contract for millions of gallons a day, and without metered reporting nobody can tell which figure describes reality.

Sources

- **Lawrence Berkeley National Laboratory**, 2024 United States Data Center Energy Usage Report (U.S. Department of Energy, December 2024) — fleet water intensity and cooling system modeling.
- **Alissa, Nick et al.**, "Using life cycle assessment to drive innovation for sustainable cool clouds," **Nature**, 1 May 2025 — comparison of air, cold plate, and immersion cooling.
- **ASHRAE**, Emergence and Expansion of Liquid Cooling in Mainstream Data Centers — facility water temperature classes W17 through W45.

- **Indiana Department of Natural Resources**, 2024 county water use summary and Significant Water Withdrawal Facility program — all Vermillion County withdrawal figures.
- **Indiana Department of Environmental Management**, NPDES permit IN0022608 — City of Clinton wastewater treatment plant design flows.
- **U.S. Census Bureau**, QuickFacts, Vermillion County, Indiana — population, households, housing units.
- **U.S. Environmental Protection Agency**, WaterSense — average household water use.
- **Indiana Geological and Water Survey**, Data Centers and Water Costs (2024) — national and Indiana scale figures. See the caution in Part 4 regarding one figure in this document.
- **North Dakota State University Extension**, AS1763, Livestock Water Requirements — per-animal daily water figures.
- **The Oregonian/OregonLive**, via Data Center Dynamics — Google water consumption in The Dalles, Oregon, 2012 through 2021.
- **CNHI News Indiana** — Meta Lebanon water allocations, cooling technology, and commitments.
- **ABC57 and WVPE** — St. Joseph County water cap and Amazon construction dewatering at New Carlisle.
- **Microsoft** corporate environmental reporting and **Google** public statements — fleet water intensity and the energy trade-off of air cooling.
- **Duke Energy** — Cayuga Energy Complex project description.

On the one figure still missing. Vermillion County's facility-level withdrawal records, which would identify each registered large water user in the county by name, capacity and actual withdrawal — are published by IDNR as a downloadable county file. Obtaining that file would allow this report's category totals to be attributed to specific facilities, and would confirm the aquifer picture under the Vermillion Rise site.