CENTRE FOR OPEN & RESPONSIBLE DIGITAL INFRASTRUCTURE DEVELOPMENT

Evaluating Data Centres: A Toolkit for Communities

Water Impacts

November 2026

DRAFT VERSION – DO NOT DISTRIBUTE

About this toolkit

How to use this toolkit: This toolkit is a general educational resource to help communities better understand data centres and take part in informed, constructive conversations about them.

It’s not an assessment of any specific project, site, or company, and it isn't intended to advocate for or against development.

Water impacts are highly regional. This toolkit aims to guide discussion and allow readers to determine what may be important for their specific project.

This toolkit is not a substitute for technical assessments or for local regulations, which vary across jurisdictions. This module reflects information available as of November 2026.

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Water at a glance

Key ideas communities need to know:

Water impacts vary significantly from site to site. There is no one-size-fits-all solution.

Using less water onsite can mean using more electricity, which can mean more water used at the power plant. The right balance depends on climate and the local grid.

Water withdrawal is different from water consumption. Some withdrawn water is returned after use, but consumed water is not.

Where other sources are available, data centres do not have to use drinking water. Options include reclaimed wastewater, brackish water, and industrial water.

Some steps communities can take:

01 Learn about local water conditions early, before a project is proposed.

02 Work with developers at the permitting stage to identify which water impacts matter locally and what trade-offs are reasonable.

03 Ask which cooling technology and water sources fit local conditions

04 Ask for water data that is publicly reported and independently verified, including water balance and water efficiency.

05 Work with developers and utilities to support the resilience of local water systems.

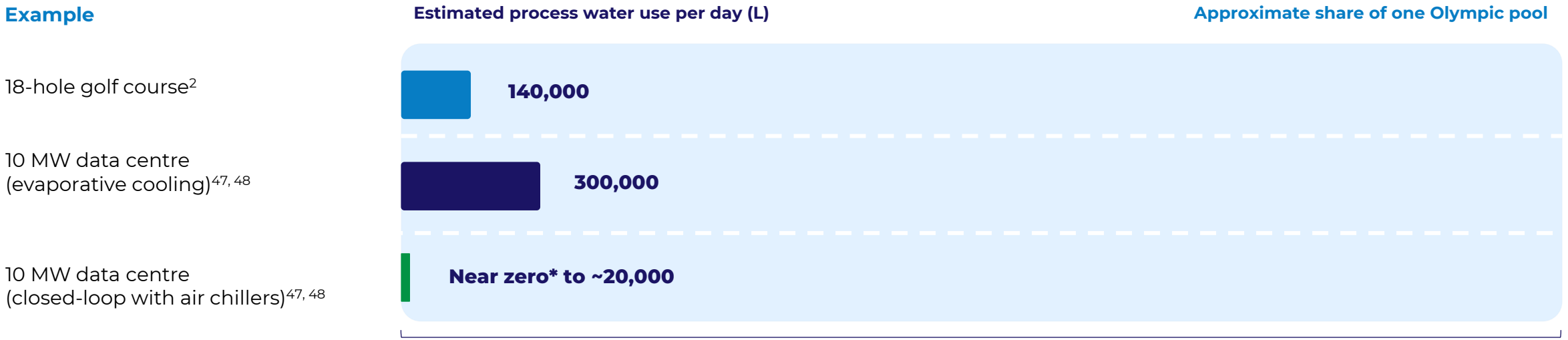
Key water concepts

“Water use” is a broad term. Understanding what enters a facility, what is consumed, and what leaves is essential to evaluating its potential impact.

Concept	What it means	Why it matters
Water withdrawal	All water brought into the facility from municipal, surface water, groundwater, reclaimed-water, or other sources.[1]	Withdrawal shows the total demand placed on the water source and the infrastructure used to supply it.
Water consumption	The portion of withdrawn water that is not returned to the original water system, most often because it evaporates.[1]	It varies significantly by cooling technology used. Consumed water is no longer locally available for other users or ecosystems. A facility can consume substantially less water than it withdraws.
Water discharge	Water that leaves the facility after use and is returned to a sewer, surface water body, or another receiving system.[1]	Discharged water may place demands on wastewater infrastructure or affect the receiving environment depending on its volume, temperature, and quality.
Water source	Where withdrawn water comes from, such as a municipal drinking water system, groundwater, surface water, or reclaimed water. The key distinction is whether the source water competes with other water needs.	The source determines whether a project competes for drinking water, draws from water that supports local ecosystems, or uses a reclaimed or non-potable alternative.
Water balance	An accounting of a facility’s water withdrawal, consumption and discharge. In simple terms: withdrawal = consumption + discharge.	A disclosed water balance allows communities to see what happens to the water, rather than relying on one ambiguous “water use” number.

How much water is a lot of water?

Water use can be hard to picture. This table compares estimated daily water use for a data centre with another familiar use.



*If little humidification is needed throughout the year, process water use will be near zero

One Olympic-sized swimming pool holds about 2.5 million litres of water

Cooling method matters. A 10 MW data centre with closed-loop cooling and air chillers uses far less water at the facility than one with evaporative cooling.

These are illustrative estimates. Actual use varies widely depending on a variety of factors.

Understanding data centre water use



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How does a data centre use water?

As introduced in the *Understanding Data Centres* module, computing equipment uses electricity and produces heat. Data centres may use water directly onsite, mainly for cooling but also for humidity control and building operations, and indirectly offsite through electricity generation.

Cooling equipment

Direct

Water may be used to absorb and remove heat from the computing equipment. How much water is used, where it comes from, and what happens to it after use vary significantly depending on the cooling design.

Humidity control

Direct

Some facilities use water to regulate indoor humidity and maintain appropriate operating conditions for computing equipment.

Building operations

Direct

Water is also used for washrooms, cleaning, landscaping, and other routine building needs. These uses are generally minor compared with water-based cooling.

Electricity generation

Indirect

Producing the electricity consumed by a data centre may also involve water, depending on the generation source and cooling system[4]. This water use generally occurs away from the data centre, potentially in another municipality or watershed.

See next page on the energy-water trade-off

The water-energy trade-off

Water and energy use are linked and represent a trade-off: less cooling water at the data centre may mean more water used at the power plant.

Onsite water trade-off

Water is used for cooling because it carries heat away more efficiently than air does[3]. Cooling designs that use less water reduces demand on site but may then require more electricity to operate.



Offsite water trade-off

Water is needed to operate certain types of power generation technologies[4]. So, depending on the grid (predominant power sources), generating additional electricity for air cooling may use more water than is saved at the site.[3]

The right balance between water and electricity use depends on climate and the local grid or power sources. This concept helps explain why measuring the water use impact of data centres, like any industrial user, is complex.

Offsite water use is typically not included in data centre water balance calculations.

This module is most focused on onsite water use, but additional materials will be developed to cover offsite impact.

Common community concerns

Concerns about water apply to many large users. Community concerns are not only about how much water a data centre uses. They are also about where the water comes from, what happens to it after use, whether local systems can support the demand, and who will be accountable over time.

Will there be enough water?

- Will it reduce our drinking water?
- Will it make water scarcity worse?
- Will it increase our water prices?

Where will the water come from?

- Will it use drinking water, groundwater, or reclaimed water?
- Will it create issues for anyone else in our community or ecosystems?

What happens to the water after use?

- Where will it be discharged?
- Are there chemicals in the discharged water?
- Is the discharged water hot, and could that impact our lakes and streams?

Who will monitor and respond?

- Will water use be measured and reported?
- Who will check measurements after operations begin?
- Can residents request an assessment?

How these concerns show up as real impact

Water concerns about data centres tend to fall into four areas: demand, infrastructure costs, discharge, and transparency. Not every data centre raises these concerns. Whether they arise depends on local water conditions and project design (see pg. 18).

Pressure on drinking water supply in water-scarce areas.

Some data centres have relied mainly on municipal drinking water for cooling, including in regions facing drought, groundwater depletion, or competing demands.[5, 6] In these areas, water withdrawals for cooling can reduce the supply available to residents, farms, and ecosystems.[5, 6]

Questions raised around who pays for water infrastructure upgrades

Water utilities may need added treatment, pumping, distribution, or wastewater capacity for large facilities.[6] Communities have raised concern that these costs could shift to existing ratepayers.[7, 26] Whether that happens depends on local cost recovery rules.[6]

Effects of discharged water on local waterways

Discharged cooling water can carry added heat and, where cooling towers are used, concentrated minerals and treatment chemicals, though discharge generally requires treatment and a permit.[23] In small waterways, added heat can contribute to algal blooms and oxygen loss.[8] How much this affects local waterways depends on the discharge limits set by municipalities and provinces, and how they are monitored.[9, 12, 13, 24, 25]

Communities find it hard to verify impacts

Water use is not consistently disclosed, is reported using different definitions, and often does not separate withdrawal from consumption.[5] More broadly, researchers note that water scarcity itself is "measured locally, inconsistently, and often not at all."[5] Together, this makes a facility's effect on local supply hard for communities to determine.

What rules apply to water use?



How water use is regulated

Two sets of rules matter most here: water use (withdrawal) and water discharge. There are no binding rules in Canada that are specific to data centres. They follow the same rules as other industrial water users.

Municipalities manage most water withdrawal, including whether a data centre can connect to the local water system. A municipality's water source, seasonal availability, and treatment capacity affect whether it can supply a facility.

Provinces also set rules, and requirements vary across Canada. Large water users that withdraw directly from lakes, rivers, or groundwater generally need a provincial permit. For example, Ontario requires a permit to take water under the Ontario Water Resources Act,[9] but a facility supplied by a municipality does not need its own permit.[27]

Level	What it covers for DCs	When it applies
Municipal	Zoning and site plan approval	• Applies when a data centre connects to the municipal water system • The municipality decides whether the facility can connect **Because many facilities connect to municipal supply, municipal approval is where communities can have the most influence.**
Provincial	Permits or licenses for taking water, which can include limits and reporting requirements	• Applies when a facility draws water directly from surface water or groundwater • Nova Scotia, for example, requires a permit above 23,000 L/day and reviews whether the withdrawal is sustainable[10] • See pg. 15 for Ontario, Alberta, BC, and Quebec
Federal	Limited role	• No federal limits or requirements apply to water withdrawal

How water discharge is regulated

Data centres follow the same discharge rules as other industrial water users, including limits on contaminant concentrations and heat release. These rules limit what a facility releases, not how much water it uses.

Municipalities and provinces both regulate discharge. Provinces set requirements for any discharge into the environment, and municipalities may add their own. Local by-laws reflect each municipality's water source, seasonal availability, and treatment capacity.

Level	What it covers for DCs	When it applies
Municipal	Site plan approval and sewer use by-laws By-laws can set water quality limits and require inspection, sampling, and enforcement	• Applies when a data centre connects to a municipal wastewater system • For example, Toronto and Vancouver by-laws set limits on discharge quantity and quality, and can require pretreatment[12, 13] **Where a data centre discharges to a municipal sewer, the sewer by-law sets limits on what it can release, and monitoring checks that it follows them. Communities can ask what is released, where it goes, and how it is monitored.**
Provincial	Facility-specific requirements for treatment, discharge, monitoring, and reporting of wastewater	• Applies when wastewater is treated and discharged onsite, not through a municipal system • Ontario requires an environmental compliance approval, and BC requires a waste discharge authorization[24, 25] • Requirements can address contaminants, heat, and how contaminants move through the environment
Federal	Any process water released into waterways	• Under the Fisheries Act, applies to any release into waterways that fish use, or where contaminants could reach them[14, 29] • It sets baseline requirements that provinces enforce[14]

Provincial rules for water use and discharge

Water rules vary by province. None were written for data centres, so each province's general water rules apply.

Emerging, non-binding: Ontario's proposed Data Centre Playbook (August 2026) would assess data centre proposals on factors that include how they mitigate environmental impacts. It is not yet final.[33] The federal Responsible Data Centre Development Principles (September 2026) set an expectation that data centres minimize water use and environmental impacts but are not legal requirements.[34]

ONTARIO

Water use (withdrawal)

- Permit to take water above 50,000 L/day[9]
- Facilities supplied by a permit holder, such as a municipality, are exempt[27]
- In the Great Lakes–St. Lawrence basin, a shared agreement with Quebec and eight US states sets a common review standard for withdrawals and bans most diversions out of the basin[28]

Discharge

- Environmental compliance approval[24]

ALBERTA

Water use (withdrawal)

- Water Act license to divert and use surface water or groundwater, with limited exemptions[30]

Discharge

- Approval or registration under the Environmental Protection and Enhancement Act[30]

BRITISH COLUMBIA

Water use (withdrawal)

- License for any groundwater use, regardless of volume[11]

Discharge

- Waste discharge authorization[25]

QUEBEC

Water use (withdrawal)

- Authorization required for larger withdrawals, and withdrawals must be declared[31]
- The same Great Lakes agreement applies in the Quebec part of the basin[28]

Discharge

- Authorization under the Environment Quality Act for activities that release contaminants[32]

What determines the impact of water on a community?



Impact depends on the place and project

A community's water impacts depend on both local conditions (place) and project design (project). Local conditions, including seasonal and future water availability, can shape design and operating choices that reduce water impacts.

1 Place

Characteristic	Why it matters
Water availability and competing needs	The same withdrawal can have very different impacts depending on the water available for residents, businesses, agriculture, and ecosystems.
Water source	Municipal, groundwater, surface, and reclaimed water each affect local users, ecosystems, and infrastructure differently.
Water sink	Large water bodies, such as Lake Ontario, make discharge easier. Smaller bodies, or those with other contaminants, may need tighter controls or different technologies.[8]
Seasonal and drought conditions	Water may be least available when cooling demand is highest. Conditions can change substantially between seasons and year to year.
Water infrastructure	Existing treatment, pumping, distribution, and wastewater capacity determine what upgrades are needed.
Local electrical grid mix	Water used offsite to generate power can be a large share of a data centre's water footprint,[15] and it varies by generation type.

2 Project

Characteristic	Why it matters
Data centre scale (MW)	Larger facilities and heavier workloads (AI) generally need more cooling.
Cooling and heat removal design	Cooling equipment affects how much water is consumed or discharged and sets the trade-off between onsite water and electricity use.[1]
Water source and discharge plan	Project decisions influence which source is used, how much water is returned, where it is discharged, and whether its temperature or quality has changed.
Operational and drought-response measures	Controls, storage, hybrid cooling, and plans to cut use can change when and how much water is used, especially in peak or dry periods.

How is the impact managed?

Developers can reduce water impacts through project design, operating practices, and collaboration with local water users and utilities. The right mix depends on local conditions. Below are approaches commonly used in North America.

1 Place

Alternate water sources: If available, facilities can reduce demand on drinking water by using:

1. Reclaimed or treated wastewater[16, 17, 19]
2. Other non-potable water, such as brackish groundwater[35, 36]

Coordination and planning: Developers, utilities, and the community can improve outcomes by planning together on:

1. Utility coordination
2. Water and wastewater infrastructure investments
3. Community engagement (i.e., what other water system upgrades are needed)

2 Project

Cooling and heat removal design: Cooling design is a major factor influencing water use and discharge, including:

1. Air-based or hybrid heat release[1]
2. Closed-loop coolant systems[1]
3. Pretreating wastewater before discharge[37]

Operational measures: Facilities can adapt water use to changing conditions, such as:

1. Seasonal operating changes
2. Drought plans, including storage and reduced use
3. Water conservation practices

See next page on the energy-water trade-off

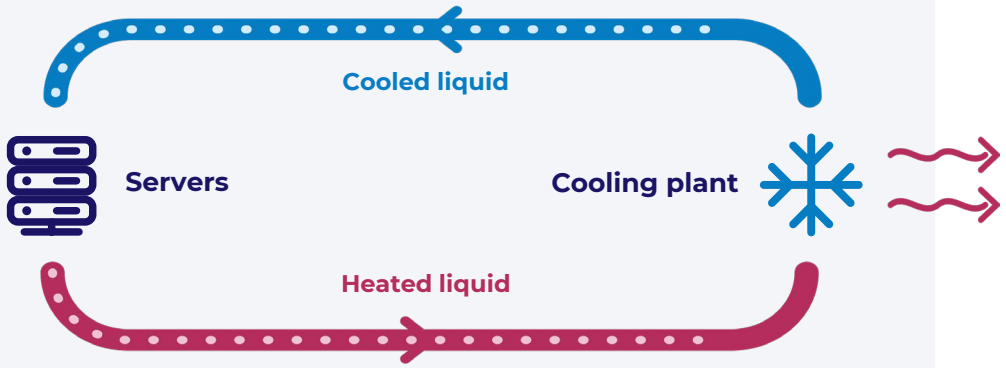
What does “closed-loop” mean?

AI data centres use more energy than other data centres types, so they need more cooling. To accomplish this, many use “closed-loop” liquid cooling, where water in a sealed loop absorbs and carries away heat from the servers. These systems use little water relative to other industrial uses. However, how the heat gets released to the outside is still a critical question.

Step 1 - Absorb heat:
Sealed liquid loop carries heat from servers

Step 2 - Release heat:
Heat rejected from loop to outside

Closed loop portion



Loop usually use treated water, which rarely requires refilling.

Ways to release heat

Increasing water consumption

Dry chillers:
use air, not water, so they use little to no water but likely more electricity[46]

Once-through:
takes water from a nearby water body and returns it warmer. Little is consumed, but the body of water is heated[46]

Hybrid:
Mixes air and water cooling, so water use depends on the design[46]

Cooling towers:
Water evaporates to carry heat away, so they can use a lot of water[46]

Emerging practices

In addition to common approaches, these emerging practices may further reduce water impacts. Some data centres have already put them in place, and results will depend on local conditions.

1. Circular water use

a) **Reuse of municipal wastewater:** Some data centres use treated municipal wastewater for cooling.[16, 18] Some have partnered with municipalities to build wastewater treatment plants, and others have built their own. Extra treated water can be shared, which can increase a region's water supply.

b) **Reuse of industrial water:** Data centres can use non-potable industrial water, such as brackish or mineral-rich groundwater.[35, 36] They can also share water with nearby industrial users, when available.

Added benefit of co-location: Data centres produce heat, and many industrial processes need heat. Locating next to industrial users who can reuse the data centre waste heat can reduce their heat demand.[38]

2. Increased water efficiency

a) **Reducing water used for onsite and offsite power generation:** Generator choices will impact the water requirements for power generation.[20] Where possible, choosing low-water power sources, such as wind and solar, can help reduce overall water consumption.

Innovation may be needed

Water use has become a major concern for data centres. New innovations are being explored. These areas are less established but may support better impact management as they mature.

1. **Total water footprint:** Water use is usually measured on site. Adding the water used to generate a facility's electricity gives a fuller picture and can change design choices, since using less water on site can mean more water used at the power plant.[15]
2. **Water metrics that reflect local conditions:** The most common metric, water use effectiveness (WUE, litres of water per kWh of computing energy), does not show whether water comes from a scarce source or is used in a dry season. Newer metrics, such as water use intensity (WUI), aim to add this context.[21, 22]
3. **Siting and shared infrastructure:** Choosing sites with reclaimed water or spare wastewater capacity, and agreeing early on who pays for upgrades, may reduce community impacts.[39, 40, 41]
4. **Groundwater-based cooling:** Aquifer thermal energy storage uses stable underground temperatures for cooling. Researchers propose it as an underused option that could cut cooling electricity and evaporative water loss.[42]
5. **Advanced treatment of cooling water:** Treating water drained from cooling systems allows more reuse and less discharge. Some sites do this, but it is not yet common.[19, 37]
6. **Water-positive commitments:** Some large operators have committed to replenish more water than they use by 2030. Progress is currently self-reported.[43, 44, 45]

Verification and accountability



Understanding and verifying local impacts

Water concerns vary by region, so no single solution fits every project. These are the local conditions communities and developers should understand early, before any project is proposed. These questions follow the local conditions on pg. 18.

Water source and availability:

a) Does municipal water come from surface water or groundwater?

b) Are non-potable sources available for a data centre to use?

c) Does the source need significant treatment?

d) Is the source large and stable, or small and seasonal?

e) Who else relies on this source, such as farms, households, and industry?

Water and wastewater infrastructure:

a) Can local systems serve both the community and a data centre?

b) Where would wastewater go, and can the receiving water body handle it?

Drought risk:

a) Does water availability change with the seasons and rainfall?

Existing water quality:

a) Is the source already affected by natural pollution, agricultural runoff, or industrial activity?

Electricity supply:

a) Is electricity mainly from renewable sources or fossil fuels?

b) Is electricity generated nearby, and does that region have enough water?

A good project looks at all of these factors through a collaborative, transparent process. What success looks like will differ for each project.

What to measure and when

Measurements at different project stages can help assess and manage water impacts. Developers and computing providers should provide this information for every project, regardless of local context.

Stage	What should be measured	Why it matters
Before approval	• Existing site conditions (see pg. 23): source availability and quality, drought risk, system capacity • Planned water use by source (withdrawn and consumed), including peak, seasonal, and offsite power generation • Planned discharge: destination, temperature, water quality • Planned water use effectiveness (WUE): litres consumed per kWh of computing energy[21]	Local conditions are the baseline for judging impacts. Planned figures let the community assess a project before it is built.
As conditions of approval are being written	• Who measures and reports after opening and how often • What happens if commitments are not met • WUE as a permit requirement	Clear requirements help ensure timely reporting and verification of results.
During construction and operation	• Actual water use by source, with peak and seasonal data, not only annual totals • Actual discharge: destination, temperature, water quality • Actual WUE, compared with the proposal • Measured often (frequency depends on the project), reported publicly, and independently verified	Actual data shows whether commitments are being met and lets the community track performance over time.

How can my community ensure a lower impact?



Questions to ask

These example questions can support a constructive conversation. Which ones matter depends on the project and local context. Pages 23 and 24 cover the local conditions and measurements behind many of them.

Before the project is approved

- Are planned water use, discharge, and WUE reported for average, peak, and seasonal conditions (see pg. 24)?
- What type of cooling will be used, and how will it affect water and energy demand, including wastewater from cooling towers?
- Has the project assessed current and future water availability, including drought and competing needs (see pg. 24)?
- What water and wastewater infrastructure will be needed, who will pay for it, and will capacity remain for others?

As commitments and approval conditions are established

- What limits will apply to withdrawal, consumption, and drinking water use, including during constrained conditions?
- What discharge quality and temperature requirements must be met?
- What must be publicly reported, how often, and using which definitions and methods (see pg. 24)?
- Who will verify performance, and what happens if commitments are not met?

Once the data centre is operating

- Where can the community see actual water use, discharge, source, and WUE? Do they match the commitments made at approval?
- Have there been exceedances, unusual events, or major operational changes, and how were they addressed?
- Who can residents contact with questions or concerns?

Additional resources



Additional resources

Standards on quantifying water use

- The Green Grid
- ISO 30134-9:2022

Existing regulations on data centre water usage

- EED Delegated Regulation 2024/1364 – Data Centre requirements
- Malaysia Guideline for Sustainable Development of Data Centres

Water scarcity

- Aqueduct Water Risk Atlas

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