
INDEPENDENT ANALYSIS

The Aquifer Says No

DEQ's SJ 25 Groundwater Study and the
Data Center Question East of I-95

A Companion Analysis in the Virginia Data Center Series

SJ 25

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THE AQUIFER SAYS NO

DEQ's SJ 25 Groundwater Study and the Data Center Question East of I-95

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Introduction: A Door Closes

In July 2026 the Virginia Department of Environmental Quality published the study the General Assembly ordered two years earlier under Senate Joint Resolution No. 25: a comprehensive accounting of the groundwater supply east of Interstate 95, the region overlying the Virginia Coastal Plain aquifer system.[1] The resolution named data centers explicitly among its reasons, directing DEQ to “evaluate potential future impacts to the groundwater supply as a result of increasing groundwater withdrawals from newer industries such as data centers.”[2] The 144-page report DEQ returned, produced with the U.S. Geological Survey and the modeling firm Aquaveo, is the most consequential water document in the Virginia data center record since JLARC’s 2024 review, and it answers the question it was asked with unusual bluntness. There is no groundwater east of I-95 for data centers. There is very little groundwater east of I-95 for anyone.

DEQ simulated a withdrawal of 3 million gallons per day, the published upper end for a hyperscale campus on evaporative cooling, at nine locations spanning the coastal plain. All nine failed the permitting criteria. The agency then asked its modelers to find the largest withdrawal that would pass at each location. The best answer anywhere was 360,000 gallons per day, at a deliberately chosen best-case site on the lower Northern Neck, far from any development corridor. Near the I-95 corridor, where the region’s data centers actually cluster, the passing amounts fall to 60,000 gallons per day and below. At the test locations in Henrico County and Sussex County, no withdrawal passed at any volume the analysis measured.[3]

This companion analysis reads SJ 25 for the audience the rest of this series serves: county supervisors, planning staff, utility boards, and residents weighing data center proposals east of the fall line. It covers what the study found, how the nine-site test worked and what its limits are, what the results mean county by county, and what DEQ asked the General Assembly to do about it. The recommendations chapter is where a hydrogeology report becomes a policy document. Twelve recommendations are on the table for the 2027 session, and at least one of them, a proposed mandate that comprehensive plans in groundwater management areas limit planned growth to the water available, would move the water question to the very front of the land-use process, ahead of every rezoning and special use permit this series has documented.

The report also arrived late, and the lateness is part of the story. It was due the first day of the 2026 legislative session. It appeared in late July 2026, after a change of administration, months of quiet, and finally a public letter from environmental organizations asking the Governor to release it. A study this consequential spending half a year between completion and publication is itself a fact about how water information moves in Virginia, and this analysis treats the release history as part of the record.

Two cautions before the detail. First, SJ 25 is not a data center exposé, and it should not be quoted as one. Its treatment of the industry's current water use is measured and, on the whole, deflationary: most Virginia data centers draw modest volumes from surface-water-fed public systems, and DEQ told reporters this spring that no data center in either groundwater management area holds a permit to cool servers with groundwater.[4] What the study forecloses is the future option, the fallback in which a water-hungry facility solves its supply problem with a well field. Second, this analysis rests on the report body and the figures and tables it reproduces; the technical appendices, including the individual Aquaveo site evaluations, were reviewed separately and are consistent with the body on every figure this analysis uses.[5]

1. Six Months in a Drawer

Senate Joint Resolution No. 25 passed the 2024 session as a study resolution from Senator Richard Stuart, whose Northern Neck district sits atop some of the aquifer system's most closely watched geography. It directed DEQ to provide historical and current data and trends on groundwater levels and quality, future projections as funds allowed, an evaluation of potential impacts from newer industries such as data centers, an assessment of the regulatory effectiveness of the Ground Water Management Act of 1992, and recommended amendments to that Act. The State Water Control Board was directed to provide technical assistance, with all state agencies on call at DEQ's request; USGS participated as DEQ's long-standing research partner. The deadline was the first day of the 2026 Regular Session, and the resolution required the executive summary and report to be posted for public consumption.[6]

The deadline passed without a public report; DEQ had in fact submitted the study to the Secretary of Natural and Historic Resources in December 2025, where it stayed through the change of administration.[8] By late April 2026, DEQ staff were briefing the study's scientific findings, and press coverage described the essentials: average Potomac aquifer levels falling since 2021, counties being steered from groundwater toward surface water. The recommendations, the part addressed to the General Assembly, were being withheld while the new administration reviewed them.[7] On July 20, Friends of the Rappahannock and allied organizations sent Governor Spanberger a public letter noting that publication was six months overdue and asking her to approve and release the study. The letter added context that made the delay awkward: Virginia was in its second driest year on record, twelve of thirteen drought evaluation regions stood under drought warning or emergency, groundwater observation wells were setting record daily lows, and DEQ was actively telling localities east of I-95 to find alternatives to the aquifer.[8] The report, dated July 2026, became public within days.

The sequence matters for two reasons. First, it means the 2026 session, which debated data center taxation, water-use reporting, and the budget, legislated without the state's own groundwater verdict on the table. A 2026 bill requiring water providers to report monthly deliveries to certain data centers moved through the session on incomplete information about the resource behind it.[9] Second, it sets up 2027 as the session that will act on SJ 25 or shelve it. The recommendations are specific, drafted, and costed. Their fate is now a legible test of how seriously the General Assembly takes its own commissioned science.

2. The System Under Study

The Virginia Coastal Plain aquifer system underlies essentially everything east of I-95: the Richmond-Petersburg fringe, the Middle Peninsula and Northern Neck, Hampton Roads, and the Eastern Shore. The system is a stack of confined aquifers separated by clay confining units, and one of them dominates. The Potomac aquifer, the deepest and largest, accounts for 70 percent of reported and estimated withdrawals in the Eastern Virginia Groundwater Management Area. On the Eastern Shore, where the Potomac is saline, the shallower Yorktown-Eastover system carries 95 percent of withdrawals. Across the two regulated areas, industrial users take 35 percent of the water, private domestic wells 34 percent, and public water supply 26 percent.[10] Total withdrawals in the Eastern Virginia GWMA run about 96 million gallons per day.[11]

The system's modern history is the history of two paper mills. Withdrawals at Franklin and West Point, each drawing tens of millions of gallons per day across the twentieth century, pulled inland groundwater levels below sea level and reversed the region's natural flow pattern; water that once discharged outward to the rivers and the Bay now flows inward and downward toward the pumping centers. The consequences are measurable land subsidence and locally rising chloride concentrations, the signature of saltwater working into a freshwater system.[12] When the Franklin mill cut its withdrawal by 89 percent in 2010 — a reduction DEQ characterises as 29 million gallons per day — groundwater levels rebounded across a broad region, and DEQ's 2014-2017 groundwater initiative locked in much of the gain by negotiating tiered reductions with the largest permittees. The mill did not close permanently: it resumed operations in 2012, and DEQ records the post-2013 withdrawal averaging 42 percent of the pre-2010 rate, rising to 47 percent by 2024. Levels held roughly stable from about 2015 to 2021. The report's sobering news is that the rebound has been spent: the recovery has stalled, has begun to reverse, and DEQ expects the Potomac aquifer to enter a general decline within five to ten years under current conditions.[13]

Two structural facts complete the picture. Lawful unpermitted withdrawals are the system's blind spot: DEQ puts them at as much as 40 percent of total groundwater withdrawal volume in eastern Virginia. Private domestic wells are the largest component but not the whole of that share — DEQ's own table gives them 33.3 of the 96.3 million gallons per day withdrawn in the Eastern Virginia Groundwater Management Area, or 34.6 percent. They are growing with population at a projected 200,000 to 300,000 additional gallons per day each year through 2050, and are invisible to DEQ except by estimate.[14] And the regulatory gate, the Ground Water Management Act of 1992, applies only to withdrawals of 300,000 gallons or more in any month, roughly the demand of a thirty-house subdivision. Anything above that line requires a permit, and a permit requires passing a technical evaluation against the state's groundwater flow model.[15]

3. The Nine-Site Test

The technical evaluation is the mechanism that turns the model into a permitting decision, and understanding it is essential to reading the study's headline numbers. For a proposed withdrawal, Aquaveo runs the flow model's "total permitted" simulation, which assumes every existing permittee pumps its full allocation, with and without the new withdrawal, projected to stabilized conditions 50 years out. The run maps the area of impact, everywhere the model predicts at least one foot of drawdown, and tests the 80 percent drawdown criterion: no withdrawal may pull water levels in a confined aquifer below a critical surface set at 80 percent of the distance from land surface to the top of the aquifer. Model cells already below that surface are "critical cells." If the proposed withdrawal's area of impact touches an existing critical cell or creates a new one, the permit is typically denied.[16]

For SJ 25, DEQ commissioned this evaluation for hypothetical withdrawals at the centroids of its eight groundwater budget regions, plus a ninth site chosen as a deliberate best case: Surprise Hill in Northumberland County, near Reedville, where the Potomac aquifer is about 1,800 feet thick and hydraulic head is relatively plentiful. Each site was tested at 3 million gallons per day, the upper end of published estimates for an evaporatively cooled hyperscale campus, and then iteratively at lower volumes to find the maximum that would pass.[17]

Every 3-million-gallon test failed. The simulated withdrawals threw areas of impact as far as 91 miles, cut across five and six overlying aquifers in the southern regions, intersected existing critical cells, and created new ones. The maximum-passing amounts are the durable result, and they are worth setting out in full.[18]

Location tested	Locality	Aquifer	Max. passing (gal/day)
Surprise Hill (best case)	Northumberland County	Potomac	360,000
Northwest Coastal Plain centroid	Caroline County	Potomac	60,000
Northern Neck centroid	Richmond County	Potomac	180,000
Middle Peninsula centroid	King and Queen County	Potomac	180,000
Middle James centroid	Henrico County	Potomac	<30,000
York-James centroid	James City County	Potomac	120,000
Chowan centroid	Sussex County	Potomac	<30,000
Southeast Virginia centroid	City of Chesapeake	Potomac	120,000
Eastern Shore centroid	Accomack County	Yorktown-Eastover	180,000

For scale: DEQ's own benchmarks put a typical 100 MW hyperscale campus at roughly 300,000 gallons per day and 3.2 million square feet, and a 3-million-gallon-per-day user at around 1,000 MW.[19] Only Surprise Hill clears the 100 MW bar, and Surprise Hill was chosen precisely because nothing about its location resembles a development corridor; the report notes drily that the area's infrastructure "would not necessarily attract or support data-center or other large scale development." A variant test splitting the Surprise Hill withdrawal across three wells a mile apart produced an identical result, closing the obvious engineering workaround.[20] The Henrico and Sussex centroids sat in cells already critical under the baseline simulation, which means any withdrawal generating any area of impact fails there; even 30,000 gallons per day, one percent of the requested volume, was too much, and DEQ found that relocating the test sites to nearby non-critical cells would not substantially raise the ceiling.[21] On the Eastern Shore, the failure came with a quality warning attached: the model predicted chloride increases exceeding 250 milligrams per liter and pumping-induced upconing of saline water into the aquifer people actually drink from.[22]

The report's one-sentence synthesis deserves direct quotation: "it appears unlikely that a data center with evaporative cooling technology (or any comparable water user) would find a reliable, sufficient groundwater supply anywhere in the VCP." [23] The parenthetical is the analytically important part. The ceiling binds any large water user: a bottling plant, a chip fab, an irrigation district, a municipal wellfield. Data centers prompted the question; the answer is general.

4. What This Means in the Data Center Counties

The finding lands differently in different parts of the series footprint, and it is worth being precise about the mechanism. Almost no Virginia data center self-supplies from groundwater today; facilities buy water from public systems, most of which draw from rivers and reservoirs. Only about 7 percent of reported public water supply withdrawals statewide come from groundwater, and DEQ reports no groundwater-cooling permits in either management area.[24] SJ 25 does not say data centers are draining the aquifer. It says the aquifer cannot be anyone's growth plan, and that has three practical consequences for counties east of the fall line.

First, the self-supply fallback is gone. Any facility proposing its own wells at data center scale needs a permit above the 300,000-gallon-per-month threshold, and the state's own modeling now documents that the permit will not issue anywhere near the development corridors. A developer's suggestion that a project could "drill if it needs to" can be answered with a page number.

Second, every large water commitment is now visibly a surface-water and municipal-capital commitment. Where a county's public system itself leans on groundwater, as systems east of the corridor do, a data center's demand competes directly against the region's tightest resource; where the system draws surface water, the commitment cascades into treatment, storage, and intake capacity that residents will finance. The series has documented the pattern from Louisa's water agreements to the Western Virginia Water Authority's role in Botetourt; SJ 25 supplies the regional resource ceiling those local stories sit under.

Third, the geography of the finding tracks the geography of the buildout uncomfortably well. The Middle James centroid, with its sub-30,000-gallon ceiling and pre-existing critical cells, sits in Henrico County, the anchor case study of this series and home to one of its densest concentrations. The Northwest Coastal Plain centroid, at 60,000 gallons, is Caroline County, squarely in the Fredericksburg ring, where this series counted a corridor pipeline of roughly 44 million square feet; DEQ is already steering Caroline from the aquifer toward the Rappahannock. [25] Eastern Hanover and eastern Chesterfield lie on the coastal plain margin where the aquifer system thins toward zero availability. The Piedmont Environmental Council's inventory, cited by DEQ, maps existing and proposed facilities around Richmond, Fredericksburg, and along I-95, inside the Eastern Virginia GWMA; JLARC expects statewide capacity to double within ten years.[26]

One more geographic wrinkle matters for Northern Virginia readers. The state's flow model does not extend into the geologically distinct region north of Fredericksburg, which DEQ concedes is inadequately characterized. Recommendation 7 would prohibit permits for significant withdrawals in GWMA territory outside the model's extent, converting a data gap into a categorical no. [27] Loudoun and Prince William sit outside the coastal plain system and are

largely untouched by this report, but the corridor between Fredericksburg and the Occoquan is exactly where the model runs out, and the study's honesty about that ignorance is its own kind of finding.

5. The Twelve Recommendations

DEQ organized its legislative package around eight problem areas and twelve recommendations. They sort into four groups.

Authority to say no. Recommendation 1 would codify, in the Act itself, DEQ's regulatory authority to deny any permit whose cumulative stabilized impact would breach the 80 percent drawdown criterion; the authority currently lives in regulation, where a future administration could soften it without a vote of the legislature.[28] Recommendation 2 is the sleeper of the authority group: it would let DEQ deny a groundwater permit, or shrink the volume, whenever alternative sources such as surface water or reuse are "reasonably available." For a data center inside a public service area, an alternative is nearly always reasonably available, which makes Recommendation 2 an effective categorical bar on industrial groundwater self-supply in serviced territory.[29] Recommendation 3 asks the legislature to resolve a real statutory tension: the Act prioritizes human consumption but also protects existing permitted uses, and DEQ has no clear rule for a new drinking-water application that conflicts with an incumbent industrial permit. The report is candid that "human consumption" is so narrowly defined in regulation that no purely human-consumption withdrawal exists.[30] Recommendation 7 is the model-extent prohibition described above.

Land use. Recommendation 5 reaches beyond DEQ's own program into Title 15.2, the local-government title this series works in constantly. It would require comprehensive plans in groundwater management areas to limit planned growth based on groundwater availability where no other water supply is feasible. Current law merely permits localities to designate groundwater-sustainability areas in their plans.[31] Section 6 below treats this recommendation separately, because its mechanics deserve more than a paragraph.

Money and staff. Four recommendations are appropriations: one FTE to wrangle withdrawal data including the invisible private-well sector (\$135,000 per year, Recommendation 4); two FTEs for compliance, where exactly two staff currently inspect 484 permitted withdrawal facilities statewide and cannot meet DEQ's own 20-percent-per-year inspection floor (\$270,000 per year, Recommendation 6); two FTEs to characterize the aquifer system, including the uncharted territory north of Fredericksburg (\$270,000 per year, Recommendation 8); and real-time monitoring equipment plus a future aquifer-recharge siting study (\$45,000 per year and a one-time \$300,000, Recommendations 9 and 10). The package totals \$1,020,000 in FY 2027 and \$720,000 in FY 2028.[32] Recommendation 12 addresses the structural poverty underneath: permit fees are capped by statute at \$9,000, produced \$381,000 in FY 2025 against a roughly \$4 million program, and DEQ asks the cap be raised until fees cover at least half of program costs.[33] Readers of this series will recognize the pattern from the data center tax debates: a regulatory program priced far below the value of what it regulates.

Trading. Recommendation 11 is a checklist of preconditions rather than an endorsement. Groundwater trading has circulated among stakeholders for years, and the report explains patiently why the carbon-market analogy fails: groundwater does not mix, circulation through the system takes as long as tens of thousands of years, and without a model that can certify hydrogeological connection between two parties, a traded credit is a legal fiction with physical consequences. Virginia's common law of groundwater conflict is uncertain, the public right to the resource is statutory, and DEQ suggests the sounder near-term policy is shrinking allocations to actual use at renewal rather than letting permittees monetize paper water.[34] Counties should expect trading proposals to resurface wearing efficiency language; Recommendation 11 is the measuring stick to hold against them.

Alongside the recommendations, the report flags SWIFT, the Hampton Roads Sanitation District's program to inject highly treated wastewater into the Potomac aquifer, as both the region's best hope and a forecasting problem. Full-scale operations at the James River and Nansemond plants, starting in 2026 and 2029, are designed to inject a combined 50 million gallons per day, comparable in magnitude to the Franklin closure that produced the last regional rebound. But the study's physics finding cuts both ways: pressure effects propagate through the aquifer tens of thousands of times faster than the water itself moves, so injections can raise regional levels quickly, and a suspension, technical, economic, or political, could surrender the gains just as quickly. DEQ declines to bank SWIFT in its permitting math until roughly a decade of operational data exists.[35] Counties hearing that SWIFT will make room for new withdrawals should note that the agency running the models does not yet believe that.

6. The Comprehensive-Plan Lever

Recommendation 5 deserves its own section because it operates at a different point in the approval sequence than anything else in the report, and because this series has spent eleven volumes documenting how much depends on where in that sequence a constraint bites.

The mechanics: every Virginia locality must adopt a comprehensive plan; zoning and rezoning decisions are made against its backdrop, and Virginia courts read § 15.2-2232 to require that major facilities be substantially in accord with it. Today, § 15.2-2223 lists groundwater-availability measures among the things a plan “may include.” Recommendation 5 would convert that option into a mandate for the localities inside groundwater management areas: their plans would have to limit planned growth to the groundwater actually available wherever no other supply is feasible.[36]

The practical effect, if enacted with any teeth, is to move the water question from the end of the process to the beginning. Under current practice, water capacity typically surfaces late, in utility comments on a specific rezoning, after land assembly and option contracts have hardened the project, sometimes after by-right entitlement has foreclosed the question entirely. The series has documented the cost of that sequencing repeatedly: the leverage a county holds at the comprehensive-plan stage is cheap and general, while the leverage it holds at the project stage is expensive, adversarial, and often already bargained away. A plan that must designate where groundwater cannot support growth is a plan that pre-answers a category of data center siting questions before any applicant is in the room.

Its limits are equally worth stating. The recommendation’s framing grew out of the private-well problem, residential subdivisions platted on groundwater that will not sustain them, not out of the data center debate, and its reach depends on drafting: “if no other water supply is feasible” could be read to exempt any parcel a utility is willing to serve, which would return the question to the utility agreements this series has examined elsewhere. It binds planned growth, not existing entitlements. And comprehensive-plan mandates arrive in Richmond trailing a long history of dilution in committee. Recommendation 5 as written settles nothing; it opens a drafting fight worth watching closely, because it is the first state-level proposal in the data center era that would write water availability into the land-use documents counties actually govern with.

7. Limits and Open Questions

Four limits on the analysis, stated plainly.

The nine-site test evaluated one withdrawal at a time. Each simulation added a single hypothetical well field to the fully permitted baseline; no run tested two or more new withdrawals together. The maximum-passing amounts are therefore ceilings for a lone applicant, not a budget the region can hand out nine times over. Cumulative availability is strictly less than the table implies, and the report says so.[37]

The appendices confirm the body. The supporting volume, Appendix A's data tables and Appendix B's nine Aquaveo technical evaluations, is published separately by DEQ and was reviewed in full for this revision. The site evaluations independently corroborate the figures used here: the York-James addendum sets the maximum passing withdrawal at 43,800,000 gallons per year, exactly 120,000 per day, with the Potomac area of impact reaching 91 miles; the Middle James evaluation found no determinable maximum because the site sits in an existing critical cell; and the Eastern Shore evaluation carries the chloride and upconing findings. Nothing in the body's headline table is qualified by its supporting documents.[38]

The projections inherit the model's blind spots. Up to 40 percent of withdrawal volume — the lawful unpermitted share, of which private domestic wells are the largest part — is estimated rather than reported, the model does not cover the coastal plain north of Fredericksburg, and the 50-year "stabilized" convention assumes every permittee pumps its full paper allocation, which overstates current pumping (about 91 percent of permitted volume is actually used in the Eastern Virginia GWMA) while arguably understating a future in which those allocations are exercised.[39]

The industry baseline is a moving target. The study's data center water figures lean on JLARC's 2024 review: 83 percent of facilities using roughly office-building volumes, wide variance above that, cooling choices driving the spread. Air-cooled and closed-loop designs are gaining share precisely because water has become a siting constraint, and a 2026 reporting bill may soon give Virginia actual delivery data.[40] The aquifer ceiling is durable; the demand side of the equation is not.

8. What to Watch in 2027

The report converts into a short watchlist. Whether the General Assembly codifies the 80 percent criterion and the alternative-source denial authority (Recommendations 1 and 2), and whether either is narrowed to exempt pending applications. Whether Recommendation 5 survives drafting with a definition of “feasible” that means anything. Whether the \$1.02 million ask survives a budget year in which the data center consumption tax, first-in-the-nation and expiring June 30, 2028, has already made the industry a named fiscal object. Whether the fee cap moves. Whether a trading bill appears and whether it engages Recommendation 11’s preconditions or routes around them. Whether the appendices are published. And whether the Potomac aquifer’s projected decline begins to show in the observation-well record on the five-to-ten-year schedule the study forecasts, because that schedule, not any legislative calendar, is the binding one.

For the counties, the practical takeaway fits in three sentences. East of I-95, every large new water user is a surface-water user, whatever its site plan says. The state’s own model now puts numbers, county by county, on how little the alternative holds. A county that wants those numbers in its next data center hearing can cite them from a public document with the Commonwealth’s seal on it, which, for reasons this series has documented at length, is worth more in a hearing room than any consultant’s estimate.

Endnotes

- [1] Virginia Department of Environmental Quality, *Groundwater Supply East of Interstate 95* (SJ 25 Report), July 2026, 144 p. Prepared with technical assistance from the U.S. Geological Survey; technical evaluations by Aquaveo, LLC. Report: <https://www.deq.virginia.gov/home/showpublisheddocument/37496>; Appendices: <https://www.deq.virginia.gov/home/showpublisheddocument/37494>.
- [2] Senate Joint Resolution No. 25 (2024 Regular Session) (patron: Sen. Richard Stuart), reprinted in SJ 25 Report, Section 1.1.
- [3] SJ 25 Report, Sections 2.5.3–2.5.4 and Table 10; Key Point 7.
- [4] SJ 25 Report, Section 2.5.2; Lauren Hines-Acosta, “Average water levels dropping in Virginia’s Potomac Aquifer,” *Bay Journal*, April 28, 2026 (DEQ: no data centers in the groundwater management areas hold permits to use groundwater for server cooling).
- [5] SJ 25 Report, Section 2.5.4 and passim; SJ 25 Report Appendices (<https://www.deq.virginia.gov/home/showpublisheddocument/37494>): Tables A.1–A.5 and Technical Evaluations B.1–B.9 (Aquaveo, LLC). Reviewed in full; consistent with the report body on all figures cited in this analysis.
- [6] SJ 25 (2024), operative clauses (i)–(v); deadline and posting requirement per resolution text and Friends of the Rappahannock letter cited at note 8.
- [7] Hines-Acosta, *Bay Journal*, April 28, 2026.
- [8] Friends of the Rappahannock, “Press Release: Release Groundwater Study,” July 20, 2026, with attached letter to Gov. Abigail Spanberger, riverfriends.org/2026/07/pr-release-groundwater-study/. December 2025 submission to the Secretary of Natural and Historic Resources per contemporaneous coverage (e.g., Middle Neck News, July 2026); release followed within days of the letter, with AP wire coverage July 24, 2026.
- [9] SB 553 (2026 Regular Session) (monthly reporting by water suppliers of deliveries to certain data centers), lis.virginia.gov/bill-details/20261/SB553. See the statewide volume in this series, Section 12, for the 2026 session record.
- [10] SJ 25 Report, Key Point 1 and Sections 1.2.2, 1.5.
- [11] Hines-Acosta, *Bay Journal*, April 28, 2026 (96.3 Mgal/day, Eastern Virginia GWMA).
- [12] SJ 25 Report, Key Points 3–4 and Sections 1.4.4, 2.2, 2.4.3, 3.5.2.
- [13] SJ 25 Report, Key Point 5 and Section 2.6 (Franklin closure, 2014–2017 groundwater initiative, stall and reversal post-2021, five-to-ten-year decline projection).

- [14] SJ 25 Report, Key Point 2 and Sections 1.4.3, 4.2.3 (40 percent share; growth projection; well-driller registration since 2016).
- [15] SJ 25 Report, Sections 1.6.3, 4.2.3; Ground Water Management Act of 1992, Va. Code Ann. § 62.1-254 et seq.; 9 Va. Admin. Code § 25-610 (300,000 gal/month threshold; 30-house comparison per report).
- [16] SJ 25 Report, Section 1.6.3 and Figure 19 (technical evaluation, area of impact, 80 percent drawdown criterion, critical cells); 9 Va. Admin. Code § 25-610-110 (human-consumption exceptions).
- [17] SJ 25 Report, Section 2.5.3 (eight groundwater budget region centroids plus Surprise Hill/SOW 216; 3 Mgal/day = 1,095 Mgal/year; iterative maximum-passing procedure).
- [18] SJ 25 Report, Section 2.5.4, Table 10, and Figure 37 (areas of impact to 91 miles; five to six aquifers affected in southern regions).
- [19] SJ 25 Report, Section 2.5.2, citing Joint Legislative Audit and Review Commission, *Data Centers in Virginia*, Report 598 (2024); Fairfax County Department of Planning and Development, *Data Centers: Report and Recommendations* (2024) (90–100 gal/day per 1,000 sq ft); Shehabi et al., *United States Data Center Energy Usage Report*, LBNL (2024) (WUE 0.45–0.48 L/kWh).
- [20] SJ 25 Report, Section 2.5.3 (Surprise Hill site selection and quoted caveat; three-well scenario with identical result).
- [21] SJ 25 Report, Section 2.5.4 (Henrico and Sussex centroids in baseline critical cells; 30,000 gal/day as lower limit of analysis; relocation finding).
- [22] SJ 25 Report, Section 2.5.4, and SJ 25 Report Appendices, Technical Evaluation B.9 (<https://www.deq.virginia.gov/home/showpublisheddocument/37494>) (Eastern Shore chloride exceeding 250 mg/L; upconing of Middle Yorktown-Eastover water into the Upper Yorktown-Eastover aquifer).
- [23] SJ 25 Report, Section 2.6.
- [24] SJ 25 Report, Section 2.5.2 (7 percent of public water supply withdrawals from groundwater; 0.01 percent of power-generation withdrawals); *Bay Journal*, April 28, 2026.
- [25] Fredericksburg ring figures per the regional volume in this series (5,457 MW; approximately 44 million sq ft pipeline); Caroline steering per *Bay Journal*, April 28, 2026, and related coverage of the Rappahannock withdrawal litigation.
- [26] SJ 25 Report, Section 2.5.2, citing Piedmont Environmental Council web map (2023) and JLARC Report 598 (2024) (capacity likely to double within ten years).
- [27] SJ 25 Report, Section 4.2.5 and Recommendation 7 (region north of Fredericksburg inadequately characterized; model extent).

[28] SJ 25 Report, Section 4.2.1 and Recommendation 1; 9 Va. Admin. Code § 25-610-340.

[29] SJ 25 Report, Section 4.2.1 and Recommendation 2.

[30] SJ 25 Report, Section 4.2.2 and Recommendation 3; Va. Code Ann. §§ 62.1-260, 62.1-261, 62.1-263; 9 Va. Admin. Code § 25-610-10 (definition of human consumption).

[31] SJ 25 Report, Section 4.2.3 and Recommendation 5; Va. Code Ann. §§ 15.2-2210, 15.2-2223.

[32] SJ 25 Report, Sections 4.2.3-4.2.6 and Recommendations 4, 6, 8, 9, 10 (staffing counts: two compliance staff for 106 surface water and 378 groundwater facilities; 20 percent inspection floor; appropriations totals per Executive Summary).

[33] SJ 25 Report, Section 4.2.8 and Recommendation 12; Va. Code Ann. § 62.1-44.15:6 B3 (\$9,000 groundwater cap; \$12,000 surface water cap; FY 2025 fee revenue \$381,000 against approximately \$4 million program cost; FY 2024 revenue \$101,000; 5 to 80 applications per year).

[34] SJ 25 Report, Section 4.2.7 and Recommendation 11; Va. Code Ann. § 62.1-254 (public right).

[35] SJ 25 Report, Key Point 6 and Sections 2.6.1, 4.2.6 (SWIFT design injection of approximately 50 Mgal/day at James River and Nansemond plants, 2026 and 2029 starts; ten-year data recommendation; interim permitting posture). More than one billion gallons injected at the SWIFT Research Center since 2018 per Hampton Roads Sanitation District, as reported in *Bay Journal*, April 28, 2026.

[36] Va. Code Ann. §§ 15.2-2223, 15.2-2232; SJ 25 Report, Recommendation 5.

[37] SJ 25 Report, Section 2.5.3 (“the analysis did not simulate the combined effects of multiple added withdrawals”).

[38] SJ 25 Report Appendices (https://www.deq.virginia.gov/home/showpublisheddocument/37494), Technical Evaluations B.5 (Middle James), B.6 (York-James), and B.9 (Eastern Shore centroid); see also Tables A.3-A.5 (water-level and chloride trend data).

[39] SJ 25 Report, Sections 1.4.3, 1.6.3, 4.2.5; *Bay Journal*, April 28, 2026 (91 percent utilization, Eastern Virginia GWMA; 64 percent, Eastern Shore).

[40] JLARC Report 598 (2024); SJ 25 Report, Section 2.5.2; SB 553 (2026).

Deliverable Notes

Series. This is a companion analysis in the Virginia data center series. It accompanies the statewide report (*What Virginia Is Spending, What Virginia Is Getting*), the analytical volume *Governing the Demand Shock*, the water volume *Two Systems, One Drought: Virginia's Groundwater Ceiling, Its Rivers, and the Water the Energy Buildout Actually Uses* (10.5281/zenodo.21816008), and the county case studies for Henrico, Hanover, Chesterfield, Culpeper, Orange, Louisa, Goochland, Botetourt, Mecklenburg, Prince William, and the Fredericksburg regional volume. County-level water findings in those volumes remain authoritative for local detail; this volume supplies the regional groundwater ceiling above them.

Method. Prepared entirely from public sources: the SJ 25 Report as published (July 2026), the text of SJ 25 (2024) and cited provisions of the Code of Virginia and Virginia Administrative Code, JLARC Report 598 (2024), contemporaneous press coverage, and the Friends of the Rappahannock release correspondence. The report's technical appendices (DEQ document 37494) were reviewed in full; every appendix-derived figure cited here was checked against the Aquaveo evaluations directly, and all body figures were checked against the report text.

Disclosure. In July 2026 the author was named to the advisory board of "Data Centers and the Southern Energy Buildout: Implications for Electricity Costs, Energy Transition, and Energy Justice," a 2026–2029 study at Emory University funded by the Alfred P. Sloan Foundation and covering Georgia, Tennessee, and Virginia, for which he receives a token honorarium. This report was prepared independently and entirely from public sources and is not a product of, or funded by, that project. The DEQ report analysed here was released in late July 2026 and the research for this analysis was conducted after that appointment. Version 1.1 and earlier stated that the advisory relationship postdated the underlying research; that was incorrect and is corrected here.

Version. v1.2, August 2026. DOI: 10.5281/zenodo.21817721 (this version); 10.5281/zenodo.21556435 (all versions); v1.1 = 10.5281/zenodo.21630812; v1.0 = 10.5281/zenodo.21556436.

Changelog v1.2 (August 2026). Three corrections, none of which changes a finding. First, the Franklin mill is no longer described as having closed and removed a 29-million-gallon-per-day withdrawal: it cut by 89 percent in 2010, resumed in 2012, and has since averaged 42 percent of its pre-2010 rate, rising to 47 percent by 2024. The resumption is why the regional rebound proved temporary, which strengthens rather than weakens the section it appears in. Second, the 40 percent figure is DEQ's share for lawful unpermitted withdrawals as a class; private domestic wells are the largest component at 34.6 percent, not the whole of it. Third, the disclosure statement previously said the advisory relationship postdated the underlying research. It did not, and the corrected statement appears above. A

cross-reference to the water volume *Two Systems, One Drought* has also been added.

Changelog v1.1 (July 27, 2026): appendix availability corrected — DEQ's supporting volume (document 37494) is published and was reviewed in full; appendix citations made direct; the site evaluations independently corroborate every figure used. December 2025 submission date added to the release chronology. No findings changed.