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Stormwater & Backyards: Toronto Drainage Resilience Review

Two 100-year storms in one summer pushed Toronto's drainage to its limits — what an engineered turf base can, and cannot, do for city backyards

REPORT	RR-2026-ATT-02 · August 2026
COVERAGE	City of Toronto, Ontario (single-tier municipality, Greater Toronto Area)
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Artificial Turf Toronto Research publishes data-driven local studies on residential landscaping, water use and outdoor surfaces in Toronto and the Greater Toronto Area. This report is provided free for information purposes.

ABSTRACT

This report reviews Toronto's modern flood record — the July 8, 2013 storm, the July 16, 2024 cloudburst that shut the Don Valley Parkway, and the August 17, 2024 event that set a new daily rainfall record at Pearson — alongside published descriptions of how water moves through an engineered artificial-turf system, and asks where a synthetic lawn honestly fits in a flood-resilient Toronto backyard. Every input is drawn from published sources: Toronto Fire and TRCA event documentation, Environment and Climate Change Canada records, Insurance Bureau of Canada releases, the City's Basement Flooding Protection Subsidy page and the 2021 Census backgrounder. Derived figures are labelled with their inputs where they appear.

The findings are deliberately two-sided. The exposure is real: a typical 500 sq ft Toronto yard took on about **4.5 m³ of rain in a few hours on July 16, 2024** and roughly 6.0 m³ on August 17 — the station's rainiest day on record at **128.3 mm**. A well-built turf base gives that water a designed path instead of a compacted-soil lottery and keeps the yard usable between storms. But turf is not a flood fix: basements are protected by grading, downspouts and plumbing — the City's Basement Flooding Protection Subsidy pays up to **$6,650** toward those defences and nothing toward a lawn surface. Toronto's lot mix, with apartments and attached homes making up more than three-quarters of occupied dwellings, also means most of the city's drainage problem is not a backyard problem at all.

KEY FINDINGS AT A GLANCE

128.3 mm	≈4.5 m³	21,000+	$6,650
rain at Pearson on Aug 17, 2024 — the station's rainiest day on record	rain on a 500 sq ft yard in a few hours, Jul 16, 2024 (depth × area)	basement flood claims in Toronto from the Jul 8, 2013 storm	max City basement-flooding subsidy — keys to plumbing, not lawn surface

Contents

1 Toronto's flood story: three storms that reset the baseline

Toronto's stormwater conversation is no longer theoretical. On **July 8, 2013**, **126 mm of rain at Pearson** broke the all-time daily record set by Hurricane Hazel in 1954 (121.4 mm); the storm produced more than **21,000 basement flood claims**, left 300,000 hydro customers without power, flooded the Don Valley Parkway, and required the boat rescue of roughly 1,400 GO train passengers. Insured damages ran $940 million to more than $1 billion — at the time, Ontario's costliest natural disaster [1][2].

Summer 2024 then delivered two benchmark events within a single month. On **July 16, 2024**, **97.8 mm fell at Pearson in a few hours** — more than the ~74 mm July monthly normal — the Don River breached its banks and completely flooded the DVP, Toronto Fire rescued 14 people from vehicles, Union Station flooded, and roughly 167,000 Toronto Hydro customers lost power at the peak; the GTA-wide event caused about $940 million in insured damage [2][3]. July 2024 would go on to set a monthly rainfall record at Pearson of **215.4 mm**, surpassing Hurricane Hazel's October 1954 [6]. On **August 17, 2024**, Toronto Pearson recorded **128.3 mm — the rainiest single day in the station's recorded history**, with most of it falling in roughly four hours at rates of 40–80 mm/h; Environment Canada classified it as a 100-year storm, the second that summer. Little Etobicoke Creek rose 3.1 m in under two hours; flash flooding hit Etobicoke, and the event caused more than $100 million in insured damage [4][5].

Together, the two 2024 storms pushed summer GTA flood losses past $1 billion and made 2024 a record-setting precipitation year at Pearson [6]. The climate backdrop explains the pattern: Pearson's 1981–2010 normals show 785.9 mm of annual precipitation, with roughly 87% falling as rain and the rest as snow, well distributed through the year (the driest month, February, still delivers ~47.7 mm); August is the wettest month at ~78.1 mm [7]. Summer rain tends to arrive in intense convective bursts — exactly the pattern both 2024 storms displayed — rather than gentle, soaking falls. Table 1 summarizes the three events that define the modern flood baseline.

Table 1 — Three storms that define Toronto's modern flood record. *Sources: [1][2][3][4][5][6].*

Event	Recorded rainfall	Recorded local impacts
July 8, 2013	126 mm at Pearson (all-time daily record, surpassing Hazel)	21,000+ basement claims; 300,000 hydro out; DVP flooded; 1,400 GO passengers rescued; $940M–$1B+ insured
July 16, 2024	97.8 mm in a few hours at Pearson (>July monthly normal)	Don River breached; DVP flooded; 14 vehicle rescues; Union Station flooded; ~167,000 hydro out; GTA insured ~$940M
Aug 17, 2024	128.3 mm at Pearson (station record; 40–80 mm/h intensities)	Little Etobicoke Creek +3.1 m in <2 h; Etobicoke flash flooding; insured damage >$100M

LOCAL CONTEXT — A 100-YEAR SUMMER, TWICE

Environment Canada classified both the July 16 and August 17, 2024 events as 100-year storms — a pair of nominal once-in-a-generation rains arriving within five weeks of each other, and the second of which set a new daily rainfall record at the station that has measured Toronto's weather since 1937 [4][5].

2 How water moves through an engineered turf system

Hydrologically, an artificial lawn is a layered construction, not a carpet. Rain passes through the turf backing — perforated in most landscape products, while some specialty products use knitted backings marketed for full-surface drainage — then through the granular infill into an open-graded aggregate base. The base is the workhorse: its stone voids store and convey water while it infiltrates into the subgrade or moves laterally toward a drainage route. In Toronto, the clay soil typically requires a **4–6 inch crushed limestone base**, deeper than the norm in sandier regions, to manage the volume a cloudburst delivers [10].

A well-built base turns a cloudburst into a queue: water enters stone at the surface instead of ponding on compacted soil, then releases at the rate the subgrade accepts. What does a Toronto storm actually deliver to one yard? Figure 1 applies the recorded rainfall depths to a typical 500 sq ft (46.45 m²) backyard (1 mm over 1 m² = 1 litre; uniform depth assumed). Across a normal year, roughly **36.5 m³ of precipitation** lands on that yard; the August 17, 2024 storm delivered about 6.0 m³ of it in roughly four hours.

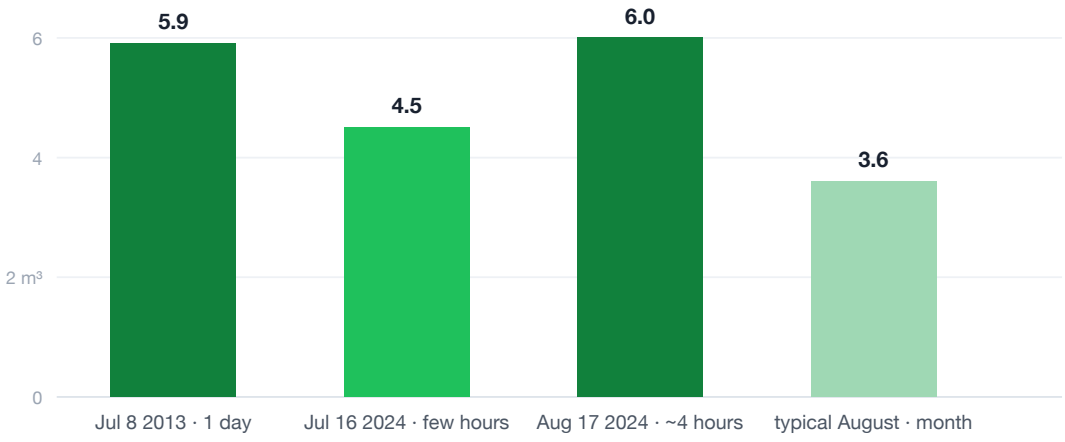

Figure 1 — Rain delivered to a typical 500 sq ft (46.45 m²) Toronto backyard, per event, computed as recorded depth × area (1 mm over 1 m² = 1 L; uniform depth assumed). *Rainfall records: [1][2][4][7]; derivation in §M.*

Table 2 — Layers of an engineered residential turf system, Toronto build. *Sources: published installer base-prep descriptions [10]; §M.*

Layer	Typical Toronto build	Drainage function
Turf carpet & backing	perforated, or knitted in drainage-first products	admits rainfall across the whole surface
Infill	granular, product-dependent	holds the pile open so water reaches the backing
Engineered base	4–6 in crushed limestone on Toronto clay [10]	temporary storage and conveyance — the workhorse
Subgrade	native clay, common across the city	final infiltration step; the slowest layer

3 Turf vs natural lawn on infiltration: a balanced reading

Does swapping the lawn change how a lot takes water? The evidence cuts both ways, and this report presents both. **In turf's favour:** many Toronto lawns sit on thin topsoil over subsoil compacted during construction, and a compacted, thatched lawn on clay can shed an intense burst nearly as fast as it lands. Replacing that profile with an open-graded engineered base substitutes a designed drainage path for an accidental one [10] — which is why well-built turf yards are typically puddle-free and back in use soon after a storm.

Against overclaiming: a healthy, deeply rooted natural lawn is itself a competent infiltration medium — living soil stores water, roots open channels, and evapotranspiration returns moisture to the air between storms. Artificial turf removes that living layer and replaces it with inert aggregate. And on Toronto's clay subsoils, the final infiltration step is slow no matter what the surface is. The honest summary: in a cloudburst, an engineered base can outperform a tired, compacted lawn; over a season, a thriving lawn's living soil does work that no aggregate can. **Neither surface prevents basement flooding** — that job belongs to the measures in Section 4.

One structural fact shapes the question differently than it lands in the suburbs. Toronto's 2021 Census records **1,160,892 occupied dwellings, of which only 23.3% are single-detached houses, 30% are semis and townhouses, and 46.7% are apartments** [8]. Most of the city's stormwater problem is a roof-and-pavement problem, not a backyard-lawn problem. The City does not levy a separate stormwater charge keyed to lawn surface; stormwater is funded through Toronto Water's combined water-and-wastewater rate — **$4.8629/m³ in 2026** for residential Block 1, after a 3.75% Council-approved increase [9]. Converting a lawn does not move that bill.

LOCAL CONTEXT — TORONTO HAS NO MANDATORY WATERING BYLAW

Unlike neighbouring York Region (Markham, Vaughan) and Peel Region (Mississauga, Brampton), Toronto has no standing odd/even lawn-watering schedule. Under Chapter 851 s. 851-14, Toronto Water's General Manager may issue a restriction order only during a declared shortage — none is active as of 2026 — and year-round s. 851-14(A) prohibits water waste such as runoff into gutters or storm drains. A voluntary once-a-week summer guidance, in place since 2000, is the city's main residential tool [11].

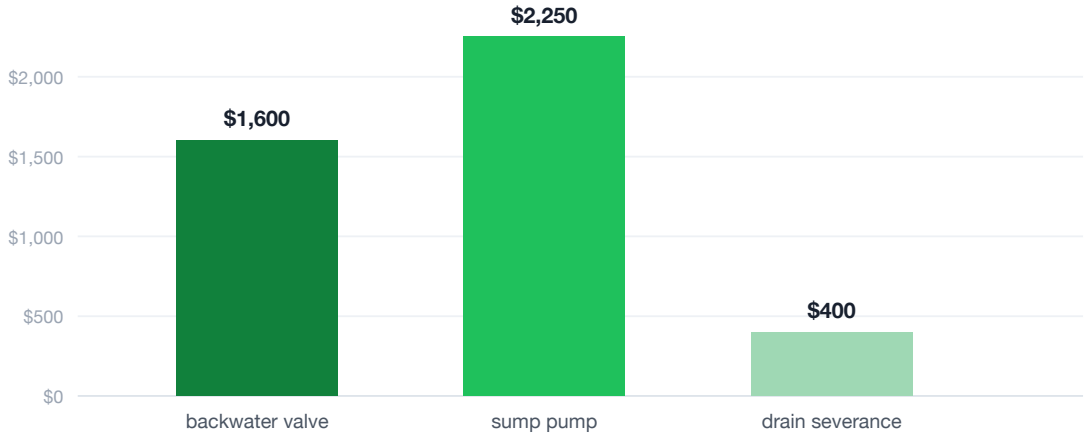

Figure 2 — City of Toronto Basement Flooding Protection Subsidy, per-component maximums (80% of invoiced cost up to these caps; $300 battery backup and $500 plumbing assessment also available; overall cap $6,650). The subsidy is keyed to plumbing and foundation work, not lawn surface. *Source: City of Toronto Basement Flooding Protection Subsidy Program [9].*

4 What actually protects basements

Basements flood when water arrives at the foundation faster than it can be taken away, or when municipal sewers surcharge — both mechanisms were on display across Toronto in 2024 [2]. The defences are unglamorous, and none of them is a lawn surface. Table 3 sets out the standard stack and where a turf project honestly fits within it. The City's Basement Flooding Protection Subsidy pays 80% of invoiced cost, to a maximum of **$6,650 per property**, for the measures that actually protect basements: backwater valves ($1,600 cap), sump pumps ($2,250) with optional battery backup ($300), foundation drain severance ($400), and a $500 plumbing assessment [9].

Table 3 — The basement-protection stack, and where artificial turf fits. *Framing: §M; event context [2]; subsidy [9].*

Measure	What it does	Where turf fits
Lot grading	positive slope carries surface water away from the foundation	a turf base must preserve the same falls — not flatten them
Downspout management	extensions move roof water away from the house	turf edges and seams should never block discharge routes
Backwater valve & sump pump	block sewer surcharge; remove foundation seepage	unrelated to surface; subsidy-eligible up to $6,650 [9]
Window wells & sealing	keep below-grade openings drained and tight	unaffected by lawn surface
Permeable, puddle-free yard	limits ponding; keeps the yard usable between storms	**turf's real role** — liveability, not flood proofing

Where turf genuinely helps is liveability: a yard that drains through its base instead of ponding on compacted clay returns to use quickly after events like those of 2024, and the mud-and-rutting cycle disappears. For Toronto homeowners considering both a turf project and basement protection, the rational sequence is to apply for the City's subsidy first — the backwater valve and sump pump address the mechanisms that actually flood basements — then address the surface. But no homeowner should buy turf as flood protection.

5 Design notes for Toronto lots

Toronto's housing stock frames the design problem. The 2021 Census records 1,160,892 occupied dwellings, with only 23.3% single-detached; downtown semis and rowhouses run as narrow as 13 ft wide by 66 ft deep, a typical semi lot is 25 × 125 ft, and 30 × 125 ft is considered unusually large downtown; the active teardown market centres on postwar bungalows in North York, Etobicoke and Scarborough on 40–60 ft frontages [8] [12].

- **Respect the clay.** Toronto's clay holds water and heaves in freeze-thaw cycles; budget for a deeper engineered base — 4–6 inches of crushed limestone — rather than a thin screed [10].
- **Keep an overflow route.** In a storm that exceeds the base's storage, water needs a defined surface path — to the street or swale — that respects property lines and stays clear of neighbouring lots.
- **Scale changes little.** Even a compact 300 sq ft (27.9 m²) semi yard took on roughly **2.2 m³ in the peak hour of August 17, 2024** (80 mm/h × area) — small urban yards face the same intensities as large suburban ones.
- **Sequence the work.** Surface choice is secondary: grading, downspouts and plumbing come first, then the surface — especially on streets that saw the DVP and Union Station flood in July 2024 [2].

M Methodology & data sources

This is a desk-research report. Published figures were collected in August 2026 from the sources listed under References: Global News's 2013 storm retrospective, The Weather Network's one-year-later review of the July 16, 2024 event, Insurance Bureau of Canada damage releases for both 2024 storms, the TRCA's July–August 2024 severe storm events report, The Canadian Press's Environment Canada precipitation-year review, Environment and Climate Change Canada's 1981–2010 climate normals for Toronto Pearson, the City of Toronto's 2021 Census backgrounder, its Basement Flooding Protection Subsidy and water-rates pages, Toronto Municipal Code Chapter 851 (Water Supply), a Toronto Realty Blog lot-size guide, and published Toronto installer descriptions of turf construction.

Derived figures and stated assumptions. Yard water volumes are computed as recorded rainfall depth multiplied by yard area — 46.45 m² for a 500 sq ft yard, 27.9 m² for a 300 sq ft yard — using 1 mm over 1 m² = 1 litre and assuming uniform depth across the lot. That is an idealization: real lots have roofs, trees, slopes and flow paths, so figures such as "4.5 m³ in a few hours" describe the rain that fell on the yard's footprint, not the water any surface actually held. The peak-hour figure of 80 mm/h used for the 300 sq ft derivation is the upper end of the 40–80 mm/h range Environment Canada reported for August 17, 2024. No per-hour turf permeability rates are quoted, because none in the source set could be verified against a fetched specification; drainage performance is therefore presented qualitatively. The basement-protection framing in Section 4 is standard practice presented without invented statistics.

Limitations

This report is not a site assessment, an engineering study or drainage-design advice for any specific property. Rainfall records are point measurements at Toronto Pearson and may not match intensities elsewhere in the city — Toronto is large enough that storms land unevenly. The 1981–2010 climate normals predate both 2024 storms. Infiltration on any specific lot depends on soil, compaction and maintenance history. Dollar figures are nominal event-wide totals, not per-property losses, and insured-damage figures exclude uninsured losses. The 2024 storm classifications as "100-year" events are Environment Canada's, not this report's.

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CITE THIS REPORT

Artificial Turf Toronto Research (2026). *Stormwater & Backyards: Toronto Drainage Resilience Review*. ATT Research Series RR-2026-ATT-02, Toronto, Ontario. https://artificialturftoronto.ca/research/turf-drainage-stormwater-resilience-toronto/

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