

# Vélo Tunnel Québec

## FINANCIAL ANALYSIS — OPERATIONS

# Operating costs

The annual budget to run 150 km of tunnels around the clock, 365 days a year — staffing, maintenance, energy, drainage, geothermal, immersive theming, shuttles and photoluminescence, all included.

≈ **\$212M / yr**

Realistic 2030 scenario · range \$174M to \$272M / yr · about 2.4% of construction cost.  
Constant Canadian dollars (CAD), excluding capital amortization.

Prepared by **Philippe Leblond** · Vélo Tunnel Québec · June 2026

Informational document · Planning-level orders of magnitude, to be refined by quotes

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# 1. A complete budget at last

Running a 150 km underground cycling network means operating a genuine public-transit service: patrols, a control centre, maintenance, energy and shuttles. This document sets out that annual budget, **all included**, in constant dollars and excluding amortization of the construction capital.

The realistic total comes to  $\approx$  **\$212M / yr**. It now incorporates five line items that were long missing or buried inside aggregate lines: drainage, geothermal, immersive-theming maintenance, the optimized shuttles, and photoluminescence. Making them explicit is a mark of rigour — and exactly what any reviewer will look to verify.

**The key point.** Even with absolutely everything counted, operations represent only about **2.4% of the construction cost** ( $\approx$  \$8.9B). That is a lean, normal — even conservative — ratio for this type of infrastructure, and a strong argument for the project's viability.

## The five newly explicit line items

Line item	\$M/yr	Status
Drainage and pumping	3.8	Already counted, blended into Energy + Maintenance
Station geothermal	1.0	Already counted; saves \$0.7–0.9M/yr
Immersive theming (décor)	15.0	$\approx$ \$11M genuinely new
Shuttles (optimized)	+5.1	From \$9.9M to \$15.0M total
Photoluminescence	0.6	Net new (zero electricity)

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# 2. Staffing

Costs include fully loaded salaries (benefits and payroll charges, i.e. salary +  $\sim$ 30%). We assume about 1,700 productive hours per full-time employee per year. Three crews rotate with ridership; a position staffed around the clock all year requires about 5.15 FTE.

Category	FTE	Cost (\$M)
Bike patrollers (50 at peak, 20 off-peak)	150	11.2
Control centre (10 posts, 24/7)	52	4.3
Shuttle crews + terminals (optimized fleet)	90	7.0
Maintenance technicians (electromechanical, civil, cleaning)	120	10.2
Bike-fleet mechanics	60	3.8
Station staff and customer service	60	3.5
Management, admin, IT, finance, HR, marketing	70	7.0

Category	FTE	Cost (\$M)
<b>Total staffing</b>	<b>602</b>	<b>≈ 47</b>

### 3. Energy in detail

The network draws ≈ 94,000 MWh per year, about 10% of the electricity carried by a major substation. At the assumed Hydro-Québec rate (≈ 8.5 ¢/kWh), electricity comes to ≈ \$8.0M, plus ≈ \$1.5M for backup and test generators.

Energy use	MWh/yr	Cost (\$M)
Ventilation	44,000	3.74
Stations (heating, cooling, equipment)	20,000	1.70
LED lighting + gobos	12,000	1.02
Pumping and drainage	9,000	0.77
E-bike charging	5,000	0.43
Controls, telecom, cameras	4,000	0.34
<b>Electricity subtotal</b>	<b>94,000</b>	<b>8.00</b>
Generators (backup + testing)	—	1.50
<b>Total — "Energy" line</b>	<b>—</b>	<b>9.50</b>

### 4. The long-missing line items

#### Drainage and pumping — ≈ \$3.8M/yr

In places the tunnel runs below the water table: water seeps in continuously and must be pumped 24/7 across 150 km, on top of summer condensation. Unlike ventilation, which throttles down at night, the pumps never stop. Cost: ≈ \$0.77M/yr in electricity (9,000 MWh) and ≈ \$3M/yr to maintain dozens of pump stations — submersible pumps replaced on a rolling basis, drain jetting, controls.

#### Station geothermal — ≈ \$1.0M/yr, a net-positive line

Heating and cooling the 150 entrances with geothermal heat pumps (COP 3.5) costs ≈ \$0.3M/yr in electricity and ≈ \$0.7M/yr in maintenance. But by replacing direct electric heating (10–14 GWh) with just 3–4 GWh, geothermal **saves \$0.7–0.9M/yr**: it is the rare line that pays for itself in operation.

#### Immersive theming (décor) — ≈ \$15M/yr

The décor that turns a concrete tube into an underground forest — LED sky, printed surfaces, gobos, sound and station screens — must be maintained: LED replacement, recalibration, optics cleaning, sacrificial-film replacement and vandalism repair. The dedicated analysis sets this at 2–4% of the \$500M capital cost.

Scenario	Annual rate	Décor OPEX
Optimistic	2%	\$10M
<b>Realistic (retained)</b>	<b>3%</b>	<b>\$15M</b>
Conservative	4%	\$20M

**\$15M is already the optimized figure.** Dynamic everywhere (screens, video mapping over 150 km) would push maintenance to  $\approx$  \$45M/yr. Because  $\sim$ 70% of the décor is passive — printed surfaces, porcelain enamel, an LED sky that lasts 30-50 years — and the costly electronics are confined to the stations, the line holds at \$15M. Of that \$15M,  $\approx$  \$4M was already counted;  $\approx$  \$11M is genuinely new.

### Optimized shuttles — \$15M/yr in total

Until a dedicated under-river tunnel is bored, the Québec-Lévis link relies on a fleet of  $\approx$  26 trucks and 4 boats (double the capacity per vehicle: 50 bikes per truck). It absorbs the peak and raises the line from  $\sim$ \$10M to  $\approx$  \$15M/yr:  $\approx$  \$7M in salaries (90 FTE, counted under staffing) and  $\approx$  \$8M in operations (fuel, maintenance, terminals).

### Photoluminescence — $\approx$ \$0.6M/yr, and zero electricity

The photoluminescent evacuation marking recharges passively from the LED lighting already installed: its electricity draw is nil. Operation is limited to photometric inspection ( $\approx$  \$0.1M) and a re-application provision amortized over  $\sim$ 12 years ( $\approx$  \$0.5M).

## 5. The consolidated annual budget — realistic 2030

Budget line	\$M/yr	Share
Staffing (602 FTE)	47.0	22%
Energy (excl. drainage, geothermal, theming)	7.4	4%
Drainage and pumping	3.8	2%
Station geothermal	1.0	<1%
Immersive theming (décor)	15.0	7%
Tunnel + station maintenance	25.3	12%
Photoluminescence	0.6	<1%
Security + telecom maintenance	18.0	8%
Bike-fleet maintenance	45.0	21%
Shuttles (excl. salaries)	8.0	4%
Rents and leases	4.0	2%
Insurance and miscellaneous	18.0	8%

Budget line	\$M/yr	Share
<b>Subtotal</b>	<b>193.1</b>	<b>91%</b>
Operating contingency (10%)	19.3	9%
<b>TOTAL — realistic 2030</b>	<b>≈ 212</b>	<b>100%</b>

The largest lines are the bike fleet (\$45M), staffing (\$47M), tunnel and station maintenance (\$25.3M) and immersive-theming maintenance (\$15M). All of the network's electricity combined weighs only ≈ \$9.5M thanks to Hydro-Québec's rates — which confirms the energy-independence argument.

## 6. Minimum and maximum by choice

Staffing is nearly fixed; what really moves the total is the bike fleet, the ambition of the immersive décor (2-4% of its cost), and the decision to buy or lease premises.

Driver	Minimum	Realistic	Maximum
Staffing (headcount fixed)	46	47	49
Energy (excl. drainage, geo, theming)	6	7.4	10
Drainage and pumping	3	3.8	5
Station geothermal	0.8	1.0	1.3
Immersive theming (décor)	10	15	20
Tunnel + station maintenance	23	25.3	28
Photoluminescence	0.5	0.6	0.8
Security + telecom maintenance	16	18	20
Bike fleet (the key line)	30	45	75
Shuttles (excl. salaries)	6	8	10
Rents (owned or leased)	1	4	8
Insurance and misc.	16	18	20
<b>Subtotal</b>	<b>158.3</b>	<b>193.1</b>	<b>247.1</b>
Contingency (10%)	15.8	19.3	24.7
<b>TOTAL</b>	<b>≈ 174</b>	<b>≈ 212</b>	<b>≈ 272</b>
Per user (200,000 users)	≈ \$870	≈ \$1,060	≈ \$1,360

The per-user cost covers operations only; amortization of the construction capital is added on top, depending on the financing model chosen.

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## 7. Reducing the net cost: revenues

This budget is **gross**, before any revenue. The network would generate several income streams to subtract for the true net cost:

- Self-service e-bike and e-scooter rental at every station;
- Network access pricing (monthly or annual membership);
- Advertising in the tunnels and stations;
- Concessions, retail and secure parking at the entrances.

Even modest pricing — on the order of **\$30-50 per month** per regular user — would cover a large share, if not all, of the annual operating budget.

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## 8. Assumptions and limitations

- Amounts in constant Canadian dollars (CAD), excluding inflation and loan interest.
- The budget excludes amortization of the construction capital, which depends on the financing structure (public borrowing, P3, subsidy).
- Planning-level orders of magnitude, to be refined through quotes and lot-by-lot tenders.
- The most uncertain line remains the bike fleet ( $\approx$  \$600/vehicle, range \$500-1,500); drainage and energy have limited impact on the total.
- Actual costs should be validated on a pilot segment (1-2 km with a full station) before any large-scale rollout.

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Vélo Tunnel Québec — A citizen project for a 150 km underground cycling network in the greater Québec City region, using The Boring Company's tunnelling technology. Prepared by Philippe Leblond · June 2026 · For information only.  
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