BIKE TUNNEL QUÉBEC

150 km underground cycling network

Québec City region — The Boring Company technology

Annual operating and maintenance cost analysis

Detailed estimate of the annual operating budget

Complementary document to the construction financial analysis

Prepared in May 2026

1. Executive summary

After establishing the construction cost of the network at about C$8.7 billion, this analysis estimates the annual operating and maintenance cost required to run the 150 km underground cycling network, 24 hours a day, 365 days a year.

The analysis covers all the requested items: maintenance of the tunnels and stations, the patrollers (50 at peak hours, 10 the rest of the time), the two Québec–Lévis shuttles (truck and boat), lighting, ambiance projectors, generators, ventilation, electricity, management, as well as all the connected items usually overlooked (control centre, bike-fleet maintenance, insurance, telecommunications, etc.).

> **KEY FIGURE**
> Annual operating cost: ≈ C$174 million per year.
> That is about 2.0% of the construction cost per year — a ratio that is typical and even prudent for this type of transport infrastructure.
>
> Operating cost per user: ≈ C$870 per year (over 200,000 users: 100,000 intensive + 100,000 non-intensive).

This figure represents the gross operating cost, before any revenue. The network would also generate revenue (e-bike rental, access pricing, advertising, concessions, secure parking) that would reduce the net cost borne by the state or by users accordingly.

2. Methodology and base assumptions

The operating budget was built using a bottom-up approach (item by item), then validated by cross-checking against the standard ratios of the public-transit industry.

2.1 Main assumptions

Assumption	Value used
Operating hours	24 h / 24, 365 days a year
Network length	150 km of tunnels + 150 stations (75 major, 75 minor)
Users served	200,000 (100,000 intensive + 100,000 non-intensive)
Capital amortization	C$8.7B over 50 years at 3% (lifespan of a tunnel)
Average loaded salary	Salary + ~30% (benefits and payroll charges)
Productive hours / FTE	≈ 1,700 h/yr (35-hour week, leave, training)
Hydro-Québec rate	≈ 8.5¢/kWh all in (high power, rate M/L, energy + power)
Peak capacity	50 patrollers simultaneously 7 h/day; 10 the rest of the time

Note on the electricity rate: as of April 1, 2026, Hydro-Québec's residential rate sits around 7 to 11¢/kWh, and the high-power rates (rate M and rate L) combine a low energy charge (about 5 to 6¢/kWh) with a power premium. For a high-use, continuously operating network like this one, an all-in rate of about 8.5¢/kWh is used — which remains among the lowest in North America and confirms the energy-independence argument.

3. Personnel (labour)

The network operates as a genuine public-transit service and requires staff spread across seven main categories. The costs below include loaded salaries (benefits and payroll charges).

Personnel category	FTE	Annual cost (C$M)
Bike patrollers (50 at peak, 10 off-peak)	115	8.6
24/7 control-centre operators + supervisors	45	3.7
Maintenance technicians (electromechanical, civil engineering, cleaning)	120	10.2
Bike-fleet mechanics	60	3.8
Station staff and customer service	60	3.5
Shuttle crews (trucks, boats, terminals)	70	5.5
Management, administration, IT, finance, HR, marketing	70	7.0
TOTAL PERSONNEL	**540**	**42.3**

3.1 Patroller calculation

The need for 50 simultaneous patrollers at peak hours (one patroller every 3 km over 150 km) and 10 the rest of the time translates into person-hours:

- Peak: 50 patrollers × 7 h = 350 hours per day
- Off-peak: 10 patrollers × 17 h = 170 hours per day
- Total: 520 patroller-hours per day × 365 = 189,800 hours per year

At about 1,700 productive hours per full-time employee, this represents ≈ 112 FTE, rounded up to 115 to cover replacements, leave and training.

4. Energy and electricity

Electricity is the largest operating item after personnel. The ventilation of a 150 km network is the dominant share, followed by lighting and stations.

Consumption item	MWh / yr	Share
Ventilation (jet-fans, air renewal over 150 km)	44,000	46%
Stations (entrance heating, elevators, escalators, lighting)	20,000	21%
Tunnel LED lighting + gobo projectors	12,000	13%
Pumping and drainage (water table)	9,000	10%
E-bike fleet charging	5,000	5%

Consumption item	MWh / yr	Share
Control, telecom, cameras, signage	4,000	5%
TOTAL ENERGY	**≈ 94,000**	**100%**

Cost of electricity: 94,000 MWh × 8.5¢/kWh ≈ C$8.0M per year. The phosphorescent paint incurs no electrical cost: it recharges passively from the light of the LEDs.

Energy item	Annual cost (C$M)
Electricity (≈ 94,000 MWh, Hydro-Québec)	8.0
Fuel and periodic testing of backup generators	1.5
TOTAL ENERGY	**9.5**

The generators run only during a Hydro-Québec outage; their annual cost covers the fuel for regular tests, maintenance and renewal of the diesel stock.

5. Maintenance and repairs

This item groups together materials, parts and specialized contracts (the maintenance labour is already counted in section 3). The concrete structures are durable and nearly free of major maintenance for 30 years; it is the electromechanical systems and the bike fleet that dominate.

Maintenance item (materials and contracts)	Annual cost (C$M)
Tunnel structure and civil engineering (inspections, waterproofing, joints)	6.0
Pavement, drainage, marking	3.0
Electromechanical systems (ventilation, pumps, lighting, fire)	20.0
Security systems (1,500 cameras, 1,500 SOS posts, drones, AI)	12.0
Telecommunications and IT (5G, WiFi, fibre, app, software)	6.0
Bike fleet (parts + replacement of 76,000 vehicles)	30.0
Cleaning and miscellaneous	3.0
TOTAL MAINTENANCE AND REPAIRS	**80.0**

> **ITEM TO WATCH: THE BIKE FLEET**
> With 50,000 e-bikes, 25,000 regular bikes and 1,000 quadricycles in self-service, the intensive wear is considerable. Bike-share systems typically require C$500 to 1,500 per bike per year (repairs + replacement). The C$30M estimate corresponds to progressive replacement and ongoing maintenance — it is one of the most uncertain items and could climb if ridership is very high.

6. Québec–Lévis shuttles

In the absence of a short-term under-river tunnel, two shuttles provide the Québec–Lévis link: a shuttle-truck (departure every 5 minutes, 24/7) and a shuttle-boat. The costs below exclude crews (already counted in section 3).

Item (excluding labour)	Annual cost (C$M)
Fuel — shuttle-truck (fleet of 30, continuous service)	2.5
Fuel — shuttle-boat (4 boats, marine fuel)	2.0
Vehicle and boat maintenance	2.5
Terminal operations (ramps, docks, ticketing)	1.0
TOTAL SHUTTLES	**8.0**

7. Insurance and other costs

Item	Annual cost (C$M)
Insurance (civil liability + property, ≈ 0.14% of capital)	12.0
Marketing, customer service, ticketing and payment	3.0
Water, sewer and waste management	1.0
Snow clearing and de-icing of the 150 surface entrances	2.0
TOTAL INSURANCE AND OTHER	**18.0**

8. Annual budget summary

The following table brings all the items together into a complete annual operating budget.

Budget item	C$M / yr	Share
1. Personnel (540 FTE)	42.3	24%
2. Energy (electricity + generators)	9.5	5%
3. Maintenance and repairs	80.0	46%
4. Québec–Lévis shuttles	8.0	5%
5. Insurance and other costs	18.0	10%
SUBTOTAL	**157.8**	**91%**
Operating contingency (10%)	15.8	9%
TOTAL ANNUAL OPERATION	**≈ 173.6**	**100%**

CROSS-CHECK VALIDATION

C$174M ÷ C$8,710M of capital = 2.0% per year.

Annual operating-maintenance costs of transport infrastructure normally fall between 1.5% and 3% of the construction cost. At 2.0%, the estimate is credible and rather prudent, all the more so as a cycling network is simpler than a metro (no trains, no rails, no railway signalling).

9. Total cost per user and comparison

The cost per user is calculated over 200,000 users (100,000 intensive and 100,000 non-intensive) and a capital amortization over 50 years — a realistic, and even prudent, lifespan for a tunnel. It combines the amortization of the construction and the annual operation.

9.1 Bike Tunnel cost per user

Component	Total / yr	Per user
Capital amortization (C$8.7B over 50 years at 3%)	≈ C$338M	≈ C$1,693
Operation and maintenance (section 8)	≈ C$174M	≈ C$870
TOTAL COST PER USER (before revenue)	**≈ C$512M**	**≈ C$2,560**

Note: a simple amortization without interest (C$8.7B ÷ 50 years) would bring the capital share down to ≈ C$870 per user, i.e. a total cost of barely ≈ C$1,740. Doubling the number of users (from 100,000 to 200,000) and lengthening the amortization (from 30 to 50 years) radically reduce the cost per user, which falls from ≈ C$6,100 to ≈ C$2,560.

9.2 The real cost of a car

The often-cited figure of C$4,000/yr is unrealistic: it barely covers fuel and insurance. Even a reliable, economical car costs much more, especially once the public costs are added — road-network maintenance and police services — which all taxpayers bear, whether they drive or not.

The real cost of a reliable, economical car in Québec	Annual cost
Private cost (depreciation, financing, fuel, insurance, registration, licence, maintenance, tyres)	C$6,000 to 10,000
Public cost — road-network maintenance and construction	≈ C$1,500
Public cost — police, road enforcement and justice	≈ C$500
REALISTIC TOTAL	**C$8,000 to 12,000 / yr**

Sources: CAA-Québec estimates the private cost of a typical compact car at about C$9,500 to 12,000/yr (purchase or lease, financing, insurance, registration, licence, maintenance, tyres, depreciation, fuel and taxes); an economical used car driven moderately is lower, around C$6,000 to 8,000. On the public side, Québec maintains more than 61,000 km of roads financed almost entirely by the state, at a cost per kilometre about twice the Canadian average; spread over the roughly 5 million vehicles, this represents on the order of C$1,500 to 2,000 per vehicle, to which police and road-enforcement services are added.

9.3 Comparison of transport modes

Mode	$/user/yr	Notes
Bike Tunnel Québec	≈ C$2,560	Capital (50 years) + operation, 200,000 users
Public transit (RTC)	≈ C$4,700	Public subsidy per user

Mode	$/user/yr	Notes
Car (reliable, economical)	C$8,000 to 12,000	Private + public cost (roads, police)
Surface bike (city)	C$10 to 100	But limited ~6 months/yr and dangerous trips

> **THE ECONOMIC ARGUMENT**
> At 200,000 users and over 50 years, the Bike Tunnel comes to ≈ C$2,560 per user per year — about 3 to 5 times cheaper than the car and 2 times cheaper than public transit, while operating 365 days a year.

9.4 Potential revenues

This cost is gross, before any revenue. The network would generate several revenue sources to subtract in order to obtain the real net cost, notably:

- Self-service e-bike and e-scooter rental at each station
- Network access pricing (monthly or annual subscription)
- Advertising in the tunnels and stations
- Concessions, shops and secure parking at the entrances

Even modest access pricing (for example C$30 to 50 per month per regular user) would cover a significant share, or even all, of the C$174M of annual operation.

10. Sensitivity analysis

Several items rest on estimates (ventilation consumption, fleet wear, staffing levels). Here are three scenarios that bracket the operating cost (the cost per user is over 200,000 users, operation only).

Scenario	Annual total	Per user
Optimistic (−17%)	≈ C$145M	≈ C$725
Median (reference)	≈ C$174M	≈ C$870
Prudent (+20%)	≈ C$210M	≈ C$1,050

The realistic range is therefore between C$145 and C$210M per year. The main uncertainty levers are ventilation consumption, the bike-fleet maintenance cost and the staffing level.

11. Conclusion

The operating and maintenance cost of the Bike Tunnel Québec network is estimated at about C$174 million per year, i.e. 2.0% of the construction cost and about C$870 per user (over 200,000 users). This ratio is in line with — and even prudent relative to — the standards of the public-transit industry.

Combined with the capital amortization over 50 years, the total cost reaches about C$2,560 per user per year — about 3 to 5 times less than the real cost of a car (C$8,000 to 12,000/yr, private and public costs included) and 2 times less than public transit.

The three dominant items are maintenance and repairs (C$80M, mainly the bike fleet and the electromechanical systems), personnel (C$42M) and insurance and miscellaneous costs (C$18M). Electricity, despite the scale of the network, remains remarkably low (C$8M) thanks to Hydro-Québec rates — confirming the energy-independence argument.

> **Recommendation:** present the operating cost publicly in a range of C$150 to 200M per year, systematically accompanying it with a revenue strategy (access pricing, bike rental, advertising) to demonstrate that the net cost to the state would be significantly lower, or even neutral.

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