

# Crossing the river: shuttle demand, fleet and costs

How many people would cross the St. Lawrence by bike, how to split them across the shuttle-truck, shuttle-boat and ferry, what vehicle size and frequency maximize trips — and what it all costs to buy and to run.

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The 150 km underground cycling network serves both shores, but the river remains its only real break: until a dedicated under-river tunnel is bored, the Québec-Lévis link is handled by two shuttle services — a **shuttle-truck service** (over the bridge) and a **shuttle-boat service** (on the water) — complemented by the existing **ferry** operated by the Société des traversiers du Québec. This note quantifies demand, sizes the vehicles *right* to maximize throughput, and establishes the costs.

**Consistency principle.** A bike always crosses *with* a person. Capacities are therefore expressed as “bikes + total people,” always with **bikes ≤ people**: the people count includes the cyclists, plus a few walk-on passengers.

## 1. The pool: how many people cross the river today

The cycling crossing demand is a *fraction* of a flow that already exists. Recent data from the Ministry of Transport and from the STQ paint a clear picture:

### TWO BRIDGES

≈ 157,000

Vehicles per day, both directions  
(Pierre-Laporte ≈ 126,000 in 2024  
+ Québec Bridge ≈ 31,000).

### FERRY

1.5 M

Passengers per year, plus ≈  
300,000 vehicles and ≈ 100,000  
bikes. Departures every 30  
minutes.

### WEEKDAY PEAK

≈ 63,000

Vehicles over the combined 6-  
9 a.m. + 3-6 p.m. windows,  
across both bridges.

The decisive variable is **origin-destination**: crossing is the exception, not the rule. Fewer than 4 % of the roughly 725,000 daily trips on the North Shore cross the river, and about three quarters

of Lévis motorists never cross the bridges. Converting vehicles into people ( $\approx 1.2$  occupants) and adding ferry and bus traffic, the total is on the order of **200,000 person-crossings per day** (both directions), a core of about **45,000 to 50,000 regular commuters**. The morning peak, heavily Lévis→Québec, accounts on its own for  $\approx 35,000$  to 38,000 people.

## 2. How many would cross by bike

The crossing is the hardest segment to capture, because the shuttle forces a transfer the rest of the network does not. We therefore apply a more conservative capture than the network's average mode share ( $\approx 10\%$ ). Using the same scenario logic as the market study:

SCENARIO	SHARE CAPTURED	CYCLISTS/DAY (ROUND TRIP)	CROSSINGS/DAY (ONE WAY)	AM PEAK (BIKES/H, NORTHBOUND)
Conservative	$\approx 5\%$	$\approx 2,500$	$\approx 5,000$	$\approx 700-1,000$
<b>Median (target)</b>	<b><math>\approx 10\%</math></b>	<b><math>\approx 5,000</math></b>	<b><math>\approx 10,000</math></b>	<b><math>\approx 1,500-2,000</math></b>
Optimistic	$\approx 15\%$	$\approx 7,500$	$\approx 15,000$	$\approx 2,200-2,800$

On top of this comes **leisure and tourism**: the ferry already carries  $\approx 100,000$  bikes a year ( $\approx 275$ /day, mostly in summer), a baseline that could rise to 500–1,500/day in the warm season. Cross-check: Lévis accounts for only about 20% of the regional population, so the “river” segment is only about **3,000 to 6,000 of the network's 100,000 intensive users**. Both approaches converge.

## 3. Vehicles sized to maximize throughput

The original capacity (30 bikes for the truck, 12 for the boat) under-used both vehicles. We re-size them to a realistic but ambitious capacity, keeping the numbers consistent:

MODE	CAPACITY PER DEPARTURE	BREAKDOWN (CONSISTENT)	ROLE
<b>Shuttle-truck</b>	50 bikes / 55 people	50 cyclists + 5 walk-on passengers	Year-round backbone
<b>Shuttle-boat</b>	60 bikes / 100 people	60 cyclists + 40 walk-on passengers	Summer complement, zero in winter (ice)
<b>Ferry (STQ)</b>	Several dozen	existing, free with a transit pass	Baseline, leisure and overflow

The structuring factor is **winter**: ice runs in the river from December to March, when the boat cannot operate. So the shuttle-truck, on the bridge, carries the bulk of winter demand; boat and ferry add capacity in summer.

**Why a truck far larger than a bus?** It is a purpose-built articulated vehicle (auto-transport style), where bikes are stored in two-tier racks and cyclists ride standing alongside. 50 bikes in a  $\approx 16$  m trailer is realistic for a dedicated vehicle; the boat has more deck area, hence an even higher bike capacity.

## 4. Frequency, throughput and fleet

Sizing hinges on the peak. “Every 5 minutes” is not a ceiling: it is one frequency among many. The tighter the headway, the higher the throughput — at the cost of more trucks in circulation. With the new 50-bike capacity:

TRUCK HEADWAY (AT PEAK)	DEPARTURES/HOUR	THROUGHPUT (BIKES/H, PER DIRECTION)	ACTIVE TRUCKS (CYCLE $\approx 35$ MIN)
every 5 min	12	600	$\approx 7$
<b>every 2 min (conservative scenario)</b>	<b>30</b>	<b>1,500</b>	<b><math>\approx 18</math></b>
every 1.5 min (median scenario)	40	2,000	$\approx 23$
every minute (optimistic scenario)	60	3,000	$\approx 35$

In summer, the boat adds  $\approx 240$  bikes/h (every 15 min) to  $\approx 360$  bikes/h (every 10 min) with 3 vessels in service. The coverage of each scenario is then:

SCENARIO	PEAK (BIKES/H)	TRUCK CONFIG	TRUCK THROUGHPUT	+ BOAT (SUMMER)	VERDICT
Conservative	700-1,000	every 2 min	1,500/h	(optional)	Covered, wide margin
<b>Median</b>	<b>1,500-2,000</b>	<b>every 1.5 min</b>	<b>2,000/h</b>	<b>+240-360</b>	<b>Covered</b>
Optimistic	2,200-2,800	every minute	3,000/h	+360	Saturation $\rightarrow$ tunnel

The **recommended fleet** is  $\approx 26$  **shuttle-trucks** ( $\approx 23$  active at median peak + spares) and **4 shuttle-boats** (3 in service + 1 spare). At launch, fewer run ( $\approx 18$  trucks, every 2 minutes), then the headway tightens and units are added as demand grows.

## The threshold that triggers the tunnel

With these vehicles, the shuttle now **comfortably covers both the conservative AND median scenarios** — a leap over the original version. Every 2 minutes, the truck moves 1,500 bikes/h; every 1.5 minutes, 2,000/h. Only in the **optimistic** scenario (2,200–2,800/h) does the link saturate, when even a 1-minute headway means  $\approx 35$  trucks bumper-to-bumper on the bridge. **That breaking point is what justifies building the dedicated under-river tunnel.** The shuttle does not absorb mature peak demand: it measures it, and its saturation triggers the tunnel.

## 5. Costs — the purchase (capital)

Larger, more numerous vehicles raise the rolling stock, but it remains a modest fraction of the total; it is still the **terminals** that dominate.

ITEM	QUANTITY	UNIT PRICE	SUBTOTAL
Shuttle-truck (purpose-built articulated vehicle, 50 bikes / 55 people)	26	$\approx$ \$500,000	$\approx$ \$13 M
Shuttle-boat (aluminum catamaran, 60 bikes / 100 people)	4	$\approx$ \$4 M	$\approx$ \$16 M
<b>Rolling stock — total</b>			<b><math>\approx</math> \$28-30 M</b>
Terminals (Lévis + Québec): docks, ramps, bike handling, shelters, displays, link	2	—	$\approx$ \$60 M
<b>Link total</b>			<b><math>\approx</math> \$90 M</b>

The basis: a purpose-built articulated vehicle (heavy tractor + rack-and-passenger trailer) runs around  $\approx$  \$450,000–550,000. For the boat, the benchmark is that a 32 m aluminum catamaran ferry for 278 passengers cost  $\approx$  US\$6.25 M in 2014 ( $\approx$  CA\$11 M today); a 22–24 m format (60 bikes / 100 people) runs closer to  $\approx$  \$4 M each. Rolling stock is thus only  $\approx$  **30 %** of the \$90 M: a minimalist launch (basic terminals + a dozen trucks) would cost a fraction of the total, scaling up with measured demand.

## 6. Costs — operation and maintenance

The larger fleet raises operation from  $\approx$  \$10 to  $\approx$  **\$15 M/year**, split between labour and equipment.

ITEM	DETAIL	ANNUAL COST
Salaries ( $\approx 90$ FTE)	drivers + boat crews + ground staff (loaded salaries, $+ \sim 30\%$ )	$\approx \$7$ M
Fuel + maintenance + terminals (excl. salaries)	24/7 diesel, truck/boat parts, dock operation	$\approx \$8$ M
<b>Operating total — shuttles</b>		<b><math>\approx \\$15</math> M/year</b>

The salary line stays verifiable: in Québec, the average truck-driver wage is around \$27/hour (range  $\approx \$38,500$  to  $\$89,400$  depending on experience). With payroll burdens ( $+ \sim 30\%$ ), that yields  $\approx \$70,000$ – $90,000$  loaded per driver; at  $\approx \$78,000/\text{FTE}$ ,  $\approx 90$  FTE give  $\approx \$7$  M. Fuel and maintenance stay contained: the trucks make very short round trips ( $\approx 2$ – $3$  km per direction on the bridge) and the boats run only about 6 months.

## $\approx 8\%$ of the network's operating budget

The optimized fleet costs  $\approx \$28$ – $30$  M to buy and  $\approx \$15$  M/year to run — about  $8\%$  of the  $\approx \$194$  M/year operating cost of the whole network. For  $\approx \$5$  M more in capital and  $\approx \$5$  M more per year than the original version, peak throughput is multiplied by **4 to 8** (from 360 to 1,500–3,000 bikes/h per direction). The trade-off is excellent.

**Two honest caveats.** This  $\approx \$15$  M/year does not include amortization of the  $\approx \$90$  M in capital: financed over 20 to 25 years, that adds  $\approx \$4$ – $5$  M/year. And the real heavy item remains the terminals, not the vehicles.

## 7. The staged logic

The shuttles are not meant to absorb mature demand: they are the transition solution that lets the project **measure** real inter-shore demand, at low cost. Thanks to the re-sizing, this light service now covers the conservative and median scenarios with ease; only when demand crosses the optimistic threshold does its saturation —  $\approx 35$  trucks bumper-to-bumper every minute — make the case for a **dedicated under-river tunnel**. Each step is committed only once the previous one is validated by the numbers.

## Sources and assumptions

**Real-world data:** traffic on the Pierre-Laporte and Québec bridges (Ministère des Transports et de la Mobilité durable, 2022–2024); ridership and capacity of the Québec-Lévis ferry (Société des traversiers du Québec); origin-destination split of inter-shore trips (analyses 2023–2025); Québec truck-driver wages (2025–2026); reference prices for aluminum passenger vessels (comparable builders and fleets).

**Project assumptions:** optimized capacities (50 bikes/55 people for the truck; 60 bikes/100 people for the boat), frequencies (2 min at peak at launch, tightened to 1–1.5 min as demand grows), fleet ( $\approx 26$  trucks + 4 boats), and costs

(≈ \$90 M in capital, ≈ \$15 M/year operating). The capture percentages, the split across modes and the hourly peaks are illustrative estimates intended for sizing, to be refined by an origin-destination survey and by real measurement of a first segment.

For information only. Amounts in constant dollars, excluding inflation and financing costs. Shuttle cycle time ≈ 35 min (loading + crossing + unloading, twice), with a priority lane and roll-on/roll-off terminals.