

Cost of the nature simulation

Immersive treatment of the 150 km underground bike network — capital cost (CAPEX)

Vélo Tunnel Québec · June 2026 · Canadian dollars (CAD) · Order-of-magnitude figures, to be refined by quote

The principle: why invest in beauty

Underground, beauty is not decoration: it is the factor that decides whether the tunnel gets used. Cyclists who love nature will not ride down a grey concrete corridor, and people with claustrophobia will not enter at all. Immersive treatment is therefore not a comfort expense — it is what generates ridership, and ridership is the entire value of a network of this cost.

Chosen strategy: a premium, **passive and durable** layer across the full 150 km (printed forest, luminous sky, sound, movement), with the costly **dynamic** effects (screens, video projection, high-end artificial sky) concentrated at station entrances and the showcase segment. This maximizes the felt effect everywhere while keeping operating costs low (see the companion document, “Operating costs”).

\$500M devoted to the treatment is about **5.6%** of a roughly \$8.9B project. This is not an accessory decoration: it is the investment that ensures the remaining 94% actually gets used.

The six technology layers

Realism does not come from a single piece of equipment, but from stacking layers. The first four cover the full 150 km — that is what creates the sense of openness from end to end. The last two concentrate the spectacular effect where it converts the most people.

Layer	Role	Technology	Coverage
1. Luminous sky	Openness, anti-claustrophobia	Tunable-white LED backlight + printed diffuser	150 km
2. Printed forest	Visual immersion	Laminate (HPL), porcelain-enamel steel, printed acoustic panels	150 km
3. Movement	Life, shifting light	Steel gobo projectors + effect wheels (DMX)	150 km
4. Sound	Audio immersion	Zoned speakers + DSP, spatialized soundscape	150 km
5. Depth	Relief, added realism	Foreground 3D elements, real plants (moss, ferns)	Stations / portals
6. Dynamic wow	Spectacular effect	Video mapping, LED screens, artificial sky (CoeLux-type)	Stations + demo

Protection: lasting 50 years

The classic objection — “the paint will get damaged” — is correct: that is precisely why there is no paint and no fragile image in the contact zone. Durability rests on three levers: height, hard materials, and replaceable protective films.

Height	Surface	Protection
0 to 1.2 m (contact zone)	Hard, washable panels	Sacrificial anti-graffiti film (replaced cheaply)
1.2 to 2.4 m (eye level)	Rigid printed panels	Anti-abrasion hardcoat film
2.4 m to the ceiling (the dome)	Printed porcelain / acoustic	Out of reach, never touched

The reference material: porcelain-enamel steel has clad subways for a century. Graffiti wipes off, it is 100% non-combustible, and the surface lasts more than 50 years with no maintenance — while now being printable in full-color photography. It is reserved for stations and the most-travelled sections.

Budget breakdown — CAPEX \$500M

Item	Coverage	Budget (\$M CAD)
Luminous sky (the openness)	150 km, everywhere	110
Printed forest + films (the immersion)	150 km, 3 heights	140
Movement (gobos) + soundscape	150 km, everywhere	80
All 150 stations finished well	each station	100
Demo segment + signature stations	the showcase	50
Reserve + upgrades (sponsorship possible)	—	20
Total		500

About **70% of the spend is passive and durable** (printed surfaces, porcelain, LED sky), and only **~30%** is dynamic and concentrated at stations. This ratio is what keeps operating costs low.

Spread across the network, the treatment of 150 km amounts to roughly **\$2.5 to \$3M/km** — about 5% of the cost of boring and fitting out the tunnel itself (~\$59M/km).

Why not dynamic everywhere

It would be tempting to install screens or video projection across the full 150 km. Three reasons rule it out:

- **Wrong tool in a lit tunnel:** a screen or projection washes out under the permanent safety lighting. A physical printed surface is more realistic, not less.
- **Prohibitive cost:** continuous dynamic media over 150 km would far exceed \$1B in CAPEX, before energy.
- **Short lifespan:** electronics last 10 to 15 years; all 150 km of equipment would have to be replaced each cycle. Passive surfaces last 30 to 50 years.

Assumptions and limits

- Figures in Canadian dollars (CAD), 2026.
- Order-of-magnitude, planning-level figures, to be refined by quote and lot tenders.
- CAPEX excludes operating costs (energy, maintenance, vandalism), covered in the document “Operating costs of the simulation”.
- Real installation costs must be validated on a pilot segment before any large-scale rollout.