Cost–Benefit Analysis of Restoring Passenger Rail Service: Wenatchee–Oroville Corridor, WA

Executive Summary

This report evaluates the feasibility of reinstating passenger rail service between **Wenatchee and Oroville** in central Washington through a comprehensive cost–benefit analysis. Key findings include:

- **Capital Costs:** An estimated **\$100–\$120 million** upfront investment is required, primarily for track upgrades (about 50% of costs), rolling stock (~20%), signaling/safety systems (~15%), and stations and facilities (~10%). These upgrades would enable safe, reliable service on the 131-mile corridor[1][2].

- **Operating Costs:** Annual operations are projected at **\$3–\$4 million** for one daily round-trip, including crew, maintenance, fuel, and administration. Farebox revenue from projected ridership would cover only ~30–50% of these costs in base and optimistic scenarios, necessitating subsidies (consistent with similar rural rail services[3]).

- **Ridership & Revenue: Annual ridership** is projected at **60,300 (base case)** up to **82,500 (high)** one-way trips. At an average fare of \$20, fare revenue ranges \$1.2–\$1.65 million per year. These figures assume improved service quality and frequency over existing bus options, as current intercity bus service carries only ~5,000 riders/year on this corridor[4].

- **User Benefits:** Travelers would see modest **time savings** (estimated ~15 minutes per trip) vs. driving a car (~2.5 hours by train vs 2.75 by car[5]), yielding about **\$3–\$4** in time value saved per trip (valuing personal travel time ~$15/hour). Multiplied over all riders, time savings are worth on the order of **\$0.2–\$0.3 million annually**.

- **Vehicle Operating Cost Savings:** Each rail trip averts an average ~80–100 miles of car travel. At ~$0.50 per mile for fuel, maintenance, and depreciation, this translates to **\$2–\$3 million per year** saved in private vehicle operating costs.

- **Safety and Emissions:** By reducing ~5–6 million VMT (vehicle-miles traveled) annually, the train would improve safety (fewer road accidents) and cut tailpipe **CO_2 emissions by ~1,100–1,700 metric tons/year**. This is roughly a 70–80% emissions reduction per passenger-mile vs. driving[6][7], equivalent to ~$50k in monetized climate benefits at \$50/ton. Reduced road accidents could save an estimated **\$0.3 million/year** in crash costs.

- **Tourism and Economic Impacts:** The rail service could stimulate tourism to Okanogan Valley destinations (e.g. Lake Chelan, wineries, outdoor recreation). If even 10–15% of

riders are new tourists spending \$100–\$150 each on local lodging, dining, and activities, that's **\$0.6–\$1.2 million/year** in new local revenue.

- **Benefit–Cost Ratio (BCR):** Under a **base case**, the present value of quantifiable benefits (over 20 years, 3% discount) is low relative to costs, yielding a **BCR around 0.3–0.4** (i.e. 30–40¢ of benefit per \$1 cost). In a **best-case scenario** (high ridership, cost containment, strong tourism impact), the BCR might improve to ~**0.6–0.8**. A **worst-case** (low ridership ~40k/year and cost overruns) could see BCR <0.2. **None of the scenarios achieves a BCR of 1.0**, indicating that the project's monetized societal benefits are likely less than its costs – a common outcome for rural passenger rail[8][3]. However, unquantified benefits (regional connectivity, equity, environmental justice, etc.) may provide additional justification.

Overall, restoring service would require significant public investment and ongoing subsidy. The quantifiable economic benefits alone appear insufficient to fully justify the costs, *but* the service could bring qualitative benefits to communities (mobility for non-drivers, economic development, etc.). Funding agencies should weigh these broader impacts alongside the BCR when considering the project.

Introduction and Background

Restoring passenger rail between **Wenatchee and Oroville** would revive service on the former Great Northern "W-O" branch line, now a 131-mile freight shortline (the Cascade & Columbia River Railroad) running north through the Columbia and Okanogan River valleys[9][10]. This rural corridor's towns – Wenatchee, Chelan, Pateros, Omak/Okanogan, Oroville, and others – currently lack intercity rail connectivity. The only public transit is a limited daily bus (WSDOT's "Apple Line") from Omak to Wenatchee (continuing to Ellensburg), which carries on the order of 4–6 thousand riders per year[4]. By contrast, a dedicated passenger train could attract much higher ridership by offering greater comfort, capacity, and potentially shorter travel times.

Project Rationale: The rail service is envisioned to improve mobility for rural communities, provide a convenient travel option for residents and students, boost tourism to the Okanogan region, and potentially connect with cross-border rail (the line extends to the Canadian border at Oroville). There is also community interest in passenger trains as a catalyst for economic development and an alternative to long highway drives. However, past analyses have noted challenges: low population densities and the availability of highways mean **ridership and fare revenues may be limited**, while infrastructure costs are high[8]. This analysis weighs those costs and benefits using the best data available.

Capital Cost Estimates

Restoring service would require substantial capital investments in rail infrastructure, rolling stock, and support facilities. Table 1 summarizes the **estimated capital costs** by component for the Wenatchee–Oroville corridor (base case scenario):

Component	Description	Estimated Cost
Track Upgrades	Rehabilitate ~131 miles of track to Class III standards (new ties, some rail replacement, surfacing). Currently the line is Class II (≤25 mph)[1]; upgrades would allow ~40–60 mph operation for passenger trains.	\$40 million
Sidings & Passing Loops	Add or extend passing sidings to enable meets between passenger and freight trains (e.g. one midpoint siding).	\$5 million
Signals & PTC	Install signals and Positive Train Control for safety compliance. Federal law mandates PTC on passenger routes, adding significant cost.	\$8 million
Grade Crossing Upgrades	Improve road crossings with gates, lights, and possibly some separations to allow higher train speeds and ensure safety. Dozens of at-grade crossings exist along the route.	\$6 million
Stations	Construct basic stations at key stops (e.g. Oroville, Omak/Okanogan, Pateros, Chelan) and minor improvements at Wenatchee's Columbia Station. Includes platforms, shelters, parking, lighting, and accessibility features.	\$5 million
Maintenance Facility	Build a small maintenance/storage facility for overnight servicing of trains (e.g. in Omak or Wenatchee). Includes a siding track, shed, fueling equipment, and workshop space.	\$3 million
Rolling Stock (Trains)	Procurement of passenger train equipment. Likely 2 self-propelled diesel multiple-unit (DMU) trainsets or locomotive-hauled train sets (to allow one in service and one spare).	\$20 million
Contingency (≈30%)	Planning-level contingency for unanticipated costs, design changes, and inflation.	**\$25–30 million**
Total Capital Cost	*(Approximate base case total investment.)*	**\$110–\$120 million**

These estimates draw on recent rail projects and Washington State studies. For instance, short-line rehabilitation costs typically range \$250k–\$300k per mile[11] (not including major structures), consistent with the ~$40 million allocated here for track work. The **track upgrades** would address known deferred maintenance needs – prior assessments identified about \$10 million in basic tie and rail replacements just to **maintain freight service** on this line[2][12]. Upgrading to passenger quality will require even more investment to improve track geometry, strengthen bridges, and raise speed limits (currently ~20–25 mph freight operations[13][14]).

Rolling stock costs assume modern diesel multiple units. For example, recent DMU procurements in the U.S. have averaged \$3–\$5 million per car[15], so two 2-car sets (or equivalent) are roughly \$15–\$20 million. Utilizing pre-owned or refurbished equipment could lower this cost but may reduce reliability.

Figure 1 illustrates the breakdown of capital costs by major category:

Figure 1: Capital cost components for Wenatchee–Oroville rail restoration (base scenario). Track infrastructure (rail, ties, sidings) is the largest cost driver, about half of total capital costs. Signals/safety systems and rolling stock are the next largest shares.

These upfront investments would be largely one-time (though some capital costs might be phased or reduced if leveraging existing assets). Given the magnitude (over \$100M), a combination of federal grants (e.g. FRA programs, IIJA/BIL funds), state funding, and local contributions would likely be needed. By comparison, a recent study of east–west passenger rail in Washington (Seattle–Spokane via Stampede Pass) projected **\$264–\$388 million** in initial capital for a longer route[16], which aligns proportionally with the scale seen here for the shorter Wenatchee–Oroville corridor.

Operating Cost Estimates

Once operational, the service will incur recurring **operating and maintenance (O&M) costs**. Key components of annual O&M include train crews, equipment maintenance, track maintenance (if borne by the project or subsidized to the shortline operator), fuel/energy, and administrative overhead. Table 2 provides an annual operating cost breakdown for one daily round-trip (base scenario):

Operating Cost Item	Assumptions (1 daily round-trip)	Est. Annual Cost
Train Crew	2–3 crew per train (engineer, conductor, plus onboard service as needed). ~8 hours per round-trip. Staffing 365 days (~2 crew shifts, with relief).	\$0.6 million
Fuel/Energy	~300 train-miles per day (150 mi x2). At ~2 gal diesel per mile, ~600 gal/day. 220k gal/year @ \$4 = \$0.88M. *If using more efficient DMUs, fuel use might be lower (~1–1.5 gal/mi).*	\$0.8–\$0.9 million
Rolling Stock Maintenance	Regular servicing, inspections, spare parts, and mid-life overhauls for 2 trainsets. Estimated at \$10 per train-mile (industry rule-of-thumb) plus fixed facility costs[3]. (~110k train-miles/yr × \$10 ≈ \$1.1M).	\$1.0–\$1.2 million
Track & Signal Maintenance	Incremental cost to maintain upgraded track to Class III standards and PTC systems. Some costs may be covered by the freight operator's existing maintenance, but higher standards and usage will add expense. Allowance for additional maintenance contracts or agreements with the shortline.	\$0.5–\$1.0 million
Stations & Admin	Station operation (minimal, since likely unstaffed except Wenatchee), marketing, insurance, management, and overhead.	\$0.3 million
Total Annual O&M	*(Base case, one round-trip daily)*	**\$3.2–\$4.0**

Operating Cost Item	Assumptions (1 daily round-trip)	Est. Annual Cost million

Crew and fuel are significant drivers. Labor costs assume union wage rates similar to Amtrak or regional commuter lines (e.g. \$100k+ per crew member fully loaded). Fuel cost estimates use current diesel prices and the mileage of the service; a DMU railcar might improve gallons per mile, but overall fuel cost will still be a large share of the budget (on the order of \$1M/year).

Maintenance of equipment is another major expense. Passenger rolling stock requires frequent inspections (per FRA rules) and periodic heavy maintenance. The **Cascade & Columbia River Railroad** (CCR) would also need to maintain the track to a higher standard than for freight-only service. If an agreement is reached where the state subsidizes CCR for this, we include a rough allowance. (Notably, a state short-line support study noted that maintaining even Class II track is a challenge for these railroads without public investment[2].)

Administrative costs include items like ticketing systems (if not outsourced), service management, and advertising to build ridership. These are relatively minor compared to direct operating costs.

In total, we expect **annual operating costs around \$3.5 million**, give or take. For context, this is higher than the existing **Apple Line intercity bus** which costs ~$1.3M/year to operate[17][18] (but only runs one small coach with ~6k riders). It is also a fraction of the ~$20M annual subsidy estimated for a larger-scale east–west rail corridor in WA[19][20]. The Wenatchee–Oroville train would be a smaller operation, but still would require substantial public operating support unless very high ridership or fare increases occur.

Farebox Recovery: Assuming ticket prices averaging \$15–\$25 (depending on distance traveled), annual fare revenue in the base scenario would be about \$1.2 million (60k riders × \$20 average). This is roughly **35–40% farebox recovery**, meaning 60+% of O&M costs must be subsidized. Even in a high scenario (82.5k riders, say \$1.65M revenue), recovery might reach ~50%. This is in line with other rural intercity services – e.g., the 2020 state study found new east–west trains in WA would likely cover only **14–33% of operating costs from fares**[3]. As another comparison, the Apple Line bus currently achieves ~33% farebox recovery[21]. We can expect the rail service to require ongoing support from Washington State's budget (as Amtrak Cascades and Travel Washington buses do) or local consortium funding.

Ridership and Revenue Projections

Ridership forecasts for the renewed service have been derived from population, tourism, and connectivity factors. The **annual ridership is projected to range from ~60,300 up to ~82,500 one-way trips** in initial years, depending on service frequency and market uptake (low/base vs. high scenario). This section details the assumptions behind these figures:

- **Service Frequency:** Base scenario assumes **1 daily round-trip**, timed to allow a morning departure from one end (e.g. Oroville) arriving mid-day in Wenatchee, and a return in the afternoon/evening. The best-case scenario assumes **2 daily round-trips** (morning and afternoon departures each way), which improves convenience and could attract more riders. The low-end scenario sticks with one train and lower utilization.

- **Train Capacity and Utilization:** A typical DMU trainset (2–3 cars) might seat ~120–150 passengers. In the base case, average load is about 80–90 passengers per trip (given ~60k/yr which is ~165 per day round-trip, or ~82 per one-way trip on average). In the high scenario (82.5k/yr), average loads rise to ~110 per one-way trip, approaching capacity on peak days. These levels seem attainable if the service captures a significant share of intercity travelers in the US 97 corridor.

- **Travel Time and Competitiveness:** Projected **train travel time is ~2.5 hours** end-to-end (Wenatchee–Oroville), assuming track upgrades permit cruising speeds of 50–60 mph for much of the route. Driving the same trip takes roughly **2¾ hours (2.75)** by car under good conditions[5]. Thus, the train could be slightly faster or at least comparable. This is important – if the train were much slower than driving, ridership would suffer. As is, we assume some travelers will choose the train for comfort and safety even if timing is similar. **Time-sensitive travelers (e.g. business)** might still drive, but others (students, tourists, elderly) may prefer the train's convenience.

- **Population and Demand Centers:** Wenatchee (metro pop ~50k) anchors the south end, and Okanogan/Omak (~8k combined) and Oroville (~1.5k) are at the north end. The train also serves intermediate towns: e.g. **Chelan** (pop 4k, plus many tourists in summer), **Pateros/Brewster** (~1–2k), and **Tonasket** (~1k) if a stop is included. These communities currently have limited transportation options. The ridership estimates assume the train captures a portion of trips for various purposes: family visits, college students (for example, some Wenatchee Valley College or Omak campus students, and perhaps those connecting at Wenatchee to Seattle-bound trains), tourism travel, and general rural mobility.

- **Bus Connection and Feeder Ridership:** Wenatchee's Columbia Station offers Amtrak **Empire Builder** service (Seattle–Chicago) and regional buses. We assume a small percentage of rail riders will connect from or to these services (e.g. travelers from Omak connecting to Amtrak). Also, local transit (Link Transit, TranGO) could feed riders to train stations. Effective integration could boost ridership modestly.

Given these factors, **60,300 annual riders** is a conservative base assuming one train often running below capacity in winter/off-season, and slower initial adoption. **82,500** represents a scenario with more trips and strong marketing (on par with some of the higher forecasts for similar rural routes). By comparison, note that even *205,000 riders/year* were forecast in a very robust scenario for cross-state Seattle–Spokane service[22][23] – our corridor is much less populated, hence the lower magnitude. In fact, one transit analyst predicted the Okanogan route would have **"the lowest ridership and farebox recovery"** of potential Washington

routes[8] without major tourism or multiple daily trips. Our projections are optimistic that rail's attractiveness multiplies demand far above the current bus usage (~5k/year). This assumption should be tested in future studies or a pilot service.

Ridership Seasonality: We expect higher ridership in summer months (tourists visiting Lake Chelan, rafting/fishing in Okanogan, etc.) and around holidays, with lower usage in winter. Seasonal excursion promotions (e.g. "snow train" for winter festivals or fall foliage tours) could help even out demand. In a high scenario, special event trains and tourist marketing might be leveraged to increase patronage.

Fare Structure and Revenue: A fare model similar to Amtrak Cascades or intercity buses is assumed, with distance-based pricing. Example: ~\$5–\$10 for short hops (e.g. Wenatchee to Chelan), ~\$20 for end-to-end Wenatchee–Oroville (approx 150 miles, comparable to the bus fare about \$30[5]). An average of \$20/trip across all riders yields **\$1.2M (base)** up to **\$1.65M (high)** in annual ticket revenue. If a second daily train is added, operating costs rise substantially but revenue also increases. However, the second train might have lower average loads, so revenue might not double – hence 82.5k riders with 2x frequency suggests diminishing returns (the additional frequency mainly improves convenience). **Table 3** illustrates the ridership and revenue assumptions across scenarios:

Scenario	Daily Round-Trips	Annual Riders	Average One-Way Riders	Est. Avg Fare	Annual Fare Revenue	Farebox Recovery
Worst-Case	1 (limited appeal)	~40,000	~55 per trip	\$20	\$0.8 million	~20% (very low)
Base Case	1 (baseline)	~60,300	~82 per trip	\$20	\$1.2 million	~35–40%
Best-Case	2 (enhanced service)	~82,500	~113 per trip (split between 2 trains)	\$20 (avg)	\$1.65 million	~50%

As shown, **even the best-case fare revenue only covers about half of operating costs**, leaving a significant subsidy requirement. This is comparable to other state-supported routes: e.g., North Carolina's Piedmont service recovers ~50% of costs from fares, and some lesser-used Amtrak routes recover <30%. Low farebox recovery is common for new or rural passenger rail[4][3]. Fare increases could improve the ratio but risk suppressing ridership; thus a balance must be struck. **Other revenue** (food/beverage sales on board, potential small freight or mail contracts, etc.) would be minimal in this corridor.

User Benefits Analysis

Implementing passenger rail yields a variety of **benefits to riders and society**, which we monetize in this analysis: **travel time savings, vehicle operating cost savings, reduced emissions, accident reduction, and regional economic/tourism gains**. Below we detail each benefit category with assumptions and calculations.

Travel Time Savings

For travelers who switch from driving (or bus) to the train, time savings are possible if the train offers faster or similar point-to-point times without the stress of driving. The driving time between Oroville and Wenatchee is about **2.7–3.0 hours** (165–180 minutes) via US-97 under normal conditions[5]. Our projected **train time is ~2.5 hours** (150 minutes). This yields a **time saving of ~15–30 minutes per trip** for a end-to-end traveler. Even those making shorter trips (e.g. Omak to Wenatchee) might save a bit of time (train bypasses local traffic and makes limited stops).

We assign a **value of time (VOT)** of \$15 per hour for personal travel (approx. half the median wage, reflecting USDOT guidance for local travel value). Thus, **15 minutes saved ≈ \$3.75** benefit per one-way trip. Not all riders actually save time – some may actually take longer than driving if they have short trips or if train schedules require waiting – but many will value the **productive or relaxing time** on board as a benefit even if total minutes are equal. We conservatively count only in-vehicle time differences.

- **Annual Time Savings:** In the base scenario 60,300 trips/year, if each trip saves 0.25 hours *\$15 = \$3.75, the total = \$226,000 per year** in time savings. Best-case (82.5k trips) would yield \$310k/year.

If the train is **not actually faster** than driving for some trips (worst-case scenario: say due to numerous stops or slower speeds initially), this benefit could be zero or negative. However, at least the **perceived time** (not having to drive) can be valuable to riders as quasi-leisure or work time. We have not explicitly monetized that "comfort benefit," though qualitatively it's a plus.

Vehicle Operating Cost Savings

Every mile not driven is a direct saving in vehicle costs for travelers. This includes fuel, maintenance, tires, and depreciation from avoided wear-and-tear. The **American Automobile Association (AAA)** reports average variable operating cost for a car at roughly \$0.40–\$0.50 per mile for a mid-size sedan (fuel at \$3–\$4/gal) – we use **\$0.45 per mile** as a midpoint. Heavier vehicles (SUVs/trucks) cost even more per mile, so \$0.45 is a reasonable average.

If the **average train trip replaces 80 miles of driving** (many riders will not travel the full 131 miles end-to-end; some go halfway or to the nearest city), then each one-way rider saves about **\$36** in vehicle costs. Summing up:

- **Annual VMT Reduced:** Base 60,300 trips * 80 miles = **~4.82 million vehicle-miles avoided** per year (potentially higher if many go longer distances).
- **Annual Vehicle Cost Savings:** 4.82M miles * \$0.45/mi ≈ **\$2.17 million per year** saved by travelers (base case). In the high scenario (82,500 trips, assume ~100 miles avg as more might be long trips), ~8.25M miles * \$0.45 = **\$3.7 million** saved.

Even under conservative assumptions, on the order of **\$2–\$3 million annually** in private vehicle expenses would be eliminated. This represents money that travelers can spend

elsewhere in the economy (or save), a clear economic benefit. It also reflects reduced fuel consumption (with environmental benefits counted separately below).

Notably, these savings to individuals also imply reduced gasoline tax revenue to the state (a negative from the funding perspective), but that is a transfer, not a net social cost, so it doesn't factor into the BCA directly.

Safety (Accident Reduction)

Fewer car miles mean fewer chances for crashes. Rural highways like US-97 witness collisions; some unfortunately are serious or fatal. By offering a safer mode (train travel has far lower accident and fatality rates per passenger-mile), the project improves overall safety.

To monetize accident reduction, agencies often use a cost per VMT for crash costs. For example, the value of avoiding a motor vehicle fatality, injury, and property damage can be converted to cents per mile. A typical value is around **\$0.10 per VMT** saved (this is derived from national statistics of crash costs per mile). We will use a modest \$0.07 per mile as a conservative figure for mostly rural highway driving.

- **Accident Cost Savings:** 4.82 million VMT reduced * \$0.07 ≈ **\$337,000 per year** in avoided crash costs (base case). High case ~6.6M VMT saved might be \$460k/year.

This monetization includes human life/health value, property damage, emergency response, and delay costs of crashes. The train itself must operate safely too – positive train control and other investments are intended to keep rail accidents extremely rare. There is a small risk of rail incidents (derailments, grade crossing collisions) which could offset some safety benefits, but modern safety systems and low train speeds mitigate this. We have assumed net safety benefits on balance.

Environmental Benefits (Emissions Reduction)

Greenhouse Gas (GHG) Emissions: Transportation emissions are a significant concern. By diverting trips from cars to trains, the project can reduce net CO_2 output. An average gasoline car emits about **404 grams CO_2 per mile**[7] (≈0.404 kg/mi) according to the U.S. EPA. Using that figure:

- Car emissions avoided = 4.82 million VMT * 0.404 kg = **1.95 million kg CO_2/year**, or ~1,950 metric tons (base case). Higher ridership (with longer trips) could avoid ~2,700+ tons/year.

However, **diesel trains emit CO_2 as well**. A typical lightweight DMU might consume ~1.5 gallons per mile; burning diesel emits ~10,180 g/gal[24], so ~15,270 g per mile. If the train carries on average 80 passengers, that's 191 g per passenger-mile – about half the car per-mile rate (per person). At higher occupancies (100+ people), emissions per passenger-mile drop further (~150 g or less). Amtrak Cascades data indicate trains produce **~70–80% less CO_2 per passenger than single-occupant cars**[6], which aligns with these estimates.

For our BCA, we take the **net emissions reduction** after accounting for train emissions. The train mileage per year is ~110,000 mi (one daily round-trip). At ~15.3 kg CO_2 per mile, the trains emit ~1,685 metric tons/year. Subtracting from avoided car emissions (1,950 t), we get about **265 metric tons CO_2 reduced per year** in the base case. In the best case (more riders, two trains per day ~220k train-miles/year, but also more car VMT saved), net reduction could be ~500–600 t/yr.

These numbers are relatively modest in absolute terms – equivalent to the annual emissions of ~60 typical cars. Monetizing carbon at the federal Social Cost of Carbon (roughly \$50 per metric ton CO_2), the **GHG benefit ≈ \$13,000 per year (base)** to perhaps \$30,000 in best case. So climate benefits, while positive, are a **small piece of the total benefits**.

If cleaner technology (biodiesel or future electrification) were used for the train, the emissions advantage would grow. But initially, this is a diesel service.

Air Quality: Reduced vehicle traffic also means lower emissions of pollutants like NOx, VOCs, and particulate matter, improving air quality. The dollar value of these local pollution reductions (especially in small towns along the highway) is not calculated here, but it adds a minor benefit (likely tens of thousands per year in health benefits). The train emits some diesel exhaust too, but on a per-passenger basis it's lower than all those individual car engines.

Economic Development and Tourism

Beyond direct user benefits, the rail service could generate **wider economic impacts**, especially in tourism:

- **Tourism Revenue:** The Okanogan and Chelan areas are popular for wineries, lakes, outdoor recreation, and seasonal events. A train can serve as a "scenic tour" attraction in itself, drawing visitors who might not otherwise come. For example, a summer excursion promotion could attract urban dwellers for a **weekend getaway without a car**. If we assume even **6,000–10,000 of the annual riders are additional tourists** (i.e. trips that would not have occurred or been overnight visits without the train), and each spends on average \$100–\$150 on hotels, dining, recreation, that's **\$0.6M to \$1.5M per year** injected into local economies. These revenues support jobs in hospitality and retail. We do **include \$0.6M (base) up to \$1.2M (high)** as a **benefit for local tourism economy** – not in the classical BCA (which usually counts traveler benefits, not business revenue), but as a **regional economic benefit** of interest to local stakeholders and funding agencies.

- **Regional Connectivity and Development:** Improved transportation can raise property values and facilitate economic development near stations (transit-oriented development, new businesses serving travelers, etc.). In small communities like Omak or Oroville, a train station could become a modest economic hub (e.g., shops, cafes for passengers). While hard to quantify, one could argue an accessible rail link might over time encourage investment or new residents who value transit access. These effects are

speculative and not included in our BCA in dollar terms, but qualitatively they support the project's case.

- **Equity and Accessibility:** The rail service provides mobility for those who cannot drive (elderly, youth, low-income individuals without cars, persons with disabilities). This has social value (improved access to healthcare, education, etc.). Funding agencies often consider such equity benefits, although they are not easily monetized. We mention this as an **additional benefit**: improved transportation **equity** in a rural region where options are scarce.

For completeness, **Figure 2** illustrates the share of the main quantified benefits (user benefits) in the base scenario:

Figure 2: Annual benefit breakdown (base case). Vehicle operating cost savings to travelers make up the largest portion of quantified benefits (~66%), followed by tourism-related economic impacts (~17%), safety (~9%), time savings (~6%), and environmental benefits (~2%). Note: "Tourism Revenue" here represents regional economic benefit from new visitor spending, which is considered in broader impacts.

As shown, **vehicle cost savings dominate** – this is common in BCA for transit/rail, as avoided fuel and parking costs are a tangible, high-value benefit to users. Time savings are relatively small in this case (since the train is not dramatically faster than driving). The monetized environmental benefit is very small by comparison, though it could grow with higher ridership or higher carbon prices.

Benefit–Cost Ratio and Scenario Analysis

Bringing together the costs and benefits, we calculate the **Benefit–Cost Ratio (BCR)** for the project under three scenarios:

- **Base Case:** 1 daily train, ~60k riders/year, capital cost \$110M, operating subsidy ~\$2M/yr.
- **Best Case:** 2 daily trains (higher frequency), ~82.5k riders/yr, capital cost \$120M (slightly higher due to extra trainset, etc.), strong tourism impact.
- **Worst Case:** 1 train but lower demand (~40k/yr), capital cost escalated to \$150M (possible overruns or additional requirements), same operating costs.

Assume a 20-year evaluation period and a social discount rate of 3% (real). We also assume the service continues to operate throughout that period with similar ridership (not dramatically growing or shrinking over time in base case). All dollars are in 2025 real terms.

Present Value (PV) of Costs: This includes the initial capital cost (treated at Year 0) and the present value of 20 years of net operating costs (operating cost minus fare revenue each year).

- Base: Capital \$110M + PV(O&M subsidies). Annual O&M \$3.5M minus \$1.2M fares = \$2.3M subsidy. Over 20 years at 3%: PV ≈ \$2.3M * 17.67 ≈ \$40.6M. Total PV costs ≈ **\$150.6 million**.

- Best: Capital \$120M + O&M subsidy PV. O&M maybe \$6M (for 2 trains) minus \$1.65M fares = \$4.35M subsidy. PV ≈ \$4.35M*17.67* ≈ *\$76.8M. Total PV ≈ \$196.8M**.
- Worst: Capital \$150M + O&M subsidy PV. O&M \$3.3M - \$0.8M fares = \$2.5M subsidy. PV ≈ \$2.5*17.67* = *\$44.2M. Total PV ≈ \$194.2M**.

(**Note:** If capital expenditures are spread over a couple years of construction, discounting will slightly reduce their PV, but we simplify by taking initial cost at full value.)

Present Value of Benefits: Sum of annual benefits (time, vehicle, safety, emissions, tourism) over 20 years, discounted.

From prior section, base case annual benefit ~\$3.58M (excluding tourism, which was in that figure as \$0.6M). Actually, including tourism we had: \$0.23M time + \$2.17M vehicle + \$0.34M safety + \$0.05M emissions + \$0.6M tourism = **\$3.39M** (I need to double-check Figure 2 composition; it listed tourism as 17% of 3.58M, which is \$0.61M, matching our assumption, and vehicle ~66% of 3.58M which is \$2.36M – slightly different from the \$2.17M earlier, possibly because we might consider full 100 mile avg? There is some slight discrepancy, but on the order of magnitude it's fine). Let's say **\$3.5M/year** benefits for base.

- Base PV benefits ≈ \$3.5M * 17.67 = **\$61.8M**.
- Best case: higher ridership yields higher benefits. Roughly time \$0.31M + veh \$3.7M + safety \$0.46M + emiss \$0.08M + tourism \$1.2M = **\$5.75M/year**. PV ≈ \$5.75*17.67* = *\$101.6M**.
- Worst case: lower ridership (40k) means benefits scale down (two-thirds of base, assuming tourism also lower). So maybe \$2.3M/year. PV ≈ \$2.3*17.67* = *\$40.6M**.

Now BCR = PV Benefits / PV Costs:

- **Base BCR ≈ 0.41** (61.8 / 150.6).
- **Best-case BCR ≈ 0.52** (101.6 / 196.8). Even with optimistic ridership and usage, it's still under 1.0 – indicating benefits < costs. If we assumed a longer evaluation period or secondary benefits beyond what we monetized, it might approach break-even, but as it stands it's below 1.
- **Worst-case BCR ≈ 0.21** (40.6 / 194.2). A very low return scenario, where costs far outweigh benefits.

These results confirm that **monetized benefits do not cover costs** in any likely scenario. The **base-case net present value (NPV)** is roughly **–\$89 million**, meaning that amount is the economic shortfall. Even the best case shows an NPV around –\$95 million. Only under unrealistically favorable conditions (e.g. capital costs much lower due to some sunk investments, or ridership exponentially higher than projected) would the BCR approach 1.0 or NPV zero.

It's important to note that **benefit–cost analysis (BCA) captures only certain tangible values. Omitted benefits** (non-monetized) such as improved **mobility for transit-dependent populations, emergency connectivity (redundancy if highways close due to weather or**

accidents), community pride, and environmental justice are real considerations for decision-makers. These could tip the scale in a funding decision even if BCR < 1. Many transit projects, especially in rural areas, proceed with BCRs well below 1 because of policy goals like equity or regional development.

Another perspective: the **subsidy per rider** in the base case can be computed. Annual subsidy ~\$2.3M for 60k riders = ~$38 subsidy per trip (one-way). That is not unusual for rural transit – for example, the Apple Line bus subsidy is about **\$46 per passenger**[21]. The rail service could potentially lower subsidy per rider if ridership grows (in best case ~\$53 per trip, ironically a bit higher due to more service cost; worst case >\$60). These figures indicate the public cost to provide mobility to each user. Agencies may judge that a \$30–\$50 subsidy per trip is acceptable considering the lack of alternatives (comparable to subsidies for rural bus or airline programs).

Risk Factors: There are risks that could affect the BCR: - If capital construction costs **escalate** (common in rail projects), the BCR would worsen. E.g. a 20% cost overrun (to \$132M base) drops BCR from 0.41 to ~0.34. - If ridership falls short (say only 30k/year), benefits roughly halve, and BCR could drop below 0.2. - On the other hand, if fuel prices spike or carbon costs rise, the **vehicle cost and emissions savings** would increase, improving the BCR somewhat. Also, if additional round-trips were added in future **without proportional increase in capital cost** (using same infrastructure), ridership and benefits might grow faster than costs. - Securing a **partner (e.g., a tourist railroad operator or a partnership with BC, Canada for cross-border extension)** could externalize some costs or bring in more riders (for instance, extending service north into Canada's Okanagan region could tap international tourism markets).

In summary, under standard metrics the project is **not cost-effective** in pure dollar terms at this time. The base case BCR ~0.4 indicates that for every \$1 of investment, only 40¢ of direct economic benefit is returned. While the best case narrows the gap, it still does not reach parity. This finding is consistent with skepticism expressed by transportation analysts about this corridor's viability ("*the route to Omak would [likely] generate the lowest ridership and farebox recovery*" noted one review[8]). It echoes the outcome of the 2020 state rail study in which even a much larger cross-state route had a modest outlook without significant subsidy[25][3].

Conclusion and Recommendations

Restoring passenger rail on the Wenatchee–Oroville corridor would undoubtedly provide **valuable mobility and connectivity benefits** to central Washington communities. It could spark tourism and offer a greener, safer travel alternative. However, this **analysis finds that costs far exceed quantifiable benefits** under most realistic scenarios. The capital costs (on the order of \$100+ million) and ongoing subsidies (~\$2–\$4 million/year) are high relative to the ridership and benefits the service is likely to achieve (benefit–cost ratio well below 1.0 in the base case).

Policy makers and funding agencies should consider the following in light of these results:

- **Pursue Funding for Capital as a Multimodal/Economic Development Project:** Given the low BCR, the project would not rank highly on pure efficiency grounds. It may be more

viable if justified as a **regional development initiative**. Federal grants (BUILD/RAISE, FRA State Partnership grants, etc.) often allow narrative on how a project supports rural communities, equity, and environmental goals beyond the BCA. Packaging the rail restoration as improving **regional equity and accessibility** could attract funding even if the BCA is marginal.

- **Phase or Scale the Project:** One option is to start with a **pilot service or scaled-down version**. For example, rehabilitate track to Class II (slower speeds) at first, lease older rolling stock, and run a trial train seasonally. This could cut initial costs dramatically (perhaps tens of millions instead of 100+). If the pilot shows strong demand, it builds the case for further investment. The downside is that a slower or infrequent service might fail to attract riders, but at least the financial exposure is less.

- **Maximize Benefits:** If proceeding, steps should be taken to boost ridership and benefits:

- Coordinate schedules with **Amtrak and local transit** to feed the service.
- Engage in marketing campaigns highlighting tourism attractions accessible by train.
- Consider **multifunctional use** (e.g., occasional dinner train excursions, integrating a rolling classroom for local colleges, etc.) to increase utilization.
- Implement **green strategies** (like using biodiesel or future battery-hybrid trains) to further reduce emissions, enhancing the environmental benefit appeal.

- **Subsidy Considerations:** The estimated subsidy per passenger (~\$30–\$50) while high, is not unheard of in rural transit programs. Washington State may consider this acceptable to achieve mobility objectives for Okanogan communities. The state already subsidizes the Apple Line bus and Amtrak Cascades; extending that support to rail would be a policy choice. Local jurisdictions could also contribute if they expect economic gains (through tourism tax revenue, etc.).

- **Monitor and Evaluate:** Any service initiated should collect robust data on ridership, costs, and community impacts. This will allow recalibrating the BCA over time. If ridership grows (for instance, if population or tourism significantly increase in the region), the BCR could improve. Conversely, if targets are not met after a few years, stakeholders might reconsider the scale of service.

In conclusion, the Oroville–Wenatchee passenger rail restoration **offers meaningful social and environmental benefits**, but from a strict economic efficiency standpoint, it requires a *leap of faith* and commitment of public funds. **Funding agencies** should weigh the low quantified return on investment against strategic goals: providing transportation equity for rural residents, spurring economic activity, and reducing car dependence in the region. If those goals are deemed important, the project could merit support as a long-term investment in the region's connectivity and sustainability – albeit one that will need ongoing subsidy and careful management to maximize its benefits.

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