Chief Peguis Trail West – Main Street to Brookside Boulevard

Socio-economic, Financial, and Long-Term Economic Impact Summary

The Chief Peguis Trail (CPT) Extension West is a major transportation facility that will enhance the City's strategic goods movement road network.

The completion of this project will have several socio-economic, financial, and macroeconomic impacts on citizens and businesses in Winnipeg.

The new transportation facility will:

- Reduce user travel times and distances for commuters and the goods movement industry for the 1.9 million daily trips that occur in northern Winnipeg
- Enable growth and development in Precincts A, B, and D, that will accommodate 15 thousand housing units, 38 thousand people, and over 5 thousand jobs
- Once fully developed, these precincts will add $731 million in GDP to the economy and provide long-term tax revenue to all three levels government, with each receiving approximately $60 million annually

The following pages provide a summary on the socio-economic, financial, and economic impacts of this project.

Winnipeg

Background

The City of Winnipeg Transportation Master Plan (TMP) identifies the CPT Extension West as a major transportation facility and an important component within the City's strategic road network. Growth over the next 25 years in north Winnipeg and the adjacent municipalities will increase multi-modal travel demand. CPT is intended to provide a continuous east-west link between the east and west section of the Perimeter Highway via CentrePort Canada Way, thereby improving access to industrial parks in the vicinity of the airport and further develop the strategic road network. In addition to supporting the completion of the Strategic Inner Ring Road, it will also reduce traffic on neighborhood streets, Leila Avenue, and sections of the North Perimeter Highway. It is one of several infrastructure servicing projects to enable and support land development in precints A, B, and D in northwest Winnipeg. The latest cost estimate is $649.6 million (2023 dollars).

Project Description

The current design is a four-lane divided road approximately 10 kilometers in length with two grade seperations (one at Main street and another at McPhillips Street) and active transportation paths. The map below illustrates the location of the new roads and grade seperations.

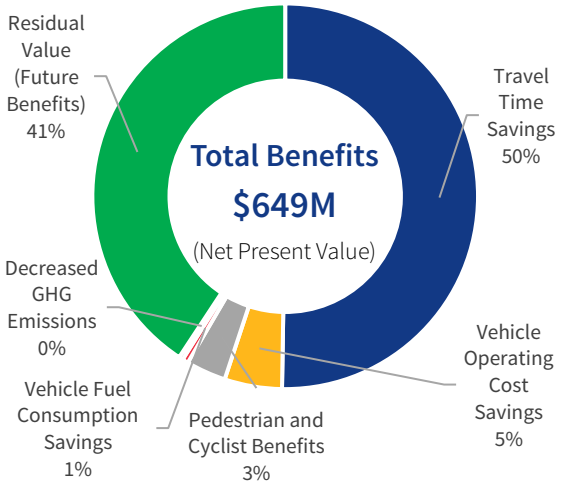
Socio-economic Impacts

This transportation facility has been analyzed to understand how its completion will impact user travel times, vehicle operating costs, provide pedestrian and cyclist benefits, result in fuel consumption savings, and change greenhouse gas (GHG) emissions for commuters over the fifty year lifecycle of the asset. The analyis indicates the following:

- **Benefits:** $649 million[1]
- **Costs:** $550 million[1]
- **Net Present Value:** $98 million[2]
- **Benefit-cost Ratio:** 1.18
- **Internal Rate of Return:** 6.2%

An internal rate of return of 6.2% exceeds both the City of Winnipeg's discount rate and long-term borrowing rate of 5.5%.

CPT Net Present Value of Benefits



Half of the benefits accrue to users in the form of travel time savings within the next 25 years, while the next largest benefit at 41 per cent is the residual value, which represents the net benefits accuring to users in years 26 to 50. There are also marginal benefits associated with reduced fuel consumption, vehicle operating costs, reduced emissions, and new active transportation assets.[3]

A 50-year time horizon was chosen due to the long land development period associated with precincts benefiting from the road while accounting for the lifecycle of the road itself.

CPT Benefits and Costs

Preliminary modelling suggests 100 per cent of registered light-duty vehicles in Manitoba could be ZEV by around 2050 if sales targets are met.

[1] Figure in present value.

[2] Figure in net present value dollars. Net present value discounts all future cashflows at a set discount rate.

[3] Due to the long time horizon of this analysis, the eventual transition to zero-emission vehicles (ZEV) is taken into consideration using current federal government ZEV sales targets.

Financial Impacts

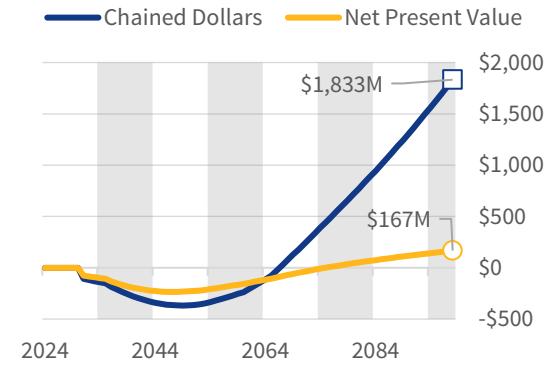
CPT Extension West is the largest and one of several capital projects required to enable and support growth in the largely vacant/agricultural lands in precincts A, B, and D in northwest Winnipeg. Once serviced, these three precincts would provide 1,200 net acres of residential and 600 net acres of employment lands. At full build out, these lands will accommodate 38,000 people, 15,000 dwelling units, and 5,600 jobs within the City of Winnipeg, at standard land use densities.

However, servicing requires $1.1 billion in capital investment, of which, these three precincts are responsible for $551 million based on estimated usage and asset catchment areas.

After 75 years, the cumulative financial impact of this land development to the municipality is as follows:

- **Total Cost:** $4.76 billion[4]
- **Total Revenue:** $6.59 billion[4]
- **Net Position:** $1.83 billion[4]
- **Net Present Value:** $167 million[5]
- **Break-even Year:** 2067 (36 years after development begins)
- **Internal Rate of Return:** 7.1%

Municipal Fiscal Position by Year



A minimum annual property tax increase of 2.48% over 75 years is required for the development of these three precincts to break even at the end of year 75 (i.e., revenue = cost).

Considerable municipal investment is required upfront to enable development, with 31% being attributed to the CPT Extension West. Of the $1.1B in capital costs, $739M in debt would be required, but there is insufficient room to support this in the Council-approved Debt Strategy so alternative funding sources would be required.

Long-Term Economic Impacts

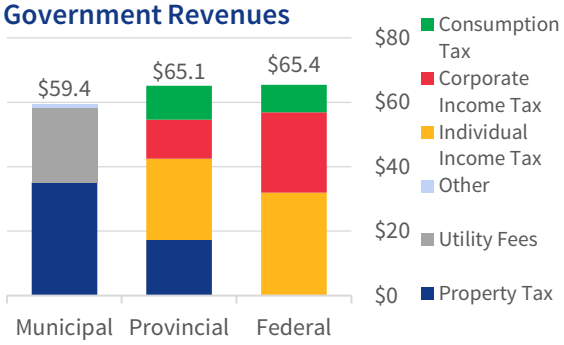
Once fully built out, the servicing of new employment lands is estimated to have the following impact on the local economy on an ongoing annual basis:

- **Employment:** 5,694 jobs
- **Economic Output:** $1.42 billion[6]
- **GDP at Market Prices:** $731.3 million[6]
- **Wages and Salaries** $286.6 million[6]

At full build out the following revenues to governments annually:[7]

- **Municipal:** $59.4 million[8]
- **Provincial:** $65.1 million[8]
- **Federal:** $65.4 million[8]

Government Revenues



It should be noted that if the eligible costs of CPT Extension West are shared equally among the municipal, provincial, and federal governments, and all incremental revenues from land development are used to pay for it, then all three levels of government are estimated to fully recover the principal cost of their investment by 2045, which is 14 years after land development in precincts A, B, and D is assumed to begin.

[4] Figure in 2024 chained dollars.
[5] Figure in net present value dollars. Net present value discounts all future cashflows at a set discount rate.
[6] Figure in 2019 dollars and are annual.
[7] Assumes all employment is net new.
[8] Figure in 2019 dollars at 2019 tax rates.

Frequently Asked Questions

1. How much will CPT Extension West cost?

The updated Class 3 Estimate for CPT Extension West is **$649.6 million in 2023 dollars**. However, since the road's construction will take place over several years in the future, when construction inflation is added in the cost rises to $755.3 million in current dollars. Finally, if the project is solely funded by the City using debt, an additional $147.0 million in consturction period interest is added to the cost. For comparison, the 2019 Class 3 Estimate was $449.1 million.

2. How will the CPT Extension West reduce user travel times in the area?

It is estimated that are over 1.9 million individual trips occurring daily in northern Winnipeg, and this is expected to grow to 2.2 million by 2050. The CPT Extension West will have an impact on many of those trips, and reduce travel times **by 0.4 per in 2030, rising to a 0.8 per cent reduction by 2050**. While this may seem small, this is an average over millions of trips, some of which may not use CPT Extension West but may still experience faster travel times due to less congestion along their chosen route. However, for those that are making direct east-west trips across the northern part of Winnipeg, based on current traffic conditions the CPT Extension West is estimated to save **6 to 11 minutes** versus the alternative of taking the North Perimeter Highway or Jefferson and Leila, which is a 32 to 35 per cent reduction in travel time. Overall, the CPT Extension West is expected to save all users over thirty-one million hours of travel time in the first 25 years.

3. What are socio-economic benefits and why are they being calculated for a road transportation project?

Socio-economic benefits represent the monetary value of the impacts a policy, program, or public asset may have on those who use it, even if there is no actual financial transaction. In this instance, the public asset is a new road, which will result in more efficient travel options for those travelling through the area. More efficient travel options will save users time, and if using a gasoline/diesel powered vehicle, it is expected to reduce fuel consumption and GHG emissions. New active transportation options may induce new users to walk or bike, resulting in personal health benefits that have positive effects on society. While some benefits don't translate to direct financial compensation to users, research and various methods are used to estimate what the monetary or economic value of these benefits are to society so that the monetary cost of a public asset can be compared to its monetized benefits.

4. Will CPT Extension West generate more revenue for the City of Winnipeg?

In general, unless a road requires paying a fee or toll to use, the road itself will not generate any revenue. However, in some instances such as CPT Extension West, building the road (and other growth-enabling/supportive assets) will allow more land to be developed around it for residential and employment uses. Land that becomes developed will generate more revenue to all levels of government, by adding revenue such as increased property taxes, utility fees, personal and corporate income taxes, and consumption taxes. It is estimated that the development enabled by CPT Extension and other capital projects will expand each level of government's revenue by **$60 million (2019 dollars)**. So, while the road itself doesn't generate revenue, the road helps enable land development which will, over time, generate revenue to all three levels of government.

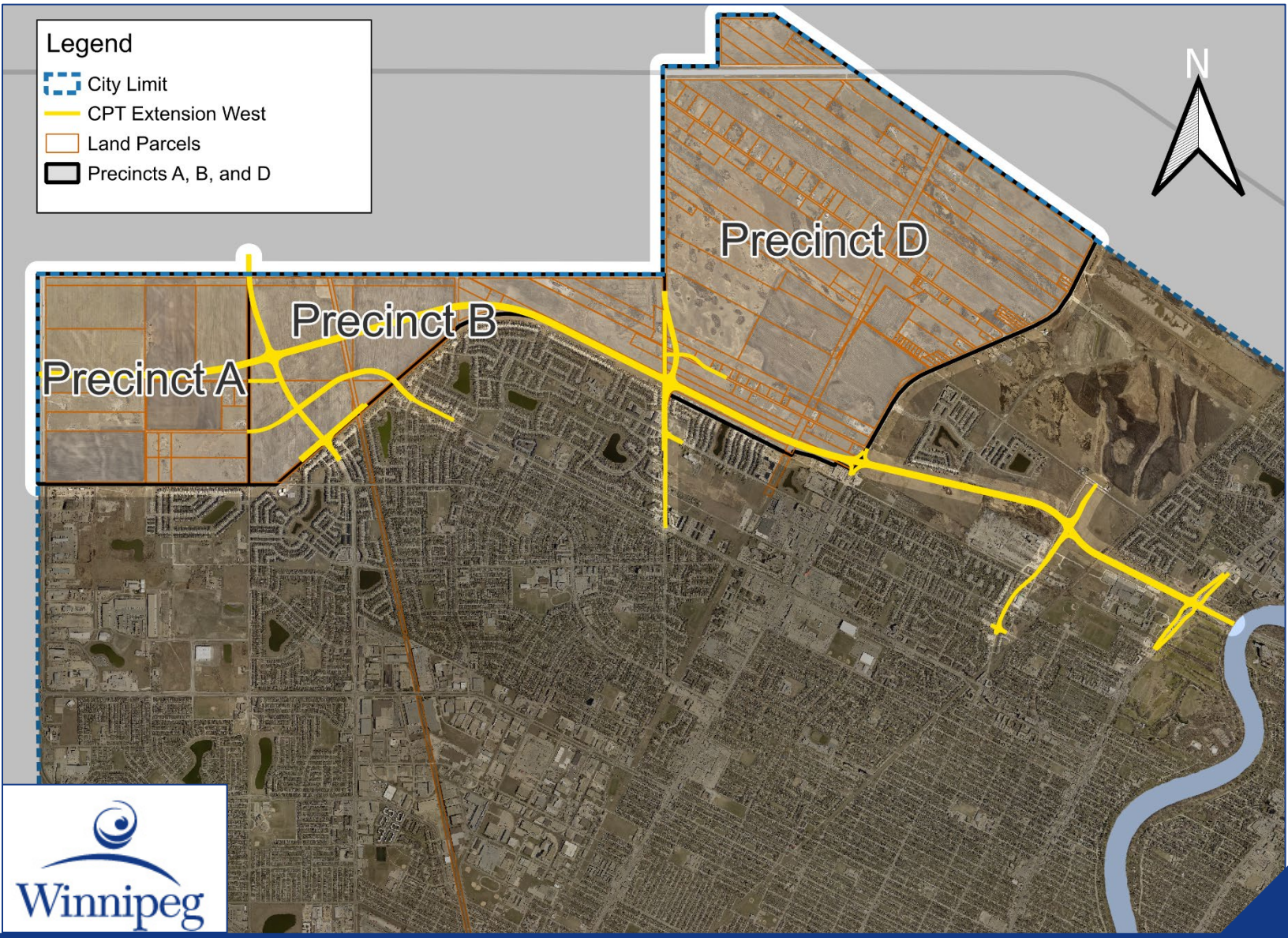
5. How will CPT Extension West impact the local economy?

In addition to reducing travel times for both residents and the goods movement industry, this transportation project will impact the local economy in two ways:

Short term: once the project begins, there will be short-term benefits to the economy resulting from the construction of the new road. The government purchasing consulting and construction services will create demand for employment in the applicable sectors, along with the associated earnings, taxes, and consumption of those employees. These effects are not yet calculated as they will depend on the final estimated cost of the project once it is put out for tender.

Long term: once precincts A, B, and D are serviced, land development can begin. Once the employment lands are fully developed and full employment is taking place (estimated to be around 2059), it is anticipated this economic activity will add **$731 million to Winnipeg's GDP annually (2019 dollars)** which is roughly equivalent to 2% of Winnipeg's current GDP. It will also add **$287 million in wages and salaries (2019 dollars) annually** to Winnipeg's economy.

For all results, methodology, and assumptions, please consult the full benefit-cost and financial/economic analysis reports pertaining to the CPT Extension West project.



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Chief Peguis Trail Extension West

Main Street to Brookside Boulevard

Benefit-Cost Analysis

Technical Report

Public Works & Economic Development and Policy · August 2024

Executive Summary

This report estimates the monetary value of the socio-economic benefits associated with extending Chief Peguis Trail (CPT) to the west, from Main Street to Brookside Boulevard.

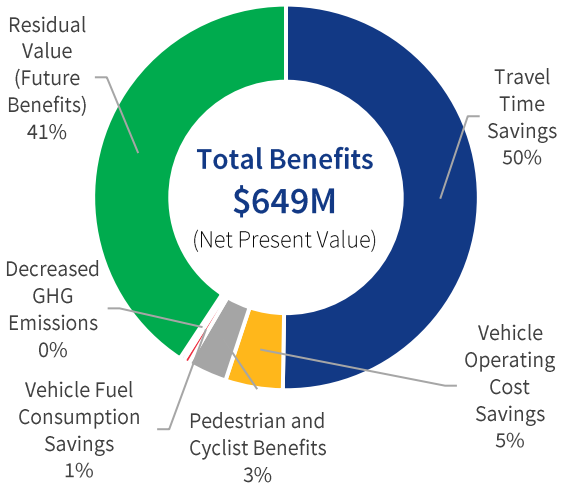
Overall, the findings indicate that the present value of benefits are worth $649 million and present value of costs are $550 million, with a positive net present value of $98 million over the 2024-to-2079-time horizon**. This represents a benefit-cost ratio of 1.18 and an internal rate of return of 6.2%.** For every dollar invested, one dollar and eighteen cents in socio-economic benefits are returned to the public from this project.

For reference, the Route 90 Improvements project had a benefit-cost ratio of 1.17 and an internal rate of return of 6.6%.[1]

Benefits are divided into two time periods: the medium-term appraisal period (first 25 years of the road's lifecycle) and the long term, also called the residual value (years 26 to 50 of the road's lifecycle). For the first 25 years of the road's lifecycle, the benefits are as follows:

1. **Vehicle Travel Time Savings worth $326.2 million:** the extension is anticipated to provide 31.3 million hours of travel time savings to the public from more efficient transportation routing options and reduced congestion over 25 years.
2. **Vehicle Operating Cost Savings worth $31.3 million:** more efficient routing options are anticipated to reduce distances traveled by users by 155.1 million kilometers over 25 years, resulting in less vehicle maintenance and depreciation.
3. **Pedestrian and Cyclist Benefits worth $21.7 million:** new active transportation facilities are estimated to add value to users and bring about health benefits from additional induced cyclist and walking trips.
4. **Vehicle Fuel Consumption Savings worth $3.2 million:** more efficient travel options resulting in less kilometres traveled are anticipated to save the public 3.2 million litres of fuel consumption over 25 years, but this benefit is gradually reduced over time as more vehicles transition to zero-emission.
5. **Decreased Greenhouse Gas (GHG) Emissions worth $2.2 million:** the reduction in fuel consumption is expected to result in a minor reduction in CO_2, CH_4, and N_2O emissions over 25 years, but this benefit becomes reduced over time as more vehicles transition to zero-emission.
6. **Residual Value (Future Benefits) worth $264.3 million:** this is the net value (benefits minus costs) of the road to the public in years 26 to 50.

Net Present Value of Benefits



In addition to these socio-economic benefits, CPT Extension West is one of several major capital projects required to provide servicing and enable development of residential and employment lands in precincts A, B, and D. The development of these lands has several financial implications for the municipal, provincial, and federal governments, as well as economic impacts to the wider region in terms of job creation and wage growth. The financial and economic impacts of servicing and developing these precincts are discussed in the report titled "Precincts A, B, and D Financial and Economic Impact Analysis" which has been published concurrently along side this report.

Within the City of Winnipeg's 2024 Infrastructure Plan, Chief Peguis Trail Extension West – Main to Brookside is identified as a growth-enabling regional road project that is currently unfunded.

[1] Please note that the Route 90 Improvements Benefit-Cost Analysis Technical Report incorrectly stated the IRR as 1.4% when it is 6.6%.

Contents

1. Background Information

The Purpose of Benefit-Cost Analysis (BCA)

A benefit-cost analysis (BCA) is a process that identifies and quantifies the expected socio-economic benefits of an investment and compares it to the expected costs. Benefits aim to quantify the social and economic value of expected outcomes associated with the investment and can include the economic value of time savings, safety improvements, reduced emissions, and reduced operating costs for users resulting from the investment and represent the monetized value of changes in overall welfare to citizens. The economic value of these benefits is contrasted to the financial costs associated with making the investment and include both capital and incremental operating expenditures.

The methodology followed in this report has been developed using guidance and resources publicly provided by various organizations including the U.S. Department of Transportation, the British Columbia Ministry of Transportation and Infrastructure, the California Department of Transportation, and the UK Department for Transport. Additional details on assumptions and calculations used in this benefit-cost study are provided in the sections below.

In general, benefit-cost analysis is most informative when it is used to rank projects that are competing for a limited quantity of funding. Typically project proposals with a higher benefit-cost ratio will receive priority over projects with lower benefit-cost ratios as higher benefit-cost ratios suggest more benefits are provided to users per dollar of expenditure and are therefore a more efficient use of the public's tax dollars.

Further, projects with a benefit-cost ratio below one indicates that the measurable benefits provided by the investment are less than the cost of the investment. However, many public programs and investments are made based on social rather than economic considerations, and so a BCA ratio of less than one isn't necessarily indicative that a project should not be completed. At a very high level, broadly investing in infrastructure can lead to productivity gains and economic growth but the ultimate effect a particular public investment may have will be more dependent on local variables such as the wider economic context of the region, the state regional transportation infrastructure, and the availability and productivity of local human capital.[2] Given this, it is important to note that:

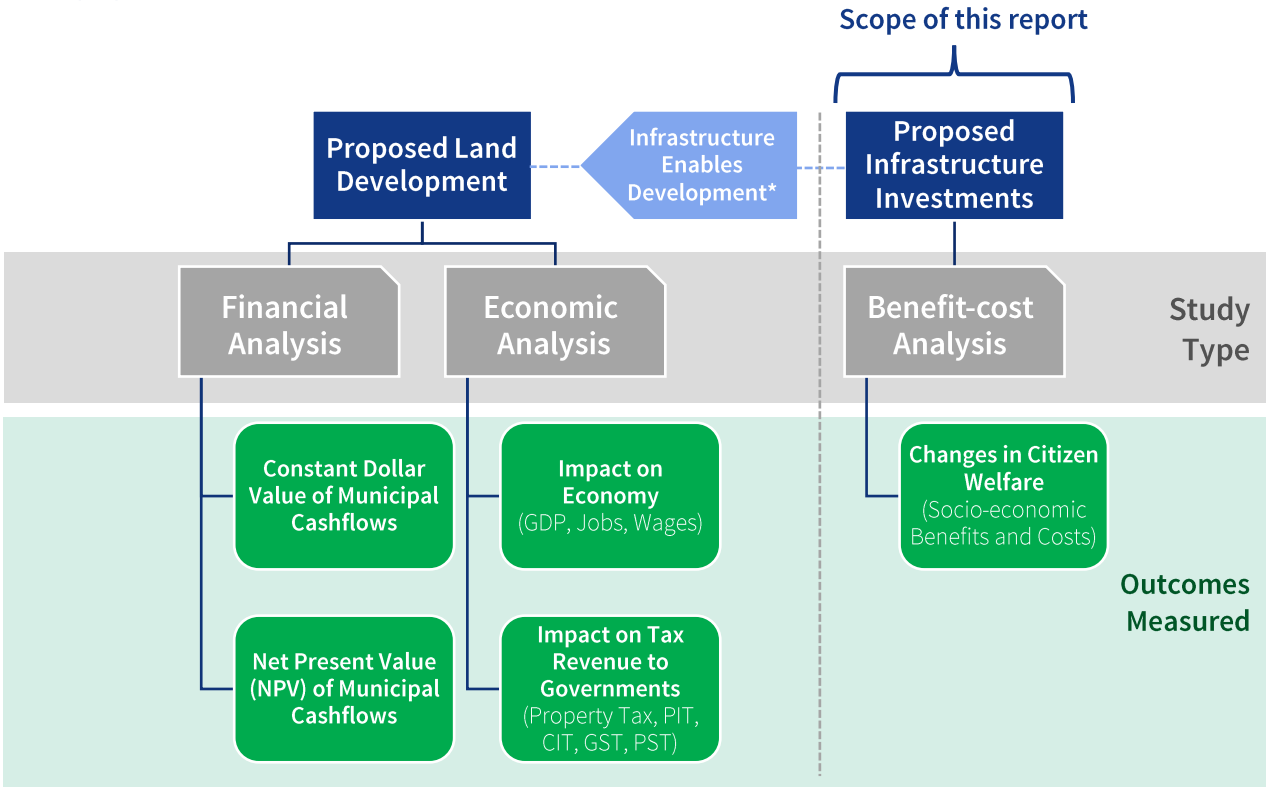
- **Benefit-cost analysis is not a financial or long-term economic impact analysis:** infrastructure projects that provide servicing to land may enable further development, which may generate additional tax revenue and add long-term employment to the region. These impacts are analyzed separately in a financial and long-term economic impact analysis, as the benefits from increased taxation simply represent a transfer from households and businesses to governments and are not counted as a benefit in a benefit-cost analysis.
- **Benefit-cost analysis is not an economic impact assessment (EIA):** Economic impact assessments provide estimates on the short-term economic impact that results from the physical construction of an infrastructure asset, and these assessments are provided by the public service outside of this report.

[2] For further discussion, please see Deng, Taotao. 2013. "Impacts of Transport Infrastructure on Productivity and Economic Growth: Recent Advances and Research Challenges." *Transport Reviews 33*(6), 686-699.

This report has been written to provide information on the socio-economic benefits and costs of the Chief Peguis Trail Extension West – Main to Brookside regional transportation project. It should be read in combination with the financial and economic impact analysis study for the same project to provide a fulsome picture on many of the benefits, costs, financial, and economic impacts associated with the transportation project and subsequent land development.

Figure 1 below provides an overview of the types of studies and outcomes measured when considering land developments and infrastructure investments and defines the scope of this report.

Figure 1: Evaluating the Impact of Land Development and Infrastructure Investments: Study Types and Outcomes



* Note: not all proposed infrastructure investments will have associated new/intensified land development.

2. Chief Peguis Trail Extension West Project Overview

Project Description

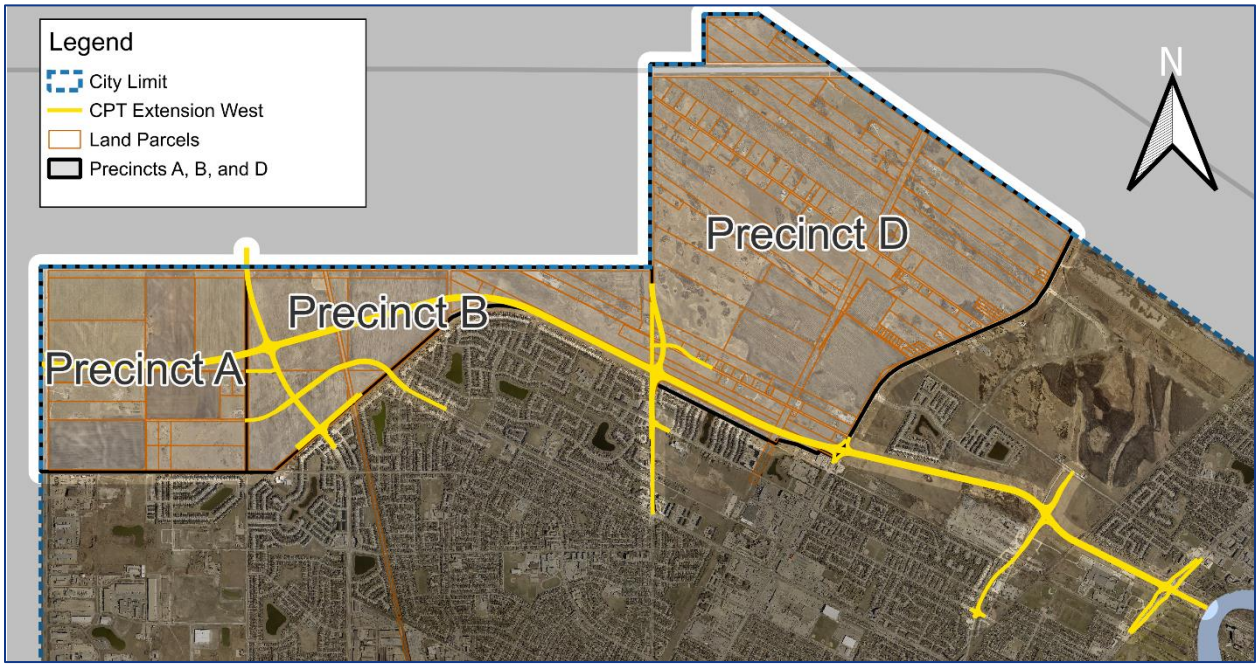
The City of Winnipeg Transportation Master Plan (TMP) identifies the Chief Peguis Trail Extension – Main Street to Brookside Boulevard (hereafter referred to as "CPT Extension West") as a major transportation facility and an important component on the City's strategic road network.

The ultimate completion of the CPT Extension West will provide a continuous east-west link between Brookside Boulevard (Route 90) and Main Street approximately 10 kilometers in length. The CPT Extension West aims to support economic development, create recreational opportunities, and support the completion of the Strategic Inner Ring Road to reduce traffic on neighborhood streets to make them more accommodating for public transit, walking and cycling.

The proposed project consists of the construction of a four-lane divided roadway from Main Street to Brookside Boulevard (Route 90), including overpasses at Main Street and McPhillips Street. It will include four intersections and three pedestrian and cycling overpasses, and improvements to the Kildonan Settlers Bridge to accommodate intersection improvements at Main Street and multi-use pathways on both sides of the roadway.

In addition, this project aims to support economic development by being one of the major municipal infrastructure assets required to enable and service development in Precincts A, B, and D in northwest Winnipeg. Enabling the development of these three precincts would accommodate approximately 38,000 people, 15,000 dwelling units, and 5,600 jobs at full build out.

Map 1: Chief Peguis Trail Extension West Study Area



Key Considerations

The addition of a new major regional road adds several socio-economic benefits and costs to users in the region. Since the proposed project is a new facility as opposed to upgrading an existing facility, benefit-cost analysis requires careful consideration of a variety of factors that may be different from analyzing the improvement of an existing facility. Some considerations include:

- **Region-wide Impacts:** Unlike improving an existing transportation facility where the differences in travel time and other benefits are easily calculated, adding a new facility to an area where no current facility exists requires analysis of changes in travel behavior across the entire region. In the case of Chief Peguis Trail Extension West, once functional, it may serve to primarily alleviate congestion on Leila Avenue and the north Perimeter Highway which are currently the main east-west routes in this region of Winnipeg.
- **Connecting to CentrePort Canada:** The CPT Extension West will move the city closer to having a full east-west corridor in northern Winnipeg and enhance transportation connectivity to the logistics-focused industrial and warehousing hub of CentrePort Canada. CentrePort Canada is one of North America's largest trimodal inland ports and Foreign Trade Zones and aims to connect businesses to major markets across the world through close proximity to rail, air, and highway transportation networks. CPT Extension West will make traversing the northern area of Winnipeg more efficient and accessible, especially to the goods movement and transportation sector. However, increases in transportation efficiency may only be fully realized once Chief Peguis Trail is fully extended east and west: connecting CPT westward, from Brookside to CentrePort Canada Way (under Provincial jurisdiction), and then eastward from Lagimodière Boulevard to the east Perimeter Highway will improve the efficiency of travel choice options in northern Winnipeg and the surrounding area.
- **Greenfield Land Development:** CPT Extension West, in addition to other municipal capital projects, would enable the development of Precincts A, B, and D. This would add population and employment to the area, generating additional trips that may not exist otherwise in northwest Winnipeg, but may instead exist in alternative regions of Winnipeg that would have the capacity to grow even in the absence of CPT Extension West. The financial and economic impacts of induced greenfield land development are considered in a separate report.
- **Safety Impacts:** While a new link in a regional road has regional impacts to transportation across northwestern Winnipeg and causes changes in travel behavior for millions of trips per day, limitations in safety analysis mean that net changes in safety can only be analyzed on Leila Avenue, the north Perimeter Highway, and the new Chief Peguis Trail Extension West. As such, the addition of a new regional road will show an increase in accidents and collisions when compared to its absence and may show a net decrease in safety directly on the facility itself. However, this doesn't capture the full picture because trips diverted away from all other roads (excluding Leila Avenue and the Perimeter) will cause a net reduction in accidents on those roads, with the increase transferring to CPT Extension West, but this cannot be accounted for due to data limitations.
- **Pedestrian and Cyclist Facility Benefits:** With the new regional road would also come new active transportation paths that don't otherwise exist, including AT-specific grade separations in certain areas, enhancing active transportation and recreational options in the area. The socio-economic benefits of these new paths are taken into consideration.

The impact of these considerations is detailed further in this report.

Traffic Modelling Results

Adding a ten-kilometer segment of regional road in an area where none currently exists will impact trip choices for millions of trips every day in this area of Winnipeg. As such, a regional approach to traffic modelling is taken, to understand how trip behaviour changes in a no-build versus build scenario. Table 1 below provides the key statistics on region-wide transportation impacts that inform the benefit-cost calculations.

Table 1: Traffic Modelling Results – Existing Users

Day Type	Statistic Type	Statistic	2030 Model Year		2050 Model Year	
			No Build	Build	No Build	Build
Weekday	**Daily Trips**	Total Trips	1,959,717	1,959,717	2,276,363	2,276,363
	Daily Travel Time	Cumulative Travel Time (hours)	392,052	390,650	492,402	488,285
		Average Travel Time per Trip (minutes)	12.00	11.96	12.98	12.87
		Change in Cumulative Travel Time (hours)		-1,402		-4,117
		% Change in Travel Time		-0.4%		-0.8%
	Daily Vehicle Kilometers Travelled (VKT)	Total VKT	16,356,067	16,347,392	20,621,497	20,593,196
		Average Trip Distance (km)	8.35	8.34	9.06	9.05
		Change in VKT		-8,675		-28,301
		% Change in VKT		-0.1%		-0.1%
	Daily Fuel Consumption[3]	Total Fuel Consumption (litres)	1,455,690	1,454,918	0	0
		Average Fuel Consumption per Trip (litres)	0.74	0.74	0	0
		Change in Fuel Consumption (litres)		-772		0
		% Change in Fuel Consumption		-0.1%		0%
Weekend	**Daily Trips**	Total Daily Trips	1,611,537	1,611,537	1,859,839	1,859,839
	Daily Travel Time	Cumulative Daily Travel Time (hours)	321,455	320,518	401,813	399,123
		Average Travel Time per Trip (minutes)	11.97	11.93	12.96	12.88
		Change in Travel Time (hours)		-938		-2,690
		% Change in Travel Time		-0.3%		-0.7%
	Daily Vehicle Kilometers Travelled (VKT)	Total VKT	13,807,896	13,804,987	17,528,508	17,519,112
		Average Trip Distance (km)	8.57	8.57	9.42	9.42
		Change in VKT		-2,909		-9,396
		% Change in VKT		0.0%		-0.1%
	Daily Fuel Consumption	Total Fuel Consumption (litres)	1,228,903	1,228,644	0	0
		Average Fuel Consumption per Trip (litres)	0.76	0.76	0	0
		Change in Fuel Consumption (litres)		-259		0
		% Change in Fuel Consumption		0.0%		0%

[3] The transition to electric vehicles is assumed in this analysis, and currently estimates 100% of light-duty vehicles in Manitoba will be zero-emission by around 2050 if current federal sales targets are met. As such, fuel consumption savings are zero in both a build and no build scenario by 2050 and onwards.

Figure 2 summarizes the overall changes to region-wide transportation statistics in a no-build and build scenario, in both 2030 and 2050, while figure 3 illustrates them on a percentage change basis.

Overall, current traffic modelling suggests the following regional impacts to transportation:

Weekdays: across 1.96 million trips daily in 2030, rising to 2.28 million trips daily by 2050, it is anticipated that building CPT Extension West will, on a daily basis:

- Reduce cumulative time spent travelling by 1,402 hours (0.4%) in 2030, rising to 4,117 hours (0.8%) in 2050.
- Reduce cumulative trip lengths by 8,675 kilometers (0.1%) in 2030, rising to 28,301 kilometers (0.1%) in 2050.
- Reduce cumulative fuel consumption by 772 litres (0.1%) in 2030, falling to 0 litres by 2050 due to vehicle electrification.

Weekends: across 1.61 million trips daily in 2030, rising to 1.86 million trips daily by 2050, it is anticipated that building CPT Extension West will, on a daily basis:

- Reduce cumulative time spent travelling by 938 hours (0.3%) in 2030, rising to 2,690 hours (0.7%) in 2050.
- Reduce cumulative trip lengths by 2,909 kilometers (0.0%) in 2030, rising to 9,396 kilometers (0.1%) in 2050.
- Reduce cumulative fuel consumption by 259 litres (0.0%) in 2030, falling to 0 litres by 2050 due to vehicle electrification.

Figure 2: Impact of CPT Extension West, Aggregate Changes, Daily

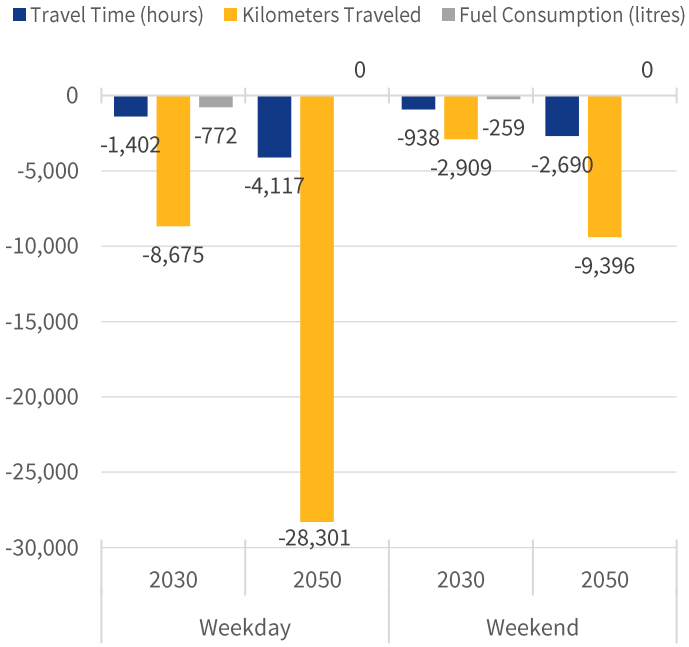
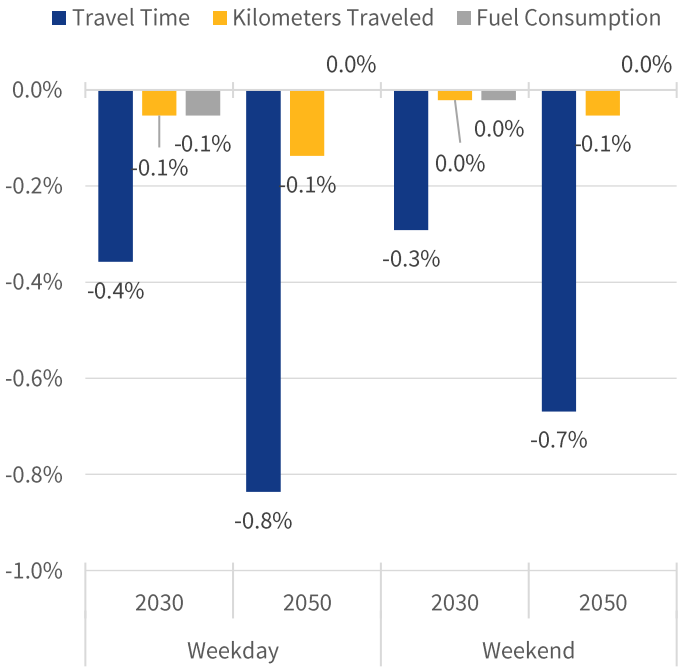


Figure 3: Impact of CPT Extension West, % Changes, Daily



Important note on region-wide travel time impacts versus CPT Extension West end-to-end travel time impacts: while changes at the individual trip level may seem marginal, these small changes when applied to more than 670 million trips per year add up over time. Further, while network-wide impact statistics include the trips that directly utilize the entirety of CPT Extension West (which are the trips that will benefit the most from the new facility), they do not make up the majority of trips in the region and so the actual time savings related to those traversing the entire length is much higher than the overall average.

For illustrative purposes, using the model's estimation and current Google travel time information, a user traveling the entire length of the facility (from Brookside Boulevard to Main Street) during weekday PM peak hours could potentially reduce their travel time by 6 minutes (compared to taking PTH 101) to 11 minutes (compared to taking Jefferson/Leila), representing a 32 percent to 35 percent reduction in travel time for those traversing the entire east-west length on this region of Winnipeg.[4]

Traffic from New Development

As previously discussed, one of the key aspects of this transportation project is that it is one of the servicing requirements necessary to enable residential and employment lands development in precincts A, B, and D in northwest Winnipeg. The addition of approximately 38,000 people, 15,000 dwelling units, and 5,600 jobs at full build out in these precincts will add additional traffic to the area.

The traffic modelling results for existing users presented in previous sections have considered the new traffic generated by the development of these precincts when calculating travel speeds to ensure road capacity is properly accounted for so as not to overestimate travel speeds.

With respect to calculating the benefits received by new users, because new users reflect precinct development that is contingent on CPT Extension West being built, their current trips in the absence of the new facility are not known since they do not exist. Therefore, standard practice is to assume that the reduction in travel time savings, fuel consumption, and vehicle operating costs are equal to half the benefit received by existing users.[5]

Table 2 summarizes key statistics relating to traffic generated from this new development.

Table 2: Traffic Modelling Statistics – New Users

Day Type	Statistic	2030 Model Year	2050 Model Year
Weekday	Total Daily Trips	28,499	80,314
	Total Vehicle Kilometers Travelled (VKT)	103,018	818,182
Weekend	Total Daily Trips	22,744	64,096
	Total Vehicle Kilometers Travelled (VKT)	84,056	667,587

[4] Google Maps travel time information was retrieved during a weekday in August 2024.
[5] Source: United States Government, Department of Transportation. 2023. "Benefit-Cost Analysis Guidance for Discretionary Grant Programs." Accessed December 12, 2023.

3. Data Sources and Assumptions

To complete a benefit-cost analysis, several inputs are required to estimate benefits and costs. Financial data is needed to estimate costs and the timing of cash outflows, traffic simulations are required to estimate changes in travel times, distances, fuel consumption, and emissions, and various socio-economic data is required to estimate aspects like the value of time and social cost of emissions.

The following sections provide greater detail on how this information was obtained, what values are assumed, and the rationale behind the assumptions.

Project Cost and Financial Data

Cost of Chief Peguis Trail Extension West – Main Street to Brookside Boulevard

Table 3 below provides the most recent CPT Extension West class 3 cost estimate in 2023 dollars and current dollars (which includes construction inflation), before debt and finance charges. This data has been obtained from the most recent basis of estimate with costing data provided by Morrison Hershfield.

The cost of CPT Extension West, excluding contingency and administrative costs, is estimated to be $578.1 million in 2023 dollars and $674 million in current dollars after accounting for construction inflation.

When contingency and administrative charges are included, the cost rises to $649.6 million in 2023 dollars, or $755.3 million in current dollars.

Table 3: Chief Peguis Trail Extension West – Main Street to Brookside Boulevard Costs

Expenditure	Cost (2023 Dollars, Millions)	Cost (Current Dollars, Millions)	% of Total Cost (Current Dollars)
Roadworks	$305.1	$359.8	47.6%
Structures	$122.1	$143.2	19.0%
Grading and Drainage	$68.4	$79.6	10.5%
Engineering, Planning, and Project Management	$30.4	$34.9	4.6%
Property	$52.0	$56.5	7.5%
Total Cost Included in BCA	**$578.1**	**$674.0**	**89.2%**
Contingency	$55.6	$63.6	8.4%
Administrative Charges	$15.9	$17.8	2.4%
Total Cost Excluded in BCA	**$71.5**	**$81.3**	**10.8%**
CPT Extension West Total Cost	**$649.6**	**$755.3**	**100.0%**

Debt and Finance Charges

The debt and finance service charges associated with this project are excluded from this analysis as the use of a discount rate renders the final debt and finance charges equal to the sum of principal payments of the project (i.e., the initial project cost).

The rationale is that debt and finance service charges are expressed in nominal dollars which are calculated based on a nominal interest rate that includes both real and inflationary components. Benefit-cost analysis expresses all costs and benefits in constant dollars, which requires converting the stream of nominal debt and finance service charges to real dollars, which is simply principal payments plus real interest payments. When principal payments plus real interest payments are converted to present dollars using the real discount rate, the real interest payments are cancelled out which only leaves the sum of principal payments that equates to the initial project cost. This eliminates the need to include debt and finance charges in the BCA calculations.[6]

Discount Rate

Discount rates are used in calculating costs and benefits because it is generally acknowledged that future costs and benefits are worth less today than costs and benefits occurring closer to the present. As such, the further into the future a cost or benefit occurs, the less it is valued in net present terms. The discount rate for all non-environmental costs and benefits is 5.5% as per the City of Winnipeg's 2024 Q2 corporate-wide economic and demographic variables guidance document.[7]

However, analysis that have significant costs up front (e.g., detailed design and construction) that only enable benefits later (e.g., opening a transportation facility *after* construction is complete) are sensitive to the assumed discount rate. Therefore, the results of the BCA at 0% (undiscounted), 3%, and 7% are presented in the sensitivity analysis section of this report.

For environmental benefits and/or costs, a 2.0% discount rate is used as this is the rate recommended by Environment and Climate Change Canada, which is consistent with the Federal Treasury Board Secretariat's guidance. This is due to the long intergenerational effects of climate change on society, and to enable more accurate representation of intertemporal trade-offs over longer time horizons.[8]

Facility Residual Value (Future Net Benefits)

The benefit-cost analysis focuses on the construction period and then a 25-year appraisal period with the assumption the improved facility is operational beginning in 2030. However, benefits and costs continue to accrue beyond 2054. Limiting the appraisal period to 25 years of operation only captures 55 per cent of the total benefit associated with the assumed 50-year service life of the roadworks. In some jurisdictions such as New Zealand, benefit-cost analysis guidance suggests the analysis needs to capture at least 90 per cent of total benefits within an asset's service life.[9]

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[6] For additional information on this concept, please see the section titled "Initial Project Investment Costs" in the California High -Speed Rail Authority 2014 Business Plan Technical Supporting Document (pg. 22).

[7] Source: City of Winnipeg. 2024. "Economic and Demographic Variables – 2024 Q2". Accessed July 3, 2024.

[8] Source: Government of Canada, Environment and Climate Change Canada (ECCC). 2023. "Social Cost of Greenhouse Gas Estimates – Interim Updated Guidance from the Government of Canada". Accessed January 25, 2024.

[9] For further discussion, please see Nellthorp, John and Ojeda-Cabral, Manuel. 2021. "Residual Values and Appraisal Period in Multimodal Transport Appraisal", Institute for Transport Studies (ITS), University of Leeds, UK.

Given that this is a major project, with significant benefits to citizens and businesses beyond the 25-year appraisal period, especially since it enables land development within the region that will continue to build out beyond 2054, it is prudent to further extend the benefit and cost cashflows to year 50 add the net value outside the appraisal period to the final cashflow entry in year 25.

Following methods discussed by Nellthorp and Ojeda-Cabral (2021), the residual value of the facility is calculated by estimating costs and benefits accruing to users in years 26 to 50 with the following assumptions:[10]

- **Benefits:** the real dollar-value of benefits estimated in year 25 is held constant to year 50 and is adjusted for inflation over time
- **Costs:**
  - Annual maintenance: the real dollar-value of annual maintenance in year 25 is held constant to year 50 and is adjusted for inflation over time
  - Road resurfacing at year 26: $25.24 million (2023 dollars)[11]
  - Road rehabilitation at year 40: $37.86 million (2023 dollars)[11]
  - Bridge rehabilitation at year 40: $40.97 million (2023 dollars)[11]

To reduce the risk of underestimating costs and/or overestimating benefits, a risk adjustment is included that inflates estimated facility renewal and rehabilitation costs by 10 per cent and reduces estimated facility benefits by 5 per cent from years 26 to 50. The justification for these values is as follows:

- **Benefits:** A 5 per cent reduction in long-term facility benefits is selected to represent present risks to long-term wage growth in Canada, which is the primary anchor used to measure the value of time for citizens and businesses. While growth in nominal wages since 2001 in Manitoba has been relatively constant at around 3.0 per cent per year, Canada's economic productivity has been falling in recent years, which ultimately puts long-term nominal wage growth at risk, justifying a lower valuating in benefits in the future if recent productivity issues cannot be solved.
- **Costs:** A 10 per cent increase in long-term facility costs is selected to represent the potential to underestimate road project cost overruns using current methods. A review of large-sample studies in the United States suggest that on average, the magnitude of cost overruns for road projects can run between 5 per cent and 9 per cent. As such, a 10 per cent increase to long-term costs is prudent.[12]

The result is that the socio-economic residual value of the facility, in net present terms, is $264.3 million which is included as a benefit. This represents the net benefit accruing to the public over the long-term (years 26 to 50).

This method is used in contrast to the alternative method of measuring a facility's physical residual value, which utilizes straight-line depreciation to estimate the salvage value of the facility at its useful life (prior to full replacement). While straight-line depreciation is standard practice in some jurisdictions, it forgoes calculating the additional socio-economic costs and benefits of a transportation project that accrue beyond the 25-year appraisal period in favor of estimating the market value of physical assets at the end

[10] Nellthorp, John and Ojeda-Cabral, Manuel. 2021. "Residual Values and Appraisal Period in Multimodal Transport Appraisal", Institute for Transport Studies (ITS), University of Leeds, UK.
[11] Values are adjusted for construction inflation in the year in which the resurfacing/rehabilitation is anticipated to take place.
[12] Source: Edwards, Alexandria. 2020. "Cost Overruns in Infrastructure Projects: Evidence and Implications". *Studies in Applied Economics, No. 161.* The John Hopkins Institute for Applied Economics, Global Health, and the Study of Business Enterprise.

of their useful life. In projects wide in scope that have significant impacts beyond 25 years, such as the Chief Peguis Trail Extension West - Main to Brookside project, it is more reasonable to consider the approach which is more inclusive of the socio-economic implications beyond year 25.

Given the considerable differences that may arise depending on the method used for residual value (RV) calculations, the results of the benefit-cost analysis using straight-line depreciation instead of long-term socio-economic benefits as the method for calculating RV are presented in appendix D.

Incremental Annual Operating Costs

Aside from the capital costs associated with the Chief Peguis Trail Extension West – Main to Brookside, there are incremental operating costs to consider. These costs are mainly going to be incremental operating costs associated with snow clearing, beautification/street sweeping costs, and reactive maintenance. These costs are anticipated to be $889,580 million annually (2023 dollars).

Expected road resurfacing costs in year 26, and road/bridge rehabilitation costs in year 40 are accounted for in the residual value calculation as explained above and are not considered an incremental annual operating cost.

Inflationary Adjustments

The 5.5% discount rate used represents a nominal discount rate. As such, all benefits and costs are adjusted to current dollars using various measurements of inflation. For the value of time, nominal hourly wages are assumed to continue to grow at 3.0% annually based on average hourly wage data for Manitoba back to 2001. Construction inflation is assumed at 3.0%, operating cost inflation is assumed at 2.0%, vehicle operating cost inflation is assumed at 2.9%, fuel inflation rate is assumed at 1.9% and pedestrian and cyclist benefits are also inflated at 2.0% annually.[13]

Facility and Traffic Simulation Data

Vehicle Travel Times and Fuel Consumption

To derive the net change in travel times, trip distances, fuel consumption, and emissions for northwest Winnipeg with and without the Chief Peguis Trail Extension West – Main to Brookside, a regional approach to traffic modelling is taken using PTV VISUM software. Data is produced in in 2030 and 2050, for both weekdays and weekends, and linearly interpolated for the remaining years.

Distribution of Vehicle Types

It is assumed that 94.5% of vehicle counts using the facility will be automobiles and the remaining 5.5% will be commercial trucks based on data from the traffic model.

Pedestrian and Cyclist Counts

Since CPT Extension West is a new facility and will provide active transportation options where none currently exist, pedestrian and cyclist user counts are estimated using statistics collected from the Kildonan Settlers Bridge and adjusted for the significantly longer facility length. The new active

[13] Source: for vehicle operating costs, the annual inflation rate is taken data observed from 2001 to 2023 from Statistics Canada, Table 18-10-0005-01, Consumer Price Index, annual average, not seasonally adjusted – passenger vehicle parts, maintenance, and repairs for Manitoba. For fuel inflation, the annual inflation rate is derived from the U.S. Energy Information Administration (EIA), Short-Term Energy Outlook, November 2022 and EIA, AEO2023, Average Prices, All Sectors, Motor Gasoline, Reference Case data series (2023 to 2050).

transportation option will provide 8 signalized pedestrian crossings and is otherwise grade separated in most areas, with the path being approximately 15 feet wide.

Table 4 provides the estimated annual pedestrian and cyclist usage counts. The "existing trips" represent the number of trips that are anticipated to occur based on current active transportation trip habits nearby. The "induced trips" represent the number of trips shifted away from some other mode of transport and into either the pedestrian or cyclist category as a direct result of having a new active transportation facility installed. It is assumed that 10% of total trips are induced users, based on research from the National Institute for Transportation and Communities at Portland State University.[14]

Table 4: Estimated Annual Pedestrian and Cyclist Trips along CPT Extension AT Paths

Trip Mode	Existing Users (Annual)	Induced Users (Annual)	Total Trips (Annual)	Average Trip Length (kms)[15]
Pedestrian	107,370	11,930	119,300	0.94
Cyclist	165,060	18,340	183,400	3.60

Facility Safety

Adding a new, higher speed transportation facility to northwest Winnipeg where none currently exists will have an impact on safety, though the net impact is not known. As CPT Extension West has a regional impact on traffic flows and patterns across northern sections of Winnipeg, there is a lack of modelling capabilities that provide the accuracy necessary to understand how a change in traffic behavior will impact collision probabilities and outcomes on every segment of road in a build and no build scenario.

In general, it can be assumed that building a new higher speed road will result in collisions occurring on that facility as traffic diverts from old routes to the new one, but how safety changes on the old routes is unknown.

These limitations mean that a network-wide safety performance comparison cannot be reasonably calculated for a build and no build scenario at this time, so no estimates on the socio-economic benefit or cost of safety changes is provided.

[14] For further discussion, please see Monsere, Chris et al. 2014. "Lessons from the Green Lanes: Evaluating Protected Bike Lanes in the U.S."
[15] Source: Google Environmental Insights Explorer

Socio-economic Data

Value of Travel Time Savings (VTTS)

One of the largest benefits, and therefore justifications for improved transportation infrastructure is a reduction in user travel times. The general assumption is that a reduction in travel times for users means more time for users to engage in one of three activities: engaging in economic production (e.g., transportation of goods or business travel) engaging in personal recreation or leisure activity, or avoiding personal negative experiences associated with travel such as fatigue or stress.

While there is extensive literature on how to apply a monetary value to an individual's time along with debate and variance on the metrics to use, the method employed in this study is consistent with the U.S. Department of Transportation's guidance on the subject, which is to value time savings at 50% of individual average hourly income for non-work related trips, 100% of individual average hourly income plus employer overhead for work related trips, and the average hourly earnings plus employer overhead in the transportation industry for goods movement.[16] Table 5 summarizes these values.

Table 5: Value of Travel Time Savings (VTTS)

Vehicle Type	Trip Type	Share of Traffic	Hourly Value of Time (2023 Dollars)[17]
Automobile	Business Travel	4.3%[18]	$36.43
	Personal Travel	90.2%	$14.01
Commercial Truck	Goods Movement	5.5%	$36.83
Composite Hourly Value of Time Savings:			**$16.25**

Hourly wages are derived from Statistics Canada's Survey of Employment, Payrolls and Hours using Manitoba data for 2023. The above composite hourly value is applied to any time savings (or travel time increases) for vehicle occupants, while all pedestrian and cyclist travel times are considered to be personal travel.

For additional discussion on approaches to valuing travel time savings, "The Value of Travel Time Savings: Departmental Guidance for Conducting Economic Evaluations Revision 2 (2016 Update)" publication produced by the United States Department of Transportation may act as a good resource.

[16] Source: United States Government, Department of Transportation. 2016. "The Value of Travel Time Savings: Departmental Guidance for Conducting Economic Evaluations Revision 2 (2016 Update)". Accessed December 12, 2023.
[17] Data Source: Statistics Canada, Table 14-10-0206-01, Average hourly earnings for employees paid by the hour, by industry, annual. Note: industrial aggregate excluding unclassified businesses (including overtime) in Manitoba is used for overall wage rates, and Truck Transportation (NAICS 484) is used for goods movement. Both business travel and goods movement hourly value of time include a 30% increase over the average hourly rate to account for employer overhead.
[18] In the absence of local data, the distribution of business versus automobile trips for automobiles is derived from the United States 2001 National Household Travel Survey (NHTS) as recommended by the United States Department of Transportation.

Occupants per Vehicle

To calculate the value of vehicle travel time savings across all facility users, both the expected number of vehicles and occupants per vehicle is required. The number of occupants per automobile vehicle is assumed to average 1.25 people per vehicle and 1 person per vehicle for commercial trucks. This information is derived from 2007 Winnipeg Area Travel Survey.

Fuel Costs

A new transportation facility may provide more efficient travel route options, and result in less vehicle kilometers travelled resulting in lower fuel consumption. Fuel prices tend to be volatile, but as the initial values used in the BCA reference 2023 prices, the 2023 average price for retail gasoline in Winnipeg is used and then inflated at 1.9 percent annually based on projections from the U.S. Energy Information Administration Short-term Energy Outlook from November 2022.

This value is $1.55 per litre for regular unleaded gasoline.[19] As there is no distinction between gasoline and diesel consumption in the PTV VISUM modelling output and automobile traffic represents 94.5% of all traffic, all fuel consumption statistics calculated in the models are assumed to represent unleaded gasoline.

Zero-Emission Vehicles and Electrification Impacts

This report takes into consideration the eventual electrification of light-duty passenger vehicles in Manitoba as it is anticipated this will reduce the future benefits associated with reduce fuel consumption and the associated greenhouse gas emissions. In 2023, zero-emission vehicles (ZEV) only made up an estimated 3.3 per cent of vehicle sales and composed 0.5 per cent of the total light-duty fleet of vehicles in Manitoba.

The data available to study trends in how zero-emission vehicle sales will evolve is very limited, with provincial data going back only to 2017. As such, it is difficult to anticipate how zero-emission vehicle sales will increase over the coming decades with a high degree of accuracy, and how the composition of the overall fleet will change. Regardless, the current federal government has provided regulated sales targets that apply to light-duty vehicles sold in Canada starting in 2026.[20] These federal targets aim to have 20 per cent of new light-duty vehicle sales be ZEV, increasingly to 100 per cent of sales by 2035 and beyond. Under these assumptions, which likely represent a very optimistic case for zero-emission vehicle sales in Manitoba, the share of light-duty passenger vehicles in Manitoba that are zero-emission is estimated to rise from 0.5 per cent in 2023 to 100 per cent in 2049. For more information regarding this assumption, please see appendix C.

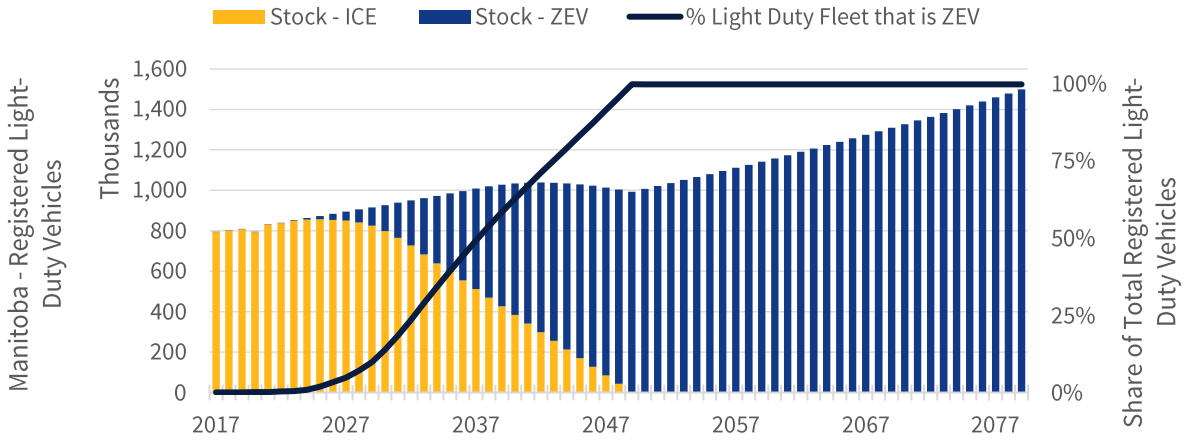
With respect to benefit calculations, the benefits associated with reduced fuel consumption and greenhouse gas emissions are scaled down in proportion to the share of light-duty vehicles in Manitoba that are anticipated to be zero-emission in a given year. For example, if traffic modelling output estimates that in 2044, the new transportation facility will save all users $100 in fuel costs and $10 in greenhouse gas

[19] Source: Statistics Canada, Table 18-10-0001-01, Monthly average retail prices for gasoline and fuel oil, by geography (Winnipeg CSD; 2023 average)
[20] Source: Environment and Climate Change Canada. “Canada’s Electric Vehicle Availability Standard (regulated targets for zero-emission vehicles).

emissions, but it is estimated that 80 per cent of light-duty vehicles are zero-emission by that year, then fuel costs and greenhouse gas emission savings are reduced by 80 per cent to $20 and $2 respectively.[21]

Figure 4 below shows internal modelling estimates on the share of Manitoba's light-duty fleet that would be zero-emission if current federal sales targets are met, all vehicles have an assumed 15-year lifespan, and the stock of light-duty vehicles continues to expand at 1.2 per cent annually based on recent historical trends.

Figure 4: Estimated Stock of Zero-Emission Vehicles in Manitoba and Share of Overall Light-Duty Fleet, 2017 to 2077: Assuming sales meet current federal regulations



Sources: Statistics Canada, Table 23-10-0308-01, Vehicle registrations by type of vehicle and fuel type; Statistics Canada, Table 20-10-0002-01, New motor vehicle sales, by type of vehicle; Environment and Climate Change Canada, "Canada's Electric Vehicle Availability Standard (regulated targets for zero-emission vehicles"; City of Winnipeg Economic Development & Policy calculations.

Vehicle Operating Costs

Aside from changes in fuel consumption, a new transportation facility that provides more efficient travel options and reduces kilometers traveled may reduce overall operating costs in terms of maintenance and depreciation. Table 6 provides the monetary value of vehicle operating costs per kilometer (maintenance and depreciation only). Vehicle operating costs are escalated at 2.9 per cent annually.[22]

Table 6: Vehicle Operating Cost per KM (Maintenance and Depreciation only)

Vehicle Type	Operating Cost per km (2023 Dollars)
Automobile	$0.29[23]
Truck	$0.90[24]

[21] Limitations in current traffic modelling software assume that all vehicles, regardless of the model year, are gasoline vehicles. As such, manual adjustments must be made after the fact to proportionately reduce fuel consumption and emission estimates to account for vehicles transitioning to zero-emission.
[22] Source: Statistics Canada, Table 18-10-005-01, Consumer Price Index, annual average, not seasonally adjusted; data for Manitoba – Passenger vehicle parts, maintenance and repairs is used from 2001 to 2023.
[23] Source: CAA Driving Costs calculator. Note: average of compact, intermediate, SUV, van, and pickup truck maintenance and depreciation costs taken, assuming 20,000 kms driven per year.
[24] Source: American Transportation Research Institute. 2023. "An Analysis of the Operational Costs of Trucking: 2023 Update". Note: adjusted from USD to CAD via FRED DEXCAUS ($1 USD = $1.3014 CAD).

Pedestrian and Cyclist Benefits

Adding new active transportation facilities can have socio-economic benefits to users and society at large. This includes two aspects of socio-economic benefits:

1. **Shadow price of new active transportation facilities:** public assets such as active transportation facilities can be freely used by anyone at no cost to the user. However, that does not mean they do not have value to the user, it's just that public funds are used to build the asset, not user fees. As such, survey data can reveal user preferences and provide insight on how much users theoretically value an asset despite not having to pay to use it. The monetary value of this theoretical value is called the shadow price and can be used to capture the socio-economic benefit associated with the installed facility. These values are derived from published research.
2. **Mortality reduction benefits:** inducing users to become active by walking or cycling may improve their health outcomes, reduce mortality, and reduce overall healthcare costs. A new or improved active transportation facility may induce users to become active when they otherwise might not have in the absence of the facility. The monetary values of induced user trips are derived from published research.

Given the availability of existing pedestrian and cyclist routes in the area, no net improvement in pedestrian and cyclist travel time is expected in a build scenario.

Table 7 provides the monetary value of socio-economic benefits related to pedestrian and cyclist infrastructure. Not all benefit types may be applicable to all projects.

Table 7: Socio-economic Benefits of Pedestrian and Cyclist Infrastructure

Category	Benefit Type	*Unit*	Value (2023 Dollars)[25]
Revealed Preferences/ Shadow Price	Expanded sidewalk, per foot of added width	*Per person km*	$0.09
	Marked crosswalk for pedestrian/cyclist crossing	*Per trip crossing*	$0.25
	Signalized intersection for pedestrian crossing	*Per trip crossing*	$0.68
	Cycling path with at-grade crossings	*Per cycling km*	$1.29
	Cyclist path with no at-grade crossings	*Per cycling km*	$1.62
	Dedicated cycling lane	*Per cycling km*	$1.53
Mortality Reduction	Walking	*Per induced trip*	$10.13
	Cycling	*Per induced trip*	$9.03

The new pedestrian and cyclist infrastructure to be installed as a part of the CPT Extension West transportation project, the current design indicates it will add new paths 14.8 feet wide, with 8 signalized pedestrian crossings, and is generally grade separated most of the way. Given these parameters, and the assumptions on existing and induced users and average trip length in table 4, the annual undiscounted benefit of the pedestrian and cyclist facility added is $1.52 million (2023 dollars).

[25] Source: United States Government, Department of Transportation. 2023. "Benefit-Cost Analysis Guidance for Discretionary Grant Programs". Values taken from tables A-8, A-9, and A-13, adjusted from USD to CAD via FRED DEXCAUS ($1 USD = $1.3014 CAD), and inflated by 2.0% to bring to 2023 dollars.

Socio-economic Cost of Greenhouse Gas (GHG) Emissions

The socio-economic impact that an increase or decrease in fuel consumption on a transportation facility may be estimated by translating fuel consumption to greenhouse gas (GHG) emissions and emissions to their social cost estimated by Environment and Climate Change Canada. Greenhouse gas (GHG) emissions are then estimated by translating fuel consumption to carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) using the ratios presented in table 8 below. Total emissions in a build and no build scenario are then compared, and the net change in carbon dioxide, methane, and nitrous oxide as a result in a change in total fuel consumption is monetized using values provided by Environment and Climate Change Canada.[26]

For CPT Extension West, while regional traffic modelling outputs do not provide information on how average fuel consumption changes per vehicle, the modelling does predict that daily vehicle kilometers travelled (VKT) will decrease in a build scenario due to more efficient travel routes becoming available. Therefore, on the assumption that average fuel consumption per vehicle remains the same, less fuel will be consumed in a build scenario due to lower VKT. The model assumes fuel consumption of 8.9L/100km.[27]

This analysis does not include the effects of emissions caused by construction of the proposed improvements from sources such as construction material extraction, refinement, and transportation, as well as the manufacture, maintenance, and operation of construction equipment to accomplish the work.

Table 8: Emissions Factors for Refined Petroleum Products[28]

Greenhouse Gas	g of GHG/L Fuel
Carbon Dioxide (CO_2)	2,307.000
Methane (CH_4),	0.100
Nitrous Oxide (N_2O)	0.020

Greenhouse Gas (GHG) Emissions Originating from Construction of the Asset

Using data from Statistics Canada's Infrastructure Economic Accounts (Environmental Perspective) it is estimated that 0.2492 tonnes of greenhouse gasses are emitted for every $1,000 invested in highway and road structures in Manitoba.[29] Assuming $496 million in hard construction costs (2023 dollars), it is estimated that constructing CPT Extension West will generate **123,516 tonnes** of greenhouse gases.[30] This value is presented for information only, as the standard practice observed in methodologies surveyed from organisations such as the US Department of Transportation and B.C. Ministry of Transportation and Infrastructure do not appear to include construction emissions in benefit-cost calculations.

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[26] Source: Government of Canada, Environment and Climate Change Canada. 2022. "Social Cost of Greenhouse Gas Estimates – Interim Updated Guidance for the Government of Canada". Values derived from "Table 1: Updated SC-GHG estimates (C$2021, $/tonne of respective GHG)". Accessed December 13, 2023.

[27] Source: Government of Canada, Canada Energy Regulator. 2019. "Market Snapshot: How does Canada rank in terms of vehicle fuel economy". Accessed August 13, 2024.

[28] Source: Government of Canada, Environment and Climate Change Canada. 2023. "Emissions Factors and Reference Values". Accessed December 5, 2023.

[29] Source: Statistics Canada, Table 36-10-0655-01, Infrastructure Economic Accounts, Environmental Perspective. Data represents highway and road structures and networks in Manitoba for 2022.

[30] Hard construction costs are costs related to roadworks, structures, grading, and drainage. Costs excluded from this figure are those related to engineering/planning/project management, property acquisition, contingency, and administrative costs.

4. Methodology

This section describes the methods used to calculate the benefits and costs associated with CPT Extension West. Generalized mathematical formulas are provided in appendix B.

Benefits

Net Present Value: Benefits are calculated on an annual basis and expressed as a series of positive cashflows accruing to the public and/or municipality, depending on the type of benefit. All cashflows are discounted to net present dollars using the prescribed discount rate.

Vehicle Travel Time Savings: Vehicle travel time savings (VTTS) are calculated at an annual level, based on total time savings accruing to all users in the region using hourly difference in travel times. Calculations are made based on modelled data in 2030 and 2050 and linearly interpolated between and after these two modeling years. With respect to induced demand, while a new facility may induce additional traffic from new development, this additional traffic would likely exist in the region but just be located elsewhere as the forgone development of precincts A, B, and D aren't likely to deter overall population and employment growth in the Winnipeg region. Like the travel time calculations, it is assumed that the average new user enjoys half (50%) of the benefits of an existing user to account for uncertainty about what their current travel behaviour looks like in the absence of the new facility.

Vehicle Fuel Consumption Savings: Vehicle fuel consumption savings is calculated at an annual level, based on comparing total regional fuel consumption in a build and no build scenario. Calculations are made based on modelled data in 2030 and 2050 and linearly interpolated between and after these two model years. Vehicle electrification is considered in this analysis, and fuel consumption savings over time are reduced proportionately.

Vehicle Operating Cost Savings: Vehicle operating costs savings are calculated based on the overall net change in vehicle kilometers traveled (VKT) between a build and no-build scenario and weighted towards the overall usage between automobiles and trucks.

Pedestrian and Cyclist Travel Benefits: Pedestrian and cyclist benefits are calculated based on estimated usage, induced demand, and the socio-economic benefits associated with trips on the new active transportation facilities.

Emission Reductions: A new facility may result in reduced emissions if the improvements result in more efficient travel routes resulting in less kilometers travelled, and therefore less fuel consumption. Vehicle electrification is considered in this analysis, and emission reductions over time are reduced proportionately.

Costs

Costs are calculated on an annual basis and expressed as a series of negative cashflows accruing to the public and/or municipality, depending on the type of cost. All cashflows are discounted to net present dollars using the same formula used for benefits.

Capital Expenditures

The capital costs associated with CPT Extension West, as summarized in table 9 are converted to annual cash outflows incurred by the municipality.

The timing of these cash outflows is shown in table 9 where it is assumed the first costs representing 6.8% of total expenditures will be incurred in 2025, and all costs related to the project will be incurred by 2031. These values are obtained from the latest basis of estimate for this project.

It is expected that based on this schedule the benefits associated with the project would begin to accrue in 2030.

Table 9: Distribution of CPT Extension West Expenditures by Year

Year	% Expenditure	Cumulative Expenditure
2024	0.0%	0.0%
2025	6.8%	6.8%
2026	1.0%	7.8%
2027	7.4%	15.2%
2028	36.0%	51.2%
2029	43.4%	94.6%
2030	5.2%	99.8%
2031	0.2%	100.0%

Incremental Operating Expenditures

As described in section 3, incremental operating costs related to snow clearing, beautification/street sweeping costs, and reactive maintenance are anticipated to be $889,580 million annually (2023 dollars).

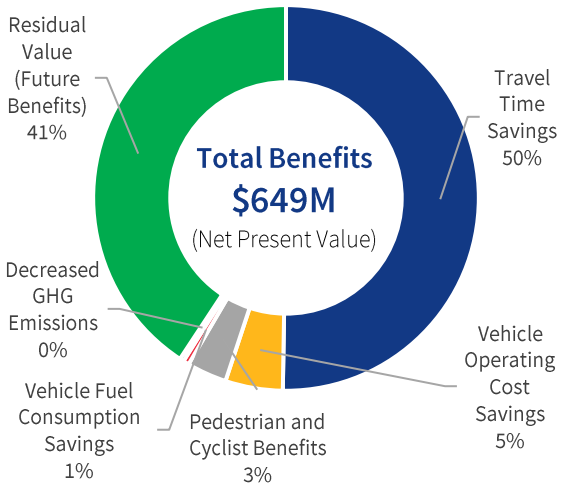
5. Results

Benefit-Cost Analysis Results

Benefit-cost analysis for the Chief Peguis Trial Extension – Main to Brookside shows a **benefit-cost ratio of 1.18**. In other words, for every dollar invested in the project, one dollar and eighteen cents-worth of benefits in total are returned to the public over the duration of construction and 50 years afterwards. The present value of costs is $550.8 million and present value of benefits is $648.9 million, resulting in a **positive net present value of $98.2 million.**

The primary socio-economic benefit associated with this project is the reduction in time spent traveling within the first 25 years, and this represents 50 percent of all benefits.

Figure 5: NPV of Benefits



Further, there are other financial and economic aspects related to this project originating from future land development contingent on its completion. These aspects, while not accounted for here, are reported in the financial and economic impact report for CPT Extension West.

Table 10: Chief Peguis Trail Extension West – Main to Brookside Socio-economic Benefits (Net Present Values)

Benefit	Net Present Value ($ Millions)	Description
Vehicle Travel Time Savings	$326.2	Economic value of 31.3 million person-hours saved over 25 years
Vehicle Operating Cost Savings	$31.3	Economic value of 155.1 million kilometers of travel saved over 25 years
Pedestrian and Cyclist Benefits	$21.7	Socio-economic value of new pedestrian and cyclist active transportation paths and induced trips
Vehicle Fuel Consumption Savings	$3.2	Economic value of 3.18 million litres of fuel saved over 25 years
Decreased GHG Emissions	$2.2	Socio-economic value of a net reduction in 8,881 tonnes of CO2, 0.38 tonnes of CH4, and 0.08 tonnes of N2O over 25 years
Residual Value (Future Benefits)	$264.3	Net value (benefits minus costs) of socio-economic benefits from years 26 to 50
Total Discounted Benefits		**$648.9 million**
Total Discounted Costs		**$550.8 million**
Net Present Value		**$98.2 million**
Benefit-Cost Ratio		**1.18**
Internal Rate of Return (IRR)		**6.2%**

Conclusion

This report quantifies the incremental socio-economic benefits and costs associated with the Chief Peguis Trail Extension West – Main to Brookside transportation project. Overall, the findings indicate that when accounting for the road's 50-year lifecycle, the socio-economic benefits exceed costs by $98 million. However, as shown in figure 6 below, this is a large project with significant upfront costs, and it will take several decades for the cumulative benefits to exceed cumulative costs when measured in present values.

Figure 6: Chief Peguis Trail Extension - Main to Brookside Benefit-Cost Cashflow, 2025 to 2079

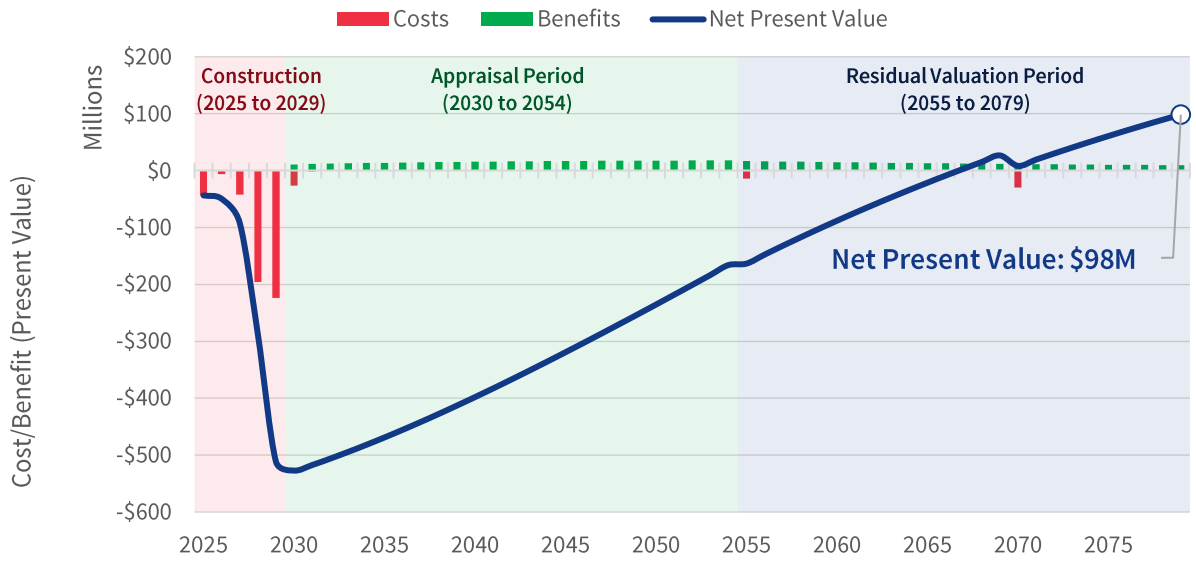


Table 11 further demonstrates how large transportation projects have long payback periods for the public. When looking at just the construction period plus a 25-year appraisal period afterwards, only 55 per cent of benefits are captured while 92 per cent of costs are captured. Extending the analysis to the end of a road's typical lifecycle at year 50 results in 100 per cent of benefits *and* costs being captured in the analysis.[31]

Table 11: Present Value of Costs and Benefits by Time Period

Period	Years	Time Period	PV Costs	PV Benefits	Net Present Value	Share of Benefits	Share of Costs
Construction	N/A	2025 to 2029	$511	$0	-$511	0%	85%
Apprisal	1 to 25	2030 to 2054	$39	$385	$345	55%	7%
Residual	26 to 50	2055 to 2079	$49	$314	$264	45%	8%
Total			**$600**	**$698**	**$98**	**100%**	**100%**

Finally, in addition to the socio-economic benefits accruing to the public, this project will also enable greenfield land development that will accommodate housing, population, and employment, which has financial implications for all three levels of government. These effects are analyzed in a separate report.

[31] In general, properly maintained roads will have a lifecycle beyond 50 years. However, to remain consistent with other reports and assumptions used by other jurisdictions, a 50-year lifecycle is assumed for BCA modelling purposes.

Report Appendices

Appendix A: Summary of BCA Assumptions

Summary of BCA Assumptions

Category	Assumption	Value	Unit	Source
Facility Information	Facility Length in Study Area	10.00	KM	1
	2030 Total Daily Weekday Trip Counts – Existing Users	1,959,717	Trips	1
	2050 Total Daily Weekday Trip Counts – Existing Users	2,276,363	Trips	1
	2050 Total Daily Weekday Trip Counts – New Users	80,314	Trips	1
	2030 Total Weekday Travel Time - No Build – Existing Users	392,052	hours	1
	2030 Total Weekday Travel Time – Build – Existing Users	390,650	hours	1
	2050 Total Weekday Travel Time - No Build – Existing Users	492,402	hours	1
	2050 Total Weekday Travel Time – Build – Existing Users	488,285	hours	1
	2030 Total Wkdy Fuel Consumed - No Build – Existing Users	1,455,690	litres	1
	2030 Total Wkdy Fuel Consumed – Build – Existing Users	1,454,918	litres	1
	2050 Total Wkdy Fuel Consumed – No Build – Existing Users	0	litres	1
	2050 Total Wkdy Fuel Consumed – Build – Existing Users	0	litres	1
	Incremental Operating Costs (2023 dollars)	$889,580	$	1
Share of Total Traffic Counts	Automobile - Personal Travel	90.2%	% of total	2
	Automobile - Business Travel	4.3%	% of total	2
	Truck Transportation - Goods Movement	5.5%	% of total	1
Value of Time	Average Hourly Wage - All Industries	$28.02	$/hr	3
	Average Hourly Wage - Truck Transportation	$28.33	$/hr	3
	Employer Overhead Multiplier	1.30	number	4
	Personal Travel Multiplier	0.50	number	2
	Value of Time - All Traffic	$16.33	$/hr	N/A - calculated
	Value of Time - Pedestrian/Cyclist	$14.01	$/hr	3
Fuel Consumption and Emissions	Average Fuel Price	$1.55	$/l	5
	Carbon Dioxide (CO2) Emissions per Litre of Fuel Consumed	2,307.00	grams/l	6
	Methane (CH4) Emissions per Litre of Fuel Consumed	0.10	grams/l	6
	Nitrous Oxide (N2O) Emissions per Litre of Fuel Consumed	0.02	grams/l	6
	Social Cost of Emissions	N/A - see source		7
Other Assumptions	Discount Rate	5.50%	%	11
	Annual Week Days	261	days	N/A - calculated
Inflationary	Construction Inflation	3.0%	%	11
	General Inflation	2.0%	%	11
	Nominal Wage Increases	3.0%	%	3
	Gasoline Inflation	1.9%	%	12
	Vehicle Operating Cost Inflation	2.9%	%	13

Source List

Source Number	Source
1	City of Winnipeg Public Works Department
2	United States Government, Department of Transportation. 2016. “The Value of Travel Time Savings: Departmental Guidance for Conducting Economic Evaluations Revision 2 (2016 Update)”
3	Statistics Canada, Table 14-10-0206-01, Average hourly earnings for employees paid by the hour, by industry, annual (Manitoba data used)
4	Intuit Quickbooks, 2022. "How to Calculate the True Cost of a New Employee"
5	Statistics Canada, Table 18-10-0001-01, Monthly average retail prices for gasoline and fuel oil, by geography (Winnipeg CSD 2023 average data used)
6	Government of Canada, Environment and Climate Change Canada. 2023. “Emissions Factors and Reference Values"
7	Government of Canada, Environment and Climate Change Canada. 2022. “Social Cost of Greenhouse Gas Estimates – Interim Updated Guidance for the Government of Canada"
8	Government of Canada, Treasury Board of Canada Secretariat. 2023. “Canada’s Cost-Benefit Analysis Guide for Regulatory Proposals”
9	Government of Canada, Transport Canada. 2020. “2020 statistics on the social costs of collisions in Canada”
10	De Leur Consulting Ltd. 2018. “Collision Cost Study Update Final Report, prepared for: Capital Region Intersection Safety Partnership”
11	City of Winnipeg Corporate Finance Department
12	U.S. Energy Information Administration (EIA), Short-Term Energy Outlook, November 2022 and EIA, AEO2023
13	Statistics Canada, Table 18-10-0005-01, Consumer Price Index, annual average, not seasonally adjusted

Appendix B: Benefit-Cost Model Equations

Benefits

Net Present Value:

$$PV_t = \frac{FV_t}{(1+i)^t}$$

Where: PV = present discounted value of future payment (cashflow) from year "t"
FV = Future value of payment in nominal dollars in year "t"
i = Discount rate
t = Years in the future for payment, assuming base year t = 0

Vehicle Travel Time Savings (existing users):

$$VTTS_{t,exisit} = (CTT_{t,build} - CTT_{t,no\ build}) \times VT \times \pi_w$$

$$VTTS_{t,new} = \frac{VTTS_{t,exist}}{Trips_{t,exist}} * Trips_{t,new} \times 0.5 \times VT \times \pi_w$$

Where: VTTS Exist = value of travel time savings in year t for existing users
CTT = cumulative annual travel time for existing users in a build and no build scenario in year t
VT = value of time for vehicle traffic
VTTS New = value of travel time savings in year t for new users
Trips = number of annual trips for existing or new users in year t
π = inflationary escalator for wages

Vehicle Fuel Consumption Savings:

$$NCFC_t = \Big((AFC_{t,build} - AFC_{t,no\ build}) \times (Exisiting\ Users_{t,no\ build})\Big) + \Big((0.5) \times (AFC_{t,build} - AFC_{t,no\ build}) \times (New\ Users_{t,build})\Big)$$

Where: NCFC = Net change in fuel consumption in year t
AFC = average fuel consumption per vehicle on the facility for users in year t in a build or no build scenario
Existing Users = total amount of users on the facility in year t in a no build scenario
Induced Users = total of users on the facility in year t in a build scenario

$$FCS_t = (NCFC_t) \times (Fuel\ Price) \times \pi_g$$

Where: FCS = Value of fuel consumption savings in year t
NCFC = Net change in fuel consumption in year t
Fuel Price = Assumed price of unleaded gasoline (dollars/litre)
π = general inflationary escalator

Emissions and Environmental Benefits:

$$TSCE_{p,t} = (NCFC_t) \times (EF_p) \times (SCE_{p,t})$$

Where: TSCE = total social cost (or benefit) of emissions from pollutant type p in year t
NCFC = Net change in fuel consumption in year t
EF = emissions factor (emissions per litre of fuel) for pollutant type p
SCE = social cost of emissions from pollutant type p in year t per unit of fuel consumption, as defined by Environment and Climate Change Canada.

Costs

Capital Expenditures

$$CAPEX_t = (TC) \times (\%\ Expenditure_t)$$

Where: CAPEX = total nominal capital expenditure in year t
TC = total capital expenditures related to the build scenario
% Expenditure = percent of total project expenses incurred in year t

Incremental Operating Expenditures

$$OPEX_t = (TO) \times (Length) \times \pi_g$$

Where: OPEX = total operating expenditure in year t
TO = total operating expenditures per lane KM of regional road, including snow clearing, street sweeping, beautification, and reactive maintenance
Length = incremental length of lane kms added to the city's regional road inventory in a build scenario.
π = general inflationary escalator

Facility Residual Values

$$RV_e = \left(\frac{U_e - Y}{U_e}\right) \times (TC_e)$$

Where: RV = residual value of expenditure group e
U = useful life (in years) for expenditure group e
Y = years of analysis for the appraisal period (25 years)
TC = total capital cost of expenditure group e

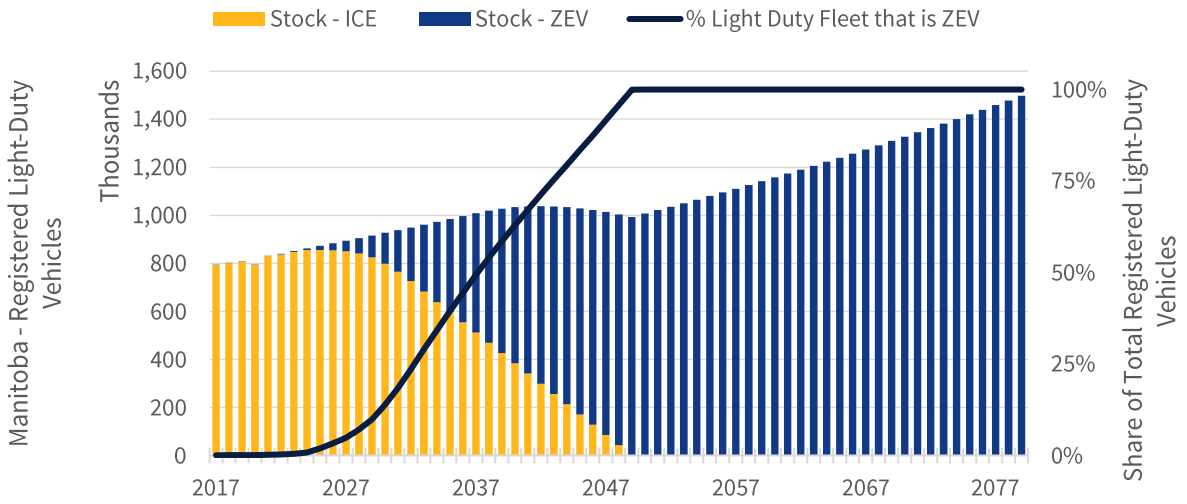
Appendix C: Vehicle Electrification

The scope of this project requires estimating costs and benefits to the public over a long time horizon, from 2025 to 2079. Over this period, it is anticipated that zero-emission vehicles (ZEV) will become increasingly popular and eventually fully-replace internal combustion engine (ICE) vehicles in the light-duty passenger sector (cars, SUVs, vans, light-duty pickup trucks, etc.). Therefore, it is important to reduce the anticipated benefits from more efficient transportation options that reduce fuel consumption and greenhouse gas emissions as zero-emission vehicles become more prevalent.

Currently only a small percentage (0.5 per cent in 2023) of Manitoba's light-duty passenger vehicle fleet are zero-emission vehicles, but if current federal regulations are met by consumers and the industry, the light-duty passenger fleet could reach 100 per cent in 2049. While optimistic, these assumptions are factored into the benefit-cost analysis to ensure the socio-economic benefits of reduced fuel consumption and greenhouse gas emissions are not overstated in this analysis.

The chart below shows estimated stock of registered light-duty passenger ZEV and ICE vehicles in Manitoba from 2017 to 2079 that is used in this analysis. These estimates are developed using registration and new vehicle sales data from Statistics Canada, along with share of new vehicles sales that must be ZEV according to federal guidelines beginning in 2026.[32] Further, it is assumed that all vehicles have an approximate lifespan of 15 years before being deregistered and exiting the fleet (6.7 per cent attrition rate).With respect to heavy-duty vehicles (semi trucks and busses), the assumptions surrounding their transition to zero-emission alternatives are significantly more uncertain. Further, as the traffic modelling output only provides fuel consumption estimates for regular light-duty vehicles, the electrification of this segment of the fleet is not applicable to this analysis. Note that the calculations below are preliminary and subject to change in future reports as more information becomes available and federal regulations change.

Estimated Stock of Zero-Emission Vehicles in Manitoba and Share of Overall Light-Duty Fleet, 2017 to 2077: Assuming sales meet current federal regulations



[32] Sources: Statistics Canada, Table 23-10-0308-01, Vehicle registrations by type of vehicle and fuel type; Statistics Canada, Table 20-10-0002-01, New motor vehicle sales, by type of vehicle; Environment and Climate Change Canada, "Canada's Electric Vehicle Availability Standard (regulated targets for zero-emission vehicles"; City of Winnipeg Economic Development & Policy calculations.

Appendix D: BCA Results Using Alternative Assumptions

Benefit-cost analysis requires relying on a variety of assumptions that will affect the calculation of benefits and/or costs. The table below provides BCA results under assumptions different from those used in the main analysis for stress-testing purposes.

Criteria	0% Discount Rate	3% Discount Rate	7% Discount Rate	Inclusion of Admin. and Contingency Costs	Residual Value: Straight-line Depreciation Method
Agency Costs (present value, millions)	$707	$614	$518	$616	$551
User Benefits (present value, millions)	$3,811	$1,345	$443	$649	$461
Net Present Value (millions)	$3,104	$731	-$74	$33	-$90
Gross Benefit-Cost Ratio	5.39	2.19	0.86	1.05	0.84

The table above shows that the final benefit-cost ratio is sensitive to the assumptions used in this report:

- If the analysis assumes a 0 percent discount rate (i.e., future benefits and expenditures are not discounted and worth just as much tomorrow as they are today), the benefit-cost ratio is much higher at 5.39 (versus the current 1.18), with the net present value of the facility exceeding $3.1 billion.
- If a 7 per cent discount rate is assumed, the net present value becomes negative, and the benefit-cost ratio falls below one.
- If administrative and contingency costs are included in the project's overall cost, the net benefit is reduced to $33 million (versus the current $98 million) but remains positive.
- If straight-line depreciation of the physical asset is used to measure the facility's residual value at the end of 25 years instead of valuing the net socio-economic benefits that accrue to the end of the asset's lifecycle, the net present value becomes negative, and the benefit-cost ratio falls below one.

Ultimately, benefit-cost analysis is most useful when trying to rank or prioritize the order in which public projects are constructed, with the same methodology being applied to each project. Beyond this, reviewing results in isolation is sensitive to the underlying assumptions and so caution should be used when interpreting standalone results.

Appendix E: Analysis Limitations

In general, benefit-cost analysis (BCA) is most useful when being used to do the following:

1. **Compare different configurations or design options for a single project:** BCA can be used to analyze the ratio of benefits to costs for multiple design options for a single project. This can help provide clarity in selecting the optimal design for a single project that will provide the greatest ratio of benefits to expenditures that can then be ranked against other capital projects.
2. **Compare and prioritize multiple different capital projects:** BCA can be used to analyze many different capital projects all competing for limited funding. If there are multiple options for investing a fixed amount of capital, projects that yield the highest benefit-cost ratios are generally prioritized over those with lower ratios to maximize the return on infrastructure investments to the public.

For the current study, only one configuration, the current preliminary design, was studied.

Further, the Route 90 Improvements project is the only other major transportation project to have a benefit-cost analysis completed. The Route 90 Improvements project had a BCA ratio of 1.17 (compared to 1.18 for the current project) and an internal rate of return (IRR) of 6.6 percent (note that the Route 90 Improvements benefit-cost analysis technical report incorrectly stated the IRR as 1.4%, which has been restated to 6.6%). However, the Route 90 Improvements project did not have any land development contingent on it, and therefore did not have any financial or long-term economic impacts associated with it unlike the current project.

There may be other projects or proposals that yield better results, but the outcomes of those projects are currently unknown. This limits the usefulness of benefit-cost analysis.

Finally, this analysis attempts to quantify the economic and socio-economic benefits and costs associated with this transportation project which requires relying on a wide variety of assumptions and traffic models. The actual benefits and costs are unknown until they are realized. Readers should familiarize themselves with the assumptions used in the modelling and calculations for this report as any deviation from these assumptions could result in outcomes different from those projected.

Appendix F: CPT Extension West Proposed Design


INITIAL - Brookside Boulevard to Pipeline Road
1
msp Winnipeg
CHIEF TEGAKE TRAIL
LEGEND (PLAN)

510 Main Street | Winnipeg | Manitoba | Canada | R3B 1B9 | winnipeg.ca

Precincts A, B, and D Financial and Economic Impact Analysis

Technical Report

Economic Development and Policy · August 2024

Executive Summary

This report provides a financial and economic analysis related to the development of precincts A, B, and D in northwestern Winnipeg. This analysis is being conducted as part of the Chief Peguis Trail Extension West – Main to Brookside transportation project. This transportation project, in combination with other municipal assets, is required to service and enable the development of these precincts.

The development of these three precincts enables 1,200 net acres of residential and 600 net acres of employment land development, accommodating 38,000 people, 15,000 dwelling units, and 5,600 jobs at full build out.

The financial impact analysis considers all the municipal costs and revenues associated with this land development over a 75-year period, and the economic impact analysis estimates how additional employment lands being developed will impact the broader economy and add revenue to all three levels of government on an ongoing basis.

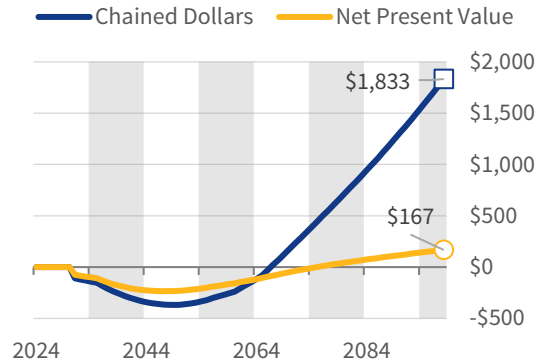
Financial Impact Analysis Findings:

To enable and support the development of these precincts, nearly $1.1 billion[1] in capital investment is needed, of which $551 million[1] is specifically attributable to the three precincts.

After 75 years, the cumulative financial impact of the development of these three precincts is as follows:

- **Total Cost:** $4.76 billion[2]
- **Total Revenue:** $6.59 billion[2]
- **Net Position:** $1.83 billion[2]
- **Net Present Value:** $167 million[3]
- **Break-even Year**: 2067

Municipal Fiscal Position by Year



Considerable municipal investment is required upfront to enable development, with 31% being attributed to the CPT Extension West. Of the $1.1B in capital costs, $739M in debt would be required, but there is insufficient room to support this in the Council-approved Debt Strategy so alternative funding sources would be required.

Cumulative land development revenue is only projected to exceed costs 36 years after beginning, with a $1.83B cumulative surplus projected at the end of 75 years, and an internal rate of return of 7.1%.

This financial analysis is highly sensitive to the assumed rate of increase in property tax. The current rate of 3.5%, as set by the current council, is assumed. Sensitivity analysis indicates a rate of 2.48% is the minimum viable rate to break even after 75 years, as increases below this will result in a deficit. Between 1990 and 2023, property taxes have increased at a compound annual growth rate of 1.98%, which would be insufficient to financially sustain the development under consideration.

Long-Term Economic Impact Analysis Findings:

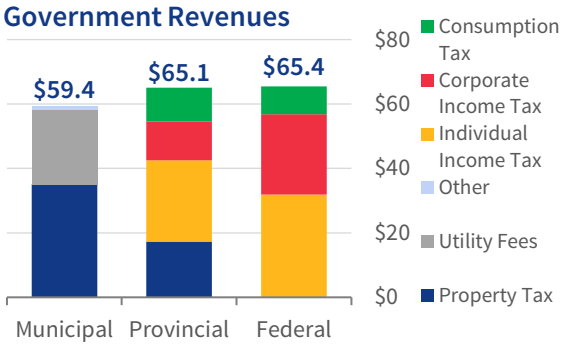
Once fully built out, the servicing of new employment lands is estimated to add the following impacts to the local economy annually:

- **Employment:** 5,694 jobs
- **Economic Output:** $1.42 billion[4]
- **GDP at Market Prices:** $731.3 million[4]
- **Wages and Salaries** $286.6 million[4]

At full build out the following revenues to governments annually:[5]

- **Municipal:** $59.4 million[6]
- **Provincial:** $65.1 million[6]
- **Federal:** $65.4 million[6]

Government Revenues



[1] Figure in 2024 dollars.
[2] Figure in 2024 chained dollars.
[3] Figure in net present value dollars. Net present value discounts all future cashflows at a set discount rate.
[4] Figure in 2019 dollars.
[5] Assumes all employment is net new.
[6] Figure in 2019 dollars at 2019 tax rates.

Contents

1. Background Information

The Purpose of Financial and Economic Impact Analysis

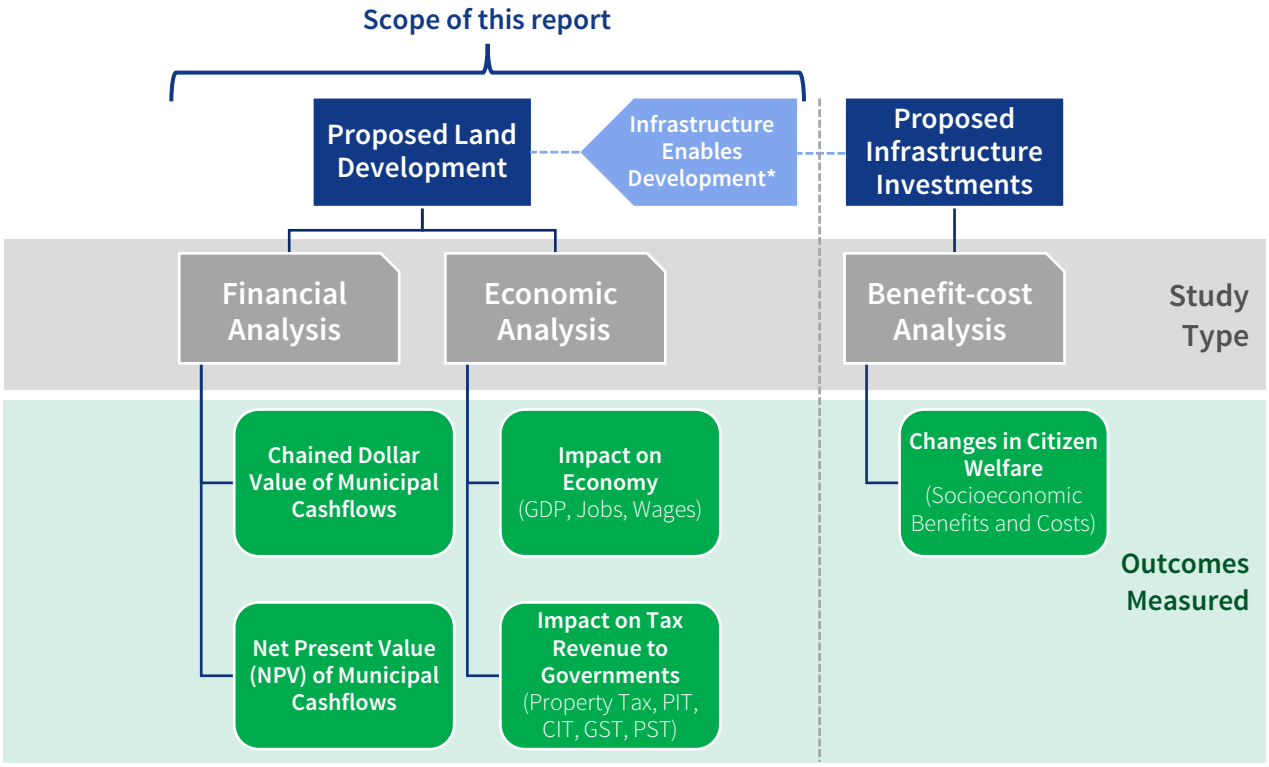
Financial impact analysis is used to evaluate what impact developing or intensifying land uses has on the City of Winnipeg's operating and capital budgets based on current cost estimates, budget trajectories, and **policy directions from the current City Council**. Economic impact analysis used to estimate the impact land development has on the economy and tax revenue to all three levels of government. Each potential development is unique in potential land uses, servicing and capital requirements, potential costs and revenues, and impact on the local economy.

Financial impact analysis supports the goals and polices set forth in OurWinnipeg policy 6.7 and Complete Communities Direction Strategy 2.0 goal 3.3.

This report has been written to provide financial and economic context to the Chief Peguis Trail Extension West – Main to Brookside regional transportation project. It should be read in conjunction with the benefit-cost study for the same project to provide a fulsome picture on many of the benefits, costs, financial, and economic impacts associated with project.

Figure 1 below provides an overview of the types of studies and outcomes measured when considering land developments and infrastructure investments and defines the scope of this report.

Figure 1: Evaluating the Impact of Land Development and Infrastructure Investments: Study Types and Outcomes



* Note: not all proposed infrastructure investments will have associated new/intensified land development.

Precincts A, B, and D Development Overview

Precincts A, B, and D are largely undeveloped agricultural lands in the northwestern corner of Winnipeg. Map 1 highlights these precincts along with the proposed Chief Peguis Trail Extension – Main to Brookside regional road that would be one of the municipal assets required to enable the full development of these precincts. With respect to the planning aspects of these three precincts, it should be noted that:

- Precincts B and D are designated as New Communities in Complete Communities Direction Strategy 2.0 and are planned to primarily accommodate future residential development. Council must adopt a precinct plan for both as a secondary plan bylaw prior to development.
- Precinct B is designated as "short-to-medium, tier 4" in the CCDS 2.0 phasing policy.
- Precinct D is designated as "short-to-medium, tier 3" in the CCDS 2.0 phasing policy.
- As per policy B1.4.4 (General Growth) in CCDS 2.0, the servicing and planning of Precinct D should be prioritized over Precinct B
- Precinct A is designated as employment lands in CCDS 2.0. As a greenfield employment site, Council must also adopt a secondary plan for this area prior to development.

Overall, it is currently assumed that at full build out, these three precincts will accommodate approximately 15,110 dwellings, 37,700 residents, and 5,700 jobs across 1,823 net acres, adding $2.8 billion in taxable portioned assessment values (at 2024 assessment values). The existing taxable portioned assessment value is $27 million, yielding approximately $365,000 in municipal property taxes for 2024.

Given that no precinct or secondary plan exists for these precincts at present, land development assumptions used in financial impact modelling have been developed based on current land use patterns for similar existing developments in northwestern Winnipeg. The current land development assumptions used for these three precincts are presented in tables 3A and 3B.

It is important to note that in future years when secondary plans are developed for these

Map 1: Precincts A, B, and D Study Area

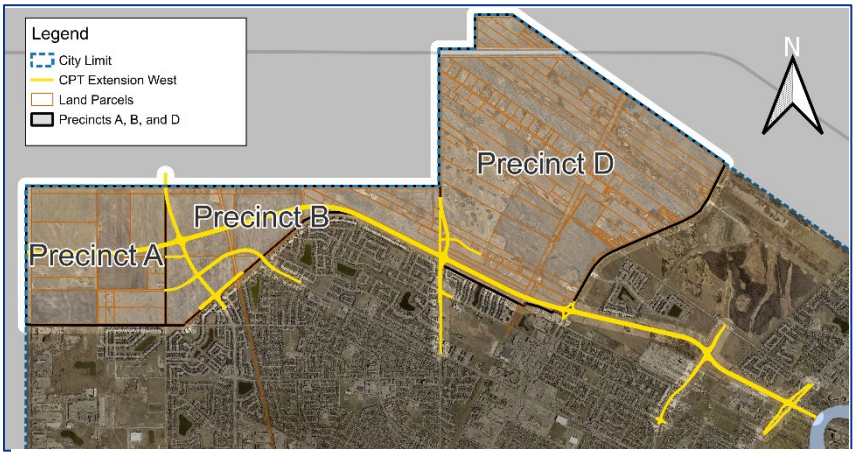
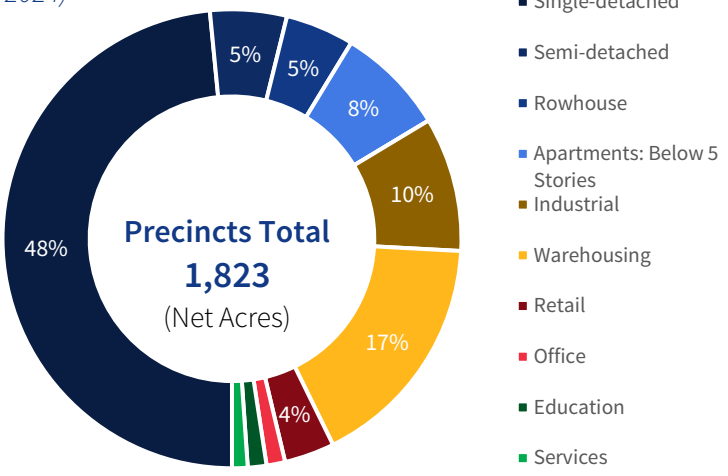


Figure 1: Precincts A, B, and D Land Use Distribution

(as of 2024)



precincts, land use assumptions may change and as more information about future development becomes available, this would change the outcomes of financial impact modelling.

As such, the land use estimates presented in this report should be considered high-level, preliminary results derived from information current as 2024.

Table 3A: Precincts A, B, and D Preliminary Land Use Assumptions

Precinct	Land Use	Total Net Acres	Absorption Rate (Net Acres/Year)	Development Start Year	Development End Year
A	Residential	0.0	0.00	2035	N/A
	Employment	472.0	18.88	2035	2059
B	Residential	313.8	14.94	2036	2056
	Employment	1.0	1.00	2036	2037
D	Residential	896.6	35.86	2032	2056
	Employment	140.0	5.60	2032	2056

Table 3B: Precincts A, B, and D Development Assumption Summary

Land Use	Type	Net Acres	Population or Employment	Taxable Portion Value per Acre (2024)
Residential	Single-detached	883.6	18,555	$1,837,406
	Semi-detached	98.6	4,929	$2,405,143
	Rowhouse	88.3	3,707	$2,405,143
	Apartments: Below 5 Stories	140.0	10,500	$1,902,295
	Apartments: 5 or More Stories	0.0	0	$1,902,295
	Residential Lands Total	**1,210.4**	**37,690**	**$2,339,141,160**
Employment	Industrial	120.2	1,069	$581,781
	Warehousing	360.5	1,107	$581,781
	Retail	64.5	1,644	$1,300,108
	Office	23.9	894	$2,227,283
	Education	24.0	475	$0
	Services	20.0	505	$1,300,108
	Primary	0.0	0	$581,781
	Employment Lands Total	**613.0**	**5,694**	**$442,647,866**
Development Total		**1,823.4**	**43,385**	**$2,781,789,026**

2. Development Costs and Revenues

This section summarizes key assumptions about the costs and revenues associated with servicing and enabling development in precincts A, B, and D.

Municipal cashflow and NPV analysis are divided into three operating entities: tax-supported, utilities, and transit with each entity having its own set of costs and revenues. When these are combined, it represents a complete municipal financial impact, but it is important to understand that the tax-supported, utility, and transit entities are generally separate operations and individually can have different financial outcomes depending on the nature and servicing requirements of each development examined.

For the tax-supported operating entity, only revenue that can be specifically attributable to land development or location (i.e., property taxes, frontage levies, permit revenues, business taxes, and utility fees) are calculated. Other sources of municipal revenue that are sourced at-large, such as enforcement fines, program or service fees, and operating grants from other levels of government are not calculated. Likewise on the operating cost side, only tax-supported costs net of grants and own-source revenue are attributed to the development.

Municipal Costs

The modelled municipal cost streams are described below. Further, if there are development-specific costs that are in addition to generalized costs, those are identified as well. Four municipal cost streams are taken into consideration when projecting costs associated with land development. They are as follows:

A. Operating Costs

Description: on the tax-supported side of city operations, this encompasses municipal operating costs for each service, net of grants and own-source revenue. It includes ongoing operating costs attributed to the development such as policing, fire protection, recreation, planning, and administration. These are attributed to a development based on budget and population projections and are allocated on a per-capita and per-employment basis as the development builds out. If there any additional operating costs unique to the development, over and above general per-capita costs, these are also considered if applicable. For utility operations, this includes water and wastewater treatment costs, and for transit, it includes route operating costs.

Development-specific Details: The addition of 8 feeder bus routes is anticipated to cost $6.4 million per year (2024 dollars).

B. Road Network Costs

Description: these costs represent ongoing road lifecycle maintenance and replacement costs once they are built, regardless of if roads are built by the city or private developers. This also includes annual snow clearing, reactive maintenance, and beautification costs. The amount of road network existing within the development each year is a function of the total percentage of land that has been developed in that year, and road lifecycle costs are estimated accordingly.

It is important to note that while the analysis extends for 75 years, current asset management practices indicate that properly maintained roads do not need to be replaced until 75 to 90 years after they are built. As such, road replacement costs do not begin to accrue until 75 years after they are built which is beyond the time horizon of the analysis. Therefore, this cost is not considered but would be a significant municipal expenditure in future years.

Development-specific Details: at present there are no secondary or precinct plans in place for the area under consideration, so the future length and size of local road networks within the area are unknown. Given this, the ratio of local road network to dwellings and employment lands is taken from existing developments nearby that are anticipated to look like a fully built out precinct A, B, and D, and scaled accordingly. The total amount of local road network added to the city's inventory at full build out is estimated to be as follows:

- **Local Residential Streets:** 896,933 m^2
- **Local Non-Residential Streets:** 0 m^2
- **Collector Streets:** 505,510 m^2
- **Industrial Roads:** 74,100 m^2
- **Regional Roads (excluding CPT Extension West):** 0 m^2

C. Capital Costs

Description: these are the costs associated with capital projects that have been identified as required to service or support the land development. All required municipal infrastructure is considered to the best of the city's ability to estimate their costs (sometimes far in advance), and may include transportation and transit, policing, fire, recreation, parks, and utility infrastructure.

Development-specific Details: table 4 on the following page presents the estimated capital costs associated with this land development based on information known as of 2024. Approximately $1.08 billion-worth of capital costs are required to enable development, however some of these assets service a wider catchment area so when apportioned on anticipated usage, precincts A, B, and D are responsible $551.3 million (2024 dollars). Of the $1.08 billion in capital costs, the current share of funding from debt assumptions indicate $738.7 million in new debt would be required. As of the writing of this report, the remaining debt room for the Council-approved debt strategy, inclusive of Administrative Reports under consideration by Council approximates $70 million. These projects would need to seek alternative funding sources.

D. Capital Maintenance Costs

Description: if new infrastructure assets are required and there is annual maintenance costs associated with them over and above per-capita operating costs, these costs are also captured.

Development-specific Details: increased maintenance costs associated with the Chief Peguis Trail Extension West – Main to Brookside are estimated at $1.08 million annually (2024 dollars) for annual snow clearing, reactive maintenance, and beautification costs.

Table 5: Current Precinct A, B, and D Capital Cost Estimates as of 2024

(Dollar values in millions of 2024 Dollars)

Service	Project Description	Rationale Reference Document	Project Construction Start Year[1]	Total Cost Estimate [2]	Share of Funding from Debt[3]	Municipal Share of Costs[4]	Development Share of Costs[5]	Development Capital Cost
Directly Related Capital Costs								
Community Services	Precinct D - Land Acquisition for New Regional Recreation Campus [b]	Winnipeg Recreation Strategy	2031	$5.5	100%	100%	81%	$4.5
	Precinct D - New Regional Recreation Campus [b]	Winnipeg Recreation Strategy	2036	$123.4	100%	100%	81%	$100.5
	Precinct D - New Regional Recreation Campus - Library Component [b]	Winnipeg Recreation Strategy	2036	$22.0	100%	100%	72%	$15.8
	Precinct B - New Community Centre [b]	Winnipeg Recreation Strategy	2035	$27.0	100%	100%	100%	$27.0
	Precinct B - New Outdoor Aquatic Park [b]	Winnipeg Recreation Strategy	2038	$15.0	100%	100%	100%	$15.0
Fire Paramedic Services	Precinct D - Fire Paramedic Station Land [a]	NFPA Standards	2031	$1.5	100%	100%	100%	$1.5
	Precinct D - Fire Paramedic Station [a]	NFPA Standards	2034	$14.0	100%	100%	100%	$14.0
Water & Waste	Regional wastewater servicing [a]	Southwest Interceptor Class 3 Capital Cost Estimate with internal adjustments	2031	$95.5	100%	100%	100%	$95.5
Public Works	Chief Peguis Trail Extension West - Main to Brookside [c]	Morrison Hershfield CPT Extension Class 3 Estimate;	2031	$669.1	50%	100%	26%	$173.1
	Parks [a]	Winnipeg Parks Strategy	2036	$8.5	50%	100%	100%	$8.5

	Bus Stops [a]	262 new bus stops with platforms. Some locations may require heated shelters	2036	$2.6	100%	100%	100%	$2.6
Transit	Bus Operator Comfort Station [a]	Two new operator comfort stations	2036	$0.4	100%	100%	100%	$0.4
	Bus Loop or Traffic Signals [a]	Two new bus loops or signals	2036	$0.5	100%	100%	100%	$0.5
	Transit Bus - Zero-Emission 60' (x20) [a]	Approximately 1 bus per 1,100 residents	2036	$48.0	100%	100%	100%	$48.0
	Transit Bus - Zero-Emission 40' (x14) [a]	Approximately 1 bus per 1,100 residents	2036	$36.0	100%	100%	100%	$36.0
	Contribution toward expansion of New North Garage [a]	Transit Master Plan	2036	$8.5	100%	100%	100%	$8.5
			Total (2024 dollars):	**$1,077.5**	**69%**	**100%**	**51%**	**$551.3**

Table Notes:
1. Project construction start year represents the year in which capital costs are incurred for the project for modelling purposes. Estimated timelines are based on the following: CPT Extension and wastewater servicing are complete by 2031 so precinct development can begin. Community service, park, and transit assets are in place within 4 to 7 years of development beginning, and fire paramedic services are in place within 15 years of development beginning.
2. Where no formal class of estimate for a given project is available, cost estimates are based on previously projects of similar nature. Costs are adjusted for 3% annual construction inflation to reflect 2024 dollars where applicable.
3. Share of funding from debt represents the assumed proportion of municipal project costs to be funded by 30-year external debt issuance at current interest rates. The remaining proportion is assumed to be funded by cash and/or reserves.
4. Estimated municipal share of costs represents the share of a project's total costs to be paid for by the municipality after contributions from other levels of government (i.e., Provincial or Federal grants).
5. Estimated development share of costs represents the assumed share of total project costs that are driven by proposed development area. Some capital projects may service an area with a wider catchment area/user base outside the scope of the proposed development, in which case not all project costs can be attributed to the proposed development. For projects with catchment areas/user base extending beyond the proposed development being analyzed, costs are generally allocated to the proposed development based on the following methodology:
- Community Services and Parks: costs apportioned based on the proposed development's share of population relative to the project's total population within the catchment area
- Fire Paramedic Service, Police Service, Water & Waste, and Transit Service: costs apportioned based on the proposed development's share of population and employment relative to the project's total population and employment within the catchment area
- Regional Roads: costs apportioned based on the proposed development's usage of the regional road relative to total usage of the regional road, as measured by daily vehicle kilometers traveled (VKT).

Class of Estimate Indicators:
a: N/A - High Level estimate
b: Class 5
c: Class 3
Projects with a "N/A - High Level" class of estimate represent projects with no formal class of estimate available.

Municipal Revenues

The modelled municipal revenue streams are described below. Further, if there are development-specific costs that are in addition to generalized costs, those are identified as well. Six municipal cost streams are taken into consideration when projecting costs associated with land development. They are as follows:

A. Municipal Property Taxes and Frontage Levies

Description: this is the main source of revenue in the financial analysis and represents the net increase in municipal property taxes and frontage levies sourced from the proposed development. Revenue received from existing land parcels is subtracted to ensure only the net increase in revenue is considered.

B. Permit Fees

Description: This represents the temporary income sourced from permits for land development and structures being built within the proposed development.

C. Business Tax

Description: This represents the ongoing income sourced from employment lands in the development. This revenue stream is only considered if the current City Council has not frozen or decreased the total expected levy in business taxes. If business taxes are frozen, business tax added from new development simply reduces the overall business tax rate, leaving the total levy the same, in which case this does not represent a net-new revenue stream to the municipality.

Development-specific Details: as of 2024, Council's current policy on business taxes is for the overall amount levied to remain approximately frozen. As such, no business taxes are calculated for this development as any increase in this amount would decrease the tax rate, resulting in no net increase in business tax revenue.

D. Utility Dividend

Description: This represents the revenue received by tax-supported operations that is derived from the utility dividend policy and budgeted gross water and sewer sales. To avoid double-counting revenues, the utility dividend is derived as a fixed percentage of water and sewer utility fees based on the current utility dividend policy, and this amount is applied as a revenue to tax-supported operations and as an expense to utility operations.

E. Utility and Water Meter Fees

Description: This represents the utility revenue generated by residents and businesses consuming water and producing wastewater within the proposed development. Unless otherwise stated, wastewater produced is equal to water consumed. Revenue from water meters is also considered.

F. Transit Fares

Description: This represents the revenue generated by transit fares paid for by the anticipated ridership originating from the proposed development.

Development-specific Details: The addition of 8 feeder bus routes is anticipated to generate $1.3 million in transit fares per year (2024 dollars).

Precinct A, B, and D Cost and Revenue Projection

The in-year costs and revenues associated with precincts A, B, and D are presented below in figure 2. Initially there are significant costs incurred to provide regional road and wastewater servicing to the area in 2031 which then enables development, with ongoing debt payments extending over the next 30 years. As provided in table 5, additional capital projects to service these precincts will be required as development proceeds, including assets such as a regional recreation campus, community centre, outdoor aquatic park, fire station, and transit infrastructure for feeder routes.

Figure 2: In-Year Chained Dollar Revenues and Expenditures for All Entities
(2024 chained dollars)

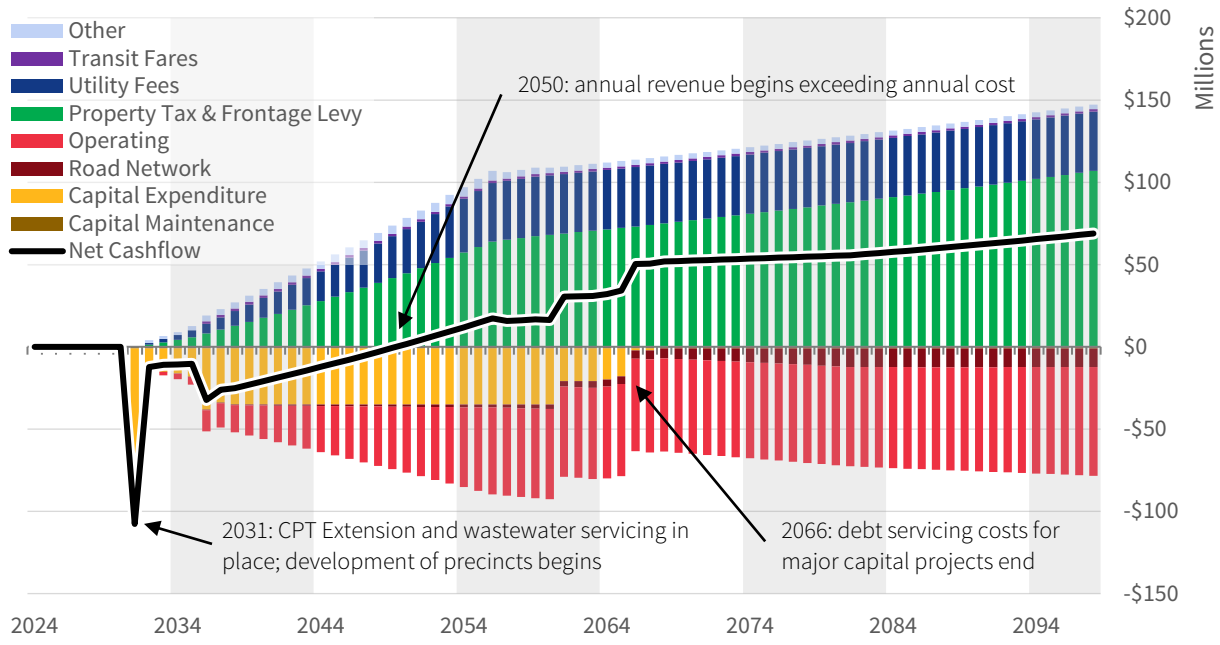
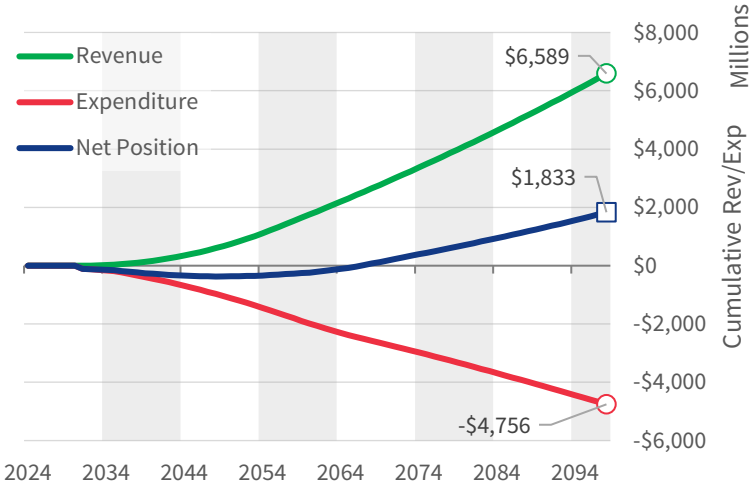


Figure 3 shows the cumulative financial position for all municipal operating entities, which is the sum of all revenues and expenditures up to the given year. While the in-year revenue generated is expected to surpass in-year costs by 2050, on a cumulative basis the development is not expected to generate a surplus until 2067 (43 years from now).

Figure 3: Cumulative Municipal Fiscal Position
(2024 chained dollars)



3. Methodology

Chained Dollar Cashflow and Net Present Value (NPV) Financial Analysis

Chained dollar cashflow and net present value financial analysis both use the same methodology, with the exception that:

- Chained dollar cashflows are expressed in base year dollars that adjust for price movements in capital and operating expenditures made by the municipality, and these adjustments are made by using a Fisher price index
- Net present value analysis discounts future cashflows at a fixed discount rate

Anticipated municipal revenues, expenditures, and net cashflow are calculated on an annual basis using the cost and revenue streams described in the previous section, with results being reported in both chained dollar cashflows and net present values.

Long-Term Economic Impact Analysis

Long-term economic impact analysis translates projected land uses to economic output, gross domestic product (GDP), wages and salaries, and government tax revenues (property tax, consumption tax, individual and corporate income tax).

This is done to demonstrate how new or intensified land uses provide long-term and ongoing impacts to the local economy and government revenues.

These values are tied to the year from which input-output multipliers are taken from Statistics Canada's input-output multiplier data series. As such, the values presented may be in a dollar year that is different from the chained dollar cashflow analysis. Further, they are not inflated over time, and instead are expressed as constant in the input-output multiplier year.

Note: this analysis does not account for the short-term impacts that the temporary construction activity arising from land development and infrastructure investments have on the economy and government revenues.

Further Methodological Details

To keep this document brief, the full methodology used to conduct both financial and economic impact analysis can be accessed on the City of Winnipeg's economic and demographic website by clicking on this link.

The full methodology is described in detail in the technical methodology document linked above.

4. Financial Analysis Results

Chained Dollar Cashflow Analysis

The values provided below represent the revenue, cost, and net financial position of providing municipal servicing to precincts A, B, and D over the next 75 years (2024 to 2098). These values are presented in chained dollar terms. For reference, full build-out of the area is anticipated to occur in 2059.

Table 6 shows the cumulative financial position of the area, by year and operating entity, on a chained dollar basis. The cumulative financial position represents the accumulation of all municipal costs and revenues applicable to the development up to the given year.

Figure 4 below shows the same values over all time periods, split out by municipal entity.

Table 6: Precinct A, B, and D Cumulative Net Financial Position
(2024 chained dollars, millions)

Year	Tax-Supported	Utilities	Transit	Municipal Total
Year 1 (2024)	$0.0	$0.0	$0.0	**$0.0**
Year 5 (2028)	$0.0	$0.0	$0.0	**$0.0**
Year 10 (2033)	-$111.9	-$19.0	$0.0	**-$130.9**
Year 25 (2048)	-$208.5	-$5.6	-$153.7	**-$367.8**
Year 50 (2073)	$343.1	$389.7	-$396.4	**$336.4**
Year 75 (2098)	$1,463.3	$890.6	-$521.2	**$1,832.7**
Break-even Year	2064	2049	N/A	**2067**
IRR	7.87%	13.00%	N/A	**7.08%**

In sum, the development of these precincts will generate more cost than revenue on a cumulative basis up until 2067, which is 43 years from now and 36 years after development begins. However, within the individual operating entities the deficit remains longer on the tax-supported side relative to utilities, but the surplus eventually surpasses that of the utility due to property taxes escalating faster than utility rates (3.5% versus 2.0%) in the model. Transit will run a deficit indefinitely since suburban feeder routes only recover approximately 20% of their operating costs currently.

Figure 4: Cumulative Financial Position by Entity and Year
(2024 chained dollars, millions)

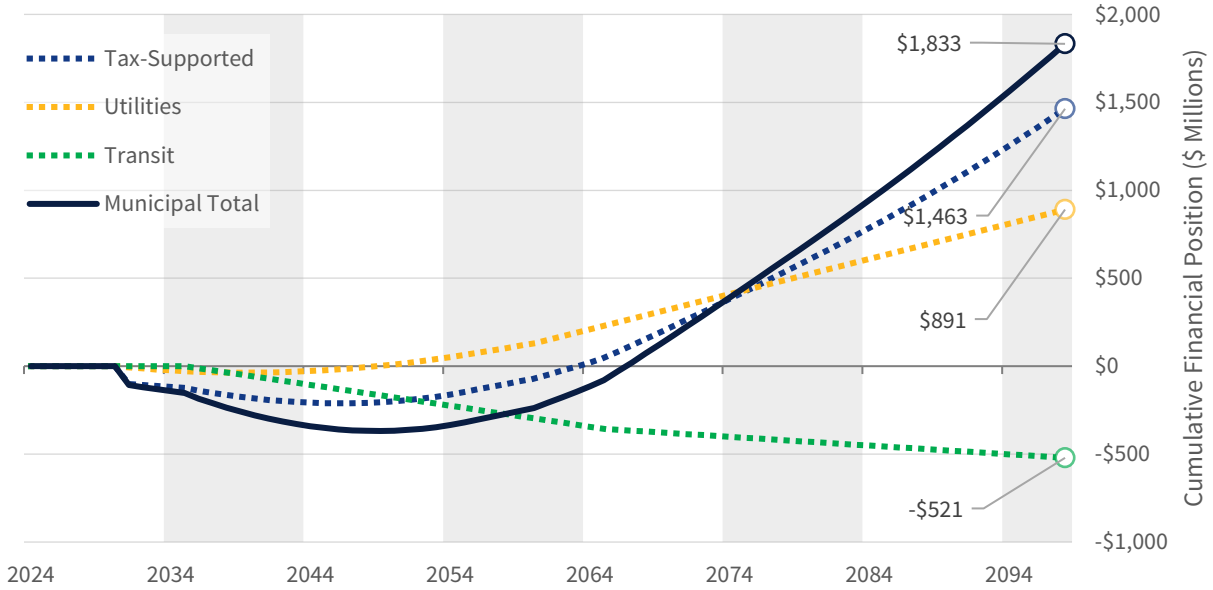


Figure 5 displays the in-year revenues and expenditures applicable to both tax-supported operations and the utility (Water & Waste).

Both entities will have to incur significant costs related to capital so that development in the region can begin, and once development starts then revenue begins to accumulate.

The significant costs associated with the Chief Peguis Trail Extension West – Main to Brookside means that the time for tax-supported revenues to begin exceeding costs attributable to the development takes a significant period of time; in-year tax-supported revenues do not exceed costs until 2047, and on a cumulative basis do not exceed costs until 2064. For the utility, costs related to the expansion of regional wastewater servicing are recovered slightly quicker; in-year utility revenues do not exceed costs until 2040, and on a cumulative basis do not exceed costs until 2049. Transit remains in a deficit the entire period as operating costs will always exceed revenue for this development profile.

Figure 6 below shows the cumulative municipal financial position at the end of 75 years.

Figure 5: In-Year Revenue and Expenditures
(By entity, 2024 chained dollars, millions)

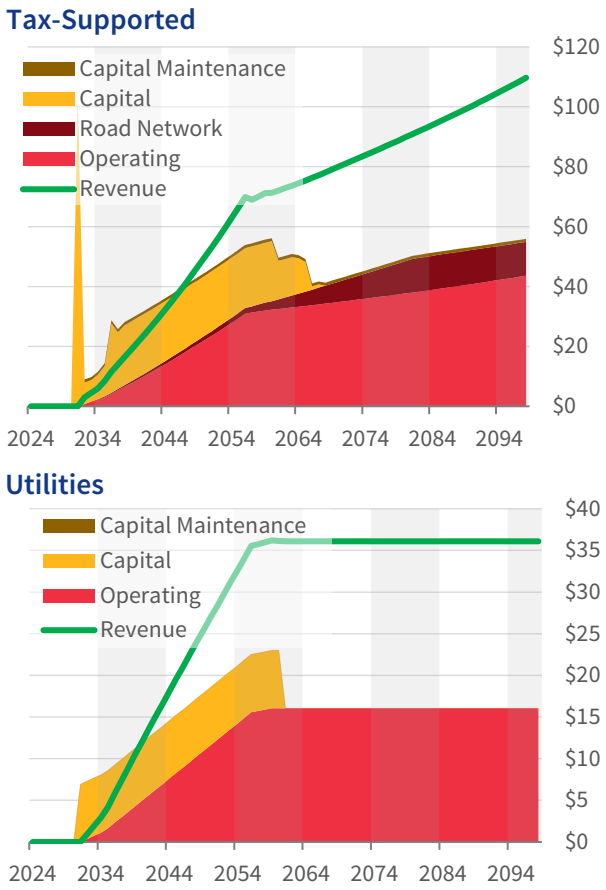
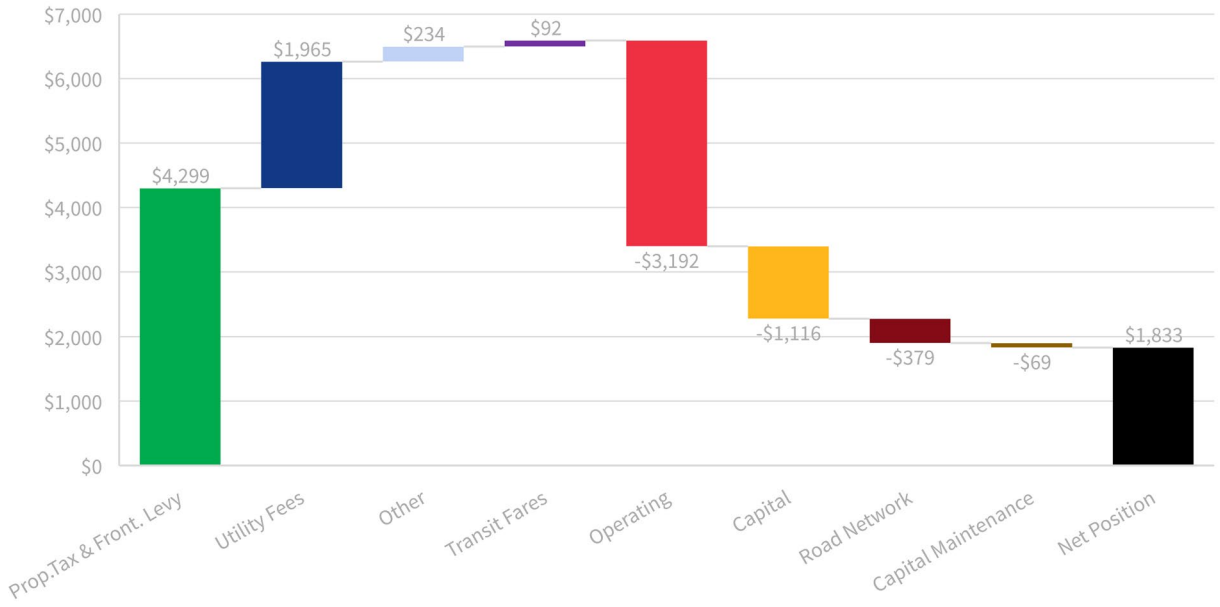


Figure 6: Cumulative Revenue and Expenditure over 75 Years
(All entities, 2024 chained dollars, millions)



Net Present Value (NPV) Analysis

The values provided below represent the net present value (NPV) of providing municipal servicing to precincts A, B, and D over the next 75 years (2024 to 2098). For reference, full build-out of the area is anticipated to occur in 2059.

Table 7 shows the cumulative net present value of the area, by year and operating entity. The net present value of the development represents the net present value of revenue and expenditure cashflows by the given year at the set discount rate.

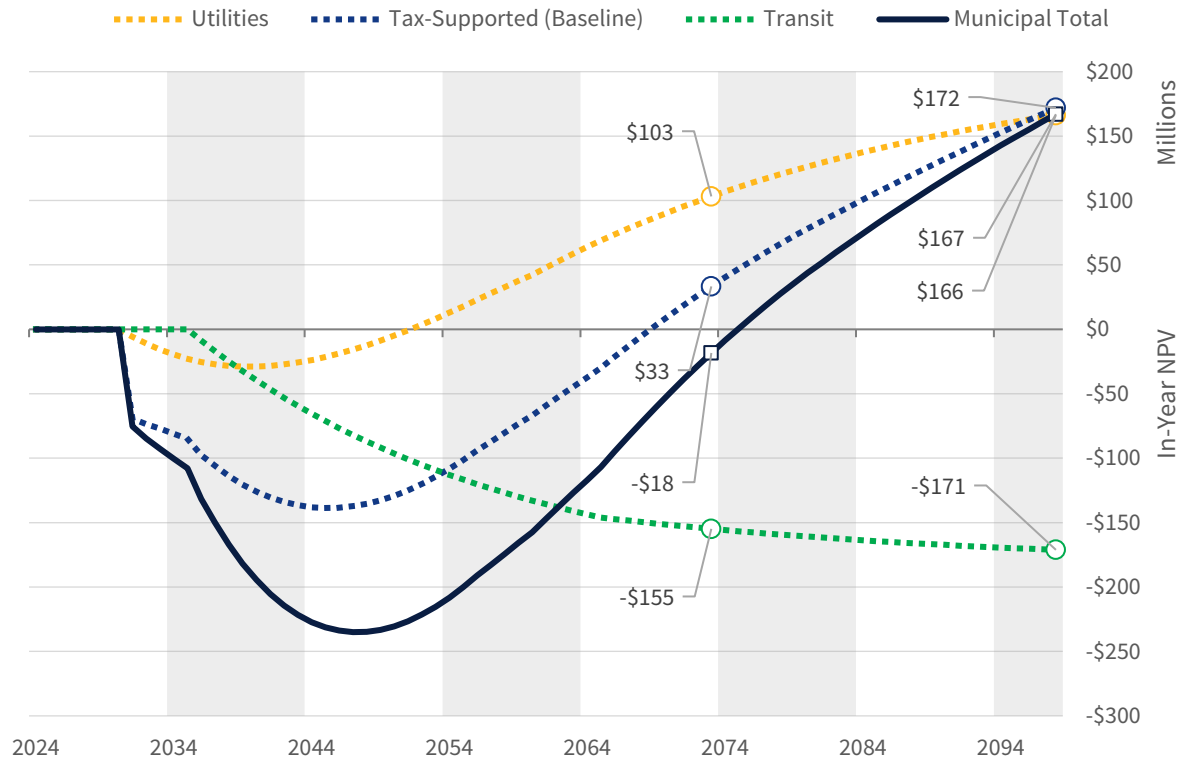
Table 7: Precinct A, B, and D Net Present Value (NPV)
(millions)

Year	Tax-Supported	Utilities	Transit	Municipal Total
Year 1 (2024)	$0.0	$0.0	$0.0	**$0.0**
Year 5 (2028)	$0.0	$0.0	$0.0	**$0.0**
Year 10 (2033)	-$77.2	-$15.6	$0.0	**-$92.8**
Year 25 (2048)	-$135.4	-$12.4	-$87.0	**-$234.8**
Year 50 (2073)	$33.3	$103.2	-$154.8	**-$18.3**
Year 75 (2098)	$171.9	$166.3	-$171.1	**$167.0**
Break-even Year	2069	2052	N/A	**2075**

The discount rate used in NPV analysis is fixed and is higher than the inflation rates assumed in the model. As such, net present values further into the future will be discounted at greater rates when compared to the values presented in the chained dollar analysis.

Figure 7 below shows the same values over all time periods, split out by municipal entity.

Figure 7: Net Present Value (NPV) by Year and Entity
(net present value, millions)



5. Long-Term Economic Impact Results

The development of precincts A, B, and D includes employment lands. While precinct A is primarily employment lands, and encompasses most of expected jobs, non-residential uses are also forecasted in precincts B and D. Developed employment lands results in economic output, gross domestic product, wages, increased housing demand, and tax revenue to all three levels of government.

Table 3 summarizes the long-term, ongoing economic impact of a fully built out precinct A, B and D. This represents the assumed net increases in economic outcomes in the region from opening land to development and businesses locating themselves on the land, providing employment, and producing goods and services.

Table 8: Precinct A, B, and D Economic Impact at Full Build Out
(Dollar figures in millions of 2019 dollars)

Description	Value
Net Acres of Employment Lands	613
Jobs	5,694
Economic Output	$1,423.9
Gross Domestic Product (GDP)	$731.3
Wages and Salaries	$286.6
Dwelling Demand	2,064

Please note that this **does not** include the short-term economic impacts associated with the construction of infrastructure, residential, and non-residential structures during the build-out period.

Figure 8 illustrates the economic impact over time in 2019 dollars, in terms of GDP (at market prices), wages and salaries, and gross operating surplus (income accruing to corporations after paying wages and salaries) over time. Figure 9 shows the assumed distribution of employment by land use once fully built out.

Figure 8: Economic Impacts
(2019 Dollars)

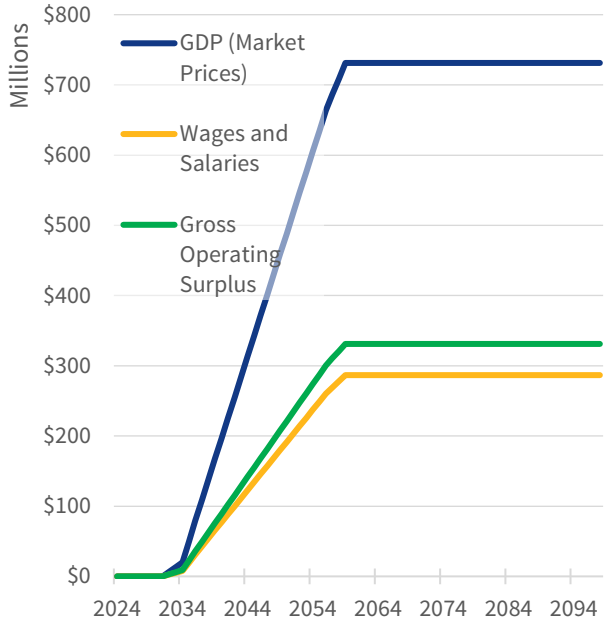


Figure 9: Employment by Land Use
(At Full Build Out)

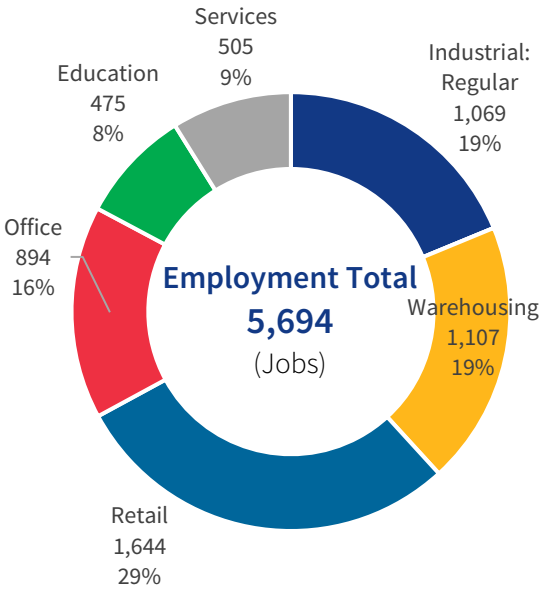


Table 9 shows the impact that the development of these lands has on tax revenue to all three levels of government, by year. These figures are expressed in 2019 dollars at 2019 tax rates (to match the input-output multiplier year).

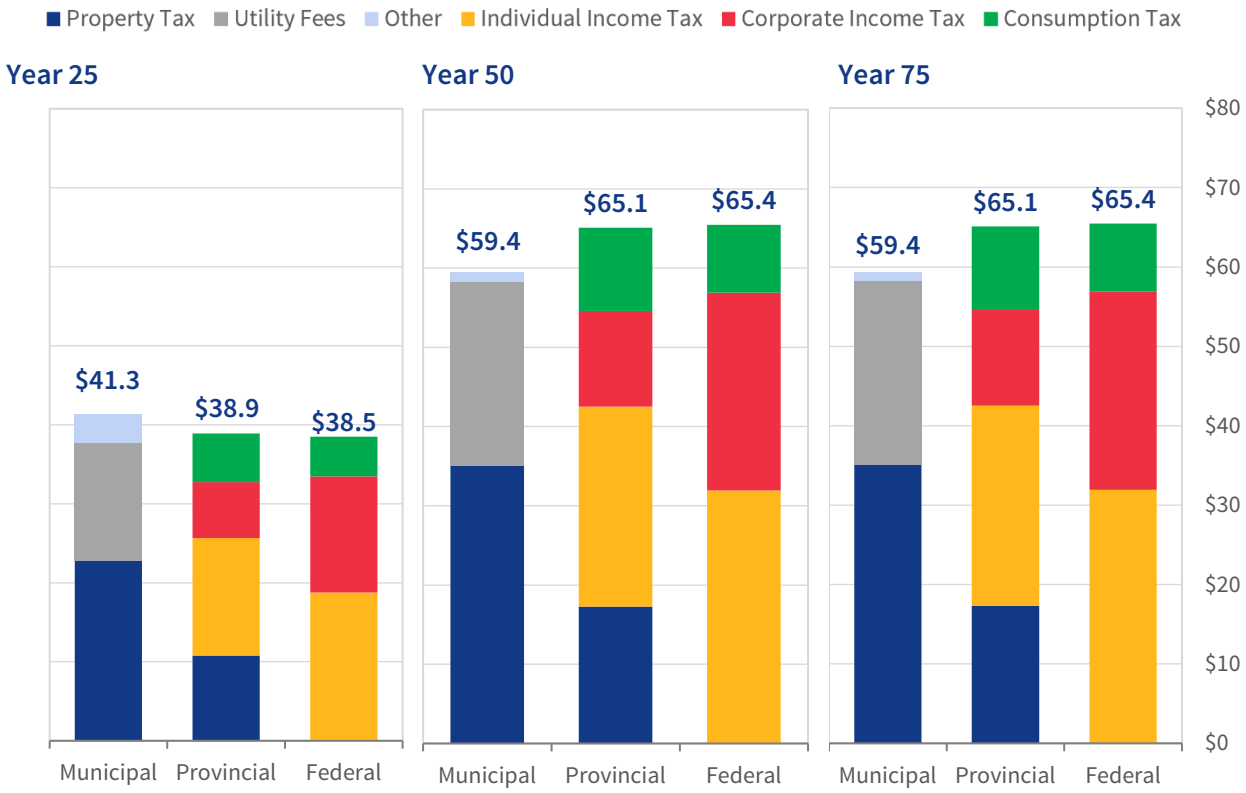
Table 9: In-Year Government Revenues by Year and Level
(Dollar figures in millions of 2019 dollars at 2019 tax rates)

Year	Municipal	Provincial	Federal	Total
Year 1 (2024)	$0.0	$0.0	$0.0	**$0.0**
Year 5 (2028)	$0.0	$0.0	$0.0	**$0.0**
Year 10 (2033)	$4.2	$1.5	$1.2	**$6.9**
Year 25 (2048)	$41.3	$38.9	$38.5	**$118.7**
Year 50 (2073)	$59.4	$65.1	$65.4	**$189.9**
Year 75 (2098)	$59.4	$65.1	$65.4	**$189.9**

For the municipality, this includes within-development revenue from property taxes, frontage levies, permit fees, and utility fees. For the provincial government, it includes revenue from education property taxes (less credits), personal and corporate income taxes (less basic personal amounts), and PST paid for by households out of wages. For the federal government, it includes revenue from personal and corporate income taxes and GST pay for by households out of wages. Figure 10 below illustrates the data in table 9.

Overall, earlier in the analysis period, the municipality is expected to receive a slightly larger share of revenue, primarily due to permit fee revenue and the assumption that precinct A (which is primarily employment lands) will take longer to develop, delaying revenue generation of income taxes and consumption taxes accruing to other levels of government. However, once the area is fully built out, the revenue shares to the municipal, provincial, and federal government are 31.3 per cent, 34.3 per cent, and 34.5 per cent, respectively.

Figure 10: In-Year Government Revenues by Year and Level
(In millions of 2019 dollars at 2019 tax rates)



6. Scenario and Sensitivity Analysis

The financial impact that land development has on a municipality is highly sensitive to the assumptions used. The assumed change in property tax rates and cost of infrastructure are among the two biggest drivers of changes in cashflows. Changes to assumptions in these areas are presented below.

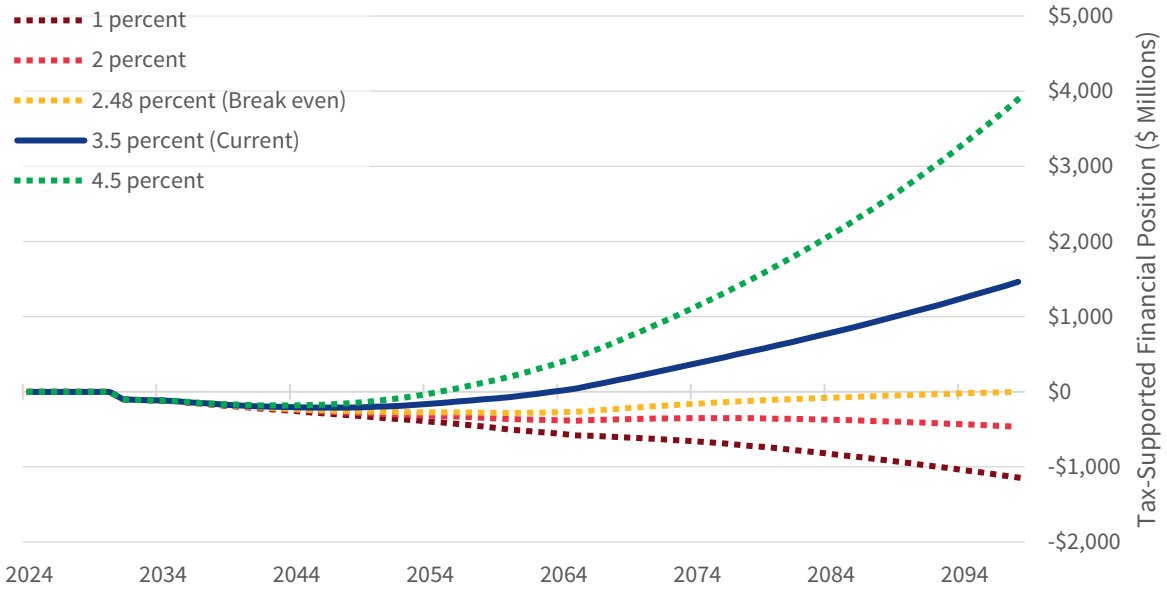
Property Tax Policy Sensitivity

The current model utilizes a 3.5% annual increase in property taxes, based on the policy rate set by the current council. However, since 1991 changes in the property tax policy rate set by council have varied, with increases as high as 9 per cent observed in 1994 and decreases as low as a 2 percent reduction observed for three years from 2000 to 2002. When looking over the last three decades, the average homeowner's property tax bill has increased from $1,184 in 1991 to $2,036 in 2024, representing a compound annual growth rate of 1.9 percent over the last 32 years.

The financial impact on the tax-supported budget of any development will be sensitive to the assumed growth in tax revenue, and as such, various property tax scenarios are presented in chart 11 below (note: utilities and transit are excluded). While there is little variation in the net position of the development in the earlier years, after approximately 30 years there can be a significant departure in outcomes, depending on the assumed growth rate in taxes.

An average annual tax rate of anything below 2.48 percent leads to a net financial loss by year 75, and an annual increase of 2.48 percent leads to a break-even position in tax-supported operations (i.e., cumulative revenue is equal to cumulative expense). The current rate of 3.5 percent is expected to generate a tax-supported surplus of more than $1.4B and adding an additional 1 percent to the tax rate over 75 years would more-than-double the surplus to $3.9B.

Figure 11: Tax-Supported Fiscal Position by Property Tax Policy Rate
(2024 chained dollars, millions)

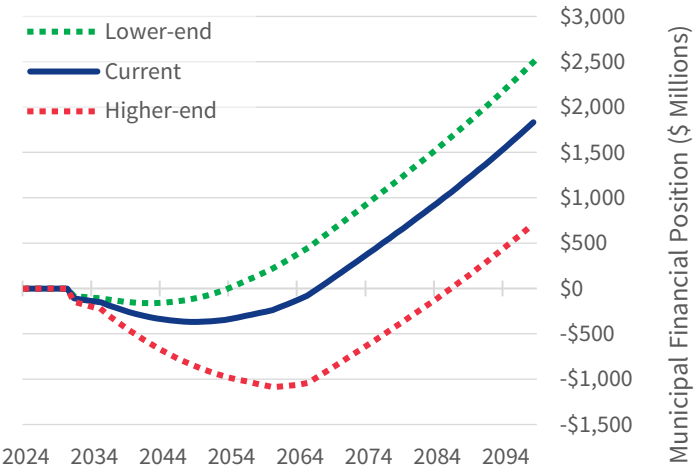


Infrastructure Costs: High and Low Ranges

Capital costs, especially those far in the future, can have significant ranges to their estimates. While the main model assumes the cost estimate midpoint, each class of estimate has its own defined range. Figure 12 shows how the municipal total financial position (all entities) changes if infrastructure costs come in at the low-end of their range and at the high-end of their range. The ranges used are as follows:

- **N/A – high level estimate:** -50% to +100%
- **Class 5:** -50% to +100%
- **Class 3:** -20% to +30%

Figure 12: Municipal Fiscal Position by Infrastructure Costs
(2024 chained dollars, millions)

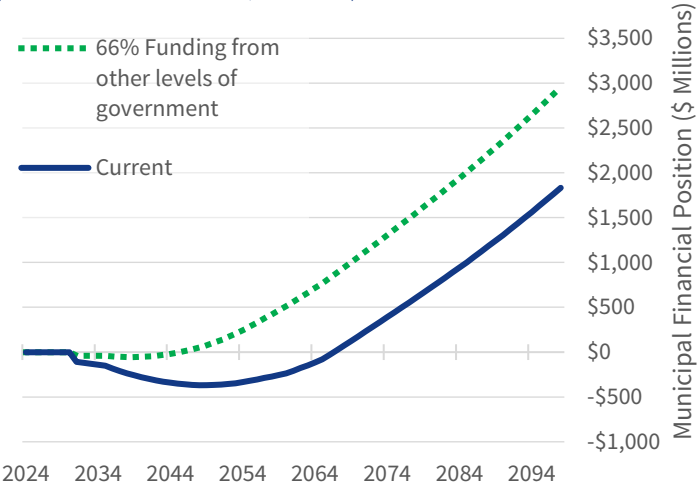


As expected, if all infrastructure costs required to service the development come in at the high end of their range, the fiscal position of the development will be severely deteriorated at the end of 75 years and runs a deficit around one billion dollars for several years. Conversely, its position will improve to a significant degree if all infrastructure costs come in on the low end of their current estimates.

Infrastructure Costs: Cost Sharing with Other Levels of Government

Like infrastructure costs coming in at the lower end, cost-sharing infrastructure with other levels of government who may also stand to benefit from land development can increase the net fiscal position a development to the municipality. Figure 13 below shows how the net fiscal position of the development to the municipality changes if the municipality's cost share of all infrastructure assets is reduced from 100 percent to 37 percent, with the remaining 66 percent come from other levels of government.

Figure 13: Municipal Fiscal Position with Tri-level Funding for Infrastructure
(2024 constant dollars, millions)



In this scenario, the net financial position improves from $1.83B to $2.96B at the end of 75 years, representing a 62 percent increase. The break-even period also occurs much sooner, and the development runs a deficit for a much shorter period.

However, it should be noted that there is only one taxpayer, so this simply represents a transfer of funds from one level of government to another, with provincial and federal taxpayers offsetting the burden to municipal taxpayers in Winnipeg.

7. Concluding Discussion

Conclusion

The development of precincts A, B, and D in northwestern Winnipeg represent an opportunity to enable approximately 1,200 net acres of residential and 600 net acres of employment land development. This would allow for the city to absorb an additional 38,000 people, 15,000 dwelling units, and 5,600 jobs. The addition of these jobs, if they are net new, would add $731 million in GDP to Winnipeg's economy, $287 million in wages, $60 million in annual tax and utility revenue to the municipality, and $65 million in annual revenue to both the provincial and federal governments at full build out.[7]

However, the capital required to service this development is significant: nearly $1.1 billion in municipal assets are required to service or support growth in this quadrant of the city, and $551 million of that is directly attributable to residents and jobs located in these three precincts.[8] Further, of the $1.1 billion in capital costs, the current share of funding from debt assumptions indicate $739 million in new debt would be required. As of the writing of this report, the remaining debt room for the Council-approved debt strategy, inclusive of Administrative Reports under consideration by Council approximates $70 million. These projects would need to seek alternative funding sources.

At the end of 75 years, under current policy decisions and budget trajectories, these three precincts would return a $1.83 billion surplus to the municipality.[9] This equates to an internal rate of return (IRR) of 7.08 per cent, which exceeds both the City's discount rate and long-term borrowing rate of 5.5 per cent. As a reference point, the City's total consolidated revenue in 2023 was $1.89 billion, so this development would, on net, generate approximately one-years worth of city-wide consolidated revenue over the course of 75 years.

As shown in the previous sections, the ultimate financial position of this development is highly dependent on the property tax policies chosen by current and future city councils, final capital costs, and capital cost sharing agreements with other levels of government. These, and other variables can have a material impact on whether the development generates a surplus or deficit from a municipal financial perspective.

Are Greenfield Subdivisions Financially Sustainable?

This report and its current assumptions suggest that the greenfield subdivision under consideration is financially sustainable when taking a long-term municipal perspective; it could generate more revenue than cost over the course of 75 years. However, there are a few caveats to this conclusion:

1) **Historical property taxes in Winnipeg:** On average, historical property tax increases in Winnipeg have been slightly below 2.0% since 1991. At this rate, capital-intensive greenfield subdivisions with high road replacement costs in the future are not financially viable as shown in section 6.
2) **Multiple subdivisions running deficits:** capital-intensive greenfield subdivisions, such as those like precincts A, B, and D, will run a deficit for several years or decades until the development has sufficiently built out and cumulative revenues begin to exceed capital financing and annual operating costs. A municipality with multiple subdivisions that are at various stages of the build out process may mean some or all of them are running deficits to varying degrees

[7] In 2019 dollars at 2019 tax rates.
[8] In 2024 dollars.
[9] In 2024 Chained dollars.

simultaneously. This puts financial pressure on existing areas and may require the municipality to divert funds away from existing areas to help fund and maintain new and recent areas. Alternatively in this scenario, the municipality may underfund new areas and forgo "optional" investments and instead only provide the minimum requirements to enable growth.

3) **Road replacement costs:** properly maintained local and regional roads may only require replacement 75 to 90 years after construction. This analysis only extends 75 years into the future from the present year, and as such, these costs which may be significant are beyond the time horizon analyzed.
4) **Financial surplus after 75 years is marginal:** The current model projects a $1.83 billion municipal financial surplus after 75 years (across all operating entities). This amounts to less than one-year's worth of total consolidated revenue the city received in 2023. So, while a surplus is projected, it is likely insufficient to help significantly address infrastructure or servicing needs in other regions of Winnipeg.
5) **Transit Service running deficits:** It is anticipated that feeder routes to suburban greenfield subdivisions have only approximately 20 percent revenue recovery, owing to development layouts and densities that do not necessarily encourage high transit ridership. However, it may be possible to incorporate design considerations into layouts and densities that could encourage higher transit ridership, resulting in higher cost recovery for transit service and lower operating deficits that require taxpayers elsewhere to subsidize transit service delivery.
6) **Each development is unique:** the capital required to service each development is unique and may change over time. As such, broad conclusions about costs and revenues associated with different forms or types of growth should not be made and each development examined individually.

Given the above considerations, caution should be used when making conclusions about whether a particular greenfield subdivision is financially sustainable or not, and what constitutes as financial sustainability.

Finally, the financial analysis only provides a single perspective, which is the financial impact a development has on a municipality. There may be aspects of greenfield subdivisions that have a broader impact on the socioeconomic well-being of society, including perceived negative impacts such as car dependency, constraining mode shift, and not enhancing the vibrancy of mature neighbourhoods, and perceived positive aspects such as ground-orientated and single-detached housing, and generally quieter and more spacious environments.

Demand for Greenfield Residential Subdivisions and Employment Lands

While accommodating precincts A, B, and D may be costly with the break-even year several decades into the future, the alternative is to not accommodate this set of greenfield residential subdivisions and employment lands. However, this may present a problem to the municipality, because demand for single and multi-family homes in greenfield settings will continue to exist, and be absorbed to a degree, whether the city accommodates the development or not.

If greenfield subdivisions are not accommodated within the City of Winnipeg, development in the northern region around Winnipeg may still be absorbed into the surrounding municipalities such as

Rosser, West St. Paul, and East St. Paul. Many of these residents work, shop, and travel to and within the City of Winnipeg using the city's municipal assets and contributing to their deprecation, but do not pay corresponding property taxes and frontage levies to the City of Winnipeg to assist with their upkeep.

Historically, homeowner and condominium absorptions in the Winnipeg CMA have averaged over 2,600 units per year since 2010 with over 80 percent of absorptions being within the City of Winnipeg.[10] Demand for this type of development will continue to exist in Winnipeg and the surrounding areas, and not accommodating this growth within city limits will not necessarily mitigate the demand, but rather encourage it to take place in other surrounding municipalities. This still puts pressure on city services and infrastructure, with no commensurate revenue to recover these costs.

Further, the Complete Communities Direction Strategy 2.0 provides the following reasons as to why accommodating greenfield development is necessary:

- Due to their large size and property ownership, greenfield development can accommodate many dwelling units in a reliable and predicable way, where a single greenfield site can accommodate thousands of units
- In contrast, infill development is more sporadic, and there is greater uncertainty in the approvals process and the economics of land development. Moreover, individual sites can accommodate far fewer units, and as such is a less reliable supply of land.
- Without greenfield to accommodate single-family homes, unmet demand would increase the cost of housing in Winnipeg, have negative environmental consequences for the Winnipeg region as the distance between residences and city amenities would lengthen as development shifts to rural municipalities, and it would limit Winnipeg's ability to collect revenue to address the increased demand on city services spurred by this increased exurban growth.

Greenfield land is needed to accommodate demand for ground-orientated dwellings, which includes single-detached, semi-detached, and row housing. From 2018 to 2022, greenfield development accounted 77 percent of new singles, 87 percent of new semis, and 65 percent of new rows. Infill areas alone cannot accommodate demand for these dwelling types as they are too land intensive.[11]

Finally, the servicing and development of the employment lands within precinct A would act as a complement to the nearby CentrePort Canada, as both areas provide strategic access to nearby transportation networks that are important to logistics-orientated industries such as transportation, warehousing, wholesale trade, and manufacturing.

[10] Source: CMHC Starts and Completions Survey.
[11] Source: City of Winnipeg 2023 Complete Communities Land Monitoring Report.

Report Appendices

Appendix A: Summary of Assumptions

The tables below provide a summary and sources for the key assumptions used in this analysis.

Summary of Chained Dollar Cashflow and NPV Analysis Assumptions

Category	Metric	*Unit*	Value	Source
Financial	Analysis Start Year	*Year*	2024	1
	Analysis End Year	*Year*	2098	1
	Discount Rate	*%*	5.50%	2
	Operating Inflation Rate	*%*	2.00%	1
	Capital Inflation Rate	*%*	3.00%	1
	30 Year External Debt Issuance	*%*	5.50%	2
	Sinking Fund Rate	*%*	1.78%	2
Municipal Policy Rates	Starting Mill Rate	*Mill Rate*	13.352	3
	Annual Property Tax Change	*%*	3.50%	N/A - Current Council Policy
	Starting Frontage Levy	*$/combined frontage foot*	$6.95	3
	Annual Frontage Levy Change	*%*	3.96%	N/A - Current Council Policy*
	Business Taxes Calculated	*Yes/No*	No	N/A - Current Council Policy
	Business Tax Growth Rate	*%*	0.00%	N/A - Current Council Policy
	Starting Water Rate	*$/m³*	$2.04	4
	Annual Water Rate Change†	*%*	2.00%	1
	Starting Sewer Rate	*$/m³*	$3.21	4
	Annual Sewer Rate Change†	*%*	2.00%	1
	Annual Permit Rate Change	*%*	2.54%	1
	Utility Dividend Rate	*%*	11.00%	N/A - Current Council Policy
Operating Costs	Tax-Supported, population	*2024 Dollars, per-capita*	$596	1, 5
	Tax-Supported, employment	*2024 Dollars, per-employment*	$505	1, 6
	Water Treatment Costs	*2024 Dollars per Ml*	$1,190	7
	Wastewater Treatment Costs	*2024 Dollars per Ml*	$1,357	7
Residential Development Characteristics	Single-detached	*Population/Net Acre (Dwellings/Net Acre)*	21 (7.3)	1, 8, 9
	Semi-detached	*Population/Net Acre (Dwellings/Net Acre)*	50 (14)	1, 8, 9
	Rowhouse	*Population/Net Acre (Dwellings/Net Acre)*	42 (23)	1, 8, 9
	Apartments Below 5 Stories	*Population/Net Acre (Dwellings/Net Acre)*	75 (37.5)	1, 8, 9
	Apartments 5 or More Stories	*Population/Net Acre (Dwellings/Net Acre)*	75 (37.5)	1, 8, 9
	Industrial	*Employment/Net Acre*	8.9	1, 8, 9
	Warehousing	*Employment/Net Acre*	8.9	1, 8, 9

Non-Residential Development Characteristics	Retail	*Employment/Net Acre*	3.1	1, 8, 9
	Office	*Employment/Net Acre*	25.5	1, 8, 9
	Education	*Employment/Net Acre*	37.4	1, 8, 9
	Services	*Employment/Net Acre*	19.8	1, 8, 9
	Primary	*Employment/Net Acre*	25.3	1, 8, 9
Road Lifecycle Maintenance Costs	Local Residential Streets	*Lifecycle Maint. Cost per m3 in 2024 Dollars*	$335	10
	Local Non-Residential Streets	*Lifecycle Maint. Cost per m3 in 2024 Dollars*	$335	10
	Collector Roads	*Lifecycle Maint. Cost per m3 in 2024 Dollars*	$365	10
	Industrial Roads	*Lifecycle Maint. Cost per m3 in 2024 Dollars*	$510	10
	Regional Roads	*Lifecycle Maint. Cost per m3 in 2024 Dollars*	$605	10

Table Notes:
* Represents the compound annual growth rate in the frontage levy by it going from $5.45 in 2022 to an anticipated $6.95 by the end of 2026, which equates to a compound annual growth rate of 3.96% over that timeframe. Therefore, a $6.95 combined rate is assumed until the end of 2026, with a growth rate of 3.96% taking effect in 2027 and beyond.
† Annual increase only takes affect in years beyond the most current Council-approved Water and Sewer rate report.

Summary of Long-Term Economic Impact Analysis Assumptions‡

Category	Metric	Unit	Value	Source
Dwelling Demand	Dwellings demanded per employment	*per-employment*	0.3625	1, 6, 11
Municipal Rates	Municipal Mill Rate in 2019	*Mill Rate*	13.29	3
	Municipal Combined Frontage Rate (per foot) in 2019	*$ per frontage foot*	$5.45	3
	Municipal Water Rate in 2019	*$ per m3*	$1.82	4
	Municipal Sewer Rate in 2019	*$ per m3*	$2.80	4
Education Property Taxes	School Division Education Support Mill Rate	*Mill Rate*	9.82	3
	School Division Special Levy	*Mill Rate*	16.725	3
	Annual Property Tax Change	*%*	0.00%	1
	Residential Rebate	*$/dwelling*	$1,500§	12
	Non-Residential Rebate	*N/A*	$0	N/A
Personal Income Taxes	Provincial Tax Brackets	*Tax Year Used*	2019	N/A
	Federal Tax Brackets	*Tax Year Used*	2019	N/A
Corporate Income Taxes	Provincial Corporate Income Tax	*as % of gross operating surplus*	3.64%	13, 14
	Federal Corporate Income Tax	*as % of gross operating surplus*	7.53%	13, 14
Consumption Taxes	PST Revenue	*as % of household gross income*	3.67%	13, 15, 16
	GST Revenue	*as % of household gross income*	2.99%	13, 15, 16

Table Notes:
‡ Data is tied to the year used for Statistics Canada's input-output multipliers. In this case, 2019 was the year used. As such, all policy and tax rates used should reflect the 2019 calendar year.
§ Due to the magnitude of the change in education property tax credits in 2024 ($1,500/dwelling) versus 2019 ($700/dwelling), the 2024 tax credit is used to prevent significantly overstating provincial government education property tax revenue.

Weighted Input-output Direct Multipliers by Land Use

Land use	Jobs per Million Dollars of Output (2019 Dollars)	Gross Domestic Product per Dollar of Output (Market Prices) (2019 Dollars)	Wages and Salaries per Dollar of Output (2019 Dollars)	Gross Operating Surplus per Dollar of Output (2019 Dollars)	Source
Industrial	2.879	0.349	0.164	0.139	1, 18
Warehousing	3.838	0.505	0.209	0.233	1, 18
Retail	8.494	0.655	0.339	0.249	1, 18
Office	2.496	0.547	0.153	0.257	1, 18
Education	18.667	0.591	0.320	0.108	1, 18
Services	3.094	0.629	0.179	0.385	1, 18
Primary	2.185	0.923	0.203	0.570	1, 18

Source List

Source Number	Source
1	City of Winnipeg Economic Development and Policy calculations
2	City of Winnipeg Corporate Finance Department
3	City of Winnipeg Assessment and Taxation Department
4	City of Winnipeg Water & Waste Department
5	Statistics Canada, Table 17-10-0155-01, Population estimates, July 1, by census subdivision, 2021 boundaries
6	Statistics Canada, Table 14-10-0393-01, Labour force characteristics, annual (Winnipeg Economic Region)
7	Municipal Benchmarking Network (MBN) Canada, Water and Wastewater Treatment Benchmarks
8	City of Winnipeg Property, Planning and Development Department
9	Statistics Canada, 2021 Census of Population
10	City of Winnipeg Public Works Department
11	Canada Mortgage and Housing Corporation (CMHC) Starts and Completion Survey
12	Manitoba Finance
13	Statistics Canada, Table 36-10-0221-01, Gross domestic product, income-based, provincial and territorial, annual
14	Statistics Canada, Table 36-10-0450-01, Revenue, expenditure and budgetary balance - General governments, provincial and territorial economic accounts
15	Statistics Canada, Table 36-10-0224-01, Household sector, current accounts, provincial and territorial, annual
16	Statistics Canada, Table 36-10-0432-01, Detailed household final consumption expenditure - sales taxes and expenditure excluding sales taxes, provincial and territorial, annual
17	Statistics Canada, Table 14-10-0204-01, Average weekly earnings by industry, annual
18	Statistics Canada, Table 36-10-0113-01, Input-output multipliers, provincial and territorial, summary level

Appendix B: General Analysis Limitations

There are several limitations to the current report, including the following:

- **Unknown Counterfactual Scenarios:** This report provides cost and revenue projections for only one study area of population and employment growth. What is not known is the cost and revenue associated with alternative forms of growth, and whether there may more costly or more efficient ways of enabling population and economic growth within the municipal boundary.
- **Projection Accuracy:** Like many projections, financial impact analysis faces limitations as it tries to predict how future costs and revenues will evolve based only on information available today. The objective of financial and economic impact analysis is to translate current budgetary, policy, and economic reality and cast it forward onto a proposed development to better understand how the future may look under today's reality, which is best used when evaluating multiple proposals to compare against one another. Every financial analysis is subject to making assumptions about the future that may change at any point in time. Assumptions about operating or capital costs may be augmented by things such as decisions made by future City Council's, cost estimate updates, or changes in funding agreements with other levels of government. While every effort is made to develop reasonable assumptions based on current knowledge, a change in assumptions may alter the projections provided in this report. This analysis attempts to quantify the financial costs and revenues of long-term infrastructure and land servicing projects. The actual revenues and costs are unknown until they are realized. Readers should familiarize themselves with the assumptions used in the modelling and calculations for this report as any deviation from these assumptions could result in outcomes different from those projected.

Appendix C: Summary of Cashflows

Figures in $ Millions, 2024 Chained Dollars (unless otherwise noted)

Year	Revenue Cashflows					Expenditure Cashflows					Net Cashflows		
	Prop. Tax & Font. Lev.	Utility Fees	Transit Fares	Other	**Total Revenue**	Operating	Road Network	Capital	Capital Maint.	**Total Expend.**	**Net**	Cumulative Net	NPV
2024	$0.0	$0.0	$0.0	$0.0	**$0.0**	$0.0	$0.0	$0.0	$0.0	**$0.0**	**$0.0**	$0.0	$0.0
2025	$0.0	$0.0	$0.0	$0.0	**$0.0**	$0.0	$0.0	$0.0	$0.0	**$0.0**	**$0.0**	$0.0	$0.0
2026	$0.0	$0.0	$0.0	$0.0	**$0.0**	$0.0	$0.0	$0.0	$0.0	**$0.0**	**$0.0**	$0.0	$0.0
2027	$0.0	$0.0	$0.0	$0.0	**$0.0**	$0.0	$0.0	$0.0	$0.0	**$0.0**	**$0.0**	$0.0	$0.0
2028	$0.0	$0.0	$0.0	$0.0	**$0.0**	$0.0	$0.0	$0.0	$0.0	**$0.0**	**$0.0**	$0.0	$0.0
2029	$0.0	$0.0	$0.0	$0.0	**$0.0**	$0.0	$0.0	$0.0	$0.0	**$0.0**	**$0.0**	$0.0	$0.0
2030	$0.0	$0.0	$0.0	$0.0	**$0.0**	$0.0	$0.0	$0.0	$0.0	**$0.0**	**$0.0**	$0.0	$0.0
2031	$0.0	$0.0	$0.0	$0.0	**$0.0**	$0.0	$0.0	$106.7	$1.0	**$107.7**	**-$107.7**	-$107.7	-$75.4
2032	$1.4	$1.0	$0.0	$1.7	**$4.0**	$1.1	$0.1	$14.1	$1.0	**$16.3**	**-$12.3**	-$119.9	-$84.7
2033	$2.8	$2.0	$0.0	$1.8	**$6.5**	$2.2	$0.1	$14.1	$1.0	**$17.5**	**-$11.0**	-$130.9	-$92.8
2034	$4.2	$2.9	$0.0	$1.8	**$8.9**	$3.3	$0.2	$15.1	$1.0	**$19.6**	**-$10.7**	-$141.7	-$100.5
2035	$5.9	$4.2	$0.0	$2.6	**$12.7**	$4.7	$0.3	$17.1	$1.0	**$23.0**	**-$10.4**	-$152.0	-$107.9
2036	$8.2	$5.8	$1.6	$3.4	**$18.9**	$12.9	$0.4	$37.1	$1.0	**$51.4**	**-$32.4**	-$184.5	-$131.7
2037	$10.5	$7.4	$1.6	$3.5	**$22.9**	$14.7	$0.4	$32.9	$1.0	**$49.0**	**-$26.1**	-$210.6	-$150.0
2038	$12.8	$9.0	$1.6	$3.6	**$27.0**	$16.6	$0.5	$34.0	$1.0	**$52.1**	**-$25.1**	-$235.7	-$167.0
2039	$15.2	$10.5	$1.6	$3.7	**$31.0**	$18.4	$0.6	$34.0	$1.0	**$54.0**	**-$23.0**	-$258.7	-$181.8
2040	$17.6	$12.0	$1.6	$3.9	**$35.1**	$20.3	$0.7	$34.0	$1.0	**$56.0**	**-$20.9**	-$279.5	-$194.5
2041	$20.1	$13.6	$1.6	$4.0	**$39.2**	$22.2	$0.8	$34.0	$1.0	**$58.0**	**-$18.7**	-$298.3	-$205.4
2042	$22.6	$15.1	$1.6	$4.1	**$43.4**	$24.1	$0.9	$34.0	$1.0	**$60.0**	**-$16.6**	-$314.8	-$214.4
2043	$25.2	$16.6	$1.6	$4.3	**$47.6**	$26.0	$1.0	$34.0	$1.0	**$62.0**	**-$14.4**	-$329.2	-$221.7
2044	$27.8	$18.1	$1.6	$4.4	**$51.8**	$28.0	$1.0	$34.0	$1.0	**$64.0**	**-$12.2**	-$341.4	-$227.3
2045	$30.4	$19.6	$1.5	$4.5	**$56.1**	$30.0	$1.1	$34.0	$1.0	**$66.1**	**-$10.0**	-$351.4	-$231.3
2046	$33.2	$21.0	$1.5	$4.7	**$60.4**	$32.0	$1.2	$34.0	$1.0	**$68.2**	**-$7.7**	-$359.2	-$233.9
2047	$36.0	$22.5	$1.5	$4.8	**$64.8**	$34.0	$1.3	$34.0	$1.0	**$70.3**	**-$5.5**	-$364.6	-$235.0
2048	$38.8	$24.0	$1.5	$4.9	**$69.2**	$36.1	$1.3	$34.0	$1.0	**$72.4**	**-$3.2**	-$367.8	-$234.8
2049	$41.7	$25.4	$1.5	$5.0	**$73.7**	$38.0	$1.4	$34.0	$1.0	**$74.4**	**-$0.7**	-$368.5	-$233.2
2050	$44.7	$26.9	$1.5	$5.2	**$78.3**	$40.1	$1.5	$34.0	$1.0	**$76.5**	**$1.7**	-$366.8	-$230.4
2051	$47.7	$28.3	$1.5	$5.3	**$82.9**	$42.2	$1.5	$34.0	$1.0	**$78.7**	**$4.2**	-$362.6	-$226.5
2052	$50.8	$29.8	$1.5	$5.4	**$87.5**	$44.3	$1.6	$34.0	$1.0	**$80.9**	**$6.7**	-$355.9	-$221.4
2053	$54.0	$31.2	$1.5	$5.6	**$92.3**	$46.4	$1.7	$34.0	$1.0	**$83.1**	**$9.2**	-$346.7	-$215.3
2054	$57.3	$32.7	$1.5	$5.7	**$97.1**	$48.6	$1.7	$34.0	$1.0	**$85.3**	**$11.8**	-$334.9	-$208.2
2055	$60.6	$34.1	$1.5	$5.8	**$102.0**	$50.7	$1.8	$34.0	$1.0	**$87.5**	**$14.5**	-$320.4	-$200.1
2056	$64.0	$35.5	$1.5	$5.9	**$106.9**	$52.9	$1.9	$34.0	$1.0	**$89.7**	**$17.2**	-$303.2	-$191.1
2057	$65.1	$35.8	$1.5	$3.8	**$106.1**	$53.4	$2.1	$34.0	$1.0	**$90.5**	**$15.6**	-$287.6	-$182.8
2058	$66.2	$36.0	$1.5	$3.8	**$107.4**	$53.9	$2.4	$34.0	$1.0	**$91.3**	**$16.2**	-$271.4	-$174.3

2059	$67.3	$36.2	$1.4	$3.9	**$108.8**	$54.4	$2.6	$34.0	$1.0	**$92.0**	**$16.8**	-$254.6	-$165.7
2060	$68.1	$36.1	$1.4	$3.2	**$108.8**	$54.7	$2.9	$34.0	$1.0	**$92.5**	**$16.3**	-$238.4	-$157.4
2061	$68.9	$36.1	$1.4	$3.2	**$109.5**	$54.9	$3.2	$19.8	$1.0	**$79.0**	**$30.5**	-$207.9	-$147.0
2062	$69.7	$36.1	$1.4	$3.2	**$110.4**	$55.2	$3.6	$19.8	$1.0	**$79.7**	**$30.7**	-$177.2	-$136.8
2063	$70.5	$36.1	$1.4	$3.1	**$111.2**	$55.4	$4.0	$19.8	$1.0	**$80.3**	**$30.9**	-$146.3	-$126.9
2064	$71.4	$36.1	$1.4	$3.1	**$112.0**	$55.7	$4.4	$18.8	$1.0	**$79.9**	**$32.1**	-$114.2	-$116.9
2065	$72.2	$36.1	$1.4	$3.1	**$112.9**	$56.0	$4.8	$16.9	$1.0	**$78.6**	**$34.3**	-$79.9	-$106.9
2066	$73.1	$36.1	$1.4	$3.1	**$113.8**	$56.2	$5.2	$1.1	$1.0	**$63.5**	**$50.3**	-$29.7	-$94.8
2067	$74.1	$36.1	$1.4	$3.1	**$114.7**	$56.5	$5.6	$1.1	$1.0	**$64.2**	**$50.5**	$20.8	-$83.0
2068	$75.0	$36.1	$1.4	$3.1	**$115.6**	$56.7	$6.0	$0.0	$1.0	**$63.7**	**$51.9**	$72.7	-$71.4
2069	$76.0	$36.1	$1.4	$3.1	**$116.6**	$57.0	$6.4	$0.0	$1.0	**$64.4**	**$52.2**	$124.9	-$60.1
2070	$76.9	$36.1	$1.4	$3.1	**$117.5**	$57.3	$6.8	$0.0	$1.0	**$65.1**	**$52.5**	$177.3	-$49.2
2071	$77.9	$36.1	$1.4	$3.1	**$118.5**	$57.5	$7.2	$0.0	$1.0	**$65.8**	**$52.7**	$230.1	-$38.6
2072	$78.9	$36.1	$1.4	$3.1	**$119.5**	$57.8	$7.6	$0.0	$1.0	**$66.4**	**$53.0**	$283.1	-$28.3
2073	$79.9	$36.1	$1.4	$3.1	**$120.4**	$58.1	$8.0	$0.0	$1.0	**$67.1**	**$53.3**	$336.4	-$18.3
2074	$80.8	$36.1	$1.4	$3.1	**$121.4**	$58.4	$8.4	$0.0	$1.0	**$67.8**	**$53.6**	$390.0	-$8.6
2075	$81.8	$36.1	$1.4	$3.0	**$122.4**	$58.7	$8.8	$0.0	$1.0	**$68.5**	**$53.9**	$443.9	$0.8
2076	$82.8	$36.1	$1.4	$3.0	**$123.4**	$59.0	$9.2	$0.0	$1.0	**$69.2**	**$54.2**	$498.1	$9.9
2077	$83.8	$36.1	$1.4	$3.0	**$124.3**	$59.2	$9.6	$0.0	$1.0	**$69.9**	**$54.5**	$552.5	$18.8
2078	$84.8	$36.1	$1.4	$3.0	**$125.3**	$59.5	$10.0	$0.0	$1.0	**$70.6**	**$54.8**	$607.3	$27.4
2079	$85.8	$36.1	$1.4	$3.0	**$126.3**	$59.8	$10.4	$0.0	$1.0	**$71.3**	**$55.1**	$662.4	$35.7
2080	$86.8	$36.1	$1.4	$3.0	**$127.3**	$60.1	$10.8	$0.0	$1.0	**$72.0**	**$55.4**	$717.7	$43.8
2081	$87.8	$36.1	$1.4	$3.0	**$128.3**	$60.4	$11.2	$0.0	$1.0	**$72.7**	**$55.7**	$773.4	$51.7
2082	$88.9	$36.1	$1.4	$3.0	**$129.3**	$60.7	$11.3	$0.0	$1.0	**$73.0**	**$56.3**	$829.7	$59.4
2083	$89.9	$36.1	$1.4	$3.0	**$130.4**	$61.1	$11.3	$0.0	$1.0	**$73.4**	**$57.0**	$886.7	$67.0
2084	$91.0	$36.1	$1.4	$3.0	**$131.4**	$61.4	$11.4	$0.0	$1.0	**$73.7**	**$57.7**	$944.3	$74.5
2085	$92.0	$36.1	$1.4	$2.9	**$132.5**	$61.7	$11.4	$0.0	$1.0	**$74.1**	**$58.4**	$1,002.7	$81.8
2086	$93.1	$36.1	$1.4	$2.9	**$133.5**	$62.0	$11.4	$0.0	$1.0	**$74.4**	**$59.1**	$1,061.8	$89.0
2087	$94.2	$36.1	$1.4	$2.9	**$134.6**	$62.3	$11.4	$0.0	$1.0	**$74.7**	**$59.8**	$1,121.7	$96.1
2088	$95.3	$36.1	$1.4	$2.9	**$135.7**	$62.6	$11.4	$0.0	$1.0	**$75.1**	**$60.6**	$1,182.3	$103.1
2089	$96.4	$36.1	$1.4	$2.9	**$136.8**	$63.0	$11.4	$0.0	$1.0	**$75.4**	**$61.4**	$1,243.6	$110.0
2090	$97.5	$36.1	$1.4	$2.9	**$137.9**	$63.3	$11.4	$0.0	$1.0	**$75.7**	**$62.2**	$1,305.8	$116.7
2091	$98.6	$36.1	$1.4	$2.9	**$139.0**	$63.6	$11.4	$0.0	$1.0	**$76.0**	**$63.0**	$1,368.8	$123.4
2092	$99.8	$36.1	$1.4	$2.9	**$140.1**	$64.0	$11.4	$0.0	$1.0	**$76.4**	**$63.8**	$1,432.5	$129.9
2093	$100.9	$36.1	$1.4	$2.9	**$141.3**	$64.3	$11.4	$0.0	$1.0	**$76.7**	**$64.6**	$1,497.1	$136.3
2094	$102.1	$36.1	$1.4	$2.8	**$142.4**	$64.6	$11.4	$0.0	$1.0	**$77.0**	**$65.4**	$1,562.5	$142.7
2095	$103.3	$36.1	$1.4	$2.8	**$143.6**	$65.0	$11.3	$0.0	$1.0	**$77.3**	**$66.3**	$1,628.8	$148.9
2096	$104.5	$36.1	$1.4	$2.8	**$144.8**	$65.3	$11.3	$0.0	$1.0	**$77.7**	**$67.1**	$1,695.9	$155.0
2097	$105.7	$36.1	$1.4	$2.8	**$146.0**	$65.7	$11.3	$0.0	$1.0	**$78.0**	**$68.0**	$1,763.8	$161.1
2098	$106.9	$36.1	$1.4	$2.8	**$147.2**	$66.1	$11.3	$0.0	$1.0	**$78.4**	**$68.8**	$1,832.7	$167.0

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