Transportation Background Report

Niagara Region 2022 Development Charge Update

Niagara Region

FINAL
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1 Introduction

The Niagara Region has retained WSP Canada Inc. in association of HDR Corporation to develop a travel demand model using a new activity based GTAModel V4.0, and prepare a Transportation Background Study Report in accordance with the Development Charges Act, 1997, as amended (D.C.A.) and associated regulations.

This 2022 Development Charges Update Transportation Background Study (herein referred to as the "Transportation DC Background Study") was prepared by HDR Corporation, identify the growth-related capital costs of the Regional road network for 2022 to 2041. The recommended 2041 transportation network identified through the Region's ten-year Capital Plan and Region's 2017 Transportation Master Plan (TMP) Study form the basis of the roads and roads-related capital program for Niagara Region's Development Charge (D.C.). This report documents

- approaches utilized to assess the historical service levels for the transportation services and determining the increased needs arising from development by assessing future service levels;
- deduction and allocations of costs (i.e., growth vs. non-growth, residential vs. non-residential) and for the roads and related capital program for input to the Development Charge Background Study for the update of the Region's D.C. By-law.

2 Road Infrastructure Costing Methodology

This section describes the road construction costs and other road-related construction costs. The road construction costs represent the cost for a curb-to-curb construction including excavation, granular, asphalt, curb and gutter, manhole, catch basin, etc. Other road-related construction items include traffic signals, structures, illumination, multi-usage path, roundabout, etc.

2.1 Road Construction Costs

The road construction costs for future projects were estimated by the Region's Transportation Services Division based on the recent contracts awarded by the Region and types of improvements identified in the Region's ten-year capital program and 2017 Transportation Master Plan.

2.2 Unit Costs for Historical Infrastructure Values

To estimate the historical infrastructure values and asset management plans for the roads and road-related infrastructures and associated replacement costs, the following items were included in this study:

Traffic Signals

The unit price of $400,000 for a new signal installation per intersection was used in this study, which was estimated based on the Region's recent contracts.

Structures

The structure construction costs for bridge and culvert were estimated based on the replacement values derived from the Region's 2016 Assets Management Plan. The NRBCPI received from the Region was applied to the structure construction costs to reflect the current (2022) currency value.

Illumination

The unit price for illumination of $8,500 per light pole (2016 currency value) was provided by the Region. The NRBCPI received from the Region was applied to this unit price to reflect the current (2022) currency value.

Multi-Usage Path

The construction cost for multi-usage path of $ $1,584,300 per kilometer was derived from two recent construction contracts carried out within the Region.

Roundabout

The construction cost of $4.3 million for a modern roundabout was used in this study, which was estimated based on the recently constructed roundabouts in the Niagara Region.

Road Right-of-Way Property

The value of the road right-of-way was estimated and provided by the Region based on recent land purchases at high-level. The unit prices are $450, $400, and $350 per square meter of the right-of-way area for a roadway within urban, sub-urban, and rural environment, respectively.

The unit prices considered in the road construction were revised from the Region and reflect the most-recent average prices. The unit prices for basic construction items are presented in Table A-1 in **Appendix A**.

The historical road infrastructure values were estimated based on the Region's 2016 Assets Management Plan. The unit prices are $250/ $250/ $115 per square meter of the asphalt area for a roadway with urban/ sub-urban/ rural environment, respectively. It is noted these unit prices represent the 2016 currency value; the Non-Residential Building Construction Price Index (NRBCPI) received from the Region was applied to the unit prices to reflect the current (2022) currency value.

3 Roads and Road-Related Service Levels

3.1 Measuring Roads and Road-Related Historical Service Levels

The Development Charges Act, 1997 and associated regulations require that analysis be undertaken to determine the average service level that has been provided over the last ten years and that the service level that is applied to future growth cannot exceed the ten-year historical average. The following three different types of service level methodologies were utilized for the Transportation DC Study to provide justification for the proposed road and road-related program:

- Average Vehicles per Lane,
- Lane-Kilometers per Population and Employment, and
- Historical road infrastructure value (incorporates a total value for all road related infrastructure)

The road service level methodologies (i.e., utilizing average vehicles per lane, and lane-kilometers per population and employment) are the most commonly used service level methodologies, which have been used by many other municipalities for the transportation background studies completed for the Development Charges Updates.

3.1.1 Average Vehicles per Lane

The 'Average Vehicle Per Lane' service level measure consists in determining the average daily vehicles per lane for the major road network over the past ten years. This approach utilizes traffic databases compiled by the Region that include daily traffic counts by major road segments (sections) for Regional Roads for each year from 2012 to 2019. Traffic volumes on Regional Roads for the last three years were affected due to COVID-19 pandemic and therefore, do not represent the normal conditions. The traffic demands for 2020 to 2022 were estimated based on the historical traffic growth rates observed for each segment of Regional Roads.

These historical traffic volumes were used together with the number of lanes and length of each road segment (section) to calculate the daily vehicle kilometers travelled and lane kilometers for each road section. The vehicle kilometer and lane kilometer totals for the Regional Road network were used to calculate the average daily traffic per lane for each of the analyzed years.

The average ten-year historical service level was established by averaging the service levels for each of the ten years. This approach is consistent with the Region's previous development charge study. The ten-year average historical vehicle per lane is presented in **Table 3-1**.

Table 3-1: Ten-Year Historical Average Vehicle per Lane

Year	Lane km	Vehicle km	Average Vehicle / Lane
2012	1,657	4,518,241	2,726
2013	1,659	4,492,553	2,709
2014	1,660	4,507,339	2,715
2015	1,662	4,582,591	2,757
2016	1,663	4,682,197	2,815
2017	1,664	4,804,448	2,887
2018	1,667	4,877,778	2,927
2019	1,669	4,930,907	2,955
2020	1,671	4,979,406	2,980
2021	1,673	5,029,214	3,006
Average	**1,665**	**4,740,467**	**2,848**

3.1.2 Lane Kilometer per Capita (Population and Employment)

The second service level measure used to assess the ten-year historical service level for the Region's road network consists of measuring lane kilometer per capital (including population and employment). As with the vehicles per lane measure, the lane kilometer per population and employment measure is based on the average ten-year historical (2012 to 2021) lane kilometer per population and employment for the major road system using the Region's population and employment totals for the respective years.

The ten-year historical lane kilometers per population and employment are presented in **Table 3-2**. The detailed vehicle kilometer and lane kilometer data used to calculate the historical service levels are document in **Appendix B**.

Table 3-2: Ten-Year Historical Lane-Kilometers per Population and Employment

Year	Lane km	Population	Employment	Total Capita (Pop. + Emp.)	Lane km per 1,000 Capita
2012	1,657	434,017	186,700	620,717	2.67
2013	1,659	436,476	187,760	624,236	2.66
2014	1,660	439,912	188,830	628,742	2.64
2015	1,662	443,636	189,890	633,526	2.62
2016	1,663	447,888	190,950	638,838	2.60
2017	1,664	454,451	192,600	647,051	2.57
2018	1,667	460,273	194,250	654,523	2.55
2019	1,669	465,930	195,910	661,840	2.52
2020	1,671	473,012	197,560	670,572	2.49
2021	1,673	478,957	199,210	678,167	2.47
Average	**1,665**	**453,455**	**192,366**	**645,821**	**2.58**

Note: The population and employment data for year 2011, 2016, and 2022 was collected from the Region and interpolated for the interval years.

3.1.3 Historical Road Infrastructure Value

An inventory of the Region's road infrastructure for the ten-year period (2012-2021) was compiled to calculate the historical average road infrastructure value. The historical road infrastructure value per capita (population and employment) can be used to determine the maximum growth-related funding envelope based on forecasted future population and employment to 2041, since the DC Act, 1997 and associated regulations require that the service level to be applied to future growth not exceed the historical average over the last ten years. The existing right-of-way inventory was developed based on the Region's roadway and structure database and included additional infrastructure items and land within the Right-of-way .

The infrastructure items included in the inventory are as follows:

- Roadways (curb-to-curb)
- Bridges and Culverts (widening and new construction)
- Traffic Signals
- Illumination
- Multi-usage Path
- Roundabout
- Property ROW

The average ten-year historical road infrastructure value is presented in **Table 3-3**. Details of historical road infrastructure values are presented in **Appendix C**.

Table 3-3: Ten-Year Historical Road Infrastructure Value

Year	Road Infrastructure Value ($ Millions)	Population	Employment	Total Capita (Population + Employment)	Road Infrastructure Value per 1000 Capita ($ Millions)
2012	8,791.0	434,017	186,700	620,717	14.16
2013	8,795.8	436,476	187,760	624,236	14.09
2014	8,806.2	439,912	188,830	628,742	14.01
2015	8,822.6	443,636	189,890	633,526	13.93
2016	8,846.9	447,888	190,950	638,838	13.85
2017	8,862.8	454,451	192,600	647,051	13.70
2018	8,876.6	460,273	194,250	654,523	13.56
2019	8,883.9	465,930	195,910	661,840	13.42
2020	8,917.2	473,012	197,560	670,572	13.30
2021	8,919.9	478,957	199,210	678,167	13.15
Average	**8,852.3**	**453,455**	**192,366**	**645,821**	**13.71**

The ten-year historical road infrastructure value was defined to establish the maximum allowable growth-related funding envelope.

3.2 Service Levels for Future Planning Horizon Year 2041

The future (2041) service level is estimated for the measures of Average Vehicles per Lane, and Lane-Kilometers per Capital (Population and Employment). The future service levels were reviewed and compared with the historical service levels, providing needs and justification for the proposed road and road-related program, without resulting in excess road network capacity.

3.2.1 Average Vehicles per Lane for Year 2041

The future average vehicles per lane road network service level was estimated based on the forecasted future vehicle kilometers travelled and the total lane kilometers derived from the Region's travel demand model (GTA V4 based Emme model).

The 2016 and 2041 morning peak hour traffic volumes were extracted from the Region's models for the regional road network. Traffic growth rates were derived for each of the regional road sections using the 2016 and 2041 model volume forecast. The estimated traffic growth rates were then applied to the existing (2021) road section AADTs to forecast the future 2041 vehicle kilometers travelled.

The total lane kilometers for the road network were calculated based on the required number of lanes and length of each road section. The average vehicles per lane for the forecast 2041 and 'Growth Portion Only' were calculated based on the total forecast vehicle kilometers travelled and the total future lane kilometer as shown in **Table 3-4**. The 'Growth Portion Only' calculation reflects the growth-related component of the future vehicle kilometers and lane kilometers as derived from the Region's travel demand model.

Table 3-4: Ten-Year Historical Average Vehicles per Lane

Year	Lane km	Vehicle km	Average Vehicles / Lane
Average 10-Year Historical	1,665	4,740,467	2,848
Growth Portion Only*	101	1,422,279	14,082
Forecast 2041	1,774	6,451,494	3,637

Note: the 'Growth Portion Only' indicates the difference between 2022 and 2041.

The average vehicles per lane for the 'Growth Portion Only' was calculated based on planned growth occurring between years 2022 and 2041. The results of the Average Vehicle per Lane service level analysis indicate the following:

- the average vehicles per lane is forecasted to increase significantly by 2041
- the future road network will be more congested in the future planning horizon year (2041) than it has been over the past ten years
- the service level for the 'Growth Portion Only' is forecasted to be declined from the historical ten-year average
- the road network service level is forecast to deteriorate over the next 20 years

The detailed vehicle kilometer and lane kilometer data used to calculate the 2041 service levels are provided in **Appendix B**.

3.2.2 Lane Kilometers per Capita for Year 2041

The future lane kilometers per capita (population and employment) service level is calculated using the forecast lane kilometers, population, and employment for the year 2041. The future lane kilometers per capita measure is expressed in terms of total future (existing plus growth) and 'Growth Portion Only'.

The total future analysis includes all future road infrastructure, population and employment; while the 'Growth Portion Only' measure is based on additional lane kilometers required to meet the future population and employment growth forecast between 2022 and 2041. The forecast lane kilometers per population and employment service levels are presented in **Table 3-5**.

Table 3-5: Forecast Lane-Kilometers per Capita

Year	Lane km	Population	Employment	Total Capita (Population + Employment)	Lane km per 1000 Capita
Average 10-Year Historical	1,665	453,455	192,366	645,821	2.58
Growth Portion Only*	101	121,889	40,337	162,226	0.62
Forecast 2041	1,774	608,203	241,197	849,400	2.09

Note: the 'Growth Portion Only' indicates the difference between 2022 and 2041.

The lane kilometers per population and employment service level assessment shows that the service level is forecast to deteriorate (decreasing lane kilometers per population and employment) over the next 20 years.

3.2.3 Findings of the Forecast Service Level Analysis

The results of the ten-year historical and forecast Year 2041 service level analysis using vehicles per lane (**Table 3-4**) and lane kilometer per capita (population and employment -**Table 3-5**) indicate that the service levels are forecast to deteriorate over the next 20 years, as presented in **Table 3-6**.

Table 3-6: Road Network Service Level Summary

Year	Average Vehicles per Lane	Lane km per 1000 Capita
Average 10-Year Historical	2,848	2.58
Growth Portion Only	14,082	0.62
Forecast 2041	3,637	2.09

The service level of the Region's road network is forecast to deteriorate by 28% based on the average 24-hour average vehicles per lane measure and by 19% based on lane kilometer per capita (population and employment) service level measure. Therefore, regardless of the road network service level measure that is used, the Region's road infrastructure is forecast to experience deterioration in the service level of the road network over the next 20 years.

3.2.4 Allowable Funding Envelope

The ten-year historical road infrastructure value was defined to establish the maximum allowable growth-related funding envelope. Based on the 10-year historical road infrastructure value per capita, a maximum DC-eligible cost of **$ 2.241 Billion** (presented in Table C-11 in **Appendix C**) could be expected to meet the future increase in needs for transportation services for roads, and road related infrastructure, including cycling lanes, rail grade separations, structures, etc.

4 Cost Sharing

4.1 Cost Allocation to Benefit-to-Existing (B.T.E.)

Transportation network expansions, capacity improvements, and efficiencies provide benefit to new development growth as well as the existing residents and workers in Niagara Region who will be able to use the enhanced transportation system. A Benefit-to-Existing (B.T.E.) deduction is applied when existing development is expected to receive a benefit as a result of the capital project. A Benefit-to-Existing amount (provided as a percentage of the construction cost) was applied based on the extent to which the road infrastructure project was anticipated to benefit existing development.

The Benefit-to-Existing percentage are proposed for the following nine categories of improvements for the 2022 Transportation D.C. Background Study (as presented in **Table 4-1**):

1. **Capacity Improvement – New Roads:** The extension of road or construction of new road corridors that are required to provide connection to a new sub-division or provide additional capacity for the population and employment growth to address growing demand.
2. **Capacity Improvements Widening:** Projects that add capacity to the network by providing additional vehicular lanes (i.e., road widening) are considered to be primarily growth-related as the need for the improvement is to address growing demand.
3. **Capacity Improvements Active Transportation:** Active Transportation Infill Projects, identified as part of the Region's Strategic Cycling Network, have been assigned a 75% benefit to existing share which reflects the proportion of existing and new development growth in Niagara. Other A.T. facilities that may be constructed as part of a road capital project are considered to be a road capacity improvement project.
4. **Intersection Improvements** – Traffic signal installation, addition of turn lanes, **roundabouts** and other intersection improvements that add capacity to the road network are primarily growth-related. Reconstruction of existing intersections and operational improvements at existing intersections provide benefits to both existing and new development.
5. **Road Reconstruction / Improvements** – An existing road that undergoes major reconstruction, even without increasing the vehicular lanes, may include additional active transportation facilities (e.g., bicycle lanes, sidewalk, multi-use path) to support increased demand related to growth within or supporting existing or urban growth areas, providing benefit to both existing and new development. May

include, but not limited to, reconstruction of existing general-purpose lanes, structural design, geometric improvements, and improvements to shoulder widths.

6. **Structure Reconstruction / Improvements** – Bridge or culvert reconstruction projects may increase capacity, provide additional active transportation facilities, may provide benefit to both existing and new development.
7. **Illumination and Traffic Signals** – Installation of lighting and traffic signals are considered to primarily provide a benefit to existing roadways.
8. **Miscellaneous Road Properties** – Land acquisitions for various types of projects, such as intersection improvements, road widening, or new roadways.
9. **Transportation Studies and Annual Traffic Counts** – The Transportation Studies includes transportation master plans, environmental assessments, road widening studies, and other studies that assess the impact of a proposed change to the transportation network. The Annual Traffic Counts is conducted to collect traffic counts on Regional Roads to assess the transportation conditions and future transportation studies.

The Region's Road Resurfacing Program and other maintenance-related annual programs are funded entirely from existing development and no cost is charged to growth even though new development incurs a small benefit from the improved condition of the road.

Table 4-1: Allocation of Benefit to Existing

Category	Benefit to Existing %	Remarks
Capacity Improvements - New Roads/ Missing Link	0%	Includes new roads, associated structures, and other infrastructure. New arterial roads are identified to support Greenfield and provincially designated development areas. Typically, in many developing communities the existing arterial road functions as a main street through the Hamlet. To service the transportation needs of these new communities, new roads are constructed to serve as arterials to traverse the community. In many incidences, the new arterial road is designed as a by-pass to distribute traffic away from existing nodes and villages. However, the new roads provide additional capacity to the transportation network as they provide additional capacity directly and "free up" capacity on existing roads for those existing trips. 0% BTE is allocated to new roads as the new corridors are strictly required to address the future travel demands (this policy is in line with municipalities in the GTA such as Halton Region, City of Mississauga, and York Region). New for 2022
Capacity Improvements - Road Widening	15%	Includes road widening, structure widening/improvements as part of road projects. 15% benefit to existing is based on cost of resurfacing the existing segment in cases of road widening, or the marginal road use benefit to existing users in the case of new road sections.

Category	Benefit to Existing %	Remarks
Capacity Improvements - Active Transportation	75%	Active Transportation Infill Projects, identified as part of the Region's Strategic Cycling Network, have been assigned 75% BTE to reflects the proportion of existing and new development growth in Niagara. Other A.T. facilities that are constructed as part of a capital road project are considered to be a road capacity improvement.
Intersection Improvements - Additional Capacity	0%	Signals and intersection improvements are associated with projects that add capacity to the road network to accommodate growth.
Intersection Improvements - Others	50%	Reconstruction, minor capacity improvements, or operational improvements to increase capacity and improve traffic flow at an existing intersection.
Road Reconstruction / Improvements -No Capacity Improvement	100%	Road reconstruction with no capacity improvement or intersection improvements on a roadway not commonly used for heavy trucks serving new development.
Road Reconstruction / Improvements - Minor Capacity Improvement	90%	Road reconstruction with minor capacity improvement (<10%) with a paved shoulder to accommodate cyclists and minor intersection improvements (5% of project cost) on a roadway occasionally used by heavy trucks serving new development.
Road Reconstruction / Improvements - Moderate Capacity Improvement	75%	Road reconstruction with moderate capacity improvement (10-50%) and moderate intersection improvements (5-10% project cost), and/or accommodation of pedestrians and cyclists (with sidewalk, bicycle lane, or multiuse path) on a roadway commonly used by heavy trucks serving new development.

Category	Benefit to Existing %	Remarks
Road Reconstruction / Improvements - Significant Capacity Improvement	60%	Road reconstruction with significant capacity improvement (>50%) and significant intersection improvements (>10% project cost), and/or accommodation of pedestrians and cyclists (with sidewalk, bicycle lane or multiuse path) on a roadway frequently used by heavy trucks serving new development, and/or conversion to an urbanized (complete street) cross-section from a rural cross-section.
Structure Reconstruction / Improvements	Based on the % increase in net deck width/area	Structure replacement or rehabilitation to existing width, or provide a wider cross-section to allow for greater capacity and/or accommodation of pedestrians and cyclists. New for 2022
Structure - New Grade Separation	10%	New rail/road grade separation structure to replace an existing at-grade rail crossing.
Structure Construction -New Structure	0%	New structure for system expansion and accommodation of pedestrians and cyclists. New for 2022
Illumination and Traffic Signals	90%	Install lighting and traffic signals. New for 2022
Miscellaneous Road Properties	15%	Acquire land for various projects. 15% BTE is allocated as property is required/purchased for a future new road or road widening/improvement program. New for 2022
Transportation Studies and Annual Traffic Counts	10%	Transportation Studies assess impacts to the transportation network and annual traffic data collection required for future transportation improvements. New for 2022

4.2 Residential vs. Non-residential Share

The growth-related costs for transportation projects are split between residential and non-residential uses generally based on the proportion of residential and non-residential growth forecasted through the D.C. planning period, with adjustments for Work from Home (W.F.H.) employment and No Fixed Place of Work (N.F.P.O.W.) employment.

Work from Home (W.F.H.)

For work-from-home, the employment use is physically located in a residential unit, but to allocate the impacts of work-at-home employment to non-residential would increase the non-residential cost share but not the associated non-residential floor area to which the development charge could be applied. Additionally, the work-from-home designation implies that the individual works from home on a regular basis and it would be reasonable to assume that travel demands related to "work" would be based out of the home location. Thus, for the consideration of residential / non-residential split, the work-from-home employment is included under residential category.

There was also discussion on whether a work-from-home worker makes more or fewer trips than a worker with a non-home usual place of work. While the commute to work trip (and the return trip) is eliminated, many work-from-home worker still generates work-related trips (i.e., travel to meet with clients) or attract work-related trips (i.e., clients meeting at worker's home office, business-related deliveries, etc.). To account for the reduced trip making for work-from-home, a 50% factor was applied to the Work from Home employment numbers and added into the Residential category.

No Fixed Place of Work (N.F.P.O.W.)

In the case of no-fixed-place-of-work, the worker travels to a number of different locations for work, such as a construction site, a client's office, an employer's office, field locations, etc., without first reporting to a headquarters or depot at the start of each workday. The issue with allocating no-fixed-place-of-work employment to non-residential is the increase of non-residential share without the ability to increase the associated floor area to which the development charge could by applied. However, to allocate no-fixed place-of-work employment fully to residential would ignore the fact that these workers have an employer with headquarters, offices, or other types of non-residential buildings, which "generate" the work for the worker. These headquarters may or may not be located in Niagara Region.

Thus, for the consideration of residential / non-residential split, the no-fixed-place-of-work employment is included under residential uses, to capture the commute to work trip. To account for the portion of the worker's trips that are not home-based, a 50% factor was applied to the Work from Home employment numbers and added into the Residential category, as presented in **Table 4-2**.

Table 4-2: Residential / Non-Residential Allocation

Residential Category	Residential Amount	Non-residential Category	Non-residential Amount	Total
Population Growth	121,889	Employment Growth	40,337	
50% WFH	2,145	WFH	-4,290	
50% NFPOW	3,143	NFPOW	-6,286	
Total	**127,177**	**Total**	**29,761**	**156,938**
Allocation	81%	Allocation	19%	100%

4.3 Post-period Benefit (P.P.B.)

Post Period Benefit (P.P.B.) is not explicitly addressed within the D.C.A., however, it has been identified in instances where a clear benefit from the capital works will be experienced by growth outside of the growth forecast period. For the most part, the various roads and associated needs are identified through traffic modeling and master planning and target specific residential and non-residential growth assumptions. The works included in D.C. are meant to address the required additional trips that new growth would add to the regional road system and generally do not make oversizing provisions within that needs assessment.

The 2022 Transportation D.C. Background Study follows the previous D.C. Study approach for allocating the Post Period Benefit, which considered a post-period benefit capacity deduction of 25-50% for capacity improvement projects in the last 10 years (2032-2041) of the planning period, with the exception of the Niagara Escarpment Crossing project, identified for 2022-2031, which has been allocated a 25% deduction to reflect its significance for the current planning period and beyond. For capacity improvement projects in the earlier phases of the D.C. planning period, the need for the capacity improvement is driven by growth within the planning period, and thus a post-period deduction was not applied to projects identified for implementation in the first 10 years (2022- 2031). A 25% post-period benefit was considered for the projects identified in the following five-year period (between 2032-2036), and a 50% post-period benefit was considered in the last five-year period (i.e., between 2036-2041).

No P.P.B. deduction has been applied to the intersection improvement program, road rehabilitation program, or other annual programs where cost has been estimated based on annual capital expenditure.

5 Forecast 2041 Road Infrastructure and Costs

5.1 Road and Road-Related Infrastructure Costing

The 2041 required road and roads-related program consists of projects that are included in the Region's 10-year Capital Plan (2022-2031) and identified as longer-range transportation infrastructure needs by the Region's Transportation Services Division. The additional projects in the 10-year to 20-year period were determined based in part on the Region's updated 2041 travel demand forecasting model and the professional judgement of Transportation Services Division staff.

The road and road-related construction costs were provided by the Region considering roadway classifications, improvement category, infrastructure location, property impacts, utility impacts, complexity, etc. Construction costs for the following programs were included in the road and road-related infrastructure:

- Projects in Capital Budget
- Additional Projects Identified in TMP
- Intersection Improvement Program
- Road Rehabilitation Program
- Structure Rehabilitation Program
- Annual Programs

A summary of the total road and road-related infrastructure costs for 2022 to 2041 is presented in **Table 5-1**. The detailed proposed road and road-related infrastructure costs are presented in Table D-1 in **Appendix D**. The costs presented in **Table 5-1** have been rounded to the nearest $1,000 and may not exactly reflect the totals presented in **Appendix D** (Table D-1).

Table 5-1: Road and Road-Related Infrastructure Cost Estimates

Road & Road-Related Program Components	Proposed Total Cost
Projects in Capital Budget	$435,285,000
Additional Projects Identified in TMP	$115,846,000
Intersection Improvement Program	$75,471,000
Road Rehabilitation Program	$782,144,000
Structure Rehabilitation Program	$292,771,000
Annual Programs	$152,565,000
Total	$1,854,082,000

5.2 Final Road Infrastructure Costs

The road infrastructure costs are separated into 'growth' related (i.e., either Region-wide roads and road-related or charge to the developers) and 'non-growth' related components as presented in Error! Reference source not found. (rounded to nearest $1,000).

As presented in the table, the total capital cost requirements for the roads and road-related capital program (to year 2041) are $1,854 million. The 'post-period benefit' share of the cost is $35 million, the 'non-growth' share of the cost is $1,093 million, and the growth-related DC eligible share is $708 million.

Table 5-2: Preliminary Road and Road-Related Capital Cost Estimates

Roads Program Component	Total Capital Cost	Growth Related (Region-wide DC)	Non-Growth Related	Post-Period Benefit	Grants, Subsidies and Other Contributions
Projects in Capital Budget	$435,285,000	$361,593,000	$46,796,000	$11,459,000	$2,700,000
Additional Projects Identified in TMP	$115,846,000	$54,661,000	$37,328,000	$23,857,000	$0
Intersection Improvement Program	$75,471,000	$57,224,000	$18,172,000	$0	$0
Road Rehabilitation Program	$782,144,000	$168,865,000	$612,352,000	$0	$629,000
Structure Rehabilitation Program	$292,771,000	$19,011,000	$273,164,000	$0	$500,000
Annual Programs	$152,565,000	$46,934,000	$105,632,000	$0	$0
Total	$1,854,082,000	$708,287,000	$1,093,442,000	$35,316,000	$3,829,000

6 Summary

The technical analysis presented in this report is used in calculating the growth-related development charge for the roads and road-related service. The cost estimation and findings will be used as the input to the Development Charge Background Study for the update of the Region's D.C. By-law.

Technical Appendices

Appendix A

Unit Prices

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Roadway Service Level Analysis

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Historical Infrastructure Inventory

Appendix D

Road and Road-Related Improvement Program Costs