APPENDIX C

Review of Accessible Taxi operations for the City of Toronto

Final Report

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Acknowledgements

Taxi Research Partners would like to thank the City of Toronto for its commission and allowing the research team to undertake a review of accessible taxi provision in the city. We would also wish to acknowledge and thank the taxi industry and vehicle manufacturers, as well as the Toronto Insurance Industry, conversion companies and vehicle retailers for their kind assistance in preparing this report.

1. Executive Summary

The introduction of accessible vehicles into a taxi fleet can be subject to a wide range of issues, many emotional and reflecting the sensitivities and costs of such provision. Accessible taxi vehicles, in the main, cost more to purchase and operate than a fleet average vehicle, making their provision appear onerous to the operator. Moreover, as the actual use of accessible vehicles in the current fleet may appear low, or very low, the need to provide such vehicles as well as their financial viability may be reasonably questioned. Against this background, the rights of an individual to travel, and the potential benefits of providing accessible taxis should also be considered. Low levels of taxi use by wheelchair users may also reflect the lack of availability of services, a phenomenon known as demand suppression; while many of the stated concerns over costs of provision may be based on an incomplete view of the market for and types of vehicle available.

In our analysis we have considered the actual costs of accessible vehicle provision, and sought to avoid false comparisons between differing vehicles or different age profiles. Vehicle purchase cost, operating patterns and life cycles are compared using like-for-like comparisons of new vehicles, as well as comparing the equivalent costs of new accessible vehicles to non-accessible vehicles purchased second hand. A fleet average vehicle, reflecting the current Toronto fleet mean, is used as a primary comparison, whether accessible vehicles in a number of scenarios are able to meet the cost / income characteristics of the fleet average. While a number of accessible vehicles do not achieve the income levels after costs of the fleet average vehicles, some do and should highlight the fact that a correctly operating fleet maintaining and delivering service to all can be achieved without negative impact on driver income.

Capital Cost

The capital cost of an accessible vehicle remains higher than the purchase of a non-accessible taxi. We have identified a variety of vehicle types in both classes, accessible and non-accessible, and a range of different levels of cost in each. The extent to which vehicle costs can alter contributes to a variety of misinterpretation and misunderstanding of costs within the industry, and by advocate groups. In some instances this is illustrated by comparison between higher specification vehicles in one category and lower specifications in the other. Moreover, the direct comparison of purchase costs fails to account for the lifetime costs that may be attributed to a vehicle, with lifetime costs affected by lifetime within the fleet as well as headline retail values. We have provided a range of comparisons between purchase and depreciation costs across the fleet using the primary metric of driver income after costs for fleet average, non-accessible, converted accessible and purpose built vehicles. Two vehicle types perform

significantly better than the fleet average, the Karsan V1, an accessible purpose built vehicle (driver income measured at 106% of fleet average), and the Toyota Prius, a fuel efficient hybrid vehicle unable to carry wheelchairs (driver income measured at 104% of fleet average). Vehicle conversions perform less well, partly as a result of the significant cost of their conversion, though the Ford Transit Connect 2014 Taxi, a newly released converted taxi, performs better than other vehicles in the same category, and can match fleet average driver income levels in some scenarios.

Operating Costs and Operating Performance

In addition to the purchase costs of a vehicle, its running costs, particularly fuel efficiency and other variable costs need to be considered. A legitimate concern arises in respect of the vehicle weight, operating cost and fuel efficiencies of larger vehicle types, including many accessible vehicles. The most fuel efficient vehicle types operating in taxi service (excluding fully electric vehicles) can be demonstrated to be gasoline hybrid vehicles. The Toyota Prius outperforms all other vehicle types currently used as taxis on fuel economy, and has the lowest operating costs. Accessible van conversions perform less well on fuel economies, and some reported additional costs apply to the conversion itself, identified by conversion companies as associated to door operating or door sliding mechanisms. Purpose built vehicles split between the MV1, which has a relatively high fuel cost, and the Karsan V1, which performs significantly better in its internal combustion version. Hybrid and fully electric versions of the Karsan V1 are also proposed for the Toronto market, which will further reduce the fuel costs of these vehicles. Analysis is undertaken on the basis of the traditional engine version.

Like-for-Like Comparison

A significant confusion arises in the comparison of differing vehicle specifications, differing model years and differing ages. The 'fairest' method of comparison is comparing new vehicle costs over their life for all vehicle types. Additional impacts of the market should also be considered, the fact that the market may grow to reflect suppressed use should be considered, see table below.

Figure: Annual driver Income* - Fleet Average vehicle, Ford Transit Connect 2014 taxi, Karsan V1

Vehicle	Income bought new	Income with extended WAV life, conservative market growth	Income with extended WAV life and full market growth
Fleet Average	$59,792	$59,792	$59,792
Ford Transit Connect 2014	$52,870	$58,575	$59,712
Karsan V1	$57,041	$61,594	$62,790

***** Figures include income derived from vehicle rental to a second driver

The nature of demand suppression and potential market growth are discussed in subsequent sections. It should be noted, however that such growth can be threatened both by a lack of availability of vehicles, and the unwillingness on the part of the driver, and lack of infrastructure on the part of the city to fully realize this growth. Action is appropriate to ensure a full understanding of the benefits, including additional income, and correct service levels for all customers. This may include the provision of appropriate signage at taxi ranks and physical infrastructure to facilitate ramp deployment at key locations.

Vehicle Availability

Further issues relate to the actual availability of vehicles to the Toronto market. Both Karsan and Ford Transit Connect represent vehicles that are new to the Toronto market, while both underline availability in the market, this follows from the development of a dealership network in the case of the Karsan; and appropriate conversion in the case of the Ford. Other market entrants, including Nissan, were unable to outline plans for the Toronto market, though all were keen to discuss developments with the city. Other purpose built vehicles are available to the Toronto market through existing dealership networks, but may result in higher costs and lower potential income to drivers.

Model Testing

The team undertook three tests, baseline without growth in the market, conservative and full market growth following the provision of accessible vehicles. Tests were also applied to differing methods of vehicle introduction, requiring new vehicles to be accessible from point of new license issuance, from point of license transfer and within the natural replacement cycle for existing vehicles. The best performing outcome relates to the purchase of accessible vehicles at point of next vehicle replacement with the allowance of an additional 2 years service for accessible vehicles. The calculation is based on the purchase of the most efficient accessible vehicle, but is also beneficial where the second highest rated accessible vehicle is purchased. Less efficient converted vehicles or less fuel-efficient purpose built vehicles are likely to result in a loss to drivers, albeit a relatively small loss in some instances. The loss of income is between $2,000 and $7,000 dependent upon the previous vehicle types used. It is our conclusion that accessible vehicles can operate in the Toronto market at a ‘break-even’ point, where the additional costs can be recovered when compared to the fleet average vehicle without significant impact on the driver.

Although we understand the range of argument and concerns expressed by the trade we do not agree that these are made on the basis of like for like comparison. It is our conclusion that the most efficient accessible taxis can be provided at minimal cost to the trade.

2. Defining Accessible Taxis

The provision of accessibility in a taxi fleet should, in its most basic definition, relate to the ability of any individual to use a taxi regardless of physical ability. This simple definition allows for a positive view of service provision, that anybody should be able to make use of a taxi. The reality is, however, somewhat more complex; reflecting the differences between abilities and vehicle requirements, and has resulted in a concentration in design and legislation on particular forms of access requirements, more commonly associated on specific disabilities and most frequently on the accommodation of wheelchairs.

Current legislation applicable in Toronto relates to the Accessibility for Ontarians with Disabilities Act, 2005 (AODA), which includes a requirement for licensing authorities to consider accessibility in the taxi fleet; and the Canadian standard CSA-D409[1] (D409), which relates to physical and engineering requirements of the vehicles, and in particular the definition of standards appropriate for the carrying of wheelchairs. It is sometimes suggested that result of this definition has been a focus on the carriage of wheelchairs above other forms of disability.

2.1 Wheelchair Accessible Vehicles (WAV)

A wheelchair accessible vehicle is defined as any vehicle that is manufactured to accommodate wheelchairs that complies with the CSA-D409 standard for physical and mechanical design and signage; or any vehicle that has been converted to meet the standard thus defined. In practical terms, for the purpose of this report, any taxi that is equipped with appropriate access: ramp, door openings etc.; physical space and wheelchair restraint mechanisms as required by the CSA-D409 standard.

The majority of WAVs available to the Canadian taxi market are converted minivans, vehicles that have been structurally altered to meet the design requirements of carrying wheelchairs. Converted vehicles, commonly referred to as ‘conversions’ are custom post-production alterations to standard production vehicles offered by specialist coach builders (converters).

[1] CAN/CSA – D 409–02 (R2012) – Motor vehicles for the transportation of persons with physical disabilities

Converted WAVs can be side loading, allowing a wheelchair user to enter from a side door, or rear entry, allowing a wheelchair user access at the rear of the vehicle.

The conversion process is typically related to the replacement of of parts of the floor pan with ramp equipment, and may include additional alteration to the vehicle roof to achieve height requirements in some vehicles. Conversion is an established method of providing accessible vehicles and can be undertaken by coach builders directly approved by original equipment manufacturers, Marley being 'conversion partners' to the Ford Transit Connect; or by independent companies providing after market conversions. Some discussion arises as to the impacts of structural changes to vehicles related to physical strength, vehicle life and fuel efficiencies following conversion, and the methods by which minimum standards may be achieved - particularly around the issue of door height, discussed in more detail in subsequent sections.

The alternative to a converted vehicle is to use a 'purpose built' WAV. The purpose built WAV is designed and constructed for the carriage of of wheelchair passengers. Purpose built vehicles represent a relatively small part of the North-American market, but are in widespread use in other countries. At the time of writing the North American market is limited to a single purpose built vehicle, the MV1; but a number of alternative purpose built vehicles are close to market, including the Karsan V1, discussed in more detail below.

Safety testing and certification is required of both purpose built and converted vehicles, tests complying to Canadian safety standards based on both the original equipment standards, effectively the final product in the case of purpose built vehicles; with an additional test of converted vehicles specific to fuel tank safety - the result of moving fuel tanks in some conversions.

2.2 Vehicle Availability

The restricted range of WAV vehicles available in the North American market has an impact on the availability of WAV services to the public. Delays may result from the time taken to convert a vehicle, approximately 8- 10 weeks, or in relation to the production of new purpose built vehicles. The process of 'ramping up' vehicle production, including the allocation of a specified number of vehicles to the Toronto to meet additional demands may also delay delivery of new

purpose-built vehicles. Vehicle suppliers serving the Toronto market did not anticipate this creating a backlog - inability to serve demand in the period to Summer 2015; though the exact market dynamic may vary as new vehicle manufacturers are also proposing to serve the market in the same timeframe. Ford and Karsan were both keen to address supply with the city. It is also possible that vehicle purchasing decisions may be delayed to 'wait and see' the market entry price and availability of Karsan or Ford before committing to other manufacturers.

2.3 Financial impacts and cost comparisons of WAV / traditional vehicles

The cost effectiveness of accessible taxi transport, as compared to traditional taxi use, will depend upon a number of factors, including the capital costs of the vehicle, its depreciation and effective life, and the impacts of vehicle type on demand. Vehicle costs, particularly comparison of costs will also depend on the range of factors that are measurable and regularly considered. Perceptions of costs do not always reflect actual costs, and a perception based on partial analysis of the market or on comparison of different factors, those which are not directly comparable, may result in an overly pessimistic view, or an overly optimistic view, of the market impacts.

In subsequent sections we have set out an analysis of the capital costs, operating and market impacts of providing accessibility in the Toronto taxi market. Although many of these factors may become parable between cities, we would highlight that individual cities reflect different market factors. Direct comparison between cities is not, therefore, advisable. Where we have made reference to experiences in other locations, we have identified the range of issues that may affect transfer of analysis.

3. Capital Costs, vehicle purchase and depreciation

The capital cost of a vehicle relates to its purchase, primary infrastructure cost - including sales tax and depreciation. Effectively how much a vehicle costs to put on the road, and its life in service. Depreciation relates to the life of a vehicle, in service, and any residual value that a vehicle may have on resale at the end of its service life. A range of patterns exist in the life cycles and purchase patterns within the taxi market, which can complicate measurement and perception of effective cost, reflecting the choice to buy vehicles new, or used, and their resale whether sold with a residual value or scrapped.

Purchase prices comprise a combination of dealer list price, taxation and 'on-the-road' costs, as well as any discounting, dealer incentive or value packages that may be available. The actual costs of a vehicle on the road may, therefore vary from the headline price of dealer list price plus tax. While it is not possible to predict the exact amount of discounting that may exist, the comparison list and other on the road costs remains consistent, and has been used in this analysis. It is also noted that value packages are not limited to any one vehicle type, with the result that any (all) of the vehicles listed in the subsequent analysis may actually cost less than shown, with the potential impact of increasing earnings from those shown.

Depreciation costs relate to the reduction in value of a vehicle over its life. A number of measures are possible and will reflect the actual life in service as well as any residual value that a vehicle may have at the end of its useful life in service. To ensure accuracy of comparison we have taken a measure of straight line depreciation to a zero value, discussed in more detail in subsequent sections.

3.1 Vehicles in WAV use

Given the ability to convert many different vehicles to wheelchair use, a wide range of vehicles could, in theory, be used as wheelchair accessible taxis. Conversion, by its nature, provides accessibility through a combination of adding ramps, lowering floors and raising roof areas in many different vehicle types. This said, a specific range of vehicle lend themselves more to conversion than others, see figure 1. Passenger minivan vehicles such as the Dodge Grand Caravan, Toyota Sienna and Chrysler Town and Country are in widespread use as accessible

vehicles; and, given the dimensions of the original vehicle, are relatively well suited to conversion. Commercial use vehicles including the Ford Transit Connect and other light goods vehicles may also be appropriate to conversion - moving from a van design to taxi use. Purpose-built vehicles, such as the MV1 and Karsan V1, which do not require conversion, should also be included in the assessment.

Figure 1 illustrates the comparable costs of the most popular new vehicles, plus conversion where appropriate. Costs shown do not account for any incentives or value packages that may be offered. Total capital costs include tax and illustrate the relatively high costs of vehicles entering the fleet new. We have also included the capital costs of the fleet mean vehicle, being the arithmetic mean cost in the current Toronto fleet, and the Toyota Prius, the most fuel efficient vehicle in taxi use.

Figure 1: New vehicle cost with conversion

NEW VEHICLES	2013 MODEL							
Vehicle Make / Model	**Purpose Built / Conversion**	**Basic Vehicle Price***	**Fuel Type**	**Conversion type**	**Conversion Price**	**HST @ 13%**	**Total Capital Cost**	**Vehicle efficiencies (l/ 100kms)*****
Dodge Grand Caravan	Conversion	$35,500	Gasoline	Side Entry	$19,500	$7,150	$62,150	11.6
Dodge Grand Caravan	Conversion	$35,500	Gasoline	Dual Entry	$22,500	$7,540	$65,540	11.6
Dodge Grand Caravan	Conversion	$35,500	Gasoline	Rear Entry	$15,000	$6,565	$57,065	11.6
Toyota Sienna	Conversion	$30,579	Gasoline	Side Entry	$19,500	$6,510	$56,589	10.6
Toyota Sienna	Conversion	$30,579	Gasoline	Dual Entry	$22,500	$6,900	$59,979	10.6
Chrysler Town and Country	Conversion	$41,670	Gasoline	Rear Entry	$15,000	$7,367	$64,037	12
Honda Odyssey	Conversion	$42,000	Gasoline	Rear Entry	$15,000	$7,410	$64,410	10.7
Ford Transit Connect 2014 Taxi**	Conversion	$32,100	Gasoline	Side entry	$19,500	$6,708	$58,308	10.5
Karsan V1**	Purpose Built	$40,000	Gasoline	None	$0	$5,200	$45,200	9
VPG MV1	Purpose Built	$45,000	Gasoline	None	$0	$5,850	$50,850	16.8
Fleet Mean	Not Accessible	$28,207	Gasoline	None	$0	$3,667	$31,874	12
Toyota Prius	Not Accessible	$31,782	Hybrid	None	$0	$4,132	$35,914	6.5

* Does not include tax or license fees, based Toronto dealership, 2013 model year. Does not include purchase incentives or discounting.
** Includes manufacturer data. Also includes destination delivery charges, FOB
*** Includes current US Government fuel efficiency figures,
Data sources: US Environmental Protection Agency, Canadian Black Book, Conversion costs: Savaria, Creative Carriage, Universal Motion. Dealer costs: MV1 Canada, Karsan, Ford Canada

The analysis includes assessment of two new market entrants: The Ford Transit Connect Taxi (2014), and the Karsan V1. Cost and operational data on the Nissan NV200, a further new market entrant, was available to the US model alone, and has not been included. New market entrants present differing challenges to analysis than established vehicle types as operating information including fuel efficiencies are not fully tested. The Ford Transit Connect 2014 is a new vehicle model in North America requiring conversion for use as an accessible taxi, while the transit connect has a record of use in taxi service in other countries. The Karsan V1 is a completely new purpose built taxi currently in final pre-production stages but has undergone product testing and efficiency measurements, providing the basic figures that are included in this analysis.

The new vehicle types may be suggested to offer an improved layout and passenger experience, whilst the Karsan V1 is also demonstrated in manufacturer testing to deliver a considerably better fuel efficiency. Vehicle life in service is also a critical element, with previous versions of the Ford Transit Connect achieving lengthy service lives in European countries. Karsan also estimate extended life span of 7 years and beyond. We have no independent corroboration of efficiency ratings nor of potential life in service of new vehicle types, but would highlight that the figures provided fall within expected life and efficiency figures for similar vehicles operating in Europe.

3.2 Depreciation from new

A further calculation is required to arrive at an annual cost, being the depreciation cost of the vehicle over its life including finance rates as appropriate. Depreciation is a measure of the loss of value of a vehicle over its life, effectively how much value can be attributed to a vehicle in each year of its life. Two measures may be applied to this calculation: Straight Line depreciation, where the loss in value is considered to be the same for each of the years in operation; and declining value depreciation, where loss in value is greater in the early years of life when compared to later years. While the latter (declining value) more accurately reflects retail value changes, in particular a loss of value after sale from a showroom, its measurement is complex and hard to validate. In short, the immediate loss of value from leaving a showroom is not readily measured nor validated. Straight line depreciation is much more commonly applied, and provides a consistent and repeatable measure. Some conflict does arise, however,

in the comparison of new with used vehicle values, a mistaken comparison of costs often cited within the taxi industry, and this will also need to be resolved, see subsequent sections.

Further elements in the calculation of depreciation from new relate to the lifespan of a vehicle in service; and its residual value, if any, upon retirement from service. The more years a vehicle remains in service the lower the annual cost maybe, as the cost is effectively spread across a longer period. Some conflict exists where the costs of maintaining a vehicle in service for an extended period may increase, effectively the costs of repair, and some vehicles may not be sufficiently resilient to survive significantly extended periods of service.

Assuming that a vehicle will operate in service for a period of 5 years and then be scrapped without resale value, the calculations set out in Figure 2 apply. We have no independent verification that vehicles will remain in a serviceable state for this, or extended, periods; and note that actual life in service will also reflect on the driving style and extent of use made of the individual vehicle itself.

Figure 2: Depreciation Costs - 5 years in service, zero resale value

DEPRECIATION COSTS						
Vehicle Make / Model	**Assumed life (years)**	**Full capital costs**	**Gross annual cost**	**Finance rate**	**Effective annual cost**	**Notes**
Dodge Grand Caravan	5	$62,150	$12,430	8%	$13,424	Side entry conversion
Toyota Sienna	5	$56,589	$11,318	8%	$12,223	Side entry conversion
Chrysler town and country	5	$64,037	$12,807	8%	$13,832	Side entry conversion
Honda Odyssey	5	$64,410	$12,882	8%	$13,913	Side entry conversion
Ford transit connect 2014 Taxi	5	$58,308	$11,662	8%	$12,595	Side entry conversion
Karsan V1	5	$45,200	$9,040	8%	$9,763	Pupose-built
MV1	5	$50,850	$10,170	8%	$10,984	Pupose-built
Fleet mean	5	$31,874	$6,375	8%	$6,885	Not accessible
Toyota Prius	5	$35,914	$7,183	8%	$7,757	Not accessible

Data sources: Canadian Black Book, Conversion costs: Savaria, Creative Carriage, Universal Motion. Dealer costs: MV1 Canada, Karsan, Ford

An initial overview of the depreciation costs based on 5 years in service life provides a stark comparison between the effective annual costs of current converted vehicles in the Toronto

fleet to those of purpose-built vehicles. Conversions displaying a significantly higher effective annual cost than those purpose built for the accessible market.

Differences between current perceptions of accessible vehicles as a significantly more expensive vehicle, and the potential costs of providing accessible vehicles may be partly explained by the nature of comparisons that may be made between vehicle types, and in particular that purpose built vehicles available in Canada do not have a significant secondary market nor proven operating costs. Figure 3 illustrates a illustration of the purchase price of used vehicles converted to wheelchair use. We have used 'average price' Canadian Black Book values specific to Toronto to identify resale prices for 1 year old minivans, and 2 year old converted minivans (figure 4). Total capital cost is then divided by the effective life in service (assuming a 5 year life for all vehicles) to show annual costs. Figures 3 and 4 illustrate used vehicle costs on the basis of a post purchase conversion. It is likely that this cost will fall as the secondary market for ready converted taxis and purpose built accessible taxis expands.

It should be highlighted that the secondary market for vehicles that have already been converted, ie: selling on a converted taxi, is not well established nor effectively measured in Toronto, in large part as a result of the small numbers of accessible taxis in the market. Secondary markets for purpose built vehicles are equally unclear for much the same reason.

Figure 3: 2012 conversion (purchase price plus conversion)

USED VEHICLES	2012 MODEL							4 years service
Vehicle Make / Model	**Purpose built/ conversion**	**Basic vehicle price**	**Fuel type**	**Conversion type**	**Conversion price**	**HST @ 13%**	**Total capital cost**	**Annual cost**
Dodge Grand Caravan	Conversion	$24,661	Gasoline	Side entry	$19,500	$5,741	$49,902	$12,475
Toyota Sienna	Conversion	$24,992	Gasoline	Dual entry	$21,000	$5,979	$51,971	$12,993
Chrysler town and country	Conversion	$26,159	Gasoline	Side entry	$19,500	$5,936	$51,595	$12,899
Honda Odyssey	Conversion	$30,351	Gasoline	Side entry	$19,500	$6,481	$56,332	$14,083
Fleet mean	Not accessible	$22,396	Gasoline	Not accessible	$0	$2,911	$25,307	$6,327
Toyota Prius	Not accessible	$24,709	Hybrid	Not accessible	$0	$3,212	$27,921	$6,980
NEW VEHICLES								5 years service
Karsan V1	Purpose-built	$40,000	Gasoline	Not required	$0	$5,200	$45,200	$9,040
Ford Transit Connect 2014 Taxi	Conversion	$32,100	Gasoline	Side Entry	$19,500	$6,708	$58,308	$11,662

Figure 4: 2011 conversion (purchase price plus conversion)

USED VEHICLES	2011 MODEL							3 years service
Vehicle Make / Model	Purpose built/ conversion	Basic vehicle price	Fuel type	Conversion type	Conversion price	HST @ 13%	Total capital cost	Annual cost
Dodge Grand Caravan	Conversion	$16,995	Gasoline	Side entry	$19,500	$4,744	$41,239	$13,746
Toyota Sienna	Conversion	$22,565	Gasoline	Dual entry	$21,000	$5,663	$49,228	$16,409
Chrysler town and country	Conversion	$23,900	Gasoline	Side entry	$19,500	$5,642	$49,042	$16,347
Honda Odyssey	Conversion	$27,901	Gasoline	Side entry	$19,500	$6,162	$53,563	$17,854
Fleet mean	Not accessible	$19,220	Gasoline	Not accessible	$0	$2,499	$21,719	$7,240
Toyota Prius	Not accessible	$21,206	Hybrid	Not accessible	$0	$2,757	$23,963	$7,988
NEW VEHICLES								5 years service
Karsan V1	Purpose-built	$40,000	Gasoline	Not required	$0	$5,200	$45,200	$9,040
Ford Transit Connect 2014 Taxi	Conversion	$32,100	Gasoline	Side Entry	$19,500	$6,708	$58,308	$11,662

Figures 3 and 4 illustrate the purchase price of used minivans from a dealership converted after purchase. Used vehicle prices have been taken from the Canadian Black Book in respect to the base model, and demonstrate that lower purchase costs do not equate to lower annual costs. This is in part due to the cost of conversion relative to the cost of the vehicle, and the effective shorter service of a vehicle in taxi use when compared to the wider vehicle life when used privately. The calculation does not include calculation of costs for used vehicles from other heavy use industries, such as purchase of used police vehicles, as heavily used vehicles will vary significantly in price and quality. In short, a vehicle purchased at the end of its useful service life in one industry limits the extent of life that can be provided if converted to use in the taxi industry.

Even this comparison suggests that the purchase of new purpose built vehicles may be economically advantageous, an indicator that is reinforced where the life span of the vehicle is considered. Of the minivans in service, the Dodge Grand Caravan appears the most favorable on purchase price alone, as the vehicle looses value more quickly than its counterparts and is thus cheaper when bought second-hand, but this may reflect lower serviceable life when compared to purpose built vehicles.

Figure 5 illustrates the comparative annual costs of two purpose built vehicles (MV1 and Karsan V1) bought new with the cost of the converted Grand Caravan and the Toronto fleet average vehicles bought used (1 year old). The most common (average) vehicles are not accessible.

Figure 5: Annual costs: Used Prius, Used Grand Caravan, New MV1, New Karsan V1, New Ford Transit Connect 2014

DEPRECIATION COSTS					
Vehicle Make / Model	**Assumed life– years**	**Total capital cost**	**Gross annual cost**	**Finance Rate**	**Effective Annual Cost**
Dodge Grand Caravan	4	$49,902	$12,476	8%	$13,474
Fleet Mean	4	$25,307	$6,327	8%	$6,833
Karsan V1	5	$45,200	$9,040	8%	$9,763
MV1	5	$50,850	$10,170	8%	$10,984
Ford Transit Connect 2014 Taxi	5	$58,308	$11,662	8%	$12,595

Assumed life in years is reduced in the case of the Prius and Dodge Grand Caravan reflecting the use of second-hand vehicles, and limited to 5 years in the instance of new purpose built vehicles. Vehicle lifespan is discussed in subsequent sections. It is noted that the effective annual costs of accessible vehicles remains higher than the same costs for the fleet average vehicle, supporting the view expressed within the taxi trade that operating accessible vehicles incurs a higher cost, though this does not account for additional traffic, nor extended vehicle life, discussed below.

3.3 Vehicle Age

The length of time over which a vehicles costs can be depreciated will have a major impact on the annual costs of that vehicle in service. Two factors are significant in defining the age to which a vehicle may operate in service; a limit applied by a licensing authority, and the physical condition of the vehicle itself. The former (limit imposed by the authority) may reflect a desire to maintain a modern fleet, while the latter reflects physical conditions such as road condition, weather, and may also reflect on the quality of testing regimes and inspection standards.

Age related tests have been undertaken for the fleet mean vehicle, an accessible Grand Caravan, Transit Connect and Nissan NV200 converted for side door entry on purchase, MV1 and Karsan V1, with maximum vehicle lives of 5 years from new, 6 years and seven years respectively. We have used the Karsan V1 Gasoline version in this example, Hybrid and full electric version of the Karsan are also likely to be available to the Toronto market. Second hand vehicles are also tested, when purchase 1 year old, and 2 year old, with the exception of new vehicle make and models, including the Transit Connect, Nissan NV1, Karsan V1 and MV1 are not available in the used vehicle market, and are tested from new alone, see figure 6. It is noted that the calculations in tables 6a - 6c take no account of a vehicle's ability to remain in service, discussed in more detail below.

Figure 6a: Permitted Vehicle Life 5 years, new and used vehicle cost comparison

Effective annual cost	**NEW VEHICLES**				
Vehicle Make / Model	**Permitted life for testing**	**Total capital cost**	**Gross annual cost**	**Finance Rate**	**Effective Annual Cost**
Dodge Grand Caravan	5	$62,150	$12,430	8%	$13,424
Fleet Mean	5	$31,873	$6,375	8%	$6,885
Nissan NV1	5	$50,285	$10,057	8%	$10,862
Karsan V1	5	$45,200	$9,040	8%	$9,763
MV1	5	$50,850	$10,170	8%	$10,984
Ford Transit Connect 2014 Taxi	5	$58,308	$11,662	8%	$12,595
Effective annual cost	**USED - 1 Year old**				
Fleet Mean	4	$25,307	$6,327	8%	$6,833
Dodge Grand Caravan conversion	4	$49,902	$12,476	8%	$13,474
Effective annual cost	**USED - 2 Year old**				
Fleet Mean	3	$21,719	$7,240	8%	$7,819
Dodge Grand Caravan conversion	3	$41,194	$13,731	8%	$14,830

Figure 6b: Permitted Vehicle Life 6 years, new and used vehicle cost comparison

Effective annual cost	NEW VEHICLES					
Vehicle Make / Model	**Maximum permitted life**	**Life in service**	**Total capital cost**	**Gross annual cost**	**Finance Rate**	**Effective Annual Cost**
Dodge Grand Caravan	6	6	$62,150	$10,358	8%	$11,187
Fleet Mean	6	6	$31,873	$5,312	8%	$5,737
Nissan NV1	6	6	$50,285	$8,381	8%	$9,051
Karsan V1	6	6	$45,200	$7,533	8%	$8,136
MV1	6	6	$50,850	$8,475	8%	$9,153
Ford Transit Connect 2014 Taxi	6	6	$58,308	$9,718	8%	$10,495
Effective annual cost	**USED - 1 Year old**					
Fleet Mean	6	5	$25,307	$5,061	8%	$5,466
Dodge Grand Caravan	6	5	$49,902	$9,980	8%	$10,779
Effective annual cost	**USED - 2 Year old**					
Fleet Mean	6	4	$21,719	$5,430	8%	$5,864
Dodge Grand Caravan	6	4	$41,194	$10,299	8%	$11,122

Figure 6c: Permitted Vehicle Life 7 years, new and used vehicle cost comparison

Effective annual cost	NEW VEHICLES					
Vehicle Make / Model	**Maximum permitted life**	**Life in service**	**Total capital cost**	**Gross annual cost**	**Finance Rate**	**Effective Annual Cost**
Dodge Grand Caravan	7	7	$62,150	$8,879	8%	$9,589
Fleet Mean	7	7	$31,873	$4,553	8%	$4,918
Nissan NV1	7	7	$50,285	$7,184	8%	$7,758
Karsan V1	7	7	$45,200	$6,457	8%	$6,974
MV1	7	7	$50,850	$7,264	8%	$7,845
Ford Transit Connect 2014 Taxi	7	7	$58,308	$8,330	8%	$8,996
Effective annual cost	**USED - 1 Year old**					
Fleet Mean	7	6	$25,307	$4,218	8%	$4,555
Dodge Grand Caravan	7	6	$49,902	$8,317	8%	$8,982
Effective annual cost	**USED - 2 Year old**					
Fleet Mean	7	5	$21,719	$4,344	8%	$4,691
Dodge Grand Caravan	7	5	$41,194	$8,239	8%	$8,898

While it is noted that allowing a vehicle to remain in service for longer will reduce the annual costs of its purchase, the practice of purchasing older vehicles does not necessarily result in additional savings. Savings made from a lower purchase price can be reduced or removed from the additional finance charges, ie: making payments over a shorter service life is not necessarily offset by lower purchase prices. In addition, the operating costs of an older vehicle are likely to be higher, discussed in section 4. The distinction between annualized costs of second hand vehicles over their effective service life compared to the annualized costs of new vehicles over (a longer) service life is not always made using like for like comparisons. This is discussed in more detail below.

4. Operating Costs

Capital costs, described above, are one of two major cost elements in providing taxi services, reflecting the initial purchase of a vehicle. Not all drivers purchase vehicles, with many choosing to lease a vehicle or share of a vehicle, from an owner, another driver or from a garage. Leased vehicles will also vary in cost as the lease reflects the costs incurred by a lessor, additional capital costs experienced by the lessor will be reflected in higher lease rates. Capital costs are typically fixed (or semi-fixed in the case of leased vehicles) as they remain constant regardless of the extent to which a vehicle is used or the distances driven. Operating costs reflect the day-to-day costs of running a vehicle, such as fuel and maintenance, many of which alter dependent on the numbers of miles driven. It is noted that the extent that costs are offset by income will depend on the actual number of miles driven in service, with part time drivers incurring higher costs per mile driven than those driving full time or extended hours, as capital costs remain constant for owner operators regardless of miles driven. Lease drivers will also experience fixed costs associated with the type of lease arrangement to which they have agreed.

We have set out an overview of operating costs in the following sections, and calculation of potential income in section 5 of this document.

4.1 Insurance Costs

The provision of insurance is seen as a required cost in transport. Motor insurance can be a significant expense, and is highlighted in a number of articles as a major expense to the Toronto taxi trade. Insurance costs will also vary dependent upon the claim record of an individual and a variety of personal circumstances that may include age. This said, the inclusion of a typical insurance cost is necessary in a calculation of comparative costs and income between non-accessible and accessible taxis.

We contacted a number of insurance brokers and the Insurance Bureau of Canada (IBC) to identify the impacts of accessibility on insurance costs. No single rate of insurance is identified for the Toronto fleet as all drivers and fleet insurance reflect the individual circumstances of the drivers insured. A typical rate was identified for older drivers without a record of claims, set out

in figure 7, but this was qualified by the fact that the majority of taxi insurance would be higher than the rate quoted.

Figure 7: Most favourable taxi insurance costs

Vehicle type	Annual Insurance Cost non-accessible (from)	Annual Insurance Cost-accessible (from)
Owner operator	$5,000	$6,500
Ambassador driver	$5,500	$7,000
Leased vehicle, 1 driver	$7,000	$8,000
Leased vehicle, 2 drivers	$7,500	$9,000
Fleet insured vehicle for 3rd party injury only	$9,000	$10,500

Source: Greater Toronto Insurance brokers

Despite the high costs quoted, the total amount fall well short of the average $12,000 reported in the driver survey as the cost of insuring non-accessible vehicles, suggesting that the actual amounts paid in the Toronto industry are above the 'most favourable' amounts quoted to the research team. This said, the difference between annual insurance costs for accessible and non-accessible vehicles were not as significant as have been suggested in some commentaries. One broker went further as broker to a large accessible company, the broker suggested that the claims costs for accessible vehicles was lower than that for non-accessible vehicles in the same fleet. The issue of ability to purchase cover was also discussed with the IBC, as this had been highlighted as an issue in some commentaries. IBC data indicates a significant increase in costs per claim in the taxi industry in 2012 compared to 2011, 2012 claims averaging $56,349, compared to a 2011 value of $34,882. The bureau suggesting that the level of claim reflected a 99% loss ratio on income to insurers. This provided, in the view of the IBC, a challenge in the provision of insurance, that may result in higher premiums in future years, or a loss of insurers willing to insure taxis.

4.2 Maintenance Costs

Maintenance costs may be defined as a semi-variable cost. The extent to which a vehicle requires maintenance will reflect the amount that the vehicle is used. The research team undertook a major survey of the Toronto taxi trade in Spring 2013, identifying the major

replacements and repairs across the range of vehicles in use in the fleet at that time. Information for purpose built accessible vehicles was not reported on as these vehicles were not in widespread use at the time of undertaking the initial survey.

Maintenance costs for purpose built vehicles are more complex to determine than those for the range of non-accessible vehicles currently in the fleet as little 'track record' is available from Toronto. Track records do exist for the MV1, the only purpose built accessible taxi in the North American market, based on its operation in US cities including Atlanta and Chicago, but these should be treated as indicative as they do not fully reflect the driving conditions in Toronto. This said, the Province of Quebec has recently completed an in service evaluation of the MV1 (preliminary version dated October 2013) indicating a number of key issues, set out in figure 8.

Figure 8: Reported MV1 operating statistics

Metric	Measured value	Notes
Fuel Consumption	17.48 l / 100KMS	Gasoline version

Source: Rapport d'evaluation: Projet pilote du vehicule MV-1, Preliminary report, Province of Quebec

The measured fuel consumption is marginally less good than the quote of 16.8 l / 100 KMS, but is with a reasonable margin reflecting the intensity of taxi use and particular climatic conditions in Quebec compared to the USA cities currently using the vehicle. The manufacturer claims extended life for the MV1 in line with its purpose built design, suggesting an equivalent life to the Ford Crown Victoria (many of the construction frames and parts are the same). The Ford Crown Vic can see upwards from a decade in active service, making it one of the longest serving vehicles in the US and Canadian taxi markets. While this can not be verified from practice, the potential to achieve a 7 year service life, rather than a 5 year life should be seen as a reasonable outcome.

Figures for the Karsan V1 are even more difficult to identify than for the MV1. The Karsan vehicle is new and not yet in service. All figures remain those of the manufacturer, and without confirmed independent use. We have use a base analysis of new vehicle parts using equipment costs for a similar cycle as for purpose built vehicles in other cities to provide an indicative cost. The manufacturer suggests that actual costs are lower than these may indicate as the V1 has been designed on modular replacement, a lower cost method of replacement than on large single parts.

4.4 Variable Costs

Variable costs include those costs that vary as a vehicle is driven in service. The most commonly quoted variable cost is fuel, as this will vary as a direct result of vehicle use. We have included variable costs in the calculations set out in section 5, using fuel efficiencies measured in our 2013 analysis of the Toronto market and those estimated for new vehicle types, as set out above.

In addition to the variable costs associated with distance driven we have also included a time cost, discussed in more detail in section 6. It should be noted that time costs are incurred through a variety of operating practices, which range from time with passenger, while loading/ unloading, time costs whilst in service - typically when in a traffic jam / signalized junction etc., and time costs associated with training, testing, or other time when a vehicle is unavailable (sometimes called opportunity costs). Figure 9 illustrates the primary variable costs used in our calculation. These may differ from values used in previous calculations reflecting changes in retail prices etc.

Figure 9: Gasoline costs used in calculation

Metric	Measured value	Source
Gasoline (Liter)	$1.176	Torontogasprices.com

4.5 Time Costs

An argument is forwarded in some commentary in relation to the time taken to load and unload wheelchair passengers. Providing proper loading and care to a wheelchair passenger should form the basis of any trip, and should be seen as an integral part of any training requirement. The value of this process, or more precisely measurement of its costs, are somewhat more complex. In our analysis we acknowledge the need and would urge the requirement that appropriate levels of time are allocated to correctly loading, securing and assisting wheelchair passengers. It is not a conclusion, however, that this activity represents legitimate additional cost. We make this argument on the basis of two factors, the actual time taken in securing - which may contrast to the loading of other passengers, particularly those

with shopping, buggies or elderly passengers; and the nature of time costs, which may be defined as opportunity costs or marginal costs.

Insofar as the handling of wheelchair passengers may necessitate additional time it is appropriate to acknowledge this as impacting on the driver. It is not certain, however, that this time actually impacts on the driver's ability to attend another call. This would only be justified if a driver were engaged on trips 100% of the time and the additional time in loading a wheelchair were removing the real opportunity to attend another call. We would suggest that loading times actually impact on the marginal time value of a driver the additional minutes taken to assist a passenger removing from time between calls rather than from actual earnings. Moreover, as the measured loading times identified in other cities vary little between wheelchair carriage and carriage of some other passengers we would suggest the effort taken to load and assist passengers be treated as a courtesy and an integral element in increasing business rather than detracting from it.

4.6 Training Costs

In a similar vein to the argument laid out for time costs, we would highlight the need for all drivers to understand and be trained to handle all passengers, including those in wheelchairs. This is an integral part of the training package in cities operating accessible taxis on a wider scale, and should not impact on the cost of properly constituted training.

5. Calculation of income

In this section we detail the potential income for a base scenario and impacts of operating an accessible taxi in the on-demand fleet in Toronto. Calculations are based on typical distances driven as measured in our previous analysis. We highlight the fact that no single driver will drive the same number of kilometres, nor experience the same demand as any other. Our basic calculation highlights the typical income that may be expected.

In section 6 we discuss the impacts of a growth in the market that may arise from the presence of accessible vehicles in the market.

5.1 Base line cost calculation

The baseline calculation provides an indicative cost and income for owner drivers operating a non-accessible taxi in the city of Toronto. Values input are set out in figure 10.

Figure 10: Baseline statistics / costs, Owner Operator

Metric	Measured value	Notes
Distance Driven with passenger	35,476	KMS
Total distance in service, including positioning	53,214	KMS
Annual Vehicle Cost, including finance	$6,092	Mean non-accessible vehicle cost
Insurance Costs	$12,000	Reported insurance
Brokerage Costs	$6,360	
Credit Card Processing	$600	
Annual Parts	$1086	
Annual Labor	$1042	
Fuel Cost	$7982	@ 12 liters / 100 KMS, fuel price $1.176
Sub Total	$34,691	

The calculation of costs is based on a driven distance of 35,500 KMS with passenger, using mean vehicle costs identified for non-accessible taxis in the market review 2013. The costs of fuel have been updated using current listings for the City of Toronto and a mean fuel efficiency

of 12 liters / 100 KMS driven. Using the cost assumptions set out in figure 10 it is possible to suggest a typical operating cost of $34,600 for an owner driver.

5.2 Base line income calculation

The second element in the calculation of driver income relates to a measurement of monies taken in service and any other income that may be measured, such as second driver rental etc. Figure 11 sets out the measurement of income through farebox, being the amount received from passengers. As in the previous calculation typical distances identified in the market review have been used.

Vehicles can be operated by a single driver, or using a shift system of two drivers. In the latter case an additional income can be identified to the owner operator, where the vehicle is rented directly, or by a garage. Figure 11 illustrates income to an owner driver as sole driver and where an additional income is received from a shift driver paying rent. The impacts of vehicle operating 24 hours are discussed in more detail in subsequent sections.

Figure 11: Baseline income, Owner Operator

Metric	Measured value	Notes
Number of trips made per annum	3547	
Mean Trip Distance	10	KMS
Included distance	143	Meters
Distance payment excluding flag	9857	Meters
Flag Drop / trip	$4.25	
Distance amount / trip	$17	
Income per trip	$21.25	
Sub Total - Income	$75,387	Does not exclude time cost nor tips
Sub Total - Costs	$34,691	From figure 10
TOTAL DRIVER INCOME	$40,695	Excludes additional income
Rental Income	$20,637	Potential income from shift rental
Total driver income including rental	$61,332	

5.3 Cost comparisons, existing vehicle types

In section 5.2 we presented a fleet wide average for vehicle costs and income for the City of Toronto fleet. This was calculated using the vehicle types recorded by the city and base costs set out in the 2013 market review, updated as described above. In this sub-section we highlight the operating costs of specific vehicles within the existing fleet, and extend the same analysis to newer vehicle types in section 5.4. Calculations in both this section, and as set out in section 5.4 assume that the numbers of trips and life span of a vehicle in service remain consistent. In section 6 we discuss the impacts of extended vehicle life and the impact of growth in the demand for accessible transport.

5.3.1 Dodge Grand Caravan (unconverted)

The Ford Crown Victoria had been a mainstay of the taxi trade as a reliable and readily repairable vehicle. As the 'crown vic' ceased production a number of vehicle types have entered the market as alternatives. The Dodge Grand Caravan is one such vehicle, benefitting from its design and ability to be converted to accessible use. The base version, without conversion, is listed at $35,000 new, with a number of value options reducing this price further. Figure 12 illustrates the costs and potential income of the vehicle without conversion. It should be noted that we have used list price for new vehicles to provide a consistency in comparison. While value options may result in a lower cost and thus higher potential income, such options typically apply across most models.

The unconverted Grand Caravan has a lower fuel efficiency than the mean across the fleet, and thus a higher cost. Potential income using the fleet average vehicle (figure 12) and an unconverted Grand Caravan in standard service (figure 12a) is measured at $59,500 compared to the fleet average of $61,000. Conversion of the vehicle to accessible use adds to the vehicle costs and reduces income further, see figure 13.

Figure 12: Baseline income - Fleet Average vehicle

Fleet Average vehicle	Cost/income metric	Amount	Value	
Annual infrastructure costs	Distance and driven with passenger (kms)	35,476		
	Total distance in service (including positioning)	53,214		
	Annual vehicle cost (including finance if appropriate)		$6,885	
	Shift rental fee costs (if appropriate)			
	Insurance costs (if paid separately)		$12,000	
	Lease costs (if paid)			
	Agent costs (if paid)			
	Brokerage costs (if paid)		$6,360	
	Credit card processing fees		$600	$25,845
Maintenance costs (if paid separately)	Annual parts costs		$1,086	
	Annual maintenance labour costs		$1,042	$2,128
Fuel costs	Fuel efficiency (litres per 100 km)	11.6		
	Annual litres required in service	6173		
	Annual fuel cost		$7,259	$7,259
	Equivalent total annual cost			$35,232
Operating income loaded KM	Mean trip distance	10 kms		
	Included distance	143 metres		
	Distance remaining after included	9,857 metres		
	Number of increments for distance	68		
	Flag drop amount		$4.25	
	income based on distance (per trip)		$17.00	
	Tip amount (per trip)		$0.00	
	Subtotal (per trip)			$21.25
Annual Income calculations	Income loaded km		$2.1250	
	Number of trips per anum	3,547.604		
	All income before costs			$75,387
Earnings Income	**Income minus Costs**			**$40,155**
Additional income (if available)	Rental Income		$20,637	
	Earnings income PLUS Rental			$60,792
	Additional insurance cost, second driver		$1,000	
Take home income	Earnings plus rental minus additional cost			**$59,792**

Figure 12a Baseline income unconverted Grand Caravan

Grand Caravan UNCONVERTED	Cost/income metric	Amount	Value	
Annual infrastructure costs	Distance and driven with passenger (kms)	35,476		
	Total distance in service (including positioning)	53,214		
	Annual vehicle cost (including finance if appropriate)		$7,910	
	Shift rental fee costs (if appropriate)			
	Insurance costs (if paid separately)		$12,000	
	Lease costs (if paid)			
	Agent costs (if paid)			
	Brokerage costs (if paid)		$6,360	
	Credit card processing fees		$600	$26,870
Maintenance costs (if paid separately)	Annual parts costs		$1,086	
	Annual maintenance labour costs		$1,042	$2,128
Fuel costs	Fuel efficiency (litres per 100 km)	11.6		
	Annual litres required in service	6173		
	Annual fuel cost		$7,259	$7,259
	Equivalent total annual cost			$36,257
Operating income loaded KM	Mean trip distance	10 kms		
	Included distance	143 metres		
	Distance remaining after included	9,857 metres		
	Number of increments for distance	68		
	Flag drop amount		$4.25	
	income based on distance (per trip)		$17.00	
	Tip amount (per trip)		$0.00	
	Subtotal (per trip)			$21.25
Annual Income calculations	Income loaded km		$2.1250	
	Number of trips per anum	3,547.604		
	All income before costs			$75,387
Earnings Income	**Income minus Costs**			**$39,130**
Additional income (if available)	Rental Income		$20,637	
	Earnings income PLUS Rental			$59,767
	Additional insurance cost, second driver		$1,000	
Take home income	Earnings plus rental minus additional cost			**$58,767**

5.3.2 Accessible Dodge Grand Caravan (converted)

The Grand Caravan is also suited for conversion, as are a number of other vehicle types described in preceding sections. Conversion is the process of removing the floor pan to allow for the fitting of wheelchair ramp and securing positions. All conversions occur post-production and are typically undertaken by specialist companies, a number of whom serve the Toronto market.

Figure 13 illustrates the costs and potential income of the Grand Caravan converted for side entry access using a Savaria conversion. It is noted that other entry options and converters are available that may result in different costs of conversion.

Figure 13 Baseline income accessible converted Grand Caravan

Accessible Grand Caravan	Cost/income metric	Amount	Value	
Annual infrastructure costs	Distance and driven with passenger (kms)	35,476		
	Total distance in service (including positioning)	53,214		
	Annual vehicle cost (including finance if appropriate)		$13,424	
	Shift rental fee costs (if appropriate)			
	Insurance costs (if paid separately)		$13,500	
	Lease costs (if paid)			
	Agent costs (if paid)			
	Brokerage costs (if paid)		$6,360	
	Credit card processing fees		$600	$33,884
Maintenance costs (if paid separately)	Annual parts costs		$1,086	
	Annual maintenance labour costs		$1,042	$2,128
Fuel costs	Fuel efficiency (litres per 100 km)	11.6		
	Annual litres required in service	6173		
	Annual fuel cost		$7,259	$7,259
	Equivalent total annual cost			**$43,271**
Operating income loaded KM	Mean trip distance	10 kms		
	Included distance	143 metres		
	Distance remaining after included	9,857 metres		
	Number of increments for distance	68		
	Flag drop amount		$4.25	
	income based on distance (per trip)		$17.00	
	Tip amount (per trip)		$0.00	
	Subtotal (per trip)			$21.25
Annual Income calculations	Income loaded km		$2.1250	
	Number of trips per anum	3,547.604		
	All income before costs			**$75,387**
Earnings Income	**Income minus Costs**			**$32,116**
Additional income (if available)	Rental Income		$20,637	
	Earnings income PLUS Rental			$52,753
	Additional insurance cost, second driver		$1,000	
Take home income	Earnings plus rental minus additional cost			**$51,753**

The cost of conversion impacts on the potential income significantly, reducing the typical income to $53,000 on the basis of a like for like comparison. This does not consider growth in demand for accessible vehicles discussed in subsequent sections. More recent vehicles and new vehicle types available to the Toronto market are considered in section 5.4.

5.4 Cost comparisons, new vehicle types

New vehicle types can influence the costs and thus driver incomes that can be achieved in the taxi industry. Two primary routes are available, the provision of accessibility through the use of accessible vehicle types, and a move toward more fuel efficient vehicles. The two are separate activities but need not be mutually exclusive as some fuel efficient accessible vehicles are also becoming available to the Toronto market. The following sections set out the 5 year costs of new vehicle types, while subsequent sections discuss the impacts of increased numbers of years in service life. In the initial review the assumption is made that kilometers in service remain the same.

5.4.1 Toyota Prius

The Toyota Prius is a production hybrid vehicle that has established a strong record in taxi fleets across North America. The vehicle is more expensive to purchase, retailing at $35,900 inclusive, than its closest traditional alternatives, but benefits from a significant improvement in fuel economy. The vehicle is somewhat smaller than its predecessors (such as the Ford Crown Victoria), though this is unlikely to impact on carriage of groups up to 3 people.

Despite the higher purchase price, the Toyota Prius delivers significantly better fuel efficiencies than standard sedans, effectively halving fuel bills and resulting in a net increase in owner driver income from $61,332 to $63,109 including additional driver rental. The difference goes a long way to explaining the popularity of the vehicle type in the Toronto fleet, and placing additional challenges in that comparative costs of converted accessible vehicles compare worse against the Prius than against other vehicle types. Figure 14 illustrates the costs and incomes achieved using a Toyota Prius as a non-accessible taxi.

Figure 14 Baseline income: Toyota Prius

Toyota Prius	Cost/income metric	Amount	Value	
Annual infrastructure costs	Distance and driven with passenger (kms)	35,476		
	Total distance in service (including positioning)	53,214		
	Annual vehicle cost (including finance if appropriate)		$7,757	
	Shift rental fee costs (if appropriate)			
	Insurance costs (if paid separately)		$12,000	
	Lease costs (if paid)			
	Agent costs (if paid)			
	Brokerage costs (if paid)		$6,360	
	Credit card processing fees		$600	$26,717
Maintenance costs (if paid separately)	Annual parts costs		$1,086	
	Annual maintenance labour costs		$1,042	$2,128
Fuel costs	Fuel efficiency (litres per 100 km)	6.5		
	Annual litres required in service	3,459		
	Annual fuel cost		$4,068	$4,068
	Equivalent total annual cost			**$32,913**
Operating income loaded KM	Mean trip distance	10 kms		
	Included distance	143 metres		
	Distance remaining after included	9,857 metres		
	Number of increments for distance	68		
	Flag drop amount		$4.25	
	income based on distance (per trip)		$17.00	
	Tip amount (per trip)		$0.00	
	Subtotal (per trip)			$21.25
Annual Income calculations	Income loaded km		$2.1250	
	Number of trips per anum	3,547.604		
	All income before costs			**$75,387**
Earnings Income	**Income minus Costs**			**$42,474**
Additional income (if available)	Rental Income		$20,637	
	Earnings income PLUS Rental			$63,111
	Additional insurance cost, second driver		$1,000	
Take home income	Earnings plus rental minus additional cost			**$62,111**

5.3.2 MV-1

The MV-1 is a purpose built accessible vehicle, and currently the only purpose built accessible vehicle taxi available to the Toronto market. The vehicle has an established history, despite a recent change in ownership, and a track record in a number of cities in the USA. The MV-1 is supplied as a Gasoline vehicle with a number of alternative fuel options, of which the Compressed Natural Gas (CNG) version is popular in the US, particularly in the City of Chicago.

Production of the MV-1 has emerged from a period of uncertainty, as the previous company VPG was taken over by AMGeneral (AMG), but the vehicle appears to be re-entering production for the Canadian market. The MV-1 is a spacious accessible taxi that is reported by the manufacturer to be compliant with current requirements set out in CSA-D409, as well as equivalent standards in the USA. A number of cities have seen the MV-1 in service, including Chicago, with few issues in use or maintenance. Figure 15 sets out the costs and potential income in using the MV-1. An add on insurance cost is included in all accessible vehicle calculations based on figures supplied by Toronto insurance brokers.

Figure 15: Baseline income MV-1

MV1	Cost/income metric	Amount	Value	
Annual infrastructure costs	Distance and driven with passenger (kms)	35,476		
	Total distance in service (including positioning)	53,214		
	Annual vehicle cost (including finance if appropriate)		$10,983	
	Shift rental fee costs (if appropriate)			
	Insurance costs (if paid separately)		$13,500	
	Lease costs (if paid)			
	Agent costs (if paid)			
	Brokerage costs (if paid)		$6,360	
	Credit card processing fees		$600	$31,443
Maintenance costs (if paid separately)	Annual parts costs		$1,086	
	Annual maintenance labour costs		$1,042	$2,128
Fuel costs	Fuel efficiency (litres per 100 km)	17.48		
	Annual litres required in service	9302		
	Annual fuel cost		$10,939	$10,939
	Equivalent total annual cost			**$44,510**
Operating income loaded KM	Mean trip distance	10 kms		
	Included distance	143 metres		
	Distance remaining after included	9,857 metres		
	Number of increments for distance	68		
	Flag drop amount		$4.25	
	income based on distance (per trip)		$17.00	
	Tip amount (per trip)		$0.00	
	Subtotal (per trip)			$21.25
Annual Income calculations	Income loaded km		$2.1250	
	Number of trips per anum	3,547.604		
	All income before costs			**$75,387**
Earnings Income	**Income minus Costs**			**$30,877**
Additional income (if available)	Rental Income		$20,637	
	Earnings income PLUS Rental			$51,514
	Additional insurance cost, second driver		$1,000	
Take home income	Earnings plus rental minus additional cost			**$50,514**

The calculation of potential income suggests that the MV-1 is likely to experience higher costs on a like for like comparison with other vehicle types. The vehicle would allow for an income level of approximately $50,500 for an owner driver with a second shift income, compared to $61,000 for a median sedan in the current fleet, and $62,000 for a Toyota Prius. Positive aspects of the MV-1 relate to the accessibility that the vehicle provides compared to traditional vehicles, which in turn may lead to an increase in the amount of business the vehicle receives, see subsequent sections. A demonstrable track record suggests that the vehicle may also be in service behind the current limits imposed in the city of Toronto, which may provide an opportunity to reduce the operating costs of the vehicle by extending the period over which it operates in service. Impacts of extending service life are considered in section 6.

5.3.3 Karsan V1

The V1 is a new vehicle scheduled to enter the Toronto market from late 2015 to early 2016. The vehicle was originally proposed in the New York taxi of tomorrow competition and has been developed through to pre-production development vehicle. Its manufacturer, Karsan, is in the process of establishing a production base in Buffalo and a network of dealers in Toronto. The vehicle is offered in a number of fuel versions both as internal combustion (IC) engines including Hybrid, and full electric versions. The following calculations are based on the IC version without hybrid.

The calculation of potential income suggests that the V1 is likely to match income achieved across the traditional vehicle fleet, with an approximate annual income of $57,000 without any additional passenger growth nor extended life, but fall short of the Toyota Prius income of approximately $62,000. The vehicle significantly outperforms converted accessible vehicles in terms of price and performance, and will similarly outperform larger vehicles used in non-accessible taxi service. The similarity of the Karsan V1 potential income to that achieved across the fleet as it stands should be seen as a major benefit to the vehicle, allowing the provision of accessible taxi service without significant intervention on the part of the city. It should be noted that performance figures for the Karsan can not be fully confirmed prior to operation. The manufacturer also suggests that hybrid and fully electric versions will achieve a significant saving in operating costs when compared to the base model used in calculations in this document.

Figure 16 Baseline income Karsan V1

Karsan V1	Cost/income metric	Amount	Value	
Annual infrastructure costs	Distance and driven with passenger (kms)	35,476		
	Total distance in service (including positioning)	53,214		
	Annual vehicle cost (including finance if appropriate)		$9,763	
	Shift rental fee costs (if appropriate)			
	Insurance costs (if paid separately)		$13,500	
	Lease costs (if paid)			
	Agent costs (if paid)			
	Brokerage costs (if paid)		$6,360	
	Credit card processing fees		$600	$30,223
Maintenance costs (if paid separately)	Annual parts costs		$1,086	
	Annual maintenance labour costs		$1,042	$2,128
Fuel costs	Fuel efficiency (litres per 100 km)	9		
	Annual litres required in service	4,789		
	Annual fuel cost		$5,632	$5,632
	Equivalent total annual cost			**$37,983**
Operating income loaded KM	Mean trip distance	10 kms		
	Included distance	143 metres		
	Distance remaining after included	9,857 metres		
	Number of increments for distance	68		
	Flag drop amount		$4.25	
	income based on distance (per trip)		$17.00	
	Tip amount (per trip)		$0.00	
	Subtotal (per trip)			$21.25
Annual Income calculations	Income loaded km		$2.1250	
	Number of trips per anum	3,547.604		
	All income before costs			**$75,387**
Earnings Income	**Income minus Costs**			**$37,404**
Additional income (if available)	Rental Income		$20,637	
	Earnings income PLUS Rental			$58,041
	Additional insurance cost, second driver		$1,000	
Take home income	Earnings plus rental minus additional cost			**$57,041**

5.3.4 Ford Transit Connect (2014) Taxi

The Ford Transit Connect is an established commercial vehicle available in a variety of commercial goods van and passenger van combinations. The transit has an established history of operation in goods services, and some use in taxi service, particularly in European markets. The 2014 Transit Connect models are available with a taxi pack, in tended for ready application to the taxi market, and are available to post-production conversion. The Canadian market will be offered the Transit Connect 2014 Taxi version with a named conversion partner, Marley Industries.

The Transit Connect has a fuel efficiency, according to manufacturer's figures of 10.5 litres / 100 kms in city use, 9.0 litres combined on the 2.5 litre six speed model. We have applied these efficiencies to the following calculations, baseline figures for an owner driver.

Figure 17 Baseline income Ford Transit Connect

Transit Connect	Cost/income metric	Amount	Value	
Annual infrastructure costs	Distance and driven with passenger (kms)	35,476		
	Total distance in service (including positioning)	53,214		
	Annual vehicle cost (including finance if appropriate)		$12,995	
	Shift rental fee costs (if appropriate)			
	Insurance costs (if paid separately)		$13,500	
	Lease costs (if paid)			
	Agent costs (if paid)			
	Brokerage costs (if paid)		$6,360	
	Credit card processing fees		$600	$33,455
Maintenance costs (if paid separately)	Annual parts costs		$1,086	
	Annual maintenance labour costs		$1,042	$2,128
Fuel costs	Fuel efficiency (litres per 100 km)	10.5		
	Annual litres required in service	5587.47		
	Annual fuel cost		$6,571	$6,571
	Equivalent total annual cost			**$42,154**
Operating income loaded KM	Mean trip distance	10 kms		
	Included distance	143 metres		
	Distance remaining after included	9,857 metres		

	Number of increments for distance	68		
	Flag drop amount		$4.25	
	income based on distance (per trip)		$17.00	
	Tip amount (per trip)		$0.00	
	Subtotal (per trip)			$21.25
Annual Income calculations	Income loaded km		$2.1250	
	Number of trips per anum	3,547.604		
	All income before costs			**$75,387**
Earnings Income	**Income minus Costs**			**$33,233**
Additional income (if available)	Rental Income		$20,637	
	Earnings income PLUS Rental			$53,870
	Additional insurance cost, second driver		$1,000	
Take home income	Earnings plus rental minus additional cost			**$52,870**

5.3.5 Nissan NV200

The Nissan NV200 is a new taxi market entrant, based on the commercial van range of Nissan. The NV200 is a non-accessible vehicle successful in the New York Taxi of Tomorrow competition, currently entering service in New York. Additional versions of the vehicle are being developed for the London (UK) market and other US markets.

The NV200 is available to after market conversion, with a number of vehicles being converted for the New York and London markets. Braun is the conversion partner for the North American markets. The research team approached Nissan for costs and operating information, which was available in respect of the US market. This is included in figure 18, below.

Figure 18 Nissan NV200

Nissan NV200		Amount	
MSRP USA	Nissan NV200 Taxi (unconverted)	US$29,700	
	Wheelchair conversion (Braun)	US$12,000	
	Fuel Efficiency	24 MPG	9.8 l/100KMS

6. Extended Service Life

In preceding sections we highlighted that vehicles were compared on a like-for-like basis. This refers to the length of time over which a vehicle remains in service, and the numbers of kilometres estimated driven in a year. In reality these factors are variable, and may result from updates to policies, those which limit vehicle operating age; and to the design and quality of the vehicles themselves. In this section we discuss the impacts of changes in service life, and potential growth in demand that may arise from provision of accessible, rather than non-accessible vehicles.

6.1 Life in service

The calculation of potential income set out in preceding sections is based on the use of a five year service life. Vehicle life, sometimes referred to as a sunset requirement, can often be defined by an authority to provide a consistency in the age of vehicles operating in a city, and may be seen as an arbitrary figure that is not, or may not be, related to the serviceable life of the vehicles in use. A number of manufacturers suggest that their vehicles are serviceable over a longer time period than the 5 years used in the calculations set out above. This is particularly felt to be an issue in the instance of purpose built vehicles, rather than conversions, that have operating records on other locations in excess of the defined period.

Service life may also provide an incentive, or offset, that would impact upon the additional cost that may be associated with the provision of accessible vehicles. Figure 19, below, set out the potential impacts of an extension to a six years and seven years of life for accessible vehicles. The calculation does not imply that the vehicle will be serviceable for the additional period thus allowed, as the serviceable life of any vehicle reflects a large number of factors, not least the extent to which it is services and maintained.

Figure 19 Potential income with extended life

Vehicle Type	Potential annual income 5 year life owner driver with rental income	Potential annual income 5 year life owner driver alone	Potential annual income 6 year life owner driver with rental income	Potential annual income 7 year life owner driver with rental income
Fleet Average	$59,792.00	$40,155.00		
Toyota Prius	$62,111.00	$42,474.00		
Accessible Grand Caravan	$51,753.00	$32,116.00	$54,000	$55,600
Ford Transit Connect	$52,870.00	$33,233.00	$55,370	$56,869
MV1	$50,514.00	$30,877.00	$52,300	$53,700
Karsan V1	$57,041.00	$37,404.00	$58,700	$59,800

Figure 19 Illustrates the potential impact of extending service life for accessible vehicles.The table sets out the potential income on the basis of changes in permitted retirement age for accessible vehicles and provides a comparison against the fleet average and Prius income levels. The Prius retains the highest income levels, largely as a result of its fuel efficiencies and size, whilst the Karsan V1 performs better than its direct alternatives and is the best performing vehicle for the extended age calculations. The calculation makes no assumption that vehicles can last for the extended life shown, a number of commentaries suggesting that converted vehicles would not be able to do so. This effectively requires comparison between the highest income levels of converted vehicles (Karsan V1 over 7 years) of $60,000 against a fleet average of $60,000 over 5 years; and converted Grand Caravan values over 5 years of $52,000.

On this basis, the income levels associated with the Karsan with a permitted life of 7 years compare well with the current fleet average, which includes the Toyota Prius, and exceeds all other vehicle types. Effectively a requirement to provide accessible taxis in an on-demand fleet can be achieved without additional subvention on the basis of the Karsan. Difficulty arises in this calculation in that the Karsan figures do not have corroborating service based evidence, nor will be available to the Toronto market until 2016. The next best performing accessible vehicle can be disputed between the MV1 with a service life of 7 years and the converted vans with a similarly extended life. If the effective life of a conversion is measured at 5 years the MV1 income level of $53,700 should be compared with the fleet average of $60,000. Figure 20

illustrates the potential effective incomes as a percentage of the mean Toronto taxi currently used. All comparisons are made on the basis of an owner driver receiving rental income from a second driver.

Figure 20: Take Home income comparison by vehicle type

Vehicle Type	5 Years in service	6 Years in service	7 Years in service
Fleet Average	**100%**		
Toyota Prius	104%		
Accessible Grand Caravan	88%	90%	92%
Ford Transit Connect	89%	92%	95%
MV1	84%	87%	90%
Karsan V1	95%	98%	100%

6.2 Growth in Demand

Additional consideration should also be given to the positive effects of providing accessibility within the Toronto fleet. Growth in demand may be suggested to follow from the provision of accessible vehicles to the wider Toronto population and from the transfer of passengers currently using other forms of accessible transport, including TTC Wheel-Trans and other mobility services.

Demand for accessible vehicle use is affected by a number of factors, including the availability of appropriate services, their reliability and cost; and perceptions of service accessibility. The current Toronto taxi market splits between a majority of the fleet, which are currently provided by non-accessible vehicles, and a significantly smaller number of WAV taxis licensed as 'W' plated vehicles and used predominantly to fulfil contracted services, including those contracted to TTC Wheel-Trans. While this split remains, the perception, and reality for the vast majority of instances, is that the Toronto 'on-demand' taxi fleet is not accessible to wheelchair users. In other words, very few trips are made as a result of a lack of on-demand service.

The most common quoted demand figure (1% of current on demand trips) should not be taken to be an indication of level of demand where all vehicles are accessible. The provision of an

accessible fleet, or a larger number of accessible vehicles within the fleet, is likely to have the effect of reducing barriers to use and increasing reliability. The reduction in demand suppression would grow the number of taxi journeys being made, and be additive to the incomes of taxi drivers, rather than detractive. A critical point arises where the additional income attributed to accessible trips exceeds any additional cost of vehicle provision.

6.2.1 Existing service demand

A demand for accessible transit is seen across the city by city's own TTC Wheel-Trans services, providing bus-based services, and a number of specialist providers. The TTC reports 10,250 active users in 2012 making a total of 700,000 non-ambulatory trips in the same year. A non-ambulatory trip relates to a trip where a wheelchair equipped vehicle is required.

Participation has grown from 8,250 in 2008, a growth of 24% over 4 years, supporting the argument that suppressed demand had existed, and further reports that an average of 10% of applicant per year are rejected, suggesting an even greater demand than the figures measure.

The TTC also reports that of this number 164,500 non-ambulatory trips were allocated to taxis, around 23% of trips, rather than using TTC own account vehicles. While this number is currently accommodated within the specialist 'W' plate, growth and indicated suppressed demand would suggest a significant benefit from increased availability of accessible vehicles within the on-demand fleet.

Other submissions to the Taxi Reform process suggest a demand suppression for accessible taxis, though few are specific. The Wheelchair Accessible Transit submission 'Proposal, On-Demand Metered Accessible Taxicab Service for the City of Toronto' indicates the potential for non-subsidised accessible taxis, going a step further to submit a proposal for dispatch services, that would also act to enhance demand and provide a level of certainty in the view of users above that currently seen. A different approach is taken by the Martin Prosperity Institute 'Releasing constraints, projecting the economic impacts of increased accessibility in Ontario[2]' who highlight the growth in the numbers of individuals with disabilities, estimating a 7% growth

[2] http://martinprosperity.org/media/ReleasingConstraints_June22.pdf

in the period 2001 - 2006. While neither demonstrates precise growth in demand, both indicate an underlying demand that is currently not met.

6.2.2 Comparable service demand

A number of examples exist where The provision of accessible vehicles has been shown to increase the level of accessible use, in some instances quite significantly.Examples of long-standing good practice includes the cities of Philadelphia and New York, where Significant growth in accessible use has resulted. More recent additions included Chicago, notably with the provision of a dedicated booking service for accessible trips. Whilst the circumstances in each city are unique it appears a reasonable conclusion that growth will occur as a result of the provision of accessibility in the fleet. The original estimate of an additional tapered growth to 3% set out in the 2013 market analysis appears an underestimate in terms of market growth experienced. The longest standing location, Philadelphia approximates a growth up to 5%, based on comments from accessible vehicle operators and association, though the number of trips will vary in relation to the total numbers of trips that are made by ambulant passengers.

Greater impacts demonstrated in some US cities suggest that the initial forecast of 3% as set out in our original report is conservative. Using a mid point estimate between growth in eligible population forecast (Martin Prosperity) and TTC demand growth in the period 2008 - 2012, it is possible suggest a potential growth of 3.875% without diversion from other sources, effectively that the need for accessible vehicles of all kinds including taxis is higher than the 3% initially used. The demonstrated TTC growth in applicants exceeds this figure and would suggest a larger benefit than this.

We have tested three scenarios, conservative, midpoint and optimistic growth scenarios, see figures 21 - 23. The low growth scenario maintains the initial growth as set out in our previous report, expressed as potential income levels and compared as a percentage for other scenarios. A mid range growth, using the combination of predictions described above, and a full growth scenario using the demonstrated TTC applicant growth rate observed in the period 2008 - 2012. The test also includes an income measure where accessible vehicles are permitted to remain in service to 7 years.

Figure 21 Potential income with market growth and extended life, conservative growth

Vehicle Type	Potential annual income 5 year life owner driver with rental income	Potential annual income 5 year life owner driver alone	Potential annual income 7 year life owner driver with rental income
Fleet Average	$59,792	$40,155	
Toyota Prius	$62,111	$42,474	
Accessible Grand Caravan	$53,306	$33,079	$57,268
Ford Transit Connect	$54,456	$34,229	$58,575
MV1	$51,659	$31,803	$55,311
Karsan V1	$58,752	$38,526	$61,594

Figure 21a Comparative income with market growth and extended life, Conservative growth, Fleet mean = 100

Vehicle Type	Potential annual income 5 year life owner driver with rental income	Potential annual income 7 year life owner driver with rental income
Fleet Average	100%	
Toyota Prius	104%	
Accessible Grand Caravan	88%	95%
Ford Transit Connect	89%	96%
MV1	86%	93%
Karsan V1	98%	103%

Figure 22 Comparative income with market growth and extended life, Mid Range growth, Fleet mean = 100

Vehicle Type	Potential annual income 5 year life owner driver with rental income	Potential annual income 7 year life owner driver with rental income
Fleet Average	100%	
Toyota Prius	104%	
Accessible Grand Caravan	90%	97%
Ford Transit Connect	91%	97%
MV1	87%	94%
Karsan V1	99%	104%

Figure 22 Comparative income with market growth and extended life, Full growth, Fleet mean = 100

Vehicle Type	Potential annual income 5 year life owner driver with rental income	Potential annual income 7 year life owner driver with rental income
Fleet Average	100%	
Toyota Prius	104%	
Accessible Grand Caravan	92%	99%
Ford Transit Connect	93%	100%
MV1	89%	96%
Karsan V1	101%	106%

In all instances the Karsan V1 performs best of the accessible vehicle types, exceeding the income levels achieved by the fleet average in the base scenario. The Ford Transit Connect 2014 Taxi matches the baseline fleet average. Other accessible vehicle types do not meet the income levels measured for traditional vehicles in the base scenario, and would require consideration of additional measures to support their operation. The availability of vehicles should also be considered, which will also impact on the best method of delivering accessible taxis to the city. This is discussed in more detail in the subsequent section. A positive impact will accrue to early adopters of accessible vehicles as these vehicles and the companies that operate them are likely to become known for accessible supply and may therefore capture market share above that indicated above. This should be considered against the additional costs of adopting early technologies rather than mainstream vehicles that may be available in the market in future years.

7. Vehicle Replacement

In the preceding sections we have identified the potential costs and benefits of using accessible taxis in the Toronto market. In this section we consider the impact of various requirements to owners and operators replacing vehicles within their fleets.

7.1 Purchase on new issuance

The requirement to purchase an accessible vehicle following the issue of a new permit should not, properly, be referred to as a replacement decision. Vehicles purchased with new permits are effectively a capital cost that would be incurred normally in the development of a new business. That said, the comparative cost of the lowest priced accessible vehicle, the Karsan V1 entering the market at $45,200 (inclusive) is some $10,000 higher than the list price of the Toyota Prius ($36,000 inclusive), and is likely to experience marginally higher operating costs, though these are offset where an extended life is permitted for the V1. The next best priced accessible vehicle, the MV1 retail list price of $50,100 incl. may be more problematic with the wider difference in purchase price.

A positive impact may be considered in terms of the likely take up time new issuance favouring the introduction of new vehicles, but should also be considered against the absence of accessible vehicles in the market in the interim period.

7.2 Replacement at point of sale or transfer

The second option relates to a required replacement at the point of sale or transfer of a license. This option has a number of similarities to that of new issuance, but assume existence of a plated vehicle at the time of transfer. Vehicles in service at the point of a transfer would effectively loose their value as their replacement is required, which can range from brand new vehicles recently brought into service, to the oldest vehicles ready to be scrapped. If we take the median point considering the replacement of an average vehicle this accounts to an additional $15,200 opportunity cost that can not be recovered.

The loss of value considered as an opportunity cost of required replacement at point of sale can not be recovered through operation and is likely to reflect the least favourable option.

7.3 Replacement with accessible vehicle at purchase on next vehicle

A third option exists that owners are required to 'upgrade' to an accessible vehicle at the point of next purchase. This option provides the best outcome of the three by resulting in a rapid upgrade of the Toronto fleet, while having the least impact on driver income, though it is possible that it may appear to be less effective on the basis of headline vehicle cost alone.

In previous sections it was identified that some accessible vehicles can operate with similar income levels (income minus cost) compared to traditional vehicle types. This option assumes that extended life is permitted of accessible vehicles. Where owners transfer to the most cost effective accessible vehicles this can be achieved at no cost or low cost. Higher costs will accrue, however, where the transfer is made to a less efficient accessible vehicle. As the most cost effective vehicle is not currently available on the market this option has limited opportunity and will result in a level of costs to be borne by the owner and/or driver.

Using the income levels calculated for the best performing non-accessible (Toyota Prius) operating for 5 years and second best performing accessible vehicle (MV-1) operating for 7, this cost accounts to $7,000; though a more realistic comparison, the MV1 compared to the fleet average results in a lower cost of $4,000, and a yet lower loss compared to the fleet excluding Prius.

7.4 Replacement policy

The most effective measure, replacement with accessible vehicle on next purchase, results in a zero cost where vehicles are able to be replaced by the V1, but some costs where other accessible vehicles are used. Of the other options, replacement at new issuance although not technically an operating cost, should also be considered.

8. Conclusions

The research team have undertaken a review of the costs and impacts of introducing accessible taxis to the Toronto taxi fleet. The analysis follows from the Taxi Review being undertaken by the city and resulting in the framework for taxi reform. The framework document sets out a desire to move to accessible taxis, and this has formed the basis of our analysis. The introduction of accessibility to a fleet need not constitute a significant cost on the operator, nor by extension on drivers leasing vehicles, though some commentary made and in the public domain appears to suggest a significant cost in achieving this goal.

In our analysis we have considered the actual costs of accessible vehicle provision and sought to avoid false comparisons between differing vehicles or differing age profiles.

The capital cost of an accessible vehicle remains higher than purchase of a non-accessible vehicle. We have identified a variety of vehicle types in both classes, accessible and non-accessible, and a range of differing levels of cost in each. This range causes the greatest level of misinterpretation in relation to capital costs, with a number of comparisons made between higher specification vehicles in one category and lower specifications in the other. Moreover direct comparison of purchase prices between categories fails to account for the cost of vehicles in other aspects, such as may arise from higher insurance costs in one category, second hand purchases or vehicle life span. In our calculations we have identified the annualised costs of vehicles in three categories: Non-accessible vehicles, Converted Accessible vehicles and purpose built accessible vehicles. We have also undertaken a review of the impacts of purchasing vehicles used, see section 4, although the impact of reduced second hand vehicle costs are largely lost to higher credit payments (over a shorter period) and additional costs described in preceding sections.

Figure 23 illustrates the annualised purchase cost from new and the cost of finance for primary vehicles in the fleet. while the extended life permitted in the column marked 7 years offset the purchase price of the MV1 and Karsan V1 compared to the average vehicle in the fleet. Other costs accrue in the operation of accessible vehicles, discussed in more detail in preceding sections and including additional insurance and continuing maintenance cost.

Figure 23 Annual income with market growth and extended life, owner driver with rental income

Vehicle Type	Potential annual income 5 year life owner driver with rental income	Potential annual income 5 year life owner driver alone	Potential annual income 7 year life owner driver with rental income
Fleet Average	$59,792.00	$40,155.00	
Toyota Prius	$62,111.00	$42,474.00	
Accessible Grand Caravan	$51,753.00	$32,116.00	$55,600
Ford Transit Connect	$52,870.00	$33,320.00	56869
MV1	$50,514.00	$30,877.00	$53,700
Karsan V1	$57,041.00	$37,404.00	$59,800

Increased demand may also follow from the introduction of accessible vehicles to the taxi fleet, reflecting the additional mobility permitted by the vehicle type. The calculation of this element is complex and follows from an estimation as to the extent of suppressed or latent demand within the Toronto population. A number of figures exist, including the suggested figure that 1% of trips require accessible taxis provided by the trade. It is highlighted that this estimate reflects existing use rather than latent demand. Other locations which have moved to accessible taxis can also provide an indication of the potential market growth. We have been provided with estimates of growth from Philadelphia and New York, both providing a significant expansion of taxi use with a partial and expanded taxi fleet. It is noted that each city reflects differing demographics and it does not necessarily hold that growth in one city will be mirrored in another. While the experiences of Philadelphia and New York reflect a live market, they may also be considered as quite high when compared to the Toronto market, and may not be sustained in a move to accessible transport in the city.

Figure 24 sets out the potent income where the initial estimate set outing the 2013 Toronto Market Review is sustained. All other aspects of the calculation remain consistent with the figures shown above allowing for direct comparison.

Further scenarios were tested illustrating the impacts of a more significant growth in demand for accessible taxi services, including a 'full growth' scenario using observed TTC Wheel-Trans growth statistics, set out in section 6.

Figure 24 Potential income with market growth and extended life owner driver with rental income, base scenario

Vehicle Type	Potential annual income 5 year life owner driver with rental income	Potential annual income 5 year life owner driver alone	Potential annual income 7 year life owner driver with rental income
Fleet Average	$59,792	$40,155	
Toyota Prius	$62,111	$42,474	
Accessible Grand Caravan	$53,306	$33,079	$57,268
Ford Transit Connect	$54,456	$34,320	$58,575
MV1	$51,659	$31,803	$55,311
Karsan V1	$58,752	$38,526	$61,594

The analysis set out in figure 24 suggests that the Karsan V1 purpose built taxi may be introduced into service without negative cost impacts on owner operators, though the exact impact will vary dependent upon the method by which the fleet is moved to accessible vehicles. The Ford Transit Connect 2014 Taxi approaches the same 'break even' but falls short by a small percentage. Other converted vehicles, and the MV1 do not break even.

The team tested three models of application, requiring new vehicles to be accessible from point of new license issuance, from point of license transfer and within the natural replacement cycle for existing vehicles. Of the three the last, replacement with accessible vehicles on point of next vehicle purchase, has the least impact on the costs experienced within the trade, but is also calculated on the purchase of the most cost effective accessible taxi, the Karsan V1. As this vehicle is not currently in the market the potential of this option is

limited to the second best value vehicle, the MV-1, which results in a loss of income as a result of its higher annualised cost. The loss of income is between $2,000 and $7,000 dependent upon the previous vehicle types used.

Other options also led to some additional costs, of which transfer at point of new issuance was the most limited. A further argument may relate to wider gains from license transfer or value capture, though this has not been valued in our calculation.

On conclusion, in our view, the impacts of moving toward accessibility are tangible and measurable. On the basis of comparisons made using like for like costing, described above it is our conclusion that accessible taxi vehicles can be provided to the Toronto taxi fleet without significant cost impacts. Although we understand the range of argument and concerns expressed by the trade we do not agree that these are made on the basis of like for like comparison. It is our conclusion that the most efficient accessible taxis can be provided at minimal cost to the trade. It is important to note that our analysis makes a number of assumptions, detailed in the text above, including operating patterns and replacement frequencies. We have used conservative figures in the case of new vehicles to provide an indication of costs and potential income that is likely to underestimate opportunities rather than overstate potential.