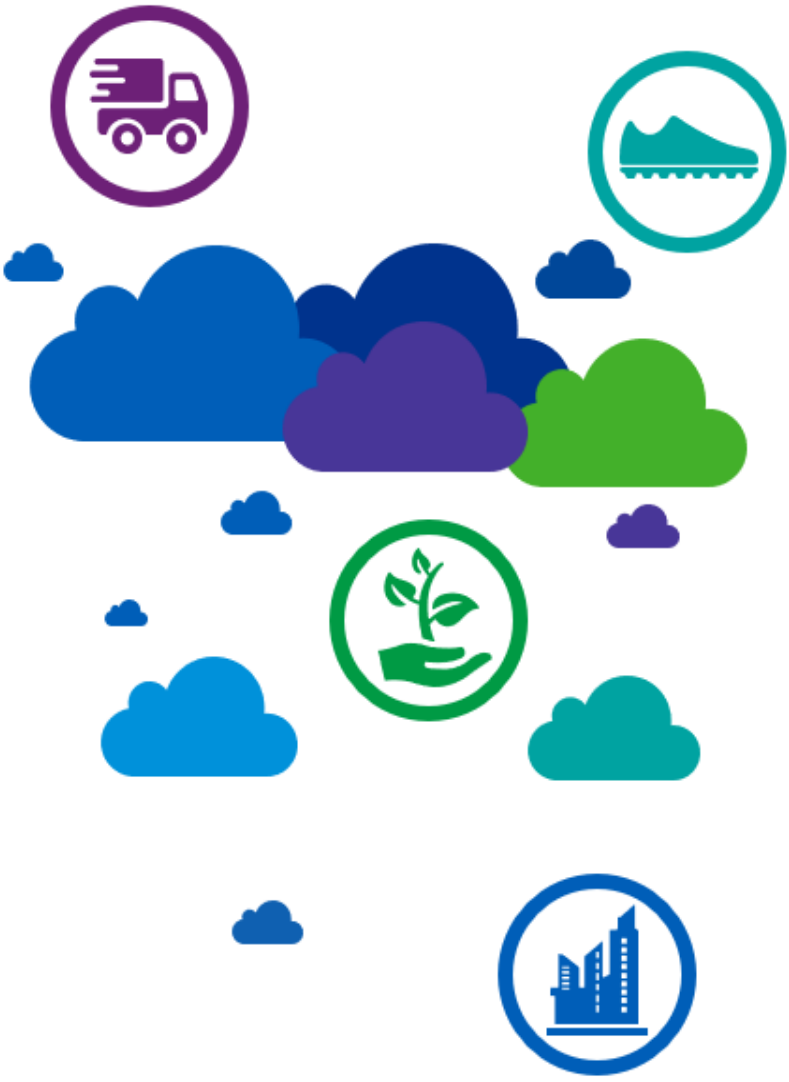
KPMG

Reimagine Services

Business Case: Lifecycle Replacement Framework

CITY OF EDMONTON

MAY, 2021



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Opportunity Summary

The City's fleet currently includes approximately 5,100 units comprised of vehicles, equipment, and attachments. Managing this fleet includes activities that range from procurement through to disposal. An important decision within the fleet management function is when to replace and dispose of units. This decision has impacts to both capital and operating costs, as well as the ability of a department to meet service levels.

The City currently uses an "established interval approach" to maintain and to determine the replacement point for vehicles. This includes target guidelines based on the number of years or kilometers accumulated. Under this approach, decisions are not necessarily made on the condition of the asset or its ongoing cost to maintain. Assets may not be replaced at a point to minimize the City's total cost of ownership. In addition, planned maintenance is performed based on predefined intervals, which does not consider whether the vehicle or equipment requires the maintenance based on its condition.

This opportunity explores a transition to a different approach for fleet management where the total cost of ownership for a vehicle or piece of equipment is used to manage costs from procurement through to disposal.

With an understanding of the total costs of ownership, the City could optimize its fleet replacement using a lifecycle management approach, supported by a new condition-based monitoring process. The proposed shift in approach would see financial decisions about replacement supported by an assessment of the condition of assets, and an understanding of their full costs throughout the lifecycle.

Recommendation: Lifecycle Replacement Framework

Based on analysis of the current and potential new approach, **the City should consider changing how its fleet replacement decisions are made through the implementation of a lifecycle approach with condition-based monitoring**. It is estimated that this opportunity could deliver potential cumulative savings of $2.3 million over five years and potential annual savings of approximately $0.5 million by year 5.

The main impacts of this opportunity are changes to fleet operations and decision making for existing staff. In particular, new monitoring processes could lead to more consistent and data-informed decisions about the replacement of the City's vehicles and equipment. This opportunity should also be considered in conjunction with the Reimagine Services Fleet Size Optimization Business Case as it identifies ways to potentially reduce the reliability risks of the retained fleet if the vehicle lifecycle were to be extended.

Opportunity Background & Context

The City's fleet includes approximately 5,100 units including vehicles, equipment and attachments. Managing this fleet includes activities from procurement through to disposal. An important decision within the fleet management function is when to replace and dispose of units. This decision has impacts to both capital and operating budgets, as well as the ability of a department to continue meeting service levels.

The costs to maintain a unit typically rise over its lifecycle, meaning that the timing of disposal is an important financial decision about when it makes more sense to spend the money to replace as opposed to repair. Without visibility to these costs over the life of a unit, it is unclear whether vehicles are retained past their economic replacement point, or whether they should be held longer.

Lifecycle reviews have been performed by the City for a select number of vehicle categories, such as heavy fire apparatus, sweepers, sanders, and waste collection curbside loaders. Collectively, these vehicles represent 6% of the City's fleet. For vehicle categories where a lifecycle review has not been completed, the City uses an established interval approach, with target guidelines for maintenance and disposal based on the number of years or kilometers accumulated.

In looking at the age of the City's current fleet, it is possible that the City is already extending the useful life on a number of its assets. Applying a lifecycle approach to these categories of vehicles could allow the City to further reduce costs by redefining the economic replacement point for vehicles.

Adding condition-based monitoring to select preventative maintenance practices (e.g., age, usage, reliability, physical asset condition), could further strengthen the fleet lifecycle approach. Condition-based monitoring is a practice that identifies when maintenance is required based on asset health indicators. Indicators can be monitored regularly, for instance using a scorecard that supports lifecycle replacement decisions.

In analyzing the City's current replacement intervals and the City's adherence to those intervals on their fleet of light- and heavy-duty trucks and vans, and self-propelled equipment, it was identified that there may be an opportunity to extend the lifecycle on 22 unique categories of vehicles.

CITY CONTEXT

This business case aligns with the City's strategy and objectives as shown in Table 1.

Table 1: Alignment to City Strategy

City Context	Alignment
City of Edmonton Corporate Business Plan	The City's Business Plan highlights that improvements to project and asset management will be made through actions to, *"Conduct lifecycle analyses on the City's vehicle fleet to improve management of capital costs.*" This aligns with the opportunity to implement a lifecycle cost management approach for vehicles and equipment.

City Context	Alignment
Greenhouse Gas Management Plan for Civic Operations 2019-2030	The City's Greenhouse Gas Management Plan for Civic Operations "Carbon Neutral" GHG Reduction Scenario states, *"purchase carbon offsets to address remaining GHG emissions from vehicle fleet."* This aligns with the opportunity to review the total cost of ownership for vehicles as the analysis includes considerations around fuel efficiency and carbon pricing.
Program and Service Review (PSR)	In September 2020, a Program and Service Review (PSR) recommended clarifying the roles and responsibilities of the Fleet Branch and Business Areas in order to improve asset management decisions. The draft report also identifies that decisions such as, "replacing or keeping aging assets in service," would benefit from clarified roles and responsibilities.

Source: Based on information provided by the City.

LEADING AND COMPARATIVE PRACTICES

LEADING PRACTICES

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Leading practices Table 2 were identified in lifecycle cost management and condition-based monitoring to support the evaluation of this opportunity.

Table 2: Leading Practices for Lifecycle Cost Management and Condition-Based Monitoring

Area of Focus	Leading Practice	Commentary on Relevance for Edmonton

Fleet Lifecycle Cost Management	– Fleet lifecycle cost management is recognized as a widespread industry practice for minimizing the capital and operating costs associated with fleet management.[1]
	– The analysis necessary to build a lifecycle cost management framework requires that fleets:
	  – Accurately classify assets into categories of assets that have similar configurations, acquisition costs, and operating use cases;
	  – Collect maintenance, fuel, and downtime costs to model annual operating costs; and
	  – Capture purchase and disposal costs to model the cost of ownership. [2]
		– The City already has some experience with a lifecycle cost analysis.
		– There is an opportunity for the City to continue expanding this practice across vehicle types and self-propelled equipment.

Condition-Based Monitoring	Condition-based monitoring is a practice that identifies when maintenance or replacement is required based on asset health indicators. Indicators can be monitored regularly, for instance by using a scorecard that supports lifecycle replacement decisions. These indicators can be monitored using basic tools but can also become increasingly automated using telematics technology.	– Starting with a "manual" approach allows the City to begin monitoring without significant investment. – Once capabilities are established through this format, they can be reviewed for automation opportunities.

[1] Government Fleet. https://www.government-fleet.com/340746/how-to-prepare-your-data-for-a-life-cycle-analysis. (Accessed April 2021).
[2] Government Fleet. https://www.government-fleet.com/340746/how-to-prepare-your-data-for-a-life-cycle-analysis. (Accessed April 2021).

Area of Focus	Leading Practice	Commentary on Relevance for Edmonton
	Manual Approach A manual approach using Word or Excel can be used to leverage criteria for determining extension of life (e.g., asset condition). Templates can be used as "scorecards" that are populated and analyzed by fleet staff.[3] **Automated Approach** Condition-based monitoring can be automated in the future through telematics technology that provides real time information on vehicle health. This approach provides further customization to maintenance and replacement schedules through real-time monitoring of oil life, engine hours, time and mileage.[4] This technology could also be used to predict failure and determine remaining life of a vehicle. This would support the future reliability of vehicles in the fleet.	

Source: Based on publicly available information.

COMPARATIVE PRACTICES

Select practices used in Calgary and Winnipeg are shown in Table 3. They were collected through interviews with representatives from these municipalities. Calgary is notable in its consideration of multiple factors to manage fleet lifecycle, and its defined process for approving retained fleet.

Table 3: Comparative Practices

Area of Focus	City of Calgary	City of Winnipeg	Commentary on Relevance for Edmonton
Fleet Lifecycle Cost Management	– Formal process in place with ongoing reviews for improvements. – Total cost of ownership is a required response in most fleet RFPs.	– Prior to COVID-19, a formal process was in place. Due to recent budget constraints, the focus is on minimizing capital replacements.	– Interviewees from both jurisdictions were strong proponents of the lifecycle cost management approach. – Future practice could include integration with RFP process.
Fleet Governance Model	– Fleet has clear roles and responsibilities from budgeting through to disposal that align with lifecycle cost management (e.g., clear decision making over when to dispose of a unit).	– Fleet has clear roles and responsibilities from budgeting through to disposal that align with lifecycle cost management. – As noted above, recent budget constraints have impacted their ability to execute on key decisions, such as disposal.	– Interviewees from both jurisdictions credited clear governance and decision making with the successful implementation of lifecycle cost management. – The City does not currently have clarity in this area, which could present a challenge for future implementation.

[3] Government Fleet. https://www.government-fleet.com/351843/improving-maintenance-workflows-and-safety-with-electronic-dvirs. (Accessed April 2021).

[4] Ford Telematics. https://www.commercialsolutions.ford.com/ford-telematics#:~:text=Ford%20Telematics%E2%84%A2%20Drive%20is,that%20can't%20be%20automated. (Accessed April 2021).

Area of Focus	City of Calgary	City of Winnipeg	Commentary on Relevance for Edmonton
Condition-Based Monitoring	– Formal "Extended Life Review" process in place that evaluates relevant criteria (e.g., maintenance cost, type of service, condition, salvage value). – Capital asset management technology was implemented to provide visibility to fleet performance throughout the lifecycle. Allows "what-if" scenarios to support in life extension decisions.	– Prior to COVID-19, a formal scorecard was being implemented that identified factors of condition (e.g., component health), utilization, and value of disposal. – Value of disposal is a key consideration in extending the life of a unit as they want the best "gain on sale." – Current budget constraints require a focus on minimizing capital replacements.	– Both jurisdictions have implemented a form of condition-based monitoring as it relates to decisions around extending the life of a unit. – The impact of these decisions on the lifecycle cost would be dependent on business units adhering to the outcome of a condition-based monitoring assessment.

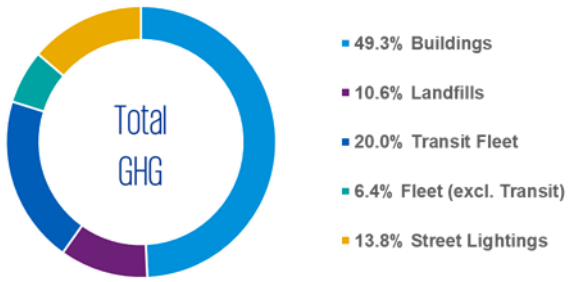
Source: Based on interviews with each jurisdiction and publicly available information.

ENVIRONMENTAL CONSIDERATIONS

The "Greenhouse Gas Management Plan for Civic Operations 2019-2030," outlines the impacts of City operations on Greenhouse Gas (GHG) emissions and identifies scenarios for carbon reduction. This plan aligns with Edmonton's long-term goal of carbon-neutrality as set out in the Global Covenant of Mayors, the Edmonton Declaration and the 1.5 degree scenario. [5]

In reviewing Fleet's impact on GHG emissions, Figure 1 identifies that Fleet (excluding Transit) contributes 6.4% of the City's emissions. To support a carbon neutral scenario for the City, it is proposed within the GHG Management Plan that carbon offsets are purchased to address emissions from vehicle fleets.[6]

Figure 1: City of Edmonton GHG Emissions by Sector



Source: City of Edmonton GHG Management Plan.

A lifecycle costing approach to vehicle and equipment replacement can further support progress towards a carbon neutral scenario as it considers the total cost of ownership of a vehicle. Fuel efficiency targets could be set as a part of the condition-based monitoring criteria when deciding to extend the life a vehicle or equipment. Future maturity in condition-based monitoring could increase sophistication of fuel consumption monitoring through remote sensing.

The total cost of ownership approach could also be used when considering the replacement of internal combustion engine vehicles (ICEVs) and equipment with electric. Electric vehicles have larger capital costs compared to their ICEV counterparts, making a total cost of ownership analysis critical to creating a strong financial case.[7]

[5] Greenhouse Gas Emissions Reduction. https://www.edmonton.ca/city_government/documents/PDF/GHGMgmtPlan2019-2030CivicOps-SummaryReport.PDF. (Accessed April 2021).
[6] Greenhouse Gas Emissions Reduction. https://www.edmonton.ca/city_government/documents/PDF/GHGMgmtPlan2019-2030CivicOps-SummaryReport.PDF. (Accessed April 2021).
[7] UBC. https://sustain.ubc.ca/sites/default/files/2019-12_Lifecycle%20Costing%20Tool%20for%20Selecting_Rakhimova.pdf. (Accessed April 2021).

Options

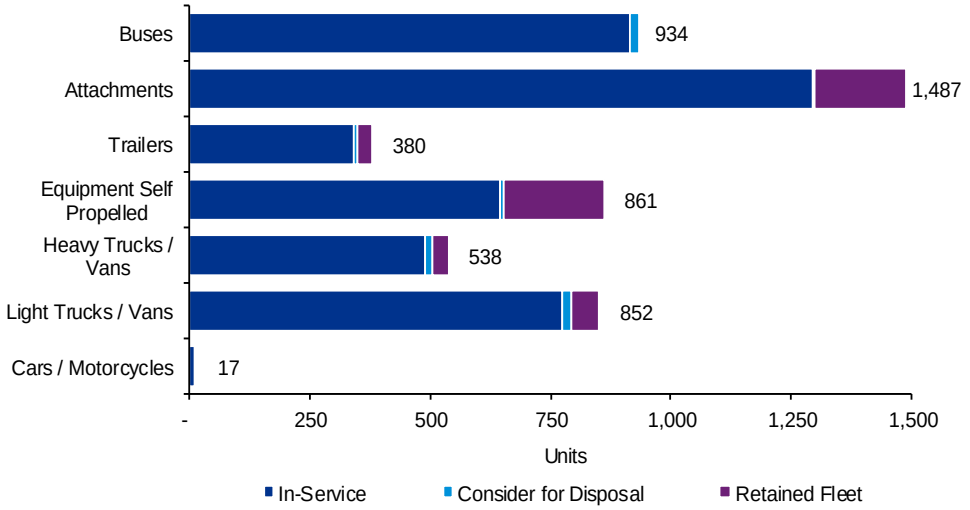
This opportunity evaluated a single option around optimizing the City's lifecycle replacement for a portion of the highest value vehicles and self-propelled equipment with a basic level of condition-based monitoring. This is a change to how decisions are made about fleet replacement, which would shift the City's asset monitoring and evaluation practices.

The City currently uses an established interval approach to determine the replacement point for vehicles and equipment. This includes target guidelines based on the number of years or kilometers accumulated. As budget holders, individual branches can decide to retain their fleet beyond the replacement point. In evaluating the age of the City's current fleet against the established intervals, it is likely that the City is already extending the life of some vehicles. The City categorizes their assets according to three status categories:

- In-service, assets that are within their useful life and are in-use by departments,
- Consider for Disposal, assets that are currently in-service, but have reached the end of their lifecycle and have not been replaced, and
- Retained, assets that are beyond their replacement point, but have been kept by budget holders.

As shown in Figure 2, 10% of the City's fleet is currently retained units.

Figure 2: Fleet Count by Asset Class and Status (2020)



Source: Prepared by KPMG with information from the City of Edmonton's FAST Reporting Portal

Transitioning to a lifecycle management approach would involve the determination of the economic useful life and replacement point of an asset. This would include the evaluation of criteria across a range of categories that support effective fleet management and maintenance, including economic, technical and functional. The criteria for determining the economic useful life of a vehicle or equipment could include those found in Table 4.

Table 4: Lifecycle Analysis Criteria

Category	Criteria	Rationale
Economic	Maintenance costs	Identifies whether maintenance and repairs are becoming more costly than the residual value of the asset.
	Acquisition costs	Identifies the cost of replacing an existing asset with a new one and provides the starting point for lifecycle analysis as it represents the starting value of an asset.
	Disposal costs	Identifies the residual value of an asset at the end of its lifecycle with consideration to depreciation and the ability to sell the unit in the market.

Category	Criteria	Rationale
Technical	Asset condition	Identifies the potential ability to extend or decrease the useful life pending inspections on overall condition.
	Asset usage	Identifies number of kilometers or hours that have been used on the vehicle or equipment.
	Failure probability	Identifies the probability that the asset would fail and would not be available for service delivery.
	Obsolescence cost	Identifies technological advancements in a potential replacement asset that could improve safety, fuel economy, emissions and maintenance requirements.
Functional	Asset failure impact	Identifies the impacts of downtime on service levels, employee productivity and increased costs associated with replacement rentals.
	Ability to repurpose	Identifies the opportunity to repurpose the asset at the end of its useful lifecycle in a different application based on requirements.
	Alignment to GHG targets	Identifies how the asset is aligned with environmental priorities, including the cost of carbon offsets.
	Apparent Useful Life	Identifies when assets are actually being replaced against established lifecycle intervals.

Source: Prepared by KPMG.

A condition-based monitoring approach should be used throughout the lifecycle of the asset to determine recommendation around the economic replacement point using criteria found in Table 4.

In order to fully realize the benefits associated with this opportunity, a consistent decision-making approach needs to be established by the City to assist its branches adhere to the recommendations of the condition-based monitoring. Consistency in decision-making would also support continuous improvement of the criteria as it would allow evaluation of the effectiveness of the recommendations.

This opportunity is supported by lifecycle costing analysis that shows the potential for cost savings. In evaluating the economic replacement point for vehicles, analysis was completed on the City's highest value fleet of cars, light trucks, heavy trucks, vans, and self-propelled equipment. This grouping of vehicles accounts for 2,268 or 44% of the City's entire fleet. Of those 2,268 units, the analysis included 1,563 units based on the availability of data and specific exclusion criteria. The exclusion criteria can be found in **Appendix B: Financial Projections**.

This analysis considers vehicles at the asset category level (e.g., Truck/Full/0.75 Ton, Mower/Riding/Small), and aggregates to the asset class. The City could build upon this analysis by defining their vehicle categories in more detail and considering the use of vehicles (e.g., a half-ton truck in use for photo radar could have significantly different lifecycle considerations than a half-ton truck used to support the delivery of horticultural services).

Key Consideration – Asset Replacement Behavior

A key input into this analysis is the understanding of the City's asset replacement behavior. Once an asset reaches the end of its lifecycle interval, the City makes a decision regarding a vehicle's future use and may decide to defer some maintenance if they anticipate retiring the vehicle shortly. Overall, understanding that the City could extend the useful life of current assets is telling in terms of the potential useful life. Applying this to the lifecycle costing analysis enables a conservative evaluation of the current useful life of assets against their potential economic useful life.

The analysis is supported by an evaluation of the following key lifecycle milestones:

- **Current lifecycle interval:** when the City looks to replace their vehicles,
- **Apparent useful lifecycle:**[8] when the City appears to be replacing their vehicles, and
- **Economic useful lifecycle:**[9] when the City should replace their vehicles.

To derive the overall value for this opportunity, the economic useful lifecycle can be compared to the current or apparent useful life of assets in order to understand the potential savings opportunity. Table 5 highlights the opportunity to extend the useful life on a sample asset category (i.e., a tool carrier utility truck). In this analysis, maintenance costs have been calculated at the unit level, with a multiplier to account for deferred maintenance costs not incurred by the City post-lifecycle interval.

The City's current lifecycle interval on ½ ton trucks is 10 years. Based on the City's current distribution of vehicle ages within this category, the apparent useful life would be 11 years. The evaluation of a potential economic replacement point suggests 12 years. The analysis then compares the potential savings on ½ ton trucks in extending the life from 11 years to 12 years. Further information around assumptions used can be found **Appendix B: Financial Projections.**

Table 5: Example ½ Ton Truck Analysis Output

	Current Lifecycle Interval (years)	Apparent Useful Life (years)	Potential Useful Life (years)
Number of Years	10	11	12
Median Acquisition Value	$40,603	$40,603	$40,603
Plus: Maintenance cost over useful life	$25,443	$29,297	$33,537
Less: Disposal Value	$4,229	$3,383	$2,707
Cost of Ownership over useful life	$61,817	$66,516	$71,432
Average Annualized Cost of Ownership	$6,181	$6,046	$5,952
Potential Annualized Savings per Vehicle	-	-	$94
Current Number of Vehicles	-	-	165
Potential Estimated Total Annualized Savings	**n/a**	**n/a**	**$15,550**

Source: Based on data and analysis provided by the City and assumptions outlined in Appendix B.

[8] Apparent useful lifecycle was derived by examining the current breakdown of the City's fleet by category, to determine the age at which ~85% to ~95% of the City's fleet are in-service.
[9] Economic useful lifecycle was derived through analysis of the economic replacement point in the City's asset lifecycles. Specifically, the point where maintenance costs, with the addition of an end-of-lifecycle multiplier, became more expensive than the projected value of the vehicle.

Impact Assessment

SERVICE IMPACT

Under the current decentralized fleet governance model, business units have a high level of discretion in decisions related to vehicle disposal or retention at the end of life. The lifecycle replacement approach would change the decision-making criteria around when a City vehicle should be retained, replaced, reduced, or repurposed based on the evaluation of the full lifecycle cost of vehicles or equipment.

The change in decision making process may be experienced as a loss of control by business units. Internal customers may observe vehicles and equipment being retained beyond their current lifespan or being disposed of earlier. Although the goal of maintaining "uptime" (the time that an asset can be in active service) would still drive the lifecycle approach, there could be a perception of a change in service levels from internal customers.

Under the lifecycle replacement and condition-based monitoring approach, the City should be able to expect a more consistent approach to vehicle replacement that aligns with the actual vehicle performance, and not a pre-determined interval. Given this and the expansion of criteria when considering replacement, there could be an anticipated improvement around the performance of assets. As this approach would include an ongoing evaluation of data to improve the lifecycle management process, there could also be an improvement in the City's ability to manage over the lifecycle as criteria are refined over time.

DELIVERY IMPACT

Through the implementation of a lifecycle strategy, vehicle reliability should be monitored to manage impacts to the fleet. In considering the recommendations included in the Reimagine Services Fleet Size Optimization Business Case, the reliability of the fleet should be a consideration for the determining the appropriate level of spares. As different vehicles could have different reliability risks, the condition-based monitoring criteria could also be used to support the identification of vehicles that have more critical reliability requirements when making lifecycle decisions.

To support decision making around the economic replacement point for assets, clear governance roles and responsibilities around fleet maintenance and management need to be established. In September 2020, a Program and Service Review recommended clarifying the roles and responsibilities of the Fleet Branch and Business Areas in order to improve asset management decisions. The Program and Service Review also identified that decisions such as, "replacing or keeping aging assets in service," would benefit from clarified roles and responsibilities.

There are existing capabilities for data management and tracking at the City and specifically within the Fleet branch. However, lifecycle analysis is currently done in an ad hoc manner based on the capacity of Fleet's analytics team. This opportunity would require a shift in formal capabilities, as processes would need to be put in place to complete or update lifecycle analysis in a timely manner. With the existence and tracking of the City's FAST reporting portal, there are likely no system changes required for this opportunity.

VIABILITY

The effectiveness of the lifecycle replacement approach and condition-based monitoring of the fleet could be impacted by the City's current decentralized fleet governance model. In order to achieve the anticipated benefits, business units would need to be prepared to address the outcomes of the condition-based monitoring assessment from Fleet.

The jurisdictional scan identified that both Calgary and Winnipeg have clear roles and responsibilities for decisions from budgeting through to disposal. Stakeholders from both municipalities emphasized this as critical to driving a lifecycle replacement approach and implementing ongoing improvements.

GBA+ IMPACTS AND MITIGATIONS

This opportunity is focused on asset management and would not create any barriers to more vulnerable populations in Edmonton.

FINANCIAL IMPACTS

Financial impact estimates can be seen in **Appendix B: Financial Projections**, which also includes a notice to reader and significant assumptions.

Based on the financial analysis completed, extending the expected useful lives of the City's fleet could result in annualized cost savings of $0.4 million, or nearly $2.3 million over five years. These results are shown by asset class in Table 6.

Table 6: Potential Estimated Annual Savings by Asset Class ($ in thousands)

Asset Class	# of Unique Categories Analyzed	# of Vehicles	Potential Estimated Annual Average Cost of Ownership Savings
Cars / Motorcycles	1	17	$5
Light Trucks / Vans	11	488	$161
Heavy Trucks / Vans	3	51	$31
Equipment Self Propelled	7	126	$263
Total	**22**	**1,264**	**$460**

Source: Based on data and analysis provided by the City of Edmonton and assumptions outlined in Appendix B.

Note: Figures rounded to nearest thousand.

RISKS

There is a medium level of risk associated with this opportunity, due to the potential impacts of extending vehicles beyond their current life. Some key risks are described in Table 7. Additional risks and mitigations can be found in **Appendix C: Risk Analysis.**

Table 7: Key Risks

Potential Risk	Potential Mitigation
Data Availability There is a risk that adherence to lifecycle analysis criteria related to the organization would be difficult to track as there is a lack of data on the application of specific assets.	The probability of this risk occurring may be reduced through the formal tracking of asset applications. This could ensure decisions related to the repurposing of assets at the end of their lifecycle are made in an effective manner.

Potential Risk	Potential Mitigation
Fleet reliability There is a risk that fleet reliability could decline if vehicles are extended beyond their current life and require more maintenance and downtime.	The probability of this risk occurring may be reduced through implementation of condition-based monitoring criteria that identifies maintenance based on asset health indicators, supporting the timely identification and resolution of issues. These criteria could also identify those vehicles where reliability is more or less critical to support decision making. This risk could be exacerbated if reliability of vehicles declined while the City reduces its fleet spares through efforts to optimize overall fleet size.

Source: Based on information provided by the City and assumptions outlined in Appendix B.

Opportunity Assessment

OVERALL ASESSMENT OF OPPORTUNITY AGAINST CRITERIA

Table 8 summarizes the opportunity assessment of both options against the criteria identified in this business case where green, grey, and red represent a positive, neutral, and negative impact respectively.

Table 8: Opportunity Assessment

	Impact						Implementation			
Options	**Service**	**Delivery**	**GBA+**	**Financial**	**Risk**	**Estimated Potential Five-Year Benefit (Millions)**	**Time**	**Cost**	**Risk**	**Estimated Potential Implementation Cost (Millions)**
Optimize lifecycle replacement for highest use vehicles with condition- based monitoring	●	●	●	●	●	$2.3	●	●	●	$0

Source: Prepared by KPMG.

CONCLUSION AND RECOMMENDATION

Based on the analysis and potential for cost savings, the City should consider pursue optimizing lifecycle replacement for their highest use vehicles with condition-based monitoring.

Recommended Action 1

The City should consider changing how its fleet replacement decisions are made through the implementation of a lifecycle approach with condition-based monitoring.

This would include a new model of decision making supported by consideration of full lifecycle costs, and a condition-based monitoring approach. Financial analysis across several categories of current assets demonstrates a significant potential for cost savings through different decisions about when to retire and replace assets. Extending the useful lives of the City's fleet could result in a cost savings of $0.4 million per year, or nearly $2.3 million over five years.

Recommended Action 2

The City should address Fleet governance roles and responsibilities through implementation of the Program and Service Review recommendations.

This would include clarifications around roles and responsibilities in this report would be expected to provide the necessary governance to support the lifecycle decision making.

Appendix A: GBA+ Assessment

EVALUATION SUMMARY

What is the overall GBA+ assessment?
This opportunity is focused on asset management and does not increase or reduce barriers to more vulnerable populations.
What are the main groups that could be affected (including those with no vulnerabilities), and what impacts are noted?
The expected impacts of this opportunity are internal; Edmontonians are not expected to see an impact in terms of barriers or service. The main groups involved with this idea are Fleet and business areas that use the vehicles and equipment to deliver services.
What do we know about the people who would be affected by this change?

-2. Very little known about them or their characteristics	**-1. Some general idea of numbers or types of people affected**	0. Good idea of overall numbers and some other aspects – e.g., time/nature of needs	+1. Good information on the numbers of people affected and some key characteristics	+2. Good information on numbers, demographics groups, and contact lists (e.g., email / phone lists)

What impact would there be from this change on the staff members of the City or other agencies who may be from these groups?
Operational impacts are expected for staff which could include changes to practice and decision making. No changes in numbers or types of staff roles are anticipated.
What equity measures could we use or implement to improve or positively mitigate impact for one or more of the groups identified?
As this idea focuses on shifting the approach to vehicle and equipment replacement, no meaningful opportunities have been identified to improve or positively mitigate impact for specific groups.
How confident we are in the information we are basing our decisions on? What could we do to check or confirm our assumptions?
There is a reasonable degree of certainty that impacts would be limited to operational and practice changes for existing staff roles.

IMPACT OF THIS CHANGE ON PEOPLE BY KEY IDENTIFIED VULNERABILITIES

Consider how you would expect this change to affect people with various types of characteristics that may give rise to vulnerabilities:

Personal Characteristics	-2 Could create new barriers	-1 Could exacerbate existing barriers	0 Limited effect or impact unknown	+1 Could reduce existing barriers	+2 Substantially improved access
People who are not physically strong or confident in their movements			0		
People with vulnerable people with them			0		
People who currently have very limited or no income			0		
People who may experience fear or distress due to threats or violence			0		
People with additional language or communication needs			0		
People who may find mainstream activities unwelcoming or not appropriate for their needs			0		
Total Score	**0 Limited effect or impact unknown**				

Appendix B: Financial Projections

NOTICE

The financial projections contained in this document provide future-oriented financial information. The projections are based on a set of circumstances and the City's assumptions as of April 2021. Significant assumptions are included in the document and must be read to interpret the information presented. Should events differ from the stated assumptions, actual results will differ from the financial projections and such differences may be material.

The financial information and assumptions contained herein has been prepared to assist readers in deciding whether or not to proceed with their own in-depth investigation and evaluation of the options presented and does not purport to contain all the information readers may require. Readers should conduct their own investigation and analysis of the options.

KPMG accepts no responsibility or liability for loss or damages to any party as a result of decisions based on the information presented. Parties using this information assume all responsibility for any decisions made based on the information.

SIGNIFICANT ASSUMPTIONS

1. In consultation with FFS, maintenance costs used in lifecycle calculations specifically exclude the following work order job reason codes:
   - Accident
   - Abnormal Usage
   - Modifications
   - Ground Engaging Repair
   - Vehicle Fabrication
   - Non-Standard Requests
   - Disposal
   - Vandalism
   - Capital Work
2. The City began collecting maintenance and repair costs in their current format in 2011. The maintenance and repair data used to inform this analysis was collected between 2011 and 2020.
3. The analysis excludes maintenance data on units for the following out of scope municipal fleet maintenance clients:
   a. [redacted]
4. Depreciation is calculated using a declining balance of 20%.
5. Analysis is conducted on asset category level only (e.g., Truck/Full/0.75 Ton, Mower/Riding/Small, Loader/Front).
6. Current length of ownership is estimated through total cost of ownership (TCO) reports or the lifecycle analysis summary, both of which are provided by the City of Edmonton.
7. Specific assets were excluded from the analysis on the basis of:
   a. Lack of available data on acquisition value (196 assets).
   b. Asset categories with fewer than 5 vehicles in the City's current fleet (100 assets)
   c. Asset categories with no prior lifecycle analysis summary to estimate current intervals (74 assets).

d. Asset categories with prior TCO reports that fulsomely estimate economic lifecycle (315 assets). This include:

- Fire Aerial/Platform/Tandem
- Fire Pumper
- Fire Pumper/Tanker/Single Axle
- Sander/Mixer/Tandem
- Sweeper/Street
- Fire Pumper/Tanker/Tandem
- Fire Rescue Truck
- Refuse/Side Loader/Single Axle
- Refuse/Tandem/Side Loader
- Sander/Asphalt/Tandem
- Sander/Dump/Single Axle
- Sander/Dump/Tandem
- Sander/Flusher/Tandem

e. Asset categories that appear to be optimized and would result in no savings (319 assets).

8. Asset acquisition value was calculated using median acquisition value by category from the BA25 Asset Balance Report, provided by the City of Edmonton.

9. Disposal value of the asset is equal to the projected net book value minus the costs for administration of asset disposition of 3%. The 3% is inclusive of auction commission and shipping.

10. To account for decreased maintenance costs on post-lifecycle interval assets, a multiplier highlighting 10% cumulative growth in out-of-lifecycle years was added. This multiplier was established to highlight the decrease in maintenance costs for older assets due to deferred maintenance and decreased usage. This represents the high-savings scenario with this opportunity.

    a. The low savings scenario introduces a 25% cumulative growth in out-of-lifecycle years based on feedback provided by the City.

11. Inflation is adjusted for in each year at the following rates:

	2022	2023	2024	2025	2026
Inflation Rate (%)	1.7%	1.9%	2.1%	2.5%	2.5%

FIVE-YEAR PROJECTIONS

The analysis is supported by an evaluation of the following key lifecycle milestones:

- Currently lifecycle interval: when the City looks to replace their vehicles,
- Apparent useful lifecycle: when the City appears to be replacing their vehicles, and
- Economic useful lifecycle: when the City should replace their vehicles.

The following projections are underpinned by the assumption surrounding maintenance costs in later years. The high savings scenario projects savings based on a 10% cumulative increase in maintenance costs for every year after the current lifecycle interval of the assets. This high scenario accounts for the 22 asset categories shown in Table 9 and is the primary analysis used in this opportunity. The low savings scenario projects savings based on a 25% cumulative increase in maintenance costs for every year after the current lifecycle interval of the assets, this accounts for the 14 asset categories shown in Table 10. Overall, the larger the value of cumulative increase in maintenance costs, the earlier on the economic replacement point will be.

Table 9: Potential Estimated Annualized Savings Projections by Asset Category ($ in thousands) – Potential High Scenario

Asset Class / Category	Number of Units	Current Lifecycle Interval (years)	Apparent Useful Life (years)	Potential Useful Life (years)	Potential Estimated Annualized Savings	Potential Estimated Five Year Annualized Savings
CARS / MOTORCYCLES	**17**	**-**	**-**	**-**	**$5**	**$25**
CAR (FWD or RWD)	17	7	12	14	$5	$25
LIGHT TRUCKS / VANS	**488**	**-**	**-**	**-**	**$161**	**$807**
SUV/MID	37	8	8	13	$52	$262
TRUCK/FULL/0.5 TON	165	10	11	12	$17	$83
TRUCK/FULL/0.75 TON	77	10	11	12	$12	$59
TRUCK/FULL/1 TON	35	10	11	12	$7	$35
TRUCK/FULL/1 TON/DUMP BOX	16	10	10	13	$13	$63
TRUCK/FULL/1 TON/FLATDECK	18	10	8	12	$16	$78
TRUCK/FULL/1 TON/FLATDECK/WELDER	6	10	10	14	$8	$39
TRUCK/FULL/1.5 TON/DUMP BOX	8	10	9	15	$16	$82
TRUCK/MID	57	10	10	12	$12	$61
VAN/FULL/0.75 TON/CARGO	23	10	12	13	$5	$23
VAN/MINI	46	8	10	11	$4	$22
HEAVY TRUCKS / VANS	**51**	**-**	**-**	**-**	**$31**	**$158**
DUMP/2 TON	26	10	13	11	$21	$107
DUMP/2 TON/CRANE<2 TON	16	10	11	10	$7	$35
UTILITY/2 TON/CRANE	9	10	13	12	$3	$15
EQUIPMENT SELF PROPELLED	**126**	**-**	**-**	**-**	**$248**	**$1,240**
BOAT / POWERED / JET	5	10	11	16	$13	$63
GOLF CART / GAS	17	5	5	9	$3	$14
GRADER	21	10	10	13	$161	$804
MOWER / RIDING / SMALL	25	9	6	11	$13	$64
ROLLER / RUBBER / PNEUMATIC TIRE	5	8	11	18	$35	$174
TRACTOR / FARM (85+HP)	16	10	9	12	$20	$99
UTILITY WORK MACHINE (TOOL CARRIER)	37	9	9	10	$19	$95

Asset Class / Category	Number of Units	Current Lifecycle Interval (years)	Apparent Useful Life (years)	Potential Useful Life (years)	Potential Estimated Annualized Savings	Potential Estimated Five Year Annualized Savings

Source: Based on data and analysis provided by the City and outlined assumptions.

Note: Values are rounded to the nearest thousand. Projected Annualized Savings and Five Year Projected Annualized Savings include adjustment for inflation.

Table 10: Potential Estimated Annualized Savings Projections by Asset Category ($ in thousands) – Potential Low Scenario

Asset Class / Category	Number of Units	Current Lifecycle Interval (years)	Apparent Useful Life (years)	Potential Useful Life (years)	Potential Estimated Annualized Savings	Potential Estimated Five Year Annualized Savings
LIGHT TRUCKS / VANS	**143**	**-**	**-**	**-**	**$83**	**$415**
SUV/MID	37	8	8	12	$33	$166
TRUCK/FULL/1 TON/DUMP BOX	16	10	10	12	$6	$32
TRUCK/FULL/1 TON/FLATDECK/WELDER	6	10	10	13	$4	$22
TRUCK/FULL/1 TON/UTILITY BODY	19	10	8	11	$18	$91
TRUCK/FULL/1.5 TON/DUMP BOX	8	10	9	13	$15	$75
TRUCK/MID	57	10	10	12	$6	$29
HEAVY TRUCKS / VANS	**42**	**-**	**-**	**-**	**$17**	**$82**
DUMP/2 TON	26	10	11	13	$12	$58
DUMP/2 TON/CRANE<2 TON	16	10	10	11	$5	$25
EQUIPMENT SELF PROPELLED	**104**	**-**	**-**	**-**	**$202**	**$1,009**
BOAT / POWERED / JET	5	10	11	14	$8	$40
GRADER	21	10	10	13	$120	$602
MOWER / RIDING / SMALL	25	9	6	11	$39	$193
TRACTOR / FARM (85+HP)	16	10	9	11	$24	$118
UTILITY WORK MACHINE (TOOL CARRIER)	37	9	9	10	$11	$56

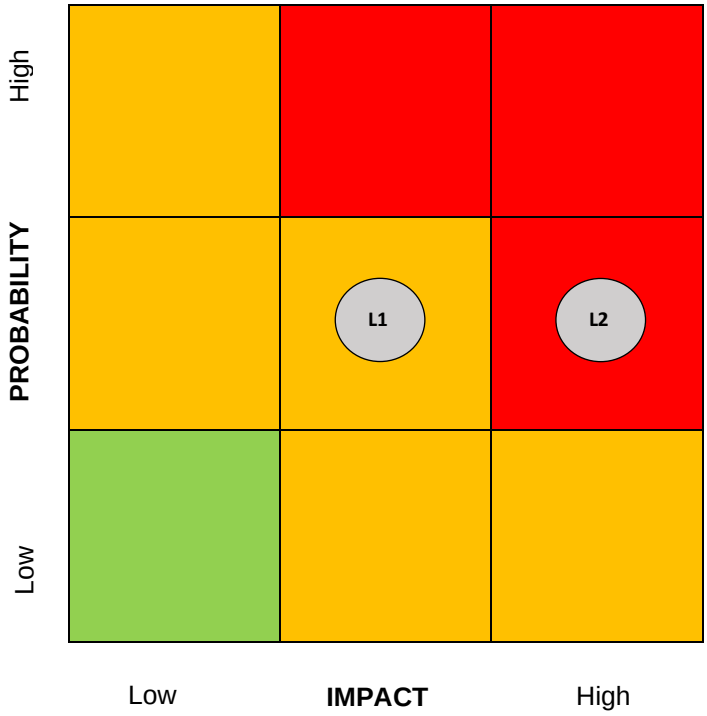
Source: Based on data and analysis provided by the City and outlined assumptions.

Note: Values are rounded to the nearest thousand. Projected Annualized Savings and Five Year Projected Annualized Savings include adjustment for inflation.

Appendix C: Risk Analysis

RISK ASSESSMENT

There is a medium level of risk associated with this opportunity, due to the potential impacts of extending vehicles beyond their current life.



RISK ASSESSMENT AND MITIGATIONS

Risk	Relevant Categories	Highest Rating	Mitigation	Residual Risk
Data Availability There is a risk that adherence to lifecycle analysis criteria related to the organization would be difficult to track as there is a lack of data on the application of specific assets.	**Financial**	**Financial** Impact: Medium Probability: Medium Overall: Medium	The probability of this risk occurring may be reduced through the formal tracking of asset applications. This could ensure decisions related to the repurposing of assets at the end of their lifecycle are made in an effective manner.	**Operations** Impact: Medium Probability: Medium Overall: Medium

Risk	Relevant Categories	Highest Rating	Mitigation	Residual Risk
Fleet reliability There is a risk that fleet reliability could decline if vehicles are extended beyond their current life and require more maintenance and downtime.	**Operations** **Financial**	**Operations** Impact: High Probability: Medium Overall: High	The probability of this risk occurring may be reduced through implementation of condition-based monitoring criteria that identifies maintenance based on asset health indicators, supporting the timely identification and resolution of issues. These criteria could also identify those vehicles where reliability is more or less critical to support decision making. This risk could be exacerbated if reliability of vehicles declined while the City reduces its fleet spares through efforts to optimize overall fleet size.	**Financials** Impact: Medium Probability: Medium Overall: Medium

Source: Based on information provided by the City and assumptions outlined in Appendix B.

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