Fleet Replacement Evaluation Tool for the Town of Bernardston

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OVERVIEW

Project Scope

The Edward J. Collins Jr. Center for Public Management at the University of Massachusetts Boston was hired by the Town of Bernardston to develop an evaluative tool (or "model") that would assist in determining if and when a piece of rolling stock should be replaced and to prepare a multi-year replacement schedule based on the currently available relevant data. The tool subsequently developed can be used in future years by the Town Coordinator, with input from other municipal staff, and will provide much-needed information to Town decision-makers including the Town Coordinator, Selectboard, Finance Committee, and Town Meeting.

Accurate fleet replacement projections are not simply quantitative calculations but require the expertise of managers and maintenance personnel to identify the strengths and weaknesses of a particular vehicle for its assigned mission. Two identical vehicles operated in very different environments, under varying conditions, with different operators and preventative maintenance histories, will reach their failure thresholds at different times. As such, there is no definitive time one *must* replace a vehicle, as its life can be shortened or lengthened by numerous factors. It should also be noted that different levels of risk are acceptable to different managers and organizations. However, judging all vehicles by the same criteria will help reach decision points more consistently and with less inherent prejudice.

The goal of this fleet replacement evaluation tool is to consider a vehicle's operative status within context, especially the potential impact on the municipality if the vehicle becomes inoperative. This analysis can better inform town officials as they select of a course of action, one that typically involves the expenditure of hundreds of thousands of public dollars in any given year.

Methodology

Incorporating generally agreed upon best practices for municipal fleet management, the fleet model was designed to offer a prioritized list of vehicles to replace by asking two key questions: (1) what is the likelihood that the vehicle will fail in the next year? and (2) what is the consequence to the Town should that failure occur? While not conclusive, the model is intended to help municipalities make an informed decision as to whether and when it is prudent to replace a specific vehicle in the fleet. The evaluation tool will need to be updated annually in conjunction with the capital investment plan to capture the most recent assessment of each vehicle's cost and performance.

Determining the optimal time to replace a piece of equipment can be as much an art as a science, and will ultimately depend on the amount of risk that can be tolerated by decision-makers. However, the model attempts to replicate the considerations in such a decision and provide consistency in decision-making for fleet replacement. Too often the decision to replace a vehicle is based on one or two criteria-most commonly mileage and/or age. This is partly because the data are easily obtainable and offer a "black or white" decision. While these data are useful and ultimately should have a role in the final disposition of the vehicle, they should not be used in isolation of the many other factors that affect vehicle life, and a broader assessment should yield more effective decisions.

Through the application of fleet management theory, several parameters were identified that either accelerate or inhibit vehicle deterioration, thus helping to predict the likelihood of vehicle failure the following year. But in addition to the physical and operational assessments, this model also considers financial measures which play a role in replacement decisions. As illustrated below, acceptable risk is a function of different parameters, such as how critical a function a vehicle provides (i.e., the more highly critical, the lower the acceptable risk), or whether there is an easy back-up option (i.e., with readily available back-up options, more risk can be tolerated), and so on. The model uses 18 parameters in 5 major categories, as listed here:

1. Condition
    a. Age
    b. Mileage
    c. Storage Condition
    d. Vehicle Cleaning
    e. Degree of Corrosion

2. Utilization of Equipment
    a. Nature of Work
    b. Skill to Operate
    c. Mandated by State/Fed Regulations

3. Impact on Operations
    a. Alternative Plan to Achieve Mission
    b. Frequency of Use
    c. Reliability
    d. Environmental Impact

4. Return on Investment (ROI)
    a. Historical Repair Cost Trend
    b. Projected Future Repair Costs
    c. Depreciation
    d. Annualized Cost-to-Own

5. Obsolescence
    a. Evolution of Technology
    b. Availability of Repair Parts

In the model, points are granted to each sub-category based on the vehicle's history and an educated estimate of its future performance made by municipal staff and available service providers who are most knowledgeable about the vehicle. Each parameter is then weighted based on its relative impact on vehicle viability over the period of continued utilization. While the gross score for any vehicle across all parameters can total several hundred points, the output is normalized to a 100-point scale, with defined "break points" for recommended actions.

Model Scale:

- 0-50 points – **RETAIN**
- 50-65 points – **PREPARE** (for replacement)
- 65-100 points – **REPLACE**

This predictive tool is not designed to achieve definitive certainty as to a vehicle's fate in any given year, but rather to provide some degree of numerical probability of failure while offering consistency in the decision-making process to determine whether or not to remove a vehicle from service. The output is a numerical estimate of the risk to a municipality should they retain a specific vehicle for its intended purpose. This defined risk may be acceptable or unacceptable to decision-makers, and if unacceptable, shifts the conversation to actions to be taken to mitigate the risk of failure.

As these decisions can be financially significant and occur infrequently for some vehicle types, it may be worth using the interim period when a vehicle is approaching the end of its reasonable lifetime to explore alternatives to a "replace-in-kind" action. Looking critically at the function of the vehicle, the current state of the operation, and what other communities are doing to address the same challenges might suggest satisfactory alternative solutions other than purchasing an equivalent replacement vehicle. An overview of such alternatives is provided in Appendix A.

PROCESS

The project team met with the Town Coordinator and Highway Department staff to kick-off the project. The team also visited Raymond's Repair, a local repair shop that handles a substantial portion of the Town's fleet maintenance, to review available records. The Town Coordinator informed both the Police and Fire Chiefs about the project and their roles and responsibilities.

Using the Town's insurance schedule as a starting point, the team built a spreadsheet-based fleet inventory. Each of the three aforementioned department heads was then asked to submit a form that collected quantitative and qualitative information about each vehicle or piece of equipment. The department heads remitted the forms to the project team and the data were subsequently entered into the model. Meanwhile, the project team created a database of maintenance and repair records for FY2017 and FY2018 (Q2) using paper records gathered by the departments and Town Coordinator. This database provided additional important data for the evaluative tool and, if continually updated, will be useful to the Town in future years for records management and fleet cost analyses.

Next, project team members visited the departments to visually inspect the fleet, ask clarifying questions, and collect additional data as needed. The model was adjusted to accommodate the particularities of the Bernardston's equipment usage, and draft results were discussed with staff. This report presents the project team's findings and serves as a user guide to help Town staff maintain and use the model in future years.

MODEL PARAMETERS

EVALUATIVE CRITERIA INPUT

Baseline data for each vehicle must be input into the model, as seen below. Of these, items 4-6 below will need to be updated annually. Items 1-3 will remain unchanged:

(1) Type/Model
(2) Industry Life Expectancy (years or miles)
(3) Year of Manufacture
(4) Mileage (or Hours) on Vehicle
(5) Current Replacement Cost
(6) Current Estimated Turn-in Value

These data are used together with additional quantitative and qualitative data to generate an overall risk factor rating for each vehicle. The following sections describe the content of and rationale for the point assignments for each of the sub-sections of the model. In addition, the scoring “bands” for each parameter are identified below. Points may be granted from 0-10 for each of the parameters below – descriptions are included for scores of 0, 5, and 10 for illustrative purposes, but scores may be granted across the full range.

VEHICLE CONDITION

Probably one of the most important factors in determining whether a vehicle should be retained or replaced is its condition. Condition is pervasive in determining a vehicle’s disposition as it is also a factor in its reliability, operations, and return on investment. The probability of whether a vehicle will fail in its intended purpose is inexorably tied to its condition. A wide variety of factors impact a vehicle’s condition, but the most familiar are age and mileage/hours operated. However there are factors that can prolong a vehicle’s service such as storing the vehicle in a heated, dry location, or washing those areas on a vehicle that are exposed to corrosive chemicals if used in roadwork and snow fighting. The longer the corrosive materials are in contact with the metals on a vehicle, the more corrosive damage to the mechanical systems will occur. Vehicle condition indicators include:

- ***Age.*** Many municipal fleet managers use age as one of the single-most important criteria for determining the replacement schedule for a vehicle. This is partly because it is easily determined and removes the guesswork out of what might fail on the vehicle, thereby jeopardizing reliability. However two vehicles of the same age could have experienced significantly different life histories that could result in a drastically different plan for their ultimate retirement. For instance, one may have been used for light trucking on a daily basis and stored inside a heated garage while another truck that may been worked hard lifting great loads in the most severe environment while utilizing corrosive materials. As such, age is not a stand-alone benchmark in this model, but weighted appropriately along with several other parameters.

- ***Mileage.*** An indicator of the degree of usage is a more significant parameter than age as it indicates relative wear and tear on the power train as well as the electrical, mechanical and hydraulic systems on the vehicle. In some cases, more constant usage can be more beneficial to a vehicle than incidental use throughout the year, as moving parts are continuously lubricated. In other cases, such as on construction sites, the increased usage in a rough environment puts a much greater strain on all the vehicle components.

Some equipment do not regularly transit on public streets, and instead are mostly used for site-specific work. Examples of these vehicles are backhoes, front end loaders, forklifts, and brush chippers. The measure of wear for these type vehicles is the hours they have been operating, not mileage.

- ***Storage.*** The location where a vehicle is stored when not being used is important in gauging the impact of its years on its ability to perform. Comparing a vehicle stored outside in the elements all year to one that is stored in a heated, dry environment, can significantly impact the costs anticipated to maintain the vehicle. Additionally, the repetitive "cold starting" of a vehicle in freezing temperatures over the course of several years can prematurely wear the power train (such as engine pistons and rings) due to poor lubrication, and can further result in greater metal fatigue as the moving parts go through temperature extremes on a repeated basis. Other impacts can be expected due to moisture condensation accelerating chemical reactions in areas such as the exhaust system.

- ***Cleaning.*** The build-up of dirt and corrosive materials on electrical and hydraulic systems will more quickly render components inoperative as increasing contact time allows for more deterioration. Especially during the winter, when washing is difficult without an interior wash bay, salts and liquid brines can aggressively corrode the metals they come in contact with, resulting in premature failure.

- ***Degree of Corrosion.*** Corrosion is likened to a cancer to the structural and mechanical parts on a vehicle and is one of the hardest conditions to reverse or mitigate without exceptional expense. The chemical composition of the metals that make up a vehicle interact with the salts used to melt ice, resulting in corrosion which reduces the metal's strength. Spreading initially to exposed parts, if left unattended rust can penetrate deep into metals and significantly weaken structural members and result in decreased reliability in the earliest stages (e.g. electrical problems or 'frozen' hydraulic parts). In the more advanced corrosion cases, the likelihood of catastrophic failures or safety hazards (e.g. cracked frame or penetrations in the metal allowing unsafe exhaust gases to enter the cab) increase. To reflect the importance of condition to the operative status of a vehicle, this parameter is weighted heavily.

VEHICLE CONDITION – 110 points maximum		
Parameters to Assess	**Points**	**Criteria for Point Bands**
Age relative to industry standard (weight = 2)	10	More than 3 years older than industry standard
	5	1 year under to 3 years over industry standard
	0	More than 1 year below industry standard
Mileage relative to industry standard (weight = 3)	10	More than 20% greater than industry standard
	5	+/- 20% of industry standard
	0	More than 20% lower than industry standard
Storage location (weight = 1)	10	Outside exposed to elements
	5	Under roof only
	0	Indoors, heated

VEHICLE CONDITION – 110 points maximum		
Parameters to Assess	**Points**	**Criteria for Point Bands**
Vehicle washing, annually (weight = 1)	10	Never washed
	5	Occasionally, less than 5x per year
	0	Frequently, more than 5x per year
Degree of corrosion (weight = 4)	10	Significant rust (>70% with rot on undercarriage)
	5	Modest rust (30%) with some flaking
	0	Little rust (<5%) and only on paint/surface

UTILIZATION

- ***Nature of work.*** In the event that a vehicle under review should fail to operate, assessing the nature of the work to which it is dedicated will help to determine the amount of risk a municipality could accept when determining whether to replace it or extend its service for another year. For instance, is the vehicle engaged in public safety tasks or is its main mission to maintain aesthetics? A vehicle engaged in daily road safety work would be assessed higher than one that seasonally maintains roadside brush.

- ***Skill to operate.*** In order to accomplish some tasks, special training and licenses may be required to operate a vehicle. In fact, in some cases, personnel are hired specifically to operate a particular type of vehicle. Thus, a lower risk factor threshold would be appropriate in order to maintain continuity of operations and avoid paying the salary of trained personnel without the proper vehicle to operate. Examples of this are street sweepers, sewer vactor trucks, or TV camera trucks.

- ***Mandated work by State/Federal regulation.*** In some instances, State or Federal regulations dictate the performance of a task. Should the vehicle responsible for the execution of that task fail, and if the municipality does not have a viable back-up plan, they could be deemed out of compliance and subject to fines or administrative consent orders. Cleaning catch-basins with specialized equipment is an example of this type of work. Fire response times could also be deemed under regulation as insurance premiums are determined by such standards.

VEHICLE UTILIZATION – 60 points maximum		
Parameters to Assess	**Points**	**Criteria for Point Bands**
Work Critical or Life/Safety (weight = 3)	10	Critical to life-safety
	5	Core mission of Town
	0	Aesthetics, not permanent
Skills needed to Operate (weight = 1)	10	Specific license required, limited operators
	0	No special license required
Work Mandated by State/Federal Regulations (weight = 2)	10	Yes
	0	No

OPERATIONS

- ***Alternatives available to achieve end result*.** One question to answer is what alternatives may exist if/when a vehicle becomes inoperable. For instance, if several of vehicles in the inventory could be re-purposed to accomplish the task(s) assigned, then the severity of the impact of failure of the vehicle in question is lessened, and it is granted a lower score. Other alternatives may be available such as to secure the same services from the commercial sector in a reasonable time, such as a small dump sander. Hence, a higher risk factor is acceptable to perhaps get additional years of service from the vehicle.

- ***Frequency of use*.** How often a vehicle is used impacts the consequence should the vehicle fail unexpectedly. Daily usage for a safety-related mission of the department necessitates taking less risk due to the impact on the disruption of operations. Alternatively, if a vehicle is used sporadically throughout the year, then the model provides fewer points, allowing a higher level of risk to maximize the investment in the vehicle.

- ***Upgrade includes environmental improvements*.** In some models of vehicles, substantial progress has been made in improved fuel efficiency or even alternative fuels (e.g., propane or electric) that greatly lessen the impact on the environment and reduce operating costs. Depending on the community, realizing a “green” component in a new vehicle may be a significant reason for replacing fleet vehicles, especially those used for administrative purposes.

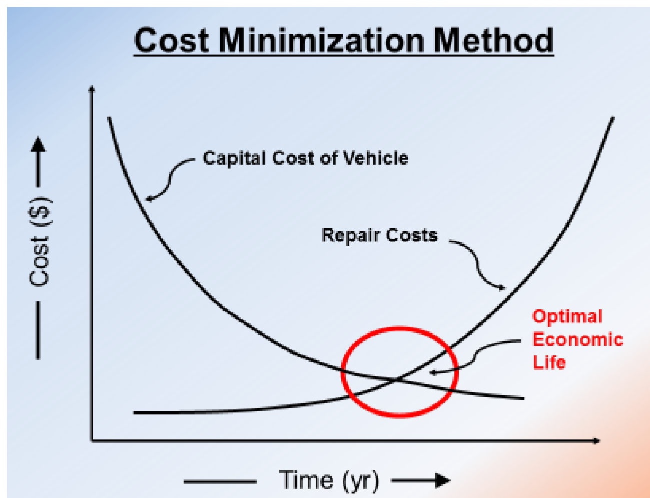
- ***Reliability*.** Once a task has been scheduled, having the resources available is an important management concern; and that includes having a vehicle reliable for operation. Historical records provide an insight into the amount of time a vehicle was in the shop and for how long. Depending on whether the vehicle could be driven or had to be towed back to the shop, or the number of days in the shop for repair, helps determine its reliability and subsequently influences the replacement decision. Documented situations where the vehicle has caused the mission to be delayed or aborted on a repeated basis will assess greater points toward replacement in this category.

VEHICLE OPERATIONS – 70 points maximum		
Parameters to Assess	**Points**	**Criteria for Point Bands**
Alternatives Available to Achieve Result (weight = 2)	10	No dependable alternative
	5	Could be contracted out or borrowed from another community
	0	Have other available pieces
Frequency of Use (weight = 1)	10	Relied on daily, 5+ months per year
	5	Relied upon seasonally, <5 months per year
	0	Used randomly as need arises
Reliability (Downtime) (weight = 3)	10	Down >2x per month or 10 days/month (33%)
	5	Down 3x in 3 months or 14 days in 3 months (15%)
	0	Down 1x in 3 months or <3 days in 3 months (<55)
Environmental (Green) Component (weight = 1)	10	New model with specific green component
	5	No targeted initiative, generally improved mileage

RETURN ON INVESTMENT (ROI)

Financial considerations are important in any business or municipal operation as they define not only the annual operating costs, but the cost-to-own over the life of the vehicle, or the life-cycle costs. Good records on repair costs are important to be able to quantify the ROI. To understand how the costs change over time, the graph below illustrates capital costs versus the operational repair costs.

The chart below illustrates the annual costs of a vehicle, where the intersection of the capital cost curve with the repair cost curve identifies the point in time where the annual cost of owning the vehicle is lowest. However this may not be the optimal time to replace the vehicle. In fact, annual costs higher than the minimum may be acceptable when they are compared to the annualized cost of purchasing a new vehicle (see Annualized Cost-to-Own ratio). Factors that help determine the return on investment of retaining a vehicle versus purchasing new include:



- ***Repair cost five-year trend.*** Evaluating the repair cost trend over the most recent five-year period helps to define where the vehicle is on the cost minimization curve. An upward trend may indicate that the vehicle is approaching or has passed its optimal economic life. The rate of expenditure growth should be taken into account when assessing this factor.

- ***Projected repair cost in the next year.*** Estimating next year's repair costs is even more important than past repair costs, but it relies on experienced operators and maintenance personnel to provide the necessary expertise, as such a prediction can be more of an art than a science. A thorough inspection of the vehicle can highlight conditions that inevitably will result in higher repair costs in the following year. Replacing the vehicle before incurring those anticipated expenses is usually the better practice, assuming the vehicle is beginning to meet or exceed other criteria such as life expectancy, mileage, and reliability, among others. This parameter is used in the calculation of the "Annualized Cost-to-own Ratio" below.

- ***Depreciation.*** What value the vehicle has on the resale market is important financial information. If a vehicle has no trade-in value on the market, then there is less incentive by the owner to replace it. However If the resale results in a sizable cash value, it can help off-set the cost of a new vehicle. Hence in an effort to optimize the "cash back", the greater the retained vehicle value, the less points awarded to the vehicle. This parameter is used in the calculation of the "Annualized Cost-to-Own Ratio" below.

- ***Annualized Cost-to-Own Ratio.*** Calculations are provided whereby the projected costs the following year are compared to the annual cost of purchasing a new vehicle. For the current vehicle, the projected costs to own the vehicle for the next year are the sum of the repair costs next year plus the loss in value (depreciation), while the annual cost to own a new vehicle is the total cost of the vehicle divided by the life expectancy. Annualized, if it is less expensive to own and operate the current vehicle, then the ratio of the two values will be less than 1.0. In the model, it would be economically prudent to replace a vehicle when the ratio exceeds (0.7), while anything between 0.5 and 0.7 would be questionable as to whether to continue with the older vehicle and would look to other factors to reinforce the decision.

For example, if a new vehicle (assuming no repairs) costs $100,000 and industry standards predict the life to be 10 years, then the cost-to-own the new vehicle is hypothetically $10,000 per year. If an older vehicle of the same model has repair costs estimated at $12,000 next year, but will likely keep the vehicle operational for 2 more years, then the cost to retain the older vehicle is $6,000 per year just for repairs. There is also a "lost value" due to depreciation. If the market value for a vehicle of its age and condition is $10,000, the annual depreciation is estimated to 10% annually, or $1,000.

The ratio then is calculated to be: ($6,000 + $1,000) / $10,000 = 0.7. In this example, while it is still cheaper on an annual basis to repair and continue to own the older vehicle, considering the likelihood of further unanticipated costs in the next year or two and general overall vehicle demise, the threshold for the ratio is set where any ratio value above 0.7 is awarded the highest points for this parameter, indicating "replacement".

RETURN ON INVESTMENT – 100 points maximum		
Parameters to Assess	**Points**	**Criteria for Point Bands**
Repair costs over the last 5 years (weight = 2)	10	Steep rise in repair costs; vehicle likely past optimal economic life point
	5	Gradual rise in repair costs
	0	No upward trend in repair costs
Projected repair cost next year (weight = 3)	10	Major costs foreseen (>10% of replacement)
	5	Constant minor repair costs expected (<10%)
	0	No signs of future failure
Depreciation (weight = 1)	10	Turn in value >20% of new
	5	Turn in value 5-20% of new
	0	Turn in value <5% of new
Annualized cost to own ratio (Future repair costs+ depreciation)/(cost new/life span) (weight = 4)	10	Ratio > 0.7
	5	Ratio from 0.5-0.7
	0	Ratio <0.5

OBSOLESCENCE

- ***Evolution of technology.*** As technology continues to evolve, improvements in the safety, functionality, and comfort will typically accompany newer models of the same vehicle. In some cases, while the vehicle could continue to be operated, there are key improvements in the vehicle technology that favor replacement sooner than later. Especially in public safety vehicles, such as a fire truck or ambulance, while a vehicle could remain in service for several additional years, the advanced technological improvements in the newer vehicles mandate replacement to ensure the safety of the crew or public health of the patient. Additionally, in the public works or parks maintenance vehicles, redesign of equipment in recent years has allowed the merging of tasks to be accomplished with one piece of equipment instead of two or three. This consolidation of functions can result in significant savings due to reduction in the fleet size, and may warrant vehicle replacement on the earlier side of the analysis.

• ***Repair parts availability***. Over time, a specific vehicle model undergoes redesign and its repair parts are no longer manufactured and are phased out of the supply system. Once the limited stock is consumed, a vehicle deficiency may only be repaired by finding a similar vehicle in a scrap yard, unless the part can be fabricated in the shop. If these options are not possible, it could render a vehicle unusable for its intended purpose. The phasing out of specific models are driven by market forces. An example of a recent phase-out has been the Crown Vic police cruisers which were phased out for a newer Interceptor model which is safer and more rugged for the needs of police departments. In coming years, the only available Crown Vic parts will be through the reuse system where parts are stripped from old vehicles. However, this form of resupply is unacceptable for a front-line vehicle due to the emergency response needs, and such a vehicle would consequently be granted very high points to support replacement.

OBSOLESCENCE – 50 points maximum		
Parameters to Assess	**Points**	**Criteria for Point Bands**
Evolution of technology (weight = 1)	10	Newer models combine multiple tasks in one vehicle
	5	Significant improvements in efficiency/safety
	0	Small or negligible improvements
Repair parts availability (weight = 4)	10	Repair parts no longer available
	5	Parts only by special order or cannibalization
	0	Parts are readily available

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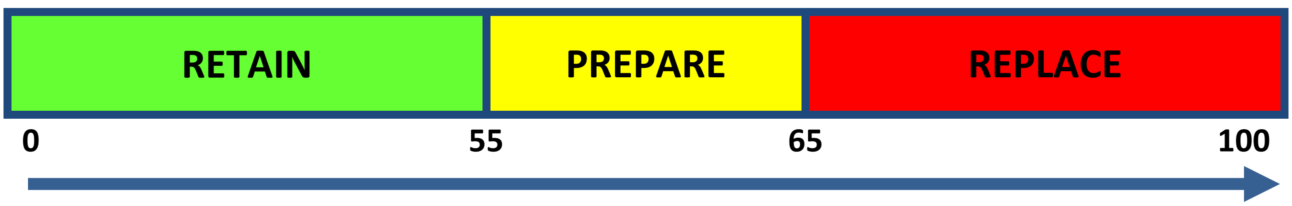
RISK FACTOR RATINGS

As discussed above, the calculation of the risk factor for a vehicle is achieved through the assessment of parameters defined in five categories. It then determines a vehicle's: (1) likelihood of failure in the next year (see Condition); and, (2) the consequence if a vehicle is does fail (see Utilization, Operations, Return-on-Investment, and Obsolescence).

As some empirical parameters involve more complex calculations, in an effort to facilitate input and reduce errors, the assessment values are auto-calculated using input data. The gross raw points assessed for a vehicle is automatically normalized to a 100 scale, and the resultant score is termed the "Risk Factor". The risk factor can be used to inform decisions as to a vehicle's disposition as follows:



In this model, a vehicle theoretically starts near zero risk factor when purchased new, and progresses to a higher risk index as it ages and is utilized to a greater degree. Unless the vehicle was a "lemon" and fails to perform early in its usage, it would be expected that with "normal" usage, the vehicle reaches its optimal time for replacement at about the industry standard for age and mileage. However, because no vehicle or operating environment or frequency of usage is exactly the same, this model attempts to quantify some of those variables which may either lengthen or shorten a vehicle's usefulness and highlight a reasonable point for which to replace the vehicle.

RETAIN

Starting from the time of a new purchase and through the first years of utilization, a vehicle is expected to perform its intended function with a high degree of reliability. Like any mechanical system, there are requirements for regular servicing and standards of good operation that limit the extent of repairs during this period. Policies and procedures in a motor pool that ensure fluids and filters are checked regularly and renewed at designated intervals, and lubrication occurs at points where there is metal-on-metal moving parts, will help maximize the performance and life expectancy of a vehicle.

It has been demonstrated that through good, thorough fleet maintenance practices, a high percentage of repair costs can be saved over the life of a vehicle while extending its operating capacity significantly. For vehicles costing nearly a quarter million dollars (e.g. street sweepers, large dump trucks, front end loaders, etc.), this could result in tens of thousands of dollars saved per vehicle over its life. Especially in New England, the outside environment can be extremely harsh on the wear and tear a vehicle experiences, so making extra efforts to wash and remove corrosive chemicals as well as storing the vehicle in a dry environment will enhance a vehicle's long term condition. Giving operators refresher training and reinforcing good maintenance practices will also go a long way toward reducing a vehicle's life-cycle costs.

Prepare

As a vehicle nears its expected life expectancy, various components begin to show outward signs of wearing out. As these parts comprise larger systems on the vehicle, they are interrelated and can cause larger and more expensive repairs. As mentioned earlier, how soon a vehicle gets to this point is very much a factor on not only how it was used on a day-to-day basis, but how it was maintained. However, usually there develops a pattern of increasing down-time when a vehicle is in the shop, or when the number of unanticipated repairs is growing. This begins to characterize the vehicle's downturn in performance. A good fleet manager or mechanic will take notice of these signs and look to more systemic problems that will help forecast when a vehicle is nearing replacement.

While a vehicle could begin to be listed in year 4 or 5 on a 5-year capital improvement plan based on its industry standard for age alone, as the reliability begins to decrease and costs increase, this model reflects the point in time to prepare for the vehicle's replacement. At this point, while the vehicle is still serviceable, the risk factor indicates more costly repairs will be forthcoming without sufficient time remaining for an adequate return on investment. Planning for a vehicle's replacement at this point would be reflected in year 2 or 3 of the CIP. Even at this point nothing is conclusive, and depending on utilization and maintenance, it could be that very little changes over the next year and the vehicle could remain 2 or 3 years out in the CIP.

Replace

As the risk factor increases over time, at some point the vehicle may be projected to reach a single or multiple point of failure, where it is uneconomically feasible to repair it or operations may be jeopardized beyond acceptable limits. That said, the predictive model calculates a level of risk that a vehicle *may* fail, and the consequence if it *does* fail, but does not guarantee this will occur. While a risk factor of 68 indicates "replacement", albeit at the lower end of the scale, the culture of the community may be that such risk is acceptable or perhaps the community may lack sufficient funds to replace the vehicle, thus sustaining its operational status for another year (or longer).

However, at the higher end of the risk factor scale, perhaps at 80 or beyond, it is indicative of several areas of unacceptable risk; not only a higher assurance of failure but increasingly higher impact on operations and likely a very poor financial return on investment. Certainly, the highest risk factors are indicative of vehicles that pose serious life-safety concerns, or when a repair cannot be made due to lack of available parts or it is actually less expensive to purchase a new vehicle.

It should be noted that the overview of the fleet replacement model has been about *need* to replace a vehicle, but not about *availability* of a particular piece of equipment. Market conditions will vary from year to year and even month to month, but typically for the more expensive or very specialized equipment (e.g. fire engines, large dump trucks, vactor trucks), vehicles are not likely available upon demand, but rather may take up to a year (or more) to actually receive the vehicle after placing the order. Therefore, part of the replacement planning should allow for this delay in the delivery of the replacement vehicle once it is ordered.

ANNUAL MODEL MAINTENANCE

Town staff will need to update the fleet replacement evaluation tool to ensure that the tool remains an accurate reflection of the fleet status and to determine if any priorities for vehicle replacement may have changed in the intervening months. Often this would occur during the Capital Improvement Plan development to better inform managers of potential investments for vehicle replacements.

QUANTITATIVE DATA FOR MODEL UPKEEP

In the model itself, the fleet inventory is listed in order of the vehicle number (column C). White cells are intended to be numeric ratings (1-10) that are input by staff. Cells that are yellow highlighted (for example, columns O through V) will auto-fill data as they have formulas embedded that draw from the database to calculate metrics. Additional yellow highlighted cells (columns AH, AI, AJ) are auto-fill numeric ratings (1-10) awarded based on computations and criteria defined in the various tabs. These cells should not be modified unless the intention is to change the model calibration. Finally, cells in columns AM through BH are strictly internal calculation cells and need not be altered. In fact, it may be advantageous to “hide” these cells to simplify the screen viewing.

Each year then, a fleet manager should review the data in the white cells for each vehicle in the fleet and update as needed as they are used for model calculations. Specifically:

- Column C - Vehicle Identification
- Column D - Owning Department
- Column E - Vehicle Type or Model (choose from pull-down menu)
- Column F - Year (only in the event the vehicle was replaced)
- Column G - Current odometer reading in mileage/hours for the vehicle
- Column H - Unit of measure (miles or hours)
- Column I - Any changes to the vehicle description or utilization
- Column J - Update as to operational condition and areas of particular concern
- Column K - Projected repair costs for the next year (do not include normal servicing)
- Column L - The number of years this repair will last
- Column M - Turn-in Value
- Column N - Market cost for new vehicle of desired replacement

For Columns M and N, the relevant fiscal year will automatically change so that the information input would apply to the subsequent fiscal year. Users should be careful to save a new version of the file at the beginning of each fiscal year.

QUALITATIVE DATA FOR MODEL UPKEEP

The columns that contain ratings based on qualitative assessments, (e.g., Columns W-AG, AK, and AL) must be reviewed closely each year by staff to determine if any conditions have changed. An in-depth discussion of each category can be found in the “Model Parameters” section above. In the section below, specific questions have been posed for consideration when staff provide a vehicle qualitative ratings. All ratings can range from 0-10.

Vehicle maintenance staff and users are best positioned to consider the reliability of each vehicle under review and should be responsible for updating the ratings in the model, as appropriate. However, as noted above, the care and maintenance of a vehicle will directly impact its lifespan so these same individuals should also be actively involved in making sure that vehicle(s) entrusted to their care receive timely preventative maintenance, are cleaned regularly, and are stored in sheltered conditions wherever and whenever possible.

In inputting the qualitative ratings, it is imperative that staff be honest and rigorous in their vehicle assessments, as failure to be objective will affect the usefulness of the fleet evaluation tool. They should recognize that public funds will be invested as a result of their assessments – dollars that if not used to purchase vehicles could be used upgrade town parks, make improvements to schools and the town library, improve local streets, and make other investments that directly affect the quality of life of local residents. Therefore, all involved in updating the fleet assessment tool should take their responsibility seriously and strive to maximize the lifetime of any public vehicle.

Further definition of the qualitative rating inputs can be informed by consideration of additional questions offered below:

Condition

- **Column V, Mileage/Hours** -Have the majority of vehicle miles/hours been in a highly dusty and/or corrosive environment or used for work which pushes the threshold of its rated capability and has it reached industry standards for this type of vehicle; or has the utilization been mainly on paved streets for lighter transport however at industry standard?
- **Column W, Storage** --Was the vehicle consistently stored in a dry, heated environment or out in the motor pool exposed to rain, snow and extreme temperatures?
- **Column X, Cleaning** -How soon after utilization was the vehicle washed of its damaging materials (salts, mud, sand); hours, days or weeks?
- **Column Y, Corrosion** - Where is the greatest degree of the corrosion taking place; on peripheral body sections that could be replaced if desired such as cab, dump bed, or attached lines (hydraulic or electric), or on areas which could result in catastrophic failure, such as the vehicle frame?

Utilization

- **Column Z, Work critical** --Should the vehicle fail, will critical work for the department go unmet for an unacceptable length of time causing either an unavoidable safety condition or distress to the community?
- **Column AA, Skill to operate** - Is the equipment intended for a unique function that employees were hired/trained to conduct which could render them without work for the period of time without the vehicle? (e.g. Sewer/stormwater television truck, mowing tractor for summer hires, police cruisers)
- **Column AB, Mandated by regulations** -Is the task normally accomplished by the vehicle mandated by local/state/federal regulation and unable to be reasonably accomplished without this vehicle in the immediate future? (e.g. catch basin cleaning, fire truck, special needs van)

Operations

- **Column AC, Available alternatives** - Are alternatives to complete the mission of the vehicle reasonably available? Are there back-up vehicles, mutual aid, rentals or contracting of the service available?
- **Column AD, Frequency of use** -How often is this vehicle used throughout the day, week or season? Will the op-tempo of the department be negatively impacted immediately by less effectiveness and loss of productive man-hours?
- **Column AE, Reliability** - How dependable is the equipment for its assigned mission; is there likelihood that it will be returning to the motor pool for necessary adjustments, potentially jeopardizing the safety of the operator or success of the mission?
- **Column AF, Environment/Energy** - Is the vehicle a detriment to sustainability (e.g. fuel consumption) or the environment (e.g. leaking oil) and could be replaced by a much "greener" vehicle without compromising the tasks expected of it? Is this move toward "greener" vehicles encouraged by the Administration?

Return on Investment

- **Column AG, Historical repair costs** – Have repair costs been on an upward trend over the past five years? How quickly have repair costs escalated? Can it be determined that the vehicle has likely passed the optimal economic life point on the Cost Minimization curve (see page 8)?

All other Return on Investment parameters are calculated by the model.

Obsolescence

- **Column AK, Technology advancement** -Has the industry evolved such that the technology on a newer model would support a wider array of tasks making the workforce more efficient or significantly improve the safety for the operator/public or offer far greater protections for the equipment?
- **Column AL, Repair part availability** -Can repairs be quickly acquired by using the supply system without jeopardizing the mission? Do routine orders entail special order? Is the only means to keep the vehicle operating through the fabrication of parts?

Once all input data have been defined, a "Risk Factor" (defined from 0-100) for each vehicle is automatically calculated and color coded on the point scale described in the previous section. A summary of vehicle risk factors is provided in a condensed format of key information is offered on the "Results Report" tab that may be useful for viewing and/or printing.

Should additional vehicles be added to the rating model, new rows will need to be added at the bottom, making sure to copy any cell formulas from the row above it to ensure the Risk Factor is calculated properly. Since there are links to different tabs, such as Industry Standards, it is important that the Vehicle/Equipment Type or Model be chosen from the pull-down menu using the arrow key which appears when the cursor is selected in that cell. Additions to the types of vehicles currently offered requires coding of the cells and related data tabs.

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RISK FACTORS & RECOMMENDED REPLACEMENT SCHEDULE

FLEET OVERVIEW

The Town of Bernardston is a rural town in northwestern Massachusetts, bordering Vermont. The Town has vehicles and equipment that are used by its Highway, Police, and Fire Departments. The Highway Department staff performs some basic, routine maintenance in-house, such as oil changes, but most maintenance is done by local repair shops. Major repairs may be done by specialized shops in the broader region. It is the same case for the Police and Fire Departments.

The model incorporates a total of 20 vehicles and pieces of equipment across the Highway, Police, and Fire Departments, including:

Highway Department

- Grader
- Loader
- Tractor
- Backhoe
- Hillside mower
- Five (5) dump trucks
  - Three (3) 10-wheelers
  - Two (2) 6-wheelers
- One (1) pick-up truck

Fire Department

- Three (3) fire engines
- One (1) medical first-responder pick-up truck

Police Department

- Three (3) frontline cruisers
- One (1) spare/back-up cruiser

Other

- Chipper (primarily used by Tree Warden, but maintained by Highway)

REPLACEMENT PRACTICES OVERVIEW

Historically, the Town has purchased Highway and Fire Department vehicles on an as-needed basis using available free cash. The Police Department follows a regular replacement schedule of one cruiser every two years, such that no frontline cruiser will be more than 6 years old, with the oldest front-line cruiser being downgraded to spare/back-up status.

The Town is open to the purchase of new or used equipment, depending on the recommendation of the department head and resource availability. For example, the Highway Department's 2003 Ford pick-up truck was purchased used and is used lightly for transporting staff.

Also, the Town is currently party to at least one regional purchase program. The Town participates in a five-town collective tractor purchase program. Every five years, a new tractor is purchased, housed at one of the towns, and made available to the other towns for three weeks per year. At the end of five years, ownership of the tractor reverts to the housing town. This is how Bernardston obtained its 2012 John Deere tractor.

Vehicle Risk Factor Ratings (FY2018)					
Vehicle ID #	**Type or Model**	**Year Built**	**Est Cost New in FY2019**	**Vehicle Description / Operational impact**	**Risk Factor**
#11	Front End Loader	1995	$180,000	1995 Cat Loader 928F. It is used for loading trucks and moving materials almost daily.	**75**
#21/ Car 4	Sedan/SUV	2009	$38,000	2009, Part-time officer's spare cruiser.	**53**
4 E 3	Pumper Truck	2000	$400,000	2000 International/KME fire truck. Emergency response.	**52**
4 Squad 1	F-350 Utility Body	2003	$75,000	2003 Ford F-350 Super Duty Crew Cab. Emergency response/Medical first responder. Goes out on most calls.	**49**
4 E 1	Pumper Truck	1991	$400,000	1991 Ford F-700 all-wheel drive fire truck. Emergency response when needed.	**46**
#9	F-550 Dump Truck	1986	$230,000	1986 Ford 9000. The truck is only used in the winter for plowing and sanding roads.	**44**
#14	Sedan/SUV	2003	$35,000	2003 Ford Explorer Sport Trac. Everyone in the department uses this pickup truck, which was purchased used, for running errands.	**44**
#16	Intl Dump Truck	2007	$210,000	2007 International Dump Truck. This truck has a plow and sander. It is driven daily and used for hauling materials, plowing, and sanding.	**41**
4 E 2	Pumper Truck	2007	$400,000	2007 KME Predator fire truck. Emergency response.	**39**
#22/ Car 2	Front-line Cruiser	2012	$38,000	2014, Police sergeant's assigned vehicle. 40 hours per week on patrol.	**38**
#23/ Car #3	Front-line Cruiser	2014	$40,000	2014, Full-time officer's cruiser. 40 hours per week on patrol.	**36**
#13	Backhoe	2002	$90,000	2002 John Deere 310G Backhoe. It is used in the snow and for cleaning and replacing culverts.	**34**
#17	Intl Dump Truck	2007	$85,000	2007 GMC 4500 Dump Truck. This is a 1-ton dump truck with a plow and sander. It used by the whole department year round for plowing, sanding, and hauling material.	**33**
#19	Intl Dump Truck	2013	$210,000	2013 International Dump Truck. The truck is a single axle dump truck with plow and all season dump body. It is used randomly, but more so in the winter.	**24**
#24/ Car #1	Front-line Cruiser	2016	$38,000	2016, Chief's vehicle. Used daily while on shift.	**20**
#12	Large Tractor	1999	$380,000	1999 John Deere grader 670CH. The grader is used randomly throughout the year for grading dirt roads.	**19**
CHP	Chipper	1990	$25,000	1990 Eager Beaver Chipper. This machine is mainly used by the Tree Warden.	**19**
#20	F-550 Dump Truck	2016	$100,000	2016 Ford F-550 Dump Truck. The truck is a 1-ton 4X4 dump truck with a slide in sander. It is used by everyone.	**18**
#18	Large Tractor	2012	$160,000	2012 John Deere 6330 Tractor. This is a tractor with a boom mower for mowing the sides of the roads. It is used seasonally.	**14**

REPLACEMENT SCHEDULE & RECOMMENDATIONS

The vehicle replacement model results indicate that the Town's fleet is in a favorable position in terms of having few short-term replacement needs. In fact, the 1995 Caterpillar 928F Loader is the only vehicle that the model identifies being in a replacement cycle out of all highway, fire, and police vehicles. However, there are more significant decisions to be made in coming years as the model suggests the Town "prepare" to replace two vehicles including:

- Police Department Car 4, a 2009 sedan used as a spare/back-up cruiser (est. cost: $38,000)
- Fire Department Engine 3, a 2000 International/KME pumper truck (est. cost: $400,000)

Note that at this point nothing is conclusive. Depending on utilization and maintenance, the risk factors for these vehicles could remain stable over the next year, and these vehicles could remain 2 or 3 years out in the CIP. There is also the potential for other vehicles' risk factors to increase substantially, moving them from the "retain" category into the "prepare" or even "replace" category. After each annual update, it is incumbent upon the Town to reassess its replacement plan.

Recommendation 1: Consider replacing the 1995 Caterpillar 928F Loader (est. cost: $180,000)

The loader is used on a daily basis by the Highway Department staff to load trucks with sand/salt for snow fighting, move materials, and do other lifting/loading/scraping functions. Multiple reported factors converged to result in a high risk factor indicating replacement is warranted, including:

- Frequency of use: The loader is used on virtually a daily basis year-round to support fundamental town operations.

- Age: Most municipalities utilizing best practices replace a front-end loader between 15-20 years of age. This loader is 23 years old.

- Degree of corrosion and wear: Physical inspection of this vehicle indicates severe rust throughout the body and undercarriage, compromising its electrical systems and structural integrity. Additionally, the pins and bushings are worn, affecting the maneuverability and stability of moveable components and potentially creating an unsafe situation while articulating or lifting heavy loads.

- Lack of reliability: Staff have indicated that the loader is providing a reduced level of service and is not efficient for accomplishing routing tasks due to decreased engine power and the need to make recurring mechanical adjustments.

- Degree of repair anticipated: Necessary repairs over the next few years are expected to be costly and require the loader be out of service for significant periods of time. Extensive body work would only be a stop-gap measure to abate the advanced corrosion that is apparent on all components of the vehicle.

- Availability of repair parts: Partly due to its age and partly due to location, should failure occur the loader is expected to be out of service for an extended amount of time due to availability of parts. This would require a back-up plan such as using the backhoe (which is not equipped to do the same extent of work as the loader), renting a replacement, contracting out work, or borrowing a loader from a neighboring municipality. None of these options appear to be very satisfactory solutions to meet the high level of needs in the Town.

Recommendation 2: Begin discussing vehicles in the "Prepare" (for replacement) category.

The Town faces potentially-costly replacements in the medium term. The two vehicles that the model suggests the Town prepare to replace include:

- Police Department Car 4, a 2009 sedan used as a spare/back-up cruiser (est. cost: $38,000)
- Fire Department Engine 3, a 2000 International/KME pumper truck (est. cost: $400,000)

It should be noted that it is possible that the results may change next year when the model is updated. These

Police Department Car 4

It is the project team's understanding that the Town and Police Department are already anticipating the replacement of Car 4, the spare/back-up cruiser, because the Town has established a replacement schedule for cruisers.

The project team supports this approach. This replacement schedule aligns with existing best practices; i.e., establishing a regular and consistent cycle for replacing cruisers while maintaining a spare/back-up. This practice helps to mitigate the negative impact to public safety which could result from unreliable or unavailable police cruisers.

Fire Department Engine 3

The Fire Department faces significant decisions regarding apparatus over the medium-to-long term (five to ten years). While Engine 3 (the 2000 Pumper) is currently the only apparatus that falls within the "prepare" category indicating it is time to prepare for replacement, the F-350 medical first response truck and Engine 2 (the 1991 Pumper) are not far behind. As fire apparatus are costly, it would be prudent for the Town to bear this in mind when considering the potential replacement of Engine 3.

Furthermore, Engine 2 is the only all-wheel drive fire engine. This feature is seldom-used but reportedly very important for the department's ability to access certain remote areas, especially in extreme weather conditions. The Town should take this into consideration when devising a fire engine replacement plan.

NEXT STEPS

The fleet replacement model is intended to be a dynamic tool that is updated annually by municipal officials. This report includes detailed instructions about updating the tool, and the project team will provide informal training to the Town Coordinator as part of this project.

The project team also offers the suggestions below to improve the Town's ability to use the fleet replacement model in subsequent years:

- Maintain electronic records of repairs. This does not necessarily have to include regular or preventive maintenance, although it can and this data may prove useful to the Town. However, the model is designed to take into account a five-year historical repair record.

- Define a process for department heads to anticipate future costs. This may involve having trusted outside vendors provide inspections or make recommendations. In particular, this would be helpful for the Fire Department as these data were missing from the current assessment and the project team had to make educated assumptions based on discussion with department staff.

APPENDIX A

BEST PRACTICE ALTERNATIVES TO "REPLACEMENT-IN-KIND" CAPITAL INVESTMENT

Municipalities generally have significant investments in vehicles and equipment in order to provide the level of services the community expects. Often, the purchase of capital equipment significantly impacts the operating budget and takes bonding capacity away from other projects. With large equipment replacement cycles typically on the order of 10 to 20 years, many factors internal and external to the municipality may have changed during that period and close review is warranted before an investment of hundreds of thousands of dollars is made in new equipment. As such, the end of a life for major pieces of equipment should be seen as an opportunity to evaluate the scope of services provided by the equipment, along with the opportunities to reduce costs and move to a more sustainable investment model.

Options that could maintain levels of service but in a less expensive manner than a straight "replacement-in-kind" action, may include:

- **Purchase used equipment.** Local commercial auctions often allow a municipality to become certified to bid on used vehicles with other dealers on the floor. ADESA in the Town of Acton or Central Mass Auto Auction in Oxford are examples of such local vendors. This option has been shown to be a good option for smaller administrative fleet vehicles such as sedans, SUVs, and pick-up trucks as they constitute the largest inventory in these auction houses. Savings as high as 25-50% could result if the municipality is willing to purchase a vehicle that is a few years old instead of purchasing new.

- **Utilize the State contract**. "COMMBUYS" is offered by the Commonwealth's Executive Office of Administration and Finance (Operational Services Division), and is available for use by all municipalities. This service pre-qualifies vendors and lists the specifications for a variety of larger equipment, thereby saving time in the bidding process while also adhering to State purchasing regulations. The prices are competitive and often reflect savings through economies of scale by vendors hoping to attract state-wide attention on the equipment offered.

- **Team up with a neighboring municipality.** Most municipalities require the same equipment to accomplish similar services for their communities and some of that equipment may be needed for only a few weeks or months per year. If the work to be accomplished can be scheduled to meet each community's needs, it may be prudent to share in the cost of the equipment. Alternatively, the State Legislation allows for mutual aid between communities and through formal agreements municipalities can provide the service on a reimbursable basis.

- **Outsource the work.** Often the service desired by a municipality is available in the private sector, and it is prudent to conduct a full-cost accounting of the expenses involved in providing the service with municipal employees versus contracting with a private vendor. Such an analysis will allow for a more in-depth conversation with staff regarding the best use of resources, including use of employee time, operating and maintenance costs, and the cost of debt service and impact on the town's bonding capacity available to meet other capital needs.

- **Purchase multi-use equipment.** As the equipment industry evolves, newer models of equipment are released that have greater capability for accomplishing multiple tasks, potentially allowing the use of the vehicle to expand from seasonal to year round use. Not only could this shift consolidate equipment with an obvious savings of a smaller fleet inventory, but such continuous usage often benefits the equipment by keeping its components operational and systems maintained.

- **Negotiate the turn-in of the old equipment for cash credit at the time of sale.** Often commercial vendors are incentivized to make sales for their equipment and will offer better turn-in credit if the used piece of equipment is traded in than if the used equipment was auctioned off separately. This option is market driven and the two options should be evaluated before making a decision, as the result could be a significant reduction in cash out-lay for the new equipment and should be considered when determining the optimal time to replace a piece of equipment.

- **Involve the fleet manager in the purchasing decision.** Annual maintenance of the fleet can be as significant an expense as the original purchase. A fleet manager will likely be familiar with the routine maintenance costs for various models/years of equipment and if some consistency in the makes/models of equipment can be achieved, the fleet manager can also take advantage of the economies of scale when stocking repair parts and training staff. To by-pass the fleet manager's opinion in vehicle purchase decisions may result in a much more costly investment in the long run than originally anticipated.

- **Create an administrative vehicle motor pool.** Often in municipal government, each position requiring the use of a vehicle has a sedan, van, or SUV assigned to it. Depending on the nature of use, such vehicles may need replacement more due to age than accumulated mileage. As such, this practice may be less efficient than having a motor pool where vehicles are signed in/out as needed. In instances when an employee does not use a vehicle throughout day, or a position is vacant due to transition, or an employee is off due to illness or vacation, the creation of an administrative sign-in/out process could potentially reduce the size of the fleet by as much 10-30%.

- **Build small equipment purchases into the General Operating Budget.** The purchase of supporting equipment such as trailers, sedans, sanders, etc. (less than $30,000) should be considered for inclusion in the annual operating budget instead of being added to the capital improvement plan. During capital planning, such modest-sized equipment must compete with other longer term and more significant equipment, while using up municipal bonding capacity and potentially reducing capacity available for longer term investments.

- **Spread out the purchase of costly equipment.** Should more costly vehicles and equipment be requested for replacement at the same time (e.g., the replacement of three large construction trucks in one year can result in a combined cost of nearly $600,000), it would be prudent to try to spread the replacement over several years, thereby creating a more sustainable operations and financial model which can better average out changing economic conditions.

APPENDIX B

BERNARDSTON VEHICLE INVENTORY

Veh #	Dept	Year	Manufacturer & Model	Vin #	Plate #
4 E1	FIRE	1991	FORD MHVF7F	1FDXK74AOMVA02999	MF7135
4 E3	FIRE	2000	INTERNATIONAL FIRE TRUCK	1HTSDADRXYH288623	MF4058
4 SQ1	FIRE	2003	FORD F350 SUPER DUTY	1FTSW31S23EB29759	MF7147
4 E2	FIRE	2008	KME PREDATOR	1K9AF42878N058402	MF9866
9	HWY	1986	FORD TRUCK	1FDXK90X8GVA57808	M72432
CHP	HWY	1990	EAGER BEAVER CHIPPER	486SE 1516LW006389	M51422
11	HWY	1995	CATERPILLAR LOADER	2XL01728	M56187
12	HWY	1999	JOHN DEERE GRADER	DW670CH574023	M62428
13	HWY	2002	JOHN DEERE BACKHOE	T031OGX905042	M80113
14	HWY	2003	FORD EXPLORER	1FMZU77E33UB91234	M98197
16	HWY	2007	INTERNATIONAL 700SER	3HTWDAARX7N458571	M86195
17	HWY	2007	GMC C4500	1GDE4C3277F410399	M76480
18	HWY	2012	JOHN DEERE TRACTOR W/BOOM	1L06330GVCG722602	M86929
19	HWY	2013	INTERNATIONAL DUMP	1HTWLAZR5DJ325464	M86449
20	HWY	2016	FORD F550 DUMP TRUCK	1FDUF5HT6GEB06392	M94205
21	POLICE	2009	DODGE CHARGER	2B3KA43T39H576517	MP41Z
22	POLICE	2012	DODGE CHARGER	2C3CDXAT4CH209992	MP41Z
23	POLICE	2014	FORD EXPLORER	1FM5K8AR5EGC26662	
24	POLICE	2016	DODGE CHARGER	23CDXKT8GH229537	MP44B

Note: Data sourced from the Town's insurance schedule

APPENDIX C

LOOK-UP TABLE FOR ASSESSMENT VALUES

The following section provides a summary of the point "bands" for each parameter which defines suggested cut-offs for which points are awarded in order that repeated grading occurs in a consistent manner. It is to be noted that each parameter can be scored on a scale of 1 to 10. The importance of the parameter in replacement determination is reflected by the "weight" assigned to it as a point multiplier.

VEHICLE CONDITION – 110 points maximum		
Parameters to Assess	**Points**	**Criteria for Point Bands**
Age relative to industry standard (weight = 2)	10	More than 3 years older than industry standard
	5	1 year under to 3 years over industry standard
	0	More than 1 year below industry standard
Mileage relative to industry standard (weight = 3)	10	More than 20% greater than industry standard
	5	+/- 20% of industry standard
	0	More than 20% lower than industry standard
Storage location (weight = 1)	10	Outside exposed to elements
	5	Under roof only
	0	Indoors, heated
Vehicle washing, annually (weight = 1)	10	Never washed
	5	Occasionally, less than 5x per year
	0	Frequently, more than 5x per year
Degree of corrosion (weight = 4)	10	Significant rust (>70% with rot on undercarriage)
	5	Modest rust (30%) with some flaking
	0	Little rust (<5%) and only on paint/surface

VEHICLE UTILIZATION – 60 points maximum		
Parameters to Assess	**Points**	**Criteria for Point Bands**
Work Critical (weight = 3)	10	Critical to life safety
	5	Core mission of Town
	0	Aesthetics, not permanent
Skills needed to Operate (weight = 1)	10	Specific license required, limited operators
	0	No special license required
Work Mandated by State/Federal Regulations (weight = 2)	10	Yes
	0	No

VEHICLE OPERATIONS – 70 points maximum		
Parameters to Assess	**Points**	**Criteria for Point Bands**
Alternatives Available to Achieve Result (weight = 2)	10	No dependable alternative
	5	Could be contracted out or borrowed from another community
	0	Have other available pieces
Frequency of Use (weight = 1)	10	Relied on daily, 5+ months per year
	5	Relied upon seasonally, <5 months per year
	0	Used randomly as need arises
Reliability (Downtime) (weight = 3)	10	Down >2x per month or 10 days/month (33%)
	5	Down 3x in 3 months or 14 days in 3 months (15%)
	0	Down 1x in 3 months or <3 days in 3 months (<55)
Environmental (Green) Component (weight = 1)	10	New model with specific green component
	5	No targeted initiative, generally improved mileage

RETURN ON INVESTMENT – 80 points maximum		
Parameters to Assess	**Points**	**Criteria for Point Bands**
Projected repair cost next year (weight = 3)	10	Major costs foreseen (>10% of replacement)
	5	Constant minor repair costs expected (<10%)
	0	No signs of future failure
Depreciation (weight = 1)	10	Turn in value >20% of new
	5	Turn in value 5-20% of new
	0	Turn in value <5% of new
Annualized cost to own ratio (Future Repair Costs+ Depreciation)/(# Years Extended) (weight = 4)	10	Ratio > 0.7
	5	Ratio from 0.5-0.7
	0	Ratio <0.5

OBSOLESCENCE – 50 points maximum		
Parameters to Assess	**Points**	**Criteria for Point Bands**
Evolution of technology (weight = 1)	10	Newer models combine multiple tasks in one vehicle
	5	Significant improvements in efficiency/safety
	0	Small or negligible improvements
Repair parts availability (weight = 4)	10	Repair parts no longer available
	5	Parts only by special order or cannibalization
	0	Parts are readily available

ABOUT THE CENTER

The Edward J. Collins, Jr. Center for Public Management in the McCormack Graduate School of Policy and Global Studies at the University of Massachusetts Boston was established in 2008 to improve the efficiency and effectiveness of all levels of government. The Center is funded by the Commonwealth and through fees charged for its services.

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