

Warranty Recovery Modernization Business Process Review

Report of Findings and Recommendations Report

19 December 2022

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Executive Summary

This report is the outcome of the Warranty Recovery Modernization Business Process Review that was commissioned by the Fleet Services Branch in response to the findings of the City Auditor. During the process of this review Bronson Consulting worked directly with the members of the Fleet Services Branch to determine the best methods for addressing the recommendations of the Auditor. The combined team focused on the identification and assessment of opportunities to improve warranty recovery without generating negative impacts on the business value of services provided to the internal City of Ottawa clients that are supported by the Fleet Services Branch.

This review identified several opportunities to increase the number of claims raised with vendors however, an initial review provided no indication that this would increase the value of services provided to Fleet clients. In some cases there is potential to increase costs if the focus is solely placed on the rate of claims and not on the value of the claims. Unclaimed warranty may cause the city to incur additional costs, however it is possible that these costs are less than the negative impact on client operations, additional unrecoverable labour costs, or other expenses that may exceed the value of a potential warranty claim. For this reason it is recommended that a focus be placed on ensuring that the Warranty Recovery Process generates value for both Fleet Services and their client groups.

This report outlines the context of the claim process at Fleet Services Branch and details the factors that contribute to the decisions of whether to raise a warranty claim. The recommendations in the report include an approach to warranty management as well as a process improvement plan. The recommendations and plan focus on opportunities to improve the quality of warranty claim outcomes by:

1. Enhanced use of existing technology assets and data,
2. Increasing the transparency of decisions related to warranty claims and recoveries, and
3. Determining a sustainable approach to staffing and knowledge transfer for warranty staff.

The process improvement plan will focus on ensuring ongoing business value and not a simple increase in the volume of warranty claims. This means leveraging existing business data in the work order management system (M5) to better monitor warranty related activities and record the criteria used for warranty recovery decisions. This plan also calls for adjustments to staffing and responsibilities for individuals that are directly involved with the configuration and set up of data in M5. The skills and knowledge related to warranty management have been highly concentrated which has made them susceptible to disruption. These skills must be more broadly distributed across multiple team members.

Methodology

The City of Ottawa engaged Bronson Consulting to conduct this business process review between April and September 2022. This review followed a four phased approach to engaging with the Fleet Services Branch as outlined below:

Initiation Phase (April 2022)

The joint Fleet Services Branch (Fleet) / Bronson team collaborated to define the details of the project. This includes establishing the working relationship, stakeholder identification and establishing common project management practices.

Discovery Phase (April-June 2022)

Information, documentation, artifacts, and anecdotal accounts were consolidated into a shared body of knowledge. This initial scan generated the initial standardized view of warranty related activities. This information was structured into draft process maps and supporting documentation that was used to support stakeholder interviews. Information from these interviews was then used to update the draft process maps and generate the preliminary findings that were used to inform the Analysis Phase.

Analysis Phase - 7 Weeks (June-July)

During the Analysis phase the project team conducted a series of virtual workshops that were focused on three primary areas related to Warranty Management. These were:

1. Procurement
2. Work Order Management
3. Parts Management

Through the workshop process stakeholders validated the process maps, confirmed issues and challenges within the context of each process, and identified options for the resolution of issues.

Recommendation Phase (July – September)

The contents of this report represent the deliverables that were created during the Recommendation Phase. This report was generated and reviewed by the joint project team during Late July and September 2022.

Quantitative Analysis (November – December)

The contents of this report represent the deliverables that were created during the Recommendation Phase. This report was generated and reviewed by the joint project team during Late July and September 2022.

City of Ottawa Context - Fleet Services Operating Environment

Overview

The City's fleet services functions are carried out by the Municipal Fleet Services (Fleet) group within the Innovative Client Services Department. Fleet supports all City departments as well as some City boards and utilities that rely on vehicles and equipment to deliver their services. Fleet is responsible for procuring, maintaining, administering, repairing, and replacing the City's diverse fleet of roughly 5,000 vehicles.

The 2021 Fleet Services Audit indicated that approximately \$32.7M was spent on maintenance in 2019. Of that work, seventy percent represented in-house parts and labour and the additional thirty percent represented outsourced work. Fleet Services staff notes that warranty and recall work is most often done by the dealer or manufacturer at their expense, and these avoided costs are not quantified, nor included in the total maintenance value provided above.

Operational Context

Fleet plays a critical role in supporting the operational effectiveness across City of Ottawa vehicle fleets. Fleet is not responsible for supporting all vehicles within City of Ottawa organizations however Fleet does provide support to all organizations and departments within the City of Ottawa. Every unit that is operated by the City of Ottawa has a designated owning department (organization) as well as a designated operator (individual person).

In some cases, the owning departments take responsibility for maintaining a portion of units that they operate and rely on Fleet to support the remaining units. A clear example of this relationship is Transit (Figure 1 – Fleet Services Clients) where Transit supports the revenue fleet (e.g. buses) and relies on Fleet to support the portion of units that comprise Transit's "Non-Revenue Fleet" (e.g. heavy recovery / towing, supervisor vehicles, etc.).

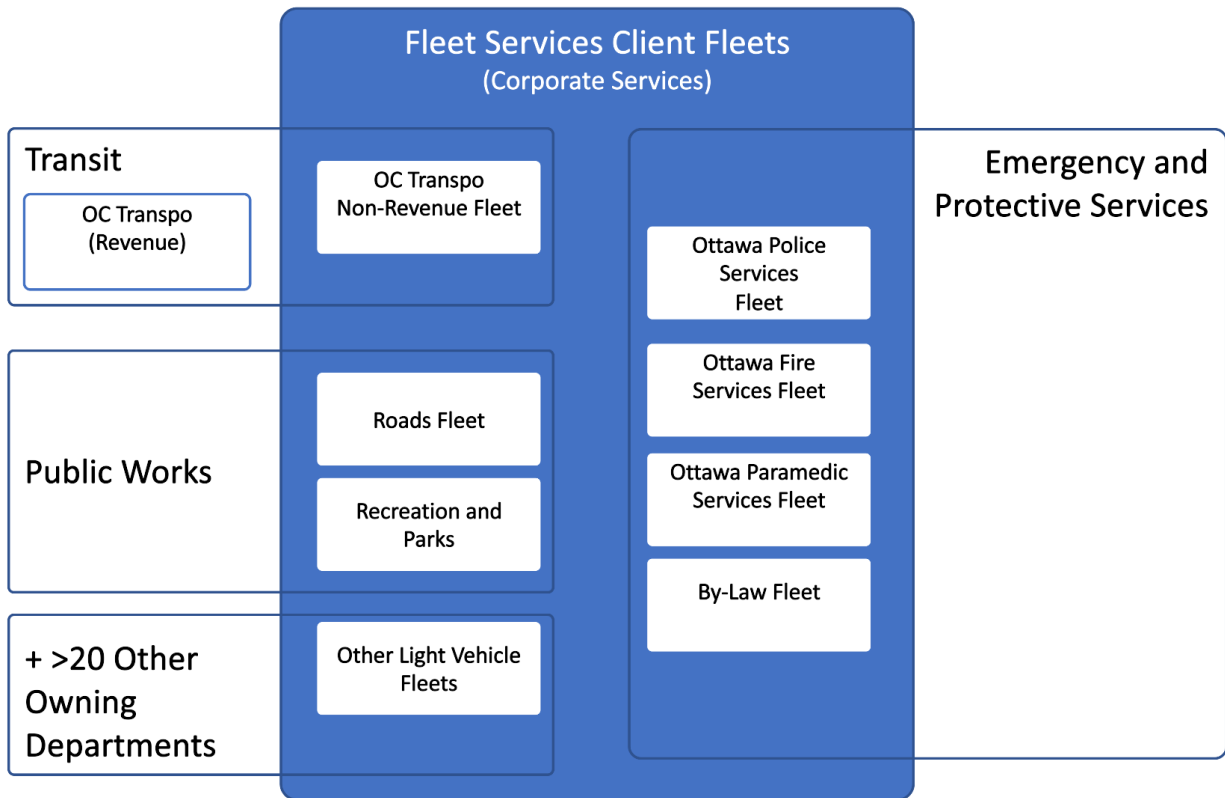
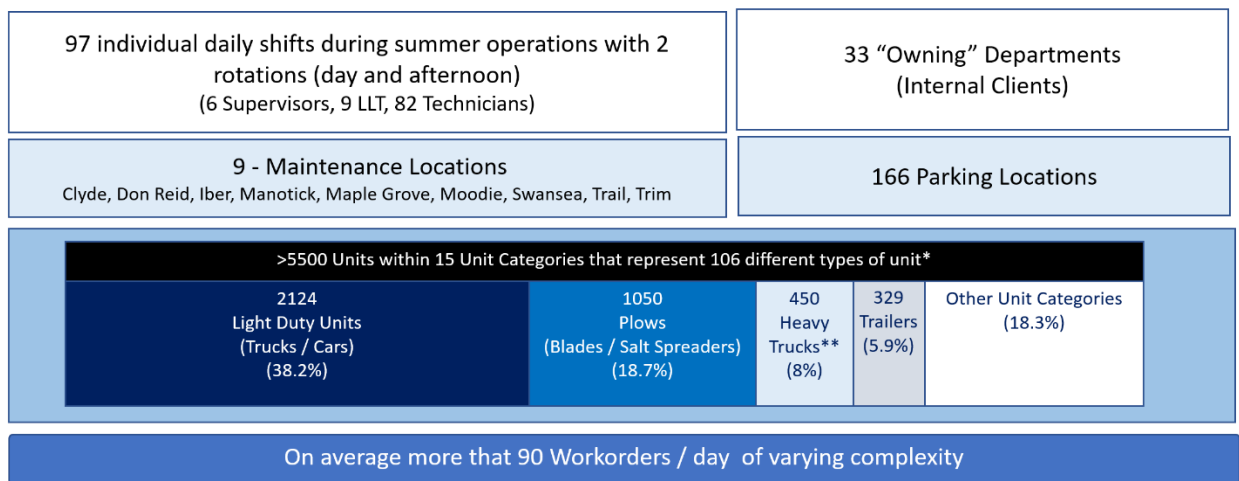


Figure 1 - Fleet Services Clients

This model means that Fleet services a very diverse range of unit types that include multiple categories of heavy vehicles, heavy equipment, emergency vehicles, light duty vehicles, agricultural equipment, small engines, boats, trailers, and any equipment that may be associated with those units. Figure 2 summarizes Fleet’s operations.



* Does not reflect diversity associated with make, model or unit configurations

**Includes Combo Trucks, Garbage Trucks, Buses, Fire Vehicles

Figure 2 - Fleet Services Operations Summary

Within this context there are several factors that determine the priority of activities that are performed by Fleet and specifically warranty claim management activities. These are as follows:

1. **Ongoing operational priorities** – The requirement for units to be operational is highly dependant upon weather, special events, seasonal requirements, emergencies, or other activities that impact the time or resources available to perform maintenance. While some maintenance activities can be scheduled for “off-seasons” for some units there are also frequently cases where units must be kept in service or returned to service in order to prevent gaps in city services (e.g. Fire, ambulance, plows, etc.).
2. **Unit Location** - The physical unit of the location or the requirement to transport a unit between one or more locations (i.e. parking location to maintenance location to vendor location) requires both time and resources. Some of these resources (e.g. towing, road side assistance, etc.) can be vendor provisioned, however in some cases operational priorities may require City resources to be used to move units.
3. **Unit (fleet) Distribution** – The fleet of units supported by Fleet is not uniformly distributed across all maintenance facilities or geographically across the city. While units do have designated parking and maintenance facilities this does not generally correspond to concentrations of specific unit types at specific facilities. The maintenance of some unit types is concentrated (e.g. fire, ambulance, etc.); however, this is not the norm for majority of the units. In effect many of the maintenance facilities are required to support multiple unit types with overlapping capabilities across all the maintenance facilities.
4. **Staffing Levels** - The number of individuals and shifts that are worked can have a significant impact on the order in which units are serviced, the wait time for servicing, and the ability to return a unit to a client department. In many cases this means that supervisors are required to make decisions related to the opportunity costs related to specific work orders. These decisions are often related cost effectiveness of using technicians to perform non-maintenance tasks such as moving units to / from vendor facilities.
5. **Vendor Management**– The relationship between vendors and Fleet is impacted by contractual terms, the use of sub-contractors, the geographic distribution of vendor facilities and the ongoing working relationship between Fleet and the vendor. In addition, Fleet supervisors at each facility are required to maintain working relationships that reflect the diversity of unit types and the number of active vendors that provide certain units. Specifically light duty vehicles are typically sourced from individual vehicle dealerships within the geographic boundaries of the City but units from a single vendor can be supported by many maintenance facilities. This means that many supervisors would be required to maintain relationships with a single dealership.
6. **Procurement Approach** – Historically the units supported by Fleet have been procured and deployed in small batches. This has increased the diversity of the fleet and makes is difficult to

achieve economies of scope and scale when configuring data in M5, concentrating resources or identifying patterns related to failure rates across the fleet (i.e. n<30)

Comparison With Other Internal Delivery Models

It is important to recognize that Fleet is not directly comparable to other organizations within the City. However, as noted in Figure 1 (above) Fleet acts as a service provider to many client departments within the City. These clients, such as OC Transpo and Ottawa Police Services, own and operate significant fleets of vehicles and have been able to achieve economies of scope and scale within their fleets. The sources of those economies of scope and scale can be found within the organizational structure, staffing approach, procurement, and general homogeneity of their units. OC Transpo preserves these economies by relying upon Fleet to support their “non-Revenue” vehicles while concentrating their efforts on a relatively homogeneous “Revenue” fleet that is mostly standardized.

The comparison of these contrasting delivery models (Figure 3 below) clearly identifies several quantifiable measures that point to the greater complexity of service delivery faced by Fleet. This figure does not quantify the complexity of the vendor environment associated with each of these fleets or the number of relationships that must be maintained by supervisors. The following points should be noted from this comparison of delivery models:

1. Fleet manages a large diversity of relationships (vendor and client),
2. Fleet has fewer staff that are dispersed across a wider geographical area, and
3. The units supported by fleet are not necessarily based (parked) near Fleet facilities.

City of Ottawa Fleet Services Branch		OC Transpo Fleet and Facilities Maintenance Branch	
Defining Characteristics: <ul style="list-style-type: none"> High levels of diversity <ul style="list-style-type: none"> Small procurement batches, niche equipment, small number of units over multiple years, multiple vendors Frequent requirement to enter “new” types of units. Operational demands from many clients More complex parts management Warranty on the majority of units must contractually be performed by the vendor <ul style="list-style-type: none"> High levels of workforce transition Complexity of data set / Historical transitions 		Defining Characteristics <ul style="list-style-type: none"> Highly homogeneous units <ul style="list-style-type: none"> Large procurement blocks Common age of units Similar configurations and data Economies of Scope <ul style="list-style-type: none"> Similar units are parked and maintained in a single location by the same technicians Technicians are vendor certified and typically work on units of a single type Warranty <ul style="list-style-type: none"> Vendor certified technicians Cost recovery on labour and parts by default 	
>5000	Individual Units	1279 (992 Buses)	
>100	Unit Types	5	
166	Parking Locations	4	
33	Internal Clients	1	
9	Maintenance Locations	4	
194	Staffing(FTE)	410	

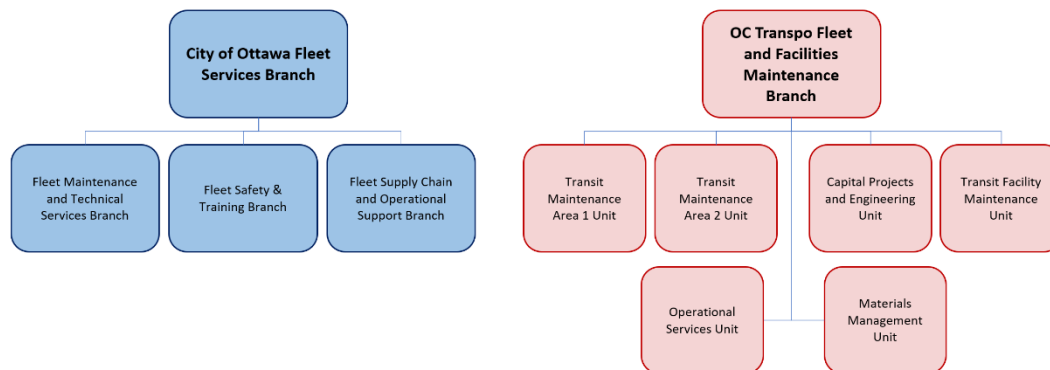


Figure 3 - Contrasting Delivery Models

Fleet Services - Warranty Business Process Context

During the initiation phase of this review the project team identified the scope of business processes that directly impacted warranty management activities at fleet and the findings within the Auditor’s report. During the discovery phase the understanding of this process context was expanded and matured to define the overall scope of business processes that would be examined during the Analysis Phase of the review. These process activities occur within the context of three major lifecycle phases associated with a unit, the Procurement, Management and Disposal (described in Figure 4 below).

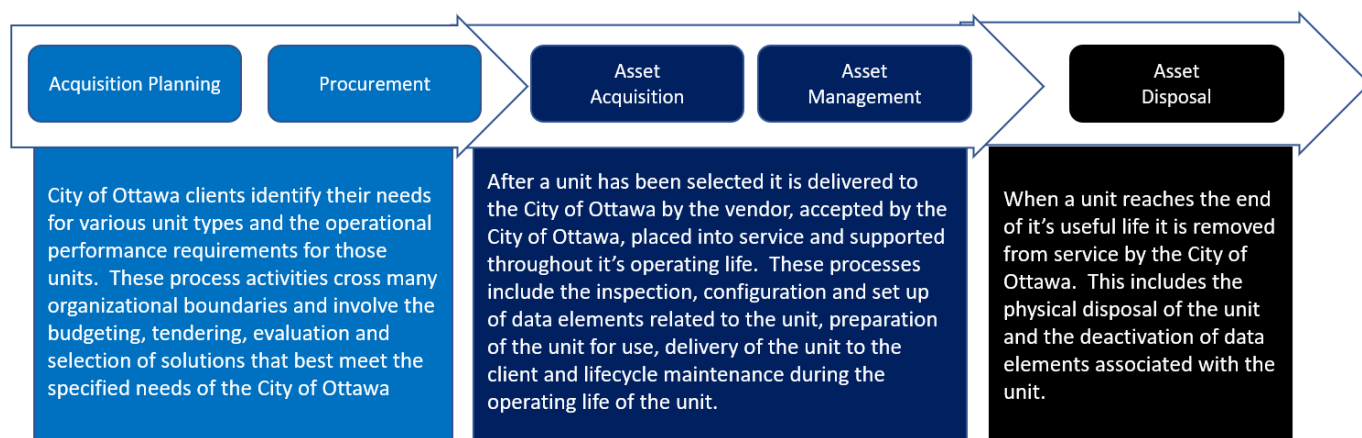


Figure 4 - Level 0 Business Process Context

The business activities that are involved in supporting these lifecycle phases are represented in Figure 5 below and form the core scope of the business process areas that were reviewed and summarized in this report. These Level 1 processes influence the outcomes of the warranty claim management process for both whole unit warranty claims and part warranty claims. The Fleet Services Operating Environment outlined above (Figure 4) has been shaped and influence by decisions that occur during acquisition planning and last until units are removed from service. While most warranties are between 0 and 10 years it is possible for some units or their components to have warranties of up to 20 years. This means that the current contract management, lifecycle support and data management activities within the Fleet Services Operating Environment are directly influenced by the unit distribution, procurement approach and vendor management practices during the previous decade. Furthermore,

the data constructs in M5 that are used to manage the units remain static to ensure the integrity of the data in M5 (i.e. changes to the warranty technical specification of an active unit is likely to negatively affect the quality of job line data on work orders or warranty claims)).

This influence is particularly strong with respect to the diversity of units withing the scope of Fleet's lifecycle support responsibilities. Decisions made during the acquisition planning stage directly determine the following key dimensions of warranty:

1. Diversity of the fleet (i.e. number of units and configurations),
2. The scope of unit warranty, and
3. Locations and methods for vendors to meet the terms and conditions of warranty

Following acceptance of units by the City of Ottawa the Fleet team works to maintain the operational effectiveness of units by applying the remaining Level 1 processes. These processes involve the steps necessary to manage the unit's lifecycle, manage the work order history of the unit, support cost recovery from internal City of Ottawa clients, raise warranty claims and minimize the impact on the operational service delivery capacity of the City of Ottawa.

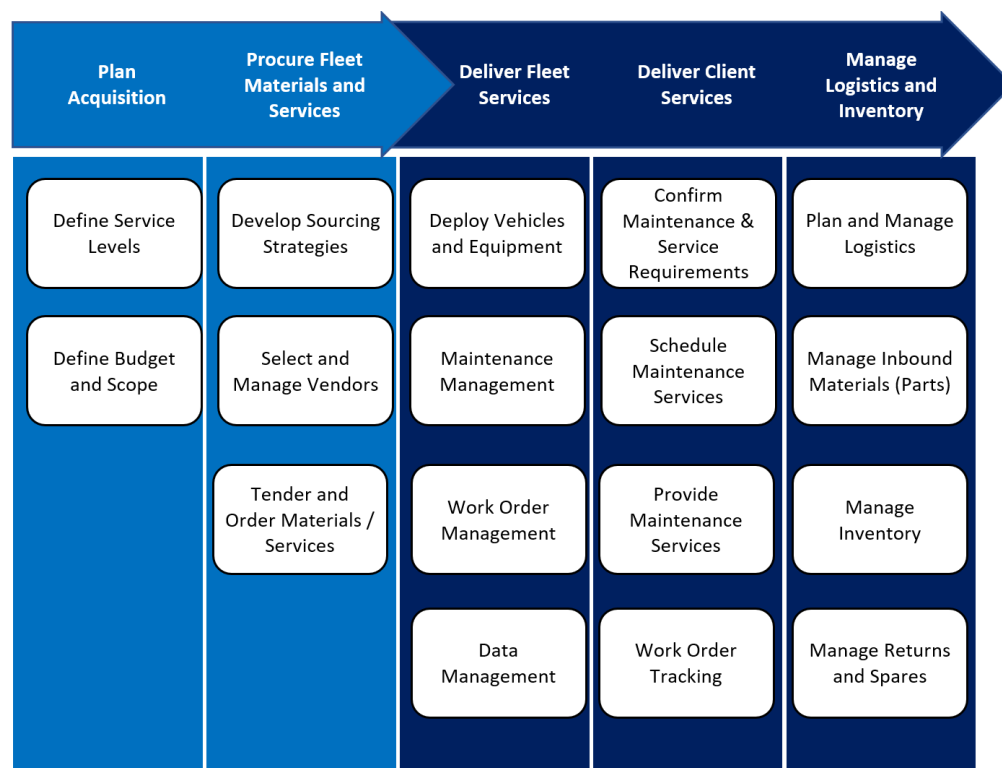


Figure 5 - Level 1 Fleet Services Processes - Warranty Management

The detailed process maps for the elements that are relevant to warranty claims are attached as Appendix C to this report. These process maps are not representative of all activities performed by Fleet

and are intended to document the subprocesses, tasks and organizational activities that are relevant to the overall process improvement plan and remediation with the findings of the Auditor.

Technology Context

Technology is an important enabling resource for Fleet and the business processes outlined above however it does not play a central role to the core services that are provided by Fleet. The delivery of maintenance services can still be achieved without the technology solutions that are outlined in the section of the report. However, these systems are critical to the management, governance and improvement of the processes that support those maintenance services. The solutions and their relevant process domains are outlined in the figure below.

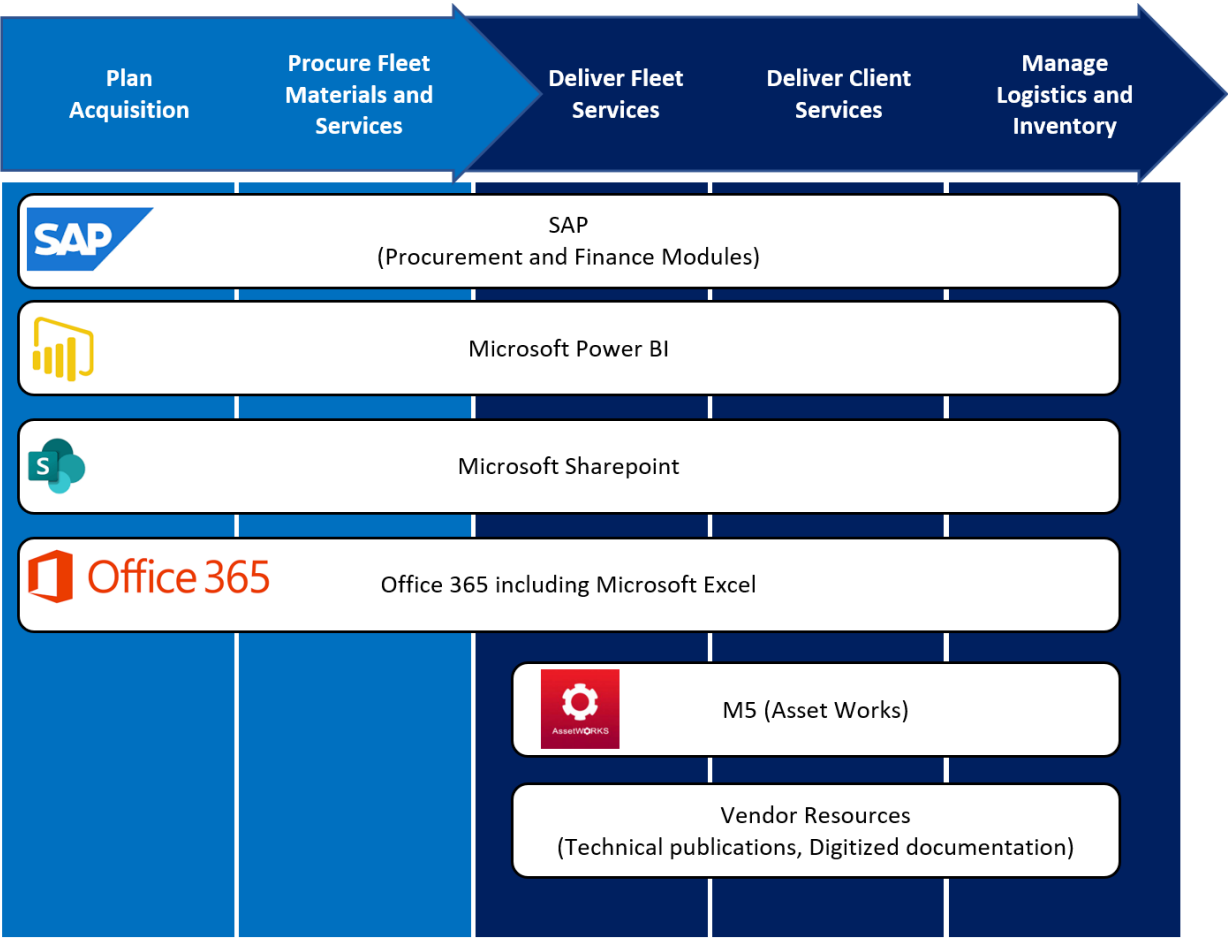


Figure 6 - Primary Technology Solutions Used in Fleet

The AssetWorks solution (M5) is the primary solution that directly supports and enables technicians to track the maintenance activities related to a specific unit through work order management functionality.

The M5 solution does provide configurable business rules related the core activities related to work order management processes but as deployed for Fleet does not provide configurable business rules related to warranty management. In the context of this report M5 should be considered primarily as a work order tool used to capture the planned maintenance activity, completed maintenance activity, costs related to parts, internal labour, external labour, and meta data associated with the handling of work orders (e.g. state, status, created date, closed date, notes, associated activities, etc.).

During the business process review M5 was identified as the primary solution that is used by stakeholders within Fleet to track and manage the activities of the organization. During interviews with these stakeholders the following key information was confirmed with respect to M5:

1. **Work Orders** are the primary unit of work for Fleet and correspond directly to the associated data elements and meta data in M5. This data set represents the transactional history of both the unit, components, and work activities (maintenance and approvals) that have been carried out by core stakeholders. This data set is actively managed daily and monitored for quality issues.
2. **Client Billing** activities are directly supported using data from the work order and job lines within each work order. In addition to the detailed financial information associated with costs (parts, internal labour, external labour, towing services, etc.) the data in M5 also reflects the reasons that a unit was serviced and often the business context related to maintenance decisions. The importance of these workloads contributed directly to the quality and routine oversight of work order data by Technicians, LLT and Supervisors.
3. **Reporting capabilities** within M5 do provide end users with the ability to extract information from the system, generate views of the data, and share views with other users. However, these features are not modern and require knowledge specific to M5 to achieve the best results possible. The views, filters and queries do not provide any form of modelling capability that could support broader analysis by managers and supervisors.

M5 Conceptual Architecture – Warranty Related Objects

Within the context of Warranty Claims there are several objects within the M5 architecture that are critical to the configuration and management of units. These provide the baseline functionality necessary to associate the terms and conditions of a vendor warranty to a unit or component. The objects generally align with the distinct process areas as outlined in Figure 7 below.

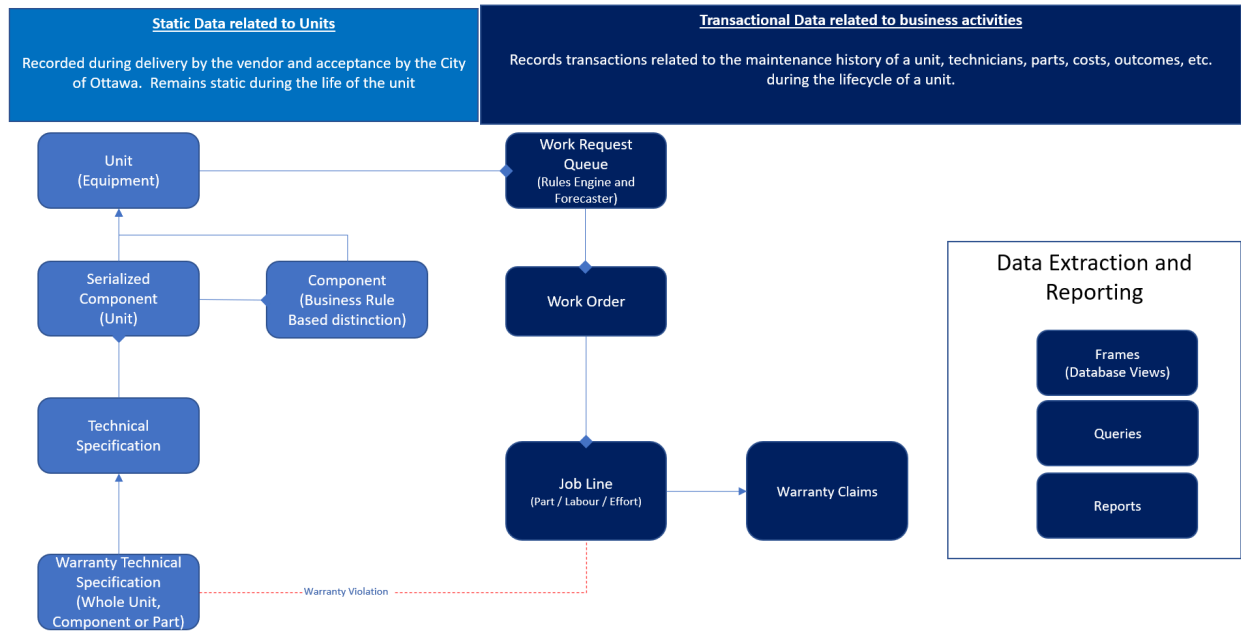


Figure 7 - M5 Conceptual Architecture - Warranty Related Objects

Static Data Related to Units

These data elements represent the outcome of the Acquisition Planning and Procurement processes. Through those processes a vendor delivers a unit to the City of Ottawa and the initial entry and set up of the following objects must occur so that a work order for the initial inspection of the unit can be created:

1. **Technical Specification** – This object records a configuration (e.g. make, model, year, etc.) that will be applied to one or more units. The technical specification provides a mechanism to simplify the set up of multiple units and to manage categories of units. All units require a Technical Specification. This object is capable of recording the detailed composition of a unit and detailed component codes (e.g. engine type, chassis, hydraulics, etc.) based on an industry standard classification system.
2. **Warranty Technical Specification** – The Warranty Technical Specification is associated directly with a Technical Specification. This specification should be a direct translation of the contractual warranty terms and conditions as agreed with the vendor for a specific unit type. This means that warranty can be configured at the unit, system, and component level in a standard way for each contract. The specification records the terms for each unit (whole unit warranty), system / component based (component warranty), or part specific (part warranty) on a defined meter (i.e distance, usage or age) that is specific to the contract. When a unit is created using a technical specification the corresponding Warranty Technical Specification is used to create a “Warranty Violation” alert at the job line level for a work order.

3. **Unit** – Within M5 a unit is the representation of the City of Ottawa business rules that define a specific vehicle or piece of equipment. The unit refers to the individual serialized item that is delivered by a vendor to the City of Ottawa for inspection and acceptance. These business rules permit the association of components to units, effectively representing the different configurations that a specific unit may have during the course of seasonal operations (e.g. plow wings, blades, heavy trucks, etc). In general, there will be a single primary unit that is represented as the **Serialized Unit** and an associated **Component** that can be added or removed from the Serialized Unit. A Component may have an associated Technical Specification and Warranty Technical Specification

These three objects are created for a given unit prior to the unit entering service. Once the unit has entered service these elements remain fixed and are not changed.

Transactional Data Objects Related to Warranty

The individual transactional elements rely upon the accurate configuration of the static data elements described above to facilitate the identification of warranty claims. These elements are used to manage and track the services delivered by Fleet to their internal clients and track the lifecycle of units. The following aspects of each object that relate to warranty claims are as follows:

1. **Work Orders** – Work orders are initiated manually or through automated business rules that forecast maintenance activities through a job queue. Work orders are assigned at the Unit (i.e. Serialized Unit or Component) level. A work order is used to associate multiple job lines (activities and tasks) with to a specified unit. For the purposes of warranty claims this is the method by which the Warranty Technical Specification is associated to a job line.
2. **Job Lines** – Job lines reflect the actual tasks and activities that are associated with a given work order. This includes attributes such as the reason for the visit, labour costs (internal and/or external), parts, job notes, resolutions, and other information that is used to track the work. At the job line level, a **Warranty Violation** may appear if the system or component associated with a task is within the limits of the **Meter** as defined in the Warranty Technical Specification. Warranty Violations do not have associated logic or automation to determine if there are grounds for a valid warranty claim. The technician responsible for the Job Line must assess the potential validity of the Warranty Violation which will result in the cancellation of the violation or the initiation of a claim.
3. **Warranty Claims** – The Warranty Claim object in M5 is used to track the status of warranty claims (e.g. cancelled, negotiation, approved, etc.) related to a specific work order. This provides a simple method of associating any recoveries associated with a claim to the work order. This serves to prevent Fleet clients from incurring charges associated with a recovery.

Notes on M5 Architecture

The relationships between the data objects described above are critical to understanding issues related to warranty claim processes within fleet. Data within M5 reflects use by the City of Ottawa for more

than a 20-year period. During this time the technology platform has been upgraded, business processes have changed, and many different stakeholders have been involved with the setup, configuration, and use of data within the system. These transitions have not been governed specifically with warranty management in mind and will continue to impact warranty claim management until standardized approaches have been adopted. This means that some of the existing issues related to reporting and warranty violation may remain for several years until the warranty terms have expired (i.e. the current warranty meters on units in service have expired on distance, usage or age).

Findings and Recommendations

This section of the report contains a management level summary of the finding and general recommendations for subsequent phases of the review. A more detailed list of itemized findings that are specific to individual roles, tasks, processes, and other areas of Fleet operations is included in Appendix A. Where appropriate those detailed findings are accompanied by a list of associated recommendations. An aggregated summary of the major recommendations is contained in the next section.

Summary of Key Findings

The following items represent the findings that are most relevant to determining the recommendations that follow. The additional findings documented in Appendix A should be considered as supporting information to the following key findings:

People

1. Staff at all levels are very aware of warranty and the factors that contribute to submitting valid warranty claims.
2. There has been a high level of transition related to staff directly involved with warranty administration.
3. The workload for warranty administration is currently concentrated in a few (1-2) people.

Process

1. There has historically been limited integration of warranty across the lifecycle for units from procurement through to disposal.
2. Core elements of the process (i.e. decisions on warranty claims) are based on common values and a shared understanding of priorities however, the criteria for these decision are not documented.

Technology

1. The data in M5 is well maintained (i.e. cost recovery ensures that staff within Fleet are focused on the accuracy of costs and job line activities).
2. The functionality of M5 for managing warranty meets the requirements to track warranty (i.e. must have) but is limited in more advanced capabilities and reporting.
3. Historically, warranty data (Warranty Technical Specification) has not been standardized which has limited the ability to conduct reporting.

Summary of Key Recommendations

People

1. In order to stabilize warranty administration, the knowledge and clerical responsibilities for warranty administration should be more widely distributed (i.e. a part time effort for 3-4 staff vs a single FTE).

Process

2. The warranty information for units should be captured and standardized as early as possible (i.e. during procurement) so that the data on each unit can be standardized.
3. Align information captured during procurement (i.e. RFT submissions) to create more standardized Warranty Technical Specifications.
4. Documentation to support warranty related decision making should be created (i.e. user guides) and a standard for recording the rational in M5 should be defined.

Technology

5. Power BI should be leveraged to a greater extent for reporting on warranty and maintenance activities. This will increase the accessibility of data.
6. Leverage current data at the job line level of work order to identify where the same part has failed or been replaced within less than 1 year (i.e. 100% monitoring of parts warranty).

Description of Key Findings and Recommendations

Context

The recommendations contained in this report have been identified as actions that can directly contribute to addressing the concerns of the auditor and ensuring that warranty management practices within Fleet provide value to the city. The determination of value within this process is not as simple as maximizing warranty claims. If Fleet could achieve a 100% claim recovery rate the resulting financial benefits would not offset the labour costs and operational impacts necessary to achieve that recovery rate. This is based on the following assumptions:

1. The additional cost of multiple FTE necessary to administer all parts and whole unit warranty are greater than \$50K
2. The increase in warranty claims is in low dollar value parts.
3. The work order labour costs associated with these parts warranty claims is not usually reimbursed (i.e. unlike whole unit warranty, part warranty does not cover the effort to replace the part).

Objectives for Sustaining Value

This process improvement plan proposes that Fleet focus on achieving four objectives that are related to assuring that warranty management practices provide value to stakeholders. These objectives span the

people, process and technology dimensions of warranty management in the medium to long term. These objectives are to:

1. Ensure that there is capacity and depth within Fleet to manage and administer warranty.
2. Improve the long-term quality, usability, and business value of fleet data
3. Improve the transparency and efficiency of decisions related to warranty claims.
4. Ensure that stakeholders have greater access to modelled warranty data

The relationships between the key recommendations and the objectives are identified in the matrix below. The recommendations are intended to support long term value within each area as indicated by an “x”.

		1	2	3	4
	Objective	Ensure Capacity	Usability and Quality of Data	Decision Support and Transparency	Access to Warranty Data
Domain	Recommendation				
People	To stabilize warranty administration, the knowledge and clerical responsibilities for warranty administration should be more widely distributed	x		x	
Process	The warranty information for units should be captured and standardized as early as possible so that the data on each unit can be standardized.	X	X	X	
Process	Align information captured during procurement to create more standardized	X	X		
Process	Warranty Technical Specifications. Documentation to support warranty related decision making should be created		X	X	X
Technology	Power BI should be leveraged to a greater extent for reporting on				X

	warranty and maintenance activities. This will increase the accessibility of data.				
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Proposed Process Improvement Plan and Roadmap

The process improvement plan outlined below proposes a series of concrete activities to implement the recommendations listed above. This plan includes activities related to the design and implementation planning of the deliverables associated with the plan.

Warranty Management Capacity

Ensure that there is capacity and depth within Fleet to manage and administer warranty. This means the addition of staff or the realignment of existing staff capacity in a way that adds depth to warranty management knowledge and skills across Fleet. Where possible the focus will be on distributing workload to ensure redundancy and eliminate single points of failure.

Activities

The following activities are proposed to enable the development of this capacity:

- Formal definition and documentation of the specific operating procedures for warranty administration.
- Identification of workload elements that can be distributed across multiple stakeholders
- Recommend adjustments to staffing levels or roles and responsibilities
- Create desktop/quick reference guides, and other supporting documentation to facilitate the transfer or distribution of the workload for tasks across several people (i.e. enable vacation coverage or absences by document common practices.
- Definition and implementation of template-based standards for the creation of units
- Align procedural documentation with the application of these standards using M5 data structures
- Document how these standards are applied in simple easy-to-use documentation

Quality, Usability and Value from Data

Improve the long-term quality, usability, and business value of fleet data by assuring long term consistency within M5. This means focusing on capturing warranty information for units using standard methods as early as possible during Fleet processes.

- Definition and implementation of template-based standards for the creation of units
- Align procedural documentation with the application of these standards using M5 data structures
- Document how these standards are applied in simple easy-to-use documentation

Transparency and Efficiency of Decisions

Improve the transparency and efficiency of decisions related to warranty claims. This means working with stakeholders to formalize the criteria used to make decisions in warranty management processes.

This means providing decision makers with the ability apply and record decisions in a way that transparently demonstrates the business value of their decisions.

- Formally define the criteria used by stakeholders to assess warranty at the unit and part level.
- Document the criteria in the form of a policy or procedural guide
- Design data capture methods to align with decision criteria (e.g. use of notes / flags in M5)
- Standardize methods for tracking / reporting on warranty claims
- Document the delegations of authority for decision making related to warranty.

Access to Fleet and Warranty Data

Ensure that stakeholders have greater access to modelled warranty data. Increase the use of existing analytics and modelling capabilities at the City of Ottawa to manage and monitor warranty management.

- Work with stakeholders to define detailed warranty management reporting requirements
- Work with technology stakeholders to design and prioritize potential reporting solutions that can be implemented using MS Power BI.

Process Improvement Plan Schedule

The table below outlines the proposed schedule for the elements described in the plan above. The plan can be implemented with the same level of resourcing as the Recommendation and Analysis phases of the engagement.

Activity	Start Week	Finish Week	Weeks												
			1	2	3	4	5	6	7	8	9	10	11	12	13
Warranty Management Capacity															
Procedural Documentation	1	4													
Workload Distribution Analysis	4	4													
Organizational Alignment / Adjustment Recommendation	5	5													
Develop Desktop Guides	5	8													
Review For M5 Alignment	9	11													

Activity	Start Week	Finish Week	Weeks												
			1	2	3	4	5	6	7	8	9	10	11	12	13
Quality Usability and Value															
Design Warranty Templates	5	8													
Implement Warranty Template(s)	10	12													
Transparency and Efficiency of Decisions															
Document initial draft of decision criteria	1	1													
Workshop criteria with stakeholders	2	3													
Review and approve criteria	4	6													
Consolidate criteria (policy / procedural guide / Delegations)	7	8													
M5 Alignment	9	11													
Documentation of Delegations															
Access to Fleet and Warranty Data															
Reporting design workshops	3	6													
Integrate Process Improvement Elements	7	8													
M5 Alignment	9	11													
Project Management															
Weekly Team Meeting	1	13													
Weekly Project Review	1	13													

Appendix A - Detailed Findings

Row ID	Related Process Domain	Context	Short Title	Description	Observations
1	General Context	Scope of Services	Diversity of Units in the fleet(s)	Fleet services supports a very large range of units when compared with OC Transpo	Fleet services deals with a larger variety of unit types as a whole and individual technicians are involved with a wider range of units.
2	General Context	Scope of Services	Diversity of Fleets	Within the City of Ottawa there are multiple instances of fleets that are not direct comparators.	The fleets for OC Transpo, Ottawa Police Services, Ottawa Fire, Paramedics and the remaining City of Ottawa cannot be directly compared (benchmarked) due to the distinct characteristics of each fleet.
3	General Context	Scope of Services	Diversity of Fleets - OC Transpo	OC Transpo fleet maintenance activities realize economies of scope and scale that other departments cannot achieve.	The OC Transpo Revenue Fleet consists of a small number of unit types (i.e. models of buses) that are maintained in facilities that are specific to each type of unit. This means that maintenance technicians and warranty clerks are dealing with a large number of identical / similar units in a single physical location. They are easily able to identify and validate patterns in both maintenance requirements and warranty violations.
4	General Context	Scope of Services	Diversity of Fleets - Ottawa Police Services	The Ottawa Police Services fleet consists of vehicles that are primarily serviced by vendors.	Fleet services does some maintenance on these vehicles, but most warranty repairs are done through recalls or when vehicles are serviced at dealerships. Most of these vehicles (cars, SUV, motorcycles) fit the category of light duty vehicles.
5	General Context	Scope of Services	Vendor Certifications - Warranty - OC Transpo		OC Transpo effectively serves as an OEM warranty department.

Row ID	Related Process Domain	Context	Short Title	Description	Observations
6	People and Organization	Organization and Roles	Staff Turn Over	Key positions within the warranty process have new staff or have churned	There has been significant churn in the various levels of management involved in the warranty management processes since the Auditor General's Report.
7	People and Organization	Organization and Roles	Shift Structure and Planning	The shifts, staff and supervisors at each site has an impact on the ability to track and manage warranty	The workforce is not concentrated in a single location or continuously staffed. In instances where there are fewer staff members and or fewer supervisors there are operational priorities that may supersede the tracking and management of warranty. This means that the sole Warranty Clerk must also service multiple sites.
8	People and Organization	Organization and Roles	Staffing Levels	Fleet has a much lower level of staffing when compared to warranty for OC Transpo.	Warranty management activities are staffed at a much lower level within Fleet Services than in comparable City of Ottawa organizations (e.g. Fleet Services). The vendor certification of OC Transpo technicians to perform warranty repairs plays a significant role in the staffing levels at OC Transpo. The performance of certified warranty repairs on site means that the direct and indirect costs can be identified and used to offset the cost of additional staffing. In contrast many of the vehicles in Fleet must be serviced at a vendor facility meaning that work is not directly tracked or managed by Fleet. (ie. there are no offsetting savings for additional staffing levels).
9	Procurement	Procurement	Vendor Warranty Definition - Procurement	The warranty requirements are not always easy to align with the actual data structures in M5	Warranty technical specification structures can not always be defined directly from the information provided from the RFT due to language or other unique aspects of the procurement (e.g. "Drive Train" is not part of the unit).
10	Procurement	Procurement	Prime and Sub-Contractor Accountability	Some prime contractors direct the city to engage with their Sub-Contractors	In some cases, prime contractors make efforts to force the City to engage with sub-contractors (e.g. Rush Trucks for vehicles / chassis) rather than handling the warranty claims directly. This is not currently standardized in the pro forma contract language (i.e. who leads warranty).

Row ID	Related Process Domain	Context	Short Title	Description	Observations
11	Procurement	Procurement	Vendor Support	The location and nature of vendor support services are defined when units are procured.	The types of services and the locations for provisioning services are normally specified by the vendor in their response to an RFT. Once these terms have been accepted in the form of a signed contract Fleet must operate within the defined limits of these terms. This means that items such towing services, hours of operation, service levels / turn around times, methods of communication / negotiation, service locations, inclusions / exclusions, locations and City of Ottawa responsibilities are contractually defined. These remain in place for the duration of warranty coverage and define the constraints that supervisors must consider when considering a warranty claim.
12	Acquisition Planning	Procurement	Warranty and Associated Services	Some units have services (e.g. recovery / towing) associated with them that cause direct expenses to the city if they use a different services contract	Due to operational priorities claims for services may be overlooked. These expenses are noted on the M5 work order (unit notes record how recovery should be done and job lines would show towing costs [flat rate from RFSO]).
13	Acquisition Planning	Procurement	Vendor Management - Diversity	By the design the tendering process for fleet vehicles encourages a diversity of vendors and therefore more individuals with whom claims could potentially be negotiated.	The tender for light duty vehicles can be won and fulfilled by multiple dealers across the City of Ottawa. This means that similar warranty claims on similar units could involve multiple vendors even though the units were from the same OEM.
14	Asset Management	Organization and Roles	Claim rate variability	The negotiation of a claim with a vendor varies from supervisor to supervisor.	The rate at which claims are negotiated or raised with vendors varies based on the line of business that is supported by a supervisor. Where there is homogeneity of unit types within a particular team then it is more likely that warranty claims will be raised (e.g. Fire, Ambulance, etc). However, when the maintenance of a unit type is distributed across many teams or locations (i.e. increased diversity of work) claim rates are more variable.

Row ID	Related Process Domain	Context	Short Title	Description	Observations
15	Asset Management	Work Order Management	False Positives	End users (Technicians) may ignore warranty flags.	Configuration of the warranty technical specification may create "false positives" for warranty violations in M5. This means that technicians may ignore job lines / flags and not create a claim.
16	Asset Management	Organization and Roles	Tacit Knowledge of Technicians	The assessment of valid warranty violation vs a false positive is highly dependant the tacit knowledge of an individual technicians.	The knowledge of what "may be" a valid warranty violation vs a false positive is highly dependant on the knowledge and experience of an individual technicians.
17	Asset Management	Work Order Management	Part Warranty	If a replacement part used it may have its own warranty.	New parts that replace broken or faulty items on any unit in the fleet may have a manufacturers warranty however, there is not a mechanism to track this in M5 (i.e. the new part inherits the original unit configuration).
18	Asset Management	Financial	Diminishing Returns for Claims	It is possible that the human effort (labour costs) to make a warranty claim from a vendor exceeds the financial value of the claim.	Where a repair is covered under warranty there is no clear guidance on the minimum / maximum tolerances for negotiating a warranty claim with a vendor. There are very few claims recorded by the City in SAP that are below \$50.00 and most claims for 2022 exceed \$500.00.
19	Asset Management	Financial	Opportunity Costs	Warranty claims do not reflect all costs that the City of Ottawa Clients or Fleet may incur associated with a warranty claim.	In cases where Fleet is able to claim parts or labour under warranty from a vendor the true costs of administering the claim may be much higher than the benefit from the claim. This is true in cases where Fleet labour must be used to transport units to / from facilities, operational priorities necessitate overtime to resolve a situation, or where staff capacity to close other work orders is reduced by the requirement to meet specific conditions for the vendor warranty terms.
20	Asset Management	Work Order Management	Supervisor / LLT Warranty Decision Tree	Documentation of the factors and criteria that contribute to warranty decisions by LLT and Supervisors are commonly known but not documented.	It is clear that operational priorities, warranty eligibility, staffing, organization and business value are all factors that are considered by supervisors when assessing the decision to initiate a warranty claim. Some of these criteria (e.g. out of service reports) are documented however many are made based on logical but undefined criteria (i.e. the labour costs to move the

Row ID	Related Process Domain	Context	Short Title	Description	Observations
					vehicle to a vendor facility are greater than any potential vendor reimbursement).
21	Asset Management	Work Order Management	Vendor Compliance with Warranty Terms as Contracted	In some warranty claim cases vendors attempt to avoid filling the terms of the warranty.	This issue may arise in one or more scenarios where there are prime / sub relationships or where there are services required (eg. Recover / transportation to the unit to a vendor facility) to perform the repair. Supervisors have little recourse in the moment to resolve these issues.
22	Asset Management	Work Order Management	Vendor Labour Requirement and City of Ottawa Operating Priorities	Some vendors do not allow City of Ottawa technicians to perform warranty repairs.	In some instances, the repair must be performed by the vendor at a vendor facility. In these instances, it may not be possible or feasible to send the unit to the vendor due to operating priorities (i.e. taking the unit out of service for an extended period).
23	Asset Management	Work Order Management	Vendor Delivery and Service Level	In some cases, it is impossible for a vendor to make a repair and return the vehicle on a timeline that meets client needs.	There are many reasons that a vendor will not be able to complete a repair in a timely manner or that a client has a timeline that is shorter than the vendor's service level standard. In these instances, it often falls to City of Ottawa Fleet Services to conduct the repair. This is a "I can do it faster myself" scenario where operational priorities or other factors make it necessary to do the work internally. This has an impact on the ability for the work to be claimed if the vendor insists on performing all warranty repairs.
24	Data and Technology	Data and Technology	Unit Technical Specification Configuration	Standards for the configuration of units and unit types vary.	The technical specification for similar units (e.g. Light duty) can vary from vendor to vendor and vehicle to vehicle in a way that templates are not easy to define.
25	Data and Technology	Data and Technology	Unit and Component Complexity	Units may consist of multiple components from different suppliers that have different warranties.	It is not always clear how many warranties could be associated with a single unit in cases where there are components (e.g., wings, boxes, plows, hydraulics, etc.) that have been deployed on the unit.

Row ID	Related Process Domain	Context	Short Title	Description	Observations
26	Data and Technology	Data and Technology	Warranty Technical Specification Configuration	Standards for the configuration of units and unit types vary.	The Warranty specification for similar units (e.g. Light duty) can vary from vendor to vendor and vehicle to vehicle in a way that templates are not easy to define.
27	Data and Technology	Data and Technology	Legacy Configurations	Warranty Technical Specifications that trigger warranty violations in the present were configured many years ago.	Decisions on the approach to managing, configuring and tracking warranty must take into account that it will take multiple years before all existing warranties have expired (i.e., before the data set reflects all new business rules).
28	Financial Management	Financial Management	Internal Transfers	When an invoice is sent for a warranty claim the funds are immediately transferred to back to fleet.	Before the warranty claim / invoice has been paid by the "client" (vendor) the finance team transfers the amount of the claim back into the budget for fleet / internal client department.

Appendix B - Process Inventory (In Scope Processes)

The graphic below (Figure C 1) represents a summary of the full scope of operational processes that were identified during the initial interviews with Fleet and Fleet stakeholders. This Level 1 conceptual process architecture does not reflect the relationships but should be regarded as a high level inventory of the initial processes that could have an impact on warranty claims.

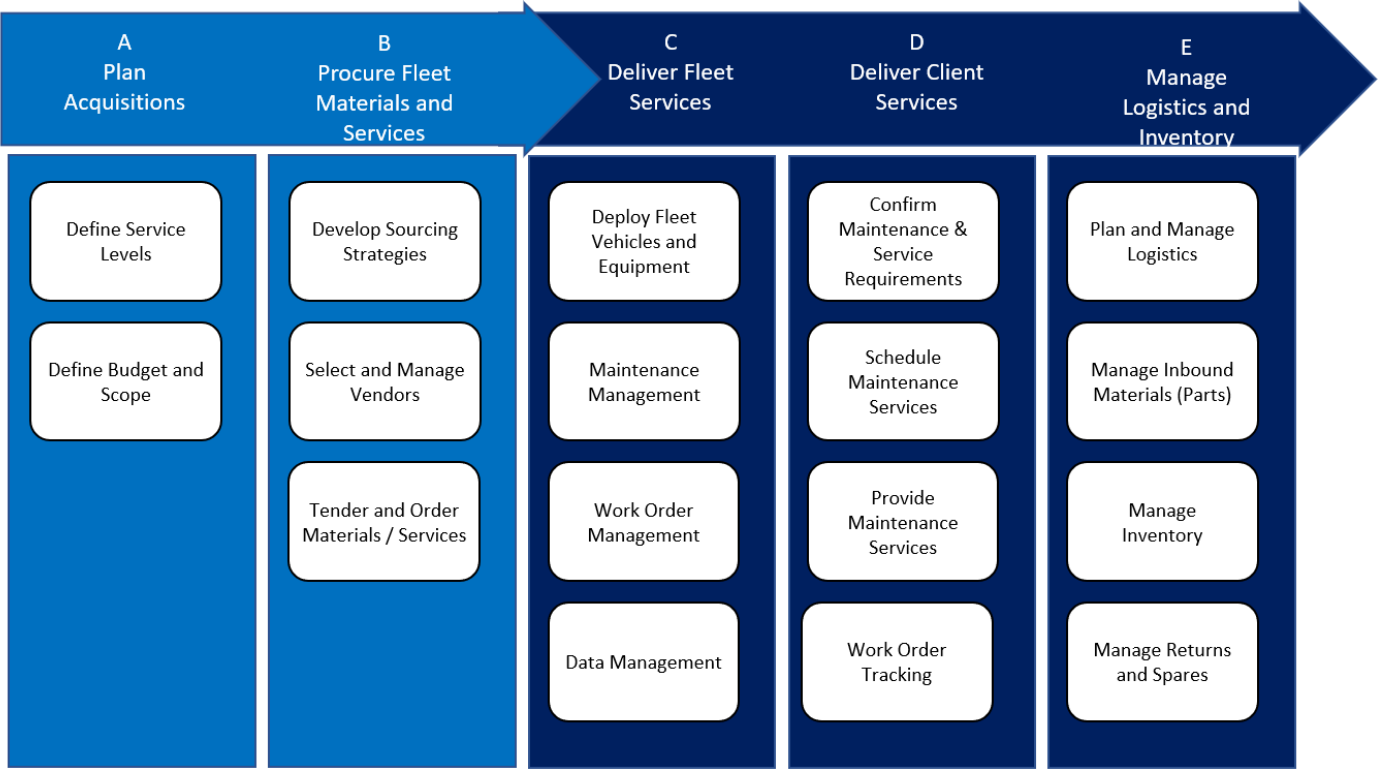


Figure C 1 Level 1 Process Inventory

Following the initial review with stakeholders Bronson worked with stakeholders to identify the processes in the inventory that directly impacted the warranty claim process. The outcome of this work is identified in Figure C-2. Process titles in the unshaded boxes formed the basis for workshop discussions with member of Fleet and other stakeholders. The detailed breakdown of these processes is included in Appendix C to this report

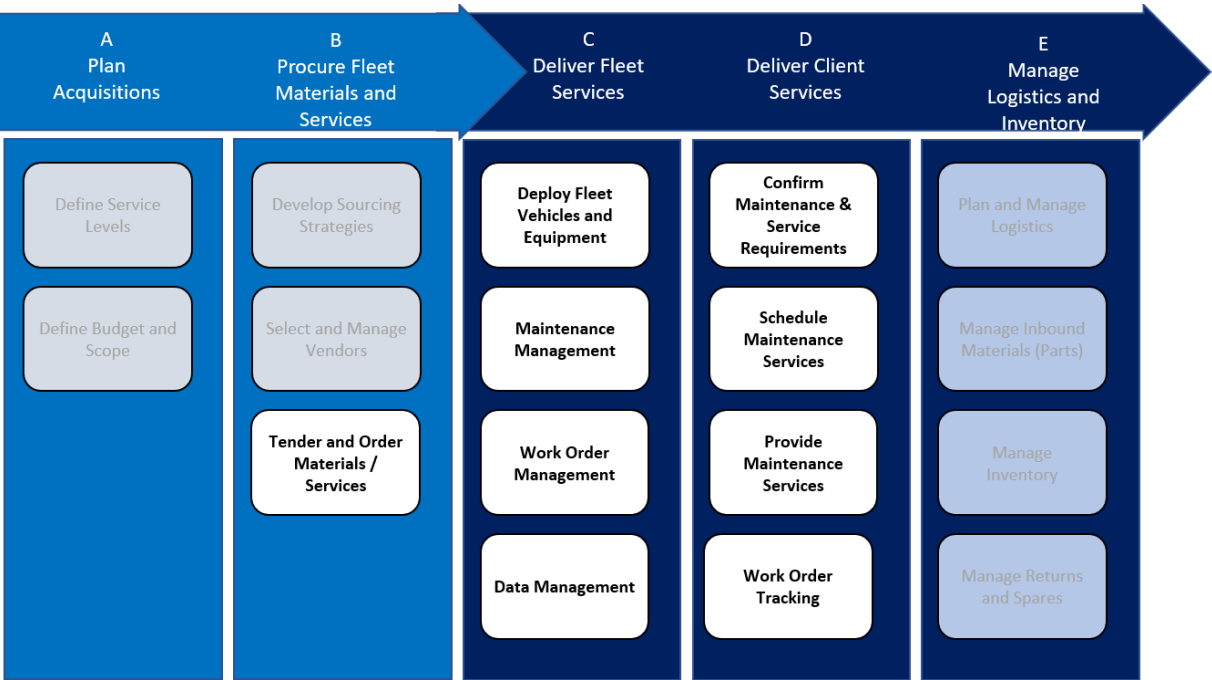
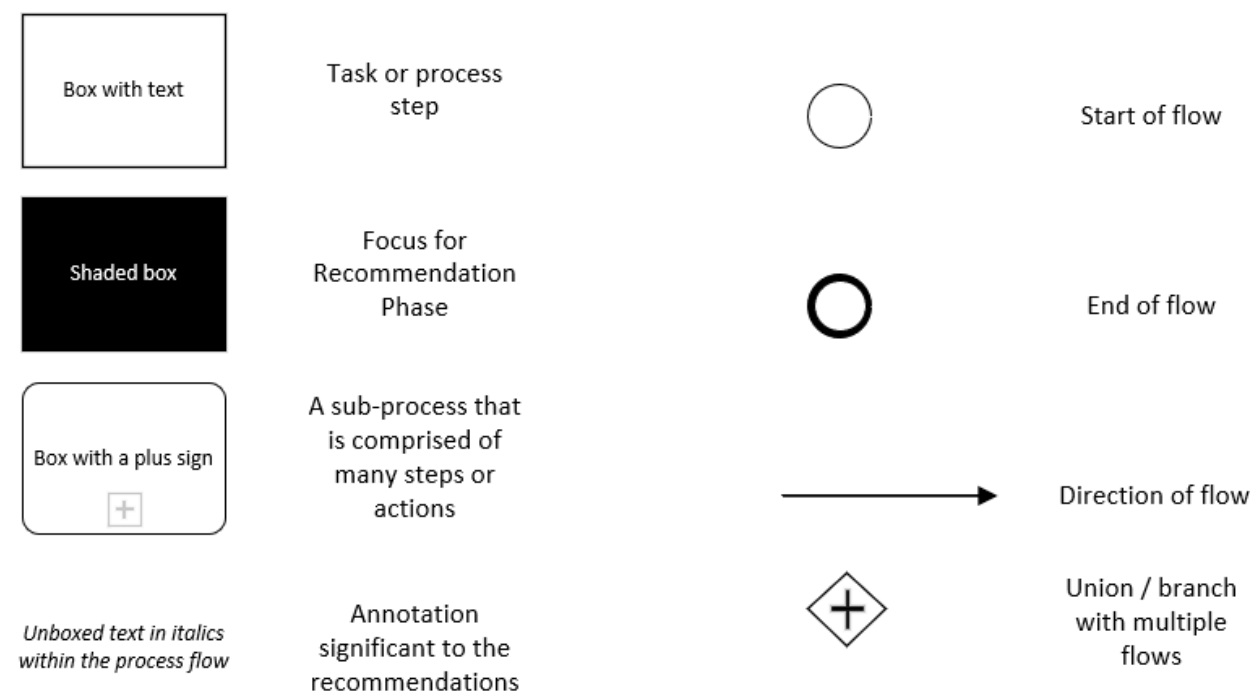


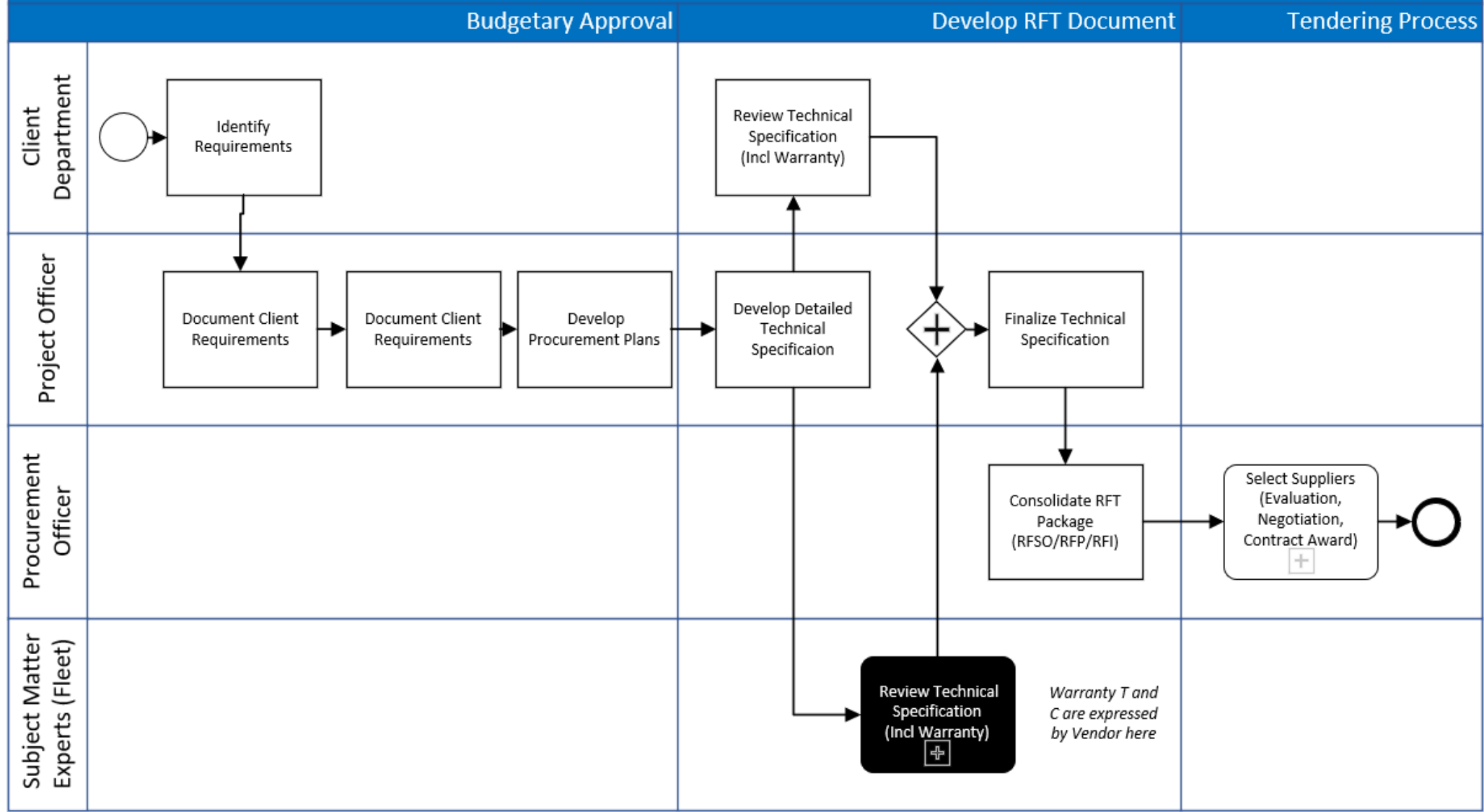
Figure C 2 - In Scope Processes

Appendix C – Process Maps

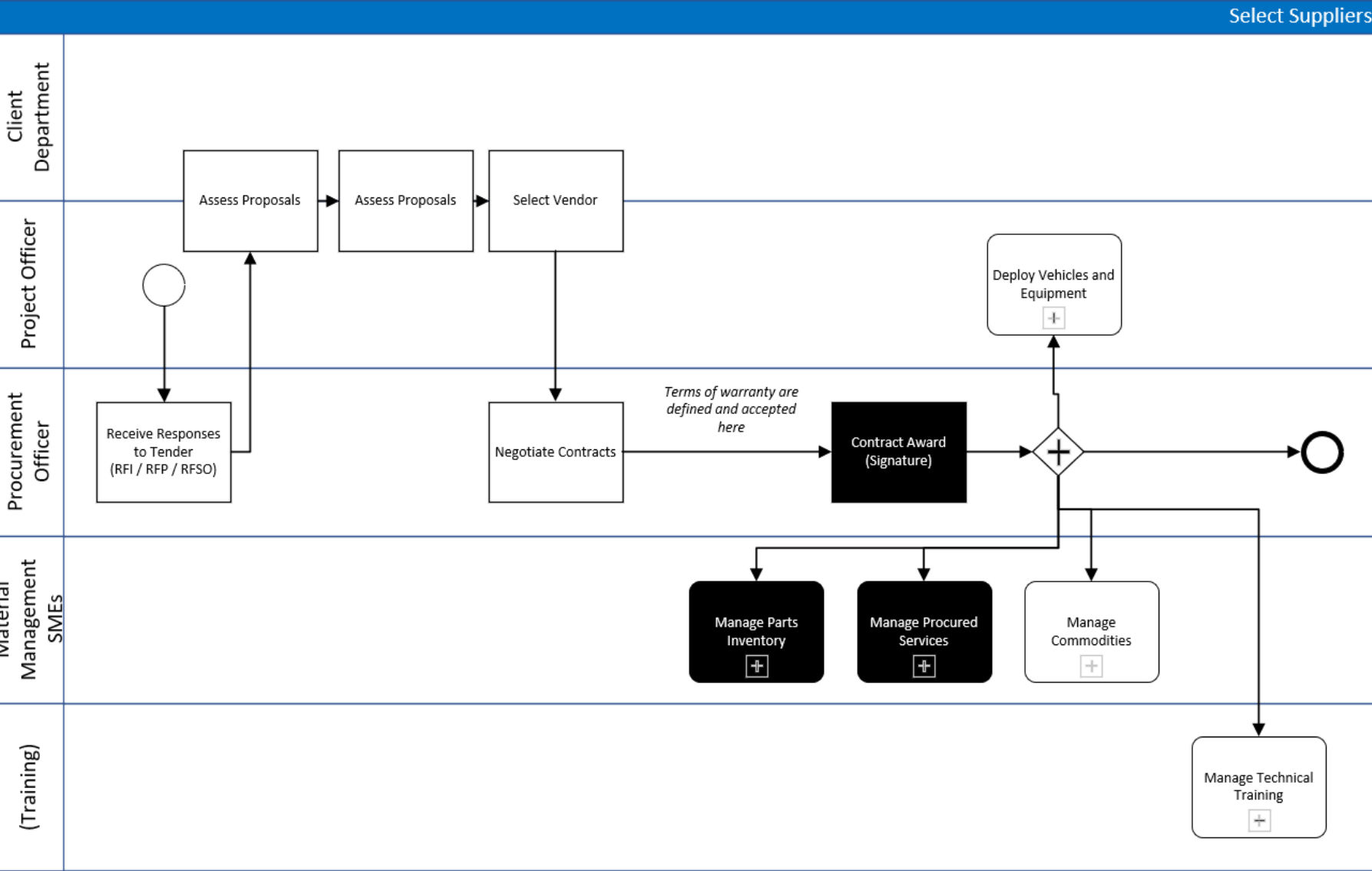
The process maps on the following pages summarize the level 2 activities that are conducted during the course of warranty management activities within Fleet Services. These summaries are intended to depict the general sequencing of activities, broad actions within the organization and the actors involved with those actions. The focus of these summaries does not include all processes, actions or actors within fleet. These maps are represented as cross-functional flows with each actor assigned to a horizontal band (a.k.a. swim lane) within the chart. The annotations for these maps are as follows:



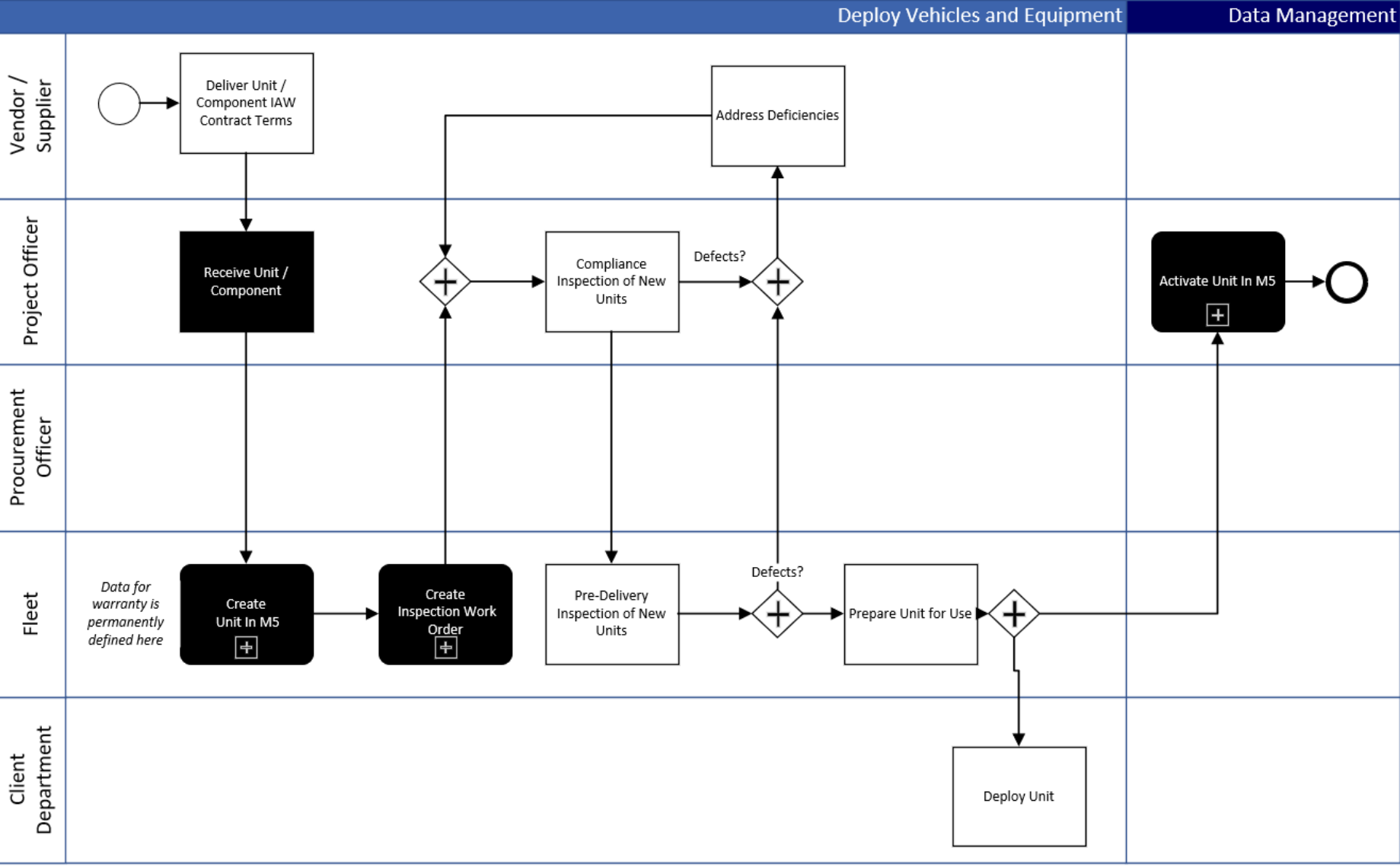
B1 - Procure Fleet, Materials and Services



B2 - Procure Fleet, Materials and Services

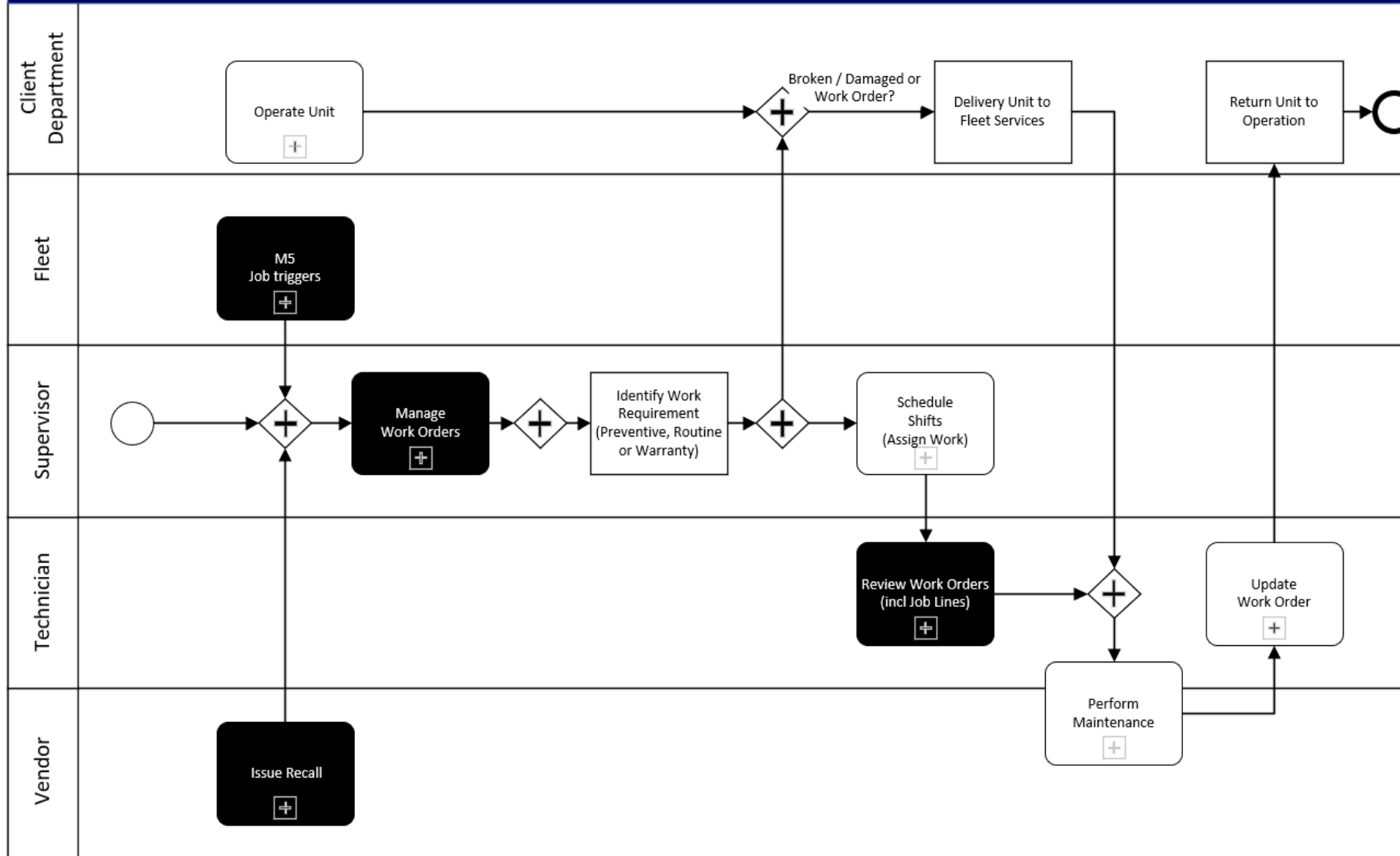


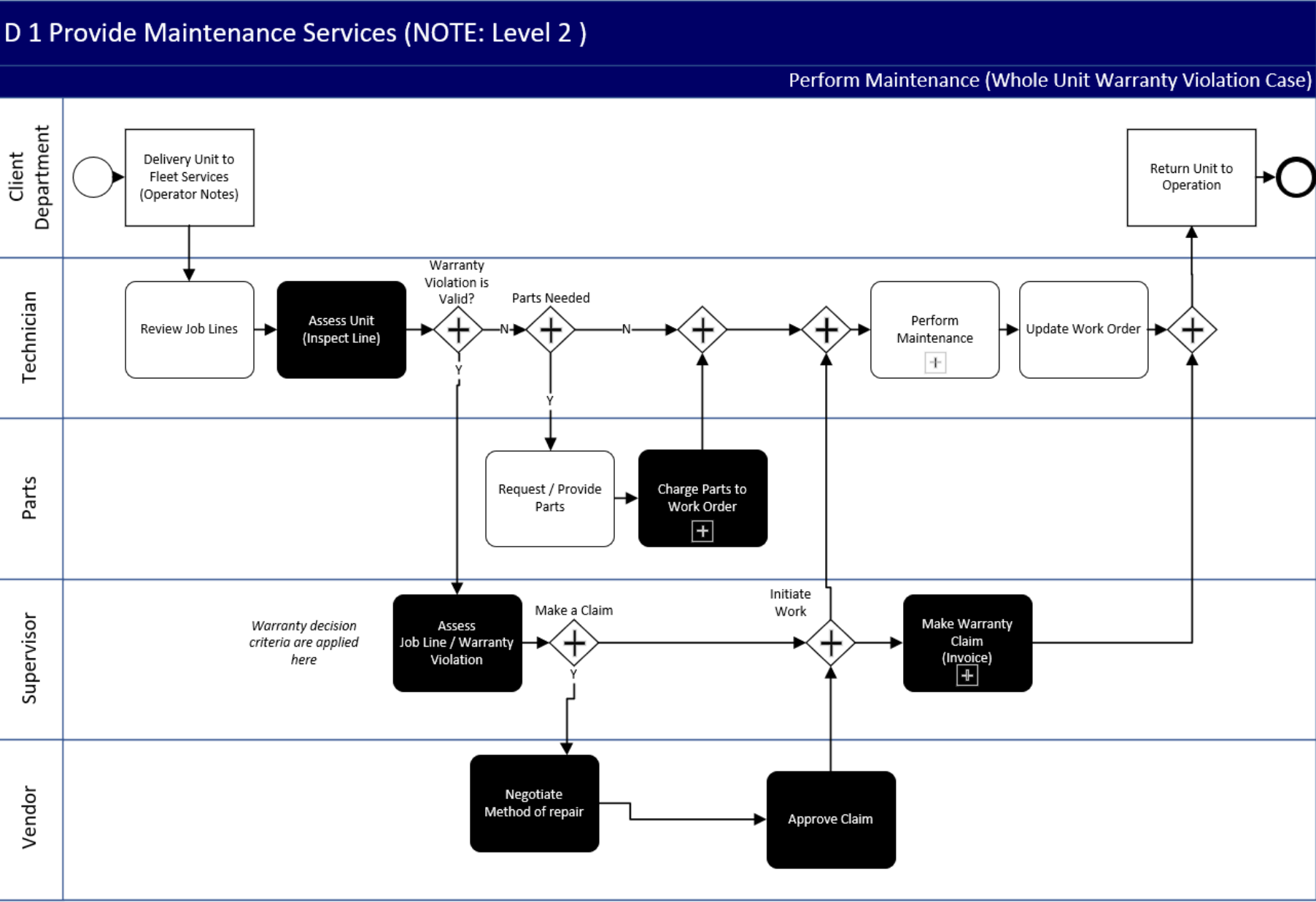
C - Deliver Fleet Services



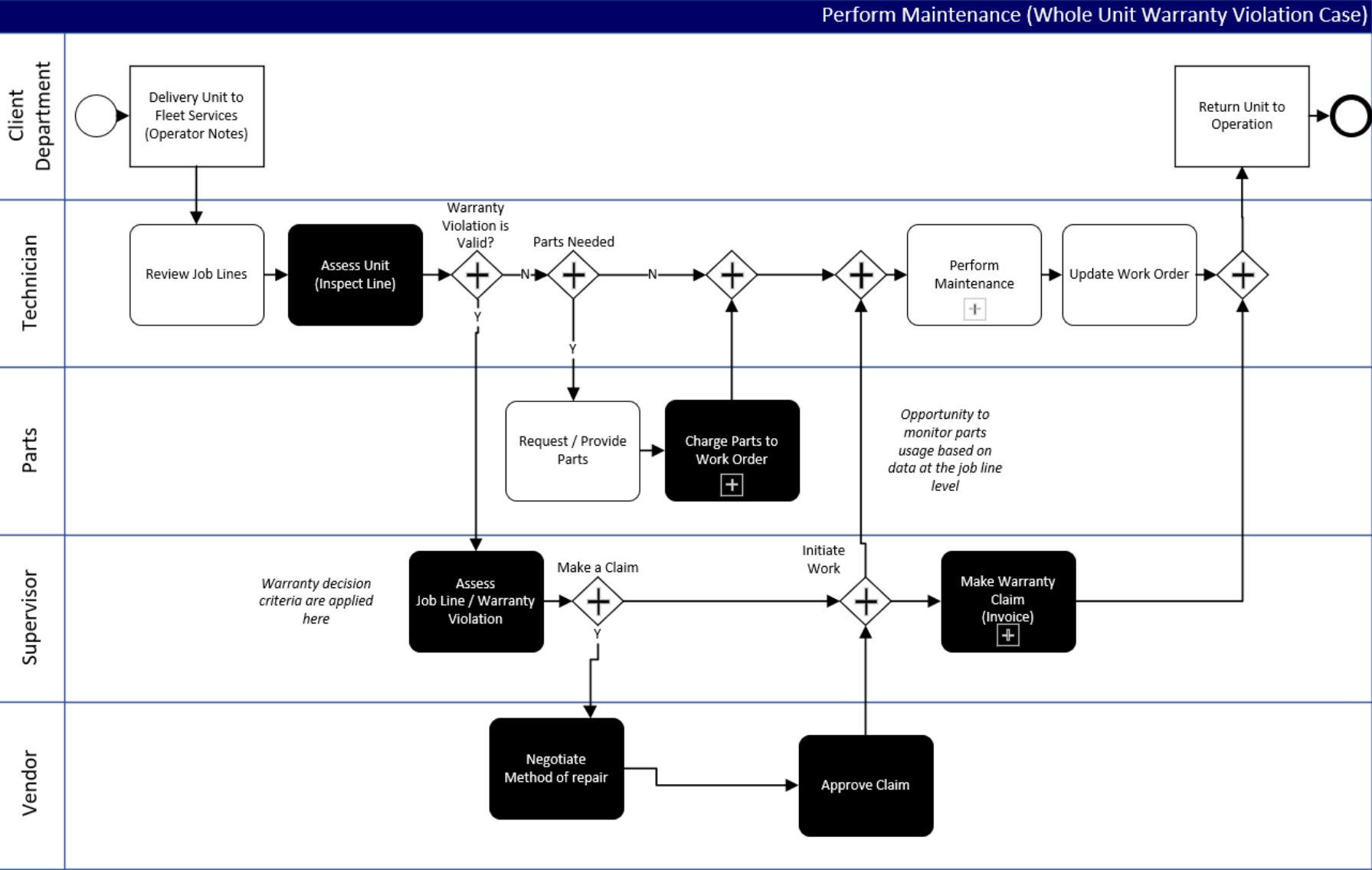
D Deliver Fleet Services

Maintenance Management

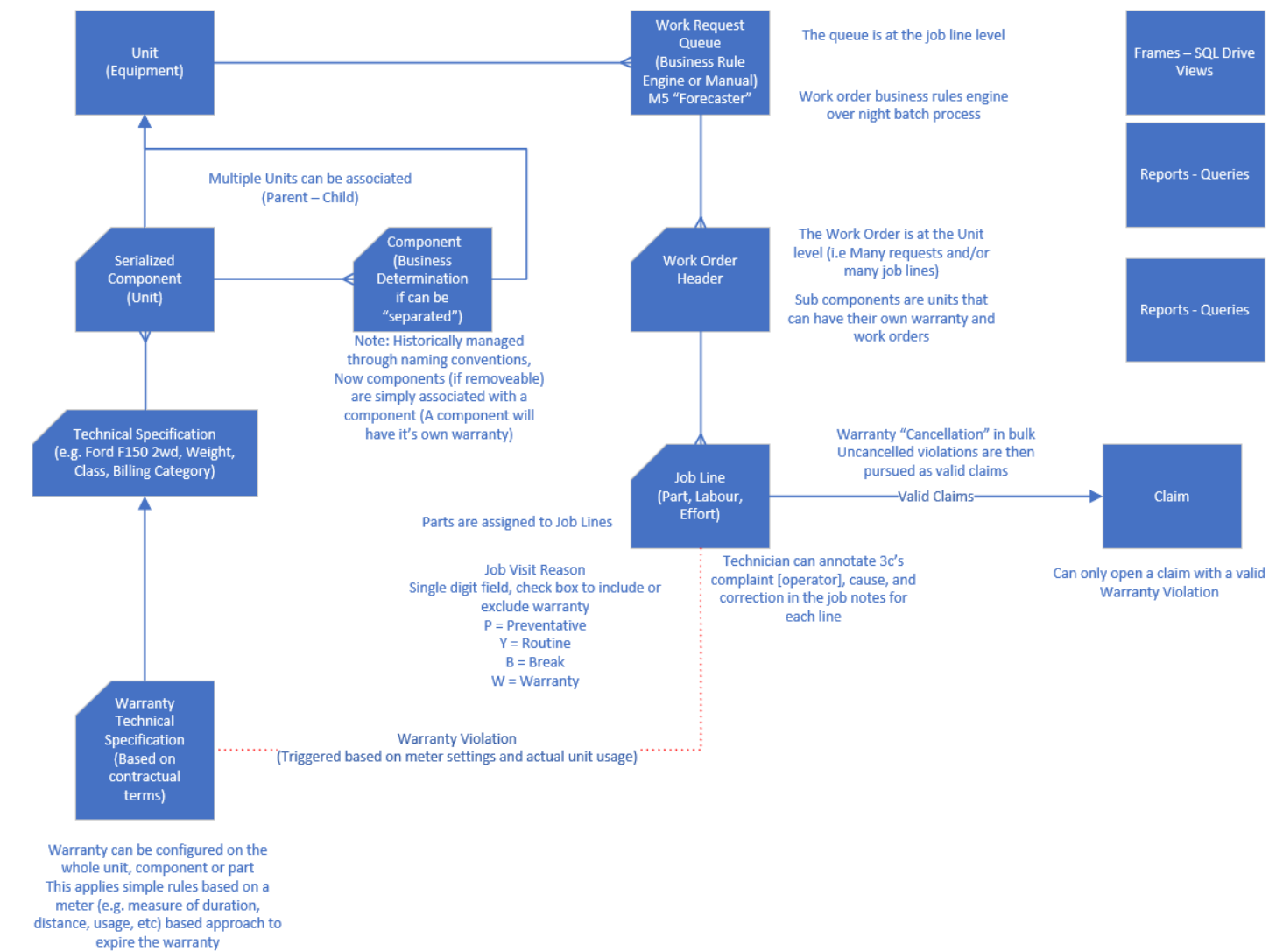




D 1 Provide Maintenance Services (NOTE: Level 2)



Appendix D – M5 (Asset Works) Annotated Conceptual Architecture



Appendix E – Quantitative Analysis of Baseline Warranty

This Appendix contains the results of a quantitative analysis of the Baseline Warranty Costs by the project team. The purpose of this analysis was to establish a framework to measure the baseline costs associated with warranty claims.

Methodology

The quantitative analysis was conducted through the following steps:

1. Data Collection and Analysis
2. Subject Matter Expert Review and Input
3. Model Development
4. Model Review

Data Collection and Analysis

The Fleet Services Branch provided Bronson Consulting with three data sets that contained information as follows:

1. An extract of M5 data for all claims from 2002 to November 2022 at the Job Line level (roughly 13,000 job lines associated with 6200 Work Orders / Claims).
2. A list of all active units that are currently maintained at a Fleet Services Branch facility various owners (more than 5500 Units of 106 Types in 15 different Categories)
3. A series of human readable lists for job codes, vehicle category codes, and work codes to support the analysis of the remaining data sets.

Using automated data preparation and blending tools these data sets were combined, analysed and review to determine the general historical patterns. The outcomes of this analysis were presented to subject matter experts from the City of Ottawa with recommendations on defining the scope of data to be used for this analysis.

Subject Matter Expert Review and Input

Bronson Consulting presented the initial findings to the subject matter experts and the following recommendations for narrowing the scope of analysis were agreed upon:

1. Reducing the data set to the period from 01 January 2018 to the present
2. Reduce the complexity of the analysis by
 - a. Focusing on unit concentrations where Units, Types and Categories are more homogeneous.
 - b. Creating a single “Generic” warranty case for all Categories of Units included in the baseline analysis
 - c. Create “Unit Specific” cases to address unique processes or claims for some unit types
3. Usage of the “Agreed Claim Amount” from M5 to represent the dollar value of the benefit from a claim.

Model Development

The result of the review and input was a model with the elements that are depicted below (Figure E - 1 - Quantitative Model Elements). A functional model was created using MS Excel which can be edited and adapted to reflect baselines in the present or to used to support future analysis.

Within this model the activities that contribute to the overall effort associated with a claim are captured against one of two scenarios. If the effort or task is commonly associated with all warranty claims, then it is considered as part of the “Common / Base Case” scenario. If the effort is unique to a specific type of unit then it is identified separately in the relevant “Unit Specific” Case.

Within the Common case the tasks and activities are specifically identified by their relationship to an individual claim or work order. If an activity can reasonably be linked or associated with a specific claim or the associated M5 Work Order then it is considered to be have a “Direct” impact on the baseline. If the effort cannot be associated with a specific claim, then it is considered to be “Indirect”. For Unit Specific Cases all impacts are considered as Direct.

In all cases the efforts are translated to either a Baseline (Common Case) or Incremental (Incremental in addition to the Common Case) using assumptions as identified in the model.

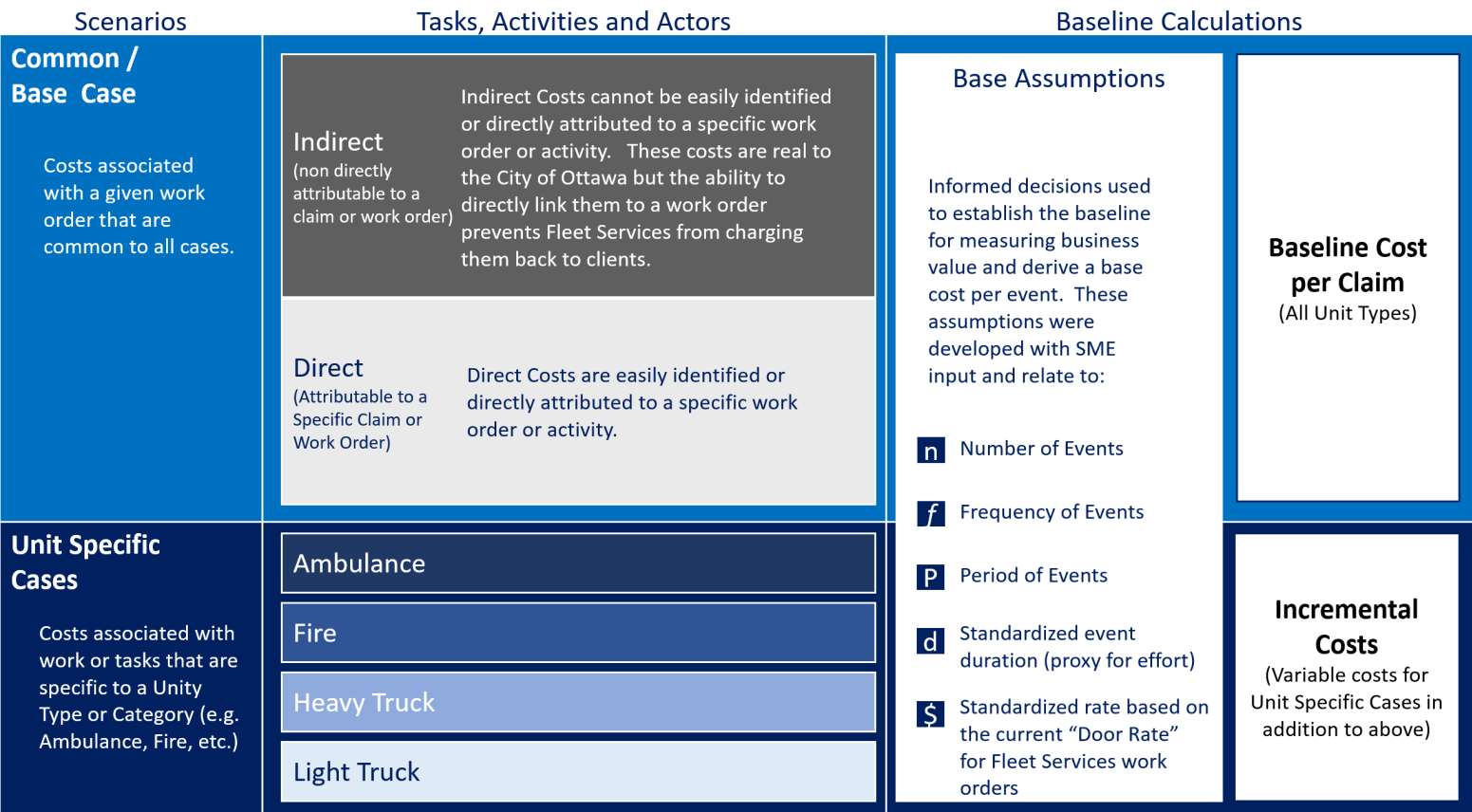


Figure E - 1 - Quantitative Model Elements

Identification of Unit Specific Cases

The Unit Specific Cases used in the quantitative model were identified from the population of units in the M5 Data. The approach summarized in the graphic below reflects the general criteria that were used to reduce the selection from 15 Unit Categories to the 4 Unit Categories (Ambulance, Fire, Heavy Truck and Light Truck) and to 16 Unit Types from the 106 identified in M5. This segmentation was done to ensure that there will sufficient data to enable historical, current, and future analysis. These units are reflected as “In-Scope” cases below.

Characteristics of In-Scope Cases

- An In-Scope “Category” has and will likely continue to have enough units to enable ongoing measurement (i.e. has both historical and future warranty claim potential)
- The In-Scope “Category” generally has fewer “Unit Types” per “Category”
- Identifying the relationship between a “Unit” and the associated M5 “Category” is clear and simple (e.g. Fire, Ambulance, Heavy Truck and Light Truck)
- Units within an In-Scope “Category” are likely to have similar warranty terms across all vendors (e.g. drive train and body)

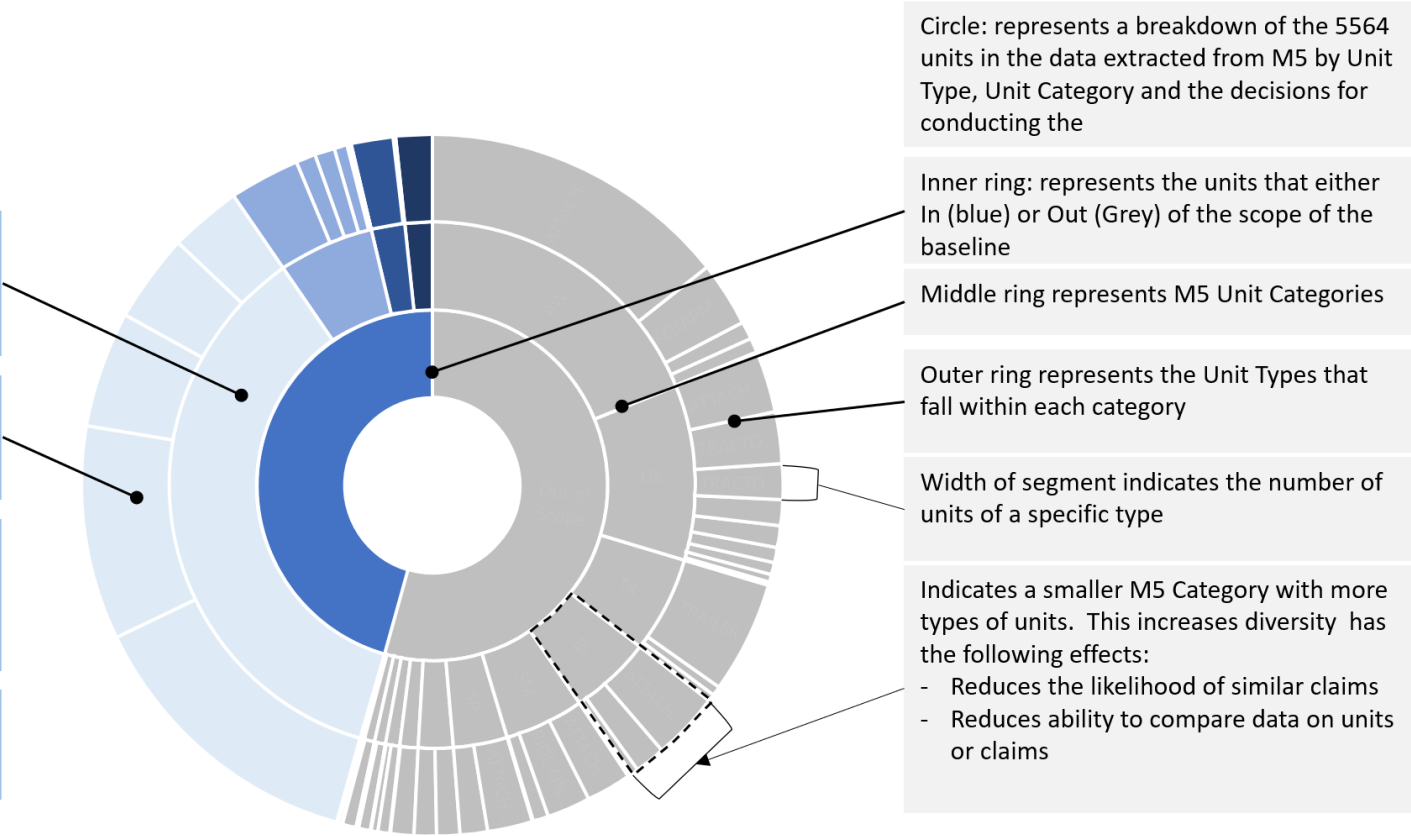


Figure E - 2 Unit Specific Case Identification

Detailed Breakdown of In Scope Cases

The graphic below represents an expanded view of the contents of each case as well as a summary of the inclusions or exclusions for each case.

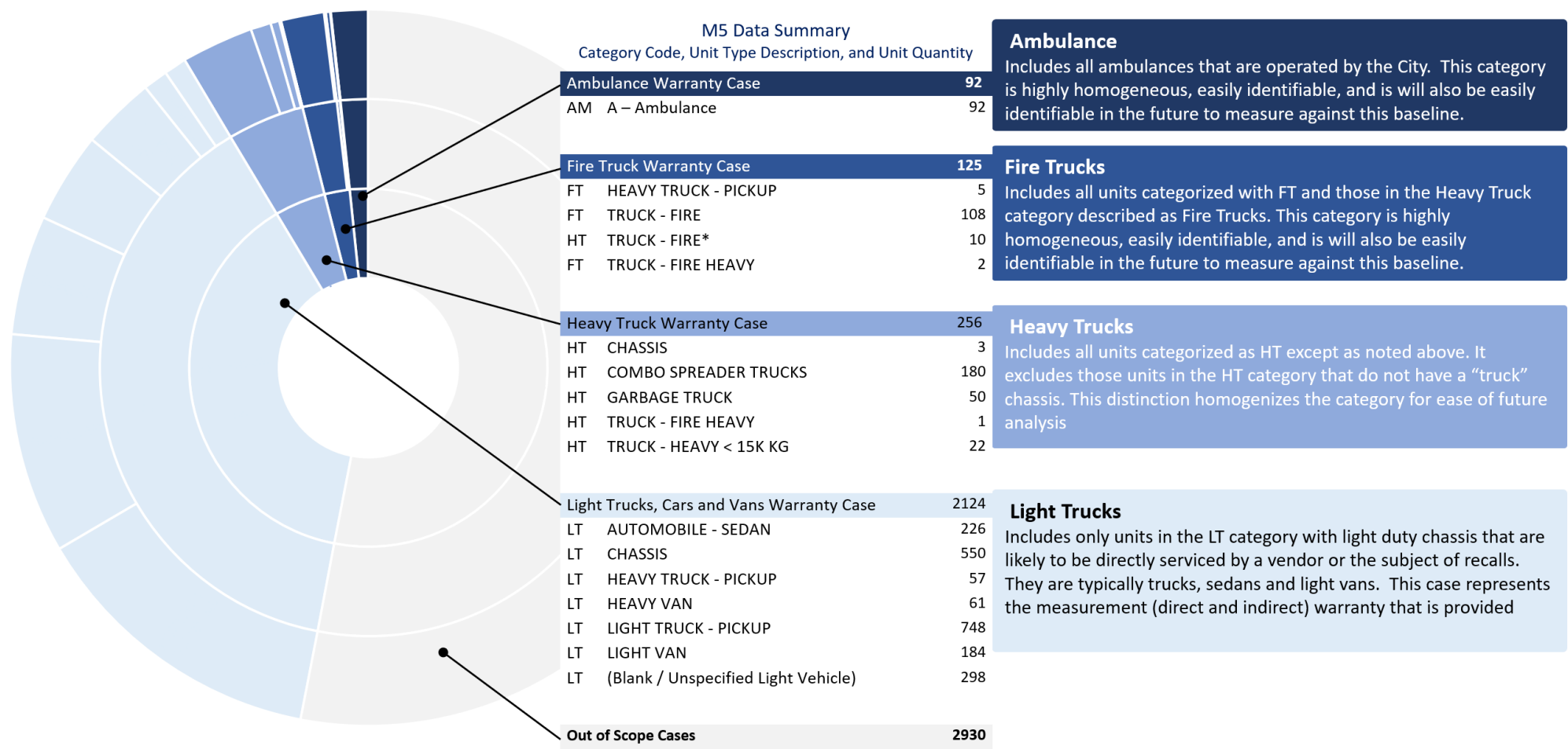


Figure E - 3 - Detailed Case Breakdown by M5 Category and Unit Type

Historical Summary of Warranty Claims – In Scope Cases

Following the definition of the In-Scope Case the following information was consolidated based on M5 Data. This includes the history of warranty claims from 2018 through to 2022 as represented in Figure E-4 -Summary of In-Scope Claims and the summary of claims by their Status Figure E-5 – Summary of In-Scope Work Orders by M5 Claim Status (2018-2022)

Figure E - 4 - Summary of In-Scope Claims (M5 2018-2022)

Unit Category				Annual Averages			Number of Claims Created by Year					Average Agreed Claim Amount (M5)				
Claim Use Case	Group Code	Code	M5 Group Description	Claim Amount	Claims	Claim Amount	2018	2019	2020	2021	2022	2018	2019	2020	2021	2022
Ambulance Warranty Case Claims				\$ 7,908.61	48	\$ 164.76	88	61	52	29	10	\$109.31	\$174.06	\$162.99	\$306.35	\$194.61
	AM	70	A - Ambulance	\$ 7,908.61	48	\$164.76	88	61	52	29	10	\$109.31	\$174.06	\$162.99	\$306.35	\$194.61
Fire Truck Case Claims				\$ 40,165.75	116	\$345.07	246	141	99	41	55	\$308.80	\$278.83	\$386.70	\$802.13	\$261.40
	FT	72	HEAVY TRUCK - PICKUP	\$ 1,033.56	3	\$318.02		1	7	3	2	-	\$57.26	\$350.46	\$183.23	\$537.02
	FT	74	TRUCK - FIRE	\$ 21,041.19	92	\$229.21	225	128	74	6	26	\$263.29	\$157.68	\$286.57	\$247.52	\$118.90
	HT	75	TRUCK - FIRE	\$ 6,952.07	3	\$2,317.36	2	2		4	4	\$3,327.40	\$3,426.05	-	\$3,519.46	\$55.89
	FT	75	TRUCK - FIRE HEAVY	\$ 1,628.51	5	\$348.97			5	3	6	-	-	\$500.90	\$407.61	\$193.04
	FT	76	TRUCK - FIRE	\$ 5,925.86	12	\$515.29		2	8	21	15	-	\$3,469.86	\$549.55	\$465.94	\$172.18
	FT	79	TRUCK - FIRE	\$ 7,018.26	8	\$923.46	19	8	5	4	2	\$530.03	\$660.39	\$1,544.69	\$1,441.78	\$3,123.56
Heavy Truck Case Claims				\$ 10,593.51	37	\$283.25	22	41	25	62	37	\$328.35	\$322.25	\$238.19	\$348.24	\$134.75
	HT	12	GARBAGE TRUCK	\$ 1,412.34	14	\$98.54		1		15	27	-	\$739.15	-	\$135.95	\$54.02
	HT	35	COMBO SPREADER TRUCKS	\$ 9,746.11	29	\$338.41	22	40	25	47	10	\$328.35	\$311.83	\$238.19	\$416.00	\$352.71
Light Vehicle Case Claims**				\$ 2,654.24	7	\$379.18	13	4	13	3	2	\$459.97	\$572.88	\$183.07	\$558.74	\$471.97
	LT	A2	AUTOMOBILE - SEDAN	\$ 910.11	1	\$910.11				1		-	-	-	\$910.11	-
	LT	A3	AUTOMOBILE - SEDAN	\$ -	2	\$0.00	2					\$0.00	-	-	-	-
	LT	B2	CHASSIS	\$ 1,681.47	2	\$840.74		2				-	\$840.74	-	-	-
	LT	B2	LIGHT TRUCK - PICKUP	\$ 186.15	3	\$62.05	1	1	7			\$0.00	\$0.00	\$79.78	-	-
	LT	B3	LIGHT TRUCK - PICKUP	\$ -	1	\$0.00	1					\$0.00	-	-	-	-
	LT	B4	LIGHT TRUCK - PICKUP	\$ 610.03	1	\$610.03		1				-	\$610.03	-	-	-
	LT	B5	CHASSIS	\$ 4,751.61	7	\$678.80	7					\$678.80	-	-	-	-
	LT	B5	HEAVY TRUCK - PICKUP	\$ 1,178.18	3	\$428.43	2		5	2	2	\$614.02	-	\$354.93	\$383.06	\$471.97
	LT	C4	CHASSIS	\$ 46.81	1	\$46.81			1			-	-	\$46.81	-	-
Total per Year							369	247	189	135	104	\$267.72	\$264.93	\$291.50	\$481.77	\$213.97

* Based on "Agreed Amount" as recorded on the Job Line within the M5 work order. This may vary from the amount actually invoiced or collected.
** Most warranty repairs in the Light Vehicle Case are performed at a vendor facility (i.e dealership) as zero dollar repairs. These are not presently captured as claim within this data set.
NOTE: This summary does not consider other financial dimensions of the work order.

Figure E - 5 - Summary of In-Scope Work Orders by M5 Claim Status (2018-2022)

M5 Claim Status		Claim Year (M5 Actuals)					Averages		Assumed Value
		2018	2019	2020	2021	2022	2018-2022	2018-2021	
	Cancel	25	20	1	2	5	11	12	10
	Denied	12	11	9	4	1	7	9	10
	Invoice	343	239	169	122	69	188	218	200

Quantitative Analysis – Common Case [Note: See MS Excel Document]

		Order (a)	Process Area (b)	Process (c) CnO Process/Order Documents	Role (d) CnO Org Title	Task (e) Procedural Step	Description (f)	Assumption (g)	Unit of Measure (h) Units of Effort (\$, \$, \$)	Effort (i) Person Effort (hours) per occurrence	n (j) Occurrences	Unit Cost (k) Rate (\$/Unit)	Cost Per Claim (l) (i) x (j) x (k) ÷ 200	Cost Per Claim (l) Sum of (k)
Common / Base Case (Common to all claim scenarios)	Indirect (Not Directly attributable to a Claim)	1	Deliver Fleet Service	Manage Work Order	Service Coordinator	Create Work Order	Effort specific to the creation of a work order and associated job line in MS.	There is no additional effort associated with the creation of a warranty claim or a non-warranty claim work order.	Work Order	0.00	Not Applicable	\$115.00	-	\$274.05
		2	Deliver Fleet Service	Identify Work Request	Service Coordinator	Identify Warranty Requirement	Effort focused on explicitly identifying warranty associated with a unit.	Service Coordinator does not identify warranty. This is rarely accomplished through automated MS Warranty Violation at the job line level.	Work Order	0.00	Not Applicable	\$115.00	-	
		3	Deliver Fleet Service	Manage Work Order	Service Coordinator	Assign Vendor Recall	Vendor notifies the City of Ottawa that multiple units are subject to a recall for a common defect. Units are identified by a vendor identifier (e.g. VIN or Serial Number) which the Service Coordinator then uses to associate the unit with an MS Campaign. The Campaign is a data object used to consolidate many different types of maintenance activities (i.e., it is not exclusive to the manufacturer's recall notification).	During a given calendar year it is estimated that 200 units that are recalled by vendor for any given year. The number of units within a given campaign can vary however it is assumed that there are units distributed across 24 campaigns per year.	Number of MS Campaigns Created	1.00	24	\$115.00	\$13.80	
		4	Provide Maintenance Service	Assign Unit	Technician	Validate MS Warranty Violation	Effort expended on the inspection of a unit by a Technician in order to validate that a claim is required. The inspection of a unit is a common task across all Work Orders.	The validity of many warranty violations can be assessed quickly and without additional effort. If a more complex inspection is required the effort is neither increased nor decreased in cost where there is a warranty claim.	Job Line Warranty Violation	0.00	Not Applicable	\$115.00	-	
		5	Provide Maintenance Service	Assign Unit	Technician	Document Warrantyable Issue	Effort expended specific to the documentation of warranty for work order resulting in a claim.	Following the completion of an inspection there is no additional effort on the part of the Technician to document or record the	Job Line Warranty Violation	0.00	Not Applicable	\$115.00	-	
	Direct (Attributable to a Claim)	6	Provide Maintenance Service	Assign Warranty Violation	Supervisor	Assign Business Value	Effort to determine if the amount to be claimed is less than the direct financial benefit of the claim.	The act of determining off availability, transportation cost and other factors takes the supervisor 15 minutes and includes the effort to document this decision in MS.	Warranty Claim	0.25	220	\$115.00	\$31.63	
		7	Provide Maintenance Service	Assign Warranty Violation	Supervisor or LLT	Document Business Value / Investigate details	Record the details of the business value assessment if they result in a decision to not submit a warranty claim to a vendor.	The effort to investigate the details of the claim and substantiate the assessment. This requires review of information related to the unit and warranty. It is assumed that this effort is 15 minutes by the Supervisor or LLT.	Number of MS Warranty Claims with the status of Denied, Cancelled and Invoiced	0.25	220	\$115.00	\$31.63	
		8	Provide Maintenance Service	Negotiate Method of Repair	Supervisor	Negotiate Repair with Vendor	Management of communication with the original vendor during the claim process.	Vendor communication is ongoing throughout the claim process and may be limited to a single email or protracted communication over a longer period if issues need to be resolved. It is assumed that the majority of communication requires less than 15 minutes of direct supervisor effort with an average of 30 minutes. It is assumed that there are 220 such cases per year (See MS Claims by Status).	Number of MS Warranty Claims with the status of Denied, Cancelled and Invoiced	0.50	220	\$115.00	\$63.25	
		9	Provide Maintenance Service	Make Warranty Claim	Warranty Administrator	Manage warranted parts	Where specific parts are eligible for warranty the "cost" must be returned to the vendor in order to validate the warranty terms.	The return of part cost is a standard practice that most vendors include within warranty terms and conditions. The collection and return of the "cost" requires effort on the part of the Warranty Administrator to identify, collect and ship the part. On average it is assumed that this activity takes approximately 20 minutes per claim.	Number of MS Warranty Claims with the status of Denied, Cancelled and Invoiced	0.33	220	\$115.00	\$41.75	
		10	Provide Maintenance Service	Make Warranty Claim	Warranty Administrator	Manage claims from negotiation through consolidated invoicing	The effort necessary to initiate and sustain communication with the vendor until the claim is either Denied, Cancelled or Invoiced.	This level of effort assumes that claims are batched monthly by the Warranty Administrator and are submitted to finance. The effort to perform data entry / data management, consolidate claims for invoicing, and communicate with other internal City stakeholders is assumed to be 30 minutes per claim. It is assumed that there are 200 such cases per year (See MS Claims by Status).	Number of MS Warranty Claims with the status of Denied, Cancelled and Invoiced	0.50	220	\$115.00	\$63.25	
		11	Provide Maintenance Service	Make Warranty Claim	Finance	Invoice Vendor	The effort necessary to perform data entry for the invoice and ensure that it falls under the appropriate account responsible for cost.	The effort necessary to perform data entry for the invoice and ensure that it falls under the appropriate account responsible for cost.	Number of MS Warranty Claims with the status of Invoiced	0.25	200	\$115.00	\$28.75	
		12	Provide Maintenance Service	Make Warranty Claim	Finance	Follow up on unpaid invoice	The effort necessary to follow up on an unpaid invoice.	Invoicing of vendors is not the direct responsibility of the Fleet Services Branch and falls within the responsibility of Accounts Receivable. Under the current assumption it is assumed that all invoices are paid on time.	Number of MS Warranty Claims with the status of Invoiced	0.00	N/A	\$115.00	-	

Quantitative Analysis – Unit Specific Cases [Note: See MS Excel Document]

Unit Specific Cases (Not Directly attributable to a		Order	Process Area	Process	Role	Task	Description	Assumption	Unit of Measure	Effort	n	Unit Cost	Cost Per Claim	Incremental Cost Per Claim
		(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i) Person Effort (hours)	(j) Occurrences	(k) Rate (\$/Unit)	(l) (j)x(i)x(k) / 50	(1) Sum of (k)
Ambulance			CaO Procedural Document		CaO Org Title		Procedural Step		Unit of Effort (\$,\$,h)					
		1								-	0	\$115.00	-	\$0.00
		2								-	0	\$115.00	-	
		3								-	0	\$115.00	-	
Fire		Order	Process Area	Process	Role	Task	Description	Assumption	Unit of Measure	Effort	n	Unit Cost	Cost Per Claim	Incremental Cost Per Claim
		(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i) Person Effort (hours)	(j) Occurrences	(k) Rate (\$/Unit)	(l) (j)x(i)x(k) / 100	(1) Sum of (k)
			CaO Procedural Document		CaO Org Title		Procedural Step		Unit of Effort (\$,\$,h)					
		1								-	0	\$115.00	-	\$0.00
		2								-	0	\$115.00	-	
		3								-	0	\$115.00	-	
Heavy Truck		Order	Process Area	Process	Role	Task	Description	Assumption	Unit of Measure	Effort	n	Unit Cost	Cost Per Claim	Incremental Cost Per Claim
		(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i) Person Effort (hours)	(j) Occurrences	(k) Rate (\$/Unit)	(l) (j)x(i)x(k) / 40	(1) Sum of (k)
			CaO Procedural Document		CaO Org Title		Procedural Step		Unit of Effort (\$,\$,h)					
		1	Provide Maintenance Service	Perform Maintenance	Technician	Prepare Unit for Transportation	If a unit must be returned to a vendor then components (e.g. pump, spreader, etc.) that are not from the OEM must be removed. Then the unit is prepared for transportation and removed from the unit declaration.	This work is only performed on units that are returned to a vendor. It is assumed that the most all return rate in the Heavy Truck category is 5% of all claims and that preparation takes 4 hours	Work Order Requiring transportation to vendor site.	4.00	2	\$115.00	\$23.00	\$23.00
Light Trucks		Order	Process Area	Process	Role	Task	Description	Assumption	Unit of Measure	Effort	n	Unit Cost	Cost Per Claim	Incremental Cost Per Claim
		(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i) Person Effort (hours)	(j) Occurrences	(k) Rate (\$/Unit)	(l) (j)x(i)x(k) / 200	(1) Sum of (k)
			CaO Procedural Document		CaO Org Title		Procedural Step		Unit of Effort (\$,\$,h)					
		1	Deliver Fleet Services	Manage Work Order	Service Coordinator	Authorize Vendor Recall	Effort to manage vendor generated recall (warranty repairs) Vendor recall multiple units (by VIN or Serial Number) for a common defect. These units must be identified and associated with an MS Number.	Poughly 15 minutes per unit to identify and report on the unit that is being recalled by a vendor in addition to the Campaign that are warranty specific (above in the General Case)	Number of Units Recalled	0.25	300	\$115.00	\$43.13	\$43.13