TOWNSHIP OF NIPISSING

AUTOMATED VEHICLE LOCATION AND GLOBAL POSITIONING SYSTEMS

Business Case Analysis

Final Report
August 11, 2020

KPMG

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Opportunity Overview

The Township of Nipissing (the "Township") is responsible for the year-round maintenance of 264 lane kilometers of paved and unpaved roads. During 2019, the Township spent just over $831,000 on roads maintenance, including $243,000 on winter roads maintenance activities. Approximately two-thirds of winter roads maintenance costs ($181,000) relate to materials, including fuel, sand and salt, with the remaining costs ($62,000) consisting of wages and benefits for Township employees.

The Township's winter roads maintenance, which is compliant with minimum maintenance standards established by the Province, is undertaken predominantly through the use of Township personnel and equipment, including a fleet of three snow plow trucks, one grader and one truck used to perform winter roads patrol. The scope of the Township's winter roads maintenance activities includes snow plowing, the application of sand and salt, ice scarification and snow bank removal as required.

In order to enhance operating efficiencies as well as improve risk management, a number of Ontario municipalities have implemented the use of automatic vehicle location and global positioning systems ("AVL/GPS") for individual vehicles in combination with control systems for salt and sand application. The use of AVL/GPS systems allow municipalities to obtain almost continuous information (e.g. every ten seconds) concerning the vehicle and its operating conditions. For example, AVL/GPS systems can collect and record information concerning:

- Ignition status (on/off)
- Vehicle speed
- Location (GPS coordinates)
- Odometer reading
- Status of plows, including front, wing and tow plows (plow up, plow down)
- Status of sander (on/off) and rate of application

In addition to vehicle data, AVL/GPS systems also allow for the collection of weather information, most importantly air and surface temperature.

Data collected by AVL/GPS systems can be transmitted either in real time (continuously) or upon return to the public works depot.

At the present time, the Township maintains records concerning winter maintenance activities in a hardcopy format as opposed to electronically, primarily through worksheets completed by public works operators. This documentation, which is intended to satisfy the Township's requirements with respect to hours worked, CVOR requirements and demonstrating the Township's performance of winter roads maintenance activities, differs from the data available through AVL/GPS systems in that:

- Hard copy documentation only provides point in time data, as opposed to AVL/GPS systems that provide near continuous data (e.g. every five seconds); and
- Hard copy documentation requires staff to search files for information relating to a specific data and/or plow route, which likely requires a higher level of effort than electronic data retrieval.

The Township is proposing the acquisition of AVL/GPS systems for five public works vehicles and has requested a business case analysis for this initiative.

Benefits

The use of AVL/GPS systems is regarded as a best/common practice for municipalities across North America, although the implementation of systems appears to be more common in larger centres as opposed to smaller municipalities. Based on a survey of 15 municipalities in Northeastern and Central Ontario, we note that municipalities with populations in excess of 7,500 residents tend to have a higher rate of adoption than smaller municipalities. In addition, some small municipalities have only adopted portions of AVL/GPS systems – for example, collecting information on sand and salt application but not implementing GPS location tracking.

Based on our review, including discussions with municipalities that have adopted AVL/GPS systems, we understand that the benefits of the systems include the following:

- AVL/GPS systems are regarded as contributing towards the improved health and safety of residents and users of municipal road networks by supporting pre-programmed routes and material application on key areas of the road network (e.g. hills, curves, school bus routes), thereby removing subjectivity from winter roads maintenance and ensuring the delivery of services at the intended standard. AVL/GPS systems also collect information on weather and road conditions on a near continuous basis, providing municipalities with the ability to adapt their maintenance activities to reflect current conditions.
- AVL/GPS systems are regarded as enhancing a municipality's risk management process and reducing its overall exposure to liability in the event of a claim relating to winter roads maintenance. AVL/GPS systems are able to instantly demonstrate that a municipality has met its maintenance standards by providing information on the location of its vehicles at a particular time, as well as information concerning the operating state of the vehicle (plow up/plow down, sander on/sander off). In the absence of AVL/GPS systems, municipalities are most likely required to rely on manual records which provide only point-in-time (as opposed to continuous) information on the vehicle, may not capture all of the requisite data required to defend against a claim and may require a considerable amount of manual effort for the capture, storage and retrieval of the necessary data.
- AVL/GPS systems are regarded as improving the overall operating efficiency of winter roads maintenance activities. The use of preprogrammed material application has been demonstrated to reduce sand and salt usage by up to 15% to 20%, providing for cost savings for the municipality. At the same time, other roads maintenance activities may experience cost reductions. For example, street sweeping can experience a reduction in effort due to lower volumes of material on the road network, which clerical functions experience reductions due to the automated nature of data collection and retention. In addition, the collection of near continuous data concerning winter roads maintenance provides better information for route planning and optimization, further contributing to the efficiency and effective of the municipality's winter roads maintenance activities.

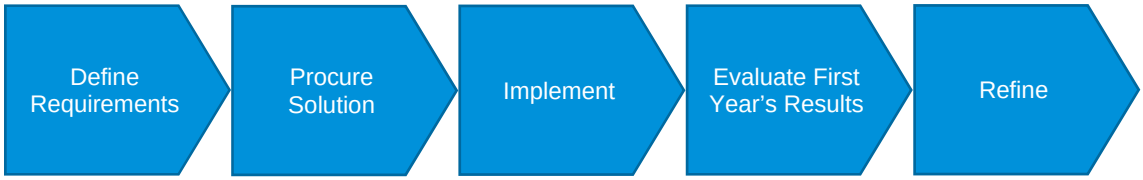
Financial Analysis

During 2019, the Township incurred $861,000 in operating costs relating to roads maintenance, which included over $50,000 in materials (sand and salt) for winter roads maintenance activities. Based on our discussions with municipalities that have implemented AVL/GPS systems, we understand that sand and salt use can decrease by 15% to 20% as a result of utilizing preprogrammed application patterns (supported by the AVL/GPS system), as opposed to operator-determined applications. Based on this level of savings and the Township's winter maintenance material cost of approximately $50,000 per year, we have estimated that the adoption of AVL/GPS systems could save the Township approximately $10,000 per year.

Based on our discussions with other municipalities, we understand that the typical cost of an AVL/GPS unit is in the order of $8,000 per vehicle. Based on the installation of AVL/GPS units in five vehicles (three plow trucks, two graders, one winter roads patrol truck), the total capital cost is estimated to be in the order of $40,000. Based on the estimated savings of $10,000 per year, this results in a four-year payback period. We note, however, that certain municipalities indicated the payback period was less than two years.

Implementation Framework

The suggested transformation framework for the implementation of the recommended course of action incorporates five steps, as outlined below.



The implementation strategy is based on the completion of the first two stages in the summer of 2020, with installation of the AVL/GPS systems in the fall of 2020, allowing for operating during the 2020-2021 winter roads maintenance season.

DEFINE REQUIREMENTS

The phase is intended to lay the groundwork for the acquisition and implementation of the Township's AVL/GPS systems and includes determining the exact capabilities and functionalities of the system. Specific items to be addressed in this stage of the implementation process include the following

- Confirming the exact AVL/GPS requirements for the Township, including active (real time) vs. passive (batch download) data transfer and the nature of data to be collected by the AVL/GPS system.
- Inspect solutions adopted by other municipalities so as to understand how other municipalities are using AVL/GPS systems and lessons learned that could be relevant to the Township.
- Obtaining input from operators and other influencers, which was suggested by one municipality as a best practice in order to ensure that the ultimate users of the AVL/GPS systems (i.e. operators) have input into the process in order to reflect operational aspects.

PROCURE SOLUTION

Following the definition of the Township's need, we suggest that the Township undertake a competitive procurement process for the selection of a solutions provider. As part of the request for proposal process, the Township may wish to consider:

- Requiring suppliers to conduct a technology demonstration of their product in order to provide the Township with an indication of its functionality;
- Strongly weighting references from other municipalities, which would allow the Township to gauge the operational use of the AVL/GPS systems in a real-world environment; and
- Consider warranty and performance standards in the vendor selection decision.

IMPLEMENT

Implementation activities represent the installation of the technologies onto the Township's winter maintenance fleet. This would involve the initial installation and calibration of the AVL/GPS systems and operator trainer on the use of the systems. A municipality suggested that the Township consider performing dry runs in advance of the commencement of the winter maintenance season as a means of ensuring operator familiarity and the proper calibration of the AVL/GPS systems.

EVALUATE FIRST YEAR RESULTS

At the conclusion of the first season of operation, we suggest that consideration be given to reporting on the financial and non-financial benefits of the AVL/GPS technology, including but not limited to cost savings, customer service enhancements and risk management. As part of this evaluation process, the Township may wish to seek input from residents as to whether the use of AVL/GPS systems enhanced overall service levels as well as from operators with respect to what worked well and what requires revision in terms of operational aspects.

REFINE

We suggest that in advance of every winter roads maintenance season, the Township should review data collected from the AVL/GPS system and adjust its maintenance strategy and activities accordingly. In addition, it was suggested that the Township conduct an annual “snow school” prior to the commencement of the winter maintenance season that would allow for:

- Ongoing training for operators;
- Testing of contemplated changes to plow routes and sand/salt application patterns; and
- Additional data recording that could be implemented through the use of AVL/GPS systems.

Restrictions

This report is based on information and documentation that was made available to KPMG at the date of this report. Should additional documentation or other information become available which impacts upon the observations reached in our report, we will reserve the right, if we consider it necessary, to amend our report accordingly. This report and the observations and recommendations expressed herein are valid only in the context of the whole report. Selected observations and recommendations should not be examined outside of the context of the report in its entirety.

Our observations and full report are confidential and are intended for the use of the Township. Our review was limited to, and our recommendations are based on, the procedures conducted. The scope of our engagement was, by design, limited and therefore the observations and recommendations should be in the context of the procedures performed. In this capacity, we are not acting as external auditors and, accordingly, our work does not constitute an audit, examination, attestation, or specified procedures engagement in the nature of that conducted by external auditors on financial statements or other information and does not result in the expression of an opinion.

Pursuant to the terms of our engagement, it is understood and agreed that all decisions in connection with the implementation of advice and opportunities as provided by KPMG during the course of this engagement shall be the responsibility of, and made by, the Township of Nipissing. Accordingly, KPMG will assume no responsibility for any losses or expenses incurred by any party as a result of the reliance on our report.

This report includes or makes reference to future oriented financial information. Readers are cautioned that since these financial projections are based on assumptions regarding future events, actual results will vary from the information presented even if the hypotheses occur, and the variations may be material.