



The Research Bureau

Tracking City Equipment

How Expanded GPS Monitoring Could Benefit Worcester

Report 18-08

October 2018

Research in the Public Interest

Worcester Regional Research Bureau, Inc.

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Introduction

While local government is often viewed as monolithic, it is complex, composed (in the case of Worcester) of thousands of employees on thousands of assignments all over the city. Since workloads can require employees to spend significant time outside the office, managers are challenged to keep track not just of employees and work products, but also municipal resources. A municipality owns significant capital assets including vehicles and heavy equipment. Municipalities like Worcester have spent millions on state-of-the-art investments, but often rely on analog management methods instead of one of the greatest government inventions of all time—location tracking.

The Global Positioning System (GPS) was launched by the U.S. Department of Defense in the 1970s to aid worldwide military operations, enabling commanders to track and deploy troops effectively. Today, it is a standard application on smartphones, helping civilians find directions to a restaurant or keep tabs on a wayward teenager. Somewhere along the way, though, many municipalities overlooked the opportunity to integrate GPS into their sizeable fleets.

As the technology becomes cheaper and more prevalent—one study estimated there were 8 million GPS or wireless devices used to manage fleet vehicles in 2016, and the number is expected to grow to more than 14 million units by 2019—cities and towns have begun outfitting their vehicles with location trackers. They can be used on snowplows to plan efficient routes and address missed spots, on police vehicles to streamline dispatching, or on garbage trucks to verify citizen complaints. Some cities have used them to devise routes that reduce mileage and save fuel—and by extension, taxpayer money. Others have used the data to catch employees engaged in personal business during work hours. There are even examples of city administrators putting GPS information online so the local citizenry can watch their government work in real time.

This report examines municipalities that have equipped city vehicles with GPS to identify potential applications, benefits, and pitfalls. It

explores how the benefits of tracking city vehicles measures up to the monetary cost. It identifies successful ways for municipalities to approach this powerful technology.

Applications

The prevalence of GPS means organizations and individuals have been experimenting with numerous ways to use the technology. For municipalities, tracking systems mainly fall into two categories—saving money and increasing efficiency. But the flexibility of the system means there are many different ways to achieve those goals, and the same system residents are using to find their way around town can be amplified, molded, and adapted in the hands of creative public officials.

Cost Savings

Installing GPS devices in a city fleet can be expensive—at least \$200 or more per vehicle, plus a recurring fee that varies based on the vendor—especially for cities that maintain large numbers of cars and trucks. Proponents of tracking systems, however, have pointed to significant cost savings. These savings generally take the form of eliminating previously undetectable inefficiencies in government services.

Fuel consumption is a major cost for most municipal fleets, and it has therefore become a major focus of GPS tracking companies. In addition to providing a geographic location, most platforms can keep track of vehicle speed and idle time, both of which play into fuel efficiency. Depending on the size of the vehicle, idling can consume anywhere from 0.2 to 1 gallon of fuel per hour, according to the U.S. Department of Energy, which also estimates that speeding and rapid acceleration can lower gas mileage by up to 30 percent at highway speeds and up to 40 percent elsewhere. Dallas, Texas estimated savings of more than \$675,000 in the first year after installing a tracking system in 400 garbage trucks, \$170,000 of which was fuel costs. The Cape Fear, North Carolina Public Utility Authority reported \$8,000 in fuel savings in the three months after installing GPS units in 128 vehicles.

Tracking has also been used to optimize routes for city vehicles. Just as private consumers use GPS to find new and faster ways to get around, cities and towns have discovered more efficient ways to deploy their fleets for snowplowing, garbage collection, or other services that require vehicles to cover the whole municipality. This means employees spend more time working and less time getting to work. Baltimore County, Maryland, added GPS units to 850 vehicles spread across multiple purposes—dump trucks, snowplows, buses, and more—and saw county vehicles drive 817,000 fewer miles than the previous year, saving nearly \$300,000 in fuel expenditures. California's Eastern Municipal Water District installed tracking devices on most of its 350-vehicle fleet, and saw an annual drop in miles driven of about 165,000 miles, a corresponding drop in fuel costs of around \$79,000, and a “productivity savings” estimated at around \$350,000 by agency officials.

A Verizon Telematics report, from the arm of the telecommunications giant that sells GPS and tracking technology, studied various metrics before and after the implementation of a GPS program in Arkansas. In the 62 months before GPS, the Arkansas fleet consumed an average of nearly 168,000 gallons of fuel per month. In the 20 months after GPS was introduced, that number dropped to nearly 143,000 gallons, for an

estimated savings of \$81,000 per month, or nearly \$1 million annually.

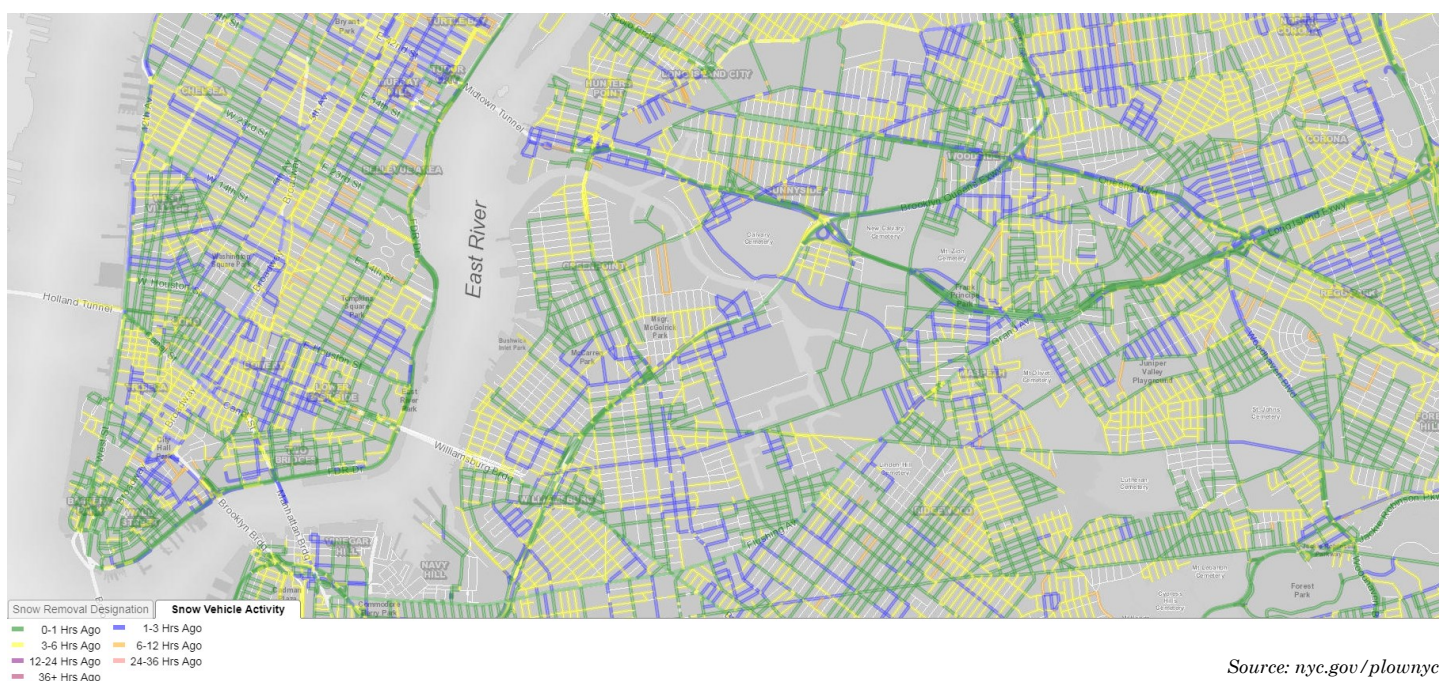
Customer Service

GPS can resolve many resident complaints. Trackers on snowplows can allow city officials to tell aggrieved citizens if a plow was in the area of a damaged car or mailbox during a storm, for example, or confirm reports that a garbage truck missed a street on its assigned route.

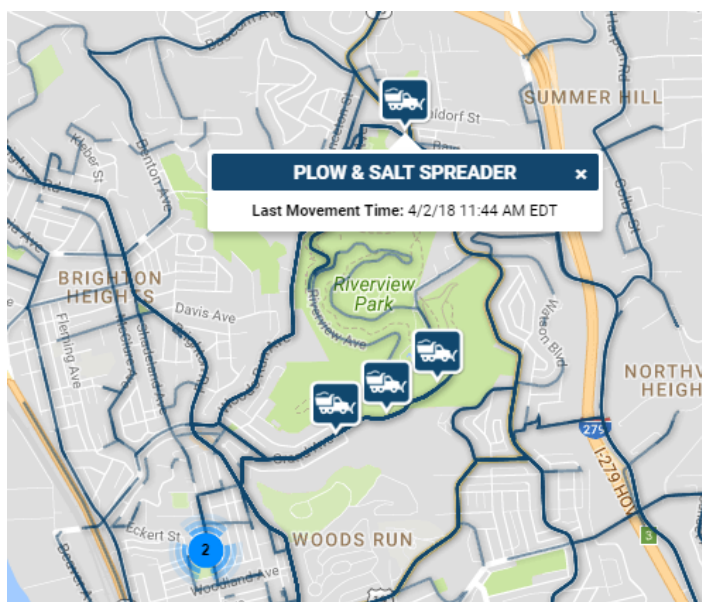
Some cities, including notable large metropolises like New York City and Chicago, have created software tools that are open to the public, allowing residents to see the same tracking data as city employees. This allows residents who might otherwise call in complaints to a customer service center to instead view the progress of the city's plowing fleet in real time. These systems can also end disputes between residents who claim their street has been ignored, sometimes by proving a plow had stopped by and sometimes by proving that it had not.

The City of Boston initially allowed the public to see the same real-time data as city officials during snowstorms when it launched an online GPS-driven portal in 2013. Somewhat notoriously, the site was so popular that it

Figure 1: PlowNYC Resident Portal Map



Source: nyc.gov/plownyc

Figure 2: City of Pittsburgh Snow Plow Tracker

Source: pittsburghpa.gov Snow Plow Tracker web app

crashed and had to be taken down, since information required by public officials shared the same servers struggling to meet public demand. Boston still uses SnowCOP, or Snow Common Operating Picture, an internal tool that pings the more than 700 plows and sanders the city uses during storms once every minute, offering supervisors an opportunity to see the current locations of vehicles and the specific timeframe for the plowing of specific streets. A dashboard allows this information to be cross-referenced with citizen complaints, permitting officials to deploy vehicles to where they are most needed.

Driver Oversight

While sometimes controversial, GPS systems can and have been used to make sure public employees are doing their assigned tasks appropriately. Even the most committed employees have off days, but a tracking system can identify long-term patterns of behavior—who is spending too much time idle, who is missing parts of their assigned route, or who is making unauthorized trips during work hours. For off-site municipal jobs, it can be difficult to determine when an employee needs guidance, but GPS tracking provides at least some quantitative measures for managers to review when looking at staff performance.

Like any driver, municipal workers are more likely to observe the posted speed limit and drive more carefully if their movements are being tracked. Modern systems can review and record speed of travel, routes taken, turns made, and many other variables that, taken together, can paint a comprehensive portrait of an employee's driving habits and behavior. Augusta, Georgia, adopted the technology in 2008, and cited a 29 percent decrease in accidents in which municipal employees were found to be at fault in the first year of its tracking program. The city also doled out penalties, including dismissal, for some employees who were found to be driving recklessly. And while most applications catch fault with bad drivers, the technology can also be used to identify vehicles that have become stranded or incapacitated, and locate drivers in need of assistance even when they are not in communication with a supervisor.

In addition to unsafe driving, GPS tracking systems can identify fraud or criminal activity. Public utilities workers in San Diego, health department employees in Indiana, and public works employees in Tampa Bay have all been fired in the past after GPS systems caught them running personal errands or spending time at home when they were supposed to be on the clock at work.

States, which manage larger fleets than municipalities, have been on the cutting edge of utilizing vehicle tracking to improve driver behavior. Verizon released a detailed report on a pilot program for the state of North Carolina in 2015 that showed widespread opportunities for improvement via GPS monitoring. In a sample of 76 vehicles spread over the state's many departments over a seven-month period, the study found around 2,000 instances per month of vehicles exceeding the speed limit by 10 miles per hour or more, for example. The company claims previous customers saw a decrease of 90 percent or more in incidents of excessive speeds when employees' vehicles were outfitted with their GPS system.

It only took one year from when the Commonwealth of Massachusetts started tracking snowplow drivers with GPS systems (in 2004) for two drivers to be charged with larceny for veering

off their assigned routes to plow for private customers—using salt provided by the state. Governor Charlie Baker has expanded the program, most recently with the State Police and Environmental Police in 2018.

Worth noting is that opposition to this oversight can hinder taking action on findings—an inability to negotiate an agreement with a labor union meant Columbus, Ohio, which discovered through GPS that a construction manager was spending hours at a casino during the work day, could not use GPS evidence to discipline employees for five years after tracking systems were installed in its fleet.

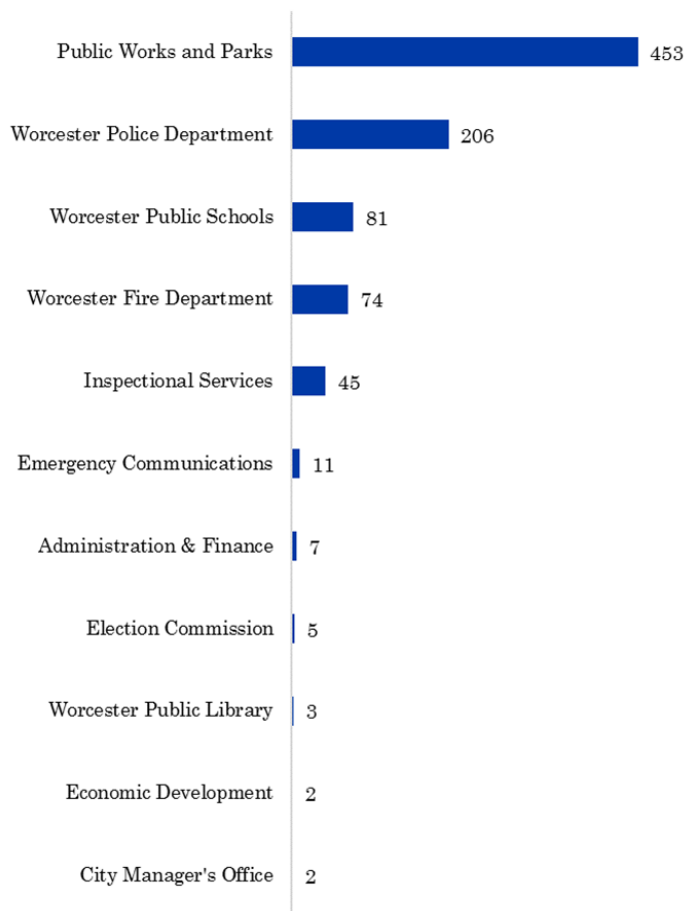
Environmental Impact

While efficient vehicle design is important for reducing a fleet's environmental impact, how those vehicles are used is also a major factor in reducing greenhouse gas emissions and other environmental side effects of a large number of vehicles that need to be on the road frequently. Fleet managers have long recognized the role of vehicle tracking in achieving environmental sustainability, and a 2015 executive order even mandated the use of telematics (long-distance transmission of data) for all new acquisitions at federal agencies with more than 20 vehicles.

Many of the same benefits that telematics companies use to promote cost savings also apply to environmental efforts. Driving fewer miles and spending less time idling reduces spending on fuel, but also reduces fuel consumption, a major cause of harmful emissions. The Environmental Protection Agency (EPA) estimates that 27 percent of U.S. greenhouse gas emissions are from transportation, the second-leading cause in the country, and the one with the largest increase since 1990. In Massachusetts, 40 percent of greenhouse gas emissions are believed to come from transportation.

The previously-mentioned Verizon study from North Carolina estimated a reduction of more than 1,700 pounds of greenhouse gas emissions per vehicle in the state's fleet. That number is roughly equivalent, according to the EPA's

Chart 1: City of Worcester Vehicles by Department



Source: City of Worcester Department of Administration and Finance. Most recent counts available, from 2015 to 2017.

Greenhouse Gas Equivalencies Calculator, to the electricity used by more than two residential properties in one year.

Worcester's Tracking Status

Worcester currently outfits all City-owned street sweepers and sanders, and most contracted sanders, with GPS tracking units through the Department of Public Works and Parks. No other departments make use of GPS tracking devices.

DPW started tracking vehicles in 2015 through a contract with GPS Insight. The installation cost around \$25,000, along with a monthly fee paid to the company, and currently includes 35 sanders/salters and 14 street sweepers, with installation ongoing for the remaining contracted vehicles.

The main function of the system is to ensure that sanders, most of which are also equipped with snow plows, and sweepers are following their assigned routes, according to the City. These routes are carefully planned to ensure efficiency, and the GPS system allows DPW employees to track drivers in real time or to revisit a route later to make sure a street has been covered. A secondary benefit is the ability to monitor performance and ensure that drivers and vehicles are working correctly.

While the DPW would not estimate a dollar amount saved through the system, GPS Insight, which holds Worcester up as a case study, claims a savings of \$10,000 per year between time and material saved.

The City owns nearly 900 vehicles, according to a Department of Administration and Finance inventory. More than half are assigned to the Department of Public Works and Parks, probably the most studied government department nationally in relation to GPS and the one with perhaps the most to gain from the application of location tracking.

While contracting with a professional location tracking firm is relatively new for Worcester, the City was actually on the forefront of labor relations law when it comes to an employer's right to require location tracking of its employees. In 2007, the former Massachusetts Labor Relations Commission ruled that the City could require DPW employees to use GPS-enabled phones while sanding to assist in overseeing operations. The local National Association of Government Employees union had challenged this requirement, which was designed to improve on a system of inspectors who would make in-person checks, on the grounds that it altered standards of productivity and performance. The Commission ruled that the GPS system was simply a way to enforce preexisting rules, allowing the program to continue, although subsequent rulings in other regions have had different outcomes.

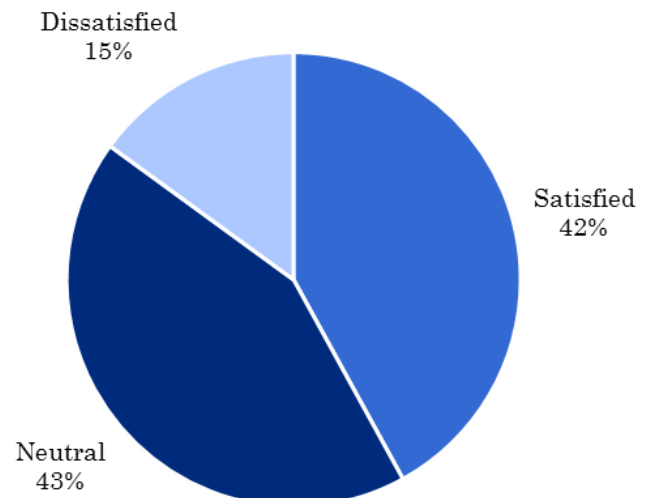
Nationwide Studies

While research from non-industry sources is limited, as GPS technology and the broader field of telematics become more integral to the workings of private and public vehicle fleets, an increasing number of organizations have attempted to quantify the benefits or disadvantages of giving fleet supervisors location tracking capabilities.

A 2017 survey of "fleet leaders" conducted by fleetanswers.com, an online community of professionals in the fleet management industry, found that 54 percent of respondents saw an improvement in driver behavior after installing GPS or other telematics equipment in their fleet, while 49 percent saw increased fuel savings. Respondents, 46 percent of whom worked for a government agency, ranked tracking driving behavior as their number one reason for using telematics or GPS, although government workers were more likely to say getting odometer or engine hour readings was their top priority. Other priorities given included location information (#2), asset utilization (#5), route management (#7) and customer service (#8).

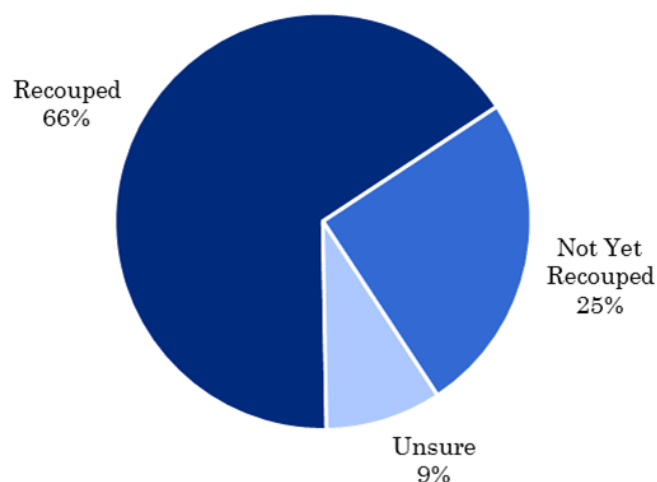
In terms of satisfaction, 42 percent of those surveyed were satisfied or very satisfied with their system, while 15 percent were dissatisfied or

Chart 2: FleetAnswers Members' Satisfaction With Current Telematics Experience



Source: FleetAnswers.com

Chart 3: Recouped Investments in GPS Tracking Systems across 500 Fleets



Source: CJ Driscoll and Associates

very dissatisfied, with the rest remaining neutral. A lack of accountability and issues with data or data integration were the top reasons cited for a neutral or unsatisfactory experience. Those who were satisfied said good quality data was their top reason for giving a good review for their system, with analysis of the data and integration of telematics data with other metrics from their fleet also factoring into happiness levels.

The U.S. Government Accountability Office, a federal agency, released a report in 2014 that identified cost savings and other benefits from telematics broadly and GPS systems specifically. It found that a number of factors influenced the cost savings of these technologies, including the size of the fleet in question (with larger fleets handling fixed costs better than smaller fleets), type of vehicle (specialized vehicles or ones with low fuel efficiency see a higher return on investment), and length of service (vehicles that are replaced frequently may not recover upfront expenses).

As part of the study, the General Services Administration, which provides fleet products for the government, among other duties, requested information from various agencies on their experience with telematics. Some used the technology to identify underutilized vehicles and optimize routes and assignments. A study of the Natural Resources Conservation Service fleet

using GPS and engine diagnostics found the potential for the elimination of 30 to 40 percent of its fleet. The National Archives and Records Administration reported a decrease in its fleet size of 21 percent, a reduction in fuel consumption of around 13 percent, and the identification of employees who misused government vehicles. The Department of Homeland Security reduced spending by \$3.5 million in the year following the introduction of GPS and diagnostics for around 2,300 vehicles. An Idaho fleet with the Department of Energy reported net savings of \$390,000 after installing GPS tracking in around 350 vehicles.

A 2017 study by CJ Driscoll & Associates, a marketing and consulting research firm for GPS and wireless product industries, found in a survey of more than 500 participating fleets that 80 percent of those using a tracking system were satisfied with their GPS fleet management systems, while 6 percent were not satisfied. Fleets in the study included both private and government fleets, and ranged in size from five vehicles to more than 10,000.

Around 64 percent of fleet managers surveyed by CJ Driscoll were using or had used a GPS tracking system, and of those, 66 percent said they had already recouped their investment in the system. When asked what obstacles they encountered when deploying GPS trackers in their fleet, 23 percent of respondents said installation was an issue, 12 percent cited training, and 6 percent mentioned employee acceptance, while 37 percent reported no serious obstacles.

A 2011 American Association of State Highway and Transportation Officials survey of state departments of transportation found that 27 of the 33 states that responded were using a GPS system for vehicle tracking. While the survey results are a bit dated, respondents were already reporting a wide range of applications for their systems, including vehicle maintenance scheduling, weed control mapping, emergency patrol tracking, motorist assistance, and mileage reporting. Data from the GPS systems was used by a variety of departments and agencies in and out of the state transportation departments.

Gateway Cities

Any new technology will be adopted at different speeds by different municipalities depending on their needs, funding, and other local considerations. A sampling of Gateway Cities in Massachusetts reveals an array of approaches—some cities have taken Worcester’s approach and installed GPS systems only on snow plowing equipment, while others have gone much further.

Haverhill installed GPS tracking devices on DPW vehicles after a 2007 scandal involving the Highway Department superintendent and others who were investigated for working private jobs on city time. Devices were installed to provide a measure of accountability for the department. Haverhill later installed GPS units in firetrucks, in 2009, and police cruisers, in 2014. Installations were used to improve dispatch efficiency.

Lowell tracks police vehicles with GPS consoles, approved in 2013 in union negotiations. Officer safety and deployment improvement were mentioned as advantages of the system.

New Bedford uses GPS on vehicles in its snow removal fleet, part of a comprehensive overhaul of that department in 2016. In April 2018, the Police Union approved a contract that allows for GPS tracking in marked police cruisers; proponents are calling it an improvement for officer safety.

Lawrence announced the installation of GPS systems in snowplows and other DPW trucks in 2011 as a cost saving and oversight initiative.

The Bureau’s View

When GPS technology was first introduced for civilian use, it was expensive and rudimentary compared to today, making installation a tough proposition for municipalities. After years of improvements and cost reductions, tracking systems no longer carry the same risks. The Research Bureau believes the time has come to equip the entirety of Worcester’s fleet with GPS tracking capabilities.

Worcester uses GPS tracking technology on nearly 50 sweepers and sanders, and has seen benefits from that program. However, the rest of the Department of Public Works fleet, as well as the hundreds of vehicles in the Police Department and dozens of trucks and cars in the Fire Department, do not have the technology. The City is missing an opportunity to collect data that can offer now-hidden optimizations and cost savings that cannot be uncovered by human oversight alone. Benefits from GPS tracking can include cost savings from optimizing routes, better fuel efficiency, improved maintenance scheduling, and eliminating underused vehicles. All of the above can also mitigate a fleet’s environmental impact. Tracking systems can improve customer service and identify staff misconduct. They can cut down on reckless driving and citizen lawsuits. In especially desperate situations, they can help with employee safety by transmitting a location to supervisors or first responders.

While the benefits of GPS tracking are numerous and varied, drawbacks and pitfalls exist. There is a per-unit and ongoing maintenance cost for any GPS system, and while most vendors advertise a substantial monetary return on that investment, municipalities must be careful to screen and select a program that is appropriate and cost-effective for their situation. More oversight and control over employees can rectify bad behavior, but could also draw objections from workers and potentially their unions. And supervisors must have the training and capacity to monitor data from a tracking system and the will to make changes, including difficult personnel decisions, based on new information.

Other municipalities have followed the lead of private companies and state agencies, implementing tracking systems and ending up in a better, more efficient place because of them. As the second-largest city in New England, with an active fleet of vehicles, Worcester should be a leader in this area. The benefits of a GPS tracking system that encompasses the City’s entire fleet could yield multifaceted benefits for employees, taxpayers, and the city as a whole.

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