



*Response to*

City Of Rochester, New York

Automated Vehicle Locator and ITS

*for the*

Department of Environmental Services Vehicle Fleet

*Prepared by*

AmeriTrak Fleet Solutions, LLC

August 1, 2012

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## **Executive Summary**

This proposed AmeriTrak Fleet Solution, LLC (AmeriTrak) AVL/ITS project will offer the City of Rochester, New York (the City) unprecedented flexibility, solution extensibility and security.

The success of any complex AVL implementation begins with and depends on a robust, rugged and flexible in-vehicle telematics package. To this end, we are proposing AmeriTrak's family of AT500 and AT400 transponder kits, complete with a power distribution circuit board and mechanical mounting kit. Each kit may be augmented with an 8" mobile data terminal (MDT), ATE-SA10 Event Module and ATE-CAN1 CAN-bus module.

AmeriTrak was founded in early 2004, and has enjoyed steady growth with a diversity of customers ever since. Our direction and focus changed in late 2009 when AmeriTrak was awarded a Minnesota State contract by the Minnesota Department of Transportation (MnDOT) to outfit all statewide snow and ice vehicles with its latest telematics solution. Since its inception, AmeriTrak had always been involved with applying AVL to the snow and ice fighting industry, but we always frustrated with the diversity of feature requests and the ever broadening scope of Agency reporting requirements, demand for greater fleet accountability and more sophisticated data collection and processing needs. At that time, our new product lines, developed to address this very dynamic requirements environment, were just emerging from an intensive summer-long R&D cycle. Although we were proud of our accomplishments and our new devices were usable "right out of the lab," MnDOT had other, more ambitious plans.

Lead researchers from various MnDOT departments have since pushed and directed AmeriTrak's R&D efforts to yield what can now be described as the most snow-and-ice fighting appropriate AVL solution. At the same time, they strongly suggested that sufficient hooks and controls be designed-in to ensure many years of continued service, easy expansion of mobile, in-vehicle application development and ease of remote command-and-control across all levels of MnDOT Administration. In other words, we were pushed to design and implement a very flexible "multitasker."

As we read and evaluate your RFP, a strong common thread can be seen between The City of Rochester's published requirements and AmeriTrak's accomplishments at MnDOT. However, we also see areas that differ significantly and offer ambitious machine-to-machine / system-to-system integration opportunities. This ambitious strategy fits perfectly within the design and direction of AmeriTrak's product line and future development directions.

## Company Background Information

### ***Brief historical summary***

As mentioned, AmeriTrak was founded in early 2004. The two founders of AmeriTrak go back even further, to late 1999, when they were partners in a now defunct AVL company known then as ComStar. AmeriTrak's successful experience with GPS processing, data collection and machine-to-machine (M2M) integration began in the late 1990's when embedded computing and field-to-base communication options were limited and challenging.

A few AmeriTrak highlights include the following events:

2004, Late	First customer was MnDOT. Small pool of metro-area patrol vehicles.
2006, Early	Began landside bus tracking operations for Kansas City International Airport. Ongoing.
2006, Late	Began a pilot snow-and-ice AVL project with New York State DOT. This project is on going.
2007, Mid	Began designing and implanting an airside runway incursion prevention system in conjunction with a large metropolitan airport. Ongoing.
2009, Late	Awarded a Minnesota State contract for statewide snow and ice vehicles. Ongoing and expanding.
2011, Mid	MnDOT/AmeriTrak was awarded an ambitious Federal Highway Administration grant to prototype and implement intelligent mobile weather observations. "IMO Data Collection and Application Demonstration Project," solicitation number: DTFH61-08-D-00012. This project was recently granted Phase-II funding, continuing our efforts for the next two years.

### ***Vision, Mission and Strategic Company direction***

A strong research interest includes the technical development of machine-to-machine (M2M) and system-to-system (S2S) communication. Using this larger concept as our overall R&D template, we design our in-vehicle equipment, user interface clients and back-end systems to reflect and fit this model.

AmeriTrak firmly believes in, implements its systems with, and fully supports the Open Source Software movement. You will find Open Source software components within all levels of our products and services. For example, as we go forward as a company, all of our fielded mobile devices will be under operating system control. This and other Open Source concepts implement our vision of providing easy-to-extend products, essentially designing and building "multitaskers."

It is our belief that the best product ideas come from our customers, experts in their fields. They in turn rely upon us as implantation experts to combine Open Source components, industry standards for networking, storage and communication and our software development expertise to turn these ideas into reality.

We further believe our mission is to provide affordable computing and information solutions for corporations and government agencies, especially when taxpayer money is being used to fund projects.

The City of Rochester benefits greatly from these policies. A few examples are:

- A full operating system environment present in AmeriTrak’s mobile devices allows seamless extensions of the City’s office environment into each vehicle.
- Systems and policies that AmeriTrak has already put in place allows for the complete remote command-and-control of the AT500 and AT400 telematics packages. Extensions to our policies can be easily implemented.
- Documentation for all of our Open Source components is readily available
- Development of additional functionality on AmeriTrak’s mobile platform can be accomplished by City IT staff. AmeriTrak will help your staff get started, if this direction is of interest.

**Three-year history of research and development**

R&D highlights during the past three years include:

- AmeriTrak has been adding considerable functionality to the AT500 and AT400, mostly driven by MnDOT requirements and suggestions.
- Considerable time was spent implementing the joint MnDOT/AmeriTrak FHwy grant “IMO Data Collection and Application Demonstration Project,” solicitation number: DTFH61-08-D-00012.
- A full J1939 and OBD-2 CAN-bus interface has been developed and fielded.
- Several large-scale, real time M2M interfaces were designed and implemented. Consumers of AmeriTrak’s real time data include:
  - National Center for Atmospheric Research (NCAR)
  - Clarus (Mixon-Hill)
  - Meridian Environmental Technologies
  - The City of St. Paul

**Vendor information**

<b>Question</b>	<b>Vendor Response</b>
Official name of Company	AmeriTrak Fleet Solutions, LLC
Headquarters address	12978 Haven Road, Little Falls, MN 56345
Telephone number	(612) 310-1419
Fax number	(888) 437-1180
Federal tax Id number	20-169-8091
Names under which the business has operated within the last ten years	AmeriTrak Fleet Solutions, LLC
Contact name for questions concerning this RFP response	Bev Edelstein
Contact’s telephone number	(612) 310-1419
Contact’s e-mail address	Bev@AmeriTrak.biz
Is company authorized and/or licensed to do business	AmeriTrak currently conducts business with New York

<b>Question</b>	<b>Vendor Response</b>
in the State of New York?	State DOT.
Does your company have an office in the City of Rochester or County of Monroe?	No. Flower City Communication represents AmeriTrak in Rochester and the State of New York.
Company ownership	Private
If Private, list primary owners and their percentage ownership.	Contact AmeriTrak for this information
If Public, list stock trading symbol and market which it is traded.	----
Has corporate ownership changed in the last five years? If so, provide details.	No
Has the company purchased any other companies or divisions of companies in the last 5 years? If so, provide details	No
Has the company or any of its principals defaulted on any municipal contracts in the past 5 years? If so, provide details.	No
Please provide details on any lawsuits involving the company that are currently pending or occurred in the past 5 years.	No lawsuits are pending
Has your company ever been declared bankrupt or filed for protection from creditors under state or federal proceedings? If so, state the date, court, jurisdiction, amount of liabilities and amount of assets.	No
Is your Company currently on the approved NYS Contract list? If yes, identify contract services.	No

### **Vendor Customer Reference**

<b>Company/organization name</b>	Minnesota Department of Transportation
<b>Contact name and position</b>	Curt Pape, Road/Weather Information System Coordinator
<b>Address</b>	Office of Maintenance and Security Mail Stop 722, Second Floor South 395 John Ireland Boulevard St. Paul, MN 55155-1899
<b>Telephone</b>	(651) 366-3571 Office (507) 381-3540 Cell
<b>Fax</b>	(651) 366-3555
<b>E-mail address</b>	<a href="mailto:curt.pape@dot.state.mn.us">mailto:curt.pape@dot.state.mn.us</a>
<b>Web site address</b>	<a href="http://www.dot.state.mn.us/">http://www.dot.state.mn.us/</a>

## Detailed RFP Response

### *Assumptions*

The proposed AmeriTrak solution is hosted by us at our downtown Minneapolis Data Center.

We will use this portion of our RFP response to present AmeriTrak's mobile device offering.

### *AT500 Device Photos*



**Figure 1: AT500 Front Panel.**



**Figure 2: AT500 Rear panel**

### AT500 Hardware Specifications

General Specifications	<ul style="list-style-type: none"> <li>• Fanless, compact embedded chassis</li> <li>• Cast aluminum sealed enclosure</li> <li>• 50-channel WAAS-corrected GPS receiver</li> </ul>
Power	<ul style="list-style-type: none"> <li>• Operational with both 12-volt and 24-volt systems</li> <li>• Power ignition status monitor and system on/off auto control</li> <li>• 5-V and 12-V (1-A) regulated power output</li> <li>• 1.11A Idle, 1.32A Running, 800mA Suspend, 10mA Off</li> </ul>
Chipset	<ul style="list-style-type: none"> <li>• Intel® Atom N270 CPU at 1.6 GHz</li> <li>• Intel 945GSE / ICH7M</li> </ul>
Memory and Storage	<ul style="list-style-type: none"> <li>• 1 or 2-G DDR2 SDRAM (internal memory)</li> <li>• SATA solid-state disk drive (any size &gt; 10Gig)</li> <li>• Type II <i>CompactFlash</i> socket</li> </ul>
Display Support	<ul style="list-style-type: none"> <li>• VGA and LVDS dual independent display</li> </ul>
Communication	<ul style="list-style-type: none"> <li>• Optional WLAN module</li> <li>• Optional Bluetooth module</li> <li>• USB modem devices for all carriers</li> </ul>
Ports	<ul style="list-style-type: none"> <li>• 3-serial: 2-RS232 and 1-RS232 / RS422 / RS485</li> <li>• 3-USB</li> <li>• Realtek 10/100/1000 Ethernet LAN port</li> </ul>
General Purpose I/O (GPIO)	<ul style="list-style-type: none"> <li>• 4 -Isolated digital inputs and 2-digital outputs (<i>expandable</i>)</li> </ul>
Audio	<ul style="list-style-type: none"> <li>• 2-Microphone inputs and 2-Audio line outputs</li> <li>• Audio amplifier supports stereo at 6W</li> </ul>
Certifications	<ul style="list-style-type: none"> <li>• ISO-7637-2</li> <li>• CE</li> <li>• FCC Part 15 Class B</li> <li>• e13 Mark</li> <li>• EN50155</li> <li>• IP40 and IP65 Protection Class</li> </ul>
Environment Specs	<ul style="list-style-type: none"> <li>• -30 to +60 C Operating temperature range</li> <li>• 10-90% non-condensing relative humidity</li> <li>• Random vibration: 2g at 5-500 Hz</li> <li>• Operating vibration, shock and crash hazard: MIL-STD-810F</li> </ul>

- We ship the AT500 with 1-gig of memory, but an additional 1-gig is available as an option.
- A 32 or 40-gig solid state hard drive (SSD) is installed, based on environmental concerns. That is, if vehicles are to be stored outside, the smaller drive is mandatory.

*AT400 Device Photos*



**Figure 3: AT400 Front Panel**



**Figure 4: AT400 Rear Panel**

### AT400 Hardware Specifications

General Specifications	<ul style="list-style-type: none"> <li>• Fanless, compact embedded chassis</li> <li>• Cast aluminum and sheet metal enclosure</li> <li>• 50-channel WAAS-corrected GPS receiver</li> </ul>
Power	<ul style="list-style-type: none"> <li>• Operational with both 12-volt and 24-volt systems</li> <li>• Power ignition status monitor and system on/off auto control</li> <li>• 5-V and 12-V (1-A) regulated power output</li> <li>• 1.11A Idle, 1.32A Running, 800mA Suspend, 10mA Off</li> </ul>
Chipset	<ul style="list-style-type: none"> <li>• Intel® Atom™ E640 1.0GHz</li> <li>• Intel EG20T</li> </ul>
Memory and Storage	<ul style="list-style-type: none"> <li>• 1 or 2-G DDR2 SDRAM (internal memory)</li> <li>• SATA solid-state disk drive (any size &gt; 10Gig)</li> <li>• Type II <i>CompactFlash</i> socket</li> </ul>
Display Support	<ul style="list-style-type: none"> <li>• VGA and LVDS dual independent display or</li> <li>• DB26 LVDS (with 12V for backlight &amp; USB2.0)</li> </ul>
Communication	<ul style="list-style-type: none"> <li>• Optional WLAN module</li> <li>• Optional Bluetooth module</li> <li>• USB modem devices for all carriers</li> </ul>
Ports	<ul style="list-style-type: none"> <li>• 2-serial: 1-RS232 and 1-RS232 / RS422 / RS485</li> <li>• 2-USB</li> <li>• Realtek 10/100/1000 Ethernet LAN port</li> </ul>
General Purpose I/O (GPIO)	<ul style="list-style-type: none"> <li>• 4 -Isolated digital inputs and 2-digital outputs (<i>expandable</i>)</li> </ul>
Audio	<ul style="list-style-type: none"> <li>• 1-Microphone input and 1-Audio line output</li> <li>• Audio amplifier supports stereo at 6W</li> </ul>
Certifications	<ul style="list-style-type: none"> <li>• CE</li> <li>• FCC</li> <li>• e13 Mark</li> </ul>
Environment Specs	<ul style="list-style-type: none"> <li>• -20 to +70 C Operating temperature range</li> <li>• 10-90% non-condensing relative humidity</li> <li>• Random vibration: 2g at 5-500 Hz</li> <li>• Operating vibration, shock and crash hazard: MIL-STD-810F</li> </ul>

- We ship the AT500 with 1-gig of memory, but an additional 1-gig is available as an option.
- A 32 or 40-gig solid state hard drive (SSD) is installed, based on environmental concerns. That is, if vehicles are to be stored outside, the smaller drive is mandatory.

### ***AT500 and AT400 Software Specifications***

The AT500 software environment is comprised of the following Open Source and AmeriTrak-written components.

- Linux OS, running kernel version 2.6.30
- X-Windows
- Secure shell FTP server (compatible with Filezilla)
- Apache web server
- Chrome web browser
- Enterprise-class relational database (for store-and-forward)
- Java runtime environment
- SVN auto-versioning client
- Cellular service provider agnostic (Verizon, Sprint or ATT)
- Optional VPN client
- Optional Managed Skype client
- Various AmeriTrak firmware applications

### ***Advantages of AmeriTrak's Proposed Solution***

- Because we implement the in-vehicle user interface as a “localhost” web site under control of Apache, this implies that any web service the City has implemented could run directly on the AT500 or AT400 mobile platforms. Some modifications may have to be made to accommodate the smaller screens, as well as the extension or modification of the City’s security policies. But, in general, this path offers a quick way to extend the City’s Enterprise suite of software into City vehicles.
- The in-vehicle user interface that runs on the optional 8” MDT is implemented as a “localhost” web site. This local website is written using a combination of PHP, JavaScript and Ajax. Therefore, changes to the in-vehicle user interface are easily implemented using easy-to-use web authoring tools.
- We configure each AT500 with “port forwarding” enabled. This allows the AT500 to share the cellular interface device, making the AT500 an Internet sharing device.
- The AT500 and AT400 telematics kits are “carrier-agnostic.” This allows the City to shop for the best cellular data plan, or to switch plans later.
- If the optional Wifi module is included, the AT500 can service as a mobile hotspot for other Wifi enabled devices such as hand-held scanners, tablets or laptops.
- Security policies for the AT500 can be customized by the City.
- All of AmeriTrak’s developed components are written in high-level languages, allowing for a multi-platform hardware environment. In fact, AmeriTrak has Microsoft Windows versions of its software available for those vehicle that are already equipped with laptops and cellular data plans.

### ***Projects Costs and Pricing Options***

See the pricing proposals at the end of this document.

### ***On-Going Support***

<b><i>Reference</i></b>	<b><i>Requirement</i></b>	<b><i>Response</i></b>	<b><i>Xref</i></b>
3.3.5.1	Toll Free Support Phone Number	<b>N</b>	
3.3.5.2	24 x 7 Support	<b>Y</b>	
3.3.5.3	Software / Application Support	<b>Y</b>	
3.3.5.4	Remote diagnostic support software	<b>Y</b>	
3.3.5.5	Remote diagnostic support hardware	<b>Y</b>	
3.3.5.6	Documented escalation procedures	<b>Z</b>	
3.3.5.7	Dedicated Tier 2 (Mid-Level expertise) support staff	<b>Y</b>	
3.3.5.8	Dedicated Tier 3 (Senior-Level expertise) support staff	<b>Y</b>	
3.3.5.8	Portal to exchange information and support	<b>Z</b>	

### ***Internal Information Technology Production Environment Support***

Since the AmeriTrak solution is hosted by us at our Minneapolis Data Center, Internal City IT staff can be as involved as desired.

### ***Product Installation and Maintenance***

Installation of AmeriTrak's telematics and tracking products can be done by City of Rochester personnel, with on-site AmeriTrak training, or AmeriTrak's business partner, Flower City Communication, can be hired to do the installations for the City.

The following photos show an AT500 installed into a MnDOT snow and ice vehicle.



**Figure 5: AT50 installation, left cabin view.**



**Figure 6: AT500 installation, right cabin view.**



**Figure 7: AT500 installation, showing the 8" MDT installed using a custom dash bracket.**

## Process Automation Requirements

### 6.1 Vehicles

A vehicle is any equipment that is used to perform a city service or activity. The City of Rochester has a myriad of vehicles starting from HHR's to side load packers and similar heavy duty trucks.

#### 6.1.1 Assign the vehicle to a route

Dispatch will assign a specific type of vehicle to the route depending on the type of activity to be performed.

<b>Reference</b>	<b>Requirement</b>	<b>Response</b>	<b>Xref</b>
6.1.1.1	Add a vehicle to a pre-determined group. <i>User Interface</i>	Y	
6.1.1.2	Change the vehicle from one group to another. <i>User Interface</i>	Y	
6.1.1.3	Change display icons for vehicles of the same group. <i>User Interface</i>	Y	

#### 6.1.2 Retrieve the vehicle from lot

After dispatch makes vehicle assignments, the driver walks into the lot to locate and drive the vehicle assigned to his route.

<b>Reference</b>	<b>Requirement</b>	<b>Response</b>	<b>Xref</b>
6.1.2.1	Identify the location of vehicles within the parking area (e.g. CVMF parking lot). <i>User Interface</i>	Y	6.1.2.1-A
6.1.2.2	Transmit a specific signal from the vehicle indicating that the vehicle is parked for service. <i>User Interface</i>	Z	

#### 6.1.2 Comments

6.1.2.1-A	This would be accomplished with AmeriTrak's geo-fencing facility.
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### 6.1.3 Drive the vehicle

The location of a particular job can be pre-determined if it is part of a regular route, or can be inferred from a work order / work request, and then the vehicle(s) involved in performing the same will drive to this address or location.

<b>Reference</b>	<b>Requirement</b>	<b>Response</b>	<b>Xref</b>
6.1.3.1	Perform engine kill after deeming it is safe to do so in lost or stolen equipment. <i>User Interface</i>	<b>Z</b>	
6.1.3.2	Perform route playback. <i>User Interface</i>	<b>Y</b>	
6.1.3.3	Provide a bread-crum trail for a specified time frame with no limitations on the different factors. <i>User Interface</i>	<b>Y</b>	
6.1.3.4	Capture geo-fence based events. <i>User Interface</i>	<b>Y</b>	
6.1.3.5	Auto email resources when a geo-fence event triggers. The City uses MS Exchange Server / Outlook for email applications and the vendor should be able to provide this service in the specified software environment. <i>Report</i>	<b>Y</b>	
6.1.3.6	Have unlimited geo-fences on a map. <i>User Interface</i>	<b>Y</b>	
6.1.3.7	Have overlapping geo-fences. <i>User Interface</i>	<b>Y</b>	
6.1.3.8	Activate or deactivate geo-fences User Interface based on the activity that we monitor.	<b>Y</b>	
6.1.3.9	Locate vehicle or vehicle groups at any given time. <i>Report</i>	<b>Y</b>	
6.1.3.10	Optimize the different routes to reduce vehicle miles travelled. The City uses RouteSmart Technologies' RouteSmart® for route optimization and the vendor must either integrate with RouteSmart® or provide an ancillary add-on to the AVL solution for route optimization. <i>User Interface</i>	<b>Z</b>	6.1.3.10-A
6.1.3.11	Set the ping rate based on vehicle type and / or use. <i>User Interface</i>	<b>Y</b>	
6.1.3.12	Store data on the device and forward (session persistence) when it can communicate back to the base. <i>Other</i>	<b>Y</b>	
6.1.3.13	Set what types of data are transmitted in real-time or near real-time (e.g. Location, Engine Trouble) and what types are stored for download (passive) at the end of the day (e.g. Time Between Service Stops) determined on a per vehicle basis <i>User Interface</i>	<b>Z</b>	6.1.3.13-A
6.1.3.14	Notify 911 or trigger emergency alarms from the device for certain vehicle (e.g. Panic button). <i>System Interface</i>	<b>Y</b>	
6.1.3.15	Capture vehicle maintenance and emergency repair issues (e.g. Engine light). The City uses CCG Systems' FASTER Fleet Management for management of its fleet of vehicles and equipment. The vendor must be able to provide integration with FASTER. <i>Report</i>	<b>Y</b>	6.1.3.15-A

<b>Reference</b>	<b>Requirement</b>	<b>Response</b>	<b>Xref</b>
6.1.3.16	Recognize and flag dangerous maneuvers (e.g. U-turns). <i>Report</i>	<b>Z</b>	
6.1.3.17	Notify (email, SMS) system administrator on alerts, alarms or flagged data. The City uses MS Exchange Server / Outlook for email applications and the vendor should be able to provide this service in the specified software environment. <i>Report</i>	<b>Y</b>	
6.1.3.18	Configure the unit to provide turn-by-turn directions. <i>User Interface</i>	<b>Z</b>	
6.1.3.19	Install modular AVL hardware to permit tracking a specific subset of vehicles through component removal and re-installation. <i>Other</i>	<b>Y</b>	
6.1.3.20	Vehicle operators can “flag” specific locations, and annotate conditions for immediate alert and follow-up, specifically upon encountering a potentially hazardous condition. <i>Business Form</i>	<b>Y</b>	
6.1.3.21	Track vehicle speed. <i>User Interface</i>	<b>Y</b>	
6.1.3.22	Track and report on vehicle miles traveled. The City uses CCG Systems’ FASTER Fleet Management for management of its fleet of vehicles and equipment. The vendor must be able to provide integration with FASTER. <i>Report</i>	<b>Y</b>	6.1.3.15-A
6.1.3.23	Initiate an alert if a vehicle becomes stationary for more than the designated period of time while the engine is running (i.e. Idle time). <i>Report</i>	<b>Y</b>	
6.1.3.24	Set minimum speed levels for reports based on activity. <i>Report</i>	<b>Y</b>	
6.1.3.25	Utilize “geo-fences” to deter travel beyond approved geographic limits and identify potential abuses. <i>User Interface</i>	<b>Y</b>	
6.1.3.26	Transmit alerts using data from the OBD-2 interface would be sent out over a communication network indicating when preventative maintenance is required. The City uses CCG Systems’ FASTER Fleet Management for management of its fleet of vehicles and equipment. The vendor must be able to provide integration with FASTER. <i>System Interface</i>	<b>Y</b>	6.1.3.15-A
6.1.3.27	“Encrypt” wireless data streams. <i>Other</i>	<b>Y</b>	
6.1.3.28	Notify the vehicle driver approaching hazardous/ road conditions (e.g. Speed bumps) with periodic refresh from a leading provider of maps, traffic and location data. <i>System Interface</i>	<b>N</b>	
6.1.3.29	Utilize AVL data as a remote/virtual inspection force. <i>Other</i>	<b>Z</b>	
6.1.3.30	Notify system administrator that a vehicle needs regeneration. <i>Report</i>	<b>Y</b>	6.1.3.30-A
6.1.3.31	Vehicle operators can inform dispatch when the vehicle is idling for regeneration. <i>Decision Criteria</i>	<b>Z</b>	6.1.3.30-A

<b>Reference</b>	<b>Requirement</b>	<b>Response</b>	<b>Xref</b>
6.1.3.32	Run reports to validate vehicle regeneration calls. <i>Report</i>	<b>Z</b>	6.1.3.30-A
6.1.3.33	Differentiate (color code) vehicles that are regenerating. <i>User Interface</i>	<b>Z</b>	6.1.3.30-A
6.1.3.34	Track the status of a boom on boom trucks (e.g. Boom-up or Boom-down). <i>System Interface</i>	<b>Y</b>	

### 6.1.3 Comments

6.1.3.10-A	AmeriTrak will integrate with RouteSmart®.
6.1.3.13-A	All data is sent at the time of acquisition. This feature, to delay certain data sets until later, can be easily added to the AT500 and AT400.
6.1.3.15-A	AmeriTrak will integrate with FASTER®.
6.1.3.30-A	AmeriTrak would accomplish this with its J1939 CAN-bus interface.

### 6.1.4 Dump the vehicle

The vehicle is driven to pre-determined dump locations to off-load the carrying weight.

<b>Reference</b>	<b>Requirement</b>	<b>Response</b>	<b>Xref</b>
6.1.4.1	Notify when the load limits have been exceeded on dump trucks. <i>System Interface</i>	<b>N, Z</b>	6.1.4-A

### 6.1.4 Comments

6.1.4-A	<p>It is unclear to AmeriTrak how this would be accomplished.</p> <ul style="list-style-type: none"> <li>• If onboard scaling is present on some vehicles, AmeriTrak would be glad to integrate with this interface.</li> <li>• If an external scale is present, and this scale features an external interface, AmeriTrak could also integrate with an external scale.</li> </ul>
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**6.1.5 Fuel the vehicle**

The vehicle is driven to the pre-determined city fueling facilities (unless there is an emergency or special memo in vogue) if this is part of a process mandate (i.e. must fuel at the close of shift) or on an as needed basis.

<b>Reference</b>	<b>Requirement</b>	<b>Response</b>	<b>Xref</b>
6.1.5.1	Integrate with a fuel system. The City uses OPW Petro Vend’s K800™ Fuel Control System for centralized control of our fueling operations. We use OPW’s Phoenix™ software to import and update fuel data from Petro Vend. <i>System Interface</i>	<b>Z</b>	6.1.5-A
6.1.5.2	Validate that the vehicle is authorized to fuel at a specific facility. The City uses OPW Petro Vend’s K800™ Fuel Control System for centralized control of our fueling operations. We use OPW’s Phoenix™ software to import and update fuel data from Petro Vend. <i>User Interface</i>	<b>Z</b>	6.1.5-A

**6.1.5 Comments**

6.1.5-A	AmeriTrak will integrate with Petro Vend ®.
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**6.1.6 Set salt application rate on the vehicle**

We use FORCE® America equipment on our salting vehicles. The driver sets the pre-approved salt application rate. The management staff makes this call with the knowledge of the road surface temperatures that they can get from the sensors on the vehicles.

<b>Reference</b>	<b>Requirement</b>	<b>Response</b>	<b>Xref</b>
6.1.6.1	Monitor salting rate and determine amount left. The City uses FORCE® America’s SSC5100 salt spreader controls to manage the distribution and application of anti-icing materials during winter operations. The Vendor must integrate their solution with FORCE® America. <i>System Interface</i>	<b>Y</b>	
6.1.6.2	Monitor salt spreader gate status (open/closed). The City uses FORCE® America’s SSC5100 salt spreader controls to manage the distribution and application of anti-icing materials during winter operations. The Vendor must integrate their solution with FORCE® America. <i>System Interface</i>	<b>Y</b>	
6.1.6.3	Flag the system with an empty salt truck. The City uses FORCE® America’s SSC5100 salt spreader controls to manage the distribution and application of anti-icing materials during winter operations. The Vendor must integrate their solution with FORCE® America. <i>User Interface</i>	<b>Z</b>	

**6.1.7 Plow and/or salt streets with the vehicle**

During the winter months, equipment operators drive thru the city streets performing plowing and salting operations. Any truck with a plow, or vehicles with salt bodies, can be used for this purpose.

<b>Reference</b>	<b>Requirement</b>	<b>Response</b>	<b>Xref</b>
6.1.7.1	Capture the percentage of a given route completed. <i>User Interface</i>	<b>Z</b>	6.1.7.1-A
6.1.7.2	Track the status of a plow (e.g. Plow - up or plow - down). The City uses FORCE® America’s vehicle equipment to control and manage roadway plowing during winter operations. The Vendor must be able to integrate their solution with FORCE® America. <i>System Interface</i>	<b>Y</b>	

**6.1.7 Comments**

6.1.7.1-A	The successful outcome of this requirement will involve AmeriTrak working closely with the City to implement this feature. Although not difficult, many different parameters may be required to accurately compute this result.
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**6.1.8 Sweep streets with the vehicle**

From May through October, equipment operators drive thru the city streets performing sweeping and flushing operations.

<b>Reference</b>	<b>Requirement</b>	<b>Response</b>	<b>Xref</b>
6.1.8.1	Track and report the level of water in the water tank of sweepers. The City uses Elgin Pelican® Three-Wheel Broom Sweepers (mix of mechanical and hydraulic) and Elgin Crosswind® 4 Wheel Regenerative Air Sweepers. The vendor must be able to integrate their solution with Elgin vehicle equipment. <i>System Interface</i>	<b>Z</b>	6.1.8-A
6.1.8.2	Track the status of the water flow on sweepers (e.g. water flow on or water flow off). The City uses Elgin Pelican® Three-Wheel Broom Sweepers (mix of mechanical and hydraulic) and Elgin Crosswind® 4 Wheel Regenerative Air Sweepers. The vendor must be able to integrate their solution with Elgin vehicle equipment. <i>System Interface</i>	<b>Z</b>	6.1.8-A
6.1.8.3	Track the filter status on sweepers (check if filter is clogged or needs replacement). The City uses Elgin Pelican® Three-Wheel Broom Sweepers (mix of mechanical and hydraulic) and Elgin Crosswind® 4 Wheel Regenerative Air Sweepers. The vendor must be able to integrate their solution with Elgin vehicle equipment. <i>System Interface</i>	<b>Z</b>	6.1.8-A

<b>Reference</b>	<b>Requirement</b>	<b>Response</b>	<b>Xref</b>
6.1.8.4	Track the status of the debris hopper on sweepers (check if hopper is full). The City uses Elgin Pelican® Three- Wheel Broom Sweepers (mix of mechanical and hydraulic) and Elgin Crosswind®4 Wheel Regenerative Air Sweepers. The vendor must be able to integrate their solution with Elgin vehicle equipment. <i>System Interface</i>	<b>Z</b>	6.1.8-A
6.1.8.5	Track the status of a broom on sweepers (e.g. Broom - up or Broom - down) independently for curb-side and street-side brooms. The City uses Elgin Pelican® Three-Wheel Broom Sweepers (mix of mechanical and hydraulic) and Elgin Crosswind®4 Wheel Regenerative Air Sweepers. The vendor must be able to integrate their solution with Elgin vehicle equipment. <i>System Interface</i>	<b>Z</b>	6.1.8-A

#### **6.1.8 Comments**

6.1.8-A	The ATE-SA10 Event Module can be used to acquire all of the above-mentioned signals.
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#### **6.1.9 Park the vehicle**

The vehicle will be returned to its starting point by default to park vehicle. If the driver identifies or suspects a mechanical issue with the vehicle, he drives to the Central Vehicle Maintenance Facility (CVMF) and parks it for service in the lot.

<b>Reference</b>	<b>Requirement</b>	<b>Response</b>	<b>Xref</b>
6.1.9.1	Transmit a specific signal from the vehicle indicating that the vehicle is parked for service. <i>User Interface</i>	<b>Y</b>	6.1.9-A

#### **6.1.9 Comments**

6.1.9-A	This would be accomplished with AmeriTrak's geo-fencing facility.
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**6.1.10 Dispatch City vehicles for contractor routes with breakdowns**

When a contractor calls in a breakdown, these routes will be covered with a vehicle from the City fleet.

<b>Reference</b>	<b>Requirement</b>	<b>Response</b>	<b>Xref</b>
6.1.10.1	Add a vehicle to a different group (e.g. add an arterial vehicle under contracted snow plowing). <i>User Interface</i>	<b>Y</b>	
6.1.10.2	Differentiate this route from all other normal routes under this group / activity. <i>User Interface</i>	<b>Z</b>	
6.1.10.3	Track the status of a plow (e.g. Plow-up or plow-down). The City uses FORCE® America’s vehicle equipment to control and manage roadway plowing during winter operations. The Vendor must be able to integrate their solution with FORCE® America. <i>System Interface</i>	<b>Y</b>	

**6.2 Maps**

The map object can be any physical or electronic maps used by equipment operators to reference their route, route sequence or a single location.

**6.2.1 Review the map to determine route sequence**

The equipment operator refers to map data to determine best route, next address in sequence etc.

<b>Reference</b>	<b>Requirement</b>	<b>Response</b>	<b>Xref</b>
6.2.1.1	Display a map interface on the onboard dashboard. We require ArcGIS 10 or a comparable map interface using the City's existing map layers and or routes for the different services/operations so we can track operations in a route centric or service centric format. <i>User Interface</i>	<b>Z</b>	
6.2.1.2	Resolve address on work request and plot on map. The address could come from our work order system, so we require that the AVL solution be able to resolve address information and geo reference the address provided by the work order system, in various possible address formats. <i>Other</i>	<b>Z</b>	
6.2.1.3	Display route to work location. Possible use of turn-by-turn navigation with spoken and visual instructions. <i>System Interface</i>	<b>Z</b>	
6.2.1.4	Update route to accommodate dynamic work request changes. Routesmart® or use of the in-built routing software. <i>System Interface</i>	<b>Z</b>	

<b>Reference</b>	<b>Requirement</b>	<b>Response</b>	<b>Xref</b>
6.2.1.5	Plot work locations on the map when User Interface on route. If the driver observes a situation needing attention, they can mark the location of work on a map available on the on-board display, which then is delivered to dispatch at regular intervals for further research and assignment.	<b>Z</b>	
6.2.1.6	Switch between weather maps and geo-fences to help make decisions. <i>User Interface</i>	<b>Z</b>	
6.2.1.7	Configure the unit to provide turn by turn directions with a map display. <i>User Interface</i>	<b>Z</b>	

### **6.2.2 Monitor the contractor vehicle location for compliance**

The contractors are assigned specific routes and are monitored for route compliance (e.g. they cannot deter from the route boundaries when a route is in progress).

<b>Reference</b>	<b>Requirement</b>	<b>Response</b>	<b>Xref</b>
6.2.2.1	Determine all vehicles are at their respective start points. <i>Report</i>	<b>Y</b>	
6.2.2.2	Verify that a contract vehicle is within the geo-fenced area when the activity is in progress. <i>User Interface</i>	<b>Y</b>	

### **6.3 Work Requests**

A work request is a record, form or document describing work to be done, and furnishes information about work location, route etc. This can be generated from several different systems in the city including LAGAN, Maintain-IT, Mainframe etc.

#### **6.3.1 Review the work request to determine work to be completed**

The equipment operator reads a work request to determine the location where work needs to be performed.

<b>Reference</b>	<b>Requirement</b>	<b>Response</b>	<b>Xref</b>
6.3.1.1	Access work request from an onboard display. <i>User Interface</i>	<b>Z</b>	
6.3.1.2	Make modifications to work request and track changes. <i>User Interface</i>	<b>Z</b>	
6.3.1.3	Dynamically add work request to existing work queues. <i>User Interface</i>	<b>Z</b>	
6.3.1.4	Integrate a work order/complaint management system within, or as a complement to, an AVL solution. <i>System Interface</i>	<b>Z</b>	

### 6.3.2 Create the work request

Depending on the source of the work request, different personnel can create work requests in the system if they are assigned permissions to do so.

<b>Reference</b>	<b>Requirement</b>	<b>Response</b>	<b>Xref</b>
6.3.2.1	Set up an activity in the AVL system to reflect the crew performing work requests for the day. <i>Other</i>	<b>z</b>	

### 6.3.3 Notify on the work request status

Inform dispatch about the status of a work request and/or provide updates.

<b>Reference</b>	<b>Requirement</b>	<b>Response</b>	<b>Xref</b>
6.3.3.1	Readily integrate spatial and, where applicable, vehicle status data gathered through the AVL system into LAGAN, the customer relationship management software utilized by 311. <i>System Interface</i>	<b>z</b>	

### 6.3.4 Update the work request

Update the work request with notes and status updates provided by field personnel.

<b>Reference</b>	<b>Requirement</b>	<b>Response</b>	<b>Xref</b>
6.3.4.1	Readily integrate spatial and, where applicable, vehicle status data gathered through the AVL system into LAGAN, the customer relationship management software utilized by 311. <i>System Interface</i>	<b>z</b>	
6.3.4.2	Capture the percentage of a given route completed. <i>Decision Criteria</i>	<b>z</b>	

## 6.4 Dispatch Records

A dispatch record is an entry in the Dispatch System, which is implemented using Microsoft Access. This system has the ability to track the progress in snow and ice related activities like plowing, salting, towing and more.

### 6.4.1 Dispatch the vehicle

The dispatcher in every area will assign a specific vehicle to a route depending on the activity to be performed.

<b>Reference</b>	<b>Requirement</b>	<b>Response</b>	<b>Xref</b>
6.4.1.1	Interface with the data in the dispatch system. <i>System Interface</i>	<b>z</b>	
6.4.1.2	Track all the information currently stored in the dispatch system. <i>Other</i>	<b>z</b>	
6.4.1.3	Differentiate a dispatched vehicle from a vehicle in a lot. <i>User Interface</i>	<b>z</b>	

#### 6.4.2 Update the dispatch information

Make notes and change the status of an on-going activity in the dispatch system.

Reference	Requirement	Response	Xref
6.4.2.1	Equipment operator can update the dispatch system. <i>Business Form</i>	Z	

#### 6.4.3 Notify on the route status

Inform dispatch about the status of an activity or provide updates.

Reference	Requirement	Response	Xref
6.4.3.1	Have two way communications between the vehicles and dispatch (e.g. messaging, radio). <i>Other</i>	Z	

#### 6.4.4 Create the dispatch information

Create a record in the dispatch system capturing the details of an activity and recording its start.

Reference	Requirement	Response	Xref
6.4.4.1	Set up an activity in the AVL system to reflect the dispatch information. <i>Other</i>	Z	

### 6.5 Geo-databases

A geo-database is a data repository for spatial data storage and management.

#### 6.5.1 Update the geo-database with run information

Export route data from a web-based system and import it into a geo-database for persistent storage.

Reference	Requirement	Response	Xref
6.5.4.1	Export historic AVL data into a commercial GIS environment for subsequent analysis. The City of Rochester has a centralized GIS using software products from Environmental Systems Research Institute (ESRI). Currently, ESRI® ArcView9.x client software is installed on desktop workstations throughout the City of Rochester. Central data storage of geographic data files is housed using ArcSDE and ArcIMS v4.0. System Interface	Y	6.5.1-A

#### 6.5.1 Comments

6.5.1-A	See our comments in Section 7.4, below.
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## SECTION 7 – Technical Requirements

This section of the document defines the technical requirements for the proposed system, which address architecture, data, security, and system interfaces.

### 7.1 Architecture

The purpose for the Architecture is to depict the technical elements that come into play within an informational system, in order to permit the applications to function smoothly with little or no downtime. It also functions as the baseline or foundation for which the applications reside and depend upon.

<b>Reference</b>	<b>Requirement</b>	<b>Response</b>	<b>Xref</b>
7.1.1	Provide architecture that is modular, scalable, and extensible.	<b>Y</b>	
7.1.2	Reside on any standard hardware platform and operating system (not proprietary).	<b>N</b>	7.1.2-A
7.1.3	Host the solution for the City of Rochester.	<b>! YES !</b>	
7.1.4	Provide a detailed plan with costing and assist in implementing the same if the City of Rochester decides to host the solution.	<b>Y</b>	
7.1.5	Provide an always-connected wireless data network.	<b>Y</b>	
7.1.6	Provide a satellite communication network for areas where ground-based wireless communications is weak.	<b>Y, but</b>	7.1.6-A
7.1.7	Receive and forward position information from the vehicle's satellite transmitter.	<b>Y, but</b>	7.1.6-A
7.1.8	Ability for two-way mobile messaging to allow email messaging to and from the driver over the Internet wireless communications link.	<b>Y</b>	
7.1.9	Send information via satellite, nationwide cellular network or radio frequency — or a combination thereof.	<b>Y</b>	7.1.9-A
7.1.10	Provide data transmission without recurring or monthly costs.	<b>Y, but</b>	7.1.10-A
7.1.11	Demonstrate experience with integrated AVL/GPS systems.	<b>Y</b>	

### 7.2 Comments

7.1.2-A	For speed, security and reliability, most of AmeriTrak's servers are Unix or Linux.
7.1.6-A	Although AmeriTrak is capable of providing satellite data communication from our mobile devices to or Data Center, the costs for this type of service are very high. Because fully networked data communication adds considerable overhead to any two-way M2M application, we would advise using AmeriTrak's passive, proprietary protocol over satellite.
7.1.9-A	AmeriTrak supports cellular, Wifi, UHF radio and satellite data communication. However, these four methods are not present on each mobile device. Changing from one communication method to another is done manually.
7.1.10-A	The only communication method AmeriTrak would provide to the City at no-charge would be Wifi.

<b>Reference</b>	<b>Requirement</b>	<b>Response</b>	<b>Xref</b>
7.1.12	Evolve with new technologies to meet future needs as they arise.	<b>Y</b>	
7.1.13	Perform a complete historic data recovery and reporting during an event of hardware failure or network failure emergencies.	<b>Y</b>	
7.1.14	Provide an open API to make integration processes.	<b>Y</b>	7.1.14-A
7.1.15	Provide seamless integration to PC based MS® Office products.	<b>Z</b>	7.1.15-A
7.1.16	Operate on most current version of Internet Explorer.	<b>Y</b>	
7.1.17	Use HTTPS and other secure means of data transmission including data encryption.	<b>Y</b>	
7.1.18	Interface with standard languages and protocols (not proprietary).	<b>---</b>	7.1.14-A
7.1.19	Configure software from an administrator point of view, with full audit of any configuration change captured.	<b>N</b>	
7.1.20	Support full software change control process with check-in and check-outs.	<b>Y, but</b>	7.1.20-A
7.1.21	Interface with Microsoft® SQL Server 2005 or higher.	<b>Y</b>	7.1.21-A
7.1.22	Provide complete on-line documentation including: Installation/Set-up & Configuration, Training/Tutorial, Application, Process Flow and Reference.	<b>Z</b>	
7.1.23	Define alerts at the user level to notify specified individuals or groups when triggered by an event.	<b>Y</b>	
7.1.24	Set-up alerts across all modules.	<b>Y</b>	
7.1.25	Set-up and receive administrative notification of specific activities that may not require user intervention (System Alerts).	<b>Z</b>	
7.1.26	Interface with the following to provide notifications: MS® Outlook Exchange email and PDAs.	<b>Y</b>	
7.1.27	Remotely manage the environment from a Vendor or City IT perspective using a web interface.	<b>Y</b>	

## **7.2 Comments, continued**

7.1.14-A	See the comments in Section 7.4, below.
7.1.15-A	AmeriTrak is capable of exporting many of its web reports to Microsoft Excel format, but we have not provided output to other Microsoft Office formats such as Word, Access, Visio, PowerPoint, etc.
7.1.20-A	We provide this feature on our mobile telematics platform. Our internal production software, implementing all functionality at our Data Center, is also strictly sub-version controlled, but is strictly an internal AmeriTrak development feature. In other words, AmeriTrak's internal production environment is never available to Customers.
7.1.21-A	A <i>yes</i> to this requirement refers to a custom interface database we could deploy for the City. Although the use of a Microsoft database is possible, we would strongly try to persuade you to use a different database technology.

## 7.2 Data Requirements

<b>Reference</b>	<b>Requirement</b>	<b>Response</b>	<b>Xref</b>
7.2.1	Display dates in the USA format.	<b>Y</b>	
7.2.2	Support the translation of views and instructions into multiple languages (e.g. English, Spanish).	<b>N</b>	
7.2.3	Provide Entity Relationship Diagrams (ERD) showing layout of tables, fields and data entity relationships.	<b>Y, but</b>	7.2.3-A
7.2.4	Provide data dictionary with ability to interface electronically to industry standard reporting environments (i.e. Microsoft® business intelligence).	<b>Y, but</b>	7.2.4-A
7.2.5	Provide numerous user definable fields in every table that will be used by the application.	<b>N</b>	7.2.3-A
7.2.6	Automatically archive and purge data per retention periods.	<b>Y</b>	

## 7.2 Comments

7.2.3-A	This would be true only for a custom database interface, discussed in the next section..
7.2.4-A	No to Microsoft, but yes to a Data Dictionary describing AmeriTrak's message formats.

## 7.3 System Administration, Security and Audits

<b>Reference</b>	<b>Requirement</b>	<b>Response</b>	<b>Xref</b>
7.3.1	Authenticate a person's credentials through Windows Active Directory®.	<b>N</b>	7.3.1-A
7.3.2	Easily set-up and maintain users within functional groups that can be nested, taking on the parents rights and restricting that further.	<b>Y</b>	
7.3.3	Effect Site/Group-level security (user can view site specific data or multi-site data based on security preferences assigned).	<b>Y</b>	
7.3.4	Effect Site/Group-Specific security configuration per user (user security access may differ from site to site).	<b>Y</b>	
7.3.5	Define read/select, insert, update, and delete in any combination or set for Module/Function/Field for any Group or Individual in an easy to maintain way.	<b>Y</b>	
7.3.6	Produce reports which identify who has access to run reports, audit trail log depicting report additions, deletions or changes noting the user who made, time and date stamp.	<b>Y</b>	

<b>Reference</b>	<b>Requirement</b>	<b>Response</b>	<b>Xref</b>
7.3.7	Capture a before and after snapshot of data (audit trails) that changes within a system in a text-based, non-system specific, human readable format. This should not hinder system performance, and be configurable and user friendly.	<b>Y</b>	7.3.7-A
7.3.8	Capture when reports are printed and noting the user, time and date stamp.	<b>Y</b>	7.3.8-A
7.3.9	Capture when reports are viewed and noting the user, time and date stamp.	<b>Y</b>	7.3.8-A
7.3.10	Limit access to information based on security level.	<b>Y</b>	
7.3.11	Display fields based on security level.	<b>Y</b>	
7.3.12	Limit editing capability to the record creator & security level.	<b>Y</b>	
7.3.13	Customize the software based on the end-user's role in the system.	<b>Y</b>	
7.3.14	Restrict the vehicle groups that a specific end user can see.	<b>Y</b>	
7.3.15	Restrict vehicle routes that a specific end user can see.	<b>Y</b>	

### **7.3 Comments**

7.3.1-A	Most of AmeriTrak's servers implement the Unix operating system.
7.3.7-A	Some of AmeriTrak's report generation web pages allow users to view and print the raw data used to generate the report. This is true for all material spreader report pages, but could be easily extended to other reports.
7.3.8-A	AmeriTrak's web site keeps track of who visits what page.

## 7.4 System Interfaces

AmeriTrak has designed and implanted many different machine-to-machine (M2M) interfaces over the years. Generally, a true “API” has not been made available, but Java source code, allowing agencies to log onto AmeriTrak AVL servers under programmatic control has been provided at no-charge.

There are two ways to receive data from the AmeriTrak Data Center:

<b>TCP-IP Client</b>	A real-time, socket-based TCP/IP client written in Java is provided for deployment at the City of Rochester’s Data Center. This client, using JDBC, allows our customers to receive all AmeriTrak data in real time and then populate an internal City database.
<b>Dedicated database server</b>	This method calls for a physical server to be purchased and hosted by AmeriTrak at AmeriTrak’s Data Center. Although AmeriTrak typically administers this interface machine, we also allow the City of Rochester to have complete administrative access to both the OS and database. AmeriTrak would populate this dedicated database in real time, and the City would attach to the database (continuously or on-demand) extracting data using standard SQL queries. Although AmeriTrak creates the initial schema for each customer’s dedicated database, we expect each customer to alter our initial suggestions, customizing the database interface to each unique need. We put no restriction on the number of tables or columns within each table, only suggesting that the database design be optimized for speed.

<b>Reference</b>	<b>Requirement</b>	<b>Response</b>	<b>Xref</b>
7.4.1	Interface with other software products owned by the vendor but which are in another family to meet a need that does not exist in the standard product, regardless of what platform that product may reside on.	<b>Y</b>	
7.4.2	Provide plug-in designs that do not require special coding.	<b>Z</b>	
7.4.3	Interface with third party sources of information via a Web Service call.	<b>Y</b>	
7.4.4	Perform data imports and exports from and to both desktop and applications running on other processors.	<b>Y</b>	
7.4.5	Interface seamlessly with barcode and other data collection devices.	<b>Y</b>	7.4-A
7.4.6	Interface with HID smart cards attached to user profiles.	<b>Y</b>	7.4-A
7.4.7	Provide remote help desk support via telephone and live on-screen control.	<b>Y</b>	

### 7.4 Comments

7.4-A	AmeriTrak has developed many interfaces to different hardware devices and platforms. However, we have not developed interfaces to barcode readers or HID smart cards. We would propose to extend our extensive, existing code base to accomplish these requirements.
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# Cost and Pricing Proposals