Automated Vehicle Locator (AVL) and Intelligent Transportation System (ITS) for the Department of Environmental Services Vehicle Fleet

A Proposal to

City of Rochester, New York

Solicitation #09423

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Automated Vehicle Locator and Intelligent Transportation System (AVL/ITS)

1 Introduction

This proposal is a joint effort between Applied Sciences Group, Inc (ASG), a Buffalo-based company, and Vnomics® Corp, a Rochester-based company.

The companies are capable of providing hardware, software and systems support for the AVL/ITS system for the City of Rochester. Vnomics will provide hardware, software, installation and training/help desk support; and ASG will provide project management, software support, integration with 3rd-party vendors and other subcontractors, and act as the single point of contact with the City of Rochester.

1.1 Applied Sciences Group

As a provider of engineering solutions in the areas of high tech, instrumentation, factory automation and project management since 1993, Applied Sciences Group is a qualified small business provider for subsequent City of Rochester solicitations in accordance with the mission of the company:

To integrate software solutions with the people who use them.

Applied Sciences Group, Inc. will provide technically superior engineering solutions for applications involving research, industrial and manufacturing environments, design-oriented engineering services, project management and training. Our service will be easily integrated by our customers, as we will blend into their structure while illustrating outstanding business ethics and superior technical expertise.

Applied Sciences Group takes great pride in its value proposition. We believe that with our staff of 35 highly-skilled software engineers, our experience with many disparate systems, equipments and programming languages and our dedication to quality developments that we are the best choice to lead and execute software development and systems engineering tasks, and providing subject matter expertise in matters related to database development, simulation and modeling, instrumentation, integration, data collection and data analysis. This can be seen by

- Our adherence to best practices;
- Our use of formal project management techniques;
- Our approach to requirements analysis and risk assessment prior to design;
- Our track record with projects of similar magnitude and complexity;
- Our existing staff expertise with significant database and programming languages.

1.2 Vnomics

Vnomics is a Rochester, NY based producer of Intelligent Transportation Systems that include AVL, GPS, vehicle monitoring, vehicle location, advanced driver monitoring, route monitoring/compliance and proactive maintenance monitoring. The company's products provide a complete telematics solution for military, transit authorities, municipal governments, and commercial trucking companies. Vnomics strives to be a best in class solutions provider as can be seen through the following:

- In the communications area, Vnomics is recognized as a premiere and preferred vendor for Sprint, Verizon, AT&T and Rodgers (Canada)
- In the hardware area, Vnomics has a strategic supply chain partnership with Advantech.
- A long-term strategic relationship with the Rochester Institute of Technology continues to provide customized research and algorithm development for our customer base.
- Vnomics has a strategic partnership with Lockheed Martin that focuses on technologies developed for the Department of Defense
- Vnomics is the preferred telematics supplier to Ameriquest/National Lease

- Vnomics is also an allied member of the NYS Motor Truck, Ohio Motor Truck and Georgia Trucking Associations
- Vnomics is affiliated with the DoD, ATA, Smartway

ASG and Vnomics are pleased to provide this response to the solicitation.

2 Summary

The City of Rochester wishes to improve the efficiency of public works vehicle dispatching by deployment of an automated vehicle location system coupled with software to optimize vehicle utilization. The RFP states 7 major objectives:

- Manage vehicles better;
- Optimize routing;
- Improve salting and snow plowing efficiency;
- Reduce vehicle miles;
- Improve air quality (through reduced vehicle utilization);
- Reduce accidents;
- Provide more reliable travel times.

Additionally, the RFP stresses the need for future expansion and new, yet undefined capabilities – hinting at the need for a highly robust and easily-scalable system.

This proposal provides an overall solution that addresses each of these objectives while maintaining high quality project management and integration standards to assure overall success and customer satisfaction.

Vnomics, FleetKnowSys™ is a one-system, fully-integrated and highly scalable solution that enables fleets of all kinds the confidence and reassurance knowing that the software can grow with them and meet their evolving needs. The quality of the recommendations that FleetKnowSys delivers in real-time is based off the ability to take in ALL information relating to the driver, truck, load, compliance, and environment at one time – fuse it together and intervene with an alert accompanied by an actionable recommendation. Other solutions on the market today offer modules that have silo information – the information gathered in each module doesn't fuse with other information from other modules. The "one-system, fully integrated information design" is something others in the market are only talking about achieving – Vnomics already has it!

FleetKnowSys is a platform for growth. The solution offers forward-looking functionality - based on current client needs – in order to create a design that is flexible enough to meet future requirements with minimal impact and cost.

For costing reasons this proposal focuses on a staggered installation of the first two phases as specified in RFP section 1.3.2 - *Snow & Ice Control*, and *Solid Waste Management* - representing approximately 87 and 80 vehicles, respectively. Contingent upon formal gap analysis, it may be possible to squeeze Phase 3 (Special Services Division) and its roughly 120 vehicles into the $800,000 Federal contract that Rochester received. Currently the estimated costs for all three phases slightly exceeds this limit, so inclusion of Phase 3 is not a certainly. Multiple cost scenarios are provided in this proposal for comparative purposes among the proposed options.

3 Response to RFP

3.1 Executive Summary

Applied Sciences Group

ASG is a service-oriented software and systems development company with a full-time, multi-disciplined engineering staff. ASG services many different industrial, commercial and public-sector markets. This multi-disciplined approach has allowed ASG to encompass a broad spectrum of business segments, which has helped make it more or less immune to the regular swings in business cycles over its history. The variety of work and our stability his has helped to foment a strong employee allegiance to the company. Employee turnover is very low.

ASG delivers between 40 and 100 completed projects a year. It has extensive expertise in a number of market areas, many of which are directly relevant to the type of development needed to successfully implement projects for the City of Rochester.

ASG is located directly across from the Buffalo International Airport, approximately 60 minutes from the City of Rochester.

Vnomics Corp

Vnomics, a local Rochester company, is a producer of Intelligent Transportation Systems that include vehicle location, advanced driver monitoring, route compliance/efficiency and proactive maintenance. The company's products provide a complete telematics solution for military, transit authorities, municipal governments, and commercial trucking companies. Vnomics monitors the location, the health of the vehicle and the driver's behavior in real-time. The unique in-cab coaching system improves the driver's fuel economy, route efficiency and safety. The onboard vehicle software assesses the vehicle health and in many cases can predict failures within the major vehicle subsystems. These features combine to greatly reduce a typical fleet operating costs and are accomplished through the reduction of fuel usage (5 to 15%), proactive maintenance (reducing maintenance expenses by 10 to 30%) and reduction of safety costs (10 to 40% on insurance and other safety related expenses).

Sections 3.2.1.7 and 3.2.3, below, contain a list of several additional ongoing projects that ASG and Vnomics deem relevant in order to demonstrate our knowledge and expertise.

3.1.1 Proposed Solution – Overview

Vnomics offers a complete, robust and scalable vehicle management system. The product includes all of the City of Rochester's Automatic Vehicle Locator/Intelligent Transportation System (AVL/ITS) requirements. In addition, Vnomics standard product includes additional features that reduce operating expenses from fuel, maintenance, and safety. The Vnomics Electronic Onboard Recorder (EOBR) monitors, records, assesses and communicates in real-time the operational status and health of the vehicle and its components.

The Vnomics AVI/ITS technical specification can be found in Appendix E

The proposed solution will be project managed by ASG and will include hardware and software from Vnomics and it strategic software partners, Agilis and Sygic:

- Agilis, a St. Louis, Mo based company, will have their Geofencing, Forms, Dispatch and Maps capabilities incorporated into Vnomics back office capabilities. You can learn more about Agilis at www.agilissystems.com
- Sygic, a Slovakian based company, will have their Turn by Turn software imbedded on our on-board hardware. You can learn more at Sygic at www.sygic.com

The Vnomics EOBR acts as a "black box", recording and storing everything that happens and will happen on the vehicle. The fuel savings come from a combination of detailed fuel usage analysis coupled with proper vehicle tuning and driver coaching. The unique technology monitors the way that the driver

operates the vehicle and coaches him/her into the *Envelope of Best Driving Practices™*. The product includes the company's patent pending Vnomic Shifting™ coaching program that includes classroom training, supervisor feedback, and an exclusive adaptive in-cab driver behavior modification system.

From a maintenance perspective, the robust Vnomics software can determine when vehicle health status is degraded and in some cases can provide early warning of pending maintenance problems. When these vehicle health issues occur, the system immediately notifies, in plain English warnings, both the driver and maintenance personnel. This can reduce or mitigate the effects of costly breakdowns by more than 80%. These warnings enable maintenance personnel to schedule repairs ahead of time, significantly reducing downtime and maintenance costs. When a component does fail, the system reports remotely back to the maintenance personnel, provides root cause of the failure and suggested actions to save money on third party maintenance expenses.

With regard to safety, several insurance companies offer reduced rates, up to 40%, for trucks with this black box technology installed. In addition, the system will provide safety feedback to the driver through the in-cab coaching system and send a real-time alert to a driver's supervisor via e-mail when it observes the driver operating the vehicle aggressively. The Vnomics system watches for unsafe lane changes, hard cornering, hard breaking and hard acceleration, etc. and with proper driver counseling has been shown to reduce accidents.

Vnomics' offering includes several options with a number of a la carte features that allows the City of Rochester to tailor its solution. In addition, the complete system includes integration of a handheld mobile device, which can be used for scanning barcodes, signatures, taking pictures, etc.

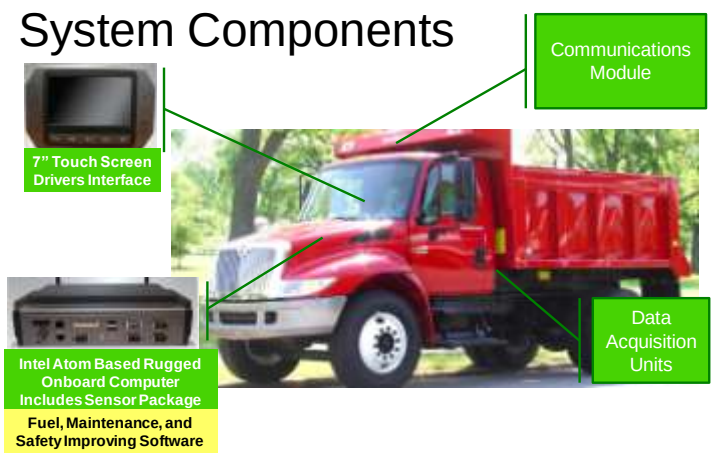


Figure 1 - System Components

Vnomics has developed a unique and scalable vehicle monitoring system (telematics) product, called FleetKnowSys. It has been proven to reliably observe, record, and interpret key parameters for critical platform systems along with providing fleet operators with in-cab driver coaching, condition-based maintenance and predictive maintenance features. The primary focus of this technology includes the following:

- Automatic Vehicle Location (AVL) and GPS
- Electronic Onboard Recorder (EOBR) from multiple sensor packages
- Geofencing with detection and notification
- Turn by Turn Directions
- Dispatch and Forms
- Electronic Hour of Service Logs
- Electronic Driver Vehicle Inspection Report (eDVIR)
- In-cab communications
- Detailed fuel use analysis and reduction

- Improved real-time vehicle health monitoring and prognostics
- Driver/Route safety & compliance
- Website and reporting
- Integration flexibility

The hardware (see *Figure 2 - Vnomics Communications Network* consists of an electronic onboard computer/recorder (EOBR) that connects directly with the onboard data buses (J1708, J1939, and future OBDII capability). Additional sensors are added as required to improve the accuracy of the maintenance assessments and predictions. The EOBR has built-in GPS, accelerometers, and assorted connectivity that enables the collection and transmission of vehicle health and driver performance data to the supervisors and vehicle maintainers in real-time. The in-cab driver's display provides unique real-time coaching via live feedback to the operators about their driving technique. It allows drivers to improve their performance with the resultant savings in fuel, lower maintenance costs, and increased safety. Another key feature of the system architecture is a unique communications system that makes use of multiple communication paths (cellular, Wi-Fi, and satellite) back to operations and maintenance personnel (see *Figure 4 - Fuel Analysis Report*).

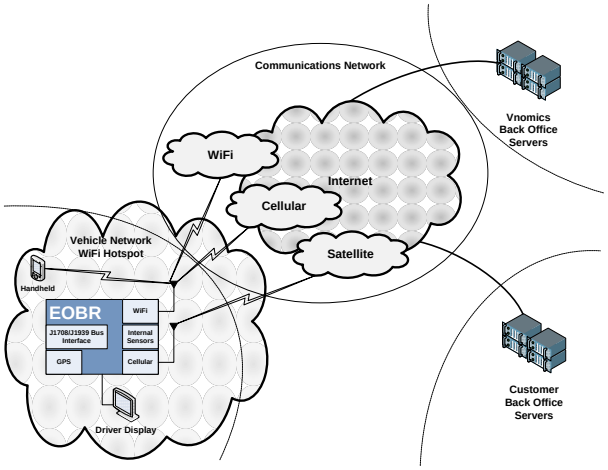


Figure 2 - Vnomics Communications Network

This robust communication system includes a priority system that minimizes communication charges and allows for rapid integration with existing hardware and software infrastructure based on individual customer needs. Vnomics has already integrated with other customer's handheld devices, peripherals, onboard, and back office software.

The Vnomics software resides in two areas; on the vehicle and in Vnomics' back office servers. The software consists of a number of modules that allows the client to choose features a la carte explained as follows:

On-Board Applications

The first of three main applications that runs on the EOBR is the Vehicle/Driver/Route Monitoring Software and In-Cab Advisor. The vehicle/driver monitoring assesses vehicle health and monitors driver behavior along with Vnomics' patent pending driver coaching system. Much of the processing is done onboard the truck so that the system can immediately alert the driver to potentially dangerous operating conditions or catastrophic route/maintenance events. The rugged onboard memory allows the system to coast through gaps in cellular coverage without any loss of data. The application also reduces the amount of data that has to be transmitted back via expensive cellular communication channels. The second major software application is the vehicle communications software that provides a prioritized data/voice channel for remote vehicle monitoring, turn by turn direction, work flow/dispatch, two-way communication, and ensures data transmission security and integrity. The final onboard application is the network services software that provides controlled web browsing and point-of-presence relay (Wi-Fi

Hotspot) for remote access to back office tools via the drivers display and/or handheld devices, laptops, etc.

Back Office Software

In the back office, the communication application ensures data transmission security and integrity for loading the Vnomics customer databases. It also allows the system to send supervisors and maintainers immediate email operational and health alerts that can be tailored for severity, scope of responsibility, and time of day. The second major piece, the customer portal and databases, provides creation and management of geofencing, forms creation, dispatch and monitoring of scheduled work, vehicle location, safe storage of alerts and vehicle data for analysis and reporting. The dedicated servers are housed in a secure SAS70 Type II Certified Enterprise Class Datacenter Facility, located in Rochester NY, with all the requisite protections. The final back office application is a customer web interface that provides stakeholder dashboards, a report generator, and two-way messaging capability.

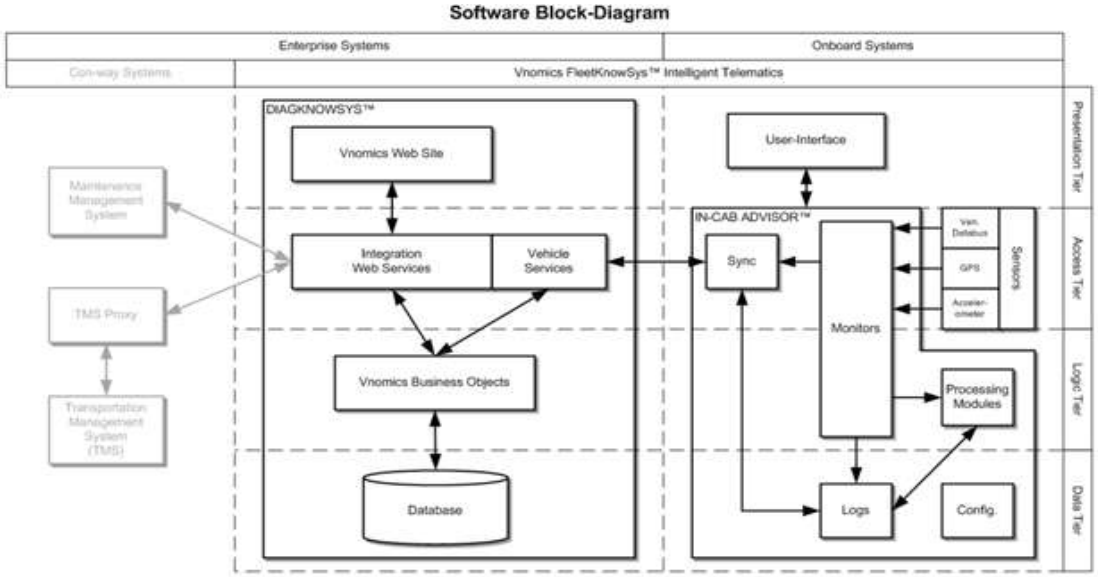


Figure 3- Software Block Diagram

With the use of the suite of products that FleetKnowSys offers, the City of Rochester will greatly achieve their stated goals of managing vehicles better; optimize routing; improve salting and snow plowing efficiency; reduce vehicle miles; improve air quality and reduce accidents.

3.1.1.1 Benefits to City of Rochester

There are many benefits to this solution:

- Availability of data to improve the overall decision-making process
- Improved supervisory decision making
- Command center composite situation display to analyze and recommend from a “big picture” viewpoint
- Improved maintenance reaction time and preventive maintenance scheduling
- Improved dispatch capability
- Fuel savings, maintenance savings, reduction in vehicle wear and tear
- Concomitant reduction in emissions, and improved air quality.
- Less road surface and tire wear and tear
- Scheduling efficiency gains
- Improved driver safety
- Likely and significant insurance rate reductions
- Historical trending leading to identification of both good and bad habits

- Web-based view-from-anywhere functionality
- Automated downloadable software updates (version control over the air)
- Room for future system functional growth and product longevity
- Built by local companies with solid performance records that plan to support the local economy for years to come.

3.1.2 Associated Costs and Timelines

A complete project cost analysis may be found in section 3.3.3, Project Costs and Pricing Options.

3.1.3 Additional Information

The ASG and Vnomics team approach provides **additional benefits** to the City of Rochester that are noted below.

3.1.3.1 Vnomics Distinguishing Features

The Vnomics product and platform can provide the requested telematics features of GPS tracking, geo-fencing, a two-way messaging system, and communication portal into the truck. However, Vnomics also includes a number of distinguishing features that provide the City of Rochester with a much stronger value proposition. These features are briefly described below:

3.1.3.2 Fuel Use Analysis and Reduction

Excess Fuel Used in Each Gear by Speed (gal)

Gear	Speed Range (mph)																					
	0-0.25	0.25-2.5	2.5-3.4	3.4-3.7	3.7-4.7	4.7-5.1	5.1-6.5	6.5-7	7-8.7	8.7-9.7	9.7-12.2	12.2-13.1	13.1-16.7	16.7-18.3	18.3-22.9	22.9-25	25-31.6	31.6-34.4	34.4-42.8	42.8-47.5	>47.5	Grand Total
1	7.04			0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.07
2						0.01	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07
3								0.05	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.11
4										0.24	0.06	0.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.51
5												0.39	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.46
6														1.53	0.41	0.00	0.00	0.00	0.00	0.00	0.00	1.93
7																3.33	1.27	0.00	0.00	0.00	0.00	4.61
8																		5.98	2.00	0.89	0.00	8.87
9																				7.87	26.90	34.78
10																						0.00
Total	7.04	0.00	0.00	0.00	0.03	0.01	0.06	0.05	0.05	0.24	0.06	0.61	0.07	1.53	0.41	3.33	1.27	5.98	2.00	8.76	26.90	58.40

Excess Fuel (gal)	%	Category
18.3	3.53%	Under-Reving
236.2	45.62%	Perfect Shfiting
7.0	1.36%	Idling
0.0	0.00%	Over-Reving
19.4	3.75%	Acceptable Shifting
32.0	6.17%	Over-Shifting
51.4	Total Fuel Wasted Shifting (gal)	
7.0	Total Fuel Wasted Idling (gal)	
517.7	Total Fuel Used (gal)	
2913.6	Total Miles	
5.63	Current MPG	
6.34	Potential mMPG	

Figure 4 - Fuel Analysis Report

In order to effectively reduce the amount of fuel used by a truck the Vnomics solution provides in-cab driver coaching, idle monitoring, speed monitoring, analysis of affect of vehicle specification, and vehicle tuning (see *Figure 5 - Typical Fuel Improvements*). The robust connectivity enables the Vnomics system to collect and transmit this performance data to the drivers, supervisors and vehicle maintainers. Data collection and fusion allows for Vnomics to determine, to the gallon, exactly where all the fuel is used by the truck. The product uses a sophisticated algorithm that calculates a driver shift score that ***uniquely normalizes*** for load weight, route, and terrain; elements that are typically masked by just considering MPG. This allows a true comparison to be made between drivers, regardless of assigned trips, loads, or

vehicle types. This critical information is provided so that the customer can target and take action on driver behavior, vehicle setup, operational processes and maintenance practices that are detrimental to fuel performance.

Rapid improvement in fuel economy
Significant reduction in carbon emissions

Vnomics Fuel Program Results Delivered:

Customer	Pre-Training MPG	Post-Training MPG	Improvement (to-date)	Time Post-Training (weeks)	Savings per Truck per Month
Private	6.87	8.37	21.8%	17	$609
LTL	5.81	6.15	5.9%	25	$222
Private	5.89	6.43	9.2%	23	$238
Private	5.50	6.00	9.1%	16	$253
LTL	5.80	6.31	8.8%	25-30	$372

Figure 5 - Typical Fuel Improvements

The FleetKnowSys software is also the only product on the market that gives the driver real-time feedback about how his/her performance is affecting fuel usage and the state of vehicle health. The system provides a series of audible tones that guide a driver into operating the vehicle so that it remains in the “sweet spot” of peak fuel economy. The driver is also provided performance feedback via the driver display on a trip-by-trip basis (*see Figure 6 - Driver Display*). To reduce driver distraction this information is displayed only when the vehicle is not in motion.

Figure 6 - Driver Display

Vnomics has also developed sophisticated health algorithms that report remaining life, allowing maintenance to be performed before a critical component fails. The software targets a number of systems that can lead to degraded performance, increased emissions, and increased fuel usage. Vnomics tracks maintenance issues that affect fuel mileage such as the fuel filter, the Exhaust Gas Re-circulation (EGR) Valve, and the Diesel Particulate Filter. This tracking is done directly from Diagnostic Trouble Codes available on the data bus.

3.1.3.3 Real-time Vehicle Health Monitoring and Proactive Maintenance

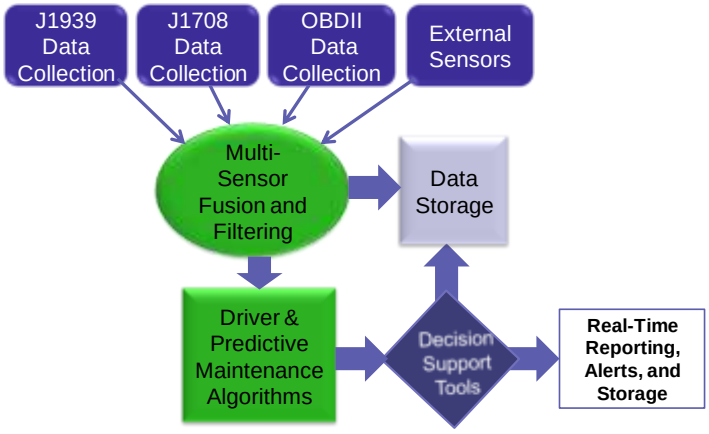


Figure 7 - Vnomics' Onboard System Architecture

The Vnomics FleetKnowSys software is compatible with the most popular commercial systems (SAE J1708, SAE J1939 and future OBDII capability) to provide the basic data sources allowing for remote vehicle diagnostics and prognostics along with in-cab driver coaching. The Vnomics software fuses information, as shown in *Figure 7 - Vnomics' Onboard System Architecture*, from multiple sources, to include the current operating conditions and driver behavior. The information is then processed through a series of predictive maintenance algorithms that assess the remaining useful life of the component. Decision support tools process the outcome of the algorithms to turn the conclusions into actionable information. This results in a clear vehicle system health assessment that provides early warning locally to the driver, and remotely back to operations and maintenance personnel of potentially catastrophic maintenance events and unsafe driving conditions. The information that Vnomics collects can also be integrated into existing maintenance programs and/or provides the basis for implementing a new Condition-Based Maintenance Program.

3.1.3.4 Driver Safety

Vnomics system monitors driver behavior not only for its impact on fuel, but also for safety. Vnomics' FleetKnowSys software determines when a driver is speeding, hard braking and accelerating, making unsafe lane changes, cornering too fast, and in the future could be used to determine if dynamic/static roll-over conditions exist. By immediately alerting a supervisor to this questionable behavior the number of accidents can be reduced. Some insurance companies are offering discounts to their customers who employ a system such as FleetKnowSys. The truck safety monitoring, real-time supervisor alerts and driver warnings reduce unsafe driving. Also, the ruggedized EOBR in the system can report exactly how an accident occurred, showing when the driver swerved to try to avoid the accident, how and when the brakes were applied, etc. All of these features reduce the cost of doing business for a fleet.

- Driver Scoring System
  - Hard braking, acceleration, cornering (tilt)
  - Speeding
  - Aggressive lane changes (swerving)
  - Following too close
  - Lane drift
  - Idle time
  - Fuel economy
  - HOS compliance
  - DVIR compliance
  - CSA compliance

  Fused together to create driver profile
  - Current and past behavior
  - Comparison within fleet and to other fleets
- Real-time supervisor alerts for aggressive driving
- Detailed accident reconstruction

Figure 8 - Driver Safety Scoring Items

3.1.3.5 On-Board Turn by Turn Sygic Software

Figure 9 - Sygic Turn by Turn Main Display

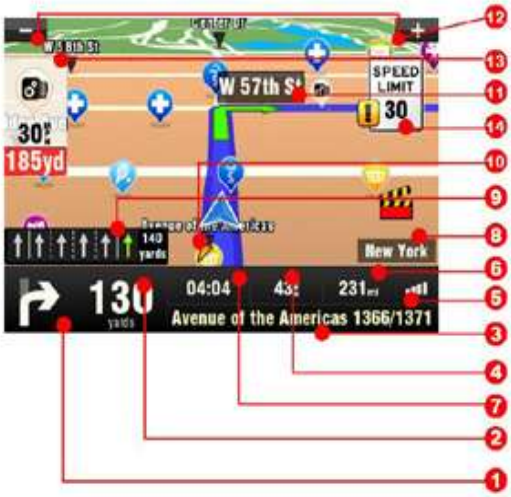
As Vnomics looks to enhance its features we look to integrate with the best in class providers to meet our customer needs. Sygic's Turn by Turn navigation is a great compliment to our software structure and is proven in many market segments. Specifically the following features will enhance the needs of the City of Rochester if need be:

- Previous work with snow removal companies
- Real-Time Traffic
- Speed Limit Sign on Map
- Maps stored on Device
- Lane Assistance

- Navigate to Postal Code
- Navigate to GPS Coordinates
- Multi-Stop Route Planning
- Points of Interest

Turn by Turn Navigation

The Navigation Screen will show the map of your surrounding area with the calculated route highlighted in blue.



As you approach a junction, further directions are displayed to indicate which road to take.

In addition to turn by turn directions, the Navigation Screen also provides a range of further useful information:

1 Next maneuver
2 Distance to next change of direction
3 Current road/street
4 Distance to destination
5 GPS signal strength
6 Current speed
7 Estimated time of arrival at destination
8 Current city
9 Lane Assistant
10 Heading to destination
11 Next road/street to take
12 Map zoom in/out
13 Speed camera warning
14 Current speed limit

Figure 10 - Sygic Turn by Turn Features

3.1.3.6 Website and Reporting

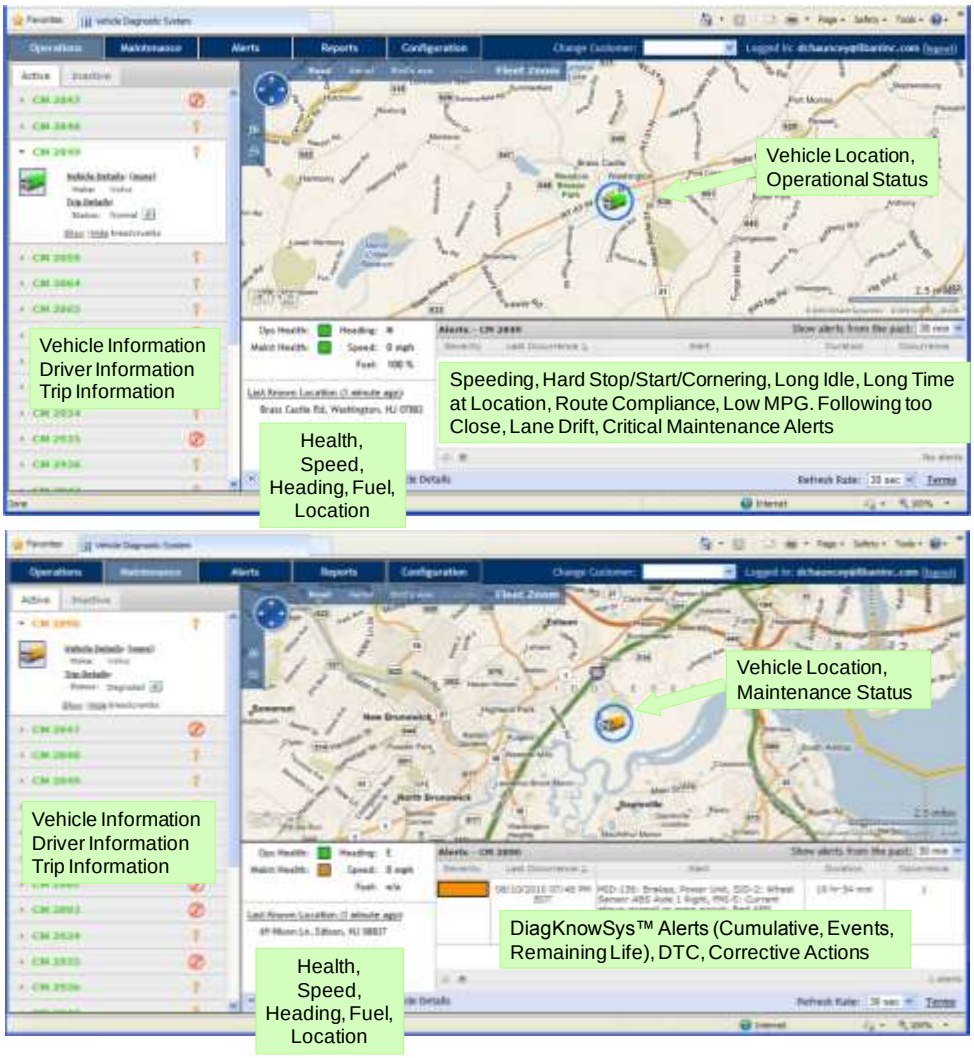


Figure 11 - Vnomics Operations and Maintenance Website Views

Vnomics hosted web pages, as depicted in *Figure 11 - Vnomics Operations and Maintenance Website Views*, provides all stakeholders (operations, maintenance, dispatch, etc.) with the information needed to turn collected data into actionable information. Vehicle status, location, operational and maintenance alerts, etc. are uploaded as often as every 45 seconds depending on the data plan selected by the customer. Integrated into the website is a series of customized reports that range from the trending information across the entire fleet, down to the individual truck maintenance health status and operating characteristics.

3.1.3.7 Geofencing

Through our integration with Agilis we are now capable of adding a series of robust features seamlessly through our back office portal. These features include the following:

- Identify drivers, jobs, assets and landmarks with custom icons on the map specific to the work being performed.
- Quickly identify a qualified worker closest to the job
- Overlay custom GIS files on the map to view GPS location information for your specific company's needs.

- Be alerted automatically when a mobile resource enters or leaves a user-defined area (Geofencing).
- Play back a history of where resources have been for any day or time (Breadcrumb Trail).

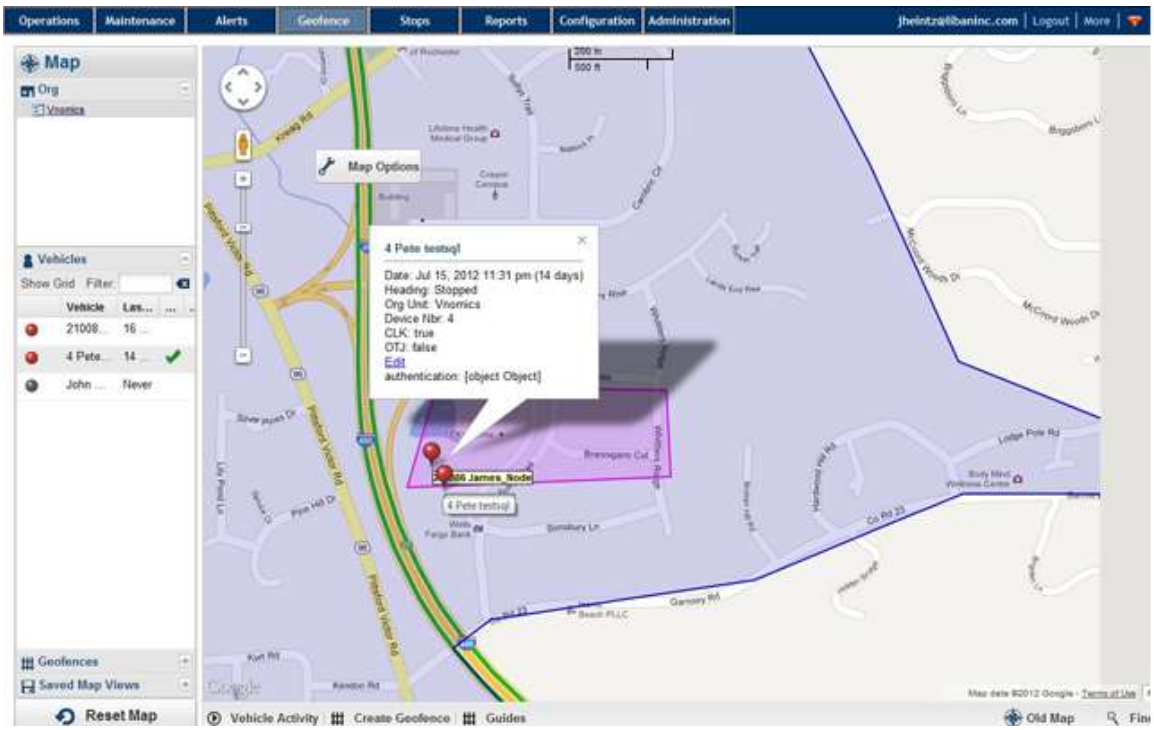


Figure 12 - FleetKnowSys with Embedded Agilis Geofencing

For fleet operators,

Driver Safety Scoring System

Safety Factor	Importance	# Incidents in Reporting Period	# Incidents per 1000 miles	Weighted Score
# of High Speed Incidents (> 70 mph)	H	2	0.24	2.35
# of Hard Accelerations	L	1	0.12	0.12
# of Hard Brakes	M	2	0.24	1.18
# of Hard Corners	M	2	0.24	1.18
# of Hard Lane Changes	M	1	0.12	0.59
# of Trips without seatbelt	H	0	0.00	0.00
Raw Safety Score	5.42			
Grade	94%			
Risk Assessment	LOW RISK			

Score of 0 is a perfect score.
Score of 10 means one of the following has occurred during 1000 miles:
- One High Speed incident
- Travel with no seatbelt
- Two occurrences of any of these:
  Hard Brake, Hard Acceleration, Hard Corner, Hard Lane Change

- Vnomics Proprietary Information -

Figure 13 - Driver Safety Scoring System below is an example of a summary report that is auto-generated from the company's backend database, which is available on demand via the customer portal. It allows fleet operators to closely track trends across the fleet and make informed decisions on what actions to take to improve fleet performance, particularly in the area of fuel economy.

Driver Safety Scoring System

Safety Factor	Importance	# Incidents in Reporting Period	# Incidents per 1000 miles	Weighted Score
# of High Speed Incidents (> 70 mph)	H	2	0.24	2.35
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- Travel with no seatbelt
- Two occurrences of any of these:
  Hard Brake, Hard Acceleration, Hard Corner, Hard Lane Change

- Vnomics Proprietary Information -

Figure 13 - Driver Safety Scoring System

As seen in *Figure 14 - Fleet Summary Fuel Report*, this example report provides the fleet operations manager with information about the amount of fuel wasted across the fleet. This is further broken down by the root cause of the inefficiency, such as excessive idling and poor driver shifting. The information enables the operations manager to institute operational changes to improve these deficiencies and improve their carbon footprint.

Fleet Statistics for 02/28/10 - 03/06/10

Current Weekly Fuel Consumption (gal.)	9,799.47
Potential Weekly Fuel Consumption (gal.)	8,577.93
Fuel Savings (gal.)	1,221.53 (12.5%)

Total Distance (mi.)	56,932.35
Total Fuel Consumption (gal.)	9,799.47
Current MPG	5.81
Potential MPG	6.64
Excessive Idle Time	1.20:38:11
Excessive Idle Fuel Loss (gal.)	25.68
Progressive Shifting Fuel Loss (gal.)	1,195.85
Excessive Speed Fuel Loss (gal.)	0.00
Number of High Accel. (> 0.35)	36
Number of Hard Brakes (< -0.35g)	28

Fleet Statistics for 03/07/10 - 03/13/10

Current Weekly Fuel Consumption (gal.)	9,589.49
Potential Weekly Fuel Consumption (gal.)	8,362.94
Fuel Savings (gal.)	1,226.56 (12.8%)

Total Distance (mi.)	56,526.64
Total Fuel Consumption (gal.)	9,589.49
Current MPG	5.89
Potential MPG	6.76
Excessive Idle Time	1.23:35:05
Excessive Idle Fuel Loss (gal.)	28.89
Progressive Shifting Fuel Loss (gal.)	1,197.67
Excessive Speed Fuel Loss (gal.)	0.00
Number of High Accel. (> 0.35)	18
Number of Hard Brakes (< -0.35g)	25

Fleet Statistics for 03/14/10 - 03/20/10

Current Weekly Fuel Consumption (gal.)	13,118.51
Potential Weekly Fuel Consumption (gal.)	11,372.42
Fuel Savings (gal.)	1,746.09 (13.3%)

Total Distance (mi.)	79,010.82
Total Fuel Consumption (gal.)	13,118.51
Current MPG	6.02
Potential MPG	6.95
Excessive Idle Time	2.19:33:18
Excessive Idle Fuel Loss (gal.)	41.57
Progressive Shifting Fuel Loss (gal.)	1,704.52
Excessive Speed Fuel Loss (gal.)	0.00
Number of High Accel. (> 0.35)	52
Number of Hard Brakes (< -0.35g)	58

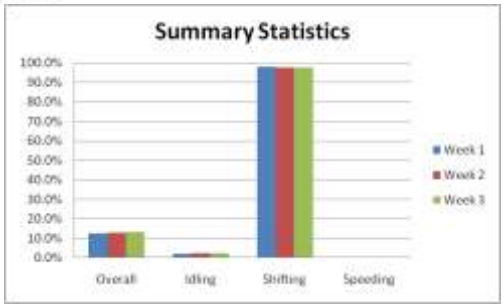

Figure 14 - Fleet Summary Fuel Report

The Vnomics system provides some innovative features that can significantly enhance existing customer capabilities. Its open architecture can readily integrate with other in-house or commercial software/hardware and it provides an easy path for adding future capabilities.

3.1.3.8 Benefits of a Broad Spectrum Service Provider

ASG is a broad-spectrum service provider. ASG uses the experience gained from its many projects to help understand and solve problems in other, not necessarily related business sectors. Our experience is that many industries and markets have analogous problems, and knowledge of multiple market segments vastly improves the efficiency by which optimal solutions to similar problems can be developed. Having an understanding of how industrial problems are solved, for example, may help to develop a robust solution in a commercial or public environment based on the observation of analogous problems in some other industry.

80 percent of ASG's business is in Upstate New York. ASG's business sectors include

- Municipalities
- Environmental applications
- Automation and Control
- Scientific programming (modeling and simulation)
- Database development
- Graphical user interfaces
- Internet applications
- Medical devices
- Pharmaceutical applications
- Embedded programming
- Military and space applications

Our average engineer has between 10 and 20 years' experience. Our engineers' average tenure at ASG is greater than 5 years. Almost every employee is a native Western New Yorker and is driven to sustain and grow ASG, in order to maintain the company's presence (and to help build the economy) in Western New York.

3.1.3.9 Benefits of a Local Provider

Vnomics and its technology come from more than a decade of local research conducted by Rochester Institute of Technology's (RIT) Center for Integrated Manufacturing Studies, a unit of the Golisano Institute for Sustainability, and the Office of Naval Research. The partnership led to the creation of a spin-off company, Vnomics (d/b/a of Liban Inc.). Vnomics and its Board members are committed to hiring locally as it continues its growth, involvement and proximity to the local community and the City of Rochester which is **synergistic to the goal of this RFP**.

Additionally, Vnomics' Board of Directors is comprised of local experts in finance, operations, and technology and includes 3 current or former public company CEOs. The Chairman, Ronald Zarrella, was directly involved in the development of OnStar while President of General Motors NA and recently retired as chairman and CEO of Bausch & Lomb. Dennis Mullen is the former CEO of Bird's Eye Foods and recently served as the CEO of the Empire State Development Corporation. Richard Kaplan CEO of Torvec, Inc., a supplier of automotive differentials and hydraulic pumps, has started 10 successful businesses. Nabil Nasr, Assistant Provost and Director of the Golisano Institute for Sustainability at RIT, was an integral part of the team who developed the original technology and is internationally recognized as one of the leaders in remanufacturing. Geoffrey Rosenberger, retired founder of Clover Capital Management, is a former transportation industry analyst. High Peaks Venture Partners is represented on the Board by Bela Musits, the Dean of the Union Graduate College of Business. RIT is represented on the Board by Dr. James H. Watters, RIT's Senior Vice President of Finance and Administration. The eighth board member is the CEO, David Chauncey an expert in start-ups and telecommunications technologies and one of the founders of Clearwire.

3.1.3.10 Benefits of a Team Approach

There is considerable engineering overlap between ASG and Vnomics, which will provide redundancy and longevity to this project. ASG will celebrate its 20th anniversary in February, 2013 and has established itself as a reliable, stable company in business for the long haul. In its 3-year history Vnomics has already built a clientele that represents a diverse customer base in the transportation industry. Vnomics customers rely on their innovative approach to solving operational challenges utilizing it unique application of its technology. ASG has provided significant software and database support to Vnomics during this period, and both companies have the expertise to provide additional software, integration, installation, training, and help desk support so that the City of Rochester's AVL/ITS needs are satisfied far into the future.

Combined, the two companies are nearly 75 employees strong with an additional subcontract bench of approximately 15 additional engineers.

3.1.3.11 Benefits to Rochester

Section 3.1.1.1 above lists the practical benefits that the ASG/Vnomics team solution provides to the City of Rochester.

3.2 Company Background Information

3.2.1 Brief Historical Summary

Applied Sciences Group

ASG was formed as a New York State "S" corporation in February, 1993. During the past 19 years it has grown from a 3-person company to one that employs 41 people with approximately 32 full-time equivalent engineers and dedicated Administrative, Financial, Sales and Marketing staff. It has two layers of corporate management and two layers of engineering management, with closed-loop communications established among all layers. See *Figure 15 - ASG Organizational Chart* in section 3.2.1.4.

Except for one administrative staff member, all ASG employees have college degrees, with over half the staff having attended SUNY Buffalo, RIT or both. Many staff engineers are dual-degreed, with at least

one of those degrees being electrical engineering, software engineering or computer science. ASG's staff has very diverse backgrounds in biology, mechanical engineering, physics, education and other disciplines.

QUICK STATS

Founded: 1993

Headquartered: Buffalo, New York

CEO: Henry Bacher

President: Paul Buckley

Employees: 41

Main Industry Served: Industrial, Commercial, Government and Municipal Markets

Offering: Engineering Management, Systems and Software Development, Systems Integration

Solution: FleetKnowSys through partnership with Vnomics

Website: ASGRP.com

Vnomics Corp

Vnomics is a privately owned and operated company and a Delaware "C" Corporation. The company is a privately held spin-out from Rochester Institute of Technology (RIT), one of the ten largest private universities in the country. The company has four main sources of capital investment: Private Investors, Rochester Institute of Technology, Astrolink International, a wholly owned Lockheed Martin affiliate, and High Peaks Venture Partners. These entities have invested $8 million to commercialize over $30 million of RIT research funded by the Department of Defense.

Vnomics as a company and its offerings come from more than a decade of research conducted by Rochester Institute of Technology's (RIT) Center for Integrated Manufacturing Studies, a unit of the Golisano Institute for Sustainability, and the Office of Naval Research. The program was funded through the efforts and support of the Rochester area Congressional and U.S. Senate delegations. In 2008, the partnership led to the creation of a spin-off company, Vnomics (formally known as Liban Inc), located in the RIT Ventures Creations business incubator.

The core technology of FleetKnowSys, the NowEngine, was developed over the past 10 years with more than thirty million dollars spent on research and development—specifically commissioned to help the United States armed forces stay safe and on task by predicting and alerting troops of vehicle part failures *before* they occurred. In 2006, the technology was granted a patent (currently pending) by the United States Patent Office and classified as a "one-of-a-kind" software innovation. After years of effort, investment, and impressive success, ***Vnomics has defined and now offers the New Generation in Fleet Management Software***.

QUICK STATS

Founded: 2008

Headquartered: Pittsford , New York

President & CEO: David Chauncey

Employees: 33 (and growing!)

Main Industry Served: Commercial Trucking

Offering: Fleet Management Software

Solution: FleetKnowSys

Website: Vnomicscorp.com

3.2.1.1 Overall Vision and Mission

Applied Sciences Group

ASG's vision is to provide applied engineering solutions to our client base. The company was originally created to fill the need in the Buffalo area for a go-to group that could be called on to solve software problems for which alternatives were neither cost-effective nor easily available. This Jack-of-all-trades philosophy has allowed ASG to grow large enough to support projects throughout the Northeast, and with organizations as diverse as General Motors and the Veterans Administration.

ASG's mission is straightforward: "*To integrate software solutions with the people who use them*." This translates to understanding how users interact with software, the hardware on which the software runs

and the system(s) that the software controls. Having Jack-of-all-trades knowledge and a multi-disciplined engineering staff is how ASG executes this mission.

Vnomics Corp

Vnomics is dedicated to helping fleet owners, executives, and managers operate the safest, most reliable, environmentally conscious, and profitable fleets in their industry. Vnomics offers **FleetKnowSys**, the Next Generation of Fleet Management Software for the Fleet industry.

FleetKnowSys is revolutionary primarily due to what is at its core—the **NowEngine**™. The NowEngine gives control and power to fleet owners and managers to confidently, quickly, and proactively make decisions necessary to operate their fleet at peak performance at all times and within the Envelope of Best Practices™ and industry compliance.

FleetKnowSys can influence outcomes and produce measurable value *in real-time*. Unlike other solutions on the market, of which have limited and disparate data functionality, FleetKnowSys continuously and simultaneously monitors and collects data relating to driver behavior, load impact, vehicle performance, and environmental conditions. The data from all collection points is fully integrated to deliver, in real-time, reliable, accurate, and actionable information that can be used at the time of vehicle operation. As a result, fleet owners, managers, and drivers can reap the benefits from FleetKnowSys the day it is installed.

3.2.1.2 Financial History

ASG's financial statements may be found in Appendix A.

Vnomics is privately held and does not give out financial statements. Please see the notes in Appendix A.

Please note that both companies are private and request that all financial information, **including Appendix A in its entirety**, *be considered proprietary and exempt from the public record.*

3.2.1.3 R&D Spending

Applied Sciences Group

ASG spends approximately $20K-$50K per year on internal R&D projects. As a service organization ASG does not normally pursue product development independent of client needs.

If client product development services are included, client-subsidized R&D spending approaches as much as $500K in any one year. This represents approximately 10-20% of ASG's yearly revenue and between 3 and 10 new product developments each year. Recent clients that fall into this category include

- American Dairy Association
- Bird Technologies
- Cobham Corporation
- New Era Cap
- EDGE Product Development
- Fisher-Price
- GE Research
- GE Transportation
- Great Lakes Orthodontics
- Goldline Controls
- Halare
- Ortho-Clinical Diagnostics
- Lorica
- Medical Conservation Devices
- Micro Instrument
- Praxair

- RR Donnelly
- Smartpill Corporation
- Veterans Health Administration
- Via Technology
- Vnomics
- Wendt Corporation

Vnomics

Vnomics devotes all of its employees and resources to the transportation solution area. 55% of the organization's direct human capital is devoted to engineering, research and development, client training, customer care and installation. 45% is devoted to operations, sales and administration.

3.2.1.4 Company Location and Staffing

Applied Sciences Group

ASG's staff is located in a single, secure facility situated directly across from the Buffalo-Niagara International Airport in Buffalo, NY.

Corporate and Engineering management consists of two layers each, as shown in the organizational chart below:

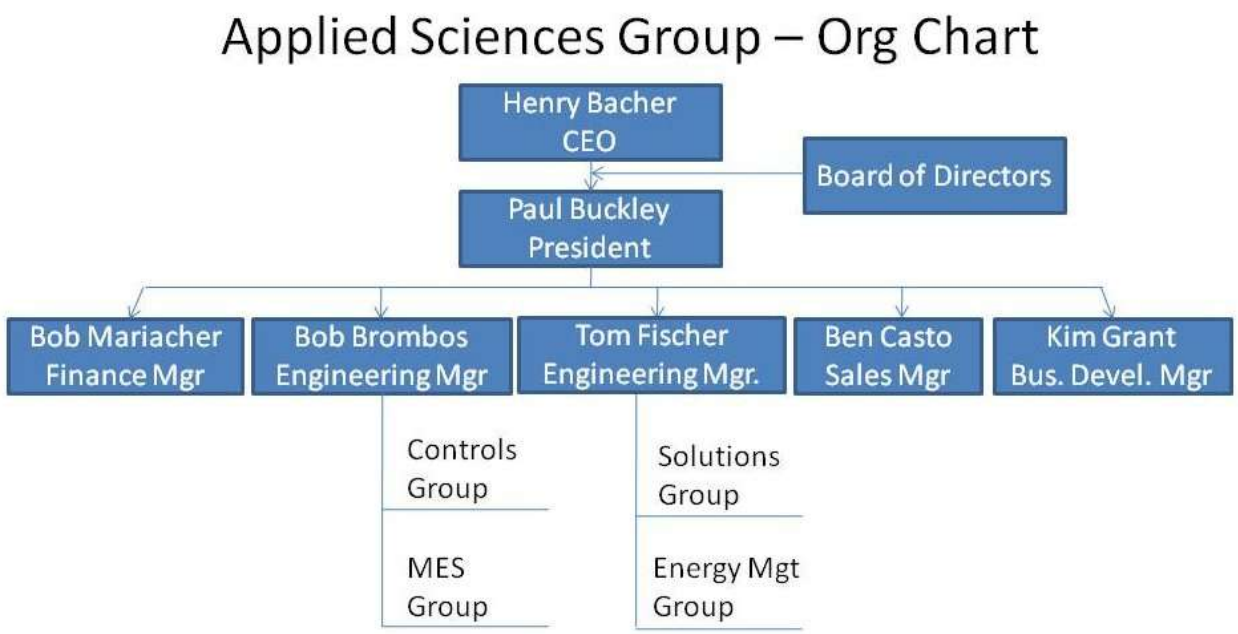

Figure 15 - ASG Organizational Chart

ASG's staff is hired on a full-time basis. Full-time employees are entitled to a salary plus generous fringe benefit package. Staffing is sometimes augmented with additional subcontractors on an as-needed basis.

Engineering management is responsible for overseeing all awarded projects based on the business sector. It is expected that solicitations from the City of Rochester would fall into the Solutions Group, under Tom Fischer's control. Tom reports to the company president (Paul Buckley). Lines of authority are clearly delineated. ASG is not matrix managed.

As with all other employees, corporate management is subject to both supervisor and peer reviews on a yearly basis, as well as post-project reviews when deemed necessary.

On all major projects ASG maintains a clear delineation of project management responsibilities apart from software development tasks. Project managers are responsible for

- Completion of project milestones;
- Adherence to schedule;
- Communications with the customer.

Vnomics Corp

Vnomics' corporate office is located in a single, secure facility situated on Sully's Trail in Pittsford, NY. The company continues to grow and we currently have 33 full-time direct employees, one part-time employee and 11 contracted software engineers.

Corporate and Engineering management is shown in the organizational chart below:

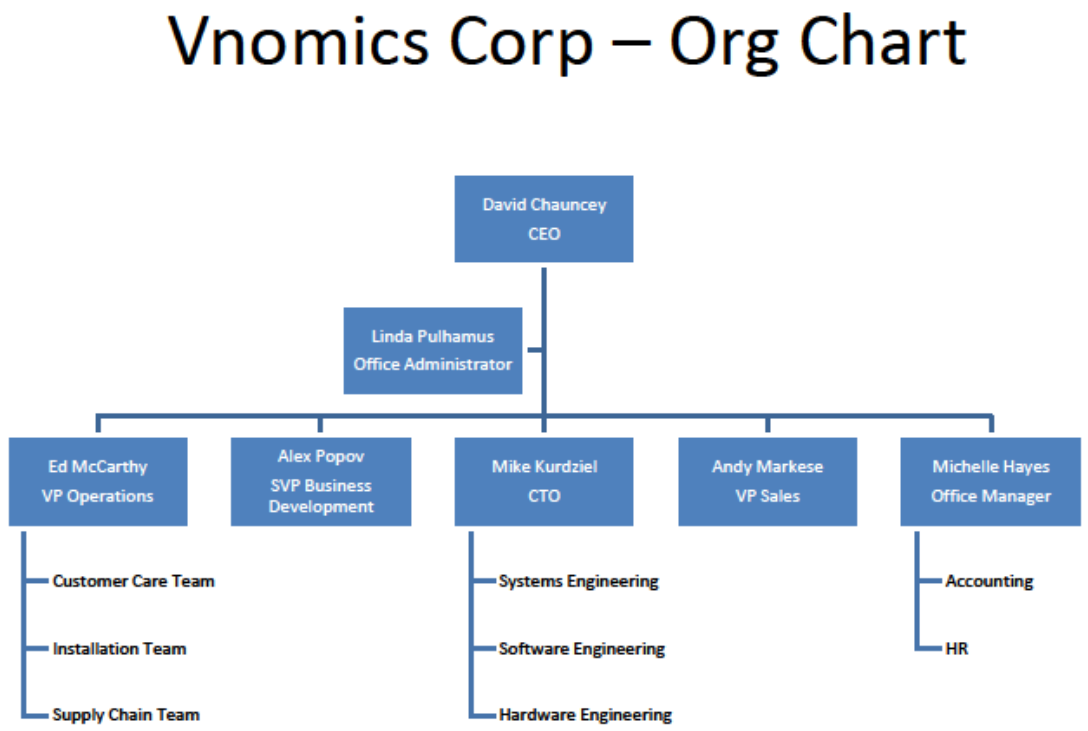

Figure 16 - Vnomics Organizational Chart

Vnomics' staff is hired primarily on a full-time basis. Full-time employees are entitled to a salary plus a generous fringe benefit package. Staffing is sometimes augmented with additional subcontractors on an as-needed basis.

The Operations department, under Ed McCarthy's control is responsible for overseeing all awarded projects. Ed reports to the company president and CEO, David Chauncey. Within the Operations

department is a team of Customer Care managers as well as an Installation Team who will work directly with the customer.

3.2.1.5 Key Personnel

Applied Sciences Group

Paul Buckley - President

Mr. Buckley has served as a technical contributor and manager in software and entrepreneurial environments for 30 years. His fields of expertise include Software and Systems Engineering to Embedded Processing, Medical Product Development, Radar Signal Analysis and Control Theory. Specialties include real-time and embedded processing, simulation and data communications systems.

EDUCATION

M.E. Computer & Systems Engineering, Rensselaer Polytechnic Institute, 1979

B.S. Bio-Medical Engineering, Rensselaer Polytechnic Institute, 1977

SKILLS

Languages: C, C#, FORTRAN, SQL, Assembly, Visual Basic, HTML, PVWave, Matlab, Ada

Operating Systems: All Windows, all embedded platforms

As Company President

- P&L responsibility for all company finances at Applied Sciences Group since June, 1997. Led and assisted in managing company growth, resulting in revenue increases from $1.1M to $5.0M, and increased staffing from 11 to 42. Currently responsible for all major business decisions. Acting Chief Technical Officer.
- Responsible for development and oversight of the company's quality and project management systems.

As Engineering Manager

- Manager of many development projects during the past twenty years, including medical devices, wireless communications, secure database systems, robotics and vision systems.

As Lead Software Engineer

- Led software engineering development and communications integration of the Air Situation Display System (ASDS), a real-time radar air traffic monitoring and graphics display system (written in Ada) that was used by NATO to monitor flights over Eastern Europe and over Iraq during Operation Desert Storm. This very complex system coordinated the inbound communications from air and ground-based radar to provide a complete air traffic composite over a roughly 1,000,000 sq km area.
- Provided on-site consulting, proposal writing, documentation and field support on other company programs.

As Software Engineer

- Responsible for development of dozens of computer programs throughout a 30+ year career in software engineering. Diverse computer language background (C++, C, Visual Basic, Ada, Fortran, PVWave, Assembler and others) led to supporting many different types of projects throughout the years

As Systems Engineer

- Advisor to SmartPill Diagnostics, a manufacturer of an ingestible electronic capsule used to measure key gastro-intestinal parameters. Assisted in the development of SmartPill's Quality System and provided engineering requirements, design and documentation support.

- Advisor to InRange Management Systems, developer of the MedDisk© drug dispensing system. Provided independent review of requirements and design.
- Advisor to Virmatics Corporation, a developer of the Virtual Cloning Suite©, software that simulates biochemical cloning procedures prior to initiating lengthy and costly biochemical operations. Provided managerial and engineering support.
- Supported development of a 45-state Kalman filter-based control system to gyro-stabilize a platform used in conjunction with gravity gradiometric research. Developed and supported all real-time algorithms used in conjunction with the filter. Created a high-speed optimized suite of linear algebra functions to support real-time Kalman filter operation.
- Developed visualization interface to gradiometric instruments using a combination of PVWave, C and Visual Basic.

Tom Fischer – Engineering Manager

A project-oriented engineering leader well versed in the three core tenets of computer engineering -- hardware, software, and peopleware.

28 years of real-time embedded software design, development and integration experience gained through industrial applications, military and government contracts. Specific experience includes real-time software development for electronic warfare training and simulation radars for 10 years and 8 years with international flight inspection, more recently with flight simulation motion platforms, and dozens of embedded industrial projects. Currently managing a staff of 18 software engineers.

EDUCATION

B. S. Electrical Engineering, State University of New York at Buffalo, 1982

SKILLS

Team Leadership & Project Management*:* Staff Development, Project Assignments, Team Building, Mentoring and Coaching, Performance Reviews, Conflict Resolution, Scheduling, Budgeting, Status Reports, Logistics, Earned-value Reports, Bug TrackingMetrics

Languages: Java, C, C++, C#, Labview, FORTRAN, Pascal, Basic, Visual Basic, Intel PLM, Motorola 68K assembly, PowerPC assembly

Operating Systems: Linux, All Windows and, DOS, Data General RTOS, pSOS, VXWorks Embedded Platforms, UNIX, VAX/VMS,

As Project Manager:

- Leads ASG's Solutions Group projects, including recent large projects with Ortho-Clinical Diagnostics and GE Research. Support complex proposal developments. Manages a staff of 18 engineers.
- Lead a team of 3 engineers in the development of the MFIRE mine simulation project, an upgrade of a FORTRAN-based program to C++. Expected completion date is 6/1/10.
- Led a team of international software engineers from 4 companies in 3 countries (US, Germany and Norway) in a development of a Java / XML based data collection application. It is being used as the software engine in 3 different flight inspection systems for 3 different companies, $1.5 mil R&D budget, 12-member team. Responsible for budgets, scheduling, work breakdown, progress tracking and system integration

As Lead Engineer:

- Responsible for maintaining 200K LOC for a flight inspection system in use with the FAA, military and civil aviation authorities in Spain, Hungary, China, Brazil, Mexico, Greece, Philippines, and Japan. Lead effort to unify branches of source code for the various countries to one pool with configuration abilities. Responsible for estimates, designs, configuration management and problem tracking.

As Software Engineer:

- Developed various interfaces for a motion platform used in flight simulation at Moog.
- Responsible for designing, coding and testing of flight inspection software. This product is responsible for presenting the data that is used to calibrate all the different avionic navigation aids in the world
- Designed, coded and tested the software used by the US Air Force to simulate surface to air missiles. The software was responsible for controlling 5 simultaneous remote radar installations via a data link. Included design operator control panels, geodetic parallax corrections, incorporating manual and auto video tracking. Project was a full scale Dod-STD-2167 development with corresponding documentation.
- Developed and delivered one month training course for a software maintenance facility to Sacramento, CA.

Tom Izard – Applications Engineer and Project Leader

Software and Systems Engineering management, design and development in mission-critical military, commercial and industrial applications. 30+ years of experience in embedded, mission-critical systems, real-time programming, networking, operating systems, CMM level 3, flight and robot control solutions, Command and Control systems, multitasking operating systems, micro and mini computers. Extensive experience with C/C++, Matlab, real-time FORTRAN, Ada and various assembly languages. Extensive experience with Unix, pSOS, VAX/VMS and Windows operating systems.

EDUCATION

MS Computer Science, SUNY at Buffalo

BS Electrical Engineering, SUNY at Buffalo

SKILLS

Languages: C, C++, FORTRAN, Matlab, SQL, Assembly, Visual Basic, Java, C++, HTML, UML, Python

Operating Systems: Unix, All Windows, VAX/VMS, pSOS

As Software Engineer

- Responsible for software design/code/test of C code for embedded missile control systems. Evaluated design of prototype hardware, combined legacy missile control software with new requirements, enhanced software methodology to meet CMM level 3 goals.
- Responsible for R&D of enhanced GPS positioning algorithms for robot control. Responsible for R&D to replace an existing proprietary wireless communications system with a low-cost single board PC using open-source software. Implemented Kalman filters in Matlab, Integrated Linux,SBCs and commercial 802.11 a/b/g wireless communications cards, developed C code for enhanced radio statistics acquisition and radio control, replicated the performance of the proprietary product providing lower cost and much improved access to software internals to provide for future growth potential
- Responsible for complete software development from requirements analysis through final integration and test for latest generation ultrasonic fingerprint scanner.
- Responsible for complete software development from requirements analysis through final integration and test for Stationkeeping equipment (SKE) and Electronic Warfare (EW) product lines
- Responsible for all software aspects of the Flight Inspection product line. This was a VME-based system for calibration of aircraft navigational aids sold throughout the world.
- Responsible for all software aspects of a proposed real-time target acquisition and tracking radar system for the US Army, including prototype system development.

Judy Powers – Applications Engineer and Project Leader

Judy is a technical contributor to most engineering projects requiring specialized graphical user interfaces or other embellishments. Judy's skill set includes system design and architecture, software development using FDA best practices and standards, distributed environments, risk assessments, GUI development for desktop, mobile, embedded, and web environments, database development and technical documentation. Judy is formerly a certified Apple genius.

Education

B.A. Computer Science and Engineering, State University of New York at Buffalo, 2002
B.S. Biological Sciences, State University of New York at Buffalo, 2002

SKILLS

***Languages**:* C/C++/C#, Java/JavaScript, Objective-C, Visual Studio .NET, WinCE, SQL/MySQL/SQLite, LINQ, ASP.NET, SilverLight, WPF, WCF, QT (Nokia), Android, iOS, Dynamic-C, XML, HTML, bash shell scripting, AppleScript, Perl, PHP

***Operating Systems**:* Unix, Solaris, Linux, Microsoft Windows – all versions, Mac OS – all versions, Mac OS X Server (up to10.4.x)

As Project Manager

- Project manager for several Veterans Administration projects involving secure distributed data collection and reporting related to veterans assistance programs (MyHealtheVet and the Homeless Veterans Project).
- Successfully practiced agile software development methodology in large-scale, long-term projects
- Coordinated efforts of developers, managers, end-user, and other project personnel for government projects involving geographically dispersed and technologically disparate groups

As Software Systems Engineer

- Specification, development, analysis, and conception of specialized software solutions and custom embedded systems from the ground up, including the generation of supporting quality, management, process, design, and architectural documentation
- Implementation and integration of software and firmware development of multiple specialized medical device systems using C/C++, Windows CE 6.0, VB.NET, C#, Visual C++ 7, and Java on Windows, Windows CE, Linux, and custom embedded platforms
- Design and implementation of multiple large-scale auditing and tracking systems using SQL technologies integrated with .NET Web Services, ASP.NET, PHP web solutions and REST or SOAP services
- Medium- and large-scale deployment and installations of server systems, network solutions, and software solutions

As Graphical User Interface Engineer

- Designed and implemented graphical user interfaces for medical analytical tools, research tools, social networking applications and general custom software desktop, embedded, and web applications using QT, .NET, Cocoa, and REALStudio with plugins such as National Instruments Measurement Studio and Telerik Controls
- Designed and implemented desktop applications for controlling custom hardware and equipment for the Windows platform, including the development and integration of hardware drivers
- Designed and implemented specialized solutions for embedded graphical user applications for both touchscreen and traditional button-press interfaces

As Mobile Applications Engineer

- Specification, design, and implementation of custom mobile applications for iOS, Android, BlackBerry, Windows Mobile, and Windows Phone 7 using telephony, location, data, and administrative services with communications to proprietary backend web services and database
- Created mobile applications for both touch-screen and keyboard/joystick style device interfaces
- Implemented secure mobile application management with integration with commercial Mobile Device Management applications such as GOOD and AirWatch
- Designed and implemented secured data-in-transit and data-at-rest schemas for mobile platforms using FIPS 140-2 certified encryption standards

As Embedded Engineer

- Intimate knowledge of the USB protocol and the derivation of custom drivers for the Windows, Linux, and OS X platforms as well as for various embedded architectures
- Custom Linux kernel, filesystem, and bootloader development based on target hardware

As Test Engineer

- Verification and validation of multiple systems based on FDA medical device certification guidelines in conjunction with rigid testing against requirements and design specifications

Jason Lehman – Applications Engineer and Project Leader

Specializes in database development, front-end and back-end support (GUIs, data collection, networking reporting), algorithm development, software and systems engineering, and integration.

EDUCATION

B. S. Computer Engineering, State University of New York at Buffalo, 2004

SKILLS

Languages: C#, SQL, Assembly, Visual Basic, Java, C++, HTML, ML, Scheme, Prolog, Erlang, Basic, QBasic, Aveanue, ASP.NET, Oracle

Operating Systems: Linux, All Windows

As Software Systems Engineer

- Responsible for the development and integration of a large, distributed inventory control system for the Dairy Industry. Created a system for field agents to complete questionnaires, stock and price checks on products, and product placement in stores along with specialized report generation. Developed software to submit requests and get responses to/from a central server over wireless connections. Original system utilized C# 2.0 and MSSQL 2005, with handheld support for Windows Mobile 5 and was recently upgraded to integrate with Android smartphones.
- Founding partner of Higher Technologies of New York, a startup company specializing in database development. Lead database developer, lead of security implementation, system design, webpage development, database optimization consultant, and technical editor.
- Provided applications and development expertise to a *green* web-based technology that linked individuals together to form car pools for efficient source/destination transport.
- Continued support and enhancement of web applications, focusing primarily on improved report generation and distribution utilizing Microsoft Reporting Services.
- Developed web based system for requesting, completing and reporting background checks for potential employees.
- Developed stand-alone software to automatically generate and manage quality manuals for business applications.
- Developed distributed Windows based system, for managing data points and downloading to industrial machinery through a WDPF OPC Server.

Vnomics Corp

Dave Chauncey – C.E.O., Vnomics

David Chauncey is the CEO of Vnomics Corp. He has more than 22 years of experience in both the commercial and government electronics industries. His diverse management experience includes general management, product development, and intellectual property management.

Prior to joining Vnomics, David was a senior manager at Harris Corporation's RF Communications Division where he spearheaded an "intrepreneurial" team focused on expanding the division's product portfolio outside its traditional markets. This growth initiative led to the introduction of a new family of products aimed at international and domestic government customers.

Before Harris, David was one of the founders and the CTO of Clearwire Technologies, a communications equipment and wireless service provider. He was instrumental in the development of the company's business strategy and core intellectual property. During this time, he also served on the IEEE 802.16 WiMAX committee that developed the standard for the 4th generation of mobile phone networks.

David holds two patents and has ten patents pending in the field of wireless communications. He has an MBA from the Simon Graduate School of Business at the University of Rochester and a BS in Electrical Engineering from Rochester Institute of Technology.

Ed McCarthy – Vice President of Operations, Vnomics

Ed will be Vnomics' primary operations leader for this project, ensuring program requirements are achieved in a timely manner. Prior to coming to Vnomics, Ed was a senior program manager at the National Center for Remanufacturing for Resource Recovery at Rochester Institute of Technology (RIT). He was responsible for the development and implementation of strategic initiatives with the Department of Defense to include leading the Marine Corps Embedded Platform Logistics System (EPLS) program team in conjunction with Lockheed Martin. A retired Military officer, Ed's skills were developed during more than 20 years of active duty with the United States Marine Corps. Ed has a BS with Merit, in Mathematics, from the United States Naval Academy at Annapolis, Maryland. He holds a Master of Science in Electrical Engineering from the Naval Postgraduate School in Monterey, California. He received his MBA from the Simon School at the University of Rochester in June 2012. Ed is also certified in Defense Acquisition Level 100 and 200 Project Management with the Federal Government.

Mike Kurdziel – Chief Technology Officer, Vnomics

Mike will be Vnomics' primary technical leader for this project, in conjunction with ASG. Prior to coming to Vnomics, Mike was a Senior Engineering Manager at Harris RF Communications in the Defense Systems Architecture and Communications Security Products Groups, as well as Principal Technical Specialist and Project Leader. His responsibilities included leading a division-wide initiative to create a "Center of Excellence" for tactical communications systems design, establishment of a CMMI qualified Systems Development Process, and project supervision including planning and tracking the simultaneous execution of multiple programs. Mike has technical expertise in the area of secure communications systems design and architecture development. He has a BS, MS and PhD in Electrical Engineering from SUNY Buffalo, holds twelve patents, has two patents pending and has been a licensed "Professional Engineer" in the State of New York since 1992.

Alex Popov – Senior Vice President of Business Development, Vnomics

Alex Popov is the SVP of Business Development with Vnomics and will be the business contact for this proposal. Alex has over 25 years of experience within the Transportation industry. He is widely known as a leader who drives continuous improvement through process design, enhancement and optimization of technology. In recent years, he has transformed four of the largest fleets in their respective industries into models of state-of-the art excellence and efficiency. By utilizing best-in-class technology he has helped to

dramatically improve key processes at major companies including: United Parcel Service, Ryder Transportation Systems, Waste Management and PHH.

Alex has led major projects in several countries, published a number of technical articles and spoken at numerous conferences on the subjects of GPS, mobile resource management, fleet optimization and work force automation in the transportation industry. In 2004 Popov and his team from Waste Management were nominated for the prestigious Franz Edelman award from INFORMS for their work in the field of Operations Research.

Popov has his MBA in Finance from Tulane University in New Orleans and a B.S. in Industrial Engineering from Roosevelt University in Chicago. He also maintains the distinction of a Certified Transportation Professional (CTP) through the National Private Truck Council.

Jeff Heintz, Principal Systems Engineer, Vnomics

Jeff is responsible for overseeing the development of requirements, preliminary design, and testing procedures for product enhancements to meet customer support and strategic development needs. In this capacity he serves as an intermediary to the engineering team and as the champion for user-centered design. Jeff is currently leading the development of the electronic Driver Vehicle Inspection Reporting (DVIR) system, which will integrate with carriers' maintenance management systems in order to improve efficiency, accountability and fleet readiness.

Jeff has extensive experience developing and managing software systems for asset life-cycle design, monitoring, maintenance, and remanufacturing within Department of Defense, Government and Commercial fleets. As a part of his experience within the Government sector, Jeff provided engineering and project management services to Rochester Genesee Regional Transportation Authority (RGRTA) in the design and implementation of its multi-million dollar intelligent transportation systems program to integrate fleet operations and maintenance. Responsibilities included the source-selection, systems design, and management of integration and deployment activities for fleet and facility Maintenance Management, Parts Inventory, Fuel Management, fixed-route and paratransit CAD/AVL, Video Surveillance, CRM, and HRIS/Payroll systems.

Jeff holds one patent in the field of systems remanufacturing. He earned a BS in Industrial and Systems Engineering, and expects to complete a Master of Science degree in Information Technology, from Rochester Institute of Technology.

3.2.1.6 Strategic Company Direction

Applied Sciences Group

ASG's long-term strategy is unchanged since the mid-'90s: The company remains a software and systems service provider for commercial, industrial and government applications. Because these markets tend to have different business cycles this strategy has proved useful in mitigating the Upstate New York economic swings and has allowed ASG a slow but consistent growth model.

With 35 engineers the company has sufficient staff diversity to support multi-million dollar and multi-year programs. Reaching such "engineering critical mass" was a long-term goal that ASG met and has exceeded for nearly a decade. Additionally ASG has no reliance on any single large contract to maintain financial stability. On the contrary, it does not pursue contracts any larger than approximately 10% of total company revenues over the contract period in order to minimize labor fluctuations. On any day ASG has approximately 25-50 active contracts across a customer base of several hundred companies.

Vnomics Corp

Vnomics continuously strides to develop its *Intelligent Telematics Software* specifically designed for the needs of the commercial fleet industry. Our goal is dedicated to helping fleet owners, executives, and managers operate the safest, most reliable, environmentally conscious, and profitable fleets in their industry. Vnomics offer of a truly revolutionary technology, **FleetKnowSys** which identifies every opportunity to reduce operating costs in *real time*. It intelligently knows what information to use and how, to deliver decision-supporting recommendations instantly, clearly, and effectively at the most opportune time to maximize returns--relating to:

- Reducing fuel consumption
- Ensuring truck and driver safety
- Minimizing downtime (Predictive & Condition-based Maintenance functionality)
- Staying in compliance
- Effectively minimizing unnecessary truck wear and tear

Vnomics is also committed to being an environmentally conscious company by providing solutions that can help to reduce fuel usage and carbon emissions. In an effort to support this goal, Vnomics has become an affiliate partner of the SmartWay™ community.

From the robust, feature-rich in-cab coaching systems to the comprehensive, easy-to-use back-office truck and driver performance dashboards, bird's eye location views, trouble codes prioritized by severity level, predictive maintenance functionality and historical trending report features, FleetKnowSys will continue to work with its customers to successfully define the next generation in Telematics.

3.2.1.7 Current Customers

Applied Sciences Group

ASG's current active clients include the following companies (ASG has multiple contracts with several of these companies). See section 3.2.3 for client references.

3M Ocello	3M Veolia
American Dairy Association	AMPAC-ISP Corporatin
API Heat Transfer	Aurubis (formerly Luvata)
Bloomingdale's Department Stores	Buffalo Sewer Authority
Bison Bag Corporation	County Line Stone
Dupont	New Era Cap
Five Star Washer Service, Inc.	GE Transportation Systems
Great Lakes Orthodontics	GM Powertrain
HVR Advanced Power Components	Ortho-Clinical Diagnostics
Koike Group	Medical Conservation Devices
Moog	Niagara County Water Authority

Niagara County Sewer Authority	Niagara Power Wash, Inc.
Power Drives, Inc.	Praxair
Roth Brothers, Inc.	RR Donnelly
Saint-Gobain Abrasives	Schick
Smart Border, Inc.	Snyder Industries
Sulzer Metco, Inc.	T M P Technologies, Inc.
State University of New York at Buffalo	Unifrax Corporation
Veterans Administration	Vnomics

Vnomics Corp

Vnomics is actively supporting the following companies.

C&M Forwarding	Cohen Bros.
DeCarolis Truck Rental	Gates Chili Central School District
Hahn Automotive	Kimco Steel
Klein Steel	Lockheed Martin
Matthews Buses	MMC Transport
Regional International	Reinsfelder, Inc.
Ronald Gross, Inc.	Saia, Inc.
Terpening Trucking	Twin Village Recycling
Upstate Niagara	Zeiter Trucking Co.

3.2.2 Vendor Information

Question	Vendor Response
Official Name of Company	**Applied Sciences Group, Inc.**
Headquarters' Address	4455 Genesee Street, Suite 103, Buffalo, NY 14225
Telephone Number	(716) 626-5100
Fax Number	(716) 626-0629
Federal Tax ID Number	16-1435016
Names under which the business has operated within the last 10 years.	Applied Sciences Group, Inc.
Contact Name for questions concerning RFP response.	Paul E. Buckley
Contact's Telephone Number	(716) 626-5100 x101
Contact's e-mail address	pbuckley@asgrp.com
Is company authorized and/or licensed to do business in the State of New York?	YES
Does your company have an office in the City of Rochester or County of Monroe?	NO
Company Ownership	**Private**
If Private, list primary owners and their percentage ownership.	Henry A. Bacher – 46% John J. Kuhn, Jr. – 20% Paul E. Buckley – 13% Michael F. Buckley – 3% 6 other minor partners – 18% total
If Public, list stock trading symbol and market which it is traded.	N/A

Has corporate ownership changed in the last 5 years? If so, provide details.	YES. Paul Buckley and 7 minor partners purchased company shares from Henry Bacher (originally 54%), John J. Kuhn (originally 23%) and Mike Buckley (originally 23%)
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.	U.S. District Court for the Eastern District of Pennsylvania, Civil Action 11-6332. Optim LLC Plaintiff v. Edge Product Development Corporation and Daniel Doorley and Applied Sciences Group, Inc, Defendants, November 29, 2011. ASG was a defendant in a breach of contract claim by Optim against the aforementioned parties. A settlement and release of all claims was reached on June 12, 2012.
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 – ASG does hold a GSA Schedule 70 contract. See section 4 for details.

Question	Vendor Response
Official Name of Company	**Vnomics Corp.**
Headquarters' Address	175 Sully's Trail, Pittsford, NY 14534
Telephone Number	585-377-9700
Fax Number	585-249-0251
Federal Tax ID Number	26-3647102
Names under which the business has operated within the last 10 years.	Liban Inc.
Contact Name for questions concerning RFP response.	Alex Popov
Contact's Telephone Number	585-704-8997
Contact's e-mail address	apopov@vnomicscorp.com
Is company authorized and/or licensed to do business in the State of New York?	YES
Does your company have an office in the City of Rochester or County of Monroe?	YES
Company Ownership	**Private**
If Private, list primary owners and their percentage ownership.	Ownership includes 8 corporations, a major private university, 1 venture capital firm, and 34 private individuals. No single owner holds more than 20% of the company.
If Public, list stock trading symbol and market which it is traded.	N/A
Has corporate ownership changed	NO

in the last 5 years? If so, provide details.	
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.	N/A
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

3.2.3 Vendor Customer References

3.2.3.1 Installed base

Since the beginning of our fiscal year Vnomics has 12 new customers using our telematics solutions. An additional 10 customers are under contract for pre-paid trials. All of our customers have customized solutions that are specifically designed for their business to meet their individual as well as vertical needs.

Number of clients currently utilizing similar systems: 18

Clients currently undergoing implementation: 7

Fully-implemented clients (at least 1 year): 7

Clients that have switched to other vendors: None

3.2.3.2 Client References

AVL Client References (Vnomics)

Customer Reference Information	
Contact Information	
• Company/organization name	**SAIA Transport**
• Contact name and position	Mark Robinson - CIO
• Address	11465 Johns Creek Parkway Suite 400 Johns Creek, GA 30097
• Telephone	(770) 232-4061
• E-mail address	mrobinson@saia.com
• Web site address	www.saia.com
Demographic Information:	
• Company/organization size	Public organization – $1B, approx. 8,000 employees
• Solutions/systems installed, in what timeframe and sequence	FleetKnowSys – 3500 units installed in 14 months

• Date(s) solutions/systems Installed	Fleet wide installation started in June of 2011 and is in the process of finalization by the end August 2012
• Number of people required on implementation team from internal staff vs. external resources	Installations occurred at 142 locations across the US. Installs were performed by 3 various groups – Saia mechanics, Velociti, an outside contractor/partner of Vnomics and the Truck OEM for new vehicles delivered from the factory

Customer Reference Information	
Contact Information	
• Company/organization name	**C&M Forwarding**
• Contact name and position	Jeff Klips, VP of Transportation,
• Address	45 Jetview Drive Rochester NY 14624 |
• Telephone	(585) 295-1878
• E-mail address	jklips@cmforwarding.com
• Web site address	www.cmforwarding.com
Demographic Information:	
• Company/organization size	Privately held company
• Solutions/systems installed, in what timeframe and sequence	FleetKnowSys - 52 units installed over a 3 month period
• Date(s) solutions/systems Installed	Units installed started in January 2010
• Number of people required on implementation team from internal staff vs. external resources	Units installed with the help of Decarolis Truck Leasing mechanics as they are the leasing company

Customer Reference Information	
Contact Information	
• Company/organization name	**Terpening Trucking Company**
• Contact name and position	Brian Brundige, Safety Manager
• Address	15 Farrell Road, Syracuse, NY 13209
• Telephone	315-451-8661 x344
• E-mail address	bbrundige@terpeningtrucking.com
• Web site address	www.terpeningtrucking.com
Demographic Information:	
• Company/organization size	Privately held
• Solutions/systems installed, in what timeframe and sequence	2 month install schedule as trucks became available or during preventative maintenance
• Date(s) solutions/systems Installed	11/11 – 1/12
• Number of people required on implementation team from internal staff vs. external resources	100% internal implementation after training by Vnomics staff (typical installation takes one

	person 2 hours)

Customer Reference Information	
Contact Information	
• Company/organization name	**Klein Steel**
• Contact name and position	Joe Rodibaugh – Operations Director
• Address	105 Vanguard Parkway Rochester, New York 14606
• Telephone	585-690-3266
• E-mail address	jrodibaugh@kleinsteel.com
• Web site address	www.kleinsteel.com
Demographic Information:	
• Company/organization size	Privately held
• Solutions/systems installed, in what timeframe and sequence	FleetKnowSys installed on the entire fleet of 18 units installed over 6 weeks
• Date(s) solutions/systems Installed	February 2011
• Number of people required on implementation team from internal staff vs. external resources	Company Mechanics trained by Vnomics personal

Integration References (Applied Sciences Group)

Customer Reference Information	
Contact Information	
• Company/organization name	**New Era Cap, Inc**
• Contact name and position	Jim Hycner, Facilities Supervisor
• Address	160 Delaware Ave., Buffalo, NY 14202
• Telephone	(716) 604-9000 x1457
• E-mail address	jim.hycner@neweracap.com
• Web site address	www.neweracap.com
Demographic Information:	
• Company/organization size	Headquarters: Buffalo, New York Manufacturing centers are in Derby, New York, Central America, Brazil Privately held Yearly Revenues: Approx. $400M Employees: Approx 1,700 worldwide
• Solutions/systems installed, in what timeframe and sequence	Wireless at-station machine downtime tracking system installed throughout the manufacturing facility to reduce machine downtime and improve overall manufacturing efficiency. System consisted of approximately 250 Samsung Galaxy Tablet computers, stands, RFID readers and routers to support 400+ machining centers in the Derby, NY manufacturing plant. Project included maintenance staff and

	employee training. Project took 10 months from concept to completion.
• Date(s) solutions/systems Installed	Project start: August 2011 Project completion: May 2012
• Number of people required on implementation team from internal staff vs. external resources	Internal Staff: 4 (project manager, software developers, integration/installation team External Staff: 2-4 depending on project schedule (project manager, IT, maintenance)

Customer Reference Information	
Contact Information	
• Company/organization name	**Department of Veterans Affairs**
• Contact name and position	Dr. Jeffrey Harrow, PhD, MD, Program Director
• Address	James A. Haley Veterans Hospital Spinal Cord Injury Community Living Center 1300 Bruce B. Downs Blvd Tampa, FL 33612
• Telephone	(813) 972-2000 x2917
• E-mail address	Jeffrey.harrow@va.gov
• Web site address	http://www.tampa.va.gov/
Demographic Information:	
• Company/organization size	(VA Size is unknown, but very large) Tampa VA Hospital has several hundred employees. The Spinal Cord Injury unit has a staff of about 100.
• Solutions/systems installed, in what timeframe and sequence	An augmentative communications system for disabled veterans (typically paraplegic, quadriplegic and aphasic patients) across the Community Living Center. System consisted of laptops, a central server, private wireless network and custom software to allow disabled veterans to more easily communicate. Project included staff and patient training.
• Date(s) solutions/systems Installed	Project start: April 2010 Project completion: December 2011
• Number of people required on implementation team from internal staff vs. external resources	Internal Staff: 2-6 employees depending on task (which included concept development, software and hardware development, test and integration, installation and training). External Staff: Approximately 10-15 hospital staff members were involved in the rollout.

3.3 Detailed RFP Responses

3.3.1 Assumptions

Final system design will come out of the kickoff meeting and gap analysis. All costing and configurations and estimated (budgetary) at this point.

It is unclear if vehicle installations will be performed by ASG/Vnomics or by the City of Rochester (i.e., there may be contractual or municipal policies in place that limit who may perform vehicle maintenance on city-owned equipment). It is assumed that we will work with the city in this regard to make sure that all installation and wiring be performed to required specifications.

The Vnomics network has remote access capability, which aids in rapid troubleshooting, software . ASG/Vnomics assumes that the City of Rochester will allow remote access capability by authorized individuals.

ASG discussed API availability with nearly all 3rd-party equipment vendors listed in the RFP in order to confirm support of a programming interface to their equipment. Not all vendors responded to our confirmation requests, however. We assume that if a programming interface is available for the equipment then it can be integrated into the FleetKnowSys system.

3.3.2 Advantages of Proposed Solution

The proposed solution has significant value associated with it that complements City of Rochester's

- Desire to improve efficiency;
- Reduce overall environmental impact;
- Reduce overall insurance rates;
- Reduce maintenance costs;
- Improve safety;
- Longevity.

Just having the ability to efficiently dispatch vehicles will clearly result in across-the-board efficiency gains as total vehicle mileage is reduced: Less fuel, less maintenance, less labor and lowered insurance rates would be expected. Predictive maintenance schedules will improve cost saving even more. Environmental impact should be at least proportional to fuel savings and probably better if winter salt can be reduced and predictive maintenance results in fewer engine mishaps.

This project specifically calls out the importance of integration and future growth across a wide range of vehicles, ancillary equipment and conditions. As an integrator with years of experience mating software and hardware with vendor-specific equipment, ASG is positioned to support the many adaptations that can and will take place over the next decade or so. Vnomics has predominant expertise in the specific problem space – that is, Vnomics has the hardware and software solutions specifically geared toward improving dispatch efficiency, reducing vehicle wear and tear, monitoring vehicle conditions, analyzing driver habits and improving preventive maintenance schedules.

As an integrator, ASG has a long history of working with 3rd-party equipment vendors to integrate software solutions into much larger, integrated networks. For over 10 years ASG has supported the energy management systems in most Bloomingdale's stores in the U.S., with each department store having unique HVAC and lighting equipment requiring integration, monitoring and control.

ASG and Vnomics have worked together on several Vnomics client projects and know each other well. They are mutually complimentary and additionally, have overlapping skill sets that provide project redundancy in the long run. Combined, the two companies fully cover the RFP requirements much better than either does separately and can jointly support the life cycle process.

3.3.3 Project Costs and Pricing Options

A breakdown of project costs and various equipment pricing options follows as a breakdown by labor (integration) and equipment. A standard Vnomics product sales & licensing agreement can be found in Appendix F.

Because of potential cost constraints with regard to the Federally-approved funding, this proposal effort includes costing of the first two phases AND the first three phases, with several examples of optional costing including on-premise versus cloud-based configuration, and vendor versus customer installation. The inclusion of all 3 phases overran the $800K Federal allotment slightly, so this proposal's focus is

primarily on the approximately 167 vehicles in Phases 1 and 2. The subsequent gap analysis at contract award may find enough headroom to fully fund the Phase 3's approximately 120-vehicle inventory as well.

The RFP is somewhat ambiguous with regard to the total number of vehicles to be integrated in Phases 1 and 2. For the purposes of this proposal we are assuming that 167 vehicles will outfitted with a mix of FleetKnowSys systems and other equipment. A summary breakdown by hardware and labor category can be found below, and a work breakdown structure with additional cost detail can be found in Appendix D. Please note that these are **budgetary estimates** only, as overall project costs are dependent on equipment quantity, selected options, existing wireless communications channels and 3rd-party integration efforts. All of these require much greater detail than is available in the RFP and Q&A responses. However, additional details can be gleaned during scripted demonstration so that finalized pricing (as mentioned in section 2.2.7 of the RFP) can be offered.

3.3.3.1 Equipment Costs

Equipment does not include installation, which is priced separately.

Product Price Sheet **City of Rochester**	
	Price
Hardware - One Time Cost	
Electronic On Board Computer	$1,649.00
7" Driver Touch Screen	$300.00
Antenna	included
Diagnostic Harness & Adapter	included
Mounting Hardware	
Screen Mount	included
Notes:	
1 Hardware is a onetime cost	
2 Financing is available for the hardware	
3 Volume pricing above 500 units	

3.3.3.2 Software Development Costs

The bulk of software development will be related to the integration of 3rd-party equipment into the FleetKnowSys hardware and back office applications. Software development includes requirements definition, gap (risk) analysis, design, coding and debugging, test, integration, validation and documentation.

Software Engineering Labor Price Sheet **City of Rochester**	
	Price
Software Development - One Time Cost	
Senior Engineering (per hour)	$95.00
Junior Engineering (per hour)	$85.00
Notes:	

3.3.3.3 Installation Costs

Vehicle installation is expected to require approximately 2 hours per vehicle.

Installation Labor Price Sheet	
City of Rochester	
	Price
Installation Labor Cost per Hour	
Installation	$90.00
Notes:	

3.3.3.4 Project Management Costs

A project manager will be assigned to coordinate the project throughout its life cycle. The project manager will act as the liaison between the City of Rochester, ASG, Vnomics and 3rd-party vendors and will be the main point of contact with the City of Rochester. It is expected that approximately 30% of the project manager's time per month (48 hours/month) will be devoted to this project.

Project Management Price Sheet	
City of Rochester	
	Price
Project Management	
Project Manager (per hour)	$100.00
Notes:	

3.3.3.5 Recurring (Monthly) Costs

Monthly recurring costs will be rolled up into a **single monthly charge** (i.e, "single billing") to the City of Rochester. With past clients ASG has provided a formal breakdown (as an Excel spreadsheet) that delineates all license and labor costs by unit. This also allows both the client and ASG to review individual options on a unit by unit basis to confirm that the appropriate equipment and options are being properly allocated and maintained. Monthly costs will be adjusted as vehicle units and options are added to the network.

New project work not part of the initial contract (custom reports, new functionality, new 3rd-party equipment will be costed separately.

Recurring Costs Price Sheet	
City of Rochester	
	Price
Software Licenses - price per month per unit	
FleetKnowSys	$45.00
Geofencing – additional	$6.00
Turn by Turn Directions -additional	$6.00
Dispatch – additional	$14.25
Verizon -50mb data plan	$14.99

Notes:	
1 Not all vehicles will require all options.	
2 Software is based on a monthly fee for 36 months	
3 Warranty is included in monthly fees	
4 Upgrades to software included in monthly fees	
5 There are no yearly maintenance fees	
6 Communications can be paid by Vnomics or by the customer	

3.3.3.6 Project Budgetary Cost Estimate

This project estimate is for a staggered Phase 1 and Phase 2 development of approximately 8 months duration; and optionally from all 3 phases, 11 months. A more detailed breakdown may be found in Appendix D.

The phases are staggered to provide a more even distribution of engineering and management labor. Estimated total labor over the project period is approximately 2.2 full-time equivalents (FTEs) per month.

Phase 1 rollout is expected to begin approximately 1 month after contract award (assuming an October 1st contract start, and AVL/ITS equipped vehicles could begin appearing on the road in December 2012, in time for some of the winter plowing season.

Phase 2 rollout would begin approximately 4-5 months after contract award and Phase 3, around month 8.

Budgetary Estimate 1 – Phases 1 and 2 Only:

This estimate assumes the following:

- All vehicles (167) will be equipped with a Vnomics FleetKnowSys data collection unit, with two-thirds also having the driver touch screen. The remaining one-third would have the data collection unit only and would communicate to the driver via existing (City of Rochester) Android-compatible mobile devices.
- About half of all FleetKnowSys units (84) will have the optional Dispatch components.
- All units will have geofencing and turn-by-turn options
- All data storage and back-end operations are **cloud-based** and not on-premise.
- All vehicle installation to be performed by ASG, Vnomics and/or designated 3rd-party.

Description	Unit Cost	Total Cost
Phase I		
Equipment		
58 FleetKnowSys units + Display unit	$1,949	$113,042
29 FleetKnowSys units w/o Display	$1,649	$47,821
Requirements and Gap Analysis	$51,840	$51,840
Design	$59,040	$59,040
Reviews and Acceptance	$7,200	$7,200
Deployment/Installation	$20,160	$20,160
Training	$7,200	$7,200
Documentation	$10,800	$10,800
System Acceptance/Signoff	$1080	$1080
Total, Phase I		**$318,183**
Phase II		
Equipment		
53 FleetKnowSys units + Display unit	$1,950	$103,350
27 FleetKnowSys units w/o Display	$1,650	$44,550

Requirements and Gap Analysis	$7,200	$7,200
Design	$39,600	$39,600
Reviews and Acceptance	$2,880	$2,880
Deployment/Installation	$20,160	$20,160
Training	$3,600	$3,600
Documentation	$3,600	$3,600
System Acceptance/Signoff	$720	$720
Total, Phase II		**$225,580**
Project Management	$38,400	$38,400
Travel + Miscellaneous	$5,000	$5,000
Grand Total		**$587,163**
Recurring (Monthly) Costs for 167 Units		
FleetKnowSys License, Cellular Communications, Geofencing, Turn by Turn Direction, Dispatch	$79.12/mo	**$13,212/mo**

Budgetary Estimate 2 – Phases 1 and 2 Only:

This estimate assumes the following:

- All vehicles (167) will be equipped with a Vnomics FleetKnowSys data collection unit, with two-thirds also having the driver touch screen. The remaining one-third would have the data collection unit only and would communicate to the driver via existing (City of Rochester) Android-compatible mobile devices.
- About half of all FleetKnowSys units (84) will have the optional Dispatch components.
- All units will have geofencing and turn-by-turn options
- All data storage and back-end operations are **cloud-based** and not on-premise.
- All vehicle installation to be performed **by the City of Rochester**, with training from ASG/Vnomics.

Description	Unit Cost	Total Cost
Phase I		
Equipment		
58 FleetKnowSys units + Display unit	$1,950	$113,042
29 FleetKnowSys units w/o Display	$1,650	$47,821
Requirements and Gap Analysis	$51,840	$51,840
Design	$59,040	$59,040
Reviews and Acceptance	$7,200	$7,200
Deployment/Installation	$12,600	$12,600
Training	$7,200	$7,200
Documentation	$10,800	$10,800
System Acceptance/Signoff	$1080	$1080
Total, Phase I		**$310,623**
Phase II		
Equipment		
53 FleetKnowSys units + Display unit	$1,950	$103,350
27 FleetKnowSys units w/o Display	$1,650	$44,550
Requirements and Gap Analysis	$7,200	$7,200
Design	$39,600	$39,600
Reviews and Acceptance	$2,880	$2,880
Deployment/Installation	$10,080	$10,080
Training	$3,600	$3,600

Documentation	$3,600	$3,600
System Acceptance/Signoff	$720	$720
Total, Phase II		**$215,500**
Project Management	$38,400	$38,400
Travel + Miscellaneous	$5,000	$5,000
Grand Total		**$569,523**
Recurring (Monthly) Costs for 167 Units		
FleetKnowSys License, Cellular Communications, Geofencing, Turn by Turn Direction, Dispatch	$79.12	**$13,212/mo**

Budgetary Estimate 3 – Phases 1 and 2 Only:

This estimate assumes the following:

- All vehicles (167) will be equipped with a Vnomics FleetKnowSys data collection unit, with two-thirds also having the driver touch screen. The remaining one-third would have the data collection unit only and would communicate to the driver via existing (City of Rochester) Android-compatible mobile devices.
- About half of all FleetKnowSys units (84) will have the optional Dispatch components.
- All units will have geofencing and turn-by-turn options
- All data storage and back-end operations are **on-premise** via the purchase of a fully-redundant server housed in the City of Rochester Data Center (included).
- All vehicle installation to be performed by ASG, Vnomics and/or designated 3rd-party.

Description	Unit Cost	Total Cost
Phase I Equipment 58 FleetKnowSys units + Display unit 29 FleetKnowSys units w/o Display	 $1,950 $1,650	 $113,042 $47,821
Fully redundant Windows Server with SQL Server and 5 CALS, antivirus and firewall software, fully configured	$30,000	$30,000
Requirements and Gap Analysis	$51,840	$51,840
Design	$59,040	$59,040
Reviews and Acceptance	$7,200	$7,200
Deployment/Installation	$20,160	$20,160
Training	$7,200	$7,200
Documentation	$10,800	$10,800
System Acceptance/Signoff	$1080	$1080
Total, Phase I		**$348,183**
Phase II Equipment 53 FleetKnowSys units + Display unit 27 FleetKnowSys units w/o Display	 $1,950 $1,650	 $103,350 $44,550
Requirements and Gap Analysis	$7,200	$7,200
Design	$39,600	$39,600
Reviews and Acceptance	$2,880	$2,880
Deployment/Installation	$20,160	$20,160
Training	$3,600	$3,600
Documentation	$3,600	$3,600
System Acceptance/Signoff	$720	$720
Total, Phase II		**$225,580**

Project Management	$38,400	$38,400
Travel + Miscellaneous	$5,000	$5,000
Grand Total		**$617,163**
Recurring (Monthly) Costs for 167 Units		
FleetKnowSys License, Cellular Communications, Geofencing, Turn by Turn Direction, Dispatch	$79.12	**$13,212/mo**

The on-Premise fully-redundant back-end housed in the City of Rochester data center will have access to the Data Center battery backup and data backup systems and therefore, pricing is not included for these options.

ASG/Vnomics will perform the server installation, setup and configuration.

Budgetary Estimate 4 – Phases 1,2 and 3:

This estimate assumes the following:

- All vehicles (287) will be equipped with a Vnomics FleetKnowSys data collection unit, with two-thirds also having the driver touch screen. The remaining one-third would have the data collection unit only and would communicate to the driver via existing (City of Rochester) Android-compatible mobile devices.
- About half of all FleetKnowSys units (144) will have the optional Dispatch components.
- All units will have geofencing and turn-by-turn options
- All data storage and back-end operations are **cloud-based** and not on-premise.
- All vehicle installation to be performed by ASG, Vnomics and/or designated 3rd-party.

Description	Unit Cost	Total Cost
Phase I Equipment 58 FleetKnowSys units + Display unit 29 FleetKnowSys units w/o Display	 $1,949 $1,649	 $113,042 $47,821
Requirements and Gap Analysis	$51,840	$51,840
Design	$59,040	$59,040
Reviews and Acceptance	$7,200	$7,200
Deployment/Installation	$20,160	$20,160
Training	$7,200	$7,200
Documentation	$10,800	$10,800
System Acceptance/Signoff	$1080	$1080
Total, Phase I		**$318,183**
Phase II Equipment 53 FleetKnowSys units + Display unit 27 FleetKnowSys units w/o Display	 $1,950 $1,650	 $103,350 44,550
Requirements and Gap Analysis	$7,200	$7,200
Design	$39,600	$39,600
Reviews and Acceptance	$2,880	$2,880
Deployment/Installation	$20,160	$20,160
Training	$3,600	$3,600
Documentation	$3,600	$3,600
System Acceptance/Signoff	$720	$720
Total, Phase II		**$225,580**
Phase III		

Equipment 80 FleetKnowSys units + Display unit 40 FleetKnowSys units w/o Display	 $1,950 $1,650	 $155,920 $65,960
Requirements and Gap Analysis	$7,200	$7,200
Design	$39,600	$39,600
Reviews and Acceptance	$2,880	$2,880
Deployment/Installation	$27,360	$27,360
Training	$3,600	$3,600
Documentation	$3,600	$3,600
System Acceptance/Signoff	$720	$720
Total, Phase II		**$285,240**
Project Management	$52,800	$52,800
Travel + Miscellaneous	$7,000	$7,000
Grand Total		**$888,803**
Recurring (Monthly) Costs for 287 Units		
FleetKnowSys License, Cellular Communications, Geofencing, Turn by Turn Direction, Dispatch	$79.12/mo	**$22,713/mo**

3.3.3.7 Return on Investment

Capital and recurring costs can be justified by examining the return on investment, particularly in light of the need to plan for future growth and functionality with the expected equipment lifespan of 10 years or more.

A return on investment (ROI) was estimated for this project based on some vehicle utilization assumptions, estimated fuel and insurance costs. The estimated ROI is about 23 months. The calculations follow.

3.3.3.7.1 Phases 1 and 2 Only

ROI Calculation - Vehicle Savings – Phases 1/2

Assumes Phase I and Phase II Vehicle Totals = 167

Reduced Mileage (Dispatch Efficiency, Driver Awareness)	
Average Vehicle Miles Traveled	25,000
Average Miles Per Gallon	5 mpg
Fuel Cost per Gallon	$3.50
Cost of Fuel per Vehicle per Year	$17,500
Number of Vehicles	167
Total Fuel Costs per Year	$2,922,500
Expected % Reduction in Fuel Usage	12%
Fuel Savings Per Year	**$350,700**
Predictive Vehicle Maintenance	
Expected Reduced Number of On-road Breakdowns/month	2
Cost per Breakdown	$1,500
Expected Reduced Maintenance Costs per Year	**$36,000**
Insurance Reduction	

Insurance per Vehicle	$700
Expected Price Reduction	10%
Number of Vehicles	167
Total Insurance Savings per Year	**$11,690**
Salt Reduction (winter season)	
Estimated Quantity (tons) – Rochester 2011-12 purchases	25000
Estimated Price per Ton	$55
Total Cost of Salt	$1,375,000
Expected Salt Reduction	5%
Total Salt Reduction Savings	**$68,750**
Yearly Savings	
Reduced Mileage (Dispatch Efficiency, Driver Awareness)	$350,700
Predictive Vehicle Maintenance	$36,000
Insurance Reduction	$11,690
Salt Reduction	$68,750
Total Savings per Year	**$467,140**
Total Savings per Month	**$38,928**
Yearly Savings per Vehicle	**$2,797**

Return on Investment

Total Yearly Savings	$467,140
Less Yearly Recurring Costs (12 months x $13,212/month)	$158,544
Total Yearly ROI	$308,596
Project Cost (Example 1)	$587,163
(ROI months) – Project Costs / Total Yearly ROI x 12	**23**

3.3.3.7.2 Phases 1, 2 and 3

ROI Calculation - Vehicle Savings – Phases 1/2/3

Assumes Phase I and Phase II Vehicle Totals = 287

Reduced Mileage (Dispatch Efficiency, Driver Awareness)	
Average Vehicle Miles Traveled	25,000
Average Miles Per Gallon	5 mpg
Fuel Cost per Gallon	$3.50
Cost of Fuel per Vehicle per Year	$17,500
Number of Vehicles	287
Total Fuel Costs per Year	$5,022,500
Expected % Reduction in Fuel Usage	12%
Fuel Savings Per Year	**$602,700**
Predictive Vehicle Maintenance	

Expected Reduced Number of On-road Breakdowns/month	3
Cost per Breakdown	$1,500
Expected Reduced Maintenance Costs per Year	**$54,000**
Insurance Reduction	
Insurance per Vehicle	$700
Expected Price Reduction	10%
Number of Vehicles	287
Total Insurance Savings per Year	**$20,090**
Salt Reduction (winter season)	
Estimated Quantity (tons) – Rochester 2011-12 purchases	25000
Estimated Price per Ton	$55
Total Cost of Salt	$1,375,000
Expected Salt Reduction	5%
Total Salt Reduction Savings	**$68,750**

Yearly Savings	
Reduced Mileage (Dispatch Efficiency, Driver Awareness)	$602,700
Predictive Vehicle Maintenance	$54,000
Insurance Reduction	$20,090
Salt Reduction	$68,750
Total Savings per Year	**$745,540**
Total Savings per Month	**$62,128**
Yearly Savings per Vehicle	**$2,598**

Return on Investment

Total Yearly Savings	$745,540
Less Yearly Recurring Costs (12 months x $22,713/month)	$272,556
Total Yearly ROI	$472,984
Project Cost (Example 4)	$888,803
(ROI months) – Project Costs / Total Yearly ROI x 12	**23**

3.3.4 Degree of Fit

As per the RFP, details regarding Degree of Fit may be found in sections 6 and 7.

3.3.5 On-Going Support

As per the RFP, ASG and Vnomics will provide on-going support for the duration of the contract, as follows:

3.3.5.1 Toll Free Support Number

For this offer ASG/Vnomics will assign a dedicated Customer Care Manager who will provide front line support for any City issues. The Toll Free Support number is:

855.VNOMICS (855.866.6427)

3.3.5.2 24x7 Support

Vnomics provides 24/7 help via a dedicated customer support team, led by a customer care manager. The customer care manager becomes intimately familiar with the customer's business and contacts. The Customer Care manager also provides cell phone numbers and back-up contacts in case of an emergency request. Vnomics strives to enhance its products based on user-driven needs and feedback. Vnomics employs an Agile development process that allows for flexibility and quick turnaround when implementing new features and enhancements.

3.3.5.3 Software/Application Support

A software/application engineer is assigned to the customer care team led by the customer care manager as described in section 3.3.5.2. This engineer provides direct support to this City assigned team for technical issues that arise with the customer. An escalation process is employed for software issues as described in section 3.3.5.6. Customer care provides all front line training on software and 3rd party applications using a "train the trainer" methodology. Customer care representatives tailor this training on a per customer basis and provide assistance to their clients for support of their internal training. Electronic documentation and product/installation manuals are provided in-cab and on the Vnomics website. APIs and 3rd Party documentation can be supplied upon request. Vnomics uses a number of metrics to improve its level of service and product quality include: time since OBC last heard, time to respond to customer-inquiry by phone or email, time to repair bugs/enhancements, new bug/enhancement rate, and number of un-prioritized bugs/enhancements.

3.3.5.4 Remote Diagnostic Support Software

All software upgrades are scheduled on the Vnomics product technology roadmap and customers are notified 7 days in advance of rollout. Regular upgrades are limited to once a quarter and done automatically and remotely over-the-air after the ignition is turned off so as to have minimal or no impact to the driver. Back office upgrades are normally completed in a manner that requires little or no service downtimes and scheduled normally for 2:00 AM to 4:00 AM on weekends.

3.3.5.5 Remote Diagnostic Support Hardware

The assigned City Customer Care team has the ability to remotely monitor and triage all installed systems. A number of tailored metrics are used (last moved, last heard, last location, missing bus data etc) so that issues can be identified and reconciled very quickly. Equipment issues that cannot be resolved remotely or working with the City directly will be serviced by our in-house installation team that is headquartered in Pittsford NY.

3.3.5.6 Documented Escalation Procedures

Vnomics uses an issue tracking system to manage all bugs and enhancement requests. Each issue is entered and assigned to a specific engineer until it is resolved. Customers have the ability to enter bugs directly through the website or by contacting their Customer Care Representative. Customer Care Representatives track these issues and enhancement requests from the time of initial report through satisfactory resolution. When a bug is entered, it is given a severity level, ranging from low to critical. All critical bugs are addressed and resolved immediately while bugs with a lower severity are placed in a queue and evaluated. Average response and cycle time for critical bug fixes is 5 days.

3.3.5.7 Dedicated Tier 2 (Mid-Level Expertise) Support Staff

Vnomics has an escalation process for problem resolution. Customer can report issues by the main phone number, cell phone, website, email, and text messages. Issues are redirected immediately to the appropriate Customer Care team. Problem escalation is handled through the City assigned Customer Care Manager as described in sections 3.3.5.2 and 3.3.5.6.

3.3.5.8 Dedicated Tier 3 (Senior-Level Expertise) Support Staff

Critical bugs are assigned to the Executive Management oversight team so they can be prioritized immediately. This team consists of the VP of Customer Care, VP of Engineering, Director of Sofware and Principal Systems Engineer. They have authorization to permit immediate software releases and hardware changes in order to correct critical customer issues.

3.3.5.9 Portal to Exchange Information and Support

The Vnomics password-protected customer website provides access to all documentation, vehicle data, configuration settings, and the ability to enter bugs/document issues directly. It can be accessed at: http://www.vnomicscorp.com/customers.asp

3.3.6 Internal Information Technology Production Environment Support

City of Rochester staff will have some responsibility in support of following system level tasks:

3.3.6.1 Equipment Maintenance

On Vehicles: Depending on the City of Rochester's willingness (or requirement) to do so, electronics equipment maintenance will generally fall to the vehicle maintenance crew. Training will be provided to teach the maintenance staff proper installation and replacement techniques, projection from damage, connection to the vehicle electrical system and data network, and so on.

IT staff member: Normal desktop maintenance (operating system, browser, anti-virus updates) by the IT staff will be sufficient to maintain the operational applications that provide data to the supervisors, dispatch and maintenance operations.

3.3.6.2 Equipment Replacement

On Vehicles: Equipment replacement will follow the same guidelines as Equipment Maintenance in section 3.3.6.1.

3.3.6.3 Software Maintenance

The Vnomics hosted solution requires only a standard web browser. Vnomics customers use web browsers (desktop and mobile devices supported) to access data, reports, configuration, live data, and conduct administration. No servers or systems are required to be installed on customer premises. No special skill sets are required to properly maintain the system on a day-to-day basis.

The City of Rochester does not need to provide staff experts to handle software issues. Software maintenance is ongoing, in support of the entire client base. Anomalies that are reported are logged and corrected, and software upgrades to the FleetKnowSys system are downloaded to each unit via the wireless network. Software upgrades do not require visits to each vehicle.

Software maintenance is included in the monthly maintenance cost.

3.3.6.4 Thin Client Maintenance

IT staff member: Normal desktop maintenance (operating system, browser, anti-virus updates) by the IT staff will be sufficient to maintain the operational applications that provide data to the supervisors, dispatch and maintenance operations.

3.3.6.5 Host Server Maintenance

For a Vnomics/ASG Hosted Solution - The Vnomics primary datacenter is located in Monroe County and is operated and maintained by a 3rd party datacenter provider, EarthLink. EarthLink has been an IT provider for over 15 years and is recognized as an industry leader. See their website at http://www.earthlinkcloud.com/company.

For the Vnomics hosted solution, Vnomics/ASG Software Engineers, in conjunction with EarthLink will handle all database administration and day-to-day system maintenance required for this contract with the city. Minimum uptime of 99.9% guaranteed not including maintenance windows. Systems are monitored via both COTS and proprietary monitoring tools designed to measure communication and transaction performance over time and alert if problems occur. Hot standby and backup systems are in place to minimize outages. If they do happen systems are designed to queue data locally so that data is not lost. Upon restoration of services data flows automatically continue. This administration is included in the monthly fees.

The City of Rochester should require no additional staff expertise with regard to the host server, other than observing and reporting any perceived anomalous behavior.

IT staff member: For the-city hosted solution, the software components required, in addition to Vnomics software, are Windows Server, Linux Server (Ubuntu preferred), Microsoft IIS, and Microsoft SQL Server. A specific version of SQL Server is determined by the level of redundancy desired by the City. Specific software requirements may change due to specific City circumstances.

For the city-hosted solution, for each 500 vehicles, we suggest one server with a minimum 2 CPU, quad core Xeon, 64 GB RAM with direct attached or SAN storage (selected based on overall requirements) for a total of 2-4 TB per year of data retention.

Additionally, the city would need Database Administrator and at least 1-2 software engineer to support the database and redundant sites.

If the City of Rochester decides to purchase an on-premise host server (or utilize existing equipment in their Data Center) then maintenance and upgrades will become the responsibility of the City of Rochester and will fall to the Data Center IT staff.

3.3.6.6 Data Backup

Cloud-based server maintenance will be handled by ASG/Vnomics. The City of Rochester should require no additional staff expertise with regard to the host server, other than observing and reporting any perceived anomalous behavior.

Critical infrastructure is supported by Redundant Network Providers, Redundant Cooling Systems, Redundant A+B Power systems, The Data Center facility, Network and Power have a 100% Uptime SLA. The VMware platform for hosting cloud servers has a greater than 99.9% uptime metrics. A disaster recovery site in Columbia, SC or Marlborough, MA is available for a Vnomics hosted solution.

IT staff member: If the City of Rochester decides to purchase an on-premise host server (or utilize existing equipment in their Data Center) than data backup will become the responsibility of the City of Rochester and will fall to the Data Center IT staff. There are no special host server backup requirements outside of the usual backup service performed in a data center.

3.3.6.7 3rd-Party Software Version Tracking

IT staff member: This person should perform standard (and consistent) version tracking of 3rd-party software upgrades to existing equipment once integration handoff has been completed. Generally, vehicle upgrades of 3rd-party software are not expected once equipment has already been installed, but with continued advances in computerization a procedure should be implemented and followed to support this endeavor, no matter how infrequently it might occur. [Note that the upgrades themselves may be relegated to ASG/Vnomics or to City of Rochester IT staff depending on the affected equipment.]

As part of its maintenance and upgrade process ASG/Vnomics will provide an inventory and installation history of each FleetKnowSys unit and the software that is installed on it, for City of Rochester records.

3.3.7 Written Documentation

3.3.7.1 Documentation to be Provided

These documents are part of the general project deliveries.

- Kickoff meeting minutes – A synopsis of the client/vendor kickoff meeting, including a discussion of requirements, schedule and milestones; a list of all action items; any other important notes.
- Project Plan – A brief description of the project, the lines of authority, the names of key personnel and their accountability; tentative schedule; defined milestones; equipment and/or facilities list; quality standards; communications plan; and project assumptions.
- Implementation Plan – A detailed description of the process by which the project will be carried out. The implementation plan is fully described in section 3.3.9.8.
- Configuration Management Plan – A description of how hardware and software is to be maintained, stored and backed-up (or inventoried) throughout the project life cycle.
- Regular Status Reports – Typically weekly reports are generated but this may change from project to project, and often within the project. "Regular Status" may include written reports, emails, teleconferences, meeting minutes, an action item list and face-to-face meetings.
- Gap/Risk Analysis – A gap/risk analysis that includes participation from all parties is generally recommended as part of the Requirements Specification development, so that gap/risk issues can be identified and mitigated very early in the development process. Mitigation of risk becomes much harder (and expensive) as the project matures, so it is beneficially to include this analysis very early into any complex project.
- Requirements Specification – The System Requirements Specification (SRS) must be documented and signed by all parties prior to the start of design. Completion of and adherence to the SRS is critical to the success of the project. This document describes WHAT the system will do. Wherever possible it should also quantify the criteria by which each requirement will be met.
- Design Specification – The Design Specification must be documented and signed by all parties prior to development, implementation and test of hardware and software. Completion of and adherence to the Design Specification is critical to the success of the project. This document describes HOW the system be developed to meet the requirements.
- Test Procedures – Using the measurement criteria from the SRS, the Test Procedures document contains the procedures that should be followed to confirm that all requirements in the SRS are met.
- Test Reports – A formal report indicating the results of formal testing, anomalies that may have been discovered, and recommendations to resolve (or ignore) test anomalies.
- Training Documentation – Training materials specific to learning how to correctly use the system. For this project it is likely that separate training materials will be generated for Drivers, Dispatch and/or Vehicle Maintenance staff, IT staff and possibly program managers.
- Maintenance Documentation – Troubleshooting and fix-it manuals for the vehicle maintenance staff; IT staff guides for software maintenance, backup and troubleshooting.
- User Manuals – How-to guides for the various software user interfaces and other user/equipment interactions that may take place.
- Troubleshooting Log – An on-line log available to all users, giving them the opportunity to register questions, issues, anomalies, errors or any other system shortcomings. The log contains a severity level so that issues can be prioritized and escalated if necessary.

3.3.7.2 Documentation Maintenance Procedures

As part of the standard engineering process, documents are "versioned" along with the software and hardware that they support. Hardware, software and document deliverables are thus maintained in a lockstep fashion. ASG utilizes Tigris Subversion ("SVN") for this purpose.

Any upgrades and/or additions to the hardware, software or network may require document updates. For example, an equipment inventory list would be one such document to be updated whenever new

hardware is installed on a vehicle. Except where major functional upgrades are applied (these are expected to be somewhat rare), documentation updates should be simple and straightforward. Once a system change and affected documentation have been identified, the documents are updated, reviewed and signed off. They are then versioned along with the rest of the upgrade and released.

Generally, documentation that follows this procedure includes

- System Requirements
- Project and Implementation Plans
- Design
- Hardware Schematics and Software Source Code
- Test Procedures and Reports
- User, Training and Maintenance Manuals

Exceptions to this process include troubleshooting logs. Logs are dynamic and may change daily as issues are uncovered and resolved. Logs would normally be kept in digital form, be easily accessible and would provide timely information on issue status. They would not normally be locked to any specific hardware or software version.

3.3.7.3 Additional Documentation

Standard Operating Procedure (SOP) documents (beyond those found within the training, user and maintenance manuals) may require additional development time not included in the proposal. SOP complexity varies dramatically. A moderately-complex SOP will generally require roughly 20-40 hours to gather all appropriate data and references, to develop the step-by-step procedure directions, and to review, validate and print the procedure. A simple SOP may take a couple hours to develop. Additional effort may be required for those SOPs related to a highly complex – especially physical – task, to fully test and confirm that the procedure does not cause harm to the staff or damage to any equipment.

The costs for SOP development, therefore, will vary greatly and are primarily driven by engineering labor costs (see section 3.3.3 for details) but will typically run $90/hour for the engineering labor.

Additional details about SOPs may be found in section 3.3.9.11.

3.3.8 Product Maintenance

Vnomics strives to enhance its products based on user-driven needs and feedback. The Vnomics customer care manager assigned to the City of Rochester becomes intimately familiar with the customer's business and is first point of contact for customer enhancement requests. The customer care representative records all requests in our enhancement tracking system for evaluation and prioritization. Periodically, Vnomics invites customers to participate in user conferences to better understand their needs and to allow them influence the Vnomics technical roadmap. All feature requests go before a Executive Management Team that appraises and prioritizes the requested product improvements/enhancements based on customer needs. Furthermore, current Vnomics customers are invited to participate in new feature pilots to gain their feedback on proposed product improvements and make modifications based on their recommendations. Finally, Vnomics employs an Agile development process that allows for flexibility and quick turnaround when implementing new features and enhancements.

3.3.8.1 Vnomics and Third-Party Software Releases

3.3.8.1.1 On Existing Equipment

All software upgrades, including 3rd Party vendors, are scheduled on the Vnomics product technology roadmap and customers are notified 7 days in advance of rollout. Regular upgrades are limited to once a quarter and done automatically over-the-air after the ignition is turned off so as to have minimal or no impact to the driver. Back office upgrades are normally completed in a manner that requires little or no service downtimes and scheduled normally for 2:00 AM to 4:00 AM on weekends. For Emergency

upgrades, when a bug is identified, it is given a severity level, ranging from low to critical. All critical bugs are addressed and resolved immediately while bugs with a lower severity are placed in a queue and evaluated. Average response and cycle time for critical bug fixes is 5 days. Vnomics/ASG is responsible for holding their 3rd Party vendors to this time schedule.

3rd-party releases to existing equipment should occur infrequently but are likely over the equipment lifetime. As stated in section 3.3.6.7, consistent version tracking will mitigate confusion over which releases (i.e., "versions") are on which equipment. Version control procedures can be time-consuming and must be followed consistently. Because of this, the merit of new releases must be considered prior to their installation on any vehicles.

3rd-party releases should not be haphazardly executed; they must be part of an issue or contract resolution or there may be no value to their installation.

3.3.8.1.2 On New Equipment

New equipment will be installed with the latest certified 3rd-party releases. "Alpha" or "Beta" releases are generally not allowed. ASG/Vnomics will check with 3rd-party vendors to confirm that the releases are up-to-date.

3.3.8.1.3 3rd-Party Product Installation

3rd-party products will be functionally tested to verify that they meet the stated requirements. In some cases (mainly controls for high-power machinery) certification by the product vendor may be required; all required vendor certifications must be obtained prior to use of the vendor's product.

Some release installations (the example being high-power machinery) may be controlled by 3rd-party license agreements. Where there is no conflict, ASG/Vnomics can and will handle software releases.

3.3.8.2 Vendor Responsibilities for 3rd-Party Software

Vnomics/ASG is responsible for holding their 3rd Party vendors to this upgrade time schedule. In the event a 3rd Party upgrade cannot be accomplished over the air Vnomics/ASG would assist the City of Rochester with this upgrade and is included as part of the monthly fee.

ASG/Vnomics cannot take responsibility that out-of-the-box software performance meets all 3rd-party vendor claims. However, ASG/Vnomics can and will functionally test all software, and work with 3rd-party vendors to identify issues and anomalies in order to initiate appropriate corrective actions.

3.3.9 Project Management Methodology and Implementation Plan

3.3.9.1 Project Planning Process

A Project Plan is generally developed just prior to the client Kickoff meeting and modified/confirmed at that meeting to the satisfaction of all parties. The Project Plan includes the following:

- Project scope
- Brief problem statement
- Brief solution statement
- Known risks
- Major tasks
- Key roles and responsibilities
- Schedule and Deliverables (milestones)
- Implementation methodology
- Communications methodology
- Conformance standards
- Quality assurance
- Change management

As per ASG's guidelines projects are tracked at a number of different levels:

- Projects are broken into tasks and assigned task numbers during the proposal process. A tentative project schedule is also generated during the proposal process.
- Immediately after contract award, a client **kick-off** meeting is held to review the client's Statement of Work and ASG's proposal, to confirm that both ASG and client are in agreement on all requirements, to evaluate the project tasks, schedule, and to discuss any possible changes or amendments to the project.
- Project engineers are assigned to the project. Project engineers must fill out weekly timesheets indicating their level of effort with respect to project tasks.
- The project manager is responsible for review of all project tasking efforts.
- The project manager is responsible for regular communications with the client, identifying milestone progress, communicating any risk items and notifying the client of any issues with meeting specific requirements or schedule milestones.
- The project manager and **all project engineers** are responsible for regular updates to the project binder, which includes all materials associated with the project: proposal, contract, meeting minutes, design notes, source code, status reports, emails, invoices, purchases and any other material pertinent to the project.
- All project managers meet weekly (every Tuesday morning) to review project status with the Engineering Managers and the company President.
- Project managers and corporate management are responsible for identifying and tracking project costs throughout the development effort. Since implementation of its best practices policies in 2001, ASG has experienced far fewer project overruns and schedule slippages due to inadequate tracking than prior to best practice implementation.

3.3.9.1.1 Deliverables

The following deliverables are included:

- Project Plan
- Kickoff Meeting Minutes

3.3.9.1.2 Project Audits

ASG has an **open-book policy** with respect to project tracking. Clients are invited to review all project-related efforts to verify that the work is being performed in accordance with best practices.

3.3.9.2 Frequency of Project Meetings

Meeting frequency is determined at the Kickoff meeting. At a minimum, ASG recommends a weekly teleconference and/or face-to-face meeting among key players (ASG, Vnomics, key City of Rochester staff) and more often during critical tasks.

Additional project meetings must be scheduled for the Gap/Risk Analysis (at which all parties must participate), design, and formal testing.

ASG/Vnomics already meet regularly to discuss ongoing (other) project developments and will continue this habit.

3.3.9.3 Action Item Tracking

Action Items can result from any meeting and fall into two categories.

3.3.9.3.1 Internal Action Items

Internal action items are the result of internal meetings, typically between engineering staff or engineers and project managers. Results of these actions may remain internal. For example, staff may need additional resources (computers, test equipment) to efficiently perform a task; the result of this action

would be to purchase more equipment. Many internal action items do not escalate to the client level and would remain internal to the vendor team.

Some internal action items may escalate and – depending on their severity – may appear in regular status meetings or be escalated to an "emergency" basis. Something that impacts a critical path item would fall into this category. Parts availability (long lead items) is a typical example, as is an unexpected test failure or functional shortcoming uncovered during the development process.

3.3.9.3.2 External Action Items

External action items can result from any communications between client and vendor. Status meetings often result in action items that must be handled in an efficient manner

3.3.9.3.3 Action Item Accountability

Action Items are always assigned to an individual accountable to resolve that action, and a target completion date is specified. Action item status is reviewed at regular status meetings.

3.3.9.4 Issue Tracking

ASG uses the Mantis Bug Tracker to track project issues. Because it is web-enabled it allows all parties to easily enter issues, assign a severity, and follow their progress to resolution.

3.3.9.5 Status Reporting

Regular status reports are generated weekly and project status is reviewed at the weekly client/vendor project meetings. Additional status reports may be generated during critical tasks.

Status reports are usually distributed via email.

3.3.9.6 Project Change Management

Project changes often impact schedule and cost, so change management is critical to project success.

ASG's change management process is included in the project plan. The change management process follows:

- Inconsequential changes (example: Change of a regular meeting date/time) are agreed to by all parties and an exchange of phone calls and/or emails is sufficient to note the change.
- Changes that impact schedule or cost are formally discussed. Meeting minutes are taken.
- All parties assess the impact of the change and to what extent the project is affected.
- If additional costs (or cost reductions) are indicated, a formal Engineering Change Order (ECO) is completed, detailing the change, the reasons for it and the project impact.
- ASG will then deliver a formal, written change request to the client for approval and signature.
- The client will approve and send the ECO to ASG.
- ASG/Vnomics will execute the ECO.

An example for this project might be the inclusion of weather data from stationery weather sites atop buildings in different parts of Rochester. This data may be useful for the dispatch of salt spreading and snow removal equipment. In this case, the ECO would cause inclusion of a new requirement on the project with potential impact on design, development, testing and documentation.

ECOs often require design and documentation updates which lead to new versions, so ECOs are integrated into the versioning process. ASG utilizes Tigris (now Apache) Subversion ("SVN") to capture all ECO modifications.

3.3.9.7 Problem Resolution

"Problems" will occur and be recognized throughout the project. They are often resolved at the Action Item level and signed off at regular status meetings.

Problems resulting in ECOs become part of the project development process and are resolved by incorporation into the project documentation, leading to formal testing to confirm resolution.

Post-deployment problems that result from functional confusion are generally resolved via the Help Desk and possibly additional training.

Problems that are the result of software bugs or issues arising after deployment are normally entered into the bug tracking system and resolved as part of ongoing support. Depending on severity these may escalate into either warranty or ECO issues and possibly require additional levels of approval before being acted upon.

3.3.9.8 Implementation Methodology and Approach

3.3.9.8.1 Methodology

ASG would execute projects of this type as it runs all projects:

- On contract award the Sales staff will generate a turnover document that defines the proposed work breakdown structure (WBS), the terms of the contract, and any additional information forthcoming from the client;
- The Engineering Manager will assign a project manager to the project. Generally (and depending on the timing of the award and availability of the manager), this is the same manager who was involved in the proposal development.
- The project manager will generate a **project binder** containing all required documentation, with space left for additional documentation as the project proceeds.
- The project manager will establish work tasks based on the WBS and assign engineering staff to the project.
- The project manager will organize a kickoff meeting with the client, and with key engineering staff, meet with the customer to review the requirements, design aspects, risks, schedule and any desired program amendments.
- The project manager will kick off an internal meeting with the selected engineering staff to begin development. Usually, this involves at least a few days of requirements review and risk assessment (depending on the size of the project) followed by high-level design discussions.
- The project manager and engineering staff will collectively dole out task and reporting responsibilities, and begin the design, code and test process.
- The project manager will maintain regular contact with the client and provide the client with progress updates. These include
    - Schedule/Milestone status
    - Task status (if desired)
    - Costs incurred to date
    - Risk Items
    - Action Items
    - Issues
- This process continues throughout the program life cycle.
- All key milestones must be measurable and as such, formal test procedures with expected outcomes must be developed. Tests are witnessed by vendor and client representatives, and signed off.
- A training program, user and maintenance manuals are to be provided as part of this project.

3.3.9.8.2 Implementation Plan

The RFP is somewhat ambiguous in total vehicle integration for Phases I and II (and possibly III), and therefore a definitive implementation plan, schedule and budget must await a review at the Kickoff meeting. Appendix C contains a typical implementation plan breakdown based on the clues gleaned from the RFP for a roughly 200-vehicle integration. This plan would integrate the winter-utilized equipment first (in the hopes of getting some or most of it on the streets for use during the 2012-13 winter) while deferring Solid Waste Management vehicle integration to a later schedule.

3.3.9.8.3 Quality Assurance

ASG adheres to engineering development best practices as specified by various regulatory agencies. Because ASG provides development services to companies with various corporate standards of quality, we must be aware of a number of similar standards, and as part of our corporate quality policy, have developed our standards from a combination of agencies:

- FDA (21 CFR Part 820 and 21 CFR 11)
- DoD (MIL-STD 498)
- ISO (9000-3:1997)
- IEEE (730)

Our corporate philosophy toward quality control focuses on minimizing or eliminating mistakes made during the design, development and testing stages of development. To that end, a few simple rules are applied to all projects:

- Separation of project management responsibility from development responsibility. It is far too easy for a project manager to engage so deeply in engineering development that management responsibilities are neglected for the sake of moving the project along. We don't allow this.
- Two sets of eyes on all code. This generally means that no matter what the project size, at least two engineers are assigned to it. This has a couple of benefits:
    - Coverage in case one engineer is pulled off the project for any reason (illness, vacation, personal conflict, emergency assignment elsewhere, departure from the company);
    - Each engineer looks at problems slightly differently, and often the other engineer observes mistakes (and corrects them) or discovers alternate, more optimal solutions.
- Adherence to corporate design and coding standards
- Adherence to documentation standards
- Closed-loop communications with project management, corporate management and the client.

3.3.9.9 Project Management, Communications, Change Management and Reporting

3.3.9.9.1 Assignment of a Project Manager

A project manager is generally assigned to the project at contract award. The project manager is a senior-level engineer who has technical experience in the subject matter. For the City of Rochester, a project manager would be assigned based on the projects or task order(s) only to the level of managerial support needed. It is expected that some well-defined projects or task orders may require little oversight while others will require attention to detail, resolution of ambiguities, significant interfacing with the customer and possibly end-user, and more senior-level expertise than might be found by engineers supporting such tasks.

3.3.9.9.2 Management of Consultants

ASG uses consultants (or subcontractors):

- When projects require a level of expertise not present within the company;
- When ASG lacks the manpower to meet scheduling or milestone requirements.

Consultants are treated as members of the full-time engineering staff and fall under the same project management rules as do all other employees. Consultants are subject to both supervisor and peer review.

Consultants are subject to background checks and must sign a non-disclosure agreement. Where applicable, they may also be required to carry business insurance to protect ASG and ASG's clients from potential liability issues.

ASG maintains a list of qualified consultants local to the Western NY area. ASG *may* use consultants on City of Rochester project tasks should an extensive understanding of the underlying physical or analytical processes be required. Generally, this level of consultant would be associated with the University at Buffalo or Rochester Institute of Technology, both of which ASG has partnered in the past.

3.3.9.9.3 Vendor Management

Out-of-the-box vendor purchases are carried out via a standard purchase request/purchase order system with deliverables as stated in the purchase request. ASG typically requests payment terms of net 30 days.

Customized vendor purchases – both hardware and software – require a written agreement that specifies requirements, deliverables, schedule and terms.

3.3.9.9.4 Communications

Regular communications channels will be established between ASG, Vnomics and the City of Rochester. These are normally established during the Kickoff Meeting.

Two formal communications channels will be established:

- Contract management, typically between company officers with signing authority.
- Technical management, typically between project managers.

Communications channels will be established among the development teams for efficiency; however, task direction and signoff must have project manager approval before any work is to be performed.

As stated in section 3.3.7.1 and various subsections of 3.3.9, communications will take the form of weekly status meetings, teleconferences, emails, and face-to-face meetings.

3.3.9.9.5 Change Management

Section 3.3.9.6 above describes the project change management process. Engineering Change Orders (ECOs) must be approved by all affected parties. ECOs that introduce cost changes to the project must be approved by company officers with signing authority.

3.3.9.10 Business Process Design and System Configuration

FleetKnowSys is a hierarchical architecture that localizes vehicle data collection to a single piece of hardware, which collects, analyzes and transmits the data and analyses to the enterprise network. If necessary the FleetKnowSys hardware will buffer data until communications can be established at the enterprise level.

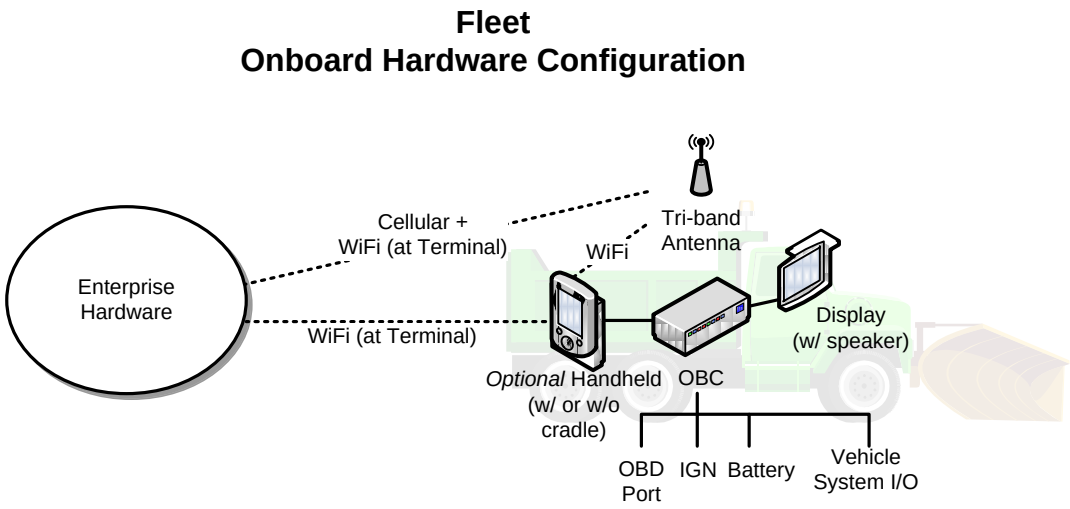

Figure 17 - FleetKnowSys Onboard Hardware

The Enterprise network will provide data aggregation, additional analysis algorithms and interfacing to Dispatch, Maintenance and Operations groups and enterprise-level 3rd-party software residing on the City of Rochester MAN, as shown in the figure below.

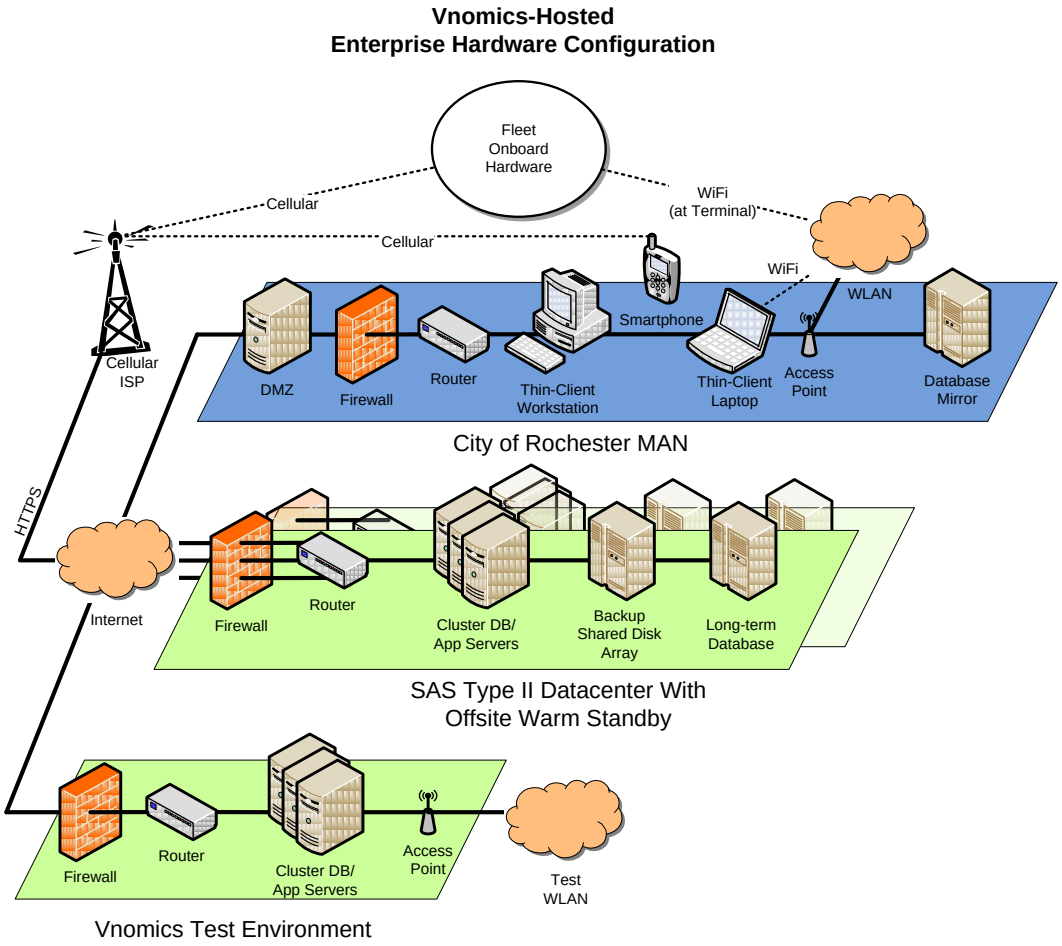

Figure 18 - Entrerprise Hardware Configuration

3.3.9.11 Hardware and Software Training and SOP Development

3.3.9.11.1 Training

Standard training plans are in place. Training is focused on truck drivers, supervisors, web site applications, and equipment.

Vnomics provides in-person instructor led training as well as remote web conference training. Additionally, to ensure a smooth rollout of the system, Vnomics will train the City of Rochester trainers. Vnomics support personnel will gather any feedback from this training and will make sure it is incorporated into future software and training material improvements. Vnomics maintains copies of all training manuals, installation manuals, troubleshooting and redeploying information on the customer web-portal. In addition Vnomics in-cab system includes help information for the drivers, maintenance personnel, and installers. Vnomics will provide digital copies via email upon request. These documents can be provided as PDF or Microsoft Word and PowerPoint files, so they can be customized to meet the customer's individual training needs. Vnomics maintains a test database that can be used for training purposes, customization, and integration efforts. In addition, there are demonstration accounts and sample data to facilitate training. This includes a live link right into Vnomics' database, so the Customer, during training, can see actual real-time results from their inputs into the system. Another option is customers can purchase extra systems that are set up as a portable training device to replicate the in-truck experience.

3.3.9.11.2 Standard Operating Procedures Development

Standard Operating Procedures (SOPs) are developed around a standard template (although "standard" is relative since most organizations tailor SOPs to their liking). ASG has developed SOPs for many projects including those that fall under strict regulator guidelines (such as medical trials). ASG recommends using an SOP template similar to any that already exists within the City of Rochester agencies (Maintenance and IT in particular). Each SOP should contain

- Title/Author
- Creation/Revision Date
- Responsible Person(s)
- Approval Signature(s)
- Purpose
- Description
- Relevant Literature and/or References
- Any Risks/Hazards (and mitigation of risks/hazards)
- Training Requirements (for example, OSHA Arc Flash)
- Safety Equipment and/or Procedures (for example, lockout/tagout, eye protection)
- Step-by-step Procedure

3.3.9.12 Project Schedule and Timeline

Appendix C contains a tentative schedule for a 167-vehicle (Phases 1 & 2) and 287-vehicle (Phases 1,2 and 3) integration broken into two (or three) phases (Snow and Ice equipment, then Waste Management, then Special Services equipment). A detailed implementation schedule and timeline is limited due to the lack of RFP specifics. However, an example budget for these implementations may be found in section 3.3.3.

3.3.9.13 Proposed Vendor Consultants and Resumes

As a joint effort with ASG, Vnomics' staff resumes may be found in section 3.2.1.5.

About Agilis Systems:

Agilis Systems began life through the foresight and innovative spirit of a small group of individuals who saw the potential created by the convergence of the Internet, robust mobile data networks, the rise of

GPS solutions and increasingly powerful mobile devices. Agilis was a pioneer in developing mobile business software solutions that unlock the power of these technologies.

Agilis' earliest efforts focused on reducing costs and paperwork in the transportation and logistics markets by creating tools that empowered remote workers. These mobile workforce management tools have evolved into a powerful platform that allows centralized management teams and field workers to:

- Monitor, track and gain immediate visibility and measurement of field activities.
- Capture data remotely reducing paperwork and dual data entry.
- Collect and analyze data to enable better decision making.
- Manage a host of field activities including clock in/clock out time tracking, remote data and signature capture, and service dispatch, routing and vehicle diagnostics.
- Monitor and track vehicles, physical assets and workers.

Over the years, the Agilis platform has matured and evolved into one of the industry's most powerful and flexible mobile application platforms. Key elements of today's solution include:

- Interoperability across mobile networks (AT&T, Sprint, T-Mobile and Verizon).
- Robust software support for Android, Blackberry, Windows Mobile, Windows, and Java operating systems.
- Flexible device deployment options including mobile handsets, laptops/netbooks/tablets, and in-vehicle black boxes.
- Support for a wide variety of mobile device peripherals such as Bluetooth printers, signature captures pads and bar code scanners.
- Powerful Web service integration with key business applications including leading CRM, ERP, and Billing and Payroll systems.

As Agilis has grown, a key element of its success has been its ability to provide customers with a "custom" solution at an out-of-the box price. They have designed their software to be incredibly flexible and configurable. It allows them to match the solution to the each customer's specific need without timely or expensive customization.

Naeem Bari - CTO

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About Sygic:

Sygic develops and sells turn-by-turn voice guided GPS navigation for a wide range of mobile devices. Its software is delivered worldwide in more than 30 languages. They are working together with map industry leaders for supreme mapping support. Their customers are considered a part of Sygic development family. They listen and respond to suggestions about application and ideas for features from their customers to create the best product possible. In 2010, Sygic was acknowledged as the 4th fastest growing IT Company in Central and Eastern Europe by Deloitte, based on business results from previous five years.

3.3.9.14 Identification of Certified Disadvantaged Business Enterprise Firms

No DBEs have been identified for this proposal effort.

3.3.9.15 Deliverables and Assumptions

Formal deliverables (and assigned milestone dates) will be defined at kickoff. The deliverables list will include the following:

- Approximately 167 FleetKnowSys units installed onto the Snow & Ice Control and Solid Waste Management vehicles, in two phases, across an approximately 8-month timeframe. Contingent

on funding, the rollout of approximately 120 additional vehicles to Special Services Division in Phase 3.

- Driver displays on selected vehicles.
- Installation (or supervision of installation) onto targeted vehicles.
- Integration of 3rd-party software into FleetKnowSys.
- Integration of FleetKnowSys into the City of Rochester MAN.
- System witness test.
- Documentation: Project plan, requirements specification, gap analysis, design, user manuals, training material, meeting minutes, status reports.
- Ongoing customer support and help desk.

3.3.9.16 Skill Sets

ASG and Vnomics believe that the City of Rochester staff will have the capability (and capacity) to support our solution with a minimum of future support from ASG and Vnomics. Some vendor support may be needed (especially with regard to improved functionality, bug fixes, and so on) but for the most part our intention is to provide a more-or-less turnkey solution, with training and documentation, so that the City of Rochester can perform most future maintenance tasks.

The following skill sets would be useful to the City of Rochester:

- Engineering Management (specifically process engineering, installation and integration management)
- Software Engineering (specifically, web, database, embedded systems, algorithm development, communications, testing and integration), and although useful it is not necessary beyond IT support.
- Automotive expertise (specifically, ODBII, CAN/J1939, 1708/1587, dispatch, maintenance and operations).
- Field expertise (specifically, installation and integration)
- Training skills (specifically, good communications skills, enthusiasm, mentoring experience) as new maintenance staff are hired.
- IT expertise (networking, databases, data backup, troubleshooting)

3.3.9.17 Assistance to City of Rochester

This project will require approximately 2 FTE staff for the contract duration. The tasks break down across several different lines: Software development, installation, documentation and training are the major divisions. Allocation of staff resources will depend on the scheduled task and therefore it is likely that several (3 to 5) different engineering staff will be involved in this project at various times.

Key staff resumes may be found in section 3.2.1.5. All selected staff are experienced engineers (college-degreed) with direct knowledge and experience in the AVL and trucking industries.

3.3.10 Strategic Direction

Vnomics was started by people already in the trucking business. Its business model is focused entirely on the AVL/ITS market. Its growth relies on this market's need to improve overall vehicle efficiencies.

ASG's 20 years of integration knowledge across multiple markets provides broad-based expertise to handle projects of this size. Its growth relies on proving that it deserves incumbency.

3.3.10.1 Product Differentiators

When Vnomics looked across the vast array of products that are in the market today for Telematics we wanted to do things that made us different. With all the "me to' features that most providers have, we specifically wanted to make a change the way work is done. To accomplish this you have to do it in the moment or in real-time as we call it. Vnomics feels that by changing behaviors in real-time, then and only

then can you see immediate cost benefits. Because of the robust hardware platform we deploy we are able to do the following that others can't.

These are the things that make us different:

- In-Cab Driver Coaching – Provides audio based coaching prompts to remind drivers of the best, most efficient and safest way to operate the vehicle. Driver performance scorecard displays on screen when the vehicle stops for more than a predetermined period of time. The results are safer drivers, less wear and tear on the vehicle, and increased fuel economy
- Fuel Analysis – Detailed analysis of how all fuel is used including actual and potential fuel economy (MPG, km/l,or MPIG). Fuel use is bucketed into six categories; normal driving, driver shifting, excess idling, PTO use, truck specification, and excess speeding.
- Driver Performance Scorecard – Includes a shift score normalized for vehicle make/model, engine/transmission type, load, and environmental conditions. Also includes information about how fuel is consumed, including details on how much fuel is used in each gear. The method of scoring drivers on how close they come to following best practices gives the fleet a fair method of benchmarking their driver performance within the fleet and industry.
- Safety Scorecard – Driver safety report measures how safe a driver is driving. The safety score is based on number of speeding, hard acceleration, hard braking, and hard cornering/lane changes. Seat belt use is also included when available.
- Proactive Maintenance – Vehicle "state-of-health" is monitored in real-time and provides early warnings of impending failures along with diagnostic trouble code alerts. Alerts also include suggested maintenance actions.
- GPS Location with Exception Alerts – Stakeholders have visibility to location, vehicle health, and driver behavior at all times (typically updated every minute). Stakeholders can also establish parameters to be alerted of operational or mechanical issues via email. Delivery of the email alerts can be user defined based on severity.
- Mobile Website – Allows stakeholders the freedom to access the status of their fleet anywhere at any time via Android, Apple iPhone and Blackberry smart phones. Mobile website includes operational and mechanical status, vehicle speed, heading, and address. It also includes links to any status alerts with suggested actions based on industry best practices.
- Electronic Hours of Service Log Book – Compliant 395.15 AOBRD functionality that eliminates the need for paper logs.
- IFTA – Delivers mileage and fuel purchase information required to complete IFTA reporting requirements.
- Critical Event Reconstruction – Provides highly detailed information and mapping leading up to a critical incident. Incident reconstruction includes driver safety evaluation, mechanical "state-of-health", and critical operating parameters precisely overlaid onto oblique aerial images.

3.3.10.2 Why ASG/Vnomics?

Vnomics roots have and will remain in the Transportation industry. "We Are Trucks". So with this mantra comes the responsibility to remain knowledgeable about our ever changing industry. As the environment continues to change Vnomics will continue to as well, from government regulations to technology changes we will be there for you and your fleet. We consider our customers partners in everything we do and from this we both benefit. The more we know about your business, the more we can help you be more efficient.

To stay current with the industry, Vnomics is actively involved in the following organizations:

- Affiliation with SmartWay™
- American Trucking Association (ATA)
- National Private Truck Council (NPTC)
- Information Technology & Logistics Council (ITLC)
- North American Fleet Administrators (NAFA)
- Technology & Maintenance Council (TMC)
- Ameriquest – NationaLease

Sections 3.1.3.8 to 3.1.3.11 elucidate the benefits to the ASG/Vnomics teaming arrangement. Basically,

- A broad-spectrum service provider (ASG) can use related business experience to quickly uncover optimal solutions as new ideas are brought to the table. The City of Rochester will come up with future plans that may require out-of-the-box solutions, and ASG is well-positioned to develop and investigate these plans.
- A local provider can respond quickly to any issues that require on-site visits. Vnomics and ASG are local providers.
- A team approach provides resource buffering in those cases where response time is critical but staff may be busy elsewhere. A team approach provides redundancy as both team members know this system intimately. A team approach is less likely to be a single point of failure. ASG and Vnomics back each other up.

3.3.11 Annual Reports

Annual reports may be found in Appendix A – Company Financial Statements.

4 GSA Contract

Applied Sciences is a General Services Administration Multiple Award Schedule Contract Holder. This contract vehicle was awarded to us by the U.S. Federal Government. The contract allows Federal, State, and Local agencies to purchase engineering services from us. These services are grouped into several labor categories (which comprise our Federal Supply Schedule) with a distinct cost per unit (labor units are hours) for each category. To summarize, the above mentioned agencies can easily purchase services directly from Applied Sciences without the need for a formal pre-qualification / bidding process. Our GSA Contract information is:

General Services Administration Multiple Award Contractor

Award #GS35F0042U, Schedule 70, SIN 132-51

Duns #: 837605146

CAGE Code: 3MMY7

Primary NAICS (North American Industry Classification System):

- 423430 - Computer and Computer Peripheral Equipment and Software Merchant Wholesalers
- 541330 - Engineering Services
- 541511 - Custom Computer Programming Services
- 541512 - Computer Systems Design Services
- 541513 - Computer Facilities Management Services
- 541519 - Other Computer Related Services
- 541990 - Professional, Scientific and Technical Services

ASG has performed approximately $1.5M of project work under this contract and is currently in Year #5 of the contract.

5 Additional Questions and Answers

ASG and Vnomics wanted to address a few questions that might come up during proposal reviews.

Q: Why a joint effort between two companies, and why is ASG the lead and not Vnomics when Vnomics supplies the hardware and has the customer base?

A: See section 3.1.3.10 and 3.3.2 for details. The team approach covers the City of Rochester needs **and** provides redundancy should one vendor get extraordinarily busy.

Q: How responsive is ASG/Vnomics going to be when problems arise?

A: Except in extreme cases the Help Desk is the first line of response and will probably directly handle 90% of the issues. The remaining issues can be divided into a few categories:

Software and Network Problems: City of Rochester staff will interact mainly through the desktop (browser) application and in-truck displays. ASG/Vnomics will remotely log into the system (assuming that we are allowed to do so) to review back-end data in order to understand issues that arise. In some cases a configuration setting will be incorrect and in others a bug will be discovered. In both cases a Troubleshooting Report will be generated and prioritized. High-priority software issues will be tackled as quickly as possible, usually same-day or next-day. Lower-priority software issues are attacked on a more casual basis – typically, for better efficiency, by aggregating them into a list and working on them as a group - but can be escalated if they are exceptionally persistent, exceptionally annoying or when there simply is no workaround for them.

On-vehicle issues may require a visit to determine the root cause but often, what appears to be a software problem is actually a loose or broken wire that can be repaired by city staff. However, we're here to help so the same rules apply: High-priority issues are tackled as quickly as possible with lower priority issues aggregated for efficiency. Rochester is a local client to both ASG and Vnomics so on-site response times can be as low as 1-2 hours.

Equipment Problems: Any hardware issues that can be diagnosed via the network will be taken care of remotely. Hardware change-outs may require a site visit (with response times as low as 1-2 hours depending on priority).

3rd-Party Problems: Some issues (such as loss of communications carrier) may be the result of 3rd-party problems that ASG/Vnomics cannot directly resolve. In this case a Troubleshooting Report will be issued, the offending party will be notified and progress will be tracked until resolution.

Q: I need some new reports. How can I get them?

A: For a small additional monthly fee we can offer a set number of programming hours dedicated to developing reports or other small functional items that might falls on someone's wish list – a "retainer" agreement, if you will. For larger functional improvements a separate contract vehicle is suggested. We found small retainer agreements to be adequate for several other clients with whom we have comparable contractual agreements (Bloomingdale's, American Dairy Association and formerly, Xerox).

Q: What kind of system options did you consider?

A: We looked at a number of different options:

- Phase 1/2 only, and Phase 1/2/3 development.
- A cloud-based architecture with a FleetKnowSys unit (installed by ASG/Vnomics installers) in every vehicle
- Optionally, installation performed by City of Rochester staff trained by ASG/Vnomics
- Optionally, an on-premise solution using a dedicated redundant server
- Optionally, an on-premise solution using the existing city data center
- Optionally, only some units with "extras" such as Turn by Turn, Dispatch, and Geofencing

We wanted to determine the different pricing options so we could estimate via formula what the growth curve would look like. This was our observation:

- In phase I the cost of equipment and non-recoverable engineering (software development and installation) are about equal. In subsequent phases the software development costs drop dramatically, with equipment purchases and installation being the two major items.
- Installation costs can be reduced if the City of Rochester staff performs this task. This results in approximately 10% project savings.
- Significant monthly savings can be obtained with pragmatic use of the optional components (Dispatch, Turn by Turn, Geofencing, Cellular data), although this may be penny-wise and pound foolish as these features greatly improve vehicle utilization efficiency.

Q: Did you do a Return on Investment analysis?

A: Yes! We looked at expected savings in

- Fuel costs (mainly reduced mileage)
- Predictive preventive maintenance and how that might reduce on-road vehicle breakdowns
- Reduction in insurance rates from improved driver awareness
- Reduction in consumables – salt in this case.

We did not try to factor in reduced driving times or repair times but if potential staff reductions are considered there would be savings here as well. We also didn't examine savings in other commodities (for example, the cost of cold asphalt in a broken-down vehicle).

Estimates were based on our client experiences. Information on salt was obtained through NYS purchasing agreements with the City of Rochester in 2010-2012 time frames.

The biggest saving is in fuel consumption. Total fuel costs across the (Phase 1/2) 167 vehicles amounted to around $2.9M/year (based on 25,000 miles travel per vehicle) and a 12% reduction due to improved dispatching, geofencing and efficient driving. This amounted to about $350K in saving per year and is linear with respect to average vehicle mileage.

Predictive vehicle maintenance, insurance reduction and salt reduction amounted to an additional $100K in savings.

Equivalent savings for Phase 1/2/3 were $600K and $145K, respectively.

If you subtract off the expense of FleetKnowSys yearly recurring costs, the ROI is approximately 23 months before the entire system is paid back. Yearly savings after that amounts to approximately $300K (Phase 1/2) or $470K (Phase 1/2/3) and will grow as the FleetKnowSys system is rolled out across more vehicles.

Additional details can be found in section 3.3.3.7 (Return on Investment).

Q: Did you contact any of the 3rd-party vendors?

A: Yes. A synopsis is below.

5.4 GIS-they use ArcView from ESRI. They are moving to Arc GIS sever version 10 in the near future (6 months). Carl Nylon from ESRI was very helpful. He said that Rochester wants to use as much of ArcGIS as possible in this integration as they are very familiar with it (Rochester has been a customer for close to 30 years!) They have tools and analytics flex APIs (Java etc) and integration for all mobile devices, applications, and databases etc…..(NOTE ESRI has a tracking software package now as well)

5.5.3 Fuel System-Rochester has a OPW PetroVend K800 FCS that uses OPW Phoenix Software. (K800 Phoenix Plus). We would have to interface to the transaction file that is downloaded each day or the database for information etc. Rochester is looking to upgrade to C/OPT FSC3000 Controller in the future that will have a better API for us to tie into.

5.5.7 311 Call Center-Rochester using Lagan-see attached as should not be an issue as they have a document regarding web services for the version of Lagan the city of Rochester is currently on. (When on Rochester's network, we can also access the WSDL through their network at http://roc-front:8080/lagan There will be a link to the WSDL there)

5.5.7 Refuse Collection and Forestry-Peterson states that they have an alarm buzzer for the driver when the boom is over a certain height. He said a proxy sensor could be added to signal if boom is up. It is mechanical and if we needed more than that to contact International on the 7400 Chassis

5.5.4 and 5.5.5 Salt Distribution and Snow Plowing- Rochester uses FORCE America. We believe FORCE might be bidding on this contract as they have their own AVL solution. They are not being responsive but we believe that they have an API based on their website etc.

5.5.5 Street Sweeping-Rochester uses Elgin. Spoke to the local dealer in Rochester (Contact Aaron Geiske 585-254-7700) he states there is an API and should not be an issue but the 6.1.8.1 water gauge is an issue as it is outside the unit and manually controlled. We would need a sensor added to the vehicle.

5.5.1 Fleet management-Rochester uses FASTER. Asset Solutions contact is not being responsive, But I believe on the web version that there is an API:

6 Process Automation Requirements

6.1 OBJECT - Vehicles

6.1.1 Assign a Vehicle to a Route

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

Reference #	Requirement	Requirement Type	Response (Y,Z,T,N)	Notes
6.1.1.1	Add a vehicle to a pre-determined group.	User Interface	Y	This is a core function of the Vnomics system today. This includes the ability to assign vehicles and drivers by geographic location and scope of responsibility. All system alerts can be configured by these groups and provide warnings ***only*** to the appropriate supervisor(s) if desired.
6.1.1.2	Change the vehicle from one group to another.	User Interface	Y	This is a core function of the Vnomics system today.
6.1.1.3	Change display icons for vehicles of the same group.	User Interface	Y	This is a function in the configuration tab of Vnomics system today. The system has a wide variety of vehicle icons today and is configured to easily add new icons.

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.

Reference #	Requirement	Requirement Type	Response (Y,Z,T,N)	Notes
6.1.2.1	Identify the location of vehicles within the parking area (e.g. CVMF parking lot).	User Interface	Y	This is a function of the current system which is able to geolocate the vehicle and the user is able to visualize that the vehicle is in the parking lot via Vnomics aerial and street maps, along with detailed street views (where available). The system currently tracks and updates where the vehicle is every 45 seconds. The system also provides a vehicle breadcrumb that displays where the vehicle was located its route and stops throughout the entire work day.
6.1.2.2	Transmit a specific signal from the vehicle indicating that the vehicle is parked for service.	User Interface	Y	Vnomics system allows the user to see that the vehicle has key on or off. If the user is using our DVIR function the driver would have performed and sent their post-trip inspection. Geo-fencing capability can provide alerts when a vehicle enters or exits maintenance facilities.

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/location.

Reference #	Requirement	Requirement Type	Response (Y,Z,T,N)	Notes
6.1.3.1	Perform engine kill after deeming it is safe to do so in lost or stolen equipment.	User Interface	Z	This is a function the current Vnomics does not currently have. The Vnomics system could be configured to provide this capability but would have to get validation from the various OEM and City approval to conduct this function.
6.1.3.2	Perform route playback.	User Interface	Z	The Vnomics system tracks the stops of a vehicle with live and historical data so the user can see where the driver was throughout the work day as well as current location.
6.1.3.3	Provide a bread crumb trail for a specified time frame with no limitations on the different factors.	User Interface	Y	This is a current function of the Vnomics system. Users can configure the views not only temporally but can designate the amount of time that constitutes a stop and level of map detail to display.
6.1.3.4	Capture geo-fence based events.	User Interface	Y	This would be done from the Vnomics Geofencing tab which connects to Agilis and provides emails for user designated location based events.
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.	Report	Y	The geo-fencing alert function from Agilis would inform the user via email when a user designated boundary has been crossed.
6.1.3.6	Have unlimited geo-fences on a map.	User Interface	Y	This can be performed via the Vnomics/Agilis Geofencing tab.
6.1.3.7	Have overlapping geo-fences.	User Interface	Y	This can be performed via the Vnomics/Agilis Geofencing tab.
6.1.3.8	Activate or deactivate geo-fences based on the activity that we monitor.	User Interface	Y	This can be performed via the Vnomics/Agilis Geofencing tab.
6.1.3.9	Locate vehicle or vehicle groups at any given time.	Report	Y	This can be performed via the Vnomics maps or Vnomics/Agilis Geofencing tab. It provides both street, aerial, and detailed street names if desired.
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.	User Interface	Z	This activity would require Vnomics to work with the RouteSmart and City teams to integrate an API between the two systems. The routes can also be sent to the Sygic Turn by Turn system and then compare the planned versus actual routes taken by the driver. This will require an API from RouteSmart to Sygic. Vnomics has integrated with a number of 3rd Party software companies as a matter of course and is willing to work with city designated companies.

Reference #	Requirement	Requirement Type	Response (Y,Z,T,N)	Notes
6.1.3.11	Set the ping rate based on vehicle type and / or use.	User Interface	Y	This is a configuration setting in the Vnomics system today. The report rate from vehicles can be set has fast as 45 seconds and as slow as the city desires to limit cell usage/bandwidth.
6.1.3.12	Store data on the device and forward (session persistence) when it can communicate back to the base.	Other	Y	This is a current feature in the Vnomics system today. System has a minimum of 4 GB storage that allows for at least 14 days of operation without any loss of data and download this data via a number of means including cell, Wi-Fi, satellite, and manually in extremis via USB. The system can be configured to take the least expensive communication path with time-settings to change download methods when a particular communication path is unavailable.
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	User Interface	Y	This is a current feature in the Vnomics system today. This Vnomics system is high configurable to allow for multiple paths and prioritization of data download.
6.1.3.14	Notify 911 or trigger emergency alarms from the device for certain vehicle (e.g. Panic button).	System Interface	Z	This is a function we would need to work with the City to develop. Vnomics partner, Agilis has a simple email based notifier if SOS key pressed in its application that could be integrated into the 911 or other emergency alarms.
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.	Report	Z	Maintenance Alerts and vehicle Diagnostic Trouble Codes (DTCs) are already captured and reported by the Vnomics system. Vnomics will work with the city to provide an API to CCG and create the middleware necessary to integrate the data into their system.
6.1.3.16	Recognize and flag dangerous maneuvers (e.g. U-turns).	Report	y	Vnomics embedded computer currently has a built in 3-axis accelerometer and requisite safety alerts to capture and report on driver activity.

Reference #	Requirement	Requirement Type	Response (Y,Z,T,N)	Notes
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.	Report	Y	This is a current feature in the Vnomics system today. It is highly configurable to include the ability to modify the delivery of alerts by priority, time of day, scope of responsibility, geographical area, and individual/digest form.
6.1.3.18	Configure the unit to provide turn by turn directions.	User Interface	Y	This feature will be provided from our Turn by Turn (TBT) partner Sygic and is integrated onto our onboard computer. It will allow addresses and lat/longs to be inputted either from the backend from via messaging or directly via touch screen in cab.
6.1.3.19	Install modular AVL hardware to permit tracking a specific subset of vehicles through component removal and re-installation.	Other	Y	Vnomics customers currently transfer equipment from one vehicle to the next when they make new equipment purchases and retire old vehicles. Additionally, Vnomics would work with the City implementation team so that a subset of equipment can be rotated regularly among a small number of vehicles.
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.	Business Form	Y	This function can be performed through the Vnomics/Agilis Geofencing tab using their Dispatch function.
6.1.3.21	Track vehicle speed.	User Interface	Y	This is a current feature in the Vnomics system today. The system track and produces Operational Alerts/emails when user configurable speed thresholds are exceeded.
6.1.3.22	Track and report on vehicle miles travelled. 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.	Report	Z	The Vnomics System currently tracks all mileage traveled for each vehicle. An API will be implemented/exchanged with CCG so this mileage information can automatically be provided and integrated into their management system.
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).	Report	Y	This is a current feature in the Vnomics system today and is customer configurable so they can set the amount of idle time to trigger on.

Reference #	Requirement	Requirement Type	Response (Y,Z,T,N)	Notes
6.1.3.24	Set minimum speed levels for reports based on activity.	Report	Y	This is a current feature in the Vnomics system today and is customer configurable.
6.1.3.25	Utilize “geo-fences” to deter travel beyond approved geographic limits and identify potential abuses.	User Interface	Y	This is a current feature of the Vnomics/Agilis Geofencing feature. Email alerts can be sent to supervisors based on their scope of responsibility when these violations occur.
6.1.3.26	Transmit alerts using data from the obd2 (on board diagnostic software) 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.	System Interface	Y	This is a current feature in the Vnomics system today. Vnomics will work with CCG and the City to implement an API to automatically pass this data to their management system.
6.1.3.27	“Encrypt” wireless data streams.	Other	Y	This is a current feature in the Vnomics system today. Vnomics will work with the city to ensure all data streams meet the customer security requirements.
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.	System Interface	Y	This map update feature will be provided from our turn-by-turn partner Sygic. Maps are periodically updated based on customer requirements.
6.1.3.29	Utilize AVL data as a remote/virtual inspection force.	Other	Y	This is a current feature of the Vnomics/Agilis Geofencing feature and bread-crumb feature along with customer configurable boundaries and website/email reporting.
6.1.3.30	Notify system administrator that a vehicle needs regeneration.	Report	Y	OEM dependent. If the OEM provides the regeneration required message on their data bus, Vnomics has the capability to alert the supervisor. Secondarily, based on user configuration Vnomics has the capability to notify supervisors if too many or too few regenerations have been conducted during a set period of time and give indication to them if there are issues with particular vehicles CO2 reduction systems.
6.1.3.31	Vehicle operators can inform dispatch when the vehicle is idling for regeneration.	Decision Criteria	Z	We would need to work with the City on report format if the data bus signal is available.

Reference #	Requirement	Requirement Type	Response (Y,Z,T,N)	Notes
6.1.3.32	Run reports to validate vehicle regeneration calls.	Report	Z	We would need to work with the City on report format if the data bus signal is available
6.1.3.33	Differentiate (color code) vehicles that are regenerating.	User Interface	Y	As long as this regeneration code is available on the vehicle data Bus, Vnomics has the capability to alert the user via a vehicle color change on the website.
6.1.3.34	Track the status of a boom on boom trucks (e.g. Boom - up or Boom - down).	System Interface	Z	Vnomics will work with the City/OEM to investigate the presence of a signal that can be captured when this activity occurs. Once the signal mechanism is identified Vnomics will work to capture and report on this activity. The Vnomics onboard hardware currently has I/O capability to directly connect to this device if needed.

6.1.4 Dump the vehicle

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

Reference #	Requirement	Requirement Type	Response (Y,Z,T,N)	Notes
6.1.4.1	Notify when the load limits have been exceeded on dump trucks.	System Interface	Z	Vnomics would need to work with the OEM to investigate what signals are available currently on the vehicle data bus or integrate a new sensor if needed to alert on this. The Vnomics onboard hardware currently has I/O capability to directly connect to this device if needed.

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.

Reference #	Requirement	Requirement Type	Response (Y,Z,T,N)	Notes
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.	System Interface	Z	Vnomics currently has an onboard touch screen method for the driver to manually enter fuel purchases both bulk and commercial transactions. Vnomics would work with the fuel system provider to integrate our data via an API.
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 User Interface Petro Vend.	User Interface	Z	Vnomics will work with the fuel system provider to integrate our fuel data via an API Vnomics will also work with the city to help them use the product's Geofencing capability to create waypoint that validate that the vehicle is fueling at an authorized location and alert when it is not.

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.

Reference #	Requirement	Requirement Type	Response (Y,Z,T,N)	Notes
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.	System Interface	Z	Vnomics will need to work with the City and OEM to better understand this process and how they do it today to generate a agreed upon set of requirements. Vnomics has integrated a number of 3rd Party software and processes and have the capability to integrate the sensor capture, Geofencing, TBT and route building capabilities to integrate this data and deliver the appropriate functionality.
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 antiicing materials during winter operations. The Vendor must integrate their solution with FORCE® America.	System Interface	Z	Vnomics will need to work with the City and OEM to better understand this process and how they do it today to generate a agreed upon set of requirements. Vnomics has integrated a number of 3rd Party software and processes and sensors to capture and integrate the data and deliver the appropriate functionality. The product hardware has the input/output ports to integrate sensors as needed to deliver this capability.
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.	User Interface	Z	Vnomics will need to work with the City and OEM to better understand this process and how they do it today to generate a agreed upon set of requirements. Vnomics has integrated a number of 3rd Party software and processes and sensors to capture and integrate the data and deliver the appropriate functionality. The product hardware has the input/output ports to integrate sensors as needed to deliver this capability.

6.1.7 Plow and/or salt streets with the vehicle

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

Reference #	Requirement	Requirement Type	Response (Y,Z,T,N)	Notes
6.1.7.1	Capture the percentage of a given route completed.	User Interface	Y	Using the integrated Agilis dispatch functionality Vnomics can use fences and waypoints to measure percentage of route completed. Vnomics/ASG would work with the city on developing reports and website display options to meet the customer requirements for this functionality.
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	System Interface	Z	Vnomics will need to work with the City and OEM to better understand this process and how they do it today to generate a agreed upon set of requirements. Vnomics has integrated a number of 3rd Party software and processes and sensors to capture and integrate the data and deliver the appropriate

Reference #	Requirement	Requirement Type	Response (Y,Z,T,N)	Notes
	and manage roadway plowing during winter operations. The Vendor must be able to integrate their solution with FORCE® America.			functionality. The product hardware has the input/output ports to integrate sensors as needed to deliver this capability.

6.1.8 Sweep streets with the vehicle

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

Reference #	Requirement	Requirement Type	Response (Y,Z,T,N)	Notes
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.	System Interface	Z	Vnomics will need to work with the City and OEM to better understand this process and how they do it today to generate a agreed upon set of requirements. Vnomics has integrated a number of 3rd Party software and processes and sensors to capture and integrate the data and deliver the appropriate functionality. The product hardware has the input/output ports to integrate sensors as needed to deliver this capability.
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.	System Interface	Z	Vnomics will need to work with the City and OEM to better understand this process and how they do it today to generate a agreed upon set of requirements. Vnomics has integrated a number of 3rd Party software and processes and sensors to capture and integrate the data and deliver the appropriate functionality. The product hardware has the input/output ports to integrate sensors as needed to deliver this capability.
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.	System Interface	Z	Vnomics will need to work with the City and OEM to better understand this process and how they do it today to generate a agreed upon set of requirements. Vnomics has integrated a number of 3rd Party software and processes and sensors to capture and integrate the data and deliver the appropriate functionality. The product hardware has the input/output ports to integrate sensors as needed to deliver this capability.

Reference #	Requirement	Requirement Type	Response (Y,Z,T,N)	Notes
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.	System Interface	Z	Vnomics will need to work with the City and OEM to better understand this process and how they do it today to generate a agreed upon set of requirements. Vnomics has integrated a number of 3rd Party software and processes and sensors to capture and integrate the data and deliver the appropriate functionality. The product hardware has the input/output ports to integrate sensors as needed to deliver this capability.
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.	System Interface	Z	Vnomics will need to work with the City and OEM to better understand this process and how they do it today to generate a agreed upon set of requirements. Vnomics has integrated a number of 3rd Party software and processes and sensors to capture and integrate the data and deliver the appropriate functionality. The product hardware has the input/output ports to integrate sensors as needed to deliver this capability.

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

Reference #	Requirement	Requirement Type	Response (Y,Z,T,N)	Notes
6.1.9.1	Transmit a specific signal from the vehicle indicating that the vehicle is parked for service.	User Interface	Y	Geo-fencing capability can provide alerts when a vehicle enters or exits maintenance facilities. We would also Vnomics DVIR function ensure that the Pre-trip had been performed by the driver.

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.

Reference #	Requirement	Requirement Type	Response (Y,Z,T,N)	Notes
6.1.10.1	Add a vehicle to a different group (e.g. add an arterial vehicle under contracted snow plowing).	User Interface	Y	This is a current function of the Vnomics system. Vehicles can be grouped by scope of responsibility, geographical area, type or by drivers.
6.1.10.2	Differentiate this route from all other normal routes under this group /activity.	User Interface	Y	This is a current function of the Vnomics/Agilis system and geo-fence alerts can be provided via website and email.

Reference #	Requirement	Requirement Type	Response (Y,Z,T,N)	Notes
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.	System Interface	Z	Vnomics will need to work with the City and OEM to better understand this process and how they do it today to generate an agreed upon set of requirements. Vnomics has integrated a number of 3rd Party software and processes and sensors to capture and integrate the data and deliver the appropriate functionality. The product hardware has the input/output ports to integrate sensors as needed to deliver this capability.

6.2 OBJECT - 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.

Reference #	Requirement	Requirement Type	Response (Y,Z,T,N)	Notes
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.	User Interface	Y	This can be achieved through the use of Vnomics turn-by-turn (T-B-T)system provided from our integration partner Sygic.
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.	Other	Y	This would be achieved using Vnomics/Agilis Geo coding and/or Sygic TBT Navigation system to integrate Bing/Google Maps and/or the Cities ArcGIS system. Backend entry of address and lat/long along with on-vehicle operator entry would be available.
6.2.1.3	Display route to work location. Possible use of turn by turn navigation with spoken and visual instructions.	System Interface	Y	This can be achieved through the use of Vnomics turn-by-turn system provided from our integration partner Sygic.
6.2.1.4	Update route to accommodate dynamic work request changes. Route smart® or use of the in-built routing software.	System Interface	Z	This can be achieved through the use of Vnomics turn-by-turn system provided from our integration partner Sygic. Integration with RouteSmart would be accomplished with our existing dispatch API and current product message capability.

Reference #	Requirement	Requirement Type	Response (Y,Z,T,N)	Notes
6.2.1.5	Plot work locations on the map when 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 gets delivered to dispatch at regular intervals for further research and assignment.	System Interface	Z	This would be achieved using Vnomics/Agilis Geo coding and/or Sygic TBT Navigation system to integrate Bing/Google Maps for plotting potential work locations.
6.2.1.6	Switch between weather maps and geo-fences to help make decisions.	User Interface	Z	This would be achieved using Vnomics/Agilis Geo coding and/or Sygic TBT Navigation system to implement live weather feeds.
6.2.1.7	Configure the unit to provide turn by turn directions with a map display.	User Interface	Y	This can be achieved through the use of Vnomics turn-by-turn system provided from our integration partner Sygic.

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).

Reference #	Requirement	Requirement Type	Response (Y,Z,T,N)	Notes
6.2.2.1	Determine all vehicles are at their respective start points.	Report	Y	This would be accomplished using Vnomics/ Agilis Geofencing feature as every vehicle can be given a depot fence.
6.2.2.2	Verify that a contract vehicle is within the geo-fenced area when the activity is in progress.	User Interface	Z	Current system can identify that a vehicle is in a fence, but work will be needed to integrate the current fence with the current vehicle status (plow down). Vnomics would need to work with the OEM to investigate what signals are available currently on the vehicle data bus or integrate a new sensor if needed to alert on this. The Vnomics onboard hardware currently has I/O capability to directly connect to this device if needed.

6.3 OBJECT - Work Requests

A work request is a record / form / document describing the work to be done and furnishes information about the work location, route etc. as well. 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 through a work request to determine the location where work needs to be performed.

Reference #	Requirement	Requirement Type	Response (Y,Z,T,N)	Notes

Reference #	Requirement	Requirement Type	Response (Y,Z,T,N)	Notes
6.3.1.1	Access work request from an onboard display.	User Interface	Y	Vnomics would need to work with the City to better understand their work order system and develop requirements from that. Vnomics can then rapidly adapt its current capability through its existing Agilis workflow capability or through a custom API from their dispatch order systems to provide this functionality directly from our mobile unit.
6.3.1.2	Make modifications to work request and track changes.	User Interface	Y	Vnomics would need to work with the City to better understand their work order system and develop requirements from that. Vnomics can then rapidly adapt its current capability through its existing Agilis workflow capability or through a custom API from their dispatch order systems to provide this functionality directly from our mobile unit.
6.3.1.3	Dynamically add work request to existing work queues.	User Interface	Y	Vnomics would need to work with the City to better understand their work order system and develop requirements from that. Vnomics can then rapidly adapt its current capability through its existing Agilis workflow capability or through a custom API from their dispatch order systems to provide this functionality directly from our mobile unit.
6.3.1.4	Integrate a work order/complaint management system within, or as a complement to, an AVL solution.	System Interface	Y	Vnomics would need to work with the City to better understand their work order system and develop requirements from that. Vnomics can then rapidly adapt its current capability through its existing Agilis workflow capability or through a custom API from their dispatch order systems to provide this functionality directly from our mobile unit.

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.

Reference #	Requirement	Requirement Type	Response (Y,Z,T,N)	Notes
6.3.2.1	Set up an activity in the AVL system to reflect the crew performing work requests for the day.	Other	Y	We would need to work with the City to better understand their work order system. Vnomics has this capability through Agilis workflow or through a custom API from their dispatch order systems to our mobile unit.

6.3.3 Notify on the work request status

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

Reference #	Requirement	Requirement Type	Response (Y,Z,T,N)	Notes
6.3.3.1	Readily integrate spatial and, where applicable, vehicle status data gathered through the AVL system into LAGAN, the customer relationship management	System Interface	Z	Vnomics would work with the City and their CRM provider to better understand the data interface needs. Vnomics has developed a number of standard APIs that allows for automated access to and integration of all vehicle maintenance data via a custom API to 3rd Party software and database

Reference #	Requirement	Requirement Type	Response (Y,Z,T,N)	Notes
	software utilized by 311.			systems.

6.3.4 Update the work request

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

Reference #	Requirement	Requirement Type	Response (Y,Z,T,N)	Notes
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.	System Interface	Z	Vnomics would work with the City and their CRM provider to better understand the data interface needs. Vnomics has developed a number of standard APIs that allows for automated access to and integration of all vehicle maintenance data via a custom API to 3rd Party software and database systems.
6.3.4.3	Capture the percentage of a given route completed.	Decision Criteria	Y	Using the integrated Agilis dispatch functionality Vnomics can use fences and waypoints to measure percentage of route completed. Vnomics/ASG would work with the city on developing reports and website display options to meet the customer requirements for this functionality.

6.4 OBJECT - Dispatch Records

A dispatch record is an entry in the Dispatch System which is an MS Access based system. 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.

Reference #	Requirement	Requirement Type	Response (Y,Z,T,N)	Notes
6.4.1.1	Interface with the data in the dispatch system.	System Interface	Z	Vnomics would work with the City and Route smart to implement a dispatch API as it has done with other customers in the past. Vnomics has developed a number of standard APIs that allows for automated access to and integration of all vehicle operational data via a custom API to 3rd Party software and database systems.
6.4.1.2	Track all the information currently stored in the dispatch system.	Other	Z	Vnomics would work with the City and Route smart to implement a dispatch API as our company has done with other customers in the past. Vnomics has developed a number of standard APIs that allows for automated access to and integration of all vehicle operational data via a custom API to 3rd Party software and database systems.
6.4.1.3	Differentiate a dispatched vehicle from a vehicle in a lot.	User Interface	Z	Vnomics would work with the City and Route smart to implement a dispatch API as our company has done with other customers in the past. Vnomics has

Reference #	Requirement	Requirement Type	Response (Y,Z,T,N)	Notes
				developed a number of standard APIs that allows for automated access to and integration of all vehicle operational data via a custom API to 3rd Party software and database systems.

6.4.2 Update the dispatch information

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

Reference #	Requirement	Requirement Type	Response (Y,Z,T,N)	Notes
6.4.2.1	Equipment operator can update the dispatch system.	Business Form	Z	Vnomics would work with the City and Route smart to implement a dispatch API as our company has done with other customers in the past. Vnomics has developed a number of standard APIs that allows for automated access to and integration of all vehicle operational data via a custom API to 3rd Party software and database systems. Operator updates will ride on the current Vnomics 2-way messaging system.

6.4.3 Notify on the route status

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

Reference #	Requirement	Requirement Type	Response (Y,Z,T,N)	Notes
6.4.3.1	Have two way communications between the vehicles and dispatch (e.g. messaging, radio).	Other	Y	Vnomics currently has 2 way data messaging available in its current product that allows customers to send messages or groups of messages by both vehicle or by driver.

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	Requirement Type	Response (Y,Z,T,N)	Notes
6.4.4.1	Set up an activity in the AVL system to reflect the dispatch information.	Other	Z	Vnomics would work with the City and Route smart to implement a dispatch API as our company has done with other customers in the past. Vnomics has developed a number of standard APIs that allows for automated access to and integration of all vehicle operational data via a custom API to 3rd Party software and database systems.

6.5 OBJECT - Geodatabases

A geodatabase is a data repository for spatial data storage and management.

6.5.1 Update the Geodatabase with Run Information

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

Reference #	Requirement	Requirement Type	Response (Y,Z,T,N)	Notes
6.5.1.1	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	Z	Vnomics would need to work with the City and their 3rd Party providers to better understand their data flow, databases, and architecture to develop requirements from that. Vnomics can provide any of the collected data automatically to various locations through multiple API's and data connections.

7 Technical Requirements

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.

Reference #	Requirement	Response (Y,Z,T,N)	Notes
7.1.1	Provide architecture that is modular, scalable, and extensible.	Y	The Vnomics system is very modular and the hardware components that are to be installed in the vehicle are subject to the final configuration requirements that the City specifies. The in-cab hardware includes an Onboard Computer (OBC), JBUS Adapter or OBD II adaptor, Multi-band Antenna and Diagnostic/Serial/Display/Power Cables. The unique non-intrusive Vnomics Y-connection to the JBUS preserves the integrity of the high speed data bus to within the SAE specification preventing interference on the bus that has been known to cause problems with vehicle operation. It also provides the shop technician access to vehicle diagnostic port without having to disconnect the telematics device, and reduces the chance of tampering with the system. All components, with exception of the antenna, are mounted/contained within the cab. The components are custom manufactured to Vnomics' strict specifications for performance and reliability.
7.1.2	Reside on any standard hardware platform and operating system (not proprietary).	Y	Vnomics' software component items include: IN-CAB ADVISOR™ - Onboard Driver coaching system, responsible for interfacing to sensors, real-time data processing, and communicating with the Enterprise system. The embedded on vehicle computer is normally a Linux based system, however it is architected in a way that would allow it to run on other operating systems with modest amount of work. For the backend systems the Vnomics DIAGKNOWSYS™ - Enterprise system, responsible for communicating with Onboard systems deployed in the fleet, post-processing data, and interfacing with third-party information systems e.g. CMMS. Any browser-equipped thin-client device (e.g. desktop computers, tablets, laptops, Smartphone's) access to live data and reporting services. The Vnomics hosted solution requires only a standard web browser.
7.1.3	Host the solution for the City of Rochester.	Y	Vnomics standard product is a hosted solution but Vnomics provides a customer hosted option as well.
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.	Y	If hosted solution is desired by City of Rochester, supporting hardware and software will be required. For the City hosted solution, the software components required, in addition to Vnomics software, are Windows Server, Linux Server (Ubuntu preferred), Microsoft IIS, and Microsoft SQL Server. Specific version of SQL Server determined by level of redundancy desired by the city. Specific software requirements may change due to specific City circumstances. For City of Rochester hosted solution, for each 500 vehicles, three servers with 2 CPU, quad core Xeon, 64 GB RAM. Direct attached or SAN storage (selected based on overall requirements) for a total of 15-18 TB per year of data retention.

Reference #	Requirement	Response (Y,Z,T,N)	Notes
7.1.5	Provide an always connected wireless data network.	Y	Yes. Vnomics' unique communications configuration is very flexible and focuses on delivery of information in a timely manner via the most cost effective path ***available***. This significantly reduces data communications charges. The City has the option to use their current cellular network, Vnomics' cellular network, Wi-Fi, or satellite for communications. Data is prioritized by criticality and can be delivered via cellular or Wi-Fi depending on channel availability and immediacy of data. This prioritization permits the Vnomics product to reduce the amount of data sent via the cellular channel while simultaneously collecting and delivering much more information for back-end analysis.
7.1.6	Provide a satellite communication network for areas where ground-based wireless communications is weak.	Y	Yes. Vnomics is currently integrating satellite capability into its product for one of customers so that it can maintain GPS location, messaging, and critical maintenance health status in extremely remote or off-road work sites.
7.1.7	Receive and forward position information from the vehicle's satellite transmitter.	Y	Yes. Vnomics is currently integrating satellite capability into its product for one of customers so that it can maintain GPS location.
7.1.8	Ability for two-way mobile messaging to allow email messaging to and from the driver over the Internet wireless communications link.	Y	Yes, two-way messages can be sent to specific drivers or specific vehicles or it can be sent to groups of drivers and vehicles depending on customer preferences.
7.1.9	Send information via satellite, nationwide cellular network or radio frequency — or a combination thereof.	Y	Yes. Vnomics' unique communications configuration is very flexible and focuses on delivery of information in a timely manner via the most cost effective path available. This significantly reduces data communications charges. The City has the option to use their current cellular network, Vnomics' cellular network, Wi-Fi, or satellite for communications. Data is prioritized by criticality and can be delivered via cellular or Wi-Fi depending on channel availability and immediacy of data. This prioritization permits the Vnomics product to reduce the amount of data sent via the cellular channel while simultaneously collecting and delivering much more information for back-end analysis.
7.1.10	Provide data transmission without recurring or monthly costs.	Y	Yes. Vnomics' unique communications configuration is very flexible and focuses on delivery of information in a timely manner via the most cost effective path available. This significantly reduces data communications charges. The City has the option to use their current cellular network, Vnomics' cellular network, Wi-Fi, or satellite for communications. Data is prioritized by criticality and can be delivered via cellular or Wi-Fi depending on channel availability and immediacy of data. This prioritization permits the Vnomics product to reduce the amount of data sent via the cellular channel while simultaneously collecting and delivering much more information for back-end analysis.
7.1.11	Demonstrate experience with integrated AVL/GPS systems.	Y	Yes. Over the past 4 years Vnomics has fielded integrated AVL/GPS systems on over 4000 commercial vehicles, truck, school buses, and passenger buses, across the United States and in Canada.
7.1.12	Evolve with new technologies to meet future	Y	Yes Vnomics and ASG both have a history of adding new technologies and features using its Agile Development and Participatory Design. Vnomics prides itself on delivering the latest

Reference #	Requirement	Response (Y,Z,T,N)	Notes
	needs as they arise.		technology solutions that meet its customer's needs rather than making them adapt their business processes to a particular off-the-shelf product. The Vnomics and ASG systems engineering team works directly with the customer to understand their business goals. The new technology and required customization is then prioritized into the development process. Customer-participation is encouraged during design and prototyping. After appropriate testing and training, the technology is released, and roll-out and validation support is provided if warranted.
7.1.13	Perform a complete historic data recovery and reporting during an event of hardware failure or network failure emergencies.	Y	Yes. Role-based access and automatic backup. Access is controlled via role based security with limited access on an as needed basis. Systems are backed by hot standby systems and backups are conducted continuously and stored on separate HW. For a Vnomics hosted solution critical infrastructure is supported by Redundant Network Providers, Redundant Cooling Systems, Redundant A+B Power systems, The Data Center facility, Network and Power have a 100% Uptime SLA. The VMware platform for hosting cloud servers has a greater than 99.9% uptime metrics. A hot backup site is available. The location may also be tailored based on customer needs but preference is Marlborough, MA or Columbia, SC where we have relationships in place. Activating backup sites can be achieved in 1 hour or less based on specific customer requirements. Minimum uptime of 99.9% guaranteed not including maintenance windows. Vnomics will pro-rate the monthly service charges on an annual basis if guaranteed uptime is not met.
7.1.14	Provide an open API to make integration processes.	Y	Private web service APIs are an integral part of the Vnomics software architecture. Vnomics has a number of APIs for integration with maintenance, ERP, CRM, dispatch and operational databases. Vnomics has integrated with a number of 3rd Party software companies as a matter of course and is willing to work with city designated companies. Vnomics will integrate seamlessly with any language supporting RESTful web services via HTTPS.
7.1.15	Provide seamless integration to PC based MS® Office products.	Y	Yes. Vnomics customers use web browsers (desktop and mobile devices supported) to access data, reports, configuration, live data, and conduct administration. All of Vnomics current web services provide access to the data through reporting in both Acrobat .PDF and Microsoft Excel format. They can be run on any PC using any standard browser.
7.1.16	Operate on most current version of Internet Explorer.	Y	Yes. All of Vnomics current web services provide access to the data through reporting in both Acrobat .PDF and Microsoft Excel format. They can be run on any PC using any standard browser including the most current version of Internet Explorer.
7.1.17	Use HTTPS and other secure means of data transmission including data encryption.	Y	Yes. SFTP, SCP, and HTTPS. Multiple data transfer mechanisms are supported based on customer needs and specific situations. Systems such as SFTP, SCP, and HTTPS are some options. All systems are secured following industry standard best practices. Multiple mechanisms such as authentication, encryption, firewall rules, and VPNs are used to secure all servers and devices on public networks. In addition, the number and types of public services are minimized in order to reduce exposure points. All interactions with our product are authenticated with the exception of transient "live" data for the website. The live data has a very short useful life, thus it was determined for bandwidth that the

Reference #	Requirement	Response (Y,Z,T,N)	Notes
			added overhead resulting from the authentication was not justified. Vnomics systems are designed to use cellular data efficiently to reduce cost and lower latency. Datacenters with controlled access. All systems are backed up and stored in enterprise grade datacenters. Physical access is controlled at multiple levels designed to limit access to only authorized individuals. Electronic security is handled via industry standard authentication and encryption protocols. Intrusion prevention accomplished via firewall systems.
7.1.18	Interface with standard languages and protocols (not proprietary).	Y	Yes. The Vnomics product is based on open architecture to facilitate the exchange of information between its system and 3rd party vendors. Vnomics APIs integrate seamlessly with any language supporting RESTful web services via HTTPS.
7.1.19	Configure software from an administrator point of view, with full audit of any configuration change captured.	Y	Yes. The customer is provided the ability to control access to device applications based on scope and responsibility via the notion of user roles on the website. The customer administrator grants role-based access to users via the website. Access to specific applications is enabled by configuration at the backend, and can be customized on a per vehicle/driver basis.
7.1.20	Support full software change control process with check-in and check-outs.	Y	Yes. Software updates are released using a deliberate process that includes fully temporal subversion repository for change control and release notes for customer enhancement requests and standard product line enhancements. This typically occurs once a quarter. Software updates are downloaded over-the-air and may be installed on selected individual units (e.g. update a single vehicle or group of vehicles) or the entire fleet based on customer preference.
7.1.21	Interface with Microsoft® SQL Server 2005 or higher.	Y	Yes. Vnomics data resides in a SQL database residing on a Microsoft SQL server.
7.1.22	Provide complete on line documentation including: Installation/Set-up & Configuration, Training/Tutorial, Application, Process Flow and Reference.	Y	Yes. Via a secure website that is password protected. Online documentation is the methodology that Vnomics delivers this information to its current customers. All electronic documentation and product/installation manuals are provided in-cab and on the Vnomics website.
7.1.23	Define alerts at the user level to notify specified individuals or groups when triggered by an event.	Y	Yes. Mission-critical data and all alerts are available at the backend immediately and can be configured to be delivered via to individual users and or groups based on scope of responsibility and their level of alert criticality. Alerts can be sent to these individuals or groups immediately, daily or in digest form at particularly times of the week based on user preferences.
7.1.24	Set-up alerts across all modules.	Y	Yes all vehicles equipped with the Vnomics on board computer will configured for the alerts tailored for the specific vehicle type.
7.1.25	Set-up and receive administrative notification of specific activities that may not require user intervention (System Alerts).	Y	Yes. For example, Vnomics Geofencing tab which connects to Agilis and provides administrative notifications for user designated location based events. Vnomics will work with the city to identify activities requiring notification and that they can be configured to meet notification needs.
7.1.26	Interface with the following to provide notifications: MS® Outlook Exchange email and	Y	Yes. Vnomics current product uses email notification, as the preferred method for alert notification and integrates seamlessly with customers using email software including Microsoft Outlook

Reference #	Requirement	Response (Y,Z,T,N)	Notes
	PDAs.		Exchange and/or receives their email on PDAs.
7.1.27	Remotely manage the environment from a Vendor or City IT perspective using a web interface.	Y	Yes. Vnomics current product uses web services and browsers as the preferred method for its customers to remotely manage their fleets.

7.2 Data Requirements

Reference #	Requirement	Response (Y,Z,T,N)	Notes
7.2.1	Display dates in the USA format.	Y	Yes. The system can be configured to use both local time and/or GST based on customer preferences.
7.2.2	Support the translation of views and instructions into multiple languages (e.g. English, Spanish).	Z	Vnomics is willing to translate its instructions into multiple languages based on customer needs.
7.2.3	Provide Entity Relationship Diagrams (ERD) showing layout of tables, fields and data entity relationships.	Y	Yes. A complete layout of our production database is available for our customers.
7.2.4	Provide data dictionary with ability to interface electronically to industry standard reporting environments (i.e. Microsoft® business intelligence).	Y	Yes. A data dictionary of our production database and APIs that allow access to the database is available for our customers.
7.2.5	Provide numerous user definable fields in every table that will be used by the application.	Y	Yes. Our system is highly configurable, reports and collective data manipulation is part of our current offering/product. Vnomics is willing to work with the City to provide them ability to define fields on an as needed basis.
7.2.6	Automatically archive and purge data per retention periods.	Y	Yes. The particular requirement is highly customer dependent and Vnomics will work with the City to define a data retention plan and purge requirements for their data.

7.3 System Administration, Security, Audits

Reference #	Requirement	Response (Y,Z,T,N)	Notes
7.3.1	Authenticate a person's credentials through Windows Active Directory®.	Y	The customer is provided the ability to control access to device applications based on scope and responsibility via the notion of user roles on the website. Access to the Vnomics onboard system requires a driver to log in using his private PIN. This PIN is authenticated against a driver list, which is controlled by a backend administrator; integration with a dispatch system would allow this to be automated. Access to specific applications is enabled by configuration at the backend, and can be customized on a per vehicle/driver basis.

Reference #	Requirement	Response (Y,Z,T,N)	Notes
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.	Y	The customer administrator grants role-based access to users/groups via the website. The customer is provided the ability to control access to device applications based on scope and responsibility via the notion of user roles on the website.
7.3.3	Effect Site/Group-level security (user can view site specific data or multi-site data based on security preferences assigned).	Y	The customer administrator grants role-based access to users/groups via the website. The customer is provided the ability to control access to data based on scope and responsibility via the notion of user roles on the website.
7.3.4	Effect Site/Group-Specific security configuration per user (user security access may differ from site to site).	Y	The customer administrator grants role-based access to users/groups via the website. The customer is provided the ability to control access to data based on scope and responsibility via the notion of user roles on the website. Vnomics would work with the city to develop a security policy (particularly for site to site differences) that meets its needs.
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.	Y	The customer administrator(s) can configure/add/delete groups including adding/deleting drivers, vehicles/vehicle types/representations/personnel information via the website. The customer administrator can assign others this capability based on their roles/responsibilities.
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.	Z	While this is currently not a standard report, Vnomics retains this information and will work with the City to develop a report that meets its requirements for displaying this data.
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.	Z	While this is currently not a standard report, Vnomics retains this information and will work with the City to develop a report that meets its requirements for displaying this data.
7.3.8	Capture when reports are printed and noting the user, time and date stamp.nk.	Z	While this is currently not a standard report, Vnomics retains this information and will work with the City to develop a report that meets its requirements for displaying this data.
7.3.9	Capture when reports are viewed and noting the user, time and date stamp.	Z	While this is currently not a standard report, Vnomics retains this information and will work with the City to develop a report that meets its requirements for displaying this data.
7.3.10	Limit access to information based on security level.	Y	The customer administrator grants role-based access to users/groups via the website. The customer is provided the ability to control access to data based on scope and responsibility via the notion of user roles on the website.
7.3.11	Display fields based on security level.	Y	The customer administrator grants role-based access to users/groups via the website. The customer is provided the ability to control access to data based on scope and responsibility via the notion of user roles on the website. Vnomics would work with

Reference #	Requirement	Response (Y,Z,T,N)	Notes
			the City to ensure that its data security configuration meets the security needs of the customer.
7.3.12	Limit editing capability to the record creator & security level.	Y	The customer administrator grants role-based access to users/groups via the website. The customer is provided the ability to control access to and ability to edit the data based on scope and responsibility via the notion of user roles on the website. Vnomics would work with the City to ensure that its data security configuration meets the security needs of the customer.
7.3.13	Customize the software based on the end-user's role in the system.	Z	The customer has some ability to configure the software features and loads based on user preference. Vnomics would work with the City to provide the flexibility it may need to further modify the software based on role.
7.3.14	Restrict the vehicle groups that a specific end user can see.	Y	Yes. The customer administrator can grant role-based access to vehicles/groups via the website.
7.3.15	Restrict vehicle routes that a specific end user can see.	Z	Masking routes by role is not a current capability of the Vnomics product, however Vnomics would work with the City to provide the flexibility it would need to provide this based on user configured access.

7.4 System Interfaces

The purpose of this section of the document is to provide easy access between independent and disparate systems and assure accuracy in the transfer of data between them. Describe in the response how interfaces will be addressed in the recommended solution. For example, are Application Program Interfaces (API's) used or will interfaces be developed on a case-by-case basis. In addition, identify if interfaces have been implemented with existing customers and what type of applications have been interfaced.

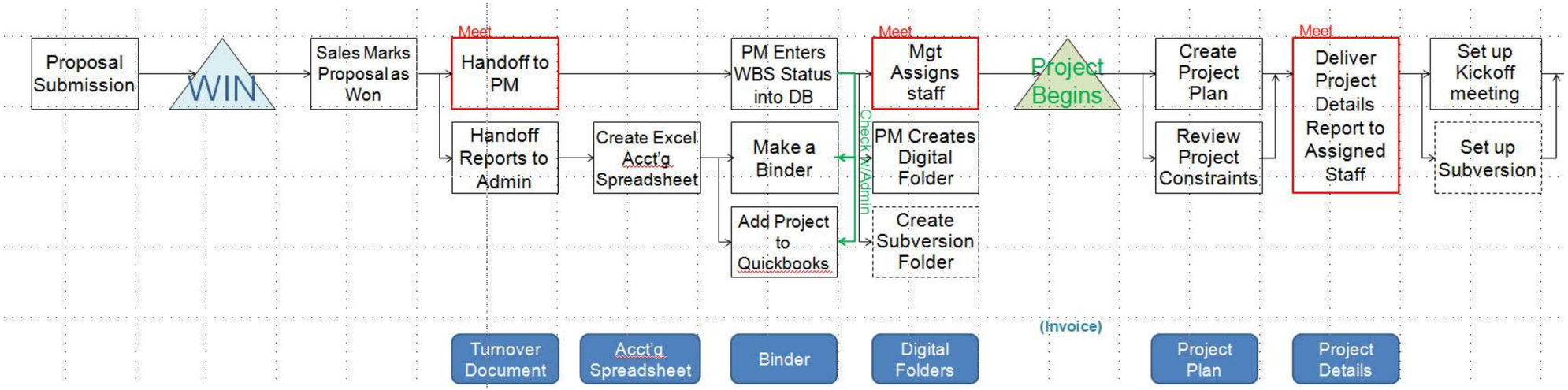
The vendor should provide a diagram that visually shows all integration points in their proposed solution, as well as any other vendors' product recommended to meet the requirements of this RFP.

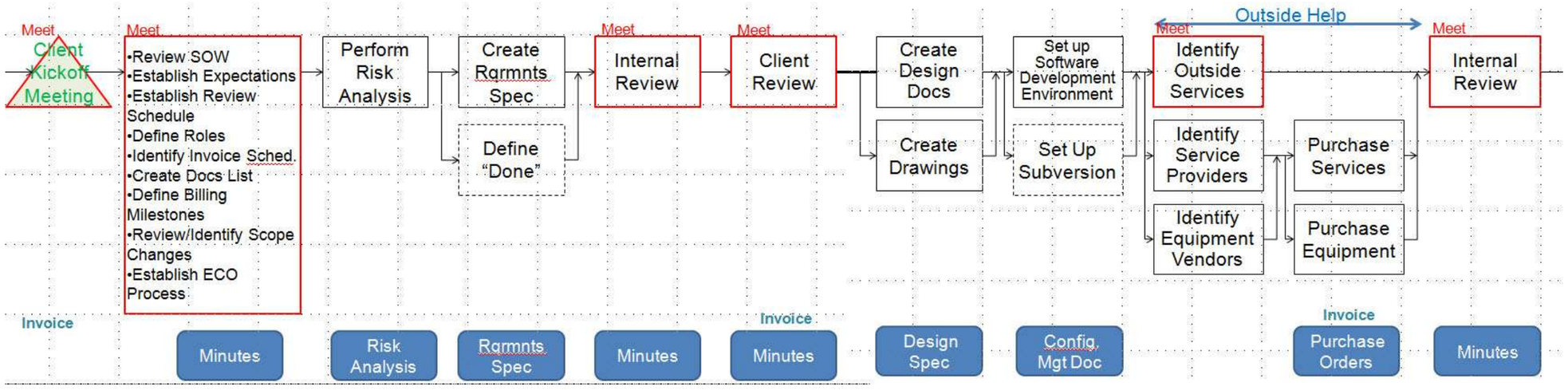
In addition, the vendor should describe its technical strategy to actively integrate products or existing City in-house systems described in Section 5 – *Legacy Systems Environment* that fulfill the City of Rochester's functional needs outside the scope of this RFP.

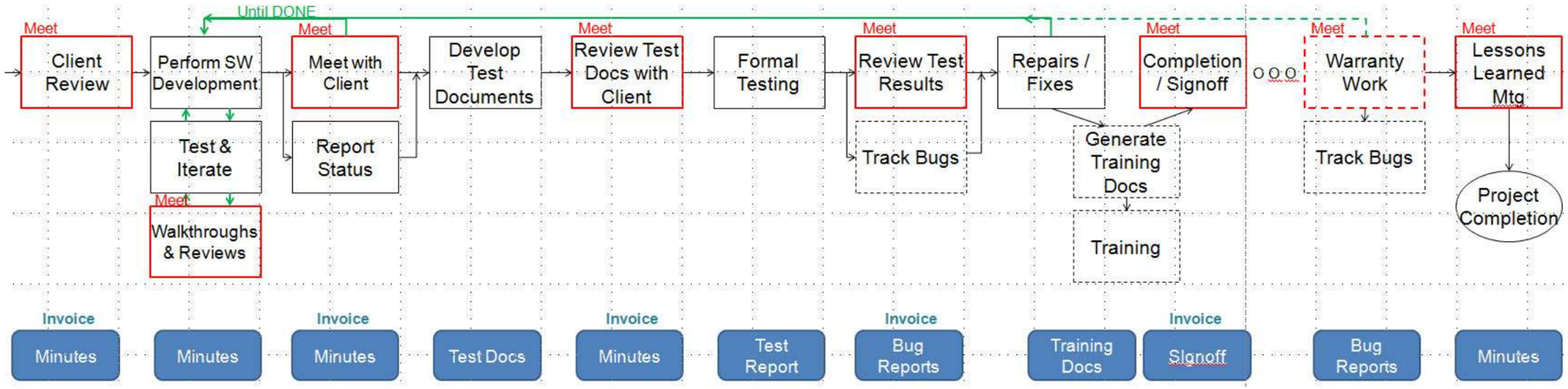
Reference #	Requirement	Response (Y,Z,T,N)	Notes
7.4.1	Interface with other software products owned by the vendor but which are in another family to meet a need that does not exist in the standard product, regardless of what platform that product may reside on.	Z	Yes. Vnomics would work with the City and their 3rd Party providers to better understand their data flow, databases, and architecture to develop requirements from that. Vnomics is willing to interface with other software products using multiple API's and data connections with other product platforms.
7.4.2	Provide plug-in designs that do not require special coding.	Z	The Vnomics APIs are designed to minimize or eliminate the need for middleware and special coding to interface between systems.
7.4.3	Interface with third party sources of information via a Web Service call.	Y	Private web service APIs are an integral part of the Vnomics software architecture. Vnomics APIs for integration with 3rd Party custom software will be modified as needed and provided for this offering.

Reference #	Requirement	Response (Y,Z,T,N)	Notes
7.4.4	Perform data imports and exports from and to both desktop and applications running on other processors.	Y	Yes. Vnomics existing product allows for data imports and exports in Excel, CSV, and PDF format.
7.4.5	Interface seamlessly with barcode and other data collection devices.	Z	Vnomics hardware is capable of integrating with barcode and other data collection devices as it is currently configured. Vnomics would work with the City and their 3rd Party providers to integrate the drivers that will allow their devices to be recognized by our onboard computer.
7.4.6	Interface with HID smart cards attached to user profiles.	Z	Vnomics hardware is capable of integrating with HID smart cards as it is currently configured. Vnomics would work with the City and their 3rd Party provider to integrate the driver necessary to allow this device to be recognized by our onboard computer.
7.4.7	Provide remote help desk support via telephone and live on-screen control.	Y	Yes. The primary support center is located in the Vnomics headquarters in Pittsford, NY, a suburb of Rochester.

9 Appendix B - Project Plan Execution Flowchart

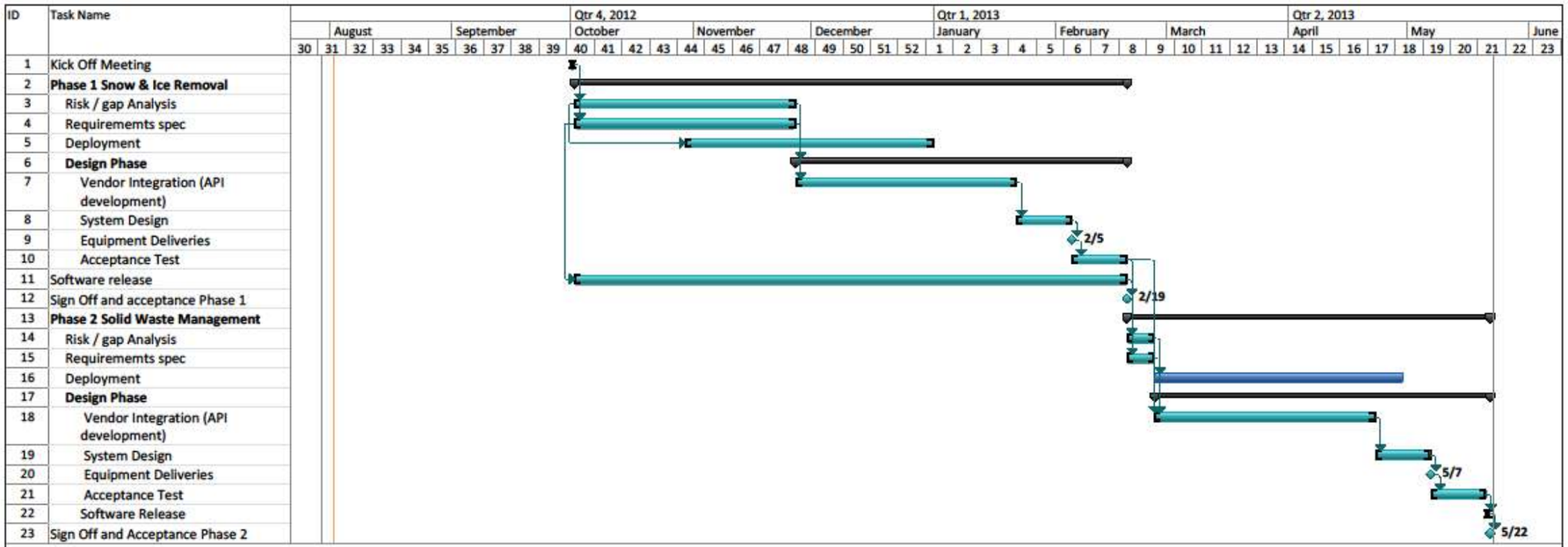





Until DONE
Meet
Client Review
Perform SW Development
Test & Iterate
Meet
Walkthroughs & Reviews
Meet
Meet with Client
Report Status
Develop Test Documents
Meet
Review Test Docs with Client
Formal Testing
Meet
Review Test Results
Track Bugs
Repairs / Fixes
Meet
Completion / Signoff
Generate Training Docs
Training
Meet
Warranty Work
Track Bugs
Meet
Lessons Learned Mtg
Project Completion
Invoice
Minutes
Minutes
Invoice
Minutes
Test Docs
Invoice
Minutes
Test Report
Invoice
Bug Reports
Training Docs
Invoice
Signoff
Bug Reports
Minutes

10 Appendix C – Implementation Plan Schedule

Scenario 1: Phase 1 and 2 Rollout Only

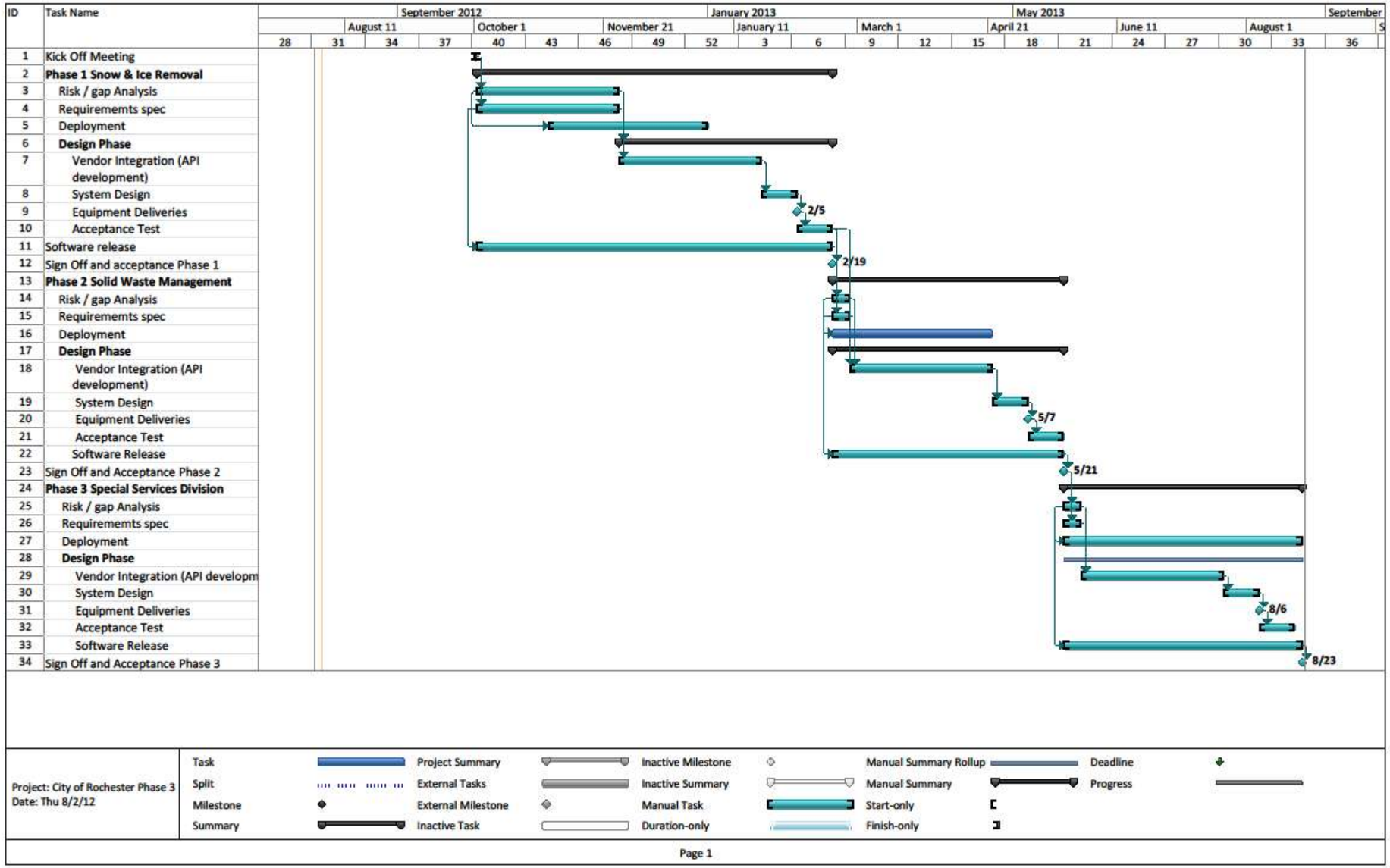


Project: City of Rochester.mpp
Date: Thu 8/2/12

Task		Project Summary		Inactive Milestone		Manual Summary Rollup		Deadline	
Split		External Tasks		Inactive Summary		Manual Summary		Progress	
Milestone		External Milestone		Manual Task		Start-only			
Summary		Inactive Task		Duration-only		Finish-only			

Page 1

Scenario 2: Phase 1, 2, and 3 Rollout



11 Appendix D – Project Budgetary Estimate Details

The Implementation Plan will include a work breakdown structure for all tasks. This example below was used to estimate the costs and timelines for the Phase 1/2/3 rollout of approximately 287 vehicles, staggered across an 11-month calendar.

City of Rochester:

2-Phase development with Optional 3rd Phase
All 287 vehicles integrated with FleetKnowSys Solution, 1/3 with "Black Box Only"
All units with optional components except only 50% have Dispatch option
All installation performed by ASG, Vnomics and/or designated 3rd-party #
Cloud-based server (existing server farm)

Task Description / Engineer	Rollup Costs	Months ARO 1	2	3	4	5	6	7	8	9	10	11	12
Kickoff													
Kickoff Meeting	$ 1,440												
Engineer 1		■											
Engineer 2		■											
Phase I Snow & Ice Removal													
Risk/Gap Analysis	$ 28,800												
Engineer 1		■	■										
Engineer 2		■	■										
Requirements Specification	$ 21,600												
Engineer 1		■	■										
Engineer 2		■	■										
Design													
Vendor Integration (API Development)	$ 43,200												
Engineer 1				■	■								
Engineer 2				■	■								
System Design	$ 14,400												
Engineer 1						■							
Engineer 2						■							
Equipment Purchase	$ 162,303												
Equipment Units (Black Box + Display)			■										
Equipment Units (Black Box only)			■										
Engineer 1			■										
Engineer 2			■										
Equipment Deliveries	$ 4,320												
Engineer 1			■	■									
Engineer 2													
Acceptance Test	$ 7,200												
Engineer 1						■							
Engineer 2						■							
Deployment	$ -												
Installation	$ 16,200												
Engineer 1			■	■									
Engineer 2			■	■									
Training	$ 7,200												
Engineer 1						■							
Engineer 2						■							
Documentation	$ 10,800												
Engineer 1						■	■						
Engineer 2						■	■						
Signoff & Acceptance	$ 720												
Engineer 1							■						
Engineer 2							■						
	$ -												
Equipment Phase I	$ 160,863												
Engineering Labor Phase I	$ 157,320	■	■	■	■	■	■						

Task Description / Engineer	Rollup Costs	Months ARO 1	2	3	4	5	6	7	8	9	10	11	12
Phase II Solid Waste Management	$ -												
Risk/Gap Analysis	$ 3,600												
Engineer 1													
Engineer 2													
Requirements Specification	$ 3,600												
Engineer 1													
Engineer 2													
Design													
Vendor Integration (API Development)	$ 36,000												
Engineer 1													
Engineer 2													
System Design	$ 3,600												
Engineer 1													
Engineer 2													
Equipment Purchase	$ 149,260												
Equipment Units (Black Box + Display)													
Equipment Units (Black Box only)													
Engineer 1													
Engineer 2													
Equipment Deliveries	$ 4,320												
Engineer 1													
Engineer 2													
Acceptance Test	$ 2,880												
Engineer 1													
Engineer 2													
Deployment	$ -												
Installation	$ 14,400												
Engineer 1													
Engineer 2													
Training	$ 3,600												
Engineer 1													
Engineer 2													
Documentation	$ 3,600												
Engineer 1													
Engineer 2													
Signoff & Acceptance	$ 720												
Engineer 1													
Engineer 2													
Equipment Phase II	**$ 147,820**												
Engineering Labor Phase II	**$ 77,760**												

Task Description / Engineer	Rollup Costs	Months ARO 1	2	3	4	5	6	7	8	9	10	11	12
Phase III Special Services Division	$ -												
Risk/Gap Analysis	$ 3,600												
Engineer 1													
Engineer 2													
Requirements Specification	$ 3,600												
Engineer 1													
Engineer 2													
Design													
Vendor Integration (API Development)	$ 14,400												
Engineer 1													
Engineer 2													
System Design	$ 3,600												
Engineer 1													
Engineer 2													
Equipment Purchase	$ 223,320												
Equipment Units (Black Box + Display)													
Equipment Units (Black Box only)													
Engineer 1													
Engineer 2													
Equipment Deliveries	$ 4,320												
Engineer 1													
Engineer 2													
Acceptance Test	$ 2,880												
Engineer 1													
Engineer 2													
Deployment	$ -												
Installation	$ 21,600												
Engineer 1													
Engineer 2													
Training	$ 3,600												
Engineer 1													
Engineer 2													
Documentation	$ 3,600												
Engineer 1													
Engineer 2													
Signoff & Acceptance	$ 720												
Engineer 1													
Engineer 2													
Equipment Phase III	**$ 221,880**												
Engineering Labor Phase III	**$ 63,360**												

Task Description / Engineer	Rollup Costs	Months ARO 1	2	3	4	5	6	7	8	9	10	11	12
Project Management	$ 52,800												
ASG PM													
Vnomics PM													
Total Equipment	$ 530,563												
Total Labor Cost	$ 351,240												
Grand Total	$ 881,803												

Montlhy Recurring	$ -												
Integrated Vehicle Count			50	86	86	86	126	167	167	227	287	287	287
Verizon Communications	$ 27,821		50	86	86	86	126	167	167	227	287	287	287
FleetKnowSys	$ 83,520		50	86	86	86	126	167	167	227	287	287	287
Geofencing	$ 11,136		50	86	86	86	126	167	167	227	287	287	287
Turn by Turn Directions	$ 11,136		50	86	86	86	126	167	167	227	287	287	287
Dispatch	$ 13,253		25	43	43	43	63	84	84	114	144	144	144
Warranty	included												
Server Farm (Cloud)	included												
Help Desk and SW Support (per hour)	included												
3rd-party SW Upgrade Support	included												
Regular Data Backup	included												
PM	included												
Monthly Recurring Total	$ 22,713												
Monthly Recurring Total per Unit	$ 79.14												
Support costs per year (all vehicles)	$ 272,558												

Notes: The zero-cost monthly recurring costs are rolled up into the FleetKnowSys $45/month fee
For the black-box only devices assume that City of Rochester already has Android mobile devices for communications
API complexity is unknown and has to be pinned down during Gap analysis
Minimal travel except during installations
The bulk of API development occurs during Phase I. Subsequent phases will generally have less development costs.

12 Appendix E - Vnomics AVL/ITS Technical Specification ("FleetKnowSys")

FleetKnowSys™
Technical Specifications

As the industry leader in real-time on-board technology, only the Vnomics FleetKnowSys system can maximize cost savings and increase fleet efficiency.

IN-CAB ADVISOR™ coaching system

FleetKnowSys provides you with information in real-time right from the cab—everything from MPG and shift efficiency to maintenance alerts—and reports seamlessly back to the supervisors' phone. This "black box" technology coaches your drivers by training them to be as efficient and safe as possible, as well as helps you:

- **Increase productivity**
- **Decrease wasted fuel**
- **Stay in compliance**
- **Accurately measure hours of service and IFTA reporting**

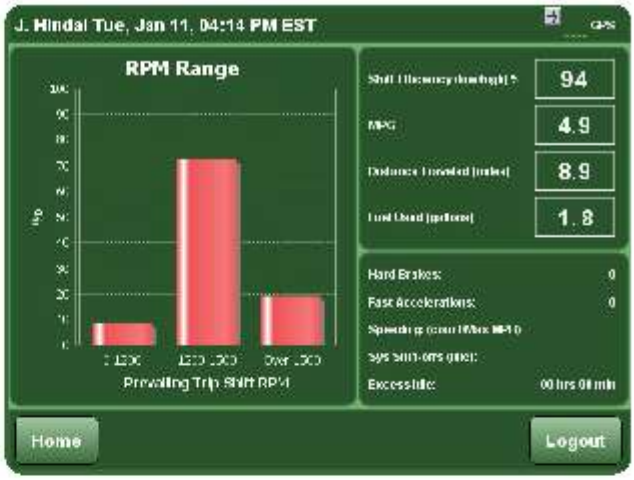
Guaranteed to deliver a return on your investment in less than a year. You will also increase driver retention and effectiveness. The result? You'll better retain and reward your best or "A" drivers. Turn your "B" drivers into "A" drivers. Train your "C" drivers to become "A" or choose to replace them.

Features:

- In-Cab Driver Coaching
- Fuel Analysis
- Safety Scorecard
- Proactive Maintenance
- Real-Time Alerts with GPS Location
- Messaging & Workflow
- Electronic Driver Log Book / IFTA
- Mobile Website
- Accident Reconstruction

FleetKnowSys™

Technical Specifications



On-Board Computer

- Linux Operating System
- Intel Atom Z510PT, 1.1GHz Processor
- 1GB Industrial Memory
- Storage - 4GB Industrial Compact Flash, up to 64GB optional
- Built-in Inertial System
- GPS (L1) Location Services

Communication

- Cellular (GSM or CDMA)
- WiFi (802.11a/b/g/n)
- Bluetooth – Optional
- MultiBand Antenna

Interfaces

- (2) USB2.0
- (1) Gigabit LAN
- (1) CAN2.0 (SAE J1939 / J1708 / J1587 Compliant)
- (1) RS-232
- (1) Audio Line-Out / Mic-In
- (1) High-Density Video Port

Environment

- IP Rating: IP54 (connector not included)
- Operating Temperature: -30° to 70° C (-22° to 158° F)
- Storage Temperature: -40° to 85° C (-40° to 185° F)
- Vibration/Shock: MIL-STD-810F, Method 516.5
- Power Regulation: SAE J1455, ISO7637-2, SAE J1113

Power Management

- DC Input: 6V – 36V DC
- Power On/Off Delay - Programmable

Display Screen

- Size: 7-inch 4 wire Resistive Touchscreen
- Resolution: 800 x 480
- (5) User Defined Function Keys
- (1) USB2.0 Port
- 2-Watt Speaker
- Power / Wake-Up Button

vnomics
A Revolution In Vehicle Economics Through Technology

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For additional information or speak to one of our Technical Sales Representatives.

855.VNOMICS (866.6427) or 585.377.9700
info@vnomicscorp.com
vnomicscorp.com

Vnomics Corp • 175 Sully's Trail, Suite 203 • Pittsford, NY 14534 • 585.377.9700

13 Appendix F - Product Licensing Agreement

This appendix contains a standard Vnomics product Sales & Service agreement, along with licensing terms, general terms and conditions, and product return policy.

Dated _____, 20__.

Sales and Service Agreement			
Seller:	Vnomics Corp., ("Seller"), located at 175 Sully's Trail, Suite 203, Pittsford, NY, 14534	Seller Contact: Title: Phone: Fax: Email:	 585-377-9700 585-249-0251 _____@vnomicscorp.com
Buyer:	_____, ("Buyer") located at _____	Buyer Contact: Title: Phone: Phone: Email:	
Date:	_____, 20__	Contract #	
Agreement:	**Seller agrees to sell to Buyer and Buyer agrees to purchase from Seller for Buyer's use, the Product(s) and Service(s) listed below upon terms and conditions in this Agreement (as defined in Attachment A):**		
Term:	The term of this Agreement (as defined in Attachment A) is ____ months from date of installation for each unit ("Term") and from month to month thereafter unless terminated in accordance with this Agreement.		
Product Hardware	Buyer to purchase FleetKnowSys™ on board computer with driver display screen, diagnostic cables and onboard communication system(s)		
Product Software	Buyer to license FleetKnowSys™ software and access data via the FleetKnowSys™ web portal.		
Quantity:	_____(__) FleetKnowSys units of hardware and software (collectively, the "Purchased System"), installed in _____. Vehicle Identification Numbers to be provided in advance and approved for installation by Seller. Buyer may switch the Purchased Unit to another vehicle owned by Buyer upon 30 day written notification to Seller [and approval by Seller], so that Seller can update the Software (as defined in Attachment A) with regard to the new vehicle.		
Price:	Hardware per vehicle price: $_____ Hardware Mounting kit per vehicle price $___ (collectively the "Purchase Price") Monthly Service Fee per vehicle: $_____		
Shipping Cost	Unless otherwise specified, delivery terms are FOB Vnomics Corp. Pittsford, NY, 14534		
Taxes	Buyer is responsible for any and all sales, use or other taxes for the hardware cost, monthly fees, etc, for the full term of this agreement including if this agreement is extended to a month to month agreement.		
Delivery	Delivery schedule will be as follows:		
Warranty:	If the Hardware should need repair during the term of this Agreement, Buyer may return the Hardware to the Seller for repair or replacement, see Attachment C (in Seller's discretion, not to be unreasonably exercised). Hardware is subject to the Warranty set forth in Attachment A.		
Payment:	Payment of the Purchase Price is due within 30 days of shipment. Buyer shall pay the Monthly Service Fee by the first (1st) of each month beginning _____ 20__. The first payment will be prorated based on actual activation date that is not the first of the month.		
Accounts Payable	A/P Contact Name: _____ Phone: _____ Billing Address: _____ Fax: _____ _____ E-mail: _____ _____ Preferred Method to receive invoices: __ Mail __ E-mail Is this purchase tax exempt? __ Yes __ No (If so, please attach proof of tax exemption)		
Guarantee:	If the Buyer is not completely satisfied with the Hardware within the first 90 days of Installation, the Buyer may return the Hardware to Seller and Seller will refund the product hardware purchase price upon its receipt of the Hardware, provided it is in good condition, ordinary wear and tear excepted.		

{MLO 00038948 4}

- Vnomics Proprietary Information -

1

GENERAL TERMS AND CONDITIONS

1. **General Terms and Conditions**. These general terms and conditions ("Terms and Conditions"), together with the sales agreement incorporating these Terms and Conditions and Attachment B hereto (collectively, the "Agreement"), sets forth the complete and exclusive understanding and agreement of the Parties for the purchase and sale of the product(s) and service(s) ("Product") manufactured or sold by Seller and the original Buyer thereof. Seller and Buyer shall individually be referred to herein as a "Party" or collectively as the "Parties".

2. **Purchase and Sale of FleetKnowSys Systems and Service**. The Purchase Price and each Monthly Service Fee Payment shall be paid in cash or by company check or wire transfer to an account designated by the Seller. Title to the purchased hardware systems shall be transferred to Buyer upon payment in full of the Purchase Price.

a. As a condition to the sale of the Purchased Systems to the Buyer as set forth herein, for each Purchased System Buyer shall pay the Monthly Service Fee to the Seller.

b. In consideration of the Monthly Service Fee, Seller will provide to Buyer during the Term a designated internet portal (the "**Designated Portal**") at which Buyer may access data and information gathered by or from Purchased System (collectively, in any form, the "**Data**"). For purposes hereof, "**Term**" with respect to a particular Purchased System shall mean the period commencing on the date that Purchased System is installed, or such shorter period of the Term is terminated pursuant to this Agreement.

c. In consideration of the Monthly Service Fee, Buyer also will be provided with a customer administrative UserID and will be required to establish a password and agree to the terms and conditions set forth on Seller's website at www.vnomicscorp.com ("**Seller's Site**"). Buyer agrees that it is subject to all of the terms and conditions at Seller's Site including, without limitation, the Privacy Policy set forth thereon, all as may be amended from time to time at Seller's discretion. Seller has the right, at its discretion, at any time, to revise, update or modify Seller's Site and the Designated Portal.

d. In the event Buyer fails to make any Monthly Service Fee payment in full within thirty (30) days of the date when due, then Seller, in its discretion, may terminate the Term and Buyer's access to and right to use the Designated Portal and Seller's Site until such time as all Monthly Service Fees that are due and payable are paid in full, without any right of reduction to, proration of or reimbursement in any portion of the Monthly Service Fees.

3. **Installation**. For purposes of this Agreement, the term "**Installation**" shall be deemed to have occurred the date on which the Purchased System is activated as reasonably determined by Seller. Seller shall provide assistance with the Installation and/or validation of the Installation (which may include, at Seller's discretion, engaging a third party to provide assistance) at no charge to Buyer (which assistance may include instruction by phone or WebEx or other electronic means), it being acknowledged and agreed that after a pre-determined hours of assistance from Seller, Buyer shall be charged an hourly rate.

4. **Covenants of the Parties**.

a. Buyer shall comply with all applicable federal, state and local laws, rules and regulations in the installation and use of the Purchased Systems and Seller's Site, including without limitation laws governing the export of technology and technical information.

b. During the Term, the Seller shall make available to the Buyer, scheduled calls or meetings for Buyer to provide feedback relating to the use and functionality of the Purchased Systems.

c. During the Term, Seller, through the Designated Portal, will read and provide interpretation of data collected by the Purchased System and relayed to the Designated Portal. The parameters and limitations of the interpretation are set forth at the Designated Portal, and Seller makes no representation or warranty, express or implied, as to completeness or accuracy of any interpretation or information presented to Buyer by Seller at or through the Designated Portal.

d. Buyer may not take any action to interfere with, interrupt or limit the use or functionality of the Seller's Site and may not use or send any "Trojan horse", spider, worm, other automatic device, or manual process to monitor, "mine," or copy the web pages on the Site or the content contained therein, and may not otherwise upload, use or otherwise transmit any code, content or other files that contain a virus or other similar component.

e. In the event Buyer breaches any of the covenants in this Agreement, or upon any other Default (hereafter defined) which breach or Default is not cured within twenty (20) days of Buyer's receipt of written notice from Seller specifying such

breach or Default, Seller, in its discretion, may terminate the Term and Buyer's access to and right to use the Designated Portal and Seller's Site permanently (or such other period of time as Seller determines in its sole discretion) without any right of reduction to, proration of or reimbursement in any portion of the Monthly Service Fees. "Default" by Buyer shall mean Buyer ceases to function as a going concern, makes an assignment for the benefit of its creditors, becomes the subject of any proceeding under applicable bankruptcy, receivership, insolvency or similar laws instituted by or against Buyer, which proceeding is not dismissed as to the other Party within 45 days after it has been instituted, or liquidates, dissolves, sells substantially all of its assets, or merges or consolidates with a third party other than where the surviving entity is Buyer.

f. Buyer acknowledges and agrees that Seller, at its discretion but on reasonable prior notice to Buyer, may inspect (in person) the Installation and, after Installation, inspect the Purchased Systems and use thereof.

5. **Indemnification**. Buyer agrees to indemnify and hold harmless Seller and its officers, directors, shareholders, agents, successors and assigns from and against all damages, claims, suits, expenses and fees (including reasonable attorneys' fees) arising from or related to Buyer's breach of any of its covenants in this Agreement or from any of Buyer's acts or omissions and/or from any use or operation of a Purchased System including without limitation damage or injury to any third persons or agent or employee of Buyer.

6. **Warranty; Disclaimer; Limitation of Liability**.

a. With respect to each Purchased System, SELLER warrants to Buyer that the Purchased System will be free from material manufacturing defects, subject to ordinary wear and tear, and subject to other restrictions set forth below. The foregoing is the sole warranty of Seller with respect to the Purchased Systems and the intellectual property therein. No course of dealing or representation, warranty or statement from Seller or any of its agents or employees shall be binding on Seller unless in writing and signed by a duly authorized officer of Seller. The sole remedy for Buyer upon a breach of warranty during the term of the Agreement is for Seller to repair or replace the defective Purchased System, in Seller's discretion, not to be unreasonably exercised and as reasonably promptly as possible.

Without limitation to the limited warranty set forth above, Seller is not responsible for and does not warrant with respect to:

- Defects or failures caused by Buyer or its agent or user abuse or misuse, or by unauthorized attempts to repair or alter the Purchased System in any way.
- Defects caused by act, omission, negligence, abuse or misapplication by or of Buyer or its agent, or defects caused by improper Installation.
- Performance of Purchased Systems when used in combination with equipment or software not purchased from Seller

b. EXCEPT AS EXPRESSLY SET FORTH IN SECTION 6.a ABOVE, THE FLEETKNOWSYS SYSTEMS ARE BEING PROVIDED, SOLD AND/OR LICENSED "AS IS" WITHOUT WARRANTY OF ANY KIND. ALL WARRANTIES, EITHER EXPRESSED OR IMPLIED, REGARDING THE PURCHASED SYSTEMS OR THE USE OF OR RESULTS OF THE USE OF THE PURCHASED SYSTEMS ARE DISCLAIMED BY SELLER, INCLUDING, WITHOUT LIMITATION, IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, WORKMANLIKE EFFECT, ACCURACY, NON-INFRINGEMENT AND WARRANTIES ARISING THROUGH COURSE OF DEALING OR USAGE OF TRADE, AND WARRANTIES THAT ACCESS OF THE SITE AND ANY THIRD PARTY CONTENT WILL BE UNINTERRUPTED OR ERROR-FREE. BUYER ASSUMES THE ENTIRE RISK AS TO THE RESULTS AND PERFORMANCE OF THE PURCHASED SYSTEMS.

c. SELLER SHALL NOT BE LIABLE UNDER ANY CIRCUMSTANCES, FOR ANY DAMAGES WHATSOEVER, ARISING OUT OF THE USE OF, OR THE INABILITY TO USE, THE PURCHASED SYSTEMS OR THE DESIGNATED PORTAL OR SELLER'S SITE, EVEN IF SELLER HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. IN PARTICULAR, BUT NOT AS A LIMITATION THEREOF, IN NO EVENT SHALL SELLER BE LIABLE FOR ANY INDIRECT, SPECIAL, INCIDENTAL, PUNITIVE OR CONSEQUENTIAL DAMAGES (INCLUDING DAMAGES FOR LOSS OF BUSINESS, LOSS OF PROFITS, LITIGATION, OR THE LIKE), WHETHER BASED ON BREACH OF CONTRACT, BREACH OF WARRANTY, TORT (INCLUDING NEGLIGENCE), OR OTHERWISE. NOTWITHSTANDING ANYTHING ELSE IN THIS AGREEMENT, SELLER'S TOTAL LIABILITY TO BUYER WITH RESPECT TO ANY CLAIMS, LOSSES OR DAMAGES ARISING OUT OF OR IN ANY WAY RELATED TO ANY CAUSE WHATSOEVER IN RELATION TO THIS AGREEMENT WHETHER BASED IN CONTRACT, TORT (INCLUDING NEGLIGENCE AND/OR GROSS NEGLIGENCE), STRICT LIABILITY, BREACH OF

WARRANTY, INDEMNITY OR OTHER CAUSE (a "CLAIM") SHALL IN NO EVENT EXCEED TWO [2] TIMES THE PURCHASE PRICE OF THE PARTICULAR PURCHASED SYSTEM WITH RESPECT TO WHICH SUCH CLAIM RELATES.

7. **Confidentiality**.

a. As used in this Agreement, the term "Proprietary Information" means any information about Seller, or the FleetKnowSys System, including without limitation, results from the use of the FleetKnowSys Systems, Intellectual Property Rights, inventions, processes, process improvements, process technology, software and other technology, business plans, vendors, pricing, methodologies and trade secrets, but excluding information that Seller deliberately and voluntarily makes publicly available.

b. Buyer agrees at all time during the Term and thereafter to hold in strictest confidence, and not to use or to disclose (except as required by law) to any person or entity, any Proprietary Information. Further, Buyer agrees that immediately upon any termination of this Agreement, or at any time upon Seller's request, Buyer shall deliver all Proprietary Information to Seller and delete or destroy all Proprietary Information in its control in electronic form. In the event of a breach or threatened breach of Section 7, Seller may obtain an injunction, temporary restraining order or any other legal or equitable remedy available to Seller.

8. **Intellectual Property Rights and Data**.

a. Buyer acknowledges and agrees that Seller is and shall be the owner of all right, title and interest in and to all copyright, trademark, inventions, patents and patents pending, trade secret, know-how and any other intellectual property rights in or to the FleetKnowSys Systems including without limitation the software used and embedded in the FleetKnowSys Systems (the "**Software**") and intellectual property rights in and to the Seller's Site (collectively the foregoing is referred to as the ("**Intellectual Property Rights**")) as well as the Data, and at no time whatsoever shall Buyer have any right, title or interest in or to any of the Intellectual Property Rights or the Data, subject to Buyer's right to use or access the Data through the Designated Portal and Seller's Site. Without limitation to any other rights of Seller herein, Seller, in its discretion, may use, reproduce, distribute or sell any or all of the Data (in whole or in part) for any purpose, without consideration to Buyer.

b. Buyer may not use the Software, Designated Portal or Seller's Site for any purpose other than as set forth in this agreement. Buyer shall not directly or indirectly disassemble, reverse engineer, decompile, or otherwise attempt to derive source code from the Purchased Systems or Seller's Site. Buyer may not make any modifications or derivative works of the Software and may not remove, cover or change any proprietary notices or markings on the Software or Purchased Systems or any components thereof. Buyer acknowledges the Purchased Systems may contain third party product provided to Seller under certain terms and conditions and any use or access to such third party product would be subject to terms and conditions related thereto and this Agreement.

c. Buyer acknowledges and agrees that all object or source code and software programs and works of authorship that Buyer may create, jointly or with Seller, that relates to the FleetKnowSys System, the Software, Designated Portal or Seller's Site is a derivative work thereof and it and any copyright therein shall be owned solely by Seller and shall be works made for hire, as that term is defined in the United States Copyright Act (17 U.S.C. § 101). In the event that all or any part of a work is deemed not to be a work made for hire, or in the event that Buyer should, by operation of law, be deemed to retain any rights in a work then it irrevocably and unconditionally assigns to Seller all right, title and interest in and to that work and all intellectual property therein. Buyer will execute upon request all assignments, applications and other documents, and take such other actions, as Seller reasonably requests to effect the foregoing.

d. Subject to this Agreement, Seller grants to Buyer a non-transferable, non-exclusive, non-sublicensable license to use the Software as it is integrated in and a part of the Purchased System and as necessary to use the Purchased System as contemplated hereunder. Buyer may not modify, disassemble, decompile or reverse engineer the Software or any code relating thereto. The foregoing license is granted with respect to a Purchased System solely during the Term for that Purchased System and shall cease immediately as to a particular Purchased System after the applicable Term.

9. Freight Claims and Shipment Damage.

a. If the Buyer receives the original product in damaged condition, Buyer shall notify the Carrier Service Provider at the time of delivery or in an appropriate and timely manner. In addition, the Buyer shall notify Seller's Customer Care Department immediately.

b. The freight claim for loss or damage with the Carrier shall be made by the Beneficial Owner of the goods/assignment: Seller or Buyer.

c. Seller will provide assistance as required to process the freight claim.

d. The same terms will apply if product is shipped from the Buyer to Seller for any reason.

10. **General Provisions**.

a. This Agreement contains the entire agreement of the Parties with respect to the subject matter herein, and supersedes any prior agreements or discussions between the parties, and may not be changed except by written agreement of the parties. This Agreement shall be for the benefit of and binding upon the heirs, successors and permitted assignees of either party.

b. Buyer may not assign, license, sublicense or otherwise transfer this Agreement (or any of its rights hereunder) to any third party and any attempted assignment, license, sublicense or transfer shall be null and void and without effect.

c. This Agreement shall be governed by the laws of the State of New York, without reference to conflicts of law principles. The parties irrevocably consent to the jurisdiction of the state and federal courts in Monroe County, State of New York, in any action arising out of or relating to this Agreement, and waive any other venue to which either party might be entitled by domicile or otherwise.

d. The failure of Seller at any time to require performance of Buyer's obligations under this Agreement shall not affect Seller's right to enforce any provision of this Agreement at a subsequent time, and the waiver by Seller of any right arising out of any breach shall not be construed as a waiver of any right arising out of any other or subsequent breach. If a court finds any clause in this Agreement invalid or unenforceable, the remainder of this Agreement will not be affected and all other provisions herein will remain valid and enforceable.

e. All notices required or permitted under this Agreement shall be in writing and shall be deemed to be duly delivered when delivered in person or three days after being mailed certified mail return receipt requested, postage prepaid to the address specified on the Sales and Service Agreement cover page.

f. The parties acknowledge and agree that nothing in this Agreement shall be deemed to create a partnership or joint venture or employment relationship between the parties.

g. The parties agree that if any portion of this Agreement shall become illegal and/or unenforceable, the remaining portion shall continue to be binding and enforceable.

h. Notwithstanding any other provision of this Agreement to the contrary, neither Seller nor Buyer shall be in default by reason of any delay or failure in its performance under this Agreement resulting, directly or indirectly, from acts beyond the reasonable control of such Party, including, without limitation, fire, explosion, strike, freight embargo, Act of God or of a public enemy, war, civil disturbance, act of government, unusually severe weather, quarantine, epidemic, or catastrophe.

i. This Agreement may be executed simultaneously in one or more counterparts (including by facsimile), each one of which shall be deemed an original, but all of which together shall constitute one and the same instrument.

Attachment C

REPAIR AND REPLACEMENT POLICY

A Return Material Authorization Number MUST BE OBTAINED from Vnomics prior to returning any products. The RMA number is valid for 30 days from the date of issuance.

Boxes received without an authorized RMA Number will be shipped back at the customer's expense.

All Product returns fall into two categories:

1. Warranty
2. Non Warranty

1. Return Procedure

For returns please complete all of the required information on the attached RMA form. The RMA form can be found on the Help section of the Customer Website (http://customer.diagknowsys.com/User/Documents.aspx), or contact your Customer Care Representative. Upon completion of the required information, submit the form to Vnomics per the instructions on the RMA form. Vnomics, after review of the RMA form, will generate your RMA number within 2 business days (Mon – Fri, non-Holiday).

An RMA number is only an authorization for returning a product; it is not an approval for repair or replacement. Returned products will be inspected, the appropriate action will be determined and the customer may be contacted with recommended options by Vnomics (i.e., in the event that the return is not covered under warranty).

Vnomics is not responsible for any returned items not listed on the RMA form.

To ensure timely processing, **please print the RMA number on the shipping label or on the outside of the package**.

Replacement parts will be shipped to the Customer within five business days of the RMA acceptance.

2. Warranty RMA

A. Warranty Period

For detailed warranty terms and conditions and the status of an item, please refer to your contract with Vnomics or your Customer Care Representative.

Any replacement parts furnished at no cost to the Customer in fulfillment of this warranty are warranted only for the unexpired portion of the original warranty. Such replacement parts may be new or refurbished.

Normal "Wear and Tear" as determined by Vnomics is NOT covered by this warranty.

B. Repair Fees

There is no repair fee for in-warranty service.

3. Non-Warranty Items

Vnomics is not responsible for damages outside of Vnomics control including, but not limited to, physical damage, user abuse or misuse, defects or failures caused by unauthorized attempts to repair or alter the equipment in any way, modifications to the product by user, improper packaging, or acts of nature (i.e., lightning strikes, floods, etc…). Such conditions will be determined by Vnomics at its sole unfettered discretion.

In no event shall Vnomics be liable for any special or consequential damages including, but not limited to, loss of anticipated profits or revenue, cost of substitutive equipment, downtime costs, facilities or services, or claims of customers of the Customer.

In no event shall Vnomics be liable for the performance of the equipment when used in combination with equipment not purchased from Vnomics.

A fee must be paid to have a non-warranty item repaired or replaced. This fee will also extend the product's warranty for an additional three months on the parts that have been repaired and/or replaced. Additional repairs do not apply to products which have been misused, abused, or subjected to unauthorized disassembly/modification; placed in an unsuitable physical or operating environment; improperly maintained by the customer; or failure caused which Vnomics is not responsible whether by accident or other cause.

A. Replacement Parts

Vnomics will provide a quote for out of warranty replacement components, at the request of the customer.

B. Repair Fees

If it is determined that the component can be repaired, the customer will be provided a quote for the repair cost. Approval to repair is given by the customer by order of a PO.

If an out of or non-warranty item cannot be repaired, the customer will be notified.

Other charges may apply if the product is tested or calibrated after expiry of the warranty period, and a No Problem Found (NPF) result is obtained.

4. Repair Procedure

If the product is under warranty, it will be repaired or replaced at the sole discretion of Vnomics.

5. RMA Status Check

Please email support@vnomicscorp.com or contact your Vnomics Customer Care representative and have your RMA number ready when making inquiries.

6. Packaging

- Customer is responsible for proper return packaging.
- To avoid voiding the warranty, use Vnomics or equivalent packaging to return a product. Packaging should be such that the product is not damaged during shipping.

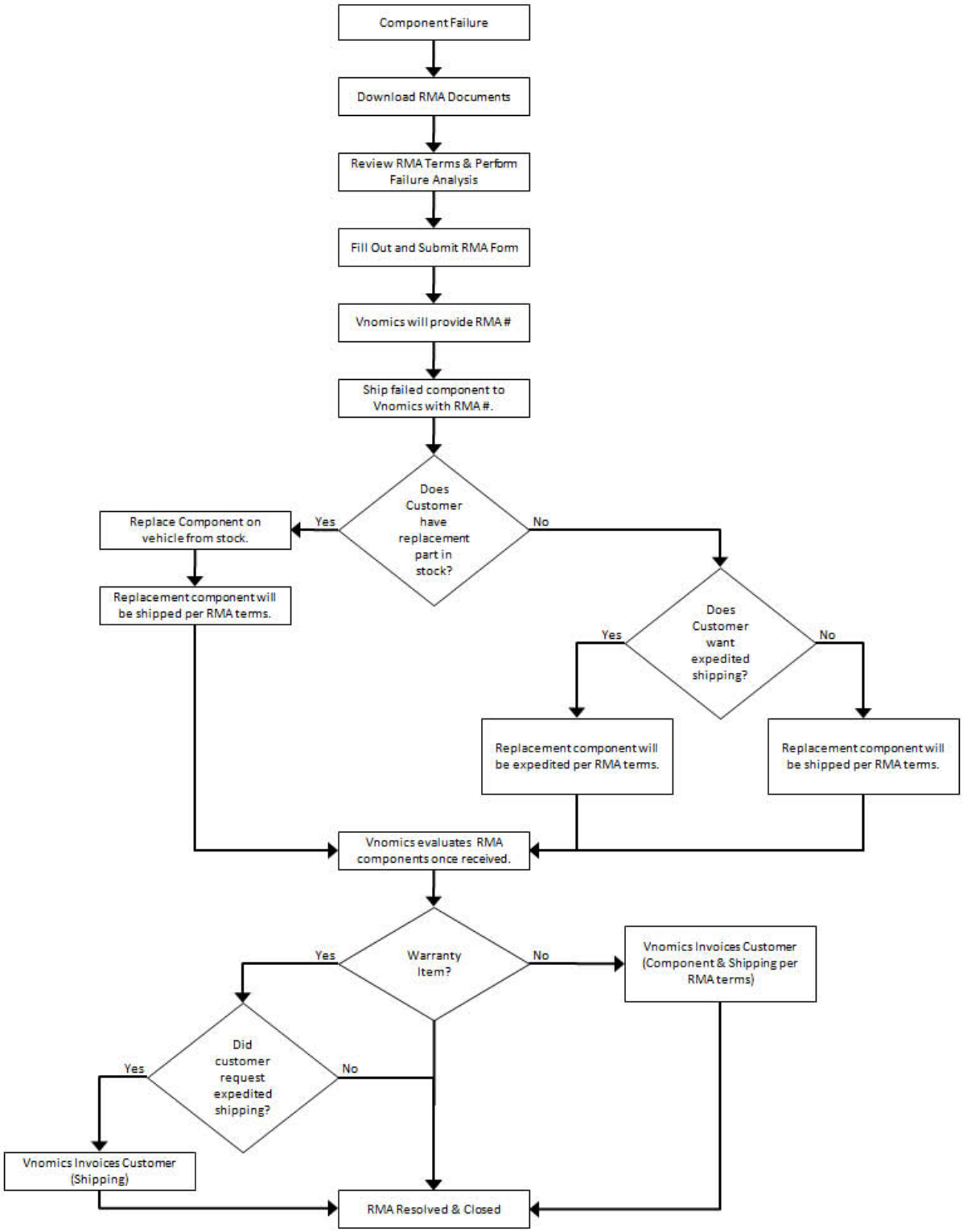
7. Shipping Cost

A. Shipping Terms

The customer is responsible for shipping costs to Vnomics. Vnomics is not responsible for damage during shipment. Vnomics recommends that Customer insures the shipment.

As a courtesy, Vnomics will be responsible for the shipping costs for returning the products back to the customer (**in-warranty components only**).

Unless otherwise requested, the shipping method will be UPS Ground, or equivalent. If Customer requires overnight or other special requirements for expedited shipment, these will be at Customer's expense. Customer may pay freight by either issuing a purchase order with the clear notation "Prepay and Add Freight" or Customer may choose a carrier and provide an account number (freight collect).

The customer is responsible for all shipping costs (to and from customer) for out-of-warranty service products.

RMA Process Flow