1. SPECIFICATIONS

General

* 1. Applicable Specifications
		1. These Specifications shall apply to the Work.
		2. Bidders are reminded that requests for approval of substitutes as an approved equal or an approved alternative shall be made in accordance with B6.
	2. Goods

SPEC NOTE: Provide detailed specifications for each item.

* + 1. The Contractor shall supply the hardware and software necessary to provide an Automatic Vehicle Location (AVL) system (“system”) in accordance with the requirements hereinafter specified.
		2. The system shall be comprised of several subsystems, including but not limited to the GPS receiver, data transmission, monitoring software and a data server or host. It shall also offer the option to interface with on board sensors (see E2.14).
		3. The AVL units must be capable of transmitting geographical coordinates of their current location along with date/time information to the host computer (“tracking server”) in real time.
		4. The data must be stored in a manner that would allow multiple clients to access the data simultaneously.
		5. The system must have the ability to access the stored vehicle positional information and as a minimum, display the current location on a map that is run as a client application.
		6. The system must be extensible through development of custom reports, and other analytical and business applications by offering full access to its data in a structured manner. Software Development Kit (SDK) and reference material required for implementation of custom reports/applications must be supplied.
		7. The Bidder should provide information on key differentiators and unique aspects of the Bidder’s proposal which should include but not be limited to the following:
			1. why the key differentiators and unique aspects are most appropriate for the City;
			2. implementation plans and transition strategy, including data conversion and training;
			3. what tamper proof capabilities are available in their system.
			4. proposed system architecture.
			5. hardware and software functionality;
			6. ease of use.

**GPS Receiver**

* + 1. The following are applicable for the GPS Receiver. The GPS Receiver subsystem:
			1. shall include a satellite receiver capable of determining geographic locations to within 3m accuracy;
			2. shall include an antenna;
			3. shall be powered directly from the vehicle’s 12 volt power system;
			4. must operate in field conditions experienced in the daily operation of a wide variety of equipment such as snowplows, material spreaders, sweepers, motor graders, mowers, front-end loaders, trucks, cars, and snow mobiles;
			5. must be able to function in Winnipeg’s weather (-40C to 45C and humidity up to 100%) and shall be enclosed in a suitable water resistant, salt resistant, and shock & vibration resistant housing;
			6. should have device fault detection functionality;
			7. positional accuracy shall be 3 meters minimum and velocity accuracy shall be no less than 1 meter per second, heading accuracy to be 5 degrees minimum.
			8. maximum time to first fix shall be 150 seconds for cold start, 60 seconds for warm start, and 15 seconds for reacquisition after losing signal;
			9. shall be able to track vehicle status data which includes:
				1. vehicle number,
				2. vehicle speed,
				3. direction and location,
				4. engine on and off status,
			10. shall include the firmware and user definable configuration points which must be remotely upgradeable via wireless interface from a central location;
			11. Instead of transmitting data to the host server at regular timed intervals, the data update shall be triggered by events such as the following:
				1. upon vehicle start;
				2. whenever the location has changed by 100m (or a distance deemed more appropriate);
				3. whenever the vehicle turns greater than 30 degrees (or a value deemed more appropriate);
				4. whenever a change in response/availability status is entered;
				5. on demand by the AVL monitoring software (not a mandatory requirement);
				6. on receiving an alert/new data from on-board sensors (see E2.14);
				7. every 5 minutes if powered on and stationary (or an interval deemed more appropriate);
				8. vehicle shutdown;
			12. with reference to E2.7(k): AVL devices should allow polling by a remote software (such as AVL Monitoring Software) for on-demand data transmission to the host server;
			13. with reference to E2.7(k): AVL devices should be configurable to adjust parameters of any of the update triggering events;
			14. shall include warranty and support.

**Data Transmission System**

* + 1. The purpose of Data Transmission System is to transmit the positional data from the vehicles to the tracking server using a modem connected to the GPS Receiver, and a supporting wireless network.

The wireless network could be a cellular carrier’s data network; the City of Winnipeg’s Taitnet MPT1327 voice radio trunking system; or another wireless data system provided by the vendor.

The data transmission network shall support a minimum of 1500 unique GPS Receiver Systems transmitting data in real-time.

The GPS receiver system should be flexible to use a data transmission modem already installed in the vehicle. This provision is to allow for connection pooling and save on multiple communication connections and charges originating from the same vehicle. If the system being proposed allows for the flexibility of connection pooling with modems already installed in the vehicle, the Bidder shall state the modem interface capabilities of their system, such as RS-232, Bluetooth, Wi-Fi, USB, etc.

The data transmission subsystem shall be compatible with 3G and 4G cellular data networks. The proposal shall include the Bidder’s suggested transmission standard (3G or 4G) to meet usage demands as laid out in E2.10.3.

The Data Transmission System shall include warranty and support.

**Data Server**

* + 1. The Data Server shall be a centrally managed tracking server administered by the City of Winnipeg or a comparable Contractor supported hosted service capable of wirelessly receiving GPS data from AVL units in real-time and making this data available to the AVL Monitoring Software.

If data server is hosted by the Contractor, hosting server and all related components shall be located in Canada.

If data server is to be hosted by the City of Winnipeg, hosting server and all related components must be compatible with the Information Technology environment in the City of Winnipeg as in accordance with D3.

The following are applicable for the Data Server. The Data Server:

shall be able to receive and commit data transmitted from 300 unique GPS receivers concurrently;

shall be able to support 100 concurrent connections from users running AVL Monitoring Software;

shall support export of data in Oracle compatible format. Data export functionality shall support export of full database or only the data meeting specified criteria;

shall support export of geographic data in Intergraph GeoMedia compatible format;

shall support scheduled or on-demand data exports;

shall have a software development kit (SDK) and reference material required to make changes or enhancements to its functionality such as implementation of automated processes to support customized data feeds to other City systems;

for server capacity and transaction-processing load planning purposes, following usage pattern can be assumed: of all of WFMA’s fleet, at most only 33% of vehicles will be in “active” (i.e. engine turned on and in a state to potentially trigger an update event—see E2.8(k)) state at any given time.

for City of Winnipeg hosted servers, must include recommended hardware and software specifications for the server components suitable to meet the load demands as laid out in this section (E2.10.3) and E2.11.5.

**AVL Monitoring Software**

* + 1. The following are applicable for the AVL Monitoring Software. AVL Monitoring Software:
			1. shall be a server-based application which can be used to track and report the location of at least 1500 unique devices in real and near-real time;
			2. shall only be available to authorized Users;
			3. shall have User login mechanism which should integrate with City’s Active Directory services;
			4. shall have access management features allowing users to only see authorized data;
			5. shall be capable of connecting multiple instances to the same data server, allowing the monitoring software to be run from multiple networked locations;
			6. shall extract data from the server and present it in tabular or graphical formats;
			7. shall have the ability to use maps provided by the City of Winnipeg. Users shall be able to easily add, update, and replace these maps as often as needed;
			8. data shall be easily exported for use in other applications;
			9. shall have a software development kit (SDK) and required reference material that allows City of Winnipeg IT staff to make changes or enhancements to its functionality and implement custom management reports;
			10. shall include warranty and support.

The following features must be available from the AVL Monitoring Software:

map display of current locations of all vehicles a user is authorized to see, as well as for user defined length of history (sometimes referred to as “bread crumbs”);

ability to zoom in and out;

latitude/longitude displays;

replay feature to show past vehicle behaviour. Any activities shall be made available for replay of any vehicle or route. Replay time frame will be determined by the City of Winnipeg, playback shall have fast forward and rewind capabilities;

annotate mobile resources on screen with City of Winnipeg defined information such as vehicle number or operator name. The dispatch operator should be capable of changing the annotation and having it reflected on the display in less than three (3) minutes;

monitor the location and status of mobile resources, receive alerts/reports when a defined status changes or a predefined event occurs (example: exceeding speed limit, idling for extended periods, hard starts/stops, etc.);

shall have the ability to create multiple map areas with boundaries (“Geo zones”). Events that occur within or outside these user defined Geo zones (example: entering, exiting, time in zone, etc.) shall generate alarms or alerts and can be shown in a report;

The following Management reports must be available (per unit, where appropriate) in special printable format and Excel spreadsheet format:

activity summary reports;

stop reports;

status reports;

district reports based on geographic boundaries supplied by the City of Winnipeg;

drill down capability for more detailed information;

start, finish and idle time;

total hours of operation per calendar day or user defined period;

total distance of operation per calendar day or user defined period;

exception reporting for speeds;

Geo zone exceptions or compliance reports;

Controller usage.

The AVL Monitoring Software should have a mobile version suitable for smart phones (such as iPhone 4) and tablets (such as iPad). The mobile version need not have the full suite of functionality offered by the regular version of the software;

The AVL Monitoring Software should have the option of using Google Maps as the mapping engine (i.e the standard mapping component to work with AVL data through operations like view, report, etc) in all versions of the software (i.e. mobile and regular). Google Maps support must allow usage of City of Winnipeg maps as outlined in E2.11(g).

For City of Winnipeg hosted solutions, the Proposal must include recommended hardware and software specifications for the server components required to support the AVL Monitoring Software infrastructure. This requirement should be read in conjunction with E2.10.3(h).

The Proposal must include detailed design and architecture notes on the AVL Monitoring Software including, but not limited to, details such as following:

Is it a web based application (thin-client running in a browser) or a traditional desktop application;

In case of web application, does it need plugins like ActiveX, Java, or Flash;

In case of web application, what is developmental platform of server side components (e.g. JSP, .Net, etc);

Who is the developer of the mapping component (e.g. ESRI, Intergraph, MapXtreme, Bing, Google Maps, Microsoft MapPoint, etc)

Which platforms is the mobile version supported on (e.g. iOS, Android, Windows 8, etc);

Procedures for updating maps and creating geo-zones;

Where is the base GIS data sourced from;

Base GIS data storage format: is it local file based such as MapInfo tab files and Access MDB, or relational database driven;

If relational database driven, is mapping component natively compatible with Oracle Spatial;

Any open source components used.

**Training and Documentation**

* + 1. The Contractor shall provide necessary training and reference material to City of Winnipeg’s designated staff for each of the following categories:
			1. install hardware and shall be at a City of Winnipeg location;
			2. install, configure, and administer all software comprising the AVL system;
			3. remotely configure AVL devices (GPS Receiver and Data Transmission subsystems) and perform other maintenance functions such as upgrading firmware
			4. demonstrate the functionality and operability of the GPS Receiver and AVL monitoring software;
			5. training for the IT staff to demonstrate functionality of the system, implementation of the tracking server (if applicable; see B10.1), software interfaces and SDK’s, data import/export mechanisms, report writing, and other such topics required to ensure City’s self-sufficiency in administration of the system, managing configurations, and extending its functionality through software development;

The Contractor shall provide following documentation relating to the hardware components of the AVL system:

operating manuals;

interface drawings;

installation schematics.

**Hardware Installation**

* + 1. Hardware installation shall include the GPS Receiver and Data Transmission subsystems (E2.8 and E2.9), integrating it into the vehicle’s electrical system, and activating its link to the data tracking server and telecommunications network.

**Vehicle Telematics**

* + 1. The following are applicable for Vehicle Telematics:
			1. Vehicle Telematics shall have the option to add interface with on-board sensors to carry out “Binary Monitoring” such as plow up/down, sweeper brooms on/off and up/down, etc;
			2. Vehicle Telematics shall have the option to add interface with material spreader systems, which use Bosch Rexroth CS440 and Parker brand controllers, to read data such as material type, spread-rate, etc.;
			3. Vehicle Telematics should offer the option of adding driver identification module. This module shall support reading of identification tags (“ID tag”) using RFID, card swipe, or similar technology. Once installed, the system must not allow it to be bypassed—ID tags must be read by the system before the unit can be started. If RFID technology is supported, the Bidder shall state if it is compatible with “HID Corporate 1000” cards.
			4. Vehicle Telematics should have the option to add interface with engine diagnostics port using following connector types (as applicable) to read and transmit engine diagnostics data:
				1. OBD-II for gasoline and light-duty diesel engines;
				2. Deutsche 6-pin J-1708 for heavy duty diesel engines;
				3. Deutsche 9-pin J-1939 for heavy duty diesel engines.