



## 900 MHz AMR/AMI SPECIFICATIONS

This document is intended for utilities and consultants and provides specifications for a meter reading system (the System) that operates seamlessly as BOTH an Automatic Meter Reading (AMR) and/or an Advanced Metering Infrastructure (AMI) system.

### 1. SCOPE OF WORK

The utility issues this RFP to procure a System capable of meeting the current and future meter reading needs within our service area. The scope of work involves, but is not limited to, providing and installing the System which includes software, hardware, and all necessary training and installation support. The reading equipment shall be capable of receiving meter readings while utilizing a handheld reading device and/or a mobile reading unit (collectively as "AMR" or "mobile") and/or permanently mounted data collector units (collectively as "AMI" or "fixed network").

The System must have the capability to improve meter reading efficiency, increase meter reader safety, and provide data that facilitates resolution of customer bill complaints, water conservation initiatives, and distribution system management efforts. The vendor shall describe the upgrade requirements to incorporate radio frequency (RF) technology.

During an upgrade to RF meter reading, the System shall still be able to read probed water meters, direct read water meters via manual keyed entry, and meters equipped with RF meter interface units (MIUs) within the same meter reading route without detaching the receptacle or RF meter interface unit or switching modes within the meter reading equipment.

The proposed System must be provided by the same company or an equity partner (specifics must be submitted with the proposal).

All System components furnished (software, reading equipment, RF MIUs, meters with absolute encoders) shall be produced from an ISO 9001 certified manufacturing facility.

### 2. SYSTEM OVERVIEW

The System shall be comprised of RF MIUs, data collection devices, and host software. The System shall be capable of operating simultaneously in a walk-by (handheld), mobile (drive-by), full fixed network (permanently mounted data collectors), or any combination of these data collection methods without the need for reprogramming RF MIUs.

The transition from walk-by to mobile to fixed network shall be seamless and allow all meter reading methods to operate together simultaneously. MIUs shall transmit messages required for both mobile AND fixed network operation on an interleaved basis, allowing both mobile AND fixed network data collection capability at the same time. Systems with MIUs that must be configured or programmed to operate in either one "mode" or the other will not be allowed.

The System shall provide 8-digit meter reading resolution capability for encoders using Neptune E-Coder® or Sensus UI-1203 protocol in both mobile and fixed network data collection applications.

#### Fixed Network Functionality

When deployed as a fixed network, the System shall provide hourly consumption interval data, time-synchronized at the host meter reading software. The host software shall provide individual account consumption interval data displayed in graphical as well as tabular formats, readily accessible to utility Customer Service Representatives to facilitate customer bill complaint resolution without the need for a truck roll.

When deployed as a fixed network, the System shall provide priority alarm notification of potential leak and/or reverse flow events with user-configurable email or text messages for notification to utility personnel.

When operating as a fixed network, the System shall provide the capability for a demand read initiated from the host software application. The number of demand read requests made over the lifetime of an MIU shall not impact the battery life or warranty.

### **Mobile AMR Functionality**

When used as mobile AMR, the System shall provide 96 days of hourly consumption data storage at the MIU, retrievable from mobile data collection devices. Mobile data devices shall facilitate retrieval of consumption data for field presentment on a handheld-, laptop-, or Android-powered mobile device, as well as storage for later use with the host software application.

The System shall provide capability of mobile retrieval of individual off-cycle (specific date) reads as stored for 96 days in the MIU. Mobile data devices shall facilitate retrieval of off-cycle reads for field presentment on a handheld or Android-powered mobile device, as well as storage for later use with the host software application.

### **3. METER INTERFACE UNITS (MIUs)**

Meters connected to RF MIUs shall collect meter usage from an encoder meter register and shall transmit the meter reading and a unique ID number to the data collection device.

The MIUs must be compact electronic devices connected to the water meters. They shall interrogate the encoder register and transmit the meter reading and other information to a remote reading device. They shall be compatible with Neptune and Sensus-protocol (UI-1203) absolute encoder registers. MIUs shall feature "auto detect" functionality to detect the type of encoder connected and shall not require reprogramming in the field. The same RF MIUs must be capable of being read by a walk-by handheld computer equipped with an RF receiver, a mobile system with an RF receiver mounted in a vehicle, and a fixed network data collection system. This shall allow an easy migration between the three meter reading systems without any change to the MIU devices or revisiting the site.

The MIU shall log 96 days of hourly consumption data, available for retrieval via RF activation from the handheld data collection device.

The MIUs shall be attached to new meters, or they shall retrofit existing meters in the field. The MIUs shall be manufactured in both wall and pit models. The wall MIU shall have the ability to be mounted in a basement or on the outside of a house. The pit MIU shall have the ability to be mounted in a pit or an underground vault and offer an optional through-the-pit-lid antenna. The wall and pit MIUs shall have a fully-potted, submersible design.

MIUs shall also be available as integrated devices in which the encoder register and RF transmitter module are integrated into a single module. The unit shall interrogate the solid state odometer of the integrated absolute encoder register and transmit the meter reading and other information to a data collection reading device.

The absolute solid state encoder register with integrated MIU shall be attached to new meters, or they shall retrofit existing meters in the field via a bayonet mount on top of the meter maincase. The absolute solid state encoder register with integrated MIU shall be manufactured in both inside and pit models. The inside MIU shall have a water-resistant enclosure and a permanent internal antenna. The pit MIU enclosure shall be a roll-sealed copper can and glass lens, designed to ensure a watertight seal with a permanent internal antenna and offer an optional through-the-pit-lid antenna to optimize performance in hard-to-read or fixed network applications.

### **Encoder Description – General**

Encoder Register Specifications

#### **3.1 PHYSICAL/MECHANICAL REQUIREMENTS**

##### **3.1.1 WALL UNIT**

- The MIU housing shall be constructed of a polycarbonate plastic compound and be capable of mounting both indoors and outdoors on wall or pole or attached directly to the meter. The device must be water-resistant and capable of exposure to spray and splash. The device must be able to withstand a 200-hour salt fog test as specified in NEMA 4 standard.
- The device shall provide a location for a tamper-deterrent seal. Tampering with the device functions or connections shall not be possible without causing visible damage to the device exterior or to the seal.
- The device shall be capable of operating at temperatures of -22°F to +149°F (-30°C to +65°C) with operating humidity of 0 to 100% condensing.

- The circuit board and the battery will be protected by a potting material.
- The unit must retrofit to existing installations.
- The MIU device must be protected against static discharge without loss of data per IEC 801-2, issue 2.

### **3.1.2 PIT UNIT**

- For pit or vault applications, the MIU antenna shall be designed to be installed through the industry-standard 1¾" hole in the pit lid with no degradation of transmission range. The MIU antenna unit will be capable of mounting to various thicknesses of pit lids from ½" to 2½".
- The device shall be capable of operating at temperatures of -22°F to +149°F (-30°C to +65°C) and operating humidity of 0 to 100% condensing.
- The range will not be affected when the pit is flooded.
- The circuit board and the battery will be protected by a potting material.
- The antenna shall be made of a metallic-and-polymer material to withstand traffic and shall have a dual-seal connection to the MIU housing.
- The MIU device must be protected against static discharge without loss of data per IEC 801-2, issue 2.

### **3.1.3 INTEGRATED UNIT – INSIDE SET**

- The integrated MIU housing shall be constructed of a polycarbonate plastic compound and be capable of mounting indoors.
- The MIU shall be designed with an internal antenna.
- The device shall provide a location for a tamper-deterrent seal. Tampering with the device functions or connections shall not be possible without causing visible damage to the device exterior or to the seal.
- The device shall be capable of operating at temperatures of -22°F to +149°F (-30°C to +65°C) with a humidity factor of 0 to 95%.
- The encoder circuit board will be coated for moisture protection.
- The radio circuit board and battery will be protected by encapsulation in a hard potting.
- The unit must retrofit to existing installations.
- The MIU device must be protected against static discharge without loss of data per IEC 801-2, issue 2.

### **3.1.4 INTEGRATED UNIT – PIT SET**

- The MIU shall be sealed in a roll-sealed copper can and glass lens to allow for submersion in a flooded pit environment.
- For pit or vault applications, the MIU shall be designed with an internal antenna.
- The device shall provide a location for a tamper-deterrent seal. Tampering with the device functions or connections shall not be possible without causing visible damage to the device exterior or to the seal.
- The device shall be capable of operating at temperatures of -22°F to +149°F (-30°C to +65°C) and operating humidity factor of 0 to 100% condensing.
- The radio circuit board and battery will be protected by a hard potting material.

- The device shall be designed for an optional remote antenna capable of being installed through the industry-standard 1¾" hole in the pit lid for maximum transmission range.
- The optional through-the-lid antenna will be capable of mounting to various thicknesses of pit lids from ½" to 2½" and various distances from meters.
- The optional through-the-pit-lid antenna shall be rigid in design to withstand traffic and shall have a dual-seal connection to the MIU housing.
- The MIU device must be protected against static discharge without loss of data per IEC 801-2, issue 2.

### **3.2 OPERATION SPECIFICATIONS**

- The MIU shall operate within FCC Part 15.247 regulations for devices operating in the 902 MHz to 928 MHz unlicensed band. The output power of the devices will be governed by their conformance to these relevant FCC standards.
- To minimize the potential for RF interference from other devices, the MIU shall transmit using the frequency-hopping, spread-spectrum technique comprised of alternating pseudo-random frequencies within the 902 MHz to 928 MHz unlicensed band.
- For ease of implementation, the System shall not require any special licensing, including licenses from the FCC. The System must, therefore, operate in the 902 MHz to 928 MHz unlicensed band.
- The System must be expandable at any time without getting authorization from the FCC.
- No wake-up tone shall be necessary.
- No MIU programming shall be necessary for installation.
- The MIU shall provide 8-digit reading resolution from encoded registers using either Neptune E-Coder or Sensus UI-1203 protocol in mobile as well as fixed network data collection applications, simultaneously, without need for programming.
- The MIU shall read the encoded register at 15-minute intervals to provide accurate leak and reverse flow detection using 8-digit resolution reads.
- The MIU shall transmit readings from the encoder that are not older than 15 minutes.
- The MIU shall transmit the meter reading continuously at a predetermined transmission interval.
- The MIU shall transmit fixed network messages every 7½ minutes – standard. No programming shall be necessary to activate transmission of fixed network messages.
- The fixed network message shall include multiple meter readings for redundancy to improve read success rates.
- The MIU shall transmit mobile messages every 14 seconds – standard. No programming shall be necessary to activate or revert to transmission of mobile messages.
- Power shall be supplied to the MIU by a lithium battery with capacitor. The vendor shall warrant that the MIUs shall be free of manufacture and design defects for a period of twenty (20) years – the first ten (10) years from the date of shipment from factory without prorating and the second ten (10) years with prorating, as long as the MIU is working under the environmental and meter reading conditions specified.
- The number of radio-based meter reads performed must not affect the battery life.
- The battery life shall not be affected by outside erroneous wake-up tones (e.g., other water, gas, or electric utilities reading and therefore sending out a wake-up tone).
- The battery shall be a fully-potted component of the MIU with no external wires.
- For reliability and meter reading integrity, the vendor shall be the sole manufacturer of the different components of the System (water meters, RF MIUs, meter reading equipment, and meter reading software) and provide a turnkey system offering to the utility.

- In the event of a cut wire, the MIU shall not send the last good read as this can lead to mis-billing. The MIU shall transmit a trouble code in lieu of the meter reading.
- Tamper – If wiring has been disconnected, a “non-reading” shall be provided indicating wire tamper; a reading that gives the last available reading is an incorrect reading.
- Each device shall have unique preprogrammed identification numbers of ten (10) characters. ID numbers will be permanent and shall not be altered. Each device shall be labeled with the ID number in numeric and barcode form. The label shall also display FCC approval information, manufacturer’s designation, and date of manufacture.
- The MIU shall transmit the encoder meter reading and a unique MIU ID number.
- The MIU shall interface to Neptune ARB® V, ProRead™, E-Coder, or Sensus UI-1203 communication protocol absolute encoder registers via a 3-conductor wire without need for special configuration of the MIU.
- The MIU shall be mounted per the manufacturer’s installation instructions.
- The handheld reading equipment shall provide a test mode to verify proper operation of the MIU by displaying the MIU ID number and meter reading.
- The MIU RF signal shall be capable of being received by either a handheld receiver, mobile receiver, or fixed network receiver without special configuration, programming of operation modes, or remanufacture.

#### **4. DATA COLLECTION DEVICES**

The System shall provide a means of communication between the MIU installed at the meter site and the host software. In a walk-by system, it must be a handheld computer capable of reading meters using keyed-entry, inductive encoder probing, or RF communications with an attached receiver device without the need to switch modes within the handheld. In the case of a mobile application, the data collection device must be a portable personal computer integrated to an RF receiver that can be installed in any vehicle. For the fixed network application, the data collection device must be an environmentally-sealed control box able to adapt to various installation settings and must have the capability to receive, store, and communicate meter readings to the host software for further use and analysis.

##### **4.1 WALK-BY APPLICATION**

For walk-by applications, the System must give user the ability to collect metering data in several ways:

- Keyed entry.
- Inductive probing.
- RF communication: The handheld must connect via Bluetooth to an RF receiving device.

The proposed walk-by data collection system must include:

- Handheld data collector device with Bluetooth RF receiving device.
- Communication cradles for charging and loading the handheld unit.
- Probes for interrogating Neptune ProRead/E-Coder or Sensus UI-1203 protocol absolute encoders (optional).

##### **4.1.1 HANDHELD DATA COLLECTOR DEVICE**

###### **4.1.1.1 BASIC FUNCTIONS**

The handheld data collection device shall have the capability to collect and store meter readings at any time of the meter reading route by any of the following methods:

- Manual use through an alphanumeric keypad.
- Probing of water meters equipped with supported absolute encoders.
- Via radio frequency through a Bluetooth-paired receiver.

The unit shall be able to obtain all types of readings on any particular route without requiring:

- Reprogramming of the handheld computer.
- Physical change of software contained within the unit while in the field.
- Access through special software menus contained within a given route/program.

The handheld data collection device must be able to multitask by collecting data while in keyed entry (manual) meter reading mode.

#### **4.1.1.2 HARDWARE REQUIREMENTS**

##### **4.1.1.2.1 PROCESSOR AND OPERATING SYSTEM**

The System must support a variety of handheld data collection devices. These devices must run Windows Mobile 6.1 or 6.5. The handheld must operate with either a Marvell PXA320 Processor at 806 MHz or TI AM3715 Sitara ARM Cortex-A8 processor at 800 MHz.

##### **4.1.1.2.2 CASE**

- The unit must be able to withstand twenty-six (26) drops at room temperature from four (4) feet onto plywood over concrete.
- The handheld must meet and exceed MIL-STD 810F standard, method 516.5, procedure IV for drop tests.
- The handheld shall be ergonomically designed to be comfortable for handheld meter reading.

##### **4.1.1.2.3 DISPLAY**

- The handheld screen must be full-VGA, sunlight-readable 16-bit color TFT with LED backlighting. The size of the display characters must be selectable, allowing the use of larger characters that are easier to read. The screen must support a resolution of 480 by 640 pixels or 640 by 480 pixels.
- The manufacturer's specification on the contrast ratio on the LCD display must automatically adjust contrast based on temperature, which will give clear readings in extreme temperatures. There must also be a manual contrast adjustment feature which will allow the user to adjust the contrast to his or her satisfaction.
- The display must have no degradation when exposed to storage temperatures of -40°C to +70°C (-40°F to +158°F) and operating temperatures of -30°C to +60°C (-22°F to +140°F).

##### **4.1.1.2.4 KEYBOARD**

- The handheld must support one of the two keyboard options:
  - The keyboard must have independent numerical keys with adequate separation for use with a gloved hand. Must have a full on-screen, customizable alphanumeric keyboard.
  - Full QWERTY keypad with adequate separation with a gloved hand with number pad as well as directional buttons with four programmable buttons.
- There must be an auto-repeat function on keys and a rapid response between keying and seeing results on the screen.

#### **4.1.1.2.5 BATTERY**

- The battery capacity must be sufficient for a minimum of ten (10) hours of meter reading.
- The handheld must utilize a rechargeable lithium ion battery with a capacity of 2,500 mAh or 5,200 mAh.
- The handheld must come with a power management system designed to conserve power.
- The handheld must come with an integrated intelligent, fast-charge capability that allows for full charge in four (4) hours.

#### **4.1.1.2.6 MEMORY**

- The handheld data collection device must include a minimum of 128 MB of DDR SDRAM.
- The handheld must have 512 MB to 2 GB of on-board, non-volatile flash storage.
- The handheld must come with a Secure Digital (SD/SDHC) card slot for additional storage expansion.

#### **4.1.1.2.7 CARRYING METHOD**

- A hand strap must be provided with each unit and must provide ease of use for right- or left-handed operators.

#### **4.1.1.2.8 SIZE**

The handheld data collection device dimensions must not be larger than:

- Length: 10.5" (17.6 cm)
- Width: 5.2" (10 cm)
- Height: 1.9" (5.0 cm)

#### **4.1.1.2.9 WEIGHT**

The unit's weight must be no more than 2.3 lbs. with battery installed.

#### **4.1.1.3 ENVIRONMENTAL CHARACTERISTICS**

The handheld must include but not be limited to the following:

- The unit must operate in a temperature range of -30°C to +60°C (-22° F to +140° F).
- The device shall be water-resistant, capable of unlimited exposure to spray or splash (such as rain or snow).
- The handheld unit must be capable of being immersed in 3.3 ft. (1 meter) of water for 30 minutes.
- The device must be protected against an 8 kV static discharge without loss of data.
- The unit must be resistant to various chemical products and must be sealed to keep out dust, humidity, and water.
- The device must be shock-resistant, exceeding IEC 68-2-32 method 1 (a one-meter drop on concrete).
- The unit must be CE and FCC certified.

#### **4.1.1.4 HANDHELD SOFTWARE REQUIREMENTS**

##### **4.1.1.4.1 BASIC FUNCTIONS**

The handheld software must be easy to use and give the meter reader control over the route in searching for accounts, tagging accounts for later action, entering related notes, and manually reading meters.

The handheld software must include entry of meter readings.

In addition, the handheld software shall include but shall not be limited to the following basic features:

- User-customizable key assignments.
- Allow manual or automatic entry of meter readings, ID numbers, and note codes.
- Perform high/low test on readings.
- Date- and time-stamps to each reading.
- Identify type of reading – manual keyed, probed, or RF MIU.
- Perform unread meter search.
- Found meter processing for new accounts.
- Allow forward and reverse walk order.
- Data search capability (display, notes, and ID).
- Auto-search for automatic reading of encoded meters.
- Display the number of read and unread accounts on demand.
- Enable left-to-right, right-to-left, or calculator entry of manual meter readings.
- Capture multiple meter readings from two networked encoders.

##### **4.1.1.4.2 SOUNDS**

Successful meter readings must be confirmed by an audible tone.

#### **4.1.2 COMMUNICATIONS/CHARGING EQUIPMENT**

##### **4.1.2.1 COMMUNICATION**

Communications between the handheld and the PC software must be established using a cradle connected via Ethernet or USB. In addition, the following basic features must be included:

- Extensive error checking is provided to ensure data integrity during communications between the handheld and the PC.
- A typical route of 400-500 accounts can be loaded or unloaded in less than one minute with the ability to load more than 5,000 records into a single handheld unit.
- Routes/books can be split at the PC level.
- Once loaded, routes may be individually selected on the handheld.

##### **4.1.2.2 COMMUNICATIONS / CHARGING CRADLES**

- The communications/charging cradle will be housed in a suitable material that can be wall- or tabletop-mounted.
- It will have the capability of recharging the handheld unit within four hours and also provide the communication port connection to the computer.
- The cradle will be capable of communicating with the host computer at 10 Mbps.



- The cradle must be capable of both USB and Ethernet communications with a PC.
- The charging units must carry the Underwriters Laboratory (UL) seal of approval.

#### **4.1.3 PROBES**

The handheld must be compatible with a wireless probe capable of reading Neptune ProRead/E-Coder or Sensus UI-1203 protocol absolute encoders.

#### **4.1.4 RADIO FREQUENCY CAPABILITY**

The meter reading system must be capable of being upgraded to radio frequency communications. The utility plans to read water meters equipped with radio frequency MIUs. Only absolute encoder registers using Neptune ProRead/E-Coder or Sensus UI-1203 communication protocols shall be acceptable. For the radio frequency-based meter reading system, the encoder registers will be connected to an RF MIU that shall provide the radio link from the meter to the handheld interface unit. MIUs shall feature "auto detect" functionality and shall not require reprogramming in the field.

The handheld radio frequency receiver must be separate from the handheld unit itself.

##### **4.1.4.1 RADIO FREQUENCY READING FUNCTION**

The function of the handheld and external receiver in radio frequency mode is to provide the utility capability of reading meters via radio signals transmitted by the RF MIUs. The external receiver must be capable of receiving RF readings and transferring those readings to the handheld via Bluetooth connection. All transmissions from supported MIUs will be collected. The reading of any MIU shall be automatically stored in the proper account record without the intervention of the meter reader.

Should any MIU not be able to be read during the route, the software shall support storage of a flag in the account record, indicating clearly that the MIU could not be read. When reading the meters in the RF mode, it should not require the meter reader to activate any wake-up tone.

The handheld with the external receiver reading equipment must provide a test mode to verify operation of the MIU. This test mode must be accessible from within the meter reading application as well as accessible from a handheld's main screen (no login required). The test application must be capable of reporting statistics for an individual MIU or displaying all MIUs within range.

##### **4.1.4.2 WALK-BY RF TRANSCEIVER**

- The walk-by RF transceiver must be a separate belt clip, wearable, transmit/receive device which communicates via Bluetooth to the handheld.
- The walk-by RF transceiver must support the ability to remotely command the MIU to transmit data logging interval data.
- The walk-by RF transceiver antenna shall be internally mounted.
- The walk-by RF transceiver must meet FCC Class B certification.
- The walk-by RF transceiver must contain an SD card.
- The walk-by RF transceiver must utilize SDR (software-defined radio) technology.
- The walk-by RF transceiver must contain a mini-USB port for both battery charging and PC communications.
- The walk-by RF transceiver must contain a field-replaceable battery.
- The walk-by RF transceiver must have four (4) LEDs displaying the following:
  - Battery/power status
  - RF status
  - Bluetooth status

- Mode status
- The external RF transceiver must be capable of unattended operations where the receiver is not paired with any handheld device but hears and stores any received reading packets to the SD card. This data must be able to be imported into the host software for use as billing reads.

The following specifications must be met:

#### **4.1.5 RADIO CHARACTERISTICS**

- Receiving frequency: 910-920 MHz unlicensed RF.
- The walk-by RF transceiver must have fifty (50) channels.
- The walk-by RF transceiver must support the reading of eight (8) channels simultaneously.
- The walk-by RF transceiver must be capable of processing 360 RF packets per second.

##### **4.1.5.1 SIZE AND WEIGHT**

Physical specifications of the external RF receiver must be within the following parameters:

- Length: 5.75" (14.6 cm)
- Width: 1.66" (4.22 cm)
- Height: 3.58" (9.1 cm)
- Weight: (with battery): 1.3 lbs.  
(without battery): 1.1 lbs.

##### **4.1.5.2 ENVIRONMENTAL OPERATING CONDITIONS**

- Operating conditions: -4°F to +122°F (-20°C to +50°C)
- Storage temperature: -40°F to +185°F (-30°C to +70°C)
- Designed to and tested to MIL-STD-810F specifications
- Designed to withstand electrostatic discharges per EN61000-4-2

##### **4.1.5.3 RF WALK-BY RECEIVER BATTERY LIFE**

The data collection device battery must provide enough power to support RF meter reading for a minimum of eight (8) hours.

## **4.2 MOBILE DATA COLLECTION SYSTEM**

The mobile data collection device must be a portable, compact electronic system mountable in any vehicle. It must collect the data transmitted by the MIUs and store it onto a USB flash drive to be downloaded to the host computer at the utility office.

The mobile data collection device shall be easily transportable from vehicle to vehicle or from vehicle to office.

### **4.2.1 HARDWARE SPECIFICATIONS**

The key components of the mobile data collection device must consist of a portable personal computer (PPC), an integrated radio receiver unit, and remote rooftop magnet mount antenna.

The mobile data collection device must be easily installed in any vehicle that will drive to the field for meter reading. It must be mounted securely in the passenger seat with a standard seat belt. Through a 12V DC plug-in power cord, the unit must be powered from the vehicle's power supply (cigarette lighter).

The mobile data collection device must include a magnetic base antenna and the antenna cord as well as all necessary power and communication cables.

The mobile data collection device shall draw no more than one (1) AMP of power. The mobile data collection device dimensions must be no larger than the following parameters: 11.0" x 8.0" x 3.15". The weight shall not be more than five (5) lbs.

The mobile data collection device shall support the connection to any laptop that meets the following minimum system requirements:

- Operating System: Windows 7 (Professional +32 and Home Premium 64), Windows 8 Professional (32 and 64 bit), Windows 8.1 Professional (64 bit)
- Processor: Intel Pentium processor 1.7 GHz
- Memory: 1 GB
- Communication: Internal 802.11 b/g wireless LAN
- USB 2.0

The mobile data collection unit should also be capable of supporting Itron R300 and Itron electric bubble-up ERTs in the event the utility supports electric meters.

#### **4.2.2 ENVIRONMENTAL CONDITIONS**

The mobile data collection device must work in the following environmental conditions:

- Operating temperature: +32° to +122°F (0° to +50°C)
- Storage temperature: -40°F to +185°F (-40°C to +85°C)
- Operating humidity: 5 to 95% non-condensing relative humidity

#### **4.2.3 MOBILE DATA COLLECTION SOFTWARE REQUIREMENTS**

##### **4.2.3.1 BASIC FUNCTIONS**

The software must be a dialog-based, intuitive, easy-to-use meter reading application.

After the meter reader starts the reading process, the software must be fully automated to collect the meter reading data received from the radio receiver unit and store it in an export file which can be used by the host software to update the mainframe route data. The System must support import/export via a USB flash drive.

The software shall be touchscreen-friendly and operate on Windows 8 or 8.1 pro tablet devices.

The software must have an option to wirelessly synchronize meter reading routes and reading data with the host software in real time or on demand.

Unit must be capable of optimizing the memory storage space by filtering out duplicate readings from the same MIU and keeping only the last reading received.

Each reading record must contain an MIU ID and a time stamp of the reading.

The software must have the option to provide found meter processing for new accounts.

The software must be capable of performing high/low tests on readings.

The software must provide a progress bar that provides route reading status for individual as well as all routes combined.

The software must support retrieval and graphing of 96 days of data logging intervals from the MIU.

The software must contain a test mode used to validate MIU installation. The test mode must provide MIU ID, reading, and flag status.

The software must have an option to geocode meter reading routes by address.

The software must allow a manual reading to be entered into the account record.

The software must allow freeform notes to be entered to record conditions in the field that require noting and may require an additional work order created to address at a later date.

The software must have a GIS mapping option powered by ESRI ArcGIS.

The software must have advanced filtering to allow the user to view route mapping data by conditions such as flag type/status, audit status, and read status.

The software must be capable of displaying meter points and read success and unread accounts via GIS mapping interface. The software must be capable of collecting the following information for the host to generate reports; leak detection, tamper detection, and backflow conditions.

The software must allow for GPS location tracking of the meter reading vehicle.

The software must allow for GPS breadcrumb tracking of the meter reading vehicle during the route reading process.

#### **4.2.4 MOBILE DATA COLLECTION DEVICE PERFORMANCE REQUIREMENTS**

The magnet mount antenna must be omni-directional and support a gain of 5 dB minimum.

The receiver utilized must operate with a minimum sensitivity of greater than 110 dBm.

The receiver module must process at minimum seventy-two (72) discreet channels across a 10 MHz bandwidth utilizing a digital signal processor capable of capturing eight (8) meter readings simultaneously from these channels.

The receiver module must operate with a dynamic range of greater than or equal to 100 dB with a message success rate greater than 50%.

The mobile data collection device must be able to maintain a minimum sustained processing rate of seventy (70) unique meter reading accounts per second.

The mobile data collection device must reject a minimum 45 dB of noise energy above the target message in adjacent channels.

The mobile data collection device must operate effectively at posted speed limits.

### **4.3. FIXED NETWORK FUNCTIONALITY**

#### **4.3.1 BASIC REQUIREMENTS**

The fixed network functionality must be able to operate in parallel with other meter reading technologies such as walk-by, handheld, and mobile systems and utilize a common interface to the CIS/billing software system. The fixed network functionality must also support the migration of technologies (e.g., handheld to mobile, mobile to fixed network).

The fixed network functionality is comprised of two major components; data collection software and fixed network data collection units.

The fixed network functionality must be capable of automatically retrieving consumption information from the same MIUs being read by walk-by and mobile data collection devices to manage customer account and meter reading information, to provide usage analysis information, and to provide a flexible host interface to utility's CIS system.

The fixed network functionality must be capable of retrieving consumption information from MIUs via walk-by, mobile drive-by, and fixed network data collection without the need for mode changes or reprogramming.

The host software must be capable of storing meter readings with the capability to store up to 96 readings per day per meter. The host software must also provide meter reading management reports, usage analysis reports (flow profiling, leak detection, tamper detection, and reverse flow conditions), off-cycle reads,

and system management diagnostics. It must provide comprehensive coverage for all selected strategic commercial and industrial customers, including indoor, outside, and in pits/vaults, utilizing a single or hybrid technology solution. The network architecture should provide scalability and adequate bandwidth to provide hourly reading requirements.

The WAN architecture must be flexible to allow communications via common public communication networks such as CDMA and GSM cellular systems.

The fixed network functionality must utilize an unlicensed radio frequency band for LAN communications.

Network management tools must be available to properly monitor the performance of the system to ensure reliable data delivery to the utility for all billing and/or other customer service applications.

Both the fixed network WAN and host software shall remain the property of the utility. All costs associated with the ongoing operation of the system will be the responsibility of the utility.

The utility shall be responsible for the operation and maintenance of the fixed network functionality.

#### **4.3.2 HARDWARE REQUIREMENTS**

Fixed network data collection must support flexible installation configurations for rooftop, pole, and wall installations.

The fixed network data collection units must utilize a 50-channel, software-defined radio (SDR) capable of processing up to 360 readings per second and eight (8) readings simultaneously. The fixed network data collector must support a web service connection to the host software.

The fixed network data collection units must provide USB flash drive data retrieval in the event of a backhaul outage. All data stored to the USB flash drive must be encrypted via AES128.

The fixed network collector shall utilize an SD card for flash memory storage.

The fixed network shall encrypt all stored reading files via AES128.

The fixed network data collection units with AC power must have an uninterruptible power supply (UPS) capable of powering the data collector for eight (8) hours in the event of a power outage.

The fixed network data collection units must support the following backhaul options:

- EVDO Rev A (CDMA)
- 1xEVDO Rev 0 (CDMA)
- 1xRTT (CDMA)
- UMTS/HSPA (GSM)
- EDGE/GPRS (GSM)
- Ethernet

The data collection units shall consist of the following:

- NEMA 4X enclosure
- 100-140 V power supply with UPS or solar cell with battery backup.
- LAN: Receiver shall support unlicensed communication protocol from MIUs and comply with FCC part 15.247.
- WAN: Multi-carrier cellular modem or Ethernet.

Must be able to provide a minimum daily meter reading resolution.

Must be able to store a minimum of seven (7) days of data in the fixed network data collector.

The data collection unit must meet the following environmental operating requirements:

- Temperature range: -22°F to +140°F (-30°C to +60°C)
- Humidity: 0 to 95% non-condensing inside enclosure

## **5. ANDROID APPLICATION REQUIREMENTS**

### **5.1 BASIC REQUIREMENTS**

The System shall have a mobile app compatible with Android mobile phones and tablets that enables retrieval of data logging and off-cycle read data as well as test functionality to validate MIU installations.

The app shall be compatible with Android version 2.3.3 and above.

The app shall support graphing of retrieved data logging intervals with views supporting a week at a time, month at a time, and a day at a time (hourly intervals).

The app shall support sharing data logging reports and graphs with the homeowner or end consumer via e-mail from the Android phone or tablet.

The app shall provide a test function to validate MIU reception and also to obtain readings and flag status notifications.

The app shall provide a security key to prevent personnel not associated with the water utility from installing the application.

## **6. METER READING SOFTWARE (HOST SOFTWARE) FOR MOBILE AND WALK-BY METER READING**

The host software must be meter reading software that will transfer files between the utility billing/CIS system and the data collection devices. The utility will provide the transfer file to the vendor's file format provided it is a standard ASCII format. The host software must be configurable for either a standalone installation or operate in a Windows Client/Server environment.

### **6.1 BASIC FUNCTIONS**

The software must provide easy management of the meter reading data. After the readings are collected, they must be unloaded to the PC for review and reporting and exported to a file to be sent to the utility billing/CIS system. New meter reading routes must then be imported into the database from utility billing/CIS system and prepared for loading into the handheld.

The meter reading software shall manage the routes that are loaded into the data collection device and be able to split them into multiple routes if necessary.

The meter reading software must include the following:

- The host software must support the display of data logging information retrieved from the handheld or mobile drive-by device.
- The host software must support viewing 96 days of hourly consumption in a graphical and tabular format.
- The host software must support read request and read assignment request for off-cycle reads.
- Must be able to load/unload from the handheld's USB or by Ethernet communications.
- Allow PC operator to review and edit any account in the meter reading database.
- Generate route and activity reports defined by the user.
- Provide integrated database backup/restore functions.
- Allow user to merge several separate files into one database.
- Enable the user to set up and save custom report formats.
- Enable the user to specify the data to be exported from the database for transferring to the billing system.
- Allow for database records to be automatically deleted during the export process.

- Enable the user to search the database for records matching specified information.
- Allow the user to define up to 100 notes.

### **6.1.1 TYPICAL READ CYCLE**

In a typical read cycle, the host software must allow the following operations:

- Merge routes into the existing database for loading onto a data collection device.
- Select routes to be read, split routes, and assign routes to a data collection device.
- Generate the route file and load it onto the data collection device or flash drive.
- Unload routes from the data collection device.
- Post readings from the data collection device onto appropriate accounts within the database.
- Make a backup copy of the routes within the database (including current system configuration files).
- Print preselected reports.
- Export routes out of the database to be sent back to the utility billing system.

### **6.1.2 REPORTS**

Standard reports must include:

- All Leak – Summarizes data relating to high-resolution, solid state absolute encoder-equipped meters that show a continuous or intermittent leak.
- Coded Notes – Summarizes data relating to any predefined notes associated with a meter. The coded notes represent any issues found at a specific meter that a meter reader is required to report during the route reading and work order process. The note codes are customizable to meet the needs of the utility.
- Continuous Leak – Prioritizes the number of days a continuous leak was detected within the last 35 days, reported by high-resolution solid state absolute encoder-equipped meters.
- High-Resolution Solid State Absolute Encoder – Summarizes data relating to the high-resolution, solid state absolute encoder-equipped meters within the last 35 days. Displayed within the report are consecutive days of no consumption, reverse flow detected at the meter, number of days a leak was detected, and the current status of the leak.
- Found Meters – Displays meters located by field technicians but not displaying within the route.
- Free-Form Notes – Displays personalized notes entered by the meter reader for a specific meter.
- Hi/Lo Fail – Summarizes all meters that exceeded the preset limits allowed for the reading on a specific meter. The preset limits are defined within the CIS.
- Invalid Readings or IDs – Lists readings that were taken but are incorrect or invalid. A non-numeric character or characters within the meter reading represents an invalid reading.
- Major Reverse Flow Event – Lists the meter information relating to high-resolution, solid state absolute encoder-equipped meters that show a major reverse flow event occurring.
- Meter ID Compare – Displays account information in which a meter reader forced a specific ID and reading to an account because it did not match information sent over from the CIS file.
- Meters with No Readings – Summarizes data relating to meters in which readings or skip codes were not obtained.
- Meters with Readings – Summarizes data relating to all meters for which readings were obtained.
- Meters with Readings or Notes – Summarizes meters that have readings but also have a code present on a specific meter.

- Non-Billable Reads – Lists the readings that were taken but are incorrect or invalid. A non-numeric character or characters within the meter reading represents an invalid read.
- Walk Order and Productivity – Lists readings statistics for a particular reader. This report shows the route, date, and time the route was read, total number of readings collected, and starting and ending times for each route, as well as the minimum, maximum, and average elapsed time.
- Zero Consumption – Prioritizes by severity the number of consecutive days of no consumption detected by an MIU and register within the last 35 days.
- Skip Codes – Summarizes data relating to meters for which readings were attempted but unable to be obtained. The skip codes that are available on the handheld are defined by the host system operator.
- Trouble Codes – Summarizes data relating to any issues reported at the meter with a reading still received at the meter. The trouble codes available on the handheld are defined by the host system operator.
- Productivity Report – Displays the information for the reader, along with the time elapsed between readings.
- Route Assignments – Allows users to view which routes are currently assigned. This report also contains information on the scheduled date and sequence of the route.
- Route Detail – Displays specific route information for all available routes. This report is an overview of all routes which shows detailed information on how the route was read, all readings received within the route, the date and time meters were read, and any codes received on specific meters.
- Data Logger – Displays daily or hourly consumption in a bar or line format reported by a data logger attached to an MIU.
- Handheld List – Lists the handheld IDs set up within the software.
- General Log – Tool used primarily by support personnel to troubleshoot customer concerns and issues regarding the software.
- Import Log – Displays all of the import activity generated within the database.
- Review Reading Log – Displays all changes made within the Review Readings module of the software.
- System Errors Log – Displays the date and time of any errors reported during any processes within the database. This report is considered a troubleshooting tool.

The host software must also provide a powerful custom report generator, allowing the user to select and order specific fields from the database to be printed; in addition, it should allow the entire database to be sorted by criteria such as date, reader ID, or other specified fields.

### **6.1.3 SPECIAL REPORTS**

Special reports must provide meter reader productivity information. The reporting module must also be a detailed productivity report that will list the total number of readings for a specific meter reader and book as well as the time elapsed between each read entered. Also available must be a summary of start time, stop time, elapsed time, mean, maximum, and minimum read times.

### **6.1.4 SECURITY**

- The host software shall provide a method for multiple levels of user login access into the software application.
- The host software shall support active directory login processes.
- The host software shall provide a method of database encryption.

### **6.1.5 ADDITIONAL HOST FEATURES AND FUNCTIONALITY**

- The host software shall provide a method to provide a last recent read.
- The host software shall support migration to fixed network without the need to implement a separate software package.



- The host software shall provide a method to view collector status in the event of power failure or other catastrophic event.
- The host software shall provide a method to work in unattended operations.
- The host software shall provide a method to auto-update or notify the users of an update when available for installation.

### **6.1.6 SYSTEM REQUIREMENTS**

- The host software shall be installed in a client/server or client-only environment. The following server and PC requirements shall be available at the utility for access to the host application.

#### **Server Requirements**

- Operating System – Windows Server 2008® System, Windows Server 2012 Standard
- Processor – Intel Premium 4 3.0-GHz or compatible processor, or faster depending on the system configuration
- Memory – 2 GB RAM (4 GB RAM or higher recommended) network adapter for networking – network adapter appropriate for the type of local-area, wide-area, wireless, or home network to which it will be connected, and access to an appropriate network infrastructure; access to third-party networks may require additional charges
- Monitor – video graphics adapter capable of 256 colors and 1024 x 768 pixels
- Keyboard/mouse – keyboard and a Microsoft mouse or other compatible pointing device
- Hard disk drive
- 10 GB available hard disk space
- USB port – one required for USB flash drive
- CD-ROM drive – 24X minimum CD-ROM
- RAID

#### **Single PC Requirements**

- Operating Windows – Windows 7 Professional, Windows 8 Professional (64 and 32 bit)
- Processor – Intel Pentium 4 3.0-GHz processor or faster
- Memory minimum – 2 GB RAM; higher recommended depending on system configuration
- Monitor – video adapter and monitor with super VGA (1024 X 768) or higher resolution
- Hard disk drive – minimum 5 GB of available space on the hard disk
- CD-ROM drive – 24X minimum CD-ROM
- Network card – used to connect to the Trimble Nomad, CE5320X, CE5320B, and CE8640X devices
- Keyboard/mouse – keyboard and Microsoft mouse or other compatible pointing device
- USB port – One required for USB flash drive
- USB flash drive must be installed if MRX920™

### **6.2 METER READING (HOST SOFTWARE) FOR FIXED NETWORK SOLUTIONS**

The host software shall be designed to support key departments within the utility organization (Customer Service, Billing, Operations) by providing data in user-friendly, function-specific screens as well as reports to help utility personnel manage their day-to-day operations. The host software shall provide users with an intuitive dashboard with key performance indicators (KPIs) for easy system monitoring and control, monthly, daily, and hourly customer usage graphs, enhanced reporting, priority alarms, and mapping functionality.

### 6.2.1 BASIC FEATURES AND FUNCTIONS

The host software is a thin-client application where the database resides on a server at the utility location or can be hosted.

The host software shall have the basic capability of supplying the following features to the end user:

- Employ thin-client (browser-based) architecture wherein the database is centralized and the host application requires no local install, but is instead accessible through typical internet browser programs.
- The host software shall interface with the utility's CIS for off-cycle meter reading.
- The host software shall interface with third-party applications such as work order systems via a standard interface such as web services.
- The host software shall provide reading performance reports and advanced usage analysis capabilities such as District Metered Area (DMA) analysis.
- The host software shall provide KPIs to allow for proactive monitoring of system health and performance.
- The host software shall provide automated alert configuration capability to send information directly to key utility personnel (via email or SMS) based on predefined triggers and thresholds.
- The host software must be able to export data to Microsoft Excel and Word applications.
- The host software must be designed to hold two (2) years of history for direct access, with an option for secondary direct-access storage and reporting of older consumption history.
- The host software shall provide an export of key data for third-party meter data management or customer web presentation.
- The host software shall provide specialized customer service screens for support of utility customers by customer service representatives.
- The host software shall include a GIS mapping module for visual analysis of AMI data throughout a utility's service area.
- The host software shall have the basic capability of providing monthly, daily, and hourly consumption and event information in a tabular and graphical format to assist with customer billing disputes and improved customer service.

### 6.2.2 SYSTEM REQUIREMENTS

The host software must provide all the control needed in the network and provide for the essential functions of network management, meter communications, reporting, database configuration, and alarms monitoring. It shall comply with prevailing industry standards and should run on a Windows-compatible PC.

The following server specifications are required for on-site deployment of the host software.

# of Services	0 - 10,000	10,000 - 50,000	50,000 - 100,000
<b>Operating System</b>	Server 2008 R2, Server 2012	Server 2008 R2, Server 2012	Server 2008 R2, Server 2012
<b>Processor</b>	2x Xeon E5-26xx or higher	2x Xeon E5-26xx or higher	4x Xeon E5-26xx or higher
<b>RAM</b>	32 GB	64 GB	128 GB
<b>Hard Drive Size (Total)</b>	3 TB	6 TB	6 TB per 100K points
<b>OS (Partitioned)</b>	100 GB	100 GB	100 GB
<b>Hard Drive Type</b>	RAID 5 (RAID 10 preferred) 10K RPM drives or SSD	RAID 5 (RAID 10 preferred) 10K RPM drives or SSD	RAID 5 (RAID 10 preferred) 10K RPM drives or SSD

<b>Network Adapter</b>	Yes - Gigabit	Yes - Gigabit	Yes - dual+ Gigabit
<b>Power Supply</b>	Redundant	Redundant	Redundant
<b>DVD-ROM Drive</b>	Yes	Yes	Yes

The minimum hardware requirements for the host software PC specifications include:

- Windows 7 Professional 64/32 bit, Windows 8 Professional 64/32bit
- Intel Core 2 Duo 2-gigahertz (GHz) processor or faster
- At least 2 gigabytes (GB) of RAM (4 GB is recommended)
- At least 1.5 gigabytes (GB) of available space on the hard disk
- Keyboard and a Microsoft mouse or some other compatible pointing device
- Minimum of one (1) USB port
- Video adapter and monitor with Super VGA (1024 X 768) (higher resolution is recommended)
- Network adapter appropriate for the type of local-area, wide-area, wireless or home network to which you wish to connect, and access to an appropriate network infrastructure; access to third-party networks may require additional charges
- Broadband Internet connection (1.5 Mbps minimum)
- Browsers supported include IE 9 and Firefox with Adobe Flash

### 6.2.3 REPORTING

The host software application shall incorporate SAP's Business Objects Platform to provide viewing of reports as well as report customization, scheduling, filtering, and modification.

The host software must provide normal reporting and exception reporting capabilities that must address basic operational requirements:

- The host software must have the ability to identify three (3) types of reading information to include; numeric reads (successful reads that can be used for billing), non-numeric reads (reads that cannot be used for billing but may indicate a problem with the meter register or MIU or tamper condition), and no readings (no transmitted reading was received).
- The host software must allow the user to review the total number and percentage of successful reads, unsuccessful reads, and no reads.
- Network Level Reports – Must identify by day or date range a summary of the total number and percentage of successful reads, unsuccessful reads, and no readings.

Standard reporting to include the following information:

#### Premise Level Reports

- Account List – Lists all premises that have account records within the database.
- Account Reads – Lists all readings received for a selected MIU.
- Billing List – Lists the latest readings for MIUs in the System that will be sent if a billing file is created (has a premise record).
- Last Read – Lists the last read received for all MIUs within the System (premise and not premise reads).
- Soft Disconnect – Lists all MIUs that have been flagged within the System for soft disconnect.
- Soft Disconnect w/Usage – Lists all MIUs that have been flagged for soft disconnect in which usage has been reported.

### **Endpoint Level Reports**

- All Readings – Lists all MIUs that have received readings within the System for a selected date range.
- Found Meters – Lists all MIUs that have not been associated with a premise within the System.
- Hourly Reads – Lists the hourly readings for a selected MIU for a specified reading date.
- Missed Reads – Lists all MIUs that have not received a reading for a specified read date.
- MIU Reads – Lists all readings for selected MIU within a specified timeframe.
- Non Billable – Lists all MIUs with non-numeric characters within the reading.
- Not Active – Lists all accounts within the System that are flagged as inactive.

### **Event Level Reports**

- Leak – Lists all leak events that have occurred within the System (continuous and intermittent).
- No Flow – Lists all MIUs that have reported zero consumption within a selected time frame.
- Leak Spy – Distribution leak report.
- Reverse Flow – Lists all reverse flow events that have occurred within the System (major and minor).
- Tamper – Lists all accounts for which specific tamper events have been configured within a specified time frame (reverse flow, no flow, disconnect with flow, and cut wire).

### **System Level Reports**

- District Metering Daily – Daily consumption comparison of billed versus pumped water.
- District Metering Hourly – Hourly consumption comparison of billed versus pumped water.
- Consumption – Total consumption for accounts within a specified group.
- Troubleshooting – Lists all MIUs that have never received a reading, non-billable, and past due.

### **System Status Reports**

- Audit – Lists user modification to the System where data updates have been made for a selected MIU for a specific date range.
- Priority Alert Log – Lists all accounts that have reported a priority alarm alert within a specified date range.
- Status Log – Displays the overall status (in percentage) of all MIUs with the System.

## **6.2.4 SECURITY**

- The System shall contain multi-level security login access for utility users.
- The System shall require each user to have a user ID and password in order to access the application.
- The System shall provide a method for a user to retrieve his/her password in the event the password is not available.

## **7. DATA REPOSITORY AND CUSTOMER WEB PORTAL**

The fixed network software suite includes a data repository and consumer web portal option, which is a cloud-based data management and analytics package that provides long-term data storage, web presentment for utilities and consumers, and advanced consumption analysis and reporting.

The application shall have the basic capability of supplying the following features to the end user:

### **7.1 UTILITY CUSTOMER WEB PRESENTMENT**

- The System must provide at a minimum hourly time-synchronized data to both utility users and utility customers.
- The System shall provide a method for utility's customers to view their own consumption information through a customer web portal.
- The System must provide the ability for utility's customers to view and manage multiple meters and/or multiple accounts.
- The System shall provide a method to ensure complete integration into utility's existing website to establish a consistent look and feel (header, footer, color, etc).
- The System must provide a method for utility's customers to set water budgets and a method to alert them in the event they exceed their budget.
- The System must be able to provide 15-minute interval leak and reverse flow monitoring and alerts via email to the utility's customers. These alerts can be generated by the endpoints themselves, or, if an endpoint option is not available, by the data repository system.
- The utility's customers shall be able to configure their System to receive alerts and configure the timeframe at which alerts are sent.
- The System shall provide a method of displaying and utilizing temperature and precipitation data synchronized with the consumption data in the System for data analysis purposes. This information shall also be made available to the utility's customers.
- The System shall be able to display synthesized data to the customer.
- The System shall enable users to display consumption information in both graphical and tabular formats.
- The System shall provide a method to allow the utility's customers to compare their consumption against utility-created, predefined groups.
- The System shall allow the utility's customers to set multi-level communications for leak, reverse flow, and consumption alerts.
- The System shall provide a method to export data in Adobe PDF and MS Excel formats.
- The application shall provide daily water budget analysis.
- The vendor must be able to promptly demonstrate all required and offered features of the utility customer web presentment via live onsite or remote use of the actual system if requested.

### **7.2 UTILITY DATA REPOSITORY**

- The System must be able to store up to ten (10) years of AMI data for immediate real-time access and must provide this data within the data repository, reporting, and customer web presentment environments.
- The System shall be able to display data graphically and in tabular form to both the utility's users and customers.
- The System must be able to export data in Adobe PDF and MS Excel formats.
- The data repository and web presentment application should not impact the performance of the operational AMI data collection system.
- The data repository shall have a facility to provide custom reporting and data analysis.
- The System must provide a method for the utility to load customized reports without vendor assistance.
- The System shall provide a method of performing District Metered Area (DMA) analysis.

- The System shall be able to support network meters, deduct meters, and compound meters.
- The System shall be able to store additional forms of data other than consumption data for long-term reporting and analysis purposes.
- The vendor must be able to promptly demonstrate all required and offered features of the utility data repository via live onsite or remote use of the actual system if requested.
- The application shall provide consumption analysis of daily, monthly, and yearly data.
- The application shall track weather data such as precipitation and temperature as it corresponds to the consumption data.
- The application shall provide alarm notification for events such as leaks and reverse flow events for water utility customers.
- The System shall provide a consumer web portal for utility customers to view consumption data and configure leak and/or reverse flow alerts.
- The application's web portal shall contain a customer self-enrollment process.
- The application shall be able to allow the customer the ability to configure consumption thresholds based on daily water budget values and receive alerts when that consumption has been exceeded.
- The application shall be able to deliver alerts via email.
- The application shall provide a list of standard reports.
- To address final reads, the System must support the ability to capture a midnight read from the database without the need to manually capture an on-demand reading of the MIU. This feature preserves battery life and reduces special handling.

## **8. TRAINING AND SUPPORT**

An approved, detailed training plan must be developed by the vendor with approval by the utility based on results of pre-implementation meetings. The following are items to be determined during these meetings:

- Identify the training personnel and the employees to be trained.
- Identify training schedules for hardware, software, and total system products.
- Define acceptance criteria for system deployment.

The vendor shall be responsible for fully training utility personnel in the system mapping, deployment planning, and installation of the fixed network LAN and WAN components.

## **9. SUPPORT SERVICES**

The vendor shall have a customer support department. The customer support department is required to maintain a telephone help desk and must have the capability of continuing the support through the use of a service agreement. A list of required services to be provided by the help desk includes but is not limited to the following:

- Answer and resolve hardware/operation/maintenance questions and problems.
- Answer and resolve software operation questions and problems.
- Evaluate information for updates or revisions.
- Evaluate personnel for training needs.
- Perform additional on-site training or evaluation as needed.

The help desk must be available weekdays between 8:00 a.m. and 6:00 p.m. EST with after-hours numbers available as needed.

## 10. INSTALLATION AND TRAINING

Complete installation and operating instructions will be included for all of the supplied hardware and software equipment. The training must be supplied by the System manufacturer or approved VAR. Proposal must include any additional costs for training and assistance to install and begin operation of the System. The vendor will also inform the customer of what pre-installation activities are to be completed and what support material will be needed for the initial installation.

## 11. PERFORMANCE WARRANTIES

In evaluating bid submittals, warranty coverage will be considered. The vendor shall be required to state its warranty and/or guarantee policy in writing with respect to each item of proposed equipment. The procedure for submitting warranty claims must also be provided.

As a minimum, the electronics shall be warranted for one (1) year from date of shipment for defects in material and workmanship.

## 12. SYSTEM MAINTENANCE SUPPORT

In addition to warranty periods, vendors are required to supply information on required or optional maintenance programs beyond the warranty period for both hardware and software.

Vendor must offer multiple-year maintenance contracts so the utility can take advantage of multi-year discounts. The location of and procedures for obtaining such support shall be stated. A toll-free help desk number must be provided for system support.

## 13. VENDOR QUALIFICATIONS

The qualified vendor will have a minimum of thirty (30) years' experience with meter reading systems. The selected vendor shall be thoroughly versed in encoder meter and RF AMR/AMI technology and be a major supplier in the marketplace. The proposed System shall be manufactured and maintained by the selected vendor or an equity partner.

All vendors shall document which water meter manufacturers and models with which they are capable of interrogating with the proposed meter reading equipment. A customer reference list shall be enclosed with the proposal.

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